IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 127 PORTARLINGTON 1 PWS WSZ SUPPLIED BY THE LE BERGERIE WTP AA SCREENING

SCREENING TO INFORM APPROPRIATE ASSESSMENT

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GLOSSARY OF TERMS & ABBREVIATIONS

Appropriate Assessment: An assessment of the effects of a plan or project on European Sites.

Biodiversity: Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Birds Directive: Council Directive of 2nd April 1979 on the conservation of wild birds (79/409/EEC) as codified by Directive 2009/147/EC.

Geographical Information System (GIS): A GIS is a computer-based system for capturing, storing, checking, integrating, manipulating, analysing and displaying data that are spatially referenced.

Habitats Directive: European Community Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna and has been transposed into Irish law by the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011). It establishes a system to protect certain fauna, flora and habitats deemed to be of European conservation importance.

Mitigation measures: Measures to avoid/prevent, minimise/reduce, or as fully as possible, offset/compensate for any significant adverse effects on the environment, as a result of implementing a plan or project.

Natura 2000: European network of protected sites, which represent areas of the highest value for natural habitats and species of plants and animals, which are rare, endangered or vulnerable in the European Community. The Natura 2000 network of sites will include two types of area. Areas/ European Sites may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive. In some situations, there may be overlap in extent of SAC and SPA.

Scoping: the process of deciding the content and level of detail to be included in the Screening for AA, including the key environmental effects and alternatives which need to be considered, the assessment methods to be employed, and the structure and contents of the Appropriate Assessment Screening Report.

Screening: The determination of whether implementation of a plan or project would be likely to have significant environmental effects on the Natura 2000 network.

Special Area for Conservation (SAC): An SAC designation is an internationally important site, protected for its habitats and species. It is designated, as required, under the EC Habitats Directive (1992).

Special Protection Area (SPA): An SPA is a site of international importance for breeding, feeding and roosting habitat for bird species. It is designated under the EC Birds Directive (1979).

Statutory Instrument: Any order, regulation, rule, scheme or byelaw made in exercise of a power conferred by statute.

1. INTRODUCTION

Ryan Hanley was commissioned by Irish Water (IW) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate (OP) dosing (herein referred to as the Project) of drinking water supplied by Le Bergerie Water Treatment Plant (WTPs) in Co. Laois to the Portarlington 1 Public Supply Scheme Water Supply Zone (WSZ).

This report comprises information in support of the Screening of the Project in line with the requirements of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (hereafter referred to as the Habitats Directive). The report assesses the potential for significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from OP dosing being undertaken to mitigate against consumer exposure to lead in drinking water. It is therefore necessary to consider the sources, pathways and receptors in relation to added P.

1.1 PURPOSE OF THIS REPORT

Screening for AA, as a first step in determining the requirement for AA, is to determine whether the Project is likely to have a significant effect on any European Site within the zone of influence (ZoI) of the Water Supply Zone (WSZ), either individually or in combination with other plans or projects, in view of the sites qualifying interests and conservation objectives. This Screening Report complies with the requirements of Article 6 of the Habitats Directive transposed in Ireland principally through the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). In the context of the proposed project, the governing legislation is the Birds and Habitats Regulations 2011 and the "public authority" is Irish Water, specifically:

"The public authority shall determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

1.2 THE PLAN

Irish Water, as the national public water utility, prepared a Lead in Drinking Water Mitigation Plan (LDWMP) in 2016 (here after referred to as the Plan). The Plan provides a framework of measures for implementation to effectively address the currently elevated levels of lead in drinking water experienced by some IW customers as a result of lead piping. The Plan was prepared in response to the recommendations in the *National Strategy to reduce exposure to Lead in Drinking Water* which was published by the Department of Environment, Community and Local Government[1] and Department of Health in June 2015.

The overall objective of the Plan is to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework in as far as is practical within the areas of IW's responsibility. Lead in drinking water is derived from lead pipes that are still in place in the supply network. These pipes are mostly in old shared connections or in the short pipes connecting the (public) water main to the (private) water supply pipes (IW, 2016[2]). Problems can also be caused by lead leaching from domestic plumbing components made of brass and from lead-containing solder, with the most significant portion of the lead pipework lying outside of IW's ownership in private properties (IW, 2016). Lead can be dissolved in water as it travels through lead supply pipes and internal lead plumbing.

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).

[2] Irish Water (IW) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

When lead is in contact with water it can slowly dissolve, a process known as plumbosolvency. The degree to which lead dissolves varies with the length of lead pipe, local water chemistry, temperature and the amount of water used at the property.

Health studies have identified risks to human health from ingestion of lead. In December 2013, the acceptable limit for lead in drinking water was reduced to 10 micrograms per litre (µg/l) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was 25 µg/l, which was a reduction on the previous limit (i.e. pre 2003) of 50 µg/l.

The World Health Organisation (WHO), Environmental Protection Agency (EPA) and Health Service Executive (HSE) recommend lead pipe replacement (both lead service connections in the public supply, and lead supply pipes and internal plumbing in private properties) as the ultimate goal in reducing long-term exposure to lead. It is recognised that this will inevitably take a considerable period of time. In recognition of this, short to medium term proposals to mitigate the risk are being examined.

The Plan sets out the short, medium and longer term actions that IW intends to undertake, subject to the approval of the economic regulator, the Commission for Regulation of Utilities (CRU). It is currently estimated that 85% to 95% of properties meet the lead compliance standards when sampled at the customer's tap. The goal is to increase this compliance rate to 98% by end of 2021 and 99% by the end of 2027 (IW, 2016). This is subject to a technological alternative to lead replacement being deemed environmentally viable.

The permanent solution to the lead issue is to replace all water mains that contain lead. IW proposes that a national programme of replacement of public lead service pipes is required. However, replacing the public supply pipe or the private pipe on its own will not resolve the problem. Research indicates that unless both are replaced, lead levels in the drinking water could remain higher than the Regulation standards. Where lead pipework or plumbing fittings occur within a private property, it is the responsibility of the property owner to replace it.

The Plan assesses a number of other lead mitigation options available to IW. Other measures, including corrective water treatment in the form of pH adjustment and OP treatment, are being considered as an interim measure for the reduction of lead concentrations in drinking water in some WSZs.

IW proposes to introduce corrective water treatment at up to 400 WTPs. This would be rolled out over an accelerated 3-year programme, subject to site-specific environmental assessments. The corrective water treatment will reduce plumbosolvency risk over the short to medium term in high risk water supplies where it is technically, economically and environmentally viable to do so. This practice is now the accepted method of lead mitigation in many countries e.g. Great Britain and Northern Ireland. The dosing would be required to continue whilst lead pipework is still in use, subject to annual review on a scheme by scheme basis.

Orthophosphate (OP) is added in the form of Phosphoric acid - a clear, odourless liquid that is safe for human consumption. Phosphoric acid is already approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of P every day as part of the normal diet. The OP dose rate for Portarlington WSZ will be 1.0 mg/l P for treated water supplied from Le Bergerie WTP.

1.3 PROJECT BACKGROUND

Phosphorus (P) can influence water quality status through the process of nutrient enrichment and promotion of excessive plant growth (eutrophication). It is therefore necessary to quantify any potential environmental impact and the pathways by which the added (OP) may reach environmental receptors and to evaluate the significance of any such effects on European Sties. To facilitate the assessment of any significant effectto the receiving environment an Environmental Assessment Methodology (EAM) has

been developed based on a conceptual model of P transfer (from the water distribution and wastewater collection systems), using the source-pathway-receptor framework.

The first step of Screening for AA is to identify the European sites that are in close proximity to or have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed OP dosing. The Screening recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) which have connectivity to the WSZ, there are pathways for effects which require further evaluation. The Screening Report applies objective scientific information from the EAM as outlined in this document and evaluates whether the proposed dosing will give rise to significant effect on any of these European Sites, in the context of the Site-Specific Conservation Objectives (SSCO) as published on the NPWS website.

2. APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora better known as the "Habitats Directive" provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of European Sites. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

The scope of the assessment is confined to the effects upon habitats and species of European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect European Sites (Annex 1.1). Article 6(3) establishes the requirement for AA:

"*Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In 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:

"*If, in spite of a negative assessment of the implications for the [European] 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*".

Over time legal interpretation has been sought on the practical application of the legislation concerning AA, as some terminology has been found to be unclear. European and National case law has clarified a number of issues and some aspects of European Commission (EC) published guidance documents have been superseded by case law.

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

The assessment completed in this Screening, had regard to the following legislation and guidance documents:

European and National Legislation:

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the 'Habitats Directive');
- Council Directive 2009/147/EC on the conservation of wild birds, codified version, (also known as the 'Birds Directive');
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- Planning and Development Act 2000 (as amended).

Guidance / Case Law:

- *Article 6 of the Habitats Directive – Rulings of the European Court of Justice*. Final Draft September 2014;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. DEHLG (2009, revised 10/02/10);
- *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*. European Commission (2002);
- *Communication from the Commission on the Precautionary Principle*. European Commission (2000b);
- *EC study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC*. European Commission (2013);
- *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission*. European Commission (2007); and
- *Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission (2018).

Departmental/NPWS Circulars:

- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- *Appropriate Assessment of Land Use Plans*. Circular Letter SEA 1/08 & NPWS 1/08;
- *Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*. Circular L8/08;
- *Guidance on Compliance with Regulation 23 of the Habitats Directive*. Circular Letter NPWS 2/07; and
- *Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*. Circular Letter PD 2/07 and NPWS 1/07.

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

According to European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive, the assessment requirements of Article 6 establish a four-staged approach as

described below. 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 as follows:

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)/ Derogation.

Stages 1 and 2 relate to Article 6(3) of the Habitats Directive; and Stages 3 and 4 to Article 6(4).

Stage 1: Screening for a likely significant effect

The aim of screening is to assess firstly if the plan or project is directly connected with or necessary to the management of European Site(s); or in view of best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site. This is done by examining the proposed plan or project and the conservation objectives of any European Sites that might potentially be affected. If screening determines that there is potential for significant effects or there is uncertainty regarding the significance of effects then it will be recommended that the plan is brought forward to full AA.

Stage 2: Appropriate Assessment (Natura Impact Statement or NIS)

The aim of Stage 2 of the AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

If it is not possible during the Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly, this means alternative solutions that do not have negative impacts on the integrity of a European Site. It should also be noted that EU guidance on this stage of the process states that, 'other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria' (EC, 2002). In other words, if alternative solutions exist that do not have negative impacts on European Sites; they should be adopted regardless of economic considerations.

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

This stage of the AA process is undertaken where no alternative solutions exist and where adverse impacts remain. At this stage of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

It is important to note that in the case of European Sites that include in their qualifying features 'priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'over-riding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

2.4 INFORMATION SOURCES CONSULTED

To inform the assessment for the Project and preparation of this Screening Report, the following key sources of information have been consulted, however it is noted this is not an exhaustive list and does not reflect liaison and/ or discussion with technical and specialist parties from IW, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2022 - 2027 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National Biodiversity Plan (DCHG, 2022) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*".

Ireland aims to conserve habitats and species, through designation of conservation areas under both European and Irish law. The focus of this Screening is on those habitats and species designated pursuant to the EU Birds and EU Habitats Directives in the first instance, however it is recognised that wider biodiversity features have a supporting role to play in many cases where the Conservation Objectives of designated sites is to be maintained/restored.

2.5.1 Identification of European Sites

Current guidance (DEHLG, 2010) on the ZoI to be considered during the AA process states the following:

"*A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than*

100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects".

A buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential effects. With regard to the current project, the 15km distance is considered inappropriate to screen all likely pathways for European Sites in view of all hydrological and hydrogeological connections to aquatic and water dependant receptors Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies.

2.5.2 Conservation Objectives

Article 6(3) of the Habitats Directive states that:

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 of the site in view of the site's ***conservation objectives.***

Qualifying Interests (QIs)/ Special Conservation Interests (SCIs) are annexed habitats and annexed species of community interest for which an SAC or SPA has been designated respectively. The Conservation Objectives (COs) for European Sites are set out to ensure that the QIs/ SCIs of that site are maintained or restored to a favourable conservation condition. Maintenance of favourable conservation condition of habitats and species at a site level in turn contributes to maintaining or restoring favourable conservation status of habitats and species at a national level and ultimately at the Natura 2000 Network level.

In Ireland 'generic' COs have been prepared for all European Sites, while 'site specific' COs (SSCOs) have been prepared for a number of individual Sites to take account of the specific QIs/ SCIs of that Site. Both the COs and SSCOs aim to define favourable conservation condition for habitats and species at the site level.

Generic COs which have been developed by NPWS encompass the spirit of SSCOs in the context of maintaining and restoring favourable conservation condition as follows:

For SACs:

- '*To maintain or restore the favourable conservation condition of the Annex I habitats and/or Annex II species for which the SAC has been selected*'.

For SPAs:

- '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for the SPA*'.

Favourable Conservation status of a habitat is achieved when:

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

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;
- 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.

A full listing of the COs and QIs/ SCIs for each European Site, as well as the attributes and targets to maintain or restore the QIs/ SCIs to a favourable conservation condition, are available from the NPWS website www.npws.ie. COs for the European Sites relevant for this Screening Report, are included in **Appendix A**.

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; The status of EU protected Habitats and Species in Ireland (NPWS 2013 a, b &c) and on information contained in Ireland's most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity, and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening of European Sites.

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

Le Bergerie WTP typically supplies 1,548m^3/day to the Portarlington 1 PWS which supplies drinking water to Portarlington town centre and eastern environs. Mains leakage across the WSZ is assumed to be 64%.

The WSZ boundary encompasses the Portarlington WWTP which discharges treated wastewater into the River Barrow. The water consumption per person is assigned as 125 litres per day with an average of 2.7 persons per household assumed.

The Plumbosolvency Control Plan for Portarlington WSZ recommends that all areas receive OP dosed water. Specifically, 1.0 mg/l P will be dosed at Le Bergerie WTP (Figure 1).

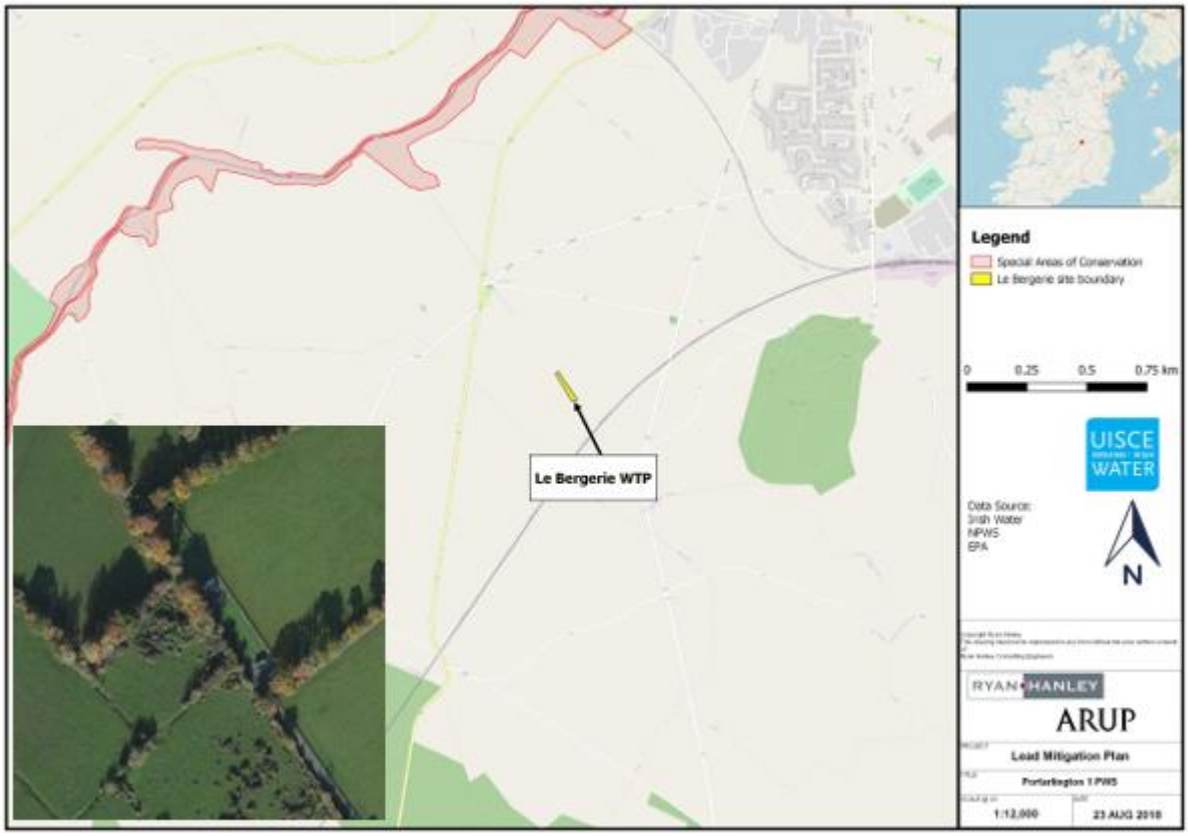

Figure 1 Location of the Le Bergerie Water Treatment Plant site, Co. Laois.

The proposed works will be confined to within the Water Treatment Plant and comprise **construction** and **operational** activities.

3.1.1Construction Works

Le Bergerie WTP includes an OP Dosing Unit and pH Dosing Facilities. No additional infrastructure is required for the realisation of OP Dosing in this WSZ. Therefore, there are no construction requirements for the proposed project.

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 1.0 mg/l P for treated water from Le Bergerie WTP in a process similar to the addition of chlorine for disinfection.

3.2 LDWMP APPROACH TO ASSESSMENT

3.2.1 Work Flow Process

In line with the relevant guidance, the Screening Report to inform AA comprises two main steps:

- **Impact Prediction** – where the likely potential impacts of this project (impact source and impact pathways) are examined.
- **Assessment of Effects** - where project impacts are assessed on the basis of best scientific knowledge (the EAM); in order to identify whether they are likely to give rise to significant effect on any European sites, in view of their COs;

At the early stages of consideration, IW identified the pathways by which the added orthophosphate may reach and / or affect environmental receptors including European Sites. In order to carry out a robust and defensible environmental assessment and to ensure a transparent and consistent approach, IW devised a conceptual model based on the 'source – pathway – receptor' framework. This sets out a specific environmental risk assessment of any proposed orthophosphate treatment and provides a methodology to determine the risk to the receiving environment of this corrective water treatment.

This conceptual Environmental Assessment Model (EAM), has been discussed with the EPA and has been developed using EPA datasets including the orthophosphate susceptibility output mapping for subsurface pathways; the nutrient risk assessment for waterbodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from domestic wastewater treatment systems.

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process, to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal, as influenced by the Plumbosolvency Report and EAM output, may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.2.2** below.

3.2.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 2**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of phosphorus is defined as the orthophosphate dosing at water treatment plants which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- *Pathways* include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from Domestic Wastewater Treatment Systems (DWWTS).

– *Receptors*, and their sensitivity, is of key consideration in the EAM. A waterbody may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where an SAC/SPA is hydrologically connected to dosing from more than one WSZ, the potential for cumulative impacts on OP indicative water quality are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 3** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance. For each WSZ where orthophosphate treatment is proposed the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process.

A summary report outlining the EAM is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters and the potential for any impact on Orthophosphate indicative water quality status from an increase in orthophosphate loading arising from the proposed OP dosing.

