Awel y Môr Offshore Wind Farm

Category 8: Other Documents

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Glossary of terms

TERM	DEFINITION
AyM	The Awel y Môr Offshore Wind Farm Project.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS).
EIA	Environmental Impact Assessment
ES	Environmental Statement (the documents that collate the processes and results of the EIA).
Export Cable Corridor (ECC)	The area(s) within which the export cables will be located.
Landfall	The location where the offshore export cables are brought ashore and jointed to the onshore export cables in Transition Joint Bays (TJBs).
Maximum Design Scenario (MDS)	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures are commitments made to reduce and/or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts through the assessment process.

TERM	DEFINITION
Onshore Export Cable Corridor (Onshore ECC)	The proposed cable route which represents a corridor, typically 40 m to 60 m wide, within which the cables will be laid and cable trenching, haul road and stockpiling areas associated with cable construction, will be located.
Onshore Substation (OnSS)	Where the power supplied from the wind farm is adjusted (including voltage, power quality and power factor as required) to meet the UK System-Operator Transmission-Owner Code (STC) for supply to the National Grid substation.
PEIR	Preliminary Environmental Information Report. The PEIR is written in the style of a draft Environmental Statement (ES) and was the basis of statutory consultation undertaken in August / September 2021.
OnSS Access zone	The area which will contain the final OnSS access route (both construction and operational) – The route of the construction and operational access will be confirmed as part of detailed design (post consent)
OnSS Construction Area	The area within which the substation construction would take place. This area incorporated both the Substation Footprint and areas of cut and fill required to construct the substation platform.
OnSS Footprint	The footprint for the substation which would incorporate either Air Insulated Switchgear (AIS) or Gas Insulated Switchgear (GIS) technology.
OnSS Cable Corridor Zone	The area which will contain the final cable connection into and out of the OnSS. The route of the cable connections to the substation will be confirmed as part of detailed design (post consent). The cable route will be either east or

TERM	DEFINITION
	west of the pond located immediately south of the substation.
The Applicant	Awel y Môr Offshore Wind Farm Limited.

Abbreviations and acronyms

TERM	DEFINITION
AIS	Air Insulated Switchgear
AyM	Awel y Môr Offshore Wind Farm
CoCP	Code of Construction Practice
DCC	Denbighshire County Council
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Gas Insulated Switchgear
GCN	Great Crested Newt
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
MDS	Maximum Design Scenario
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OnSS	Onshore Substation

TERM	DEFINITION
OSP	Offshore Substation Platform
PEIR	Preliminary Environmental Information Report
RHPG	Registered Historic Park and Garden
SABP	St Asaph Business Park
STC	System-Operator Transmission-Owner Code
TCC	Temporary Construction Compound.
TJB	Transition Joint Bay

Units

UNIT	DEFINITION
km	Kilometre
M^2	Square metre
m	Metre

1 Introduction

1.1 Project Overview

1 Awel y Môr Offshore Wind Farm Limited (the Applicant) has submitted an application to the Planning Inspectorate (PINS), on behalf of the Secretary of State, for a Development Consent Order (DCO) for the Awel y Môr Offshore Wind Farm (AyM) under the Planning Act 2008. A separate application for a Marine Licence for the works required to construct AyM is being made to Natural Resources Wales (NRW), who act as the marine licensing authority on behalf of the Welsh Government.

2 AyM will comprise up to 50 offshore wind turbine generators (WTGs) . The WTGs will be situated to the west of the operational Gwynt y Môr OWF (GyM) offshore wind farm. Power generated by the WTGs will be transmitted via export cables to a grid connection that will be made at the existing National Grid Bodelwyddan Substation, to the south of St Asaph Business Park (SABP) in Denbighshire. Offshore export cables will be joined to onshore export cables at a landfall point located between Rhyl and Prestatyn. From landfall, the onshore export cables will run approximately 12 km (underground), to the grid connection point.

3 As part of the onshore cable connection, a new onshore substation (OnSS) will be constructed to the west of SABP. As the export cables between landfall and the ONSS will be buried (other than some manhole-type covers), the OnSS represents the main aspect of above ground infrastructure for the onshore elements of AyM.

1.2 Purpose of this Document

4 At this stage in the AyM development process, decisions on exact locations of infrastructure and the precise technologies and construction methods that will be employed have not been made. This includes the exact layout, equipment and technology of the OnSS.

5 These details will be determined during detailed design that would take place between a decision on the application for development consent and the start of construction. Such details would be provided to Denbighshire County Council (DCC) for approval prior to the commencement of construction works.

6 In this respect, the process would operate in a similar way to an outline planning consent that establishes the principle of a development and confirmation that the environmental impact of the development would be acceptable (this is established by the DCO application and ES). Later detail is then provided for 'Reserved Matters' which is similar to the provision of detailed design for approval by DCC. The provision of detailed design for approval prior to commencement is secured within the DCO.

7 This document sets out the design and landscaping parameters that the Applicant proposes to apply to the OnSS when undertaking detailed design.

8 The design and landscaping principles and parameters are secured through the draft DCO and will form the framework for the final design and mitigation (including landscaping) for the OnSS. These design principles will also be applied in conjunction with the Outline Landscape and Ecological Management Plan (application ref: 6.5.11)

9 This document has been prepared in accordance with the design guidance contained in Overarching National Policy Statement (NPS) for Energy (NPS EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for Electricity Networks Infrastructure (EN-5). In addition to the current NPS, draft NPSs were consulted upon during September to November 2021. This document has also been prepared in accordance with the design guidance contained within the draft NPS EN-1, draft NPS EN-3 and draft NPS EN-5.

1.3 The Applicant

10 The Applicant is Awel y Môr Offshore Wind Farm Limited, owned by RWE Renewables (60%), Stadtwerke München (30%) and Siemens Financial Services (10%). RWE is leading on the development activities for AyM.

11 RWE is the largest renewable energy operator in Wales, generating approximately one third of all of Wales' renewable electricity. Put together, the onshore, offshore and hydro projects RWE operates produce enough electricity to meet the equivalent needs of almost half the households in Wales.

12 As a leading European energy company, RWE has extensive experience in developing, building and operating renewable energy projects that make a significant contribution towards the Welsh Government's ambitious target to generate 70% of its electricity needs from Welsh renewable sources by 2030 and to reach "net-zero" by 2050.

1.4 Project Summary

13 AyM is a proposed sister project to the operational GyM OWF located off the north-east coast of Wales. GyM consists of 160 WTGs and has been operational since 2015.

