NNB GENERATION COMPANY (HPC) LIMITED

HINKLEY POINT C PROJECT

CASE FOR REMOVAL OF THE REQUIREMENT TO INSTALL AN ACOUSTIC FISH DETERRENT

Updated Water Framework Directive Compliance Assessment

APPROVAL SIGN-OFF: UPDATED WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT REPORT

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ACRONYMS

The following acronyms will be used in the report.

Acronym	Definition
A/HMWB	Artificial or Heavily Modified Water Body
AFD	Acoustic Fish Deterrent
BEEMS	British Energy Estuarine and Marine Studies
CIMP	Comprehensive Impingement Monitoring Programme
CWS	Cooling Water System
DCO	Development Consent Order
EA	Environment Agency
EAV	Equivalent Adult Value
EC	European Commission
ECC	European Economic Community
EIA	Environmental Impact Assessment
ES	Environmental Statement
EQR	Ecological Quality Ratio
FRR	Fish Recovery and Return
GEP	Good Ecological Potential
GES	Good Ecological Status
HPA	Hinkley Point A
HPB	Hinkley Point B
HPC	Hinkley Point C
HRA	Habitats Regulations Assessment
ICES	International Council for Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
INNS	Invasive non-native species
LVSE	Low Velocity Side Entry

MMO	Marine Management Organisation
MTF	Marine Technical Forum
MSL	mean sea level
NNB GenCo	NNB Generation Company (Hinkley Point C) Limited
NSIP	Nationally Significant Infrastructure Project
RBMP	River Basin Management Plan
RIMP	Routine Impingement Monitoring Programme
SoS	Secretary of State
SSB	Spawning Stock Biomass
TFCI	Transitional Fish Classification Index
TR456	Report by CEFAS entitled Revised Predictions of Impingement Effects at Hinkley Point C – 2019 HPC-DEV024-XXX-000-RET-100031 BEEMS Technical Report TR456
UKTAG	UK Technical Advisory Group
Updated HRA Report	Updated Assessment to inform HRA submitted with the WDA Permit Variation Application and Proposed DCO Change Application (NNB-308-REP-000722)
WDA	Water Discharge Activity
WFD	Water Framework Directive

1 INTRODUCTION

1.1 Background

1.1.1 On 31 October 2011, NNB Generation Company Limited, part of EDF Energy, made an application to the Secretary of State (SoS) under section 37 of the Planning Act 2008 ('the Planning Act') for a development consent order to build and operate a new nuclear build at Hinkley Point, Somerset known as Hinkley Point C (HPC). NNB Generation Company Limited operated from 2009 to 2015 when it was incorporated into NNB Generation Company (HPC) Limited (company no. 06937084) herein referred to as 'NNB GenCo'.

1.1.2 HPC is classed as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008. Development consent was granted by the SoS pursuant to the Hinkley Point C (Nuclear Generating Station) Order 2013 made on 18th March 2013 (S.I. 2013 No. 648) which came into force on 9 April 2013. Throughout this document the Development Consent Order is referred to as 'the DCO', the application for the DCO as 'the DCO Application' and the new nuclear build project at HPC is referred to as 'the Project'.

1.1.3 In 2011, NNB GenCo made an application to the Environment Agency (EA) under the Environmental Permitting (England and Wales) Regulations 2010 (as amended) for a permit relating to Water Discharge Activity (WDA) associated with the operational phase of the Project. This permit was determined on 13 March 2013 referenced EPR/HP3228XT and is referred to as 'the WDA Permit'.

1.1.4 In 2011 NNB GenCo made an application to the Marine Management Organisation (MMO) for carrying out activities associated with the Project for which a licence is required under Part 4 of the Marine and Coastal Access Act 2009. While a number of Marine Licences authorise and control licensable activities related to the Project, only Marine Licence L/2013/00178, granted in 2013, which specifies the requirement for the Acoustic Fish Deterrent (AFD).

1.1.5 Nuclear power stations require an Environmental Impact Assessment (EIA) to be carried out under the relevant regulations to assess the likely significant environmental impacts of what is proposed and, where necessary, propose mitigation measures to prevent, reduce or offset any such impacts. An EIA was undertaken for the DCO Application under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the 'EIA Regulations'). An Environmental Statement (ES) was prepared to document the findings of the EIA process. The ES was submitted as part of the DCO Application in 2011 and updated during the DCO examination process.

1.1.6 Given the location of the Project, the ES was also accompanied by the 'Hinkley Point C Report to Inform Habitats Regulations Assessment (HRA)' to meet the measures set out in Council Directive (1992/43/EEC) on the conservation of natural habitats and wild flora and fauna (the 'Habitats Directive') and Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and the 'Hinkley Point C Water

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Framework Directive Compliance Assessment' to meet the requirements of the Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for community action in the field of water policy, known as the Water Framework Directive (WFD).

1.1.7 NNB GenCo is proposing to make an application to change the DCO to remove the requirement to install an AFD system. This application is referred to as 'the DCO Change Application'. Applications are also being made to vary relevant conditions related to the AFD system in the WDA Permit and Marine Licence.

1.1.8 The AFD system was one of three mitigation measures proposed by NNB GenCo to reduce the risk to fish populations as a result of impingement (the trapping or organisms against the screening systems that prevent debris from entering the facility with the withdrawn water) in the Cooling Water System (CWS). An AFD system acts as an acoustic behavioural deterrent intended to provide an avoidance reaction amongst hearing sensitive fish from entering the CWS.

1.1.9 The DCO Change Application will be accompanied by an updated ES, updated HRA report and updated WFD Compliance Assessment addressing the environmental effects of the removal of the AFD system. This document has been prepared to provide an updated assessment to meet the requirements of the WFD.

1.2 Purpose

1.2.1 The proposed CWS at HPC will abstract large volumes of water to condense the turbine steam and provide essential and auxiliary cooling water flows. There is therefore the potential for fish and crustacea to be entrapped into the system via the cooling water structures. To reduce this risk, the various permissions require the provision of Low Velocity Side Entry intakes (LVSE), a Fish Recovery and Return (FRR) system and an AFD system, all of which were included in the supporting environmental assessments.

1.2.2 The planned LVSE intakes and FRR system associated with the essential and auxiliary CWS have been successfully incorporated into the final design (NNB GenCo, 2017). However, as a result of further environmental assessment, NNB GenCo are making applications to remove the requirement to install the AFD system from the DCO, WDA Permit and Marine Licence.

1.3 Scope

1.3.1 This report determines whether the removal of the AFD system from the CWS would still ensure the Project is compliant with the requirements of the WFD.

1.3.2 The objectives of this revised compliance assessment are therefore to:

- revisit the WFD water bodies that could potentially be affected by the abstraction and therefore the removal of the AFD system;
- reassess the potential for the abstraction without the AFD system to result in a deterioration in the status of WFD water bodies, or prevent status objectives being achieved in the future; and
- determine whether removal of the AFD system enables the Project to remain compliant with the requirements of the WFD.

1.4 The Water Framework Directive

Overview

1.4.1 The WFD was transposed into national law by means of the Water Environment (WFD) (England and Wales) Regulations 2003. These regulations have recently been updated by the Water Environment (WFD) (England and Wales) Regulations 2017. The WFD Regulations implement the WFD, from designation of all surface waters (rivers, lakes, transitional (estuarine) waters, coastal waters (out to one nautical mile) and ground waters) as water bodies, to the requirement for every water body to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP).

1.4.2 Unlike the EU Birds and Habitats Directives (EC Directive on the Conservation of Wild Birds (2009/147/EC) and EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC), respectively), which apply only to designated sites, the WFD applies to all bodies of water, including those that are man-made. The consideration of the cooling water abstraction under the WFD will, therefore, apply to all water bodies that have the potential to be impacted by this activity.

1.4.3 There are two separate classifications for transitional and coastal water bodies; ecological and chemical. For a water body to be in overall 'good' status, both ecological and chemical status must be at least 'good'. Ecological status is classified using information on the biological, physico-chemical and hydromorphological quality of the body of water and is assessed according to:

- the condition of biological quality elements, for example fish fauna (transitional waters only), benthic invertebrates and other aquatic flora;
- the condition of supporting physico-chemical elements, for example thermal conditions, salinity, and concentrations of oxygen, ammonia and nutrients;
- concentrations of specific pollutants, for example copper and other priority substances; and
- the condition of the hydromorphological quality elements, including morphological condition, hydrological regime and tidal regime.

1.4.4 Ecological status is recorded on the scale of ‘high’, ‘good’, ‘moderate’, ‘poor’ or ‘bad’. 'High' denotes largely undisturbed conditions and the other classes represent increasing deviation from this natural condition, otherwise described as a 'reference condition'. The ecological status classification for the water body, and the confidence in this, is determined from the worst scoring quality element. This means that the condition of a single quality element can cause a water body to fail to reach its WFD classification objectives.

1.4.5 Chemical status is assessed by compliance with environmental standards for chemicals that are listed in the EC Environmental Quality Standards Directive (2008/105/EC). Chemical status is recorded as 'good' or 'fail'. The chemical status classification for the water body is determined by the worst scoring chemical.

1.4.6 Where the hydromorphology of a surface water body has been significantly altered for anthropogenic purposes, it can be designated as an Artificial or Heavily Modified Water Body (A/HMWB). An alternative environmental objective, GEP, applies in these cases.

1.4.7 HMWBs are classified according to the 'mitigation measures approach' (UKTAG, 2008). This approach first assesses whether actions to mitigate the impact of physical modification are in place to the extent that could reasonably be expected. If this mitigation is in place, then the water body may be classified as achieving 'good' or better ecological potential. If this level of mitigation is not in place, then the water body will be classed as 'moderate' or worse ecological potential. Before an overall ecological potential classification is applied, the second step is for the results of the mitigation measures assessment to be cross-checked with data from biological and physico-chemical assessments. This approach is known as the 'Alternative Approach' and is defined in more detail in the WFD Common Implementation Strategy 2004 (European Commission, 2004).

