Natura Impact Statement

for

Great Island Power Station,

Co. Wexford.

Produced by

AQUAFACT International Services Ltd

On behalf of

AXIS Environmental Services Ltd

January 2020

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Report Approval Sheet

Client	
Report Title	Natura Impact Statement for Great Island Power Station
Job Number	JN1570
Report Status	Final
Issue Date	9.I.2020

Rev	Status	Issue Date	Document File Name	Author (s)	Approved by:
1	Draft	9.I.2020	Natura Impact Statement for Great Island Power Station	C. Tweedy	Brendan O'Connor
2	Final	9.I.2020	Natura Impact Statement for Great Island Power Station	C. Tweedy	Brendan O'Connor

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1. Introduction

1.1 Requirement for an Article 6 Assessment

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats. The annexed habitats and species for which each site is selected correspond to the qualifying interests of the sites and from these the conservation objectives of the site are derived.

The Birds and Habitats Directives set out various procedures and obligations in relation to nature conservation management in Member States in general, and of the Natura 2000 sites and their habitats and species in particular. A key protection mechanism is the requirement to consider the possible nature conservation implications of any plan or project on the Natura 2000 site network before any decision is made to allow that plan or project to proceed. Not only is every new plan or project captured by this requirement but each plan or project, when being considered for approval at any stage, must take into consideration the possible effects it may have in combination with other plans and projects when going through the process known as Appropriate Assessment (AA).

The obligation to undertake Appropriate Assessment (AA) derives from Article 6(3) and 6(4) of the Habitats Directive, and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances. Each step in the assessment process precedes and provides a basis for other steps. The results at each step must be documented and recorded carefully so there is full traceability and transparency of the decisions made.

Great Island Power Station, Wexford has been in use since the mid-1960s and it is still in use today. As part of its operational procedure, water is abstracted from the river, is then chlorinated and used as a coolant before being returned to the river.

The site is situated on the River Barrow (see Figure 1.1) which is part of the River Barrow and River Nore Special Area of Conservation (SAC).

Figure 1: An aerial photograph showing the power station at Great Island, County Wexford.

Therefore, due to the fact that the development site is located close to a number of Natura 2000 sites, it is regarded as necessary that the proposal should have due regard to Article 6 (3) of the EU Habitats Directive[1] which states:

Article 6 (3): *Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the [Natura 2000] site in view of the [Natura 2000] site's conservation objectives*.

1.2 Aim of This Report

The purpose of this report is to inform the AA process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to significant impacts on a Natura 2000 site. This NIS aims to inform the Appropriate Assessment process in determining whether the proposal, both alone and in combination with other plans or projects, is likely to have a significant impact on the Natura 2000 sites in the study area in the context of their conservation objectives and specifically on the habitats and species for which the sites have been designated. The NIS provides a description of the proposed project, a description of the receiving environment, it identifies the

[1] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

Natura 2000 sites within and close to the development site and it considers the potential for adverse effects on the conservation objectives and qualifying interests within the affected Natura 2000 site(s).

This report has been prepared in accordance with the current guidance:

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG 2009, Revised February 2010);
- Marine Natura Impact Statements in Irish Special Areas of Conservation – A Working Document. April 2012 (DAHG, 2012)
- EU Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC (EC, 2007);
- Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2002); and
- Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2000).

The report is laid out as follows:

Section 2 outlines the Appropriate Assessment procedure. Section 3 provides a description of the project, which includes details on the project, the receiving environment and the potential impacts. Section 4 covers the Stage 1 Appropriate Assessment Screening phase and Section 5 covers the Stage 2 Natura Impacts Statement section. Section 6 contains a summary.

2. Appropriate Assessment Process

2.1 Legislative Context

The requirements for AA derive directly from Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) (DEHLG, 2009). AA is an impact assessment process that fits within the decision-making framework and tests of Articles 6(3) and 6(4). The AA process encompasses all of the processes covered by Article 6(3) of the Habitats Directive *i.e.* the screening process, the NIS, the AA by the competent authority and the record of decisions made by the competent authority at each stage of the process, up to the point at which Article 6(4) may come into play following a determination that a plan or project may adversely affect the integrity of a Natura 2000 site.

Article 6(3) states:

'Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.'

Article 6 (4) states that:

'If, in spite of a negative assessment of the implications for the [Natura 2000] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted'.

'Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest'.

In addition, the European Court of Justice (Waddenzee Ruling – Case C-127/02) has made a ruling in relation to AA:

'*Any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the sites conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans of projects and that the plan or project may only be authorised where no reasonable scientific doubt remains as to the absence of such effects'*

It is the responsibility of the competent authorities, in this instance the Department of the Housing, Planning and Local Government, to make a decision as to whether or not the proposed temporary installation of a test tidal device (both alone and in combination with other plans and projects) should be permitted, taking into consideration any potential impact upon the Natura 2000 sites in question.

2.2 Stages of AA

The Commission's methodological guidance (EC, 2002) promotes a four-stage process to complete the AA, and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in Figure 2.1 below.

