HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

6.4.2 ES Volume D - WNDA Development D2 - Alternatives and design evolution

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2.1 Introduction

2.1.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 require the main alternatives studied by Horizon to be outlined in the Environmental Statement, together with an indication of the main reasons for Horizon's choice, taking into account the environmental effects. Although the 2009 Regulations apply to the Wylfa Newydd Development Consent Order (DCO) Project (see chapter A5, overarching environmental legislation, policy and guidance, Application Reference Number: 6.1.5), Horizon has also had regard to the requirements in the 2017 Regulations, i.e. "*A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant or appellant which are relevant to the proposed development and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*."

2.1.2 This chapter outlines the site selection process and design evolution for the Wylfa Newydd Development Area (WNDA) Development, and describes how design considerations, consultation responses and environmental constraints have influenced the decision-making process.

2.1.3 The chapter should be read in conjunction with chapter A4 (strategic alternatives) (Application Reference Number: 6.1.4), which outlines the need for the Wylfa Newydd Project and the strategic alternatives considered. Volume 2 (Wylfa Newydd Development Area) of the Site Selection Report (Application Reference Number: 8.24.2) provides further detail on the options that have been considered in determining the layout of the WNDA Development, including the location of the Site Campus within the Wylfa Newydd Development Area. Volume 4 (Temporary Workers' Accommodation) of the Site Selection Report (Application Reference Number: 8.24.4) explains the rationale for selecting the Site Campus as the preferred solution for Temporary Workers' Accommodation (TWA).

2.1.4 Reference should also be made to chapter D1 (proposed development) (Application Reference Number: 6.4.1) which provides a detailed description of the proposed WNDA Development, and to volumes 2 (Power Station Site) and 3 (Associated Developments and Off-Site Power Station Facilities) of the Design and Access Statement (Application Reference Numbers: 8.2.2 and 8.2.3, respectively) for further information on the design evolution of the Power Station and the Site Campus respectively.

2.2 Alternatives considered

Alternative solutions

The Power Station

2.2.1 As set out in chapter A4 (Application Reference Number: 6.1.4), the UK Government has identified the "*urgent need for new electricity generation plant, including new nuclear power*" [RD1]. Therefore, the alternatives to constructing a new nuclear power station, including other forms of energy generation and a 'do nothing' scenario, are not considered herein.

Temporary Workers' Accommodation

2.2.2 Horizon's approach to ensuring that worker accommodation needs are met during construction is set out in the Workforce Accommodation Strategy (Application Reference Number: 8.4).

2.2.3 A detailed assessment was undertaken to determine the likely number and type of workers required for the Wylfa Newydd Project and the availability of these people within a commutable distance. This assessment identified the need for up to 7,000 non-home-based workers during the peak of construction. Horizon estimates that approximately 3,000 of these workers would be housed in existing tourist accommodation or the private rental sector, which represent alternative solutions to the provision of purpose-built TWA. However, these forms of accommodation would provide insufficient bed spaces for the required workforce. As such, a 'do nothing' scenario in which Horizon would not provide any purpose-built TWA has not been considered further, since up to 4,000 additional bed spaces would be required.

Alternative locations

The Power Station

2.2.4 As set out in chapter A4 (Application Reference Number: 6.1.4), the UK Government identified within the *National Policy Statement for Nuclear Power Generation (EN-6)* [RD2], the Wylfa NPS site as potentially suitable for the deployment of a new nuclear power station in 2011 following a Strategic Siting Assessment. The rationale behind this decision is summarised in chapter A4 (Application Reference Number: 6.1.4) and therefore it is not discussed further in this chapter.

Temporary Workers' Accommodation

2.2.5 A site option assessment process was undertaken to identify the preferred site for the TWA. This is described in detail in volume 4 of the Site Selection Report (Application Reference Number: 8.24.4), and summarised in this chapter.

2.2.6 The site selection process provides an objective assessment of alternative sites against a range of planning and environmental criteria. The site selection process has therefore taken into account guidance in the relevant local and national planning policies, as follows.

- *Overarching National Policy Statement for Energy (EN-1)* [RD1]
- *National Policy Statement for Nuclear Power Generation (EN-6)* [RD2]
- The Joint Local Development Plan for Anglesey and Gwynedd [RD3] sets out a spatial strategy to inform the location of development associated with the Wylfa Newydd Project.
- The *New Nuclear Build at Wylfa: Supplementary Planning Guidance* [RD4] provides locational guidance on Associated Developments, including freight logistics.

2.2.7 The principles of the site selection process for the TWA have been informed by an ongoing process of consultation, including the outcomes of Pre-Application Consultation Stage One (PAC 1) undertaken by Horizon at the end of 2014, the Environmental Impact Assessment Progress Report in January 2016, Pre-Application Consultation Stage Two (PAC 2) between August and October 2016, and Pre-Application Consultation Stage Three (PAC 3) in May and June 2017.

2.2.8 Horizon undertook a four-stage site identification, screening and assessment process to identify potentially suitable sites for the TWA, as summarised below.

- Stage 1 comprised a desk-based exercise to generate a 'long-list' of sites using a number of data sources to ensure that Horizon was aware of as many potentially available sites as possible.
- Stage 2 comprised initial screening of the long-list to discount any sites within/covered by one or more of the following constraints:
  - Special Area of Conservation (SAC);
  - Special Protection Area (SPA);
  - Ramsar Sites;
  - Site of Special Scientific Interest (SSSI);
  - World heritage site; and
  - Flood Risk Zone C2.
- Stage 3 of the assessment determined whether the remaining sites (following stage 2) met Horizon's operational pre-requisites, as well as locational, and compatibility pre-requisites.
- Stage 4 comprises a detailed assessment of the 'short-listed' sites following the stage 3b assessment. This assessment was based on a number of planning and environmental criteria.

2.2.9 The project optimisation process that took place in late 2016 and early 2017 resulted in the development of more efficient and cost-effective proposals for the TWA, which fed into the site selection methodology. This, together with the results of stages 1 to 3, is described in detail in the Site Selection Report.

2.2.10 Fifteen sites for the provision of TWA were short-listed for consideration within the stage 4 assessment (see volume 4 of the Site Selection Report, Application Reference Number: 8.24.4), as discussed below.

Stage 4 – Detailed assessment

2.2.11 Stage 4 comprised a detailed assessment of the 15 short-listed sites, based on a number of planning, accommodation capacity, and environmental criteria. The features of the short-listed sites are summarised in table D2-1 below. Volume 4 of the Site Selection Report (Application Reference Number: 8.24.4) provides detail on how each site scored in this assessment.

Table D2-1 Summary of short-listed sites

EZ10	Rhosgoch
The site comprises approximately 82.3ha of land located to the south-west of Amlwch and north of Rhosgoch. The site is not within a settlement, with the village of Rhosgoch approximately 2.5km to the south and Amlwch 4km to the north-east. Access to the site is from a local road which links to the A5025 to the north. The site is brownfield land, formerly used as an oil storage terminal. The site currently includes some agricultural land and tree cover with former oil storage tanks and bunding. The site is surrounded by agricultural land. The site was proposed as a 'preferred site' for the provision of TWA during PAC 2.	
	Site Campus (Option A, Wylfa Newydd Development Area)
The site comprises approximately 15ha of greenfield land within the Wylfa Newydd Development Area to the north-east of the Power Station Site and to the east of the Existing Power Station. Part of this land was previously identified for the development of TWA (based on 500 bed spaces) and materials storage during PAC 2.	
	Site A Amlwch
The site comprises approximately 5ha of land located to the south of the A5025 and is accessed from this road. The site is immediately adjacent to the Amlwch settlement boundary to the west. The site is bounded by the A5025 to the north and the B5111 to the east. Open land lies to the south and west, with the Amlwch Leisure Centre located further to the west. The site comprises greenfield land which is within the Parys Mountain registered historic landscape in the Joint Local Development Plan [RD3]. The site was proposed as a preferred site for the provision of TWA at PAC 2.	
	Site B Amlwch
The site comprises approximately 14.7ha of land located to the west of the A5025 and to the south of a petrol station. The site is outside of a recognised settlement but is adjacent to the settlement boundary of Amlwch. The site is bounded mainly by roads and agricultural land to the east. It comprises undeveloped undulating agricultural land which is within the Parys Mountain registered historic landscape [RD3].	

