XLINKS' MOROCCO-UK POWER PROJECT

Design Principles Statement

Document Number: 7.4

Document Reference: EN010164/APP/7.4

APFP Regulations: 5(2)(q)

November 2024

For Issue

Version	For Issue
Purpose of Document	Application
Authored by	DB3
Reviewed by	Xlinks 1 Ltd
Approved by	Xlinks 1 Ltd
Review Date	November 2024

Contents

Acronyms & Glossary

Abbreviations & Acronyms

Acronym	Meaning
AIL	Abnormal Indivisible Load
AONB	Area of Outstanding Natural Beauty
BEIS	The former Department for Business, Energy & Industrial Strategy
CTMP	Construction Traffic Management Plan
DAD	Design Approach Document
DCO	Development Consent Order
DESNZ	The Department for Energy Security and Net Zero
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
LPA	Local Planning Authority
MDS	Maximum Design Scenario
NIC	National Infrastructure Commission
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
SSSI	Site of Special Scientific Interest
SuDS	Sustainable urban Drainage Systems
TJB	Transition Joint Bay
UK	United Kingdom
ZTV	Zone of Theoretical Visibility

Definitions

Term	Meaning
Terminology Relating to the Proposed Development	
AIL route works	Potential minor works to the Abnormal Indivisible Loads (AIL) routes, which are required for the transportation of the transformers and cable drums. The proposed AIL route runs from Appledore to the Onshore Infrastructure Area.
Alverdiscott Substation	The existing National Grid Electricity Transmission substation at Alverdiscott, Devon, which comprises 400 kV and 132 kV electrical substation equipment.
Applicant	Xlinks 1 Limited.
Bipole	A Bipole system is an electrical transmission system that comprises two Direct Current conductors of opposite polarity.
Converter Site	The Converter Site is proposed to be located to the immediate west of the existing Alverdiscott Substation Site in north Devon. The Converter Site would contain two converter stations (known as Bipole 1 and Bipole 2) and associated infrastructure, buildings and landscaping.
Converter Station	Part of an electrical transmission and distribution system. Converter stations convert electricity from Direct Current to Alternating Current, or vice versa.
Horizontal Directional Drilling	Horizontal Directional Drilling is a method of installing underground pipelines, cables and service conduit (or ducts) through trenchless methods to avoid obstacles and sensitive features (e.g. roads, watercourses, woodlands, etc.).
HVAC Cables	The High Voltage Alternating Current cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVAC Cable Corridors	The proposed corridors (for each Bipole) within which the onshore High Voltage Alternating Current cables would be routed between the Converter Site and the Alverdiscott Substation Site.
HVDC Cables	The High Voltage Direct Current cables which would bring electricity to the UK converter stations from the Moroccan converter stations.
Landfall	The proposed area in which the offshore cables make landfall in the United Kingdom (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Cornborough Range, Devon, between Mean Low Water Springs and the transition joint bays inclusive of all construction works, including the offshore and onshore cable routes, and landfall compound(s).
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.
National Grid Electricity System Operator	National Grid Electricity System Operator operates the national electricity transmission network across Great Britain. National Grid Electricity System Operator does not distribute electricity to individual premises, but its role in the wholesale market is vital to ensure a reliable, secure and quality supply to all.
National Grid Electricity Transmission	National Grid Electricity Transmission owns and maintains the electricity transmission network in England and Wales.

Acronyms & Glossary

Term	Meaning
Offshore Cable Corridor	The proposed corridor within which the offshore cables are proposed to be located, which is situated within the UK Exclusive Economic Zone.
Onshore HVDC Cable Corridor	The proposed corridor within which the onshore High Voltage Direct Current cables would be located.
Onshore Infrastructure Area	The proposed infrastructure area within the Order Limits landward of Mean High Water Springs. The Onshore Infrastructure Area comprises the transition joint bays, onshore HVDC Cables, converter stations, HVAC Cables, highways improvements, utility diversions and associated temporary and permanent infrastructure including temporary compound areas and permanent accesses.
Order Limits	The area within which all offshore and onshore components of the Proposed Development are proposed to be located, including areas required on a temporary basis during construction (such as construction compounds).
Proposed Development	The element of the Xlinks Morocco-UK Power Project within the UK. The Proposed Development covers all works required to construct and operate the offshore cables (from the UK Exclusive Economic Zone to Landfall), Landfall, onshore Direct Current and Alternating Current cables, converter stations, and highways improvements.
The national grid	The network of power transmission lines which connect substations and power stations across Great Britain to points of demand. The network ensures that electricity can be transmitted across the country to meet power demands.
Transition joint bay	A transition joint bay is an underground structure at the landfall area where the offshore cables are jointed to the onshore cables.
Utility diversions	Works required by statutory utility providers to re-route infrastructure around the Proposed Development.
Xlinks Morocco UK Power Project	The overall scheme from Morocco to the national grid, including all onshore and offshore elements of the transmission network and the generation site in Morocco (referred to as the 'Project').
Further Terminology	
Abnormal Indivisible Loads	Loads or vehicles that exceed maximum vehicle weight, axle weight or dimensions as set out in the Road Vehicles (Construction and Use) Regulations 1986 as amended.
Biodiversity Net Gain	An approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, developers are encouraged to provide an increase in appropriate natural habitat and ecological features over and above that being affected to ensure that the current loss of biodiversity through development will be halted and ecological networks can be restored.
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.
Climate resilience	The capacity of social, economic and ecosystems to cope with a hazardous event or trend or disturbance.

Term	Meaning
Construction Environmental Management Plan	A document detailing the overarching management principles for construction, which includes construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
Construction Traffic Management Plan	A document detailing the construction traffic routes for heavy goods vehicles and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
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.
Flood Risk Assessment	A flood risk assessment is an assessment of the risk of flooding from all flood mechanisms, including the identification of flood mitigation measures, in order to satisfy the requirements of the National Planning Policy Framework and Planning Practice Guidance.
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and County Borough Councils. The relevant Local Authorities for the Proposed Development are Devon County Council and Torridge District Council.
Local Planning Authority	The local government body (e.g., Borough Council, District Council, etc.) responsible for determining planning applications within a specific area.
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023.
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
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.
Receptor	The element of the receiving environment that is affected.
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.

1.0 Introduction

1.1 Purpose of Design Principles Statement

1.1.1 This Design Principles Statement establishes the core design principles for the UK Offshore element and UK Onshore Infrastructure Areas of the Xlinks' Morocco UK Power Project. The Offshore element is defined as the 371km of Offshore Cable Route within the UK Exclusive Economic Zone (EEZ). The Onshore Infrastructure Areas consist of Landfall, Onshore Cable Route Corridor and Onshore Converter Stations. As an evolving document, it will be updated throughout the design process to record the agreed principles following reviews and consultations.

1.1.2 At the current stage of the development process, decisions on exact locations of specific components and the precise technologies, and construction methods to be employed are yet to be confirmed. These details remain pending as the Applicant is following a Project Design Envelope approach (PDE). The PDE approach defines a design envelope and parameters within which the final design would sit. It allows flexibility for elements that would require more detailed design subsequent to submission of the application for development consent, such as siting of infrastructure and construction methods. The Applicant would procure Engineering, Procurement and Construction (EPC) contractors who would be responsible for detailed design solutions during the detailed design stage.

1.1.3 Indicative layouts and designs developed during the consultation process represent a 'Maximum Design Scenario' approach, assessing the environmental impact scenario based on the maximum parameters defined for the UK Onshore Infrastructure areas. The key principles derived from these indicative layouts and designs are outlined in this document and would be adhered to during the detailed design phase.

1.1.4 Detailed design would be finalised post consent, once a Principal Contractor has been appointed, prior to the start of construction. The detail design would require approval from the Local Planning Authority (Torridge District Council) in line with the relevant DCO requirements before construction begins.

1.1.5 This document is organised into sections that detail the design principles for the offshore element and the Onshore Converter Stations of the Proposed Development. The design principles for the Onshore Converter Stations are divided into specific topics, covering various aspects such as key building and landscaping principles and parameters. These principles and parameters, secured through the draft DCO, would shape the final design and mitigation measures for the Onshore Converter Stations during detailed design.

1.1.6 Additionally, these design principles would be applied alongside the final Landscape Ecology Management Plan (LEMP), which would be based on the Outline Onshore Construction Environmental Management Plan submitted with the DCO application.

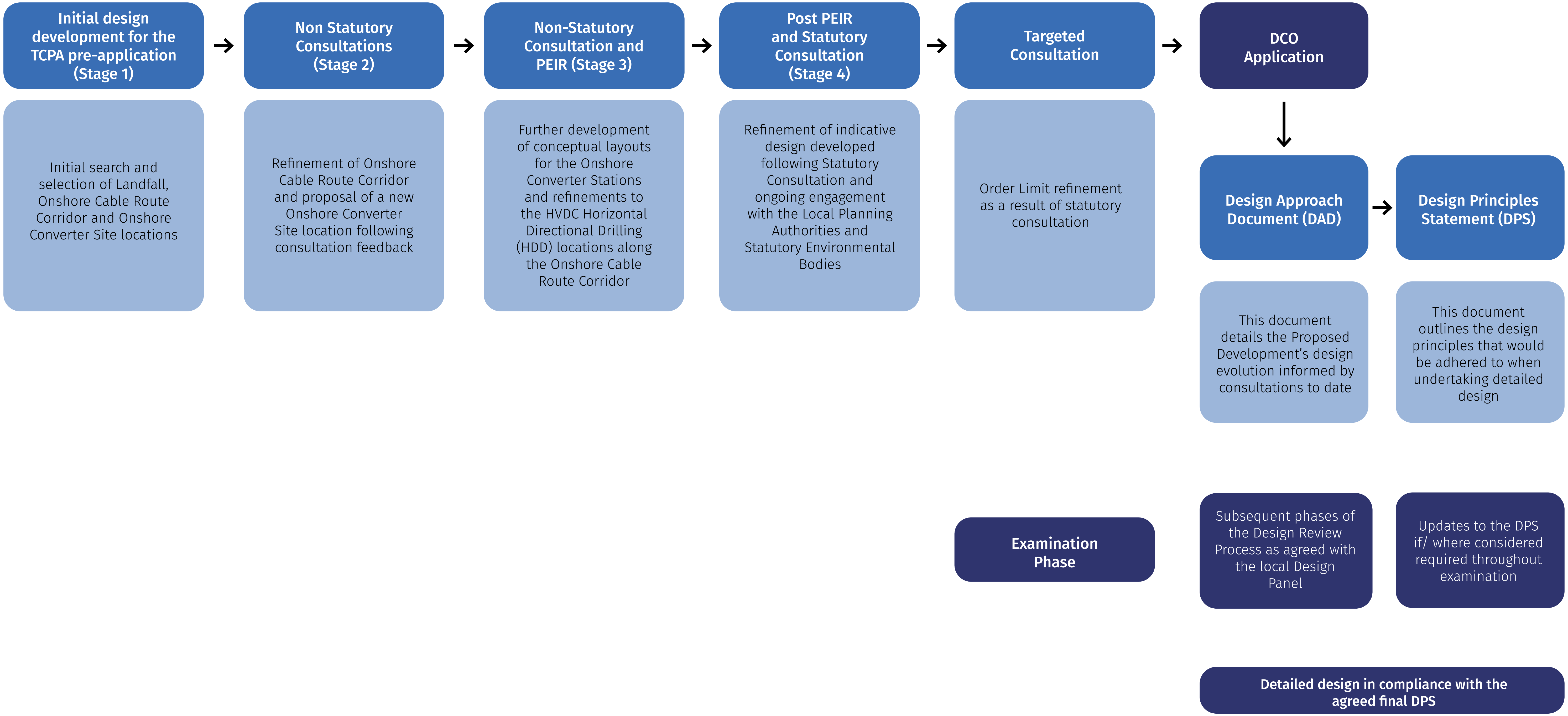
1.1.7 Table 1.1 provides an the overarching principles for all the Onshore Infrastructure Areas of the project.