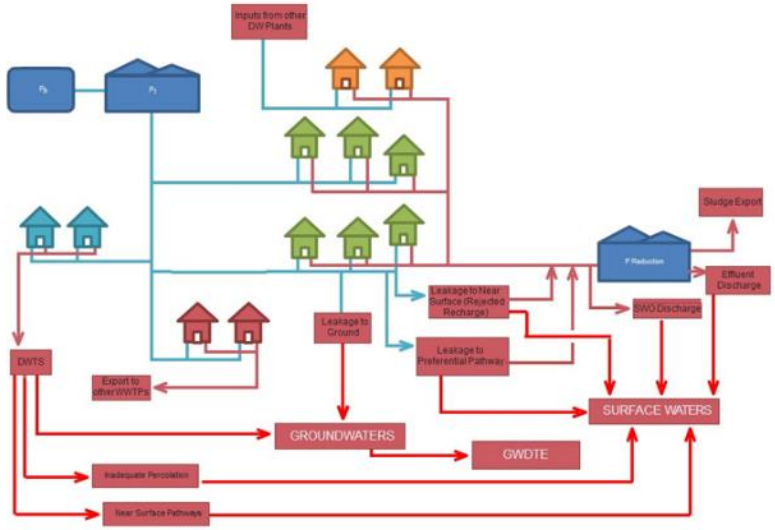

Figure 2 Conceptual Model of P Transfer

(Diagrammatic layout of P transfers from drinking water source (top left), through DW distribution (blue), wastewater collection (brown) and treatment systems to environmental receptors (red). P transfers that by-pass the WWTP (leakages, storm overflows, discharges to ground, and misconnections) are also indicated.)

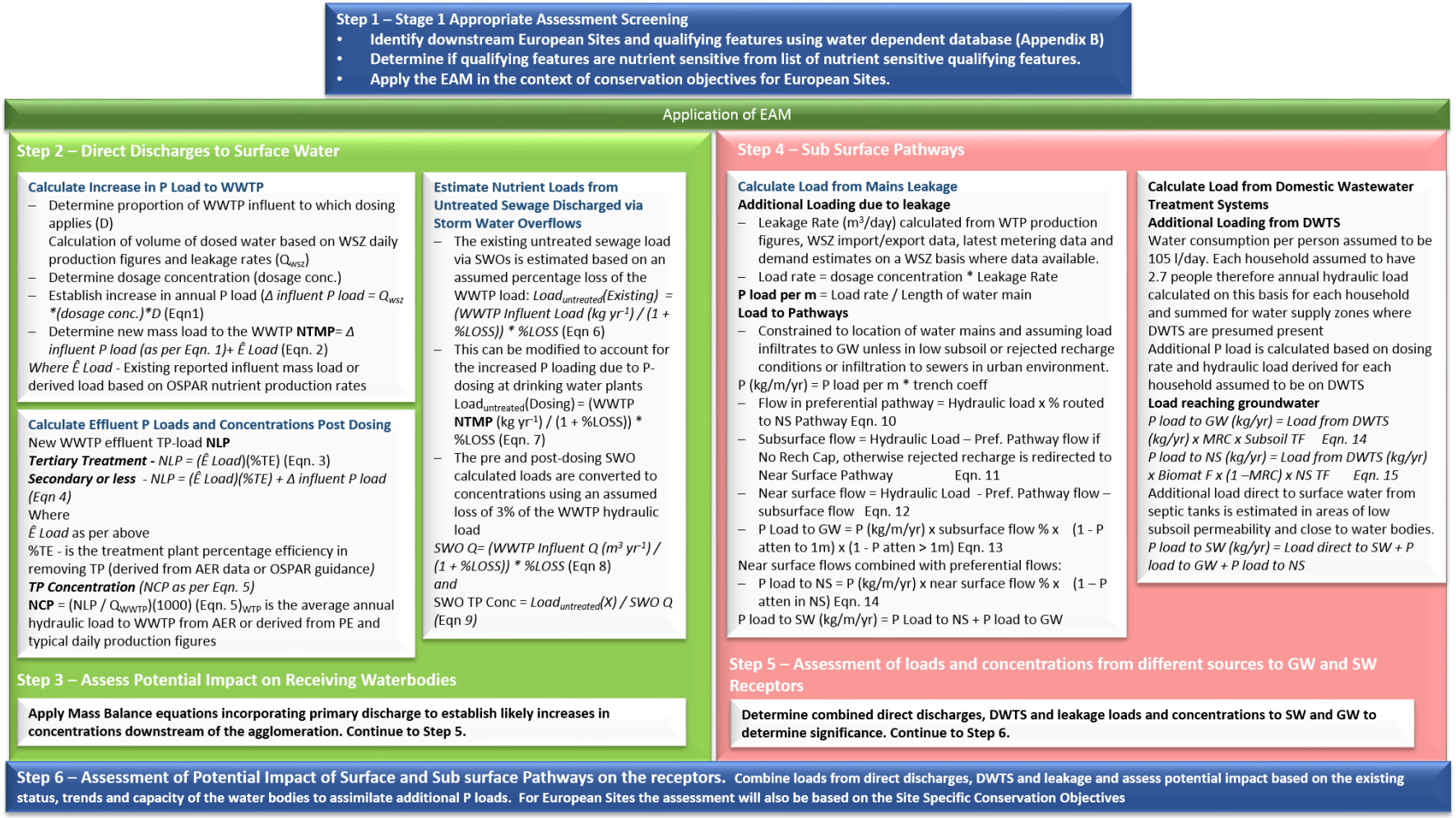

Figure 3 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

With regard to the operation of the proposed project, the pathways by which the added OP may reach and / or affect environmental receptors is considered by means of an operational ZoI, which was determined by establishing the potential for hydrological and hydrogeological connectivity between the Le Bergerie WTP and associated WSZ and European Sites. This operational ZoI was therefore defined by the surface water sub-catchments and groundwater bodies that are hydrologically and hydrogeologically connected with the Project. European Sites within the operational ZoI are listed in **Table 1** and are displayed in **Figure 4**.

The EAM process identified 3 river waterbodies potentially impacted following OP dosing of drinking water highlighted in bold. This AA Screening identifies the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites:

- Barrow_070 (IE_SE_14B010780) river waterbody flows into the Barrow_080 (IE_SE_14B010900), Barrow_090 (IE_SE_14B011000), Barrow_100 (IE_SE_14B011130), Barrow_110 (IE_SE_14B011300), Barrow_120 (IE_SE_14B011500), Barrow_130 (IE_SE_14B011600), Barrow_140 (IE_SE_14B011900), Barrow_150 (IE_SE_14B012000), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190 (IE_SE_14B012820), Barrow_200 (IE_SE_14B012920), Barrow_210 (IE_SE_14B013100), Barrow_220 (IE_SE_14B013300), Barrow_230 (IE_SE_14B013514), Barrow_240 (IE_SE_14B013600) river waterbodies, Upper Barrow Estuary (IE_SE_100_0300), Barrow Nore Estuary Upper (IE_SE_100_0250), New Ross Port (IE_SE_100_0200), Lower Suir Estuary (Little Island-Checkpoint) (IE-SE-100_0500) and Barrow Suir Nore Estuary (IE_SE_100_0100) transitional waterbodies and the Waterford Harbour coastal waterbody.

The EAM process identified 3 groundwater bodies (highlighted in bold). Groundwater bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are taken into account:

- **Industrial Facility (P0247-01) (IE_SE_G_005)**
- **Cushina (IE_SE_G_048)**
- **Bagenalstown Upper (IE_SE_G_153)**

Table 1: European Sites within the ZoI of the Proposed Project

Site Name	SAC/SPA Code	Water Dependent Species/Habitats	Nutrient Sensitive	Potential Hydrological/ Hydrogeological Connectivity
Hook Head SAC	**000764**	**Yes**	**Yes**	**Yes**
The Long Derries, Edenderry SAC	**000925**	**No**	**Yes**	**No**
Lower River Suir SAC	**002137**	**Yes**	**Yes**	**No**
River Barrow and River Nore SAC	**002162**	**Yes**	**Yes**	**Yes**
Ballyprior Grassland SAC	**002256**	**No**	**Yes**	**No**

The Long Derries, Edenderry SAC (000925) is located 18km northeast of the dosing zone. This site is located within the Cushina groundwater body, a locally important aquifer which is moderately productive. The main discharge mechanism for this aquifer is towards the overlying rivers where they are hydraulic continuity with the aquifer. The qualifying interest of this site is semi-natural dry grasslands and scrubland facies on calcareous substrate (*Festuco-Brometalia*) which is not listed as a water dependent habitat but is listed as nutrient sensitive under flood conditions. There are no records of flood events in this SAC (floodinfo.ie) and therefore this site is not considered further in this report.

Lower River Suir SAC (002137) is located approximately 120km downstream of the dosing zone and is hydrologically connected to the OP dosing area via a small section of the Lower Suir Estuary transitional waterbody. This transitional waterbody also forms part of the River Barrow and River Nore SAC and is assessed as such. It is considered that additional OP within this waterbody will be captured in the main channel of the Barrow/Nore transitional waterbody and will not flow upstream into the Lower River Suir SAC. Therefore, this SAC is not considered further in this report.

Ballyprior Grassland SAC (002256) is located approximately 16km south of the dosing zone. This site is located within the Bagenalstown groundwater body, a regionally important karstified aquifer. The main discharge mechanism for this aquifer is via the river in the lower section between Milford and Bagenalstown where there is a restriction in the cross-sectional area of this aquifer. The qualifying interest of this site is semi-natural dry grasslands and scrubland facies on calcareous substrate (*Festuco-Brometalia*) which is not listed as a water dependent habitat but is listed as nutrient sensitive under flood conditions. There are no records of flood events in this SAC (floodinfo.ie) and therefore this site is not considered further in this report.

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

Each European Site was assessed for the presence of water dependent habitats and species, nutrient sensitivity and hydrological/hydrogeological connectivity (operational ZoI). A number of sites have been excluded from further assessment in Section 5 and 6, due to the absence of hydrological/hydrogeological connectivity to at least one nutrient sensitive and water-dependant QI or SCI. The remaining sites are included for further assessment in order to determine whether the Project is likely to give rise to significant effects; these sites are detailed in **Table 2**.

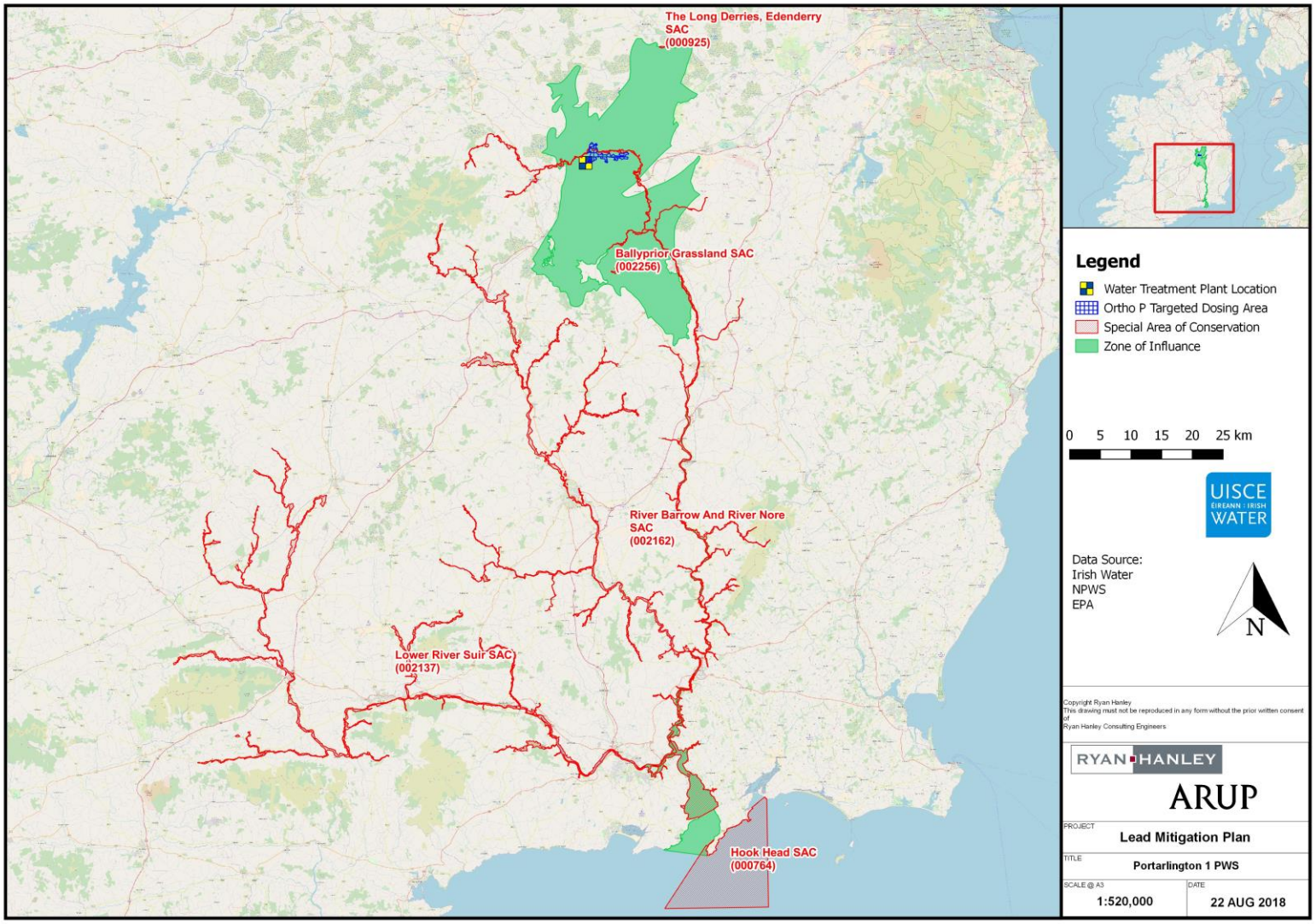

Figure 4 European Sites within the ZoI of the Proposed Project

Table 2: European Sites Hydrologically Connected to or Downstream of the WTP and WSZ

Site Name	SAC/ SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species/Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
River Barrow and River Nore	**SAC 002162**	**19th July 2011**	1016	Desmoulin's whorl snail *Vertigo moulinsiana*	Yes	Yes	Yes for Operational ZoI
			1029	Freshwater pearl mussel *Margaritifera margaritifera*	Yes	Yes	
			1092	White-clawed crayfish *Austropotamobius pallipes*	Yes	Yes	
			1095	Sea lamprey *Petromyzon marinus*	Yes	Yes	
			1096	Brook lamprey *Lampetra planeri*	Yes	Yes	
			1099	River lamprey *Lampetra fluviatilis*	Yes	Yes	
			1103	Twaite shad *Alosa fallax*	Yes	Yes	
			1106	Atlantic salmon *Salmo salar*	Yes	Yes	
			1130	Estuaries	Yes	Yes	
			1140	Tidal mudflats	Yes	Yes	
			1310	Salicornia mud	Yes	Yes	
			1330	Atlantic salt meadows	Yes	Yes	
			1355	Otter *Lutra lutra*	Yes	Yes	
			1410	Mediterranean salt meadows	Yes	Yes	
			1421	Killarney fern *Trichomanes speciosum*	Yes	Yes	
			1990	Nore freshwater pearl mussel *Margaritifera durrovensis*	Yes	Yes	
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes	Yes	
			4030	European dry heaths	No	Yes	
			6430	Hydrophilous tall herb	Yes	Yes	
			7220	*Petrifying springs	Yes	Yes	
			91A0	Old oak woodlands	No	Yes	
			91E0	Residual alluvial forests*	Yes	Yes	
Hook Head	**SAC 000764**	**21st Oct 2011**	1160	Large shallow inlets and bays	Yes	Yes	Yes for Operational ZoI
			1170	Reefs	Yes	Yes	
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	

* indicates a priority habitat under the Habitats Directive

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

The methodology for the assessment of impacts is derived from the *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites* (EC, 2002). When describing changes/activities and impacts on ecosystem structure and function, the types of impacts that are commonly presented include:

- Direct and indirect impacts;
- Short and long-term impacts;
- Construction, operational and decommissioning impacts; and
- Isolated, interactive and cumulative impacts.

5.2 IMPACT IDENTIFICATION

Operational Phase

In considering the potential for impacts from implementation of the Project, a "source–pathway–receptor" approach has been applied.

The AA has considered the potential for the following significant effects to occur:

- Altered structure and functions relating to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For aquatic habitats these include attributes such as vegetation and water quality.
- Altered species composition due to changes in abiotic conditions such as water quality;
- Reduced breeding success (e.g. due to disturbance, habitat alteration, pollution) possibly resulting in reduced population viability; and
- Impacts to surface water and groundwater and the species they support (changes to key indicators).

The source-pathway-receptor approach has identified a number of impact pathways associated with the orthophosphate dosing. These will be evaluated in relation to the potential for significant effects to any European Site with regard to:

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication; with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent effects on these habitats and species; and therefore, will be subject to an evaluation of the significance of any such effect;
- The discharge of additional P loads to the environment (through surface and sub surface pathways) may have implications for nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish;

- Phosphorus (P) in wastewater collection systems is the result of drinking water and derived from a number of other sources, including P imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of P removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;

- Leakage of phosphates from the drinking water supply network to the environment from use of OP;

- Direct discharges of increased P to waterbodies from the wastewater treatment plant licensed discharges; and

- Potential discharges to waterbodies of untreated effluent potentially high in OP Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS RELATING TO OPERATIONAL ACTIVITIES

Article 6 of the Habitats Directive states that:

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 of the site in view of the site's conservation objectives.

The focus of this section of the Screening to inform AA is the potential for significant effects arising from the additional OP load due to OP dosing at Le Bergerie WTP. The conceptual model developed for OP transfer identified the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which could provide a hydrological or hydrogeological pathway to the European Sites. These waterbodies are listed in **Table 3**. The table identifies the following:

- European sites included for assessment;

- Waterbodies hydrologically or hydrogeologically connected to the European Sites;

- Existing OP indicative water quality and trend of each waterbody;

- The baseline OP concentration of each waterbody;

- 75% of the upper threshold;

- Cumulative OP load to surface from leakage, DWWTS and agglomerations;

- The modelled OP concentration following dosing at the WTP; and,

- The OP potential baseline concentration (mg/l) following dosing at the WTP.

The EAM has been completed assuming the capacity of a waterbody is a measure of its ability to absorb extra pressures before its status changes. For example, a river waterbody at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l. River waterbodies with mean phosphate concentrations of 0.0275 mg/l have 75% capacity left, i.e. high capacity, while river waterbodies with a mean of 0.0325 mg/l have lower capacity (25%) as the concentrations are closer to the Good/Moderate Status boundary. In assessing the additional loads from the proposed orthophosphate dosing, the capacity of the water will be assessed. This information is available on the WFD App on a national basis using the "Distance to Threshold" parameter, where waterbodies with high capacity are termed "Far" from the threshold and those with low capacity are "Near" the threshold.

It is predicted that OP dosing will not have a significant impact on Orthophosphate indicative water quality (or the Conservation Objectives of a European Site) where it does not cause the P concentration

to increase to a level within 25% of the remaining capacity left within the existing status band, i.e. cause a change in the distance to threshold from far to near. This assessment will be supported by trend analysis as outlined below to ensure the additional OP dosing and statistically significant trends for a waterbody will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the waterbody baseline concentration is "Near" to the threshold before the effect of OP dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to OP is very low (i.e. below 5%/ <0.00125 mg/l P of the High/Good status) this test will pass as the OP dosing itself is not having a significant impact on the Orthophosphate indicative water quality and thus not having the potential or significant effect on connected European Sites in terms of aquatic and water dependant Qis/SCIs and their conservation objectives.

The identification of statistically and environmentally significant trends for waterbodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Status will not be achieved within two future river basin cycles, i.e. within the next 12 years.

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to GWB with statistically significant trends according to the WFD App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in OP concentration is lower than the absolute value of the Sens Slope, then the test passes.

