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MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 5, annex 4.2: Site Selection Onshore Substation BRAG

Image of an offshore wind farm

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Glossary

Term	Meaning
Bodelwyddan National Grid Substation	This is the Point of Interconnection (POI) selected by National Grid for the Mona Offshore Wind Project.
Cable Route Protocol	This comprises a set of requirements developed by The Crown Estate detailed in Appendix 1, to help developers establish a transmission system infrastructure including export cabling
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Export Cable Region	The Region defined by Niras within the Round 4 HRA for the Irish Sea and North Wales bidding area where preferred bidders may place cable infrastructure
Mona Offshore Wind Project	The Mona Offshore Wind Project is comprised of both the generation assets and offshore and onshore transmission assets and associated activities.
Mona Offshore Transmission Infrastructure Scoping Search Area	The area that was presented in the Mona Scoping Report as the area encompassing and located between the Mona Potential Array Area and the landfall up to Mean High Water Springs (MHWS), in which the offshore export cables and any offshore booster substation will be located.
Mona Onshore Transmission Infrastructure Scoping Search Area	The area that was presented in the Mona Scoping Report as the area located between Mean High Water Springs (MHWS) at the landfall and the onshore National Grid substation, in which the onshore export cables, onshore substation and other associated onshore transmission infrastructure will be located.
Mona Offshore Cable Corridor	The corridor located between the Mona Array Area and the landfall up to Mean High Water Springs (MHWS), in which the offshore export cables and the offshore booster substation will be located.
Mona Onshore Cable Corridor Search Area	The corridor located between Mean High Water Springs (MHWS) at the landfall and the Mona onshore substation, in which the onshore cable route will be located.
Mona 400kV Cable Corridor	The corridor from the Mona onshore substation to the Bodelwyddan National Grid substation.
Mona Proposed Onshore Development Area	The area in which the landfall, onshore cable corridor, onshore substation, mitigation areas, temporary construction facilities (such as access roads and construction compounds), and the connection to National Grid Bodelwyddan substation will be located.
Offshore Substation Platform (OSP)	The offshore substation platforms located within the Mona Array Area will transform the electricity generated by the wind turbines to a higher voltage allowing the power to be efficiently transmitted to shore.
Applicant	Mona Offshore Wind Limited.
Wind turbines	The wind turbine generators, including the tower, nacelle and rotor.
Inter-array cables	Cables which connect the wind turbines to each other and to the offshore substation platforms. Inter-array cables will carry the electrical current produced by the wind turbines to the offshore substation platforms.
Interconnector cables	Cables that may be required to interconnect the Offshore Substation Platforms in order to provide redundancy in the case of cable failure elsewhere.
Intertidal area	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The area in which the offshore export cables make contact with land and the transitional area where the offshore cabling connects to the onshore cabling.
The Northern Wales and Irish Sea Bidding Area	The Northern Wales and Irish Sea Bidding Area was one of four Bidding Areas identified by The Crown Estate through the Offshore Wind Leasing Round 4 process.
Preferred Bidding Areas	The Applicant identified two Preferred Bidding Areas (Morgan and Mona) within the Northern Wales and Irish Sea Bidding Area. In February 2021, The Crown Estate awarded the Applicant the right to develop up to 1.5GW of wind capacity within each of the two Preferred Bidding Areas.
Offshore Wind Leasing Round 4	The Crown Estate auction process which allocated developers preferred bidder status on areas of the seabed within Welsh and English waters and ends when the Agreements for Lease (AfL) are signed.

Acronyms

Acronym	Description
AfL	Agreement for Lease
AoS	Area of Search
BRAG	Black, Red, Amber, Green
CRIA	Cable Route Identification and Approval
CRP	Cable Route Protocol
HND	Holistic Network Design
JNCC	Joint Nature Conservation Committee
MCZ	Marine Conservation Zone
NRW	Natural Resources Wales
POI	Point of Interconnection
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

1. Site Selection Onshore Substation BRAG

1.1 Introduction

1.1.1 Purpose

1.1.1.1 This annex summarises the site selection work undertaken to identify a preferred zone(s) for potential onshore substation locations for the Mona Offshore Wind Project within the defined onshore substation area of search (as described in volume 5, annex 4.1: Site Selection Area of Search Identification of the PEIR); and provides recommendations for further work for the micro-siting of the onshore substation within that zone(s).

1.1.1.2 This annex does not consider the process of the onshore cable corridor routing – this is discussed within section 4.7.5 and section 4.8.5 of volume 1, chapter 4: Site Selection and Consideration of Alternatives. Similarly, this annex does not consider the site selection work undertaken to define the landfall location – this is discussed within section 4.7.4 and section 4.8.4 of volume 1, chapter 4: Site Selection and Consideration of Alternatives of the PEIR.

1.1.1.3 Other elements of the site selection process, such as the selection of construction accesses and further refinements to the design as a result of the Environmental Impact Assessment process are not captured within this annex.

1.1.2 Data Sources

1.1.2.1 Targeted data collection and consultation has informed and will continue to inform the site selection process following identification of a preferred zone(s) to progress micro-siting of the Mona Offshore Wind Project onshore substation. A comprehensive list of data sources used to identify the onshore substation area of search and identification of zones for this Black-Red-Amber-Green (BRAG) assessment are identified in section 1.4.5 of volume 5, annex 4.1: Site Selection Area of Search Identification of the PEIR.

1.1.2.2 Surveys and targeted consultation will be undertaken as part of the Scoping, Preliminary Environmental Information Report and Environmental Impact Assessment processes to inform the ongoing site selection work.

1.2 Mona Offshore Wind Project Onshore Substation Site Selection

1.2.1 Introduction

1.2.1.1 This section describes the site selection process undertaken to identify a potential location for the onshore substation within the onshore substation area of search.