Table 1.1. Overarching Design Principles for the Proposed Development

Overarching Design Principles
Integrated Development Where reasonably practicable, development and construction would be integrated to streamline the Onshore Infrastructure areas delivery, mitigate any unnecessary environmental impacts and limit local receptor and stakeholder disruption while achieving the functional, safety and security requirements for critical national infrastructure.
Safeguard Sensitive Receptors Where possible, cable route and locations for both Converter Stations would be chosen to avoid sensitive receptors, including settlements, ecologically valuable or designated sites, and habitat areas.
Minimise Construction Impact Construction in the Onshore Order Limits would adapt to existing conditions and designations to minimise impact. This includes installing cables underground to reduce visible infrastructure, narrowing corridor widths, and employing trenchless crossings to limit disturbance where feasible.
Landscape Restoration Where plants have been significantly disturbed or removed, new planting would be designed to blend into the natural landscape wherever reasonably practicable.
Ecological Enhancement Design proposals would aim to compensate for any loss by reinstating and creating new habitats and vegetation, ensuring ecological enhancements. The goal is to achieve no net loss to biodiversity and, where reasonably practicable, promote improvement in biodiversity.

1.0 Introduction

Figure 1.1 Key development phases of the Design Principles Statement



2.0 Offshore Cable Route Corridor

2.1 Overview

2.1.1 The Offshore Cable Corridor is located between the UK Exclusive Economic Zone and the landfall at the Cornborough range. The total length of the Offshore Cable Corridor in UK waters is approximately 370km.

2.1.2 The Offshore Cable Corridor has a nominal width of 500m extending up to 1,500m at some crossing locations (where the cable needs to cross existing power and telecoms cables) to provide the cables with sufficient space to cross the existing assets as close to 90 degrees as possible. This reduces the footprint of the crossing on the seabed minimising environmental impacts. The Offshore Cable Corridor width is also extended to 1,500m at the western edge of The Crown Estate's Project Development Area 3 (Offshore Wind Leasing Round 5) to ensure sufficient separation from the wind farm and the edge of the MCZ.

2.1.3 The location and siting of the Offshore Cable Corridor has been informed by a site selection and route optimisation process. Multiple desktop studies and marine investigation surveys have been completed as well as formal and informal consultation with key stakeholders. Route optimisation had consideration for water depth, seabed (benthic) features and geohazards, metocean influences, external stakeholders (e.g. seabed leaseholders, general fishing activities, shipping etc) and environmental constraints such as marine protected areas including Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Marine Conservation Zones (MCZ).

2.1.4 The Design Principles for the Offshore Cable Corridor are derived from technical requirements for the installation of the cable that form the assessment principles in the Environmental Statement.

2.2 Offshore Cable Route Design Principles

2.2.1 Cables would be buried (where possible) up to approximately 1.6 m below the seabed, subject to detailed Cable Burial Risk Assessment (CBRA). Target depth is 1.5 m. Only when full burial is not possible would additional protection be installed.

2.2.2 Cable protection measures - Where possible, and as far as reasonably practicable introduced cable protection i.e. rock placement (and potentially concrete mattresses), would be kept level with the seabed, and if above the seabed would be kept to a maximum of c.1 m above seabed level (excluding crossings).

2.2.3 Micro-routing of the cables would be undertaken to minimise as far as reasonably practicable any potential damage to Annex I habitats, to avoid sand waves or large ripples (that would otherwise require pre-lay seabed flattening), and to avoid direct impacts where possible on archaeology and cultural heritage assets and submerged land surfaces.

2.2.4 To ensure there is flexibility within the cable corridor for micro routing of the eventual cable placement, the cable corridor would be 500m wide, or four times water depth, whichever is the greater.

2.2.5 HDD methods would be employed to avoid as far as reasonably practicable any direct disturbance of the intertidal, the foreshore and the coastal cliffs.

2.3 Cable Engineering Design Principles

2.3.1 Utilisation of best-in-class, proven cable technology and proven existing asset crossing designs.

2.3.2 Offshore cables would be installed below the seabed with cable burial the preferred method for protection of the cable in the operations phase.

2.3.3 A straight route would be used for approximately 1,000m from the UK landfall (for the HDD).

2.3.4 Consideration would be given to the minimum bending radius of the cable system to ensure the Route Position List (RPL) corridor or future micro routing does not damage the cable system.

2.4 Construction Methodology Principles

2.4.1 An Offshore CEMP will detail the best practice approach to offshore activities and would implement those measures and environmental commitments identified in the EIA as far as reasonably practicable. The following measures will be included in the Offshore CEMP: marine pollution prevention; waste management; marine invasive species; and dropped object procedures. An Outline Offshore CEMP (document reference 7.9) forms part of the DCO (with a final Offshore CEMP finalised by the offshore contractor).

2.4.2 The Offshore CEMP will include construction methods using the following principles as far as reasonably practicable:

- Installation will utilise specialist ROVs to minimise trench width and the scale of any sediment disturbance (compared to less precise trenching tools).
- Bentonite will be utilised as the HDD drill lubricant.
- The HDD drill system and the associated fluid (bentonite) will allow for the monitoring of pressure loss and therefore provision for the rapid identification of potential break outs.

2.0 Offshore Cable Route Corridor

- 1m width of grapnel hook for removal of seabed debris
- 15m swath width of 'pre-lay plough' for e.g. boulder clearance (where required)
- 15m swath width of 'pre-lay plough' for pre-lay trenching (where required)
- Avoid any long-term exposure of the cable once laid on the seabed by completing trenching or burial activities as soon as reasonably practicable.
- All potential sediment disturbance activities in Bideford Bay to avoid peak spring tides and significant wave activity - to limit any potential for sediment mobilisation. These activities would include the excavation / sediment clearance at the HDD exit pits and trenching works.
- All construction activities undertaken on the seabed including boulder clearance activities (inclusive of the depositing of moved boulders) remain within the OCC, and a minimum distance of 20m from any MCZ boundary.

3.0 Landfall

3.1 Overview

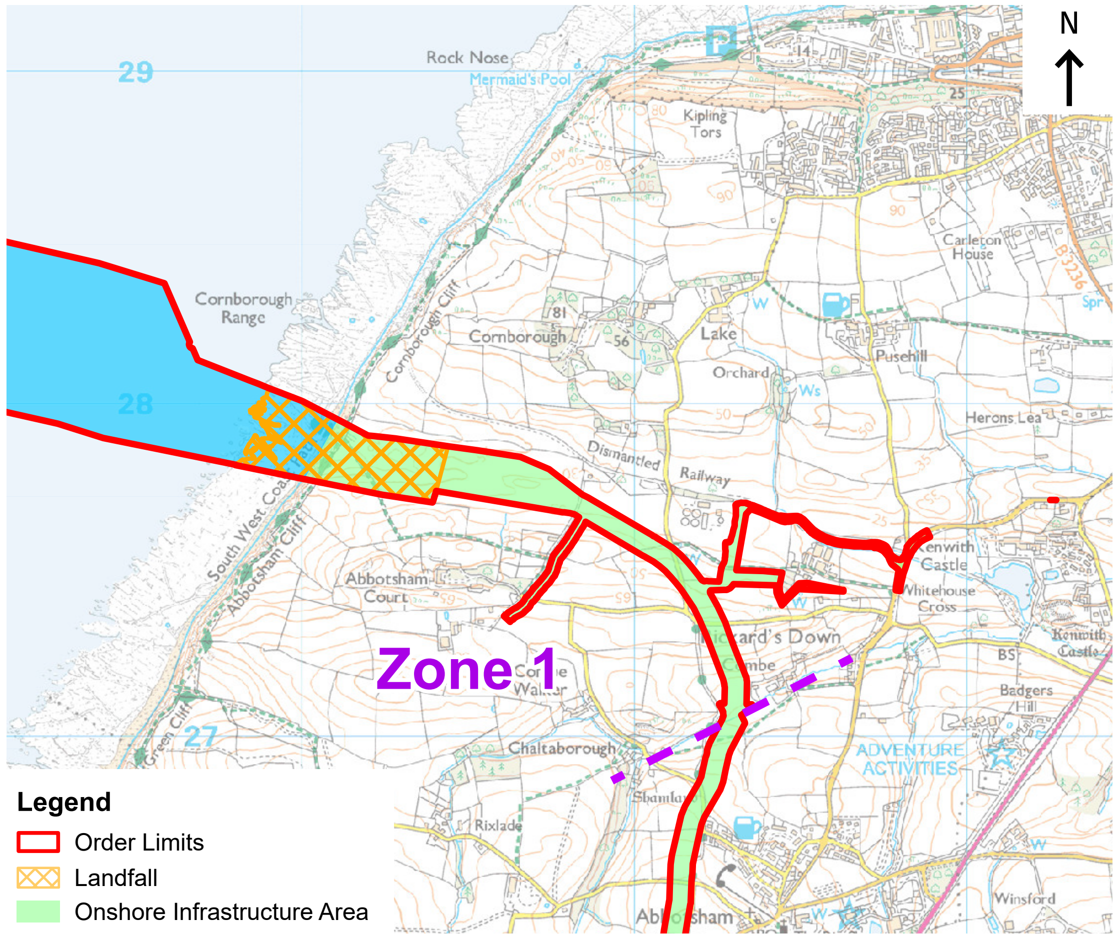
3.1.1 The offshore HVDC Cables make landfall at Cornborough Range on the North Devon coast, to the south-west of Cornborough and approximately four km west of Bideford (Figure 3.1). This area of the site lies within the North Devon Coast National Landscape and the Heritage Coast. The Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI) is also situated along this stretch of coastline.

3.1.2 The landfall at Cornborough Range would be constructed using Horizontal Directional Drilling (HDD) under the seabed and shoreline. The landfall section is a transition zone from offshore to onshore cabling. The HDD's are constructed from the shore and subsequently the offshore cables are pulled in through the ducted HDD and jointed to the onshore cable at a transition joint pit.

3.1.3 A temporary construction compound including associated temporary utility services, plant, equipment, as well as parking and welfare facilities would be required for the landfall construction works.

3.1.4 The criteria for selection of the landfall location are detailed within Volume 1, Chapter 4 - Need and Alternatives (Document Ref. 6.1)

Figure 3.1 Landfall Zone Site Context



3.2 Landfall Design Principles

3.2.1 Cables would be installed in ducts under the beach using trenchless crossing techniques. This would help to avoid physical obstacles and minimise any impact to the local environment.

3.2.2 With the exception of cable markers and manholes covers, no permanent above ground infrastructure would be visible during operation of the project.

3.3 Construction Methodology Principles

3.3.1 The Landfall zone would extend inland to provide space for the temporary construction compound, logistics and access requirements.

3.3.2 Any temporary ground disturbance within the Landfall construction compound would be reinstated to pre-construction condition by backfilling affected areas with subsoil and topsoil.

4.0 Onshore Cable Route Corridor

4.1 Overview

4.1.1 The Onshore Cable Route Corridor works would consist of infrastructure necessary for connecting HVDC cables between the transition joint bay at landfall zone and the proposed converter stations at the Old Webbery Showground site.