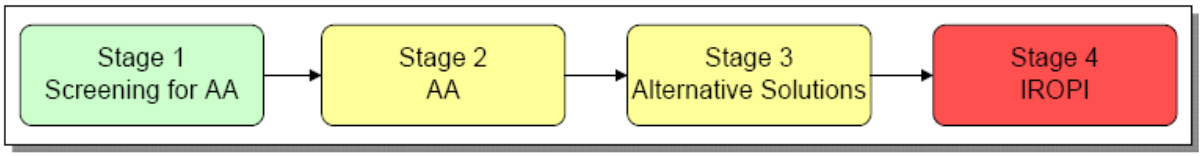

Figure 2.1: Stages in the AA process (Source: DEHLD, 2009).

2.2.1 Stage 1. Screening for Appropriate Assessment

Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

i. whether a plan or project is directly connected to or necessary for the management of the site, and

ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 Appropriate Assessment (preparation of an NIS). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification is needed in circumstances where the process ends at the screening stage on grounds of no impact.

According to DAHG (2012) NIS Guidelines, AA Screening should include:

1. Description of the plan or project and local site or plan area characteristics;
2. Identification of relevant SACs/SPAs, compilation of information on their qualifying interests and conservation objectives;
3. Assessment of the likely effects – direct, indirect, cumulative – undertaken on the basis of available information (desk study, field survey and/or primary research), which will result in a screening assessment and screening statement.

2.2.2 Stage 2. Appropriate Assessment (NIS)

This stage considers whether the plan or project, alone or in combination with other projects or plans, will have an adverse effect on the integrity of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit a **Natura Impact Statement (NIS)**, *i.e.* the report of a targeted professional scientific examination of the plan or project and the relevant Natura 2000 sites, to identify and characterise any possible implications for the site in view of the site's conservation objectives, taking account of in comb the appropriate assessment. If the assessment is negative, *i.e*. adverse effects on the integrity of a site cannot be excluded, then the process must proceed to Stage 4, or the plan or project should be abandoned. The AA is carried out by the competent authority, and is supported by the NIS.

2.2.3 Stage 3. Alternative Solutions

This stage examines any alternative solutions or options that could enable the plan or project to proceed without adverse effects on the integrity of a Natura 2000 site. The process must return to Stage 2 as alternatives will require appropriate assessment in order to proceed. Demonstrating that all reasonable alternatives have been considered and assessed, and that the least damaging option has been selected, is necessary to progress to Stage 4.

2.2.4 Stage 4. Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a Natura 2000 site to proceed in cases where it has been established that no less damaging alternative solution exists. The extra protection measures for Annex I priority habitats come into effect when making the IROPI case[2]. Compensatory measures must be proposed and assessed. The Commission must be informed of the compensatory measures. Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.

[2] IROPI reasons that may be raised for sites hosting priority habitats are those relating to human health, public safety or beneficial consequences of primary importance to the environment. In the case of other IROPI, the opinion of the Commission is necessary and should be included in the AA

3. Description of the Project

3.1 Description of the Development

Great Island power station, in county Wexford, comprises two 60MW and one 120MW oil-fired turbines and commenced commercial operations in 1967. Its function is to help maintain security of electricity supply in Ireland's all-island Single Electricity Market (SEM) by being available to operate on quick responses to peak in national energy demand. In 2015, the Great Island heavy fuel oil power station was closed down and a combined cycled gas power station was opened. The station comprises of a combined-cycle gas turbine (CCGT) power plant and consists of a single shaft Mitsubishi gas turbine and steam turbine operating on the same generator with natural gas being the main source of fuel.

The gas turbine contains a multi-stage-axial flow compressor section, a combustion chamber, and a multi-stage axial-flow turbine section. The natural gas is combusted using the air compressor and the resulting hot gas passing through the turbine and rotating the shaft. This drives both the generator and compressor to produce electricity.

The waste that is generated in this process is used to convert water to high pressure steam using a heat recovery steam generator. This steam is used to drive the generator to produce additional and the water that is used to cool the system is taken from the Burrow estuary.

This project involves the assessment of the surrounding waters of the Burrow estuary and its ecology, in regards to the cooling waters being released back into the estuary.

3.2 Description of Receiving Environment

The Great Island power station is situated adjacent to the River Barrow and River Nore Special Area of Conservation (SAC). The nearest area of settlement is at Cheekpoint, County Waterford, which is approximately 700 metres to the south of the site. In Wexford, the nearest significant area of settlement is Campile, and is situated approximately 3.75 kilometres to the east. The closest occupied dwelling is located approximately 450 metres to the northwest of the development site. The nearest school is located approximately 5 kilometres to the north east.

3.2.1 Annex I Habitats

It is possible that the cooling waters released from the Great Island power station could affect the marine habitats in the River Barrow. The site contains a number of Annex I habitats which include;

Estuaries [1130], Tidal Mudflats and Sandflats [1140], and Reefs [1170]. There are extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. On the western side of Waterford Harbour, good quality intertidal sand and mudflats have formed on a linear shelf, which extends over 6km from north to south between Passage East and Creadaun Head, and in parts can be 1 km wide. The sediments in the estuary are mainly firm sands, and grade into muddy sands towards the upper shore. Macro-invertebrate fauna including polychaetes and bivalves characterize these mud and sand communities. Common species include: *Cerastoderma edule, Arenicola marina, Lanice conchilega, Nephtys hombergii* and *Scoloplos armiger* (NPWS, 2011).

