



XLINKS MOROCCO-UK POWER PROJECT

Preliminary Environmental Information Report

Volume 2, Chapter 4: Geology, Hydrogeology and Ground Conditions



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Appendices (See Volume 2, Appendices)

Appendix Number	Appendix Title
4.1	Desk Top Study, Preliminary Risk Assessment and Site Reconnaissance

Glossary

Term	Meaning
Alverdiscott Substation	The existing National Grid Electricity Transmission substation at Alverdiscott, Devon, which comprises 400 kV and 132 kV electrical substation equipment.
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.
Aquifer	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Baseline	The status of the environment without the Proposed Development in place.
Climate change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
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.
Cumulative Effects	The combined effect of the Proposed Development in combination with the effects from other projects, on the same receptor or resource.
Development High Risk Area	Part of the coal mining reporting area which contains one or more recorded coal mining related features at surface or shallow depth.
Duration (of impact)	The time over which an impact occurs. An impact may be described as short, medium or long-term and permanent or temporary.
Effect	The term used to express the consequence of an impact. The significance of effect is determined by correlating magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Impact	Change that is caused by an action/proposed development, e.g., land clearing (action) during construction which results in habitat loss (impact).
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).
Maximum design scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Proposed Development.
Mean High Water Springs	The height of mean high water during spring tides in a year.

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Term	Meaning
Mineral Consultation Area	Areas where consultation with the Mineral Planning Authority (Devon County Council) and the minerals industry is required to ensure that future extraction of resources or operation of infrastructure is not sterilised or constrained
Mineral Safeguarding Area	Areas which reflect the surface extent of the mineral resource, quarrying planning permission, processing facility or transport infrastructure.
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023.
Onshore HVDC Cable Corridor	The proposed corridor within which the onshore High Voltage Direct Current cables will be located.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Principal Aquifer	A strategically important aquifer unit, which is designated by the Environment Agency.
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.
Secondary Aquifer	A locally important aquifer unit.
Site of Special Scientific Interest	A site designation specified and protected in the Wildlife and Countryside Act 1981. These sites are of particular scientific interest due to important biological (e.g., a rare species of fauna or flora), geological or physiological features.
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.
Toolbox talk	A short presentation to the workforce of a single aspect of health and safety.
Transboundary effects	Effects from a project within one state that affect the environment of another state(s).

Acronyms

Acronym	Meaning
AIL	Abnormal Indivisible Loads
bgl	Below Ground Level
BGS	British Geological Survey
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
DCO	Development Consent Order
Defra	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
DTS	Desk Top Study
EA	Environment Agency
EIA	Environmental Impact Assessment

Acronym	Meaning
ES	Environmental Statement
GCR	Geological Conservation Review
HDD	Horizontal Directional Drilling
LPA	Local Planning Authority
MCA	Mineral Consultation Area
MHWS	Mean High Water Springs
MSA	Mineral Safeguarding Area
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPS	National Policy Statement
On-CEMP	Onshore Construction Environmental Management Plan
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PRA	Preliminary Risk Assessment
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TFD	Tidal Flat Deposits
UXO	Unexploded Ordnance
WFD	Water Framework Directive

Units

Units	Definition
km	Kilometre
m	Metre
m ²	Square metre
m ³	Cubic metre

4 GEOLOGY, HYDROGEOLOGY AND GROUND CONDITIONS

4.1 Introduction

- 4.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary findings of the Environmental Impact Assessment (EIA) work undertaken to date for the United Kingdom (UK) elements of the Xlinks Morocco-UK Power Project. For ease of reference, the UK elements of the Xlinks Morocco-UK Power Project are referred to in this chapter as the 'Proposed Development'.
- 4.1.2 This chapter considers the potential impacts and effects of the Proposed Development on geology, hydrogeology and ground conditions during the construction, operation and maintenance and decommissioning phases. Specifically, it relates to the onshore elements of the Proposed Development landward of Mean High Water Springs (MHWS).
- 4.1.3 In particular, this PEIR chapter:
- sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation undertaken to date;
 - presents the potential environmental impacts and effects on all aspects of geology, hydrogeology and ground conditions arising from the Proposed Development, based on the information gathered and the analysis and assessments undertaken to date;
 - identifies any assumptions and limitations encountered in compiling the environmental information; and
 - highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.
- 4.1.4 This chapter draws upon information contained within Volume 2, Appendix 4.1: Desk Top Study, Preliminary Risk Assessment and Site Reconnaissance (DTS, PRA and Site Reconnaissance).
- 4.1.5 The PEIR will inform pre-application consultation. Following consultation, comments on the PEIR and any refinements in design will be reviewed and taken into account, where appropriate, in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate for development consent.

4.2 Legislative and Policy Context

Legislation

Water Resources Act 1991

- 4.2.1 The Water Resources Act 1991, as amended, principally relates to the protection of controlled water (i.e., rivers, lakes, canals and groundwater) from pollution. It sets out the responsibilities of the Environment Agency (EA) in relation to water

pollution, resource management, flood defence, fisheries and, in some areas, navigation. It also regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater.

The Environmental Protection Act 1990, as amended

- 4.2.2 The Environmental Protection Act 1990, set out a regime for prescribing limits on the release of substances to the environment. The Environmental Protection Act was amended by the Environment Act 1995 making provision for a risk-based framework for the identification, assessment and management of contaminated land within the UK. These provisions came into effect in April 2000.
- 4.2.3 Part IIA (Contaminated Land) of the Environmental Protection Act was added by the Environment Act 1995 and defines a means of identifying contaminated land for its remediation. Part IIA is implemented through the Contaminated Land (England) Regulations 2006 (as amended).
- 4.2.4 The Part IIA regime is aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk that considers the 'source-pathway-receptor' scenario (contaminant linkage). Under Part IIA, contaminated land is defined as:
- '...any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*
- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or*
- (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.'* (section 78A, Part IIA, Environmental Pollution Act).
- 4.2.5 'Significant harm' is defined according to risk-based criteria and must be the result of pollutant linkages.
- 4.2.6 A contaminant source, pathway and receptor must be present to complete the pollutant linkage and for a potentially significant risk to exist. As such, the presence of contamination in itself does not necessarily indicate a need for remedial action. Accordingly, a site can only be considered 'contaminated' when a risk to the environment or human health is present due to the presence of a 'source-pathway-receptor' linkage. In such circumstances and where there is a significant risk posed to human health and/or the environment, the Environmental Protection Act 1990 states that local planning authorities must *'ensure that remediation achieves a standard sufficient to ensure that the land no longer poses sufficient risk to qualify as contaminated land'*. This means that the approach to remediating a site is dictated by the site's proposed end use.

The Contaminated Land (England) Regulations 2006

- 4.2.7 As set out above, these regulations make provisions for a contaminated land regime, in accordance with Part IIA of the Environmental Protection Act 1990, which includes actions for the remediation of such land. These regulations (and the accompanying 2012 Contaminated Land Statutory Guidance (Department for Environment, Food and Rural Affairs (Defra), 2012)) introduced four possible grounds under which land can be classified as contaminated. These grounds are:
- significant harm is being caused to a human, or relevant non-human, receptor;

- there is a significant possibility of significant harm being caused to a human, or relevant non-human, receptor;
- significant pollution of controlled waters is being caused; and/or
- there is a significant possibility of significant pollution of controlled waters being caused.

Environmental Damage (Prevention and Remediation) (England) Regulations 2015

- 4.2.8 The aim of the Environmental Damage Regulations 2015 is to prevent and remedy damage to land, water and biodiversity.

Groundwater (England and Wales) Regulations 2009

- 4.2.9 The Groundwater Regulations 2009 transpose the provisions of the EU Groundwater Directive into law in England. Although the Directive no longer has effect in the UK, the regulations remain in place to provide a comprehensive and risk-based approach to pollution prevention, in relation to groundwater contamination.

The Water Supply (Water Quality) Regulations 2016 and 2018

- 4.2.10 The quality of public drinking water supplies in England is regulated by the Water Supply (Water Quality) Regulations 2016 and the Water Supply (Water Quality) Regulations 2018. These regulations set standards for drinking water quality. Although standards are not specified for all chemical compounds in existence, the regulations do require that, in order to be regarded as ‘wholesome’, drinking water must not contain any substance at a level which would constitute a potential danger to human health (as well as meeting the other requirements of the regulations).

Environmental Permitting (England and Wales) Regulations 2016

- 4.2.11 These regulations revoke and replace the Environmental Permitting (England and Wales) Regulations 2010 and the Groundwater (England and Wales) Regulations 2009. These regulations control groundwater pollution, including from contaminated land sources.

Water Environment (Water Framework Directive) Regulations 2017

- 4.2.12 These regulations implement the EU Water Framework Directive in England. Although the Directive no longer has effect in the UK, the regulations remain in place to control groundwater pollution.

Planning Policy Context

4.2.13 The Proposed Development will be located within the UK Exclusive Economic Zone (EEZ) offshore waters (beyond 12 nm from the English coast) and inshore waters, with the onshore infrastructure located wholly within Devon, England. As set out in Volume 1, Chapter 1: Introduction, of the PEIR, the Secretary of State for the Department for Energy Security and Net Zero has directed that elements of the Proposed Development are to be treated as development for which development consent is required under the Planning Act 2008, as amended.

National Policy Statements

- 4.2.14 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 (Department for Energy Security and Net Zero 2023a);
 - NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy Security and Net Zero 2023b); and
 - NPS for Electricity Networks Infrastructure (NPS EN-5) (Department for Energy Security and Net Zero 2023c).
- 4.2.15 **Table 4.1** sets out key aspects from the NPSs relevant to the Proposed Development, with particular reference to the need for and approach to consenting such infrastructure.

Table 4.1: Summary of relevant NPS policy

Summary of NPS requirement	How and where considered in the PEIR
NPS EN-1 (DESNZ, 2023a)	
The ES should clearly set out any effects on internationally, nationally and locally designated sites of geological conservation importance (paragraph 5.4.17 of NPS EN-1).	The effects of the Proposed Development on sites of geological conservation importance are considered in section 4.8 of this chapter.
<i>‘The applicant should show how the project has taken advantage of opportunities to conserve and enhance geological conservation interests’</i> (paragraph 5.4.19 of NPS EN-1).	Mitigation measures relating to geology, hydrogeology and ground conditions are set out in Table 4.20 of this chapter.
<i>‘For developments on previously developed land, applicants should ensure that they have considered the risk posed by contamination’</i> (paragraph 5.11.8 of NPS EN-1).	The risks posed by land contamination are considered in the assessment summarised in sections 4.8 to 4.10 of this chapter, with further details of baseline conditions provided in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR.
Development should aim to avoid significant harm to geological conservation interests, including through mitigation and consideration of reasonable alternatives; where significant harm cannot be avoided, then appropriate compensation measures should be sought (paragraph 5.4.42 of NPS EN-1).	Likely significant effects on designated sites have been taken into account in the site selection process and are considered in section 4.8 . Mitigation and design measures are outlined in Table 4.20 of this chapter. Biodiversity is considered in Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the PEIR.

Summary of NPS requirement	How and where considered in the PEIR
<p><i>'Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place'</i> (paragraph 5.11.19 of NPS EN-1).</p>	<p>There are no Mineral Safeguarding Areas (MSAs) or Mineral Consultation Areas (MCAs) within the study area and therefore this has been excluded from further assessment.</p>
<p>The ES should describe:</p> <ul style="list-style-type: none"> <i>'the existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges;</i> <i>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 Catchment Abstraction Management Strategies);</i> <i>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; and</i> <i>any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions...'</i> (paragraph 5.16.7 of NPS EN-1). 	<p>Hydrogeological resources, groundwater abstractions and Source Protection Zones (SPZs) are identified in section 4.5 of this chapter and in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR.</p> <p>Impacts in relation to Water Framework Directive water bodies are assessed in detail within Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR and Volume 2, Appendix 3.2: Preliminary Onshore Water Framework Directive Assessment of the PEIR.</p>
<p>NPS EN-3</p>	
<p>No requirements specifically applicable to geology, hydrogeology and ground conditions chapter.</p>	
<p>NPS EN-5</p>	
<p>No requirements specifically applicable to geology, hydrogeology and ground conditions chapter.</p>	

The National Planning Policy Framework

4.2.16 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019, 2021 and 2023 (Department for Levelling Up, Housing and Communities, 2023). The NPPF sets out the Government’s planning policies for England.

4.2.17 **Table 4.2** sets out a summary of the NPPF policies relevant to this chapter.

Table 4.2: Summary of NPPF requirements relevant to this chapter

Policy	Key provisions	How and where considered in the PEIR
<p>15. Conserving and Enhancing</p>	<p><i>'Planning policies and decisions should contribute to and enhance the natural and local environment by:</i></p> <ul style="list-style-type: none"> <i>protecting and enhancing sites of geological value and soils (in a manner commensurate</i> 	<p>Designated sites notified on the basis of geological, geomorphological interest are identified in Table 4.11.</p>

Policy	Key provisions	How and where considered in the PEIR
the Natural Environment	<p><i>with their statutory status or identified quality in the development plan);</i></p> <ul style="list-style-type: none"> <i>preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of pollution or land instability. Development should, wherever possible, help to improve local environmental conditions; and</i> <i>remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.’ (Paragraph 180)</i> 	<p>Potential impacts on those features identified are assessed in section 4.8 of this chapter. Mitigation and design measures are outlined in Table 4.20 of this chapter.</p>
	<p><i>‘Planning policies and decisions should ensure that:</i></p> <ul style="list-style-type: none"> <i>a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);</i> <i>after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and</i> <i>adequate site investigation information, prepared by a competent person, is available to inform these assessments.’ (Paragraph 189)</i> 	<p>Historical quarrying and mining activities and ground conditions are identified in section 4.5 of this chapter. Effects on groundwater are considered in sections 4.8 to 4.10 of this chapter. Targeted site investigation will be conducted in support of the ES.</p>
	<p><i>‘Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.’ (Paragraph 190)</i></p>	<p>Existing sources of contamination identified within the EIA process will be taken into account throughout the design process for the Development Proposal.</p>
17. Facilitating the Sustainable Use of Minerals	<p>Local planning authorities should not normally permit other development proposals in Mineral Safeguarding Areas if it might constrain potential future use for mineral working (Paragraph 218).</p>	<p>There are no MSAs within the study area and therefore this has been excluded from further assessment.</p>

4.2.18 The Planning Practice Guidance (PPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) supports the NPPF and provides guidance across a range of topic areas.

4.2.19 Paragraph 001 of the PPG in the section relating to ‘Minerals’ (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2014) confirms that minerals can only be worked where they naturally occur and therefore it is necessary to protect minerals from non-minerals development.

4.2.20 Paragraph 018 of the PPG in the section in relation to the ‘Natural environment’ (Department for Levelling Up, Housing and Communities and Ministry of Housing,

Communities and Local Government, 2016) sets out that information on geodiversity impacts and opportunities should inform all stages of development.

Local Planning Policy

4.2.21 The onshore elements of the Proposed Development are located within the administrative area of Torridge District Council. The relevant local planning policies applicable to geology, hydrogeology and ground conditions based on the extent of the study areas for this assessment are summarised in **Table 4.3**.