1.4.8 In addition, some surface waters require special protection under other European legislation. The WFD therefore brings together the planning processes of a range of other European Directives, such as the Habitats Directive. These Directives establish protected areas to manage water, nutrients, chemicals, economically significant species and wildlife, and have been brought in line with the planning timescales of the WFD.

Roles and responsibilities

1.4.9 The EA is the competent authority for WFD implementation in England, and therefore must assess plans and projects to ensure that they are compliant with the requirements of the WFD. The EA also acts as a consultee to other regulators in relation to WFD compliance and therefore will advise the organisations involved in consenting projects on the requirements of the WFD.

1.4.10 Consultation for the proposal to remove the AFD system has been undertaken within the HPC Marine Technical Forum (MTF), of which the EA is a member. During the preparation of the evidence to inform the review of the environmental assessments, comments relevant to WFD compliance were received (see **Section 3.3** for further detail).

1.5 Report structure

1.5.1 This report is divided into six sections:

- **Section 1** (this section) describes the purpose of this report.
- **Section 2** presents the background to the removal of the AFD system and previous assessments.
- **Section 3** presents the WFD compliance assessment methodology used in this report.
- **Section 4** presents the results of the screening (stage 1) and scoping (stage 2) stages of the WFD compliance assessment.
- **Section 5** presents the results of the detailed assessment undertaken for Stage 3 of the WFD compliance assessment.
- **Section 6** presents a summary of the assessment and mitigation measures required.

2 PROJECT DESCRIPTION

2.1 Cooling water abstraction and mitigation measures

2.1.1 As outlined in **Section 1.1**, the CWS at HPC will abstract large volumes of water to condense the turbine steam and provide essential and auxiliary cooling water flows. HPC will comprise a once through cooling system design with the total volume of cooling water abstracted at 132 m^3s^{-1} at mean sea level (MSL). Given the large volumes of water to be abstracted, it is inevitable that fish and crustacea are at risk of being entrapped during the process. Consequently, the intake design at HPC incorporates a significant number of design characteristics to reduce this risk. These include:

- the intakes being sited away from the low water mark where intertidal fish congregate;
- the intakes being raised 1 m off the seabed to reduce the impingement of benthic species;
- the intakes having a low profile structure with minimal areas of shelter to reduce the risk of an artificial reef developing; and
- the intakes being sited away from the main channel which is considered to be the favoured route for migratory species using selective tidal stream transport.

2.1.2 Additional mitigation measures described in the DCO ES include:

- An AFD system designed to cause pelagic and some demersal species to swim away from the intakes and thereby avoid entrapment.
- LVSE intake heads.
- A FRR system designed to return robust species safely back to sea.

2.1.3 The four LVSE intake heads will be sited approximately 3.3 km offshore. These intakes are capped with the intake surfaces perpendicular to the approximately east-west direction of the tidal flows. The LVSE heads have been designed to present a reduced cross-sectional area to fish being transported in the tidal flow of 64% of the HPB intakes, thereby reducing impingement by the same amount. In addition, based upon previous measurements during Sizewell B commissioning, the use of capped intakes at HPC is expected to reduce impingement of pelagic species (sprat, herring, allis and twaite shad) to 38% of that at HPB (Cefas, 2019). Whilst the impingement data have been altered to account for the capped design and reduced cross sectional area, the reduction in impingement associated with the depth of the intakes and being raised off the seabed has not been built into the assessment (Cefas, 2019).

2.1.4 Debris and organisms which pass through the initial widely spaced bars on the intake structures will be removed before the water enters the power station CWS to prevent them blocking the condenser tubes. This occurs using fine mesh (5 mm) drum screens, which protect the main cooling water supply to the station condensers, and band screens (also 5 mm), which protect the CWS. Anything smaller is entrained and passes through the power station cooling system without causing blockages.

2.1.5 Each drum and band is fitted with buckets to recover fish and discharge them into a common gutter system for return to sea (the FRR system). The FRR system ensures material from the screening process flows into a debris recovering pit – note that the raking system on these screens is designed to allow as many fish as possible to pass through unharmed. A route back to sea using an Archimedes' screw lifts the water and fish to an elevation that is high enough to allow the return to sea via gravity through a dedicated tunnel and outfall head structure. Further information is provided in NNB GenCo, 2017.

2.1.6 FRR systems have been reported to achieve 80% to 100% survival rates for robust epibenthic species and moderate rates for demersal species (50% to 60%) (Cefas, 2019). However, for delicate pelagic species such as herring and sprat, survival rates are relatively low (<10%) (Cefas, 2019).

2.2 Outcome of previous Water Framework Directive Compliance Assessment

2.2.1 The requirement to abstract cooling water was assessed in the original WFD Compliance Assessment submitted as part of the DCO application (NNB GenCo, 2011). This identified that there was a risk to the WFD biological quality element 'fish fauna' because of potential entrapment via the cooling water intakes and filtration screens. The assessment used the information available in the DCO ES (NNB GenCo, 2011) which concluded that impingement at HPC would increase fourfold compared to that at Hinkley Point B (HPB), given the equivalent increase in flows required to be abstracted. This initiated the requirement for Stage 3 'Further Assessment' which consequently concluded that the mitigation measures outlined in **Section 2.1** (LVSE, AFD system and FRR system) were required to ensure no deterioration within the WFD water bodies and therefore compliance with the WFD.

2.3 Changes accounted for in this updated WFD Compliance Assessment

2.3.1 Since the completion of the previous WFD Compliance Assessment, a number of updates to the impingement assessment have been made. These can be summarised as follows:

- Revision of impingement indicators based on latest scientific advice (adult population sizes, international catch and data ranges extended to include 2017).
- Updates to various assessment parameters and techniques such as Adult Equivalent units (EAVs) and a more statistically robust bootstrapping procedure for example.
- Incorporation of detailed design for the HPC CWS.
- The addition of more species to the assessment.

- Quantification of the expected impact of the HPC LVSE intake heads on impingement numbers.
- Completion of a comprehensive uncertainty analysis and an assessment of the effects of interannual variability in fish populations.
- Enhanced quality assurance on the baseline datasets which has altered the baseline figures used within the assessments.
- Publication of new guidance in relation to undertaking WFD compliance assessments.

2.3.2 Further detail on the technical aspects of the changes is provided in TR456 (Cefas, 2019). Further detail on the guidance used is discussed in **Section 3** below.

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3 ASSESSMENT METHOD

3.1 Available guidance

3.1.1 This updated assessment has been carried out in line with the EA's 'Clearing the Waters for All' Guidance (Environment Agency, 2016) and the Planning Inspectorate Advice Note 18: The WFD (Planning Inspectorate, 2017).

3.1.2 As required by Advice Note 18 (Planning Inspectorate, 2017) this assessment includes the following three stages:

- Stage 1: Screening.
- Stage 2: Scoping.
- Stage 3: Further assessment.

3.1.3 These stages are summarised in **Table 3.1** below.

Table 3.1 Summary of the WFD process

Stage	Name	Description
Stage 1	Screening	Initial screening to identify relevant water bodies in the study area. Water bodies will be selected for inclusion in the early stages of the compliance assessment with reference to the 2015 River Basin Management Plans (RBMP) (as presented in the online Catchment Data Explorer).
Stage 2	Scoping	Identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1. This scoping assessment is usually undertaken separately for each water body and each activity and adheres to the scoping questions detailed within the EA's 'Clearing the Waters for All' Guidance. In all cases, the water body and activity under assessment will be progressed to further assessment (Stage 3) if the answer to one or more of the scoping questions is 'Yes', but only for those quality elements that could potentially be impacted. Conversely, if the answer to a scoping question is 'No' or enough information can be provided at this stage to scope the issue out, the quality element is scoped out of further assessment. Note that activities will only be scoped out if there is clear, definitive evidence that they will not adversely affect a particular quality element. Given that the quality element under consideration is fish (i.e. a mobile species covering a large area), a wider geographical area is considered.
Stage 3	Further assessment	The Stage 3 assessment determines whether the activities and/or project components that have been put forward from the Stage 2 scoping assessment will cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of one or more WFD quality elements at water body level. If it is established that an activity and/or project component is likely to affect status at water body level (that is, by causing deterioration in status or by preventing achievement of WFD objectives and the implementation

Stage	Name	Description
		of mitigation measures for HMWBs), or that an opportunity may exist to contribute to improving status at a water body level, potential measures to avoid the effect or achieve improvement must be investigated. This stage considers such measures and, where necessary, evaluates them in terms of cost and proportionality. Note that this stage is referred to as a WFD Impact Assessment in the Planning Inspectorate guidance. Consideration of the potential for cumulative impacts is also included in this stage.

3.1.4 In the event that an activity is assessed as likely to cause a deterioration in class status, and no suitable measures can be identified to mitigate the potential adverse impacts of the project assessed in Stage 3, it may be necessary to undertake an Article 4.7 assessment (noting that the overall ethos of the Project is to prevent deterioration in water body status and avoid the need for an application for an exemption under Article 4.7 of the WFD). To determine the scope of this assessment, consultation with the EA would be required and would include;

- an assessment of whether the Project can be classified as being of imperative overriding public interest and if the benefits to society resulting from the project outweigh the local benefits of WFD implementation;
- an assessment of whether all practicable steps to avoid adverse impacts have been taken. These steps are defined as those that are technically feasible, not disproportionately costly, and compatible with the overall requirements of the Project; and
- an assessment of whether the Project can be delivered by an alternative, environmentally better option. This option will need to be technically viable and not disproportionately costly to be deemed as feasible.