The mud and sand flats can be separated into two different communities: Muddy Estuarine Community Complex and Sand to Muddy Fine Sand Community Complex. Distinguishing species of the Muddy Estuarine Community Complex include: the polychaete *Streblospio shrubsolii*, bivalves *Scrobicularia plana* and *Macoma balthica*, the oligochaetes *Tubificoides pseudogaster* and *Tubificoides benedii,* and the amphipod *Corophium volutator.* These species are indicative of a variable salinity community (NPWS, 2011). Species that characterise Sand to Muddy Fine Sand Community Complex include: *Cerastoderma edule* and the *polychaete Scolelepis squamata,* when there is little mud, and the bivalve *Macoma balthica* and the polychaete *Pygospio elegans* as the sediment becomes firmer (NPWS, 2011).

Adjacent to the shores of Duncannon, Co. Wexford, there is an extensive area of honey-comb worm biogenic reef. This reef is formed by the polychaete worm *Sabellaria alveolata.* The *Sabellaria alveolata* reef is created as a layer of interlocking tubes over a substantial area of exposed bedrock. *Sabellaria alveolata* constructs tubes comprising of aggregated sand grains, in tightly packed masses and have a distinct honeycomb appearance. These can be up to 25cm and can form hummocks, sheets or more massive formations. There has been a range of species recorded at these reefs and these include *Mytilus edulis, Patella vulgata, Littorina littorea, Littorina obtusata, Enteromorpha* sp., *Ulva* sp., *Fucus vesiculosus, Fucus serratus, Polysiphonia* sp., *Chondrus crispus, Palmaria palmata, Corallinus officialis, Nemertea* sp. and *Actinia equina* (NPWS, 2011).

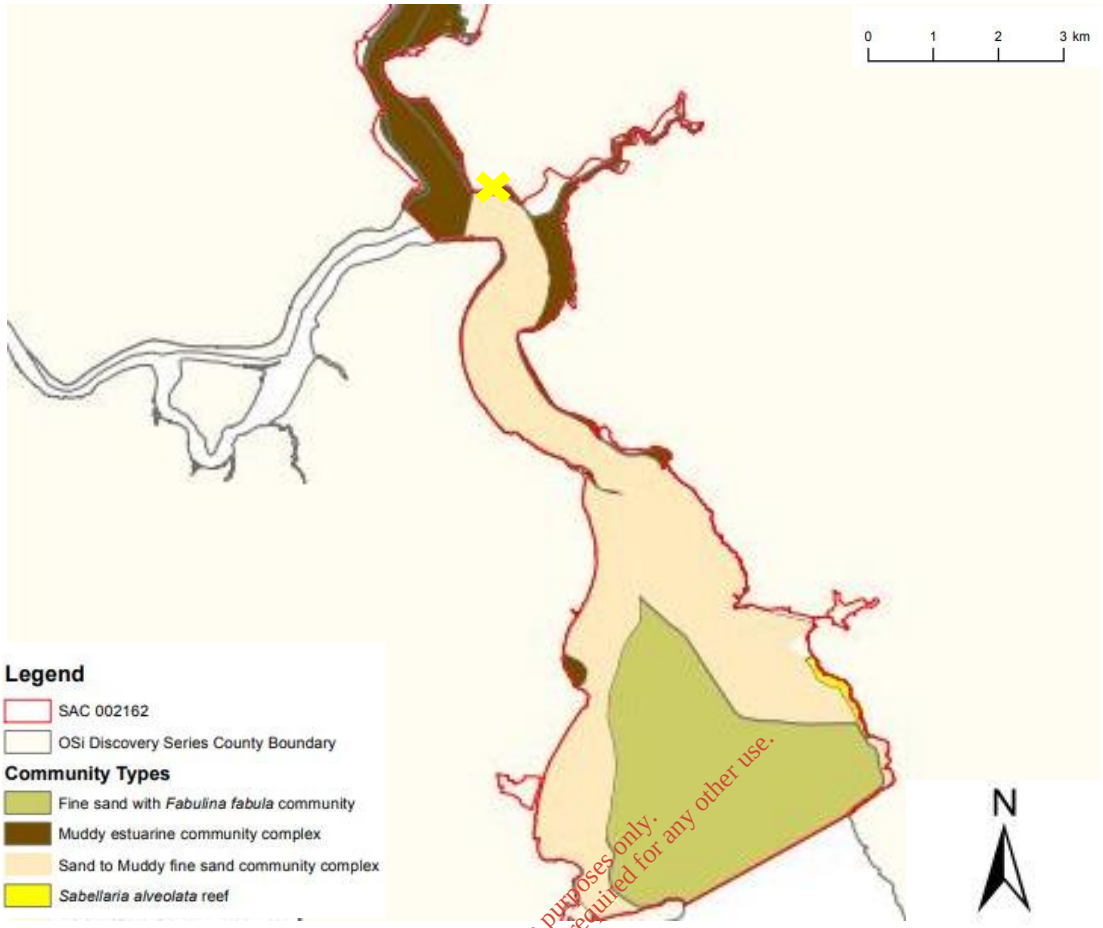

Figure 3.1: A map taken from NPWS (2011a) showing the community types in the River Barrow along with the Great Island power station marked with an "X".