Table 4.3: Summary of local planning policy relevant to this chapter

Policy	Key provisions	How and where considered in the PEIR
North Devon and Torridge Local Plan 2011 - 2031		
Policy ST14: Enhancing Environmental Assets	<p><i>'The quality of northern Devon's natural environment will be protected and enhanced by ensuring that development contributes to:</i></p> <ul style="list-style-type: none"> • <i>(d) conserving northern Devon's geodiversity and its best and most versatile agricultural land;</i> • <i>(h) recognising the importance of the undeveloped coastal, estuarine and marine environments through supporting designations, plans and policies that aim to protect and enhance northern Devon's coastline;</i> • <i>(l) improving failing water bodies and preventing deterioration of water quality.'</i> 	<p>The design of the Proposed Development seeks to avoid harm to designated sites of geological interest. The approach to site selection and consideration of alternatives is set out in Volume 1, Chapter 4: Need and Alternatives of the PEIR.</p> <p>The location of nationally and regionally important sites is set out in section 4.5 of this chapter. The potential impacts to these sites of geological interest are set out in section 4.8 of this chapter.</p>
Policy DM02: Environmental Protection	<p><i>'Hazards</i></p> <ul style="list-style-type: none"> • <i>Development will be supported where it does not cause an unacceptable risk to public health and safety due to:</i> <ul style="list-style-type: none"> – <i>(a) coastal erosion or land instability;</i> – <i>(b) its siting on known or suspected contaminated land which is unsuitable for the use proposed; or</i> – <i>(c) the storage or use of hazardous substance;</i> – <i>unless taking account of appropriate remedial, preventative or precautionary measures to remove, reduce or mitigate risk to an acceptable level.</i> <p><i>Pollution</i></p> <ul style="list-style-type: none"> • <i>(2) Development will be supported where it does not result in unacceptable impacts to:</i> <ul style="list-style-type: none"> – <i>(b) pollution of surface or ground water (fresh and salt) including rivers, canals, other watercourses, water bodies, wetlands, water gathering grounds including catchment areas, aquifers, groundwater protection areas, harbours, estuaries or the sea...'</i> 	<p>Details of ground conditions are provided in section 4.5 of this chapter.</p> <p>Reported incidences of contaminated land within the study area will be further characterised and assessed within the ES. Measures to protect land from contamination during construction are defined within Table 4.20.</p>
Policy DM08: Biodiversity and Geodiversity	<p><i>'(1) Development should conserve, protect and, where possible, enhance biodiversity and geodiversity interests and soils commensurate with their status and giving appropriate weight to their importance. All development must ensure that the importance of</i></p>	<p>The location of nationally and regionally important geological sites are identified in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR. The</p>

Policy	Key provisions	How and where considered in the PEIR
	<p><i>habitats and designated sites are taken into account and consider opportunities for the creation of a local and district-wide biodiversity network of wildlife corridors which link County Wildlife Sites and other areas of biodiversity importance.</i></p> <p><u>Local Sites</u></p> <p><i>(5) Development likely to affect adversely locally designated sites, their features or their function as part of the ecological network, including County Wildlife Sites, County Geological Sites and sites supporting Biodiversity Action Plan habitats and species, will only be permitted where the need for and benefits of the development clearly outweigh the loss, and the coherence of the local ecological network is maintained.</i></p> <p><u>Avoidance, Mitigation and Compensation for Biodiversity and Geodiversity Impacts</u></p> <p><i>(8) Development should avoid adverse impact on existing features as a first principle and enable net gains by designing in biodiversity features and enhancements and opportunities for geological conservation alongside new development. Where adverse impacts are unavoidable they must be adequately and proportionately mitigated, If full mitigation cannot be provided, compensation will be required as a last resort.'</i></p>	<p>potential impacts to these sites of geological interest are set out in section 4.8 of this chapter.</p>
Devon Minerals Plan 2011 – 2031		
<p>Policy M2: Mineral Safeguarding Areas</p>	<p><i>'Mineral resources and infrastructure within the Mineral Safeguarding Areas defined on the Policies Map will be protected from sterilisation or constraint by non-mineral development within or close to those Areas by permitting such development if:</i></p> <ul style="list-style-type: none"> <i>• (a) it can be demonstrated through a Mineral Resource Assessment and in consultation with the relevant mineral operators that the mineral resource or infrastructure concerned is not of current or potential economic or heritage value; or</i> <i>• (b) the mineral resource can be extracted satisfactorily prior to the non-mineral development taking place under the provisions of Policy M3; or</i> <i>• (c) the non-mineral development is of a temporary nature and can be completed and the site restored to a condition that does not inhibit extraction or operation within the timescale that the mineral resource or infrastructure is likely to be needed; or</i> <i>• (d) there is an overriding strategic need for the non-mineral development; or</i> <i>• (e) it constitutes exempt development, as set out in the exemption criteria.'</i> 	<p>There are no MSAs or MCAs within the study area and therefore this has been excluded from further assessment.</p>

4.3 Consultation and Engagement

- 4.3.1 In January 2024, the Applicant submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction and operational phases of the Proposed Development. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Proposed Development would not have the potential to give rise to significant environmental effects in these areas.
- 4.3.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 7 March 2024. Key issues raised during the scoping process specific to geology, hydrogeology and ground conditions are listed in **Table 4.4**, together with details of how these issues have been addressed within the PEIR.

Table 4.4: Summary of scoping responses

Comment	How and where considered in the PEIR
Planning Inspectorate	
<p><i>'No direct reference is made to the potential requirement for dewatering activities in Section 4 of the Scoping Report, although it is noted that dewatering is referenced as an example activity in Table 7.4.4 and at paragraph 7.5.54 in respect of potential inter-related effects between the hydrology and flood risk chapter and hydrogeology, geology and ground conditions chapter.</i></p> <p><i>The ES should provide a full description of any such activities and present an assessment of any resulting likely significant effects, where these could arise. The Applicant's attention is directed to the comments of the Environment Agency (EA) at Appendix 2 of this Opinion with regards to dewatering and permits.'</i></p>	<p>The potential requirement of dewatering is described within Volume 1, Chapter 3: Project Description of the PEIR. The potential impact of dewatering activities on reduce groundwater quantity or quality in aquifer units is considered within section 4.8 of this chapter.</p>
<p><i>'It is unclear from the Scoping Report what potential effects on statutory designated sites are to be included in the impact assessment. The Inspectorate notes the statement that the Proposed Development would not directly affect the Torridge Estuary SSSI/LNR and would avoid its primary estuarine habitats by drilling under using HDD. At present there is no information in the Scoping Report to confirm the likely proximity of construction activity to the designated sites and their interest features, such as the likely location of HDD exit/entry points, compounds, and haul roads.</i></p> <p><i>The SSSI and LNR are designated for their important estuarine habitats, plants and bird species. The Inspectorate considers there is the potential for likely significant effects during construction (and decommissioning) to these sites and their features from potential changes to air quality, including dust deposition, changes to water quality, including proximity of HDD and accidental release of drilling fluids such as bentonite, and disturbance to species. The ES should include an assessment of such impacts to designated sites and features, where likely effects could occur.'</i></p>	<p>Deterioration of water quality is discussed within section 4.8, section 4.9 and section 4.10, and groundwater dependent receptors are discussed within section 4.8 and section 4.10.</p>
<p><i>'The Inspectorate advises that, in addition to the receptors identified in the Scoping Report, the ES should identify, describe and assess any likely significant effects to the following receptors:</i></p>	<p>Data regarding permitted sites, discharges and abstractions are provided in section 4.5.</p>

Comment	How and where considered in the PEIR
<ul style="list-style-type: none"> • <i>Westward Ho! designated bathing water;</i> • <i>Permitted sites, discharges and/ or abstractions, reflecting data available from the EA’s public register;</i> • <i>Jennetts Reservoir and Gammaton Lower Reservoir, in terms of their designated nitrate vulnerable zones; and Torridge Estuary designated shellfish water (refer to the Inspectorate’s comments at ID 3.10.7 of this Opinion). The Applicant’s attention is drawn to the comments of the EA (Appendix 2 of this Scoping Opinion).’</i> 	<p>Further consideration of impacts in relation to surface waters is provided in Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR. Details of effects on ecological receptors are considered in Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the PEIR.</p>
<p><i>‘The ES should describe the measures proposed to deal with UXO encountered during construction and confirm how the measures would be secured through the DCO.’</i></p>	<p>Impact resulting from contact with UXO is discussed in section 4.8. Mitigation measures are presented in Table 4.20.</p>
<p><i>‘The study area should include the nearshore area and be of sufficient extent to enable an assessment of all likely significant effects arising from ground conditions and contamination, including where this extends into the offshore area. Effort should be made to agree the final study area with relevant consultation bodies.’</i></p>	<p>The study area is provided within sections 4.4.11 to 4.4.14.</p>
<p><i>‘The Scoping Report states that additional surveys are proposed in 2024 to supplement an intrusive survey of the proposed converter station site in 2023. No information is presented about the proposed location and scope of the planned surveys. The Inspectorate advises that survey effort should be designed to provide sufficient information to inform an understanding of the baseline to enable assessment in the ES. Effort should be made to agree survey location and scope with relevant consultation bodies. The Inspectorate understands from information presented in Table 7.5.4 that a survey is to be undertaken where HDD is proposed at the landfall location within Mermaid’s Pool to Rowden Gut SSSI to inform design/ construction techniques. The findings of the survey should be reported in the ES.’</i></p>	<p>Section 4.15 of this chapter states that intrusive ground investigations will be undertaken for engineering and environmental purposes. Survey location and scope will be agreed with relevant consultees. Further ground investigations as mitigation will be detailed within the Onshore Construction Environmental Management Plan (On-CEMP), as stated within Table 4.20.</p>
<p><i>‘For the avoidance of doubt, the Inspectorate considers that reference to controlled water receptors to be considered in the assessment includes WFD groundwater bodies within the study area. The ES should consider whether the construction and/ or decommissioning of the Proposed Development could negatively impact the status of any groundwater bodies protected under the WFD. The results of the WFD Assessment should inform the ES.’</i></p>	<p>The impact to controlled water receptors is provided in section 4.8, section 4.9 and section 4.10. The Water Framework Directive (WFD) Assessment is provided in Volume 2, Appendix 3.2: Preliminary Onshore Water Framework Directive Assessment of the PEIR.</p>
<p><i>‘The Inspectorate notes the reference to the desk-based assessment, including a conceptual site model (CSM) and preliminary risk assessment (PRA). The Applicant should seek to agree the approach to the assessment, including the CSM and PRA with relevant consultation bodies, including the EA and Local Authority.’</i></p>	<p>The conceptual site model (CSM) and preliminary risk assessment (PRA) are provided within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR.</p>
<p><i>‘The Scoping Report states that inter-related effects will be considered in this chapter of the ES, including in relation to potential for a reduction in groundwater levels to impact on flow of surface watercourses. It is not apparent from the Scoping Report where this would be considered and presented. The ES must include an assessment of any likely significant effects on groundwater flow arising from the Proposed Development. Any proposed mitigation and monitoring with regards to groundwater flow effects must be clearly described in the ES, including likely</i></p>	<p>Assessment of reduced groundwater quantity in aquifer units is provided in section 4.8, section 4.9 and section 4.10. Inter-related effects are presented within Volume 4, Chapter 5: Inter-related Effects of the PEIR. Mitigation measures are presented in Table 4.20.</p>

Comment	How and where considered in the PEIR
<p>efficacy. Mitigation and monitoring measures should be appropriately secured.'</p>	
<p>'Table 7.5.3 of the Scoping Report states that the British Geological Survey (BGS) ground stability hazard ratings identify a moderate landslide risk at the valley slides of River Torridge. Paragraph 7.5.30 states there is moderate [risk] rating for compressible ground and uneven settlement at the river crossing. It is unclear whether the Proposed Development would require activities that could result in ground stability hazard and potential likely significant effects. The ES should include an assessment of any likely significant effects and, where relevant, describe any mitigation required and how this would be secured.'</p>	<p>Ground stability is discussed within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR. It is referenced within section 4.5 and mitigation measures are provided in Table 4.20.</p>
<p>'For the avoidance of doubt, the assessment should include consideration of any likely significant effects arising from exploratory cores into the rock on the foreshore as part of geological investigation prior to HDD, where such investigation is proposed.'</p>	<p>The impact of damage to Mermaid's Pool to Rowden Gut SSSI is provided in section 4.8.</p>
<p>Environment Agency</p>	
<p>'The River Basin Management Plan cites groundwater pollution as a concern; therefore the applicant should take particular care with regards to enacting pollution prevention measures.'</p>	<p>An Outline Pollution Prevention Plan (PPP) and Onshore Decommissioning Plan will be developed as detailed within Table 4.20.</p>
<p>'The scoping report confirms that the applicant will produce a Construction Environmental Management Plan (CEMP) to reduce the risk of potential effects on water quality during construction. Large construction sites often cause pollution due to the production of an insufficient CEMP or the failure of contractors to follow the CEMP. To reduce this risk, the EA recommends ensuring that the CEMP includes pollution prevention measures that can withstand significant heavy rainfall events. Additionally, we recommend the inclusion of monitoring, reporting, and reviewing procedures to ensure the project team and principal contractor have sufficient oversight of the contractors that they employ.'</p>	<p>An On-CEMP would be developed in accordance with the Outline On-CEMP (see Volume 1, Appendix 3.2). For ES, the Outline On-CEMP will incorporate an Outline PPP that details measures to ensure the effective management of pollution.</p>
<p>'Horizontal directional drilling (HDD) may be used to aid installation of the cables. This could involve the use of drilling muds and their use may require risk assessment to ensure they do not pose a risk to controlled waters. This is important within the Secondary A aquifer and any other groundwater receptors that may be identified during the next stage of assessment (for example, private water supplies). The proposed use of directional drilling techniques should therefore be included in the CEMP.'</p>	<p>To be included within the On-CEMP as detailed within the Table 4.20.</p>
<p>Natural England</p>	
<p>'The development site is within or may impact on the following Sites of Special Scientific Interest:</p> <ul style="list-style-type: none"> • Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI) • Taw Torridge Estuary SSSI • Lundy SSSI <p>The Environmental Statement should include a full assessment of the direct and indirect effects of the development on the features of special interest within the SSSI and identify appropriate</p>	<p>Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI) falls within the study area of this Chapter. The impact of damage to Mermaid's Pool to Rowden Gut SSSI is provided in section 4.8.</p>

Comment	How and where considered in the PEIR
<i>mitigation measures to avoid, minimise or reduce any adverse significant effects.'</i>	

4.3.3 Following scoping, consultation and engagement with interested parties specific to geology, hydrogeology and ground conditions (including the Environment Agency, Devon County Council and Torridge District Council) will continue based on the Scoping Opinion response from the Planning Inspectorate.

