



Department
of Energy &
Climate Change

**RECORD OF THE HABITATS REGULATIONS ASSESSMENT UNDERTAKEN
UNDER REGULATION 61(1) OF THE CONSERVATION OF HABITATS AND
SPECIES REGULATIONS 2010 (AS AMENDED) FOR AN APPLICATION
UNDER THE PLANNING ACT 2008 (AS AMENDED)**

***Project Title:* HINKLEY POINT C NUCLEAR GENERATING STATION AND
ASSOCIATED DEVELOPMENT**

Final

18 March 2013

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1. INTRODUCTION

Background

- 1.1 This is a record of the Habitats Regulations Assessment (HRA) the Secretary of State for Energy and Climate Change has undertaken under Regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) in respect of the Development Consent Order (DCO) for the proposed Hinkley Point C Nuclear Generating Station and Associated Development, (“HPC” hereafter). For the purposes of Regulation 61, the Secretary of State is the competent authority for the HPC application that has been submitted under the Planning Act 2008 regime (as amended).
- 1.2 On 31 October 2011, NNB Generation Company Ltd. (part of EDF Energy and “the applicant” hereafter) submitted an application under Section 37 of the Planning Act 2008 (as amended) to the Infrastructure Planning Commission (IPC) (now the Planning Inspectorate) for consent for the construction and operation of a nuclear power station comprising two European Pressurised Reactor (EPR) units at Hinkley Point in Somerset (HPC main site) and several linked items of infrastructure, termed “associated development.” Each EPR unit would be capable of producing around 1,630 MW of electricity, giving a total generating capacity of 3,260 MW. The application is described in more detail in **Section 2**.
- 1.3 In England and Wales, onshore energy generating stations greater than 50 MW constitute nationally significant infrastructure projects (NSIPs) and applications for consent are subject to the requirements of the Planning Act 2008 (as amended).
- 1.4 On 17 February 2012, the Chair of the IPC appointed a three member Panel as the Examining Authority for the application (the “Panel” hereafter). Two additional members to the Panel were appointed in March and April 2012. The examination of the application began on 21 March 2012 and was completed on 21 September 2012. The Panel submitted its report of the examination to the Secretary of State on 19 December 2012. The Secretary of State’s conclusions on habitats and wild birds issues contained in this HRA report have been informed by the Panel’s report to him and further information and analysis, including a Report on the Implications for European Sites (RIES), as set out in paragraph 1.11.

Habitats Regulations Assessment (HRA)

- 1.5 Council Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive) aim to ensure the long-term survival of certain species and habitats by protecting them from adverse effects of plans and projects.
- 1.6 The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation (SACs). The Birds Directive provides for the classification of sites for the protection of rare and

vulnerable birds and for regularly occurring migratory species. These sites are called Special Protection Areas (SPAs). SACs and SPAs are collectively termed “European sites” and form part of a network of protected sites across Europe. This network is called Natura 2000.

1.7 The Conservation of Habitats and Species Regulations 2010 (as amended) (“the Habitats Regulations” hereafter) transpose the Habitats and Birds Directives into UK law as far as the limit of territorial waters. The Convention on Wetlands of International Importance 1972 (the Ramsar Convention) provides for the listing of wetlands of international importance. These sites are called Ramsar sites. UK Government policy is to afford Ramsar sites the same protection as European sites.

1.8 Regulation 61 of the Habitats Regulations provides that:

“a competent authority, before deciding to... give consent, permission or other authorisation for... a project which is likely to have a significant effect on a European site [or Ramsar site]... (either alone or in combination with other plans or projects), and is not directly connected with or necessary to the management of that site, must make an appropriate assessment of the implications for that site in view of that site's conservation objective.”

1.9 This project is not directly connected with, or necessary to, the management of a European site¹. However, it may affect European and Ramsar sites and so an HRA is required by Regulation 61.

1.10 In considering the possible impacts of HPC and reaching his conclusions, the Secretary of State has also taken into account duties and obligations provided for under the Conservation of Habitats and Species (Amendment) Regulations 2012, SI 2012 No. 1927, which came into force on 16th August 2012 and amend the Habitats Regulations. In particular, new regulations 9(1) and 9A(1), (3) and (8) of the 2010 Regulations as inserted by regulation 8 of the 2012 Regulations are engaged when the Secretary of State exercises his functions in relation to granting consent for a new electricity generating station and applies Regulation 61(1). The key considerations in this context are securing compliance with the Habitats and Birds Directives; preserving, maintaining and re-establishing a sufficient diversity and area of habitat for wild birds in the United Kingdom; and using all reasonable endeavours to avoid any pollution or deterioration of habitats of wild birds.

1.11 This report should be read in conjunction with the following documents that provide extensive background information:

- [Planning Act 2008 Hinkley Point C \(Nuclear Generating Station\) Order \[\] - Panel's Report to the Secretary of State, 19 December 2012](#) – termed “the Panel's report”

¹ European site as defined in Regulation 8 of The Conservation of Habitats and Species Regulations 2010 (as amended).

- [Report on the Implications for European Sites \(RIES\): Proposed Hinkley Point C Nuclear Power Station. An Examining Authority Report Prepared with the Support of the Planning Inspectorate Secretariat, July 2012.](#) – termed “the RIES”
- [The Countryside Council for Wales response to the RIES, letter ref: C38.09.03/1720277/SCH/IG dated 17 August 2012 from Chris Uttley.](#)
- [Natural England’s response to the RIES, letter ref: dated 17 August 2012 ref: EN010001 from Kyle Lischak.](#)
- [The Environment Agency’s response to the RIES, letter ref: WX/2011/120100/03-L03 dated 17 August from Louisa Mackay.](#)
- [The applicant’s response to the RIES, letter and attached reports project ref: EN010001, dated 17 August 2012 from Tim Norwood.](#)
- [Hinkley Point C Appropriate Assessment for related Environment Agency permissions Final Version: Environment Agency, July 2012.](#) – termed “the EA’s HRA”
- [Statements of Common Ground between the Applicant and Natural England, CCW, the Environment Agency and the MMO, May 2012.](#) – termed “SoCG”
- [Hinkley Point C Project Report to Inform Habitats Regulations Assessment \(HRA\). Document Reference Number 3.16. EDF, October 2011.](#) - termed “the applicant’s HRA”
- [Hinkley Point C Environmental Statement \(ES\). Document Reference Numbers 4.1 - 4.20. EDF, October 2011.](#) - termed “the ES”
- [Conservation of Habitats and Species Regulations 2010 – Hinkley Point C Jetty Development: Record of Habitats Regulations Assessment. Marine Management Organisation, July 2012.](#) – termed “the MMO’s HRA”

1.12 Further relevant information and correspondence was submitted during the examination period and has been considered by the Secretary of State. This includes, but is not limited to:

- [The issue specific hearing on Habitats Regulations Assessment \(HRA\) matters and ecology held on 23 August 2012;](#) and
- Responses from Interested Parties to Rule 17 requests by the Panel – see Appendix B Examination Library of the Panel’s Report.

1.13 So far as is possible, the key information in these documents is summarised and referenced here.

The RIES and Regulation 61(3) consultation

1.14 Under Regulation 61(3) of the Habitats Regulations, the competent authority must, for the purposes of an appropriate assessment (AA), consult the appropriate nature conservation body and have regard to any representation made by that body within such reasonable time as the authority specify.

- 1.15 The Panel, with support from Planning Inspectorate (“PINS”), prepared a document entitled “Report on the Implications for European Sites” (“RIES”). The RIES was published on PINS planning portal website on 26 July 2012 for a period of 21 days for the purposes of Regulation 61(3) consultation. At the time of publication, there were still a number of outstanding items and matters for clarification in the RIES. Written responses were received from Natural England (“NE”); the Countryside Council for Wales (“CCW”); the Marine Management Organisation (“MMO”); the Environment Agency (“EA”); and the applicant. The RIES and written responses to it have been taken into account in this assessment, alongside an HRA produced by the EA for its consents and published in July 2012 and one produced by the MMO in respect of the temporary jetty.
- 1.16 At the subsequent issue-specific hearing on 23 August 2012, on HRA matters and ecology, NE, the CCW, the MMO and the EA stated that they were content with the sufficiency of the RIES.
- 1.17 The Panel reported back as follows:

For our part, we have carefully examined the requirements included in the draft DCO which would give protection to the integrity of the European sites (and Ramsar sites) and consulted extensively with the relevant statutory bodies and regulatory authorities. The Applicant has reached agreement with these bodies that these requirements would be sufficient to secure the protection of the integrity of the designated European sites. We have no reason to disagree.
[para. 5.162.]

Relationship to other consents and licences / interdependencies

- 1.18 The DCO is not the only consent, licence or permit required to construct and operate the power station and its associated development. At the time of writing, some of these had been obtained, whilst decisions were still awaited on others. Key consents and licences that are required (in addition to the DCO) are summarised below and a brief description given of timings (where known), the competent authority and any relationship with this HRA and the DCO.

Consents and licences issued

- 1.19 Before making its application for a DCO, the applicant applied separately to West Somerset District Council (WSDC) for planning permission to carry out fencing, site clearance, earthworks and other works on the proposed power station site. Conditional planning permission for these preliminary works was granted in January 2012.
- 1.20 The applicant applied to the MMO for a Harbour Empowerment Order (HEO) and the licences required to enable construction of a temporary jetty to enable the delivery by sea of bulk materials, such as aggregate and cement, to be used in the construction of HPC. An application was also made to Secretary of State under the Transport and Works Act 1992 for the compulsory acquisition of land or interest in land to be used for the jetty development. These were granted in July 2012, subject to conditions. An HRA was undertaken by the MMO for the

temporary jetty and this concluded there would be no adverse impact on the integrity of any European site, with the proviso that certain conditions were implemented to protect Shelduck.

- 1.21 This DCO also seeks authorisation for the same temporary jetty development as has previously been consented by the MMO and which forms part of the associated development for HPC. It should be noted that the MMO's decision on the jetty was independent of this DCO application. The Nuclear Site Licence was issued by the Office for Nuclear Regulation in November 2012 and the Generic Design Assessment (GDA) approved in December 2012.

Other HRAs

- 1.22 Environment Agency - the EA has undertaken an HRA, published in July 2012, covering its consents and permits necessary for HPC. On 13th March 2013, it issued permits to the applicant to discharge cooling water and liquid effluents into the Bristol Channel and to operate a standby diesel generator. The permit to discharge cooling water and liquid effluents contains a number of conditions that are relied on in this report as mitigation measures to avoid adverse effects. The EA considers that an abstraction licence is not required for cooling water abstraction from the open sea. As the abstraction of seawater for cooling is linked to its discharge, impacts arising as a result of abstraction (such as the impingement and entrainment of fish and other organisms) were considered in their HRA. This has resulted in a number of conditions for mitigation measures to tackle abstraction-related impacts being attached to the discharge consent.
- 1.23 The EA's HRA considered impacts on all of the features of the Severn Estuary European sites (SAC/SPA/Ramsar) as a result of the construction and operational activities at HPC linked to their consents. The EA concludes that there would not be an adverse impact on the integrity of any of these European sites, based on the inclusion of certain mitigation measures in its consents and also the inclusion by the Secretary of State of appropriate mitigation in his DCO. Amendments to the EA's HRA, in response to consultation, were published in March 2013. Impacts on terrestrial sites and species were beyond the scope of the EA's HRA, but are covered in this report.
- 1.24 Marine Management Organisation - The MMO undertook an HRA in July 2011 in respect of the Harbour Empowerment Order (HEO) and two marine licences that it granted for the temporary jetty. It also placed conditions on this consent in order to offer protection to Shelduck. The MMO has one remaining marine licence application for HPC. This is for the marine works, including installation of the cooling water infrastructure and associated dredging; the seawall; Combwich Wharf and flood defence works at Junction 23. The MMO has indicated to the Secretary of State that it does not expect to determine its marine licence until after the Secretary of State has made his decision on the DCO. The Secretary of State has no reason to suppose that a decision from the MMO will not be forthcoming in due course.

1.25 This report makes extensive reference to the EA's HRA which provides a detailed assessment of impacts on the Severn Estuary sites (Sections 6 and 7) and some reference to the MMO's HRA with respect to impact on Shelduck.

Consents and licences to be determined

1.26 At the time of writing, a number of other consents and licences had yet to be determined by the relevant competent authorities. The principal ones are:

- Permits to discharge and dispose of radioactive wastes (EA)
- Flood Defence Consents (EA)
- European Protected Species Licences (NE)
- Marine Licence (dredging associated with the cooling water infrastructure; the seawall; Combwich Wharf and the flood defence works at Junction 23) (MMO).
- Deposition of dredged material from the Severn Estuary will require a disposal licence from the Welsh Government, if in Welsh Territorial Waters.

1.27 The Secretary of State has no reason to suppose that these won't be forthcoming.

Scope of this assessment

1.28 The Panel recommends and the Secretary of State accepts that it is appropriate for him **to assess the implications of the whole [DCO] application including the temporary jetty, other marine works and water discharge activities, rather than leave elements to be assessed by another competent authority.**

1.29 The Secretary of State accepts this recommendation and has produced an overarching assessment which draws extensively on the EA's HRA, the applicant's HRA, the recommendations of the Panel [and the other documents and information referred to in paragraphs 1.11 and 1.12]. However, the conclusions made on the resultant impacts of the entirety of the project are those of the Secretary of State.

1.30 The National Policy Statements (NPS) for Energy EN-1 and EN-6 note the roles and responsibilities of regulators and require that, when considering an application for a DCO, the decision maker should act on the basis that the relevant licensing and permitting regimes will be properly applied and that duplication of matters within the remit of the Nuclear Regulators should be avoided. For this, reason this report does not address matters related to nuclear safety and storage of nuclear waste that are the remit of the Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE).

Structure of this report

1.31 This report contains a description of the proposed project (**Section 2**) and its location with respect to the relevant European sites (**Section 3**). The assessment is divided into two

sections, comprising a no significant effects (screening) report in respect of eleven European sites (**Section 4**) and an Appropriate Assessment (AA) (**Sections 5, 6, 7, 8 and 9**) in respect of four of these (Severn Estuary SAC/Ramsar, Severn Estuary SPA/Ramsar, Somerset Levels and Moors SPA/Ramsar and Exmoor and Quantock Oakwoods SAC) where a risk of likely significant effects could not be excluded. **Section 10** summarises the conclusions on site integrity. Conservation objectives for the sites considered in the AA are included as **Annex A** and a list of the relevant DCO requirements and EA conditions is provided as **Annex B**.

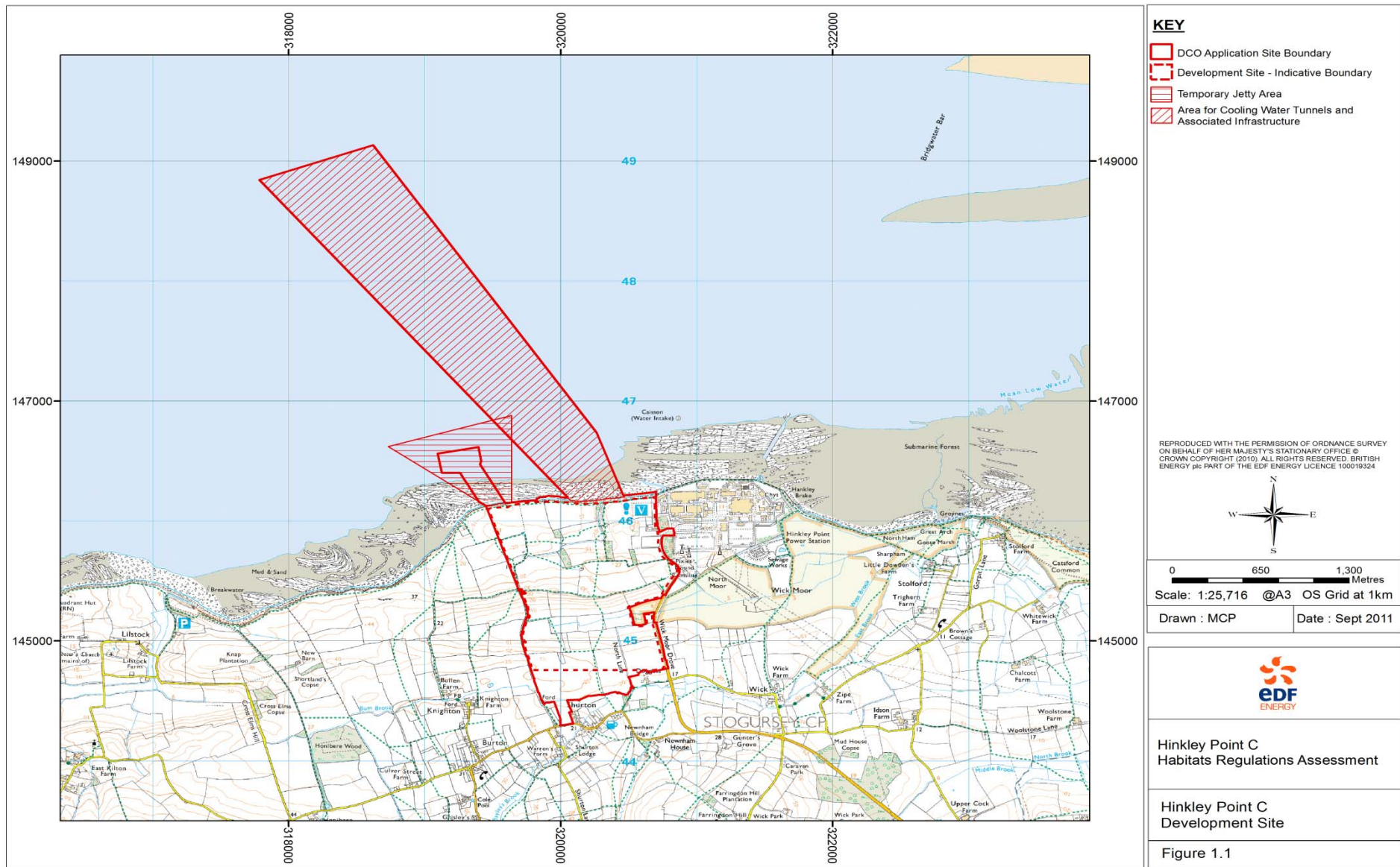
2 PROJECT DESCRIPTION

Overview

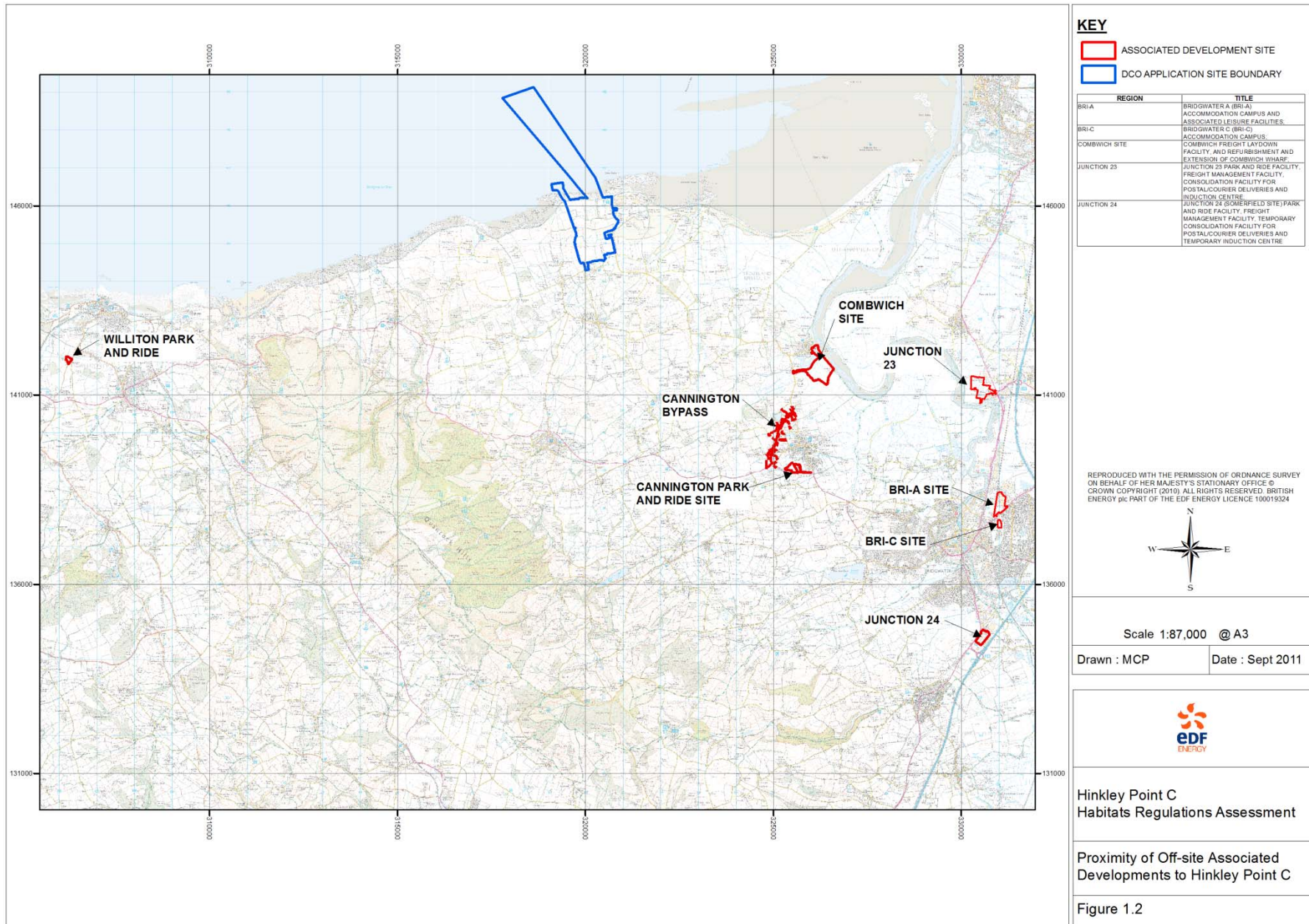
- 2.1 This application is to construct and operate a nuclear power station comprising two European Pressurised Reactor (EPR) units and supporting development at Hinkley Point on the Somerset coast. Each EPR unit would be capable of producing around 1,630 MW of electricity, giving a maximum generating capacity of 3,260 MW. The main development site is immediately to the west of two existing nuclear power stations (Hinkley Point A and Hinkley Point B) and is shown in **Figure 1.1**.
- 2.2 The main site works include the construction of a temporary jetty along HPC frontage and works to an existing sea wall to increase flood defences. In addition to the main power station site, the DCO includes a number of associated developments. These are required to facilitate the construction of the power station. They include:
- The refurbishment of an existing wharf at Combwich and provision of an associated freight storage area;
 - Two accommodation campuses in Bridgwater and one on the main site;
 - Freight management facilities near to J23 and J24 of the M5, together with park and ride sites for workers to use;
 - Further park and ride sites at Cannington and Williton; and
 - A bypass around Cannington.
- 2.3 The location of offsite associated development is given in **Figure 1.2**.
- 2.4 On completion of construction, the park and ride facilities at Williton, Cannington and Junctions 23 and 24 of the M5 would be removed as would the freight management facilities and other development on the J23 site and the temporary jetty. The proposed construction campus buildings in Bridgwater and on the main site would no longer be required. At Combwich, the proposed freight storage area would be removed, but the refurbished wharf would be retained for occasional use in connection with the ongoing delivery of any Abnormal Indivisible Loads (AILs) required by the operational power station. Cannington Bypass would be retained.
- 2.5 Several highway junction improvements are proposed to reduce the impact of construction traffic on the highway network. All of these would be retained.

The main site

- 2.6 The main site comprises an area of approximately 175ha. Of this, the proposed power station would occupy approximately 67.5ha. The remainder of the site would be primarily required during the construction period and would include a 530 bed-space accommodation campus.



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- 2.7 When construction is complete, it would be landscaped and turned to agricultural, amenity or ecological uses.
- 2.8 Land within the site was until recently mainly in agricultural use, with some woodland. It is gently undulating and crossed by two streams that run from west to east. Existing ground levels range from around 10m to around 35m above ordnance datum (AOD). There were previously several farm buildings on the site, but these have now been demolished. Several public rights of way formerly crossed the site and the South West Coastal Path ran along the foreshore on its northern edge, but these have been closed, and the site fenced off to secure it in advance of the site preparation works.
- 2.9 The closest settlements are the hamlets of Shurton, Knighton, Burton and Wick. Stogursey lies approximately 1.5 km to the south of the main site boundary. Combwich and Cannington lie approximately 5km and 8km respectively to the south-east. The nearest main town, Bridgwater, is approximately 12km southeast of the site.
- 2.10 The construction of a temporary jetty; a new sea wall; cooling water infrastructure; and the refurbishment of Combwich Wharf are described in more detail below due to their proximity to the Severn Estuary SPA/SAC/Ramsar and potential for impacts on European sites.

The temporary jetty

- 2.11 The temporary jetty comprises the creation of a harbour made up of a jetty, a berthing pocket, a jetty head and some terrestrial works. The offshore works would extend into Bridgwater Bay. The construction of the jetty is estimated to take approximately 12-16 months and it would be in operation for a period of eight years, before being decommissioned. Decommissioning is estimated to take 12 months, plus a further 24 months for site reinstatement.

The sea wall

- 2.12 A new sea wall is planned along the shoreline in front of HPC to reduce wave overtopping and provide flood defence. It would be a continuation of an existing wall and be some 760m in length, with a crest height of 13.55m AOD to protect the site during a 1 in 10,000 extreme flood event. At either end, the sea wall will turn through 90 degrees inland for 50m to prevent outflanking of the main sea wall by coastal erosion. The return walls would retain the land which would be levelled at 14m AOD for the power station development site.
- 2.13 The sea wall would be located at the top of the beach, above Mean High Water Spring (MHWS) tide level and be designed to minimise encroachment onto the beach and the need for long-term maintenance. Rock protection boulders of some 1.35m mean diameter would be placed at the foot of the wall to absorb wave impact during storms and protect the foundations from scour and beach lowering.

- 2.14 Barges would deliver the rock to the foreshore where it would be craned off and stored. Barges would be brought towards the shore during a high tide and allowed to ground when the tide falls. On completion of the sea wall works, the pre-existing beach profile will be restored.

The cooling water infrastructure

- 2.15 Seawater for cooling will be abstracted from Bridgwater Bay via a series of seabed intake structures and tunnels. Each EPR reactor will have a single dedicated intake tunnel with two dedicated seabed intakes. At either end of the tunnels, there will be vertical shafts that provide connection on the landward side to the onshore cooling water infrastructure and at the seaward end to the seawater intake heads. The tunnels will extend approximately 3.5km and 3.4km from the foreshore high water mark and at a depth of approximately 20m below the seabed. At their seaward extent, the two intake structures will be some 480m apart. The two sea bed intake heads associated with each intake tunnel will be separated by approximately 200m.
- 2.16 An acoustic fish deterrent system will be associated with each intake head to act as a behavioural deterrent for certain species of fish. The applicant indicates that these will comprise two modular sound projector arrays and a series of amplifiers. The AFD modules would be streamlined and would incorporate cowled tidal turbines to provide power for the sound projectors.

Associated development sites

- 2.17 In summary these comprise:

- **Refurbishment of Comwich Wharf** - south of Comwich on the west side of the River Parrett. This is an existing facility which would be upgraded to allow the unloading of abnormal indivisible loads (AILs) brought in by barge. A private access road connects the Wharf to the C182. Included in the proposals at Comwich is a temporary freight storage area on open farmland land to the south of the access road.
- **The Bridgwater A site** - some 13.8ha of land fronting the A39 in Bridgwater. The northern section of the site was formerly occupied by the Innovia Cellophane factory, but this has now been demolished. The southern section of the site contains various sports facilities operated by the Bridgwater Sports and Social Club. The site is part of the proposed North East Bridgwater development which has outline planning permission for housing, employment and other mixed uses.
- **The Bridgwater C site** - a 1.9ha site close to Bridgwater A. The main part of the site contains a rugby pitch used by Bridgwater and Albion Rugby Football Club as a training pitch.
- **The Junction 23 site** - 20.6ha of mainly agricultural land adjacent to Dunball roundabout on the A38.

- **The Junction 24 site** - within the Huntworth Business Park. It comprises parking areas and buildings previously used by Safeway as a distribution centre.
- **The Cannington park and ride site** - on land to the south of Cannington. It is bounded by the A39 to the south, agricultural fields to the north and east and a flood relief channel to the west. It currently comprises agricultural land used for grazing.
- **The Williton park and ride site** - a former HGV lorry park on the west side of the B3190 around 1km north of the junction with the A39.
- **The Cannington bypass** - on the western side of Cannington and would connect the A39 to the C182.

Combwich Wharf, freight laydown area and flood defences

- 2.18 Combwich Wharf is located at the confluence of Combwich Pill and the River Parrett at the eastern edge of the village of Combwich approximately 4km upstream from the mouth of the River Parrett at the Severn Estuary. Whilst the wharf area is outside of the designated Severn Estuary sites, it lies directly adjacent to them and is of particular interest from an HRA perspective and so is described here in more detail. Refurbishment of the wharf is required to accommodate the arrival of approximately 180 Abnormal Indivisible Loads (AILs) over a four-year construction period. In addition to AIL deliveries, 'other goods' deliveries to the wharf are expected to total up to 15-16 deliveries per month at peak, over the four years. Small tug boats will also be required further down river to guide the larger boats out of the River Parrett. The refurbishment will involve demolition of parts of the old wharf (finger pier and unwanted piles), construction of the new wharf area and dredging of a berth bed. There will also be construction and enhancements to flood defences around Combwich village and the creation of a freight laydown facility adjacent to the Wharf to manage the flow of personnel and freight to HPC.
- 2.19 It is expected that the refurbishment of Combwich Wharf and construction of the freight laydown facility will each take 12 months to complete. Combwich Wharf construction activities will commence approximately 1 year ahead of the laydown facility construction activities.

Indicative construction timeframes

- 2.20 The application documents contain an indicative construction programme. However, during the examination, the applicant announced that the main preliminary earthworks would not begin until 2013, approximately one-year later than planned and a revised programme was submitted. The most recent phasing schedule (June 2012) is given overleaf. By 2020, most on site works would be complete. However, construction of the spent fuel store is expected to continue until the end 2023. Final landscaping of the site is intended to be progressive as contractors vacate the site.
- 2.21 Works on the associated development sites are shown as commencing during the second half of 2013, with the exception of the Combwich freight storage area on which work may start a

year later, although provision has been made in the DCO to bring forward construction of the freight storage area, should the applicant choose to do so. The precise phasing and duration of these works is considered by the applicant to be “variable”.