3.2.2 Annex II Species

It is possible the cooling waters released from the plant could affect the Annex II species in the River Barrow. There are a number of Annex II species found in or near the River Barrow including: Sea Lamprey [1095], River Lamprey [1099], Brook Lamprey [1096], Atlantic Salmon [1106], Otter [1355], and Twaite Shad [1103].

The Otter (*Lutra lutra* (L.)) has been described as a fish specialist but studies have suggested that the Otter may be a more opportunistic predator. Otters are now recognised as top predators in freshwater systems and play an important role in the functioning of these ecosystems (Ottino and Giller, 2004). The Eurasian otter is listed by IUCN as 'near threatened', is monitored throughout Europe using the 'Standard Otter Survey' method. Eurasian otters utilize both salt and freshwater, but when utilizing salt water they need access to freshwater to bathe and drink (NPWS, 2009). The River Barrow in Co. Carlow was found to be a poor area in terms of otter abundance (Ottino and Giller, 2004). Otter have been observed frequently at the site.

Atlantic Salmon (*Salmo salar*) inhabit freshwater on both side of the Atlantic Ocean. European populations of Atlantic Salmon extend from Spain to northern Norway and Russia (King *et al*., 2011). Atlantic Salmon spawn in freshwater channels of suitable gradient and bed type in November to March. Juveniles live in freshwater for 2 years and descend to saltwater as smolts in spring of the third year. The smolts migrate to feeding grounds in the North Norwegian Sea and adults may return after one winter at sea (grilse, 1SW) or after two or more years (multi-sea winter fish, MSW). Commercial hydroelectric schemes have had a substantial impact on salmon populations in four major Irish rivers, along with artificial barriers and polluted waters (King *et al*., 2011).

Sea Lamprey (*Petromyzon marinus*) are found on the Atlantic coasts of North America and Europe, and has spread into the Great Lakes (landlocked populations). The Sea Lamprey population has been noted to extend into the Mediterranean (Economidis *et al*., 1999). Adult are external parasites on a variety of fish species, and migrate from the sea to fresh water and appear in late May. Spawning occurs in groups between May and July, in shallow water and create large salmon-sized redds in cobble/gravel beds in large rivers. (Maitland, 2003; King *et al*., 2011). Adults die after spawning and, and juveniles spend a number of years in fine-grained sediment before developing into young, free swimming adults (King *et al*., 2011).

Brook Lamprey (*Lampetra planeri*) range from the North West Mediterranean to Scandinavia, and are also found in British and Irish waters (Kelly and King, 2001). Brook Lamprey live solely in freshwater channels that can range in size from small streams to large rivers (Maitland, 2003). Distribution can be patchy and is related to the availability of a suitable habitat. Brook Lamprey prefer fine or sandy areas as they are suitable for adult spawning or areas of deposition of fine sediments which is suitable for the juvenile stage (King *et al*., 2011). Spawning occurs in late March to mid-May in shallow, creating simple redds in gravel or sandy beds. Juvenile Brook Lamprey spend many years in fine grain sediment before developing into free swimming adults. Brook Lamprey are believed to be a paired or twin species with the anadromous river lamprey, and are considered non-parasitic and non-migratory. Threats to Brook Lamprey include: pollution causing fish kills, barriers such as bridges which can impede brook lamprey dispersal, and dredging which can lead to loss of habitat (King *et al*., 2011).

River Lamprey (*Lampetra fluviatilis*) range from the western Mediterranean to north Finland (Kelly and King, 2001). River Lamprey are now found in the Shannon and there is a large population in the Slaney (Igoe *et al*., 2004; King and Linnane, 2004). The River Lamprey is considered a twin or paired species with the non-migratory brook lamprey and they spawn in groups in late March to mid-May. The River Lamprey spawn in shallow river areas creating simple redds in sandy/gravel beds (King *et al*., 2011). Adult River Lamprey live in the sea and live closer to the shoreline than sea lamprey and

they are external parasites on fish species (King *et al*., 2011). In autumn, adults undergo reproductive migration from salt to fresh water, although there have been cases in which a non-migratory population has been identified in Lough Neagh (Inger *et al*., 2010). Threats to the River Lamprey population include: pollution causing fish kills, river dredging leading to loss of habitat, barriers leading to passage obstruction for migrating fish, and commercial harvesting (King *et al*., 2011).

Twaite shad (*Alosa fallax*) is found in Scandinavian waters in the Bay of Biscay and the Mediterranean as well as Ireland and Britain (King *et al*., 2011). Adults who live in the sea and estuaries feed on shrimp during the spawning run which occurs from May to June (King *et al*., 2011). Anecdotal reports have suggested that spawns aggregate in large noisy schools at night at the top of tidal waters in the Barrow and Suir. After spawning, adults move down to lower reaches of the estuary and then move to the open sea (King *et al.,* 2011). The young spend the first year in estuarine waters. Sub-adults have previously been recorded in the Barrow and Suir (King and Roche, 2008), and in Munster King and Linnane, 2004). Threats to the species include: eutrophic waters in estuaries, bycatch as a result of commercial fishing and barriers in rivers impeding segregation and leading to hybridization (King *et al*., 2011).