Table 3: Surface and groundwater bodies within the WSZ with a hydrological or hydrogeological connection to European Sites

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status and Trends[4]	Baseline P Conc[5] (mg/l)[6]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW (kg/yr)[7]	Modelled Conc. (mg/l)[8]	Baseline Conc @ 1.0mg/l dosing rate (mg/l)	Evaluation
River Barrow and River Nore SAC (002163)	Industrial Facility (P0247-01)	GWB	Good	0.0175	0.0263	2.9	0.0097	0.0272	No risk of deterioration to OP indicative WQ
	Cushina	GWB	Good	0.0135	0.0263	15.1	0.0010	0.0145	No risk of deterioration to OP indicative WQ
	Bagenalstown Upper	GWB	Good	0.0067	0.0263	4.9	0.00005	0.0067	No risk of deterioration to OP indicative WQ
	Barrow_070	RWB	Moderate	0.0424	0.0508	161.6	0.0007	0.0431	No risk of deterioration to OP indicative WQ
	Barrow_080	RWB	Moderate	0.0485	0.0508	178.6	0.0007	0.0492	No risk of deterioration to OP indicative WQ
	Barrow_090	RWB	Moderate	0.0351	0.0508	337.9	0.0006	0.0356	No risk of deterioration to OP indicative WQ
	Barrow_100	RWB	Poor	0.0720	0.0868	414.4	0.0007	0.0727	No risk of deterioration to OP indicative WQ
	Barrow_110	RWB	Good	0.0300	0.0325	414.5	0.0007	0.0307	No risk of deterioration to OP indicative WQ
	Barrow_120	RWB	Moderate	0.0399	0.0508	509.0	0.0006	0.0405	No risk of deterioration to OP indicative WQ
	Barrow_130	RWB	Good	0.0278	0.0325	519.0	0.0006	0.0284	No risk of deterioration to OP indicative WQ
	Barrow_140	RWB	Good	0.0305	0.0325	522.8	0.0007	0.0312	No risk of deterioration to OP indicative WQ
	Barrow_150	RWB	Good	0.0276	0.0325	522.8	0.0007	0.0283	No risk of deterioration to OP indicative WQ

[3] Monitoring period is annual unless specified.
[4] Surrogate Status indicated in italic.
[5] Baseline year is 2014.
[6] Ortho P in RWBs, TWBs, CWBs and GWBs; TP in LWBs.
[7] Cumulative Ortho P load to SW and GW (kg/yr) from upstream and downstream OP dosing
[8] Values above 5% of Good / High boundary (0.00125 mg/l) for SW or 5% of Good / Fail boundary (0.00175 mg/l) for GW highlighted in yellow.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status and Trends[4]	Baseline P Conc[5] (mg/l)[6]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW (kg/yr)[7]	Modelled Conc. (mg/l)[8]	Baseline Conc @ 1.0mg/l dosing rate (mg/l)	Evaluation
	Barrow_160	RWB	Good	0.0278	0.0325	711.3	0.0006	0.0284	No risk of deterioration to OP indicative WQ
	Barrow_170	RWB	Good	0.0262	0.0325	806.2	0.0006	0.0268	No risk of deterioration to OP indicative WQ
	Barrow_180	RWB	High	0.0246	0.0188	895.1	0.0006	0.0252*	No risk of deterioration to OP indicative WQ
	Barrow_190	RWB	Good	0.0338	0.0325	897.3	0.0006	0.0344	No risk of deterioration to OP indicative WQ
	Barrow_200	RWB	Good	0.0252	0.0325	1130.1	0.0009	0.0261	No risk of deterioration to OP indicative WQ
	Barrow_210	RWB	Good	0.0255	0.0325	1131.9	0.0008	0.0263	No risk of deterioration to OP indicative WQ
	Barrow_220	RWB	High	0.0227	0.0188	1131.9	0.0007	0.0234*	No risk of deterioration to OP indicative WQ
	Barrow_230	RWB	High	0.0241	0.0188	1131.9	0.0007	0.0247*	No risk of deterioration to OP indicative WQ
	Barrow_240	RWB	High	0.0213	0.0188	1131.9	0.0007	0.0219*	No risk of deterioration to OP indicative WQ
	Upper Barrow Estuary	TWB	Summer High	0.0150	0.0188	337.9	0.0002	0.0152	No risk of deterioration to OP indicative WQ
			Winter Good	0.0270	0.0363			0.0272	
	Barrow Nore Estuary Upper	TWB	Summer High	0.0235	0.0188	337.9	0.0001	0.0236*	No risk of deterioration to OP indicative WQ
			Winter Good	0.0315	0.0363		0.0001	0.0316	
	New Ross Port	TWB	Summer Good	0.0320	0.0363	337.9	0.0001	0.0321	No risk of deterioration to OP indicative WQ
			Winter Good	0.0320				0.0321	
	Barrow Suir Nore Estuary	TWB	Summer High	0.0165	0.0188	337.9	0.0001	0.0166	No risk of deterioration to OP indicative WQ
			Winter Good	0.0315	0.0363			0.0316	

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status and Trends[4]	Baseline P Conc.[5] (mg/l)[6]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW (kg/yr)[7]	Modelled Conc. (mg/l)[8]	Baseline Conc @ 1.0mg/l dosing rate (mg/l)	Evaluation
Hook Head SAC (000764)	Waterford Harbour	CWB	High Summer /Winter High	0.0060 / 0.023	0.0188	337.9	0.0001	0.0061/ 0.0231*	No risk of deterioration to OP indicative WQ

****Baseline concentration > 75% of threshold but dosing concentration is insignificant.***

5.3.1 Assessment of direct impact from WWTPs and Storm Water Overflows

The conceptual model developed for P transfer identifies a number of pathways by which orthophosphate can reach receptors. In the case of these pathways, factors contributing to the potential direct impacts are:

- the quantitative increase in P loading to wastewater collecting systems;
- the efficiency of P removal at WWTPs;
- the increased P loading to surface waters via storm water overflows; and
- the sensitivity of receptors.

For the purposes of assessing the potential impact on the receiving environment within the EAM, a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 4**). The baseline OP indicative water quality in the existing situation prior to orthophosphate dosing is established and compared to the potential loading to the receiving waters post-dosing. In-combination impacts of the operation of the SWO and the continuous discharge from the WWTP were also assessed within the EAM.

The pre-dosing scenario is based on a mass balance calculation of both the intermittent SWO discharges, in combination with the continuous discharge from the WWTP. A comparison of the pre- and post-dosing scenarios is made to identify changes in predicted concentrations downstream of the point of discharge. A summary of the results and evaluation of orthophosphate dosing downstream of each agglomeration is provided below.

Table 4 provides the data used for the WWTP continuous discharge, and the SWO intermittent discharge, to compare with the emission limit values (ELVs) from the waste water discharge licence (WWDL) (if it has been set) that are applicable to the agglomeration discharge to transitional waters or freshwaters.

Table 4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.2 mg/l P at Le Bergerie WTP

Agglom. & Discharge Type	ELV from WWDL		TP Load Kg/yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*[9]		
				0.5	*0.4*	*0.68*
Portarlington Primary Discharge	**Total Phosphate 2 mg/l Ortho-phosphate 0.5 mg/l**	Existing	913	0.61	0.49	0.83
		Post Dosing	913	0.61	0.49	0.83
		% Increase	0%	0%	0%	0%
Portarlington SWOs (9 No.)		Existing	157	0.52	0.41	0.70
		Post Dosing	161	0.53	0.42	0.72

Portarlington WWTP Agglomeration

The Portarlington WWTP Agglomeration provides tertiary treatment. The ELVs for the WWTP are 2 mg/l P total Phosphorus and 0.5 mg/l P OP. The WWTP is currently exceeding its ELV [GK1]for TP and OP. However, Irish Water has assessed the WWTP performance and has determined that, the additional P load to the WWTP resulting from this project will not disimprove the performance of the plant, and that no additional P will be discharged in the effluent as a result of the proposed project. The SWO concentration will increase from 0.72 mg/l P to 0.74 mg/l P as a result of dosing (3%). The Portarlington WWTP discharges into the River Barrow (Barrow_080 river waterbody) which forms part of the **River Barrow and River Nore SAC.**

[9] Cells highlighted in amber are exceeding ELV

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the results of the EAM regarding the combined loading as a result of increased OP dosing from the WWTP discharge, seepage from mains and DWWTS. Upstream and downstream dosing areas (i.e. Rathvilly, Srowland, New Ross, Toberdaly, Derryguile, Bagenalstown, Troyswood, Clogh Castlecomer, Ballyragget and Mountfin) have been considered and cumulatively assessed by the EAM. The figures presented here are representative of this.

River waterbodies

- Barrow_070 (IE_SE_14B010780), Barrow_080 (IE_SE_14B010900), Barrow_090 (IE_SE_14B011000), Barrow_100 (IE_SE_14B011130), Barrow_110 (IE_SE_14B011300), Barrow_120 (IE_SE_14B011500), Barrow_130 (IE_SE_14B011600), Barrow_140 (IE_SE_14B011900), Barrow_150 (IE_SE_14B012000), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190 (IE_SE_14B012820), Barrow_200 (IE_SE_14B012920), Barrow_210 (IE_SE_14B013100), Barrow_220 (IE_SE_14B013300), Barrow_230 (IE_SE_14B013514), Barrow_240 (IE_SE_14B013600) river waterbodies are directly connected to the **River Barrow and River Nore SAC (002162).**

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways. The increase in OP concentrations due to dosing is up to 0.0007 mg/l P. The modelled increases in concentrations of all the above listed rivers are below the 5% significance threshold for surface waterbodies (<0.00125 mg/l P) (see Table 3 above) and their WFD status remain unchanged. Therefore, there is no risk of deterioration in WFD status for any of the aforementioned waterbodies.

Groundwater bodies

- Industrial Facility (P0247-01) (IE_SE_G_005), Cushina (IE_SE_G_048) and Bagenalstown Upper (IE_SE_G_153) groundwater bodies are hydrologically linked to **River Barrow and River Nore SAC (002162)**.

The OP dosing contributes OP load to receiving GWBs via subsurface and surface pathways.

The increase in Orthophosphate concentrations due to dosing is up to 0.0097 mg/l P at Industrial Facility GWB. Cushnia GWB OP concentration will increase up to 0.0010 mg/l P due to dosing while the baseline concentrations of the Bagenalstown Upper GWB does not change significantly following dosing (0.00005 mg/l P) and the WFD status remains unchanged, i.e. Good.

While the baseline concentration of the Industrial Facility GWB increases significantly (>0.00175 mg/l P) its indicative OP WFD status remain unchanged, i.e. Good. The Industrial Facility GWB is a small GWB which has been delineated out from the surrounding parent GWB to allow for specific programme of measures associaited with the licenced facility within the GWB. The footprint of the GWB has a large urban footprint and therefore the dosing has a clear effect on the groundwater concentrations. The downgradient boundary of the GWB is the River Barrow where the groundwater discharges into. The minor amount of groundwater flow through this restricted area would be massively diluted by the flows in the River Barrow. As the GWB result does not lead to any deterioration in the surface water body status and therefore overall the EAM considers this GWB to pass its assessment.

Transitional waterbodies

- Upper Barrow Estuary, Barrow Nore Estuary Upper, New Ross Port, Barrow Suir Nore Estuary transitional waterbodies lie within the **River Barrow and River Nore SAC (002162)**, however, they have not yet been assessed by the EAM. On completion, they will be updated here.

Coastal waterbodies

- Waterford Harbour coastal waterbody lie within the **Hook Head SAC (000764)** however they have not yet been assessed by the EAM. On completion, they will be updated here.

The increase in OP concentrations in the downstream transitional and small coastal waterbodies as a result of the OP dosing of all twelve connected EAMs is up to 0.0004 mg/l P. The modelled increase is below the significance threshold for SW bodies (<0.00125 mg/l P) and the increases do not cause a deterioration in the status of any transitional and coastal waterbodies therefore there is no impact on water quality from the proposed project.

5.3.3 Conclusions

The EAM model data identifies that additional OP dosing as part of this Project does not cause a deterioration in the OP indicative water quality of any surface waterbody or groundwater body listed in **Table 3**. Concentrations from other dosing area with regard to cumulative loading on downstream waterbodies has been considered in this assessment. Section 6 evaluates the OP indicative water quality status 'no deterioration' in the context of AA and the QIs of the European Sites.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and the connectivity to the qualifying interests (habitats and species) identified in **Table 2** that are both water dependent and nutrient sensitive (**Appendix B**). Two European sites remain for evaluation of potential for significant effect with respect to operational affects: **River Barrow and River Nore SAC (002162)** and **Hook Head SAC (000764).** The potential for the proposed orthophosphate dosing to give rise to significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.1 HOOK HEAD SAC 000764

6.1.1 (1160) Large shallow inlets and bays

There are no nutrient specific targets in the SSCO (NPWS, 2011[10]). The attributes and targets that will maintain the favourable conservation condition of this habitat do not make specific reference to water quality and nutrient conditions. The COs supporting document for Marine habitats (NPWS, 2011) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to 'Large shallow inlets and bays' habitat in Hook Head SAC. Hook Head SAC is directly connected to Waterford Harbour coastal waterbody which receives surface water from the Barrow Suir Nore Estuary, which is connected to the Lower Suir Estuary (Little Island - Cheekpoint), the Barrow Nore Estuary Upper, the New Ross Port and the Upper Barrow Estuary transitional waterbodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Waterford Harbour coastal waterbody (IE_SE_100_0000) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is unchanged remaining in the range of 0.0061 mg/l P in summer and 0.0231 mg/l P in winter (**Table3; Appendix C**). The CWB WFD OP status is unchanged following dosing, i.e. High (summer and winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on WFD OP indicative water quality have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned coastal waterbody, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on inlets and bays in Hook Head SAC.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of inlet and bay habitats in Hook Head SAC / no deterioration of its favourable conservation condition is identified.

6.1.2 (1170) Reefs

There are no nutrient specific targets in the SSCO (NPWS, 2011). The attributes and targets that will maintain the favourable conservation condition of this habitat do not make specific reference to water quality and nutrient conditions. The COs supporting document for Marine habitats (NPWS, 2011) does require that activities or operations that cause significant disturbance to communities but may not

[10] NPWS (2011) Conservation Objectives: Hook Head SAC 000764. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to 'Reefs' habitat in Hook Head SAC. Hook Head SAC is directly connected to Waterford Harbour coastal waterbody which receives surface water from the Barrow Suir Nore Estuary, which is connected to the Lower Suir Estuary (Little Island - Cheekpoint), the Barrow Nore Estuary Upper, the New Ross Port and the Upper Barrow Estuary transitional waterbodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Waterford Harbour coastal waterbody (IE_SE_100_0000) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is unchanged remaining in the range of 0.0061 mg/l P in summer and 0.0231 mg/l P in winter (**Table3; Appendix C**). The CWB WFD OP status is unchanged following dosing, i.e. High (summer and winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on WFD OP indicative water quality have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned coastal waterbody, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on reef habitat in Hook Head SAC.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of reef habitats in Hook Head SAC / no deterioration of its favourable conservation condition is identified.

6.1.3 (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts

There are nutrient specific targets in the SSCO (NPWS, 2011), however they relate to groundwater influences and there are no groundwater bodies hydrologically connected to Hook Head SAC associated with OP dosing at Le Bergerie WTP and so it has been demonstrated that the potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of sea cliffs in Hook Head SAC/ no deterioration of their favourable conservation condition is identified.

6.2 RIVER BARROW AND RIVER NORE SAC 002162

6.2.1 (1016) Desmoulin's whorl snail (*Vertigo moulinsiana*)

There are no nutrient specific targets for Desmoulin's whorl snail in the SSCO (NPWS, 2011) for the River Barrow and River Nore SAC. The snail is a wetland species, with preference for rich fen and flushes, swamps, marsh, river riparian zones, etc. However, (NPWS, 2011) identifies 'Pollution to surface waters (limnic and terrestrial)' as a potential 'negative' pressure. The SSCOs identify the overall target for this species is to 'maintain' the favourable conservation condition. **Table 3** identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River Nore SAC. Review of the SSCOs (NPWS, 2011) identify that Desmoulin's whorl snail has been recorded at two locations in the River Barrow and River Nore SAC; Borris Bridge, Co. Laois, and Boston Bridge, Co. Carlow. They have been recently recorded at a third location in Troyswood Kilkenny (M. Long pes comm.). Borris Bridge and Troyswood are within the River Nore catchment; and Boston Bridge is situated a significant distance downstream of the dosing zone on the River Barrow. As none of these locations have direct hydrologically connectivity to the proposed OP dosing ZoI, it is demonstrated that there will be no alteration to Desmoulin's whorl

snail, or its supporting habitat, in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this species can be excluded.

6.2.2 (1029) Freshwater pearl mussel (*Margaritifera margaritifera*) and (1990), Nore freshwater pearl mussel (*Margaritifera durrovensis*)

Margaritifera durrovensis: Review of the SSCOs for the River Barrow and River Nore SAC have highlighted that the conservation objective for *M. durrovensis* is to 'restore' to favourable conservation condition. Specific targets/ environmental quality objectives are defined in the SSCOs (NPWS, 2011) to demonstrate how the restoration to favourable conservation condition can be achieved. Targets and attributes relevant to the proposed OP dosing project include:

- Habitat extent: To restore suitable habitat in length of river corresponding to distribution target (i.e. 15.5 km from Poormans' Bridge to Lismaine Bridge as outlined in the SSCOs for *M. durrovensis*) and any additional stretches necessary for salmonid spawning;

- Water quality – macroinvertebrates and diatoms: To restore the water quality of the habitat extent to greater than 0.90 for macroinvertebrates and 0.93 for diatoms. These EQRs relate to very high-water quality/ oligotrophic conditions). The habitat of the Nore pearl mussel has previously failed both standards; and

- Host fish: Maintain sufficient juvenile salmonids to host glochidial larvae.

Margaritifera margaritifera: Examination of the SSCOs for the River Barrow and River Nore SAC have revealed that the status of *M. margaritifera* is currently 'under review'. However, the approach adopted here is that the attributes and targets above employed for *M. durrovensis* be utilised for *M. margaritifera* in the areas designated by the S.I. 296 of 2009 Freshwater Pearl Mussel Regulations in the River Barrow catchment (Áine O'Connor, NPWS, pers. comm.). The Freshwater Pearl Mussel Regulations make reference to populations residing in the Aughavaud (Barrow), the Ballymurphy (Barrow), and the Mountain (Barrow) rivers. Review of the SSCOs (NPWS, 2011) highlight that habitat extent for *M. durrovensis* is limited to a 15.5 km stretch of the River Nore from Poormans' Bridge to Lismaine Bridge, and any additional stretches necessary for salmonid spawning.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River Nore SAC:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good.

Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements and have water quality below requirements for host fish (salmonid) spawning habitat, the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of mussel species in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.3 (1092) White-clawed Crayfish (*Austropotamobius pallipes*)

The overall conservation objective for white-clawed crayfish in the River Barrow and River Nore SAC is to maintain the favourable conservation condition. There is no nutrient specific target for white-clawed crayfish in the River Barrow and River Nore SAC SSCOs, however a water quality target of Q3-4 or better, which equates to 'moderate' ecological status is specified (NPWS, 2011). Any reduction in water quality as a result of P loading would be contrary to the conservation objectives for this species. The crayfish is present almost throughout this SAC.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River

Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on receiving waterbodies including sub-surface pathways and so only waterbodies connected to white-clawed crayfish in the River Barrow and River Nore SAC and identified in the ZoI are considered further:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good.

Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of white clawed crayfish in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.4 (1095) Sea lamprey (*Petromyzon marinus*), (1096) Brook lamprey (*Lampetra planeri*), (1099) River lamprey (*Lampetra fluviatilis*), (1103) Twaite shad (*Alosa fallax*) and (1106) Atlantic salmon (*Salmo salar*) (only in fresh water)

The conservation objectives for all above listed species is to 'restore' to favourable conservation condition. The distribution target refers to '% river accessible' for each of the above listed fish fauna. Water quality is a particular threat to all fish fauna listed as qualifying interests. The latest Red List of Irish amphibians, reptiles and freshwater fish (King *et al.,* 2011) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes the potential effects from municipal discharges. The SSCO (NPWS, 2011) for all of these species requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on water quality and nutrient conditions on receiving waterbodies including sub-surface pathways and so only waterbodies connected to the above species in the River Barrow and River Nore SAC and identified in the ZoI are considered further:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged

following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Upper Barrow Estuary transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0156 mg/l P in summer and 0.0276 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Nore Estuary Upper transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0239 mg/l P in summer and 0.0319 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- New Ross Port transitional waterbody (IE_SE_100_0250) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0324 mg/l P in summer and 0.0324 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Lower Suir Estuary (Little Island) transitional waterbody (IE_SE_100_0200) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0378 mg/l P in summer and 0.0383 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP

indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Suir Nore Estuary transitional waterbody (IE_SE_100_0500) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0063 mg/l P in summer and 0.0233 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for these species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these species in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.5 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the River Barrow and River Nore SAC do not make specific reference to water quality and nutrient conditions; however, there is a requirement to conserve community types in their natural conditions (NPWS, 2011). The COs supporting document for Marine habitats does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context -specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River Nore SAC. Estuarine habitats are associated with transitional waterbodies, in this case the Nore Estuary transitional waterbody has been assessed. Other surface waterbodies are not connected to this habitat particularly and neither are the groundwater bodies. As such only the transitional waterbody is considered further. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Upper Barrow Estuary transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0156 mg/l P in summer and 0.0276 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Nore Estuary Upper transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0239 mg/l P in summer and 0.0319 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following

dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- New Ross Port transitional waterbody (IE_SE_100_0250) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0324 mg/l P in summer and 0.0324 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Lower Suir Estuary (Little Island) transitional waterbody (IE_SE_100_0200) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0378 mg/l P in summer and 0.0383 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Suir Nore Estuary transitional waterbody (IE_SE_100_0500) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0063 mg/l P in summer and 0.0233 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there is no potential for significant effects to estuaries in the River Barrow and River Nore SAC.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of estuaries in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.6 (1140) Mudflats and sandflats not covered by seawater at low tide; (1310) *Salicornia* and other annuals colonising mud and sand; (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); and (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Mudflat habitat was estimated at 926 hectares and communities present include Muddy estuarine community complexes and Sand to muddy fine sand community complexes. *Salicornia* habitat was estimated at 0.03 hectares; Atlantic salt meadows at 35.07 hectares and Mediterranean salt meadows 35.07 hectares. These habitats are located downstream of the Nore Estuary transitional waterbody. SSCOs require no significant disturbance to communities. Disturbance can be in the form of nutrients, as in a change to the current input which are central to the development, growth and survival of the habitats and communities that exist there.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the River Barrow and River Nore SAC. The above listed mud and sand habitats (1140 and 1310) and salt meadow habitats (1330 and 1410) are associated with transitional waterbodies, in this case the Nore Estuary transitional waterbody has been assessed. Other surface waterbodies are not connected to this habitat particularly and neither are the groundwater bodies. As such only the transitional waterbody is considered further. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Upper Barrow Estuary transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0156 mg/l P in summer and 0.0276 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Nore Estuary Upper transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0239 mg/l P in summer and 0.0319 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- New Ross Port transitional waterbody (IE_SE_100_0250) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0324 mg/l P in summer and 0.0324 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Lower Suir Estuary (Little Island) transitional waterbody (IE_SE_100_0200) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0378 mg/l P in summer and 0.0383 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Suir Nore Estuary transitional waterbody (IE_SE_100_0500) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0063 mg/l P in summer and 0.0233 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there is no potential for significant effects to estuaries in the River Barrow and River Nore SAC.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these habitats in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.7 (1355) Otter (*Lutra lutra*)

A review of the SSCOs for otter (NPWS, 2011) found no specific attributes or targets relating to water quality however the National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS, 2009), a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. There will be no interference with the terrestrial, marine or freshwater habitat of the species as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater. The current FCS target

is for 88% however, the current range is 73% and so the CO for otter in the River Barrow and River Nore SAC is to restore the favourable conservation condition.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to otter in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged

following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Upper Barrow Estuary transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0156 mg/l P in summer and 0.0276 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Nore Estuary Upper transitional waterbody (IE_SE_100_0300) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0239 mg/l P in summer and 0.0319 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in WFD OP status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- New Ross Port transitional waterbody (IE_SE_100_0250) and estimated an increase in OP concentrations of up to 0.0004 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0324 mg/l P in summer and 0.0324 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Lower Suir Estuary (Little Island) transitional waterbody (IE_SE_100_0200) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0378 mg/l P in summer and 0.0383 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. Good (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

- Barrow Suir Nore Estuary transitional waterbody (IE_SE_100_0500) and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentrations following dosing is unchanged remaining in the range of 0.0063 mg/l P in summer and 0.0233 mg/l P in winter (Table3; Appendix C). The TWB OP indicative water quality status is unchanged following dosing, i.e. High (summer)/ Good (winter). Therefore, there is no risk of deterioration in OP indicative water quality status following OP dosing in Le Bergerie WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on indicative OP water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of otter in the River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.8 (1421) Killarney fern (*Trichomanes speciosum*)

A review of the SSCOs for Killarney fern (NPWS, 2015) found no specific attributes or targets relating to nutrients or water quality. There are currently three locations known where this species occurs within

this SAC – two on the River Barrow and one on the River Nore downstream of Inistioge. The species is also known to occur within the Annex I oak woodland habitat which occurs within this SAC on the steep slope of the lower courses of the River Barrow and River Nore.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Killarney fern in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Bagenalstown Upper (IE_SE_G_153) groundwater body and estimated an increase in OP concentration of up to 0.00005 mg/l P. The resulting OP concentration following dosing is 0.0067 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this groundwater body.

- Cushina (IE_SE_G_048) groundwater body and estimates an increase in OP concentration of up to 0.0010 mg/l P. The resulting OP concentration following dosing is 0.0145 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this groundwater body.

- Industrial Facility (IE_SE_G_005) groundwater body and estimated an increase in OP concentration of up to 0.0097 mg/l P. The resulting OP concentration following dosing is 0.0272 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. The modelled OP dosing concentration is above the 5% significance threshold for Groundwater Bodies High status (0.00175mg/l P), however, a walkover survey of lands which include both the SAC and this groundwater body was conducted by a Ryan Hanley Ecologist and no specimens or suitable habitat for Killarney fern were identified. Therefore, it is not considered that there will be a deterioration of the conservation conditions of Killarney fern in this groundwater body following OP dosing in Le Bergerie WTP.

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307

mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). The industrial facilities groundwater body is currently exceeding the significant threshold however no Killarney fern habitat was identified within this groundwater body. Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these habitats in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.8 (3260) Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Distribution of water courses of plain to montane levels habitat has not been fully determined in the River Barrow and River Nore SAC. The site was selected for SAC based on the presence of an excellent example of the vegetation community (nutrient-rich type) associated with extensive tufa deposits on the river bed in the Kings tributary of the Nore (NPWS, 2011). The attributes and targets relevant to the current project are 'water quality: nutrients' and 'the concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition. Water quality should reach a minimum of WFD good status, in terms of nutrient standards, and macroinvertebrate and phytobenthos quality elements.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to otter in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431

mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these habitats in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.9 (6430) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

The SSCOs (NPWS, 2011) for the River Barrow and River Nore do not contain any nutrient specific water quality targets for this habitat, however an important attribute for the habitat is hydrological regime, namely flooding depth/height of the water table. The habitat relies on winter inundation, which results in deposition of naturally nutrient-rich sediment. The distribution of this habitat in this site is currently unknown; however, it is considered to occur in association with some riverside woodland, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of the river. In the absence of a water quality target, a surrogate target of at least Q3-Q4 is adopted.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to this habitat in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged

following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of this habitat in the River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.10 (7220) * Petrifying springs with tufa formation (*Cratoneurion*)

The SSCOs (NPWS, 2011) for this habitat include the maintenance of an appropriate hydrological and hydrogeological regime, although current regime requirements are unknown and vary widely (petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources). An additional target is to maintain oligotrophic and calcareous conditions. Spring water chemistry requirements are outlined in Lyons and Kelly (2016), which includes a target of no increase [in phosphorus] from baseline and not above 15 µg/l. A site has been identified for this habitat at Dysart, between Thomastown and Inistioge, on the River Nore; however further sites are likely to occur within the site.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to this habitat in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Bagenalstown Upper (IE_SE_G_153) groundwater body and estimated an increase in OP concentration of up to 0.00005 mg/l P. The resulting OP concentration following dosing is 0.0067 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this groundwater body.

- Cushina (IE_SE_G_048) groundwater body and estimates an increase in OP concentration of up to 0.0010 mg/l P. The resulting OP concentration following dosing is 0.0145 mg/l P (Table 3,

Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this groundwater body.

- Industrial Facility (IE_SE_G_005) groundwater body and estimated an increase in OP concentration of up to 0.0097 mg/l P. The resulting OP concentration following dosing is 0.0272 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality status is unchanged following dosing, i.e. Good. The modelled OP dosing concentration is above the 5% significance threshold for Groundwater Bodies High status (0.00175mg/l P), however, a walkover survey of lands which include both the SAC and this groundwater body was conducted by a Ryan Hanley Ecologist and no specimens or suitable habitat for Killarney fern were identified. Therefore, it is not considered that there will be a deterioration of the conservation conditions of Killarney fern in this groundwater body following OP dosing in Le Bergerie WTP.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst the industrial facilities groundwater body is currently failing to meet 'good status' requirements no petrifying spring habitat was identified within this groundwater body. Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these habitats in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.2.11 (91E0) * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

The SSCOs (NPWS, 2011) for the River Barrow and River Nore SAC do not contain any nutrient specific targets for this habitat. A review of the SSCOs for this habitat in other SACs found no nutrient specific targets. The CO supporting document for woodland habitats identified fertilizer drift from agriculture as a potential threat to this habitat. Fertiliser drift may increase the trophic status of the wood leading to the stronger growth of nitrophilous species and loss of less vigorous species, and herbicide drift, which may kill vegetation on the woodland edge. In the absence of a water quality target, a surrogate target of at least Q3-Q4 is adopted.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to alluvial woodland in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on water quality and nutrient conditions on:

- Barrow_070 (IE_SE_14B010780) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0431 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_080 (IE_SE_14B010900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0492 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_090 (IE_SE_14B011000) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0356 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged

following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_100 (IE_SE_14B011130) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0727 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Poor. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_110 (IE_SE_14B011300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0307 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_120 (IE_SE_14B011500) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0405 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_130 (IE_SE_14B011600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_140 (IE_SE_14B011900) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0312 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_150 (IE_SE_14B012000) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0283 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_160 (IE_SE_14B012460) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0284 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0268 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0252 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimated an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0344 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimated an increase in OP concentration of up to 0.0009 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3, Appendix C). The RWB OP status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentration of up to 0.0008 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0234 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0247 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Le Bergerie WTP for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0219 mg P/l (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Le Bergerie WTP for this RWB.

The EAM assessment results which evaluate the additional OP loading from dosing at Le Bergerie WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements the modelled concentrations from the proposed orthophosphate dosing are significantly below the significance threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of these habitats in River Barrow and River Nore SAC/ no deterioration of their favourable conservation condition is identified.

6.3 ASSESSMENT OF IN-COMBINATION EFFECTS WITH OTHER PLANS OR PROJECTS

In order to ensure all potential effects upon European sites within the project's ZoI were considered, including those direct and indirect impact pathways that are a result of cumulative or in-combination effects, the following steps were completed:

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;

2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;

3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;

4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);

5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and

6. Assessment: comment on whether or not the potential cumulative effects are likely to be significant.

A search of Laois County Council planning enquiry system was conducted for developments that may have in-combination effects on European Sites with the ZoI. Plans relevant to the area were searched in order to identify any elements of the plans that may act cumulatively or in-combination with the proposed development.

Based on this search and the Project Teams knowledge of the study area a list of those projects and Plans which may potentially contribute to cumulative or in-combination effects with the proposed project was generated and listed in **Table 5** below.

Table 5: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Laois County Development Plan 2017-2023 The objectives of relevance in the Laois County Development Plan and include under Infrastructure: PWS 1- Protect both ground and surface water resources and to work with Irish Water to develop and Implement Water Safety Plans to protect sources of public water supply and their contributing catchment. WS22- Protect and develop, in a sustainable manner, the existing Group Scheme groundwater sources and aquifers in the County and control development in a manner consistent with the proper management of these resources, in accordance with the County Source Protection Zones; WS36- To ensure, through the implementation of the River Basin Management Plans and their associated Programmes of Measures and any other associated legislation, the protection and improvement of all drinking water, surface water and g round waters throughout the county;	▪ N/A	The Laois County Development plan 2017 – 2023 emphasise the objectives of its water services which include enhancement and improved quality of the service to its customers. The plan also outlines the importance of compliance with the Western River Basin Management Plan (now replaced by the Draft National Plan 2018-2011) and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.
River Basin Management Plan For Ireland 2018 – 2021 Public Consultation on the River Basin Management Plan (RBMP) for Ireland (2018 – 2021), began in February 2017. The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. Nationally, both monitored river waterbodies and lakes at 'high' or 'good' ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river waterbodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each waterbody that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of waterbodies nationally, which had been characterised at the time. 1,517 waterbodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake waterbodies that are *At*	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each waterbody. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives.

Risk. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; and ▪ In-combination impacts within the same scheme	CFRAM Studies and their product Flood Risk Management Plans, will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of waterbodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative effects with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	Foodwise 2025 was subject to its own AA. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination effects are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2022 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2022 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	The RDP for 2014 – 2020 has been subject to SEA, and AA. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed

management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2022 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting waterbodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' waterbodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes are focused on productivity for farmers but have the ability to contribute towards a reduction in point and diffuse source pollution through improved nutrient management.		measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination impacts on Natura 2000 sites.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020	▪ Habitat loss or destruction;	Ireland's Forestry Programme 2014 – 2020 has undergone AA. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the

Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to waterbodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative effects with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
Lead Mitigation Plan (2016) Included in the WSSP (2015) is the strategy WS1e – Prepare and implement a "Lead in Drinking Water Mitigation Plan" to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework. This strategy has been realised in the 2016 Lead Mitigation Plan.	▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The plan is subject to SEA and AA which have also been published and are available at http://www.water.ie. Upstream dosing areas have been considered in the EAM and the cumulative effect of dosing taken into account in the EAM model and considered in this AA Screening Report.

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects on European Sites arising from the proposed OP dosing at Le Bergerie WTP, within the Portarlington 1 PWS and within the ZoI. The potential for significant effects are evaluated with regard to the qualifying interests/species of conservation interests and associated conservation status.

The potential for direct, indirect and cumulative impacts affecting **River Barrow and River Nore SAC** and **Hook Head SAC** have been assessed. The appraisal undertaken in this Screening report has been informed by an EAM (see **Appendix C**) with reference to the ecological communities and habitats. The Screening for AA has determined that there is no potential for significant direct, indirect or cumulative impacts which could affect the qualifying interests/special conservation interests of the European sites within the study area. It is therefore concluded, beyond reasonable scientific doubt, that the proposed project will not give rise to significant effects, either individually or in combination with other plans and projects, within the identified European Sites.

On the basis of objective scientific information, this Screening has therefore excluded the potential for the proposed project, individually or in combination with other plans or projects, to give rise to any significant effect on a European Site. It is concluded that an AA is therefore not required.

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Appendix A

European Sites - Conservation Objectives

National Parks and Wildlife Service

Conservation Objectives Series

Hook Head SAC 000764

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000764	Hook Head SAC
1160	Large shallow inlets and bays
1170	Reefs
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Subtidal Investigations in Hook Head cSAC (000764), Co. Wexford
Year: 2011
Author: Aquafact
Series: Unpublished Report to NPWS

Title: Reef Investigations in Hook Head cSAC (000764), Co. Wexford
Year: 2011
Author: Aquafact
Series: Unpublished Report to NPWS

Title: National survey and assessment of the conservation status of Irish sea cliffs
Year: 2011
Author: Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series: Irish Wildlife Manuals No. 53

Title: Hook Head SAC (000764) Conservation objectives supporting document - coastal habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Hook Head SAC (000764). Conservation objectives supporting document - marine habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Year: 1997
Author: Picton, B.E.; Costello, M.J.
Series: Trinity College Dublin

Spatial data sources

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Seaward boundary defined by expert judgement
Used for:	1160 (map 2)
Year:	
Title:	Subtidal soft sediment survey 2010; reef survey 2010; 1994 BioMar Survey
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1170 (maps 3 and 4)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined
Used for:	Marine community types base data (map 4)
Year:	2011
Title:	National survey and assessment of the conservation status of Irish sea cliffs
GIS operations:	Clipped to SAC boundary
Used for:	1230 (map 5)

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in Hook Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area was estimated using OSI data as 5,244ha. See marine supporting document for further details
Community extent	Hectares	The following communities should be maintained in a natural condition: Sand with *Chaetozone christiei* and *Tellina* sp. community; and Coarse sediment with *Pisidia longicornis* and epibenthic fauna community complex. See map 4	Based on information from a subtidal survey (Aquafact, 2011). See marine supporting document for further details

1170 Reefs

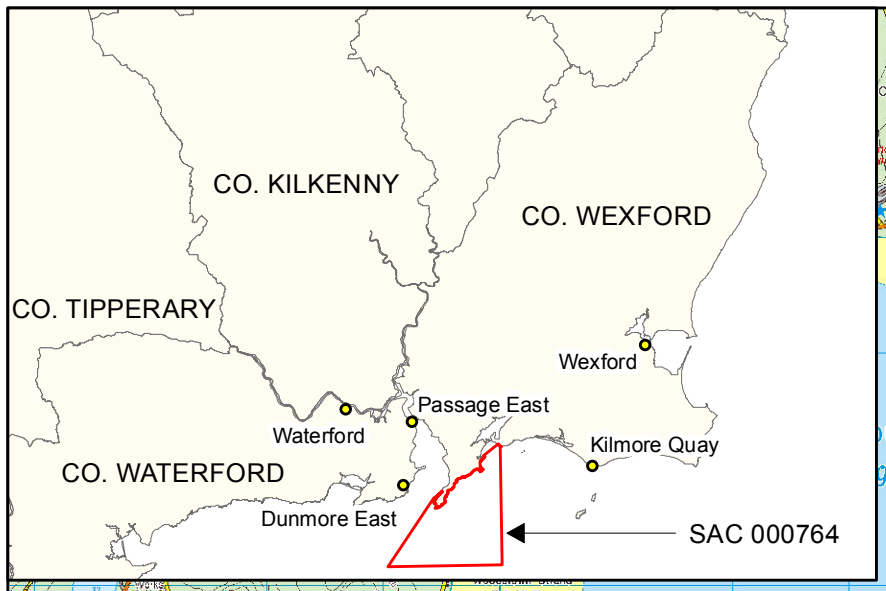
To maintain the favourable conservation condition of Reefs in Hook Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of reefs should remain stable, subject to natural processes. See map 3 for mapped distribution	Reef mapping based on information from a subtidal survey (Aquafact, 2011) and from 1994 BioMar Survey (Picton and Costello, 1997). See marine supporting document for further details
Habitat area	Hectares	The permanent area is stable, subject to natural processes. See map 3	Habitat area was estimated using 2010 survey data as 10,534ha. See marine supporting document for further details
Community structure	Biological composition	The following reef community complexes should be maintained in a natural condition: Exposed to moderately exposed intertidal reef community complex; and Echinoderm and sponge dominated community complex. See map 4	Based on information from a subtidal survey (Aquafact, 2011) and from 1994 BioMar Survey (Picton and Costello, 1997). See marine supporting document for further details
Community extent	Hectares	The extent of *Laminaria* dominated community should be conserved, subject to natural processes. See map 4	Based on information from a subtidal survey (Aquafact, 2011) and from 1994 BioMar Survey (Picton and Costello, 1997). See marine supporting document for further details
Community structure	Biological composition	The biology of *Laminaria* dominated community should be conserved, subject to natural processes	Based on information from a subtidal survey (Aquafact, 2011). See marine supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Hook Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Loftushall - 0.55km; Hook Head - 2.36km; and Baginbun Head - 9.20km. See map 5	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Three sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer giving a total estimated area of 12.11km within the SAC. Cliffs are linear features and are therefore measured in kilometres. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Maintaining natural geomorphological processes including natural erosion is important for the health of a vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea Cliff Survey (Barron et al., 2011)	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details



MAP 1: HOOK HEAD CONSERVATION OBJECTIVES SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

COUNTY WEXFORD

0 1 2 3 km

N

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208). Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