3.2 Determination of deterioration

3.2.1 Any deterioration identified must be considered within the context of the water body, in terms of the scale and magnitude of the impact as well as the timescales over which the impact would occur. However, there is currently no technical guidance on how deterioration in the status of water bodies should be assessed. Expert judgement based on the information provided in TR456 (Cefas, 2019) will therefore be used.

3.2.2 Should a deterioration be identified, it will be considered in line with the findings of the 2015 EU Court of Justice ruling which precludes the authorisation of a project which may cause the deterioration of the status of a body of water and/or jeopardise the attainment of good overall status[1]. The court also advised the deterioration of status is established as soon as the status of at least one of the quality elements falls by one class, even if the change does not result in a fall in classification of the water body as a whole (note that this applies unless the water body is already in the lowest

[1] Bund fur Umwelt und Naturshutz Deutschland eV v Bundesrepubllk Deutschland (2015) EUECJ C-461-13

status class in which case any deterioration is considered to be deterioration in status under WFD).

3.2.3 Since the EA's policy of no deterioration applies to WFD compliance assessments, it is important to consider all levels of deterioration from short term impacts to potentially long-term changes to water body status classifications. The assessment will therefore consider the potential for between class, within class and temporary deterioration in water body status. Where deterioration is not predicted, the activity will also be considered against the water body objectives to ensure status objectives (i.e. GES or GEP) will not be prevented.

3.3 Consultation

3.3.1 Full consultation regarding the Project was carried out during the DCO, WDA Permit and Marine Licence applications.

3.3.2 NNB GenCo then set up a Marine Technical Forum (MTF) following grant of the DCO, WDA Permit and Marine Licence. Members of the MTF include the EA, Marine Management Organisation, Natural England, Natural Resource Wales and, by invitation, the Devon and Severn Inshore Fisheries and Conservation Authority (IFCA). The MTF has been used to update on progress with the CWS design and fish protection measures and get feedback. The removal of the requirement to install an AFD system has been discussed with the MTF and environmental information has been shared with them on fish impingement and feedback has been considered. This engagement is ongoing.

4 THE WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

4.1 Stage 1: Screening

4.1.1 This section identifies the individual activities that could potentially impact on WFD compliance parameters as a result of the removal of the requirement to install the AFD system. This section also describes the baseline characteristics of the WFD water bodies against which potential impacts on WFD compliance will be assessed.

Identification of activities to be considered

4.1.2 The AFD system was identified as mitigation against the potential for fish impingement only, hence the only activity to be impacted by the removal of the AFD system is the cooling water abstraction. The removal of AFD system from the final design therefore requires the reassessment of the cooling water abstraction under WFD since there could potentially be a deterioration in the WFD biological quality element 'fish fauna'.

Identification of water bodies

4.1.3 It is acknowledged that the potential area over which the quality element 'fish fauna' needs to be assessed is much larger geographically than WFD water body boundaries in the study area. To address this, the assessment commences with the selection of the WFD water bodies within the local area of the abstraction. Should no deterioration be identified within these WFD water bodies, then no deterioration can be concluded for adjoining water bodies both upstream and downstream of the cooling water abstraction. Where a potential deterioration is identified, the resulting effect on other WFD water bodies outside of those initially selected will be undertaken within the 'Further Assessment' stage (Stage 3).

4.1.4 The WFD water bodies in the vicinity of the cooling water abstraction are shown in **Figure 4.1** and the following WFD water bodies are initially screened in for consideration:

- Bridgwater Bay coastal WFD water body (cooling water abstraction located within this water body).
- Parrett Estuary transitional WFD water body (water body located adjacent to Bridgwater Bay – note, however, that fish have not been classified within this water body).
- Severn Lower transitional WFD water body (this is the nearest transitional WFD water body where fish has been assessed during the latest classification round thus is selected to provide baseline information for the fish quality element in the study area).

4.1.5 Data for these water bodies have been obtained from the second River Basin Management Plan (RBMP) status objectives published by the EA, as presented in the online Catchment Data Explorer and the ‘Cycle 2 Extended Water Body Summary Report’ produced for each water body[2] and presented in **Table 4.1**.

[2] Data Catchment Explorer. Environment Agency. Downloaded on 14th January 2019. Found at http://environment.data.gov.uk/catchment-planning/

Figure 4.1 Approximate location of the HPC against WFD Water bodies

Table 4.1 Summary of WFD water body information

Parameter	WFD Water Body		
WFD water body name	Bridgwater Bay	Parrett	Severn Lower
Water body ID	GB670807410000	GB540805210900	GB530905415401
River basin district name	South West	South West	Severn
Water body type (estuarine or coastal)	Coastal	Transitional	Transitional
Water body total area (km2)	91.813	70.835	465.976
Overall water body status (2016)	Moderate	Moderate	Moderate
Ecological status	Moderate	Moderate	Moderate
Fish classification status	Not assessed as coastal water body	Not assessed	High
Chemical status	Good	Good	Good
Target water body status and deadline	Good by 2027	Good by 2027	Good by 2021
Hydromorphology status of water body	High	Supports Good	Not assessed
Heavily modified water body and for what use	No	Yes – Flood Protection	Yes –- Flood Protection
Higher sensitivity habitats present	None	Polychaete reef and Saltmarsh	Intertidal seagrass, Mussel beds, including blue and horse mussel, Polychaete reef and Saltmarsh
Lower sensitivity habitats present	Cobbles, Gravel and shingle, Intertidal soft sediment, Rocky shore, Subtidal rocky reef, Subtidal soft sediments	Cobbles, Gravel and shingle, Intertidal soft sediment, Rocky shore, Subtidal soft sediments	Cobbles, Gravel and shingle, Intertidal soft sediment, Rocky shore, Subtidal rocky reef, Subtidal soft sediments
Phytoplankton status	Moderate	–	Good
History of harmful algae	Not monitored	Not monitored	Not monitored
WFD protected areas within 2 km	See **Figure 4-1** (note that European Designated Sites are not shown in this Figure)		

4.2 Stage 2: Scoping

4.2.1 This section presents the scoping assessment undertaken on the WFD water bodies identified in **Section 4.1** of this report.

4.2.2 **Table 4.2** presents the outcome of the scoping stage as required by the 'Clearing the Waters for All' Guidance (Environment Agency, 2016).

Table 4.2 WFD Compliance Assessment scoping stage outcome

WFD quality element	Scoping question	Yes	No	Comment
Hydromorphology	Could the activity impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status? Could the activity significantly impact the hydromorphology of any water body? Is the activity in a water body that is heavily modified for the same use as your activity?		✓	The presence of the cooling water structure in relation to hydromorphological structures was assessed in the 2011 WFD Compliance Assessment (NNB GenCo, 2011). The removal of the AFD system will not alter the assessment already presented. No further assessment required.
Biology (Habitats)	Is the footprint of the activity 0.5 km^2 or larger? Is the area of the activity greater than 1% or more of the water body's area? Is the activity within 500 m of any higher sensitivity habitat? Is the activity 1% or more of any lower sensitivity habitat?		✓	The presence of the cooling water structure in relation to habitat impacts was assessed in the 2011 WFD Compliance Assessment (NNB GenCo, 2011). The removal of the AFD system will not alter the assessment already presented. No further assessment required.
Biology (Fish)	Is the activity in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary? Could the activity impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)? Could the activity cause entrainment or impingement of fish?	✓		The removal of the AFD system could potentially increase the risk of entrapment associated with cooling water abstraction. Further assessment required.
Water Quality	Could the activity affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)? Is the activity in a water body with a phytoplankton status of moderate, poor or bad? Is the activity in a water body with a history of harmful algae? Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive list. Will the activity disturb sediment with contaminants above Cefas Action Level 1?		✓	Effects on water quality and phytoplankton were assessed in the 2011 WFD Compliance Assessment (NNB GenCo, 2011). The removal of the AFD system from the proposals will not alter the assessment already presented. No further assessment required.

WFD quality element	Scoping question	Yes	No	Comment
Protected Areas	Is the activity within 2km of any WFD protected area?	✓ (European Designated Sites only)		The removal of the AFD system could potentially impact on designated species listed within European Designated Sites as interest features. No effects on bathing waters are predicted.
Invasive Non-Native Species (INNS)	Could the activity introduce or spread INNS?		✓	Cooling water abstraction without the AFD system does not present a risk to introducing INNS.

Summary of Stage 2

4.2.3 The Stage 2 scoping assessment has established that, with the exception of the WFD quality element 'fish fauna' and their associated Protected Areas, all other quality elements can be scoped out of requiring further assessment.

5 STAGE 3: FURTHER ASSESSMENT

5.1 Purpose of this section

5.1.1 This section presents the results of the further assessment undertaken on the WFD water bodies, specifically the biological quality element 'fish fauna' and their Protected Areas in relation to cooling water abstraction and the removal of the AFD system as detailed in **Table 4.2**.

5.1.2 This assessment determines whether the removal of the AFD system will cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of this WFD quality element.

5.2 Detailed assessment - cooling water abstraction and potential for impingement

5.2.1 To support the revised environmental assessments, the work undertaken to inform the DCO application has been revised by Cefas (2019) for two scenarios:

i) HPC with no fish impingement mitigation; and

ii) HPC fitted with the LVSE intake heads and FRR system (i.e. the current proposed approach of including mitigation without the AFD system).

5.2.2 Given that the LVSE intake heads and FRR system are in the detailed design, this assessment only considers the findings in relation to scenario 2. As already outlined above, the assessment has been updated with more robust evidence as more detail has become available and the provision of more detail on the CWS.