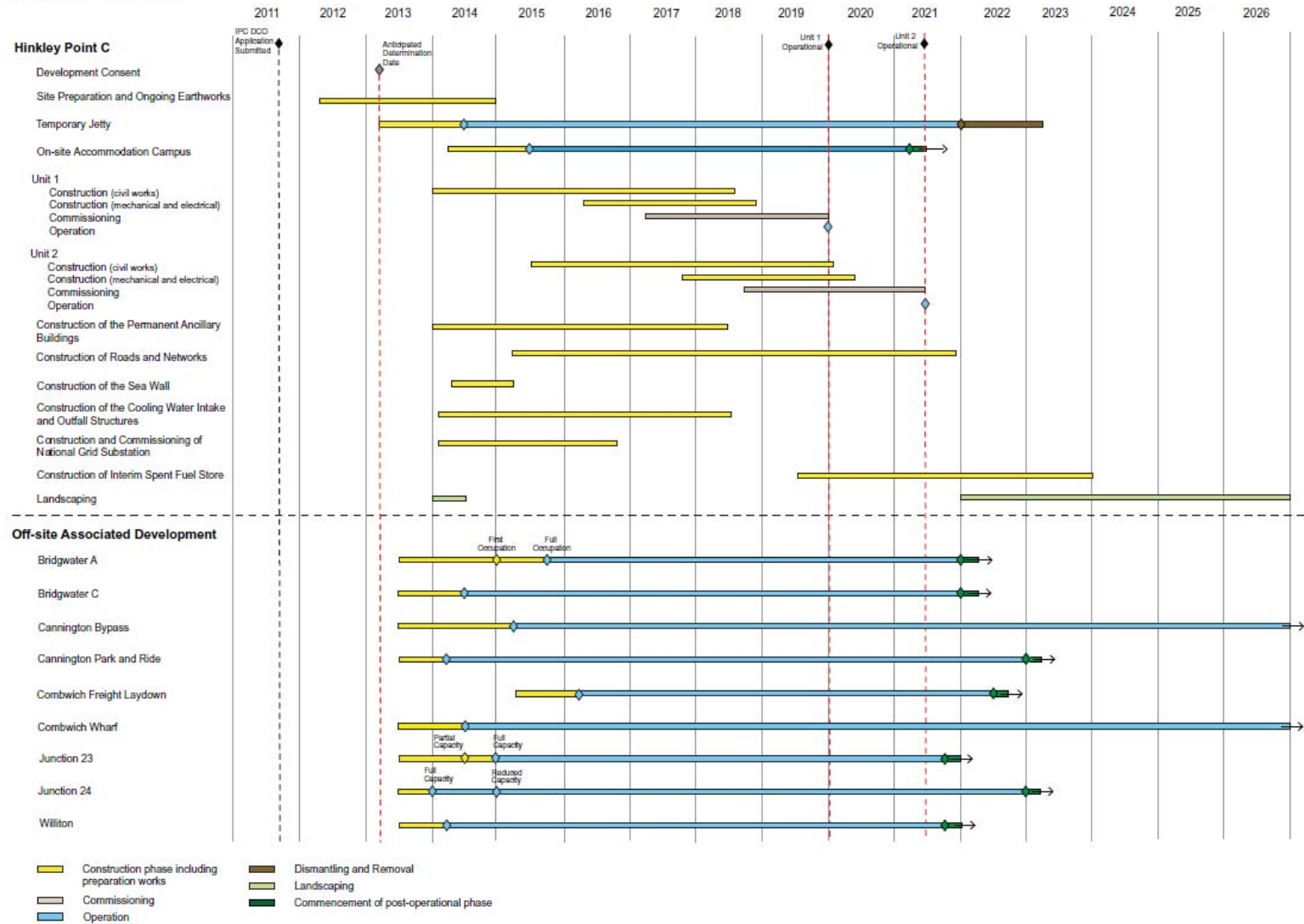
- 2.22 The J24 site would become operational in mid 2014, followed later that year by the Williton and Cannington park and ride sites. Cannington bypass is scheduled for completion in Autumn 2016.

Decommissioning

- 2.23 The cessation of energy generation is anticipated to be 2080. Decommissioning will take place at the end of the lifetime of HPC. The development involved in decommissioning of the generating station is not authorised by the proposed DCO nor by any other authorisations currently being sought in respect of HPC (although the funded decommissioning programme (“FDP”) regime set up under the Energy Act 2008 requires the operator of a nuclear generating station to have a plan for decommissioning, covering both the technical and the financial aspects of the process, approved by the Secretary of State before nuclear construction work is permitted to begin).

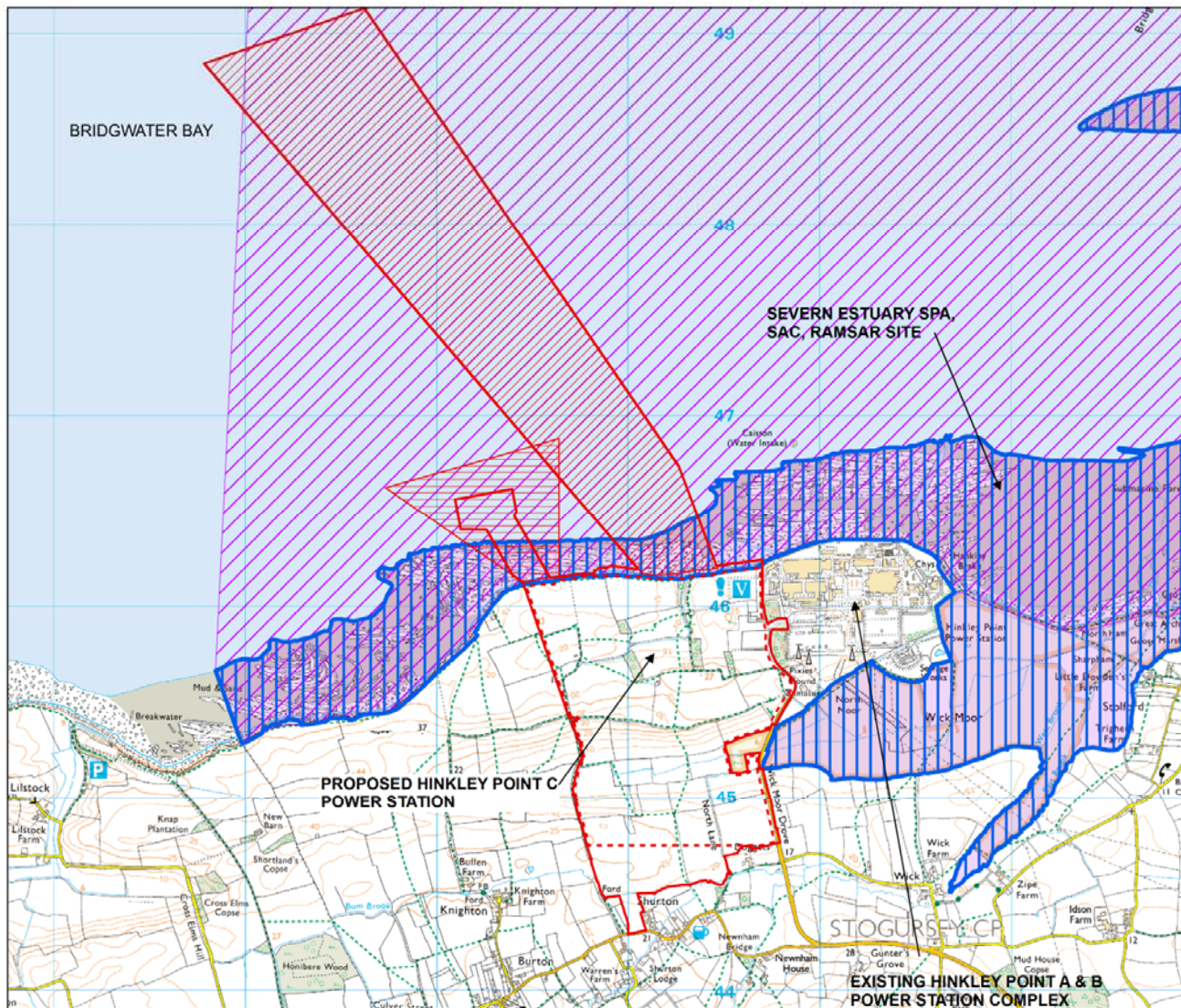
Indicative Phasing Schedule Hinkley Point C and Off-site Associated Development

Revision 2 - June 2012



3 PROJECT LOCATION AND DESIGNATED SITES

- 3.1 The proposed HPC development site is located on the West Somerset coast, 25km to the east of Minehead and 12km to the north west of Bridgwater. The main site is immediately to the west of the two existing nuclear power stations, centred on National Grid Reference (NGR) 320300 145800. The site is one of eight identified by Government in the National Policy Statement for Nuclear Power Generation (NPS EN-6) as potentially suitable for the deployment of new nuclear power stations by the end of 2025.
- 3.2 The HPC main site is immediately adjacent to the Severn Estuary which has SAC, SPA and Ramsar site designations. Parts of the proposed development (temporary jetty, cooling water infrastructure and Fish Recovery and Return (FRR) system lie within these Severn Estuary sites. See **Figure 1.3** for a map showing the location of HPC with respect to the Severn Estuary sites.
- 3.3 A further seven international and European sites were screened into the HRA process at the outset. These are: the Exmoor and Quantocks Oakwoods SAC; the Somerset Levels and Moors SPA/Ramsar; the Mendip Limestone Grasslands SAC; Hestercombe House SAC; the River Usk SAC; the River Wye SAC; and the River Tywi SAC.
- 3.4 In October 2010, the Department of Energy and Climate Change published an HRA in connection with NPS EN-6 . Annexed to EN-6 were site reports for each of the sites considered to be potentially suitable for new nuclear development before the end of 2025. The site report for HPC considered the likely effects on all European and Ramsar sites within a 20 km radius and sites at a greater distance than 20 km, where potential impact pathways were identified.
- 3.5 Given possible impact pathways, a distance of up to 120 km has been taken as appropriate for the test for likely significant effects, given that the Rivers Usk and Tywi are tributaries that flow into the Severn Estuary. Such distant sites have been included for screening as indirect effects could potentially occur due to the ecological and physical linkages between the sites (e.g. shared migratory fish populations and hydrodynamic and hydrological processes).
- 3.6 The location of these sites with respect to the project is shown in **Figure 1.4**. A summary of the qualifying features of each of these European sites, their size and distance from the project is presented in **Table 1**.



KEY

- DCO Application Site Boundary
- Development Site - Indicative Boundary
- Temporary Jetty Area
- Cooling Water Tunnels Area
- Special Protection Areas
- Special Areas of Conservation
- RAMSAR Sites

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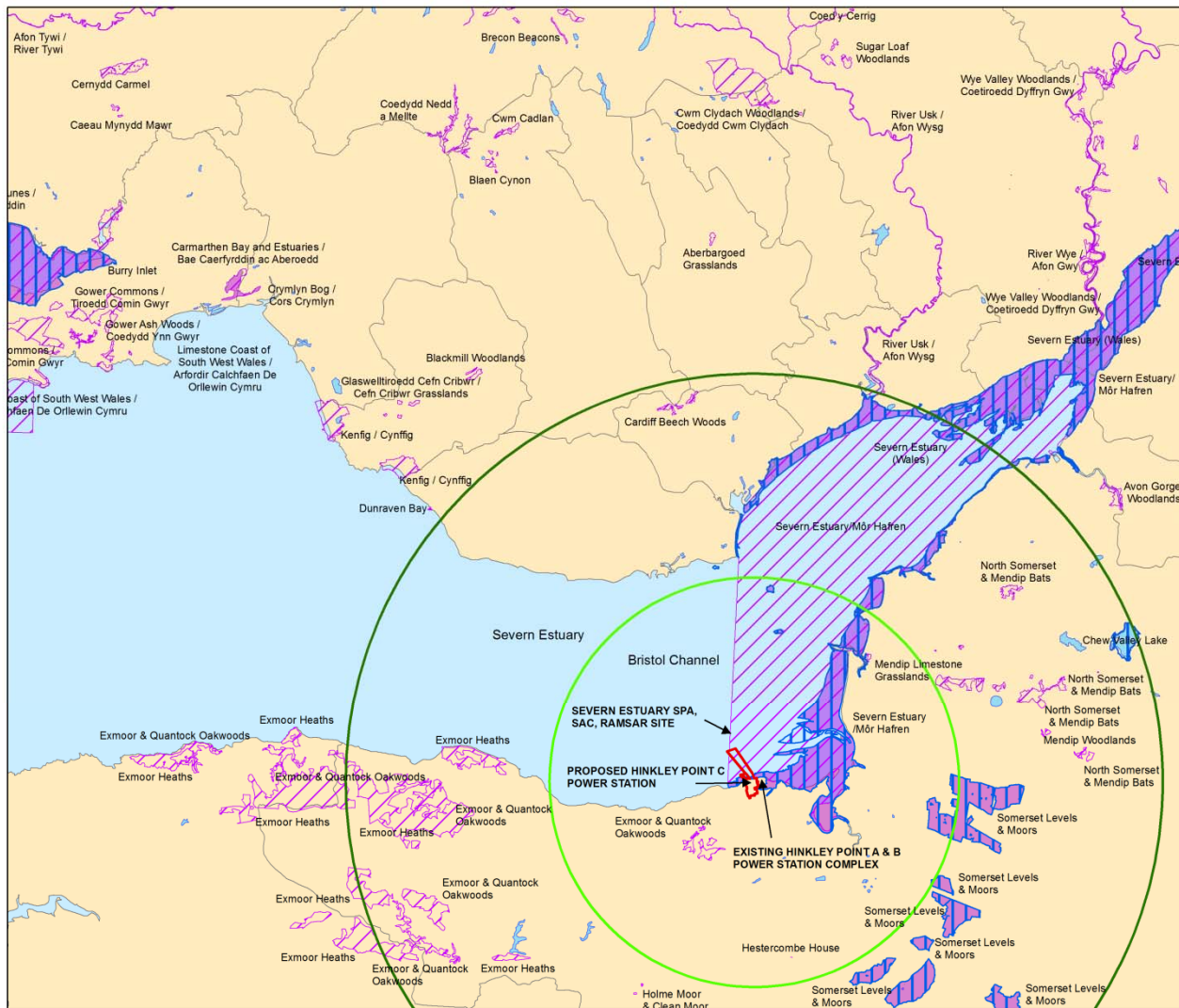
Date: Sept 2011



Hinkley Point C
Habitats Regulations Assessment

Hinkley Point C and Adjacent
European Designated Sites

Figure 1.3



KEY

- DCO Application Site Boundary
- Special Protection Areas
- Special Areas of Conservation
- RAMSAR Sites
- 20km distance from site
- 40km distance from site

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0 1,500,000 3,000 4,500 6,000 7,500 9,000 10,500 12,000 m
Scale 1:375,000 @ A3

Drawn: MCP Date: Sept 2011



Hinkley Point C
Habitats Regulations Assessment

Hinkley Point C &
European Designated Sites

Figure 1.4

Table 1. Features of relevant European sites

Designated site and area/ha	Summary of site qualifying features	Distance to project
The Severn Estuary SAC 73,715 ha	<p>Annex I habitats: Estuaries; Sub-tidal sandbanks; Intertidal mudflats and sandflats; Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>); and Biogenic reefs (<i>Sabellaria alveolata</i>).</p> <p>Annex II species (migratory): River Lamprey <i>Lampetra fluviatilis</i>; Sea Lamprey <i>Petromyzon marinus</i> and Twaite Shad <i>Alosa fallax</i>.</p>	Within and adjacent
The Severn Estuary SPA 24,663 ha	<p>Article 4.1 qualification: Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • Bewick's Swan <i>Cygnus columbianus bewickii</i> - 3.9% of the GB population (5 year peak mean 1991/92-1995/96) <p>Article 4.2 qualification. Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • Gadwall <i>Anas strepera</i> - 0.9% of the population (5 year peak mean 1991/92-1995/96) • European white-fronted goose <i>Anser albifrons albifrons</i> - 0.4% of the population (5 year peak mean 1991/92-1995/96) • Dunlin <i>Calidris alpina alpina</i> - 3.3% of the population (5 year peak mean 1991/92-1995/96) • Shelduck <i>Tadorna tadorna</i> - 1.1% of the population (5 year peak mean 1991/92-1995/96) • Redshank <i>Tringa tetanus</i> - 1.3% of the population (5 year peak mean 1991/92-1995/96) <p>Assemblage qualification - over winter the area regularly supports 84,317 waterfowl (5 year peak mean 01/04/1998)</p>	Within and adjacent
The Severn Estuary Ramsar 24,663 ha	<p>Criterion 1: immense tidal range (second-largest in world), that affects both the physical environment and biological communities</p> <p>Criterion 3: unusual estuarine communities, reduced diversity and high productivity.</p> <p>Criterion 4: the run of migratory fish between sea and river via estuary. Species include: Salmon <i>Salmo salar</i>; sea trout <i>S. trutta</i>; sea lamprey <i>Petromyzon marinus</i>; river lamprey <i>Lampetra fluviatilis</i>; allis shad <i>Alosa alosa</i>; twaite shad <i>A. fallax</i>; and eel <i>Anguilla anguilla</i>.</p> <p>Criterion 5 : a wintering waterfowl assemblage of international importance - 70,919 waterfowl (5 year peak mean 1998/99-2002/2003).</p> <p>Criterion 6: Regularly supports more than 1% of individuals in populations of Bewick's (Tundra) Swan <i>Cygnus columbianus bewickii</i> ; Gadwall <i>Anas strepera</i>; European white-fronted goose <i>Anser albifrons albifrons</i>; Dunlin <i>Calidris alpina alpina</i>; Shelduck <i>Tadorna tadorna</i>; Redshank <i>Tringa tetanus</i> as well as (since designation) Ringed</p>	Within and adjacent

Designated site and area/ha	Summary of site qualifying features	Distance to project
	<p>Plover <i>Charadrius hiaticula</i>; Teal <i>Anas crecca</i>; Pintail <i>Anas acuta</i> and Lesser Black-backed Gull <i>Larus fuscus</i>.</p> <p>Criterion 8 : The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded.</p>	
Somerset Levels and Moors SPA 6,388 ha	<p>Article 4.1 qualification: Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • Bewick's Swan <i>Cygnus columbianus bewickii</i> 2.7% of the GB population (5 year peak mean 1991/92-1995/96) • European Golden Plover <i>Pluvialis apricaria</i> - 1.2% of the GB population (5 year peak mean 1991/92-1995/96) <p>Article 4.2 qualification: Over winter the area regularly supports:</p> <ul style="list-style-type: none"> • Teal <i>Anas crecca</i> - 3.3% of the population (5 year peak mean 1991/92-1995/96) • Northern Lapwing <i>Vanellus vanellus</i> - 0.5% of the population (5 year peak mean 1991/92-1995/96) <p>Assemblage qualification: Over winter the area regularly supports: 73,014 waterfowl (5 year peak mean 01/04/1998).</p>	16 km from the main site
Somerset Levels and Moors Ramsar 6,388 ha	<p>Criterion 2: Supports 17 species of British Red Data Book invertebrates.</p> <p>Criterion 5: A wintering waterfowl assemblage of international importance - 97,155 waterfowl (5 year peak mean 1998/99-2002/2003)</p> <p>Criterion 6: Internationally important populations of Bewick's Swan <i>Cygnus columbianus bewickii</i>; Eurasian Teal <i>Anas crecca</i>; Northern lapwing <i>Vanellus vanellus</i>. Also, since designation Mute Swan <i>Cygnus olor</i>; Eurasian Wigeon <i>Anas Penelope</i>; Northern Pintail <i>Anas acuta</i>; and Northern Shoveler <i>Anas clypeata</i>.</p>	16 km from the main site
Mendip Limestone Grasslands SAC 417 ha	<p>Annex I habitats: Semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>); European dry heaths Caves not open to the public; <i>Tilio-Acerion</i> forests of slopes, scree and ravines.</p> <p>Annex II species: Greater Horseshoe Bat <i>Rhinolophus ferrumequinum</i></p>	20 km from the main site
Exmoor and Quantocks Oakwoods SAC 1,895 ha	<p>Annex I habitats: Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles; Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> and <i>Atlantic acidophilous</i> beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer.</p> <p>Annex II species: Barbastelle bat <i>Barbastella barbastellus</i>; Bechstein's bat <i>Myotis bechsteini</i>; Otter <i>Lutra lutra</i></p>	5 km from the main site
Hestercombe House SAC 0.08 ha	Annex II species: Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i>	16 km from the main site
River Usk SAC	Primary Annex I habitats: Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-</i>	40 km

Designated site and area/ha	Summary of site qualifying features	Distance to project
1008 ha	<p><i>Batrachion</i> vegetation.</p> <p>Primary Annex II species: Sea lamprey <i>Petromyzon marinus</i>; Brook lamprey <i>Lampetra planeri</i>; River lamprey <i>Lampetra fluviatilis</i>; Twaite shad <i>Alosa fallax</i>; Atlantic salmon <i>Salmo salar</i>; Bullhead <i>Cottus gobio</i>; Otter <i>Lutra lutra</i></p> <p>Other Annex II species: Allis shad <i>Alosa alosa</i></p>	
River Wye SAC 2235 ha	<p>Primary Annex I habitats: Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation.</p> <p>Other Annex I habitats: Transition mires and quaking bogs.</p> <p>Primary Annex I species: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i>; Sea lamprey <i>Petromyzon marinus</i>; Brook lamprey <i>Lampetra planeri</i>; River lamprey <i>Lampetra fluviatilis</i>; Twaite shad <i>Alosa fallax</i>; Atlantic salmon <i>Salmo salar</i>; Bullhead <i>Cottus gobio</i>; Otter <i>Lutra lutra</i></p> <p>Other Annex II species: Allis shad <i>Alosa alosa</i></p>	60 km
River Tywi SAC 363 ha	<p>Primary Annex II species: Twaite shad <i>Alosa fallax</i>; Otter <i>Lutra lutra</i></p> <p>Other Annex II species: Sea lamprey <i>Petromyzon marinus</i>; Brook lamprey <i>Lampetra planeri</i>; River lamprey <i>Lampetra fluviatilis</i>; Allis shad <i>Alosa alosa</i>; Bullhead; <i>Cottus gobio</i></p>	120 km

Source: JNCC Natura 2000 Standard Data Forms and Information Sheets on Ramsar Wetlands

**NO SIGNIFICANT EFFECTS REPORT
(SCREENING)**

4 TEST FOR LIKELY SIGNIFICANT EFFECTS

What is the likely significant effects test?

- 4.1 An appropriate assessment (AA) is required if a plan or project is likely to have a significant effect (LSE) on a European site, either alone or in combination. An LSE is, in this context, any effect that may be reasonably predicted as a consequence of a plan or project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects.
- 4.2 **The purpose of this test is identify likely significant effects on European sites that may result from HPC and to record the Secretary of State's conclusions on the need for an AA and his reasons for screening activities or sites in or out of further consideration in the AA.**
- 4.3 This section contains an explanation of what has been screened in or out of consideration in the AA, with a summary of the reasoning behind this. It also explains how certain impacts have been treated within the AA.

Sites screened in/out

- 4.4 The 11 sites included for initial consideration are as per Table 1, i.e:
- The Severn Estuary SAC
 - The Severn Estuary SPA
 - The Severn Estuary Ramsar
 - Somerset Levels and Moors SPA
 - Somerset Levels and Moors Ramsar
 - Exmoor and Quantocks Oakwoods SAC
 - Mendip Limestone Grasslands SAC
 - Hestercombe House SAC
 - River Usk SAC
 - River Wye SAC
 - River Tywi SAC
- 4.5 The information provided by the applicant has enabled two of these European sites to be screened out of the AA. These are Hestercombe House SAC and Mendip Limestone Grasslands SAC. This is because the project is located beyond the normal foraging range of the horseshoe bats which are the qualifying feature of these SACs. This is in accord with the approach taken in the RIES. More explanation is provided in **Table 2**.

Table 2. European sites screened out

Site name	Reason for screening out
Hestercombe House SAC	<ul style="list-style-type: none"> • This SAC was designated for a roost of lesser horseshoe bats <i>Rhinolophus hipposideros</i>. These bats have been recorded foraging up to 4 km from roost sites. • The HPC main site is over 16 km away and the Cannington Bypass is over 10 km away from the SAC boundary.
Mendip Limestone Grasslands SAC	<ul style="list-style-type: none"> • This SAC was designated for various Annex I habitats (European dry heaths, caves and Tilio-Acerion forests) all of which are located outside the area of potential effects. • The greater horseshoe bat <i>Rhinolophus ferrumequinum</i> is also a qualifying feature and has been recorded foraging up to 8 km from roost sites. • The SAC is more than 20km from any of the HPC project which is 12 km beyond the normal foraging range of the bat.

Treatment of decommissioning impacts

- 4.6 As outlined in paragraph 2.23, decommissioning of HPC is not expected until 2080. At that point, separate authorisation will be required, as a planning matter, after the preparation of an environmental impact assessment and HRA (including appropriate consultation with the relevant statutory nature conservation bodies). The process of decommissioning would be controlled by a number of other regulatory regimes, including the site licence. It is not possible at this stage to predict with any certainty what the European and Ramsar site context of HPC will be over 60 years in the future – sites may increase or decrease in importance over that time.
- 4.7 However, if the environmental baseline were to be similar to the current situation, then the impacts of decommissioning of the project could be expected to be similar to the anticipated impacts of construction – given the nature of the physical processes involved in decommissioning. There is no reason to suppose that the impacts of decommissioning would be more severe, provided that potential releases of radiation are effectively controlled in accordance with the relevant nuclear safety regimes, which there is no reason to suppose would not be the case.
- 4.8 The decommissioning of the temporary jetty has been covered within the MMO's HRA, where a conclusion of 'no significant effect' was reached. On this basis, the Secretary of State considers that it is reasonable not to include a detailed discussion on decommissioning impacts in this report. He accepts in principle the advice in the RIES that they will be similar in nature to those during construction and he is satisfied that they will be addressed fully by the relevant authorities, prior to decommissioning and in light of more detailed information on decommissioning processes and environmental conditions at that time.

Treatment of the Rivers Usk, Wye and Tywi SACs

- 4.9 These SACs comprise rivers that form tributaries of the Severn Estuary. Although located over 20km from the HPC project, they were included for consideration in EN-6 because of their hydrological connections with the Severn Estuary SAC and Ramsar site and importance for migratory fish. It has been agreed with Natural England (NE) and the Countryside Council for Wales (CCW) that potential effects to the Rivers Usk, Wye and Tywi SACs do not need to be considered if there are no adverse effects on the Severn Estuary migratory fish feature, specifically in relation to Atlantic Salmon, shad and sea lamprey. These are shared populations that are common features of the above sites. This approach has been taken in the EA's HRA for HPC, but not in the RIES.
- 4.10 The Secretary of State considers it appropriate, therefore, to exclude further consideration of impacts on the Rivers Usk, Wye and Tywi SACs here, unless he considers that there are likely to be adverse effects in relation to the shared migratory fish feature of the Severn Estuary SAC/Ramsar.

Treatment of Ramsar sites

- 4.11 UK Government policy is to afford Ramsar sites the same protection as European sites. For the purposes of this assessment, treatment of the Severn Estuary Ramsar designation will be in parallel with the SAC and SPA designations. The boundaries of the SAC/Ramsar designations are contiguous and the qualifying features of the SAC broadly align with the Ramsar, with some exceptions. These are Criterion 8 of the Ramsar site – fish assemblage, which is not included in the SAC qualifying features. Salmon, Sea Trout, Allis Shad and Eel are included in the Ramsar, but not the SAC designation. Conservation objectives for fish assemblage and species mentioned above will therefore be included under an overarching “Severn Estuary SAC/Ramsar” or “Seven Estuary SPA/Ramsar” depending on the features in question.
- 4.12 The same approach is taken for the Somerset Levels and Moors SPA and Ramsar site. In this case, one of the Ramsar qualifying criterion relates to invertebrates, which is not covered by the SPA designation, however, this is not a relevant feature for consideration in this HRA.

Treatment of air quality impacts

- 4.13 Air quality has been addressed by the applicant in their ES, with impacts of air quality on European sites screened out as negligible. The EA has assessed impacts on air quality, due to combustion processes, in their HRA. This concluded that there would be no adverse impact on the integrity of any European site. Air quality issues have not been raised as a concern by the SNCBs or any interested parties during the examination period. On this basis, air quality are not considered any further in this report.

Likely significant effects

4.14 The Secretary of State has considered the potential construction, operational and decommissioning impacts of HPC on the interest features of the European sites listed in **Table 1** to determine whether there will be LSE in the context of the Habitats Regulations. LSEs as a result of HPC are summarised below, with more detail included in the screening matrices in the RIES.

Seven Estuary SAC/Ramsar (see *RIES Matrices A1, A3, A11, A13*)

- 4.15 Likely significant effects have been identified on **estuary features and other habitats**. The temporary jetty, the seawall, cooling water infrastructure and Combwich Wharf could lead to habitat loss and modification. Dredging works and the disposal of dredged materials could also result in hydrodynamic and sediment transport changes, as could scour around the temporary jetty structure. Coastal “squeeze” could be worsened as habitats are trapped behind the sea wall, which would form a fixed landward boundary.
- 4.16 The thermal and chemical properties of the cooling water discharge have potential to affect water quality. The EA considers that Total Residual Oxidant (TRO) and hydrazine in the cooling water discharges would be above the relevant standards, unless controls are applied. The increased temperature of the cooling water discharges could result in a thermal “plume” in the estuary, with potential impacts on benthic species. Discharges from land-based works, increased areas of hard-standing, sewage and runoff from construction works could affect water quality.
- 4.17 Any change in water quality could then potentially affect the **estuary features; sabellaria reef; the subtidal sandbanks; Atlantic salt meadows; and the intertidal mudflats and sandflats** that are features of the Severn Estuary SAC/Ramsar.
- 4.18 **Migratory fish populations**, the **fish assemblage**, planktonic organisms and *Sabellaria* larvae could be affected by impingement/entrainment through the cooling water system. Fish may also be disturbed by underwater noise due to piling for the refurbishment and the operation of Combwich Wharf. The thermal plume from the cooling water may affect migratory behaviour, causing an obstruction to migration in and out of the River Parrett and Bridgwater Bay. There may also be disturbance to fish from an increase in underwater noise levels and artificial lighting around Combwich Wharf, the temporary jetty, seawall and cooling water infrastructure.
- 4.19 Changes in water quality and hydrodynamic regimes may result from increased vessel movements; sediment disturbance during berthing operations; maintenance dredging; and accidental or emergency spillages.

Seven Estuary SPA/Ramsar (See *RIES Matrices A2, A3, A12, A13*)

- 4.20 Important **waterbird species** and **assemblages** using intertidal areas may be disturbed and displaced due to noise and increased human activity as a result of the construction works along the foreshore of HPC (temporary jetty, seawall) by tunnelling works for the cooling water infrastructure and by Combwich Wharf refurbishment (River Parrett.) Piling and construction during winter months could result in displacement of wintering SPA birds that feed on the exposed mudflats.
- 4.21 Birds could be affected by increased vessel movements to and from Combwich and the jetty as well as small-scale intertidal habitat losses either direct or indirect, due to erosion of mudflats due to the wash effects from vessels. The main bird species of concern are Shelduck, particularly during their moulting phase in summer when they are flightless. Indirect impacts on the birds could result if there were any impact on their food resource (benthic invertebrate communities), for example due to water quality changes.
- 4.22 **Bewick's Swan**, the only Annex I species listed for the SPA site, would not be affected as they do not occur within the vicinity of HPC and this species will not be considered in the AA.

Somerset Levels and Moors SPA / Ramsar (see *RIES Matrices A4, A5, A14, A15*)

- 4.23 Teal, Wigeon and Pintail from this SPA / Ramsar site may use the Seven Estuary habitats adjacent to the HPC main site. Thus, there may be impacts on the **assemblage of birds** and key species for which this site is designated. Likely impacts will be as per the Severn Estuary SPA/Ramsar birds. Populations of wintering migratory birds and Golden Plover (Annex 1 species) may be affected by loss of habitat and disturbance to feeding or roosting as a result of the associated development. Golden Plover have been recorded in an area surrounding Cannington Bypass and at low tide near Combwich Wharf.
- 4.24 No likely significant impacts are predicted on the **Bewick's Swan** (Annex I species) nor on **invertebrates** in respect of the Ramsar site criterion and so no further consideration will be given to these features in this assessment.

Exmoor and Quantock Oakwoods SAC (see *RIES Matrices A6, A16*)

- 4.25 **Barbastelle bats**, which may be part of the SAC population, have been recorded commuting through and, to a lesser extent, foraging in the HPC main site, at Combwich Wharf and the freight laydown site, and around Cannington Bypass and Cannington Park and Ride sites. Bat foraging and their commuting routes could be disrupted by site clearance during construction and by artificial lighting. There would be some habitat loss from within the main site, although habitat corridors used by the bats would be retained and other areas enhanced.
- 4.26 The other features of the SAC (**Old sessile oakwoods, alluvial forests, Bechstein's bat and Otter**) would not be affected and no further consideration will be given to these features in the AA.

Cumulative and in-combination effects

4.27 In line with the approach taken by the applicant and in the RIES, cumulative effects are taken to be the summation of all the sub-projects (main site + associated development) which make up the HPC DCO application. In-combination effects are taken to be the interaction between the whole HPC project (the DCO application) and other relevant plans and projects.

Cumulative effects – HPC main site with associated developments

4.28 Construction of the temporary jetty and the seawall could take up to 24 months and may overlap by six months, leading to increased disturbance of the foreshore in front of the main site. Concerns have been expressed by the SNCBs about the concurrent operation of the temporary jetty with Combwich Wharf and the potential disturbance effects on SPA birds.

4.29 The refurbishment of Combwich Wharf may overlap with the construction of the seawall and cooling water infrastructure, potentially leading to additive disturbance effects on birds. The seawall and the jetty will both lead to habitat loss, although the area lost is small in the context of the estuary.