4.4 Methodology

- 4.4.1 The baseline methodology adopted for this chapter of the PEIR is primarily based on a desk-based review of relevant available information. This desk-based review is underpinned by the information and assessments provided in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR.
- 4.4.2 Geological conditions have been determined from mapped British Geological Survey (BGS) data. This has been augmented with local geological records provided by the BGS. Regionally important and locally important geological and geomorphological sites have been identified, where present.
- 4.4.3 Aquifer units in the bedrock geology and superficial deposits have been identified from information provided by the Environment Agency. WFD waterbodies (groundwater and surface water) have been identified and their status determined. Groundwater dependent receptors have then been identified through a review of Ordnance Survey mapping and consultation. These include groundwater abstractions (licensed sources and private water supplies); groundwater SPZs; and groundwater dependent ecological sites, such as watercourses, pond, lakes and springs.
- 4.4.4 Ground conditions have been identified using the information provided in a Groundsure Enviro-Geo Insights report. Features detailed within the Groundsure Enviro-Geo Insights report relevant to geology, hydrogeology and ground conditions include:
- past land use;
 - waste and landfill sites;
 - current industrial land use;
 - hydrogeology (including aquifers, groundwater abstractions and source protection zones);
 - groundwater flooding;
 - environmental designations;
 - geology 1:10,000 scale;
 - geology 1:50,000 scale;
 - boreholes;
 - natural ground subsidence; and
 - mining, ground workings and natural cavities.
- 4.4.5 A qualitative ground condition constraints assessment has been undertaken to evaluate this data.

Relevant Guidance

- 4.4.6 Relevant guidance used to inform this chapter includes the following.
- The Environment Agency’s approach to groundwater protection, version 1.2 (Environment Agency, 2018).

- Construction Industry Research and Information Association (CIRIA) Document C649: Control of water pollution from linear construction projects. Site guide (CIRIA, 2006a).
- CIRIA Document C648: Control of water pollution from linear construction projects. Technical guidance (CIRIA, 2006b).
- CIRIA Document C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings (CIRIA, 2007).
- Defra Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012).
- CIRIA Document C552 – Contaminated Land Risk Assessment: A Guide to Good Practice (CIRIA, 2001a).
- CIRIA Document C532 – Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors (CIRIA, 2001b).
- Land Contamination: Risk Management (LCRM) (Environment Agency, 2020).

Scope of the Assessment

4.4.7 The scope of this PEIR has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **Table 4.4**.

4.4.8 Taking into account the scoping and consultation process, **Table 4.5** summarises the issues considered as part of this assessment. Additional impacts associated with specific construction activities i.e. dewatering, foundations and construction techniques (namely Horizontal Directional Drilling) are assessed in terms of their potential to reduce groundwater quantity or quality in aquifer units. Furthermore changes in groundwater levels, flow or quality on groundwater dependent sites are referenced (includes both surface water and ecological receptors).

Table 4.5: Issues considered within this assessment

Activity	Potential effects scoped into the assessment
Construction Phase	
Construction of the onshore and intertidal elements of the Proposed Development, including excavation of cable trenches, Horizontal Directional Drilling (HDD) or equivalent trenchless technique and construction of converter station and substation foundations.	The impact of partial or total loss of or damage to designated geological sites.
	The impact of mobilisation of existing areas of contamination causing a deterioration of groundwater quality in underlying aquifer units.
	The impact of reduced groundwater quantity or quality in aquifer units and change in groundwater resources status.
	The impact of existing ground contamination on human receptors.
	The impact of a deterioration in groundwater quality through the accidental spillage/release of potentially polluting substances.
	The impact of changes in groundwater levels, flow or quality on other sensitive groundwater dependent sites, including surface waters fed by groundwater.

Activity	Potential effects scoped into the assessment
	The impacts resulting from contact with Unexploded Ordnance (UXO). Potential for injury to occur during construction activities if UXO is encountered.
Operation and Maintenance Phase	
Operation of the onshore and intertidal elements of the Proposed Development, including access for maintenance. Permanent management of drainage and runoff from the Converter Site and Alverdiscott Substation Connection Development.	The impact of mobilisation of existing areas of contamination causing a deterioration of groundwater quality in underlying aquifer units.
	The impact of existing contamination to human receptors.
	The impact of heat generated by the onshore HVDC Cables on groundwater quality, during the operation and maintenance phase.
Decommissioning Phase	
Decommissioning of the onshore and intertidal elements of the Proposed Development, including removal and decommissioning activity.	The impact of mobilisation of existing areas of contamination causing a deterioration of groundwater quality in underlying aquifer units.
	The impact of reduced groundwater quantity or quality in aquifer units and change in groundwater resources status.
	The impact of existing ground contamination to human receptors.
	The impact of a deterioration in groundwater quality through the accidental spillage/release of potentially polluting substances.
	The impact of changes in groundwater levels, flow or quality on other sensitive groundwater dependent sites, including surface waters fed by groundwater.

4.4.9 Effects that are not considered likely to be significant have been scoped out of the assessment. A summary of the effects scoped out is presented in **Table 4.6**.

4.4.10 For clarity, based on the findings of the desk study and preliminary risk assessment presented within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR, impacts associated with mining are scoped out in addition to the ground gas migration exposure pathway when considering the impact of ground contamination on human (end use) receptors.

Table 4.6: Issues scoped out of the assessment

Potential Impact	Potential effects scoped out of the assessment
Construction Phase	
Impact from historical mining activities	<p>The area of a construction compound is indicated to be at potential risk of underground mining, with a conjectured location of a coal (culm) seam present at outcrop in both areas. Whilst a detailed coal mining risk assessment is not considered a requirement with underground conditions not likely to be difficult, it is recommended that a visual inspection of the area around the identified outcrop is undertaken as part of the ground investigation by a suitably qualified and experienced person to identify any currently identifiable mining related settlement or subsidence effects.</p> <p>The north of the construction compound area, part of the converter station, and Alverdiscott Substation Site are classed</p>

Potential Impact	Potential effects scoped out of the assessment
	as areas with potential for restricted sporadic non-coal mining, however there is no historical map evidence to indicate that any historical mining activities have occurred and the risk presented by non-coal mining is considered to be low.
The impact of ground contamination on construction workers	It is expected that any relevant pollutant linkages will be managed by appropriate health and safety measures. As construction workers are protected under existing health and safety legislation, any potential effects will be avoided, prevented and reduced through the implementation of standard mitigation measures (including personal protective equipment, training and toolbox talks) as included in a On-CEMP. Work will be carried out in accordance with relevant Construction Design Management (CDM) Regulations 2015.*
The impact of Abnormal Indivisible Loads (AIL) routes on ground conditions receptors.	The groundworks associated with the AIL routes are of limited extent entailing minimal ground disturbance. These works can be mitigated through adoption of the mitigation measures provided as part of this chapter specifically implementation of the Discovery Strategy and On-CEMP.
Operation and Maintenance	
The impact of ground contamination on human receptors (inhalation of ground gas exposure pathway).	Ground gas has the potential to be generated from areas of Made Ground/landfills on or off site as well as any peat and other organic materials within the Alluvium/Tidal Flat Deposits and accumulate within buildings. No significant ground gas sources have been identified in relation to the substations which will be unmanned (restricted to maintenance checks only).
The impact of the Proposed Development on Mineral Resources	Sterilisation of safeguarded mineral resources. There are no MSAs or MCAs within the study area and therefore this has been scoped out from further assessment.
The impact of a deterioration in groundwater quality through the accidental spillage/release of potentially polluting substances.	The drainage strategy, which is detailed within Volume 2, Chapter 3: Hydrology and Flood Risk, will include pollution protection measures to avoid the deterioration of groundwater and surface water quality at the Converter Site and Alverdiscott Substation Connection Development. Therefore, this has been scoped out from further assessment.

Note *Though potential impacts of ground contamination on construction workers are scoped out, an assessment is presented within the PEIR cross referencing applicable potential contamination sources.

Study Area

- 4.4.11 Where data was requested from third parties, this was requested for a 1 km buffer around the Onshore Infrastructure Area (landward of MHWS) at the time of the data request. For some data sets, data was provided within an area of up to 2 km (i.e., 1 km beyond the study area).
- 4.4.12 The data request was based on the Order Limits for the Proposed Development (landward of MHWS) at the time of the request. The 1 km buffer around the Order Limits was included to provide a study area that would take account of interests or constraints that may occur adjacent or close to the Proposed Development and to allow for evolution of the boundary.
- 4.4.13 As a result of the iterative site selection process, the Proposed Development that is subject to the PEIR varies in some places from the Order Limits used to inform the desk study.

4.4.14 The area used for the desk study (and therefore the data available to inform the assessment) has formed the basis of the study area for the PEIR which includes all elements of the Proposed Development above MHWS where construction, operation and maintenance and decommissioning activity will occur (i.e., all parts of the Onshore Infrastructure Area, as described in Volume 1, Chapter 3: Project description) with a 250 m buffer (excluding the AIL routes). This distance has been selected based upon professional judgement. It enables the identification on both on-site (within the Order Limits) and off-site sources (outside the Order Limits) of potential contamination and other factors which may influence ground conditions. This will be reviewed at ES stage following PEIR consultation and receipt of any new information. The Onshore Infrastructure Area is shown on Figure 1.2 (see Volume 1, Figures of the PEIR).

Methodology for Baseline Studies

Desk Study

4.4.15 The baseline environment for geology, hydrogeology and ground conditions has been principally defined through a desk study that has considered the following.

- Publicly available data sources available from the following organisations:
 - BGS;
 - Environment Agency;
 - Devon County Council; and
 - Torridge District Council.
- Information contained in a Groundsure Insights report. That report includes:
 - general information regarding geological, hydrogeological and hydrological setting;
 - groundwater abstraction licences;
 - current and historical landfill sites;
 - current and historical waste sites;
 - pollution incidents;
 - discharge consents;
 - current and historical land-use;
 - mining and ground working areas (coal and non-mining); and
 - geotechnical constraints.
- Spatial information regarding ground conditions within the study area taken from Groundsure Insights bespoke geographic information systems data.
- Historical Ordnance Survey mapping and aerial photography.

4.4.16 In terms of land contamination, a Preliminary Risk Assessment (PRA), within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR, has been undertaken using the above information. The PRA consists of an appraisal of the source-pathway-receptor 'contaminant linkages', which is central to the approach used to determine the existence of 'Contaminated Land' as defined in Part 2A of the Environmental Protection Act 1990. For a risk to exist (under Part

2A), all three of the following components must be present to facilitate a potential 'contaminant linkage'.

- Source of contamination (e.g., primary sources - leaking above ground storage tanks; secondary sources - free phase product (typically hydrocarbon contamination present as a discrete product rather than mixed with soil or water) within the ground or soil/groundwater migration).
- Receptor (living organisms, ecological systems or property which may be harmed, e.g., end users of site, groundwater, surface water and fauna and flora).
- Pathway (a route or means by which a receptor can be exposed to or affected by a contaminant) i.e., Target mechanism between the source and receptor (e.g., gas/liquid migration through permeable strata).

4.4.17 The mere presence of a contaminant source does not mean that there will necessarily be attendant risks requiring remedial action or that the site will be designated as 'Contaminated Land'.

Site-Specific Surveys

4.4.18 A targeted site walkover was undertaken in January 2023 by an RPS environmental consultant. The purpose of the walkover was to ground truth the historical information, identifying possible sources of contamination and to identify any additional existing sources of potential contamination. The findings of the walkover are presented within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR.

4.4.19 Additionally, an intrusive ground investigation was undertaken by RPS on the Converter Site in February 2023 in order to provide information for geotechnical design purposes. The findings of this have also been considered in determining the baseline conditions for the Converter Site section of the Proposed Development Draft Order Limits.

Impact Assessment Methodology

Overview

4.4.20 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges (DMRB) methodology (Highways England *et al.*, 2020).

4.4.21 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: EIA Methodology.

Receptor Sensitivity/Value

4.4.22 The criteria for defining sensitivity in this chapter are outlined in **Table 4.7** below.

Table 4.7: Sensitivity criteria

Sensitivity	Definition
Very High	<p>Very high importance and rarity, international scale and very limited potential for substitution.</p> <p><u>Geology</u> UNESCO World Heritage Sites, UNESCO Global Geoparks and Geological Conservation Review (GCR) where citations indicate features of international importance. Geology meeting international designation citation criteria which is not designated as such.</p> <p><u>Hydrogeology</u> Principal aquifer providing a nationally important water resource and/or supporting a groundwater dependant site protected under international/EC legislation. Groundwater within an inner source protection zone (SPZ1).</p> <p><u>Contamination: Human health</u> Very high sensitivity land use such as residential or allotments.</p>
High	<p>High importance and rarity, national scale and limited potential for substitution.</p> <p><u>Geology</u> Geological site of national importance (e.g., GCR or Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR)). Geology meeting national designation citation criteria which is not designated as such.</p> <p><u>Hydrogeology</u> Principal aquifer providing locally important water resource and/or supporting a groundwater dependent site of national importance or a river ecosystem. Groundwater supports a Groundwater Dependent Terrestrial Ecosystem defined for the WFD. Groundwater within an outer source protection zone (SPZ2).</p> <p><u>Human health</u> High sensitivity land use such as public open space.</p>
Medium	<p>High or medium importance and rarity, regional scale, limited potential for substitution.</p> <p><u>Geology</u> Geological site of regional importance (e.g., LGS, LNR). Geology meeting regional designation citation criteria which is not designated as such.</p> <p><u>Hydrogeology</u> Secondary aquifer unit providing a locally important water resource and/or groundwater dependent features or sites of local importance. Groundwater within the total catchment source protection zone (SPZ3).</p> <p><u>Human health</u> Medium sensitivity land use such as commercial or industrial.</p>
Low	<p>Low or medium importance and rarity, local scale.</p> <p><u>Geology</u> Non-designated geological features of local interest (e.g., non-designated geological exposure, former quarries/mining sites, cuttings etc).</p> <p><u>Hydrogeology</u> Secondary aquifer unit of providing water resource of limited local importance with little connection to surface water.</p> <p><u>Human health</u> Low sensitivity land use such as highways and rail.</p>

Sensitivity	Definition
Negligible	<p>Very low importance and rarity, local scale.</p> <p><u>Geology</u> No geological exposures, little/no local interest.</p> <p><u>Hydrogeology</u> Unproductive strata.</p> <p><u>Human health</u> Undeveloped surplus land/no sensitive land use proposed.</p>

Magnitude of Impact

4.4.23 The criteria for defining magnitude in this chapter are outlined in **Table 4.8** below.

Table 4.8: Impact magnitude criteria

Magnitude of impact	Definition
High	<p>Adverse</p> <p><u>Geology</u> A large change from baseline conditions, that results in the large-scale loss or deterioration in condition of the geological feature, site or resource affected. The impact is typically of wide spatial extent, permanent duration and irreversible.</p> <p><u>Hydrogeology</u> A large change from baseline conditions in an aquifer unit, that results in severe deterioration of groundwater quality, groundwater levels, groundwater flow and/or resource utility, for example.</p> <ul style="list-style-type: none"> • A deterioration in overall WFD status for a groundwater body. • Rendering the groundwater in an aquifer unit non-potable through the introduction of hazardous substances into groundwater, failure against prescribed concentrations for pollutants (i.e., statutory Drinking Water Standards), or reduction in resource availability. • Rendering existing groundwater sources of supply (borehole, well or spring) non-viable. • Cause a large impact on groundwater dependent watercourse in terms of flow, overall WFD status of the water body or failure against statutory Environmental Quality Standards. • Cause statutory monitoring targets for ecological sites to be failed. • These impacts are likely to be of wide spatial extent, of permanent duration and of low reversibility. <p><u>Human health</u> Significant contamination identified. Contamination levels significantly exceed background levels and relevant screening with potential for significant harm to human health. Contamination heavily restricts future use of land.</p>
	<p>Beneficial</p> <p><u>Geology</u> A large change from baseline conditions, that results in major improvement in the condition of the geological feature or site affected. The impact will be of wide extent and permanent in nature.</p> <p><u>Hydrogeology</u> A large change from baseline conditions in an aquifer unit, that results in significant improvement in groundwater quality, groundwater levels, groundwater flow and/or resource utility, for example.</p> <ul style="list-style-type: none"> • An improvement in the overall WFD status for a groundwater body. • Rendering a previously contaminated aquifer potable or increasing resource availability.