The site was proposed as a preferred site for the provision of TWA at PAC 2.	
	Site D Amlwch
The site comprises approximately 9ha of land located to the west of Amlwch and is accessed via the B5111 to the south-west. The site lies outside of a recognised settlement but abuts the Amlwch settlement boundary to the north and east. The site is bounded to the north by residential properties in Amlwch, by the B5111 to the south and south-west, and open land to the west and east. The site is greenfield agricultural land which is adjacent to the extent of the Anglesey Area of Outstanding Natural Beauty (AONB) [RD3] and partially within Flood Zone C1.	
SP202	**Yr Ogof**
The site comprises approximately 4.7ha of land located to the north of Holyhead Leisure Centre, accessed from the roundabout of the B4545 Kingsland Road and A5153. The easternmost section of the site adjacent to Kingsland Road lies within the Holyhead settlement boundary, with the western section of the site abutting the Holyhead settlement boundary to the east and south. The site is bounded by the Holyhead Leisure Centre to the south. Residential properties are immediately adjacent to the site to the north-east. Kingsland Road is to the east of the site and open land is to the west. The site is greenfield land which is within the AONB [RD3].	
SP304	**Cae Rhos**
The site comprises approximately 4.9ha of land located to the south-west of Holyhead. The site is not within a recognised settlement, but the Holyhead settlement boundary abuts the site to the north, south and west. The site is bounded by residential development in Holyhead to the east, north and south-east, and by open land to the east and south. The site includes a number of rock outcrops.	
SP320	**Trefengan Farm**
The site comprises approximately 4.5ha of greenfield land located to the south of the A5 and is accessed from this road. The site lies outside a recognised settlement but abuts the development boundary of Valley to the north-west. The site is bounded to the north by the A5, to the south-east and south-west by railway lines and properties in Valley to the north-west.	
SP368	**Tyddyn Uchaf**
The site comprises approximately 3.8ha of land located at the southern extent of Parc Cybi. The site is accessed from Parc Cybi road, which dissects the site. The site is within the Holyhead settlement boundary. The site is bounded by open land with land subject to an allocation for employment to the east and north.	

The site comprises greenfield agricultural land and is within the AONB [RD3].

SP378	Cae Syr Rhys

The site comprises approximately 4.3ha of land located to the west of Amlwch and is accessed from minor roads which link to the A5025 to the north. The site lies outside of a recognised settlement but abuts the Amlwch settlement boundary to the north and east.

The site is bounded to the north by residential properties in Amlwch, by a highway to the east and open land to the south and west.

The site is greenfield agricultural land which is adjacent to the extent of the Anglesey AONB [RD3].

SP381	Carreg Y Fran

The site comprises approximately 7.1ha of land located to the west of Amlwch, accessed from a residential street to the north. The site lies outside a recognised settlement but the Amlwch settlement boundary abuts the site to the north.

Residential development in Amlwch is located to the north of the site and open land is to the east, south and west.

The site comprises rough land with heavy scrub.

SP696/SP785	Kingsland

The site comprises approximately 29.3ha of land located to the south of Holyhead and the Holyhead settlement boundary. The site is accessed from the B4545 which links to Junction 2 of the A55 to the north via the A5153.

The B4545 forms the eastern boundary of the site and the Holyhead Leisure Centre is to the north. Open land is to the west and south. The site is currently greenfield land which is within the AONB [RD3].

The site benefits from outline planning permission, collectively with Cae Glas (site SP784) for 3,500 worker bed spaces.

The site was proposed as a preferred site for the provision of TWA at PAC 2.

SP784	Cae Glas

The site comprises approximately 128ha of land located to the south of the A55 and Holyhead. The northern portion of the site lies within the Holyhead settlement boundary. The Cymyran Strait forms the south-eastern boundary of the site with open land to the south-west. The site is within the AONB [RD3] and near Scheduled Monuments [RD5].

The site benefits from outline planning permission, collectively with Kingsland (site SP696/785) for 3,500 worker bed spaces.

The site was proposed as a preferred site for the provision of TWA at PAC 2.

SP64	Land adjacent to Lôn Gorad Road

The site comprises approximately 3.7ha of land located to the north of Gorad Road, from which it is accessed. The site is situated on the edge of Valley. Residential properties are situated immediately adjacent to the site. The site comprises greenfield agricultural land and is located within the AONB [RD3]. The Beddmanarch-Cymyran SSSI is situated immediately adjacent to the site, to the west.	
SP755	**Land near Ynys Wen**
The site comprises approximately 4.5ha of land located to the south of the A5 and is accessed from this road. Junction 3 of the A55 is approximately 300m to the east. The site lies outside a recognised settlement but abuts the boundary of Valley to the north-west. The site is bounded to the north by the A5, to the south-east and south-west by railway lines and properties in Valley to the north-west. The site comprises greenfield agricultural land and is within Flood Risk Zone C1.	

Preferred location

2.2.12 2.2.21 provides a summary of the final assessment considerations for each of the 15 sites.

2.2.13 Following this appraisal, it was considered that EZ10 Rhosgoch and the Site Campus rated the best according to the assessment criteria set out in volume 4 of the Site Selection Report (Application Reference Number: 8.24.4).

2.2.14 The location of EZ10 Rhosgoch, as well as the boundary of potential highway improvements required if this option were chosen, is shown in figure D2-1 (Application Reference Number: 6.4.101). The main positives for this site when compared to the Site Campus were its brownfield status and lack of environmental designations.

2.2.15 However, there were constraints on the site also that affected the feasibility of the Rhosgoch Temporary Worker Accommodation which were visible from the early feasibility studies. These included the sites location 100m south of the 4.6MW two-turbine Ysgellog wind farm, which could have led to significant effects on the workers living in the Temporary Workers Accommodation and hydrocarbon contaminated land concerns arising from the sites former use as a crude oil storage terminal.

2.2.16 Further information was gathered to inform the assessments in the Preliminary Environmental Information Report when the site was included as an option for Temporary Worker Accommodation at PAC 2. When gathering this information, it was realised that to make the development feasible, works would be required on the local road network from the site to the A5025. These would generally focus on various pinch points related to road width that would inhibit both construction of the scheme and bus travel between the accommodation and the Wylfa Newydd Development Area during its operation. This would then have involved the settling of land deals to improve this access. The access also caused further problems for the parking arrangements for employees at the site, with potentially significant effects on

the local road network arising from workers parking at site before starting their stay in the worker accommodation due to the rural nature of the road network.

2.2.17 Ecology surveys undertaken at the site and reported in the Preliminary Environmental Information Report for PAC2 suggested the site may support a nationally important population of Great Crested Newt which is protected under the Conservation of Habitat and Species Regulations 2010 and the Wildlife and Countryside Act 1981. Further ecological constraints of the site include bat activity and nesting birds.

2.2.18 The development considered also resulted in moderate adverse impacts on landscape character, landscape designations and visual amenity during construction and operation of the Temporary Worker Accommodation at Rhosgoch.

2.2.19 The effect of the above constraints would evidently lead to an increase in the potential cost of the construction of Temporary Workers Accommodation compared to the Site Campus option.

2.2.20 Horizon considered a number of locations within the Wylfa Newydd Development Area for the Site Campus; this is summarised in section 2.3. This discussion focuses on the chosen location, as illustrated in figure D2-2 (Application Reference Number: 6.4.101). The main disadvantages of the Site Campus, when compared to EZ10 Rhosgoch, are its greenfield status and its close proximity to the Tre'r Gof SSSI, an ancient woodland and an existing bat barn. The design has attempted to mitigate potential effects on these designations/receptors. The main environmental advantages are that it offers better opportunities for social cohesion due to its closer proximity to settlements, and it is located on-site within the Wylfa Newydd Development Area. An on-site location would reduce travel times (a positive for worker welfare) and thus daily traffic flows and emissions and transport costs. It would also offer a high level of flexibility in terms of its size, which other sites not owned by Horizon could not.

2.2.21 Ultimately, it was concluded that the Site Campus is the most suitable and viable option for the provision of TWA, with its on-site location a significant factor. Further discussion of the layout and design evolution of the Site Campus is provided in section 2.3.

Table D2-2 Summary of final assessment considerations

EZ10	Rhosgoch
The site is remote from the Power Station Site but access is relatively easy to the A5025 via the local road network. There would be a potential lack of opportunity for social cohesion due to its remoteness from local communities, although this would reduce the potential for adverse effects on local living conditions/culture. The site comprises brownfield land, the redevelopment of which is strongly supported by *Planning Policy Wales* [RD6]. However, there are potential issues with contamination. There are no local or national environmental designations at the site but there is a Scheduled Monument in close proximity [RD5].	

	Site Campus (Option A, Wylfa Newydd Development Area)
	The site is located within the Wylfa Newydd Development Area near the Power Station Site and benefits from direct access from the A5025. Locating the TWA on-site would reduce traffic flows and emissions, and travel times for workers, in comparison to remote sites. The site is a suitable distance from the closest settlement (protecting Welsh language and culture, and living conditions). The site is near the Tre'r Gof SSSI, ancient woodland and an existing bat barn. There could be a visual impact on the sensitive seascape and Cemaes Conservation Area [RD3] (including residential amenity in Cemaes), although it would be set in the context of the Existing Power Station and the construction of the Power Station Site.