4.1.2 The Cable Corridor stretches for approximately 14.5 km and is divided into seven zones dictated by existing engineering restrictions such as major roads and rivers. The Onshore Cable Route Corridor works would consist of:

- Completion of any pre-construction surveys.
- Ecological preliminary works (for instance, hedgerow removal).
- Establishment of construction compounds, including temporary utility installation, and new access points from the highway where required.
- Installation of fencing around the construction areas.
- Site preparation works, installation of drainage, topsoil removal and storage, establishment of temporary compounds, installation of temporary haul roads.
- HDD works at identified locations.
- Trench excavation works, installation of backfill materials and installation of ducts and protective tape and tiles.
- Backfilling of trench to subsoil level.
- Excavation and construction of joint bays and link boxes along the route. The link boxes include maintenance covers for access.
- Installation of power and fibre optic cables through installed ducts between joint bays and installation of link boxes and inspection covers.
- Jointing together of cables at joint bay locations.
- Removal of construction drainage, removal of haul roads, removal of temporary compounds and fencing.
- Replacement of topsoil along the cable corridor and reinstatement to previous land use.
- Removal of temporary access points and planting of any sections of replacement hedgerow.
- Removal and reinstatement of construction compounds.

4.2 Onshore Cable Route Corridor Design Principles

4.2.1 All onshore cabling would be installed underground and avoid the need to install new pylons and overhead conductors.

4.2.2 The design and location of the cable corridor and associated infrastructure would be planned to avoid adversely impacting highway drainage infrastructure and street furniture.

4.2.3 The location of the cables and Joint Bays would be planned to avoid the requirement of traffic management measures above those stated in the Outline Construction Traffic Management Plan (CTMP). (Document Ref. 7.12)

4.2.4 The location of the cables and Joint Bays would be planned to minimise the requirement for significant traffic management during any future maintenance activities.

4.2.5 Trenchless techniques e.g HDD would be utilised wherever practicable for cable installation along the Cable Route Corridor to minimise disturbance and infrastructure needs. This approach would ensure flood risks remain low in the immediate and surrounding area.

4.2.6 Fences, walls, ditches and drainage outfalls would be retained at the landfall and along the Onshore HVDC Cable Corridor and HVAC Cable Corridors, where reasonably practicable.

4.2.7 Link boxes and associated manhole covers would be installed as close as reasonably practicable to existing hedgerows.

4.3 Ecological Impact Mitigation Principles

4.3.1 Where possible, the Cable Route Corridor is to avoid sensitive features such as woodlands or areas with groups of trees, designated sites such as SSSIs and Conservation Areas and watercourses.

4.3.2 Settlements would be avoided where possible to minimise visual impact and reduce disturbance and disruptions to local residents during the construction period.

4.3.3 During the operational phase, a permanent operational easement would be maintained along the Cable Route Corridor. While tree planting would not be possible, other habitats and existing previous land uses can be restored where reasonably practicable.

4.3.4 Where reasonably practicable and agreed upon with the landowner, landscape restoration and ecological enhancements would be carried out within the Cable Route Corridor. This can include:

- Where conditions allow, replanting trees and woodlands within the construction corridor, but outside the Cable Route Corridor's operational easement to retain or increase tree cover.

- Replanting hedgerows to their original alignment and to an improved ecological standard, wherever reasonably practicable.
- Infilling gaps in existing hedgerows with new planting to create new habitats and improve habitat connectivity.
- Reinstate areas of agricultural land to pre-construction condition as quickly as practicable to maintain the character and nature of the landscape.

4.3.5 In all instances where hedgerows and Devon hedge-banks are crossed by the Onshore HVDC Cable Corridor, they would be reinstated on a 'like-for-like' basis. Hedgerow reinstatement would include replanting with suitable species mixes tailored to replicate and enhance the diversity of the existing hedgerows, using appropriate native species of local provenance. A suitably experienced hedging contractor familiar with creation of Devon hedge-banks would be appointed to complete this work.

4.4 Construction Methodology Principles

4.4.1 Haul road(s) would be installed within the temporary working area of the Onshore HVDC Cable Corridor to minimise impacts during construction on agricultural land and reduce the number of construction vehicles on the local road network.

4.4.2 Post-construction, the working area would be reinstated to pre-existing condition as far as reasonably practicable in line with the Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022).

4.4.3 All haul roads, temporary construction compounds and temporary fencing would be removed, field drainage and/or irrigation would be reinstated in accordance with landowner requirements, and the land would be reinstated to its original condition, as far as reasonably practicable. Where practicable, consideration would be given to early restoration of sections of the Onshore HVDC Cable Corridor.

5.0 Onshore Converter Stations

5.1 Overview

5.1.1 The proposed Converter Site, consisting of two Converter Stations, is located between Gammaton and Alverdiscott, approximately 5km southwest of the town of Bideford. The existing Alverdiscott Substation sits to the east of the converter site. Figure 5.1 shows the location of the Converter Site within the Order Limit.

5.1.2 The Converter Site would accommodate two Converter Stations, referred to as Bipole 1 and Bipole 2, each with the following buildings, associated components and infrastructure:

- Converter Hall
- Transformers
- Control Building
- HVAC
- Harmonic Filters
- Cooling Fans
- AC Switch Yard
- DC Switch Yard

5.1.3 The primary function of the Converter Stations would be to convert transmitted electricity from DC to AC prior to connection with the National Grid, through the existing Alverdiscott Substation. The Converter Site would also consist of a main car park, spare parts building, a control access building and a temporary construction laydown area during the construction phase through to the operations phase. The operational needs for the Converter Stations would include:

- Appropriate electrical and magnetic clearances or shielding
- Space for maintenance and repair operations within the Converter Stations
- Allowances for replacement of equipment in a timely manner to ensure minimal disruption or interruption to operation
- Dual perimeter security fencing with sterile zone to allow appropriate entry and exit provisions for workers and deter access by others.

5.1.4 The design of the Converter Stations would comply with all relevant statutory requirements including building regulations, building control requirements, fire safety in consultation with the fire authority and the Applicant's standards. The standards include the design life of materials and components to meet functional and operational needs relating to:

- Fire Safety
- Thermal and Acoustic Performance
- Future Maintenance
- Electrical safety
- Security
- Access for Operation and Maintenance

5.1.5 The detailed design of the Onshore Converter Stations, which requires approval under a DCO Requirement, must align with the Parameter Plans, Parameter Table, and the outlined Design and Landscaping Principles. Following these principles ensures the design meets the 'Good Design' standards set by *NPS EN-1*, fulfills its functional and operational needs, and integrates well with its surroundings.

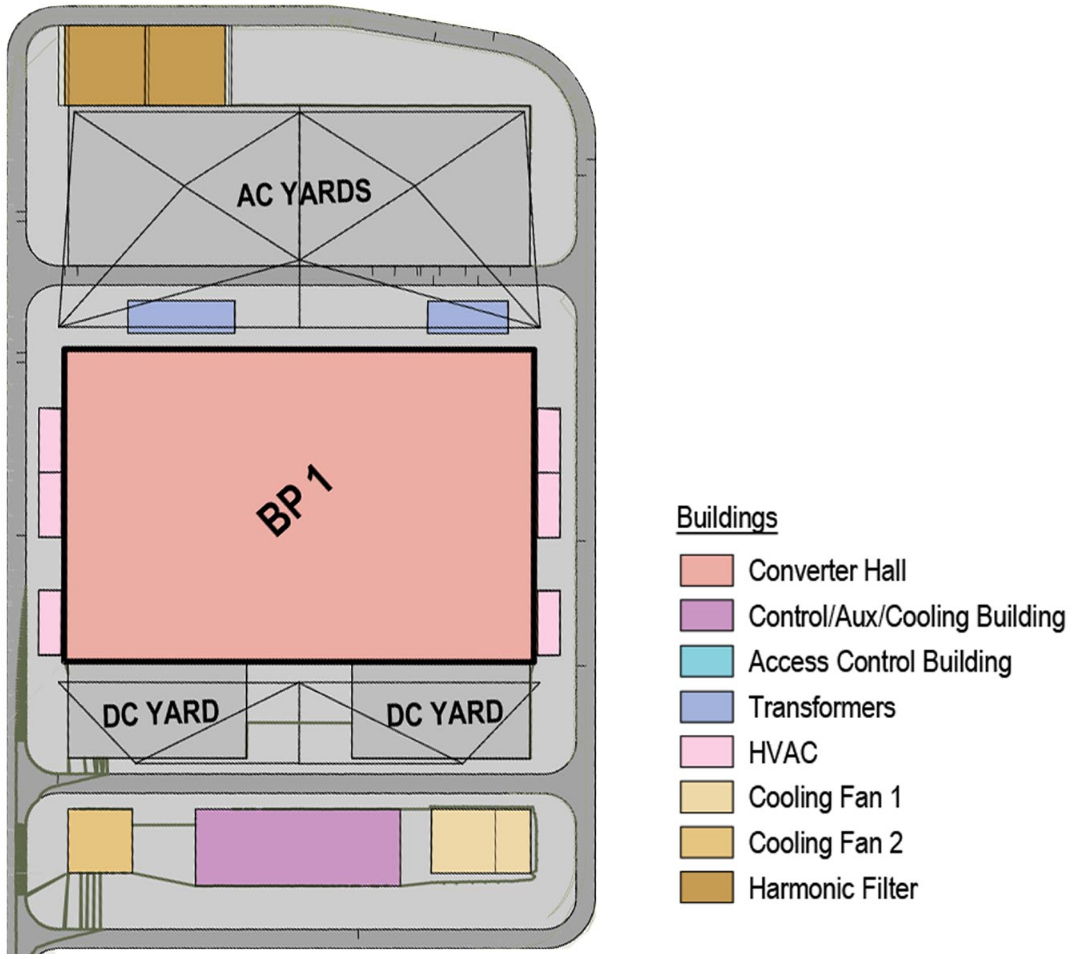
5.1.6 The criteria for selecting the Onshore Converter Site location is outlined within Volume 1, Chapter 4: Need and Alternatives. Further details on the siting and design evolution of the converter site can be found in the Design Approach Document (Document Ref. 7.3)

5.2 Indicative Converter Station Layout

5.2.1 The layout of the Converter Station electrical infrastructure is determined by the functional and technical requirements of each electrical component, which must follow a specific sequence in line with electrical transmission standards.

5.2.2 Once appointed, the Original Equipment Manufacturer (OEM) will carry out a more detailed design exercise. Figure 5.2 shows the indicative design for each Bipole/Converter Station.

Figure 5.2 Indicative Bipole Design



5.2.3 The Converter Hall occupies the largest footprint within each Bipole. Surrounding the Hall are key components like HVAC units and transformers. The AC and DC switchyards are positioned on opposite sides of the Converter Hall, with two harmonic filters located next to the AC switchyard. Adjacent to the DC switchyard is the Control/Auxiliary and Cooling Building, flanked by two cooling fans.