Magnitude of impact		Definition
		<ul style="list-style-type: none"> • Rendering existing groundwater sources of supply viable. • Cause a large beneficial impact on a groundwater dependent receptor (e.g., watercourse in terms of flow, or water quality, or WFD status; achieving statutory monitoring targets for ecological site) (Environment Agency, 2022). <p>These impacts are likely to be of wide spatial extent and of permanent duration.</p>
Medium	Adverse	<p><u>Geology</u> A moderate change from baseline conditions, that results in the loss or deterioration in condition of part of the geological feature, site or resource affected. The impact is typically of local to wide spatial extent, moderate to long duration and of low reversibility.</p> <p><u>Hydrogeology</u> A moderate change from baseline conditions in an aquifer unit, that results in the deterioration of groundwater quality, groundwater levels, groundwater flow and/or resource utility, for example.</p> <ul style="list-style-type: none"> • A deterioration in WFD criteria for certain parameters, although the overall WFD status may not change. • A deterioration in groundwater quality in an aquifer and/or possible failure against certain prescribed concentrations (i.e., statutory Drinking Water Standards). • Deterioration in quality, quantity, or reliability of groundwater source of supply (borehole, well or spring). • Cause a moderate impact on groundwater dependent watercourse in terms of flows, or WFD status or failure relative to statutory Environmental Quality Standards. • Cause statutory monitoring targets for ecological site to be failed. <p>These impacts are likely to be of local to wide spatial extent, or of moderate to long duration and/or of low reversibility.</p> <p><u>Human health</u> Contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria. Significant contamination can be present. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use.</p>
	Beneficial	<p><u>Geology</u> A moderate change from baseline conditions, that results in improvement in the condition of part of the geological feature or site affected. The impact is typically of local to wide spatial extent, moderate to long duration and of low reversibility.</p> <p><u>Hydrogeology</u> A moderate change from baseline conditions in an aquifer unit, that results in the improvement in groundwater quality, groundwater levels, groundwater flow and/or resource utility. These impacts are likely to be of local to wide spatial extent, of moderate to long duration.</p>
Low	Adverse	<p><u>Geology</u> Some measurable change from baseline conditions, that results in a small deterioration in condition of part of the geological feature, site or resource affected. The impact is typically of limited spatial extent and may be of short duration and/or reversible.</p> <p><u>Hydrogeology</u> Some measurable change from baseline condition, that results in a small deterioration of groundwater quality, groundwater levels, groundwater flow and/or resource utility but does not change its regulatory status (e.g.,</p>

Magnitude of impact		Definition
		<p>overall WFD status) or utility of resource given the impacts are small, likely to be of limited spatial extent, or of short duration and/or reversible.</p> <p><u>Human health</u> Contaminant concentrations are below relevant screening criteria, Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health.</p>
	Beneficial	<p><u>Geology</u> Some measurable change from baseline conditions, that results in a small improvement in condition of part of the geological feature, site or resource affected. The impact is typically of limited spatial extent and may be of short duration and/or reversible.</p> <p><u>Hydrogeology</u> Some measurable change from baseline condition, that results in a small improvement of groundwater quality, groundwater levels, groundwater flow and/or resource utility. This may result in measurable effects on groundwater dependent receptors. These impacts are likely to be of limited spatial extent, or short duration and/or reversible.</p>
Negligible	Adverse	<p><u>Geology</u> A small measurable change from baseline conditions, but no material change to the status or condition of the geological feature, site or resource affected.</p> <p><u>Hydrogeology</u> A small measurable change from baseline condition, but no change in the status of groundwater quality, quantity or flow within the aquifer unit affected or its utility.</p> <p>A small measurable change from baseline condition, but no change in the status of groundwater dependent receptor affected (e.g., river, stream, borehole, well, spring or wetland) and their utility.</p> <p>Very minor benefit to, or positive addition of one or more characteristics, features or elements.</p> <p><u>Human health</u> Contaminant concentrations substantially below levels outlined in relevant screening criteria. No requirement for control measures to reduce risks to human health/make land suitable for intended use.</p>
	Beneficial	No change from baseline conditions. No measurable impact either adverse or beneficial.

Significance of Effect

- 4.4.24 The significance of the effect upon geology, hydrogeology and ground conditions has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in **Table 4.9**. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.
- 4.4.25 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.
- 4.4.26 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations.

Table 4.9: Assessment matrix

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

4.4.27 Where the magnitude of impact is ‘no change’, no effect would arise.

4.4.28 The definitions for significance of effect levels are described as follows.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
- Moderate: These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- No change: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assumptions and Limitations of the Assessment

4.4.29 The assessment of effects has been determined primarily from a desk-based review of available information. The assessment will be revisited for the ES where site-specific geology, hydrogeology and ground conditions information is gathered for the process of detailed design.

4.5 Baseline Environment

Desk Study

4.5.1 Information on geology, hydrogeology and ground conditions within the study area was collected through a detailed review of existing studies and datasets. These are summarised at **Table 4.10**.

Table 4.10: Summary of desk study sources used

Title	Source	Year	Author
GeoIndex Onshore	BGS Map Viewers	-	BGS
Sheet 292 and part of 275, 276, 291 and 308: Bideford and Lundy Island (Bedrock and Superficial), 1:50,000 Scale.	BGS Map Viewers	1977	BGS
Geology of Bideford and Lundy Island. Memoir for 1:50,000 geological sheet, New Series, with sheets 275, 276, 291 and part of sheet 308	BGS Memoir Portal	1979	BGS (Edmonds <i>et al.</i> 1979)
Protected Sites (Sites of Scientific Interest, Special Areas of Conservation)	Magic Maps; and Groundsure Enviro-Geo Insights Report	-	Defra and Groundsure
Geological Conservation Review (GCR) sites	Geological Conservation Review. CSV Database	-	Joint Nature Conservation Committee
Aquifer designation – Bedrock and Superficial Deposits; Groundwater vulnerability; Groundwater safeguard zones Source Protection Zones.	Magic Maps	-	Defra
Source Protection Zones	Magic Maps and Data Services Portal	-	Defra
Mineral Safeguarding Areas	Devon Minerals Plan Policies Map ¹	-	Devon County Council
Mineral Consultation Areas	Devon County Council Open Data ²	-	Devon County Council
WFD groundwater bodies (Cycle 3 – 2019)	Catchment Data Explorer	-	Environment Agency
Groundwater and surface water quality	Water Quality Archive	-	Defra
Main Rivers in Wales	Statutory Main River Map	-	Environment Agency
Groundsure Enviro-Insights Report including historical maps	Groundsure	2023	Produced by Groundsure based on dataset sets relevant to the Environment and Ground Conditions.

Identification of designated sites

4.5.2 All designated sites within the study area and qualifying interest features that could be affected by the construction, and operation and maintenance phases of the Proposed Development are set out in **Table 4.11**.

¹ <http://map.devon.gov.uk/dccviewer/DevonMineralsPlanPoliciesMap/>

² <http://data-dcc.opendata.arcgis.com/datasets?t=mineral>

Table 4.11: Designated sites and relevant qualifying interests

Designated Site	Approximate Distance to the Proposed Development Draft Order Limits	Relevant Qualifying Interest
Pixey Copse - Designated Ancient Woodland	215 m east	Ancient and Semi-Natural Woodland.
Upcott Wood - Designated Ancient Woodland	269 m north west	Ancient and Semi-Natural Woodland.
Heale Wood - Designated Ancient Woodland	458 m south west	Ancient and Semi-Natural Woodland.
Pillmouth Wood - Designated Ancient Woodland	497 m south	Ancient and Semi-Natural Woodland.
Kynoch's Foreshore – Local Nature Reserve	On Site	Area of saltmarsh and mudflats managed for nature conservation, education, and research.
North Devon – Biosphere Reserve	On Site	Centred at Braunton Burrows sand dune system (largest sand dune system in England).
Mermaids Pool to Rowden Gut (Site of Special Scientific Interest)	On Site	Geology: Exposes the complete sequence available through the Bideford Formation, a localised development of fluvio-lacustrine (Coal Measure) type deposits.

Hydrology

- 4.5.3 There are multiple watercourses located within 500 m of the Proposed Development which are classified within a River Basin Management Plan published by the EA under the European Water Framework Directive (2000). These include Horwood Stream, Gammaton Upper and Lower Reservoir, Lower River Yeo, River Torridge, Jennet's Reservoir and Kenwith Stream.
- 4.5.4 A coastal water body namely Barnstaple Bay is located adjacent to the landfall area.
- 4.5.5 Information provided by the EA indicates that there is one record of an active licensed surface water abstractions within 500 m of the Proposed Development. The details of these are as follows in **Table 4.12**.

Table 4.12: Licensed surface water abstractions

Licence Holder	Approximate Distance (m) and Direction from the Proposed Development	Source	Volume (m ³)	Use
A C Withecombe & Son (Licence no. SW/050/0007/024)	179 south	Surface Water, Fresh - Unnamed Pond at Bideford	Maximum daily: 137 Annual: 50,000	General Farming & Domestic

4.5.6 The above abstraction relates to an unnamed pond which is located on a small stream which flows northwards to Jennets reservoir and therefore upstream of the Proposed Development.

Geology

4.5.7 The geology of the study area is dominated by a thick sequence of Carboniferous bedrock. The regional geological sequence is summarised in **Table 4.13**.

Superficial Deposits

4.5.8 Surface superficial deposits within the Proposed Development Draft Order Limits are limited to areas either side of the River Torridge and comprise:

- Alluvium;
- River (Torridge) Terrace Deposits (RTD) (overlain by Alluvium); and
- Tidal Flat Deposits (TFD)

4.5.9 The Alluvium consists of a variable assemblage of clay, silt, sand and gravel, the RTD predominantly silty clay with scattered rounded sandstone clasts and the TFD typically consists of unconsolidated clay, silt and sand deposits.

Bedrock Geology

4.5.10 The general stratigraphic sequence of bedrock beneath the Proposed Development is provided in **Table 4.13**.

Table 4.13: Description of geological strata

Strata	Description	Approximate Thickness (m)
Bude Formation - sandstone – (located along southern Order Limits)	Grey thick-bedded, somewhat argillaceous and silty sandstones, in laterally discontinuous internally massive beds 1 to 5 m thick and commonly amalgamated into units up to 10 m thick.	1,290
Bude Formation (mudstone and siltstone)	At the base of the formation there are approximately 100 m of grey mudstones and siltstones with two thin anthracitic coals (culm) above the cross-bedded thick-bedded Cornborough Sandstone that caps the underlying Bideford Formation.	100
Bideford Formation (sandstone)	Thick bedded sandstones.	1220 +
Bideford Formation (mudstone and siltstone)	Mudstones with thin/medium bedded sandstones and siltstones, with thick bedded sandstone.	1220 +
Crackington Formation (encompasses northern section of area 10)	Bedded dark blue-grey mudstones and grey siltstones.	250

Hydrogeology

4.5.11 EA data including Groundwater Vulnerability mapping (1:100,000 scale) indicates the following Superficial aquifer classification for areas of the Proposed Development as follows in **Table 4.14**.

Table 4.14: Superficial aquifer classification

Aquifer Classification	Description
Secondary A – Alluvium Deposits and Torridge RTD	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.
Secondary Undifferentiated - TFD	Assigned where it is not possible to attribute either category A or B to a rock type. These layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

- 4.5.12 These superficial aquifers are described as having high or medium groundwater vulnerability.
- High: Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
 - Medium: Intermediate between high and low vulnerability.
- 4.5.13 The underlying bedrock is designated a Secondary A Aquifer. These are rock layers with the ability to easily transmit pollution characterised by high permeability soils. This classification has a high vulnerability with localised area of medium vulnerability.
- 4.5.14 According to EA data, the Proposed Development is not located in a groundwater SPZ.
- 4.5.15 Information provided by the EA indicates that there are no records of active licensed groundwater abstractions within 500 m of the Proposed Development.
- 4.5.16 Information provided by the EA indicates that there is one record of a WFD Groundwater body within 250 m of the Proposed Development as follows in **Table 4.15**.

Table 4.15: Nearby groundwater bodies

Groundwater Body	Water Body ID	Quality Classification
Torridge and Hartland Streams	GB40802G800600	Overall – Poor (2019) Chemical – Poor (2019) Quantitative – Good (2019)

Groundwater Dependent Features

- 4.5.17 Groundwater dependent features can include surface watercourses, ponds and lakes, springs and wetlands that receive a component of groundwater discharge from underlying aquifers.
- 4.5.18 The onshore HVDC cable corridor crosses the River Torridge, and Kynoch’s Foreshore which comprises saltmarsh and mudflats. This river system is groundwater-fed with tributaries of the River Torridge being in continuity with the superficial aquifer and therefore may contribute significantly to surface water flow.

Quarrying and Mining

Coal (Culm) Mining

- 4.5.19 The Map Viewer on the Coal Authority website indicates large parts of the Proposed Development fall within Coal Mining Reporting Areas, however only the Converter Site including the construction compounds area, and Alverdiscott Substation Site is within a Development High Risk Area linked to the conjectured outcrop of a seam. A CON29M Official Coal Mining Search has been obtained for this area as well as the Converter Site to assess whether there is a risk presented by historical coal mining activities to the proposed Converter station construction activities. The remainder of the route is considered unlikely to be impacted by any historical mining activity comprising either temporary surface founded structures (compounds) or shallow trench excavations for cable routes given the information presented on the Coal Authority website. It is also apparent that there is no historical map evidence of any mining activity across the designated route corridor.
- 4.5.20 Reference to the BGS Sheet Memoir 'Geology of Bideford and Lundy Island. Memoir for 1:50 000 sheets 292, with 275, 276, 291 and part of 308' by Edmonds *et al.*, (1979) indicates that near the base of the Bude Formation are two 'culm' seams, one of soft anthracite, about 1 m above the Cornborough Sandstone and identified at outcrop on the coast, the other, the 'paint' seam to the south of this and approximately 100 m higher in the succession. They are recorded as 'carbonaceous material' rather than coal and have been sporadically worked since the Middle Ages for burning of lime or collection of 'pigment'. The seams are recorded as being steeply dipping and worked in a similar way to metalliferous mining.
- 4.5.21 Further assessment of online information sourced from a presentation made to the Open University Geological Society on Coal Mining in Devon (2015) indicates that two east west aligned seams were identified near Bideford. The northerly was termed the 'coal seam' and is present as a series of sporadic coal lenses, it is understood that this is locally termed 'Bideford Black'. The southerly was named the 'paint seam' and is a carbonaceous shale also called carbargillite used as camouflage paint, pencils, car tyre filler and mascara. It is noted that working of these two seams has been limited by their sporadic nature and main areas of working were restricted to horizontal shafts at East-the-Water near Bideford into the Bideford Black and on the coast at Greencliff where the two exposed seams were worked from adits which intersected both seams.
- 4.5.22 The presentation concluded that there has been no commercial past for coal mining in Devon and there is unlikely to be any commercial future for mining.
- 4.5.23 The CON29M Report, included in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR, indicates the conjectured position of an east west aligned seam at outcrop across the northern part of the construction compound area and extending through the centre of the Alverdiscott Substation Site. The outcrop is identified by the Coal Authority as a Development High Risk Area, assumed to be from the potential for historical unrecorded opencast/shallow workings of the outcropping seam.
- 4.5.24 The aforementioned area does not fall within the potential zone of influence of any recorded underground coal workings, although given the conjectured outcrop it is stated that the possibility of unrecorded mine workings cannot be discounted.