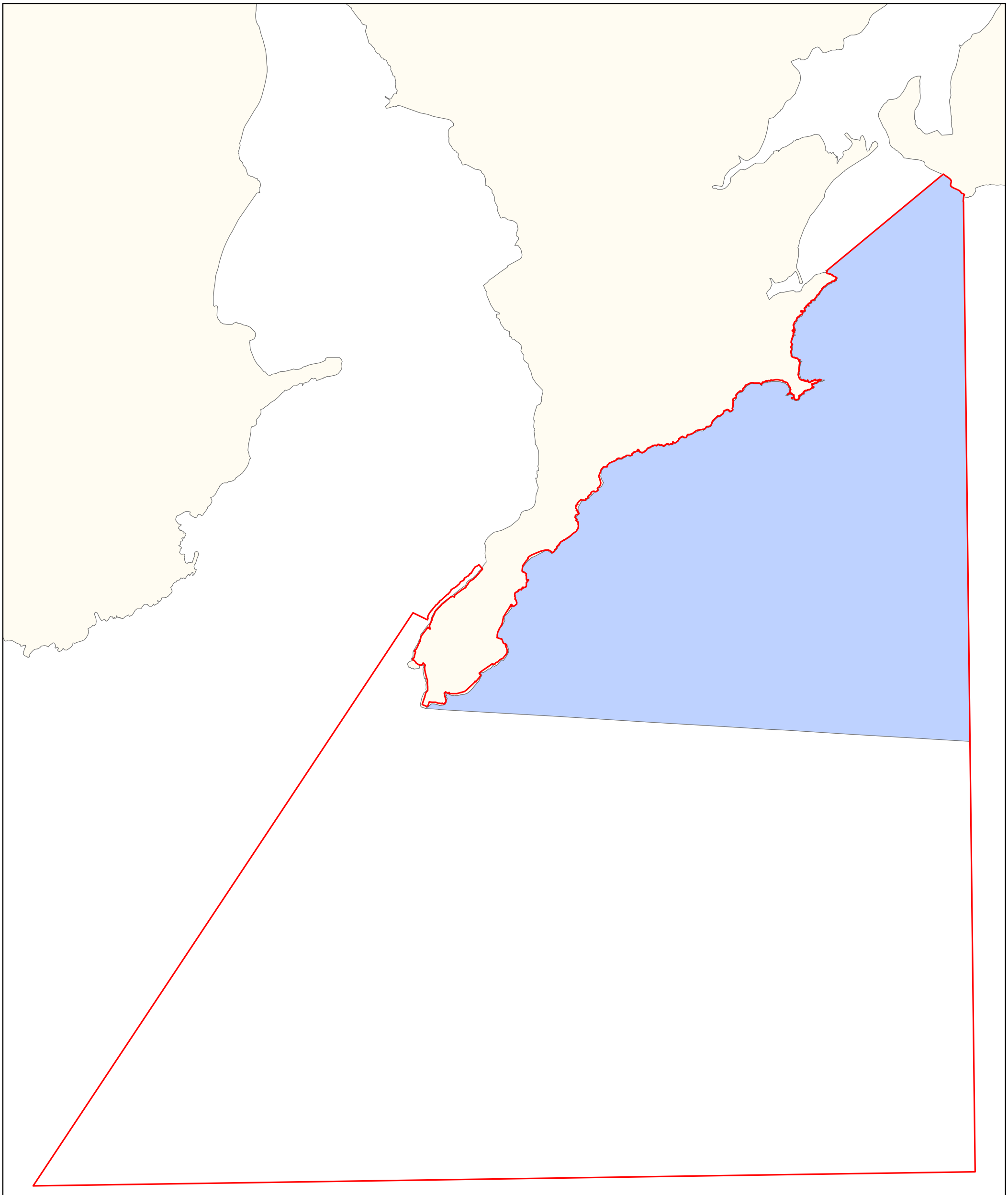
SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011

Legend

SAC 000764



Legend

- SAC 000764
- 1160 Large shallow inlets and bays
- OSi Discovery Series County Boundary

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Department of
Arts, Heritage and the Gaeltacht

MAP 2:
HOOK HEAD
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS & BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY WEXFORD

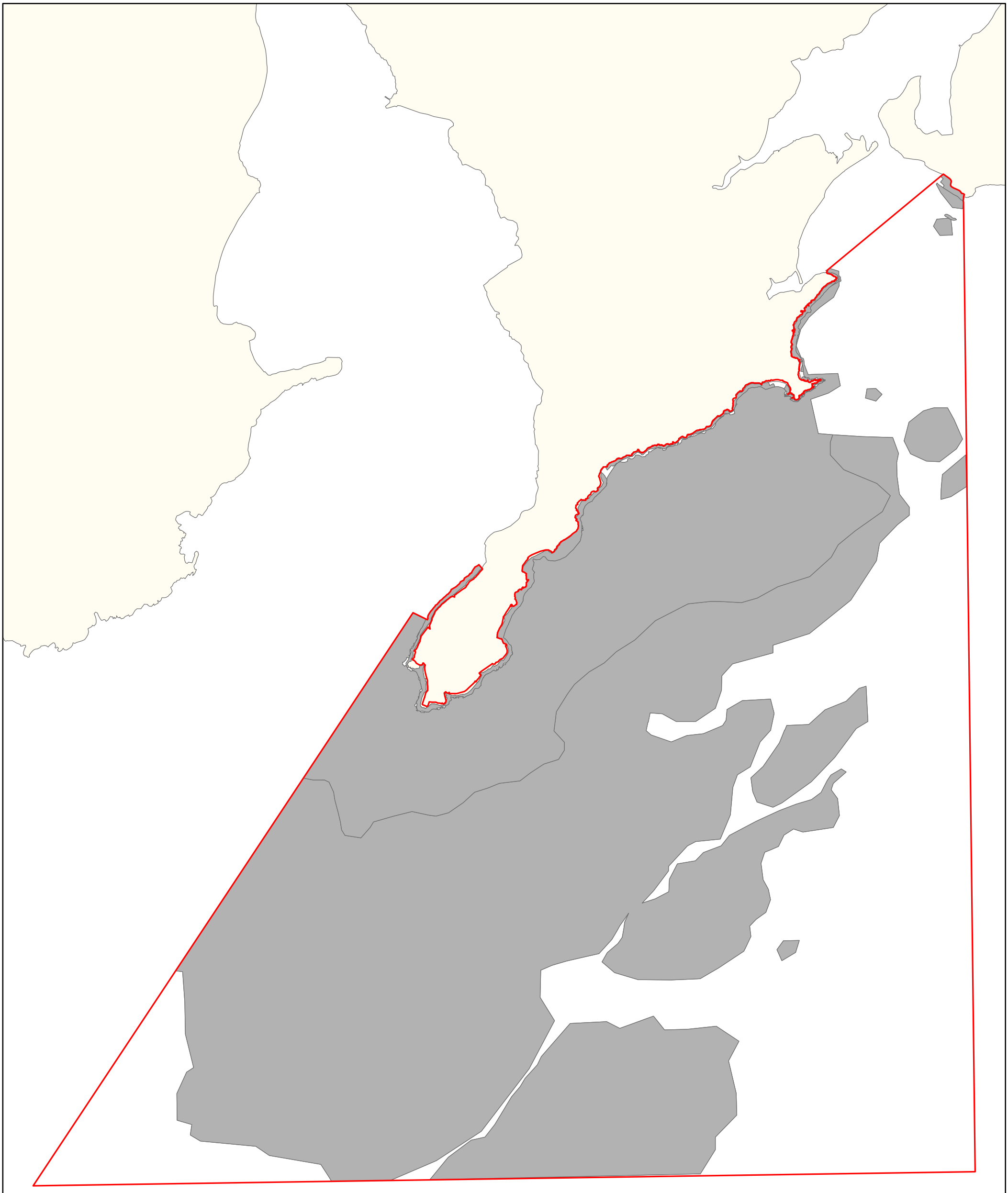
0 1 2 3 km

N

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011



Legend

- SAC 000764
- 1170 Reefs
- OSi Discovery Series County Boundary

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Department of
Arts, Heritage and the Gaeltacht

MAP 3:
HOOK HEAD
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY WEXFORD

0 1 2 3 km

N

SITE CODE

SAC 000764
Version 1

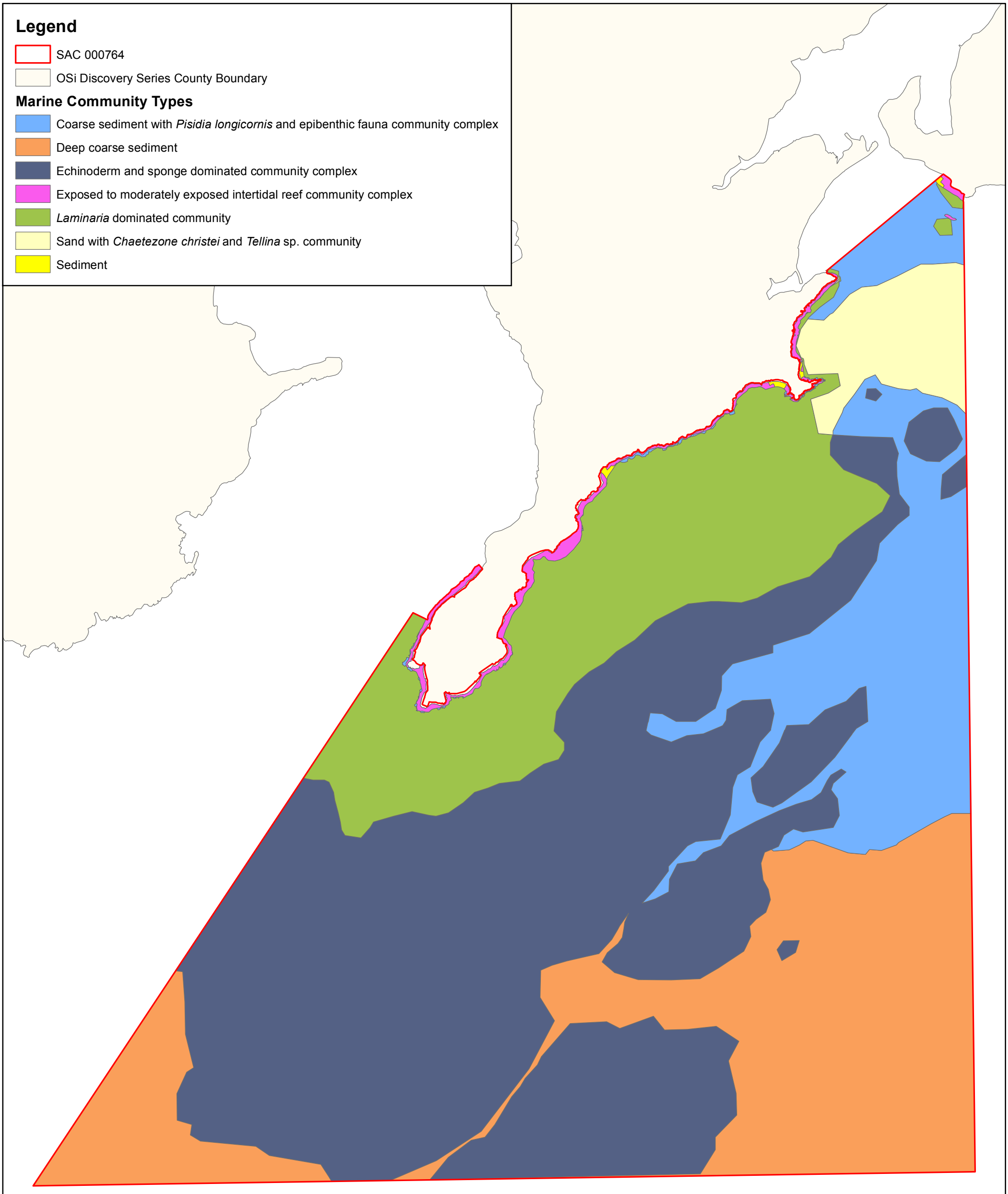
Map Version 1
Date: July 2011

Legend

- SAC 000764
- OSi Discovery Series County Boundary

Marine Community Types

- Coarse sediment with *Pisidia longicornis* and epibenthic fauna community complex
- Deep coarse sediment
- Echinoderm and sponge dominated community complex
- Exposed to moderately exposed intertidal reef community complex
- *Laminaria* dominated community
- Sand with *Chaetezone christei* and *Tellina* sp. community
- Sediment



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MAP 4:
HOOK HEAD
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY WEXFORD

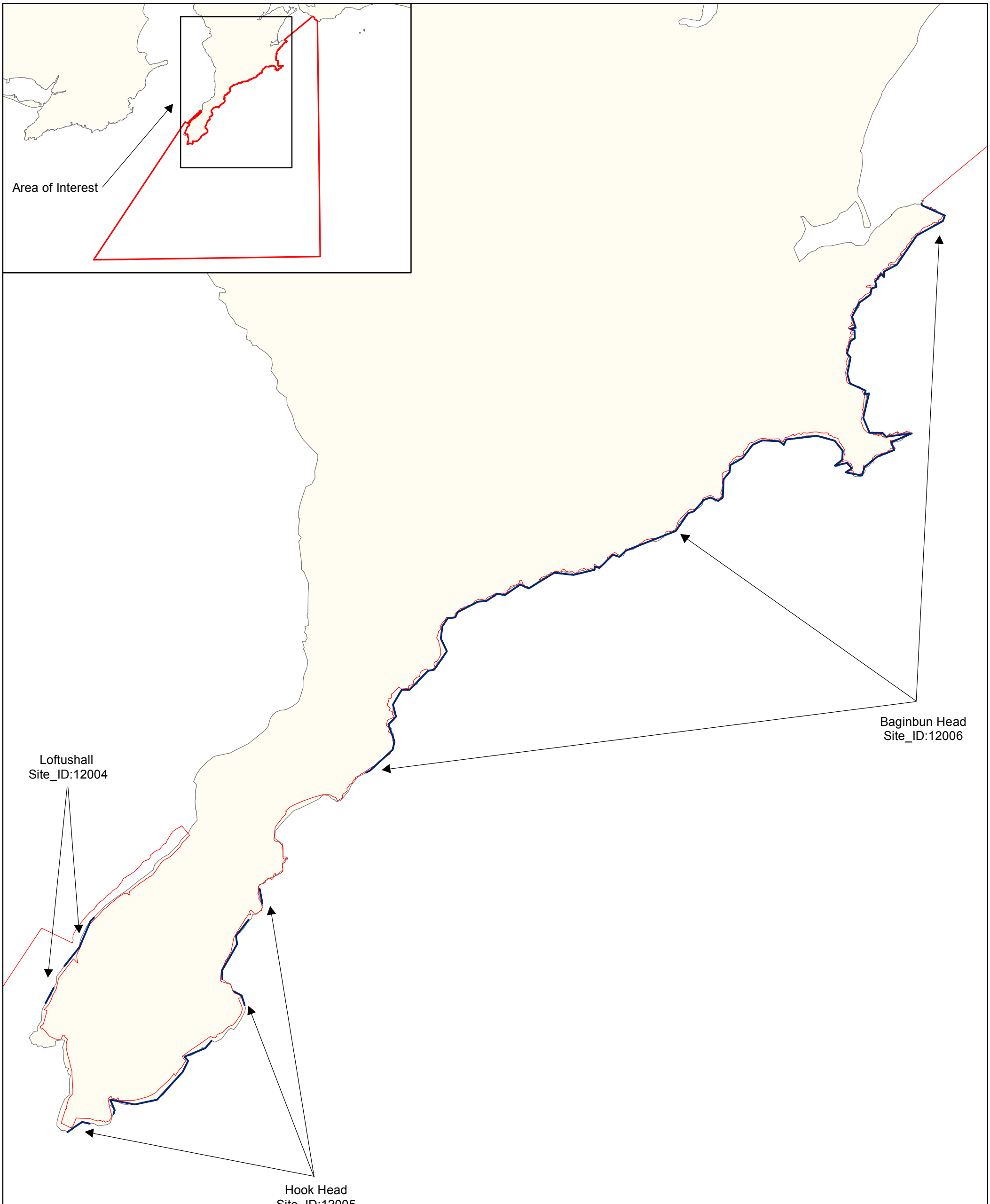
0 1 2 3 km

N

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011



Legend

- SAC 000764
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 5: HOOK HEAD CONSERVATION OBJECTIVES VEGETATED SEA CLIFFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY WEXFORD

0 0.5 1 km

N

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011

National Parks and Wildlife Service

Conservation Objectives

River Barrow and River Nore SAC 002162

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002162 River Barrow and River Nore SAC

QI	Description
1016	Desmoulin's whorl snail *Vertigo moulinsiana*
1029	Freshwater pearl mussel *Margaritifera margaritifera*
1092	White-clawed crayfish *Austropotamobius pallipes*
1095	Sea lamprey *Petromyzon marinus*
1096	Brook lamprey *Lampetra planeri*
1099	River lamprey *Lampetra fluviatilis*
1103	Twaite shad *Alosa fallax*
1106	Atlantic salmon (*Salmo salar*) (only in fresh water)
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1355	Otter *Lutra lutra*
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
1421	Killarney fern *Trichomanes speciosum*
1990	Nore freshwater pearl mussel *Margaritifera durrovensis*
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
4030	European dry heaths
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
7220	* Petrifying springs with tufa formation (*Cratoneurion*)
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Desmoulin's whorl snail (*Vertigo moulinsiana* - 1016) Conservation Status Assessment Report
Year: 2011
Author: Moorkens, E. ; Killeen, I.
Series: Unpublished Report to NPWS

Title: River Barrow and River Nore SAC (002162): Conservation objectives supporting document - woodland habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: River Barrow and River Nore SAC (002162): Conservation objectives supporting document - coastal habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: River Barrow and River Nore SAC (002162): Conservation objectives supporting document - marine habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Second Draft Nore Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)
Year: 2010
Author: DEHLG
Series: Unpublished Report to NPWS

Title: Site investigations for *Sabellaria alveolata* (Honey-comb worm) biogenic reefs in Ireland
Year: 2010
Author: NPWS
Series: Unpublished Report to NPWS

Title: Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo
Year: 2010
Author: O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.
Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland
Year: 2010
Author: Perrin, P.M.; Daly, O.H.
Series: Irish Wildlife Manuals No. 46

Title: Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland [Version 1.0]
Year: 2010
Author: Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series: Irish Wildlife Manuals No. 48

Title: A technical manual for monitoring white-clawed crayfish *Austropotamobius pallipes* in Irish lakes

Year: 2010

Author: Reynolds, J.D.; O'Connor, W.; O'Keeffe, C.; Lynn, D.

Series: Irish Wildlife Manuals No. 45

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009

Author: Government of Ireland

Series: Irish Statute Book

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: *Margaritifera durrovensis* Survey of Nore River. June – July 2009. NS 2 project

Year: 2009

Author: Moorkens, E. A.

Series: Unpublished Report to NPWS

Title: Benthic Biotope classification of subtidal sedimentary habitats in the Lower River Suir candidate Special Area of Conservation and the River Nore and River Barrow candidate Special Area of Conservation

Year: 2008

Author: ARMS

Series: Unpublished Report to NPWS

Title: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Waterford Estuary

Year: 2008

Author: ASU

Series: Unpublished Report to NPWS

Title: Assessment of the Risk of Barriers to Fish Migration in the Nore Catchment, Southern Regional Fisheries Board

Year: 2008

Author: CFB; Compass Informatics

Series: Unpublished Report to CFB

Title: Poor water quality constrains the distribution and movements of Twaite shad *Alosa fallax fallax* (Lacepede, 1803) in the watershed of river Scheldt

Year: 2008

Author: Maas, J.; Stevens, M. ; Breine, J.

Series: Hydrobiologia 602, 129 - 143

Title: All Ireland Species Action Plan - Killarney fern

Year: 2008

Author: NPWS ; EHS-NI

Series: Unpublished Report to NPWS & EHS-NI

Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Saltmarsh Monitoring Report 2006

Year: 2007

Author: McCorry, M.

Series: Unpublished Report to NPWS

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

Year: 2007

Author: O'Connor, W.

Series: Irish Wildlife Manuals No. 26

Title: Assessment of fish passage and the ecological impact of migration barriers on the River Nore catchment

Year: 2007

Author: Sullivan, A.