5.0 Onshore Converter Stations

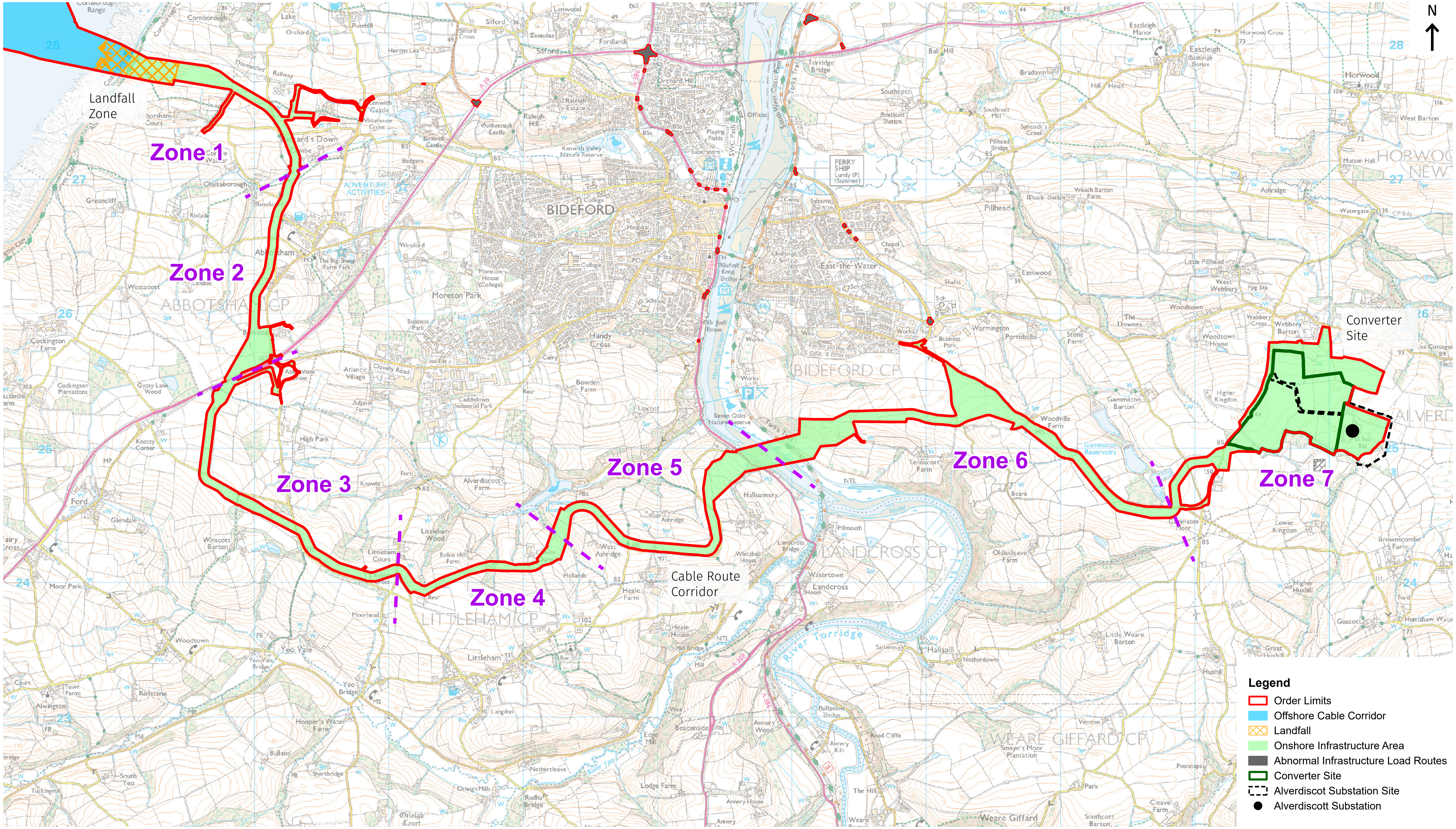


Figure 5.1 Map showing location of the Onshore Converter Site within the Order Limits

5.3 Maximum Design Parameters

5.3.1 The design of the Onshore Converter Stations will be developed and finalised post-consent within the maximum design scenario defined in the DCO and assessed in the ES. The Onshore Converter Site's maximum design scenario is outlined in Table 5.1

Table 5.1 Maximum Design Scenario for the Converter Site (CS)

Parameters	Maximum Design Scenario
Number of Converter Stations	2
Combined footprint of Converter Station platforms (m^2)	130,000
Permanent footprint of Converter Site (combined) including converter buildings, landscape bunding, planting and drainage (m^2)	395,000
Height of Converter Halls Above Ground Floor Level (excluding lightning protection, aerials, etc.) (m)	26
Height of lightning protection Above Ground Floor Level (m)	30

5.4 Design Principles for National Infrastructure 2020, National Infrastructure Commission (NIC)

5.4.1 The Design Principles for National Infrastructure is an influential document produced by the NIC's design group, whose members consist of design leaders from various disciplines including architecture, transport, landscape and engineering. It outlines four design principles to be considered by anyone involved in planning, constructing and maintaining national Infrastructure.

5.4.2 The aim of the principles is to guide the planning and delivery of major infrastructure projects in the UK by ensuring they meet high standards of design. The four principles are:

- Climate - Mitigate greenhouse gas emissions and adapt to climate change
- People - Reflect what society wants and share benefits widely
- Place - Provide a sense of identity and improve our environment
- Value - Achieve multiple benefits and solve problems well.

5.4.3 Table 5.2 outlines the general Converter Site principles categorised in line with the NIC's four *Design Principles for National Infrastructure (2020).*

Table 5.2 Applicant's General Principles in line with the NIC Design Principles for National Infrastructure

Ref	NIC Design Principle	Applicant's Design Principle	Activity
1	**People & Value**	Functionality	The design of all components shall be functional and meet the technical, environmental, operational, safety and security requirements of the Proposed Development.
2	**People & Value**	Safety	The safety of the public and site operatives is an overriding principle that must be given the highest priority when making every design decision.
3	**People & Value**	Mitigation of the visual impact of the Onshore Converter Stations	The DPS process will examine various design aspects including building materials, roof design, colours and landscaping with the goal of reducing visual impact as a central guiding principle.
4	**People & Value**	Parish Councils, local residents and relevant planning Authorities will be represented in the design development and consultation process	Chapter 5 of the DAD outlines the Applicant's engagement with stakeholders throughout the design evolution process. Chapter 6 of the DAD outlines a Local Design Panel(LDP) comprising of project stakeholders and representatives to ensure the detailed design aligns with the project's Design Principles and technical requirements.
5	**People & Value**	Establish a Local Design Panel that includes experts in the field of environmental topics that can influence the design process	The proposed makeup of the Local Design Panel (LDP) includes members of the project team and their consultant representatives, including the appointed landscaping technician. The LDP also includes Project Stakeholders such as the Local Planning Authority, Lead Local Flood Authority, Historic England and Environment Agency.
6	**Climate, People, Place & Value**	Consider 'Good Design' in line with the requirements of Overarching National Policy Statement for Energy (NPS EN-1) and the National Infrastructure Commission's 'Design Principles for National Infrastructure' (National Infrastructure Commission, February 2020)	The Criteria for Good Design from EN-1 and objectives of Climate, People, Places and Values from the NIC Design Principles guide underpin the process and development of the principles in this table. Ensure the site meets the criteria for security as critical national infrastructure.

Ref	NIC Design Principle	Applicant's Design Principle	Activity
7	Climate, People, & Place	Incorporation of ecological enhancement considerations within the adopted landscaping scheme to maximise the habitat creation on the site	Feedback from the consultation process to date has informed an Outline Landscape and Ecological Management Plan, submitted alongside the DCO Application which reinforces the development of a design that integrates opportunities for ecological preservation and enhancement.
8	Climate	The design will support the supply of renewable energy, helping to reduce carbon emissions and meet national and international carbon reduction and renewable energy targets, in line with project objectives	The purpose of the Proposed Development is to generate and supply renewable electricity to the National Grid. The technical design of the Converter Stations will minimise electrical power consumption and other losses to optimise the power delivered to the grid.
9	People, Place & Value	Develop an integrated design	The Local Design Panel (LDP) will establish a forum, creating a collaboration between engineers, landscape architects, and specialists such as design architects, environmental experts, planners, and community representatives ensuring comprehensive consideration and integration of all design aspects.
10	Climate, People & Places	The use of bunds to support visual screening	Construction of the platforms for the Converter Stations will be cut into the existing hill slope to reduce the ridge level of the building. Surplus excavated material will be used to create landscape bunds, integrating into the landscaping scheme to reduce material export from the site while mitigating the visual impact of the Converter Stations within the local setting. The design would aim to balance cut and fill to minimise surplus material
11	Climate, People & Places	The establishment of native Woodland to enhance the surrounding area	Woodland planted areas will be established to form the upper canopy structure across the site. Species selection and percentage mix will be developed to ensure compatibility with the local character. The selection of species for planting will be an aspect to be agreed with the Local Design Panel (LDP). There will be a strong emphasis on the use of native species.
12	Place	The use of site layout to mitigate adverse visual impact	The orientation of the converter halls will be carefully selected to meet the access and operational requirements of the converter site, whilst aligning with the placement of proposed bunds to reduce visual impact.

5.5 Buildings

5.5.1 The key parameter, defined as a maximum within the DCO, is the overall building height. This would be confirmed at the detailed design stage within the defined parameters and other aspects of the building design would be in accordance with the design principles.

5.5.2 Building design aspects would be considered in line with the principle of reducing visual impact and the feedback as received during consultation in relation to preferences for materials and achieving an integrated design.

Table 5.3 Maximum Design Parameters for Buildings within the Converter Site (CS)

Parameters	Design Envelope
Maximum building/ equipment height exc. Lightning Protection (m)	26 above Ground Floor Level (defined in the project description

5.5.3 Buildings - Key Design Considerations

5.5.3.1 The key design considerations for which principles can be established are:

- **Building positioning and orientation:** Based on consultation feedback and design evolution of the Converter Stations as outlined within Chapter 5.0 of the Design Approach Document
- **Building Form and Scale**: Predominantly controlled by the operational requirements and design of the preferred OEM within a maximum height parameter
- **Roof design**: Design of the Converter Hall roof, which could be pitched/ gabled roof or pitched with a parapet
- **Materiality**: Materials used to clad the building, subject to these complying with operational, electrical safety and fire standards
- **Colour**: Colour of the cladding can be within the range of commercially available options.

5.5.4 Building Positioning and Orientation

5.5.4.1 Chapter 5.0 of the Design Approach Document (Document Ref. 7.3) outlines the Design Evolution of the Converter Site through consultation, including the siting and orientation of the buildings associated with the Converter Stations within the Converter Site. The Applicant has explored a number of design options culminating in an indicative layout at Stage 4, post Statutory Consultation, which reduces the proximity between the two Converter Stations and re-orientates them within the existing topography to further reduce cut or fill surplus.

5.5.4.2 The indicative layout has informed the Proposed Parameter Plan (Figure 5.3) which shows the Limit of deviation for the Converter Halls.