4.30 Effects on migratory fish species (eels and Atlantic salmon) may result from cumulative effects of piling during the construction of the temporary jetty, Combwich Wharf and the cooling water infrastructure.

In-combination effects - HPC with other plans and projects.

4.31 The following plans and projects may affect some of the same European sites as HPC and have been screened in for further consideration:

- The continued operation of Hinkley Point B (HPB) Power Station;
- National Grid Hinkley C Connection Project;
- Bristol Deep Sea Container Terminal Avonmouth (BDSCT) compensatory habitat creation for the BDSCT project on the Steart Peninsula;
- Withy End Wind Farm;
- Black Ditch Wind Farm; and
- The proposed new Oldbury Nuclear Power Station, South Gloucestershire.

The reasons for screening these plans and projects in (and others out) is set out in the RIES and Sections 9.3 and 9.4 of the applicant's HRA.

Conclusions on Likely Significant Effect

4.32 The Secretary of State agrees with the Panel that an AA is required and that this should cover the whole HPC development (i.e. the main site and associated development, including the marine works and the cooling water abstraction and discharge) but excluding any consideration of nuclear issues, matters screened out as not likely to be significant and issues that would require excessive duplication of text from the EA and MMO's individual HRAs. The Secretary of State considers that sufficient information has been provided by: the applicant; the SNCB's; the regulators (specifically the EA and the MMO in their respective assessments); and in other

written representations to inform a robust overarching assessment in line with his duties under Regulation 61.

4.33 Having given due consideration to the information and analysis presented to him, the Secretary of State considers that the following European sites should be included within the AA and an assessment made with respect to their conservation objectives, as set out in Annex A:

- Seven Estuary SAC/Ramsar (all features)
- Seven Estuary SPA/Ramsar (assemblage of migratory waterfowl and key bird species, excluding Bewick's Swan)
- Somerset Levels and Moors SPA / Ramsar (assemblage of migratory waterfowl and key bird species, excluding Bewick's Swan and Ramsar invertebrates feature)
- Exmoor and Quantock Oakwoods SAC (Barbastelle bat feature only)

APPROPRIATE ASSESSMENT

Seven Estuary SAC/Ramsar

Seven Estuary SPA/Ramsar

Somerset Levels and Moors SPA/Ramsar

Exmoor and Quantock Oakwoods SAC

5 INTRODUCTION

What is the site integrity test?

- 5.1 An Appropriate Assessment (AA) is triggered when the competent authority, in this case the Secretary of State, determines that a plan or project may result in a likely significant effect on a European site. Its purpose is to determine whether or not adverse effects on the integrity of the site, as a result of the plan or project, can be ruled out either alone or in combination with other plans and projects, in view of the site's conservation objectives.
- 5.2 The purpose of this AA is to **determine whether or not adverse effects on the integrity of the Severn Estuary SAC/Ramsar; the Severn Estuary SPA/Ramsar; the Somerset Levels and Moors SPA/Ramsar; and the Exmoor and Quantocks Oakwood SAC can be ruled out as a result of the proposed HPC development alone and in combination with other plans and projects. This is in view of the sites' conservation objectives and using the best scientific evidence available.**
- 5.3 If the AA cannot ascertain the absence of an adverse effect on site integrity, then, under Regulation 62 of the Habitats Directive, alternative solutions should be sought. In the absence of a feasible alternative, the project can proceed only if there are imperative reasons of overriding public interest (IROPI). IROPI issues are not considered here.

Conservation Objectives

- 5.4 European Commission guidance indicates that disturbance to a species or deterioration of a European site must be considered in relation to the integrity of that site and its conservation objectives where site integrity is defined as:
- "...the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified."*
- 5.5 Conservation objectives outline the desired state for any European site, in terms of the interest features for which they have been designated. If these interest features are being managed in a way which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on integrity 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 its designation.
- 5.6 Conservation objectives and advice on operations are provided by statutory nature conservation bodies (SNCBs) in this case NE and CCW under Regulation 33 (now Regulation 35) of the Habitats Regulations. The conservation objectives for the Severn Estuary SAC/Ramsar and SPA/Ramsar; the Somerset Levels and Moors SPA/Ramsar; and the Exmoor and Quantocks Oakwood SAC; are set out in **Tables 3 – 6** and included in **Annex A**. In the assessment **sections 6-9**, the relevant conservation objectives are summarised for each site

feature screened into the AA, followed by a description of how the activities that make up HPC may affect each feature. Where a conclusion on adverse effects takes into account mitigation, cross-references are made to the DCO requirement or the EA Environmental Permit conditions that are the means for securing this mitigation.

- 5.7 There are often no set thresholds at which impacts on site integrity are considered to be adverse. This is a matter for interpretation on a site by site basis, depending on the designated feature and nature, scale and significance of the impact. However, where possible, impacts are quantified and further information sources signposted. Impacts are described for the construction and operational phase of the development (with decommissioning taken to be largely the same as construction). Main site and associated developments are shown separately, followed by a discussion of any cumulative or in combination effects. At the end of each section, a summary of conclusions and relevant DCO/Permit conditions is presented in table form, for ease of cross-reference.

6 SEVERN ESTUARY SAC/RAMSAR

- 6.1 The Severn Estuary SAC and Ramsar has been designated on the basis of six important features, for which conservation objectives have been set. These features are: estuaries; subtidal sandbanks; intertidal mudflats and sandflats; Atlantic salt meadows (saltmarsh); biogenic reefs and migratory fish and fish assemblage. All of these features could be affected by HPC and are considered in turn in this section.

Feature 1 - Estuaries

Introduction

- 6.2 The Severn Estuary is important for its immense tidal range, which affects the physical environment, the diversity and productivity of the biological communities. The tidal range is the second largest in the world, reaching in excess of 13m in some areas. This large tidal environment is partly due to the estuary's funnel shape which concentrates the tidal wave as it moves up the Bristol Channel.
- 6.3 Large tidal currents are a dominating feature, providing a mechanism for transport of particles leading to high turbidity levels. In turn, the relatively sharp divisions between muddy, sandy and rocky areas dominate the distribution of communities beneath the mud and sand (benthic communities). These factors make the Severn Estuary important in representing one of the most dynamic estuarine systems in the world. The estuaries feature is complex and encompasses various species within the water column and beneath the mud and sand, along with various habitats, such as intertidal and sub-tidal mud and sand flats, which link to the fringing saltmarsh and other surrounding terrestrial habitats. The feature also includes a rocky shore habitat as a sub-feature, which is the main habitat adjacent to the HPC main site.
- 6.4 The following impacts could affect the Estuary feature and are considered in this section:

Water quality

Impacts on entrained organisms

Habitat loss and physical damage

Changes in hydrodynamics and sediment transport

Water quality

Conservation objectives

- *The total extent of the estuary is maintained;*
- *The physico-chemical characteristics of the water column support the ecological objectives;*
- *Toxic contaminants in water column and sediment are below levels, which would pose a risk to the ecological objectives;*
- *The characteristic range and relative proportions of sediment sizes and sediment budget within the site is maintained;*
- *The extent, variety, spatial distribution and community composition of notable communities is maintained; and*

- *The abundance of the notable estuarine species assemblages is maintained or increased.*

Alone assessment

Construction

a) Water quality - contamination

- 6.5 A new sea wall is proposed along the shoreline in front of the power station to improve flood defence and to minimise the degree of wave overtopping on the site. The construction of the sea wall has the potential to affect the water quality through sediment discharges to the foreshore and impact on *Corallina officinalis* (calcareous red seaweed), which is sensitive to sediment. *Corallina* forms part of the rocky shore in front of the HPC site.
- 6.6 The EA has assessed the impact of water quality from the construction of the sea wall on *Corallina* and concludes that there would be a minimal amount of water discharge and any small amounts would be diluted by the tide. Nevertheless, a requirement has been included in the DCO (PW17) to ensure that the cross-shore rock platform is monitored for erosion and sediment transport throughout construction. DCO requirement PW14 will ensure that construction is carried out in accordance with the Code of Construction Practice (CoCP).
- 6.7 Discharge of concrete leachate and dewatering from the construction of the sea wall would be controlled via a surface and foul water drainage system, which would include means of pollution control, water management zones and a programme of construction and implementation. There are two relevant water quality requirements included in the DCO, one which relates specifically to the site preparation works (P10) and another that relates to the main site construction works (MS30). Both will ensure that the details of surface water drainage are agreed by the relevant authorities, prior to construction.
- 6.8 A requirement is included in the DCO (P10) to ensure that the details of such surface water drainage are agreed by the relevant authorities prior to construction.
- 6.9 The EA has incorporated two pre-construction measures in their construction permit EPR/JP3122GM (issued 29/02/2012), requiring the applicant to provide a Surface Water Drainage System report for EA approval, following completion of detailed contractor design (PO-01) and also to provide the final designs for the Water Management Zones for EA approval (PO-08).

Operation

a) Water quality –contamination

- 6.10 The operation of HPC will involve the discharge of cooling water direct to the Severn Estuary. This activity requires an EA discharge consent, issued on 13 March 2013. Total Residual Oxygen (TRO) and hydrazine in this discharge were screened into the EA's HRA as possible contaminants.

6.11 The EA examined the maximum loadings along with the mixing zones for both TRO and hydrazine and their potential impacts on the relevant Severn Estuary habitats. The EA does not consider the mixing zone for TRO to be significant, as it was restricted to small areas around the outfall diffusers. However, the maximum load for hydrazine and the potential mixing zone for this maximum load were potentially significant and the EA could not rule out the potential for an adverse effect on the integrity of the Severn Estuary SAC without appropriate mitigation. Therefore, the environmental permit for the operational discharges requires that hydrazine is removed from the relevant waste streams before discharge in pre-operational measure 10 (EPR/HP3228XT PO10). This permit was issued on 13 March 2013 with the relevant condition in place.

b) Water quality – thermal regime

6.12 The EA has assessed the potential impact of the thermal plume from the cooling water discharge on the water column of the receiving waters and on the sea bed. It concludes that the main area of impact of the thermal plume is on the sea bed and its associated benthic ecology, as this may be subject to a persistent temperature increase, depending on the behaviour and mixing of the thermal plume. The potential impacts of the thermal plume on the communities in the sub-tidal and intertidal habitats are discussed under the relevant interest features in paragraphs 6.64 – 6.65.

6.13 In relation to the Estuaries feature, the EA examined the size of the mixing zones in relation to target values. The results show that the mixing zone for a temperature increase of 2°C is less than 1% of the Estuaries' feature total mixing zone, but at or just greater than 1% for the SPA's mixing zone. However, the percentages for the maximum temperature of 21.5 °C as a 98%ile were greater than 1% for both the Estuaries feature and the SPA.

6.14 The EA concludes that, although the size of the mixing zone for the thermal discharge from HPC alone would be quite large, there is a lack of any significant effect from the present HPB discharge on the benthic communities in the sub-tidal area and intertidal mudflats and sandflats as a result of a similar scale of impact. HPB outfall is located directly in front of the power station foreshore and discharges directly onto the mud and sand flats and is therefore thought to have a larger direct impact than the HPC outfall, which will be located 1.8 km offshore. The species most likely affected by the potential rise in water temperature from the thermal plume is the Baltic clam, (*Macoma balthica*). This species is a significant component of the benthic community of the intertidal mudflats and sandflats and subtidal soft sediments and the consideration as to whether this temperature increase is acceptable is discussed in the intertidal mudflats and sandflats assessment in paragraphs 6.64 – 6.65.

6.15 The EA also concludes that there would be only a minor effect from the temperature increase in the thermal plume on the dissolved oxygen and ammonia levels in the waters off HPC. Further to this, the Applicant's HRA report concludes that the small rise in temperature over the

intertidal rock communities at HPC would not be expected to give rise to significant change in the extent of the *Corallina* community.

- 6.16 The EA's environmental permit for the operational discharges requires the operator under pre-operational measure 11 (EPR/HP3228XT PO11), issued on 13 March 2013, to submit to them for approval an Environmental Monitoring Plan for the Severn Estuary SAC, SPA and Ramsar, for the purpose of post-scheme appraisal. This would propose methods to determine the physical, chemical and biological characteristics of the area potentially affected by the water discharge and procedures for assessing effects and reporting results.

Associated Development

- 6.17 The construction works for the refurbishment of Comwich Wharf could cause an impact on water quality of the SAC/Ramsar due to releases of polluting materials to the River Parrett from work areas and areas of hard-standing during construction. During the operation, there could be releases of polluting materials via drainage systems serving the wharf, the freight management and storage facility, and from vessels.
- 6.18 The EA requires a number of pollution prevention protocols to control and manage pollution. These include: an environmental management and monitoring plan; a water management plan; and a waste management plan. A surface water drainage requirement for Comwich is contained within the DCO (C14) and surface and foul water drainage systems would need to be submitted to the relevant authorities for approval.
- 6.19 Surface water drainage requirements are in place for all the relevant associated development e.g. Cannington Park and Ride (CP12), Junction 23 (J23-12) and for the construction and operation of Cannington Bypass (CB11). This will ensure that the River Parrett is protected from pollution from land-based works and areas of hardstanding.
- 6.20 Accidental releases of contaminants could find their way into the River Parrett during the refurbishment of the wharf. For example, accidental deposition and run-off from concrete could cause acidity changes in the receiving water, or oil and chemicals from machines could cause contamination. Requirements are contained in the DCO (PW14) to ensure the construction is carried out in accordance with the Code of Construction Practice (CoCP) and that a scheme is in place at Comwich to treat and remove suspended sediments and potential contaminants from surface water prior to discharge (C15).
- 6.21 The applicant confirms that no maintenance dredging will take place around Comwich at this stage. If maintenance dredging is needed, then a separate licence will be required, which would be subject to an HRA.

Cumulative and in combination effects

Construction

- 6.22 The EA states that during construction, there are likely to be mixing zones of construction discharges across the foreshore, which may have an in combination impact with HPB operational discharges. The mixing zones from the construction discharges and the tunnelling water discharge will be coincident in time and will occur from the same place on the foreshore.
- 6.23 The mixing zone of TRO for HPB does not appear to coincide spatially with the construction discharges across the foreshore, so the effects are not potentially additive. The EA calculates that the potential mixing zone from the construction discharges would be about 100 m² (0.01 ha). When combined with the mixing zones of TRO from the HPB operational discharge, this would give an in combination impact of less than 0.2% of the Estuaries feature for the mixing zone both at the sea bed and at the surface. Therefore, the in combination impact is considered to be insignificant.

Operation

a) Water quality –contamination

- 6.24 The EA has carried out a cumulative and in combination assessment for water quality impacts on the estuaries feature by looking at proposed plans, projects and existing permits. The main area of concern was the impact of discharges from HPB with HPC.
- 6.25 The EA considers that the mixing zones of TRO and hydrazine from the HPC operational discharges would not overlap spatially. However, because the maximum concentrations of hydrazine were not used within the modelling, it caused uncertainty in the EA's results and therefore, as a precautionary measure, the EA has decided require the removal hydrazine from before discharge in pre-operational measure 10 of its environmental permit (EPR/HP3228XT PO10), issued on 13 March 2013.
- 6.26 The annual loads of other contaminants in the operational discharges from HPC have been assessed by the EA e.g. iron, dissolved oxygen, pH and ammonia, with modelling undertaken as appropriate to determine in combination effects. These were judged to be either insignificant or below the annual average Environmental Quality Standard (EQS).

b) Water quality – thermal regime

- 6.27 A major factor in the in combination assessment of thermal discharges is the proximity of the other discharges to the proposed cooling water discharge from HPC. The HPB cooling water discharge is about 2.5 km, to that from the proposed HPC site and it was the only project considered to be of significance. HPB is expected to cease operating in 2023.
- 6.28 Using modelling from the applicant's HRA along with its own calculations, the EA looked at the combined areas of the mixing zones for HPC working at 70% and at HPB at 100%, which was calculated to be approximately 2 years of overlap (2018-2020), and also both working at 100%,

which was calculated to be 3 - 4 years overlap (2020-2023). Once power generation ceases at HPB, there will be no thermal load in the subsequent decommissioning discharges. The results showed that with both HPB and HPC working at 100%, the percentage area affected by 2°C temperature rise was 2.67% and 2.59% for the SAC surface and seabed respectively, and 4.89% and 5.08% of the SPA surface and sea bed respectively. The percentage area affected by 3°C temperature rise was 2.67% and 2.59% for the SAC surface and bed respectively, and 2.72% and 3.03% of the SPA surface and sea bed respectively.

- 6.29 As discussed previously, the species most likely affected is the Baltic Clam (*Macoma balthica*). This species forms a significant component of the benthic community of the intertidal mudflats and sandflats, and subtidal soft sediment. All other relevant species are deemed unlikely to be negatively impacted by the combined effect on water temperature. UK *Corallina* species are not temperature sensitive in the range 20-26°C, so an adverse effect on integrity is not predicted by the EA.
- 6.30 The applicant has recently released revised construction and operation start dates (Ref: Marine Technical Forum, January 2013), indicating that the period of HPB and HPC overlap would be likely to be shorter than previously thought. The most recent information suggests that HPC would be working at 70% between 2019 – 2021 and at 100% between 2021-2023 i.e. an overlap of 3-4 years and not 5-6 years as originally envisaged. This strengthens the conclusion of no adverse effect on integrity from the combined HPB and HPC thermal impacts.

Conclusion – water quality

- 6.31 The Secretary of State has considered the potential impacts of changes to water quality on the Estuaries feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirements in place, alongside the relevant EA Environmental Permit conditions, issued on 13 March 2013, the water quality impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Impacts on entrained organisms

Conservation objectives

- *The total extent of the estuary is maintained;*
- *The extent, variety, spatial distribution and community composition of notable communities is maintained;*
- *The abundance of the notable estuarine species assemblages is maintained or increased*

Alone assessment

Operation

- 6.32 HPC will require up to 134m³/s of water for direct cooling, which will be abstracted from the Severn Estuary via a series of seabed intake structures and tunnels. The abstraction of seawater from the Bristol Channel means that organisms present in the water will be drawn into the water intakes. These organisms can include anything from planktonic bacteria and algae to

macro-invertebrates and fish. Larger organisms (>25mm length) will be impinged on the cooling water intake screens and removed from the fine-mesh (5mm) drum screen employed to prevent debris entering the cooling water heat exchangers. Smaller organisms, such as fish eggs and juveniles, are likely to penetrate the cooling water screens, be taken through the cooling water system and returned via the thermal discharge to the estuary. This process, known as “entrainment”, has the potential to affect estuarine species and therefore the overall estuarine form and function.

- 6.33 The EA investigated the impact of entrainment of planktonic organisms within their HRA using data provided by the applicant, together with extensive desk-based research. The EA looked at the combined forces of entrainment including, mechanical, temperature, pressure and chemical changes, which act on phytoplankton, zooplankton (including *Sabellaria larvae*). Fish eggs and juvenile fish small enough to pass through the filter screens are covered under the migratory fish/fish assemblage assessment (paragraphs 6.136-6.140).

Phytoplankton (microalgae)

- 6.34 Based on a worst case scenario of temperature and chlorine dosing it has been calculated that 0.7% of the phytoplankton cells in the plume volume would be killed per day. Assuming phytoplankton are uniformly distributed over the entire inner channel, operation of HPC could lead to the loss of 0.05% of the inner channel phytoplankton abundance per day, which is deemed to be insignificant.

Zooplankton (tiny free-floating organisms)

- 6.35 Annual patterns of abundance from HPB entrainment studies showed that small shrimp-like crustaceans (mysids and caridean decapods) make up a significant proportion of the zooplankton biomass within the Bristol Channel and Severn Estuary and were studied in detail. For mysids, based on a worst case scenario and using the applicant’s HRA supporting document SP063 (BEEMS Scientific Position Paper 063)², it was calculated that there would be a loss of 0.08% per day, which was considered insignificant. For copepods, it was concluded that entrainment mortality in the summer at HPC would represent 0.016% of the inner channel population per day. This was also considered insignificant. Studies suggest that zooplankton play a minor role in the Inner channel of the Severn Estuary.

Sabellaria larvae

- 6.36 Before settling on substrate to build reefs, *Sabellaria larvae* spend anything between six weeks and six months in the plankton and therefore have the potential to be entrained through the cooling water system. The applicant’s HRA was supported by an assessment on *Sabellaria larvae* entrainment, BEEMS Scientific Support Paper 066 (SPP066), which looked at a

² BEEMS Scientific Position Paper 063 (SPP063). Entrainment impact on organisms at Hinkley Point supplementary note. October 2011. Cefas report prepared for EDF.

numerical simulation model of eggs being released from potential *Sabellaria* habitat and being transported by passive tracers by the currents. Assuming 100% entrainment mortality, the predicted worst case loss of larvae was calculated as 0.33% per day which was considered insignificant given that the natural mortality is estimated at 9% per day. Other zooplankton species studied were considered to be not be adversely affected by entrainment.

Cumulative and In combination effects

- 6.37 The cumulative effects of HPC together with other potentially significant power station abstractions around the Severn Estuary were considered within the EA's HRA and included the existing Oldbury, Aberthaw and HPB power stations. Although the power stations could be considered 'background' i.e. all have been operational for more than 20 years and no significant effects to the Severn Estuary have been quantified, the EA estimated the potential cumulative impacts for a perspective on potential impacts, which are summarised below:
- 6.38 The total cumulative loss of phytoplankton was estimated to be 0.09% which not considered to be significant, particularly since new blooms of phytoplankton from neighbouring sub-regions were likely to quickly replenish any losses. CCW previously had concerns with regard to the entrainment of planktonic organisms (including *Sabellaria* larvae), however it confirmed within its response to the RIES that it is satisfied with the assessments carried out by the EA and no longer has concerns.
- 6.39 Zooplankton key species (copepod and mysid) were assessed as having less than 0.2% of their populations entrained per day, which was considered insignificant. This was based on the natural productivity of the species and the evidence that a higher proportion of zooplankton species are found in the outer channel rather than the inner channel and inner estuary where HPC and the other power stations are located.
- 6.40 Decapods, such as the common brown shrimp (*Crangon crangon*) were assessed as potentially having 2.87% of their population entrained from the estuary per day cumulatively from all four power stations. However, evidence from HPB impingement surveys suggests that the production/ biomass ratio of *C. crangon* has increased over the past 25 years, despite potential effects from entrainment or impingement. As shrimp populations are density dependant, any reductions in the population due to entrainment and impingement would be rapidly filled by new recruits and therefore cumulative entrainment impacts were not considered to be significant.
- 6.41 There is no data on the entrainment mortality of *Sabellaria* larvae associated with HPB. Therefore, the EA took a similar set of parameters to those used in the calculations for HPC and predicted the worst case loss from the cumulative effects of HPC and HPB to be 0.55% per day. As the calculations are conservative, and based on maximum abstraction rates, 0.55% is considered to be insignificant.

Oldbury B

6.42 If the application for Oldbury B is successful, then the predicted start up for operation is around 2023-2025. No information is currently available on the potential effects of the proposed new nuclear power station at Oldbury with regard to entrainment impacts. However, the scoping report for the proposed new nuclear power station at Oldbury indicates that the new station would abstract less water from the Severn Estuary than the existing Magnox station. This suggests that if Oldbury B becomes operational before Oldbury A discharge licence expires, then the combined impacts would be equal to or less than the current Oldbury.

Conclusion – entrainment

6.43 The Secretary of State has considered the potential impacts of entrainment on the Estuaries feature of the Severn Estuary SAC and Ramsar and concludes that, as reflected in the above studies, the entrainment impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Habitat loss and physical damage

Conservation objectives

- *The total extent of the estuary is maintained;*
- *The characteristic physical form (tidal prism/cross sectional area) and flow (tidal regime) of the estuary is maintained;*
- *The physico-chemical characteristics of the water column support the ecological objectives;*
- *The characteristic range and relative proportions of sediment sizes and sediment budget within the site is maintained;*
- *The extent, variety and spatial distribution of estuarine habitat communities within the site is maintained; and*
- *The abundance of the notable estuarine species assemblages is maintained or increased.*

Alone assessment

Construction

6.44 The construction works for the sea wall require a total width of 30 metres from the top of the foreshore. This area is necessary for the storage of the rock to build the toe of the wall and for machinery to work. An area on the foreshore is proposed to be used for the berthing of barges and unloading of rock material for construction. The inter-tidal 'rocky shore' habitat is part of the estuaries feature as it supports marine fauna, particularly *Corallina* (red algae). The loss of this rocky shore habitat was assessed in the applicant's HRA by mapping the intertidal habitats in the construction area and assessing their level of recoverability. All were found to have a medium to high recoverability, with full recovery expected within 5-10 years. Impacts from the barge berthing area and construction area have been assessed by EA as a percentage of the whole rocky shore SAC/Ramsar feature of the Severn Estuary. The total area impacted equated to 0.29% and the impacts to the rocky shore were, therefore, considered to be insignificant.

6.45 To protect the rocky foreshore during construction, DCO requirement P22 will ensure that construction plant and vehicles are confined to demarcated areas.

Operation

- 6.46 The seawall will be largely in the line of the existing cliff, so will not lead to the loss of any intertidal area; the affected area is not of great ecological interest and does not represent a major feeding resource for migratory fish. DCO requirement PW17 (Cross-shore rock platform erosion and sediment transport monitoring plan), will ensure that the applicant manages the construction works around the intertidal foreshore over the construction period and monitors the inter-tidal rocky shore during construction and operation.

Associated development sites

- 6.47 The only associated development impacts related to habitat loss and physical damage of SAC habitats are inter-tidal mud and sand flats, sub-tidal sandbanks and Atlantic salt meadows, which are covered in the relevant sections. The cooling water infrastructure at HPC will only lead to highly localised effects. The footprint of the offshore infrastructure is minimal in the context of the wider estuary so disruption in flow dynamics would only extend for a short distance beyond the infrastructure, so there would not be any interaction with the hydrodynamic effects of the wider estuary.

Cumulative and in combination effects

- 6.48 The cumulative impacts of the jetty, sea wall and cooling water infrastructure construction was assessed within the applicant's HRA as having an insignificant impact on habitat loss within the Severn Estuary. Habitat loss would also occur as a result of the in combination effects from the construction of the Bristol Deep Sea Container Terminal (BDSCT), but, as this is being compensated for, it is not considered any further. Any impact as a result of the EA's Steart Peninsula Project would be more than offset by the extensive creation of estuarine habitats as a result of this project. The habitat compensation scheme for the BDSCT at Steart would result from tidal scour from the realignment breach. Information on the scale of impact is unavailable but data from other realignment sites suggests that the effect would be unlikely to extend more than a couple of hundred metres from the breach site and up to a few tens of metres in width. Potential cumulative and in combination impacts on habitat loss and physical damage to the estuaries feature are, therefore, regarded as insignificant.

Conclusion – habitat loss and physical damage

- 6.49 The Secretary of State has considered the potential impacts of habitat loss and physical damage on the Estuaries feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirements in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Changes in hydrodynamics and sediment transport

Conservation objectives

- *The total extent of the estuary is maintained;*
- *The characteristic physical form (tidal prism/cross sectional area) and flow (tidal regime) of the estuary is maintained;*
- *The physico-chemical characteristics of the water column support the ecological objectives;*
- *The characteristic range and relative proportions of sediment sizes and sediment budget within the site is maintained;*
- *The extent, variety and spatial distribution of estuarine habitat communities within the site is maintained; and*
- *The abundance of the notable estuarine species assemblages is maintained or increased.*

Alone assessment

- 6.50 The construction and operation of the jetty were assessed within the MMO's HRA and changes to hydrodynamics and sediment transport were considered to have no likely significant effect at the screening stage. However, NE voiced concerns with regards to the potential impact of dredging during construction and maintenance, unless arisings are disposed of within the local sediment transport system. NE advise that the range and relative proportions of sediment sizes and budget should be retained within the estuary system. DCO requirement PW23 requires dredged material to be disposed of within the Severn Estuary SAC to maintain its sediment budget.
- 6.51 There are no predicted effects on the tidal prism³ or cross-section of the estuary from the new sea wall because of the similarity to the existing seawall. The sea wall would be located above the MHWS tide mark and, therefore, only extreme tides would interact with the structure. The new wall would be less energy absorbing than the natural cliff and the applicant proposes scour protection at the toe of the sea wall to mitigate this effect. Rates of long-shore transport and coastal squeeze are not expected to be affected by the sea wall, although it is accepted that it would result in the loss of some sediment supply to the Bristol Channel. The contribution of sand and mud from the present cliff erosion at this location is considered by the EA to be insignificant compared with that from other sources.

Associated developments

- 6.52 The refurbishment of Combwich Wharf has potential to alter the hydrodynamics and tidal properties of the River Parrett by the introduction of new structures below MHWS, causing a permanent alteration of tidal currents. This was assessed by the EA and it was concluded that any changes to the tidal prism would be only a few tens of cubic metres (about a ten thousandth of a percent of the tidal prism) and therefore insignificant. The EA also considered the potential

³ The difference between the mean high-water volume and the mean low-water volume of the estuary

impacts of the alteration to the tidal regime and sediment transport. Using the applicant's HRA and supporting technical documents, the EA concluded that any scour would be negligible. The new wharf would have a similar footprint to the original wharf, and there is no evidence to suggest that the existing facility has any adverse impacts on the hydrodynamics or tidal properties of the River Parrett.

Cumulative and in combination effects

- 6.53 No significant cumulative impacts are predicted in relation to tidal prism or estuary cross section due to the construction and presence of temporary jetty, sea wall and cooling water infrastructure. The footprint for the refurbished Combwich Wharf is largely confined to the existing structure, so no additional cumulative impacts are predicted.
- 6.54 The project infrastructure at HPC would only lead to highly localised effects. The footprint of the offshore infrastructure would be minimal in the context of the estuary, so disruption in flow dynamics would only extend for a short distance beyond the infrastructure. This makes it unlikely that there would be any interaction with hydrodynamic effects for the wider estuary. As the other projects are considered likely to have only localised effects, the in-combination effects of HPC on hydrodynamics and sediment transport would not have an adverse effect on site integrity.
- 6.55 The EA assessed the cumulative and in combination impacts on sediment budget within their HRA and consider that the generation of suspended sediments/increased turbidity from proposed plans and projects, and existing permits would be very localised and temporary or intermittent and could be judged to be negligible.

Conclusion – hydrodynamics and sediment transport

- 6.56 The Secretary of State has considered the potential impacts of changes in hydrodynamics and sediment transport on the Estuaries feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirements in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion of 'estuaries' feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements <i>See Annex B</i>	
Water quality	No	PW17 project wide	Cross-shore platform erosion and sediment transport monitoring plan
		PW14 project wide	Code of Construction Practice
		P10 site preparation works	Surface water drainage plan
		P22 site preparation works	Access to foreshore
		C14 Combwich	Surface and foul water drainage plan
		CP12 Cannington Park	Surface and foul water

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements <i>See Annex B</i>	
		and Ride	drainage plan
		J23-12 Junction 23	Surface and foul water drainage plan
		CB11 Cannington Bypass	Surface and foul water drainage plan
		MS 30 Main site	Surface and foul water drainage plan
		C15 Combwich	Treatment of potential contaminants
		EA Permit EPR/JP3122GM PO1	Surface Water Drainage System report <i>issued 29/02/2012</i>
		EA Permit EPR/JP3122GM PO8	Water Management Zones design report <i>issued 29/02/2012</i>
		EA Permit EPR/HP3228XT PO10	Removal of hydrazine prior to discharge <i>issued 13/03/13</i>
		EA Permit EPR/HP3228XT PO11	Environmental Monitoring Plan <i>issued 13/03/13</i>
Entrainment of planktonic organisms	No		
Habitat loss and physical damage	No	PW17 project wide	Cross-shore platform erosion and sediment transport monitoring plan
Changes in hydrodynamics and sediment transport	No	PW23 project wide	Disposal of dredged material
Overall effect on site integrity	No adverse effect on site integrity		

Feature 2 - Sub-tidal sandbanks

Introduction

- 6.57 The sub-tidal sandbanks feature is slightly covered by sea water all the time. It consists of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20 m below chart datum, but sometimes including channels or other areas greater than 20 m deep. The sediments of the subtidal region off Hinkley are variable, ranging from bare rock to gravels, coarse sands, fine sand and muds, together with various mixed sediment types. This feature comprises some 11,750 ha, of which about 10,450 ha are transient sandbanks. Most of the sub-tidal sandbanks occur in the middle and outer parts of the estuary.
- 6.58 The sub-tidal mud and sand flats are dominated by the Rag worm (*Hediste diversicolor*) and the Baltic clam (*Macoma balthica*). Other species present are the laver spire shell (*Hydrobia ulvae*), and the Catworm (*Nephtys hombergii*). These all provide a food source for birds.
- 6.59 Populations of benthic invertebrates in the Severn Estuary and Bristol Channel are impoverished both in terms of the number of species and their abundance. This is due to tidal

scouring, high turbidity and the shear stresses at the sea bed. The following impacts could affect the sub-tidal sandbanks feature and are considered in this section:

Water quality

Habitat loss and physical damage

Water quality

Conservation objectives

- *the total extent of the sub-tidal sandbanks within the site is maintained;*
- *the extent and distribution of the individual sub-tidal sandbank communities within the site is maintained; and*
- *the community composition of the sub-tidal sandbank feature within the site is maintained.*

Alone assessment

Construction

a) *Water quality - contamination*

6.60 The EA assessed the cumulative impacts on sediment budget within their HRA. All surface and foul water drainage from the construction site would be managed via surface water drainage systems and water management zones. Before construction commences, two requirements are included in the DCO, one which relates specifically to the site works (P10) and another that relates to the main site construction works (MS30), along with two pre-construction measures within the EA's HPC construction permit EPR/JP3122GM, issued 29 February 2012, (PO1 and PO8) would ensure that such systems are appropriately designed and managed.