4. Impacts of the Works

4.1 Fish Entrapment in Mesh

There is one water abstraction site (SW8) to the north of the site and this cooling water is extracted from the estuary at 30,000 ^{3}m/hour through a 5cm mesh screen. Debris such as leaves and other plant material is retained on screens and these screens are back washed every hour and are released back into the estuary. Some small/juvenile fish that are entrained in the mesh can die while others are returned to the river alive during the backwashing process.

4.2 Warm Water Discharges

There are two water discharge sites, one to the north of the site SW8 and a much larger one at the south of the site SW2. The release of warm water from the power station has a very localised effect on the surrounding estuary and estuarine species: observations at the much larger southern discharge location showed that both green and brown algae were growing on the walls of the discharge area and that birds (Herring Gulls, Cormorants, Herons and Little Egrets) were feeding at the same location.

Many invertebrate species are dependent on the mudflats surrounding the site of the power plant. The subtidal benthic community along with the intertidal rocky area surrounding the power plant are of low conservation value. The IPPC licence has a condition that released water should not be any

more than 10° C above ambient sea temperature. However, the average temperature for 2019 was 5° C.

Gastropods are known for their ability to attach to a substratum to maintain their position on the rocky shore (Grenon and Walker, 1981). *Patella vulgata* can tolerate extreme temperatures ranging from −8.7 to 42.8 degrees Celsius (Fenger *et al*., 2007). They are an intertidal grazer feeding on algae, diatoms and spores. Temperature can however affect their physiology. Grenon and Walker (1981) noted that in higher temperatures, *Patella* is unable to contract foot muscles more powerfully. Temperature can also influence its metabolic rate of and Davies (1966) found that *Patella* exhibits low respiration levels when water temperature increases. *Littorina littorea* (Common Periwinkle) is a eurythermal gastropod and is highly abundant on Irish rocky shores. Melatunan *et al*. (2011) demonstrated that when the winkle was exposed to elevated temperatures that it's metabolic rate decrease. Almada-Villela *et al*. (1982) showed that *Mytilus* demonstrated linear growth between temperatures of 3 and 20 degrees Celsius and that after 20 degrees Celsius growth would sharply decline. *Mytilus* is a well-adapted species and can survive changing environmental conditions (Gosling, 1992).

The rise in temperature of the water in the estuary from thermal effluent from the power station may also affect algae that inhabit the Barrow. *Corallina officinalis* is a mirco-reef building alga. It is a growing species and exhibits stunted growth when the temperature is too low and cease growth altogether when the temperature is too high (Latham, 2008). Colthart and Johansen (1973) demonstrated that *Corallina* grows at optimum levels between 12 to 18 degrees Celsius with no growth observed after 25 degrees Celsius. *Fucus vesiculosus* is a large, canopy forming brown alga and occurs as a conspicuous belt along rocky and stony coast. Due to the high productivity and biomass of *Fucus vesiculosus*, it provides protection and habitat for a wide range of species on the rocky shore (Graiff *et al*., 2015). The natural distribution range of *Fucus vesiculosus* 20 °C is considered as the highest water temperature that is reached for periods longer than weeks but the species has to endure intermediate periods of higher temperatures during low tides in most North Atlantic intertidal sites (Lüning, 1990). *Fucus vesiculosus* reaches optimum growth between 10 to 24 °C (Graiff *et al*., 2015).

4.3 Seawater Chlorination

Larval organisms in the intake water can colonize surfaces of the cooling circuits (Vinitha *et al.,* 2010) and this biofouling can be a serious problem for power station operators as it reduces water flows and can compromise the heat transfer efficiency of condensers (Jenner *et al*., 1997). Chlorination is the most widely used method of biofouling prevention as it is both economical and effective. The

uninterrupted, continuous addition of low levels of chlorine prevents the attachment of larval forms on structures rather than kill them off (Taylor, 2006).

Despite the low levels of chlorine being added to the water there may be adverse effects on entrained organisms. Chlorination has been seen to cause stress to plankton (Poornima *et al*., 2006), causes a decline in growth rate of specific diatom species (Vinitha *et al.,* 2010), alters inhibitory effects in phytoplankton (Choi *et al*., 2002) and causes a decrease in phytoplankton pigments (Poornima *et al*., 2005). At Great Island Power station, the water at the discharge points is tested weekly and has never reached the limit of 0.3 mg/l.

4.4 Increase in Noise

There may be an increase in noise levels in the estuary when the cooling waters are released into the estuary. This may disrupt certain species in the SAC such as Sea Lamprey, Brook Lamprey, River Lamprey, Twaite Shad, Salmon and Otter. These species have the potential to be impacted by the low frequency sounds produced by the thermal effluent. However, they can temporarily leave the area if disturbed. Lamprey will not be impacted by an increase in noise as this species are adapted to living in highly turbid estuarine environments.

5. Stage 1 Appropriate Assessment Screening

5.1 Identification of Relevant Natura 2000 Sites and Qualifying Interests/Special Conservation Interests

Adopting a precautionary principle, the Natura 2000 sites within 15km of the works were included in this assessment. Of these, the Natura 2000 sites deemed relevant and screened in for Appropriate Assessment are those which have Conservations Objectives or Qualifying Interests (QIs)/Special Conservation Interests (SCIs) which may be impacted by the proposed works. The potential impacts are discussed in detail in Section 4 of this report.