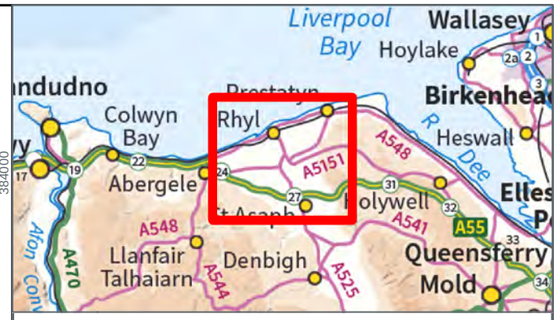
14 AyM will comprise up to 50 WTGs and will include infrastructure that is required to transmit the power generated by the WTGs to Offshore Substation Platforms (OSPs) via array cables. From the OSPs, power will be transmitted via export cables to the proposed OnSS located to the west of SABP and then to the existing National Grid Bodelwyddan substation. AyM will also comprise infrastructure required for the operation and maintenance of the wind farm for both offshore and onshore components.

15 The onshore elements of AyM comprise the following key areas:

- The Landfall: the area from Mean Low Water to where the offshore export cables are connected to the onshore export cables within Transition Joint Bays (TJBs) at Ffrith Beach to the east of Rhyl;
- The Onshore Export Cable Corridor (onshore ECC): where permanent infrastructure connects the cables at Landfall to the proposed OnSS and the onwards link to the existing National Grid Bodelwyddan substation; and

- The onshore substation (OnSS): where the power supplied from AyM is adjusted (including voltage, power quality and power factor as required) to meet the UK System-Operator Transmission-Owner Code for supply to the National Grid Bodelwyddan substation.

16 The export cable configuration will include up to two cable circuits connecting the OSPs to the proposed OnSS and existing National Grid Bodelwyddan substation via the Landfall to the east of Rhyl and underground cables within the ECC. Figure 1 provides an overview of the location of the onshore infrastructure elements of AyM.



LEGEND

- Order Limits
- Proposed Onshore Export Cable Corridor
- Proposed Substation Cable Corridor Zone
- Proposed Transition Joint Bay Construction Compound
- Proposed Onshore Substation (OnSS) Footprint
- Unlicenced Work Zone

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ONSHORE INFRASTRUCTURE (OVERVIEW)

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 1

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:50,000	A3	ODN	British National Grid

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

17 The transmission voltage will be up to 400 kV, and the onshore ECC will be approximately 12 km in length from the TJBsto the existing National Grid Bodelwyddan substation.

1.5 The 'Design Envelope' approach

18 Large-scale offshore wind developments such as AyM involve complex engineering and multi-year development programmes where it is not possible to identify the exact components to be used within the final development at the point of DCO application. Within the offshore wind industry, technology is constantly improving, with larger and more efficient turbines being developed which in turn affect a number of other onshore design aspects of the scheme such as:

- options for the number of export circuits,
- layout and technology requirements for the proposed OnSS,
- precise siting of onshore infrastructure; and
- construction methods.

19 As noted in Section 1.1 these details will be determined during detailed design that would take place between a decision on the application for development consent and the start of construction.

20 Therefore the AyM onshore description is indicative and the maximum design envelope approach (often referred to as the 'Rochdale Envelope') has been used to provide certainty that the final project as built will not exceed the identified parameters, whilst providing the flexibility to accommodate further project refinement during the detailed design phase post-consent.

21 The maximum design envelope approach will ensure that anticipated changes in available technologies between now and the detailed design phase can be accommodated within the design, whilst retaining an Environmental Impact Assessment (EIA) that considers all options, with conclusions that are robust regardless of the final design eventually built out.

22 The use of the maximum design envelope approach has been recognised in the Overarching National Policy Statement (NPS). NPS EN-1 (paragraphs 4.2.7 and 4.2.8), provides the following guidance:

In some instances it may not be possible at the time of the application for development consent for all aspects of the proposal to have been settled in precise detail. Where this is the case, the applicant should explain in its application which elements of the proposal have yet to be finalised, and the reasons why this is the case.

Where some details are still to be finalised the ES should set out, to the best of the applicant's knowledge, what the maximum extent of the proposed development may be in terms of site and plant specifications, and assess, on that basis, the effects which the project could have to ensure that the impacts of the project as it may be constructed have been properly assessed.

23 The same guidance is included in the draft NPS EN-1 paragraphs 4.2.5 and 4.2.6 with reference to '*likely worst case environmental social and economic effect*' in place of '*maximum extent*' within 4.2.6:

'Where some details are still to be finalised, the ES should set out to the best of the applicant's knowledge, what the likely worst-case environmental, social and economic effects of the proposed development may be and assess, on that basis, to ensure that the impacts of the project as it may be constructed have been properly assessed'

24 The design envelope approach is consistent with the PINS Advice Note Nine: Rochdale Envelope (PINS, 2018). Paragraph 1.2 of that note states that:

'The 'Rochdale Envelope' approach is employed where the nature of the Proposed Development means that some details of the whole project have not been confirmed (for instance the precise dimensions of structures) when the application is submitted, and flexibility is sought to address uncertainty. Such an approach has been used under other consenting regimes (the Town and Country Planning Act 1990 and the Electricity Act 1989) where an application has been made at a time when the details of a project have not been resolved.'

25 The AyM draft DCO therefore takes the following approach to the OnSS:

- Prescribing the maximum dimensions of the key elements of the infrastructure including the height of any buildings and external electrical equipment and the total footprint of any buildings and/or compounds; and
- Requiring that details of the layout, scale and external appearance of the infrastructure and landscaping are approved by the relevant planning authority (DCC) before works commence.

26 These are secured as "requirements" in the draft DCO that the Applicant must comply with in carrying out the development of the OnSS. Further information on the contents of relevant DCO Requirements is provided in Section 4.

27 This established approach has been used in the majority of offshore wind applications including Hornsea Four Offshore Wind Farm and Triton Knoll Electrical System.

