

Paper 1: The Cardiff Grounds

Sediment disposal

Introduction

The development at Hinkley Point C requires dredging of the surrounding seabed for the construction of the temporary Jetty (now completed), and to allow for the drilling of 6 vertical shafts for the direct water intake cooling system.

The disposal of dredged marine sediment, from the Somerset foreshore to an established designated disposal site, known as LU110 Cardiff Grounds (located 1 mile from Cardiff), by NNB Genco was permitted in 2018, and further works are planned for early 2021.

To maintain the health of an aquatic ecosystem, it is important to retain sediment within the same hydrodynamic system. This means that any material dredged from within the Severn Estuary/Bristol Channel area should be disposed of within the same area. There are two types of dredging:

- Maintenance dredging – sediment removal to maintain existing marine infrastructure, such as watercourses and harbour basins, where a certain depth is required to maintain navigation.
- Capital dredging – the creation of a new civil engineering works by means of dredging carried out in virgin sediment.

Marine licences are required for the dredging and disposal of sediment within the marine environment through the Marine and Coastal Access Act 2009. In Wales, such activities are regulated by Natural Resources Wales (NRW) whereas across the border responsibility falls to the Marine Management Organisation (MMO).

Disposal sites

There are 13 open disposal sites in Welsh inshore waters designated for the purpose of receiving dredged material (Figure 1 opposite), mostly comprising of maintenance and capital dredge, and amounts to an average of 3,008,129 wet tonnes per annum¹. 5 of these sites are designated for disposal of sediment for beneficial use, that is for the enhancement of the surrounding environment. 1 is designated for fish waste but has not been used since 2017.

Three sites are located within the Severn Estuary – upper Inner Bristol Channel area:

LU110 – Cardiff Grounds

LU115 – Merkur Buoy

LU140 - Newport

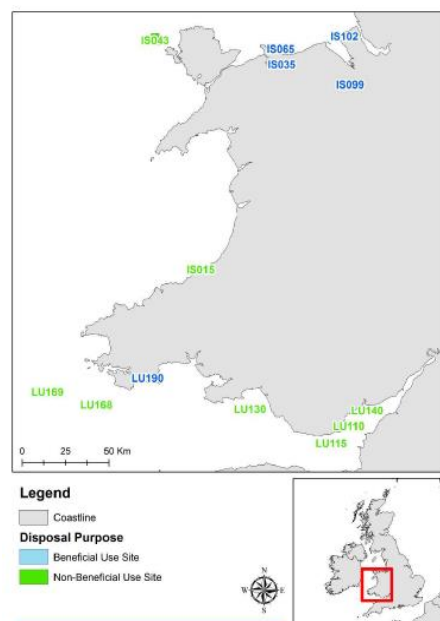


Figure 1. The 13 open disposal sites in Welsh waters¹.

¹ Clarke, C., Rees, J. (2020). Welsh Disposal Site Review. Cefas Project Report for Welsh Government. Referred to as the Cefas review within this document.

Sediment transportation and deposition

As it is important to “retain sediment within a system to support sustainable deposition (on sediment-based habitats and shorelines) and habitat restoration, beach nourishment and shoreline stabilisation”, any sediment dredged off Hinkley Point must be retained within the same hydrodynamic system. In order to understand the movements of sediments, as they are dispersed over an area, sediment transportation needs to be considered. Within the pre-application advice, NRW referred to the review carried out by Cannard (2016) and the transportation of sand and finer sediment within the Severn Estuary/Inner Bristol Channel can be seen below in Figure 2.