Those sites or individual qualifying interests that are screened out for Appropriate Assessment and require no further assessment at this stage (primarily as a result of being too great a distance away from the site and having different habitat requirements) are not assessed further. Sites/QIs/SCIs that are screened in for further assessment are highlighted in Table 6.1.

Table 6.1: Identification of relevant Natura 2000 sites. All those screened in for AA are highlighted.

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In / Out
River Barrow and River Nore SAC (002162)	Estuaries [1130]	Potential interaction	Screened In
	Mudflats and sandflats not covered by seawater at low tide [1140]	Potential interaction	Screened In
	Reefs [1170]	Potential interaction	Screened In
	Salicornia and other annuals colonising mud and sand [1310]	No pathway for interaction due to distance	Screened Out
	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	No pathway for interaction due to distance	Screened Out
	Mediterranean salt meadows (*Juncetalia maritimi)* [1410]	No pathway for interaction due to distance	Screened Out
	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	No pathway for interaction due to distance	Screened Out
	European dry heaths [4030]	No pathway for interaction due to distance	Screened Out
	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	No pathway for interaction due to distance	Screened Out
	Petrifying springs with tufa formation (Cratoneurion) [7220]	No pathway for interaction due to distance	Screened Out
	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	No pathway for interaction due to distance	Screened Out
	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	No pathway for interaction due to distance	Screened Out
	Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]	No pathway for interaction due to distance	Screened Out
	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	No pathway for interaction due to distance	Screened Out
	Austropotamobius pallipes (White-clawed Crayfish) [1092]	No pathway for interaction due to distance	Screened Out
	Petromyzon marinus (Sea Lamprey) [1095]	Potential interaction	Screened In
	Lampetra planeri (Brook Lamprey) [1096]	Potential interaction	Screened In
	Lampetra fluviatilis (River Lamprey) [1099]	Potential interaction	Screened In

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In / Out
River Barrow and River Nore SAC (002162)	*Salmo salar* (Salmon) [1106]	Potential interaction	Screened In
	Lutra lutra (Otter) [1355]	Potential interaction	Screened In
	Trichomanes speciosum (Killarney Fern) [1421]	No pathway for interaction due to distance	Screened Out
	Margaritifera durrovensis (Nore Pearl Mussel) [1990]	No pathway for interaction due to distance	Screened Out

5.2 Screening Assessment

After an initial review of all Natura 2000 sites within 15km of the proposed survey area, it was considered that "no pathway" exists by which the proposed survey activities could impact upon on the following Natura 2000 sites:

- Tramore Dunes and Backstrand SAC
- Hook Head SAC
- Bannow Bay SAC
- Bannow Bay SPA
- Tramore Back Strand SPA

Due to distance and / or habitat preferences there is no potential for any effects on these Natura 2000 sites and they can be screened out for AA.

5.3 Screening Statement

Due to the uncertainty of significant impacts on two Natura 2000 sites at this stage, it is recommended that the assessment proceed to Stage 2 Natura Impact Statement for the Natura 2000 sites and their habitats and species listed above.

6. Stage 2: Appropriate Assessment Natura Impact Assessment

6.1 Characteristics of Relevant Sites

The characteristics of the relevant sites are described below. The Conservation Objectives of the sites are discussed in Section 6.3 Impact Assessment in the context of the potential impacts on them. The habitats and species found within the sites are discussed in Section 4 above.

6.1.1 River Barrow and River Nore SAC (002162)

This SAC consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

The habitats and species of relevance to the proposed survey include: Atlantic salmon *Salmo salar* which migrates through the Barrow, Sea Lamprey *Petromyzon marinus*, Brook Lamprey *Lampetra planeri*, River Lamprey *Lampetra fluviatilis,* Twaite Shad *Alosa fallax*, Otter *Lutra lutra*, Estuaries, and Tidal Mudflats and Sandflats.

6.2 Conservation Objectives of Relevant Sites

6.2.1 River Barrow and River Nore SAC

The Conservation Objectives set by NPWS for this SAC are generic (NPWS, 2011) and summarised as follows:

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long- term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

For the purposes of this NIS, it is assumed that the precise Conservation Objectives for the qualifying interest species and habitats are carried forward for further analyses.

6.3 Impact Assessment

6.3.1 Impact Assessment Methodology

Impact analysis involves the establishment of the impact classification criteria followed by impact analysis based on these criteria. Impact analysis tables evaluate and rank the impacts compared to each other. They form the basis for rating the likelihood (see Table 6.2) of an impact occurring and the consequence of the impact (see Table 6.3). The likelihood and consequence ratings are combined to form a score for impact evaluation. Table 6.4 shows the Impact Matrix based on likelihood and consequence and the impact scores vary between from Low, Medium and High.