Operation

a) *Water quality – contamination*

6.61 The only toxic contaminants screened in to the EA's HRA were TRO (to prevent the accumulation of organisms on the intake structure) and hydrazine from the plant discharge. These would be contained in the HPC cooling water and discharged into the Severn Estuary. The EA investigated the impacts of hydrazine and TRO on the sub-tidal sandbank communities.

6.62 TRO - The EA concluded that, although the TRO mixing zone impacted on the sub-tidal area, it did not impact on the sub-tidal sandbanks feature. This suggested that there would be some stress on the benthic communities of the sub-tidal area at levels above the relevant quality standard, but not on those associated with the designated sub-tidal sandbanks feature. Levels are below lethal concentrations and were considered insignificant. To avoid unnecessary dosing of TRO, the EA's environmental permit for operational discharge (EPR/HP3228XT) contains pre-operational measure (PO7) requiring the applicant to provide a report for EA approval setting out their operational strategy to control biofouling, prior to Hot Functional Testing.

6.63 Hydrazine - The mixing zone for hydrazine is similar to that for TRO and would impact on the sub-tidal area of the Severn Estuary SAC. The hydrazine mixing zone would also affect the western edge of the sub-tidal sandbanks feature at the mouth of the Parrett Estuary. The EA considered that the sub-tidal area and the sub-tidal sandbanks would also be impacted by the hydrazine mixing zone for the maximum long-term discharge scenario, although it was not known how extensive that impact would be. Given the uncertainty with the hydrazine plume modelling, it was concluded that treatment to remove hydrazine was needed prior to discharge. Therefore, the environmental permit for the operational discharges requires that hydrazine is removed before discharge in pre-operational measure 10 (EPR/HP3228XT - PO10 Ref). This permit was issued on 13 March 2013, with the relevant condition in place. On this basis, the Secretary of State is satisfied that hydrazine levels will be controlled, so as not to have an adverse effect on the Severn Estuary SAC/Ramsar Estuary feature.

b) Water quality –thermal regime

6.64 The EA concludes that the only prey species in Bridgwater Bay sensitive to increased water temperature is the Baltic Clam (*Macoma balthica*) and therefore this is the critical factor in assessing the impact of the thermal plume. The applicant carried out a comparison of Baltic Clam populations inside the current HPB plume with populations elsewhere in the Severn Estuary. Populations of Baltic Clam on Stert Flats were not found to be significantly different from populations elsewhere in the Severn Estuary. No significant difference was observed between the populations of Baltic Clam on Stert Flats (within the HPB plume) and those on Berrow Flats which are not affected by the HPB plume.

6.65 This was supplemented by desk-based study which suggested that the temperature rises predicted at HPC would not significantly affect Baltic Clam populations. As a precautionary measure, the EA's environmental permit for the operational discharges requires the operator under pre-operational measure 11 (EPR/HP3228XT PO11), issued on 13 March 2013 to submit to the EA for approval an Environmental Monitoring Plan for the Severn Estuary SAC, SPA and Ramsar. This would include monitoring methods to determine the physical, chemical and biological characteristics of the area affected by water discharge and monitoring locations and frequencies and procedures for assessing effects and reporting results.

Cumulative and in combination effects

6.66 The EA has carried out a cumulative and in combination assessment for water quality impacts on the estuaries feature within their HRA by looking at relevant proposed plans and projects and existing permits. The main area of concern is the cooling water from HPB combined with the proposed HPC.

6.67 Based on the modelling of combined thermal plumes, the main impact would be on subtidal muds and mixed sediments. The combined mixing zones do not appear to affect the subtidal sandbanks at the mouth of the Parrett Estuary. The total subtidal area affected by the combined

mixing zone is estimated to be less than 0.5% of the subtidal area at the surface and at the bed and is therefore considered to be insignificant by the EA.

6.68 The EA's pre-operational measure (PO7) for chlorination includes a requirement for an appraisal of the operational conditions and chlorination strategy employed at HPB and a description of how this has been taken into account in defining the proposed strategy for HPC.

Conclusions on water quality

6.69 The Secretary of State has considered the potential impacts of water quality changes on the subtidal sandbanks feature of the Severn Estuary SAC / Ramsar and concludes that, with the relevant DCO and Environmental Permit conditions in place, water quality impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Habitat loss and physical damage

Conservation objectives

- *the total extent of the sub-tidal sandbanks within the site is maintained;*
- *the extent and distribution of the individual sub-tidal sandbank communities within the site is maintained; and*
- *the community composition of the sub-tidal sandbank feature within the site is maintained.*

6.70 There is a potential for habitat loss and physical damage to the sub-tidal sandbanks due to the volume and rate of cooling water discharge. This could lead to scouring of the seabed in the vicinity of the outfall structures. There is also an area of seabed which could be scoured by the intake structures. The area of sub-tidal habitat loss equates to about 0.002% of sub-tidal sandbanks in Bridgwater Bay, which is deemed to be insignificant in relation to the total extent of this habitat occurring in the sub-tidal area of the Severn Estuary SAC.

6.71 There are no impacts from associated development or cumulative and in combination permissions, plans or projects that are considered to adversely affect the sub-tidal sandbanks feature.

Conclusion of 'sub-tidal sandbanks' feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements <i>See Annex B</i>	
Water quality	No	P10 site preparation works	Surface water drainage
		MS30 main site	Surface and foul water drainage plan.
		EA Permit EPR/JP3122GM PO1 and PO8	<i>Issued 29 February 2012</i>
		EA Permit EPR/HP3228XT PO7 and PO10	<i>Issued 13 March 2013</i>
Habitat loss and physical damage	No		
Overall effect on site integrity	No adverse effect on site integrity		

Feature 3 - Inter-tidal mudflats and sandflats

Introduction

- 6.72 Inter-tidal mudflats and sandflats are submerged at high tide and exposed at low tide. The physical structure of the intertidal flats ranges from mobile, coarse-sand beaches on wave-exposed coasts to stable, fine-sediment mudflats. The extensive mudflats and sand flats support vast numbers of benthic invertebrates and these in turn provide food for fish and internationally important numbers of wading birds and wildfowl. The high suspended solid loadings provide an abundant surface area for microbial processes, while at the same time limiting light penetration and primary productivity.
- 6.73 The intertidal mudflats and sandflats closest to Hinkley Point are the Stert Flats and Berrow Flats, which comprise some 5,300 ha, equating to some 26% of the total intertidal mudflat and sandflats feature of the Severn Estuary SAC. The main components of the benthic infauna of the intertidal mudflats and sandflats are the Baltic clam (*Macoma balthica*), Laver spire shell (*Hydrobia ulvae*), Catworm (*Nephtys hombergii*), Bristleworm (*Pygospio elegans*), Mud shrimp (*Corophium volutator*), and Rag worm (*Hediste diversicolor*). The following impacts could affect the inter-tidal mudflats and sandbanks feature and are considered in this section:

Water quality

Habitat loss and physical damage

Changes in hydrodynamics and sediment transport

Water quality

Conservation objectives

- *The total extent of the mudflats and sandflats feature is maintained;*
- *the variety and extent of individual mudflats and sandflats communities within the site is maintained;*
- *the distribution of individual mudflats and sandflats communities within the site is maintained; and*
- *the community composition of the mudflats and sandflats feature within the site is maintained.*

Alone assessment

Construction

a) Water quality - contamination

- 6.74 All surface and foul water drainage from the construction site would be managed via surface water drainage systems and water management zones. Two DCO requirements (P10 and MS30) and two pre-construction measures within the EA's construction permit, EPR/JP3122GM issued 29/02/2012 (PO1 and PO8) will ensure that systems are appropriately designed to the EA's satisfaction.

Operation

a) Water quality – contamination

- 6.75 TRO and hydrazine in the cooling water were the only toxic contaminants screened in to the EA's HRA. The EA investigated their impacts on intertidal benthic communities. Using the applicant's modelling of the TRO mixing zone, the EA conclude that the mixing zone would not extend onto the intertidal mudflats and sandflats, although levels below the relevant water quality standard could impact on Stert Flats. This suggested that there is a potential for some very low level stress on the intertidal flats community, although the concentrations were below any levels considered to be significant, based on a literature review of the chlorination responses of key intertidal species provided by the applicant. These studies indicated that lethal concentrations were higher than the expected concentrations of TRO over the intertidal flats, and impacts were, therefore, not considered to be significant.
- 6.76 Should TRO dosing be required, the applicant indicates that a risk-based intermittent dosing regime would be implemented, based on 'cooling water management in European power stations: Biology and Control of Fouling' and best practice used by EDF Energy Nuclear Generation for its existing nuclear power stations. To minimise unnecessary dosing, the EA's permit for operational discharge (EPR/HP3228XT) contains pre-operational measure PO7 requiring the applicant to provide a report for EA approval, setting out their operational strategy for the control of biofouling prior to Hot Functional Testing.
- 6.77 The mixing zone for hydrazine is very similar to that for TRO, and would not impact on the intertidal area of Stert Flats. However, the EA considers that the intertidal flats would be impacted by the hydrazine mixing zone for the maximum long-term discharge scenario. Given the uncertainty associated with the hydrazine plume modelling, the EA concluded that treatment to remove hydrazine is needed. The EA environmental permit for the operational discharges therefore, requires hydrazine to be removed before discharge (EPR/HP3228XT - PO10). This permit was issued on 13 March 2013 with the relevant condition in place. On this basis, the Secretary of State is satisfied that hydrazine levels will be controlled, so as not to have an adverse effect on the Severn Estuary SAC/Ramsar intertidal mudflats/sandflats feature.

b) Water quality – thermal regime

- 6.78 The only intertidal invertebrate prey species in Bridgwater Bay that is sensitive to increased water temperature is the Baltic Clam (*Macoma balthica*). Thermal plume impacts on *Macoma* are addressed within the subtidal sandflats feature 2, paragraphs 6.64-6.65.

Associated Development

a) Water quality – contamination

6.79 Any changes to water quality are not considered to be significant during the construction or operation of Combwich Wharf or the other associated development sites with a pathway to the Severn Estuary. This has been addressed in the estuaries assessment, feature 1, paragraphs 6.5-6.31, thus, there are not likely to be any consequential effects that would impact on the inter-tidal and sub-tidal mudflat communities.

Cumulative and in combination effects

a) Water quality – contamination

6.80 The EA has carried out a cumulative and in combination assessment for water quality impacts by looking at relevant proposed plans and projects and existing permits. The main area of concern was with existing cooling water discharge from HPB combined with the proposed HPC discharge.

6.81 Modelling of the combined thermal plumes by the applicant demonstrates that the main impacts on the intertidal mudflats and sandflats would be the same as for the HPB mixing zone alone. Although there is potential for some additional stresses to the intertidal flats benthic communities, due to some areas of the combined mixing zone for TRO being above the relevant standard due to the discharge from HPB. However, the concentrations would be below any significant levels. The EA's pre-operational measure PO7 for chlorination includes a requirement for an appraisal of the operational conditions and chlorination strategy employed at HPB and a description of how this would be taken into account in defining the proposed strategy for HPC.

b) Water quality –thermal regime

6.82 The EA investigated the combined potential impacts of the thermal plumes from HPC and HPB on the Baltic Clam (*Macoma balthica*) using existing research and the applicant's HRA technical documents. This suggested that the Baltic Clam in the subtidal and intertidal sediments off HPC within the thermal plume may be more stressed relative to those outside, but that populations are still viable. In support of this, the EA noted that a significant proportion of the clams in the Severn Estuary are juveniles and apparently replenished every year from mature individuals throughout the Severn Estuary, most of which would be unaffected by the combined thermal plume from HPB and HPC.

6.83 The EA's environmental permit for operational discharges requires the operator, under pre-operational measure 11 (EPR/HP3228XT-PO11) to submit an Environmental Monitoring Plan to the EA for approval. This plan would cover thermal plume monitoring, subtidal and intertidal benthic ecology and procedures for assessing effects and reporting the results. This permit was issued on 13th March 2013 with the relevant condition in place.

Conclusion – water quality

- 6.84 Based on the assessments and research carried out by the EA and the applicant, the Secretary of State is satisfied that there will be no adverse effect on the Severn Estuary SAC/Ramsar Estuary feature from either the thermal plume or from contaminants in the cooling water discharges. He has considered the effects from HPC discharges alone and in combination with HPB. He is satisfied that the operational cooling water discharge would be controlled and monitored by the EA, so that no adverse effects would result.
- 6.85 The Secretary of State has considered water quality impacts on the intertidal mud and sand flats feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirements and EA Environmental Permit conditions in place, HPC alone and in combination would not have an adverse effect on site integrity.

Habitat loss and physical damage

Conservation objectives

- *The total extent of the mudflats and sandflats feature is maintained;*
- *the variety and extent of individual mudflats and sandflats communities within the site is maintained; and*
- *the distribution of individual mudflats and sandflats communities within the site is maintained.*

Alone assessment

- 6.86 The only potential habitat loss of concern from the main site was related to the inter-tidal rocky shore, which has been covered under the estuaries assessment, feature 1, see paragraphs 6.44-6.49. Construction and operational activities at Combwich Wharf could erode the inter-tidal habitats, particularly the muddy banks on the north side of the wharf where Combwich Pill meets the River Parrett. Movements of vessels could add to the erosion on the north side of Combwich and cause further erosion on the adjacent bank, as a result of backwash from vessels.
- 6.87 The EA and NE have expressed concerns about tug boats, that could create excessive wash and large currents when not in tug mode. These “wash effects” could cause erosion to the banks of the River Parrett. As the banks of the Parrett are already in unfavourable condition, it was considered that erosion could cause an adverse impact on site integrity due to habitat loss. The applicant issued a report (2012)⁴ clarifying vessel numbers likely to use Combwich Wharf and their speeds. A requirement for a vessel wash/speed monitoring and contingency strategy was agreed between relevant parties and is included in the DCO (C3) to ensure that erosion is monitored along the River Parrett and appropriate contingency measures implemented.

Cumulative and in combination effects

⁴ EDF Energy (2012) Clarification on vessel movements to Combwich Wharf. Letter to Natural England. 15th June 2012.

6.88 The cumulative impacts of the jetty, sea wall and cooling water infrastructure construction is considered to have an insignificant impact on habitat loss within the Severn Estuary. Habitat loss would also occur as a result of the in combination effects from the construction of the Bristol Deep Sea Container Terminal (BDSCT), but, as this is being compensated for, it is not considered as part of this assessment. Any impact as a result of the EA's Steart Peninsula Project would be more than offset by the extensive creation of estuarine habitats as a result of this project.

Conclusion - habitat loss and physical damage

6.89 The Secretary of State has considered the potential impacts of habitat loss and physical damage to the intertidal mud and sandflats feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirement in place, HPC alone and in combination would not have an adverse effect on site integrity.

Changes in hydrodynamics and sediment transport

Conservation objectives

- *The total extent of the mudflats and sandflats feature is maintained;*
- *the variety and extent of individual mudflats and sandflats communities within the site is maintained; and*
- *the distribution of individual mudflats and sandflats communities within the site is maintained.*

Alone assessment

6.90 The sea wall would result in the loss of some sediment supply to the Bristol Channel, as it will protect the cliffs fronting the power station from erosion, however, the overall contribution of sand and mud from cliff erosion at this location to the Severn Estuary is considered to be insignificant. As discussed in paragraph 6.52, the effects at Comwich Wharf on hydrodynamics and sediment transport would be confined to the immediate vicinity of the wharf and would not represent a significant change.

Cumulative and in combination effects

6.91 The applicant's HRA states that the infrastructure at HPC would only lead to localised effects and the EA agrees with this. The footprint of the offshore infrastructure for HPC is minimal in the context of the wider estuary so disruption in flow dynamics would only extend for a short distance beyond the infrastructure. This makes it unlikely that there would be any interaction with hydrodynamics of the wider estuary. As the other projects considered are also likely to have only localised effects, the in-combination effects of HPC on hydrodynamics and sediment transport would not have an adverse effect on site integrity.

Conclusion – hydrodynamics and sediment transport

6.92 The Secretary of State has considered the potential impacts of changes in hydrodynamics and sediment transport on the intertidal mudflats and sandflats feature of the Severn Estuary SAC

and Ramsar and concludes that the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion of inter-tidal mud and sandflats feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements See Annex B	
Water quality	No	P10 site preparation works	Surface and foul water drainage plan
		MS30 main site	Surface and foul water drainage plan
		EPR/JP3122GM–PO1 and PO8	<i>issued 29/02/2012</i>
		EPR/HP3228XT – PO7, PO10 and PO11	<i>Issued 13 March 2013</i>
Habitat loss and physical damage	No	C3 Combwich	Intertidal monitoring and contingency plan
Changes in hydrodynamics and sediment transport	No		
Overall effect on site integrity	No adverse effect on site integrity		

Feature 4 - Atlantic salt meadows (saltmarsh)

Introduction

6.93 There are approximately 1,400ha saltmarsh within the Severn Estuary which constitutes 1.9% of the total SAC area. Climate change threatens the survival of these salt marshes, which are being squeezed between immovable sea defences and rising sea levels. The Severn Estuary saltmarsh provides feeding grounds for very high numbers of wildfowl and waders throughout the winter. At low tide, inter-tidal areas along the upper reaches of the tidal River Parrett comprise of relatively steep mud banks. More extensive areas of open mud and sand are present further downstream of Combwich. There are no stretches of saltmarsh habitat in front of HPC main site, therefore, the only potential impacts to saltmarsh are from associated development works at Combwich and air quality impacts. Potential air quality impacts were not raised as a concern by any interested party. The only other impact of concern for Atlantic salt meadows is habitat loss and physical damage.

Habitat loss and physical damage

Conservation objectives

- *The total extent of Atlantic salt meadow and associated transitional vegetation communities within the site is maintained;*
- *The extent and distribution of the individual Atlantic salt meadow and associated transitional vegetation communities within the site is maintained;*

- *The relative abundance of the typical species of the Atlantic salt meadow and associated transitional vegetation communities is maintained;*
- *The abundance of the notable species of the Atlantic salt meadow and associated transitional vegetation communities is maintained; and*
- *The characteristic stepped morphology of the salt marshes and associated creeks, pills, drainage ditches and pans, and the estuarine processes that enable their development, is maintained.*

Direct loss

- 6.94 Saltmarsh could be lost through the direct effects of structures and also due to erosion from construction and operational activities. The applicant estimates direct loss of saltmarsh to be some 40m² due to the extension of the Combwich Wharf jetty to improve the approach road alignment. This is estimated to comprise less than 0.001% of the saltmarsh habitat in the SAC/Ramsar and is outside of the European site boundary.

Indirect loss

- 6.95 Movement of vessels to and from the wharf could erode saltmarsh, due to excessive wash effects. The applicant issued a report (EDF Energy, 2012)⁵ to clarify vessel movements and speeds at Combwich. The EA and NE had concerns with the frequent movement of smaller vessels, such as tug boats, that have the potential to reach threshold speeds, creating excessive wash and large currents when not in tug mode, eroding the banks of the River Parrett. The banks of the Parrett are in unfavourable condition, due to coastal squeeze pressures, and it was considered that this added erosion could affect site integrity.
- 6.96 The DCO contains a requirement for an intertidal monitoring and contingency plan (C3) to monitor erosion along the River Parrett and implement contingency measures, as appropriate. With this in place, the EA is able to conclude no adverse effects.

Cumulative and in combination effects

- 6.97 The movement of vessels along the River Parrett to Combwich Wharf could act cumulatively with commercial vessels, leading to erosion of fringing areas of saltmarsh, due to wash effects. As described above, the DCO contains a requirement for an intertidal monitoring and contingency plan (C3) and this would also deal with cumulative erosion impacts from vessels.

Conclusion – habitat loss and physical damage

- 6.98 The Secretary of State has considered the potential impacts of habitat loss and physical damage on the saltmarsh feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirement in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

⁵ EDF Energy (2012) Clarification on vessel movements to Combwich Wharf. Letter to Natural England. 15th June 2012.

Conclusion of ‘Atlantic saltmarsh’ feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO requirements See Annex B	
Habitat loss and physical damage	No	C3 Comwich	intertidal monitoring and contingency plan
Overall effect on site integrity	No adverse effect on site integrity		

Feature 5 - Biogenic reefs

Introduction

6.99 The Severn Estuary contains biogenic reefs, formed by the reef-building worm *Sabellaria alveolata*, also known as the ‘honeycomb worm.’ *Sabellaria* reefs are solid (albeit fragile) structures, that are generally raised above the surrounding seabed and make up part of the Severn Estuary’s benthic communities. As such, they provide a habitat that allows many other species to become established. *Sabellaria spinulosa* also exists within the Severn Estuary, but is more associated with building less stable crusts within the sub-tidal area, rather than the large biogenic reefs, that are designated under the SAC. The following impacts could affect the biogenic reefs feature and are considered in this section:

Water quality

Habitat loss and physical damage

Changes in hydrodynamics and sediment transport

Water quality

Conservation objectives

- *The total extent and distribution of Sabellaria reef is maintained;*
- *The community composition of the Sabellaria reef is maintained;*
- *The full range of different age structures of Sabellaria reef are present;and*
- *The physical and ecological processes necessary to support Sabellaria reef are maintained.*

Alone assessment

Construction

a) *Water Quality - contamination*

6.100 The EA has assessed the sea wall construction works, including the potential for concrete leachate and dewatering and accidental spills of oil or fuel that could also impact on the *Sabellaria* reefs close to shore. At high tide, any discharges would be highly diluted and dispersed and therefore, the EA considers that potential effects would be trivial. At low water, discharges would infiltrate through the beach substrate that would filter out much of the sediments and eventually collect on the rock platform and within pools and crevices. This would have a greater impact on habitats in the higher shore, particularly rock pools, rather than those in the mid or lower shore, such as *Sabellaria*.

6.101 Concrete leachate and dewatering will be controlled via a surface and foul water drainage system, which will include means of pollution control and water management zones. At the time of writing, the drainage system had not yet been agreed and so a requirement is included within the DCO (P10) to ensure that surface water management details have to be approved by the relevant authorities, prior to construction.

6.102 To ensure water quality management at the site, the EA has incorporated two pre-construction measures in their HPC construction permit EPR/JP3122GM (issued 29/02/2012.) These require the applicant to a) provide a Surface Water Drainage System following completion of detailed contractor design (PO1) and b) provide final designs for the Water Management Zones that will manage discharges of site drainage (PO8). These both need to be approved by the EA prior to construction.

Operation

Water quality – contamination and thermal regime

6.103 Small amounts of potentially toxic substances would be discharged via the cooling water outfall. *Sabellaria* process large volumes of sea water and remove organic and inorganic particulates and are therefore vulnerable to contamination. The only toxic contaminants screened into the EA's HRA were TRO and hydrazine.

6.104 TRO Although the likelihood of biofouling is low, there may be occasions when cooling water flows are reduced, when organisms could colonise the cooling system, causing blockages. The applicant therefore requires to the ability to chlorinate the cooling system (with TRO) on an occasional basis. The applicant's HRA supporting technical report 153 (TR153) investigated experiments to measure the survival of *Sabellaria* when exposed to seawater containing TRO. The tests indicate that *Sabellaria* is not sensitive to acute levels of TRO. It is thought that TRO may cause a slight irritation to the worms, encouraging them to build larger tubes to avoid the mild irritation. It is of note that the outfall location is not known to support *Sabellaria* reefs and the substrata beneath the outfall is not of suitable reef building material.

6.105 Hydrazine can cause growth inhibition, immobilisation, anomalies and mortality within aquatic organisms. The applicant's modelling shows that, although hydrazine will be present in toxic quantities, it is not expected to persist and its likely impact upon organisms associated with the seabed is predicted to be very low. Its main threat is to species in the water column, such as fish and plankton. As noted previously, the outfall location is not known to support *Sabellaria* reefs and the substrata beneath the outfall is not of suitable reef building material.

6.106 Thermal regime - studies indicate that *Sabellaria* is not sensitive to temperature increases, such as those expected from the thermal plume at HPC. In fact, the elevated temperatures may benefit the species.

Cumulative and in combination impacts

- 6.107 Construction discharges to the foreshore have the potential to impact cumulatively with the jetty and sea wall construction and with the current HPB discharges. However, there are no areas of inter-tidal or sub-tidal *Sabellaria* reef close to the proposed jetty location. The nearest area of reef is almost 1km from the jetty construction area. Any potential impacts would, therefore, be localised and insignificant. There is a patch of *Sabellaria* reef on the foreshore adjacent to the seawall site. However, the impact on toxic contaminant levels is considered to be negligible.
- 6.108 HPC discharges are expected to overlap with the HPB discharge to an extent. However, the only consented toxic contaminant in HPB operational discharges is TRO and there are no reefs around the HPC outfall location. As both discharges would be over 1km apart and *Sabellaria* has a good tolerance of poor water quality conditions and TRO, the *Sabellaria* reef feature would not be adversely affected by in combination effects from HPB and HPC TRO discharges.
- 6.109 Studies at HPB indicate that growth of the tubes in the winter was considerably greater in the thermal plume than at a control site, suggesting that *Sabellaria* and their reefs may in fact benefit from the predicted increase in water temperature.

Conclusion – water quality

- 6.110 The Secretary of State has considered the potential impacts of water quality on the *Sabellaria* reef feature of the Severn Estuary SAC and Ramsar and concludes that, with the relevant DCO requirements in place, alongside the relevant EA Environmental Permit conditions, water quality impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Habitat loss and physical damage

Conservation objectives

- *The total extent and distribution of Sabellaria reef is maintained;*
 - *The community composition of the Sabellaria reef is maintained; and*
 - *The full range of different age structures of Sabellaria reef are present.*
- 6.111 During the construction of the sea wall, large vessels delivering rock would berth on the intertidal foreshore and may directly impact on the *Sabellaria* reefs. The applicant's HRA states that the vessels will traverse the *Sabellaria* on the tide, with the aim of grounding on the designated berthing area as the tide ebbs. There should be no physical damage to the *Sabellaria* reef, although it is noted that a small area of potential *Sabellaria* reef does fall within the rock armour barge berthing and unloading area. This area equates to less than 0.05% of the SAC reef feature and is not considered significant. Nonetheless, a requirement has been included in the DCO (PW17) to ensure that the cross-shore rock platform is monitored for erosion and sediment transport throughout construction. DCO requirement PW14 will ensure the construction is carried out in accordance to the Code of Construction Practice (CoCP).
- 6.112 There are no areas of inter-tidal or sub-tidal *Sabellaria* reef close to the proposed jetty location, that could impact on the reefs feature alone, cumulatively or in combination. The nearest area of reef is almost 1km from the jetty construction area.

Conclusion – habitat loss and physical damage

6.113 The Secretary of State has considered the potential impacts of habitat loss and physical damage effects on the *Sabellaria* reef feature of the Severn Estuary SAC and Ramsar and concludes that habitat loss and physical damage impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Changes in hydrodynamics and sediment transport

Conservation objectives

- *The total extent and distribution of Sabellaria reef is maintained;*
- *The community composition of the Sabellaria reef is maintained;*
- *The full range of different age structures of Sabellaria reef are present; and*
- *The physical and ecological processes necessary to support Sabellaria reef are maintained.*

Alone assessment

6.114 *Sabellaria* require water movement to suspend coarse sand particles to build tubes and so they are generally found in exposed and turbid areas. They can tolerate burial for a period of days or even weeks; however, studies suggest that prolonged burial will cause mortality. *Sabellaria* reefs are, therefore, potentially vulnerable to accumulations or losses of sand.

6.115 The sea wall construction could generate large quantities of sediment and high concentrations of suspended solids. As *Sabellaria* reef is present on the lower foreshore (more than 200m from the construction area) it is unlikely that any discharge from seawall construction works would reach the foreshore area supporting *Sabellaria*. In addition, any discharge would be either highly diluted or greatly dispersed by the time it reaches the *Sabellaria*.

6.116 The construction and operation of the jetty were assessed within the MMO's HRA and changes to hydrodynamics and sediment transport were considered to have no likely significant effect. In support of this conclusion, it is noted that there are no areas of inter-tidal or sub-tidal *Sabellaria* reef close to the proposed jetty location, the nearest area of reef being almost 1km from the jetty construction area.

Cumulative and in combination effects

6.117 The construction discharges could act in combination with discharges from the sea wall and jetty construction, and also with the Bristol Port Steart development and Bristol Port deep sea dredging activity. However, as *Sabellaria* reef is present on the lower foreshore (more than 200m from the seawall construction area) it is unlikely that any discharge from the construction works would reach the *Sabellaria*. In addition, any discharge would be either highly diluted or greatly dispersed by the time it reaches the *Sabellaria*.

6.118 The nearest *Sabellaria* reefs are more than 2km to the north west of the Bristol Port Steart breach site and breaches and development of the creek systems would be made at locations above MHWS so any flushing would be highly localised and would rapidly disperse. Analysis of the Bristol Port dredging project suggests that, while *Sabellaria* is likely to be present within

parts of the dredge and disposal area, they do not constitute reef habitat, as defined under the SAC. Therefore in combination effects are considered to be negligible.

Conclusion - hydrodynamics and sediment transport

6.119 The Secretary of State has considered the potential impacts of changes in hydrodynamics and sediment transport effects on the *Saballaria* reef feature of the Severn Estuary SAC and Ramsar and concludes that HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion of 'reef' feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements – see Annex B	
Water quality	No	P10 site preparation works	Surface and foul water drainage plan issued 29/02/2012
		EPR/JP3122GM PO-01 and PO-08	
Habitat loss and physical damage	No	PW14 project wide	Code of construction practice
		PW 17 project wide	Cross-shore rock platform monitoring
Changes in hydrodynamics and sediment transport	No		
Overall effect on site integrity	No adverse effect on site integrity		

Feature 6 - Migratory fish and fish assemblage

Introduction

6.120 The Severn Estuary is critical for migratory fish, providing a corridor between fresh water and marine habitats, critical for the completion of their life cycle. Salmon, trout, lamprey and shad are anadromous, meaning that they return to freshwater rivers to spawn. Species that make up the rest of the fish assemblage consist of all other fish within the estuary, including marine estuarine opportunistic fish, such as whiting and bass that spend the first few years of life in the sheltered waters of the estuary, where food is abundant and there are fewer predators. The European eel is catadromous, returning to the marine environment to spawn.

6.121 Species that make up the rest of the fish assemblage include marine estuarine opportunistic fish, such as whiting and bass, that spend the first few years of life in the sheltered waters of the estuary, where food is abundant and there are fewer predators. Some species of fish spend their whole life cycle within the Estuary. Most of the knowledge of the fish in the Severn Estuary and Bristol Channel comes from data obtained from fish impinged on the cooling-water intake screens of HPB and Oldbury Power Stations sited along the shore. The following impacts could affect the migratory fish and fish assemblage features and are considered in this section:

Water quality
Entrainment and impingement
Changes in hydrodynamics and sediment transport
Disturbance

Water quality

Conservation objectives

- *The migratory passage of both adults and juveniles through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by poor water quality;*
- *The size of the populations of the migratory fish and assemblage species within the Severn Estuary and the rivers draining into it, is at least maintained and is at a level that is sustainable in the long term;*
- *The abundance of prey species forming the principle food resources for the migratory fish and assemblage species within the estuary is maintained; and*
- *Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives.*

Alone assessment

Operation

a) Water quality –contamination

6.122 TRO and hydrazine from the operational discharges were screened into the EA's HRA. The EA investigated their impacts on fish and undertook an assessment using the applicant's HRA and supporting documents. It examined the maximum loading, the mixing zones and their relationship with fish habitats.