1.2.1.2 A review of planning policy guidance was undertaken as part of defining the onshore substation area of search (see section 4.3: Policy Context in volume 1, chapter 4: Site Selection and Consideration of Alternatives). This guidance has further informed site selection and the BRAG assessment.

1.2.1.3 The Holistic Network Design (HND) process is the mechanism used by National Grid to evaluate the potential transmission options required. This leads to the identification and development of the most efficient, coordinated and economical connection point in line with National Grid's legal obligation to develop and maintain an efficient, coordinated and economical system of electricity transmission. An important element of this assessment is the cost that will be passed on to electricity consumers (the public and businesses) as a result of the works which will be required to ensure a network connection that can accommodate the project. As part of the economic assessment, the HND process considers the total life cost of the connection – assessing both the capital and project operational costs to the onshore network (over a project's lifetime) to determine the most economic and efficient design option.

1.2.1.4 In addition to the considerations placed upon the project by the HND process, the National Policy Statement for Energy (NPS-EN1) states that: "*applicants are obliged to include in the Environmental Statement, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into the account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility… alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be physically suitable, can be excluded on the grounds that they are not important and relevant to the [Secretary of State's] decision*".

1.2.1.5 Similarly, National Grid's guidelines on siting and design (the Horlock Rules) state that: "*consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effect to a reasonably practicable minimum*".

1.2.1.6 Furthermore, the Electricity Act, 1989 (EA89) states that: "*it shall be the duty of the holder of a licence authorising him to participate in the transmission of electricity to develop and maintain an efficient, co-ordinated and economical system of electricity distribution; and to facilitate competition in the supply and generation of electricity*". The same is applicable to the holder of a licence authorising them to transmit electricity. This includes Offshore Transmission Operators (OFTO) who will take over the Mona Offshore Wind Project's electrical connection after it is constructed.

1.2.1.7 Considering the requirements of the HND process, NPS-EN1, the Horlock Rules and EA89, the onshore substation area of search was required to prepare an economic and efficient solution for the onshore substation site selection that considered the environmental, amenity, cultural, local context, land use and site planning constraints, resulting in the aim to locate onshore substation options as close to the existing National Grid substation as possible.

1.2.1.8 Within these aims, the HND process, NPS-EN1, the Horlock Rules and EA89, as well as Mona Offshore Wind Project team decisions, identified a number of objectives that set a framework of site selection principles which this site selection process will adhere to:

- Shortest route preference to reduce impacts by minimising footprint for the Mona Offshore Cable Corridor and Mona Onshore Cable Corridor as well as considering cost (hence ultimately reducing the cost of energy to the consumer) and minimising transmission losses

- Avoidance of key sensitive features where possible, and where not, ensure mitigation of impacts
- Minimise the disruption to populated areas
- The need to accommodate the range of technology sought within the design envelope, such as air insulated or gas insulated switchgear for the onshore substation.

1.2.1.9 To meet the above criteria, an initial onshore substation area of search was expanded from 3km to 5km. The 3km buffer was expanded to 5km following engineering review of the maximum electrical distance between the Mona Offshore Wind Project onshore substation and the National Grid substation. This also increased the potential number of areas to site the onshore substation as part of the site selection process. Selection of this area of search was considered sufficient to locate an onshore substation footprint (125,000m^2) and associated onshore substation construction compound. footprint (250,000m^2) – see section 1.2.3 for 'Technical Considerations').

1.2.1.1 Hard constraints such as areas of infrastructure, landfills, roads, railways, National Grid overhead lines, and other potential constraints to development and / or construction. (as outlined in volume 5, annex 4.1: Site Selection Area of Search Identification of the PEIR) were plotted and removed from the onshore substation area of search. These are illustrated in Figure 1.1 and Figure 1.2.