Table 6.2: Impact Classification Table - Likelihood

Rating	Likelihood	
	Category	**Description**
1	Remote	1% likelihood of impact occurring
2	Unlikely	1-20% likelihood of impact occurring
3	Possible	20-50% likelihood of impact occurring
4	Probable	50-95% likelihood of impact occurring
5	Highly Likely	>95% likelihood of impact occurring

Table 6.3: Impact Classification Table – Consequence

Rating	Consequence	
	Category	**Description**
0	None	No change due to impact occurring
1	Negligible	Individuals in the population/characterising species in a habitat affected but effect not detectable against background natural variability
2	Minor	Direct or indirect mortality or sub-lethal effects caused to individuals by the activity/up to 15% of habitat disturbed seasonally but population remains self-sustaining. Seasonal change in characterising species and community structure and function
3	Moderate	*In situ* population depleted by the activity but regularly sub-vented by immigration/over 15% of habitat disturbed seasonally. Seasonal change in characterising species and structure and function. Frequency of disturbance < recovery time. Non-cumulative
4	Major	Population depleted by impact and immigration insufficient to maintain local populations/over 15% of habitat disturbed persistently leading to cumulative impacts. Persistent change in characterising species, structure and function. Frequency of disturbance> recovery time. Cumulative
5	Severe	Population depleted and supporting habitat significantly depleted and unable to support the population. Biodiversity reduction associated with impact on key structural species. Impact is effectively permanent due to severe habitat alteration. No recovery or effectively no recovery.

Table 6.4: Risk Matrix

Likelihood	**Highly Likely**	**5**						
	Probable	**4**						
	Possible	**3**						
	Unlikely	**2**						
	Remote	**1**						
			0	**1**	**2**	**3**	**4**	**5**
			None	**Negligible**	**Minor**	**Moderate**	**Major**	**Severe**
				Consequence				

6.4 Annex Species

6.4.1 *Salmo salar* (Salmon) [1106]

The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning. As ascending adult salmon and descending salmon smolts swim either directly up or downstream, the effluent will have no impact on Salmon in the River Barrow and River Nore SAC.

The likelihood of the effluent causing displacement of the population is low.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

Noise is unlikely to affect the population of salmon in the SAC.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This species was initially screened in as there may be a risk of contamination from chlorination but the risk is low.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure 100% of river channels down to second order accessible from estuary.

Target 2: To ensure the conservation Limit (CL) for each system consistently exceeded.

Target 3: To maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling.

Target 4: To ensure no significant decline.

Target 5: To ensure no decline in number and distribution of spawning redds due to anthropogenic causes.

Target 6: To ensure at least Q4 at all sites sampled by EPA.

6.4.2 *Lutra lutra* (Otter) [1355]

Otters have the potential to occur in the development site during early hours of the morning or at night. As Otter will swim directly through the river, the effluent will have no impact on Otter populations in the River Barrow and River Nore SAC.

The likelihood of displacement is unlikely.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

The noise from the construction activities will not significantly impact on otters in the river. In addition, construction operations will to be carried out in daylight hours. The interaction with the otter is likely to be minimal given that otter are considered to be mainly nocturnal and are mainly active after dusk and before dawn (Hayden & Harington, 2000).

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

The risk of contamination from accidental events and release of contaminated sediments is unlikely.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure no significant decline in the population.

Target 2: To ensure no significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds.

Target 3: To ensure no significant decline. Area mapped and calculated as 857.7ha.

Target 4: To ensure no significant decline. Length mapped and calculated as 616.6km.

Target 5: To ensure no significant decline. Area mapped and calculated as 2.6ha.

Target 6: To ensure no significant decline of couching sites and holts.

Target 7: To ensure no significant decline in the availability of fish biomass.

6.4.3 *Alosa fallax* (Twaite shad) [1103]

The River Barrow and River Nore SAC one of only a handful of spawning grounds in the country for Twaite Shad. As Twaite Shad swim directly upstream, the effluent will have no impact on the Twaite Shad in the River Barrow and River Nore SAC.

The likelihood of the development causing displacement of the population is low.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

Noise is unlikely to affect the population of Twaite is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This species was initially screened in as there may be a risk of contamination/fish kill from the chlorination process but this is unlikely.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure greater than 75% of main stem length of rivers accessible from estuary.

Target 2: To ensure more than one age class present.

Target 3: To ensure no decline in extent and distribution of spawning habitats.

Target 4: To ensure the oxygen in the water is no lower than 5mg/l.

Target 5: To maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth.

6.4.4 *Petromyzon marinus* (Sea Lamprey) [1095]

Sea Lamprey spawning occurs in groups between May and July in the River Barrow and River Nore SAC. As the fish swim directly upstream, the effluent will have no impact on the Sea Lamprey in the River Barrow and River Nore SAC.

The likelihood of the development causing displacement of the population is low.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

Noise is unlikely to affect the population of Sea Lamprey is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This species was initially screened in as there may be a risk of contamination/fish kill from the chlorination process but this is unlikely.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure greater than 75% of main stem length of rivers accessible from estuary.

Target 2: To ensure at least three age/size groups present.

Target 3: To ensure juvenile density at least 1/m².

Target 4: To ensure no decline in extent and distribution of spawning beds.

Target 5: To ensure more than 50% of sample juvenile sites are positive.

6.4.5 *Lampetra planeri* (Brook Lamprey) [1096]

Brook Lamprey spawn in late March to mid-May in shallow, creating simple redds in gravel or sandy beds in the River Barrow and River Nore SAC. As the fish swim directly upstream, the effluent will have no impact on the Brook Lamprey in the River Barrow and River Nore SAC.

The likelihood of the development causing displacement of the population is low.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

Noise is unlikely to affect the population of Brook Lamprey is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This species was initially screened in as there may be a risk of contamination/fish kill from the chlorination process but this is unlikely.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure access to all watercourses down to first order streams.