There are no current underground coal workings within influencing distance of the Proposed Development and is not within an area designated for any future workings.

- 4.5.25 The Converter Site including the construction compound, and Alverdiscott Substation Site are not within the boundaries of any former opencast workings, not within 200 m of any present opencast workings and are not within 800 m of any proposed opencast workings.
- 4.5.26 There are no recorded coal mine entries on or within 20 m of the Converter Site including the construction compound, and Alverdiscott Substation Site. Mine Entries recorded by the Coal Authority are located within 1 km of the Proposed Development Draft Order Limits, the closest approximately 280 m north indicated to be associated with the Bideford seam.

Non-Coal Mining

- 4.5.27 Sourced from the British Geological Survey data that assesses the potential for historical non-coal mining within 500 m of the Proposed Development Draft Order Limits indicates potential restricted sporadic mining associated with vein mineral and Bideford Black along with potential localised small scale mining within the Bideford Black.
- 4.5.28 It should be noted that there is no evidence on historical maps of former non-coal mining activity in these areas (the Bideford Black is also the aforementioned ‘Culm’).

Ground Stability

- 4.5.29 The British Geological Survey ground stability hazard ratings identify a moderate landslide risk at on the banks of the River Torridge.

Environmental Data

- 4.5.30 A preliminary assessment of ground conditions across the study area has been presented in Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR. In addition to the quarrying and mining described above, other activities that may represent potential risk to land quality or groundwater quality have been assessed.

Landfills and Waste Sites

- 4.5.31 Information provided by a number of sources and referenced in the Groundsure reports shows that there are no recorded licensed or known historical landfill sites, recorded within the Proposed Development. There are four historical landfills recorded within 500 m of the Proposed Development detailed within **Table 4.16**.

Table 4.16: Landfill/Waste Transfer/Waste Treatment Sites

License Holder	Area(s) and Approx. Distance and Direction (m)	License Details	Waste Type and Details
Historical Landfills			
Mr and Mrs Evan	425 m north west	Reference L/2/68/84	Inert, Industrial

License Holder	Area(s) and Approx. Distance and Direction (m)	License Details	Waste Type and Details
		06/07/1984	01/08/1984 to 04/03/1986
Bideford Borough Council	202 m west	None Provided	Commercial, Household 31/01/1971 to 31/12/1972
Devon County Council	85 m west	None Provided	Inert, Industrial, Commercial, Household
Jury Paul	439 m east	Reference JUR100	AO6 – Landfill taking other wastes Status: Closure

4.5.32 There are identified locations of waste exemptions immediately to the north west of the Alverdiscott Substation Site, relating to disposing or treatment of agricultural waste at Webbery Barton, Bideford including dredgings, waste wood by shredding/chipping/cutting etc, spreading of waste and incineration.

Environmental Permits

4.5.33 EA and Local Authority data indicates that there are two processes regulated by an Environmental Permit (under the Environmental Permitting Regulations 2016) within 250 m of the Proposed Development as detailed in **Table 4.17**.

Table 4.17: Environmental Permits

License Holder	Area(s) and Approx. Distance and Direction from Site	Permitted Activity
Q Plant & Haulage (Notts Contractors)	Area 11 – 9 m east	Historical Use of Bulk Cement
Evans Transport Ltd	Area 5 – 182 m north west	Use of Bulk Cement

List 2 Dangerous Substances

4.5.34 There are two records for discharge of substances identified on List II of European Directive E 2006/11/EC within 500 m of the Proposed Development. Each relating to a location 130 m north of the landfall, Typo Electronics, authorised to discharge chromium, copper, cyanide, lead, nickel, and zinc, and Bideford (Cornborough) Sewage Treatment Works, authorised to discharge chromium, copper, iron, lead, nickel, and zinc, both have active status, with the latter releasing discharge into the tidal River Torridge.

Historical Land Use

4.5.35 Historical land use features within the Proposed Development as identified from the review of historical mapping include:

- Rifle Range in the west (map editions of 1904 – 1905); and
- Former Lime Kilns (map editions of 1884 – 1904).

- 4.5.36 Further historical land use features located within 250 m of the Proposed Development include smithies and landfill sites.
- 4.5.37 Additionally anecdotal evidence has indicated that a suspected burial pit is located within the footprint of the Converter Site.

Unexploded Ordnance

- 4.5.38 CIRIA Report C681 (Stone *et al.*, (2009)) outlines recommendations for dealing with the potential risk associated with the legacy of Unexploded Ordnance Risk, largely relating to WWII bombing and military sites.
- 4.5.39 Reference to the Zetica Unexploded Bomb Risk mapping indicates that the Proposed Development is in an area of low potential risk from Unexploded Bombs. As the Proposed Development is not within an area of known military history, in general accordance with the CIRIA Report, no further consideration of Unexploded Ordnance (UXO) relating to wartime bombing is considered necessary, although given the historical presence of a rifle range within the area of the landfall, the potential cannot be entirely discounted.
- 4.5.40 A detailed desk study for potential UXO covering much of the Proposed Development is presented in Annex D of Volume 2, Appendix 4.1: Desk Top Study, Preliminary Risk Assessment and Site Reconnaissance of the PEIR. This report identified a negligible risk for Anti-Aircraft Artillery, Explosive Storage Areas, Military Airfield, Bombing Decoy Sites, Munitions Production, WWI Bombing and WWII Bombing. A low risk was identified for Defensive Positions and Military Training/Presence.

Site-Specific Surveys

Site Reconnaissance

- 4.5.41 A targeted site walkover survey was undertaken on 24 January 2023, the findings of which are presented in detail within Volume 2, Appendix 4.1: DTS, PRA and Site Reconnaissance of the PEIR. The inspection was limited to the Converter Site and Potential Areas of Concern identified from review of historical maps and aerial photographs. In summary, the findings were as follows.
- The Converter Site comprised predominantly grassed fields with gated access from adjoining minor roads;
 - A small group of timber built structures were present in the west of the field for the proposed Bipole 2; and
 - No evidence of current site contamination was observed in the areas inspected.

Converter Site Ground Conditions Site Investigation

- 4.5.42 A preliminary ground investigation for the Converter Site was undertaken by RPS in February 2023, comprising eight machine excavated trial pits up to 3.05 m below ground level (bgl) and four rotary cored boreholes up to 9.00 m bgl.
- 4.5.43 The exploratory holes identified no evidence of Made Ground. A thin cover of topsoil was encountered overlying a profile of weathered mudstone and siltstone

strata comprising gravelly clays and silts becoming intact rock. These strata are interpreted to be the Bude Formation.

4.5.44 Ten shallow soil samples from the investigation were selected for laboratory analysis for a range of organic and inorganic contaminants. An assessment of these results in relation to typical soil background concentrations and generic assessment criteria (GAC) (primarily Sutable 4 Use Levels (LQM/CIEH, 2015)) for a commercial land use identified no exceedances of GAC and other than nickel, metal concentrations in natural soils are below or in accords with the BGS typical background concentrations.

Future Baseline Conditions

4.5.45 The baseline conditions associated with geology, hydrogeology and ground conditions are not subject to significant change should the Proposed Development not come forward. Little change is expected with regards to the following.

- Geology:
 - Designated and non-designated sites and features of geological or geomorphological significance.
- Hydrogeology:
 - Groundwater bodies/aquifer units;
 - Groundwater levels and groundwater flow patterns;
 - Groundwater recharge rates;
 - Groundwater quality and the level of groundwater abstraction; and
 - Groundwater discharge to groundwater dependent receptors.
- Ground conditions:
 - Areas of potentially contaminated land/groundwater relating to historical or recent land-use; and
 - Operation of permitted landfill sites/waste facilities.

4.5.46 Climate change represents the most likely mechanism that could potentially result in measurable changes to hydrogeology, through changes to the amount and distribution of recharge to aquifers. The Meteorological Office provide UK Climate Projections (UKCP), the most recent being for 2018 (UKCP18). The projected climate change impacts on rainfall and river flow for this area of England could involve decreasing summer rainfall and increasing winter rainfall resulting in more severe low flow events in rivers and high peak river flows.

Key Receptors

4.5.47 **Table 4.18** identifies the receptors taken forward into the assessment.

Table 4.18: Key receptors taken forward to assessment

Receptor	Description	Sensitivity/Value
Geology		
Geological or geomorphological	Geological or geomorphological sites that have been designated at a national level. This includes SSSIs.	High importance and rarity, national scale and limited potential for substitution.

Receptor	Description	Sensitivity/Value
features of national or international importance.		
Hydrogeology		
Groundwater in superficial deposits Secondary A aquifer unit.	A secondary aquifer unit providing a locally important water resource and/or groundwater dependent sites of local importance. This aquifer unit has been shown to extend further east than is shown on BGS mapping. A similar aquifer has also been identified in the western end of the study area.	Medium importance and rarity, regional scale, limited potential for substitution.
Groundwater in bedrock Secondary A aquifer unit.	A secondary aquifer unit providing a locally important water resource and/or groundwater dependent sites of local importance. This aquifer unit has been shown to extend further east than is shown on BGS mapping. A similar aquifer has also been identified in the western end of the study area.	Medium importance and rarity, regional scale, limited potential for substitution.
Groundwater dependent receptors.	Surface watercourses, lakes/ponds, springs and wetlands that are supported by discharge from an underlying aquifer unit. A protected ecological site that has designated features that are supported by discharge from an underlying aquifer unit.	Medium importance and rarity, regional scale, limited potential for substitution. High importance and rarity, national scale and limited potential for substitution or medium importance and rarity, regional scale, limited potential for substitution.
Human health		
Humans	Construction workers or others that may be affected by existing contamination or ground gas arising from natural sources.	High importance.

4.6 Key Parameters for Assessment

Maximum Design Scenario

- 4.6.1 The maximum design scenarios identified in **Table 4.19** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the PEIR. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different infrastructure layout), to that assessed here be taken forward in the final design of the Proposed Development. Therefore, this comprises a conservative assessment of a maximum design scenario.

Table 4.19: Maximum design scenario considered for the assessment of potential impacts

Potential Impact	Phase ¹			Maximum Design Scenario	Justification
	C	O	D		
Loss of, or damage to, designated geological sites.	✓	×	×	<p>Construction phase: Landfall</p> <ul style="list-style-type: none"> HDD: The maximum number of cable ducts will be six, with an HDD length of 2,110 m. The maximum number of entry and exit pits are six each. A landfall working compound of 10,000 m². Duration of installation would be an initial 18 months of works, with a further six months following a gap in construction. HDD will pass beneath Mermaid’s Pool to Rowden Gut SSSI. 	HDD will be used to install the landfall cable ducts beneath the Mermaid’s Pool to Rowden Gut SSSI.
The impact of mobilisation of existing areas of contamination causing a deterioration of groundwater quality in underlying aquifer units.	✓	✓	✓	<p>Construction phase: Landfall</p> <ul style="list-style-type: none"> HDD: The maximum number of cable ducts will be six, with an HDD length of 2,100 m. Duration of installation would be an initial 18 months of works, with a further six months following a gap in construction The maximum number of transition joint bays will be two, with a total maximum permanent area of 150 m² associated with the ground level covers. HDD: A landfall working compound of 10,000 m². Duration of installation would be an initial 18 months of works, with a further six months following a gap in construction (for pulling through offshore HVDC cables for Bipole 2). <p>Construction phase: Onshore HVDC Cables Corridor</p> <ul style="list-style-type: none"> The maximum number of trenches will be two, with an approximate trench depth of 1.4 m. Construction corridor width 65 m, with a length of up to 14.5 km. There will be up to 34 joint bays and 34 link boxes, with 140 m³ and 3.15 m³ of material excavated for each joint bay and link box respectively. 	<p>HDD will be used to install the landfall beneath the Mermaid’s Pool to Rowden Gut SSSI. HDD will also be used beneath three waterbodies, three major roads and a site of suspected archaeology.</p> <p>The MDS is represented by the largest permanent footprint for the converter stations, which represents the largest physical impact and greatest area of land disturbance and the greatest risk of impact to groundwater.</p>
The impact of changes in groundwater levels, flow or quality on other sensitive groundwater dependent sites, including surface waters fed by groundwater.	✓	✓	✓		

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Potential Impact	Phase ¹			Maximum Design Scenario	Justification
	C	O	D		
				<ul style="list-style-type: none"> • Duration of installation of up to 36 months. • The maximum number of HDD locations is 7 (excluding HDD at landfall). Each major HDD location will have two compounds, measuring up to 10,000 m². Drilling mud will be stored and used at these compounds. • HDD to be used beneath River Torridge, Kenwith Stream and unnamed stream south of Jennets reservoir. There is also a potential option to HDD beneath the unnamed watercourse and woodland to the immediate south of the Converter Site. <p>Construction phase: converter stations</p> <ul style="list-style-type: none"> • Maximum number of stations is two, which would have a combined footprint of 130,000 m². • Converter station foundations may be piled. • Temporary converter station compound footprint: 20,000 m² (additional to permanent footprint). • Duration: 72 months. <p>Construction phase: Alverdiscott Substation Connection Development</p> <ul style="list-style-type: none"> • The substation would occupy a footprint of up to 28,000 m². • Duration: 24 months. <p>Construction phase: HVAC cables</p> <ul style="list-style-type: none"> • The maximum number of trenches will be four, with an approximate depth of 1.4 m. • The working area will include a construction corridor width of 65 m, with a length of up to 1.2 km. Duration of installation of up to 24 months over two phases. <p>Construction: Highways improvements</p> <ul style="list-style-type: none"> • Selective widening of Gammaton Road • Widening of unnamed road between Gammaton Cross and Converter Site including a short section 	

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Potential Impact	Phase ¹			Maximum Design Scenario	Justification
	C	O	D		
				<p>of new road to connect Gammaton Road and the unnamed road.</p> <ul style="list-style-type: none"> • Creation of accesses to onshore HVDC cable route construction sites including: <ul style="list-style-type: none"> – Creation of remodelled junction at A386 and unnamed road to Littleham. – Widening of junction at the Cornborough sewage treatment works access. – Access to other major compounds at A39 (north and south) and Gammaton Road. <p>Construction: all elements</p> <ul style="list-style-type: none"> • Construction compounds will be prepared by removing and storing topsoil and subsoil and then constructing hardstanding areas using clean crushed stone. • Temporary dewatering of cable trenches, joint bays and link boxes will be required where shallow groundwater is encountered. <p>Operation and maintenance phase</p> <ul style="list-style-type: none"> • Maintenance to the onshore HVDC Cables and the HVAC cables will be undertaken only as required. Corrective activities will be limited. • The onshore HVDC Cables, the HVAC Cables and the converter stations will be monitored remotely but will involve regular visits. • Permanent footprint of the converter stations would be 130,000 m². • Permanent footprint of the Alverdiscott Substation Connection Development would be 28,000 m². <p>Decommissioning phase</p> <p>Decommissioning is likely to operate within the parameters identified for construction (i.e., any activities are likely to occur within construction working areas and</p>	

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Potential Impact	Phase ¹			Maximum Design Scenario	Justification
	C	O	D		
				to require no greater amount or duration of activity than assessed for construction).	
The impact of existing contamination to human receptors.	✓	✓	✓	Construction parameters as defined above.	As above.
The impact of a deterioration in groundwater quality through the accidental spillage/release of potentially polluting substances.	✓	×	✓	Construction and decommissioning parameters as defined above.	As above.
The impact of heat generated by the onshore HVDC Cables on groundwater quality, during the operation and maintenance phase.	×	✓	×	<p>Onshore HVDC Cables</p> <ul style="list-style-type: none"> • Maximum number of cables: 4; • Maximum number cable trenches: 2; • Indicative approximate trench depth: 1.4 m; • Maximum voltage: 525 kV; and • Permanent cable corridor width of 32 m, which increases to 60 m at HDD locations. • A length of up to 14.5 km. <p>HVAC cables</p> <ul style="list-style-type: none"> • Maximum number of cables: 12; • Maximum number cable trenches: 4; • Indicative approximate trench depth: 1.4 m; • Maximum voltage: 400 kV; and • Permanent corridor width of 30 m, with a length of up to 1.2 km. 	Maximum number of cables will result in greatest potential for heat generation and larger permanent cable corridor width (and therefore larger area potentially impacted).