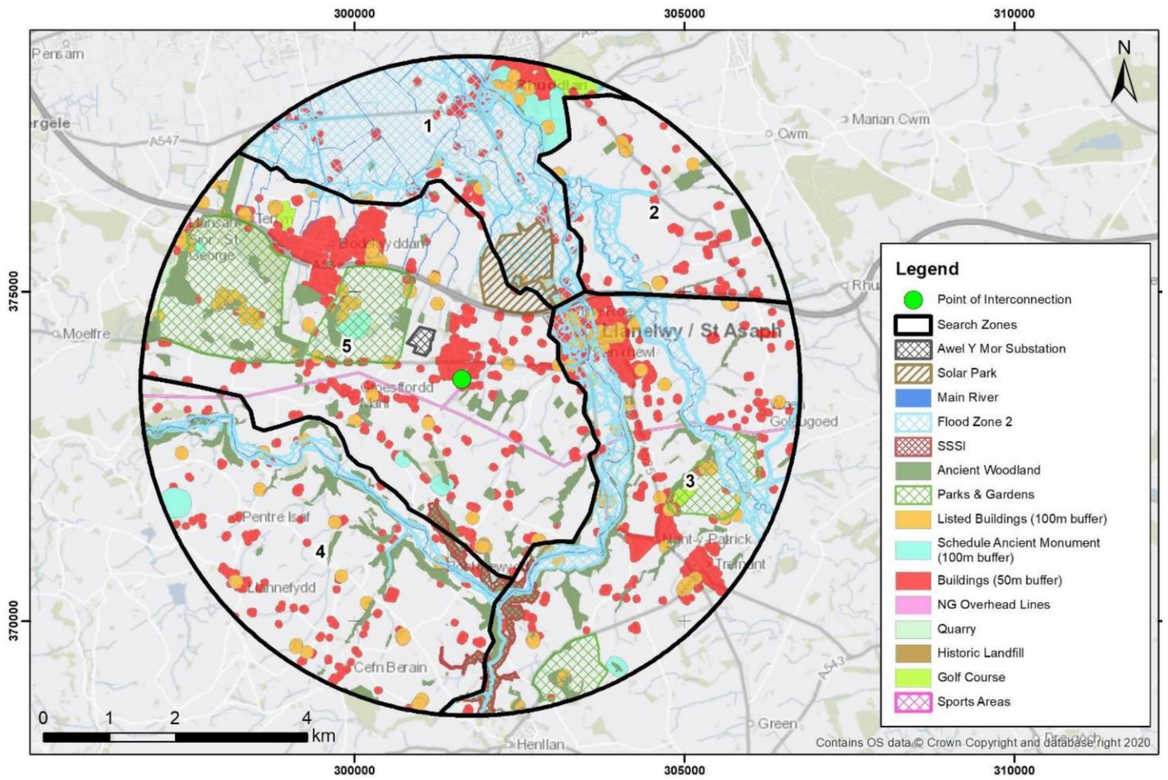

Figure 1.1: Mona Offshore Wind Project onshore substation search area and zones.

1.2.1.2 Five onshore substation search zones were identified (see Figure 1.1) with zone boundaries coinciding with the perimeters of hard constraint areas. The extents of Flood Risk Zone 2 areas of higher risk flood zones were used to define the boundary of Zone 1, extending south as far as the A55. Continuing the line of the A55 to the east created Zone 2, an area of relatively sparse constraint but from which connection to the Bodelwyddan National Grid Substation would mean crossing two river crossings or circumnavigation of the planned Elwy Solar Energy park to the west (Note: planning application for the Elwy Solar Energy Park was refused after the completion of initial site selection work though is currently subject to judicial review. This does not affect the outcomes of the site selection process).

1.2.1.3 Zone 3, south of the A55, was defined by continuing the western limit of Zone 1 to the south, following the extent of Flood Zone 2 associated with the Afon Elwy. This zone is more densely constrained than Zone 2 to the north, and connection to the Bodelwyddan National Grid Substation is complicated by the town of St. Asaph in the northwest corner as well as the river running along the western edge. The final boundary broadly follows Afon Elwy west towards its source but is defined by an area (Zone 4) of high slopes around and to the south of the river. The remaining land in the middle, surrounding the Bodelwyddan National Grid Substation and extending to the east, is Zone 5.

1.2.1.4 An appraisal of each zone was made, with conclusions as to the viability of each summarised in Table 1.1Table 1.1. Only Zone 5 was retained for further assessment, the other four having been discounted from further consideration for the reasons outlined in Table 1.1.

Table 1.1: Onshore substation search zone appraisal.

Zone	Description	Status
1	Zone lies almost entirely within higher risk flood zones 2 and 3, conflicting with Horlock rules as well as National Grid policy. The increased flood risk also presents a design and construction challenge.	Discounted
2	Access to the zone from the west is all but prevented by the planned development and solar farms within the southern portion of Zone 1. Access from the south is blocked by St. Asaph town and the necessity of crossing River Clwyd and Afon Elwy.	Discounted
3	South of the A55 the urban settlement of St. Asaph presents a barrier to cable connectivity and this barrier extends down the St. Asaph Road to Trefant effectively removing the land to the east of St. Asaph from further consideration. The western boundary of Zone 3 (where it adjoins Zone 5) runs along a ridge line in the topography. On the river Elwy side of this boundary there is a very long steep gradient slope deemed to present a highly challenging cable laying prospect. The remaining part of Zone 3 to the west of this slope, up to the settlement of St. Asaph Road is removed from further consideration.	Discounted
4	There are large areas of land in Zone 4 which are potentially suitable based on the constraints screened thus far. However, the northern boundary of Zone 4 (where it abuts Zone 5) traverses the foot of a steep hill line with a north facing aspect. This line of hills rises steeply to the south and then falls down into the River Elwy valley, before rising again to the south towards Llannefydd. The sequence of steep topography along the boundary with Zone 4 is deemed to represent a significant cable laying challenge and renders Zone 4 inaccessible.	Discounted

Zone	Description	Status
5	This area is relatively flat with rising topography to the south along the B5381 Roman Road and towards Plas-yn-Cefn in the south. There are increasing areas of built development in the St. Asaph Business Park, Bodelwyddan town to the north and large inaccessible areas of Registered Parks and Gardens to the west of the zone. These existing features will limit flexibility for cable routing but nevertheless the zone is deemed accessible. The land to the south of the PoI is relatively unconstrained.	Retained

1.2.1.5 Key areas removed from the area of search were the city of St. Asaph with its associated Conservation Area and listed buildings, as well as the Main River (Elwy), and its associated Flood Zones 2 and 3 to the east. The southern boundary was refined to avoid a further stretch of the River Elwy and its associated flood zones, along with the Coedwigoedd Dyffryn Elwy/Elwy Valley Woods SAC, Coedydd Ac Ogofau Elwy A Meirchion SSSI and the Lower Elwy Valley Historic Landscape, which encompasses scattered listed buildings and Scheduled Monuments.

1.2.1.6 The area of search (Zone 5) then formed the basis for the selection of available parcels of land to site potential onshore substations for site selection consideration.