6.123 TRO/chlorine – is used for to prevent the accumulation of organisms on the intake structure. Fish may show behavioural, chronic and acute effects on exposure to TRO. Impacts will depend on the metabolism of the individual species, but generally it affects the gills, causing a change in oxygen consumption, which can lead to death by asphyxiation. The EA did not consider the TRO mixing zone to be significant, as it was limited to small areas around the outfall diffusers. Adult fish are mobile and would avoid any chemical plume. For migratory fish, a chemical plume could act as a barrier to their migratory passage, disrupting their life cycle and the ability to reproduce. However, it was considered that such effects would be unlikely, given the area of chemical impact represents less than 0.3% of the available habitat.

6.124 The applicant has stated that, should TRO dosing be required, a risk-based regime would be implemented, based on 'cooling water management in European power stations: Biology and Control of Fouling' and best practice for its existing nuclear power stations. To minimise unnecessary dosing, the EA's environmental permit for operational discharge (EPR/HP3228XT) contains pre-operational measure (PO7), requiring the applicant to provide a report for EA approval on their operational strategy for control of biofouling, prior to Hot Functional Testing.

6.125 *Hydrazine* -The fate of hydrazine in the aquatic environment is dependent on dilution/dispersion and degradation. Hydrazine can cause growth inhibition, immobilisation, anomalies and mortality in fish and other aquatic organisms. The applicant considers that the River Parrett and the SPA are the more sensitive areas for migratory fish, with other species being relatively unexposed to hydrazine. However, the EA concludes that the maximum load for hydrazine and its mixing zone were potentially significant. The EA could not rule out an adverse effect on the integrity of the site due to the discharge of hydrazine. Therefore, its environmental permit for the operational discharges requires that hydrazine be removed in pre-operational measure 10 (EPR/HP3228XT PO10), issued on 13 March 2013. On this basis, the Secretary of State is satisfied that hydrazine levels will be controlled, so as not to have an adverse effect on the Severn Estuary SAC/Ramsar fish assemblage and migratory fish features.

b) Water quality – thermal regime

6.126 Impacts on fish due to the discharge of thermal effluent include: changes to spawning season; reproductive capacity; feeding behaviour; and recruitment. If temperature is excessive, it may block migration completely. The risk of thermal occlusion of migratory pathways was a primary consideration for the EA. The EA conducted a study of the thermal impacts on fish. This concluded that direct impacts were not a concern, although it was acknowledged that there are likely to be small-scale changes in the composition of the species living close to the estuary bed within the footprint of the thermal plume, with temperature sensitive species avoiding such hotspots. The EA consider that there is no evidence to suggest that HPB is impacting on the fish populations and HPC would have a similar, if not reduced, level of impact.

6.127 The applicant assessed the impact of a thermal barrier by using a standard which requires that estuaries should not be subject to a temperature increase of more than 2°C across more than a 25% cross section for more than 5% of the time. Four different migratory paths through the estuary were considered and at all four locations, the criterion would be met. The EA was satisfied with this assessment.

6.128 The EA environmental permit for the operational discharges requires the operator under pre-operational measure 11 (EPR/HP3228XT PO11), issued on 13 March 2013, to submit to the EA for approval an Environmental Monitoring Plan for the Severn Estuary SAC, SPA and Ramsar, for the purpose of post-scheme appraisal. This will propose monitoring methods to determine the physical, chemical and biological characteristics of the area affected by the cooling water discharge, monitoring locations and frequencies and procedures for assessing effects and reporting results.

Associated developments

6.129 The refurbishment of Combwich Wharf could impact on migratory eel and salmon. These could be affected by discharges from land-based activities, such as site clearance and excavation, or accidental or emergency discharges of polluting substances causing toxic effects, changes in acidity and by secondary effects, such as de-oxygenation or changes in ammonia toxicity.

6.130 A surface water drainage requirement is contained within the DCO (C14) to ensure that the applicant follows relevant pollution prevention protocols and submits written details of a surface and foul water drainage system to be approved by the relevant authorities.

Cumulative and in combination effects

a) Water quality –contamination

6.131 The main area of EA concern was the impact of the HPB discharges combined with those from the proposed HPC. The EA considers that there would be a mixing zone for the toxic contaminant, TRO, in the HPB operational discharges, however, this would be very small, some 0.13% of the estuaries feature at the surface. The loads of other toxic contaminants from the HPB operational discharges were not measurable and were considered to be negligible, as the only consented toxic contaminant is TRO. Hydrazine is not used at HPB, so there is no hydrazine discharge. However, there would be potential for the TRO from the combined HPB and HPC plumes to act in combination with the hydrazine on fish.

6.132 The applicant's modelling indicates that the River Parrett and the SPA are the more sensitive areas for fish and these would be relatively unexposed to hydrazine. However, the EA concluded that the maximum load for hydrazine and its mixing zone were potentially significant and could not rule out an adverse effect. Therefore, the environmental permit for the operational discharges requires that hydrazine be removed in pre-operational measure 10 (EPR/HP3228XT PO10). This was issued by the EA on 13th March with the relevant condition in place. On this basis, the Secretary of State is satisfied that hydrazine levels will be controlled, so as not to have an adverse effect on the migratory fish and fish assemblage features.

b) Water quality –thermal regime

6.133 The combined operation of HPB with HPC is likely to result in higher plume temperatures extending both offshore and west of Hinkley Point, due to the increased thermal loading. The EA investigated the combined thermal impacts and concluded that there were likely to be moderately large areas for which standards were likely to be exceeded. However, despite these exceedances the EA took into account the fact that in view of the vast amounts of literature dealing with thermal discharges, very few large-scale mortalities have occurred which can unequivocally be related to high temperature. It is also apparent that fish can and would avoid the thermal plume and so it was concluded that no direct mortality would be expected. The EA acknowledge that there were likely to be small-scale changes in the composition of fish assemblages within the footprint of both plumes, however coldwater species would avoid hotspots, provided that the plume does not pervade the full channel width and depth.

6.134 There is potential for the combined thermal plumes to create a barrier to migratory fish. The applicant assessed this with reference to the standard described in paragraph 6.127. Of the four

migratory paths through the estuary, one exceeded this standard for HPC and HPB operating at 100%. This was the section from Hinkley Point to Berrow, Burnham, covering migration through Bridgwater Bay to the River Parrett. However, there was an indication that the northeast channel of the Parrett would remain unaffected by significant temperature rises, with excess temperatures of less than 1°C throughout the tide. As such, a clear channel into the Parrett for migratory fish would be maintained and thermal impacts from the cooling water discharge would not adverse effect on site integrity.

Entrainment and impingement

6.135 HPC will require up to 134m³/s of water for direct cooling, which would be abstracted from the Severn Estuary via seabed intake structures and tunnels. Organisms in the seawater would be drawn into the cooling water intakes. Larger organisms, such as fish, would be trapped (impinged) on the cooling water intake screens. Smaller organisms, such as fish eggs and juveniles, are likely to penetrate the cooling water screens and be taken through the cooling water system and returned via the thermal discharge to the estuary (entrainment).

Conservation objectives

- *The total extent of the estuary is maintained;*
- *The extent, variety, spatial distribution and community composition of notable communities is maintained;and*
- *The abundance of the notable estuarine species assemblages is maintained or increased.*

Alone assessment

a) Entrainment of migratory fish eggs and juvenile fish

6.136 Six of the seven migratory SAC/Ramsar species are anadromous, which means that the species spawn in freshwater and therefore the very early egg and larval stages will not be exposed to entrainment impacts at Hinkley Point. The eel, designated under the Ramsar, spawns in the Sargasso Sea and so eggs and larvae would not be affected. The EA assessed the potential for migratory fish juveniles to be entrained and the only species with potential to pass through the screening mesh was juvenile eel. Experiments were conducted on elvers to determine their likely survival rates, following entrainment through Shoreham Power Station. Taking a mean value for natural mortality of 0.01 per day (or 0.995%), entrainment through HPC would increase the mortality of glass eels at worst by 1.007% per day. As the calculations were very conservative, this increase in mortality was not considered significant.

6.137 None of the designated migratory fish spawn in or around the Hinkley Point area and consequently the only fish species that could be affected by entrainment of fish eggs are those of the Severn Estuary Ramsar fish assemblage. With the exception of eels, the juveniles of the other migratory fish species are too large to be entrained through the mesh screen. Eel entrainment is considered to be insignificant.

b) Entrainment of the fish assemblage species (small / juvenile fish)

- 6.138 Entrainment studies at HPB and plankton studies suggest that juveniles, eggs and larvae of the following species are at risk of being entrained: sea bass, cod, eel, flounder, haddock, herring, lemon sole, plaice, pout, sole, sprat, gobies and whiting. The applicant undertook fish sampling surveys around the HPC area between 2009-10, covering the main spawning periods i.e. late winter, spring and early summer. Eggs and larvae of 20 species were found, along with one glass eel. The surveys confirm that the Hinkley Point area has a very limited community of fish eggs and therefore the risk of entrainment is limited to a narrow range of species.
- 6.139 The applicant then used the data taken from an Entrainment Mimic Unit (EMU) to compare survival rates for each species. This showed that survival for fish eggs is fairly high, whilst survival rates for fish larvae is lower. Temperature and chlorine were the main factors causing mortality, with abrasion and pressure differentials are considered negligible, even for more fragile organisms. Entrainment survival rates were then applied to the data collected in the surveys between February and June 2010 and were compared with the abundance data of fish eggs from the closest spawning area to HPC (Trevose Head spawning area). Due to limited data, however, only sea bass, sole and sprat were comparable.
- 6.140 The predicted numbers of eggs and larvae of sea bass entrained by HPC were predicted to be less than 0.45% of the mean abundance within the Trevose spawning ground. For sole and sprat, the numbers of entrained eggs and larvae over the same period were predicted to be less than 0.005% of the mean abundance within the Trevose spawning ground, all of which were considered insignificant losses. For the other species, it was concluded that the community of fish eggs and larvae at Hinkley Point is small in terms of species and numbers, and that the predicted losses were highly conservative and not considered to be significant.

c) Impingement of fish

- 6.141 A number of passive and active methods will be adopted by the applicant to reduce the risk of fish entering the cooling water system. One is passive deflection, which focuses primarily on controlling the approach velocities around the intake head, to keep velocities low enough to avoid fish being drawn in. The intake ports at HPC will be designed to lie parallel to the tidal flow and abstract water at right angles from the tidal stream as it passes along the full length of both sides of the structure, creating a 'passive' intake of water. This intake design is known as a low velocity side-entry (LVSE) and is designed to achieve a mean intake velocity of 0.3m/s under the majority of tidal conditions. The design is also compliant with EA guidance with respect to fish protection.
- 6.142 Another method to reduce the risk of fish entering the cooling water system is by active deflection, which would be achieved by an Acoustic Fish Deterrent (AFD) system. AFDs act as a behavioural deterrent to provoke an avoidance reaction amongst certain groups of fish. The effectiveness of AFD systems depends on the hearing sensitivity of individual species, which is in turn dependent upon their physiology i.e. the presence/absence of a swim-bladder and the

connection between the swim-bladder and inner ear. Deflection efficiencies can be high, (around 80- 95%) for hearing specialists (swim bladder species), which include pelagic (mid-water column) fish such as herring (shad) and sprat and members of the carp family and catfish. For hearing generalists, such as many demersal (lower-water column) species, including most members of the cod family, and sea bass, along with eel and salmonids, AFD deflection efficiencies are between 50-70%. The AFD effectiveness for non-specialists, and other benthic (bottom dwelling) species, including lamprey, and flatfishes with reduced or no swim-bladder function are considerably lower. The combination of a low-velocity intake and AFD together are considered to provide suitable mitigation for hearing specialist fish, particularly shad, and some hearing generalists.

6.143 However, species such as eel, lamprey and flatfish are unlikely to be deterred by the AFD. Hence, the applicant proposes a Fish Recovery and Return (FRR) system to prevent high mortalities for these species. Water abstracted via the intake tunnels will be directed to two onshore cooling water pump houses, which will each contain a large rotating drum screen that will prevent smaller debris, that has passed the coarse screens on the intake head, from entering the cooling water system. An FRR proposes to recover and return fish that are trapped within the pump houses and return them via a series of fish lifts and flushed pipes, in accordance to EA guidance⁶. Well-designed FRR systems can achieve 80-100% survival rates for more robust epibenthic (close to sea floor) species, such as plaice and flounder, and moderate rates (~50-60%) for demersal species such as the robust gadoids (e.g. cod). However, survival rates for delicate pelagic species like herring, sprat and shad are usually low (<10%). The FRR at HPC is being designed to achieve high rates of survival for eels and lamprey in particular, but it will also benefit other epibenthic and demersal species with a higher survival rate than older designs.

6.144 Together with estimated survival rates for both the AFD and FRR systems (based on past studies), the applicant predicted the total annual impingement (numbers of fish) at HPC for selected species assuming an abstraction rate of 125 m³/s via current intake design. This data was then compared with current HPB impingement data and population estimates derived from the Severn Tidal Power Feasibility Study Strategic Environmental Assessment⁷. Spawning Stock Biomass (SSB) data and local fishery data were used as comparison data, where available. The findings have been summarised below.

Migratory fish

⁶ Turnpenny, A.W.H., Coughlan, J, Ng, B., Crews, P. Bamber, R.N., Rowles, P. (2010). Cooling water options for the new generation of nuclear power stations in the U.K. Environment Agency Science Report SC070015.

⁷ APEM (2010) Severn Tidal Power Feasibility Study Strategic Environmental Assessment (SEA) – Migratory and estuarine fish (2010). (P&B, B&V consultants) Report prepared for DECC.

6.145 The EA carried out a detailed species by species assessment of impingement impacts within their HRA using the data provided by the applicant. The predicted total annual impingement at HPC with mitigation in place (AFD, FRR, LVSE) for all of the designated migratory species were all less than 0.3% as a percentage of the population or SSB. There were no predictions for salmon and sea trout, since none of these fish species have ever been recovered from HPB intake screens. The estimated impingement losses for migratory fish were therefore considered to be insignificant.

Fish assemblage

6.146 The EA investigated the abundance trends by species group from 1981 to 2008 from the long-term impingement monitoring programme dataset for HPB collected and collated by Pisces Conservation Ltd. The 13 most abundant fish assemblage species were whiting, sprat, common sea-snail, sand goby, flounder, pout, Dover sole, poor cod, dab, bass, five-bearded rockling, herring and cod. These accounted for 95.8% of all the fish impinged. The EA concluded no significant effects on these species as a result of impingement, and for many species, noted that a significant reduction in impingement levels could be expected, compared with HPB. Furthermore, the abundance trends by species group from the monitoring programme for HPB showed that it has not had an effect on fish community structure.

6.147 The EA considered that the impingement impacts from HPC would not significantly affect the migratory fish or fish assemblage of the Severn Estuary SAC and Ramsar. The mitigation proposed for HPC, including the intake design, low velocity intake, acoustic fish deterrent system and fish recovery and return system, will provide effective protection, such that impingement losses would be similar or less than those of the existing HPB power station, with no adverse effect on site integrity.

6.148 However, given the number of variables influencing impingement and entrainment levels and the importance of this mitigation, the EA wishes to ensure that systems are optimised in the context of the local fish population and other local conditions. "Optimal performance" in this context means minimising any impacts from the cooling system across the range of different fish species present to the optimum level, to be determined in the light of the conservation objectives (i.e. going beyond merely ensuring that there will be no adverse effect on site integrity, which will be achieved in any event.) The EA therefore requires the final designs of the FRR and AFD to be tested in advance of the operation of HPC. It has also placed a pre-operational measure 08 (PO8) in permit EPR/HP3228XT to ensure that, prior to Hot Functional Testing, the operator must submit a Commissioning Plan for the AFD and FRR Systems to the EA for approval. This will ensure that the fish mitigation is tuned to its optimum level *in situ*, with no risk to the site integrity.

6.149 In response to concerns raised in the RIES over the operation of AFD and FRR systems, the applicant states (in its RIES clarification report) that systems, such as the FRR, will be designed and built to the optimal design based on prior experience with such systems in the UK and

abroad. As such, it would be expected that the performance of such systems would be close to optimal following installation and the commissioning period would be undertaken with the FRR operational. Nonetheless, a proposed approach to undertaking monitoring of the performance of the AFD and FRR systems and the adaptive measures that would be undertaken have been set out in a paper by the applicant titled: *Discussion Paper Concerning the HPC Proposed Cooling Water System and Fish Impingement*. This sets out examples from previous studies that demonstrate the successful deployment of AFD and FRR systems and was revised, based on comments received from relevant parties.

6.150 The EA has also placed a pre-operational measure 02 (PO2) in permit EPR/HP3228XT, issued 13 March 2013, to ensure that prior to Hot Functional Testing, the operator must submit a report which consists of a completed, as-built description of the cooling water plant and infrastructure relevant to the Water Discharge Activity, including the acoustic deterrent and fish returns systems. Requirements have also been included in the DCO to control the design and operation of the cooling water infrastructure and ensure that it delivers, and continues to deliver, an optimum level of mitigation. CW1 will ensure that no water abstraction can commence until the off-shore intake and outfall heads, cooling water intake and outfall tunnels, the fish recovery and return system, the low velocity side entry intakes and the acoustic fish deterrent system have had their design and location approved by the relevant authorities. CW2 requires a monitoring and adaptive measures plan to be approved by the relevant authorities and this will ensure the acoustic deterrent and fish returns systems are monitored during the operation of HPC, and enhanced if possible.

Cumulative and in combination effects

6.151 The combined impacts of impingement and entrainment have the potential to cause an additive effect on fish populations. The EA compared the predicted species numbers from the impingement data with the entrainment data for HPC. With the proposed low velocity side entry design, acoustic deterrent and fish returns system in place, numbers of fish cumulatively entrained and impinged were not considered to be significant. It is acknowledged that stresses from the cooling water discharge, such as an increase in toxins or temperature could cause additive impacts. With the exception of hydrazine, such effects have been assessed as not having an adverse effect on the designated fish of the Severn Estuary SAC and Ramsar and, therefore it is unlikely that such additive pressures will change the situation, especially since there is no evidence that the operation of HPB has lead to adverse impacts on fish populations.

6.152 The only in combination impact of concern with regards to impingement and entrainment is the continued operation of HPB. The applicant predicts that 1% or less of each migratory fish species population would be affected by these combined effects. For the fish assemblage populations, only sprat, whiting and cod were likely to be affected. Sprat was also the only species which showed that the combined impacts of entrainment and impingement could be magnified.

6.153 The EA assessed the potential impacts on these species from the combined HPB and HPC impacts by investigating population trends within the Severn Estuary. These suggest that the core species assemblage are highly resilient to change. The dominant fish species - sprat, whiting and sand gobies - showed no trend over the years. This suggested that either the dominant species are constrained by resources and under density-dependent regulation or that their populations are continuously supplied with recruits from elsewhere. Past studies demonstrated that, despite the impact of water-intake screens on fish mortality between the 1970s and 1990s, the abundance of many species has increased at Hinkley Point.

6.154 Numbers of cod, whiting, sole and plaice were also compared with the International Council for the Exploration of Seas (ICES) sector allocations for the area. The predicted tonnage of fish loss from HPB and HPC equated to less than 1% of the 2012 quotas meaning that both power stations make only a small contribution to the allowable catch. Impacts on the fish assemblage were, therefore, not considered to be significant with the mitigation in place.

Conclusion – entrainment and impingement

6.155 Based on the applicant's HRA and supporting technical documents, and the EA's assessments, the Secretary of State is satisfied that, with the appropriate EA permit measures in place, along with the relevant DCO requirements, the predicted rates of fish impingement and entrainment at HPC alone and in combination would not adversely affect the migratory fish species nor estuarine fish assemblage of the Severn Estuary SAC and Ramsar. He agrees with the recommendations of the Panel and the views of expert bodies on the effectiveness of their permitting regimes in ensuring HPC's compliance. The Secretary of State also considers that the applicant has provided sufficient examples of the effective operation of AFD and FRR systems to enable him to have confidence in their successful deployment at Hinkley Point. Furthermore, he is satisfied that DCO requirements CW1 and CW2 can be relied upon to deliver an optimal performance, well above the level required to enable a judgement of no adverse effect.

Changes in hydrodynamics and sediment transport

Conservation Objective

- *The migratory passage of both adults and juveniles through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by changes in flows.*

Alone assessment

Construction

6.156 Impacts on hydrodynamics and sediment transport due to the construction of the sea wall were considered to be localised and confined to the upper part of the intertidal zone. Based on the duration of the discharge and rapid mixing in nearshore waters, the impact of elevated turbidity and suspended sediments on the intertidal fish communities was considered to be insignificant.

6.157 The dredging of the berthing pocket for the jetty, and the addition of jetty piles would have a localised impact by re-suspending sediments, but this impact was judged to be negligible. The capital dredge would occur over a period of about a month, while the impact from piling will occur intermittently for short periods over the 15 months of construction. Based on the short duration of the activities and the existing hydrodynamic and suspended sediment regime, it was concluded that there would be negligible impacts due to elevated turbidity and suspended sediments from the jetty on fish.

Operation

6.158 The cooling water outfall would discharge some 125m³/s of cooling water at full load, so this volume of water re-entering the estuary could increase turbidity and resuspend sediment around the outfall. This could affect the ability of fish gills to absorb dissolved oxygen, particularly in the case of salmonids or shad. The Severn Estuary is one of the most turbid estuaries in the UK, with the converging coastlines of the estuary creating a very energetic system, noted for its large tides and turbulent conditions. The fish of the Severn Estuary are adapted to this high suspended sediment content, as the estuary is naturally turbid. As the discharge at HPC is only expected to create small-scale changes in siltation and turbidity around the outfall, it was not considered to have an adverse effect on migratory fish and fish assemblage features.

Associated development

6.159 Works at Combrich Wharf, such as the removal and replacement of the mooring dolphins, have the potential to affect migratory eel and salmon by changes in turbidity. However, there are no spawning grounds for eel or salmon near to Combrich and the fish are considered to be adapted to high suspended sediment content within the Severn Estuary. The same applies for the tidal River Parrett, which is also naturally turbid. The Combrich Wharf refurbishment would therefore not adversely affect the fish features of the SAC/Ramsar due to turbidity changes.

Cumulative and in combination effects

6.160 The in combination effects of all construction activities were considered to be minimal due to their short duration and the fact that fish are mobile and would move away from areas of high sedimentation. In combination effects could result from the construction of the sea wall, temporary jetty and cooling water infrastructure and the EA and Bristol Port's Steart Peninsula habitat creation projects. The EA assessed the potential impacts of each of these plans and projects. As discussed within the alone assessment above, impacts from the sea wall and jetty construction were considered to be insignificant, even when considered cumulatively. The Bristol Port Steart development was considered to have a potential in combination impact from deposition of residual sediment from the construction of the creek systems, which may smother existing flora and fauna in the inter-tidal zone adding to impacts from the jetty and sea wall developments. However, the breaches and development of the creek systems would be made at locations above MHWS. When the tide moves over the newly created breach and creek

systems, the large volume and high flushing rates of the Estuary mean that effects will be minimal and localised to the immediate area of the breach and for a short time frame only.

6.161 In combination impacts were considered to be insignificant and localised and migratory fish and fish assemblage features were not considered to be significantly affected.

Conclusion – hydrodynamics and sediment transport

6.162 The Secretary of State has considered the potential impacts of changes in hydrodynamics and sediment transport effects on the fish features of the Severn Estuary SAC and Ramsar and concludes that HPC alone and in combination would not have an adverse effect on site integrity, due to the very localised nature of the works and the background high levels of turbidity.

Disturbance (noise, visual and vibration)

Alone assessment

6.163 The construction of the sea wall could result in disturbance to fish due to noise and vibration. However, as the works for the sea wall would be above MHWS, the potential for any effects in the water column would be extremely limited. The jetty and cooling water infrastructure will require piling that could disturb fish. However, the project-wide DCO requirement PW22 requires best practice soft start-up techniques for piling, which would increase noise levels gradually, allowing fish to move away from the area. With this mitigation in place, noise disturbance from the main site would not have an adverse effect on the migratory fish or fish assemblage populations.

6.164 The construction of Comwich Wharf could impact on migratory eel and salmon. Studies suggest that salmon are sensitive to low frequency sound and detect particle motion, rather than pressure change. Eel are sensitive to sounds in the frequency range of pile driving which may cause an avoidance reaction in eels. As migration mostly takes place during the night, the EA advise that piling activities at Comwich should be restricted during the night. DCO requirement C6 sets out timing restrictions on construction hours at Comwich Wharf to ensure a sufficient migratory window for eel and salmon that migrate up the River Parrett.

Cumulative and in combination effects

6.165 The construction of Comwich Wharf and the sea wall could impact cumulatively on fish via increased noise, visual and vibration disturbance in combination with the main HPC marine infrastructure works, particularly the temporary jetty and the cooling water infrastructure. These construction activities are scheduled to overlap for at least a year. Such effects could result in avoidance of the area by fish or a disruption to their lifecycle. The construction works for the sea wall would occur above MHWS and be out of the water at all times, so the potential for any noise and vibration effects to occur in the water column are extremely limited. There is, therefore, unlikely to be any synergistic effects with regards to the seawall

6.166 The works at Comwich are a significant distance from the seawall development. Whilst it may be possible for the same fish to be disturbed from the jetty developments and cooling water infrastructure, mortality is highly unlikely. Noise related impacts from the EA Steart breach on the River Parrett could occur, if the works were to be carried out in the same time-frame. However, the breaches and development of the creek systems at the EA Steart site would be made at locations above MHWS and at sufficient distance from the water edge. No work is expected to be carried out sub-tidally; therefore noise impacts in combination would be limited.

6.167 Piling at Comwich has the potential to act in combination with boat movements along the River Parrett and disturb migratory fish. However, as discussed in the alone assessment, DCO requirement C6 will restrict construction hours and PW22 will ensure that best practice soft start-up techniques are used for piling activities.

Conclusion

6.168 The Secretary of State has considered the potential impacts of disturbance, particularly during construction, on the migratory fish species and fish assemblage of the Severn Estuary SAC and Ramsar. He concludes that, with the relevant mitigation in place and secured by the DCO, HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion of 'migratory fish and fish assemblage' features alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO / EA permit requirements See Annex B	
Water quality	No	C14 Comwich	Surface and foul water management plan
		EA Permit EPR/HP3228XT PO7 PO10	<i>Issued 13/03/2013</i> Operational strategy to control biofouling Removal of hydrazine
Entrainment and impingement	No	CW1 Cooling water	Infrastructure design
		CW2 Cooling water	Monitoring and adaptive measures plan
		EA Permit EPR/HP3228XT PO2 PO8 PO11	<i>Issued 13/03/2013</i> Infrastructure design Commissioning of AFD and FRR systems Environmental monitoring plan
Hydrodynamics and sediment transport	No		
Disturbance	No	PW22 project wide	Piling activities
		C6 Comwich	Construction hours
Overall effect on site integrity	No adverse effect on site integrity		

7 SEVERN ESTUARY SPA/RAMSAR

Features: Migratory bird species and assemblage of waterfowl

Introduction

- 7.1 Bridgewater Bay supports important populations of several species of birds that are qualifying features for the Severn Estuary SPA/Ramsar, particularly Shelduck, Ringed Plover and Curlew. It also supports significant numbers of Dunlin and Redshank. The Bay provides important food resources for birds and a slightly more sheltered environment than the rest of the Estuary, which is highly exposed to prevailing south-west winds. Shelter is likely to be a principal factor in the use of the site by moulting Shelduck during the summer.
- 7.2 The Severn Estuary SPA and Ramsar site extends up the River Parrett approximately 5km upstream of Comwich Wharf. The Parrett Estuary is an important site for birds, with seven of the nine qualifying SPA species listed recorded there. In addition, the Pawlett Hams peninsula is a part of the European designated site. This is a low-lying area of agricultural land with a network of drainage ditches and is important for foraging wildfowl and as high-tide roost site.
- 7.3 The lower reaches of the River Parrett (south of Comwich Wharf) support large numbers of regularly-occurring Dunlin, Wigeon, Teal, Ringed Plover, Grey Plover, Lapwing, Curlew and Redshank that are important in terms of the Severn Estuary SPA / Ramsar. All other SPA bird species (Curlew, Shelduck, Mallard, Teal, Wigeon, Gadwall, Ringed Plover, Black-tailed Godwit, and Whimbrel) generally occur in low numbers, particularly in comparison to numbers using inter-tidal habitats further downstream.
- 7.4 The most important foraging area for birds is found east of HPB across the western fringe of the Stert mudflats, which are largely dominated by the Baltic clam (*Macoma balthica*) which is estimated to comprise some 63% of the intertidal biomass of Bridgewater Bay. It is of note that the Wetland Bird Survey (WeBS) data for the Severn Estuary SPA/Ramsar over the last 20 years (1990 to 2009) shows that bird numbers have reduced, suggesting that it is not at ecological carrying capacity. This indicates that there is likely to be sufficient food and other resources within the SPA to accommodate some bird displacement within the site or immigration.
- 7.5 The Annex 1 species for which the site is classified (Berwick's Swan and European white-fronted Goose) were not recorded in surveys along HPC frontage and there is no evidence to suggest that either of these species make use of the tidal River Parrett fronting Comwich. The birds that are qualifying features of the SPA/Ramsar could be affected by the following impacts that are considered in this section.

Disturbance and displacement

Loss of habitat

Water quality

Background

- 7.6 The applicant has undertaken surveys of birds using the HPC frontage between April 2007 and March 2009 covering the intertidal and inshore area. This was supplemented by additional survey work of the intertidal mudflats to the east of HPC between April 2010 and January 2011, night surveys and surveys around the River Parrett between April 2009 and March 2010. The EA's HRA considers potential impacts on birds as a result of the HPC activities that require EA permits, namely three flood defence consents (Comwich Wharf refurbishment, construction of the sea wall and the temporary jetty) and a discharge consent for cooling water and process water effluents. For its HRA, the EA independently analysed WeBS data for Bridgewater Bay for the period 2004-2009 and the River Parrett WeBs data for the most recent five years to assess impacts on certain species of SPA birds in more detail and analysed the chemical plume modelling by the applicant to determine potential impacts from the discharge.

Disturbance and displacement

Conservation objectives

Internationally important populations of regularly occurring migratory species (wintering European white-fronted goose, wintering dunlin, wintering redshank, wintering shelduck, gadwall, passage ringed plover wintering curlew* wintering pintail*, wintering teal** breeding Lesser Black-backed Gull**) *recommended additions under the SPA review, **recommended under the Ramsar review*

- *aggregations of wintering European white-fronted goose, wintering dunlin, wintering redshank, wintering shelduck, gadwall, wintering ringed plover, wintering curlew, wintering pintail, wintering teal and breeding Lesser Black-backed Gull at feeding or roosting sites are not subject to significant disturbance*

Internationally important assemblage of waterfowl

- *waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.*

- 7.7 Overwintering birds may be disturbed by sudden movements and noises. This can displace birds from their feeding grounds. A reduction in food will affect the physical condition of birds with knock-on effects to breeding success and survival. Increased energy expenditure due to avoidance behaviour e.g. flights out of the usual home range, will also affect body condition and both of the above responses can lead to population level effects. The significance of displacement is governed by: the length of time and frequency of the disturbance event; the availability and quality of alternative habitat; the ability of displaced individuals to exploit the alternative habitat; and the level of competition. Research in the Wadden Sea indicates that noise between 50dB and 85dB appears to result in behavioural change, including the cessation of feeding, with impulsive, irregular noise having a greater effect.
- 7.8 The applicant cites an International Council for the Exploration of the Sea (ICES) study into the categorisation of activities related to construction work and the behavioural responses of birds. This indicates that the highest sensitivity is to the presence of humans, particularly on the mudflats, then on the seaward toe and crest. Sensitivity to irregular piling noise is high to

moderate, with sensitivity to plant and regular noise being moderate or low. The applicant indicates that disturbance effects to birds are likely to be confined to a 250m zone around the construction activities. The EA agrees that this 250m buffer zone is appropriate to estimate displacement effects for the majority of bird species, but considers a more precautionary 300m buffer zone to be more appropriate for Pintail and Curlew, based on evidence that they flush at a greater distance.