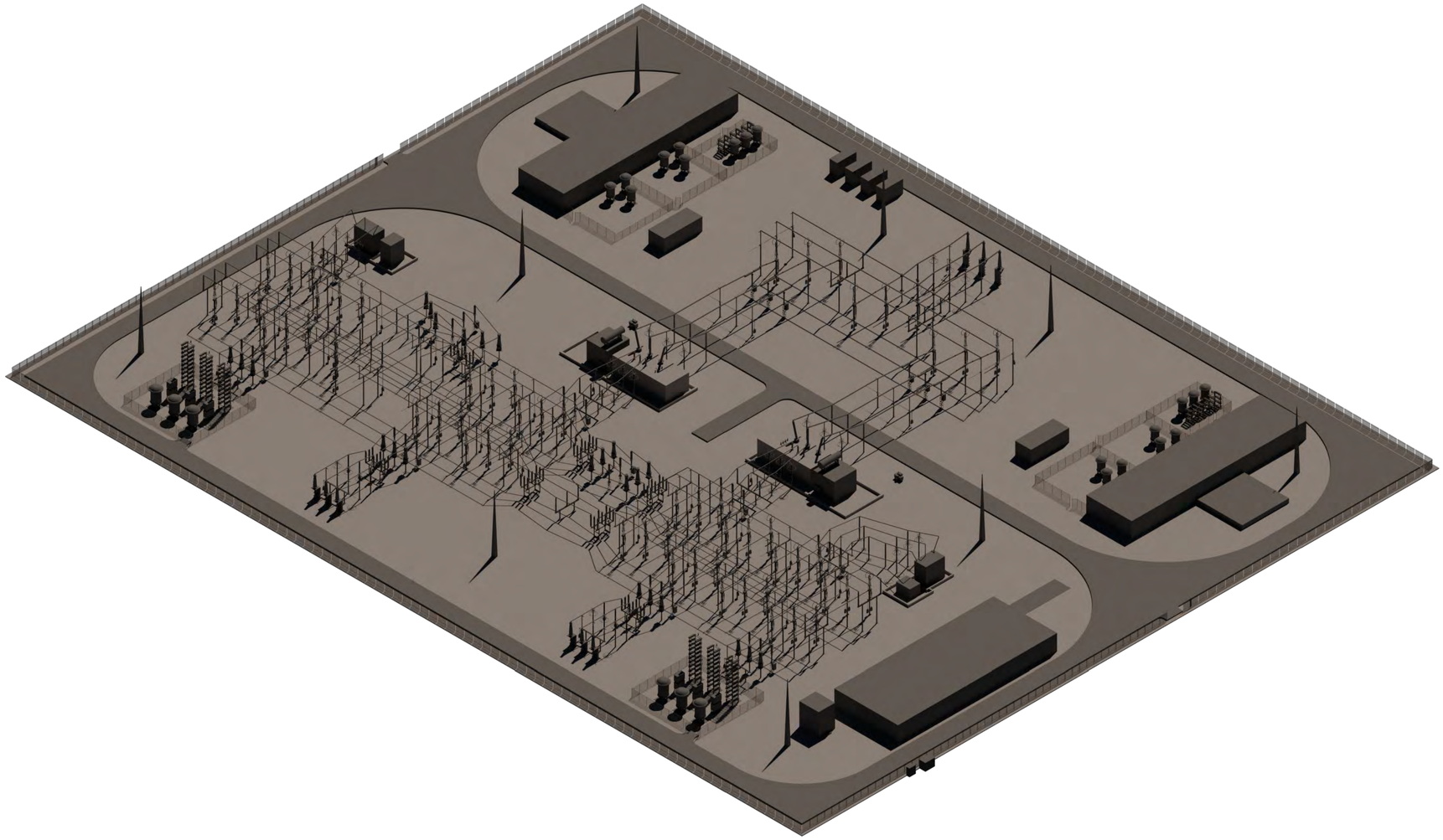
1.6 The OnSS Infrastructure

28 The OnSS will contain a number of elements including switchgear, busbars, transformers, capacitors, reactors, reactive power compensation equipment, filters, cooling equipment, control and welfare buildings, lightning protection rods (if required) and internal road access. A security fence is needed around the OnSS compound.

29 The OnSS technology will employ either air- insulated switchgear (AIS) or gas-insulated switchgear (GIS). The choice of switchgear affects both the total land area required and the size and type of buildings which will be needed. GIS substations are generally smaller than their AIS counterparts, typically taking up a 35% smaller footprint than an equivalent AIS substation, although they are likely to require a greater number of taller buildings. GIS substations typically require less maintenance as the interior elements are sealed and insulated. GIS systems do have a higher upfront cost, but may have a lower lifetime cost than equivalent AIS systems. The choice of AIS or GIS will be part of the detailed design process and a decision will be made post-consent prior to construction commencing.

30 The largest structure within the OnSS will be the OnSS building, with a maximum height of 15 m above the finished ground level of the OnSS (assuming a GIS design). All other equipment (e.g. transformers, switchgear) would be up to 12.5m above finished ground level with the exception of slender lightning masts which would be 18m in height. The total land requirement for the HVAC OnSS to the perimeter fence is 50,000 m^2 (Assuming AIS technology), as well as a 37,500 m^2 Temporary Construction Compound (TCC).

31 Figure 2 and Figure 3 provide indicative substations layouts for AIS and GIS technologies.



Notes

1. DIMENSION IS IN MM UNLESS STATED OTHERWISE.
2. THIS LAYOUT IS INDICATIVE ONLY. THE FOLLOWING ASPECTS SHALL BE CONSIDERED WHEN DEVELOPING THE DESIGN:
   - -MAGNETIC CLEARANCE FROM THE AIR CORE REACTORS
   - -FIRE SUPPRESSION SYSTEM
   - -SITE LIGHTING AND SECURITY SYSTEMS
   - -PEDESTRIAN ACCESS REQUIREMENT TO EQUIPMENT/BUILDING
   - -LIGHTNING PROTECTION
3. THE EQUIPMENT APPEARANCE AND SIZE SHOWN ARE INDICATIVE ONLY.

Key to symbols

Reference drawings

AYM-MOT-V7-ZZ-M3-E-0001

Rev	Date	Drawn	Description	Ch'k'd	App'd
02	10/08/21	JK	Title Change	MB	SA
01	22/04/21	JK	Preliminary Issue	MB	SA

Status Stamp

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Title

Awel y Môr Offshore Wind Farm
Onshore Substation
Figure 2: Indicative AIS Substation

Sheet 01 of 01

Designed	J. Kensall	JK	Eng check	M. Barton	MB
Drawn	J. Kensall	JK	Coordination	T. King	TK
Dwg check	T. King	TK	Approved	S. Anantharam	SA

