
Wylfa Newydd Project
Radioactive Substances Regulation –
Environmental Permit Application: Appendices

Appendix R
Habitats Regulations Assessment: Stage 1 Screening

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1 Introduction

1.1 Purpose of this document

- 1.1.1 This document accompanies Horizon Nuclear Power Wylfa Limited's (Horizon's) application to Natural Resources Wales (NRW) for an Environmental Permit under Schedule 23 of the Environmental Permitting (England and Wales) Regulations 2016 (EPR16) (known as the Radioactive Substances Regulation (RSR)) for the disposal of radioactive waste from the operation of the Wylfa Newydd Power Station. This is a new nuclear Power Station to be built on land to the west of Cemaes on the north coast of Anglesey (hereafter referred to as the Power Station).
- 1.1.2 The Power Station is designed and will be operated in a way that ensures that the volume and activity of radioactive waste is minimised in accordance with the current UK strategy for radioactive discharges (Department of Energy and Climate Change, 2009). In the context of radioactive waste, disposals include discharges into the atmosphere, discharges into the sea, rivers, drains or groundwater, disposals to land, and disposals by transfer to another site.
- 1.1.3 This document represents Horizon's 'Shadow' Habitats Regulations Assessment (HRA) to accompany the Environmental Permit Application for Radioactive Substances Activity. HRA is a process to identify and assess the potential effects of a project or plan on designated sites protected under international, European and UK law. This document should be read alongside Horizon's RSR Environmental Permit application.
- 1.1.4 This document represents one of the deliverables of the Shadow HRA process being undertaken by Horizon in support of all projects associated with the overarching Wylfa Newydd Project. The wider HRA for the Project will accompany the Development Consent Order (DCO), Marine Licence application and other Environmental Permit applications, namely:
- a Construction Water Discharge Environmental Permit;
 - an Operational Water Discharge Environmental Permit; and,
 - an Operational Combustion Installations Environmental Permit.
- 1.1.5 This Shadow HRA is informed by assessments that have been undertaken by Horizon and the Environment Agency on the United Kingdom Advanced Boiling Water Reactor (UK ABWR) technology. Horizon's assessment of the impact on non-human biota of radioactive discharges from the Power Station is presented in Section 7 of the Environmental Permit application, and the conclusions of this assessment that are relevant to the shadow HRA are presented and summarised in **Section 2.2** of this document.

1.2 Methodology

The HRA Process

- 1.2.1 European Union (EU) obligations in respect of habitats and species are met through Council Directive 92/43/EEC (the Habitats Directive) on the conservation of natural habitats and of wild fauna and flora, which requires Member States to schedule important wildlife sites through the European Community as Special Areas of Conservation (SACs) and to give protection to habitats and species listed in the Directive as being threatened or of Community Interest.
- 1.2.2 The EU meets its obligations for birds through Directive 2009/147/EC (Birds Directive) on the conservation of wild birds. This provides a framework for the conservation and management of wild birds in Europe. Of particular relevance is the requirement to identify and designate Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance. Together with SACs, SPAs form a network of protected areas known as *Natura 2000* sites or ‘European sites’.
- 1.2.3 As a matter of policy, the Welsh Government also applies the HRA process to designated Ramsar sites. These are sites which are regarded as being wetlands of international importance as defined following the Convention on Wetlands (Ramsar, Iran, 1971), which is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their internationally important wetland habitats. In addition, the HRA process applies to potential SPAs (pSPA), possible SACs (pSAC) and candidate SACs (cSAC).
- 1.2.4 The Habitats Directive is transposed into Welsh legislation by the Conservation of Habitats and Species Regulations 2010 (as amended) and the Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007 (as amended); hereafter referred to as the ‘Habitats Regulations’. The Habitats Regulations incorporate all SPAs into the definition of European sites and, consequently, the protections afforded to European sites under the Habitats Directive apply to SPAs designated under the Birds Directive.
- 1.2.5 The HRA process helps meet the requirements of Article 6(3) of the Habitats Directive (replicated in Regulation 61(1)) which states that any plan or project, that is not directly connected with or necessary to the management of a European site, but would be likely to have a significant effect on such a site, either on its own or in-combination with other plans or projects, will be subject to an ‘appropriate assessment’ of its implications for the European site in view of its conservation objectives. In light of the conclusions of that assessment and subject to the provisions of Article 6(4) of the Habitats Directive, the ‘competent authority’ (in this case NRW) will agree to the plan or project only having ascertained (beyond reasonable scientific doubt) that it will not adversely affect the integrity of the site(s) concerned.
- 1.2.6 Article 6(4) provides that if, in spite of a negative assessment of the implications for the site, and in the absence of alternative solutions, the plan or project must nevertheless be undertaken for imperative reasons of

overriding public interest (IROPI), the Member State will take all compensatory measures necessary to ensure that the overall Natura 2000 sites are protected.