- 7.9 This assessment therefore considers the nature and timing of construction activities; the number of birds likely to be displaced; and the ability of those displaced birds to exploit available alternative habitat.

Alone assessment

Construction

- 7.10 As much of the temporary jetty and sea wall construction work would take place in the inter-tidal zone and upper foreshore, these activities could cause significant disturbance to SPA birds. The temporary jetty, seawall and cooling water infrastructure would be built during the main HPC construction stage, with overlapping timescales.
- 7.11 Construction activity at the HPC main site would involve clearance of land, large-scale excavation work and the erection of the power station buildings and associated infrastructure. The majority of the work would take place on land to the south of the shoreline that would be out of the sightline of birds using the intertidal area. To reduce the impact of vegetation clearance on overwintering birds, a Winter Clearance Scheme is required to be submitted to and approved by the relevant authorities (P17) for any works between October to March inclusive. The Secretary of State considers that, with this mitigation in place, it is unlikely that construction activities at the HPC main site would result in any significant disturbance of SPA birds.

Temporary Jetty

- 7.12 This development involves the creation of a harbour made up of a jetty, a berthing pocket, a jetty head and some terrestrial works. The offshore works would extend into Bridgwater Bay.
- 7.13 Offshore activities likely to disturb birds:
- Creating a jetty bridge from vertical tubular piles supporting the deck;
 - Piling to create a jetty head and a deck with mooring infrastructure;
 - Dredging a berthing pocket alongside the jetty head to accommodate vessels;
 - Handling materials and conveyance equipment on the jetty head and bridge; and
 - a roadway along the jetty bridge.
- 7.14 The activities most likely to disturb birds feeding or roosting on the inter-tidal habitat are piling for the jetty approach bridge and jetty head and associated works to construct the jetty involving the movement (and operation) of construction machinery and the presence of the workforce

across the inter-tidal zone. The noise and visual impact of the works may cause displacement of some birds, most notably Shelduck. The applicant's survey work indicates large flocks of rafting Shelduck (around 500 individuals) close to the jetty construction area, some 200m-1.5km from the shore. If rafting Shelduck were within 250m of the construction area and during their summer moulting phase, this could be of significance, given their inability to fly during this period.

- 7.15 Shelduck are capable of swimming against the tide and could move away from the source of the disturbance, although this would be more energetically costly than drifting. Large areas of undisturbed habitat remain to the west and east of the jetty where displaced birds could relocate without significant energy expenditure.
- 7.16 To mitigate the disturbance impact of jetty piling, project-wide controls are included in the DCO for the use of soft start techniques or non-impulsive piling methods, such as augur piling for jetty construction (PW22). The works will not be brought into operation until a Shelduck and Non-breeding Bird Monitoring and Mitigation scheme has been approved by the relevant authorities (J2).
- 7.17 The capital dredging works would be undertaken outside the period when moulting Shelduck are on the water (between July and September). In relation to lighting, the jetty would be lit constantly, rather than intermittently during construction, with the use of directional lighting, so only the jetty and immediate work area would be lit and light spill onto the intertidal area would be limited. This would allow any birds using the intertidal and inshore waters to habituate to the development area, rather than being displaced as a result of lighting that works on a motion sensor or switch-activated basis. DCO Requirement J5 requires jetty lighting to be approved by the relevant authorities. Survey work indicates that use of the foreshore by birds at night is low and lighting is, therefore, not expected to have an adverse effect on inter-tidal bird populations.
- 7.18 The dismantling of the jetty would result in impacts that mirror those associated with construction and would be subject to the same mitigation requirements.

Sea wall

- 7.19 A new 760 m sea wall is required along the shoreline in front of the power station to reinforce existing flood defences. The sea wall has the potential to cause significant disturbance to SPA birds over a period of 12-14 months, as a result of construction activities.
- 7.20 Activities likely to disturb birds:
- excavation of the cliff, placement of vertical defence walls and rocks for scour protection;
 - delivery of rock by barges;
 - transit of vehicles and operation of machinery;
 - workforce activity on the cliff top and foreshore; and
 - artificial lighting during the 24 hour construction of the sea wall.

- 7.21 Assuming that disturbance effects are confined to a 250m zone around construction activities, this would equate to some 25 ha of inter-tidal habitat (excluding the rock delivery area) from which birds would be displaced. The works would be at a sufficient distance (>500m) from areas of open water where rafting Shelduck have been observed. The proposed working method for the construction of the sea wall includes the placement of a temporary rock bund on the foreshore to delineate the working area. The bund is expected to provide a 30m corridor above mean high water and would serve to screen much of the construction activity from the birds' line of sight, as well as restricting the movement of personnel to within the footprint of the works.
- 7.22 The movement and unloading of the barges could also disturb birds. Barges would be brought towards the shore during high water and allowed to ground as the tide falls, prior to cargo being unloaded. The movement of the barges could affect rafting and loafing Shelduck. By way of mitigation, the applicant proposes that rock delivery would not take place over winter and rocks would be stored on the front edge of the construction zone to limit visual disturbance between the estuary and the sea wall construction zone.
- 7.23 The sea wall will require a Flood Defence Consent from the EA and its impacts have been addressed in their HRA. Given the importance of Bridgewater Bay for Shelduck, Pintail and Ringed Plover in particular, the EA undertook a more detailed assessment for those species to better understand potential disturbance effects. The EA agrees with the applicant that there are large areas of available foraging habitat where birds can relocate without any significant implications for their energy expenditure or survival. This is supported by historical WeBS data which shows that the estuary is not at its ecological carrying capacity.
- 7.24 Moulting, loafing Shelduck were recorded in large numbers offshore during the summer months and are potentially vulnerable to disturbance as they are flightless during this period. The EA concludes that the construction of the sea wall alone is unlikely to have an adverse effect on the Shelduck population as:
- The habitat within the construction zone does not provide the correct resource to sustain Shelduck;
 - A working area will be defined and demarcated on the ground to restrict personnel accessing the inter-tidal rock platforms;
 - Shelduck only occasionally come into the 250m disturbance zone and there is extensive open water beyond this zone that will remain undisturbed;
 - Much of the disturbance zone for the sea wall will be screened by rocks that are to be stored at the seaward edge of the 30m construction zone;
 - Shelduck can swim away from disturbance (dependent on tidal strength, weather and bird condition); and
 - The sea wall construction works are for 12-14 months i.e. only cover one season.

7.25 The EA concludes that, although there would be some temporary displacement of birds to other areas, the construction of the sea wall would not adversely affect the integrity of the Severn Estuary SPA/Ramsar, provided that further mitigation measures are incorporated into other consents to ensure the protection of SPA birds from disturbance. The Combwich Wharf and River Parrett Non-Breeding Wildfowl and Wader Mitigation Scheme will be secured by DCO Requirement C2. This updates the Shelduck Monitoring and Mitigation scheme required under the Harbour Empowerment Order for the temporary jetty, to ensure no adverse effect on moulting Shelduck from vessel movements to / from the temporary jetty and the refurbished Combwich Wharf. Whilst not being directly related to the sea wall works, this requirement will provide additional protection for Shelduck. The EA consider that the measures specified in the mitigation and monitoring scheme enable them to conclude no adverse effects.

Cooling Water Infrastructure

7.26 The potential for SPA birds to be disturbed by the offshore works for the cooling water infrastructure is considered very low. The works would be located between 2-3.3 km from the shoreline, well outside the zone of potential disturbance for birds using inter-tidal areas. If disturbance were to occur to flocks of loafing waterfowl, they could easily relocate to other extensive areas of water that would remain undisturbed.

Associated Development

7.27 Combwich Wharf would be refurbished and an adjacent laydown facility built to service Abnormal Indivisible Loads (AILs) arriving during construction that are too big to be transported directly to the site. The laydown facility will cover 6 large fields that are outside the SPA/Ramsar boundaries, but are used for roosting by some SPA birds. There will be disturbance to SPA birds during the wharf refurbishment period of approximately 12 months, with the laydown facility becoming operational some 12 months later.

7.28 Combwich Wharf activities likely to disturb birds:

- Demolition of parts of the old wharf and construction of a new wharf area;
- Extension and raising of the existing barge bed;
- Extension of the existing AIL jetty;
- Piling and infill for the refurbished and extended wharf facility;
- Construction of the goods wharf facility and a replacement slipway;
- Dredging of berth bed;
- Construction of flood defences around Combwich and the laydown facility area;
- Improvements to Tuckett's Clyde; and
- Traffic, noise, lighting and human activity.

- 7.29 The main sources of disturbance are likely to be the piling works and in river installation. More than 1% of the SPA populations of Gadwall, Redshank, Wigeon and Mallard were observed within 250m of Comwich Wharf. Lapwing were present at levels very close to 1% of the SPA population and Curlew were observed within 300m. On this basis, the EA undertook a more detailed assessment for these species, whilst concluding that any impact on species where SPA populations were 1% or less would not result in detectable population-level effects.
- 7.30 The EA notes that there are extensive areas of suitable habitat for waders and wildfowl immediately adjacent to Comwich Wharf that would not be affected by disturbance during its refurbishment and would provide alternative habitat. The WeBS data show that the Parrett Estuary and SPA are not at full carrying capacity. In addition, it is unlikely that birds are confined to locations within the Parrett Estuary - they move around to feed and roost. However, the Estuary remains an important site for birds and the data indicate that significant numbers of SPA birds are present within 250m of the wharf construction area, including three SPA qualifying species (Gadwall, Redshank and Curlew) and three SPA listed species (Wigeon, Mallard and Lapwing) in numbers of around 1% of the SPA populations. In addition, Comwich Brickpits County Wildlife Site (CWS), which is adjacent to Comwich Wharf, contains further significant numbers of SPA birds. Whilst the CWS is situated outside the SPA, the EA consider it should still be treated as an "off-site" impact as it comprises functional habitat that is regularly used by SPA birds.
- 7.31 NE considers that there is insufficient information on construction noise mapping at Comwich Wharf to enable them to determine the level of disturbance to SPA birds. It recommends that there should be a restriction on maximum noise levels and/or timing of construction works. At the issue-specific hearing on HRA matters on 23 August, it was agreed that the applicant would monitor noise levels during the early periods of construction and operation on the adjacent mudflats where significant densities of birds are present at certain times of year. If significant noise levels are recorded (in terms of peaks and frequency) mitigation would be agreed with NE. This agreed mitigation would be secured by DCO requirement C2.
- 7.32 The EA is only able to conclude that there will be no adverse effects on the integrity of the Severn Estuary SPA/Ramsar, as a result of the refurbishment of Comwich Wharf, if suitable mitigation is included to reduce disturbance to SPA birds. This includes the Shelduck non-breeding birds monitoring and mitigation scheme (C2) and a requirement that piling should be carried out using soft start-up techniques or techniques to minimise disturbance. This has been incorporated into DCO requirement PW22 which prohibits the use of impact piling for the bird over-wintering period of October-March, inclusive.
- 7.33 Redshank and Dunlin were recorded in fields close to the Comwich freight laydown facility (in numbers of around 0.5% of the SPA population). Whilst construction activities at the laydown facility would result in an increase in noise and lighting levels, given its intermittent use and low numbers of SPA birds in adjacent fields, it is considered that this disturbance would be unlikely to result in an adverse impact on the population that uses the habitats within the corridor of the

River Parrett. It is expected that Redshank and Dunlin would relocate, given that there are extensive areas of similar grassland adjacent to the laydown facility that would remain undisturbed. No significant numbers of birds associated with the Severn Estuary SPA/Ramsar were observed in surveys of the remaining associated development sites.

Operation

- 7.34 The noise and visual presence of the jetty and movement of vessels are likely to be the key operational impacts from the main site. The jetty would be located at the western end of Bridgwater Bay and would be accessed by boat traffic arriving from the Bristol Channel. It is estimated that, during months of peak demand for aggregates and cement, there could be some 32-36 vessel movements per month (i.e.16-18 vessels). A further 8-22 vessel movements per month may be possible by utilising “spare” tides. During peak construction, all available high tides would be utilised for vessel movements.
- 7.35 The impact of increased vessel movements on SPA birds is considered to be low, as there are already a large number of vessels operating in the area and birds are accustomed to vessel movement. Furthermore, vessels would not cross the intertidal area of Bridgwater Bay; vessel movements into and out of the berthing facility would be at low speeds; and at high water, when use of the foreshore by waterbirds adjacent to the jetty would be at low levels.
- 7.36 The only potentially significant interaction is with rafts of moulting Shelduck, which are present offshore in Bridgwater Bay in late summer and autumn. Rafts of Shelduck usually occur outside the immediate area of the temporary jetty, suggesting that they are unlikely to be affected by the temporary jetty. If a raft of birds were present on the water in the vicinity of the temporary jetty during the movement of a vessel to or from the temporary jetty, any interaction would be short-lived. Only relatively limited adjustments by birds would be required in order to avoid a moving vessel.
- 7.37 Shelduck could be expected swim at 4km/h to 5km/h and, if avoiding a predator when flightless, might double this. It is, therefore, proposed that a speed limit (relative to the water) of 4 knots (7.4km/hour) be enforced during the months June to October for vessels entering Bridgwater Bay, the Parrett Estuary or within 1km of the temporary jetty. This would enable moulting Shelduck to take avoidance action. The applicant has indicated that an updated protocol and passage plans would be developed, in discussion with the Harbourmaster of Bridgwater Port, for navigation of large vessels to formalise good practice operations.
- 7.38 Noise levels are estimated by the applicant to be less than 50dB for the conveyor belt/jetty bridge (Chapter 11, Vol 2 of the ES) and would not be expected to cause disturbance to birds on the inter-tidal area. The Shelduck Mitigation and Monitoring Strategy (J2 and C2) contains measures to reduce disturbance due to construction noise and to address the in combination

impacts of vessels using the temporary jetty and Combwich Wharf. The potential impact of lighting for the operational phase of the power station as a whole would be addressed by an Operational Lighting Strategy (MS29) to minimise lighting in non-operational areas and limit light spill onto the foreshore.

Associated Development

7.39 Combwich Wharf activities likely to disturb birds:

- Increase in vessel movements
- Increased lighting

7.40 There would be a significant rise in vessel movements on the River Parrett to and from the Wharf. Assuming an evenly distributed delivery schedule, the applicant estimates that there would be 15-16 vessel deliveries per month, with some 180 deliveries to the wharf over a four-year period. Vessels carrying AILs require high water and tides greater than 4.5m in order to navigate to Combwich. Due to the time required for unloading, vessels carrying AILs would require three high tides to allow for access, unloading and departure. Unloading would take place during low tide periods with loads being manoeuvred off the vessel and onto a vehicle for transport. General construction goods would require two high tides. Small tug boats would also be required further down river to guide the larger boats out of the River Parrett.

7.41 This increase in vessel traffic could disturb waterbirds from foraging and roosting on mudflats along the length of the lower part of the Parrett up to Combwich Wharf. These mudflats and adjacent areas of coastal grazing marsh support large numbers of waterbirds during the winter months. NE has expressed concerns about potential impacts on moulting Shelduck in particular, as a result of these vessel movements and their impact alone and in combination with vessel movements to and from the temporary jetty. Further information was provided by the applicant during the examination on the effect of tugs without payloads, following concerns that the wash from the tugs could lead to a loss of saltmarsh and mudflat habitats.

7.42 In response to this, the applicant sought expert opinion and it was concluded that tugs travelling at between 3-7 knots would not cause problems. Further, the applicant would have a contractual relationship with the tug owners and could impose speed limits if required. However, as the effect could not be entirely excluded, an intertidal monitoring and contingency plan is included in the DCO for Combwich Wharf (C3). Its primary purpose is to limit coastal erosion and indirect loss of habitat as well as serving to monitor and control the speed of tugboats without payloads. NE suggest that the monitoring and mitigation strategy developed for the temporary jetty HEO be implemented for the project. This is included in DCO requirement C2.

7.43 Lighting for the wharf facility is not expected to act as a source of significant disturbance to birds. Light spillage from into the Estuary would be either avoided through design or minimised

through the use of directional lighting. Details of external lighting are required to be submitted to the relevant authorities for approval, prior to installation (C10).

- 7.44 For the freight laydown facility, similar effects are anticipated on birds as for the construction phase. Whilst there would be an increase in vehicle movements to and from the site, the low usage of the site and surrounding area by SPA birds indicates that disturbance effects would be negligible at a population level.

Conclusions – disturbance and displacement

- 7.45 The Secretary of State has considered the potential disturbance and displacement effects on birds that are features of the Severn Estuary SPA and Ramsar. In view of the numbers of birds close to the foreshore and the sensitivity of those species, most notably Shelduck, he considers it necessary to impose a range of mitigation measures during construction and operation to reduce disturbance due to noise, artificial light, vessel movements and the presence of personnel and machinery on site.
- 7.46 On the basis of the assessment work presented, he concludes that, with the relevant DCO requirements in place, the disturbance and displacement impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Loss of habitat

Conservation objectives

Internationally important population of regularly occurring migratory species (wintering European white-fronted goose, wintering dunlin, wintering redshank, wintering shelduck, passage Ringed Plover, wintering Curlew*, wintering Pintail*, wintering teal**, breeding Lesser Black-backed Gull**) *recommended additions under the SPA review, **recommended under the Ramsar review:*

- *The extent of hard substrate habitats is maintained; and*
- *the abundance and macro-distribution of suitable invertebrates in hard substrate habitats is maintained (except shelduck).*

Internationally important assemblage of waterfowl:

- *The extent of hard substrate habitats is maintained; and*
- *the abundance and macro-distribution of suitable invertebrates in hard substrate habitats is maintained.*

Alone assessment

- 7.47 The direct loss of habitat associated with HPC is of a small scale and was not raised by any of the statutory nature conservation bodies as being a significant concern. Losses would comprise:
- around 20-30m² of intertidal habitat as a result of the jetty piles;
 - A small area of upper shore habitat as a result of the sea wall; and
 - A sub-tidal area of around 1,800m² as a result of the cooling water infrastructure.

7.48 Of these, only the intertidal habitat loss associated with the jetty would have any consequences for the SPA bird populations. This is a very small area, with limited use by SPA birds. The sea wall would be located above the mean high water level, where the habitat is characterised by small boulders and rocks. There is no evidence that this location is significantly used by SPA birds for foraging or for roosting.

7.49 The refurbishment works at Combwich could lead to direct loss of intertidal habitats due to:

- the extension and raising of the barge bed;
- the extension of the AIL jetty to provide access for the approach road; and
- piling and infill for the extended wharf.

7.50 This would result in the loss of some 0.05 ha of sloping bank and adjacent intertidal area. This small area is unlikely to be significant due to its immediate proximity to the existing wharf and its location outside the SPA/Ramsar. However, once operational, increased vessel movements and the presence of the upgraded structures could cause some erosion of inter-tidal habitats, particularly the muddy banks to the north of the wharf, where Combwich Pill meets the River Parrett. Backwash from vessels could potentially cause further erosion on the adjacent bank of the River Parrett leading to indirect habitat loss, hence the inclusion of DCO Requirement C3 (intertidal monitoring and contingency plan).

Conclusion – habitat loss

7.51 The Secretary of State has considered the potential impacts due to habitat loss on the birds that are a feature of the Severn Estuary SPA and Ramsar and concludes, with the relevant requirements in place in the DCO, the effects of direct and indirect habitat loss from HPC alone and in combination would not have an adverse effect on site integrity.

Water quality

Conservation objectives

Internationally important populations of regularly occurring migratory species (wintering European white-fronted goose, wintering dunlin, wintering redshank, wintering shelduck, gadwall, wintering Ringed Plover wintering Curlew* wintering Pintail*, wintering teal**, breeding Lesser Black-backed Gull) *recommended additions under the SPA review, **recommended under the Ramsar review*

- *The abundance and macro-distribution of suitable invertebrates in inter-tidal mudflats and sandflats is maintained.*

Internationally important assemblage of waterfowl

- *the abundance and macro-distribution of suitable invertebrates in intertidal mudflats and sandflats is maintained.*

Alone assessment

7.52 The only water quality impact likely to affect prey species is as a result of the discharge of cooling water during the operational phase. Modelling of the chlorinated plume indicates that the

only habitat at risk from TRO is the sub-tidal soft sediments in the immediate vicinity of the outfall. For hydrazine, the modelling could not rule out an impact on the benthic invertebrates that are the birds' prey species. The EA has included a condition in its environmental permit for operational discharge that will require the removal of hydrazine from all waste water streams prior to discharge. As the EA's plume modelling work predicts that there will be no adverse impact on the inter-tidal soft sands, then there will also be no adverse impact on the prey species for birds and therefore, the birds themselves as a result of toxic contamination. The Secretary of State notes that this conclusion has been independently reached by the EA using their plume modelling and also by the applicant using a separate MORPH model which further supports this conclusion. Nutrient enrichment and organic loading could result due to the release of nitrates and phosphates from onsite sewage treatment works. However it is concluded in the SAC estuaries feature (paragraph 6.10 – 6.11) that this would not have a likely significant effect on the SAC (and hence the SPA) because the discharges would make only a small contribution to background values (0.01% for nitrogen, 3.8% for phosphorous and 0.1% for oxygen demand).

- 7.53 The applicant has assessed the sensitivity of various prey species to increases in water temperature and used the MORPH model to determine whether bird species will be impacted by a reduction in prey. The EA has chosen not to rely on the applicant's model, due to concerns about its validation, and has undertaken independent modelling of the thermal plume. The EA modelling indicates that an increase in seawater temperature could lead to a reduction in growth of *Macoma balthica* (Baltic clam) within an area of temperature elevation over 2°C which includes part of Steart Flats. Monitoring of the invertebrate populations within and outside the HPB thermal plume found no discernible effects on *Macoma balthica* compared to that found elsewhere on Steart Flats and within the Severn Estuary. This suggests that, even if HPB is having an impact on prey species, there are sufficient food resources to maintain bird population levels. It is likely that any reduction in *Macoma balthica* will lead to increases in the abundance of other prey species. The EA, therefore concludes that there will be no adverse effects on SPA birds as a result of temperature increases due to thermal discharges from HPC. EA permit EPR/HP3228XT contains pre-operational measure PO11 - Environmental Monitoring Plan, to require the applicant determine the biological characteristics of the area potentially affected by the water discharge activity and undertake monitoring and remedial actions as necessary.

Conclusion

- 7.54 The Secretary of State has considered the potential impacts of water quality discharges and their impacts birds that are a feature of the Severn Estuary SPA and Ramsar and concludes that, with the relevant Environmental Permit requirements in place to control hydrazine, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Cumulative and in combination effects (all activities)

Disturbance to birds

- 7.55 Disturbance-related effects on SPA waterbirds would be largely confined to the construction phase for HPC, primarily associated with the construction and operation of the temporary jetty, the seawall and Combwich Wharf. These disturbance impacts could act in combination, particularly if frequent vessel movements to and from Combwich Wharf and the temporary jetty are taken into account. Various measures to limit disturbance from site construction are described in the previous section and are detailed in a Shelduck and non-breeding bird mitigation and monitoring strategy that is a DCO requirement for both the jetty (J2) and Combwich Wharf (C2).
- 7.56 The bird displacement effects as a result of HPC as a whole could be exacerbated by in combination effects of other projects, including the EA's Steart Peninsula managed realignment scheme, some 7km to the east and the Bristol Deep Sea Container Terminal (BDSCT) Habitat Compensation Scheme proposed by the Bristol Port Company. The Steart Peninsula project aims to create some 500 ha wetland habitat to manage flood risk, whilst the BDSCT would create some 150 ha intertidal habitat at the north western end of the peninsula. This habitat compensation scheme is a requirement of the consent for the BDSCT at a site in Avonmouth Docks, some 45km north of HPC upstream in the Severn Estuary.
- 7.57 These proposals may also lead to some bird disturbance, but this would be localised and temporary and it is not anticipated that it would interact with the effects from HPC in such a way as to compromise the capacity of existing habitats to support SPA populations if these works were to coincide. The EA works at Steart began in 2012 and the Bristol port works are due to start imminently. Both projects are scheduled for completion in late 2014, so there is likely to be some temporal overlap.

Loss of habitat

- 7.58 The direct habitat loss is small-scale, with a small area of low value foreshore habitat lost or disturbed as a result of the construction of the temporary jetty, sea wall and Combwich Wharf. The sub-tidal area lost as a result of the cooling water infrastructure would not have an effect on the designated bird populations. An intertidal monitoring and contingency plan would limit the speed of unladen tugboats to reduce indirect habitat loss due to vessel wash effects at Combwich (C3). Habitat loss would occur as a result of the in combination effects from the construction of the Bristol Deep Sea Container Terminal (BDSCT), but as this is being compensated for it was not considered part of the assessment. Any impact as a result of the EA's Steart Peninsula Project would be more than offset by the extensive creation of estuarine habitats as a result of this project. Potential cumulative and in combination impacts as a result of habitat loss are therefore regarded as insignificant.

Thermal discharges

- 7.59 The thermal modelling work undertaken by the applicant indicates that water temperature increases could lead to a small reduction in biomass of the bivalve *Macoma balthica* (Baltic Clam), on part of Stert Flats, although it appears that, with the discharge from HPB, there is sufficient prey to maintain large numbers of water birds. Should the discharge from HPB overlap with the operational phase of HPC, then it is predicted that the additive effects could lead to a reduction of some 11% in *Macoma balthica* biomass. The applicant's analysis of available food resources at Stert Flats indicates that this level of impact would not significantly affect the food resource availability and survival of species that forage on the mudflats.
- 7.60 Even if HPB and HPC were to run in parallel, the maximum temperatures would not increase, rather the area of impact would increase. The EA has conducted extensive desk-based studies that have shown the impacts of HPC and HPB will not have a significant effect on this species during the expected period of overlap, currently predicted to be between three and four years. It should be noted that another HRA would be required should the operators of HPB wish to extend its licence to operate beyond 2023.
- 7.61 Since the EA's HRA report was published, the applicant has released new construction and operation start dates (Ref: Marine Technical Forum, January 2013.) This implies that the periods of HPB and HPC overlap in operation have reduced, with HPC working at 70% from 2019 – 2021 and at 100% from 2021-2023. Hence, there would only be an overlap period of 3-4 years and not 5-6 years as originally assessed. This strengthens the conclusion of no adverse effect on integrity from the combined HPB and HPC thermal impacts.

Conclusion

- 7.62 The Secretary of State has considered the potential impacts of disturbance and displacement to birds, loss of habitat and water quality impacts on the bird species and assemblage of birds that are the feature of the Severn Estuary SPA and Ramsar and concludes that, with the relevant DCO and EA Environmental Permit requirements in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion on bird species and bird assemblage features alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO or EA permit requirements See Annex B	
Disturbance and displacement	No	P17 site preparation works	vegetation clearance
		PW22 project-wide	soft start piling
		J2 & C2 Jetty and Combwich	Shelduck and non-breeding Birds Monitoring and Mitigation Strategy
		J5 Jetty	Lighting
		C10 Combwich	Lighting
		MS29 main site	Operational Lighting Strategy
Loss of habitat	No	C3 - Combwich	Intertidal Monitoring and

			Contingency Plan
Changes in water quality	No	EA Discharge consent EPR/HP3228XT - PO10	Restriction on hydrazine Issued 13 March 2013
Overall effect on site integrity?	No adverse effect on site integrity		

8 SOMERSET LEVELS AND MOORS SPA/RAMSAR

Features: Migratory bird species and assemblage of waterfowl

Introduction

- 8.1 The Somerset Levels and Moors SPA/Ramsar lies some 12km to the west of the main HPC site. The premise for considering the Somerset Levels and Moors SPA/Ramsar here is that some of the birds recorded at the HPC site may in fact originate from populations designated under this SPA/Ramsar, rather than under the Severn Estuary designations. For some species, populations may not be discrete and it is accepted that there could be some overlap between them. Both sites share internationally important populations of Teal and assemblage populations of Wigeon and Pintail.
- 8.2 On the basis of the assessment work undertaken for the Severn Estuary SPA/Ramsar, the potential impacts on Somerset Levels and Moors birds can be taken as being disturbance during construction and the effect of the thermal plume on prey resources during operation.

Conservation Objectives

To avoid deterioration of habitats or significant disturbance of the qualifying species, which are teal, lapwing, golden plover and an assemblage of waterfowl no less than 73,014 birds.

- 8.3 *For the qualifying species, to maintain:*
- *Populations are as a viable component of the site;*
 - *Distribution within the site;*
 - *Distribution and extent of supporting habitats;*
 - *Structure, function and supporting processes of habits; and*
 - *No significant disturbance.*
- 8.4 For the species common to both European sites, the applicant's survey data indicates that the usage of HPC frontage is sporadic and generally involves a small number of birds. Teal and Wigeon were observed from the HPC frontage that could be part of either or both populations. As discussed in the Severn Estuary SPA/Ramsar section, whilst there may be some localised disturbance from the construction and operation of the temporary jetty and the construction of the seawall, this would be mitigated by requirements within the DCO, such that impacts would not be significant at a population level. Operational water quality impacts on the birds' prey species will be controlled by EA permit conditions.

Associated Development – Comwich wharf and freight laydown facility

- 8.5 Peak numbers of Golden Plover recorded at Comwich (775 birds) represent approximately 25% of the SPA population for this Annex I species and are of significance. Large numbers of Golden Plover were also recorded to the north of Comwich, with a peak of 1,350 birds. This suggests that a flock or flocks of Golden Plover move around the northern part of the River Parrett Estuary.

8.6 The numbers of Somerset Levels and Moors bird species recorded by the applicant at the other associated development sites were very low and so this section considers only the potential impacts of the refurbishment and extension of Comwich Wharf and the associated freight laydown facility.

Conclusions

8.7 The Secretary of State has considered the potential impacts on bird species and the assemblage of birds that are the feature of the Somerset Levels and Moors SPA/Ramsar. For the same reasons that apply to the Severn Estuary SPA/Ramsar (covered in chapter 7 of this document), he concludes that, with the relevant DCO and EA Environmental Permit requirements in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

9 EXMOOR AND QUANTOCK OAKWOODS SAC

Feature: Barbastelle Bat

Introduction

- 9.1 The Panel's report and RIES indicate likely significant effects on Barbastelle bat, *Barbastella barbastellus*, an Annex II feature of the Exmoor and Oakwood SAC. This was the only feature of the SAC where a likely significant effect was identified. Surveys of bat activity suggest that the main HPC site and some of the project's associated development is used for commuting and, to a lesser extent, foraging by Barbastelles. On a precautionary basis, it has been assumed that this species roosts within the Quantocks SSSI (a component of the SAC). HPC is within the bat's 5-9 km foraging range of the Quantocks SSSI. Barbastelle bat populations could be affected by:

Habitat loss and fragmentation of foraging habitat
Disruption to commuting corridors

- 9.2 Roost surveys identified no evidence of roosting Barbastelles within the Development Site and so harm or disturbance to roosting sites is not considered here.

Habitat loss and fragmentation of foraging habitat

Conservation objectives

- *Subject to natural change, to maintain the population of Barbastelle bat.*

The Conservation Objectives that measure the achievement of favourable condition of habitat within the SAC are not formally applicable outside the SAC. A relevant factor that would influence the bat population is:

- *Loss of or fragmentation to foraging habitat outside the SAC*

Alone assessment

Construction

- 9.3 Survey work indicates that Barbastelle bats use the HPC main site for commuting and, to a lesser extent, foraging. The clearance of vegetation during construction could result in loss and fragmentation of habitat for foraging bats and loss of commuting corridors. This would result in bats being forced to travel further to forage, possibly preventing bats accessing more distant foraging sites and increasing their levels of energy expenditure with possible risks to population levels. Barbastelle make use of a variety of habitat types for foraging, dependent on the capacity of those habitats to support the insects that the bats prey on. Arable land is rarely used for foraging, with most use made of woodland edges, hedgerows, unimproved grassland and wetlands.