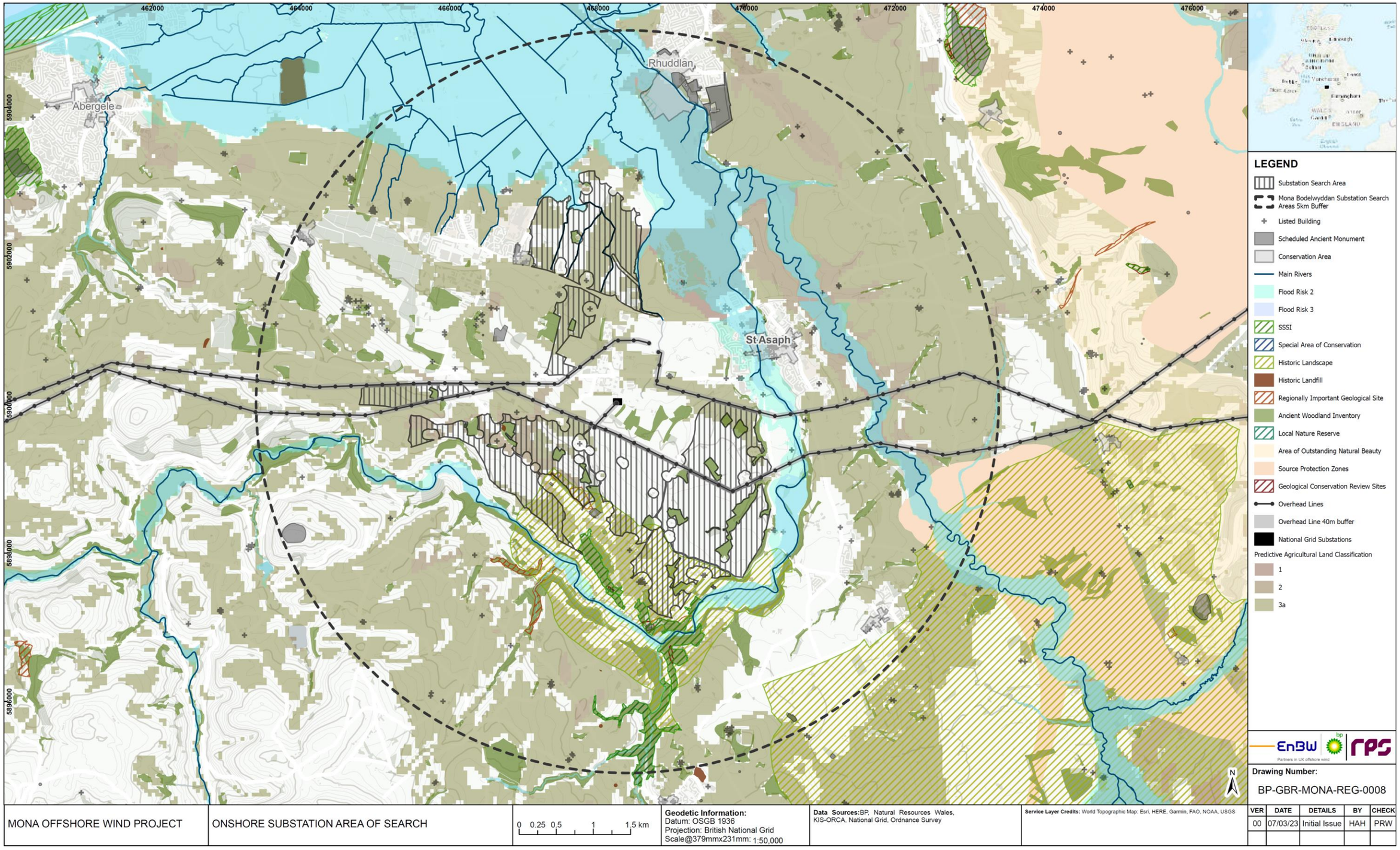

Figure 1.2: Onshore Substation Area of Search.

1.2.2 Methodology

1.2.2.1 A Black/Red/Amber/Green (BRAG) methodology has been used to inform site selection. This is considered appropriate to compare a number of sites for similar infrastructure, given the ability to capture and classify the main differentiating issues in 4 fundamental categories. A BRAG assessment of this type enables a clear and direct comparison between each site.

1.2.2.2 Development considerations captured within the BRAG assessment include archaeology/cultural heritage, ecology, landscape, hydrology and hydrogeology, engineering, community, landscape and visual, property and planning. These were assessed by a team of specialists comprising engineers, Environmental Impact Assessment (EIA) consultants, landscape, archaeology and ecological experts throughout the site selection process. This was undertaken using the BRAG system which ranks the influence of the consideration on future development, either using defined parameters, professional judgement, or assessing the issue relative to the other potential options.

1.2.2.3 BRAG is a standard assessment tool used in the pre-EIA process to assess the potential risks to proposed development options.

1.2.2.4 Each development consideration is given a classification of Black/Red/Amber/Green. These classifications indicate the adverse or positive attributes to development respectively. It should be noted that if a site is awarded a Red classification, this will not necessarily prevent an option being taken forward as preferred into the next stage if, overall, it performs better than others. A Black classification should remove an option from further consideration.

1.2.2.5 The surveys and desk-based investigations undertaken to date and the performance of the options relative to one another, along with professional judgement, have influenced the criteria of the Black/Red/Amber/Green as well as the classifications given. Information about the considerations is provided within the individual cells of the BRAG assessment tables.

1.2.2.6 The method presents all the identified development considerations equally, i.e. there is no weighting of different development considerations relative to each other. Whilst any weighting is not incorporated in the BRAG assessment findings, professional judgement, specific guidance and feedback through the consultation process is taken into consideration to inform decisions.

1.2.3 Technical Considerations

1.2.3.1 The design, layout and final location of the onshore substation and associated infrastructure is subject to ongoing assessment and will be dependent on land availability, environmental and technical constraints, landowner negotiations and consultation with stakeholders. Information on the likely design parameters and space requirements that have been used in this site selection process include:

- A footprint of up to 125,000m^2 for the indicative onshore substation footprint (with an onshore substation building footprint within this of 105,000m^2);
- Structures will be up to 20m tall; and
- The onshore substation will require land for temporary construction works (e.g. welfare, parking, storage areas and associated temporary access tracks) and a temporary construction compound footprint of up to 250,000m^2.