5.0 Onshore Converter Stations

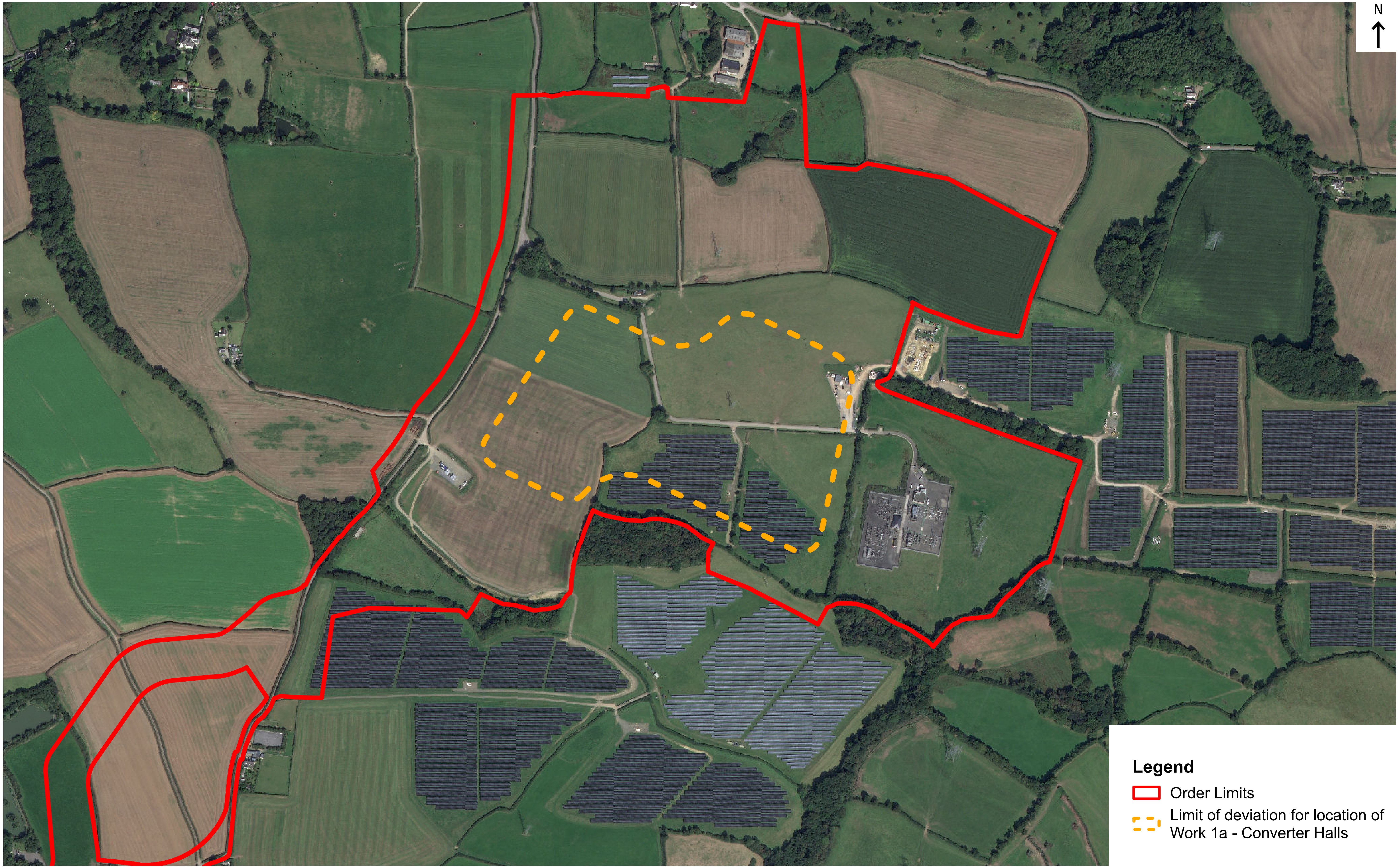


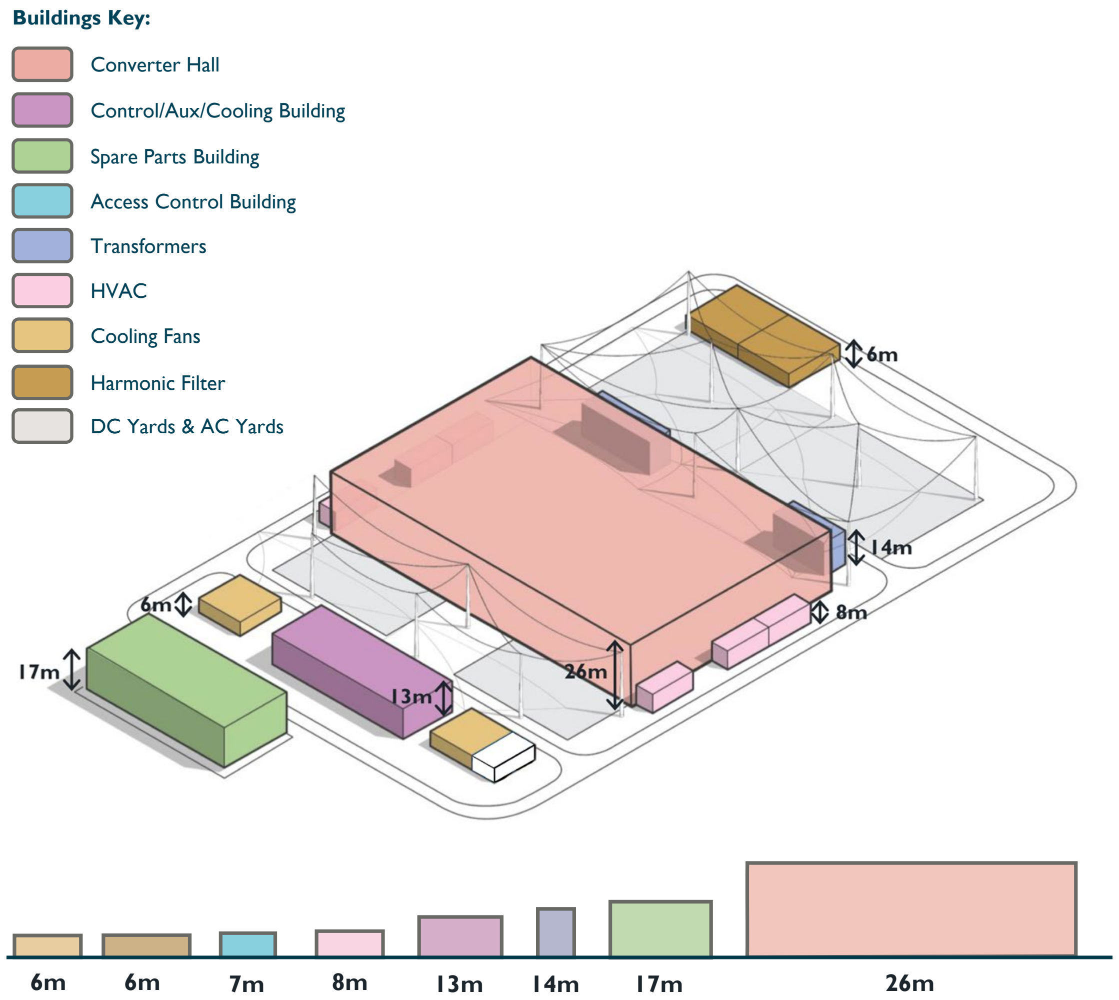
Figure 5.3 Proposed Parameter Plan showing the Limit of Deviation for the Converter Halls

5.5.5 Buildings - Form and Scale

5.5.5.1 As outlined in Section 5.2.3, the Converter Hall is the largest structure within a typical Converter Station and therefore has the biggest visual impact on the contextual landscape.

5.5.5.2 The indicative design for each Converter Station allows for a combination of likely forms to accommodate various OEM designs. At this stage, the Converter Hall is a simple rectangular shape with a maximum height parameter of 26m. A more detailed form would be developed during the detailed design stage. Key principles for the form and scale would therefore focus on mitigating the visual impact of the maximum building/ equipment height of 26m.

Figure 5.4 Indicative scale of buildings and equipment



5.5.5.3 As outlined in Chapter 5 of the Design Approach Document (Document Ref. 7.3), overlapping landscape bunds would be proposed to mitigate the maximum height of the Converter Halls by screening the buildings from sensitive receptors, helping the Converter Stations to assimilate into the wider landscape.

5.5.6 Buildings - Roof Design

5.5.6.1 Consideration would be given to the roof design of the Converter Halls at the detailed design stage as it can influence how the scale of the Converter Halls are perceived. Elements such as the roof profile and the installation of mechanical equipment on the roof can raise the building's overall height and introduce visual clutter, affecting distant views of the Converter Site.

Table 5.4 Roof Profiles and design considerations

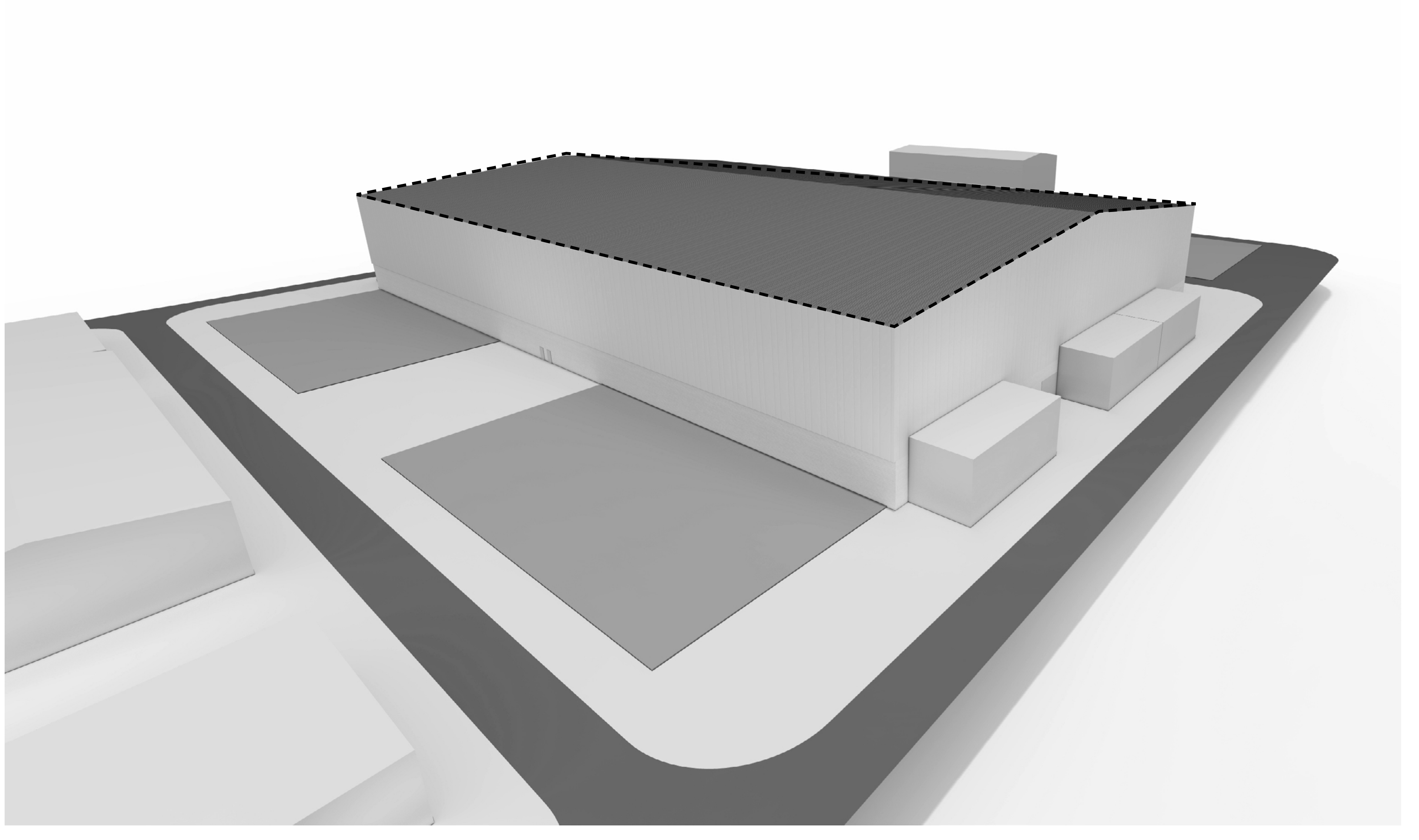
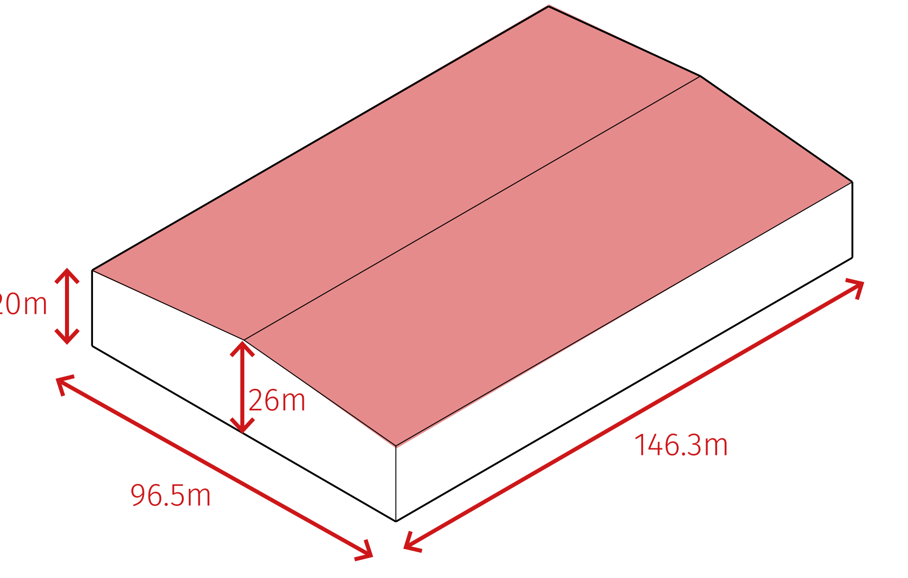
Roof Profile	Design Consideration
Curved Roof	Initially proposed in the early concepts for the Converter Halls, this option was dismissed during Stage 3 Consultation, between the Non-Statutory Consultation and PEIR. Ensuring safe internal clearances between electrical equipment and the building structure, along with the need to accommodate variations in standard designs from different suppliers, rendered this option unviable.
Pitched roof with Parapet	Mitigates the potential exposure of the roof material, however, consideration should be given to the structural implications of this option such as the additional supports required for a twin portal, potential long term maintenance of the valley gutter and risks to internal electrical equipment in case of a leak from the valley gutter.
Pitched/ Gabled Roof	Most likely roof option with the required safe internal clearances between electrical equipment and building structure. This option also presents a reduced risk to internal electrical equipment in case of a leak from the roof gutter. Consideration should be given to the degree of the roof pitch. A high degree of pitch could potentially expose the roof material from distant views, making the Converter Halls more prominent in the landscape when combined with the cladding material.