Baseline

WFD water body information

5.2.3 To determine a WFD water body classification, the health of the quality element is assessed by comparing the measured conditions against that described for reference conditions (minimally disturbed). This is reported as an Ecological Quality Ratio (EQR). An EQR of 1 represents undisturbed conditions and a value of 0 represents a severe impact. The EQR is divided into five ecological status classes (high, good, moderate, poor and bad). To assess fish fauna in the UK, the EA uses the Transitional Fish Classification Index (TFCI) to represent the requirements of Annex V (Table 1.2.3 and relevant rows reproduced in **Table 5.1**) to the WFD (UKTAG, 2014). Note that coastal waters classifications do not include fish fauna within their classification status. The tool is designed to be applied at the whole estuary level, not to individual WFD water bodies within that estuary.

Table 5.1 Excerpt from the WFD Annex V Table 1.2.3 regarding fish fauna

WFD Biological Quality Element	Status Classification		
	High	**Good**	**Moderate**
Fish Fauna (transitional water bodies only)	Species composition and abundance is consistent with undisturbed conditions.	The abundance of the disturbance sensitive species shows slight signs of distortion from type-specific conditions attributable to anthropogenic impacts on physico-chemical or hydromorphological quality elements.	A moderate proportion of the type-specific disturbance sensitive species are absent as a result of anthropogenic impacts on physicochemical or hydromorphological quality elements.

5.2.4 The TFCI includes the parameters composition, abundance and the presence and/or absence of disturbance-sensitive taxa and is a multi-metric index composed of ten individual components known as metrics. These metrics are listed in **Table 5.2**.

Table 5.2 Summary of TCFI metrics

Number	Metric	Community characteristic
1	Species composition	Species diversity and composition
2	Presence of indicator species	
3	Species relative abundance	Species abundance
4	Number of taxa that make up 90% of the abundance	
5	Number of estuarine resident taxa	Nursery function
6	Number of estuarine-dependant marine taxa	
7	Functional guild composition	
8	Number of benthic invertebrate feeding taxa	Trophic integrity
9	Number of piscivorous taxa	
10	Feeding guild composition	

5.2.5 The four EQR class boundaries are High/Good = 0.81, Good/moderate = 0.58, Moderate, Moderate/Poor = 0.4 and Poor/bad = 0.2. To calculate the TFCI a representative sample of the fish community, identified to species level, is required.

5.2.6 The information available for WFD water body classification for fish fauna in the water bodies selected for consideration is provided in **Section 4.1** above. As noted, only the Lower Severn WFD water body has a classification for the fish quality element and this is assessed as high.

Impingement survey information

5.2.7 The two primary datasets available for Bridgwater Bay are the Routine Impingement Monitoring Programme (RIMP) conducted at HPB since 1981 (Henderson & Holmes, 1989) which was designed to assess long term changes in fish populations and the BEEMS Comprehensive Impingement Monitoring Programme (CIMP) (conducted at HPB in 2009/10) (TR129 Cefas, 2011a). Further information regarding the way in which these surveys were conducted is provided in TR456 (Cefas, 2019).

5.2.8 Compared with trawl surveys, impingement sampling (in this case at HPB) is considered to have much lower species selectivity, surveys can be done day or night and continuously in any weather and at any state of the tide. Additionally, given the activity to be considered is impingement via a new power station in a similar area, the HPB data are representative of the potential effects HPC may have on this quality element. This is supported by the results of subtidal fishing surveys in the wider Bridgwater Bay area (Cefas, 2011b) which did not distinguish significant spatial differences in the fish community between the HPC and HPB locations.

5.2.9 The total number of species detected by both surveys was 92; however, 68 species were rarely recorded and contributed an average of two or fewer fish per year to the dataset.

5.2.10 The following conclusions were drawn from the RIMP dataset:

- There has been a significant rise in total fish abundance over the RIMP monitoring period (37 years) with a 54% increase in fish numbers (excluding sprat) and more than 100% increase if sprat is included.
- The same group of 13 species dominates the fish community for the period surveyed but the relative rankings have changed. This is considered to be due to climate change, changes in fishing pressure and management action to conserve ecosystems.
- There is considerable year to year variability in species abundance. For many species, this variation is driven by highly variable year to year recruitment.
- Regarding migratory fish, the international decline in eel numbers is shown in the RIMP data. The size and frequency of twaite shad recruitment events has also decreased since a peak in the early 1980s.
- River and marine lampreys, allis shad, salmon and sea trout were rarely recorded and in many years not present.
- Length data show that the community is dominated by immature juvenile fish, with only a few mature adults present in the data.

5.2.11 With respect to the CIMP data, the following conclusions were drawn:

- The fish community is dominated by sprat (48.8% of the measured fish numbers).
- Seven species contributed 95% of the impingement numbers; 12 species contributed 99%.

- Four species – sprat, whiting, sole and cod contributed 88% of the numbers with mullet, flounder and five-bearded rockling providing the next 7%.
- 50 species occurred rarely or in very low numbers, contributing a total of 0.56% of the annual impingement and individually constituting 0.1% to 0.0004% of the annual impingement numbers.

5.2.12 Based on socio-economic value, conservation and ecological importance, TR456 (Cefas, 2019) produced a list of 21 species (20 of which were fish) that represented 98.3% of the total impingement numbers from the above survey work. These are listed in **Table 5.3**.

Table 5.3 Species included in the impingement assessment

Common Name	Latin Name
Sprat*	*Sprattus spratttus*
Whiting*	*Merlangius merlangus*
Sole, Dover*	*Solea solea*
Cod*	*Gadus morhua*
Mullet, thin lipped grey*	*Liza ramada*
Flounder*	*Platichthys flesus*
Five-bearded rockling*	*Ciliata mustela*
Herring	*Clupea herangus*
Sand Goby	*Pomatoschistus minutus*
Bass	*Dicentrachus labrax*
Plaice	*Pleuronectes platessa*
Ray, Thornback	*Raja clavata*
Whiting, Blue	*Micromesistius poutassou*
Eel	*Anguilla anguilla*
Shad, Twaite	*Alosa fallax*
Shad, Allis	*Alosa alosa*
Lamprey, Marine	*Petromyzon marinus*
Lamprey, River	*Lampetra fluviataliis*
Salmon, Atlantic	*Salmo salar*
Trout, Sea	*Salmo trutta*
Brown shrimp	*Crangon crangon*

**seven taxa comprising 95% of fish abundance*

5.2.13 The list in **Table 5.3** is considered to contain examples of all functional guilds except freshwater species which, as would be expected, are rarely found at Hinkley Point. It is also considered to contain examples of all the feeding guilds and all of the indicator species found at Hinkley Point that would be included in the calculation of the TFCI for each transitional water body (Cefas, 2019). Sea trout and Atlantic salmon were not recorded in the CIMP data, however, due to their migratory behaviour it is not anticipated that these species would be impinged in any significant numbers (Cefas, 2019). Similarly, the numbers of allis shad and river lampreys were so low that they can also be discounted as being part of the WFD fish community vulnerable to impingement. As a result, these four species are screened out of the WFD assessment.

5.2.14 Given that the CIMP survey was designed to provide an unbiased, high resolution dataset, these data provide the basis of the impingement numbers used in the quantitative assessment detailed in TR456 (Cefas, 2019) and therefore represent the baseline. To account for the increase in abstraction flows compared to HPB (33.7 to 131.86 m^3s^{-1}), the numbers have been adjusted using bootstrapping (see Appendix D, TR456 (Cefas, 2019) for further detail) to calculate the potential impingement numbers at HPC and adjusted again to account for the reductions expected due to the HPC intake design. Impingement numbers used in the assessment for each species are shown in **Table 5.4**.

Table 5.4 Annual impingement numbers calculated from the CIMP data for HPB and adjusted to reflect HPC increases in flow and intake design (Cefas, 2019)

Fish species	Number (2009)
Sprat	932,129
Whiting	1,369,835
Sole, Dover	363,976
Cod	240,909
Herring	26,393
Bass	20,704
Plaice	3,266
Ray, Thornback	1,973
Whiting, Blue	728
Eel	782
Shad, Twaite	528
Lamprey, Marine	117
Brown shrimp	11,437,723

5.2.15 Regarding the species thin lipped grey mullet, flounder, five-bearded rockling and brown shrimp, the relevant baseline data uses all years collected in the RIMP dataset to look at population trends against abstraction rates from the Severn. Data are presented in TR456 (Cefas, 2019) in graphical format and demonstrate that impingement of five-bearded rockling, mullet and brown shrimp have increased exponentially over the 37-year period. Flounder also shows a positive, but statistically insignificant, trend upwards. Further information is provided in Appendix E of TR456 (Cefas, 2019).

International Council for Exploration of the Sea (ICES) Data

5.2.16 To assess the magnitude of the impingement numbers, TR456 (Cefas, 2019) compares the predictions against an objective measure of the status of each population. The measures chosen includes adult spawning stock biomass (SSB) as calculated by the International Council for Exploration of the Sea (ICES) and, where SSBs are unavailable, international catch on a fish stock in the chosen assessment year (2009, with the exception of sprat for which ICES coordinated biomass estimates from 2013-2107 were used). SSB is the adult population of a fish stock and the stock units used in the TR456 assessment are the ICES 2017 definitions (see Error! Reference source not found. and **Table 5.5**) (Cefas, 2019).