MMD Project Number	Scale at A1	Security
419577	NTS	STD

Client Number	Suit. Code
003977835	S3

Drawing Number	Revision
AYM-MOT-V0-XX-DR-E-0052	02

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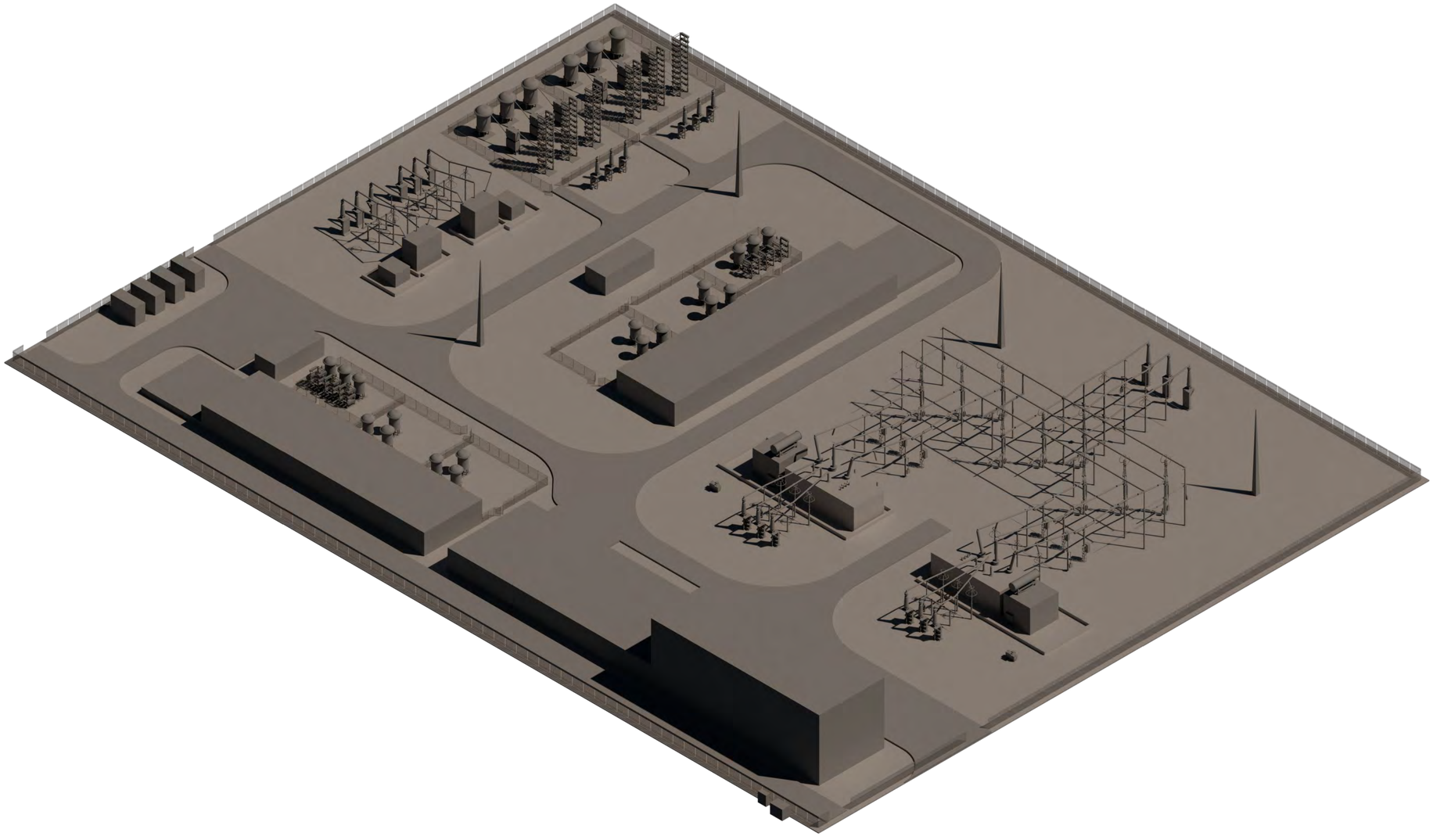

Notes

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   - -MAGNETIC CLEARANCE FROM THE AIR CORE REACTORS
   - -FIRE SUPPRESSION SYSTEM
   - -SITE LIGHTING AND SECURITY SYSTEMS
   - -PEDESTRIAN ACCESS REQUIREMENT TO EQUIPMENT/BUILDING
   - -LIGHTNING PROTECTION
3. THE EQUIPMENT APPEARANCE AND SIZE SHOWN ARE INDICATIVE ONLY.
4. THE PROPOSED SOLUTION SHOWS AN ALTERNATIVE ARRANGEMENT FOR THE SUBSTATION WITH A WORST VISUAL IMPACT. HOWEVER, WE NOTE THAT THE ARRANGEMENT DOES NOT INTEND IN ANY WAY TO OPTIMISE THE LOCATION OF THE EQUIPMENT. THIS MODEL IS FOR PLANNING PURPOSES ONLY, WITH THE AIM TO SHOW A WORST VISUAL IMPACT OF THE SUBSTATION.

Key to symbols

Reference drawings

AYM-MOT-V7-ZZ-M3-E-0002 - On shore substation - GIS 3D Model
AYM-MOT-V7-XX-DR-E-0002 - Single Line Diagram

Rev	Date	Drawn	Description	Ch'k'd	App'd
04	31/03/22	JK	Client Comments Incorporated	GR	PL
03	28/03/22	JK	Updated Layout	GR	PL
02	10/08/21	JK	Title Change	MB	SA
01	22/04/21	JK	Preliminary Issue	MB	SA

Status Stamp

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Title

Awel y Môr Offshore Wind Farm
Onshore Substation
Figure 3: Indicative GIS Substation

Sheet 01 of 01

Designed	J. Kensall	JK	Eng check	G. Rossi	GR
Drawn	J. Kensall	JK	Coordination	T. King	TK
Dwg check	T. King	TK	Approved	P. Lear	PL

MMD Project Number	Scale at A1	Security
419577	NTS	STD

Client Number	Suit. Code
003977836	S3

Drawing Number	Revision
AYM-MOT-V0-XX-DR-E-0053	04

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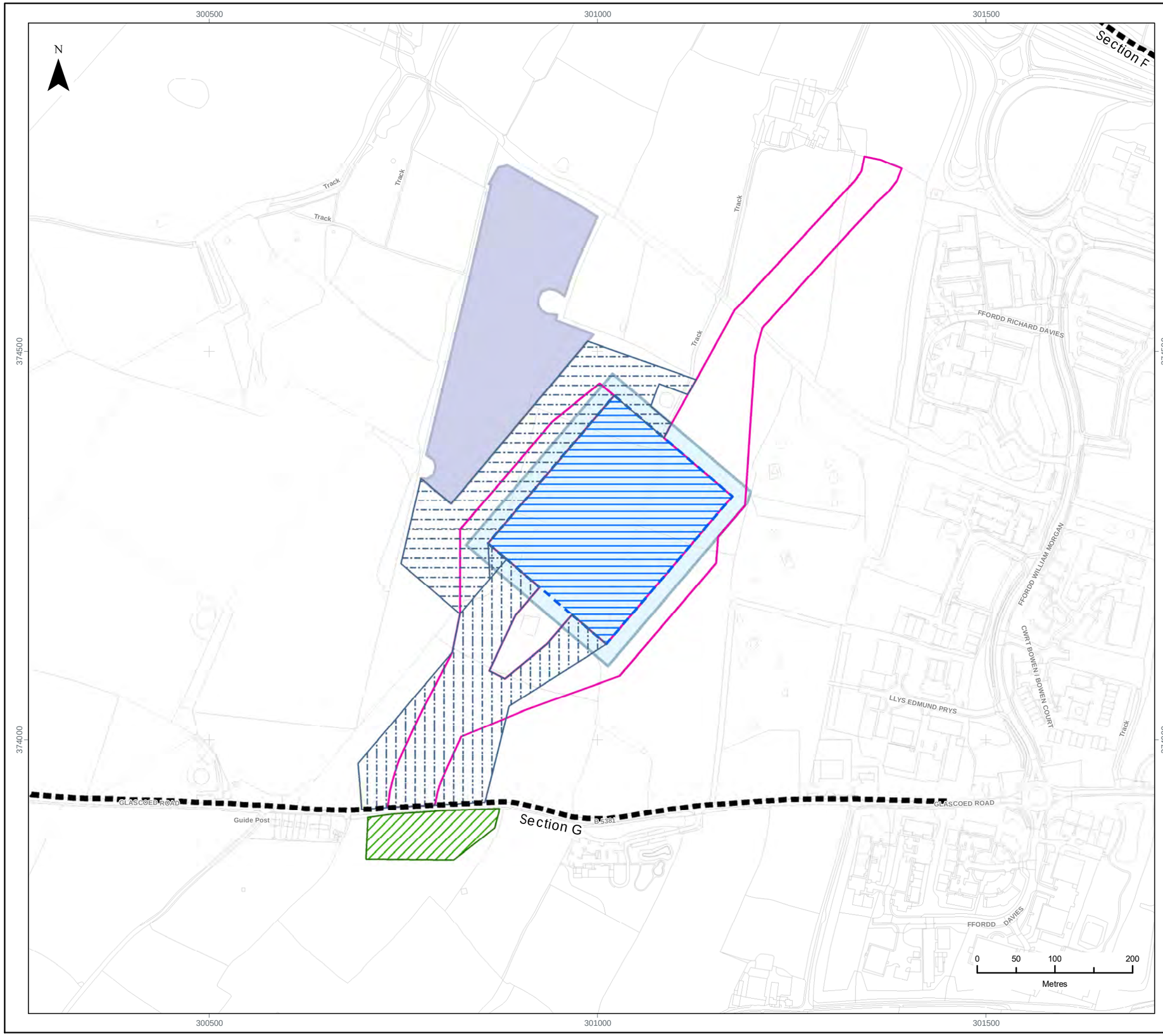
32 A number of zones and areas have been identified for the OnSS and form the design envelope. These zones are shown in Figure 4 and have been assessed and will be further refined as part of the detailed design process post-consent, and agreed with DCC in order to define specific footprints:

- OnSS Footprint The footprint for the substation which would incorporate either AIS or GIS technology.
- OnSS Construction Area The area within which the substation construction would take place. This area incorporated both the Substation Footprint and areas of cut and fill required to construct the substation platform.
- OnSS Access Zone The area which will contain the final OnSS access routes (both construction and operational) linking the substation to Glascoed Road. The routes of the construction and operational accesses will be confirmed post consent during detailed design
- OnSS Cable Corridor Zone The area which will contain the final cable connection into and out of the OnSS. The route of the cable connections to the OnSS will be confirmed following detailed design (post consent). The cable route will be either east or west of the pond located immediately south of the OnSS.
- OnSS Temporary Access Zone the area between the OnSS TCC and the OnSS Construction Area, through which a number of access tracks will be routed to allow vehicles to move between the two areas.

33 Underground cables will be laid into the OnSS and National Grid Substation. Although these are not subject to design principles, given they are underground, the location of the cables and width of the cable corridor impacts on the opportunity for landscaping as it is not feasible to plant trees above cables due to the potential for roots to damage the cables.



LEGEND

- Onshore Cable Route Section Breaks
- Proposed Substation Cable Corridor Zone
- Proposed Temporary Construction Compound
- Proposed Onshore Substation (OnSS) Footprint
- Proposed Substation Construction Area
- Substation Access Zone
- Substation Temporary Construction Access Zone
- Proposed Substation Indicative Temporary Construction Compound Area

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PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

ONSHORE INFRASTRUCTURE: SUBSTATION

VER	DATE	REMARKS	Drawn	Checked
1	26/02/2022	ES Issue	JRS	MF

FIGURE NUMBER:

FIGURE 4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:5,000	A3	ODN	British National Grid

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Offshore Wind Farm

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2 OnSS Site Context

35 This section provides a description of the OnSS Site and surrounding area along with key landscape and visual context for the proposed OnSS that have informed the principles and parameters put forward in this document.

36 The OnSS is located within the administrative area of DCC and approximately 1.3 km to the south east of Bodelwyddan, 1.8 km to the west of the settlement of St Asaph and 350m to the west of SABP.

37 The OnSS site itself comprises pastoral agricultural fields bounded by hedgerows that contain scattered mature trees. There are two tree lined ponds within the site. A buried water main runs beneath the western side of the site and there is an overhead power line, suspended by pylons, in the south eastern corner of the site.

38 The OnSS site topography falls from higher ground in the south (approximately 38 m AOD) towards lower ground in the north (approximately 29.6 m AOD).

39 Bodelwyddan Castle, which is a Grade II* Listed Building and a hotel, lies approximately 1km to the west of the OnSS site with parkland associated with the castle within the intervening area. Immediately adjacent to the OnSS site, and within Bodelwyddan Park, is an area of ancient woodland.

40 The farmstead of Faenol Bropor is approximately 380m to the north and includes a barn which is a Grade II Listed Building. A bridleway bisects the area between Faenol Bropor and the OnSS, running in a broadly northwest to south easterly direction and a small block of ancient woodland immediately adjacent to the OnSS site. The A55 is located further north and is approximately 680m from the OnSS.

41 Immediately to the east of the OnSS, located between the site and SABP, is an area of ponds that provide compensation habitat for great crested newt *Triturus cristatus* that was established following development of the SABP. To the south east of the OnSS site is Glascoed Nature Reserve.

42 Glascoed Road (B5381) runs in an east to westerly direction approximately 200m to the south of the OnSS site. Denbighshire Memorial Park and Crematorium is located on the southern side of Glascoed Rd immediately south of the OnSS and there are a small cluster of approximately 10 dwellings located on Glascoed Road approximately 400m to the south west of the OnSS.

43 In consideration of landscape character, the OnSS is located within the Eastern Lowlands (Cefn Meiriadog Vale Slopes) Landscape Character Area (as identified in the Conwy and Denbighshire Landscape Sensitivity and Capacity Assessment for Wind Energy Development, 2013). This Landscape Character Area contains gently undulating pastoral lowland, located along the western fringe of the Vale of Clwyd, just south-west of St Asaph. Man-made influence is evident in the managed landscape and frequency of dispersed farmsteads / rural properties. Modern development is most notable along the A55, at SABP, in the vicinity of large scale substations and where pylon lines cross the landscape. Skylines are occasionally punctuated by pylon lines and existing built development.

44 The close proximity of existing electricity overhead lines to the OnSS Footprint and the relatively close proximity of existing electrical infrastructure at the existing National Grid Bodelwyddan substation to the south east of the proposed OnSS provide a context of electrical infrastructure in the area immediately surrounding the site. This context was considered as part of the site selection process and has been taken into account in the proposed location and alignment of the OnSS infrastructure.