- 1.2.7 Horizon is required to provide an HRA Report (a shadow HRA) to NRW in support of NRW's own HRA process. Under Regulation 61(2) of The Conservation of Habitats and Species regulations 2010, the applicant must provide such information as the competent authority may reasonably require for the purposes of the assessment or to enable them to determine whether an appropriate assessment is required.
- 1.2.8 There is no explicit definition of likely significant effect (LSE) in the legislation and, in the context of HRA, it is typically taken as any effect that reasonably may be predicted as a consequence of the project that may undermine the European site's conservation objectives (Welsh Assembly Government, 2009). That is, the term "likely" infers the presence of a risk that a significant effect could occur. By definition, this assessment is based on the consideration of a number of factors, for example, the spatial extent and duration of an identified effect, and other considerations such as the availability of appropriate mitigation.
- 1.2.9 In general, according to The Planning Inspectorate (2016), if a large amount of evidence and data gathering is necessary to determine LSE, it is assumed that a LSE could arise and 'appropriate assessment' is required.
- 1.2.10 The conservation status of a natural habitat, as defined in the Habitats Directive, means the "*sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2*". The conservation objectives for a SAC or SPA are considered when identifying LSE. The conservation status of a natural habitat is taken as 'favourable' when:
- its natural range and area it covers within that range are stable or increasing;
 - the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
 - the conservation status of its typical species is favourable.
- 1.2.11 The HRA process typically follows a four staged approach (also see **Figure 1-1**):
- i) **Screening:** The process of identifying potentially relevant European and Ramsar sites, and whether the likely impacts of a project upon the qualifying features of the site, either alone or in-combination with other plans and projects, are likely to be significant. If it is concluded at this stage that there is no potential for LSE, there is no requirement to carry out subsequent stages of the HRA.
 - ii) **Appropriate Assessment:** The consideration of the potential impacts on the integrity of the site(s), either alone or in-combination with other plans and projects, with regard to the site's structure and function and its

conservation objectives. Where there are adverse impacts, an assessment of mitigation options is carried out to determine adverse effect on the integrity of the site. If these mitigation options cannot avoid adverse effects then development consent can only be given if the tests set out in stages 3 and 4 can be passed.

- iii) **Assessment of Alternative Solutions:** Examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on the site(s).
- iv) **Imperative reasons of over-riding public interest:** Where no alternative solution exists and where an adverse effect on site integrity remains, the next stage of the process is to assess whether the development is necessary for IROPI and, if so, the identification of compensatory measures needed to maintain site integrity or the overall coherence of the designated site network.

1.2.12 All four stages of the process are referred to cumulatively as the Habitats Regulations Assessment, to clearly distinguish the whole process from the step within it referred to as the 'Appropriate Assessment'.

1.2.13 In respect of Stage 2, the integrity of a site is defined as the coherence of the site's ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or populations of species for which it was classified or listed (Welsh Assembly Government, 2009). An adverse effect on integrity, therefore, is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of designation.

1.2.14 In addition to the stages described above, it has become common practice to undertake a site selection (scoping) exercise in order to identify the European and international sites to be taken forward into the Screening stage.