	Site A Amlwch
	The site is located adjacent to an existing settlement boundary, where the Isle of Anglesey County Council (IACC) [RD4] would generally support development, unless other material considerations apply. There is good access to the site, although it is remote from the Power Station Site. The site is located within a registered historic landscape and Special Landscape Area in the Joint Local Development Plan [RD3]. There are three assets of historical significance located adjacent to the south-western boundary of the site. There is the potential for adverse impacts on residential amenity, which would require careful mitigation.
	Site B Amlwch
	The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. The site is located within a registered historic landscape and Special Landscape Area [RD3]. There is a Grade II Listed Building located in the north of the site [RD5]. There is the potential for adverse impacts on residential amenity, which would require careful mitigation.
	Site D Amlwch
	The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. The site is located adjacent to a registered historic landscape and near the Anglesey AONB [RD3]. There is poor access to the road network and a potential for adverse impacts on residential amenity, which would require careful mitigation. The site lies partially within an area at risk of flooding.
SP202	**Yr Ogof**
	The site lies within the AONB [RD3] and therefore development should be resisted where there is the potential to locate it elsewhere. A Grade II Listed Building overlooks the site and there are four Scheduled Monuments in the surrounding area [RD5]. There is the potential for adverse impacts on residential amenity, which would require careful mitigation.

SP304	Cae Rhos
The topography is unfavourable and blasting or pecking would be required to prepare the site for development. Access to the site would require vehicles to travel through residential streets or a narrow lane. The site is situated near the AONB on elevated land [RD3]. A Grade II Listed Building overlooks the site and there are four Scheduled Monuments in the surrounding area [RD5]. There is the potential for adverse impacts on residential amenity, which would require careful mitigation.	
SP320	**Trefengan Farm**
Access to the site from the Wylfa Newydd Development Area would be poor as vehicles would need to travel through Holyhead. The development would be visually conspicuous and would require careful mitigation to avoid unacceptable landscape and visual impacts.	
	Tyddyn Uchaf
The site lies within the AONB [RD3] and therefore development should be resisted where there is the potential to locate it elsewhere. Access would be via a narrow lane which would not be appropriate for the amount of vehicle movements associated with TWA.	
	Cae Syr Rhys
The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. There is poor access to the road network and a potential for adverse impacts on residential amenity, which would require careful mitigation. The site lies adjacent to a registered historic landscape and the AONB [RD3] and therefore views into and out of the site would need to be carefully considered.	
	Carreg Y Fran
The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. There is poor access to the road network and a potential for adverse impacts on residential amenity, which would require careful mitigation. The site lies adjacent to the AONB [RD3] and therefore views into and out of the site would need to be carefully considered.	

	Kingsland
	The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. The site is situated near Scheduled Monuments and a Grade II Listed Building [RD5]. The site lies within the AONB [RD3] and therefore development should be resisted where there is the potential to locate it elsewhere. The site benefits from existing planning permission for TWA but is considered unviable for reasons including: • the high cost of transporting workers to the Wylfa Newydd Development Area; • the consented scheme does not include the necessary requirements for the proposed workers' accommodation, including in terms of power and transport; • it is unlikely that the site could provide the required number of bed spaces using the chosen form of housing (which would be suitable for legacy use); and • a number of amendments would need to be made to the design, likely resulting in the need to apply for fresh planning consent.
SP784	**Cae Glas**
	The site is located adjacent to an existing settlement boundary, where the IACC [RD4] would generally support development, unless other material considerations apply. The site lies within the AONB [RD3] and therefore development should be resisted where there is the potential to locate it elsewhere. There is a Scheduled Monument within the site and a Listed Building within 200m [RD5]. The site benefits from existing planning permission for TWA but is considered unviable for similar reasons to site SP696/785 (Kingsland), including transportation issues and the need for significant amendments to the design which was previously consented.
SP64	**Land adjacent to Lôn Gorad Road**
	Residential properties are situated immediately adjacent to the site with the potential for adverse impacts on residential amenity. The site lies within the AONB [RD3] and therefore development should be resisted where there is the potential to locate it elsewhere. The Beddmanarch-Cymyran SSSI is situated immediately adjacent to the site, to the west. A Scheduled Monument is situated immediately adjacent to the site [RD5]. Access to the A5/A5025 is along a narrow residential street or single track lane.

SP755	Land near Ynys Wen
The site is located immediately adjacent to properties along Station Road with potential impacts on residential amenity. There are two Grade II Listed Buildings in close proximity [RD5]. The site is at a high risk of flooding.	

2.3 Design evolution

Site boundary

2.3.1 The Wylfa Newydd Development Area boundary has developed from the Wylfa NPS site but is larger (433ha compared to 236ha respectively), as it includes areas to be used during construction and marine working areas. The area allows for the construction laydown areas to be located adjacent to the east and west of the Power Station Site, thereby avoiding encroachment onto the Tre'r Gof SSSI. This is consistent with the *National Policy Statement for Nuclear Power Generation (EN-6)* [RD2], which states that although the government expects the key operational elements of the Power Station to be located within the Wylfa NPS Site, it is also recognised that additional land may be needed for other elements.

2.3.2 The Wylfa Newydd Development Area remains largely unchanged since PAC 1. However, additional land was included and the boundary refined through PAC 2, PAC 3 and the Consultation on Additional Land. These changes are illustrated on figure D2-3 (Application Reference Number: 6.4.101) and were mainly made to:

- reflect changes in land ownership;
- facilitate changes to the design, siting and construction of the Marine Off-Loading Facility (MOLF) and breakwaters (see the 'Marine facilities' section), which resulted in the requirement for additional land;
- allow connection of the Power Station to the National Grid high voltage electricity transmission network at the existing National Grid substation; and
- create two new ecological mitigation areas.

2.3.3 The Consultation on Additional Land also included proposals to create or enhance wetland sites across Anglesey as compensation for potential ecology effects at the Wylfa Newydd Development Area.

2.3.4 The Power Station Site has evolved from PAC 1 to PAC 3 to respond to the points listed above and design changes discussed in the subsequent sections of this chapter; these changes are also illustrated on figure D2-3 (Application Reference Number: 6.4.101).

Site layout

Siting process

2.3.5 A number of potential locations within the Wylfa Newydd Development Area were considered for siting the main plant, common plant, supporting facilities, buildings, structures and features, and temporary construction areas/facilities (e.g. laydown areas and the concrete batching plant). The siting process was influenced by a number of factors, including the following:

- the boundary of the Wylfa NPS Site, i.e. siting the majority of the Power Station within the Wylfa NPS site;
- regulatory requirements, including site security and safety requirements;
- technical and engineering requirements;
- cost and viability;
- other constraints and practicalities, including environmental receptors within the Wylfa Newydd Development Area, e.g. maintaining a suitable distance from the Tre'r Gof SSSI;
- topography and screening opportunities, in terms of reducing landscape and visual impacts by seeking to minimise the visibility of the development;
- planning policy; and
- feedback from consultees.

2.3.6 Further details on the siting process can be found in volume 2 of the Site Selection Report (Application Reference Number: 8.24.2).

Overarching design changes

2.3.7 The layout of the WNDA Development has evolved over time, including the fundamental changes set out below.

2.3.8 At PAC 2, the site layout showed a twin cruciform design with each power block comprising:

- a reactor building;
- turbine building;
- control building;
- service building; and
- radioactive waste building.

In order to reduce the footprint of the Power Station Site, the cruciform design was replaced by a single 'power island' comprising:

- two reactor buildings;
- two turbine buildings;
- two control buildings;
- one service building; and

- one radioactive waste building.

2.3.9 The revised design shows the single power block relocated in the north-west of the site and the ancillary buildings relocated to the south of the power island.

2.3.10 In addition, buildings and structures have been combined where practicable to realise efficiencies with the design and during the construction works. Examples include:

- the radioactive waste building, which was previously designed as two separate facilities (one for each reactor);
- the spent fuel interim storage facility and dry High Level Waste (HLW) decay storage facility being combined into one building; and
- the radioactive waste building has been moved closer to the service building to allow for the provision of common access and security arrangements for accessing these facilities.

2.3.11 The sections below provide further detail on the main alternatives considered and design evolutions with respect to individual elements of the WNDA Development.