Target 2: To ensure at least three age/size groups of brook/river lamprey present.

Target 3: To ensure the mean catchment juvenile density of brook/river lamprey at least 2/m².

Target 4: No decline in extent and distribution of spawning beds.

Target 5: To ensure more than 50% of sample juvenile sites are positive.

6.4.6 *Lampetra fluviatilis* (River Lamprey) [1099]

River Lamprey spawn in groups in late March to mid-May, in shallow river areas creating simple redds in sandy/gravel beds in the River Barrow and River Nore SAC. As these areas are upstream of the plant, the effluent will have no impact on the River Lamprey in the River Barrow and River Nore SAC.

The likelihood of the development causing displacement of the population is low.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

Noise is unlikely to affect the population of River Lamprey is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This species was initially screened in as there may be a risk of contamination/fish kill from the chlorination process but this is unlikely.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To restore the favourable conservation condition of River lamprey in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure greater than 75% of main stem and major tributaries down to second order accessible from estuary.

Target 2: To ensure at least three age/size groups of river/brook lamprey present.

Target 3: To ensure the mean catchment juvenile density of brook/river lamprey at least 2/m².

Target 4: No decline in extent and distribution of spawning beds.

Target 5: To ensure more than 50% of sample juvenile sites are positive.

6.5 Annex Habitats

6.5.1 Tidal Mudflats and Sandflats [1140]

The proposed effluent will have no impacts on the mudflats or sandflats that are situated too far downstream of the plant site.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

The likelihood of the development causing displacement to the habitat is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

The likelihood that noise will impact benthic invertebrates that inhabit the sand and mudflats is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This habitat was screened in due to the risk of contamination but the risk of this occurring is low.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure permanent habitat area is stable or increasing, subject to natural processes.

Target 2: To ensure the following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex.

6.5.2 Estuaries [1130]

The proposed effluent will have no impacts estuary situated in the River Barrow and River Nore SAC as this habitat is too far downstream of the plant site.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

The likelihood of the effluent causing displacement to the habitat is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

The likelihood that noise will impact benthic invertebrates that inhabit the estuary is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This habitat was screened in due to the risk of contamination but the risk of this occurring is low.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

In terms of the conservation objectives of the River Barrow and River Nore SAC:

Objective: *To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure the permanent habitat area is stable or increasing, subject to natural processes.

Target 2: To ensure the following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community.

Target 3: To maintain the natural extent of the *Sabellaria alveolata* reef, subject to natural process.

6.5.3 Reefs [1170]

The proposed effluent will have no impacts reefs located in the River Barrow and River Nore SAC as the habitat is too far down stream of the site.

Displacement: Likelihood = Unlikely; Consequence = Negligible; Impact = Low

The likelihood of the effluent causing displacement to the habitat is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

The likelihood that noise will impact the reefs in the estuary inhabit the estuary is low.

Noise: Likelihood = Unlikely; Consequence = Minor; Impact = Low

This habitat was screened in due to the risk of contamination but the risk of this occurring is low.

Contamination Risk: Likelihood = Unlikely; Consequence = Negligible; Impact = Low.

Objective: : *To maintain the favourable conservation condition of Reefs in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:*

Target 1: To ensure the permanent habitat area is stable or increasing, subject to natural processes.
Target 2: To ensure the distribution of reefs is stable or increasing, subject to natural processes.

Target 3: To conserve the following community type in a natural condition: Current swept subtidal reef community complex.

7. Cumulative Impacts

Based on a review completed of the Foreshore Consent applications included on the Department of Housing, Planning, Community and Local Government web-site

(http://www.housing.gov.ie/planning/foreshore/foreshore-consenting) completed on 6th January 2020, there are a number of proposals planned for the area. There is a geophysical survey planed for Waterford Harbour, which will involve the deployment of 4 trawl resistant ADCP's (Acoustic Doppler current profilers) for hydrodynamic modelling. This should have little to no impact on Natura 2000 habitats and species in the area.

There is also a geophysical, geotechnical and environmental site investigation works proposed to take place close to the SAC. This project will involve grab sampling, vibrocoring, and borehole sampling which may have a significant impact on the Natura 2000 habitats and species in the area.

Furthermore, there is a regular dredge programme for Waterford Harbour as part of maintenance of the navigational and berthing areas within the harbour limits of the Port of Waterford. There should no significant negative impact of the dredging on the Natura 2000 habitats in the area as dredging of this area is carried out regularly. Waterford Harbour is a busy port with high volumes of shipping so any noise generated by the cooling waters being released back into the estuary will have no impact on the Natura 2000 species and habitats.

No cumulative impacts are foreseen of these existing activities and the disposal of aqueous effluent from the plant.

8. Mitigation Measures

As the discharge of chlorinated cooling water has been ion practice for several decades now with no significant ecological impacts having been recorded, no additional mitigation measures are required to reduce the impacts from the effluent. The discharged water released from the power station into the estuary is rapidly well mixed within a short distance of the outfalls.

9. Conclusions

This assessment has shown that given the suggested mitigation measures, there will be no adverse impact on the River Barrow and River Nore SAC as a result of the continued discharge of coolant water. It is concluded that the conservation objectives and integrity of the SAC will not be adversely affected by the discharge.

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