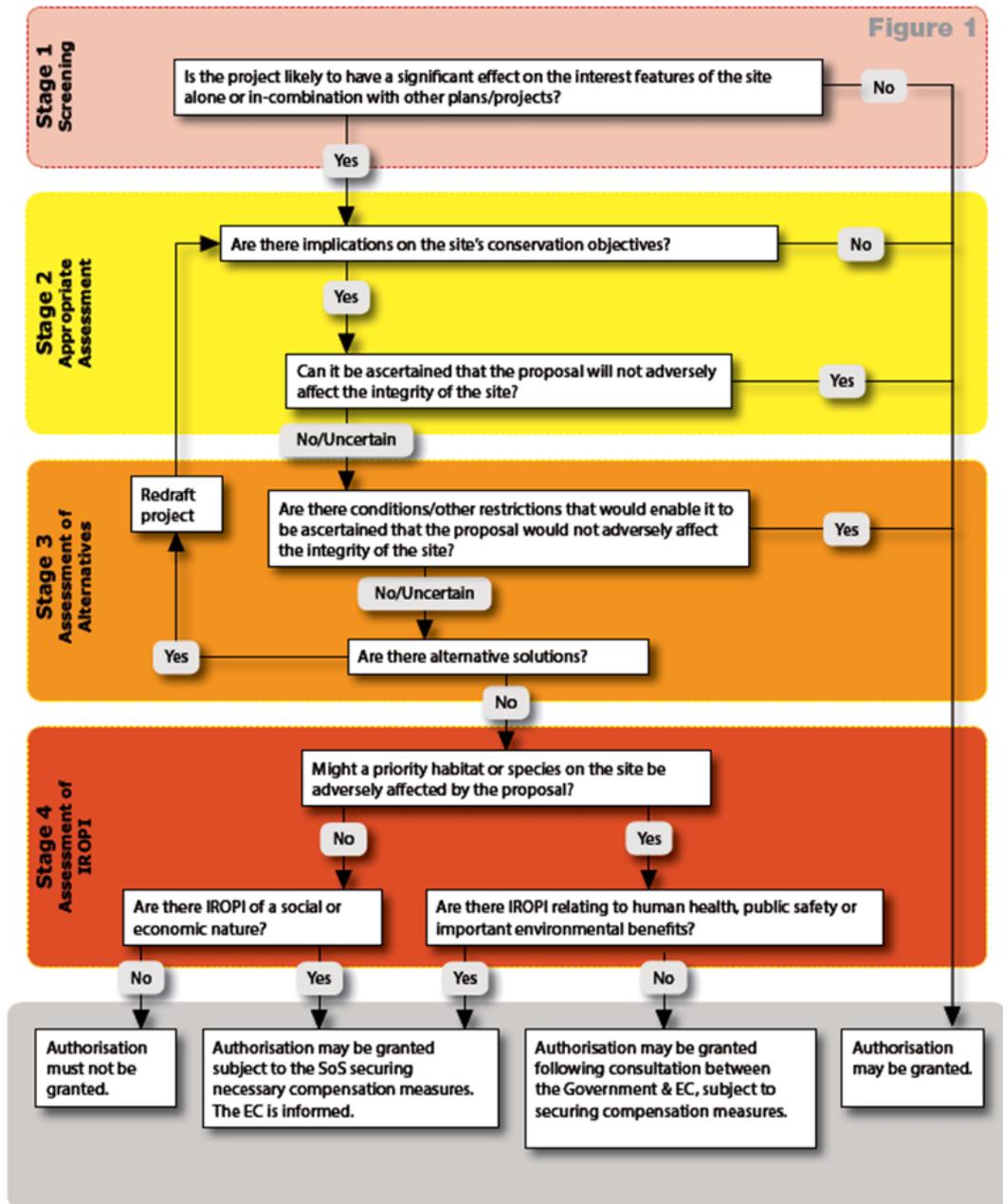


Figure 1-1 Depiction of the HRA process (The Planning Inspectorate, 2016)

2 Potential for likely significant effect

2.1 Assessment undertaken in support of the RSR Environmental Permit application

Introduction

- 2.1.1 The results of Horizon’s assessment of the impact on non-human biota of radioactive discharges from the Power Station are presented in Section 7 of supporting information to the RSR Environmental Permit application. The assessment determines the effect that routine planned radioactive discharges may have on the surrounding non-human biota. This includes further contributions to environmental radioactivity from continuing discharges from the existing Wylfa Magnox Power Station (which has now ceased electricity generation).
- 2.1.2 In summary, Section 7 presents the information as required by NRW’s guidance (Natural Resources Wales, 2015).