5.5.6.2 Key Roof Design Principles

5.5.6.2.1 There is to be no mechanical plant on the roofs of the Converter Halls.

5.5.6.2.2 The outcome of further design development of the Converter Hall at detailed design would seek to minimise views of the roof materials as much as reasonably practicable.

5.0 Onshore Converter Stations

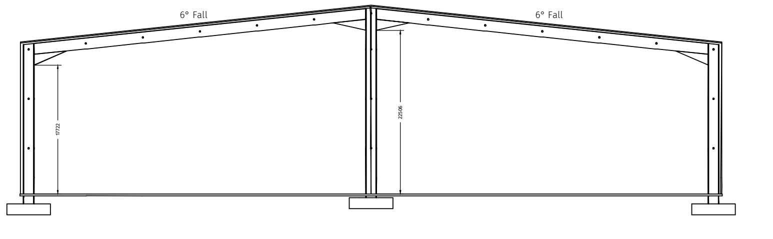


Figure 5.5 Conceptual view of Converter Hall with a pitched/ gabled roof, dimensions and indicative section

5.5.6 Materiality

5.5.6.1 Material selection would be based on the contractor's recommendations during the detailed design stage, with ongoing input and feedback from the Local Design Panel (LDP). Since the materials used for the Converter Station buildings would influence their design lifecycle, careful consideration would be given to material types, characteristics, and their role in reducing the visual impact of the Converter Station buildings within the surrounding landscape. Selected materials must also meet technical and operational requirements, including:

Material Strength: The choice of material has to be robust enough to form large scale structures

Weatherproof : The choice of material has to be resistant to severe weather conditions such as heat waves, water ingress and high winds. Surface joints should be completely impermeable to water

Fire resistance: The choice of material must be able to withstand high temperatures without compromising its structural integrity

Durability: The choice of material must be low maintenance and able to endure the demands of a 50 year lifecycle

Sustainable: The choice of material should have low embodied carbon where reasonably practicable and feasible to reduce the overall carbon footprint of the Proposed Development

Ease of Installation: The choice of material should be easy to install to reduce the time of installation.

5.5.6.2 There are various types of building materials which meet some or all of the criteria listed above. All have advantages and disadvantages which would be considered for this specific Proposed Development. With the scale of the Proposed Development, cost also plays a factor in the choice of construction material. Potential materials to be considered during the detail design can include the following:

- Metal Rainscreen cladding (Aluminium)
- Fibre Cement Cladding
- Pre-Fabricated Concrete

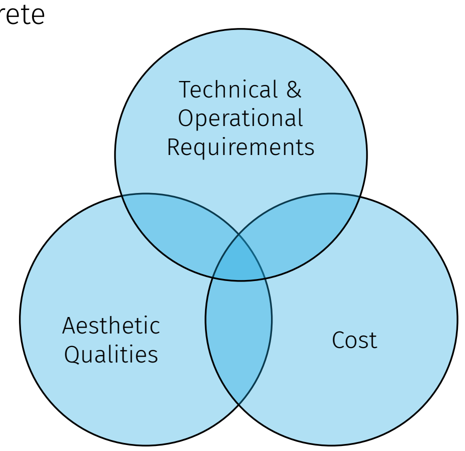


Figure 5.6 Basic Criteria for material selection

Table 5.5 Potential material types and characteristics

Metal	Aluminium Rainscreen Cladding	Material Strength: Excellent strength to weight ratio for mid to low impact areas of a facade Weatherproof: Aluminium has anti-corrosive properties and the ability to withstand harsh weather conditions without deteriorating over time Fire resistance: The choice of material must be able to withstand high temperatures without compromising its structural integrity Durability: Some finishes like anodised aluminium extend the service life Sustainable: Highly recyclable and very energy efficient during production Ease of Installation: Lightweight nature ensures an ease of installation and reduces the structural load on buildings
Composite	Fibre Cement Cladding	Material Strength: Strong rigid panels of various sizes Weatherproof: Fibre cement has exceptional resistance to extreme temperatures, frost and water Fire resistance: Non-combustible with A2-S1-d0 fire rating Durability: Requires very low maintenance with service life of up to 50 years Sustainable: 100% recyclable with bronze cradle to cradle certification Ease of Installation: Can be installed in a rainscreen system to speed up construction
	Prefabricated Concrete	Material Strength: Excellent compressive strength compared to other construction materials Weatherproof: Can be highly resistant to extreme weather conditions with additives Fire resistance: Class A1-S1-d0, providing the best fire resistance of any building material Durability: Requires very low maintenance with service life of up to 50 -100 years Sustainable: Industrial and recyclable waste can be used as aggregate. Consumes less energy during production compared with other materials Ease of Installation: Prefabrication can speed up construction

5.0 Onshore Converter Stations

5.5.6.3 Material combinations can be used to visually break up the large elevations of the Converter Hall. Composite cladding, concrete blockwork, or prefabricated concrete panels offer durability against minor impacts at lower levels, while metal cladding, such as aluminium rainscreen or standing seam panels, can be applied at higher levels to provide large-scale coverage without adding significant structural load.

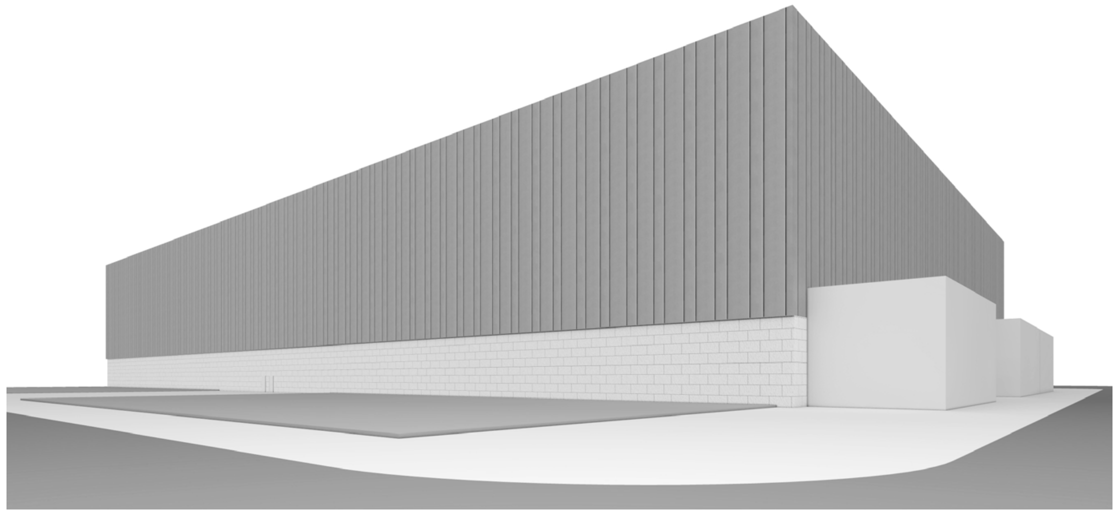


Figure 5.7 Concept image showing blockwork at low level and Metal cladding at high level

5.5.6.4 Incorporating texture into the metal, composite, and concrete cladding can also help to visually break up the large elevations and reduce surface reflectivity, thereby lessening the building's prominence within the landscape.