Main plant

Overview

2.3.12 The location of the main plant was selected on the basis of the following considerations.

- It creates a compact development envelope, thereby limiting landscape and visual impacts, and positions the Units within the Wylfa NPS site.
- The area is the largest uninterrupted and unconstrained space close to the Existing Power Station – the nearest constraints are Cestyll Garden and the Anglesey AONB to the west [RD3].
- A large part of the area is the lowest lying land within the Wylfa NPS site. This is important for setting the Power Station development platform levels, which need to be optimised relative to sea level to minimise cooling water pumping costs (subject to flood level constraints arising from pluvial, fluvial or tsunami scenarios and excavation costs).
- The area is on the south side of the Existing Power Station to Cemaes and is partially screened from Cemaes by the existing topography, the Existing Power Station and its associated landscaping mounds.
- It avoids utilising land within the Tre'r Gof SSSI and Wylfa Head, thereby limiting adverse effects on sensitive ecological receptors, and the pre-existing Dame Sylvia Crowe landscaping mounds (which screen the Existing Power Station).
- It provides access to cooling water directly from the Irish Sea, for intake and discharge.

- It reduces interference with the access route to the Existing Power Station, which assists in enabling Horizon's proposals to coordinate with the planned decommissioning of the Existing Power Station.
- It maintains the potential for National Grid to continue using the existing 400kV overhead transmission lines and substation.
- The orientation optimises the grid connection and circulating water connections between the intake, condenser and outfall.

2.3.13 In terms of alternatives, Horizon considered locating the main plant to the south-east or east of the Existing Power Station. These options were ruled out because they would:

- be closer to, or encroach on, the Tre'r Gof SSSI, which could result in adverse impacts on its hydrological regime and/or ecology;
- be closer to the villages of Cemaes and Tregele, which could result in adverse noise and vibration and landscape and visual impacts for residents;
- be further away from the existing National Grid substation;
- require re-routing of the existing 400kV overhead transmission lines;
- be further away from the source of cooling water; and
- be further away from pre-existing cooling water infrastructure (associated with the Existing Power Station).

2.3.14 The above reasoning was presented at PAC 1 and no significant changes to this reasoning have been proposed at later stages of consultation. Although changes have been made to the design of the main plant (as set out below), the chosen location for it within the Wylfa Newydd Development Area has remained consistent.

Reactor buildings and main stacks

2.3.15 A number of options were considered for the height of the main stacks for the reactor buildings.

2.3.16 Increasing the stack height improves radionuclide dispersion and therefore reduces ground-level radioactivity concentrations. However, increases in stack height also lead to disadvantages in terms of industrial safety, landscape and visual impact, and financial cost. An optioneering study was therefore undertaken to inform a stack height above which the benefits of improved dispersion start to diminish [RD7].

2.3.17 A range of stack heights was considered from 50m to 100m above ground level. The results of the modelling indicated that at stack heights below 75m, entrainment of the discharge plume could lead to higher worker doses of radionuclides. At a stack height of 75m and above, it was found that very little entrainment would occur.

2.3.18 A higher stack would lead to reductions in noise at receptor locations, but it was determined that a noticeable difference between 70m and 90m above ground level would be unlikely. Likewise, it was anticipated that birds would

habituate to a new structure relatively quickly and that there would be little difference in this respect between a height of 70m and 90m.

2.3.19 The results of a weighted analysis as part of the optioneering study indicated that the stack height should be in the range of 70m to 80m above ground level. A final stack height will be selected based on the parameters identified in D1.

2.3.20 A number of site orientations were also considered but the modelling demonstrated that the specific orientation of the stack would have very little difference on dispersion [RD8].

Radioactive waste storage buildings

2.3.21 The storage facilities for spent fuel, Intermediate Level Waste (ILW) and dry HLW would be located together to the south of the main plant. The benefits of locating these facilities together include reducing the number of radioactive waste transfer routes and improving safety. Locating the facilities adjacent to the main plant also reduces transfer distances.

2.3.22 Horizon originally proposed six potential locations for the storage facilities as part of a feasibility study. The following criteria were used in the assessment:

- land availability;
- haul paths for transfer vehicles;
- conventional safety;
- nuclear safety;
- environmental impact;
- security;
- maintenance and inspection;
- impact of construction; and
- commercial/programme risk.

2.3.23 Of the six options originally proposed, two were deemed feasible, as identified in figure D2-4 (Application Reference Number: 6.4.101), which shows their indicative locations as presented at PAC 2. These options are located near the main plant, whilst also being further away from the villages of Cemaes and Tregele than alternatives considered to the east.

2.3.24 The location to the south-west of the main plant was selected primarily because the land within the Existing Power Station would not be available for use when required, as a consequence of decommissioning. This would have resulted in unacceptable commercial and programme risks to the project if the option to the north of the main plant were selected. It is acknowledged that the chosen option is closer to some sensitive receptors, including the Isle of Anglesey AONB [RD3]. This may result in landscape and visual impacts, which are considered in chapter D10 (landscape and visual) (Application Reference Number: 6.4.10) of this Environmental Statement.

2.3.25 Two options were also considered for the building configuration: the first option comprised separate buildings for each storage facility, whilst the second

option comprised a two-building configuration, with one building storing both spent fuel and dry HLW.

2.3.26 As noted in the 'site layout' section, the second option was chosen such that dry HLW would be stored in the spent fuel storage facility; this reduces the overall construction footprint required and material usage.

Common plant

2.3.27 The location of the common plant is largely defined by technical requirements, in that the components need to be appropriately located to serve the main plant. There have been few changes to the layout of the common plant since that presented at PAC 1, but some changes have occurred to the layout and design, as discussed below.

Emergency response centre

2.3.28 The emergency response centre would be located to the south of the main plant. There is an operational requirement for it to be located close to the main plant, as this facilitates a quick response in an emergency situation.

2.3.29 Alternative sites to the east of the main plant were ruled out on the basis of potential noise and vibration, and landscape and visual impacts on the local community as they were closer to Tregele. There is insufficient land to the north and the remaining land to the south is required for other facilities associated with the Power Station.

Auxiliary boiler and tanks

2.3.30 The auxiliary boiler and tanks would be located to the west of the main plant. The boiler feeds steam into the main plant and close proximity is required for efficiency and economy.

2.3.31 Alternative sites to the east of the main plant were ruled out on the basis of potential noise and visual impacts on the local community as they were closer to Tregele. There is insufficient land to the north and the land to the south is required for other facilities associated with the Power Station.

Administration building

2.3.32 The administration building would be located to the south of the main plant. The location adjacent to the main plant was selected to ensure that the building and its staff would be available to the workers at the Power Station. The location adjacent to the main plant also provides proximity to main site access, which avoids staff travelling from the south, passing through Tregele. A location elsewhere would be impractical.

2.3.33 Alternative sites to the east of the main plant were ruled out on the basis of being closer to Tregele due to potential noise and visual impacts, whilst there is insufficient land to the north. Sites on the western side of the plant would be further away from the main access road and therefore less convenient to access from the main plant.

Outage building and facilities

2.3.34 The outage building would be located to the north-east of the main plant. As part of the optimisation process, consideration was given to locating the building and facilities to the south of the main plant. This was discounted on the basis of the requirement to position other buildings to the south of the main plant, and inefficiencies (most outage workers would be within the turbine hall and this would be closer to the northern end of the main plant). In addition, the separation of operational resources from resource supporting outages may reduce the potential for accidents.

Simulator and training building

2.3.35 The simulator and training building would be utilised by operational staff on a regular basis. An operational requirement is the ability of these to staff to move efficiently between the simulator and training building and the main plant. Therefore, it was concluded that a location within the Wylfa Newydd Development Area would be necessary for operational reasons.

2.3.36 Another factor influencing the location of the buildings is that the simulators would be used to train operational staff prior to the Power Station becoming operational. The simulators would therefore need to be operational in sufficient time for the first set of operational staff to be fully trained in readiness for the commissioning activities in the final stages of construction.

2.3.37 The need for the building during construction means that there is a requirement for it to be located outside of the main construction areas, whilst providing convenient access to the A5025. These requirements dictated the options considered in locating the building.

2.3.38 At PAC 2, it was proposed to locate the building in the north-eastern corner of the Wylfa Newydd Development Area, to the north of the village of Tregele. At PAC 3, following project optimisation, the location was revised to the south of Tregele. This location allows for the building to be protected to a greater degree from the noisiest and potentially most disruptive aspects of the construction activities for the WNDA Development. The location is also further away from Tregele.

2.3.39 Other locations within the Wylfa Newydd Development Area were considered but rejected due to interference with other construction activities, difficulty of access during the Power Station construction, being too close to the existing and proposed National Grid high voltage power lines, accessibility for operational workforce travelling from the south or insufficient land being available.