45 With regard to visual considerations, views are typically enclosed and filtered by landform and vegetation. The following sections describe existing views from key viewpoints located to the north, east and south of the OnSS (see Volume 3, Chapter 2 Landscape and Visual Impact Assessment (application ref: 6.3.2) for viewpoint locations and further description of the baseline environment).

- Viewpoint 1 - Bridlepath near Faenol-Bropor - The existing view south towards the OnSS location is across a series of fields used for grazing. Field boundaries vary between post and wire, hedgerows and hedgerows with trees. The hedgerow trees are mature in this area. The roofs of buildings within the SABP can be seen to the east beyond the Glascoed Nature Reserve and the boundary wall and mature woodlands of Bodelwyddan Park (which is a Registered Historic Park and Garden (RHPG)) can be seen to the west.
- Viewpoint 2 - St Asaph, Business Park - The existing view west towards the OnSS site is across scrub vegetation and small trees, found within and at the edges of the neighbouring Glascoed Nature Reserve. In other directions the view is dominated by the large warehouse buildings found in this part of the SABP.
- Viewpoint 3 – Glascoed Rd - Glascoed Road connects St Asaph to the small village of Glascoed. It is a busy road that also connects the rural road network of minor roads servicing the many other small villages and property clusters in the area. The SABP can also be accessed from this road. Much of the road is lined with high hedgerows, limiting views of the surrounding landscape. The viewpoint location and nearby properties are however slightly elevated from the road and have views over the hedgerows across the rural landscape and towards the site area of the OnSS. The views towards the OnSS Footprint from the western properties would be screened and filtered by intervening woodland.

3 Design Principles and Parameters

46 The key design parameters (those that set the maximum overall size of the above ground infrastructure) and key principles for the OnSS are set out below. Considered together, the key parameters and principles are important in establishing the final design of the OnSS.

3.1 OnSS Construction Areas

3.1.1 Principles

47 As set out in Section 1.6, the construction of the OnSS will utilise a construction access from Glascoed Road to the south of the OnSS for construction access and delivery of Abnormal Indivisible Loads (AILs). This allows construction traffic to be routed away from bridleway users and Faenol Bropor to the north.

48 The OnSS Temporary Construction Compound (TCC) is located in a well screened area to the north west of the OnSS Footprint. The TCC has been sited to take advantage of Coed y Gors woodland to the north west of the proposed OnSS to provide screening in views from Bodelwyddan Castle and Park. The layout of the TCC, including site buildings, storage areas, access arrangements and drainage, will be approved by DCC through the final Construction Method Statement (CMS), that will form part of the final Code of Construction Practice (CoCP). The Final CoCP will be approved by DCC through a DCO Requirement (See Section 4).

49 There will be a need for construction plant and vehicles to move between the OnSS TCC and the OnSS Construction Area. Siting access tracks to connect the TCC and OnSS Construction Area will seek to retain existing hedgerows, where practical.

50 In advance of the start of the works specific construction mitigation measures will be agreed via approval of the final CoCP, and associated environmental management plans, by DCC.

3.1.2 Parameters

51 The final construction access route will be located within the OnSS Access Zone (as shown in Figure 4: OnSS Footprint, TCC, Access Zones and Cable Corridor Figure 4), and will be confirmed post consent during detailed design.

52 The OnSS TCC will be located within the OnSS TCC area as defined in Figure 4.

53 Construction plant and vehicles will move between the OnSS TCC and the OnSS Construction Area using a number of access tracks located within the OnSS Temporary Access Zone. The access tracks will have a construction land take of 20m width average each, to include the road surface, drainage and cut/fill and there are likely to be 5 tracks needed.

3.2 OnSS Layout

3.2.1 Principles

54 The following siting principles have informed the placement of the OnSS Footprint. The location of the OnSS is offset from Glascoed Road to locate infrastructure on lower ground to the north and to position the OnSS away from roadside receptors (road users, residential properties and the crematorium). Offsetting the OnSS from Glascoed road allows much of the existing trees and hedgerows to be retained to provide screening during construction and operation of the OnSS.

55 The orientation of the OnSS Footprint, in relation to residential receptors to the south west, presents the narrower extent for an AIS layout solution facing towards the receptors, so reducing the width of proposed development in potential views. Orientating the OnSS in this way has also allowed the proposals to avoid interaction with 2 existing ponds, to reduce loss of hedgerows and mature trees and avoid a contiguous boundary with the Great Crested Newt Mitigation area to the east;

56 A number of layout configurations may be possible within the OnSS Footprint. The final configuration will be determined during the detailed design stage and will depend on the ultimate electrical system design including the number and rating of cables, the choice of electrical contractor, the manufacturer of the equipment and other engineering factors. As described in Section 1.5 the OnSS design envelope allows for either an AIS or GIS layout depending on the ultimate electrical system design.

57 The GIS option for the OnSS requires switchgear equipment to be housed within a building. This GIS switchgear building will be the tallest component of either layout (excluding lightning conductors). Other buildings for control functions, welfare and other uses will be required although these will have a smaller footprint and lower height that the GIS switchgear building. The GIS layout potentially has a less pronounced horizontal profile than the AIS layout as it has more variation in the height of its visible components.

58 The AIS option for the OnSS does not require a switchgear building as the switchgear is left open to the air. Other buildings for control functions, welfare and other uses will be required. The AIS development has a more industrial appearance due to its wider horizontal profile and has a larger footprint than the GIS option.

59 For the purpose of undertaking the EIA, a worst-case layout for both AIS and GIS technologies have been used in the Landscape and Visual Impact Assessment (LVIA). These worst case LVIA layouts place the OnSS buildings in the south western portion of the OnSS site, such that these structures, which represent the most visually apparent aspects of the OnSS, are nearest to residential receptors on Glascoed Road.

60 The Airborne Noise assessment uses a different worst-case layout which places equipment that has the greatest potential to generate operational noise, nearest to the residential receptors on Glascoed Road.

61 The final OnSS layout will be approved by DCC through a DCO Requirement (See Section 4).

3.2.2 Parameters

62 A maximum OnSS Footprint of 5 ha (50,000 sq m) if AIS equipment is used and a reduced area of 3 ha (30,000 sq m) if GIS option is selected. The GIS layout would be located within the overall OnSS Footprint.

3.3 OnSS Ground levels

3.3.1 Principles

63 The site topography is such that a degree of cut and fill will be required to provide a level platform upon which to construct the OnSS.

64 The ground levels will be approved by DCC through DCO Requirement (See Section 4).

3.3.2 Parameters

65 The level of this platform (finished ground level) is anticipated to be 34.175 m AOD to 34.975 m AOD depending on the final technology and design.

3.4 ONSS Buildings

3.4.1 Principles

66 As noted in Section 3.2, the choice of switchgear technology will influence the number and dimensions of buildings, with AIS requiring lower building heights.

67 The dimensions, colour and materials used for the OnSS buildings will be determined by detailed design and approved by DCC through a DCO Requirement (See Section 4) noting that the available palate of colours for substation buildings are likely to be limited to shades of grey.