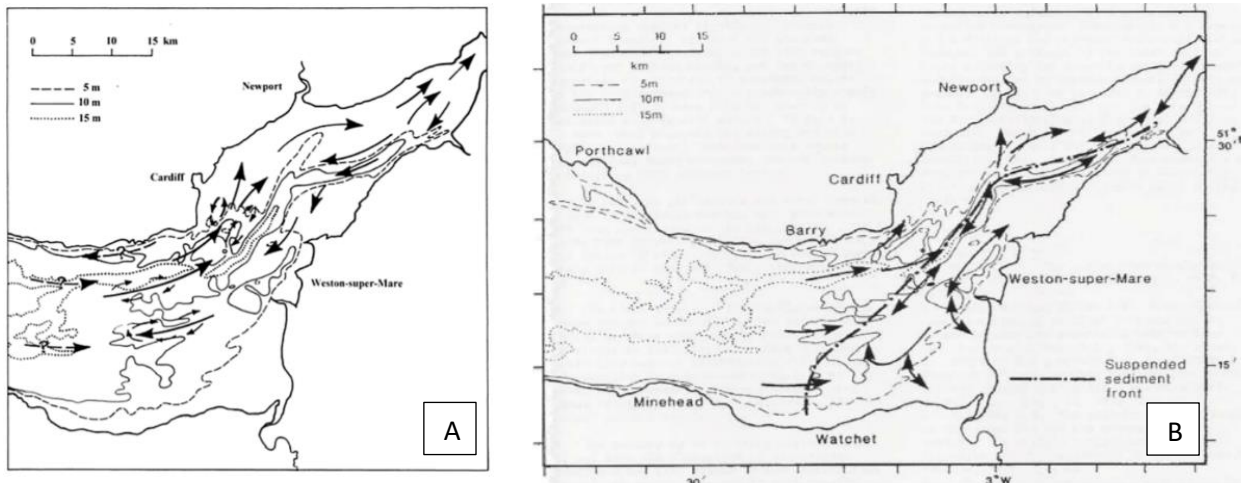


Figure 2. The sand transportation pathway (A)(Otto, 1998) and the movement of fine sediment (B)(APBmer and Atkins, 2010) around the inner Bristol Channel and Severn Estuary taken from Cannard (2016).

The review of Welsh disposal sites by Cefas¹ uses modelling to illustrate the possible movements of sediment disposed at each of the open disposal sites. It considers two types of plume that are formed when material is deposited, these are:

- Dynamic plume: This material descends within minutes to the seabed where it settles. Some of this material can be resuspended into the water column when it impacts upon the seabed.
- Passive plume: As the sediment and water descend, the finer material becomes entrained from the dynamic plume into the water column and is dispersed laterally by currents, waves and tidal action.

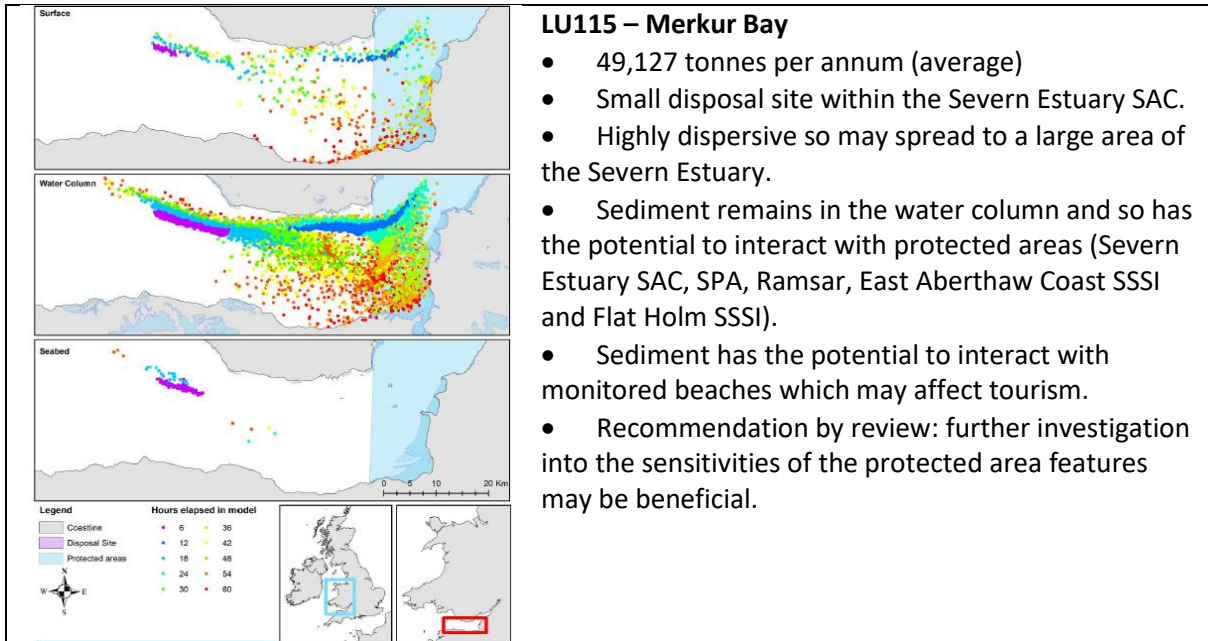
The main impacts of sediment deposition at any site are:

- A temporary increase in suspended sediments that results in an increase in turbidity.
- The sites around the disposal site can be impacted as sediment is dispersed.
- The increase in turbidity causes a decrease in light that can impact phytoplankton, seagrass and visual predators such as fish.
- It can adversely affect benthic communities through burying and smothering of the benthos.

For the purpose of this paper, the distribution at the three local, and thereby relevant, sites are shown below:

Table 1. Modelling results and summary for disposal sites within the Severn Estuary EMS.

	<p>LU110 - Cardiff Grounds</p> <ul style="list-style-type: none"> • 650,000 tonnes per annum (average) with a maximum of 1,022,874 tonnes in 2011. • Within Severn Estuary SAC. • Material remains largely within the water column and is retained within 10km of the site. • Dispersive site. • Plume spreads northeast, overlapping with boundaries of Severn Estuary SPA, SSSI and Ramsar site. • Proximity to coastline may mean site is further influenced by other factors such as wave dynamics. • Recommendation by review: further investigation into the sensitivities of the protected area features may be beneficial.
	<p>LU140 -Newport</p> <ul style="list-style-type: none"> • 159,004 tonnes per annum (average) • Within Severn Estuary SAC. • Highly dispersive site. • Plume spreads north-easterly and reaches the coast at Newport which could potentially impact upon tourism and recreation in the area. • Material reaches the shoreline in a number of locations in Wales and England that could benefit if material is deposited at a mudflat/saltmarsh habitat. • Recommendation by review: further investigation into the sensitivities of the protected area features may be beneficial.



The summary and modelling data suggest that the most suitable site is that of LU110 Cardiff Grounds as the other two potential sites receive less material each year and any material deposited has a greater potential of impacting upon surrounding protected features, and could reach the coast and beaches thereby affecting tourism.

LU110 – Cardiff Grounds

The Cardiff Grounds (LU110) disposal site was designated in the 1980’s and is located within the Severn Estuary, approximately 3 km off the South coast of Wales. The site is considered a dispersive disposal site and has received on average 650,000 tonnes per annum between 2009 and 2019 mainly from maintenance dredging, with its highest recorded disposal of 1,022,874 tonnes in 2011².



The NRW preapplication advice states that “whilst it is impossible to guarantee no single particle from LU110 will ever reach the Penarth/Barry coastline, material disposed will join the naturally highly dynamic region off Cardiff and move in a general North East direction towards the long-term sinks of the Newport Deeps and River Usk marshes”². This advice refers to the review by Cannard (2006) and not to the Cefas review, however the modelling supports this statement.

The Habitats Regulations Assessment (2010)³ for the overall Hinkley Point C Development highlights potential impacts and considers the interactions between different projects occurring within the area. It states that the proposed work at Bristol Deep Sea Container Terminal 34 at Avonmouth and

² NRW Hinkley Point C Sediment Sample Plan SP1914 Pre-application advice and public consultation responses

³ Department of Energy and Climate Change (2010) Habitats Regulations Assessment Site Report for Hinkley Point

the nuclear development at Hinkley could, in combination, affect the Severn Estuary European Sites (SAC, SPA and Ramsar) in relation to water resources and quality. In particular, capital dredging within the turning area and main estuary channel and disposal of the arisings can modify local hydrodynamics and sediment transport around the container terminal, leading to an increase in accretion over SPA and SAC habitats. Subtidal and potentially intertidal deposition of fine sediment within the estuary as a result of dredging and disposal of sediment may also result. This highlights the need to take a precautionary approach and consider other infrastructure projects within the same hydrodynamic area when assessing the significance of impact upon an ecosystem.

NNB Genco sediment disposal applications

In order for sediment disposal to occur at LU110 Cardiff Grounds, NNB Genco must go through a series of processes:

- Apply to NRW for a Marine Licence to dispose of the material with the initial stage. This includes the agreement of a Sediment Sampling Plan to analyse and assess the sediment being translocated.
The Cefas review states that Cefas produce the sampling and analysis plans on behalf of NRW.
- Apply to MMO for a Marine Licence to extract sediment samples from the proposed dredge site and for a Marine Licence to dredge material from the seabed.