Marine facilities

Marine Off-Loading Facility

2.3.40 The MOLF would be located at Porth-y-pistyll to the north-west of the main plant.

2.3.41 Horizon commissioned a strategic study in 2010 of the potential delivery options to the Wylfa Newydd Development Area for both Abnormal Indivisible

Loads and bulk material loads by road, rail and sea [RD9]. The study assessed four potential sites for a MOLF, including:

- site 1 – at Porth-y-pistyll, within the western part of the Power Station Site;
- site 2 – at Porth-y-Gwartheg, to the west of the Existing Power Station;
- site 3 – at Porth yr Ogof to the east of Wylfa Head; and
- site 4 – at Porth Wylfa, approximately 500m to the east of Porth yr Ogof.

2.3.42 These locations are shown in figure D2-5 (Application Reference Number: 6.4.101).

2.3.43 In order to determine the best location for the MOLF, the assessment considered the sites against the following criteria:

- operational availability, in terms of berth availability based on water depth and site wave exposure, including possible protection works that may need to be employed;
- MOLF layout, construction and protection requirements, dredging methods, maintenance and berth availability;
- impact on natural terrestrial and marine environments; and
- impact on heritage assets (Cestyll Garden).

2.3.44 Site 2 was discounted on the basis of its exposed nature and the considerable engineering required to make it workable and acceptable. Site 4 was discounted on the basis of its exposed nature and its narrow inlet channel making it unsuitable for delivery of Abnormal Indivisible Loads. The preferred locations for a MOLF were sites 1 and 3, both of which offered good levels of availability due to the shelter provided by natural topography.

2.3.45 The decision to locate the MOLF at site 1 (within Port-y-pistyll) rather than site 3 was ultimately made for the following reasons.

- Using site 1 avoids the need for most construction traffic to cross the Existing Power Station's access road during construction, thereby improving health and safety. It would also contain the majority of construction within the marine environment, and its associated impacts, to one area.
- Locating the MOLF at site 3 would require the construction of a 50m wide heavy haul route from the MOLF to the construction site, a distance of approximately 1km. This heavy haul route and particularly its use during construction could impinge on both the Tre'r Gof SSSI and landscaping mounds to the east of the Existing Power Station. Locating the MOLF at site 1 requires a much shorter heavy haul route.
- The construction and use of the heavy haul route to site 3, the use of the MOLF, and the planned construction activities would require the exclusion of the public from a large part of this side of the Wylfa Newydd Development Area, including the Wales Coast Path, restricting public access to Wylfa Head. The MOLF could also affect users of the Wales

Coast Path at site 3, since it would be visible from many parts of the Wales Coast Path around Cemaes Bay and out to Llanbadrig Point.

- The construction and use of the MOLF at site 3 could impact sensitive sea bird colonies on Wylfa Head (particularly choughs) and would impact on the marine life in this bay.
- Using site 1 would render land to the east of the Existing Power Station available for enhancement of the existing environmentally designated areas to provide mitigation. In general, the land to the east of the Existing Power Station is of higher ecological and environmental value than the farm land to the west.
- The breakwaters and MOLF at site 1 would be partially screened from views looking west from land to the east by the natural topography and there would only be a short section of the Wales Coast Path from which they would be visible. From seaward, the MOLF and breakwaters would be set against the backdrop of both the Power Station and the Existing Power Station, thus reducing their visual impact. It is recognised that by locating the MOLF at site 1, views from Cestyll Garden and Cafnan Mill could be affected.
- Construction activities would have a physical effect on Cestyll Garden through the removal of the kitchen garden and the plot of land where Cestyll House formerly stood. Measures to mitigate the effect of the removal of the kitchen garden during construction are detailed in chapter D11 (cultural heritage) (Application Reference Number: 6.4.11). The MOLF would be retained for potential future use during the operational lifetime of the Power Station for the transport of large items of plant and equipment that may require replacement. At site 1, maintaining this option is much simpler by virtue of the proximity of the MOLF to the Power Station.

2.3.46 Site 1 was presented as the preferred option at PAC 1 and the design location was revised for PAC 2. This was as a result of the configuration of the proposed breakwaters, which resulted in the MOLF site moving to the northern side of Porth-y-pistyll. The revised location is in close proximity and the conclusions above therefore still apply.

2.3.47 The breakwaters would have the additional benefit of offering protection for vessels berthing at the MOLF, particularly in stormy conditions.

2.3.48 As part of the design optimisation process for the MOLF, the bulk material quay was relocated to between the Roll-on Roll-off quay and the eastern breakwater and reoriented. The revised location is well connected to the proposed location of the concrete batching plant, reducing the transfer distance for bulk materials.

Cooling Water System (CWS)

2.3.49 Heat dispersal from thermal power stations can be achieved by direct cooling systems (once-through systems into surface water bodies), indirect cooling systems (air cooling systems), or a hybrid that combines both systems.

2.3.50 The suitability of both direct and indirect cooling systems was considered for the Power Station. As part of this appraisal, consideration was given to the *Overarching National Policy Statement for Energy (EN-1)* [RD1], the *National Policy Statement for Nuclear Power Generation (EN-6)* [RD2], the *Integrated Pollution Prevention and Control (IPPC): Reference Document on the application of Best Available Techniques to Industrial Cooling Systems* [RD10], and *Cooling Water Options for the New Generation of Nuclear Power Stations in the UK (SC070015/SR3)* [RD11].

2.3.51 Ultimately, it was concluded that a once-through (direct) CWS using seawater abstracted from the Irish Sea was the best option for the proposed Power Station. Air cooling, with its associated costs in terms of efficiency loss, capital and land take, was discounted as less favourable given the availability of seawater afforded by the Power Station Site's coastal location.

2.3.52 Various options for locating the cooling water intake and outfall have been considered, as illustrated by figure D2-5 (Application Reference Number: 6.4.101). Horizon carried out optimisation studies in 2011 and the options have since been subject to further technical appraisal and consultation. The options have ranged from onshore intakes and outfalls to options located at distances of up to 1.2km offshore to the east and west of Wylfa Head.

2.3.53 Impacts common to all onshore and offshore cooling water intake options include construction impacts and habitat loss from infrastructure (e.g. the pumphouse and intake tunnels), and the entrapment of fish and other marine species within the CWS during operation.

2.3.54 The degree of these impacts vary in their severity depending on the exact locations and footprint of the cooling water intake and outfall structures, the ecological receptors considered and the methods of construction. This is considered further below for the cooling water intake and outfall.

Cooling water intake

2.3.55 An ecological appraisal of the cooling water intake options presented in figure D2-5 (Application Reference Number: 6.4.101) initially screened out a number of options based on construction impacts [RD12]. These included concerns over habitat loss and disturbance associated with cut and cover techniques required for options to the east of Wylfa Head, and the length of tunnels required for options F1 and F2 which would result in longer biocide (used to treat the CWS) exposure times for entrained organisms. Onshore option E1, nearshore options C1 and F4 and offshore options A1, B1, B2, C2 and F3 were taken forward for further consideration within the appraisal.

2.3.56 Onshore option E1 within Porth-y-pistyll was selected as the preferred location for the cooling water intake. This location provides a number of advantages over offshore options, including the following.

- No or limited marine tunnels and no requirement to install and maintain intake structures; resulting in reduced seabed footprint, limited seaward construction activities, reduced construction cost and programme, and reduced health and safety risks. Due to the absence of long intake tunnels there would be a reduced requirement to biocide extensive offshore sections of the system, resulting in increased survival of entrapped fish and other marine species.
- Greater opportunity to control intake velocities to limit the entrapment of fish and other marine species.
- An onshore intake would reduce transit times before water is returned to the sea, result in limited pressure changes and reduced exposure of cooling water to biocides. The result would be the increased survival of organisms (typically zooplankton, including fish larvae, and phytoplankton) entrapped by the system.
- Mitigation measures used such as acoustic or other fish deterrent systems and strobe lighting could be effectively tested and maintained over the life of the Power Station.
- Offshore seabed intake structures and tunnels would be difficult to maintain through the life of the Power Station.
- There are quantifiable impacts of fish entrapment using extensive data collected from the onshore intake at the Existing Power Station. Fish entrapment at the Existing Power Station is extremely low.
- An offshore intake would be associated with increased health and safety risks during construction and operation and increased construction costs.

2.3.57 The main disadvantages associated with an onshore cooling water intake at Porth-y-pistyll include the following.

- The need for a breakwater structure to protect the intake from wave surges. The presence of a breakwater increases the construction footprint and may influence local sedimentary regimes and currents. The breakwater also has the potential to effect the seascape and views from Cestyll Garden and the Isle of Anglesey AONB [RD3].
- Construction activities would have a physical effect on Cestyll Garden through the removal of the kitchen garden and the plot of land where Cestyll House formerly stood.
- Increased accumulation of seaweed known to build up within Porth-y-pistyll.