3.4.2 Parameters

68 For an OnSS using GIS technology, the GIS building will be up to 15 m in height and likely maximum dimensions of 50 m x 15 m.; If an AIS technology is selected, the building heights would be up to 5m in height.

69 Other indicative building dimensions are provided below:

- 2 x Static Var Compensators (SVC) buildings: 55 x 14 x 5m
- 1 x Control building (possibly several adjacent containerised buildings): 50 x 20 x 5m
- 2 x Storage/ backup power units: 15 x 10 x 4m (possibly in the form of containers)
- 2 x Workshops: 15 x 10 x 4m (possibly in the form of containers)

3.5 OnSS Equipment

3.5.1 Principles

70 In addition to buildings, the OnSS will include several items of external electrical equipment that are likely to include:

- Switchgear;
- Busbars;
- Transformers;
- Capacitors;
- Reactors;
- Reactive power compensation equipment;
- Battery rooms;
- Filters;
- Cooling equipment;
- Control and welfare buildings; and
- Lightning protection rods (if required).

71 Noise attenuation panels and/or barriers which may be visible from outside the OnSS, may be required in order to mitigate operational noise levels and could be building-like depending on design. The level of operational noise arising from the OnSS will be controlled through a DCO Requirement (See Section 4).

72 The final number, location and dimensions of external OnSS equipment will be approved by DCC through a DCO Requirement (See Section 4)

3.5.2 Parameters

73 All electrical equipment (e.g. transformers, switchgear) will not exceed a height of 12.5 m above finished ground level with the exception of slender lightning masts which would be 18m in height. Up to 12 lightning masts would be required.

3.6 OnSS Operational Access

3.6.1 Principles

74 Access arrangements for the operational phase of the OnSS will comprise an access track between the OnSS and Glascoed Road and internal access tracks within the OnSS Footprint

75 The final routing of the access track between Glascoed Road including details of the bellmouth and other junction arrangements, alongside the internal access layout arrangements, will be approved by DCC through DCO Requirement (See Section 4).

3.6.2 Parameters

76 The operational access track between the OnSS and Glascoed Road will be located within the OnSS Access Zone (as shown in Figure 4: OnSS Footprint, TCC, Access Zones and Cable Corridor Figure 4), and will be confirmed post consent during detailed design.

77 Within this zone, the permanent access road will be 6m wide, with further additional width required for drainage, cut/fill and the bell mouth tie-in to Glascoed Road. The typical construction width will be 15m but up to 30m on approach to the substation compound to enable additional cut/fill and up to 60m width at the bell mouth.

3.7 OnSS Security and Lighting

3.7.1 Principles

78 The OnSS will not be manned, and lighting will only be required during operation and maintenance activities. Directional lighting will be needed for safety and security. Task-specific lighting will be needed externally, however, this will only be required on a very infrequent basis.

79 The OnSS will also require security fencing around the site perimeter.

80 The final security fencing and lighting details will be approved by DCC through DCO Requirement (See Section 4).

3.7.2 Parameters

81 Permanent fencing around the perimeter of the site of up to 3.4 m in height or in accordance with the National Grid standard at the time of construction.

3.8 OnSS Drainage

3.8.1 Principles

82 Development of the OnSS will result in the construction of low permeability surfacing, increasing the rate of surface water runoff from the site. A surface water drainage scheme is required to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. An outline surface water drainage scheme has been provided as part of the OnSS Flood Consequences Assessment (Volume 5, Annex 7.2 (application ref: 6.5.7.2)).

83 The OnSS will contain welfare facilities so foul drainage facilities will be required.

84 Relevant Sustainable urban Design Solutions (SuDS) principles (as set out in the Proposed Substation Preliminary Outline Drainage Strategy provided as part of the OnSS Flood Consequences Assessment (application ref: 6.5.7.2)) will be applied to the substation development. The final surface water and foul drainage details will be approved by DCC through a DCO Requirement (See Section 4).

3.8.2 Parameters

85 The detailed design (post-consent) of the surface water drainage scheme would be based on a series of infiltration/soakaway tests carried out on site and the attenuation volumes outlined in the supporting OnSS FCA (Volume 5, Annex 7.2 (application ref: 6.5.7.2)). The tests will be undertaken prior to construction and in accordance with the BRE Digest 365 Guidelines in order to determine the suitability of ground for accepting a drainage discharge.

86 Approximately 1,100m^3 of permanent attenuation will be required to manage the surface water runoff from the operational platform and access road. This is likely to be provided by an attenuation pond which would discharge into an existing surface water drainage ditch with the outfall constrained to the greenfield run-off rate of the site.

3.9 OnSS Landscaping

3.9.1 Principles

87 Landscaping principles for the OnSS to reduce landscape and visual effects were included in the Landscape and Ecology Design Principles Plan (LEDPP), that was provided within the PEIR for Statutory Consultation. These have been further developed and are provided within the Outline Landscape and Ecology Mitigation Plan (OLEMP) (ES Volume 5, Annex 5.11(application ref: 6.5.11)).

88 The existing woodland to the west and north of the OnSS Footprint is substantial and, together with other vegetation and built elements in the wider landscape, provides an element of visual screening for many visual receptors in the area. These would provide mitigation of landscape and visual effects resulting from the OnSS from the outset.

89 Outline planting mitigation principles have been developed for the OnSS site to compliment this existing landscape structure. These mitigation principles include areas of proposed woodland, areas identified for ecological mitigation in the form of habitat enhancement and areas with potential further planting following design progression and consultation.

90 The proposed woodland comprises native woodland species and would be located around the OnSS. The key aims of the proposed woodland planting are as follows:

- to provide visual screening to residential properties, road users, and visitors to the Crematorium on Glascoed Rd to the south of the OnSS site;
- to provide visual screening to users of the bridlepath immediately north of the OnSS site;
- to provide a woodland context to the OnSS site that compliments the long established woodland of the area, including woods found within Bodelwyddan Park; and
- To provide greater connectivity between the existing woodlands, retained hedgerows, field boundary trees and nearby Nature Reserve.

91 The mitigation woodland planting would comprise a mix of faster growing 'nurse' species and slower growing 'core' species. Nurse species would grow quicker so that after 15 years they would be approximately 7-10m in height. They would provide shelter to bring on core species. Whilst the nurse species would be sufficiently fast growing to provide substantial screening of the OnSS after 15 years, the core species would outlive the nurse species and provide a preferred native woodland with a more robust structure closer in character to other nearby woodlands associated with the Bodelwyddan Park.

92 Proposed woodland planting would be spaced to maximise growth rate and ultimate screening potential. An example of this would be to plant approximately one tree per m^2 in natural groups and not too regimented (i.e. in randomly spaced species groups of 3, 5 and 7 plants), however the precise detail of these spacings should form part of the planting schedule agreed at a more detailed stage.