Methodology

- 2.1.3 The assessment of radiological impacts on non-human biota (reported in Section 7 of the supporting information to the RSR Environmental Permit application) was based on the ERICA Integrated Approach, which comprises the ERICA tool and the associated FREDERICA database ^[1]. The ERICA approach does not facilitate the assessment of radiological impacts arising from releases of noble gases; it is therefore supplemented by the Environment Agency’s R&D128 methodology (Environment Agency, 2015) which facilitates such assessment. Further detail on the ERICA Integrated Approach is provided in Section 7.2.2 of the supporting information to the RSR Environmental Permit application. The Initial Radiological Assessment Tool (IRAT) was used to calculate dose rates from discharges arising from the existing Magnox power station.
- 2.1.4 ERICA calculates expected dose rates to organisms by applying dose conversion coefficients to concentrations of radionuclides in environmental media or biota.
- 2.1.5 Environmental activity concentrations were predicted by dispersion models and used as inputs to the ERICA assessments. In assessing the radiological effects of discharges and on-site disposals to non-human biota, the worst case dose rates were calculated by assuming the presence of the reference organisms for the relevant ecosystem at the location of the maximum environmental concentration due to the discharge (i.e. close to the RSR Environmental Permit site boundary for the terrestrial ecosystem and the point of discharge to the marine environment for aquatic ecosystems). This approach to the prediction of dose rates on the reference organisms is precautionary.

¹ The ERICA Tool is available at <https://wiki.ceh.ac.uk/display/rpemain/ERICA+Tool>. The latest version (v1.2.1, February 2016 release) was used for this assessment.

- 2.1.6 If it is assumed that the predicted dose rates are relevant regardless of distance of the reference organism from the discharge, the theoretical worst case potential effect for any European Designated Site can be assessed. In reality, radiological impacts will be reduced for European Designated Sites that are further away from the conservatively assessed locations.

2.2 Approach to European Designated Site scoping

Geographical scope of the Stage 1 Screening exercise

- 2.2.1 For this Stage 1 assessment, the scoping phase has focused on whether any effects on non-human biota are likely due to radioactive discharges associated with the Wylfa Newydd Power Station, alone or in-combination with other sources of radioactive discharge.
- 2.2.2 If it is concluded that there is no potential for LSE on this basis, there will be no requirement to progress to the subsequent stages of the HRA process. This approach reflects that adopted for the assessment of UK EPR (Environment Agency, 2011a) and AP1000 nuclear power plant design (Environment Agency, 2011b).
- 2.2.3 Given the conservative approach adopted for the assessment described in **Section 2.1** with regard to potential effects on European Designated Sites, it is not necessary (for the assessment of radiological discharge from the Wylfa Newydd Project in isolation) to specify a maximum zone of influence over which the radiological effect of discharges may be detected and, therefore, which European Designated Sites are relevant to the Stage 1 Screening assessment.
- 2.2.4 However, because HRA requires assessment of the in-combination effects of the predicted discharges from the Wylfa Newydd Project with all other sources of radiological discharges (which are assessed and reported at a European Designated Site level), depending on the results of the ERICA modelling, it may be necessary to consider a wider geographical scope for this Shadow HRA for the purposes of the in-combination aspect of Stage 1 Screening. This is discussed in **Section 2.3**.

Relationship between ERICA habitats and species and qualifying features of local European Designated Sites

- 2.2.5 ERICA and R&D128 deal with a range of generic reference habitats and species. In order to put this into the context of European Designated Sites, **Table 2-1** identifies which habitat types and species (of European Designated Sites in the vicinity of the Power Station with marine, terrestrial and freshwater qualifying features) are analogous to the generic reference habitats and species used in the ERICA assessments. **Table 2.1** is not intended to list all the European Designated Sites that potentially may be affected by radioactive discharges; the intention of **Table 2.1** is to capture the range of environments (marine, terrestrial and freshwater) for which the ERICA modelling has been undertaken.
- 2.2.6 The most exposed species and habitats in each of the marine, terrestrial and freshwater categories were identified and considered in the assessment.

This is a further illustration of the conservative approach adopted for this assessment.