Table 5.5 ICES fish stock assessment units relevant to HPC (taken from TR456 Cefas 2019)

Fish species	Stock Unit	ICES Working Group Report
Whiting	V11bc, e-k	WGCSE, Celtic Sea Ecoregion
Sole, Dover	VIIfg	
Cod	VIIe-k	
Herring	VIIef (no SSB estimate)	HAWG Herring Assessment for area to south of 62N, stocks with limited data
Bass	IVbc, VIIa, VIId-h	Celtic Sea, and Greater North Sea Ecoregions
Plaice	VIIfg	WGCSE, Celtic Sea Ecoregion
Ray, Thornback	VIIafg (no SSB estimate)	
Whiting, Blue	1-9, 12 and 14	North East Atlantic

5.2.17 Where ICES international fisheries landings are available, these are also included in **Table 5.6**.

Figure 5.1 Map of ICES Divisions (taken from TR456, Cefas, 2019)

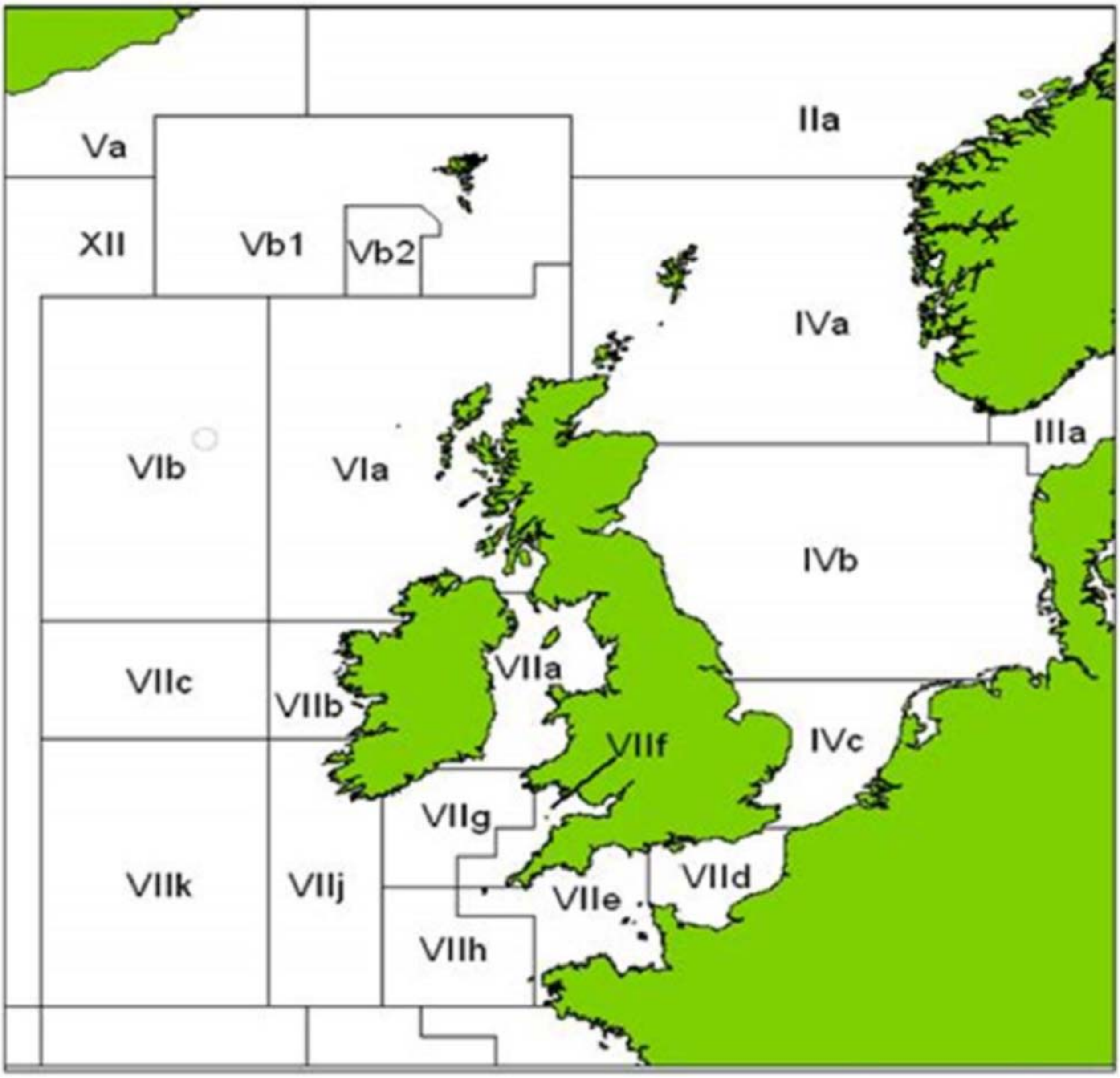

Table 5.6 ICES SSB and fisheries landing data (t) (2009)

Fish species	SSB (t) (2009)	Fisheries landings (t) (2009)
Whiting	34,918	6,572
Sole, Dover	2,857	805
Cod	5,092	3,292
Herring	-	627
Bass	18,317	5,657
Plaice	4,707	1,089
Ray, Thornback	-	755
Whiting, Blue	2,781,230	635,000

Fish stock indictors for species not included in ICES data

5.2.18 There are no SSB estimates or landings data for species that are not commercially exploited. Independent estimates are therefore applied in this assessment and are detailed in Appendix G TR456 (Cefas, 2019). The data used for each species and source of the estimate are summarised in **Table 5.7**.

Table 5.7 Summary of data used where SSB and landing information are not available

Fish species	Source	Estimate
Eel	Comparison between impingement data for eels at HPB and estimates of reported catch of each life stage 2005-2008 in the Severn River Basin District	133kg
Shad, Twaite Lamprey	Severn Tidal Power Feasibility Study Strategic Environmental Assessment (Apem, 2010)	165,778 (number) 15,269 (number)
Sand goby	RIMP trend analysis	30,814 (number)

5.2.19 An SSB for sprat is not available for 2009 and therefore it has not been possible to calculate an impingement effect from the CIMP data for 2009. The assessment therefore uses the information from the Cefas annual survey which commenced in 2013 as detailed in SPP089 (Cefas, 2016).

5.2.20 **Table 5.8** shows the calculated HPC impingement numbers based upon the RIMP data and measured population biomass (SPP089, Cefas 2016). **Table 5.8** also shows the estimated SSB in each year which was calculated by multiplying the

PELTIC sprat biomass by the EAV of the PELTIC population (see Cefas, 2019 for further detail).

Table 5.8 Summary of data used to calculate impingement effects on sprat

Year	RIMP annual numbers	Predicted HPC annual numbers	Mean SSB (t)
2013/14	2,050	299,662	7,736
2014/15	5,093	744,478	21,292
2015/16	3,157	461,480	55,331
2016/17	2,358	344,685	8,944

5.2.21 For all other species no such data exist. Therefore TR456 (Cefas, 2019) uses HPB impingement trend data to provide an indication of the state of the stock. If the impingement numbers are constant or rising under constant impingement pressure, using the precautionary approach for data poor stocks, the harvest rate (i.e. impingement mortality) is sustainable. In particular, prior to being taken offline in 2000, Hinkley Point A (HPA) abstracted more cooling water than HPB (44 as opposed to 33.7 m^3s^{-1}) from the same intake location. If an impingement impact of the size of the HPA abstraction was having any effect on local fish populations then the closure should be detectable in the impingement record.

Variability of fish stocks

5.2.22 Fish stocks are subject to considerable annual variability due to highly variable levels of recruitment, food availability and predation pressure. Individual populations and ecosystems are resilient to such high levels of variability. This can be seen in the Hinkley Point populations via the HPB impingement data. For example, the coefficient of variation of impingement numbers from the RIMP survey over the period 1981-2017 was in the range 69% to 180% for each of the top 13 species that constituted 95% of the local abundance and greater for the rarer species. Some examples of measured year-to-year variability in local fish populations since 2000 from the RIMP programme are shown in **Table 5.9**.

Table 5.9 Measured year to year variations that have occurred at Hinkley Point in RIMP dataset 2000 (taken from TR456 Cefas, 2019)

Fish species	The two largest year to year changes in annual numbers from the RIMP annual dataset 2000-2017 (shown as ratio of the impingement in adjacent years)	
Bass	29.6	9.2
Cod	29.7	17.3
Herring	31.2	26.1

Fish species	The two largest year to year changes in annual numbers from the RIMP annual dataset 2000-2017 (shown as ratio of the impingement in adjacent years)	
Sprat	4.2	3.7
Sole	9.3	2.8
Whiting	3.4	3.2
Shad, Twaite	18.5	17

5.3 Further assessment

5.3.1 Given that the fish community is largely made up of juveniles, the effects assessment undertaken by TR456 (Cefas, 2019) converts the number of juveniles taken from the CIMP work into the number of adults that would survive to maturity (called equivalent adults or EAV). This is to allow for processes such as natural mortality due to predation, for example, as the fish matures. Full details of the EAV conversion are provided in TR456 (Cefas, 2019) and the converted numbers are provided in **Table 5.10**.

Table 5.10 Unmitigated impingement numbers calculated from the CIMP data for HPC using EAVs

Fish species	Number	Result following application of EAV
Sprat	932,129	518,254
Whiting	1,369,835	194,517
Sole, Dover	363,975	85,898
Cod	240,909	2,819
Herring	25,393	2,982
Bass	20,704	2,505
Plaice	3,255	627
Ray, Thornback	1,973	669
Whiting, Blue	728	103
Eel	782	782
Shad, Twaite	528	19
Lamprey, Marine	117	117
Brown shrimp	11,437,723	11,437,723

5.3.2 Given the commitment to install the FRR system, adjustment regarding the potential for mortality following impingement is then applied to the EAV number of individuals. This assessment also accounts for the change in forebay trash screen size from 75 mm at HPB to 50 mm at HPC. The calculation of the FRR mortality rate for each species is explained in detail in Appendix A of TR456 (Cefas, 2019) based on the survival rates shown in **Table 5.11**, which are then altered to include the potential effect of the smaller forebay trash screen (see **Table 5.12**).

Table 5.11 FRR rates of survival

Group	% Survival rate with integrated FRR – drum screens	% Survival rate with integrated FRR – band screens
Pelagic (herring, sprat etc)	0	0
Demersal (cod, whiting)	50	0
Epibenthic (eels, rocklings)	80	80

5.3.3 The adjustment for the flows to each screen and size of trash screen produces the numbers presented in **Table 5.12**.