Paper 2: Fish

The fish assemblage of the Bristol Channel and Severn Estuary

The ecosystem of the Severn Estuary and Bristol Channel supports the feeding and breeding cycles of many different marine, and estuarine, fish species. Fish species migrate through the Bristol Channel and Severn Estuary to reach their feeding, nursery and spawning grounds, many of which are in protected rivers. This migratory behaviour completes their life cycles therefore, any disturbance can impact upon their populations.

Seven species of migratory fish are recognised in the Severn Estuary; Salmon, Sea trout, Eel, Twaite and Allis shad, Sea lamprey and Lampern. Bass and Herring are also known to migrate around the Bristol Channel.

The importance of these migratory fish species and the wider fish assemblage are recognised through the European Marine Site designations shown in the table below. Migratory fish are protected in the Rivers Severn, Wye and Usk. Many of which have an economical, and ecological, significance to the estuary and the surrounding communities. The fish populations residing in, and migrating through, the Bristol Channel and Severn Estuary show considerable complexity within their populations.

The Severn Estuary is particularly important for the European eel. The Eels (England and Wales) Regulations 2009 established measures for the recovery of the stock of European eel in England and Wales. European eels are present in the Severn Estuary throughout the year, although there are large seasonal variations in their numbers. Glass eels enter the Bristol Channel/Severn Estuary in large runs, moving upriver in the spring, while downstream runs of European silver eels typically start in the autumn until early spring.

Importance		European	International	National	
		Special Area of Conservation SAC	Special Protected Area SPA	Ramsar Site	SSSI (Nationally important feature)
Feature	Migratory fish (river & sea lamprey & twaite shad)	Yes	No	Yes	(Yes)
	Migratory fish (Salmon, eel, sea trout and Allis shad)	Part of notable species sub-feature of estuary feature	No	Yes	(Yes)
	Assemblage of fish species (>100 species)	Notable species sub-feature of estuary feature	No	Notable species sub-feature of estuary feature	(Yes)

The 2010 Hinkley Point C Marine Licence Habitats Regulations Assessment⁴ highlights seven species of migratory fish move through the Severn Estuary between the sea and the Rivers Severn, Wye and Usk. It also recognised that any adverse impacts on their migratory and reproductive behaviour

⁴ Department of Energy and Climate Change (2010) Habitats Regulations Assessment Site Report for Hinkley Point

might be transferred between each of the European Sites (Severn Estuary EMS, River Wye SAC, River Usk SAC). As part of The Eels (England and Wales) Regulation consideration for the passage for eels must also be given.

Fisheries in South Wales

Commercial fisheries

There are several commercial operators working out of ports along the Bristol Channel including Cardiff and Swansea. The majority of fish landed at these ports is exported as a significant number of Spanish owned UK-flagships who land their catch in Wales, and then transport it directly to markets in Spain⁵. In 2019, non-quota landings of 8,017 tonnes were taken at ports in Wales equating to £13,866,000 along with quota landings of 655 tonnes worth £1,927,000. The landing totals by species between January and June for this year are shown in Annex 2, with 356 tonnes of demersal fish, worth £972,000 and 3,371 tonnes of shellfish, worth £4,909,000 also landed.

The Burry Inlet cockle fishery has an estimated landing of 1,254 tonnes of cockles⁶. This fishery is being actively managed by NRW to ensure its sustainability (currently MSC certified).

The Severn Estuary and its rivers constitute the largest eel fishery in the UK and accounts for 95% of all glass eels caught in England and Wales. Eel and elver fisheries are operated by around 50 fishermen⁷ in Wales, and last year, in the UK, £4,445 worth of adult eels were caught (weight not available), along with 6,029kg of elver worth £33,575 (statistics for Wales only were unavailable). The industry is very lucrative, with the illegal elver trade reportedly worth around £3 billion a year and is becoming an increasing problem on the Severn⁸.

Recreational fisheries

Game, coarse and sea fishing are considerably important culturally, and economically, to many coastal communities along the Severn Estuary and Bristol Channel. Historic stake netting and lave net fishing are traditional forms of fishing that remain, albeit in much smaller numbers.