2.3.58 On balance, it was determined that the advantages outweigh the disadvantages.

Cooling water outfall

2.3.59 A number of options were considered for locating the cooling water outfall, as identified in figure D2-5 (Application Reference Number: 6.4.101). Options I1 to I4 were discounted during initial screening within an ecological appraisal of

the options as they would have created a large footprint of habitat loss during construction [RD12]. In addition, thermal plume modelling demonstrated that heat discharged from the outfall could have adverse impacts on fish populations and benthic populations. The remaining options were taken forward for further consideration within the appraisal.

2.3.60 These options were narrowed down to options J1 and K1 on the basis of potential environmental impacts and engineering considerations. The advantages of an onshore outfall to the west of Wylfa Head include:

- limited pressure changes, reduced transit times and reduced exposure to biocide for entrained organisms resulting in increased survival rates through the CWS;
- reduced seabed footprint, limited offshore construction activities, reduced construction cost and programme, and less health and safety risks;
- no need for development of the seabed or shoreline to the north of Wylfa Head where more diverse benthic communities are present; and
- understanding of the existing impacts from an onshore outfall associated with the Existing Power Station, and limiting impacts to an area already affected by that outfall.

2.3.61 Option J1 was eventually discounted due to the outcomes of thermodynamic modelling, engineering practicalities and the potential for additional environmental effects (in comparison to option K1). These environmental effects primarily relate to the potential for the outfall to impact upon Regionally Important Geodiversity Sites. The construction of an outfall at either site would necessitate the removal or destruction of part of a Regionally Important Geodiversity Site; however, the selected outfall location (option K1) would affect a smaller area of a Regionally Important Geodiversity Site than the alternative.

Breakwaters

2.3.62 The location of the breakwaters is defined by the position of the cooling water intake, in that they must be positioned to provide optimum protection. Horizon has considered the construction sequence and methodology for the Marine Works and reviewed the range of potential breakwater structures. For instance, the use of caisson structures was considered; however, it was determined that rubble mound structures would allow the reuse of suitable material excavated from within the Wylfa Newydd Development Area. This would reduce the requirement for importing construction materials and reduce the potential waste material. This has advantages in terms of reduced haulage and thus traffic flow and emissions and noise and vibration impacts, as well as less waste generation potentially requiring disposal to landfill.

2.3.63 Due to the location of the western breakwater, construction plant and materials would require access from the western shore of Porth-y-pistyll, thereby necessitating the removal of the kitchen garden and the plot of land where Cestyll House formerly stood.

2.3.64 The broad location of the breakwaters has not changed significantly since PAC 1. However, there has been a reduction in length of the western breakwater in response to a wave climate study, which determined that a 400m breakwater would be sufficient (rather than 500m as originally proposed). This offered benefits in terms of lower costs and a lesser environmental impact due to a smaller construction footprint and reduced length of time for construction, thus it was taken forward.

2.3.65 The armour to be used to cap the breakwater structures was also subject to appraisal. Natural rock armour was preferred to concrete armour (formed of pre-cast concrete) for visual purposes, so as to be in keeping with the coastal area. However, concrete armour units offered advantages in terms of higher structural stability, such that this was determined to be the most appropriate solution.

Site levels

2.3.66 Minimum site levels (ground elevation) for the buildings/facilities were selected based on the height of extreme flood event levels. As part of the design optimisation process, the proposed building platform levels were reviewed in terms of operational efficiency, construction methodologies, costs and the environmental effects. Proposed platform level parameters are included in chapter D1 (Application Reference Number: 6.4.1) and presented in figure D1-9 (Application Reference Number: 6.4.101).

2.3.67 Platform levels have increased due to the design optimisation process and as part of the parameters approach. The increase in the minimum platform height reduces the overall quantity of material to be excavated during site levelling and grading and reduces the environmental effects associated with movement and management of materials such as noise and vibration and traffic flows and emissions. It has also resulted in slightly slacker gradients for the landscape mounds which are more consistent with the surrounding landscape.

Landscape design

2.3.68 Careful design of the landscape has been required in order to integrate the Power Station into the existing landscape and seascape context and mitigate potential environmental effects, such as landscape mounding to screen the Power Station from surrounding receptors, both visually and acoustically. The proposed landscape design has evolved in tandem with the design process, architectural approach, site levels, temporary infrastructure requirements, construction method evolution, and the Environmental Impact Assessment and consultation processes. Key changes to the landscape and landform design to account for changes to site layout and to respond to feedback from stakeholders and the public include:

- development of landscape mounding to protect views from Tregele, Cemaes, Cemlyn, the Wales Coast Path, the Isle of Anglesey AONB and Cestyll Garden, amongst others;

- modifications to the heights and gradients of the landscape mounds during project optimisation to improve the design and take account of comments from consultees;
- the early completion of mound A near Cemaes to reduce disruption for the local community;
- the design of the slopes of mound A facing Cemaes have been modified such that they would be more reflective of the existing conditions of the surrounding landscape;
- mounding would be seeded, then landscaped at the earliest practical opportunity in order to help mitigate on-going views of construction, stabilise newly created slopes, control surface water runoff and integrate the mounding into the surrounding landscape; and
- a more limited realignment of the Afon Cafnan tributary in the southern part of the Wylfa Newydd Development Area than was originally proposed, with no alteration to the course of the main Afon Cafnan.

2.3.69 One of the main comments from PAC 1 was a request for further detail on the phasing of the Power Station construction and how the Wylfa Newydd Development Area would change over time. Landscape design reference points were therefore developed further following PAC 1 which provide an indication of the way in which the phased construction affects landscape mounding and environmental management.

Drainage

2.3.70 The proposed development would alter existing drainage catchment characteristics through the construction of platforms to accommodate the Power Station, associated infrastructure and mounds.

2.3.71 The drainage design has evolved in tandem with changes in the landform design through PAC 1 to PAC 3 and has been developed to maintain water quantity and quality feeding in to Tre'r Gof and Cae Gwyn SSSIs as close to their existing levels as practicable. Details are provided in chapter D1.

Site access

Internal access roads

2.3.72 The current access to the Existing Power Station has to be maintained, and in order to enable vehicular access to land either side of the Existing Power Station access road, a new road crossing would be provided. The crossing would incorporate all necessary signage (in both Welsh and English) to ensure safe passage of vehicles and pedestrians and would be controlled by a system of traffic lights.

2.3.73 An alternative temporary bridge option to enable continued access to the Existing Power Station was considered during the design process. This alternative option was discounted because traffic management systems were deemed sufficient.

Replacement car park for Wylfa Head

2.3.74 The car park that serves Wylfa Head and the beaches of Porth Wylfa and Porth yr Ogof (known as Fisherman's Car Park) would be permanently closed in order to construct the WNDA Development. Horizon's proposals presented at PAC 1, PAC 2 and PAC 3 did not involve an alternative car park during construction. Consultation feedback from the IACC has indicated that it would like to see a replacement car park, but no suitable location within the Wylfa Newydd Development Area has been identified by Horizon that would serve a similar purpose. It is instead proposed that people who currently use Fisherman's Car Park would utilise other existing car parks in the area during the construction period.

2.3.75 Two options for a replacement car park during the operation of the Power Station were presented at PAC 1. These options were:

- a car park at the same or similar location to the existing Fisherman's Car Park, with access provided along a similar route to the current highway; and
- a car park on the headland close to Porth Wylfa, which would afford sea views, with access provided along the coast from Penrhyn.

2.3.76 Further consideration of these options identified that routing traffic through Cemaes and Penrhyn to access a coastal car park would not be acceptable. An alternative access route was proposed along an alignment similar to the existing road, which would then extend further north to the coastal car park.

2.3.77 Consultation feedback from the IACC and Natural Resources Wales (NRW) indicated that their preference was for a car park to be provided at a similar location to the existing Fisherman's Car Park as this would be less visually intrusive, though the accessibility benefits of the coastal car park for less mobile users was acknowledged. The preferred option taken forward is for a new car park to be provided at a similar location and capacity to the existing Fisherman's Car Park.

Wales Coast Path

2.3.78 The Wales Coast Path (a National Trail) is routed through the Wylfa Newydd Development Area and would require diversion during construction and operation of the Power Station. On safety and security grounds it is not feasible to maintain the existing route for walkers during construction or operation.

2.3.79 Initial proposals involved the diversion of this route to beyond the boundary of the Wylfa Newydd Development Area from Cemlyn Bay to Cemaes during construction, a proposal which would have restricted access to Porth Wylfa, Porth yr Ogof and Wylfa Head for recreational purposes. During the assessment process for PAC 1, this loss of access was identified as a potentially significant effect. A commitment was therefore made by Horizon that it would maintain the Wales Coast Path route from Cemaes to Wylfa Head as a linear feature along the coastline, which would be in addition to the diversion from Cemlyn Bay and Cemaes. This decision was welcomed by the IACC, NRW, Ramblers Cymru and Ynys Môn Ramblers.