Table 5.12 Summary of numbers following application of the EAV conversion with the FRR system in place

Fish species	Number	Result following application of EAV	EAV after FRR mitigation applied	EAV wt (t)
Sprat	932,129	518,254	518,264	8.0
Whiting	1,369,835	194,517	106,012	31.6
Sole, Dover	363,975	85,898	17,523	6.2
Cod	240,909	2,819	1,559	7.4
Herring	25,393	2,982	2,982	0.2
Bass	20,704	2,505	1,747	2.0
Plaice	3,255	627	266	0.09
Ray, Thornback	1,973	669	271	0.9
Whiting, Blue	728	103	56	0.08
Eel	782	782	156	0.05
Shad, Twaite	528	19	19	-
Lamprey, Marine	117	117	23	-
Brown shrimp	11,437,723	11,437,723	2,287,545	3.41

Assessment of risk to status classification

5.3.4 The first stage in the assessment is to consider whether there is the potential to impact on fish populations such that the classification of a WFD water body changes. Information gathered in **Section 5.2** indicates that for transitional water bodies in the vicinity of the abstraction, fish fauna has been assessed as being at high status (i.e. score a TFCI greater than 0.81 (see **Section 5.2**)). Given that UKTAG (2014) recommends that the index be applied at the whole transitional water level (estuary), rather than subdivisions into WFD water bodies, it is assumed that the entire estuary is at high status for fish.

5.3.5 In considering the metrics that contribute to this score, with the exception of metric 3 (species relative abundance), all metrics are counts of the number of species in functional, feeding or indicator species groups found in the population samples (i.e. presence/absence data). TR456 (Cefas, 2019) does not predict any changes to the number of species present and only negligible additional mortality on fish populations. As described in **Section 5.2**, the fish community at Hinkley Point, and therefore within the estuary, is subject to considerable within and between-year variability as well as to long term trends such as climate change and changes in fishing pressure. Measurements of the TFCI will therefore be subject to variability and only developments that have wide scale, very large impacts on the community would be expected to have any impact on the calculated index. Given that the impingement numbers are extremely small and the number of species present would not be altered, no change in classification status is predicted.

Assessment of within classification deterioration

5.3.6 To assess whether there is the potential for within classification deterioration, the 1% threshold has been considered. This assesses whether the predicted impingement is likely to be equivalent to or greater than 1% of the SSB where possible. This level is considered appropriate given that it is much lower than the measured natural variability of the Hinkley Point populations (see **Table 5.9**). This is also considered to be appropriate to assessing the risk to predator-prey relationships as they are able to react to much greater natural variability. By comparison, accepted practice in fisheries management is that a level of fishing mortality of 10-20% per annum will have negligible effects on the sustainability of unexploited populations. 1% is therefore considered to be precautionary (Cefas, 2019).

5.3.7

5.3.8 **Table 5.13** shows the predicted impingement levels at HPC fitted with a FRR system with the exception of sprat which is shown in **Table 5.14**.

Table 5.13 HPC impingement assessment with FRR system in place

Fish species	Number	Result following application of EAV	EAV after FRR mitigation applied	EAV wt (t)	Fishery (t) from ICES, 2009	SSB (ICES) (t)	Alternative estimates to SSB (see Table 5.7) (different units)	% of fishery	% of SSB
Whiting	1,369,835	194,517	106,012	31.6	6,572	34,918	-	0.481	0.090
Sole, Dover	363,975	85,898	17,523	6.2	805	2,857	-	0.758	0.217
Cod	240,909	2,819	1,559	7.4	3,292	5,092	-	0.225	0.145
Herring	25,393	2,982	2,982	0.2	627	-	-	0.031	-
Bass	20,704	2,505	1,747	2.0	5,657	18,317	-	0.035	0.011
Plaice	3,255	627	266	0.09	1,089	4,707	-	0.008	0.002
Ray, Thornback	1,973	669	271	0.9	755	-	-	0.118	-
Whiting, Blue	728	103	56	0.08	635,000	2,781,230	-	0.000	0.000
Eel	782	782	156	0.05	-	-	133 kg	-	0.039
Shad, Twaite	528	19	19	-	-	-	165,788 (No.)	-	0.011
Lamprey, Marine	117	117	23	-	-	-	15,269 (No.)	-	0.077
Brown shrimp	11,437,723	11,437,723	2,287,545	3.41	-	-	0	-	-

Table 5.14 HPC impingement assessment with FRR system in place for sprat

Year	Predicted HPC annual numbers	Result following application of EAV	EAV after FRR mitigation applied	EAV wt (t)	Mean SSB (t)	% of SSB
2013/14	299,662	105,481	105,481	1.6	7,736	0.021
2014/15	744,478	183,142	183,142	2.8	21,292	0.013
2015/16	461,480	138,444	138,444	2.1	55,331	0.004
2016/17	344,685	151,661	151,661	2.4	8,944	0.026

5.3.9 It can be seen from

5.3.10 **Table 5.13** and **Table 5.14** that with the FRR system installed, the predicted impingement for all fish species is less than 1% of the SSB or less than 1% of landings/catch. As a result, negligible effects are anticipated on the biological quality element 'fish fauna' given that this is significantly less than that experienced naturally.

5.3.11 The additional five species to be assessed (thin lipped grey mullet, flounder, five-bearded rockling, sand goby and brown shrimp) are not subject to stock assessment, do not have defined stock units and internal catch data are sparse; nor are EAV estimates available. As a result, these were assessed by analysis of trends in the long-term RIMP data. From the trend evidence TR456 (Cefas, 2019) concludes that:

- The abundance of all five species at Hinkley Point has a statistically significant positive trend. From well-established principles for the sustainable management of fish populations, if the impingement numbers are constant or rising under constant impingement pressure, using the precautionary approach for data poor stocks described in Section **Error! Reference source not found.** of TR456 (Cefas, 2019) the harvest rate (i.e. impingement mortality) is sustainable. i.e. if the mortality due to HPB (at approximately 33.7 m^3s^{-1}) was unsustainable the population would show a decline.
- When HPA closed down an abstraction of 44 m^3s^{-1} was removed from the Hinkley Point intakes. This impingement reduction cannot be detected in the RIMP impingement record (Appendix E of TR456, Cefas 2019). The populations of the five species are, therefore, not sensitive to at least a 44 m^3s^{-1} change in abstraction. The equivalent abstraction for HPC will be less than 44 m^3s^{-1} for four of the five species with only mullet experiencing a slightly higher equivalent abstraction at 46 m^3s^{-1}. Given the statistically strong trend in mullet numbers, the 46 m^3s^{-1} from HPC is not expected to have any effect on the mullet population level.
- The equivalent unmitigated abstraction in all five cases is less than 97 m^3s^{-1} of abstraction that has ceased operation since 1989 and it can, therefore, be expected that the operation of HPC would have no effect on the population trend for all five species.
- Finally, the impingement impact on three of the species at HPC will be less than the current HPB at 33.7m^3s^{-1}. When HPC becomes operational, impingement effects on these species will drop compared with the DCO baseline. For mullet and flounder, the net increase in impingement will be 12.3 and 3.3 m^3s^{-1} respectively, both are of which are far less than the 44 m^3s^{-1} impingement pressure that was exerted by HPA and which had no effect on population numbers of these species.

5.3.12 As a final stage to the assessment, an uncertainty analysis and assessment of the effects of interannual variability in the fish community are provided in Section 8 and Section 9 of TR456 (Cefas, 2019) respectively and the results are summarised in Error! Reference source not found.. The effects are all less than the 1% threshold of the relevant SSB or landings.

Table 5.15 Summary of HPC impingement effects with the FRR system in place, taking into the account the uncertainty and interannual variability analysis

Common Name	*Species*	Mean effect	Upper 95%ile effect	Impingement indicator
Sprat	*Sprattus sprattus*	0.016% (from RIMP data)	0.043%	PELTIC SSB for 2013- 2016
Whiting[4]	*Merlangius merlangus*	0.038%	0.072%	SSB for 2009
Sole, Dover[4]	*Solea solea*	0.069%	0.140%	SSB for 2009
Cod[4]	*Gadus morhua*	0.054%	0.119%	SSB for 2009
Mullet, thin lipped grey	*Liza ramada*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Flounder	*Platichthys flesus*	Population trend increasing. Negligible effect predicted		RIMP trend analysis
Five-bearded rockling	*Ciliata mustela*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Herring[4]	*Clupea harengus*	0.050%	0.081%	International catch for 2009
Sand Goby	*Pomatoschistus minutus*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Bass	*Dicentrarchus labrax*	0.011%	0.013%	SSB for 2009
Plaice	*Pleuronectes platessa*	0.002%	0.005%	SSB for 2009
Ray, Thornback	*Raja clavata*	0.118%	0.194%	International catch for 2009 + Cefas discard estimate.
Whiting, Blue	*Micromesistius poutassou*	0.000%	0.000%	SSB for 2009
Eel	*Anguilla anguilla*	0.043%	0.084%	Independent stock estimate
Shad, Twaite	*Alosa fallax*	0.0026% (from RIMP data)[3]	0.0043%	Independent stock estimate
Shad, Allis	*Alosa alosa*	0.017%	0.053%	Independent stock estimate
Lamprey, Marine	*Petromyzon marinus*	0.078%	0.166%	Independent stock estimate
Lamprey, River	*Lampetra fluviatalis*	0.008%	0.021%	Independent stock estimate
Salmon	*Salmo salar*	Less than 0.0086%. From RIMP data.	Less than 0.020%	EA/NRW estimates
Sea trout	*Salmo trutta*	Less than 0.0054%. From RIMP data.	Less than 0.04%	Extrapolated from rod catch for 2012-2016
Brown shrimp	*Crangon crangon*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis

5.3.13 As a result, it is anticipated that HPC with LVSE intake heads and an FRR system would have a negligible effect on these species and, therefore, population trends would not be impacted. Overall, therefore, within water body class deterioration is not expected.