Series: Nore Suir Rivers Trust & OPW

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams

Year: 2006

Author: Geist, J.; Porkka, M.; Kuehn, R.

Series: Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

Title: The distribution of Lamprey in the River Barrow SAC

Year: 2006

Author: King, J.J.

Series: Irish Wildlife Manuals No. 21

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: The ecology and conservation of the gametophyte generation of the Killarney Fern (*Trichomanes speciosum* Willd.) in Ireland

Year: 2005

Author: Kingston, N. ; Hayes, C.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 105B(2): 71-79

Title: Pilot Project for Monitoring Populations of the Freshwater Pearl Mussel. Baseline survey of the Nore River SAC, Counties Laois and Kilkenny

Year: 2004

Author: Moorkens, E. A.

Series: Unpublished Report to NPWS

Title: Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*

Year: 2003

Author: Harvey, J.; Cowx, I.

Series: Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough

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Title: Ecology of Watercourses Characterised by *Ranunculion fluitantis* and *Callitricho-Batrachion* Vegetation

Year: 2003

Author: Hatton-Ellis, T.W.; Grieve, N.

Series: Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough.

Title: Ecology of the Allis and Twaite shad

Year: 2003

Author: Maitland, P.S.; Hatton-Ellis, T.W.

Series: Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough

---

Title: A survey of the white-clawed crayfish, *Austropotamobius pallipes* (Lereboullet) and of water quality in two catchments of Eastern Ireland

Year: 2002

Author: Demers, A.; Reynolds, J. D.

Series: Bulletin Français de la Pêche et de la Pisciculture, 367: 729-740

Title: Reversing the habitat fragmentation of British woodlands

Year: 2002

Author: Peterken, G.

Series: WWF-UK, London

Title: A survey of broadleaf woodlands in 3 SACs: Barrow-Nore, River Unshin & Lough Forbes

Year: 2000

Author: Browne, A.; Dunne, F.; Roche, N.

Series: Unpublished Report to NPWS

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

Year: 1999

Author: Kingston, S.; O'Connell, M.; Fairley, J.S.

Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title:	Conservation Management of the White-clawed Crayfish, *Austropotamobius pallipes*
Year:	1998
Author:	Reynolds, J.D.
Series:	Irish Wildlife Manuals No. 1
Title:	Studies on the biology and ecology of Margaritifera in Ireland
Year:	1996
Author:	Moorkens, E.A.
Series:	Unpublished PhD thesis, University of Dublin, Trinity College.
Title:	Imminent extinction of the Nore freshwater pearl mussel *Margaritifera durrovensis* Phillips: a species unique to Ireland
Year:	1994
Author:	Moorkens, E.A. ; Costello, M.J.
Series:	Aquatic Conservation: Marine and Freshwater Ecosystems 4,363-365
Title:	The spatial organization of otters (*Lutra lutra*) in Shetland
Year:	1991
Author:	Kruuk, H.; Moorhouse, A.
Series:	J. Zool, 224: 41-57
Title:	The vegetation of Irish rivers
Year:	1987
Author:	Heuff, H.
Series:	Unpublished Report
Title:	Otter survey of Ireland
Year:	1982
Author:	Chapman, P.J.; Chapman, L.L.
Series:	Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	2010
Title:	EPA transitional waterbody data
GIS operations:	Clipped to SAC boundary
Used for:	1130 (map 2)

Year:	Interpolated 2011
Title:	Intertidal and subtidal surveys 2008 & 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data
Used for:	Marine community types, 1140 (maps 3 & 4)

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; Saltmarsh and Sand Dune datasets erased out if applicable
Used for:	Marine community types base data (map 4)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Sand Dune data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 5)

Year:	Derived 2011
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial reference contained in files
Used for:	7220 (map 6)

Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary
Used for:	91A0, 91E0 (map 6)

Year:	2011
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records
Used for:	1016, 1092, 1421, 1990 (map 7)

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the landward side of the river banks data; creation of a 20m buffer applied to river centerline and stream data; combination of 10m river banks and 20m river and stream centerline buffer datasets; combined river and stream buffer dataset clipped to HWM; combination of HWM buffer dataset with river and stream buffer dataset; overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary
Used for:	1355 (no map)

1016 Desmoulin's whorl snail *Vertigo moulinsiana*

To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. Two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois. See map 7	Data from NPWS rare and threatened species database
Population size: adults	Number per positive sample	At least 5 adults snails in at least 50% of samples	Attribute and target from Moorkens and Killeen (2011)
Population density	Percentage positive samples	Adult snails present in at least 60% of samples per site	Attribute and target from Moorkens and Killeen (2011)
Area of occupancy	Hectares	Minimum of 1ha of suitable habitat per site	Attribute and target from Moorkens and Killeen (2011)
Habitat quality: vegetation	Percentage of samples with suitable vegetation	90% of samples in habitat classes I and II as defined in Moorkens & Killeen (2011)	Attribute and target from Moorkens and Killeen (2011)
Habitat quality: soil moisture levels	Percentage of samples with appropriate soil moisture levels	90% of samples in moisture class 3-4 as defined in Moorkens & Killeen (2011)	Attribute and target from Moorkens and Killeen (2011)

1029 Freshwater pearl mussel *Margaritifera margaritifera*

The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species.

1092 White-clawed crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No reduction from baseline. See map 7	The crayfish is present almost throughout this SAC. The records extend as far downstream as Thomastown on the Nore and Graiguenamanagh on the Barrow
Population structure: recruitment	Percentage occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in at least 50% of positive samples	See Reynolds et al. (2010) for further details
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as major direct threat to this species and as disease vector. See Reynolds (1998) for further details
Disease	Occurrence	No instances of disease	Disease is identified as major threat and has occurred in Ireland even in the absence of alien vectors. See Reynolds (1998) for further details
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Habitat quality: heterogeneity	Occurrence of positive habitat features	No decline in heterogeneity or habitat quality	Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree-roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus such as leaf litter. These conditions must be available on the whole length of occupied habitat

1095 Sea lamprey *Petromyzon marinus*

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:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor, (2007). King (2007) provides survey information for the Barrow
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1096 Brook lamprey *Lampetra planeri*

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:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all watercourses down to first order streams	Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artifical barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1099 River lamprey *Lampetra fluviatilis*

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:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem and major tributaries down to second order accessible from estuary	Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). King (2007) provides survey information for the Barrow. It is impossible to distinguish between brook and river lamprey juveniles in the field, hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels. Artificial barriers are currently preventing lamprey from accessing suitable spawning habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Artificial barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. See King (2006), Sullivan (2007) and CFB and Compass Informatics (2008) for further information

1103 Twaite shad *Alosa fallax*

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:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Population structure: age classes	Number of age classes	More than one age class present	Regular breeding has been confirmed in the River Barrow in recent years, but not in the Nore
Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning habitats	
Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l	Attribute and target based on Maas, Stevens and Briene (2008)
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	See Maitland and Hatton-Ellis (2003) for further information

1106 Atlantic salmon (*Salmo salar*) (only in fresh water)

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:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See Sullivan (2007) and CFB and Compass Informatics (2008) for further information on artificial barriers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Nore is currently exceeding its CL, while the Barrow is below its CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1130 Estuaries

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:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area was estimated using OSI data and the defined Transitional Water Body area under the Water Framework Directive as 3856ha. See marine supporting document for further details
Community distribution	Hectares	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. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details
Community extent	Hectares	Maintain the natural extent of the Sabellaria alveolata reef, subject to natural process. See map 4	The likely area of this community is derived from a survey undertaken in 2010 (NPWS, 2010). See marine supporting document for further details

1140 Mudflats and sandflats not covered by seawater at low tide

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:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated using OSI data as 926ha. See marine supporting document for further details
Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex. See map 4	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 (ARMS, 2008; ASU, 2008). See marine supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville - 0.03ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The Ringville sub-site was mapped and no additional areas of potential Salicornia mudflat were identified from an examination of aerial photographs, giving a total estimated area of 0.03ha. NB futher unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 1.25ha, Killowen - 2.59ha, Rochestown - 17.50ha, Ringville - 6.70ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Four sub-sites were mapped and additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area of Atlantic salt meadow of 35.07ha. NB futher unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

1355 Otter *Lutra lutra*

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:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in south-east estimated at 73% (Bailey and Rochford, 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 857.7ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 616.6km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 2.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 0.08ha, Rochestown - 0.04ha, Ringville - 6.70ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). Three sub-sites were mapped and no additional areas of potential saltmarsh were identified from an examination of aerial photoraphs, giving a total estimated area of Mediterranean salt meadow of 6.82ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated.	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on McCorry and Ryle (2009). See coastal habitats supporting document for further details

1421 Killarney fern *Trichomanes speciosum*

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

Attribute	Measure	Target	Notes
Distribution	Location	No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7	Data from NPWS rare and threatened species database
Population size	Number	Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds	Data from NPWS rare and threatened species database
Population structure: juvenile fronds	Occurrence	At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations	'Juvenile' sporophytes, which appear as small entire fronds, are known from this site. However, it is unknown whether they are due to apogamous growth or sexual reproduction. Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Habitat extent	m^2	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Hydrological conditions: visible water	Occurrence	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Hydrological conditions: humidity	Number of dessicated fronds	No increase. Presence of dessicated sporophyte fronds or gametophyte mats indicates conditions are unsuitable	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Light levels: shading	Percentage	No changes due to anthropogenic impacts	Based on Kingston and Hayes (2005) and Ni Dhuill (pers. Comm.)
Invasive species	Occurrence	Absent or under control	NPWS and EHS-NI (2008) provides further details

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 15.5km. See map 7	The population stretches from Poorman's Bridge (S407859) to Lismaine Bridge (S442660), with most of the population found between Poorman's Bridge and the Avonmore Creamery above Ballyragget (S 440 722) (Moorkens, 1996)
Population size: adult mussels	Number	Restore to 5,000 adult mussels	The extant wild population of Nore freshwater pearl mussel is estimated as 300 adult individuals (Moorkens, 2009)
Population structure: recruitment	Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. This species is known not to have reproduced successfully in the River Nore since 1970 (Moorkens and Costello, 1994; Moorkens, 2004; Government of Ireland, 2009 [S.I. 272 of 2009])
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses
Habitat extent	Kilometres	Restore suitable habitat in length of river corresponding to distribution target (15.5km; see map 7) and any additional stretches necessary for salmonid spawning	The species habitat is a stretch of large lowland river and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: Macroinvertebrates and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat of the Nore pearl mussel failed both standards during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water Objectives) Regulations 2009
Substratum quality: Filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	High abundance of macroalgae was recorded during 2009 sampling for the Sub-basin Management Plan (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: sediment	Occurrence	Restore substratum quality-stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles owing to sedimentation of the substratum. Significant sedimentation has been recorded during all recent mussel monitoring surveys. Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The redox potential loss in 2009 was 58-64% at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable Nore freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

1990 Nore freshwater pearl mussel *Margaritifera durrovensis*

To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of freshwater pearl mussels and thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. As native brown trout appear to be favoured by the Nore freshwater pearl mussel, it is particularly important that these are not out-competed by stocked fish

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline, subject to natural processes	The full distribution of this habitat and its sub-types in this site is currently unknown. The basis of the selection of the SAC for the habitat is the presence of an excellent example of the vegetation community (nutrient-rich type) associated with extensive tufa deposits on the river bed in the Kings tributary of the Nore (Heuff, 1987). Other examples of this or other sub-types may be present within the SAC
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The full extent of this habitat in this site is currently unknown. See above
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Due to regular disturbance (through variations in flow), river macrophytes rarely reach a climax condition but frequently occur as transient communities. A natural (relatively unmodified) flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For most of the sub-types of this habitat, high flows are required to maintain the substratum (see below) necessary for the characteristic species. Flow variation is particularly important, with high and flood flows being critical to the hydromorphology
Hydrological regime: groundwater discharge	Metres per second	The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation	This attribute refers to sub-types with tufa formations. Groundwater discharges to this habitat throughout the year
Substratum composition: particle size range	Millimetres	The substratum should be dominated by large particles and free from fine sediments	The tufaceous sub-types develop on relatively stable substrata such as bedrock, boulders and cobbles, where tufa can deposit and accumulate. Tufa deposition is believed to be biologically mediated, by algae and bryophytes. The substratum must remain free of fine sediments such as clay, silt and fine sand, which would adversely affect the growth of algae and mosses

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water chemistry: minerals	Milligrammes per litre	The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits	The tufaceous sub-types require mineral-(typically calcium-) rich groundwaters to allow deposition of tufa. Surface water must also be sufficiently base-rich to prevent chemical erosion. Alkalinity and/or total hardness data may also be relevant
Water quality: suspended sediment	Milligrammes per litre	The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments	See substratum composition above. Turbidity data may also be relevant
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	Phosphorus (MRP) is typically the limiting nutrient, however increased nitrogen (NO3-) negatively impacts upon the N-fixing blue-green algal communities that frequently contribute to tufa deposition. Nutrient enrichment of the habitat typically leads to increased filamentous-green-algal biomass, and consequent changes in other algae, bryophyte and macrophyte species composition and abundance. Water quality should reach a minimum of Water Framework Directive good status, in terms of nutrient standards, and macroinvertebrate and phytobenthos quality elements
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	The sub-types of this habitat are poorly understood and their typical species have not yet been defined. Typical species and appropriate targets may emerge to be site-specific. The typical species of the tufaceous sub-type in the Kings tributary of the Nore are identified in Heuff (1987). The typical species may include higher plants, bryophytes, macroalgae and microalgae
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	River connectivity with the floodplain is essential for the functioning of this habitat. The site of the tufaceous sub-type in the King's River is within an area of floodplain, with further large floodplains upstream. Floodplains regulatefine sediment deposition within the channel. See substratum composition above

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	Spatial extent currently unmapped but indicated as occurring on the steep, free-draining, river valley sides especially the Barrow and tributaries in the foothills of the Blackstairs Mountains (based on NPWS NHA Survey - 1997/98 Site Notes; Natura 2000 Form Explanatory Notes - May 2006; The above NHA survey was prior to the extensions to the SAC that included river habitat and estuary at Ballyhack which may have incorporated additional dry heath habitat)
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations	Based on NPWS NHA Survey Site Notes (1997/98); Natura 2000 Form Explanatory Notes - May 2006
Physical structure: free-draining, acid, low nutrient soil; rock outcrops	Occurrence	No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop	Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006
Vegetation structure: sub-shrub indicator species	Percentage cover	Cover of characteristic sub-shrub indicator species at least 25%: gorse (*Ulex europaeus*) and where rocky outcrops occur bilberry (*Vaccinium myrtillus)* and woodrush (*Luzula sylvatica*). Some rock outcrops support English stonecrop (*Sedum anglicum*), sheep's bit (*Jasione montana*) and wild madder (*Rubia peregrina*) as well as important moss and lichen assemblages	Dry heath in this SAC occurs on free-draining nutrient poor soils and is often characterised by gorse and open acid grassland areas. A characteristic coastal dry heath of the southeast also occurs. Several rare plants occur including two species listed in the Red Data Book (Curtis and McGough, 1988). The species occurring on the site are listed in NPWS NHA Survey Site Notes - 1997/98. A brief overview of the principal characteristics of the dry heath habitat of this SAC is given in the Natura 2000 Explanatory Notes - May 2006
Vegetation structure: senescent gorse	Percentage cover	Cover of senescent gorse less than 50%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010)
Vegetation structure: browsing	Percentage cover	Long shoots of bilberry with signs of browsing collectively less than 33%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath condition assessment methodology of Perrin et al. (2010)

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: native trees and shrubs	Percentage cover	Cover of scattered native trees and shrub less than 20%	Based on NPWS NHA Survey Site Notes - 1997/98; Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). From the NHA survey notes the main threats appear to be reclamation or invasion by scrub woodland
Vegetation composition: positive indicator species	Number	Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora	Dry heath in this SAC occurs on free-draining nutrient poor soils and is characterised by gorse and acid grassland areas. It corresponds to Annex I sub-type "heaths rich in gorse (*Ulex*) of the Atlantic margins" (European Commission, 2007). Based on NPWS NHA Survey Site Notes -1997/98; Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation structure: positive indicator species	Percentage cover	Cover of positive indicator species at least 60%. This should include plant species characterisitic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora	Dry heath in this SAC is characterised by gorse and acid grassland areas and locally bilberry and woodrush. Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: bryophyte and non-crustose lichen species	Number	Number of bryophyte or non-crustose lichen species present at least 2	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. 2010
Vegetation composition: bracken (*Pteridium aquilinum*)	Percentage cover	Cover of bracken less than 10% - however see 'Notes'	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010). Bracken appears to be quite dense in places and before any management action is considered its rate of spread needs to be established as well as its threat, if any, to other dry heath species and its potential value to important fauna (e.g. Twite)

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: weedy negative indicator species	Percentage cover	Cover of agricultural weed species (negative indicator species) less than 1%	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: non-native species	Percentage cover	Cover of non-native species less than 1%.	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified version of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation composition: rare/scarce heath species	Location, area and number	No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (*Orobanche rapum-genistae)* and the legally protected clustered clover (*Trifolium glomeratum*)	Broomrape is dependent on gorse at this site as it is parasitic on gorse roots. It is recorded as occurring on steep slopes above New Ross. A small area of excellent dry coastal heath at Ballyhack is interspersed with patches rock and of dry lowland grassland and has a high species diversity. Notably there is an excellent range of Clover (*Trifolium*) species including the legally protected clustered clover, a species known only from one other site in Ireland. Also *T. ornithopodiodes*, *T. striatum* and *Torilus nodosa*. Based on Natura 2000 Form Explanatory Notes May 2006, Irish Red Data Book (Curtis and Mc Gough, 1988) and on the NPWS database of rare and threatened vascular plants. Other areas of coastal heath may also occur
Vegetation structure: disturbed bare ground	Percentage cover	Cover of disturbed bare ground less than 10% (but if peat soil less than 5%)	Based on NPWS NHA Survey Site Notes and Natura 2000 Form Explanatory Notes - May 2006 and on a modified verison of the dry heath habitat condition assessment methodology of Perrin et al. (2010)
Vegetation structure: burning	Occurrence	No signs of burning within sensitive areas	Perrin et al. (2010) defines sensitive areas

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	No decline, subject to natural processes	Distribution of this habitat in this site is currently unknown. Considered to occur in association with some riverside woodlands, unmanaged river islands and in narrow bands along the floodplain of slow-flowing stretches of river (Natura 2000 Form Explanatory Notes)
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat in this site is currently unknown. See above
Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regimes	This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment
Vegetation structure:sward height	Centimetres	30-70% of sward is between 40 and 150cm in height	Bare ground, due to natural indundation processes, may often be present. Attribute and target based on the Irish Semi-natural Grassland Survey (O'Neill et al., 2010)
Vegetation composition: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 5 positive indicator species present	List of positive indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*)	Species listed as being present in the site (Natura 2000 Form Explanatory Notes)

7220 * Petrifying springs with tufa formation (*Cratoneurion*)

To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Square metres	Area stable or increasing, subject to natural processes	Extent of this habitat in this site is currently unknown. An area ("Tens of square metres") has been described at one location (Natura 2000 Form Explanatory Notes; internal NPWS files), see below
Habitat distribution	Occurrence	No decline. See map 6 for recorded location	Full distribution of this habitat in this site is currently unknown. It has been described in woodlands at Dysart, between Thomastown and Inistioge (Natura 2000 Form Explanatory Notes; internal NPWS files). NB futher areas are likely to occur within the site
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	Current hydrological regimes are unknown. Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources
Water quality	Water chemistry measures	Maintain oligotrophic and calcareous conditions	Water chemistry is currently unknown. Water supply to petrifying springs is characteristically oligotrophic and calcareous
Vegetation composition: typical species	Occurrence	Maintain typical species	The bryophytes *Cratoneuron commutatum* and *Eucladium verticillatum* are diagnostic of this habitat. Both are found at the location described above. Natura 2000 Form Explanatory Notes and internal NPWS files also list other typical species