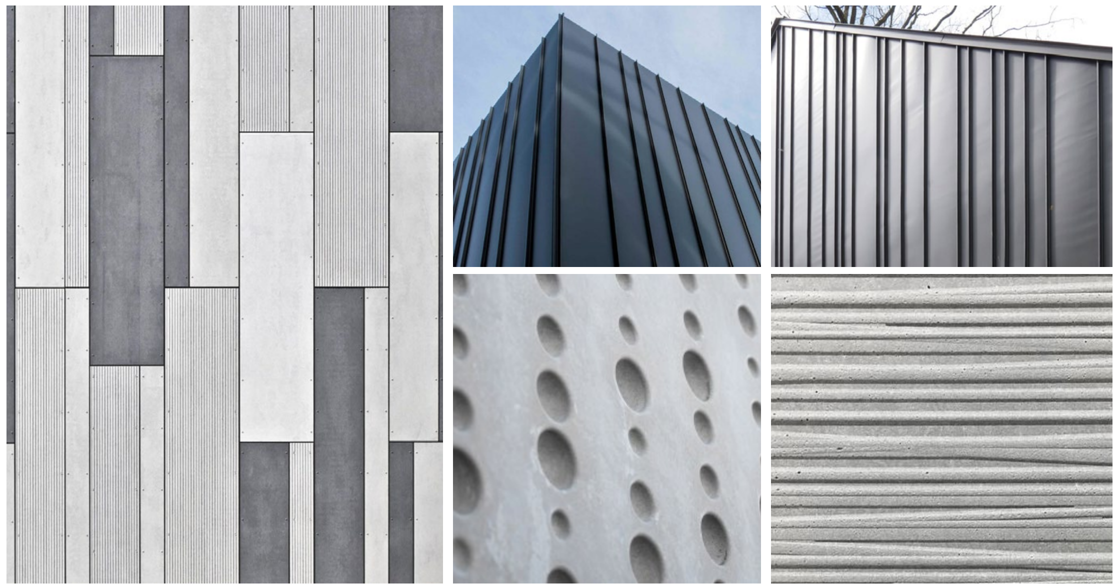


Figure 5.8 Images showing examples of texture on different materials

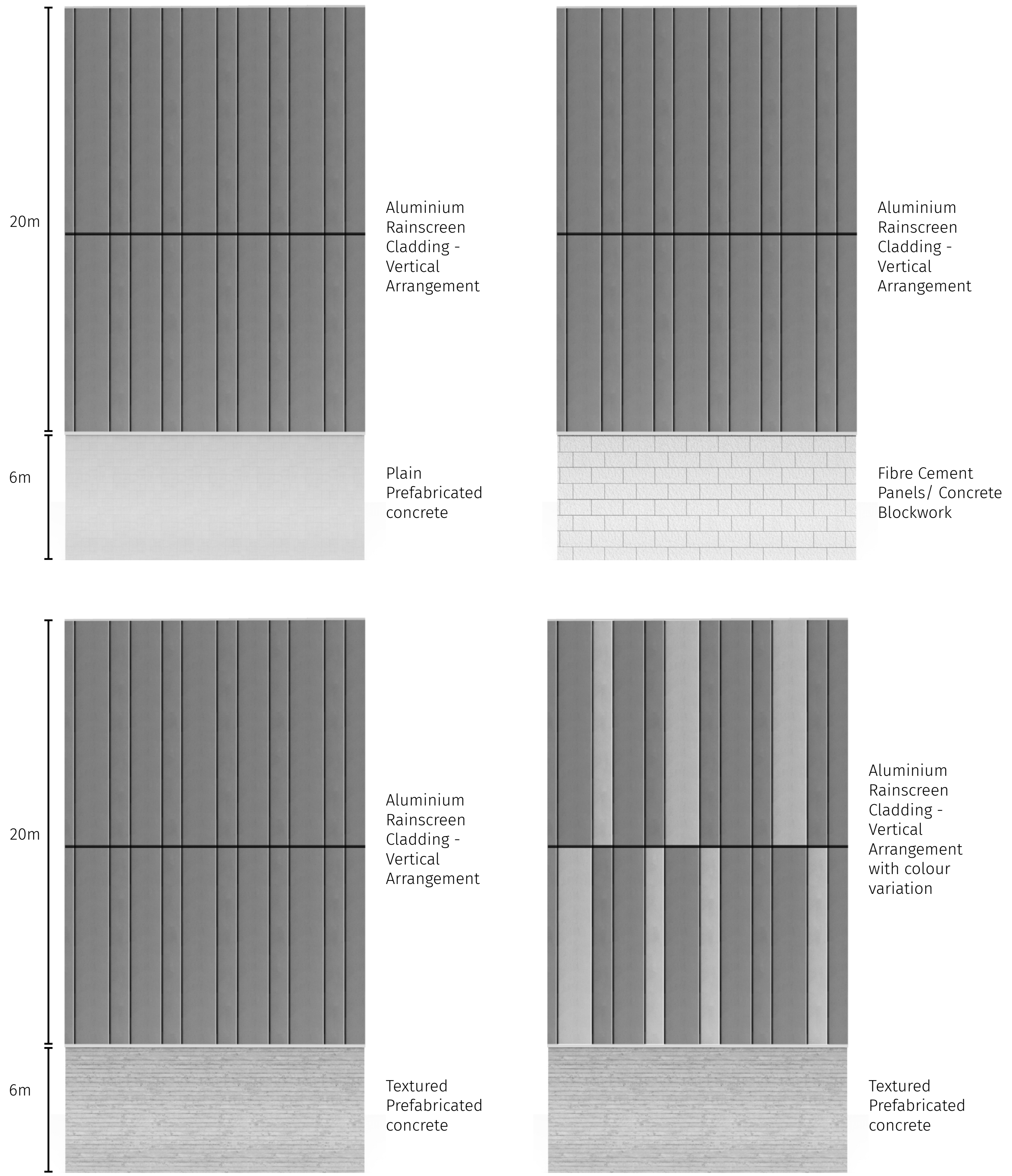


Figure 5.9 Potential material and texture combinations

5.5.6.5 Key Materiality Principles

5.5.6.5.1 Proposed materials would achieve the functional, technical and structural requirements set out within Regulation 7 of the Building Regulations (2010) whilst helping to reduce the visual impact and ensuring the integration of the site within the local landscape.

5.5.6.5.2 Proposed materials for the roof and external cladding of buildings would be hard-wearing, long-lasting and low maintenance.

5.5.6.5.3 Where practicable, materials would be sustainably sourced with the potential to reuse or recycle at the end of its operational life.

5.5.7 Colour

5.5.7.1 Applying the right colour(s) to the buildings of the Onshore Converter Stations will help reduce visual impact and blend the site into the local landscape. An Environmental Colour Assessment would be conducted post-consent to identify key colours within the surrounding landscape. This assessment would guide the development of a colour palette for the Onshore Converter Site, enhancing the integration of structures with their surroundings.

5.5.7.2 As noted in paragraph 4.17 of the Environmental Colour Assessment Technical Information Note (Landscape Institute 2018), 'Light falling on a surface can substantially alter the perceived colour, making it appear both lighter and brighter in the landscape. Among the common building materials, paint finished steel can be highly reflective'. Paragraph 4.19 goes on to state: 'When seen from a distance, the perceived colour of built form or surfaces tends to look less dark and more chromatic or brighter than the inherent colours of the construction material. A colour sample which may look slightly dull in the studio as a swatch will look more colourful and lighter on a façade or surface.'

5.5.7.3 The use of lighter colours, especially near the roof line can increase the visibility of a structure in the landscape. Additional factors such as seasonal changes and specific viewpoints around the site can have an impact on the effectiveness of colour application. Lighter greens, for example, may stand out more in winter when placed beside deciduous woodland.

5.5.7.4 The choice of colour tones will also impact the prominence of a structure. The global standard Natural Colour System (NCS) should be used when selecting colours, to ensure that tones are based on colours found in nature.

5.5.7.5 Colour choices will depend on selected materials, manufacturer constraints, and availability. Final decisions on materials and colours will be made during the detailed design stage, in consultation with the Local Planning Authority (LPA), following best practices to meet functional, technical, and stakeholder requirements.

5.5.7.6 An initial colour sampling exercise was undertaken, based on colours identified within the local landscape. Given the rural context of the site, dark brown and green hues were the most prominent, reflecting the surrounding vegetation and local agricultural landscape. Figure 5.10 and Figure 5.11 show examples of the agricultural setting of the Converter Site.

Figure 5.10 Existing view north-northeast from minor road to the north of Gammaton Moor

Figure 5.11 Existing view south from minor road to the east of Webbery Cross

5.5.7.7 As illustrated in Figure 5.12, the indicative colors were matched with commercial options from the Tata Steel *Colourcoat HPS200 Ultra Colourcard* to create an indicative colour palette, which will be refined during the detailed design stage.

Figure 5.12 Indicative colour palette identified by initial colour sampling

5.5.7.8 Key Design Principles

5.5.7.8.1 Colours would be selected from a palette of contextual colours following an Environmental Colour Assessment. Colours for the cladding would be dark recessive and non-reflective to minimise visual impact.

5.6 Landscaping

5.6.1 The indicative landscape proposals seek to retain where feasible all existing vegetation onsite to assist in integrating the proposals. Retained existing onsite and immediately adjacent off-site vegetation would assist in providing screening to the Converter Stations as well as providing maturity to the landscape proposals and retaining biodiversity habitats.

5.6.2 Extensive earthworks form bunds around the proposed buildings, balancing cut and fill onsite. The profile of the bunds has been designed to have a more naturalistic gradient that would help to assimilate into the wider landscape. Mixed native woodland planting would be used to provide further screening, soften the bunds, provide habitat creation and assist in soil stabilisation.

5.6.3 The planted bunds would provide mitigation to the North Devon Coast National Landscape to the west of the Converter Site as well as other views to the north, south and east identified within the LVIA. Woodland planting would be designed to be in keeping with the local character and would utilise a combination of whip and standard trees to provide an effect that would mature over time.

5.6.4 Advanced planting works would assist in integrating the proposals and maximising the effectiveness of the mitigation.

5.6.5 To maximise biodiversity and minimise maintenance actions a species rich grassland would be proposed on the remaining landscape areas. The proposed landscaping would seek to recreate any loss of habitats undertaken to deliver the built proposal.

5.6.6 Hard Landscaping

5.6.6.1 The strategy for hard landscaping within the Onshore Converter Station Site would be guided by the site's safety, maintenance and technical requirements. The hard landscaping should be robust, durable and easily maintained. The materials used would be limited to a select palette, including concrete pavers, concrete hard standing, shingle and asphalt.

5.6.6.2 Where possible, permeable hard-standing would be used to assist with drainage across the site, including the AC and DC yards of each Bipole.

5.6.7 Key Landscape Design Principles

5.6.7.1 The landscape proposal would be developed and approved in accordance with landscape mitigation plans. A DCO Requirement would ensure that the detailed designs, post-consent, align with these design principles.

5.6.7.2 The landscape proposal would seek to feasibly retain as much of the existing vegetation of both landscape character and ecological value as reasonably practicable. This would include any existing vegetation immediately adjacent to the site boundary.

5.6.7.3 The introduction of new planting would be complementary to the surrounding landscape character and would incorporate native species.

5.6.7.4 A mixed native woodland would be used to soften the surface of the bunds and provide additional screening, as well as habitat creation and soil stabilisation.

5.6.7.5 The biodiversity of the grassland at the Converter Site would be enhanced to create a species-rich habitat. Consideration would be given to species which require minimum maintenance in order to reduce disturbance to wildlife.

5.6.7.6 The design for the Converter Stations would aim to balance the cut and fill of excavated earthworks to reduce the need for imported material whilst maximising the reuse of excavated soil.

5.0 Onshore Converter Stations

Figure 5.13 Indicative plan of soft landscape strategy

5.0 Onshore Converter Stations

5.7 Access & Security

5.7.1 The main access to the Onshore Converter Stations would be via the main road to the west, upcoming from Gammaton Road. A new road is proposed to the south west connecting to the new stations' internal road system. The existing road is proposed to be re-routed around the new stations to provide access to the existing Alverdiscott Substation.

5.7.2 Vehicle access would be required for staff based on-site, routine operation and maintenance, and emergency vehicles, if required. The majority of vehicles accessing the Onshore Converter Stations would be vans and cars, however, a wider internal road network would accommodate larger vehicles that may be required for the removal and replacement of larger Converter Stations equipment such as transformers.

5.7.3 Appropriate security infrastructure would be implemented to ensure the site remains safe and secure. A manned Access Control Building would be positioned at the site entrance to restrict access to authorised personnel only.

5.7.4 Two security fences would be installed at the Converter Station Site: high security fence, following the base of the bunds, and a separate high security fence around the perimeter of each Bipole. The landscape bunding would also provide a physical boundary while screening the Converter Stations to minimise the visual impact on the surrounding landscape. Key considerations at detailed design stage would include:

Fence Type: Options can include steel palisade or mesh panels.