Table 2-1 Local European Designated Sites with marine, terrestrial and freshwater qualifying features and proxy habitats and species used in the ERICA modelling

European site	Designation	Distance from WND boundary	Qualifying features	Proxy habitat and species within the ERICA modelling	Environment to which the proxy habitat and species are assigned in the ERICA modelling
Gogledd Môn Forol / North Anglesey Marine	cSAC	Within	Harbour porpoise (<i>Phocoena phocoena</i>)	Mammal	Marine
Morwenoliaid Ynys Môn / Anglesey Terns	SPA	Within	Arctic tern (<i>Sterna paradisaea</i>)	Bird	Marine and terrestrial
			Sandwich tern (<i>Sterna sandvicensis</i>)		
			Roseate tern (<i>Sterna dougallii</i>)		
			Common tern (<i>Sterna hirundo</i>)		
Bae Cemlyn / Cemlyn Bay	SAC	0.1	Coastal lagoon (this is a priority habitat feature)	Various species characteristic of marine habitat	Marine
			Perennial vegetation of stony banks	Vascular plant Shrub / grasses and herbs	Marine and terrestrial
Glannau Ynys Gybi/Holy Island Coast	SAC	13.1	Vegetated sea cliffs of the Atlantic and Baltic coasts	Shrub/ grasses and herbs	Terrestrial
			European dry heaths		
			Northern Atlantic wet heaths with <i>Erica tetralix</i>		
Corsydd Môn/Anglesey	SAC	14	Northern Atlantic wet heaths with	Shrub / grasses and	Terrestrial

European site	Designation	Distance from WND boundary	Qualifying features	Proxy habitat and species within the ERICA modelling	Environment to which the proxy habitat and species are assigned in the ERICA modelling	
Fens			Erica tetralix	herbs / tree		
			<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils			
			Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>			
			Alkaline fens			
			Hard oligo-mesotrophic waters with benthic vegetation			
			Southern damselfly (<i>Coenagrion mercuriale</i>)	Arthropod - detritivorous / flying insect / insect larvae		Terrestrial and freshwater
			Marsh fritillary butterfly (Eurodryas, Hypodryas)	Arthropod - detritivorous / flying insects		Terrestrial
			Geyer's whorl snail (<i>Vertigo geyeri</i>)	Gastropod		
Llyn Dinam	SAC	14.3	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	Various species characteristic of freshwater habitat	Freshwater	

Relevant guidance and thresholds

2.2.7 There are two guideline thresholds that are relevant to the assessment of the potential effect of the discharge of radioactive substances on ecological receptors, both of which have been used by the Environment Agency when assessing the potential radiological impact of other reactor technology on habitats and species, including European sites (e.g. UK EPR technology;

Environment Agency, 2011a). These thresholds are discussed below and have been applied in this shadow HRA.

- 2.2.8 The assessment undertaken by the Environment Agency for the UK EPR technology (Environment Agency, 2011a) adopted the default screening value in the ERICA Integrated Approach of $10\mu\text{Gy/h}$ ^[2] as a proposed generic screening value that below which 95% of all species should be protected from ionising radiation (Anderson, 2009 in Environment Agency, 2011a).
- 2.2.9 Environment Agency (2011a) states that the $10\mu\text{Gy/h}$ criterion is a screening value which should be used to screen out sites (meaning Power Stations or other sources of radioactive discharge) of low concern, with no further requirement for assessment (noting that this value is not intended for use as a dose rate limit).
- 2.2.10 With regard to protection of European Designated Sites, the Environment Agency and Natural England have agreed a dose rate threshold of $40\mu\text{Gy/h}$ relating to the potential for adverse effects to arise (at European Designated site level) (Environment Agency, 2009; Environment Agency, 2010). Guidance produced by NRW (2015) states that the applicant for an Environmental Permit should:
- “compare the assessed dose-rates with our guideline value of 40 microGy/hour (the level below which we consider there will be no adverse effect on non-human species)”.*
- 2.2.11 It should be noted that the supporting assessment information for the Environmental Permit presents the results of the application of the ERICA assessment in the context of a value of $40\mu\text{Gy/h}$ (i.e. the level below which it has been agreed that there will be no adverse effect on a European Designated Site). In this shadow HRA, the results of the ERICA assessment have first been compared against the lower threshold of $10\mu\text{Gy/h}$; the results are then compared against the $40\mu\text{Gy/h}$ threshold defined for the protection of European Designated Sites, taking into account other sources of radioactive discharge (**Section 2.3**).

Results

- 2.2.12 The results of the assessment undertaken in support of the RSR Environmental Permit application (for non-human biota) are reported in full in Section 7.2 of the supporting information to the Environmental Permit.
- 2.2.13 The results of the assessment for reference organisms within the terrestrial, freshwater and marine habitats considered are presented in **Appendix A**. The results demonstrate that the total dose rate predicted is below the screening threshold of $10\mu\text{Gy/h}$ for all habitats and species. Given the conservative approach adopted for the assessment, the results confirm that no further assessment is required of any European Designated Sites (regardless of location / distance from the Power Station or their qualifying features).