1.2.4 Assessment

1.2.4.1 The development considerations for the onshore substation BRAG assessment were:

- Ecology and nature conservation
- Hydrology, hydrogeology and flood risk
- Archaeology / cultural heritage
- Traffic and transport
- Land use (including predictive Agricultural Land Classifications)
- Noise and vibration
- Landscape and visual
- Tourism and socio-economics
- Engineering and design.

1.2.4.2 The BRAG assessment has been undertaken for each of the onshore substation site options individually as per the medium-list within section 4.8.6 of volume 1, chapter 4: Site Selection and Consideration of Alternatives (1, 2, 3, 4, 5, 6, 7, 8, 16 and 17). Criteria selected for the BRAG assessment are based on criteria for judging landscape capacity and sensitivity, for example proximity to valued landscapes, landscape character susceptibility, visual sensitivity/presence of visual receptors and opportunities to utilise existing features (such as woodlands) for screening and mitigation. Each criterion is given a classification of Black/Red/Amber/Green, indicating the relative scale of adverse or beneficial attributes to siting development, of the nature proposed, in each location. BRAG assessment classifications are based on professional judgement, desk study and a field survey visit to each site location.

1.2.4.3 Constraints identified at each potential onshore substation location are presented in Figure 1.3. The summary of the BRAG assessment's findings is presented in Table 1.2. This information was used to assess which of the options should progress to the next stage of site selection consultation – short listing for targeted community consultation.

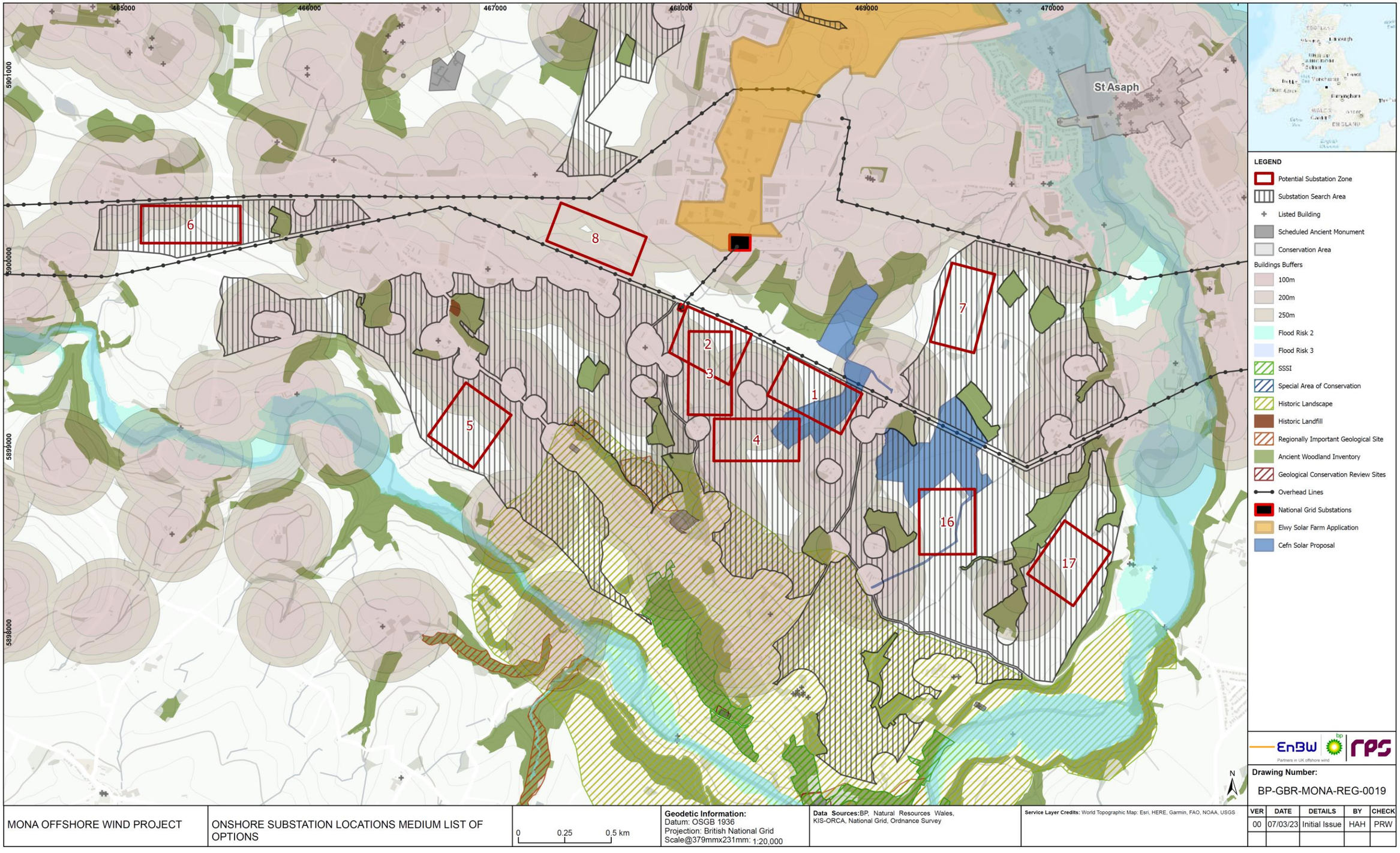

Figure 1.3: Onshore Substation Zones Medium List of Options.