¹ C=construction, O=operational and maintenance, D=decommissioning

4.7 Mitigation Measures Adopted as Part of the Proposed Development

Table 4.20: Mitigation measures adopted as part of the Proposed Development

Measure Adopted	How the Measure Will be Secured
<p>The following infrastructure, sensitive sites/features and recreational resources are proposed to be crossed by Horizontal Directional Drilling (or other trenchless methodologies), as set out within the Onshore Crossing Schedule:</p> <ul style="list-style-type: none"> • The Mermaid’s Pool to Rowden Gut SSSI, situated along the coastline at the landfall, Cornborough Range. • The following waterbodies: <ul style="list-style-type: none"> – Kenwith Stream, situated just south of Rickard’s Down and approximately 300 m north of Abbotsham. – Littleham Wood, which includes a small watercourse, situated to the west of Robin Hill Farm and approximately 800 m to the north west of Littleham. – A small stream, 290 m south of Jennets reservoir and to the west of West Ashridge, which feeds into Jennets reservoir. – River Torridge, to the south of Bideford (to note, one HDD will cross both the River Torridge and A386). • The following major roads: <ul style="list-style-type: none"> – A39, at a section approximately 250 m south west from the Abbotsham Cross roundabout and north west from High Park Farm. – A386, to the south of Bideford (as stated above, one HDD will cross both the River Torridge and A386). • A site of suspected archaeological assets at Winscott Barton. • There is an option to use HDD (or other trenchless techniques) to cross the unnamed watercourse and associated woodland to the immediate south of the Converter Site. 	<p>Secured as part of the DCO.</p>
<p>The Outline On-CEMP will be submitted as part of the application for the development consent. On-CEMP(s) will be developed in accordance with the Outline On-CEMP. The Outline On-CEMP will provide details of appropriate studies (e.g., site investigations) proposed to be undertaken where major HDDs (or other trenchless methodologies) are proposed, during the detailed design stage to confirm ground conditions. This includes on the northern and southern banks of the River Torridge where subsequent slope stability assessments will be undertaken as necessary.</p>	<p>Secured as part of the DCO.</p>
<p>An Outline On-CEMP will be developed that will manage environmental risks through the duration of the construction phase. It will include the following:</p> <ul style="list-style-type: none"> • 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; • The implementation of dust suppression measures during construction to minimise nuisance dust emissions during the works; 	<p>Secured as part of the DCO.</p>

Measure Adopted	How the Measure Will be Secured
<ul style="list-style-type: none"> • A construction and then operational drainage strategy would be implemented to minimise surface water runoff and pollution; • 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; • Use of a documented spill procedure and use of spill kits kept in the vicinity of chemical/oil storage; • The disposal of solid waste, including surplus spoil, would be managed to maximise the environmental and developmental benefits from the use of surplus material and to minimise any adverse effects of disposal. In general, the principles of the waste management hierarchy, reduce-reuse-recycle would be applied; • Potential waste arising from excavation would be sampled and analysed to determine the waste classification required to establish relevant waste streams, suitability for reuse/recycle and disposal/storage requirements; • The Outline On-CEMP will provide details of the broad types of waste produced during construction and will include good practice measures for managing waste generated during construction. All waste generated would be disposed of by a suitably licensed waste contractor; and • The implementation of suitable measures in line with the Construction Design Management Regulations (2015) would manage any risks posed to human health. These measures should include the provision of suitable Personal Protective Equipment (PPE) and welfare facilities. Other measures to manage risks to human health from the presence of asbestos should be implemented and should include dust suppression measures and air monitoring. 	
<p>An Outline Onshore PPP will form part of the Outline On-CEMP, which will be prepared and submitted with the application for development consent. Onshore PPP(s) will be developed in accordance with the Outline Onshore PPP and will include details of emergency spill procedures. Good practice guidance detailed in the Environment Agency’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.</p>	<p>Secured as part of the DCO.</p>
<p>A Discovery Strategy will be prepared, prior to construction, to detail the procedure should any previously unknown contamination be discovered. The discovery strategy would comprise a watching brief that would be undertaken by suitably trained personnel during construction activities such as ground clearance and earthworks.</p>	<p>Secured as part of the DCO.</p>
<p>The design aims for excavated materials (soils and rocks) generated by the Proposed Development to be reused, where practicable. The reuse of these materials would require demonstration that they are both environmentally and geotechnically suitable.</p>	<p>Secured as part of the DCO.</p>
<p>Appropriate Personal Protective Equipment will be used and relevant good working practices applied to avoid potential risk to</p>	<p>Secured as part of the DCO.</p>

Measure Adopted	How the Measure Will be Secured
human health including from any potential ground contamination, in line with relevant available guidance.	
An Outline Onshore Decommissioning Strategy would be developed in a timely manner in consultation with the relevant stakeholders and prior to commencement of construction. The Onshore Decommissioning Plan(s) would be developed in accordance with the Outline Onshore Decommissioning Strategy prior to decommissioning, and in line with the latest available guidance. The Onshore Decommissioning Plan will include provisions for the removal of onshore above ground infrastructure and the decommissioning of below ground infrastructure and details relevant to flood risk, pollution prevention and avoidance of ground disturbance.	Secured as part of the DCO.
All construction personnel conducting intrusive works, in any part of the site, would attend a toolbox talk regarding explosives safety & awareness. This should comprise part of the standard site induction briefing and would form a component of the Health and Safety Plan for the site adhering to the requirements of CDM regulations 2015. All personnel working on site would be briefed on UXO recognition and made aware of the possible risks. They would be informed of the actions to take to alert the site manager and to keep people and equipment away from the hazard.	Secured as part of the DCO.

4.8 Assessment of Construction Effects

- 4.8.1 The impacts of the construction of the Proposed Development have been assessed. The potential impacts arising from the construction phase of the Proposed Development are listed in **Table 4.22**, along with the maximum design scenario against which each impact has been assessed. The decommissioning phase is covered in this section where effects are commensurate with the construction phase.
- 4.8.2 A description of the potential effect on receptors caused by each identified impact is given below.

Impact of Partial Loss or Damage to Designated Geological Site

- 4.8.3 A designated geological SSSI (Mermaid’s Pool to Rowden Gut) is located along the coastline at the landfall, Cornborough Range.

Sensitivity of the Receptor

- 4.8.4 The combination of a major lateral change from Crackington to Bideford Formation facies and the associated biostratigraphical control makes the Abbotsham Coast a site of very major importance for regional and national palaeoenvironmental and palaeogeographical studies. Given the nature of the site, it cannot be readily restored or substituted. Therefore, the sensitivity of the receptor is **high**.

Magnitude of Impact

- 4.8.5 As set out in Volume 1, Chapter 3: Project description of the PEIR, the landfall and associated Offshore HVDC Cables will be installed by HDD. The drill will pass beneath the SSSI and the HDD launch pit will be set well back from the coastal path inland with drills emerging (punching out) at least 1,000 m beyond Mean Low Water Springs. There will be no open trenching through the designated geological SSSI and all construction compounds will be located outside of the designated site.
- 4.8.6 The magnitude is therefore considered to be **negligible**.

Significance of the Effect

- 4.8.7 Overall, the magnitude of the impact is negligible and the sensitivity of the receptor is high. The effect will, therefore, be of **minor adverse** significance, which is not significant.

Impact of Mobilisation of Existing Areas of Contamination Causing a Deterioration of Groundwater Quality

- 4.8.8 On-site features of potential contamination across the Proposed Development are limited and include historical lime kilns within the footprint of the River Torridge Crossing. Additionally off-site features of potential contamination include two historical landfills located within 250 m of the proposed Onshore HVDC Cable Corridor from Gammaton Moor to the River Torridge.
- 4.8.9 There is the potential for the presence of localised Made Ground that contains elevated concentrations of contaminants, particularly around any areas of reprofiled/infilled historical mineral workings, the lime kilns in the central and western sections of the onshore elements of the Proposed Development, the former rifle range in the west and suspected burial pit in the east. The existing pylons, farm buildings, Alverdiscott Substation and access road in the eastern section are not considered significant sources although there may be localised Made Ground associated with their construction. There is also a potential for agrochemicals to be present within shallow soils in areas of agricultural land usage. The identified kilns and former quarries to the west of the River Torridge coincide with the route option for temporary excavation and backfilling of trenches for the laying of high voltage DC cables, and the suspected burial pit within the Converter Site footprint.
- 4.8.10 Recent or historical land uses have the potential to result in localised areas of soil or groundwater contamination. That contamination is subject to potential mobilisation if disturbed. The mobilisation of contamination may result in an adverse impact on underlying aquifers, in terms of their WFD status.
- 4.8.11 These effects can be direct or may arise from the creation of new pathways, e.g., through piling or HDD (or equivalent trenchless technique).
- 4.8.12 The identified features are considered to present a low potential contamination risk.

Sensitivity of the Receptor

- 4.8.13 The shallow, Secondary A aquifer associated with the superficial deposits of the River Torridge/River Yeo is a locally important groundwater resource that is currently of good quantitative status. The sensitivity of this receptor is **medium**.
- 4.8.14 The underlying bedrock across the Proposed Development is also a Secondary A aquifer and may be considered **medium** sensitivity.

Magnitude of Impact

Onshore HVDC Cable Corridor – River Torridge Crossing

- 4.8.15 The use of HDD (or equivalent trenchless technique) should prevent the mobilisation of near surface soil contamination associated with current and historical land-use. HDD (or other trenchless technique) may; however, create a potential pathway that could allow the migration of contaminated groundwater outside of its current area of effect. The presence or severity of any contamination in this area is not known although the risk is qualitatively assessed as low based on the findings of the Desk Top Study. The use of trenchless technologies beneath any areas of contamination will reduce the potential for a direct impact but further mitigation is required to ensure the methodology avoids the creation of new pathways.
- 4.8.16 The magnitude of impact will be **low**.

Other areas

- 4.8.17 Piling may be used as the foundation solution for large structures, most notably the onshore Converter stations and new substation. Where piling is proposed, a risk assessment shall be undertaken to determine mitigation measures and design that will manage the risk associated with land and groundwater contamination (Note no evidence of Made Ground or elevated ground contamination was identified during the Converter Site ground investigation, though a suspected burial pit is potentially present. Made Ground may be present associated with the construction of the existing Alverdiscott Substation).
- 4.8.18 The magnitude of impact is likely to be **low**.

Significance of Effect

- 4.8.19 Overall, the magnitude of the impact on the Secondary A aquifers is low and the sensitivity of the receptor is medium. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Impact of Reduced Groundwater Quantity or Quality in Aquifer Units: Secondary A Aquifers

- 4.8.20 The Onshore HVDC Cables Corridor crosses the shallow Secondary A superficial deposit aquifer associated with the River Torridge. The WFD status for this groundwater body has been shown to be good for quantitative quality and poor for chemical quality.
- 4.8.21 The Proposed Development is underlain by a Secondary A bedrock aquifer.

Dewatering

- 4.8.22 The construction of the transition joint bays, Onshore HVDC Cables, HVAC Cables and associated joint bays or link boxes will require dry excavations. Groundwater dewatering of open trenches and excavations may therefore be required through pumping. The groundwater removed by dewatering will be discharged to local surface watercourses or across ground away from the excavations. This will be undertaken in accordance with measures agreed through the On-CEMP and PPP.
- 4.8.23 Dewatering in the vicinity of aquifer units will result in:
- groundwater levels being locally reduced within the trenches and excavations; and
 - change in local groundwater flow directions, which will become oriented towards the dewatered excavations.
- 4.8.24 Dewatering itself is unlikely to result in a significant change in groundwater quality. The effect of accidental release and or existing contamination sources on water quality are considered separately. Groundwater levels will recover after construction assuming that the excavated materials are used as backfill and are not subject to artificial compaction. This will be controlled through the On-CEMP.

Foundations

- 4.8.25 Construction of the Converter Site will require both a temporary construction compound and a permanent operational footprint for each converter station. The Alverdiscott Substation Connection Development will require an additional permanent operational footprint. The permanent footprint will include both permeable and non-permeable areas. The non-permeable parts of the Converter Site and Alverdiscott Substation Connection Development will introduce new areas of hardstanding which will affect the infiltration of rainwater to ground and hence recharge to underlying aquifer units.
- 4.8.26 Shallow foundations required for the Converter Site and Alverdiscott Substation Connection Development may also intercept groundwater causing impacts on quality, flow and levels. Piled foundations could create new pathways between previously unconnected groundwater bodies. The Converter Site and Alverdiscott Substation Connection Development are situated above the bedrock Secondary A aquifer. The effect of contamination on this aquifer is considered separately above.

Horizontal directional drilling

- 4.8.27 HDD (or equivalent trenchless technique) will be undertaken at the landfall and where required to cross main roads and rivers. It will also be used, where necessary, to pass beneath existing areas of contamination as described above.

Sensitivity of the Receptor

- 4.8.28 Both Secondary A aquifers are considered a locally important groundwater resource. The sensitivity of this receptor is medium.

Magnitude of Impact

Dewatering

- 4.8.29 The dewatering of open cut trenches and excavations will have a direct impact on shallow groundwater levels and flow. That impact will be short term and localised in nature. The magnitude of this impact on groundwater quantity will be **negligible**.

Foundations

- 4.8.30 The Converter Site and Alverdiscott Substation Connection Development are located on a Secondary A bedrock aquifer, and where excavations are significant there is potential for construction to affect recharge to the aquifer. The magnitude of this impact on the aquifer and on groundwater levels or flow is likely to be **low**.