5.3.14 It should be noted that the above assessment is considered to be highly conservative for the following reasons:

- Impingement information has been used from HPB – given that fishing surveys do not indicate significant spatial differences in fish populations between the two sites the comparison of the potential impingement information for HPB at HPC is considered appropriate. Additionally, the deeper water depth at the intake location is expected to reduce impingement per m^3s^{-1} of cooling water flow compared to that experienced at HPB. This has not been included in the assessments.
- The 1% of SSB value is applied as a screening threshold for negligible effects. This 1% threshold is significantly lower than mortality rates deemed sustainable in fisheries management.

Impact on meeting future objectives

5.3.15 Given the negligible effects predicted on the indicators used in the assessment, no effects on meeting future objectives for any of the WFD water bodies are predicted.

Detailed assessment - cooling water abstraction and the potential for impingement, implications for Protected Areas

5.3.16 European Designated Sites are considered in the accompanying updated HRA report and therefore further assessment is not required here.

5.4 Cumulative effects

5.4.1 This section considers whether any of the identified effects associated with the individual elements of the Project could be additive or combine in such a manner that they could lead to a change in a WFD water body that would be different to that determined for the individual components alone. As with the alone assessment of effects, the cumulative impact assessment considers only those projects, plans and components directly or indirectly associated with the operational effects of the CWS.

5.4.2 There are two ways in which cumulative impacts could occur; within project or cumulatively with other plans and projects. In this updated WFD compliance assessment, all cumulative effects are limited to the potential effects on the biological quality element ‘fish fauna’ given that effects on the other quality elements are either not anticipated or were scoped out as the original 2011 conclusions still stand.

Within project cumulative impacts

5.4.3 **Table 5.16** lists the within project effects that that are relevant to the cumulative assessment in this updated WFD compliance assessment and makes an assessment as to whether there is the potential for cumulative effects on any of the WFD water bodies.

Table 5.16 Potential within project cumulative effects

Potential effect	Comment on potential for cumulative effect	Output of assessment
Potential impacts during construction phase		
Effects of construction of various marine structures/discharges – such as construction and/or operation of the temporary jetty and seawall, the construction of the CWS itself, construction and operation of Combwich Wharf and land-based discharges.	The phasing of the Project means that the construction and operation of the temporary jetty and the construction of the CWS and Combwich Wharf would not overlap the operation of the CWS and there are therefore no linkages with the installation (or otherwise) of the AFD system and the actual operation of the CWS. Further the predicted insignificant effects on fish (through habitat loss and disturbance) of these activities which would happen prior to the operation of the CWS. For the operation of Combwich Wharf and land based discharges the predicted effects on fish (through disturbance changes to water quality) are localised and not significant (NNB GenCo, 2011).	No potential for within project cumulative effects on WFD water bodies.
Potential impacts during the operational phase of the CWS		
Effects of changes to thermal regime and discharge of contaminants on fish.	Based on detailed hydrodynamic modelling, the intake locations have been selected to avoid recirculation of thermal load and contaminants discharged from the CWS outfalls. The combination of physical separation and control of discharges will minimise any possibility that a fish that has experienced any minor effects from passing through the mixing zone of the discharge plume will then enter the cooling water intakes within a short time period while still affected.	No potential for within project cumulative effects on WFD water bodies.
Effects of entrainment of juvenile stages and other organisms (eggs and larvae) via the cooling water intakes.	The removal of the AFD system from the proposed design will not change the level of entrainment of juvenile stages of fish and other organisms (eggs and larvae) because they are not sensitive to sound and in many cases have no means of active avoidance.	No potential for within project cumulative effects on WFD water bodies.
Decommissioning of temporary jetty.	The decommissioning of the temporary jetty due to potential noise and artificial lighting effects on fish populations could occur during the operation of the CWS. Without mitigation, moderate effects were predicted for hearing specialist fish as a result of piling during construction of the temporary jetty, while all other effects were predicted to be insignificant (NNB GenCo, 2011). Given that noise disturbance is predicted to be less during the decommissioning than construction and the disturbance temporary, no significant cumulative effects are predicted to occur.	No potential for within project cumulative effects on WFD water bodies.

5.4.4 Overall, therefore the potential for within project cumulative effects on WFD water bodies has not been identified.

Between project cumulative impacts

5.4.5 The aim of this section is to consider whether any of the identified effects associated with the individual elements of the Project could be additive or combine in such a manner with other plans and projects that they could lead to a change that would be different to that determined for the individual components alone. As with the individual impingement assessments, the cumulative impact assessment considers only those projects, plans and components directly or indirectly associated with the operational effects of the cooling water abstraction.

5.4.6 Plans and projects that have been considered in this WFD compliance assessment are identified below in **Table 5.17**. These plans and projects include those that were identified in the 2011 documents and also reflect those that have been considered in addition, as a result of new plans and projects since the time of the original applications as well as a result of the consultation with the EA. **Table 5.17** also highlights and justifies those plans and projects which have been screened out of this assessment.

Table 5.17 Potential between project cumulative effects

Plan/Project	Stage	Screened in?	Justification for screening decision
Afon Dysynni outfall gravel removal and relocation	Licenced	No	Localised gravel management within estuary mouth over 300km by sea from HPC. Potential disturbance and effects focus on water quality. Extremely localised.
Aggregate extraction areas within the Bristol Channel: • **Bedwyn Sands (until 2024);** • **476 - Nobel Bank (until 2031);** • **526 - Culver Extension (until 2033)**	Licenced Licenced Licenced	Yes	Potential effects on fish migration in the Severn Estuary.
Orthios Eco Park, Holyhead, Anglesey	Part authorised	No	Project entirely inland, based on former aluminium smelter site. No effects on fish anticipated.
Black Ditch Wind Farm	N/a	No	No longer a project.
Bridgwater Barrier	Applications for T&WA Order and marine licence expected spring 2019	Yes	Potential disturbance and disruption of migration of fish and eels.
Bridgwater-Seabank 400 kV Transmission Infrastructure upgrade ('Hinkley Point C Connection')	DCO in place	No	Terrestrial project. No pathway of effect to WFD water bodies.
Bristol Deep Sea Container Terminal (BDSCT) and compensatory habitat creation at Stert Point	Harbour Revision Order in place	No	Proposed operational development will not have permanent effects on fisheries. There could potentially be water quality effects during construction however these are temporary and will be limited to the location at which the activity is being undertaken. The dredge will also be a one-off capital dredge. Disposal of maintenance dredge material is considered within disposal site activities.
Continued operation of HPB	Existing authorisations	No	HPB is not expected to be operational whilst HPC is operational.
Decommissioning of HPA	Authorised and almost complete	No	No changes to marine infrastructure outstanding, so no pathway of effect to WFD water bodies.
Decommissioning of HPB	Authorised	No	Reduction in effect on the fish assemblage of the Severn Estuary due to cessation of abstraction.

Plan/Project	Stage	Screened in?	Justification for screening decision
Decommissioning of Oldbury	Authorised and almost complete	No	No changes to marine infrastructure outstanding, so no pathway of effect to WFD water bodies.
HPA: **Intermediate Level Waste Store**	Authorised	No	No impingement anticipated so no pathway for effect on WFD water bodies.
HPA: **Waste Encapsulation Centre**	Authorised	No	No impingement anticipated so no pathway for effect on WFD water bodies
Holyhead Deep tidal turbine trial	CE lease for 10MW only	No	Small localised effects anticipated. Potential for cumulative effects on WFD water bodies discounted.
Dredgings disposal grounds within the Bristol Channel for disposal of arisings from port maintenance dredging: • **Milford Haven (Sites 2 & 3)** • **Watchet Harbour** • **Swansea Bay Outer** • **Cardiff Grounds** • **Bristol Holm Deep** • **Portishead** • **Royal Portbury Pier & Entrance)** • **Avonmouth (Inner and Royal Edward Entrance)** • **Newport South**	All licenced apart from Bristol Holm Deep which is now recorded as closed by the MMO	Yes	Disturbance to fish in Severn Estuary.
North Devon – Somerset Shoreline Management Plan	Plan in place	No	No pathway of effect from proposed flood defence works to fish populations.
Oldbury proposed new nuclear power station	Site identified in national policy statement EN-6	No	The development of the Oldbury new nuclear power station is still in the very early stages, so the potential for effects on the estuary environment cannot be predicted yet. Therefore, it has been screened out.
Parrett Estuary Flood Management Strategy	Strategy in place	No	No pathway of effect from proposed flood defence works to fish populations (except see separate entry for Bridgwater Barrier).
Severn Barrage Project	No applications	No	Not currently being pursued and no longer considered a viable project by the government.
Severn Estuary Flood Risk Management Strategy	Strategy in place	No	No pathway of effect from proposed flood defence works to fish populations.
Severn Estuary Shoreline Management Plan	Plan in place	No	No pathway of effect from proposed flood defence works to fish populations.