Today's angling community is considerably larger, and more active, both along the coastline, on the channel and estuary or in the tributary rivers. The Welsh Government review⁹ into sea angling in 2015 revealed that the Bristol Channel area has the greatest number of clubs, has the second busiest charter related effort and is seeing an increase in the targeting of bass whilst recreational cod and ray fisheries are declining. It also reports that visiting and residential sea anglers bring an average gross spend of £126.61 million to the Welsh economy.

The following groups are active on the Bristol Channel to represent fishers:

⁵ Wales Fisheries Strategy (2008) <http://www.fisheries.org.uk/080801walesfisheriesstrategyen.pdf>

⁶ Marine Stewardship Council (2020) Burry Inlet Cockles <https://fisheries.msc.org/en/fisheries/burry-inlet-cockles/>

⁷ NRW (2020) Fishing with nets and traps <https://naturalresources.wales/guidance-and-advice/business-sectors/fisheries/fishing-with-nets-and-traps/?lang=en>

⁸ BBC (2019) Illegal eel exporters exposed by Countryfile <https://www.bbc.co.uk/news/uk-england-gloucestershire-48647168>

⁹ Monkman, G., Cambiè, G., Hyder, K., Armstrong, M., Roberts, A. & Kaiser, M.J. (2015) Socioeconomic and Spatial Review of Sea Angling in Wales. Fisheries and Conservation Report No.52, Bangor University. <http://fisheries-conservation.bangor.ac.uk/documents/52.pdf>

- Angling Trust – representation for angling community in England and Wales
- Welsh Federation of Sea Anglers
- NRW Local Fisheries Groups for the Taff, Usk and Wye

Sustainable Fisheries Management

There is concern about the sustainability of fish stocks on the Severn Estuary. In January this year, NRW released new [byelaws](#) to protect Salmon and Sea trout. This pertains to migratory salmonids to limit fishing to catch and release, particularly for the River Wye and its tributaries, for the next 10 years to protect stocks. As of June 2020, the Environment Agency extended its emergency byelaw protecting Salmon in the River Severn and estuary until 15th December; this also stipulates that only catch and release is permitted. There are several new initiatives looking at recovering fish stocks notably

[Unlocking the Severn](#) – a project looking to reopening 158 miles of the River Severn to allow migratory Twaite shad, and other fish species, to reuse old spawning grounds and enable them to reach niche habitats to reduce hybridisation and achieve a healthy shad population. A tracking study, where 73 shad were tagged in the River Severn, has revealed the distances that some individuals travel as 12 were recorded on receivers off the North Devon coast and one was detected 950km away in Munster Blackwater Estuary (Ireland).

[I-BASS](#) – Research involving the tagging of juvenile bass in the southwest of England is revealing a complex picture regarding their migratory behaviour, usually involving an Autumn migration. Some remain in their protected nursery grounds, whilst others move between them or migrate much further afield.

[Bristol Channel Herring Project](#) – whilst the full research outcomes of this project have yet to be publicised, the Herring populations of the Bristol Channel are showing some considerable complexity with some being discrete geographical populations and others being part of a wider metapopulation that connects with the population of the Celtic Sea. Three populations being studied include those at Milford Haven, Clovelly and Minehead.

Potential impacts of HPC on fish populations

In Summer 2011, before the Development Consent Order was issued by the Planning Inspectorate, a Water Discharge Permit was applied for through the Environment Agency. As part of the process, a Habitats Regulations Assessment was carried out to determine whether the development project would have a considerable impact upon the habitats surrounding HPC. For the purpose of this paper, only fish have been considered; however, the HRA had a much wider scope. Please also note that during this process, the Environment Agency consulted widely within the DEFRA family, including NRW and that this strong link has continued throughout.

The Habitats Regulations Assessment (HRA)

The HRA was carried out in accordance with the Conservation of Habitats and Species Regulations and the Conservation of Offshore Marine Habitats and Species Regulations to determine if the project may affect protected features of the designated European Sites. It considers not only the project requesting development consent, but also the accumulative impact of other projects being considered in the same geographical location. The HRA involves a number of different stages which are briefly summarised in Annex 1.