² The Gray (1 Gray = 1 J/kg) is the concentration of physical energy absorbed locally from radiation exposure. A microGray (μGy) is a millionth of a Gray.

2.3 Assessment of in-combination effects

In-combination effect between existing Magnox Power Station and proposed new Power Station

- 2.3.1 The supporting information to the RSR Environmental Permit application includes an assessment of the combined impact on non-human biota due to discharges from the existing Magnox Power Station and the proposed new Power Station (discharges are assessed at current consented limits for the Magnox station and at proposed limits for the proposed new Power Station).
- 2.3.2 The highest estimated dose rates to the non-human biota due to discharges at the current annual limits for the existing Power Station are:
- Terrestrial receptors = 1.2 $\mu\text{Gy/h}$.
 - Marine receptors = 0.59 $\mu\text{Gy/h}$.
 - Freshwater receptors = 0.15 $\mu\text{Gy/h}$.
- 2.3.3 The organisms most exposed to the effect of the proposed Power Station from each group (terrestrial, marine and freshwater) were identified from the assessment results reported in **Appendix A**. These organisms are identified as terrestrial birds, mammals and reptiles, marine mammals and freshwater insect larvae. Adding the total predicted dose rate for these organisms to the dose rates (at current annual limits) for the existing Power Station gives the following highest combined dose rates for impacts from both Power Stations:
- Terrestrial birds, mammals and reptiles = 1.82 $\mu\text{Gy/h}$.
 - Marine mammals = 0.59 $\mu\text{Gy/h}$.
 - Freshwater insect larvae = 0.19 $\mu\text{Gy/h}$ (using the data presented in Table A5, Appendix A as the most realistic scenario for freshwater habitat).
- 2.3.4 The in-combination results for both Power Stations predict a total dose rate below the threshold of 10 $\mu\text{Gy/h}$ for the most exposed organisms.

In-combination assessment with other sources of radioactive discharge

- 2.3.5 This section assesses the in-combination effect of the proposed Power Station with other permitted nuclear and non-nuclear releases of radioactive substances at European Designated Site level.
- 2.3.6 The European Designated Sites in the vicinity of the Power Station are summarised in **Table 2.1**.
- 2.3.7 For the European Designated Sites listed in **Table 2.1**, the total dose rate for radioactive substances within each site was determined from the Environment Agency's habitats assessment for radioactive substances (Environment Agency, 2009). The Environment Agency's (2009) assessment of the total dose rate is calculated from the sum of the terrestrial dose rate and the maximum water dose rate (i.e. the maximum of the freshwater dose rate and coastal water dose rate) for the worst affected organism.

- 2.3.8 The calculated contribution from the proposed Power Station was added to the total dose rate reported by the Environment Agency (2009) to derive the in-combination effect of the proposed Power Station with other sources. For consistency with the Environment Agency's approach, the worst affected organisms for both terrestrial and water (including marine and freshwater) environments were identified from the results presented in **Appendix A**, with these results added to the total dose rate for the European Designated Site as calculated by the Environment Agency (2009). This was compared with the 40 μ Gy/h guideline threshold defined for the protection of European Designated Site.
- 2.3.9 **Table 2.2** presents the findings of the in-combination assessment. It can be seen that there are no exceedances predicted of the 40 μ Gy/h guideline threshold for any European Designated Site.
- 2.3.10 As the effect of the proposed Power Station has been demonstrated to be insignificant at the location of the maximum environmental concentration, and no significant in-combination effect is predicted for the European Designated Sites in close proximity to the Power Station, it is concluded that it is not necessary to consider any more distant European Designated Sites. However, as a further element of precaution, the results of the ERICA modelling have been assessed in-combination for the European Designated Sites with the highest dose rates as reported by the Environment Agency (2009).
- 2.3.11 For the Ribble and Alt Estuaries SPA, the Environment Agency (2009) states that Springfields Fuels Ltd was the source of the radionuclides. New, lower authorisation limits came into effect for Springfields Fuels Ltd in January 2008 for operational reasons and were agreed before the results of the habitat assessment were available. The dose rates were recalculated using the ERICA assessment tool and the revised dose rates were all less than 40 μ Gy/h.
- 2.3.12 The total dose rate for the Drigg Coast SAC was calculated by the Environment Agency (2009) to be just above the 40 μ Gy/h guideline threshold. The Environment Agency (2009), however, concludes that the coastal assessment methodology used for the assessment is generally cautious compared with the ERICA assessment tool. This SAC was, therefore, reassessed using the ERICA assessment tool and the Environment Agency (2009) subsequently concludes that the dose rate to the worst affected organism will be 20 μ Gy/h (i.e Environment Agency (2009) reports the results deriving from both the original assessment approach and the ERICA assessment tool).
- 2.3.13 Given the low magnitude of the predicted dose rates from the proposed Power Station and the various elements of precaution built into the assessment, the discharges from the Power Station are expected to make an insignificant contribution to the existing background total dose rate for any European Designated Site. A review of the Environment Agency (2009) assessment of the total dose rate to the worst affected European Designated Sites indicates that no in-combination effect is predicted to occur that would cause exceedance of the 40 μ Gy/h guideline threshold, even assuming that