Fence Colour/ Finish: Options can include galvanised, painted or plastic coated.

5.7.5 CCTV cameras would be installed throughout the site to monitor for any unusual activities, with additional cameras placed internally in high risk areas and entrances. The footage would be remotely monitored from an off-site location.

Table 5.6 Maximum Design Parameters for the Converter Site (CS) Access and Security

Parameters	Maximum Design Scenario
Height of security fence around Converter Site (m)	4

5.7.6 Key Access and Security Principles

5.7.6.1 Security for the Converter Site would meet the required security standards, in line with guidance from the UK National Protective Security Authority for Critical National Infrastructure (CNI) and other relevant government bodies for critical infrastructure security.

5.8 Operational Lighting Strategy

5.8.1 The Onshore Converter Stations would require lighting during maintenance and operational use for health and safety, and security reasons. Areas that would typically require lighting include:

- Key routes
- Wayfinding
- Safety signage
- Building entrances.

5.8.2 Lighting should only operate when required and be directional within the site boundary only to reduce light spill into the surrounding landscape. This could be achieved through strategies such as:

- Building mounted lighting
- Motion detecting lighting above entrances
- Signage lighting and Low level lighting such as bollards to reduce light spill along routes.

5.8.3 Dark corridors would be maintained, where reasonably practicable, around the site to protect local ecology and habitats, in line with the latest industry guidance. These corridors would act as buffer zones around the Onshore Converter Site, minimising disturbance to wildlife.

5.8.4 Operational Lighting Design Principles

5.8.4.1 The lighting scheme for the Converter Station site would be developed in accordance with CIBSE/ SLL recommendations and guidelines.

5.8.4.2 Operational lighting would be designed where reasonably practicable to avoid illumination of areas beyond the operational site. This would include directional lighting to minimise overspill into the surrounding landscape where reasonably practicable.

5.8.4.3 Warm-toned lighting, which avoids white and blue wavelengths could be used, subject to safety and operational risk assessment, to reduce the impact on wildlife in the local environment.

5.8.4.4 Operational outdoor lighting at the Converter Site boundary would be restricted to motion-activated security lighting or as required for safety of personnel during operations.

5.8.4.5 LED luminaires would be utilised, where reasonably practicable, to provide low-intensity lighting which can be adjusted or dimmed for seasonal benefits.

5.9 Drainage

5.9.1 An Outline Operational Drainage Strategy Technical Note (Document Ref. 7.22) has been submitted as part of the DCO application. The document identifies the strategy for the various drainage elements across the Converter Site that would be introduced into the design and explain how they would be formed as part of a future detailed drainage strategy.

The following principles have been derived from the following sub-categories:

- Surface Water Design
- Land Drainage Design
- Foul Water Design
- Oil Containment Design
- Fire Water Containment
- Exceedance Flow Routes
- Operation and Maintenance

5.9.2 Drainage Design Principles

General Principles

5.9.2.1 The drainage strategy would follow the guidelines set out in the National Planning Policy Framework (NPPF) and best practice recommendations, ensuring that surface water is managed to prevent any increase in flood risk, and, where practicable, to reduce flood risk to below current levels.

5.9.2.2 Pollution to watercourses and groundwater from daily operation of the facility would be minimised as far as practicable, including separation of hydro-carbons and disposal of contaminated water from fire suppression operations in the event of a fire.

Surface Drainage Principles

5.9.2.3 The surface drainage system would have an appraisal undertaken to confirm the most suitable and sustainable method for managing surface water runoff from the development, in accordance with Part H of the Building Regulations and paragraph 080 of the NPPF.

5.9.2.4 Wherever possible, a Sustainable Drainage Systems (SuDS) hierarchy should be utilised to:

- Reduce flood risk to the site and any neighbouring areas
- Reduce pollution leaving the site
- Provide landscape and wildlife benefits where practicable
- Provide amenity space to the development

5.9.2.5 SuDS systems to be considered during detailed design include:

- Infiltration/attenuation basins, ponds and wetlands
- Swales
- Infiltration trenches
- Soakaway
- Soft Landscaping
- Filter strips
- Permeable paving
- Rainwater Harvesting/ Butts
- Infiltration/ Attenuation tanks

5.9.2.6 The drainage system for the Converter Site would be designed to meet the discharge rate required by the relevant Lead Local Flood Authority (LLFA) identified as Devon County Council as part of the Devon Flood and Water Management Group (DFWMG)

5.9.2.7 In accordance with best practise, the discharge rate should be limited to the following heirarchy:

1. The greenfield Qp_{bar} rate
2. If the Q_{bar} rate is less than 2.0 l/s/ha a limiting discharge rate of 2.0 l/s/ha should be used
3. If the overall discharge rate from the site is less than 5.0 l/s then a discharge rate of 5.0 l/s should be used

Land Drainage Design

5.9.2.8 A Land Drainage system would be required to collect groundwater and runoff from any of the steeper areas of landscaping that would concentrate runoff into a point where flood risk could be increased. These would typically be in the form of a perforated carrier pipe in a stone trench at the base of the bunds and on the inside of the site adjacent to any retaining features such as the screening bund or platform separation running along the centre of the site.

5.9.2.9 These would discharge unrestricted into the existing ditch as a separate drainage network. Further ground investigation would be able to provide more information on the groundwater levels of the site and provide an approximation on the surrounding area, providing information on how the deep excavation required for the building platforms interact with these levels.

Foul Water Design

5.9.2.10 It is anticipated that the Foul Water network for the development would discharge via gravity to an underground septic tank that would be located in an area that has sufficient access for a tanker to empty the collected waste at intervals throughout the year. There are no foul water sewers in the vicinity of the development that would provide a suitable connection point for the foul flows, in addition, the anticipated flows from the site on a daily basis should be low enough that a septic tank is a suitable option for foul sewerage disposal.

Oily Water Design

5.9.2.11 Any areas that could potentially discharge oil into the hardstanding areas would be self-contained through the use of channel drains and kerbing, acting as a measure to prevent these oils spreading beyond the hardstanding areas. It is anticipated these areas would drain through a separate sewerage system into a petrol interceptor that would filter out the oils and discharge into the surface water system which would have an allowance for the associated surface water flows.

Oily Containment Design

5.9.2.12 Transformers would be bunded to prevent any oil leaks leaving the contained area, and an outfall would be provided within the bunded area that would discharge into an isolated drainage network designed to capture the oils from the transformers.

Fire Water Containment

5.9.2.13 In the event the sprinklers are activated due to a fire within one of the buildings within the bipole, the surface water drainage system would have an automatic diversion to a below ground tank to account for the flows of water that contains waste materials generated from the fire. The volume of this tank would be calculated in accordance with best practice and guidelines to ensure containment and safe removal after the event.

Exceedance Flow Rates

5.9.2.14 In the event that the capacity of the drainage network is exceeded due to rainfall storm events in excess of the design event or due to blockages within the drainage network, an analysis of the overland levels and the route of the excess water would be provided to give surety that these flows do not affect third parties or equally as important, the operational capability of the site. If deemed necessary these exceedance routes could either be informal i.e. across landscaping or across surfaces such as tarmac, alternatively they could be formalised for their intended duty such as concrete channels through landscaping areas to divert water from areas that must be kept free of water.

5.9.2.15 Excess water should be directed to a point where it would not cause adverse effects to neighbouring third parties, as this water would be in excess of the design storm it is not anticipated that this water would be controlled when determining flow routes to the local watercourse due to the difficulty in determining the upper limit of storage and therefore discharge rate.

Operations and Maintenance

5.9.2.16 An Operation and Maintenance Manual would be produced prior to operations which would outline the correct ways to maintain the different elements of the proposed drainage network and who is responsible for different parts of the drainage network.

5.9.2.17 The parties responsible for maintaining an operational system would be:

1. The Operational Management team or an appointed Management Company.
2. The landowners of the ditch where this runs through their land until it becomes the remit of Devon County Council.

5.10 Noise Attenuation

5.10.1 The approach to noise mitigation at the operational Converter Site would be focused primarily on siting and arrangement of the converter stations relative to the nearest noise sensitive receptors. Secondary to that, the layout of buildings and plant, and selection of quieter equipment will also be key considerations.

5.10.2 Earth-modelling required to establish level development platforms and screen the site from external views will also function as noise mitigation. As such the indicative landscape strategy has been used in the prediction of noise attenuation benefits.

5.10.3 Where further noise mitigation of specific plant items is required to meet noise limits, acoustic enclosures, attenuators, silencers for fans and acoustic barriers may be implemented as part of the Proposed Development.

5.10.4 Noise Attenuation Principles

5.10.5 The orientation and layout of the converter stations would be considered in order to minimise noise levels at nearby receptors where reasonably practicable.

5.10.6 Quieter equipment would be selected, where available and practicable and mitigation measures such as acoustic barriers and enclosures would be specified where necessary.

5.10.7 The height of any noise mitigation equipment would match that of the external equipment it is intended to screen.

5.10.8 Earth bunds would be created around the Converter Site as part of the ground works required during site preparation. These are an inherent mitigation feature for the site and aid to screen receptors from operational noise.

3.11 Earthworks

3.11.1 The larger landform character area of the Converter Site features a cross-fall of 23m from west to east and 8m from north to south. The cut-and-fill approach to the existing topography is designed to sink the converter station platforms into the landscape and create natural landscape bunds around them, effectively minimising their visual impact on the surrounding environment. These earthworks, which involve sinking platforms and forming bunds, also help balance cut and fill within the site.

3.11.2 Preliminary Cut and Fill Analysis, based on a standard construction depth of 600mm, indicates that an onsite containment strategy can be achieved for all earthwork materials, thereby eliminating the need for export and minimising any required import. This approach reduces impacts on local traffic and would be further refined during the detailed design phase.

3.11.3 Proposed earthwork bunds would be designed with natural, soft edges, blending subtly into the landscape rather than appearing as rigid engineered forms.

3.11.4 To further enhance visual integration and biodiversity, wildflowers, grasses, and shrubs could be planted atop the landscape bunds. The form, scale, and placement of these plants would be essential for seamlessly integrating the earthwork bunds into the landscape. The feasibility, placement, and scale of any proposed earthworks would depend on surveys and primary site requirements, including cable routing and the management of excess spoil.

3.12 Sustainability Principles

Operations

3.12.1 The approach to development would strive to reduce the carbon footprint of the proposed project where feasible as a response to the climate change concerns.

3.12.2 The external building materials and finishes would have an estimated minimum design life of 50 years before the first significant maintenance work.

3.12.3 A sustainable approach would be implemented for the design of the Converter Stations. Design strategies employed would include:

- Reduction of material and energy use during construction where practicable
- Minimising the use of high carbon materials
- Building design which allows efficient use of energy and resource where practicable

Construction

3.12.4 Where practicable, pre-fabricated elements would be delivered to the site ready for assembly, which would reduce on-site construction waste and reduce vehicle movements as part of the construction process.

3.12.5 Vehicles used in road deliveries of materials, equipment and waste arisings on and off-site would be loaded to full capacity, wherever practicable, to minimise the number of journeys associated with the transport of these items.

3.12.6 All machinery and plant would be procured to adhere with relevant good practice emissions standards at the time of procurement, where feasible and should be maintained in good repair to remain fuel efficient.

3.12.7 Equipment and machinery requiring electricity would only be switched on when required for use. Procedures would be implemented to ensure that staff adhere to good energy management practices.

3.12.8 Where practicable, temporary construction haul roads would be developed utilising recycled aggregates to minimise embodied carbon impacts.