- 9.4 Vegetation clearance will be undertaken as part of the Site Preparation Works application, prior to, and during, construction resulting in the loss of some 21.6 ha of habitat. Of particular significance for Barbastelle, is the loss of some 7.9 ha of established woodland and scrub and 1.7 ha of species-rich hedgerow.
- 9.5 To mitigate this, prior to, and on commencement of, construction, a variety of planting and management measures are proposed to be implemented to create alternative habitats that will benefit Barbastelles, both on and off-site. Two hectares of suitable habitat are planned to be created as mitigation for every hectare of habitat lost during the construction phase. Habitat gains by habitat type are set out in Table 6.40 of the applicant's HRA, with habitat enhancement proposals set out in Volume 2, Chapter 20 of the ES. These will form part of a Habitat Management Plan. Habitat enhancements include:
- Management of hedgerows, species-rich grassland and Bum Brook habitat within the site to maximise suitability for foraging Barbastelles
 - Planting scrub and trees on the bund along the north-west of HPC
 - Planting hedgerow connection within HPC
 - Advance planting of woodland and species-rich grassland
- 9.6 The applicant has committed to enhancing up to 25 ha of off-site agricultural land close to the HPC main site to create a flower-rich grassland. Up to 10 ha of this would be secured by the preparation works application and the remaining 15 ha by the DCO. The applicant indicates that the importance of protecting habitat around commuting corridors across HPC site (such as the Green Lane, Benhole Lane and Bum Brook) was recognised at an early stage and it will be largely retained. During the construction and decommissioning of the temporary jetty, the coastal strip will temporarily be lost, although other corridors would be available during the working period to allow bats to continue to cross the site.
- 9.7 Vegetation clearance and construction mitigation measures to protect bat habitats are covered under the Site Preparation Works requirements within the DCO i.e. P1 (ecology: tree protection) and P6 (Green Lane preservation). Requirement for bat monitoring is covered under P18 and habitat management via a requirement for a Habitat Management Plan (P19). Mitigation measures to retain bat flight corridors and the creation and enhancement 15 ha of suitable habitat off-site is covered by DCO Requirement MS1. These offsite enhancement works would need to be completed before development can begin on the main site and are in addition to the 10 ha secured by the site preparation section 106 agreement. MS1 also contains a commitment to retain and enhance the bat flight corridors.

Associated Development

- 9.8 Barbastelle bats may commute between 5 and 9km from their roost sites in the Quantocks SSSI to forage. The following associated development sites lie within foraging range of the SSSI boundary:

- Cannington Bypass (7.2 km);
- Cannington Park and Ride (7.5km); and
- Combwich freight laydown facility (8.5km).

9.9 Losses of suitable foraging habitat are considered to be small and would be mitigated by provision of bat underpasses and bridges along Cannington Bypass, strengthening existing and new planting at Cannington Park and Ride and Combwich. The DCO contains separate requirements for ecological mitigation and monitoring plans for each element of the associated development as follows: Cannington Bypass (CB2); Cannington Park and Ride (CP1) and Combwich (C1). Monitoring would be undertaken to confirm the use of the site by *Barbastelle* to ensure that mitigation and enhancement measures are successful. Three years of annual monitoring would be undertaken, followed by a review of the need for further monitoring (MS1).

Operation

- 9.10 No additional loss of habitat will occur during the operation of HPC. The total amount of habitat created or enhanced would be some 86 ha that aims to mature over a 3-5 year period to create conditions suitable for foraging *Barbastelle*. There would be some loss of foraging habitat until the habitat created during construction matures, although ultimately there will be a more extensive area created than has been lost. It should be noted that *Barbastelles* currently make only occasional use of the operational area of the site.
- 9.11 As for the associated development, mitigation planting to compensate for habitat lost during the construction period is considered to mature sufficiently within 3 to 5 years of the end of the construction period such that this will compensate for loss of habitat during the construction period. Retention of hedgerows and bat underpass / hop-overs along Cannington bypass will ensure the continued connectivity of commuting corridors.

Disruption to commuting corridors

Conservation objectives

- *Subject to natural change, to maintain the populations of *Barbastelle* bat.*

The Conservation Objectives that measure the achievement of favourable condition of habitat within the SAC are not formally applicable outside the SAC. A relevant factor that would influence the bat population is:

- *Loss/disruption to commuting routes e.g. by artificial lighting.*

Alone assessment

Construction

- 9.12 In summer, *Barbastelles* forage in dark areas under trees until light levels in open areas have dropped to levels closer to those under tree canopies. The artificial lighting of construction areas could discourage bats from using their commuting corridors and foraging. Disturbance from lighting will be minimised through classification of the commuting corridors as “dark areas”

and through other measures defined in a Construction Lighting Strategy. The requirements for this Construction Lighting Strategy to minimise external lighting, specifically its impact on important bat areas, is set out in DCO Requirement MS13.

9.13 Lighting Strategy measures include:

- Light positioned as far from hedges as is conducive to security and engineering requirements;
- Use of low-intensity sodium lamps close to the designated dark areas, with cowls to reduce light spill towards hedgerows;
- Height of lighting columns to be designed to reduce unwanted light spill; and
- Lighting to be motion or switch-activated.

9.14 Lighting is expected to be required during November to February and only during working hours. It is expected that this would coincide with the winter hibernation period for the species. For the operational phase of the jetty, disturbance from lighting on the coastal edge and habitats adjacent to the boundaries of the site would also be controlled by the Construction Lighting Strategy.

Operation

9.15 Bat surveys indicate that there is only very occasional use of the part of the HPC main site that will form the operational area. As described above, the main corridors used for commuting would be retained and coherent corridors created across the development site. Other than potential management activities, there would be no activities taking place along or adjacent to the existing commuting corridors (Benhole Lane, Green Lane) or any of the new corridors that would be created. Lighting these corridors would not be required as they all lie outside the area that will form the operational site for HPC.

9.16 Permanent lighting at the HPC Main Site is to be in accordance with the Environmental Statement as required by MS29. The DCO contains separate requirements for minimising artificial light for the associated development as follows: Cannington Bypass (CB7) Cannington Park and Ride (CP8) Combwich (C10).

Cumulative and in combination effects

9.17 It is considered that there will be no cumulative impacts from HPC with the associated developments (Cannington Bypass, Cannington Park and Ride, and Combwich freight lay down facility) due to proposed mitigation measures, which it is reasonable to assume will be effective i.e. replacement planting, creation of new habitat, bat crossing facilities on Cannington Bypass and the Construction Lighting Strategy.

9.18 This means that the commuting corridors used by Barbastelle on the HPC site would be retained and there would be no adverse effect on site integrity as a result of the interactions

between any element of the HPC project. Data suggests that the Steart Peninsula is used by Barbastelle bats for foraging. The proposed managed realignment projects on Steart will result in areas of land being inundated and eventually forming part of the estuarine habitats of the Severn/Parrett estuaries. The suitability of these areas as bat foraging habitat could be significantly reduced. Areas of land and associated waterbodies on the landward side of the seawall would remain available for use by foraging bats and may even be enhanced. At this stage, insufficient information is available to establish the extent of habitat alteration. Foraging habitat will be lost during the construction of HPC but this will be mitigated by maintaining existing commuting corridors where possible and creating new habitat, both on and off site.

Conclusion

- 9.19 The Secretary of State has considered the potential impacts of the project on Barbastelle bats, a qualifying feature of the Exmoor and Quantock Oakwoods SAC. He has assessed potential habitat losses and gains, the risk of fragmentation of foraging habitat and disruption to commuting corridors by artificial lighting. He is satisfied that, with the relevant DCO requirements in place, the impacts from HPC alone and in combination would not have an adverse effect on site integrity.

Conclusion of Barbastelle bat feature alone, cumulatively and in combination:

Potential impacts	Adverse effect on integrity?	Relevant DCO requirements See Annex B	
Habitat loss/fragmentation	No	P1 Site preparation works	Ecology: tree protection
		P6 Site Preparation Works	Green Lane retention
		P18 Site Preparation Works	Ecological Mitigation and Monitoring Plan
		P19 Site Preparation Works	Habitat Management Plan
		MS1 Main site	Wildlife mitigation: bat foraging
		CB2 Cannington Bypass	Ecology
		CP1 Cannington Park and Ride	Ecology
Disruption to commuting corridors	No	C1 Combwich	Ecology
		MS13 Main site	Construction Lighting Strategy
		MS29 Main site	Permanent lighting
		CB7 Cannington Bypass	Lighting
		CP8 Cannington Park and Ride	Lighting
		C10 Combwich	Lighting
		Overall effect on site integrity?	No adverse effect on site integrity

10 CONCLUSIONS ON SITE INTEGRITY

- 10.1 Based on the environmental information provided to the Planning Inspectorate, the Panel's report and published data and analysis from other sources, the Secretary of State considers that sufficient information is available to enable an Appropriate Assessment to be made to address the potential impact of HPC alone and in combination with other plans and projects in line with his duties under Regulation 61. He has drawn extensively from the HRA undertaken by the EA and considers this to be a robust and detailed assessment of potential impacts on the Severn Estuary. Furthermore, the SNCBs, such as NE and CCW, have been highly involved in the EA's HRA process and fully support the conclusions drawn up and the supporting requirements in both the DCO and EA permits.
- 10.2 The Secretary of State has assessed the implications of the whole DCO application including the temporary jetty, the associated development and related marine works and water discharge activities, as recommended by the Panel. He has considered the activities associated with the construction, operation and decommissioning of the works and how they might impact on the conservation objectives of four European sites, namely, the Severn Estuary SAC / Ramsar; the Severn Estuary SPA/Ramsar; the Somerset Moors and Levels SPA/Ramsar and the Exmoor Oakwoods and Quantocks SAC. This has included an assessment of how the different elements of HPC may interact with each other and how potential impacts may act in combination with other plans and projects, such as the existing HPB power station.
- 10.3 The Secretary of State considers that there will be no adverse effects on the integrity any of the above sites as a result of HPC alone or in combination with other plans and projects. This conclusion is based on the inclusion of certain mitigation measures in the DCO and conditions in the relevant EA permits.
- 10.4 This report details, at the end of each section, the measures put in place to mitigate potential impacts on European sites. The Secretary of State considers the following to be of particular importance in reaching his conclusion of no adverse effect:

Severn Estuary SAC/Ramsar

- 10.5 The Secretary of State has considered the potential water quality impacts on the features of Severn Estuary SAC/Ramsar and notes the EA's assessment of hydrazine and Total Residual Oxygen (TRO) from the cooling water discharge. He is satisfied that EA permit EPR/HP3228CT, issued on 13 March 2013, contains the appropriate conditions to avoid any risk of adverse effect on the Severn Estuary SAC/Ramsar. The Secretary of State also requires the production of surface and foul water drainage plans, prior to construction to ensure that pollution and runoff into the Estuary and the River Parrett is controlled and managed in accordance with the approved Code of Construction Practice.
- 10.6 The Secretary of State notes the EA's assessment of the thermal plume on the receiving waters and on the sea bed of the Severn Estuary and their analysis of impacts as a result of

temperature rises. He accepts their conclusion that the species most likely to be affected is the Baltic Clam (*Macoma balthica*) and that, based on studies of the existing HPB discharge, effects will not be significant. Contaminants and temperature increases in the cooling waters could also affect the reef-building worm *Sabellaria alveolata* and its biogenic reefs. He is satisfied that there are no biogenic reefs around the proposed outfall, that cooling water contaminants would be controlled by the EA permit and that reefs could benefit from temperature increases from the combined HPC and HPB plumes.

- 10.7 The Secretary of State is aware of the fact that HPC will require up to 134m³/s for direct cooling that will be abstracted from the seabed, meaning that organisms present in the sea water will be drawn into water intakes. Larger organisms will be impinged on the cooling water intake screens, whilst smaller organisms, such as plankton, fish eggs and *Sabellaria* larvae will be entrained through the cooling water system. He has considered the extent of these impingement/entrainment effects and considers that, with the acoustic fish deterrent and fish recovery system in place, there will be no adverse effect on the integrity of the Severn Estuary SAC/Ramsar. He notes the concerns expressed by the NE, CCW and others on the operational effectiveness of these systems and accepts the importance of optimising the performance of these systems *in situ*, prior to the full operation of HPC. The Secretary of State considers that the mitigation measures set out in the DCO, together with the EA's environmental permits and their enforcement, will ensure no adverse effects on the features of the Severn Estuary SAC/Ramsar sites.
- 10.8 The construction of the seawall, temporary jetty, cooling water infrastructure and Combwich Wharf could disturb fish due to noise and vibration. Of particular concern is the risk that piling for the refurbishment of Combwich Wharf could disrupt the migratory route of eel and salmon up the River Parrett. The Secretary of State is satisfied that these effects would be mitigated by a project-wide requirement for best practice soft start piling and by limiting works at Combwich to daylight hours, thus ensuring a sufficient migratory window for both species. The Secretary of State also notes the protective effects of the conditions contained within the marine licence already issued for the HEO for the temporary jetty and is satisfied that these are not in anyway diminished
- 10.9 The Secretary of State has considered the potential impact of changes in hydrodynamics and sediment transport on the estuary. He notes concerns expressed by interested parties about the potential impact of dredging during construction and maintenance and the importance of retaining the range and relative proportions of sediment sizes and budget within the estuary system. For this reason, he has included a requirement within the DCO that dredged material be disposed of within the Severn Estuary to maintain its sediment budget. He is aware that concerns have also been raised by interested parties about the risk of tugboats without payloads travelling at speeds that may create "wash effects" that could cause erosion to the banks of the River Parrett that are already in unfavourable condition. He notes that a vessel wash/speed monitoring contingency strategy has been agreed between relevant parties and he

has included this in the DCO to ensure that erosion is monitored and appropriate contingency measures implemented.

- 10.10 He considers that the presence of new infrastructure in the estuary would result in only localised effects on the hydrodynamic regime that would be minimal in the context of the wider estuary.

Severn Estuary SPA/Ramsar and the Somerset Moors and Levels SPA/Ramsar

- 10.11 The Secretary of State considers that construction works at Combwich Wharf and, to a lesser extent the temporary jetty and the seawall on the foreshore at HPC have potential to disturb and displace the bird species and bird assemblage that are the features of the Severn Estuary SPA/Ramsar. This could also affect some Somerset Levels and Moors SPA/Ramsar birds where there could be overlap between populations. He is aware that there are large numbers of birds within the 250m “displacement zone” of the wharf construction area and that the EA were unable to conclude an absence of adverse effects on the integrity of the European sites without taking preventative measures. This is also the advice of the statutory nature conservation bodies.

- 10.12 The Secretary of State accepts this advice and has incorporated requirements in the DCO for preventative measures to reduce the disturbance to birds and potential losses of their intertidal feeding and roosting habitats. These include, but are not limited to, a project-wide requirement for soft start piling techniques and, in the event that soft start techniques are not used for piling at Combwich Wharf, then no impact piling would be allowed in or adjacent to important areas for birds during the wintering season (October – March inclusive). He notes the EA’s evidence that the Severn Estuary SPA/Ramsar is not at carrying capacity and considers that displaced birds would be able to take advantage of other foraging and roosting opportunities in the estuary and so there would be no population level effects on the site due to disturbance.

- 10.13 Given the potential for in combination effects with vessels passing between the temporary jetty and the Combwich Wharf to deliver Abnormal Indivisible Loads and construction materials, the Secretary of State requires the approval by the relevant authorities of a Shelduck and non-breeding birds monitoring and mitigation scheme and a Combwich intertidal monitoring and contingency plan. He is satisfied that these measures will further reduce the disturbance and minimise any indirect loss of habitat as a result of wash effects from vessels.

- 10.14 There will also be some small intertidal direct habitat losses due to the temporary jetty, but no party has considered these to be significant. In his assessment of water quality impacts, the Secretary of State was satisfied that contamination and changes to the thermal regime would not adversely affect the food resources of the SPA/Ramsar bird species, most notably, the Baltic Clam.

Exmoor Oakwoods and Quantocks SAC

- 10.15 It has been drawn to the Secretary of State’s attention that the main HPC site and some of the associated development is used for commuting and, to a lesser extent foraging by Barbastelle

bats *Barbastella barbastellus*, a feature of the Exmoor and Quantock Oakwoods SAC. He is satisfied that adverse effects will be adequately mitigated by a range of habitat creation and enhancement measures, including the acquisition by the applicant of some 25ha of agricultural land close to the main site to create a flower-rich grassland and the protection of habitat around commuting corridors across the main HPC site. He notes that two hectares of suitable habitat are proposed to be created for every hectare lost and that the offsite habitat creation works would need to be completed before vegetation clearance can begin on the main HPC site. Bats could be deterred from using their commuting corridors at night by artificial lighting and so DCO requirements are in place to control artificial lighting, during both the construction and operational phases of the development.

10.16 With these mitigation measures in place, the Secretary of State is satisfied that habitat loss is mitigated and artificial lighting will not disturb commuting and foraging *Barbastelle* bats.

Decommissioning

10.17 The cessation of energy generation at HPC is anticipated to be in 2080, with decommissioning taking place at the end of its lifetime. The development involved in decommissioning is not authorised by this DCO, nor by any other authorisations currently being sought in respect of HPC, but will be controlled by a number of other regulatory regimes, including the site licence at the appropriate time.

10.18 It is not possible at this stage to predict with any certainty what the European and Ramsar site context of HPC will be over 60 years in the future – sites may increase or decrease in importance over that time. However, if the environmental baseline were to be similar to the current situation, then the impacts of decommissioning could be expected to be similar to the anticipated impacts of construction – given the nature of the physical processes involved in decommissioning. On this basis, the Secretary of State considers that decommissioning HPC would not have an adverse effect on the integrity of the relevant sites, since this assessment has shown that the anticipated impacts of construction and operation will not have such an effect.

10.19 The Secretary of State is satisfied that decommissioning impacts on European sites will be addressed fully by the relevant authorities, prior to decommissioning and in light of more detailed information on decommissioning processes and environmental conditions at that time.

Overall

10.20 The Panel advises that it has carefully examined the requirements included in the draft DCO dated 31st August (and incorporated into the final DCO) that would give protection to the integrity of the European sites and Ramsar sites. It has consulted extensively with the relevant statutory bodies and regulatory authorities. The applicant has reached agreement with these bodies that these requirements would be sufficient to secure the protection and integrity of the European sites and it found no reason to disagree.

10.21 The Secretary of State notes that the Panel did, however, express some concerns about competent authority co-ordination between himself, the MMO and the EA, given that a conclusion of “no adverse effects” is based on mitigation that would rightfully be contained in different consents and permits required for HPC. Since receipt of the Panel’s report, the EA has issued the relevant permits (on 13 March 2013) and the Secretary of State has confidence that these mitigation measures have now been secured. The MMO has yet to issue its remaining marine licence, although the Secretary of State has no reason to suppose that this will not be forthcoming. Nevertheless, he has included requirements in the DCO to ensure that the necessary mitigation measures, such as the acoustic fish deterrent system, have been secured.

10.22 With these safeguards in place, the Secretary of State concludes that there would be no adverse effect on any European site as a result of HPC alone and in combination with other plans and projects.

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Annex A - CONSERVATION OBJECTIVES FOR EUROPEAN SITES SCREENED INTO THE AA

Table A1. Conservation objectives for the Severn Estuary SAC/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
Estuaries	<ul style="list-style-type: none"> ➤ the total extent of the estuary is maintained; ➤ the characteristic physical form (tidal prism/cross sectional area) and flow (tidal regime)of the estuary is maintained; ➤ the characteristic range and relative proportions of sediment sizes and sediment budget within the site is maintained; ➤ the extent, variety and spatial distribution of estuarine habitat communities within the site is maintained; ➤ the extent, variety, spatial distribution and community composition of notable communities is maintained; ➤ the abundance of the notable estuarine species assemblages is maintained or increased; ➤ the physico-chemical characteristics of the water column support the ecological objectives described above; ➤ Toxic contaminants in water column and sediment are below levels which would pose a risk to the ecological objectives described above; ➤ Airborne nutrient and contaminant loads are below levels which would pose a risk to the ecological objectives described above.
Subtidal sandbanks covered by seawater all of the time	<ul style="list-style-type: none"> ➤ The total extent of the subtidal sandbanks within the site is maintained; ➤ the extent and distribution of the individual subtidal sandbank communities within the site is maintained; ➤ the community composition of the sub tidal sandbank feature within the site is maintained; ➤ the variety and distribution of sediment types across the subtidal sandbank feature is maintained; ➤ the gross morphology (depth, distribution and profile) of the subtidal sandbank feature within the site is maintained.
Inter-tidal mudflats and sandflats not covered by seawater at low tide	<ul style="list-style-type: none"> ➤ The total extent of the mudflats and sandflats feature is maintained; ➤ the variety and extent of individual mudflats and sandflats communities within the site is maintained; ➤ the distribution of individual mudflats and sandflats communities within the site is maintained; ➤ the community composition of the mudflats and sandflats feature within the site is maintained; ➤ the topography of the inter-tidal flats and the morphology (dynamic processes sediment movement and channel migration across the flats) are maintained
Atlantic salt meadows	<ul style="list-style-type: none"> ➤ The total extent of Atlantic salt meadow and associated transitional vegetation communities within the site is maintained; ➤ The extent and distribution of the individual Atlantic salt meadow and associated transitional vegetation communities within the site is maintained; ➤ the zonation of Atlantic salt meadow vegetation communities and their associated transitions to other estuary habitats is maintained; ➤ the relative abundance of the typical species of the Atlantic salt meadow and associated transitional vegetation communities is maintained; ➤ the abundance of the notable species of the Atlantic salt meadow and associated transitional vegetation communities is maintained; ➤ the structural variation of the salt marsh sward (resulting from grazing) is maintained within limits sufficient to satisfy the requirements of conditions above and the requirements of the Ramsar and SPA features; ➤ the characteristic stepped morphology of the salt marshes and associated creeks, pills, drainage ditches and pans, and the estuarine

Table A1. Conservation objectives for the Severn Estuary SAC/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
	<p>processes that enable their development, is maintained.</p> <ul style="list-style-type: none"> ➤ Any areas of <i>Spartina anglica</i> salt marsh are capable of developing naturally into other saltmarsh communities.
Reefs	<ul style="list-style-type: none"> ➤ The total extent and distribution of <i>Sabellaria</i> reef is maintained; ➤ the community composition of the <i>Sabellaria</i> reef is maintained; ➤ the full range of different age structures of <i>Sabellaria</i> reef are present; ➤ the physical and ecological processes necessary to support <i>Sabellaria</i> reef are maintained
River lamprey <i>Lampetra fluviatilis</i>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile river lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; ➤ the size of the river lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained and is at a level that is sustainable in the long term; ➤ the abundance of prey species forming the river lamprey's food resource within the estuary is maintained ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
Sea lamprey <i>Petromyzon marinus</i>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile sea lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; ➤ the size of the sea lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term; ➤ the abundance of prey species forming the sea lamprey's food resource within the estuary is maintained ➤ vi. Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
Twaite shad <i>Alosa fallax</i>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile twaite shad through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by physical barriers, changes in flows or poor water quality; ➤ the size of the twaite shad population within the Severn Estuary and the rivers draining into it, is at least maintained and is at a level that is sustainable in the long term. ➤ the abundance of prey species forming the twaite shad's food resource within the estuary, in particular at the salt wedge, is maintained.

Table A1. Conservation objectives for the Severn Estuary SAC/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
	<ul style="list-style-type: none"> ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
<p>Assemblage of migratory fish species (Ramsar & SAC estuaries sub-feature)*</p>	<ul style="list-style-type: none"> ➤ The migratory passage of both adults and juveniles through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by physical barriers, changes in flows or poor water quality; ➤ the size of the populations of the assemblage species within the Severn Estuary and the rivers draining into it, is at least maintained and is at a level that is sustainable in the long term. ➤ the abundance of prey species forming the principle food resources for the assemblage species within the estuary, in particular at the salt wedge, is maintained; ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
<p>Allis shad <i>Alosa alosa</i> (Ramsar & SAC estuaries sub-feature)*</p>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile allis shad through the Severn Estuary between the Bristol Channel and their spawning rivers is not obstructed or impeded by physical barriers, changes in flows or poor water quality; ➤ the size of the allis shad population within the Severn Estuary and the rivers draining into it, is at least maintained and is at a level that is sustainable in the long term. ➤ the abundance of prey species forming the allis shad's food resource within the estuary, in particular at the salt wedge, is maintained. ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
<p>European eel <i>Anguilla Anguilla</i> (Ramsar & SAC estuaries subfeature)*</p>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile eel through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; ➤ the size of the eel population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term; ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.
<p>Sea trout <i>Salmo trutta</i> (Ramsar & SAC estuaries sub-feature)*</p>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile sea trout through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; ➤ the size of the sea trout population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term; ➤ the abundance of prey species forming the sea trout's food resource within the estuary is maintained; ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.

Table A1. Conservation objectives for the Severn Estuary SAC/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
<p>Atlantic salmon <i>Salmo salar</i> (Ramsar & SAC estuaries subfeature)*</p>	<ul style="list-style-type: none"> ➤ The migratory passage of both adult and juvenile Atlantic salmon through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality; ➤ the size of the Atlantic salmon population in the Severn Estuary and the rivers which drain into it, is at least maintained as is at a level that is sustainable in the long term; ➤ the abundance of prey species forming the Atlantic salmon's food resource within the estuary is maintained; ➤ Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above
<p>* Note: Although officially conservation objectives do not exist for the Ramsar fish features, we have given them objectives based on a reflection of the SAC conservation objectives for the migratory fish. This approach is in accord with the EA's HRA report.</p>	

Table A2. Conservation objectives for the Severn Estuary SPA/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
<p>Internationally Important population of regularly occurring Annex 1 species: Bewick's swan <i>Cygnus columbianus bewickii</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the Bewick's swan population is no less than 289 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); ➤ the extent of saltmarsh at the Dumbles is maintained; ➤ the extent of inter-tidal mudflats and sandflats at Frampton Sands, Waveridge Sands and the Noose is maintained; ➤ the extent of vegetation with an effective field size of >6 ha and with unrestricted bird sightlines > 500m at feeding, roosting and refuge sites are maintained; ➤ greater than 25% cover of suitable soft leaved herbs and grasses in winter season throughout the transitional saltmarsh at the Dumbles is maintained; ➤ Aggregates of Bewick' swan at feeding, roosting and refuge sites are not subject to significant disturbance
<p>Internationally important population of regularly occurring migratory species: wintering European white-fronted goose <i>Anser albifrons albifrons</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the wintering European white-fronted goose population is no less than 3,002 individuals (ie the 5 year peak mean between 1988/9- 1992/3); ➤ the extent of saltmarsh at the Dumbles is maintained; ➤ the extent of inter-tidal mudflats and sandflats at Frampton Sands, Waveridge Sands and the Noose is maintained; ➤ greater than 25% cover of suitable soft-leaved herbs and grasses is maintained during the winter on saltmarsh areas; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of European white-fronted goose at feeding or roosting sites are not subject to significant disturbance.
<p>Internationally important population of regularly occurring migratory species: wintering dunlin <i>Calidris alpina alpina</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the wintering dunlin population is no less than 41,683 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); ➤ the extent of saltmarsh is maintained; ➤ the extent of inter-tidal mudflats and sandflats is maintained; ➤ the extent of hard substrate habitats is maintained; ➤ the extent of vegetation with a sward height of <10cm is maintained throughout the saltmarsh; ➤ the abundance and macro-distribution of suitable invertebrates in inter-tidal mudflats and sandflats is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in hard substrate habitats is maintained; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of dunlin at feeding or roosting sites are not subject to significant disturbance
<p>Internationally important population of regularly occurring migratory species: wintering redshank <i>Tringa totanus</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the wintering redshank population is no less than 2,013 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); ➤ the extent of saltmarsh and associated strandlines is maintained; ➤ the extent of inter-tidal mudflats and sandflats is maintained; ➤ the extent of hard substrate habitats is maintained; ➤ the extent of vegetation with a sward height of <10cm throughout the saltmarsh is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in inter-tidal mudflats and sandflats is maintained;

Table A2. Conservation objectives for the Severn Estuary SPA/Ramsar

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
	<ul style="list-style-type: none"> ➤ the abundance and macro-distribution of suitable invertebrates in hard substrate habitats is maintained; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of redshank at feeding or roosting sites are not subject to significant disturbance.
<p>Internationally Important population of regularly occurring migratory species: Wintering shelduck <i>Tadorna tadorna</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the wintering shelduck population is no less than 2,892 individuals (ie the 5 year peak mean between 1988/9 - 1992/3); ➤ the extent of saltmarsh is maintained; ➤ the extent of intertidal mudflats and sandflats is maintained; ➤ the extent of hard substrate habitats is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in intertidal mudflats and sandflats is maintained; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of shelduck at feeding or roosting sites are not subject to significant disturbance
<p>Internationally Important population of regularly occurring migratory species: gadwall <i>Anas strepera</i></p>	<ul style="list-style-type: none"> ➤ The 5 year peak mean population size for the wintering gadwall population is no less than 330 (i.e. the 5 year peak mean between 1988/9 and 1992/3); ➤ the extent of inter-tidal mudflats and sandflats is maintained; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of gadwall at feeding or roosting sites are not subject to significant disturbance.
<p>Internationally important population of regularly occurring migratory species: From the SPA review Ringed plover, curlew, pintail</p>	<ul style="list-style-type: none"> ➤ Wintering populations are maintained (5 year peak mean) ➤ the extent of saltmarsh is maintained; ➤ the extent of inter-tidal mudflats and sandflats is maintained; ➤ the extent of hard substrate habitats is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in intertidal mudflats and sandflats is maintained; ➤ unrestricted bird sightlines of >200m at feeding and roosting sites are maintained; ➤ aggregations of birds at feeding or roosting sites are not subject to significant disturbance.
<p>Internationally important assemblage of waterfowl</p>	<ul style="list-style-type: none"> ➤ the 5 year peak mean population size for the waterfowl assemblage is no less than 68,026 individuals (ie the 5 year peak mean between 1988/9- 1992/3); ➤ the extent of saltmarsh and their associated strandlines is maintained; ➤ the extent of inter-tidal mudflats and sandflats is maintained; ➤ the extent of hard substrate habitats is maintained; ➤ the extent of vegetation of <10cm throughout the saltmarsh is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in inter-tidal mudflats and sandflats is maintained; ➤ the abundance and macro-distribution of suitable invertebrates in hard substrate habitats is maintained; ➤ greater than 25% cover of suitable soft leaved herbs and grasses during the winter on saltmarsh areas is maintained; ➤ unrestricted bird sightlines of >500m at feeding and roosting sites are maintained; ➤ waterfowl aggregations at feeding or roosting sites are not subject to significant disturbance.