the maximum environmental concentration predicted for the Power Station applied to these distant sites.

Table 2-2 Calculation of in-combination total dose rates for European Designated Sites in the vicinity of the Power Station

European site	Designation	Total dose rate ($\mu\text{Gy/h}$) (Environment Agency, 2009) [A]	Calculated dose rate ($\mu\text{Gy/h}$) for most exposed organisms in terrestrial environment (proposed Power Station) [B]	Calculated dose rate ($\mu\text{Gy/h}$) for most exposed organisms in water environment (proposed Power Station) [C]	In-combination total dose rate ($\mu\text{Gy/h}$) [A+B+C]
Gogledd Môn Forol / North Anglesey Marine ³	cSAC	0.088	0.617	0.0390	0.744
Morwenoliaid Ynys Môn / Anglesey Terns ⁴	SPA	0.088	0.617	0.0390	0.744
Bae Cemlyn / Cemlyn Bay	SAC	0.088	0.617	0.0390	0.744
Glannau Ynys Gybi/Holy Island Coast	SAC	0.00011	0.617	0.0390	0.65611
Corsydd Môn/Anglesey Fens	SAC	6.70	0.617	0.0390	7.356
Llyn Dinam	SAC	0.0034	0.617	0.0390	0.659

³ As this is a cSAC, this site has not been assessed by the Environment Agency (2009). Therefore the data for Bae Cemlyn / Cemlyn Bay SAC has been used as a proxy in this case given its location and the fact that this site has the highest coastal dose rate of those European Designated Sites included in this assessment (i.e. the approach is conservative).

⁴ As this is a recently fully designated SPA, this site has not been assessed by the Environment Agency (2009). Therefore the data for Bae Cemlyn / Cemlyn Bay SAC has been used as a proxy in this case given its location and the fact that this site has the highest coastal dose rate of those European Designated Sites included in this assessment (i.e. the approach is conservative).

3 Conclusion

- 3.1.1 The results of the assessment undertaken as supporting information to the RSR Environmental Permit application demonstrate that the total dose rate predicted to arise due to the operation of the proposed Wylfa Newydd Power Station is below the screening threshold (as defined by Anderson, 2009 in Environment Agency, 2011a) of 10 μ Gy/h for all habitats and species.
- 3.1.2 The in-combination assessment has demonstrated that when the calculated total dose from the proposed Power Station is added to other sources, no exceedances of the 40 μ Gy/h guideline threshold for the protection of European Designated Sites are predicted.
- 3.1.3 There are other elements of the proposed Power Station development that will have a likely significant effect on European Designated Sites (due to non-radiological effects), and these are to be assessed within the shadow HRA to be prepared in support of applications for the additional consents, licences and permits that will be required for the Wylfa Newydd Project.