Plan/Project	Stage	Screened in?	Justification for screening decision
South West Marine Pan	Plan in place	No	Contains policy relevant to the Project (all sites within English waters). Relevant projects are listed separately in this table.
Swansea Tidal Lagoon Power (TLP)	DCO in place. Marine Licence applied for.	Yes	Potential effects on the Severn Estuary due to entrainment of fish through turbines.
Tidal lagoons (other) • **Cardiff** • **Newport** • **West Somerset**	PINS advised of expected application dates but no applications yet made	Yes	Potential effects on the Severn Estuary due to entrainment of through turbines.
Watersports centre, Ilfracombe Harbour	Harbour Revision Order application submitted	No	No effects on fish anticipated.
Welsh National Marine Plan (WNMP)	Draft published December 2017	No	Contains policy relevant to the Project (all sites within Welsh waters). Relevant projects are listed separately in this table.
West Anglesey Demonstration Zone		N/A	See Holyhead Deep tidal turbine trial.
Withy End Wind Farm	N/a	No	No longer a project.
Wylfa Newydd NNB	DCO at examination	No	Potential changes to water quality will not overlap with WFD water bodies identified in this assessment.
Pembrokeshire Wave Demonstrations Zone	No application made yet for the zone	No	Effects cannot be assessed until the zone is approved and developers come forward with proposals for trials of devices.
Commercial fisheries (including salmon netting)	Ongoing	No	No specific proposals for changes in commercial fisheries that could constitute a plan or project have been identified, so commercial fisheries are considered to form part of the baseline against which the changes due to the CWS have been assessed.

5.4.7 The assessment for projects screened in is summarised in **Table 5.18**.

Table 5.18 Between Project Cumulative Impact Assessment

Plan/Project	Summary of assessment	Conclusion
Aggregate extraction	Aggregate dredging may temporarily remove food resources and effect water quality for fish over a limited area for any one time but it is unlikely to affect movement of migratory fish within the Severn Estuary WFD water bodies such that a deterioration will occur.	No potential for cumulative effect, the effect remains as that predicted for the removal of the AFD system alone.
Bridgwater Barrier	This would include a tidal barrier located on the River Parratt which will have two gates that lift vertically in and out of the river. The gates will only be closed during tidal surges that risk flooding in Bridgwater. However, as the use of the barrier will only be occasional (and during the winter, outside of the main migratory seasons) it is unlikely that fish migration will be impacted. Significant effects are not anticipated.	No potential for cumulative effect, the effect remains as that predicted for the removal of the AFD system alone.
Dredging disposal grounds within the Bristol Channel for disposal of arisings from port maintenance dredging	During disposal, there are likely to be temporary effects on water quality which could impact on fish movements. However, these effects will be short term and will be diluted following cessation of the activity.	No potential for cumulative effect, the effect remains as that predicted for the removal of the AFD system alone
Swansea Tidal Lagoon Power (TLP) and Tidal lagoons (other) • **Cardiff** • **Newport** • **West Somerset**	Tidal lagoon development for electricity generation is proposed off Swansea and at three other locations within the Severn Estuary/Bristol Channel. The Swansea proposal has permission granted through a DCO although negotiations are ongoing regarding a marine licence. Advance notice has been given to the Planning Inspectorate of likely applications for the other projects but no applications have yet been submitted. Tidal lagoons may affect fish populations through entrainment of fish through the turbines. Particular concern has been raised in relation to entrainment of migratory salmonid fish through the turbines at the proposed Swansea Tidal Lagoon. Additionally, as part of the WFD compliance assessment an assessment was made of the potential for effects on 'fish fauna' which concluded an adverse impact and to address concerns from the regulators, a fish mitigation strategy was agreed to ensure effects on the WFD water bodies are monitored and allow for further mitigation to be implemented should it be deemed necessary.	The requirement for monitoring at Swansea Lagoon reduces the risk for cumulative effects with the CWS at HPC. Additionally, the effects at HPC resulting from the removal of the AFD system are predicted to be very small. Based on current information, the risk of cumulative effects is assessed as being low.

5.4.8 **Table 5.18** concludes that the potential for cumulative with other plans and projects will not occur.

6 SUMMARY OF ASSESSMENT

6.1 Purpose of this section

6.1.1 This section summarises the results of the compliance assessment and the activities assessed in detail. A description of the proposed mitigation measures that are required to address any impacts and prevent deterioration in status or failure to meet WFD objectives set for the relevant water bodies are then summarised.

6.2 Summary of assessment

6.2.1 The results of the screening exercise identified that the activity to be considered is the cooling water abstraction, but without one of the proposed mitigation measures assessed in the previous submission. Additionally, three WFD water bodies were identified to undertake an initial assessment and provide the baseline.

6.2.2 The results of the scoping exercise indicate that the cooling water abstraction without the AFD system could potentially lead to a deterioration in the biological quality element 'fish fauna' and therefore also the Protected Areas for which fish are designated as interest features. No other WFD quality elements were identified as being at risk.

6.2.3 As a result, the activity was carried through to further assessment in relation to 'fish fauna' (and their Protected Areas) only. All other quality parameters, not impacted by the removal of the AFD system, were considered in the previous WFD compliance assessment (NNB GenCo, 2011) and therefore were scoped out of requiring further assessment.

6.2.4 The output of the further assessment concluded that the change is so small compared to other pressures (fishing, climate change, natural variability) that it is deemed to be insignificant. As a result, no deterioration between or within class is anticipated for the WFD biological quality element fish fauna. Note that the consideration of relevant Protected Areas (i.e. European Designated Sites) is made within the updated HRA report submitted alongside this WFD compliance assessment. Additionally, the cooling water abstraction, without the AFD system, will not impact on the objectives for any of the WFD water bodies going forward. It can therefore be concluded that the removal of the AFD system from the CWS will not cause non-compliance with WFD either alone or cumulatively within project or between plans and projects.

6.3 Summary of mitigation measures

6.3.1 A summary of the mitigation measures to be applied is as follows:

- intake site locations to be located within deeper water away from intertidal area and not within the main channel where the main migratory routes are anticipated;
- incorporation of LVSE intakes; and

- incorporation of a FRR system.

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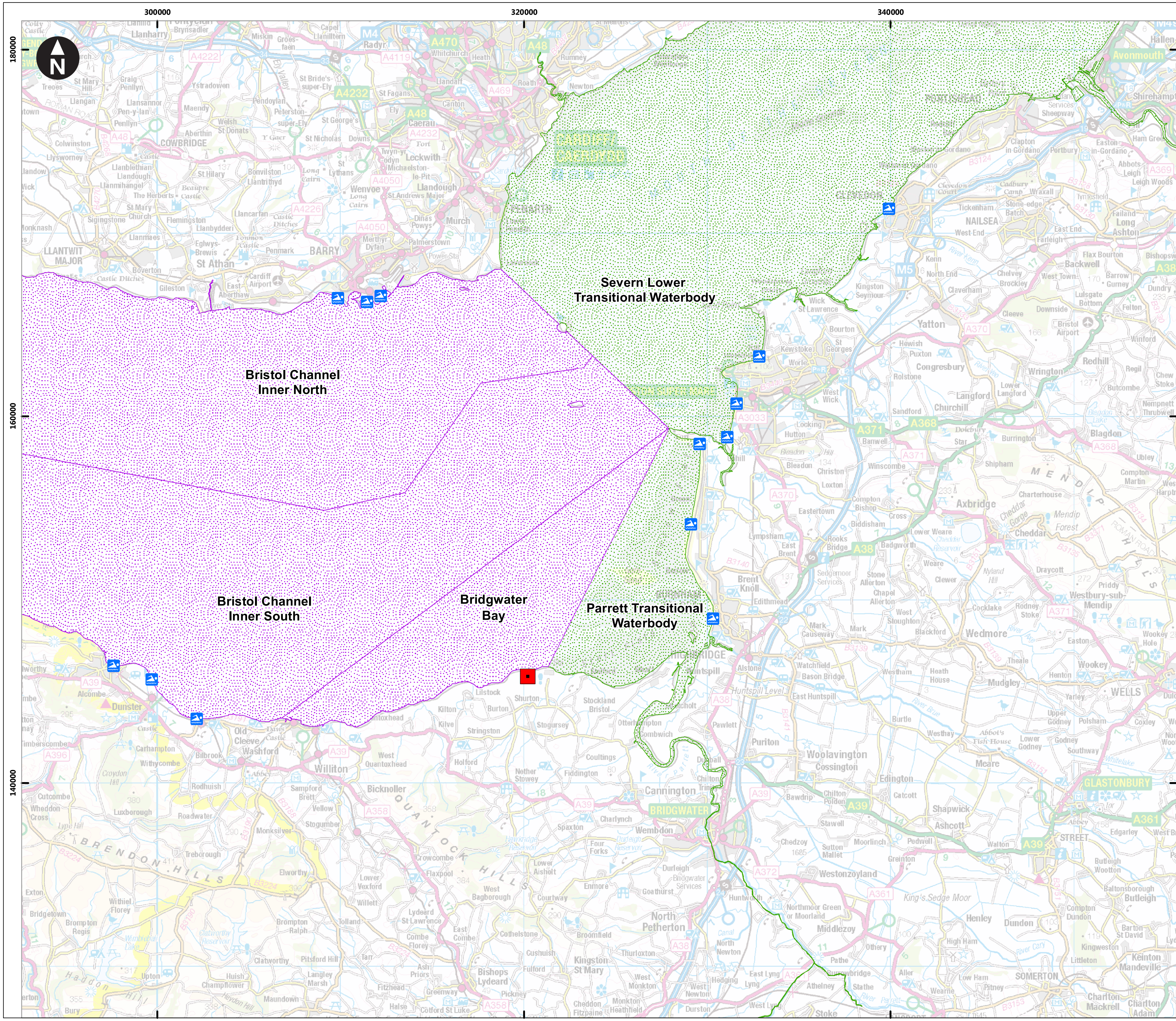

Key

- Indicative Hinkley Point C location
- Bathing Waters
- Shellfish Waters
- Coastal Waterbodies
- Transitional Waterbodies

0 — 10 km

Scale at A3: 1:200,000

REV.	DATE	AUTHOR	COMPANY
001	September 2018	GC	RHDHV

Hinkley Point C Project
Case for Removal of the Requirement to Install an Acoustic Fish Deterrent
Hinkley Point C Water Framework Directive Compliance Assessment

Figure 4.1
WFD water bodies and protected areas

NNB-308-REP-000725

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