Table 1.2: BRAG assessment table of development considerations for the 10 medium list potential onshore substation locations.

Topic	Onshore substation zone 1	Onshore substation zone 2	Onshore substation zone 3	Onshore substation zone 4	Onshore substation zone 5	Onshore substation zone 6	Onshore substation zone 7	Onshore substation zone 8	Onshore substation zone 16	Onshore substation zone 17
Ecology and nature conservation	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.	Potential for indirect effects on nationally designated sites; and for direct effects on as yet unidentified non-statutorily designated sites. Potential for impacts on a range of protected species. Nothing which, at this stage, would be unlikely to be mitigatable, although habitat creation would be required.
Hydrology, hydrogeology and flood risk	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated	No significant constraints associated with onshore water and sediment quality	No significant constraints associated with onshore water and sediment quality	No significant constraints associated with onshore water and sediment quality Watercourse present within site. If not avoided, likely to result in significant effects on watercourse, but does offer opportunity to drain to watercourse as part of SuDS scheme	No significant constraints associated with onshore water and sediment quality	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated	No significant constraints associated with onshore water and sediment quality. Surface water flood risk can be managed and mitigated

Topic	Onshore substation zone 1	Onshore substation zone 2	Onshore substation zone 3	Onshore substation zone 4	Onshore substation zone 5	Onshore substation zone 6	Onshore substation zone 7	Onshore substation zone 8	Onshore substation zone 16	Onshore substation zone 17
Archaeology / cultural heritage	High potential for impacts associated with the setting of designated assets and historic landscape character. Potential for archaeological remains to survive with mitigation options likely available.	High potential for impacts associated with the setting of designated assets and historic landscape character. Potential for archaeological remains to survive with mitigation options likely available.	High potential for impacts associated with the setting of designated assets and historic landscape character. Potential for archaeological remains to survive with mitigation options likely available.	High potential for impacts associated with the setting of designated assets and historic landscape character. Potential for archaeological remains to survive with mitigation options likely available.	Potential for archaeological remains to survive with mitigation options likely available. Moderate to high risk of impacts associated with the setting of designated assets.	Potential for archaeological remains to survive with mitigation options likely available. Moderate to high risk of impacts associated with the setting of designated assets.	Moderate risk of impacts associated with the setting of designated assets.	Potential for archaeological remains to survive with mitigation options likely available. Moderate to high risk of impacts associated with the setting of designated assets.	Moderate risk of impacts associated with the setting of designated assets	Moderate risk of impacts associated with the setting of designated assets
Traffic and transport	Access via the local unnamed road that runs west of the Substation 1 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 1 site should be discounted unless a new access (approx. 1km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	Access via the local unnamed road that runs west of the Substation 2 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 2 site should be discounted unless a new access (approx. 1km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	Access via the local unnamed road that runs west of the Substation 3 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 3 site should be discounted unless a new access (approx. 1km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	Access via the local unnamed road that runs west of the Substation 4 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 4 site should be discounted unless a new access (approx. 1km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	Access via the local unnamed road that runs north of the Substation 5 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 5 site should be discounted unless a new access (approx. 1.5km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	There would be no significant constraints associated with the Substation 6 site.	Access via the local unnamed road that runs west of the Substation 7 site would not be possible as the road is not wide enough for two vehicles and it would not be possible to widen without extensive work and land acquisition. The Substation 7 site should be discounted unless a new access (approx. 0.9km) can be constructed from the B5381. If a new access can be constructed the BRAG classification could be reduced to green.	There would be no significant constraints associated with the Substation 8 site.	There are significant engineering and road safety constraints upon access, and construction traffic would also impact upon at St. Asaph.	There are significant engineering and road safety constraints upon access, and construction traffic would also impact upon at St. Asaph.

Topic	Onshore substation zone 1	Onshore substation zone 2	Onshore substation zone 3	Onshore substation zone 4	Onshore substation zone 5	Onshore substation zone 6	Onshore substation zone 7	Onshore substation zone 8	Onshore substation zone 16	Onshore substation zone 17
Land use (including predictive Agricultural Land Classifications)	Consideration to avoid residential property.	Consideration to avoid residential property. Encroachment into Grade 3a agricultural land	Consideration to avoid residential property. Encroachment into Grade 3a agricultural land	Consideration to avoid residential property.	Consideration to avoid residential property.	Site entirely within Grade 3a agricultural land	Consideration to avoid residential property. Encroachment into Grade 3a agricultural land	Consideration to avoid, mitigate or minimise impacts to PRoW and impacts to campus and business park. Consideration to avoid residential property. Encroachment into Grade 2 and 3a agricultural land	Consideration to avoid residential property.	Consideration to avoid residential property.
Noise and vibration	Closest identified noise sensitive receptor 200m from substation footprint boundary	Closest identified noise sensitive receptor 200m from substation footprint boundary	Closest identified noise sensitive receptor 200m from substation footprint boundary	Closest identified noise sensitive receptor 200m from substation footprint boundary	Closest identified noise sensitive receptor 200m from substation footprint boundary	Closest identified noise sensitive receptor 200m from substation footprint boundary	Noise sensitive site approximately 200-300m from operational footprint boundary	Closest identified noise sensitive receptor between 100m and 200m from substation footprint boundary	Closest identified noise sensitive receptor between 100m and 200m from footprint boundary	Noise sensitive site approximately 200-300m from operational footprint boundary
Landscape and visual	Visual effects on nearby properties at close proximity. There is potential for some mitigation but this will take time to take effect. Cumulative effects with other sub-stations and pylon routes ensure a degree of clustering, however it is not adjacent so combined visibility by receptors is also cumulatively detrimental.	Visual effects on nearby properties at close proximity. There is potential for some mitigation but this will take time to take effect. Cumulative effects with other sub-stations and pylon routes ensure a degree of clustering, however it is not adjacent so combined visibility by receptors is also cumulatively detrimental.	Visual effects on nearby properties at close proximity. There is potential for some mitigation but this will take time to take effect. Cumulative effects with other sub-stations and pylon routes ensure a degree of clustering, however it is not adjacent so combined visibility by receptors is also cumulatively detrimental.	Visual effects on nearby properties at close proximity. There is potential for some mitigation but this will take time to take effect. Cumulative effects with other sub-stations and pylon routes ensure a degree of clustering, however it is not adjacent so combined visibility by receptors is also cumulatively detrimental.	Significant visual and potential residential amenity effects on residential receptors and community facility/business, which could be mitigated with offsite planting closer to properties. Widest ZTV with potential views across the valley.	Significant visual and potential residential amenity effects on residential receptors and community facility/business, which could be mitigated with offsite planting closer to properties. Widest ZTV with potential views across the valley.	Significant visual and potential residential amenity effects on residential receptors and community facility/business, which could be mitigated with offsite planting closer to properties.	Significant visual and potential residential amenity effects on residential receptors and community facility/business, with very little opportunity for mitigation due to the surrounding flat topography and visibility from wide-ranging views. Mitigation would rely heavily on offsite planting closer to properties which is difficult to secure as part of the development	Some interaction for visual receptors and valued local landscapes, but capacity to accommodate development exists.	Some interaction for visual receptors and valued local landscapes, but capacity to accommodate development exists. Potential to mitigate visibility due to available space for planting and earthworks. However, there is the possibility that the substation may be visible from higher ground locations to the east due to their elevation and lower lying woodland. At this stage in the process it is difficult to tell. If this is the case its position on the