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Appendix A Results of the assessment

Table A1 Terrestrial habitat ERICA results

Organism	Total dose rate per organism ($\mu\text{Gy/h}$)	Screening value ($\mu\text{Gy/h}$)	Total dose rate below screening value? (Y/N)
Amphibian	0.596	10	Y
Annelid	0.201	10	Y
Arthropod – detritivorous	0.202	10	Y
Bird	0.617	10	Y
Flying insects	0.200	10	Y
Grasses & Herbs	0.401	10	Y
Lichen & Bryophytes	0.405	10	Y
Mammal – large	0.617	10	Y
Mammal – small burrowing	0.617	10	Y
Mollusc – gastropod	0.201	10	Y
Reptile	0.617	10	Y
Shrub	0.401	10	Y
Tree	0.599	10	Y
Bat	0.610	10	Y

Table A2 Terrestrial habitat Environment Agency R&D128 results

Organism	Total dose rate per organism ($\mu\text{Gy/h}$)	Screening value ($\mu\text{Gy/h}$)	Total dose rate below screening value? (Y/N)
Amphibian	0.000230	10	Y
Annelid	0.0000000591	10	Y
Arthropod – detritivorous	0.000261	10	Y
Bird	0.000214	10	Y
Flying insects	0.0000000629	10	Y
Grasses & Herbs	0.000253	10	Y
Lichen & Bryophytes	0.000491	10	Y
Mammal – large	0.000276	10	Y
Mammal – small burrowing	0.000122	10	Y
Mollusc –	0.0000000528	10	Y

Organism	Total dose rate per organism ($\mu\text{Gy/h}$)	Screening value ($\mu\text{Gy/h}$)	Total dose rate below screening value? (Y/N)
gastropod			
Reptile	0.000245	10	Y
Shrub	0.000230	10	Y
Tree	0.000314	10	Y
Bat	0.0000946	10	Y

Table A3 Combined (total) terrestrial habitat results

Organism	Total dose rate per organism ($\mu\text{Gy/h}$)	Screening value ($\mu\text{Gy/h}$)	Total dose rate below screening value? (Y/N)
Amphibian	0.597	10	Y
Annelid	0.201	10	Y
Arthropod – detritivorous	0.202	10	Y
Bird	0.617	10	Y
Flying insects	0.200	10	Y
Grasses & Herbs	0.401	10	Y
Lichen & Bryophytes	0.406	10	Y
Mammal – large	0.617	10	Y
Mammal – small burrowing	0.617	10	Y
Mollusc – gastropod	0.201	10	Y
Reptile	0.617	10	Y
Shrub	0.401	10	Y
Tree	0.599	10	Y
Bat	0.610	10	Y

Table A4 Marine habitat ERICA results

Organism	Total dose rate per organism ($\mu\text{Gy/h}$)	Screening value ($\mu\text{Gy/h}$)	Total dose rate below screening value? (Y/N)
Benthic fish	0.000000496	10	Y
Bird	0.000000539	10	Y
Crustacean	0.000000970	10	Y
Macroalgae	0.000000462	10	Y
Mammal	0.0000501	10	Y
Mollusc – bivalve	0.00000122	10	Y

Pelagic fish	0.000000477	10	Y
Phytoplankton	0.000000982	10	Y
Polychaete worm	0.000000629	10	Y
Reptile	0.000000576	10	Y
Sea anemones & True coral	0.000000751	10	Y
Vascular Plant	0.000000510	10	Y
Zooplankton	0.00000145	10	Y

Table A5 Freshwater habitat ERICA results (dose rate and RQ for a lake depth of 0.3m and a flow rate of 0.0125 m3/s)

Organism	Total dose rate per organism (µGy/h)	Screening value (µGy/h)	Total dose rate below screening value? (Y/N)
Amphibian	0.000169	10	Y
Benthic fish	0.0151	10	Y
Bird	0.000135	10	Y
Crustacean	0.0202	10	Y
Insect larvae	0.0390	10	Y
Mammal	0.000183	10	Y
Mollusc – bivalve	0.0167	10	Y
Mollusc – gastropod	0.0175	10	Y
Pelagic fish	0.000175	10	Y
Phytoplankton	0.000130	10	Y
Reptile	0.0151	10	Y
Vascular plant	0.0199	10	Y
Zooplankton	0.000133	10	Y

CONTACT US:

If you have any questions or feedback regarding the Wylfa Newydd Project you can contact us on our dedicated Wylfa Newydd freephone hotline and email address, by calling on **0800 954 9516** or emailing wylfaenquiries@horizonnuclearpower.com

Horizon Nuclear Power
Sunrise House
1420 Charlton Court
Gloucester Business Park
Gloucester, GL3 4AE
T +44 (0)1242 508508
www.horizonnuclearpower.com

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