2.3.80 During internal discussions and consultation with the IACC, NRW and the Open Access Forum, the potential to utilise Public Rights of Way (PRoWs) 38/036/2, 28/013/4 and 38/013/4 (shown in figure D4-2, Application Reference Number: 6.4.101), which are routed across third party land, was proposed. Horizon has maintained throughout that it is its intention to provide a diversion route that is wholly contained within land within its control as far as possible to reduce effects on neighbouring landowners. The current proposals provide a route from Cemlyn Bay Car Park linking to the existing alignment to Cemaes, which utilises a short section of minor road (approximately 240m). While it is acknowledged that this diversion takes the route away from the coast, access would not be restricted to the Wales Coast Path between Cemlyn Bay and Porth y Felin (National Trust land) or to Wylfa Head along the coastline; thus only 600m of the route that currently provides sea views would be lost.

2.3.81 Land used during construction beyond the boundary of the Power Station Site would become available during operation. The Wales Coast Path would be diverted again at this point. Two options for the Wales Coast Path alignment during operation were presented at PAC 1 and PAC 2.

2.3.82 The two short-listed options considered for the diversion of the Wales Coast Path were:

- re-route the Wales Coast Path inland close to Tregele and around the southern extent of the Power Station Site; and
- re-route the Wales Coast Path to a coastal section around the northern extent of the Existing Power Station and to the west of the Power Station Site.

2.3.83 These involved an option seaward of the Power Station and an option that would be routed inland of the Power Station. Whilst consultation feedback indicated a preference for the seaward option the design evolution of the cooling water intake and security concerns during the operation of the Power Station have resulted in the seaward option being rejected. The inland route has been identified to provide an attractive route for walkers and enhances accessibility with sections of the path leading from car parks being suitable for wheelchair users. In identifying this route, Horizon has considered NRW's Wales Coast Path criteria, which include the following:

- there should be a continuous route around the coast of Wales;
- the public should have a permanent right of access;
- the route should be physically available at all times;
- the route should be as close to the sea as practicable and desirable; and
- by taking the route over the mounded areas it retains the ability to maintain vistas of the sea, so far as is practical.

Copper Trail

2.3.84 The Copper Trail (National Cycle Network Route 566) is currently routed along Cemlyn Road, which would be permanently closed to enable construction of the Power Station. It would therefore be necessary to divert the Copper Trail to avoid Cemlyn Road. Horizon has consulted with the IACC's cycling officer

and Sustrans regarding the need for a diversion, and the use of Nanner Road between Cemlyn Bay and the A5025 is considered to be the most appropriate diversion route. The existing Copper Trail is routed via Tregele before heading south-east to Llanfechell and the diversion would necessarily link up with this existing route at some point.

2.3.85 The two short-listed options considered for the diversion of the Copper Trail were:

- a route along Nanner Road, then north along the A5025 for a distance of 2.2km to Tregele to join its existing alignment; and
- a route along Nanner Road, then north along the A5025 for a distance of approximately 550m before taking a minor road to the east to link to Llanfechell (avoiding Tregele).

2.3.86 No preference was given by Sustrans or the IACC, though concerns regarding the routing of the cycle path along the A5025 were raised. Both of these options were presented to the public during public information events that took place in July 2015, which were primarily held to obtain feedback on the A5025 Highway Improvements in the communities most affected by that element of the Wylfa Newydd Project. Feedback obtained during these events did not reach a clear preference for either route. On this basis, Horizon took the decision to pursue the option that involves the shortest section of A5025. Having considered the feedback regarding the change between cycling on minor roads and on the A5025, a segregated cycle path is proposed along this section of main road; this would be delivered as part of the A5025 On-line Highway Improvements.

Public Rights of Way

2.3.87 There are a further 32 PRoWs within the Wylfa Newydd Development Area, all of which would be permanently closed to enable the construction of the Power Station (figure D4-3, Application Reference Number: 6.4.101). These closures would be necessary on safety and security grounds. Consultation feedback indicates a general acceptance that these closures would be necessary but that new routes should be provided once construction is complete.

2.3.88 Once construction is complete new PRoWs routes would be created on land within the Wylfa Newydd Development Area but beyond the Power Station Site. These PRoWs would link to the Wales Coast Path. The overall length of these new routes would be similar to the length of the PRoWs closed to enable construction. The routes proposed have been informed by consultation with the IACC and NRW and follow the broad principle of enabling improved access for less mobile users, access to beaches and the maintenance of sea views where possible. Whilst there have been slight modifications to the routing of these PRoWs as a result of changes to the landscape mounding and planting proposals, the general principles have remained unchanged.

Construction

Laydown areas

2.3.89 A number of laydown areas would be required to facilitate construction. The main driver in selecting the laydown area locations has been the need to locate them near the components they would be intended to serve during construction for efficiency. However, environmental constraints were also taken into account, for instance when deciding upon the location of the laydown areas serving the Site Campus and cooling water outfall, potential impacts on the Tre'r Gof SSSI and Cemaes were considered.

Construction car parking

2.3.90 Temporary car parking is proposed in various locations to service the construction areas and Site Campus. The decision to accommodate up to 4,000 workers at the Site Campus (see the 'Site Campus' section) led to the number of car parking spaces at the Wylfa Newydd Development Area being increased from 1,000 to 1,900 parking spaces; 1,000 spaces had been proposed at PAC 2.

Concrete batching plant

2.3.91 The concrete batching plant would be located within the Power Station Site, close to the proposed MOLF.

2.3.92 During optimisation an alternative location to the south of the main plant was considered. However, this was discounted in favour of shorter delivery of bulk materials that would be facilitated by locating the plant near the MOLF. The location is also further away from residential properties and the Anglesey AONB [RD3].

Soil stripping and storage

2.3.93 Topsoil and subsoil would be stripped from a number of locations within the Wylfa Newydd Development Area and mostly stored on-site; refer to chapter D1 (Application Reference Number: 6.4.1) for further details.

2.3.94 It was originally proposed that the majority of topsoil would be stripped during Site Preparation and Clearance works, with the remaining topsoil and subsoil stripped during Main Construction. However, during project optimisation, it was decided that topsoil and subsoil would not be stripped until Main Construction, as this would be advantageous in the following respects.

- Stripping topsoil during Site Preparation and Clearance works would have left subsoil exposed for a long period of time, adversely affecting soil quality and potentially causing other environmental issues such as sedimentation of watercourses.
- The duration of temporary soil storage would be reduced, thereby reducing potential effects on soil quality and visual amenity.
- The temporary soil storage mounds to be placed during Site Preparation and Clearance works, as proposed at PAC 2, would have been located

within the footprints of the landscape mounds. Therefore, they would have restricted earthworks operations and would have needed to be relocated during Main Construction, causing double-handling of the soil.

- Topsoil stripping during Site Preparation and Clearance works would have required the formation of a temporary drainage solution within the footprints of the landscape mounds.

2.3.95 The alternatives considered for soil storage (e.g. storing soil mostly off-site or far from residential properties) were deemed inappropriate due to the additional plant movements required. Additionally, the use of on-site soil storage mounds would provide some screening.

Drainage

2.3.96 Drainage designs for Main Construction have evolved in response to changes in the proposed construction phasing and temporary soil and materials storage solutions during construction. The main design evolution with regards to drainage relates to the removal of topsoil stripping from the Site Preparation and Clearance works. As noted above, topsoil stripping during this phase would have necessitated a temporary drainage solution. This would have entailed the reduction of likely high suspended solid concentrations within surface water run-off from the topsoil storage mounds using dosing systems and associated treatment ponds. The proposed locations for the treatment ponds were incompatible with the proposed phasing for Main Construction, such that they would have required modification and/or movement.

2.3.97 Following the removal of topsoil stripping from the scope of Site Preparation and Clearance, drainage designs were refined for Main Construction into the current proposals described in chapter D1 (Application Reference Number: 6.4.1).

Marine dredging

Excavation methods

2.3.98 Two excavation methods were considered in relation to construction and maintenance dredging works within Porth-y-pistyll:

- a ‘semi-dry’ option: where excavation of the inner harbour is undertaken in the dry (utilising a cofferdam) and excavation of the outer harbour is predominately carried out in the wet (using marine vessels); and
- a ‘full wet’ option: where excavation of the entire harbour is predominately carried out in the wet.

2.3.99 The main difference between the two options is that with the semi-dry option, the inner harbour would be fractured by drilling/blasting and then excavated, with peckering followed by ripping and dredging predominantly used for the outer harbour, whereas the fully wet option would use drill and blasting for the entire harbour. In addition, a temporary cofferdam would be required and surface water discharge points would need to be diverted west of the western breakwater for the semi-dry option.