Topic	Onshore substation zone 1	Onshore substation zone 2	Onshore substation zone 3	Onshore substation zone 4	Onshore substation zone 5	Onshore substation zone 6	Onshore substation zone 7	Onshore substation zone 8	Onshore substation zone 16	Onshore substation zone 17
										edge of what would appear as a slightly upland location above the valley may seem incongruous. This should be checked before proceeding with this site.
Tourism and socio-economics	No risks from current data	No risks from current data	No risks from current data	No risks from current data	No risks from current data	No risks from current data	No risks from current data	Consideration of mitigation required for impacting PRoW	No risks from current data	No risks from current data
Engineering and design	Site gradient, underlying geology, potential mining and appropriate vehicular access constraints present risks for this option.	Site gradient, underlying geology, potential mining and appropriate vehicular access constraints present risks for this option.	Site gradient, underlying geology, potential mining and appropriate vehicular access constraints present risks for this option.	Site gradient, underlying geology, potential mining and appropriate vehicular access constraints present risks for this option.	Site gradient and underlying geology constraints present risks for this option. Constraints regarding drainage connection identified but elevation difference means not a significant issue. Multiple utilities diversions required.	Site gradient and underlying geology constraints present risks for this option. Constraints regarding drainage connection identified but elevation difference means not a significant issue. Construction compounds are likely to be subject to spatial constraints. Diversion of gas main and overhead electricity line required.	Site gradient, appropriate vehicular access and drainage connection constraints present risks for this option. One complex (likely requiring HDD) crossing identified on route connecting to NG Substation. Diversion of gas main and overhead electricity line required.	Site gradient and underlying geology constraints present risks for this option. Constraints regarding drainage connection identified but elevation difference means not a significant issue. Multiple utilities diversions required.	Appropriate vehicular access and drainage connection constraints present risks for this option. One complex (likely requiring HDD) crossing identified on route connecting to NG Substation Diversion of overhead electricity line required. Connection to utilities to supply substation	Site gradient constraints present risks for this option. Appropriate vehicular access and drainage connection constraints present major risks for this option. Two complex (likely requiring HDD) crossings identified on route connecting to NG Substation. Diversion of overhead electricity lines and gas main required. Connection to utilities to supply substation present a risk for this option.

1.2.5 Conclusion

1.2.5.1 Onshore Substation Option 8 was not taken forward primarily due to the Black classification identified for landscape and visual criteria. This was related to the potential impact on nearby residential receptors in terms of visual amenity, and critically the likelihood that mitigation would not be achievable given the local topography constraints.

1.2.5.2 Onshore Substation Options 16 and 17 were not taken forward primarily due to the Black classification identified for traffic and transport. This was related to the access constraints for making these options achievable. Creating new access routes from existing highways to these two zones presented a significant health and safety concern and therefore these options were deselected.

1.2.5.3 The remaining options were all considered potentially viable options, based on the information available at that time, to be taken to the next stage of site selection refinement and consultation. The remaining seven options comprised the preferred options for the next stage of refinement process for the onshore substation site which was to take to a series of targeted non-statutory community consultation events. The targeted non-statutory community consultation was designed specifically to seek feedback on the shortlisted locations; intending to combine the ongoing environmental assessment and technical studies with local knowledge to help narrow the location for the onshore substation for PEIR assessment.:

1.2.5.4 These shortlisted onshore substation options for non-statutory community consultation are shown in Figure 1.4 (with indicative footprint size shown for information only).

1.2.5.5 A summary of the consultation responses on the short-listed onshore substation options is presented in Table 4.19 of volume 1, chapter 3: Site Selection and Consideration of Alternatives.

1.2.5.6 Following consultation responses, a further review of the preferred onshore substation options was undertaken. Responses to onshore substation options 1 and 2 were comparatively more favourable to those of onshore substation options 3 and 4 – despite their immediate proximity. Onshore substation option 3 required significant excavations due to the topography in the south of the potential footprint. Onshore substation option 4 overlaps the proposed St Asaph Solar Farm footprint. As a result, onshore substation options 3 and 4 have been discarded.