In 2010, the HRA report for HPC highlighted the following concerns:

- Lamprey and Shad, qualifying features of the Severn Estuary SAC, are vulnerable to contamination from toxic compounds, from anti-fouling agents used in the intake system, that may accumulate within them.
- Sea and River Lamprey and Twaite Shad migrate up and down the channel past Hinkley Point and so it is likely that habitat adjacent to the site acts as a possible nursery and feeding grounds. “Effects on these species at Hinkley may therefore affect their populations in the River Usk and River Wye.”
- “Alterations in water temperature and the availability of oxygen can result in artificial thermal and chemical barriers to species and communities, significantly affecting these qualifying features.”
- There are “implications for designated fish species, in particular, the migratory Shad species and Atlantic salmon (Severn SAC, River Usk SAC and River Wye SAC), through the impingement of fish on cooling water intake screens and the entrainment of eggs and larvae as part of the intake cycle.”
- “Adverse impacts upon migratory fish species in the Severn Estuary may be transferred to populations at the Rivers Wye and Usk.”
- Long-term monitoring of fish at HPB has shown that there has been a change in fish species composition; a greater number of warmer water species have been caught through impingement indicating that the warmer discharged waters have affected the species numbers and diversity within the Severn Estuary. However, it should be noted that rising temperatures are not beneficial to all species of fish.

The Development Consent Order application committed HPC to the requirement of the following fish protection measures:

- Fish Recovery and Return (FRR) system
- Provision of Low Velocity Side Intake (LVSE) heads
- Acoustic Fish Deterrent (AFD) system

These devices are to address the anticipated 182 million fish deaths annually, due to impalement of fish onto the mesh on the intake pipes at HPC.

In October 2018 NNB Genco submitted an application to the Planning Inspectorate for a material change to the Development Consent Order, to remove the Acoustic Fish Deterrent (AFD), which incorporates the requirements of the water discharge permit conditions stipulated by the Environment Agency. Its grounds were that further environmental work and assessment by CEFAS concluding that the operation of the cooling water system without an AFD system has no impact on fish populations¹⁰. In addition to this formal reason, EDF has also stated during public consultations H&S concerns over the maintenance of devices and that the technology for AFD’s is not currently available nor suitable for the environment of the Severn Estuary-Bristol Channel.

Since the application, the Environment Agency has been undertaking a Habitats Regulations Assessment to identify whether the removal of the AFD will cause any significant impact on the European sites of nature conservation importance surrounding the HPC site. The EA¹¹ have now

¹⁰ NNB Genco Letter to the Planning Inspectorate <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010102/EN010102-000011-EDF%20Energy%20Lrt%20to%20SoS%20Request%20re%20Consultees%20-%20AFD%20Change%2019.10.18.pdf>

¹¹ Update on HRA process from the Environment Agency, pers. Comms. Lisa Wright, 24th September 2020

completed Stages 1 and 2 of the HRA process, after delays in acquiring data and further evidence from NNB Genco needed to complete these initial stages.

Over 100 fish species have been reviewed alongside the impacts to cetaceans, including porpoise whose protected breeding site is located at the mouth of the Bristol Channel (South West Approaches to the Bristol Channel MCZ). Throughout the process, the EA has consulted widely with other members of the DEFRA family (including NRW and Natural England) to ensure that they have used the best available technical advice. They launched a consultation process in Wales (on behalf of NRW) with the aim of consulting widely across all sides of the Severn Estuary and Bristol Channel and, to date, have received over 100 responses. The EA was progressing into the 3rd and 4th stages of the HRA in order to consider further mitigation measures, however on 4th August NNB Genco served notice on the EA as it considered its application to remove the AFD as refused as the EA had not completed its' determination through the HRA process. They are now seeking a public inquiry through the Planning Inspectorate which has a deadline, for all responses and evidence, by 22nd October 2020.