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed: see map 6	Minimum area, based on 13 sites surveyed by Perrin et al. (2008) - site codes 14, 20, 49, 73, 125, 508, 509, 510, 514, 515, 518, 519, 521, and other sources. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak regenerates poorly. In suitable sites ash can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem.
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 14, 20, 73, 125, 508, 509, 510, 514, 515, 518, 521 as potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: beech (*Fagus sylvatica*), rhododendron (*Rhododendron ponticum*), cherry laurel (*Prunus laurocerasus*)

91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

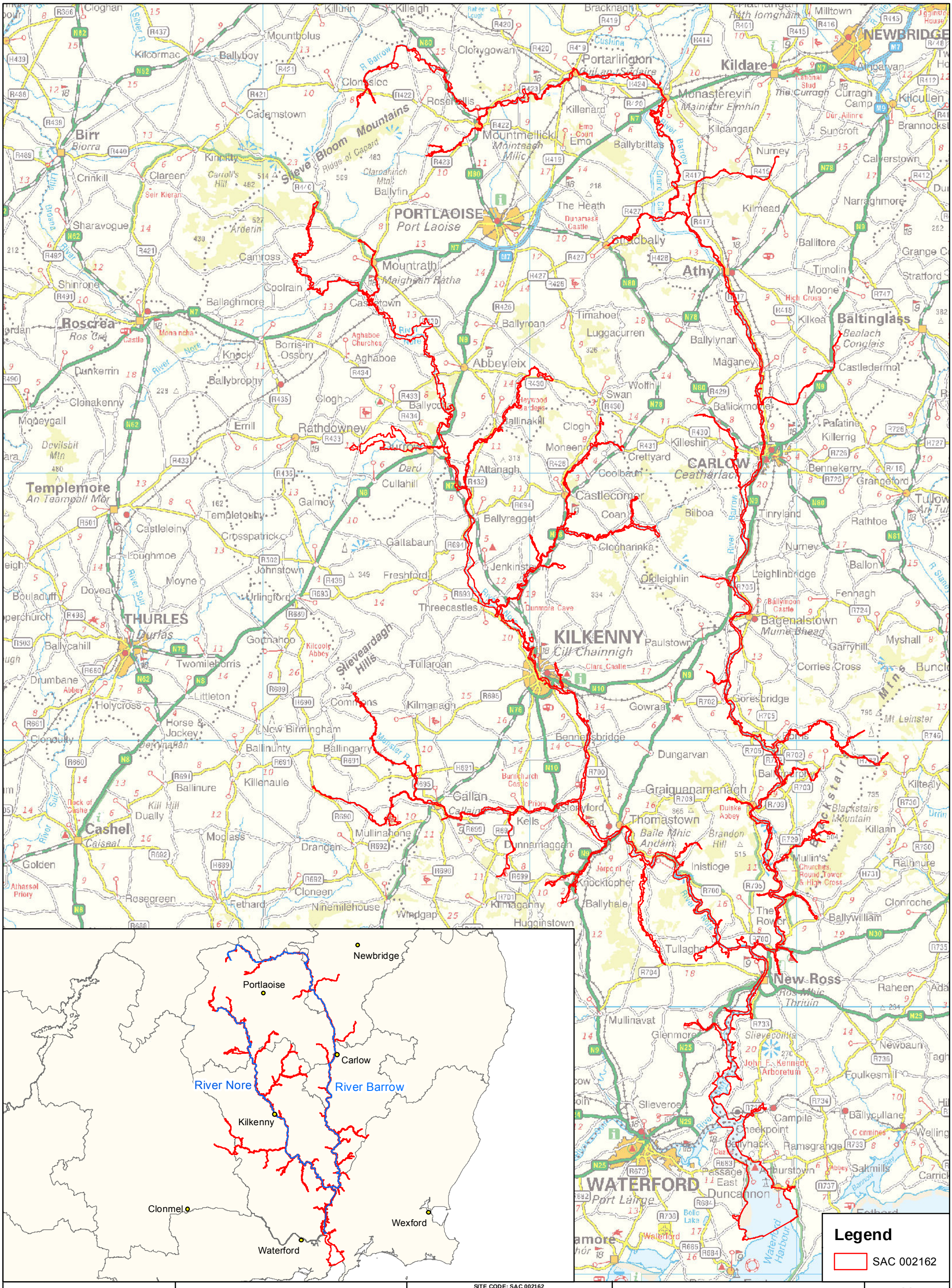
To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed: see map 6	Minimum area, based on 16 sites surveyed by Perrin et al. (2008) - site codes 10, 15, 17, 126, 127, 262, 282, 287, 511, 516, 517, 518, 520, 608, 1021; Coillte LIFE project and other sources. NB further unsurveyed areas maybe present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	Distribution based on Perrin et al. (2008). NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008); Browne et al. (2000). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: Flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river flood plains but not for woodland around springs/seepage areas
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

91E0 * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list sites 10, 15, 17, 127, 282, 516, 517, 518, 608 as potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur*)	Species reported in Perrin et al. (2008); Browne et al. (2000)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*), rhododendron (*Rhododendron ponticum*), cherry laurel (*Prunus laurocerasus*), dogwood (*Cornus sericea*), Himalayan honeysuckle (*Leycesteria formosa*) and Himalayan balsam (*Impatiens grandiflora*)



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MAP 1: RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

0 5 10 15 km

N

Map Version 1
Date: April 2011

Legend

- SAC 002162
- 1130 Estuaries
- OSi Discovery Series County Boundary

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MAP 2:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES ESTUARIES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

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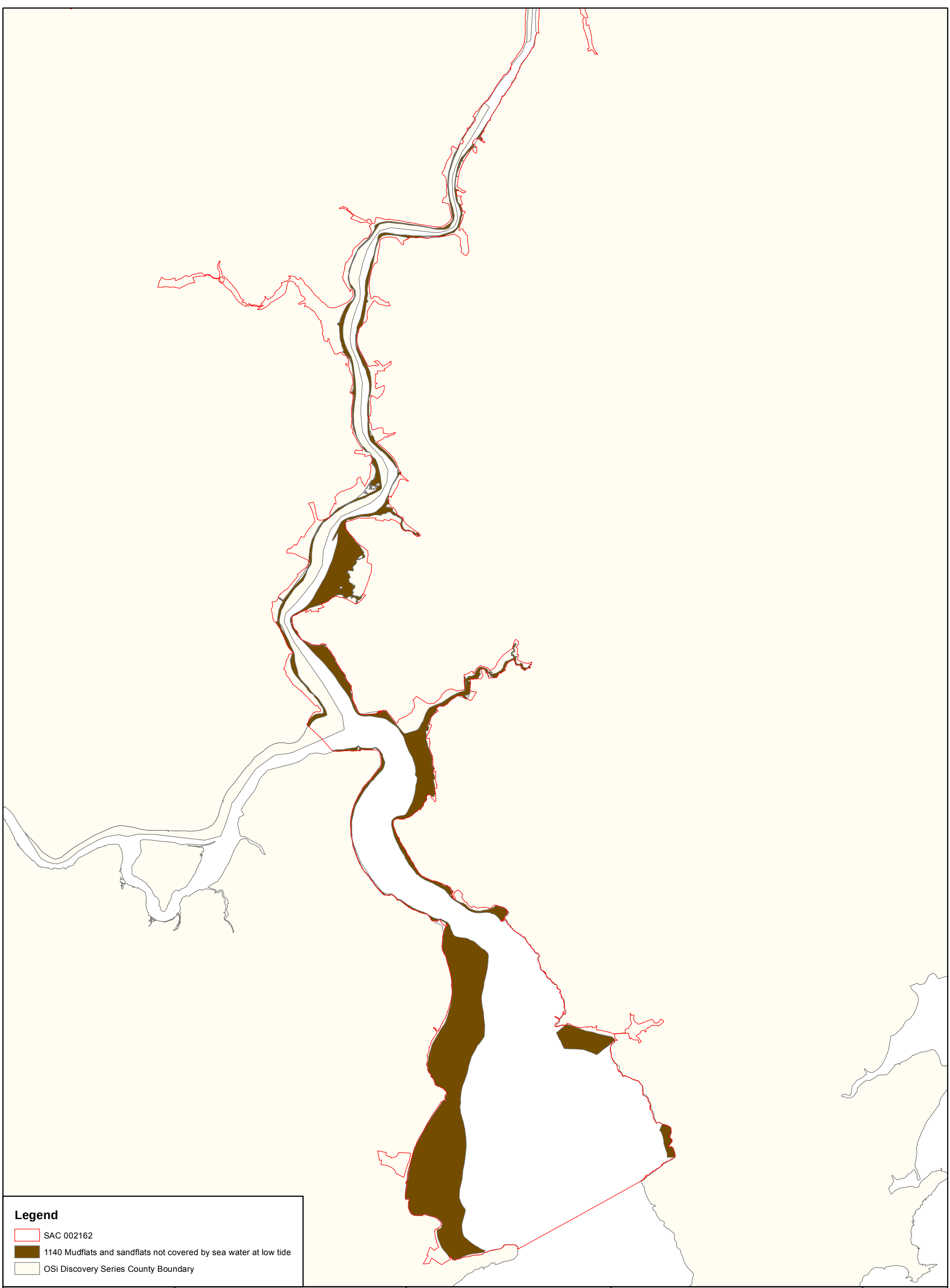
N

Map Version 1
Date: April 2011



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MAP 3:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES TIDAL MUDFLATS AND SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

0 1 2 3 km

N

Map Version 1
Date: April 2011

Legend

- SAC 002162
- OSi Discovery Series County Boundary

Community Types

- Fine sand with *Fabulina fabula* community
- Muddy estuarine community complex
- Sand to Muddy fine sand community complex
- *Sabellaria alveolata* reef

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MAP 4:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES MARINE COMMUNITY TYPES

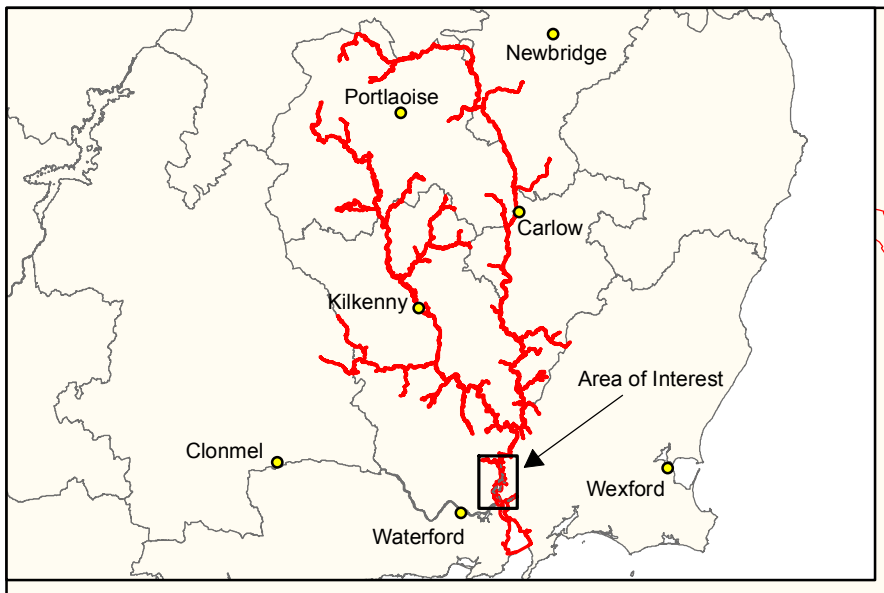
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

0 1 2 3 km

N

Map Version 1
Date: April 2011



SMP0049

SMP0050

SMP0051

SMP0048

Legend

- SAC 002162
- OSi Discovery Series County Boundary

Saltmarsh Habitats

- 1310 *Salicornia* and other annuals colonising mud and sand
- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

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MAP 5:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES SALTMARSH HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002162
CO. CARLOW; version 1.03, CO. KILDARE; version 1.04, CO. KILKENNY; version 1.1, CO. LAOIS; version 1.07, CO. OFFALY; version 1.01, CO. TIPPERARY; version 1.01, CO. WATERFORD; version 1.01, CO. WEXFORD; version 1.01

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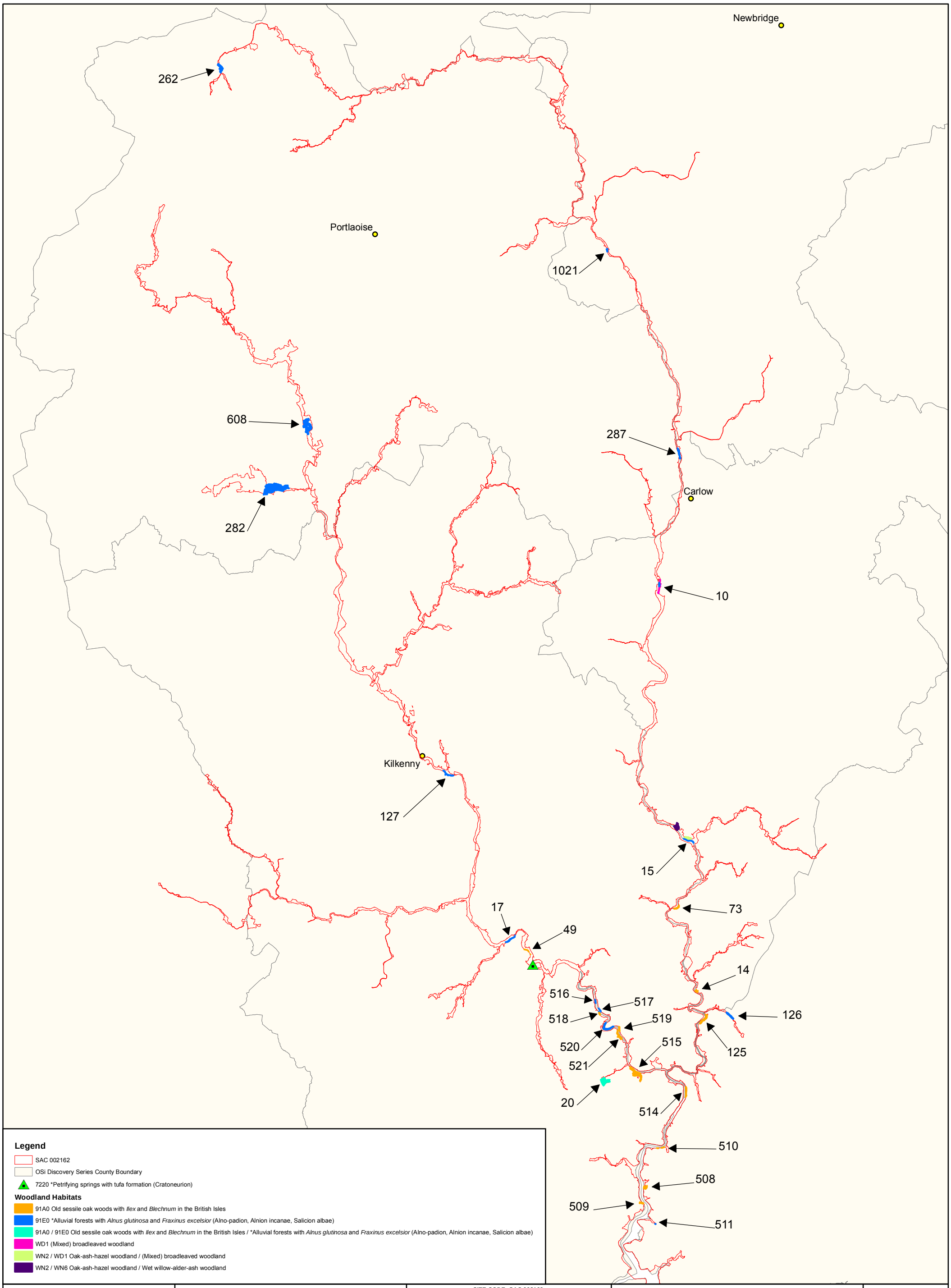
Map Version 1
Date: April 2011



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MAP 6:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES OLD OAK WOODLANDS, ALLUVIAL FORESTS & PETRIFYING SPRINGS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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0 2 4 6 8 10 km

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Map Version 1
Date: April 2011

Legend

- SAC 002162
- OSi Discovery Series County Boundary
- 1016 Desmoulin's Whorl Snail - *Vertigo moulinsiana*
- 1092 White-Clawed Crayfish - *Austropotamobius pallipes*
- 1421 Killarney Fern - *Trichomanes speciosum*
- 1990 Nore Freshwater Pearl Mussel - *Margaritifera durrovensis*

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MAP 7:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES DESMOULIN'S WHORL SNAIL, WHITE-CLAWED CRAYFISH, NORE FRESHWATER PEARL MUSSEL & KILLARNEY FERN

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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0 2 4 6 8 10 km

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Map Version 1
Date: April 2011

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Department of
Arts, Heritage and the Gaeltacht

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Appendix B

Nutrient Sensitive Qualifying Interests

Code	Qualifying Interest	Code	Qualifying Interest	Code	Qualifying Interest
A001	Red-throated Diver (Gavia stellata)	A160	Curlew (Numenius arquata)	1130	Estuaries
A003	Great Northern Diver (Gavia immer)	A162	Redshank (Tringa totanus)	1140	Tidal mudflats
A004	Little Grebe (Tachybaptus ruficollis)	A164	Greenshank (Tringa nebularia)	1150	Lagoons*
A005	Great Crested Grebe (Podiceps cristatus)	A169	Turnstone (Arenaria interpres)	1160	Large shallow inlets and bays
A013	Manx Shearwater (Puffinus puffinus)	A179	Black-headed Gull (Larus ridibundus)	1170	Reefs
A014	Storm Petrel (Hydrobates pelagicus)	A182	Common Gull (Larus canus)	1210	Annual vegetation of drift lines
A016	Gannet (Morus bassanus)	A183	Lesser Black-backed Gull (Larus fuscus)	1230	Sea cliffs
A017	Cormorant (Phalacrocorax carbo)	A184	Herring Gull (Larus argentatus)	1310	Salicornia mud
A018	Shag (Phalacrocorax aristotelis)	A188	Kittiwake (Rissa tridactyla)	1330	Atlantic salt meadows
A028	Grey Heron (Ardea cinerea)	A199	Guillemot (Uria aalge)	1410	Mediterranean salt meadows
A037	Bewick's Swan (Cygnus columbianus bewickii)	A200	Razorbill (Alca torda)	1420	Halophilous scrub
A038	Whooper Swan (Cygnus cygnus)	A204	Puffin (Fratercula arctica)	2110	Embryonic shifting dunes
A043	Greylag Goose (Anser anser)	A229	Kingfisher (Alcedo atthis)	2120	Marram dunes (white dunes)
A045	Barnacle Goose (Branta leucopsis)	A395	Greenland White-fronted Goose (Anser albifrons flavirostris)	2130	Fixed dunes (grey dunes)*
A046	Light-bellied Brent Goose (Branta bernicla hrota)	A466	A/A149 Dunlin (Calidris alpina)	2140	Decalcified Empetrum dunes*
A048	Shelduck (Tadorna tadorna)	1013	Geyer's whorl snail (Vertigo geyeri)	2150	Decalcified dune heath*
A050	Wigeon (Anas penelope)	1014	Narrow-mouthed whorl snail (Vertigo angustior)	2170	Dunes with creeping willow
A051	Gadwall (Anas strepera)	1016	Desmoulin's whorl snail (Vertigo moulinsiana)	2190	Dune slack
A052	Teal (Anas crecca)	1024	Kerry Slug (Geomalacus maculosus)	21A0	Machair*
A053	Mallard (Anas platyrhynchos)	1029	Freshwater Pearl Mussel (Margaritifera margaritifera)	3110	Lowland oligotrophic lakes
A054	Pintail (Anas acuta)	1092	White-Clawed Crayfish (Austropotamobius pallipes)	3130	Upland oligotrophic lakes
A056	Shoveler (Anas clypeata)	1095	Sea Lamprey (Petromyzon marinus)	3150	Natural eutrophic lakes
A061	Tufted Duck (Aythya fuligula)	1096	Brook Lamprey (Lampetra planeri)	3160	Dystrophic lakes
A062	Scaup (Aythya marila)	1099	River Lamprey (Lampetra fluviatilis)	3180	Turloughs*

Code	Qualifying Interest	Code	Qualifying Interest	Code	Qualifying Interest
A065	Common Scoter (Melanitta nigra)	1103	Twaite Shad (Alosa fallax fallax)	3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
A067	Goldeneye (Bucephala clangula)	1106	Atlantic Salmon (Salmo salar)	3270	Chenopodium rubri
A069	Red-breasted Merganser (Mergus serrator)	1303	Lesser Horseshoe Bat (Rhinolophus hipposideros)	6130	Calaminarian grassland
A130	Oystercatcher (Haematopus ostralegus)	1349	Bottle-Nosed Dolphin (Tursiops truncatus)	6210	Orchid-rich calcareous grassland*
A137	Ringed Plover (Charadrius hiaticula)	1351	Harbour Porpoise (Phocoena phocoena)	6410	Molinia meadows
A140	Golden Plover (Pluvialis apricaria)	1355	Otter (Lutra lutra)	6430	Hydrophilous tall herb
A141	Grey Plover (Pluvialis squatarola)	1364	Grey Seal (Halichoerus grypus)	7110	Raised bog (active)*
A142	Lapwing (Vanellus vanellus)	1365	Common Seal (Phoca vitulina vitulina)	7120	Degraded raised bogs
A143	Knot (Calidris canutus)	1421	Killarney Fern (Trichomanes speciosum)	7210	Cladium fen*
A144	Sanderling (Calidris alba)	1528	Marsh Saxifrage (Saxifraga hirculus)	7220	Petrifying springs*
A148	Purple Sandpiper (Calidris maritima)	1833	Slender Naiad (Najas flexilis)	7230	Alkaline fens
A156	Black-tailed Godwit (Limosa limosa)	1990	Nore Freshwater Pearl Mussel (Margaritifera durrovensis)	8240	Limestone pavement*
A157	Bar-tailed Godwit (Limosa lapponica)	1110	Sandbanks	8330	Sea caves
				91A0	Old oak woodlands
				91E0	Residual alluvial forests*

Appendix C

EAM Summary Report for 127 Portarlington 1 PWS WSZ

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Portarlington EAM

Issue 9 | 19 January 2022

Job number 257367

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Document Verification

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			Prepared by	Checked by	Approved by
		Name	Aristoteles Tegos	Orla Murphy	Gerry Baker
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		Description			
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			Prepared by	Checked by	Approved by
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		Name	Laura McGrath	Gerry Baker	Gerry Baker
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		Name	Sam Marchant	Gerry Baker	Gerry Baker
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		Name	Sam Marchant	Alison Orr	Gerry Baker
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		Name	Sam Marchant		Gerry Baker
		Signature			
				Issue Document Verification with Document	✓

Contents

Tables

Figures

1 Introduction

This document presents the results of the implementation of the Lead Mitigation Environmental Assessment Methodology (EAM) to assess the impact of dosing Portarlington 1 Public Water Supply with orthophosphate.