1.2.5.7 Due to the location of onshore substation options 1 and 2 being in close proximity to one another, only one of the two options has been considered relevant to take forward to the preferred list, as further micro-siting of the option would take place following the LVIA modelling. When compared against onshore substation 2, onshore substation 1 has similar risks, although has a slightly increased distance from the National Grid substation and pylons and therefore has a slightly more settled rural character and as such was identified as less favourable of the two locations at this stage from an LVIA perspective. In addition, onshore substation option 1 overlaps the proposed St Asaph Solar Farm footprint. As such onshore substation option 2 was selected as a preferred onshore substation location.

1.2.5.8 Consultation responses to onshore substation option 5 was the most negative and, in conjunction with the constraints associated with steep gradients, access and landscape visibility, this option has been discounted as a result. Further engineering review of onshore substation option 6 identified that the location of this option on a ridgeline with steep gradients was not preferable from an engineering, access or landscape perspective. In addition, the Zone of Theoretical Visibility (ZTV) modelling confirmed that the onshore substation option 6 would be visible from the other side of the valley. Due to this, onshore substation option 6 was not taken forward to the preferred list of options.

1.2.5.9 Onshore substation option 7 had mixed reviews but also very positive comments. Onshore substation option 7 also retains the flexibility to orient along an east-west axis or a north-south axis and therefore has a larger Onshore Substation Zone identified.

1.2.5.10 Therefore, following the discounting of the options outlined above, the following two options comprise the preferred option(s) for the onshore substation to be taken into the PEIR assessment:

- Onshore substation option 2
- Onshore substation option 7.

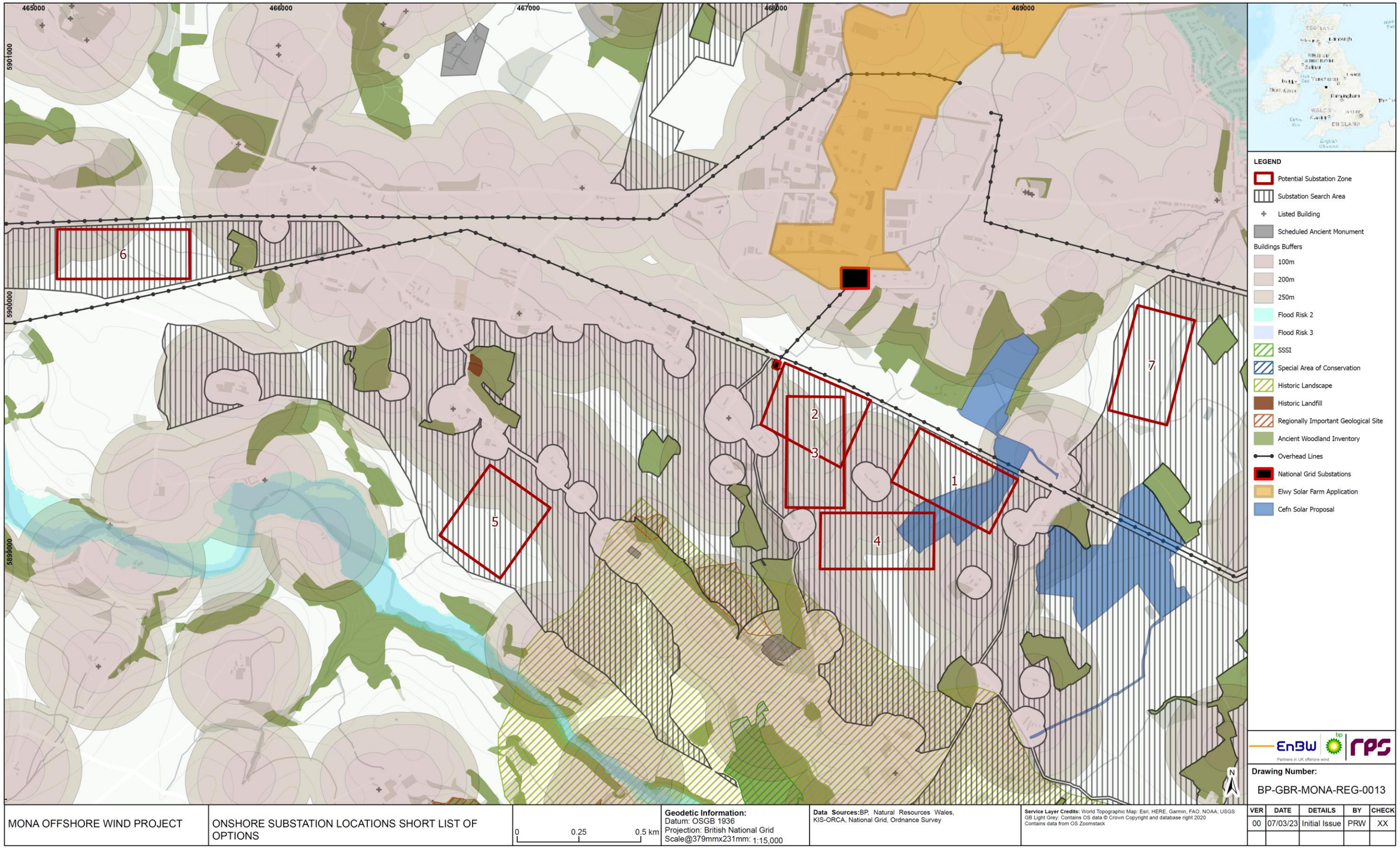

Figure 1.4: Onshore Substation Zones Short List of Options.