2.3.100 An environmental review was undertaken of these two options, which identified a number of potential effects on marine mammals and seabirds (terns) in particular, related primarily to underwater and airborne noise disturbance respectively [RD13]. The preferred marine construction method was eventually identified as the semi dry option because it offers the following key benefits:

- the environmental effects on marine mammals and terns were considered to be more acceptable with the semi dry option;
- there is considered to be greater certainty associated with the assessment of effects to terns and the effectiveness of mitigation measures than for marine mammals, thus the semi dry option is preferred for its lesser impact on marine mammals;
- although there are risks to the programme associated with proposed mitigation measures for both options, the risks are greater for the full wet option (in relation to marine mammals) than the semi dry option (in relation to terns);
- shorter programme delivery period for the critical activities;
- reduced excavation risk;
- reduced underwater excavation; and
- reduced risk due to ground conditions.

Reuse and disposal of dredged material

2.3.101 Options for disposal of dredged material have been considered, including: reuse within the Wylfa Newydd Development Area (e.g. for landscape mounding or as backfill material), recycling of dredged material, disposal at sea, and transport of material to a suitable land-based disposal location [RD14]. It is anticipated that marine-excavated rock material would be reused within the marine construction works as far as possible, using it as fill within the core of the breakwaters and temporary causeway. Options may also be available for reusing the rock material in other parts of the Wylfa Newydd Development Area, as part of the wider Project, or at third-party sites. However, the reuse of this material cannot be determined accurately at this stage.

2.3.102 Not all dredged material would be suitable for reuse or recycling, and NRW has also stated that dredged silts should remain in the marine environment so as to not result in a loss to the sediment budget. As such, disposal offshore at a licenced disposal facility would be required for material that is unsuitable for reuse (such as silts) or is surplus to requirements.

2.3.103 A review was undertaken of four offshore disposal options for marine dredged material, covering three existing sites and the option to designate a new disposal site [RD15]. A number of parameters were assessed including location, capacity, historic use and physical/chemical characteristics. It was determined that none of the existing sites have previously received the volume of material that could be produced from the project and it is unclear whether

any of them have previously received rock material. The most appropriate option was identified as the existing Holyhead North for the following reasons:

- it is the only existing site assessed which is currently open;
- it is the largest of the existing disposal sites and thus disposal there would result in the smallest increase in seabed level;
- the seabed substrate is similar to the composition of the material to be disposed; and
- the designation of a new site would likely result in a greater environmental impact on the seabed compared to existing sites and would be costlier and more time-consuming.

Site Campus

Location within the Wylfa Newydd Development Area

2.3.104 Horizon's decision to locate the Site Campus within the Wylfa Newydd Development Area is discussed in section 2.2. This section summarises the main alternatives considered for the Site Campus once the decision had been made to locate the TWA on-site.

2.3.105 Sites were identified within the Wylfa Newydd Development Area, taking into consideration the following factors:

- Able to provide sufficient area for up to 4,000 bed spaces, whilst not interfering with long-term construction activities;
- Sufficiently distant from the main construction areas to ensure that noise, dust and other factors associated with a major construction site do not interfere significantly with the amenity of the occupants;
- Accessible from the site access road; relationship to designated sites and sensitive environmental assets (sites not encroaching on the sites and those further away generally preferred); and
- Proximity to Tregele and Cemaes, with sites further away preferred.

2.3.106 Horizon identified two prospective sites known as 'Option A' and 'Option B', as described in Volume 2 (Wylfa Newydd Development Area) of the Site Selection Report (Application Reference Number: 8.24.2).

2.3.107 The assessment of each site is summarised below:

Option A

- The site is located adjacent to the Tre'r Gof SSSI;
- There is a burial ground within the site;
- The proximity of the area to the Wales Coast Path may increase impact on users and recreation; and
- There may be an increased disturbance to sea birds and the bat barn.

Option B

- The site is located adjacent to the Tre'r Gof SSSI;
- The site is much closer to residential properties than Option A;
- The site is located in closer proximity to the main part of the construction site than Option A; therefore there is an increased risk from dust and noise; and
- Land associated with Option B is required for landscape mounding.

2.3.108 The proposed location for the Site Campus is Option A, to the south of Wylfa Head and to the east of the Existing Power Station. The location is shown in figure D2-2 (Application Reference Number: 6.4.101).

2.3.109 Option A was selected on the basis that it is:

- the only site within the Wylfa Newydd Development Area able to provide sufficient area, whilst not interfering with other design proposals such as the landscape mounds;
- sufficiently distant from the main construction activities to ensure that noise, dust and other factors associated with a major construction site do not significantly affect the amenity of the occupants; and
- located away from neighbouring communities and in a location which would be partially screened by the landscaping proposals to the south and the east.

2.3.110 Discussions were held regarding the various constraints at the selected location for the Site Campus, including its proximity to Wylfa Head, the Dame Sylvia Crowe landscaping mounds and the Tre'r Gof SSSI. These discussions helped inform the delineation of the site boundary identified in figure D2-2 (Application Reference Number: 6.4.101).

Design evolution

2.3.111 The initial concept for the Site Campus comprised central amenity buildings and 20 accommodation blocks, with rectangular and L-shaped accommodation that limited the height of the buildings. This layout met the functional requirements of the site but extensive re-profiling of the site would have been required to provide flat platforms for the accommodation blocks.

2.3.112 As the site is intended to be returned to its current land use following its use for the Site Campus, an alternative layout was investigated which limited the need for changes to the topography and kept earthworks within the site boundary.

2.3.113 The concept was then further refined to develop a community arrangement for the Site Campus and improve access. A phasing strategy was also developed which allows the site to be developed in stages; increasing capacity as required during construction.

2.3.114 The proposed design:

- maintains environmental buffers to the Tre'r Gof SSSI;

- reduces the extent of site re-profiling and keeps the re-profiling within the site boundary, maintaining the existing topography for the legacy site;
- reduces the visual impact of the development by limiting building heights to below the existing skyline as defined by the Dame Sylvia Crowe landscaping mounds;
- reduces the visual impact of the development by adopting a colour palette that reflects the surrounding landscape, which was chosen following studies of a range of colour options;
- retains access to Wylfa Head, reducing impacts on recreational users, although visual impacts would still result due to the proximity of the site to the Wales Coast Path and the sensitive seascape;
- retains existing rock outcrops which are prominent in the local landscape;
- allows an existing bat barn to the southwest to be retained in its current position;
- maintains current catchment areas and water flows into the Tre'r Gof SSSI by way of the drainage design; and
- incorporates the ancient woodland and existing trees into the recreational area of the site.

2.4 References

Table D2-3 Schedule of references

ID	Reference
RD1	Department of Energy and Climate Change. 2011. *Overarching National Policy Statement for Energy (EN-1)*. London: The Stationery Office.
RD2	Department of Energy and Climate Change. 2011. *National Policy Statement for Nuclear Power Generation (EN-6)*. London: The Stationery Office.
RD3	Isle of Anglesey County Council and Gwynedd Council. 2017. *Anglesey and Gwynedd Joint Local Development Plan (2011–2026) – Written Statement*. [Online]. [Accessed: September 2017]. Available from: http://www.anglesey.gov.uk/planning-and-waste/planning-policy/joint-local-development-plan-anglesey-and-gwynedd/
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RD7	Horizon. 2015. *Wylfa Newydd Reactor Stack Height*. [DCRM WD03.03.01-S5-PDC-REP-00002]
RD8	Horizon. 2015. *Determination of UK ABWR Stack Height: Dispersion modelling results and analysis*. [DCRM 203475-0000DB40-RPT-0001].
RD9	Halcrow. 2010. *Nuclear Power Project - Site Development. Heavy Route and MOLF Strategy Study*. [Document Reference: MPC 1059].
RD10	European Commission. 2001. *Integrated Pollution Prevention and Control (IPPC): Reference Document on the application of Best Available Techniques to Industrial Cooling Systems*. [Online]. [Accessed: July 2017]. Available from: http://eippcb.jrc.ec.europa.eu/reference/BREF/cvs_bref_1201.pdf.
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RD12	Jacobs. 2012. *Ecological Options Appraisal for the Location of the Cooling Water Intake and Outfall and Marine Offloading Facility*. [DCRM WYL-JAC-PAC-REP-00005].
RD13	Jacobs. 2016. *An Environmental Review of the Marine Construction Works*. [DCRM WN034-JAC-PAC-REP-00118].
RD14	Horizon. 2017. *Waste Hierarchy Assessment.* [DCRM WN0907-JAC-PAC-REP-00003].
RD15	Atkins. 2016. *Wylfa Newydd Disposal of Dredged Material Options Appraisal*. Document reference: 5150086.301.001.