Table A3. Conservation objectives for the Somerset Levels and Moors SPA/Ramsar

Feature to maintain in favourable condition	Targets
<p>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</p>	
<p>Internationally Important population of regularly occurring migratory species: Teal <i>Anas crecca</i> (Non-breeding)</p>	<p>➤ The 5 year peak mean population size for the teal population is no less than 3.3% of the GB population 5 year peak mean between 1991/92 to 1995/96;</p>
<p>Internationally Important population of regularly occurring migratory species: Lapwing <i>Vanellus vanellus</i> (Non-breeding)</p>	<p>➤ The 5 year peak mean population size for the lapwing population is no less than 0.5% of the GB population 5 year peak mean between 1991/92 to 1995/96;</p>
<p>Internationally Important population of regularly occurring migratory species: Golden Plover <i>Pluvialis apricaria</i> (Non-breeding)</p>	<p>➤ The 5 year peak mean population size for the golden plover population is no less than 1.2% of the GB population 5 year peak mean between 1991/92 to 1995/96;</p>
<p>Internationally important assemblage of waterfowl</p>	<p>➤ No less than 73,014 waterfowl (5-year peak mean 01/04/98);</p>
<p>Conditions common to all SPA species</p>	<p>Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.</p> <p>Subject to natural change, to maintain or restore:</p> <ul style="list-style-type: none"> ➤ the extent and distribution of the habitats of the qualifying features; ➤ the structure and function of the habitats of the qualifying features; ➤ the supporting processes on which the habitats of the qualifying features rely; ➤ the populations of the qualifying features; ➤ the distribution of the qualifying features within the site
<p>Additional qualifying features identified by the 2001 UK SPA Review:</p>	<ul style="list-style-type: none"> ➤ Eurasian wigeon <i>Anas Penelope</i> (Non-breeding) ➤ Northern shoveler <i>Anas clypeata</i> (Non-breeding)

Table A4. Conservation objectives for the Exmoor and Quantock Oakwoods SAC

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
<p>Old Sessile Oak Woods</p>	<ul style="list-style-type: none"> ➤ No loss of ancient semi-natural stands. At least current area of recent semi-natural stands maintained, although their location may alter. At least the area of ancient woodland retained. ➤ At least the current level of structural diversity maintained. Understorey (2-5m) present over at least 10% of total stand area. Ground flora present over at least 50% of area. Canopy cover present over 30-90 % of stand area. All age classes present but not necessarily in an heterogeneous mix. Minimum 3 fallen lying trees >20 cm diameter. per ha and 4 trees per ha allowed to die standing. ➤ Signs of seedlings growing through to saplings to young trees at sufficient density to maintain canopy density over a 10 yr period (or equivalent re-growth from coppice stumps). No planting in sites where it has not occurred in the last 15 years. ➤ At least the current level of site-native species maintained. At least 90% of cover in any one layer of site-native or acceptable naturalised species. ➤ Oak present and providing at least 30% cover in the canopy of mature stands over feature as a whole Death, destruction or replacement of native woodland species through effects of introduced fauna or other external unnatural factors not more than 10% by number or area in a five-year period. ➤ 80% of ground flora cover referable to relevant NVC community (W10, W11, W16, W17). Distinctive elements maintained at current levels and in current locations (where appropriate). Patches and transitions maintained in extent and where appropriate location. ➤ Epiphytic lichen communities are sensitive to enrichment and acidification from atmospheric deposition; no prescribed air quality standards can be set at this stage but objectives will need to reflect this sensitivity. Species indicative of nutrient enrichment are restricted to appropriate locations. These species are not increasing in abundance.
<p>Alluvial Forests</p>	<ul style="list-style-type: none"> ➤ No loss of ancient semi-natural stands. At least current area of recent semi-natural stands maintained, although their location may alter. At least the area of ancient woodland retained. ➤ At least the current level of structural diversity maintained. Understorey (2-5m) present over at least 20% of total stand area. ➤ Ground flora present over at least 50% of area excluding temporary pool areas. Canopy cover present over 30-90 % of stand area. Age class structure appropriate to the site, its history and management. A minimum of 3 fallen lying trees or major branches per ha and 4 trees per ha allowed to die standing. At least the current level of natural hydrological features should be maintained (channels, pools, periodic flooding). ➤ Signs of seedlings growing through to saplings to young trees at sufficient density to maintain canopy density over a 10 yr period (or equivalent re-growth from coppice stumps). No planting in stands where it has not occurred in the last 15 years. ➤ At least the current level of site-native species maintained. At least 90% of cover in any one layer of site-native or acceptable naturalised species. ➤ Death, destruction or replacement of native woodland species through effects of introduced fauna or other external unnatural factors not more than 10% by number or area in a five year period. ➤ 80% of ground flora cover referable to relevant NVC wet woodland community (W 7). Distinctive elements maintained at current levels and in current locations (where appropriate). Patches and transitions maintained in extent and where appropriate location
<p>Otter <i>Lutra lutra</i></p>	<ul style="list-style-type: none"> ➤ Water quality should be good, with no pollution incidents.

Table A4. Conservation objectives for the Exmoor and Quantock Oakwoods SAC

Feature to maintain in favourable condition	Targets
<p><i>The conservation objectives for the features listed below are to maintain them in favourable condition, as defined below: The feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met:</i></p>	
	<ul style="list-style-type: none"> ➤ No reduction in water flow attributable to increased abstraction. No reduction of fragmentation of area. ➤ Fish stocks appropriate to the nutrient status of the river. No significant decline in fish biomass or species diversity. ➤ No significant change to river or bankside usage; no significant development. No permanent decrease in bankside cover. ➤ Signs of otters found at least once per year.
<p>Barbastelle bat <i>Barbastella barbastellus</i> and Bechsteins bat <i>Myotis bechsteinii</i></p>	<ul style="list-style-type: none"> ➤ Conservation of Barbastelle within the SAC will not be achieved without conservation of habitats in the surrounding landscape, as summer foraging ranged up to 9km from roost locations. Over 90% of foraging appears to occur outside the SAC along linear wooded/scrub strips including along watercourses, overgrown hedgerows, uncut grassland, heather moorland edge (within Exmoor Heath SAC), gardens and areas of low level street lighting.

Annex B - Relevant DCO Requirements and EA Conditions

Development Consent Order Requirements	
Reference number/description	Requirement
PW14: Project Wide - Code of Construction Practice	The construction of the authorised project shall be carried out in accordance with the Code of Construction Practice dated 14 September 2012, unless otherwise approved by the relevant planning authority.
PW17: Project wide - Cross-shore rock platform erosion and sediment transport monitoring plan	<p>(1) Work Nos. 1A(o), TJ1 to TJ3, 2B, 2D, 2F and 2H shall not commence until a cross-shore rock platform erosion and sediment transport monitoring plan has, after consultation with the Countryside Council for Wales, Natural England and the Environment Agency, been submitted to and approved by the Marine Management Organisation. The plan should include —</p> <ul style="list-style-type: none"> (a) the geographical extent of the monitoring which shall include, but is not limited to, the intertidal shore fronting the HPC development site, the ‘pocket beach’ at the junction between the existing and proposed sea wall defences (Hinkley Point A and Hinkley Point C interface), the offshore intake and outfall heads, the jetty head and all associated dredged areas; (b) arrangements for monitoring of the cross-shore rock platform fronting the HPC development site to seaward to quantify platform lowering during the operation of Work No. 1A; (c) arrangements for sediment transport monitoring before, during and after construction, describing the mobile bed (non-suspended) sediment load and distribution, unless otherwise agreed by the Marine Management Organisation; (d) appropriate contingency measures that would be implemented having regard to the results of the monitoring referred to in (b) and (c) above together with the trigger points at which such measures would apply; (e) monitoring arrangements associated with the offshore intake and outfall heads, jetty heads and associated dredged areas; and (f) the monitoring methodology, frequency of monitoring and format of monitoring reports. <p>(2) The cross-shore rock platform erosion and sediment monitoring plan referred to in paragraph (1) shall be implemented as approved.</p>
PW22: Project wide - Piling techniques	<p>(1) The installation of piles associated with Work Nos. 1A, TJ1, 2A to 2H and 8A(1)(a) to (f) shall use the best practice methods, including the use of soft start techniques, equivalent to or better than those outlined in the Report to Inform the Habitats Regulations Assessment.</p> <p>(2) Notwithstanding the requirement of paragraph (1) no impact piling shall be used for Work No. 8A(1)(a) to (f) during the months October to March inclusive.</p>

Development Consent Order Requirements	
Reference number/description	Requirement
PW23: Project wide - Disposal of dredged material	Dredged material arising from the authorised project shall not be disposed of except within the Severn Estuary Special Area of Conservation.
P1: Site preparation works – Ecology:- tree protection	<p>(1) No development shall commence until a plan has been submitted to and approved by West Somerset District Council that identifies the existing trees and hedgerows (or sections of hedgerows) to be retained on the site together with the type of fencing to be used and arrangements to be made in accordance with British Standard 5837:2005 to protect the retained trees and hedgerows (or sections of hedgerows). The plan shall be implemented in accordance with the approved details.</p> <p>(2) No retained tree or hedgerow (or section of hedgerow) shall be cut down, uprooted or destroyed, nor shall any retained tree or hedgerow (or section of hedgerow) be topped or lopped other than in accordance with the approved plans and particulars, without the written approval of West Somerset District Council. Any topping or lopping approved shall be carried out in accordance with British Standard 5837:2005.</p> <p>(3) If any retained tree or hedgerow (or section of hedgerow) is removed, uprooted or destroyed or dies, another tree or replacement hedgerow (or section of hedgerow) shall be planted at the same place and that tree or hedgerow (or section of hedgerow) shall be of such size and species, and shall be planted at such time, as may be specified by West Somerset District Council.</p>
P6: Site preparation works - Historic environment, ecology and landscape: Green Lane: preservation <i>in situ</i>	The development shall not commence until a scheme showing the method of working which ensures the preservation <i>in-situ</i> of the Green Lane as shown on drawing HPCSPW025A Rev2: Tree and Hedgerow Retention and Removal has been submitted and approved by West Somerset District Council. The method of working shall be implemented as approved for the duration of the construction of Work No. 1A(a).
P10: Site preparation works - Surface water drainage	<p>(1) No development shall commence until written details of the surface and foul water drainage system for that part (including means of pollution control, details of water management zones and a programme of construction and implementation) have, after consultation with the relevant drainage authority, been submitted to and approved by West Somerset District Council.</p> <p>(2) The details shall be in general accordance with figure A.1.6 of Appendix 2A of Volume 2 of the Environmental Statement and shall attenuate discharge to greenfield run-off rates.</p> <p>(3) The surface and foul water drainage system referred to in paragraph (1) shall be constructed, maintained and retained in accordance with the approved details, save to the extent MS30 indicates otherwise.</p>
P17 Site preparation works - Vegetation clearance	(1) Before undertaking any vegetation clearance within the period from October to March inclusive, a Winter Clearance Scheme designed to avoid or reduce impacts on over-wintering birds which are interest features of the Severn Estuary SPA shall be submitted to and approved by West Somerset District Council.

Development Consent Order Requirements	
Reference number/description	Requirement
P17 (Continued)	(2) Any vegetation clearance undertaken during the period October to March inclusive shall be carried out in accordance with the requirements of the Winter Clearance Scheme.
P18: Site preparation works - Ecological Mitigation and Monitoring Plan	<p>(1) No development shall commence until an Ecological Mitigation and Monitoring Plan has been submitted to and approved by West Somerset District Council. The submitted details shall reflect the survey results and ecological mitigation and enhancement measures included in Volume 2, Chapter 20 of the Environmental Statement and shall include details of—</p> <ul style="list-style-type: none"> (a) works for plant community development based on the National Vegetation Classification across the grasslands woodland and hedgerow habitats; (b) the monitoring of invertebrates (butterflies and other indicator species); (c) the scale and timing of habitat creation and enhancement works; (d) the monitoring of bat activity; (e) a scheme for the protection of badgers; (f) bird counts to be undertaken on the site, and (g) a timetable for implementation. <p>(2) The Ecological Mitigation and Monitoring Plan shall be implemented as approved for the duration of the construction of Work No. 1A.</p>
P19: Site preparation works - Habitat Management Plan	<p>(1) No development shall commence until a Habitat Management Plan has been submitted to and approved by West Somerset District Council. The submitted details shall include all areas of habitats proposed to be retained or created and include information on proposals for the management and monitoring of retained features.</p> <p>(2) The Habitat Management Plan shall be implemented as approved.</p>
P22: Site preparation works - Access to foreshore	<p>(1) The foreshore access road shall not be brought into use until demarcations are in place to prevent the movement of vehicles and plant outside the works area/access corridor on intertidal habitats that form part of the designated features of the Severn Estuary European sites and SSSI.</p> <p>(2) Construction vehicles and plant shall not be permitted to have access to any other areas of the foreshore outside the works area/access corridor.</p>
MS1: Main site – Ecology: wildlife mitigation	(1) Before haul roads are brought into use, and before vegetation is removed to create gaps in hedgerows of over 10 metres, mitigation measures to maintain bat flight corridors across haul roads and along hedgerows shall be installed as set out in the

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measures - bat foraging MS1 (continued)	<p>Environmental Statement (Volume 2, Chapter 20, paragraph 20.6.1). These mitigation measures shall be retained until replacement areas of bat habitat have been created or enhanced, in accordance with a scheme to be submitted to and approved by West Somerset District Council, in consultation with Natural England and Somerset County Council.</p> <p>(2) Notwithstanding the bat mitigation land secured by the site preparation permission section 106 Agreement – unless otherwise agreed by West Somerset District Council, Work Nos. 1A(d) to (p), 1B and 1C shall not commence until additional bat habitat creation and enhancement works to an area of 15ha, in a location agreed with Natural England, Somerset County Council, and the relevant planning authority, have been completed.</p> <p>(3) Unless otherwise agreed by the relevant planning authority, following consultation with Natural England and Somerset County Council, the bat habitat creation and enhancement works shall be carried out in accordance with the specification set out in the site preparation permission, Schedule A of “Further Clarification in Relation to Barbastelle Bats”, dated July 2011.</p> <p>(4) The bat habitat creation and enhancement works referred to in paragraph (2) above and the bat mitigation secured by the site preparation permission section 106 agreement (identified on Plan 6 to that agreement) - shall be retained until the earthworks and planting in the landscape restoration area have been completed in accordance with requirement MS28.</p> <p>(5) In this requirement, references to “the site preparation permission section 106 agreement” refer to the agreement dated 27th January 2012 and made pursuant to section 106 of the 1990 Act between (1) West Somerset District Council, (2) Somerset County Council, (3) Sedgemoor District Council, (4) EDF Development Company Limited, (5) EDF Energy Nuclear Generation Company Limited, (6) Elizabeth Periam Acland Hood Gass (of the Fairfield Estate) and (7) NNB Generation Company Limited;</p>
MS13: Main site - Construction lighting	Installation of external construction lighting shall be carried out in accordance with the Construction Lighting Strategy, Appendix A3 of the Construction Method Statement submitted on the 31st October 2011.
MS29: Main site - Permanent lighting	<p>(1) Installation of external lighting at the site shall be installed in accordance with the HPC Operational Lighting Strategy, Volume 2 of the Environmental Statement, Appendix 2B, save to the extent permitted by paragraph (2) below.</p> <p>(2) Further or revised lighting details may, after consultation with the highway authority, be submitted to and approved by West Somerset District Council.</p> <p>(3) The approved lighting scheme shall be implemented and maintained during operation of development on the permanent development site.</p>
MS30: Main site - Surface water drainage	(1) Work Nos. 1A(d) to (p), 1B and 1C shall not commence until written details of the surface and foul water drainage system (including management and maintenance arrangements, means of pollution control, sewage treatment works and a programme of construction and implementation) for those works have, after consultation with the Environment Agency and the drainage authority, been submitted to and approved by West Somerset District Council. The surface and foul water drainage proposals shall be based on sustainable drainage principles and in accordance with the Site Drainage Strategy (Appendix 2A, Volume 2 of the

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	<p>Environmental Statement).</p> <p>(2) The surface and foul water drainage system for that relevant part must be constructed and maintained in accordance with the approved details.</p>
J2: Temporary jetty- Shelduck and non-breeding birds monitoring and mitigation schemes	<p>(1) Work Nos. TJ1, TJ2 and TJ3 shall not be brought into operation until Shelduck and non-breeding birds monitoring and mitigation schemes have, following consultation with Natural England and the Marine Management Organisation, been submitted to and approved by the relevant planning authority. Unless otherwise agreed, the monitoring and mitigation schemes shall be developed in accordance with the Temporary Jetty Development Principles for an Adaptive Shelduck Monitoring Strategy (ref: NE/9).</p> <p>(2) The Shelduck and non-breeding birds monitoring and mitigation schemes shall be implemented as approved.</p>
J5: Temporary jetty – Lighting	<p>(1) Prior to its installation, details of any lighting to be used on the temporary jetty must be submitted to and approved by West Somerset District Council.</p> <p>(2) No lighting shall be installed other than in accordance with the approved details.</p>
CW1: Cooling water infrastructure - Infrastructure design	<p>(1) No development shall commence until details of Work Nos. 2A to 2H have, following consultation with the Countryside Council for Wales, Natural England, English Heritage and the Environment Agency, been submitted to and approved by the Marine Management Organisation. The details shall include —</p> <ul style="list-style-type: none"> (a) the location and design (size and shape) of the off-shore intake and outfall heads; (b) the alignment (horizontal and vertical) of the cooling water intake and outfall tunnels; and (c) the location and design of the fish recovery and return system and the low velocity side entry intakes, which shall be in accordance with the Environment Agency guidance referenced in the Environmental Statement (Volume 2, Chapter 2, paragraph 2.6.21). <p>(2) The acoustic fish deterrent system shall not be installed until details of the location and design have, following consultation with the Countryside Council for Wales, Natural England and the Environment Agency, been submitted to and approved by the Marine Management Organisation.</p> <p>(3) No water abstraction shall commence until the off-shore intake and outfall heads, cooling water intake and outfall tunnels, the fish recovery and return system, the low velocity side entry intakes and the acoustic fish deterrent system have been installed in accordance with the approved details referred to in paragraphs (1) and (2).</p>
CW2: Cooling water Infrastructure - Monitoring	<p>(1) No water abstraction shall commence until a monitoring and adaptive measures plan for Work Nos. 2A to 2H has, after consultation with the Countryside Council for Wales, Natural England and the Environment Agency, been submitted to and</p>

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Reference number/description	Requirement
and adaptive measures CW2 (continued)	<p>approved by the Marine Management Organisation. The purpose of the plan shall be to ensure that the acoustic fish deterrent system minimises the impacts of water abstraction on the relevant fish populations, having regard to the conservation objectives of the Severn Estuary SAC and other relevant ecological considerations. The plan shall set out —</p> <p>(a) the performance level to be maintained by the acoustic fish deterrent system associated with the cooling water intakes to be confirmed through trials and the fish recovery and return system, during the operation of Unit 1 and Unit 2;</p> <p>(b) the monitoring arrangements for the trialling of the acoustic fish deterrent system and the fish recovery and return system during commissioning of Unit 1 and Unit 2, in respect of the performance levels set in (a) above;</p> <p>(c) the monitoring arrangements for the acoustic fish deterrent system and the fish recovery and return system during operation of Unit 1 and Unit 2, in respect of the performance levels set in (a) above;</p> <p>(d) the additional adaptive measures arising from (a), (b) and (c) and reflecting the contents of Appendix 5: Adaptive Management and Contingency Measures, section 1.3.9 (submitted 6 August 2012 (EDF Energy – Response to Issues Raised at the Second Issues Specific Hearing), that the Marine Management Organisation may require to be adopted during operation of Unit 1 and Unit 2 to meet or improve on the performance levels agreed under (a); the conditions where such measures would apply; and the process for their implementation; and</p> <p>(e) the monitoring methodology, frequency of monitoring and format of monitoring reports.</p> <p>(2) The plan shall be implemented in accordance with its terms.</p>
CB2: Cannington Bypass - Ecology	<p>(1) The development shall not commence until a written ecological mitigation and monitoring plan reflecting the survey results and ecological mitigation measures set out in Volume 5, chapter 14 of the Environmental Statement has been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The ecological mitigation and monitoring plan shall include an implementation timetable and must be carried out as approved, unless otherwise approved by Sedgemoor District Council.</p>
CB7: Cannington Bypass - Lighting	<p>(1) Installation of highway lighting shall not commence until, after consultation with the highways authority, details of highway lighting, including a written scheme for the management and mitigation of artificial light emissions, has been submitted to and approved by Sedgemoor District Council. The lighting scheme shall be in accordance with the relevant sections of the Cannington Bypass Design and Access Statement.</p> <p>(2) The approved scheme for the management and mitigation of artificial light emissions must be implemented and maintained during the construction and operation of the development.</p>
CB11: Cannington Bypass – Surface and foul water	<p>(1) The development shall not commence until written details of the surface and foul water drainage system (including details of balancing ponds, means of pollution control and details of the future responsibility and maintenance arrangements) have, after</p>

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	<p>consultation with the Environment Agency, the sewerage authority and drainage authority (Parrett Internal Drainage Board), been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The surface and foul water drainage system shall be constructed in accordance with the approved details.</p>
CP1: Cannington Park and Ride - Ecology	<p>(1) The development shall not commence until a written ecological mitigation and monitoring plan has been submitted to and approved by Sedgemoor District Council. The ecological mitigation and monitoring plan shall be prepared to reflect the ecological mitigation and measures included in Volume 6 chapter 14 of the Environmental Statement.</p> <p>(2) The ecological mitigation and monitoring plan shall include an implementation timetable and must be carried out as approved.</p>
CP8: Cannington Park and Ride - Lighting	<p>(1) Installation of external lighting shall not commence until details of external lighting, including a written scheme for the management and mitigation of artificial light emissions, has been submitted to and approved by Sedgemoor District Council. The lighting scheme shall be in accordance with section 7 (Development Proposals) of the Cannington Park and Ride Design and Access Statement and drawing 012001: Proposed Lighting, CCTV and Signage.</p> <p>(2) The approved scheme for the management and mitigation of artificial light emissions must be implemented and maintained during the construction and operation of the development.</p>
CP12: Cannington Park and Ride – Surface and foul water	<p>(1) The development shall not commence until written details of the surface and foul water drainage system (including means of pollution control, balancing ponds and future responsibility, monitoring and maintenance arrangements) have, after consultation with the Environment Agency, the sewerage authority and drainage authority (Parrett Internal Drainage Board), been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The surface and foul water drainage system shall be constructed in accordance with the approved details referred to in paragraph (1).</p>
C1: Combwich Wharf and Freight Laydown facility - Ecology	<p>(1) Work No. 8A shall not commence until a written ecological mitigation and monitoring plan, reflecting the survey results and ecological mitigation and enhancement measures included in Volume 7 chapter 14 of the Environmental Statement have been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The ecological mitigation and monitoring plan shall include an implementation timetable and shall be carried out as approved.</p>
C2: Combwich Wharf and Freight Laydown facility - Shelduck and non-breeding birds monitoring and mitigation schemes	<p>(1) Work No. 8A shall not be brought into operation until Shelduck and non-breeding birds monitoring and mitigation schemes have, following consultation with Natural England and the Marine Management Organisation, been submitted to and approved by Sedgemoor District Council. Unless otherwise agreed, the monitoring and mitigation schemes shall be developed in accordance with the Combwich Wharf and River Parrett Non-breeding Wildfowl and Wader Monitoring and Mitigation Scheme (submitted 31st August 2012).</p>

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Reference number/description	Requirement
	(2) The Shelduck and non-breeding birds monitoring and mitigation schemes shall be implemented as approved.
C3: Combwich Wharf and Freight Laydown facility - Combwich intertidal monitoring and contingency plan C3 (continued)	<p>(1) Work No. 8A shall not commence until a Combwich intertidal monitoring and contingency plan has, after consultation with the Countryside Council for Wales, the Environment Agency, the Marine Management Organisation and Natural England, been submitted to and approved by Sedgemoor District Council. The plan should include —</p> <ul style="list-style-type: none"> (a) the geographical extent of topographical monitoring of the intertidal shore and the associated flood defences within, surrounding and immediately adjacent to the Combwich Pill (i.e. the flood defences bordering the Combwich Pill itself and both extending 75m to the north of the Combwich Pill on the western bank of the River Parrett and 75m to the south of the Combwich Pill on that same western bank of the River Parrett); (b) the geographical extent of monitoring of the eastern flood defences of the River Parrett, extending beyond the predicted area of impact related to the construction of Combwich Wharf. This monitoring shall be undertaken to a level sufficient to confirm the findings of the assessment (i.e. that there are no significant effects); (c) the details of monitoring of tug boats without payloads, comprising visual observations of vessel wash and recording of tug boat speed, to confirm the predicted absence of impact on the intertidal zone flanking the navigational stretch of the tidal River Parrett upstream to Combwich Wharf, to be undertaken during 12 observational surveys (i.e. 6 travelling to and 6 travelling from Combwich Wharf); (d) appropriate contingency measures that are to be implemented should monitoring of (a) and (c) above indicate that erosion of the areas concerned, and potential risk to the integrity of the associated flood defences, can be attributed to the construction or operation of Combwich wharf; and (e) the monitoring methodology, the frequency of monitoring and format of the monitoring reports. <p>(2) The Combwich intertidal monitoring and contingency plan referred to in paragraph (1) shall be implemented as approved.</p>
C6: Combwich Wharf and Freight Laydown facility - Construction Hours	<p>(1) Construction and demolition works associated with Combwich Wharf (Work No. 8A(1)(a) to (h)) shall only be undertaken between the hours of 08:00 and 19:00 Monday to Friday (excluding public holidays) and 08:00 and 13:00 hours on Saturdays, unless otherwise approved by Sedgemoor District Council.</p> <p>(2) Construction and demolition works associated with the Combwich Freight Laydown Facility (Work No. 8A(2)(a) to (h)) shall only be undertaken between the hours of 07:00 and 19:00 on weekdays (excluding public holidays) and 07:00 and 13:00 hours on Saturdays, unless otherwise approved by Sedgemoor District Council.</p> <p>(3) Activities excluded from the above working hours restrictions comprise non-intrusive and internal activities, such as start-up and shut-down, electrical installation, building fit-out and non-destructive testing.</p>

Development Consent Order Requirements	
Reference number/description	Requirement
C10: Combwich Wharf and Freight Laydown facility - Lighting	<p>(1) Installation of external lighting shall not commence until details of external lighting, including a written scheme for the management and mitigation of artificial light emissions, has been submitted to and approved by Sedgemoor District Council. The lighting scheme shall be in accordance with section 7 (Development Proposals) of the Combwich Design and Access Statement.</p> <p>(2) The approved scheme for the management and mitigation of artificial light emissions must be implemented and maintained during the construction and operation of the development.</p>
C14: Combwich Wharf and Freight Laydown facility – Surface and foul water	<p>(1) The development shall not commence until written details of the surface and foul water drainage system (including means of pollution control, culverts and future responsibility, monitoring of maintenance arrangements) have, after consultation with the Environment Agency, the sewerage authority and drainage authority (Parrett Internal Drainage Board), been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The surface and foul water drainage system shall be constructed in accordance with the approved details.</p>
C15: Combwich Wharf and Freight Laydown facility - Treatment of potential contaminants	<p>(1) The development shall not commence until a scheme to treat and remove suspended solids from surface water run-off during construction works has, following consultation with the Environment Agency, been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The scheme referred to in paragraph (1) above shall be implemented as approved.</p>
J23-12: Junction 23 – Surface and foul water	<p>(1) The development shall not commence until written details of the surface and foul water drainage system (including means of pollution control and future responsibility, monitoring and maintenance arrangements) have, after consultation with the Environment Agency, the sewerage authority and drainage authority (Parrett Internal Drainage Board), been submitted to and approved by Sedgemoor District Council.</p> <p>(2) The surface and foul water drainage system shall be constructed in accordance with the approved details.</p>

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EA Permit EPR/JP3122GM Discharge consent for construction activities	At least 3 months prior to commencement of Activities A-C specified in schedule 1 table S1.1, the operator shall submit to the Environment Agency a Surface Water Drainage System report following completion of detailed contractor design. The report shall include:

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PO1: Surface Water Drainage System report <i>issued 29/02/2012</i>	(a) an overview of the final proposals for the surface water drainage system serving the development site; (b) output from a suitable drainage model which reflects the attenuation provided by the WMZ's and the overall hydraulic performance of the pipe network; (c) the minimum design criteria in respect of environmental protection that the contractors used in producing their detailed design, highlighting elements of the design that will ensure that the limits within table S3.1 are achieved; and (d) details of your proposals for high level overflows on the WMZ's, both within the Built Development Area (BDA) and the Southern Construction Phase Area (SCPA). The operator shall re-assess the maximum estimated flow rate through the new foreshore outfall for the 1 in 30 year return period rainfall event based on the detailed design presented. Following written approval by the Environment Agency, this estimated flow rate shall be deemed to be incorporated into table S3.1 of this permit.
EA Permit EPR/JP3122GM Discharge consent for construction activities PO8: Water Management Zones design report <i>issued 29/02/2012</i>	At least 2 months prior to commencement of Activities A-C specified in schedule 1 table S1.1, the operator shall submit for approval by the Environment Agency, final designs for the Water Management Zones that will be put in place to manage discharges of site drainage. Appropriate engineering drawings and site plans should be included. Following written approval by the Environment Agency, the proposals shall be deemed to be incorporated under table S1.2 of this permit.
EA Permit EPR/HP3228XT Discharge consent for operational activities PO2: Cooling water discharge infrastructure design <i>issued 13/03/13</i>	Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency a report which includes a completed, as-built description of the plant and infrastructure relevant to the Water Discharge Activity. Note that the report shall take into account the cooling water system in its entirety, including the design of the Acoustic Fish Deterrent (AFD) and Fish Recovery and Return (FRR) systems. In addition the report shall contain an updated site plan clearly showing all relevant buildings and structures and the route of the associated pipework, including all land-based infrastructure associated with the cooling water system; and the national grid references of the cooling water intakes. Should the final design vary from that described in the permit application, the report shall include as appropriate, a risk assessment to demonstrate how the changes will prevent or minimise impacts on the receiving water environment, and ensure compliance with this permit.

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	Required: At least three calendar months prior to the commencement of the Hot Functional Testing phase of commissioning.
EA Permit EPR/HP3228XT Discharge consent for operational activities PO7: Control of biofouling <i>issued 13/03/13</i>	<p>Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency for approval a report which confirms and justifies their operational strategy for the control of biofouling of the cooling water system. The report shall include, but not be restricted to the following:</p> <ul style="list-style-type: none"> (a) an appraisal of the operational conditions and chlorination strategy employed at Hinkley Point B power station, and a description of how this has been taken into account in defining the proposed strategy for HPC; (b) the lessons learnt through design evolution and/or commissioning and operating the EPR at Flamanville 3 in France, or any other EPR site worldwide; (c) details of how the operational strategy has been optimised to reduce the need for chemical dosing and the subsequent discharge of TRO and the formation of chlorinated by-products (CBP"s); (d) validation of the impacts of the proposed dosing regime, to include reference to numerical modelling and ecotoxicological studies as appropriate. <p>Required: At least three calendar months prior to the commencement of the Hot Functional Testing phase of commissioning.</p>
EA Permit EPR/HP3228XT Discharge consent for operational activities PO8: Commissioning of AFD and FRR systems <i>issued 13/03/13</i>	<p>Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency for approval a Commissioning Plan for the AFD and FRR Systems. The Plan shall include, but not be restricted to the following:</p> <ul style="list-style-type: none"> (a) a description of how the operator intends to optimise the AFD and FRR systems to minimise impacts upon fish; (b) details of the monitoring proposed to facilitate optimisation and meet the above objective; (c) confirmation of the timetable associated with the AFD and FRR system commissioning; (d) proposals for demonstrating the effectiveness of the optimisation process to the Environment Agency prior to the start of Active Commissioning of Unit 1. <p>Required: At least three calendar months prior to the commencement of the Hot Functional Testing phase of commissioning.</p>
EA Permit EPR/HP3228XT Discharge consent for operational activities PO10: Removal of hydrazine prior to	<p>Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency for approval a Hydrazine Removal Plan which details how hydrazine shall be removed from the effluent prior to discharge. The Plan shall include, but not be restricted to the following:</p> <ul style="list-style-type: none"> (a) the methodology to be followed in removing hydrazine from the discharge; (b) proposals for monitoring during the Hot Functional Testing phase of commissioning to demonstrate that the level of hydrazine in (i)

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discharge <i>issued 13/03/13</i>	<p>waste streams B & C (combined), and (ii) waste stream D, is below the Limit of Detection of the analytical method, the use of which shall be approved by the Environment Agency;</p> <p>(c) proposals for on-going process monitoring to ensure that the hydrazine removal process maintains its effectiveness;</p> <p>(d) details of contingency plans to deal with equipment failure and/or breakdown, or other reasonably foreseeable incidents which may compromise the effectiveness of the hydrazine removal process.</p> <p>Required: At least three calendar months prior to the commencement of the Hot Functional Testing phase of commissioning.</p>
EA Permit EPR/HP3228XT Discharge consent for operational activities PO11: Environmental Monitoring Plan <i>issued 13/03/13</i>	<p>Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency for approval an Environmental Monitoring Plan for the Severn Estuary SAC, SPA and Ramsar, for the purpose of post-scheme appraisal.</p> <p>The Plan shall propose monitoring methods to determine the physical, chemical and biological characteristics of the area potentially affected by the water discharge activity (including impacts related to the abstraction of cooling water), and monitoring locations and frequencies. It shall also include the procedures for assessing any effects and reporting the results of the monitoring and assessment to the Environment Agency. The Plan shall include, but not be restricted to the following aspects:</p> <p>(a) thermal plume monitoring;</p> <p>(b) subtidal and intertidal benthic ecology monitoring;</p> <p>(c) water quality monitoring;</p> <p>(d) sediment quality monitoring; and</p> <p>(e) the quality assurance procedures in place; or</p> <p>(f) the progress towards MCERTS certification or MCERTS accreditation, unless otherwise agreed in writing by the Environment Agency, and if necessary a timetable for achieving the MCERTS standard.</p> <p>Required: At least three calendar months prior to the commencement of the Hot Functional Testing phase of commissioning.</p>