Discharges to ground

- 4.8.31 The temporary discharge of surface water runoff to ground during construction could result in increased recharge to the shallow Secondary A aquifer. This could result in localised increase in recharge and groundwater levels. There should be no effect on groundwater quality. The magnitude of this impact is **low**.

Horizontal directional drilling

- 4.8.32 HDD (or equivalent trenchless technique) will be used to pass beneath key constraints (e.g. Rivert Torridge). This will be developed in accordance with method statements to ensure that existing areas of contamination are avoided and that new pathways are not created. The magnitude of impact will therefore be **low**.

Significance of Effect

Dewatering

- 4.8.33 The magnitude of the impact is **negligible** and the sensitivity of the receptor is medium. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms.

Foundations

- 4.8.34 Overall, the magnitude of the impact is **low** and the sensitivity of the receptor is medium. The effect will, therefore, be **minor adverse** significance, which is not significant in EIA terms.

Discharges to ground

- 4.8.35 The magnitude of impact of temporary discharge of runoff to ground is **low** and the sensitivity of the receptor is medium. The effect will, therefore, be **minor adverse** significance, which is not significant in EIA terms.

Horizontal directional drilling

- 4.8.36 The magnitude of impact of drilling works is **low** and the sensitivity of the receptor is medium. The effect will, therefore, be **minor adverse** significance, which is not significant in EIA terms.

Impact of Existing Areas of Contamination to Construction Workers

- 4.8.37 As set out in **paragraphs 4.8.8** and **4.8.9**, areas of known potential areas of existing contamination are limited though there is potential for unexpected contamination to be encountered during construction.

Sensitivity of receptor

- 4.8.38 For this assessment the potential impact on human health of construction workers has been considered in relation to their exposure to potential contaminants within the soils/groundwater. The sensitivity of this receptor is **high** given consideration of the applicable exposure pathways and the critical receptor.

Magnitude of Impact

- 4.8.39 In areas of known contamination, HDD (or other trenchless techniques) is proposed. Secondary mitigation measures are proposed to ensure that works near the River Torridge will avoid any release of existing contamination.
- 4.8.40 In terms of currently unknown contamination, all construction works will be undertaken in line with the On-CEMP, which will include details of protective measures for construction workers. Appropriate Personal Protective Equipment will be used and relevant good working practices applied to avoid potential risk to human health including from any potential ground contamination, in line with relevant available guidance.
- 4.8.41 In addition, a Discovery Strategy will be prepared to identify the construction protocol on discovery of any currently unknown contamination.
- 4.8.42 With effective good practice measures in place, the risks will be controlled and the magnitude of impact will be **negligible** for both the construction and decommissioning phase.

Significance of Effect

- 4.8.43 The magnitude of impact is **negligible** and the sensitivity of the receptor is high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Impact of Accidental Release or Spillage of Contaminants

- 4.8.44 Potentially polluting substances will be stored, handled and used during the construction phase and decommissioning phase. Notable substances include fuels, lubricants and hydraulic oils associated with plant and machinery. Other

substances such as foul water generated from welfare facilities will also require appropriate management. As outlined in **Table 4.21**, measures will be included in the On-CEMP and PPP to ensure all controlled water receptors (including groundwater dependent features) are protected during the proposed construction and decommissioning works. The PPP shall identify how potentially polluting substances will be stored, handled and used appropriately by including the following elements.

- Reference to relevant regulatory guidance and industry best practice.
- Consideration of groundwater, surface water and environmental receptors during the design of compounds and the management of surface water runoff thereon.
- The design of material storage and refuelling areas.
- Production of method statements and emergency response plans for activities involving potentially polluting materials and associated training of the relevant personnel.

4.8.45 Impacts during decommissioning will be controlled through the Onshore Decommissioning Plan.

Sensitivity of the Receptor

4.8.46 The shallow, Secondary A aquifer associated with the superficial deposits of the River Torridge/River Yeo is a locally important groundwater resource that is currently of good quantitative status. The sensitivity of this receptor is medium.

4.8.47 The underlying bedrock across the Proposed Development is also a Secondary A aquifer and may be considered medium sensitivity.

Magnitude of Impact

4.8.48 Following adoption of the measures outlined in the On-CEMP, the likelihood of any accidental release will be minimised. The scale and duration of the release will also be reduced. The potential for the release to occur in the most sensitive area (e.g., excavation areas) would be minimised. The magnitude of the construction impact is **low**.

Significance of Effect

4.8.49 Overall, the magnitude of the impact the Secondary A aquifers is low and the sensitivity of the receptor is medium. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Impact of Changes in Groundwater Levels, Flow, Quality on Groundwater Dependent Receptors

4.8.50 As set out in **paragraph 4.5.18**, groundwater dependent features comprise the River Torridge which supports a saltmarsh and mudflat foreshore of local importance.

4.8.51 The River Crossing is to be crossed by HDD (or other trenchless techniques) which will be developed in accordance with method statements to ensure that

existing areas of potential contamination are avoided and that new pathways are not created. As detailed within paragraph 4.8.36, magnitude of impact of drilling works is **low**. The sensitivity of the shallow Secondary A superficial deposit aquifer, which is associated with the River Torridge, is **medium**. The effect will, therefore, be **minor adverse** significance, which is not significant in EIA terms.

- 4.8.52 Impacts on the flow and levels of groundwater aquifer units are assessed within **paragraphs 4.8.20 to 4.8.36**.
- 4.8.53 Measures to ensure that existing potential contamination in this area is not mobilised are set out in **Table 4.20** and considered above. Further consideration of effects in relation to surface water is provided in Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR. Details of effects on ecological receptors are considered in Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the PEIR.

Impact Resulting from Contact with UXO

- 4.8.54 The detailed UXO Desk Study Report presented within Annex D of Volume 2, Appendix 4.1: Desk Top Study, Preliminary Risk Assessment and Site Reconnaissance of the PEIR identified a negligible and low risk for encountering UXO as discussed in **paragraph 4.5.40**. Recommended mitigation measures contained therein will be detailed within the On-CEMP and include a UXO briefing of site personnel to be included within Toolbox Talks. On this basis, it is unlikely that there will be any impact from UXO and is therefore excluded from further consideration.

Further Mitigation

- 4.8.55 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further mitigation during the operational stage. Therefore, no further measures are proposed.

Future Monitoring

- 4.8.56 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further monitoring during the operational stage. Therefore, no further measures are proposed.

4.9 Assessment of Operational Effects

- 4.9.1 The impacts of the operation and maintenance phase of the Proposed Development have been assessed. The potential impacts arising from the operation and maintenance phase of the Proposed Development are listed in **Table 4.19**, along with the maximum design scenario against which each impact has been assessed. The decommissioning phase is covered in this section where effects are commensurate with the operational phase.
- 4.9.2 A description of the potential effect on receptors caused by each identified impact is given below.

Impact of Mobilisation of Existing Areas of Contamination Causing a Deterioration of Groundwater Quality

- 4.9.3 Existing areas of potential contamination are as described for the construction phase in **section 4.8**.

Sensitivity of receptor

- 4.9.4 Sensitivity of receptor is as described for the construction phase in **section 4.8**.

Magnitude of impact

- 4.9.5 Activity at the landfall and along the Onshore HVDC Cables Corridor and HVAC cable corridors during the operation and maintenance phase will be limited. The cables will be continuously monitored remotely.
- 4.9.6 The design includes an area for the access control building and car parking in addition to the Converter station buildings and Alverdiscott Substation Connection Development. The presence of a significant quantity of hardstanding and suitable management of surface water runoff will minimise the potential for leaching of any soil contamination and migration of any shallow groundwater across this section of the Proposed Development.
- 4.9.7 Once constructed, no activities are likely during operation that have the potential to result in additional mobilisation of any existing contamination.
- 4.9.8 The magnitude of impact during the operation and maintenance phase and the decommissioning phase will therefore be **negligible** for all areas.

Significance of effect

- 4.9.9 Overall, the magnitude of the impact is **negligible** and the sensitivity of the receptor medium. The effect will be **negligible**, which is not significant in EIA terms.

Impact of Existing Areas of Contamination to End Site Users

- 4.9.10 Existing areas of contamination are as described for the construction phase in **section 4.8**.

Sensitivity of receptor

- 4.9.11 For this assessment the potential impact on the health of end users has been considered. The sensitivity of these end users is considered medium given the land use sensitivity aligns with a commercial or industrial scenario.

Magnitude of impact

- 4.9.12 Mitigation measures implemented during the construction phase would ensure any contaminated and natural materials left *in situ*/reused within the Proposed Development would not pose unacceptable risk to human health or the environment during the operational phase. The ground investigation undertaken for the Converter Site included laboratory analysis of shallow soil samples. No Made Ground was encountered during the investigation and contaminant concentrations in this area do not pose any unacceptable risk to human health, though a suspected burial pit is present at this location.
- 4.9.13 Activity at the landfall and along the Onshore HVDC Cables Corridor and HVAC cable corridors during the operation and maintenance phase will be limited. This will involve infrequent on-site inspections of the cables and corrective maintenance activities. The cables will be continuously monitored remotely.
- 4.9.14 The Converter Site would provide approximately 30 full time-equivalent (FTE) jobs, with up to 15 staff on-site at any one time in the day, reducing to approximately five overnight. There would also be operation and maintenance staff visiting the converter stations and Alverdiscott Substation Connection Development to undertake preventative and corrective works.
- 4.9.15 Once constructed, any remediation of existing/residual contamination will have been implemented.
- 4.9.16 Trenches are to be backfilled on completion of cable installation using materials identified as suitable for purpose, therefore there is unlikely to be exposure of contaminated materials that could migrate via airborne pathways across the majority of the Proposed Development.
- 4.9.17 The magnitude of impact during the operation and maintenance phase will therefore be **negligible** for all areas.

Significance of effect

- 4.9.18 Overall, the magnitude of the impact is **negligible** and the sensitivity of the receptor is **medium**. The effect will be **negligible**, which is not significant in EIA terms.

Impact of Heat generated by the Onshore HVDC Cables on Ground Conditions

- 4.9.19 Underground cables, such as the Onshore HVDC Cables and HVAC Cables, generate heat that dissipates naturally to the surrounding ground during power transmission.
- 4.9.20 The levels of heat loss and dissipation of heat through the soil can only be determined once further details of the cable voltage, soil structure (including its thermal properties) and the final engineering design are known. This will include consideration of the cable depth (in terms of the receptor that may be affected).
- 4.9.21 However, it is anticipated that any heat dissipation will be localised and confined to the areas immediately surrounding the onshore cables. On this basis, it is unlikely that there will be any impact on the quality or temperature of groundwater at its point of abstraction during operation. This impact is therefore excluded from further consideration.

Further Mitigation

- 4.9.22 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further mitigation during the operational stage. Therefore, no further measures are proposed.

Future Monitoring

- 4.9.23 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further monitoring during the operational stage. Therefore, no further measures are proposed.

4.10 Assessment of Decommissioning Effects

- 4.10.1 The impacts of the decommissioning phase of the Proposed Development have been assessed. The potential impacts arising from the operation and maintenance phase of the Proposed Development are listed in **Table 4.19**, along with the maximum design scenario against which each impact has been assessed.
- 4.10.2 A description of the potential effect on receptors caused by each identified impact is given below.

Impact of Accidental Release or Spillage of Contaminants

- 4.10.3 During decommissioning, it is expected that the onshore HVDC Cables will be left *in-situ* to minimise the environmental disturbance during decommissioning. The cable ends will be cut, sealed and securely buried as a precautionary measure. Cable ducts, joint bays and link boxes would be left in-situ, to minimise environmental disturbance.
- 4.10.4 The operation of the proposed converter stations are intended to form permanent elements of electrical infrastructure serving the national grid, however as stated above, the minimum operational lifetime is currently anticipated to be 50 years. It is likely that this operational lifetime could be extended through refurbishment and the replacement of equipment, rather than decommissioning.
- 4.10.5 If complete decommissioning is required, then all of the electrical infrastructure will be removed, and any waste arising disposed of in accordance with relevant regulations. Foundations will be broken up and the site reinstated to its original condition or for an alternative (separately agreed and consented) use.
- 4.10.6 An Outline Onshore Decommissioning Strategy would be developed in a timely manner in consultation with the relevant stakeholders and prior to commencement of construction. The Onshore Decommissioning Plan(s) would be developed in accordance with the Outline Onshore Decommissioning Strategy prior to decommissioning, and in line with the latest available guidance. The Onshore Decommissioning Plan will include provisions for the removal of onshore above ground infrastructure and the decommissioning of below ground infrastructure and details relevant to flood risk, pollution prevention and avoidance of ground disturbance.

Sensitivity of receptor

- 4.10.7 The shallow, Secondary A aquifer associated with the superficial deposits of the River Torridge/River Yeo is a locally important groundwater resource that is currently of good quantitative status. The sensitivity of this receptor is **medium**.
- 4.10.8 The underlying bedrock across the Proposed Development is also a Secondary A aquifer and may be considered **medium** sensitivity.

Magnitude of impact

- 4.10.9 Activity at the landfall and along the Onshore HVDC Cables Corridor and HVAC Cable corridors during the decommissioning phase will be less than that described for the construction phase. The Converter Site will require a greater level of decommissioning activity due to the scale and operation of the plant.
- 4.10.10 The magnitude of impact during the decommissioning phase will therefore be less than that reported for the construction phase. With the Onshore Decommissioning Plan in place, the magnitude of impact is anticipated to be **low**.

Significance of effect

- 4.10.11 Overall, the magnitude of the impact is **low** and the sensitivity of the receptor is **medium**. The effect will be of **minor adverse** significance, which is not significant in EIA terms.

Impact of Reduced Groundwater Quantity or Quality in Aquifer Units: Secondary A Aquifers

- 4.10.12 Decommissioning procedures are as above in **paragraphs 4.10.3 to 4.10.6**.

Sensitivity of receptor

- 4.10.13 The shallow, Secondary A aquifer associated with the superficial deposits of the River Torridge/River Yeo is a locally important groundwater resource that is currently of good quantitative status. The sensitivity of this receptor is **medium**.
- 4.10.14 The underlying bedrock across the Proposed Development is also a Secondary A aquifer and may be considered **medium** sensitivity.

Magnitude of impact

- 4.10.15 Activity at the landfall and along the Onshore HVDC Cable Corridor and HVAC Cable corridors during the decommissioning phase will be less than that described for the construction phase. No dewatering will be required.
- 4.10.16 The converter stations will require a greater level of decommissioning activity.
- 4.10.17 The magnitude of impact during the decommissioning phase will therefore be less than that reported for the construction phase. With the Onshore Decommissioning Plan in place, the magnitude of impact is anticipated to be **low**.

Significance of effect

- 4.10.18 Overall, the magnitude of the impact is **low** and the sensitivity of the receptor is **medium**. The effect will be no greater than **minor adverse** significance, which is not significant in EIA terms.

Impact of Existing Areas of Contamination to Construction Workers

- 4.10.19 The magnitude of impact on construction workers will be similar/no worse than that described in **paragraph 4.8.42** for the construction phase.
- 4.10.20 Impact of Mobilisation of Existing Areas of Contamination Causing a Deterioration of Groundwater Quality Contamination Decommissioning procedures are as above in **paragraphs 4.10.3 to 4.10.6** and the magnitude of impact on groundwater quality will be no worse to that described in **paragraph 4.10.17**.