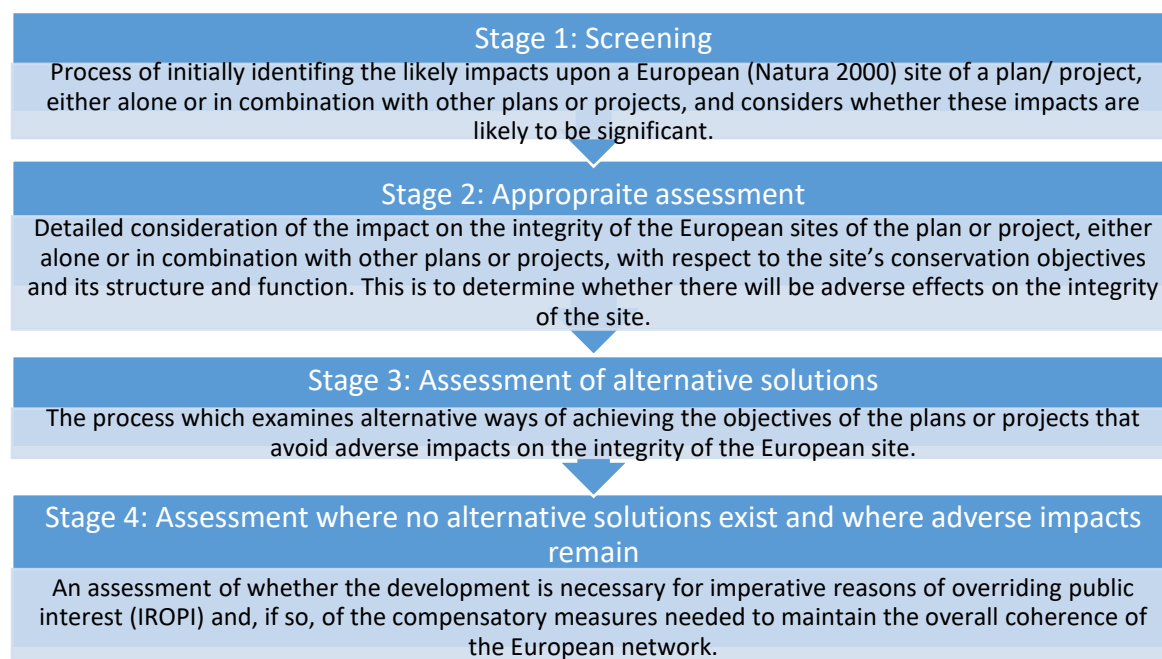
Stakeholder concerns

Through reviewing consultation responses provided by NGO's and other interested parties, the following concerns have been highlighted:

- The unique, innovative design of the fish return system relies upon the integration of the AFD with the Low Velocity Intake and so its removal would make the system ineffective.
- Issues surrounding the robustness and validity of the data presented.
- CEFAS's determination that an AFD device is not needed has raised concerns over a possible conflict of interest within CEFAS due to its operating as both the governmental advisory body and a private consultant for NNB Genco (approx. 30 staff members).
- Socio-economic impacts, including to the recreational angling economy, caused by detrimental changes to fish assemblage and wider ecosystem.
- Concerns over why a Direct Cooling (DC (the intake pipes)) was considered as Best Available Technology, instead of a closed-circuit open-air cooling system, when DC isn't permitted in other countries due to detrimental impacts to fish communities.
- Impacts of barotrauma on fish that are robust enough to survive the initial intake.
- Effects of chlorination and other cleaning chemicals on fish within the system.
- Design of the intake and outflow system, including the Archimedes screw on the outflow.

Please note that there are were other concerns raised and these are covered in the 'Environmental Concerns' paper. Those listed are the most notable regarding the fish assemblage, and none of the responses seen has included any supportive comments regarding the application to remove the AFD.

Annex 1: HRA Stages



Annex 2 - Landings by UK vessels into the ports in Wales January – June 2020¹²

Species	Tonnes landed	Value (000's)
Bass	20	155
Brill	2	14
Cod	3	9
Dogfish	11	-
Gurnard	6	3
Haddock	3	3
Hake	11	11
Lemon sole	4	9
Ling	1	1
Megrim	46	75
Monks or Anglers	58	100
Mullet	3	5
Plaice	9	14
Pollack (Lythe)	1	3
Skates and rays	109	93
Sole	46	454
Turbot	2	14
Witch	14	6
Other demersal fish	7	4
Crabs	194	242
Lobsters	50	613
Nephrops	3	4
Scallops	431	833
Whelks	2,683	3,132
Other shellfish	3,371	4,909

¹² Please note that data on landings by non-UK vessels into Welsh ports is not available.