93 The proposed woodland planting would strengthen lines of existing field boundaries, connecting to established woods in the area and thereby complimenting the existing landscape structure.

94 Further information on landscape planting proposals, including a plan showing the indicative planting type and location, is provided within the outline Landscape and Ecology Mitigation Plan (LEMP) (ES Volume 5, Annex 5.11(application ref: 6.5.11)). A final LEMP will be developed, based on the detailed OnSS design, and will be approved by DCC through a DCO Requirement (See Section 4).

3.9.2 Parameters

95 The outline LEMP shows the area that has been included within the Order Limits to facilitate suitable landscape management measures and screening within the final LEMP.

3.10 OnSS Ecological Mitigation

3.10.1 Principles

96 The following provides a summary of the proposals for ecological mitigation and compensation that are set out in the outline LEMP (application ref: 8.4)

97 The OnSS footprint, plus adjacent construction TCCs and access, affects agricultural grassland of low intrinsic ecological value, plus hedgerows and mature trees which are of greater interest. This area is also used by the local Great Crested Newt (GCN) population.

98 Compensation for loss of hedgerows and trees will be provided by re-instating native, species-rich hedgerows with trees, and including ditches where these were also present originally, as well as creating new hedgerows where this is not possible. Additional compensation for the loss of trees will be provided by the proposed screen planting around the OnSS site. At the OnSS TCC grassland will be reinstated to its previous state following construction. Elsewhere, grassland will be reinstated with the aim of creating priority habitat lowland meadow.

99 The OnSS Footprint has been orientated to retain the two existing ponds that are adjacent to the OnSS Footprint so that these will remain accessible to GCN throughout the construction phase via protected habitat links and/ or underpasses.

100 Permanent loss of hedgerows at the OnSS, which may be used by sheltering GCN, will be compensated via creation of new broadleaved woodland and species rich hedgerows comprising locally appropriate species. These will be located so as to link or buffer existing woodlands, scrub and hedgerows.

101 Drainage/management of surface water at the OnSS will not represent a hazard to GCN. In particular, gulley pots will be avoided wherever possible, or where they prove essential shall be set away from any adjacent kerbs to prevent entrapment of GCN.

102 A final LEMP will be developed, based on the detailed OnSS design, and will be approved by DCC through a DCO Requirement (See Section 4).

3.10.2 Parameters

103 Figure 1 of the outline LEMP shows the area that is available to provide ecological compensation and enhancement around the OnSS. Figure 1 also shows, in principle, how woodland and hedgerow planting could be undertaken at the OnSS to satisfy both landscape and ecological objectives. In addition, it identifies areas where grassland management will be undertaken primarily for the benefit of GCN, but with consequential benefits for other animal species too.

4 OnSS Landscape and Design Principles in the Application for Development Consent

104 This section sets out the DCO Requirements that are relevant to detailed design of the OnSS alongside landscaping and ecology mitigation. Under these DCO Requirements, DCC would be consulted with, post consent, and provided with information post consent that is based on the detailed OnSS design for DCC to review and to approve if appropriate. In this respect the DCO Requirements are akin to the approval of Reserved Matters associated with an outline consent, or the approval of planning conditions included with a Town and Country Planning Act (1990).

4.1.1 Requirement 6 Substation Works

105 Requirement 6 states that construction of the OnSS must not commence until the following OnSS details have been submitted to, and approved by DCC:

- the layout;
- scale;
- proposed finished ground levels;
- dimensions, colour and materials used for the buildings;
- security fencing;
- hard surfacing materials;
- vehicular and pedestrian access, parking and circulation areas;
- proposed and existing functional services above and below, ground, including drainage, power and communications cables and pipelines, manholes and supports.

106 The details submitted under the heading above must be in accordance with the detailed design parameters set out in Requirement 7.

4.1.2 Requirement 7 Detailed Design Parameters

107 Requirement 7 states that the onshore works must not exceed the parameters set out in Table 1.

Table 1: Onshore Design Parameters

PARAMETER	VALUE
Maximum number of landfall transition joint bays	2
Maximum height of any OnSS building within Work No. 31A above AOD (m)	49.975
Maximum height of any external electrical equipment (excluding lightning rods) within Work No. 31A above AOD (m)	47.475
Maximum number of lightning rods within Work No. 31A	12
Maximum height of any lightning rod above AOD (m)	53
Maximum area of the fenced compound within Work No. 31A (m2)	50,000

4.1.3 Requirement 8: Provision of landscaping

108 Requirement 8 states that works on the OnSS will not be commenced until a written landscaping scheme and associated work programme, (that is in accordance with the outline landscape and ecological management plan (Requirement 14)), has been submitted to and approved by DCC.

109 The written landscaping scheme must include details of all proposed hard and soft landscaping works including:

- location, number, species, size and planting density of any proposed planting including any trees; and
- implementation timetables for all landscaping works.

4.1.4 Requirement 9: Implementation and maintenance of landscaping

110 Requirement 9 states that all landscaping works must be carried out in accordance with the landscaping schemes approved under Requirement 10 (provision of landscaping) and any damaged or diseased trees or shrubs within 5 years must be replaced. The Requirement includes provision to replace damaged or deceased trees.

4.1.5 Requirement 13: Landscape and Ecological management plan

111 Requirement 13 states that a written Landscape and Ecological Mitigation Plan (LEMP) should be developed for the OnSS, in line with the outline LEMP provided with the DCO application. The LEMP must undergo consultation with NRW and then be approved by DCC before construction of the OnSS commences. The LEMP must include an implementation timetable and must be implemented as approved.

4.1.6 Requirement 16 Surface and foul water drainage

112 Requirement 16 states that construction of the OnSS must not commence until a written surface and foul water drainage plan (including details of any watercourse crossings and proposals for management and maintenance) have undergone consultation with NRW and then been submitted to, and approved by, DCC. The surface and foul water drainage plan must be substantially in accordance with the principles set out in the outline drainage strategy.

4.1.7 Requirement 18 Control of noise during operational stage

113 This requirement states that the noise rating level for the operation of the OnSS must not exceed the following levels, at a position representative of the façade, in free-field conditions, of any building lawfully occupied for residential or accommodation purposes at the date of the granting of this Order at each of the locations set out in (a) to (d) below:

a) 36 dB LAr,Tr at Gwelfryn (OS: 300654, 373889),

b) 36 dB LAr,Tr at Caer Delyn (OS 301339, 373960),

c) 39 dB LAr,Tr at Bodelwyddan Castle Hotel (OS 299967, 374819)

d) 41 dB LAr,Tr at Faenol Bropor (OS 301298, 374784)

4.1.8 Requirement 19 Control of operational artificial light emissions

114 Requirements 19 states that the OnSS must not be brought into operation until a written scheme for the management and mitigation of artificial light emissions has been submitted to, and approved, by DCC.

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