Impact of Changes in Groundwater Levels, Flow, Quality on Groundwater Dependent Receptors

- 4.10.21 The magnitude of impact on groundwater dependent features will be similar to that described in **paragraph 4.10.17**. Further consideration of effects in relation to surface water is provided in Volume 2, Chapter 3: Hydrology and Flood Risk of the PEIR. Details of effects on ecological receptors are considered in Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the PEIR.

Further Mitigation

- 4.10.22 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further mitigation during the operational stage. Therefore, no further measures are proposed.

Future Monitoring

- 4.10.23 No significant effects have been identified in relation to hydrogeology, geology or ground conditions which would require further monitoring during the operational stage. Therefore, no further measures are proposed.

4.11 Cumulative Environmental Assessment

- 4.11.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Proposed Development together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 1, Appendix 5.3: Cumulative Effects Assessment Matrix, of the PEIR). Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.
- 4.11.2 The geology, hydrogeology and ground conditions CEA methodology has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the PEIR.

As part of the assessment, all projects and plans considered alongside the Proposed Development have been allocated into 'tiers' reflecting their current stage within the planning and development process.

- Tier 1
 - Under construction
 - Permitted application
 - Submitted application
 - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact
- Tier 2
 - Scoping report has been submitted
- Tier 3
 - Scoping report has not been submitted
 - Identified in the relevant Development Plan
 - Identified in other plans and programmes.

4.11.3 This tiered approach is adopted to provide a clear assessment of the Proposed Development alongside other projects, plans and activities.

4.11.4 The specific projects, plans and activities scoped into the CEA, are outlined in **Table 4.23**.

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Table 4.21: List of cumulative developments considered within the CEA

Project	Status	Distance from Onshore Infrastructure Area (nearest point, km)	Description	Dates of Construction (if available)	Dates of Operation (if available)	Overlap with the Proposed Development?
Tier 1						
1/1133/2021/REMM	Permitted	Adjacent to the Order Limits	Reserved matters application for details of appearance, landscaping, layout and scale in respect of a proposal for 274 no. dwellings, associated infrastructure and open space pursuant outline planning permission 1/0039/2014/OUTM (Amended Plans)	Unknown	Unknown	Yes
1/1057/2021/FULM	Permitted	Partially within the Order Limits	Installation and operation of a Solar Farm together with all associated works, equipment and necessary infrastructure	Unknown	Unknown	Yes
1/1256/2021/REMM	Permitted	0.2	Reserved matters application for details of appearance, landscaping, layout and scale in respect of a proposal for 276 no. dwellings, associated infrastructure and open space pursuant outline planning permission	Unknown	Unknown	Yes
1/1266/2022/REMM	Pending	0.2	Reserved matters application for details of appearance, landscaping, layout and scale in respect of a proposal for 61 no. dwellings and associated works pursuant to Outline Planning Permission Local Planning Authority (LPA) Ref; 1/1086/2017/OUTM.	Unknown	Unknown	Yes
1/0252/2022/OUTM	Permitted	0.25	Outline application for the erection of up to 400 dwellings, amenity open space, footpath links, associated landscaping and infrastructure works with all matters reserved except access (Affecting a Public Right of Way)	Unknown	Unknown	Yes
1/0523/2021/REMM	Permitted	0.3	300 dwellings with associated infrastructure and public open space (Variation of conditions	Unknown	Unknown	Yes

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Project	Status	Distance from Onshore Infrastructure Area (nearest point, km)	Description	Dates of Construction (if available)	Dates of Operation (if available)	Overlap with the Proposed Development?
			1 (the reserved matters), 11 (highways) and 18 (contamination)			
1/0110/2023/REMM	Pending	0.35	Application for approval of Reserved Matters pursuant to 1/0947/2020/OUTM (layout, scale, appearance, and landscaping) for 200 dwellings and associated infrastructure.	Unknown	Unknown	Yes
1/0656/2020/OUTM	Permitted	0.5	Outline application for up to 211 dwellings - use classes B2, B8 and E(g), public open space and other associated infrastructure with all matters reserved except access	Unknown	Unknown	Yes
1/0880/2021/FULM	Permitted	0.7	Erection of 117 dwellings and associated works including site access	Unknown	Unknown	Yes
1/0682/2021/FULM	Under Construction	0.7	Reserved Matters (appearance, landscaping, layout and scale) application pursuant to 1/1084/2015/OUTM application for 145 dwellings, with associated public open space, play areas, landscaping and access from Cornborough Road following demolition of 2 existing dwellings (additional information)	Unknown	Unknown	Yes
1/0926/2020/OUTM	Permitted	0.8	Outline planning application for the erection of up to 290 dwellings, including affordable housing with public open space, landscaping and sustainable drainage system (SuDS) and two vehicular access points from Abbotsham Road. All matters reserved except access	Unknown	Unknown	Yes
1/0894/2021/FULM	Permitted	0.9	Reserved matters application for appearance, access, landscaping, layout & scale pursuant to planning approval 1/0111/2016/OUTM for the erection of 26 residential dwellings, associated infrastructure and open space.	Unknown	Unknown	Yes

Cumulative Effects Assessment

- 4.11.5 A description of the significance of cumulative effects upon geology, hydrogeology and ground conditions receptors arising from construction and operation of the Tier 1 developments is given below.

Change in Groundwater Quality or Quantity in Superficial Secondary A Aquifer Unit

Construction

Tier 1 Projects

Dewatering

- 4.11.6 Little dewatering is expected to be required for the Tier 1 developments, given their likely shallow foundations. The cumulative impact is predicted to be of localised spatial extent and short term duration. The magnitude is likely, therefore, to be **low**.
- 4.11.7 Any dewatering is not expected to have a direct impact on groundwater quality in the shallow aquifer except through accidental spillages which will likely be mitigated through the On-CEMP. The cumulative impact is predicted to have a magnitude that is **negligible**.
- 4.11.8 Overall, the magnitude of the cumulative impact is **negligible** or **low** and the sensitivity of the receptor is **medium**. The cumulative effect will, therefore, be of **minor adverse** or **negligible** significance, which is not significant.

Foundations

- 4.11.9 The Tier 1 developments may require small areas of temporary hardstanding during construction. These areas will be small and are unlikely to significantly affect the amount of recharge to the Secondary A aquifer, the cumulative impact is considered to have a magnitude that is **negligible**.
- 4.11.10 Overall, the magnitude of the cumulative impact is **negligible** and the sensitivity of the receptor is **medium**. The cumulative effect will, therefore, be of **negligible** significance, which is not significant.

Discharges to ground

- 4.11.11 The temporary discharge of surface water runoff to ground during construction could result in increased recharge to the shallow Secondary A aquifer. This could result in localised increase in recharge and groundwater levels, although there should be no impact on groundwater quality. The cumulative effect is predicted to be of localised spatial extent and short term duration. The magnitude is, therefore, **low**.
- 4.11.12 Where unaffected by existing sources of contamination, the magnitude of the cumulative impact is **low** and the sensitivity of the receptor is **medium**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant.

Operation and Maintenance

Tier 1 Projects

Dewatering

4.11.13 No dewatering is required in the operation and maintenance phase.

Foundations

4.11.14 The completed Tier 1 developments will result in increased hardstanding over a wider area relative to baseline conditions, through the construction of roads and structures. That permanent hardstanding will locally reduce recharge in these areas, although will be mitigated by the use of Sustainable Urban Drainage. The cumulative effect is considered to have a magnitude that is **low**.

4.11.15 Overall, the magnitude of the cumulative impact is **low** and the sensitivity of the receptor is **medium**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant.

Discharges to ground

4.11.16 The permanent discharge of surface water runoff to ground from Tier 1 developments following construction could result in increased recharge to the shallow Secondary A aquifer. This could result in localised increase in recharge and groundwater levels, although there should be no effect on groundwater quality. The cumulative effect is predicted to be of localised spatial extent and short term duration. The magnitude is therefore, **low**.

4.11.17 Where unaffected by any existing source of contamination, the magnitude of the cumulative impact is **low** and the sensitivity of the receptor is **medium**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant.

Decommissioning

4.11.18 There will be no decommissioning of the majority of Tier 1 developments. For the purpose of decommissioning, it is therefore assumed that the cumulative effects will be same as for construction of the Proposed Development outlined in above.

4.11.19 Should decommissioning of the solar farm (reference 1/1057/2021/FULM) occur at the same time as the Proposed Development with the application of standard mitigation measures described in **Table 4.21** for the solar farm the magnitude of impacts will be no worse than the construction phase.

4.12 Transboundary Effects

4.12.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to geology, hydrogeology and ground conditions from the Proposed Development upon the interests of other states.

4.13 Inter-related Effects

- 4.13.1 Inter-relationships are the impacts and associated effects of different aspects of the Proposed Development on the same receptor. These are as follows.
- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Proposed Development (construction, operation and maintenance), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g., construction noise effects from piling and operational substation noise).
 - Receptor led effects: Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor.
- 4.13.2 This chapter assesses the significance of effects on geology, hydrogeology and ground conditions. This includes consideration of the potential for groundwater dependant receptors to be present, which are fully assessed within the following chapters:
- Volume 2, Chapter 1: Onshore ecology and nature conservation; and
 - Volume 2, Chapter 3: Hydrology and flood risk.
- 4.13.3 Effects on the surface water are assessed within Volume 2, Chapter 3: Hydrology and flood risk of the PEIR. Effects on agricultural land use are assessed in Volume 2, Chapter 8: Land use and recreation of the PEIR. The generation of construction dust is assessed in Volume 2, Chapter 7: Air quality of the PEIR. Effects of the groundwater levels, flow and quality on ecological designations are assessed within Volume 2, Chapter 1: Onshore ecology and nature conservation.
- 4.13.4 A description of the likely interactive effects arising from the Proposed Development on Ground Conditions is provided in Volume 4, Chapter 5: Inter-related effects of the PEIR.

4.14 Summary of Impacts, Mitigation Measures and Monitoring

- 4.14.1 Information on geology, hydrogeology and ground conditions within the study area was collected through desktop review and consultation, supplemented by some limited ground investigation.
- 4.14.2 **Table 4.22** presents a summary of the impacts, measures adopted as part of the Proposed Development and residual effects in respect to geology, hydrogeology and ground conditions. Overall, it is concluded that there will be no significant effects arising from the Proposed Development during the construction, operation and maintenance or decommissioning phases.
- 4.14.3 **Table 4.23** presents a summary of the potential cumulative impacts, mitigation measures and residual effects. Overall, it is concluded that there will be no significant cumulative effects from the Proposed Development alongside other projects/plans.
- 4.14.4 No potential transboundary impacts have been identified in regard to effects of the Proposed Development.

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Table 4.22: Summary of potential environmental effects

Receptor	Sensitivity of receptor	Description of impact	Short/medium /long term	Magnitude of impact	Significance of effect	Significant /Not significant	Notes
Construction phase							
Mermaid's Pool to Rowden Gut SSSI	High	The impact of partial loss or damage to designated geological site	Long term	Negligible	Minor adverse	Not significant	
Secondary A Aquifers (superficial and bedrock)	Medium	The impact of mobilisation of existing areas of contamination causing a deterioration of groundwater quality	Medium term	Low	Minor adverse	Not significant	
		The impact of reduced groundwater quantity or quality in aquifer units: Superficial deposit Secondary A aquifer unit: Dewatering	Short term	Negligible	Negligible	Not significant	
		The impact of reduced groundwater quantity or quality in aquifer units: Superficial deposit Secondary A aquifer unit: Foundations	Medium term	Low	Minor adverse	Not significant	
		The impact of reduced groundwater quantity or quality in aquifer units: Superficial deposit Secondary A aquifer unit Discharges to ground	Short term	Low	Minor adverse	Not significant	

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Receptor	Sensitivity of receptor	Description of impact	Short/medium /long term	Magnitude of impact	Significance of effect	Significant /Not significant	Notes
		The impact of reduced groundwater quantity or quality in aquifer units: Superficial deposit Secondary A aquifer unit: HDD	Short term	Low	Minor adverse	Not significant	
Construction workers	High	The impact of existing contamination to human receptors	Long term	Negligible	Negligible	Not significant	
		The impacts resulting from contact with UXO.	Assessment excluded due to unlikely impact.				
Secondary A aquifers (superficial and bedrock)	Medium	Change in groundwater quality through the accidental release or spillage of potentially polluting substances	Short term	Low	Minor adverse	Not significant	
Groundwater dependent receptor (River Torridge/Kynoch's Foreshore)	Medium	Change in groundwater levels, flow or quality					Assessed within Volume 2, Chapter 1: Onshore Ecology and Nature Conservation, of the PEIR and Volume 2, Chapter 3: Hydrology and flood risk of the PEIR.
Operational phase							
Secondary A aquifers (superficial and bedrock)	Medium	The impact of mobilisation of existing areas of contamination	Medium term	Negligible	Negligible	Not significant	

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Receptor	Sensitivity of receptor	Description of impact	Short/medium /long term	Magnitude of impact	Significance of effect	Significant /Not significant	Notes	
		causing a deterioration of groundwater quality						
End users	High	Impact of existing areas of contamination to end users	Long term	Negligible	Minor adverse	Not significant		
Soils and groundwater		Impact of heat generated by the Onshore HVDC Cables on ground conditions	Assessment excluded due to unlikely impact.					
Decommissioning phase								
Construction workers	As per construction phase.							
Secondary A aquifers (superficial and bedrock)	Medium	Impact of accidental release or spillage of contaminants	Medium term	Low	Minor adverse	Not significant		
		Impact of reduced groundwater quantity or quality in Aquifer Units: Secondary A Aquifers	Medium term	Low	Minor adverse	Not significant		

Table 4.23: Summary of potential cumulative environmental effects

Receptor	Sensitivity of receptor	Description of impact	Short/medium /long term	Magnitude of impact	Significance of effect	Significant/Not significant	Notes
Construction phase							
Secondary A aquifers (superficial and bedrock)	Medium	Change in groundwater quality or quantity in Secondary A	Short term	Negligible	Negligible	Not significant	

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Receptor	Sensitivity of receptor	Description of impact	Short/medium /long term	Magnitude of impact	Significance of effect	Significant/Not significant	Notes
		aquifer unit: Dewatering					
		Change in groundwater quality or quantity in Secondary A aquifer unit: Foundations	Medium term	Low	Minor adverse	Not significant	
		Change in groundwater quality or quantity in Secondary A aquifer unit: Discharge to ground	Short term	Low	Minor adverse	Not significant	
Operational phase							
None identified							
Decommissioning phase							
As Construction phase for foundations and discharges to ground.							

4.15 Next Steps

- 4.15.1 Intrusive ground investigations will be undertaken for engineering and environmental purposes. This will allow further characterisation of the ground (and groundwater regime) in terms of its geotechnical properties and the level of any ground and/or groundwater contamination. The findings will be used to verify the levels of risk and inform the requirement for any site remediation and detailed design of the Proposed Development.
- 4.15.2 Further work will be undertaken to identify the location and extent of Private Water Supplies as part of the work for the ES with further assessment as necessary.

4.16 References

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