The assessment tracks the orthophosphate dosed drinking water from source (i.e. water treatment plant), through drinking water distribution (i.e. watermains), waste water collection and treatment systems (i.e. wastewater treatment plants and septic tanks) to environmental receptors (i.e. river water, groundwater, lake, and transitional waterbodies). The orthophosphate load that by-passes the wastewater treatment plants (i.e. through leakages and storm overflows) are also included in the assessment.

The assessment methodology is described in full in RPS (2016) *Irish Water – Lead in Drinking Water Mitigation Plan. Environmental Assessment Methodology*.

The assessment includes processing steps in Graphic Information System (GIS) and excel. The assessment also draws upon the following source data:

- Results of the Plumbosolvency reports by Ryan Hanley.
- Results of pre-processing GIS work to generate regional input files.
- Data relating to Waste Water Treatment Plants (WWTP) from Annual Environmental Reports (AER) and the Environmental Protection agency (EPA) web-based WFD App which is accessed through their Eden Portal.
- Data relating to water body monitoring and characterisation from the EPA WFD App downloaded on the 10th of November 2021.
- Data relating to rainfall and catchment areas from the OPW Flood Studies Update (FSU) Portal.
- GIS data river segment data providing river flows from the EPA “hydrotool data”.
- Gauge data providing river flows from the EPA web-based HydroNet.

2 Abbreviations & Glossary

- AER – Annual Environmental Report
- Agglomeration- the catchment of the WWTP
- DWWTS -Domestic Waste Water Treatment System
- EAM – Environmental Assessment Method
- ELV – Emission Limit Values
- EPA- Environmental Protection Agency
- FSU – Flood studies Update Portal – website hosted
- GIS - Graphic Information Systems
- GWB- Ground Water Body
- IW – Irish Water
- LWB – Lake Water Body
- OP- Orthophosphate
- PE- Population Equivalent or unit per capita loading in waste-water treatment. PE can be considered the estimated number of people required to produce a measured load (e.g. of organic matter, water or P) at the WWTP
- RWB – River Water Body
- SAAR - Standard-period Average Annual Rainfall method. The 30%ile flow for the river catchment is calculated using the catchment area and the SAAR value at the catchment outlet point. The area of the total river catchment is calculated using the Water Framework Directive App defined river sub basin GIS layer. The SAAR value is from the OPW FSU portal.
- SWO- Storm Water Overflow
- TP- Total Phosphorus
- TraC – Transitional and Coastal
- WFD- Water Framework Directive
- WSZ - Water Supply Zone
- WWTP – Waste Water Treatment Plant

3 Portarlington 1 PWS

Portarlington 1 Public Water Supply (PWS) (166PUB1100) is located in County Laois. The La Bergerie Water Treatment Plant has a groundwater source. The WTP currently supplies the Portarlington 1 PWS distributed through the Corrig Hill Reservoir. The Draft Plumbosolvency report proposed universal dosing of treated water at the La Bergerie WYP outlet. Figure 1, at the end of this report, shows the location of the three areas proposed to receive Orthophosphate dosed water.

The current flow from Le bergerie is 1,548m^3/d, which supplied Portarlington town centre and eastern envrions, bordering the Lough PWS and the Portarlington 2 PWS, which supply treated water predominately to the rural hinterland as well as exporting water to Co. Offaly. The Lough and Portarlington 2 PWSs supplied by Lough WTP is outside the scope of this study.

Approximately 36% of the flow is accounted for, and this fixed rate for water mains leakage is assumed in all the Water Supply Zones (WSZs).

Water Supply Zone	**Portarlington (1600PUB1100)**
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	All concentration and loading units for orthophosphate (PO_4-P) are expressed as mg/l P and kg P/yr. Adopted Orthophosphate Optimum Dosing Concentration is 1 mg/l P. Unaccounted for water from the mains is 64%. Seepage from the mains is distributed evenly across the entire length of the WSZ network. The water consumption per person has been assigned as 125 litres per day in order to calculate the direct discharges to surface water with 2.7 people per household. The water discharge per person is assigned as 105 litres per day for the discharge to DWWTS with 2.7 persons per household. Conversion factor for Total Phosphorus to Orthophosphate for WWTP effluent is 0.5. It is assumed there will be no treatment of additional OP load for WWTPs with secondary, primary or no treatment. For plants with tertiary treatment it is assumed all the additional load will be treated. Where a tertiary plant is in exceedance of its ELV for TP or OP then the ability of the plant to treat the additional load is confirmed with Irish Water. Where IW indicates a tertiary plant has not remaining treatment capacity it will be assumed the entire additional load is not treated.

	Where existing monitoring data is not available a surrogate status is derived from the Orthophosphate indicative quality of RWB in the following hierarchy: • Upstream water bodies • Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • Ecological status of the RWB. The mid-point of that surrogate indicative quality range is used as baseline concentration.
Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs	This section assesses the influent and effluent P loads and resultant OP dosages at WWTP within the WSZ before and after dosing. Inputs to and results of the Step 2 assessment for individual WWTP are given in Table 1. Where an agglomeration includes SWOs, discharges from this source are included. Emission Limit Value (ELVs) are assigned for WWTPs to protect the receiving River Waterbodies (RWB) from direct discharges during low flows. Where ELVs are in force these are shown in Table 1. WWTPs that are failing to comply with their ELVs are also indicated. The treatment level and PE of the WWTPs within the agglomerations are as follows; - Portarlington – Tertiary treatment PE 10,561 A sensitivity analysis was carried out on the conversion between Orthophosphate and Total Phosphorus at three factors; 0.4, 0.5 and 0.68. The results of the assessment are presented in Table 1.
Step 4 - Subsurface pathways	The loading from mains leakage is 990.7m^3/d (361.6 kg/yr P). Approximately 338.8 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 53m^3/d (19.3 kg/yr P). Approximately 19kg/yr P of the load is attenuated along the flowpaths. Flow monitoring gauges are available for two waterbodies within the assessment area. The river flows for one receiving water body is established from Hydrotool. Baseline Orthophosphate monitoring data and associated thresholds are available for all RWBs. Orthophosphate dosing does not lead to a deterioration in RWB status from subsurface and near surface pathways.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Rivers	This section assesses the combined impact as a result of increased Orthophosphate load from WWTP discharges (Steps 2 & 3), seepage from mains and DWWTS and cumulative impacts from other dosing areas. Figure 2 illustrates the scale of Orthophosphate loading to the receiving water bodies from mains leakage, DWWTS and direct discharges from WWTP SWOs and upstream EAMs. This illustrates that a significant proportion of the loads come from upstream EAMS while a smaller proportion comes from mains seepage through the subsurface pathway.

	Figure 3 presents the total loading to the dosing area from the main sources and illustrates how much of the loading is attenuated in the subsurface, treated in WWTP and ultimately how much is transported to the receiving RWBs. This illustrates that the most significant load contribution is the upstream EAMs and that the main contribution from within the dosing area is from mains leakage, the majority of which is attenuated. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point. • Portarlington WWTP- Barrow_070, Barrow_080 and Barrow_090. As this is a tertiary plant and therefore the additional load is from SWO discharges only. The Orthophosphate concentrations in the RWBs following drinking water dosing are presented in Table 2. The increase in concentration as a result of the P dosing does not cause a deterioration in the status of any RWB.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on GWBs	The increase in Orthophosphate concentrations in the GWBs as a result of the P dosing is shown in Table 3. Monitoring data is available for all the groundwater bodies except the Industrial Facility GWB in which a surrogate status was applied. Where multiple monitoring points are available within a GWB the results are averaged spatially to derive a GWB average. The Industrial Facility (P0247-01) GWB fails the assessment. This is a small GWB which has been delineated out from the surrounding parent GWB to allow for specific programme of measures associated with the licenced facility within the GWB. The footprint of the GWB has a large urban footprint and therefore the dosing has a clear effect on the groundwater concentrations. The downgradient boundary of the GWB is the River Barrow into which the groundwater discharges. The minor amount of groundwater flow through this restricted area will be massively diluted by the flows in the River Barrow. As the GWB result does not lead to any deterioration in the surface water body status and therefore overall the EAM is considered to pass the assessment.
Step 5 and 6 - Combined Impact from direct and diffuse sources on <u>Lakes</u> within the WSZ	There are no lake water bodies present within the study area.
Step 5 and 6 - Combined Impact from direct and diffuse sources on	The increase in Orthophosphate concentrations in the downstream Transitional and Coastal (TraC) water bodies as a result of drinking water dosing is shown in Table 4. Baseline Orthophosphate monitoring data and associated thresholds are available for all the TraC water bodies.

Transitional Water Bodies	The drinking water dosing with Orthophosphate does not deteriorate the status of any transitional waterbodies for both the summer and winter seasons.
Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies A cumulative assessment was undertaken to assess the impact on TraC WBs from all the contributing EAMs. The assessment is carried out on a catchment scale. **Barrow** The following EAM dosing areas are within the Barrow catchment and discharge to the same TraC as Le Bergerie, see Figure 4. 016. Srowland 023. Rathvilly 028. Kilminchy 053. New Ross 104. Toberdaly 123. Derryguile 131. Derrymoyle 252. Bagenalstown The Barrow Estuary discharges into the Barrow Nore Estuary Upper, where it receives load from the Nore Catchment EAMs including; 037. Troyswood 171. Clogh Castlecomer 296. Ballyragget 374. Mountfinn (Urlingford) The increase in Orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all thirteen EAMs with Orthophosphate is shown in Table 5. There is no deterioration in waterbody status as a result of the cumulative assessment. Step 5 and 6 Cumulative Assessment of impact from EAMs on downstream Protected Waterbodies The cumulative load from this dosing area and any upstream dosing area was tracked downstream to determine the potential concentration increase in any RWBs which are Special Areas of Conservation (SAC). The increase in Orthophosphate concentrations in the waterbodies (WBs) as a result of the P drinking water dosing is shown in Table 6. The results show there is no deterioration in WB status downstream of the EAM. The results that there will be no discernible increase (i.e. above 0.00125mg/l) in any of the downstream SAC RWBs.

Conclusions	**Red, Amber, Green (RAG) STATUS: EAM Result – GREEN** The purpose of the RAG status is to indicate the waterbodies that are failing the EAM assessment on a map. Any waterbodies failing the EAM model will be marked as **Amber** in the interim while further analysis is being completed, where the further analysis confirms the water body is failing the water body will be coloured **Red**. If the EAM indicates there will not be a deterioration in the waterbody status as a result of drinking water dosing it will remain **Green**. A map of the RAG status of water bodies is presented in Figure 5.
Recommendation	No mitigation measures necessary.

Table 1: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate =1 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load (kg/yr P)	Ortho P Concentration mg/l P TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Portarlington Primary Discharge	Tertiary	Total Phosphate 2 mg/l TP-Non-compliant Orthophosphate 0.5 mg/l P- Non- Compliant	Barrow_080	Existing	913	0.61	0.49	0.83
				Post Dosing	913	0.61	0.49	0.83
Portarlington SWOs (9 No.)				Existing	157	0.52	0.41	0.70
				Post Dosing	161	0.53	0.42	0.72

Table 2: Orthophosphate concentrations following dosing in river water bodies

Name	EU_CD	Indicative Quality *Surrogate Status in italic*	Baseline Conc. (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Barrow_070	IE_SE_14B010780	Moderate	0.0424	0.0508	161.6	0.0007	0.0431
Barrow_080	IE_SE_14B010900	Moderate	0.0485	0.0508	178.6	0.0007	0.0492
Barrow_090	IE_SE_14B011000	Moderate	0.0351	0.0508	337.9	0.0006	0.0356

Table 3: Orthophosphate concentrations following dosing in groundwater bodies

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential Baseline conc. following dosing (mg/l P)**
Industrial Facility (P0247-01)	IE_SE_G_005	*Good*	0.0175	0.0263	2.9	0.0097	0.0272
Cushina	IE_SE_G_048	Good	0.0135	0.0263	15.1	0.0010	0.0145
Bagenalstown Upper	IE_SE_G_153	Good	0.0067	0.0263	4.9	0.00005	0.0067

Table 4: Orthophosphate concentrations in transitional waterbodies and small coastal waterbodies following dosing of drinking water

Name	EU_CD	Season	Indicative Quality *Surrogate Status in italic*	Baseline conc used in calculation (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Upper Barrow Estuary	IE_SE_100_0300	Summer	High	0.0150	0.0188	337.9	0.0002	0.0152
		Winter	Good	0.0270	0.0363	337.9	0.0002	0.0272
Barrow Nore Estuary Upper	IE_SE_100_0300	Summer	High	0.0235	0.0188	337.9	0.0001	0.0236*
		Winter	Good	0.0315	0.0363	337.9	0.0001	0.0316
New Ross Port	IE_SE_100_0250	Summer	Good	0.0320	0.0363	337.9	0.0001	0.0321
		Winter	Good	0.0320	0.0363	337.9	0.0001	0.0321
Lower Suit Estuary (Little Island - Cheeckpoint)	IE_SE_100_0200	Summer	Good	0.0375	0.0363	337.9	0.0001	0.0376*
		Winter	Good	0.0380	0.0363	337.9	0.0001	0.0381*
Barrow Suir Nore Estuary	IE_SE_100_0500	Summer	High	0.0165	0.0188	337.9	0.0001	0.0166
		Winter	Good	0.0315	0.0363	337.9	0.0001	0.0316
Waterford Harbour	IE_SE_100_0100	Summer	High	0.0060	0.0188	337.9	0.0001	0.0061
		Winter	High	0.0230	0.0188	337.9	0.0001	0.0231*

**Baseline concentration > 75% of threshold but dosing concentration is insignificant.*

Table 5: Cumulative assessment of orthophosphate concentrations in transitional and coastal water bodies following dosing of drinking water

Name	EU_CD	Season	Indicative Quality *Surrogate Status in italic*	Baseline conc used in calculation (mg/l P)	75% of status threshold (mg/l P)	Load (kg/yr P) from current EAM	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Upper Barrow Estuary	IE_SE_100_0300	Summer	High	0.0150	0.0188	337.9	1160.9	0.0006	0.0156
		Winter	Good	0.0270	0.0363	337.9	1160.9	0.0006	0.0276
Barrow Nore Estuary Upper	IE_SE_100_0300	Summer	High	0.0235	0.0188	337.9	1526.6	0.0004	0.0239*
		Winter	Good	0.0315	0.0363	337.9	1526.6	0.0004	0.0319
New Ross Port	IE_SE_100_0250	Summer	Good	0.0320	0.0363	337.9	1530.3	0.0004	0.0324
		Winter	Good	0.0320	0.0363	337.9	1530.3	0.0004	0.0324
Lower Suir Estuary (Little Island -Cheeckpoint)	IE_SE_100_0200	Summer	Good	0.0375	0.0363	337.9	1530.3	0.0003	0.0378*
		Winter	Good	0.0380	0.0363	337.9	1530.3	0.0003	0.0383*
Barrow Suir Nore Estuary	IE_SE_100_0500	Summer	High	0.0165	0.0188	337.9	1608.9	0.0003	0.0168
		Winter	Good	0.0340	0.0363	337.9	1608.9	0.0003	0.0343
Waterford Harbour	IE_SE_100_0100	Summer	High	0.0060	0.0188	337.9	1619.0	0.0003	0.0063
		Winter	High	0.0230	0.0188	337.9	1619.0	0.0003	0.0233*

*Baseline concentration > 75% of threshold but dosing concentration is insignificant.

Table 6: Orthophosphate concentrations in downstream Protected waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Barrow_100	IE_SE_14B011130	Poor	0.0720	0.0868	414.4	0.0007	0.0727
Barrow_110	IE_SE_14B011300	*Good*	0.0300	0.0325	414.5	0.0007	0.0307
Barrow_120	IE_SE_14B011500	Moderate	0.0399	0.0508	509.0	0.0006	0.0405
Barrow_130	IE_SE_14B011600	Good	0.0278	0.0325	519.0	0.0006	0.0284
Barrow_140	IE_SE_14B011900	Good	0.0305	0.0325	522.8	0.0007	0.0312
Barrow_150	IE_SE_14B012000	Good	0.0276	0.0325	522.8	0.0007	0.0283
Barrow_160	IE_SE_14B012460	Good	0.0278	0.0325	711.3	0.0006	0.0284
Barrow_170	IE_SE_14B012600	Good	0.0262	0.0325	806.2	0.0006	0.0268
Barrow_180	IE_SE_14B012700	High	0.0246	0.0188	895.1	0.0006	0.0252*
Barrow_190	IE_SE_14B012820	Good	0.0338	0.0325	897.3	0.0006	0.0344
Barrow_200	IE_SE_14B012920	Good	0.0252	0.0325	1130.1	0.0009	0.0261
Barrow_210	IE_SE_14B013100	Good	0.0255	0.0325	1131.9	0.0008	0.0263
Barrow_220	IE_SE_14B013300	High	0.0227	0.0188	1131.9	0.0007	0.0234*
Barrow_230	IE_SE_14B013514	High	0.0241	0.0188	1131.9	0.0007	0.0247*
Barrow_240	IE_SE_14B013600	High	0.0213	0.0188	1131.9	0.0007	0.0219*

*Baseline concentration > 75% of threshold but dosing concentration is insignificant.

Figure 1: Portarlington Water Supply Dosing Areas

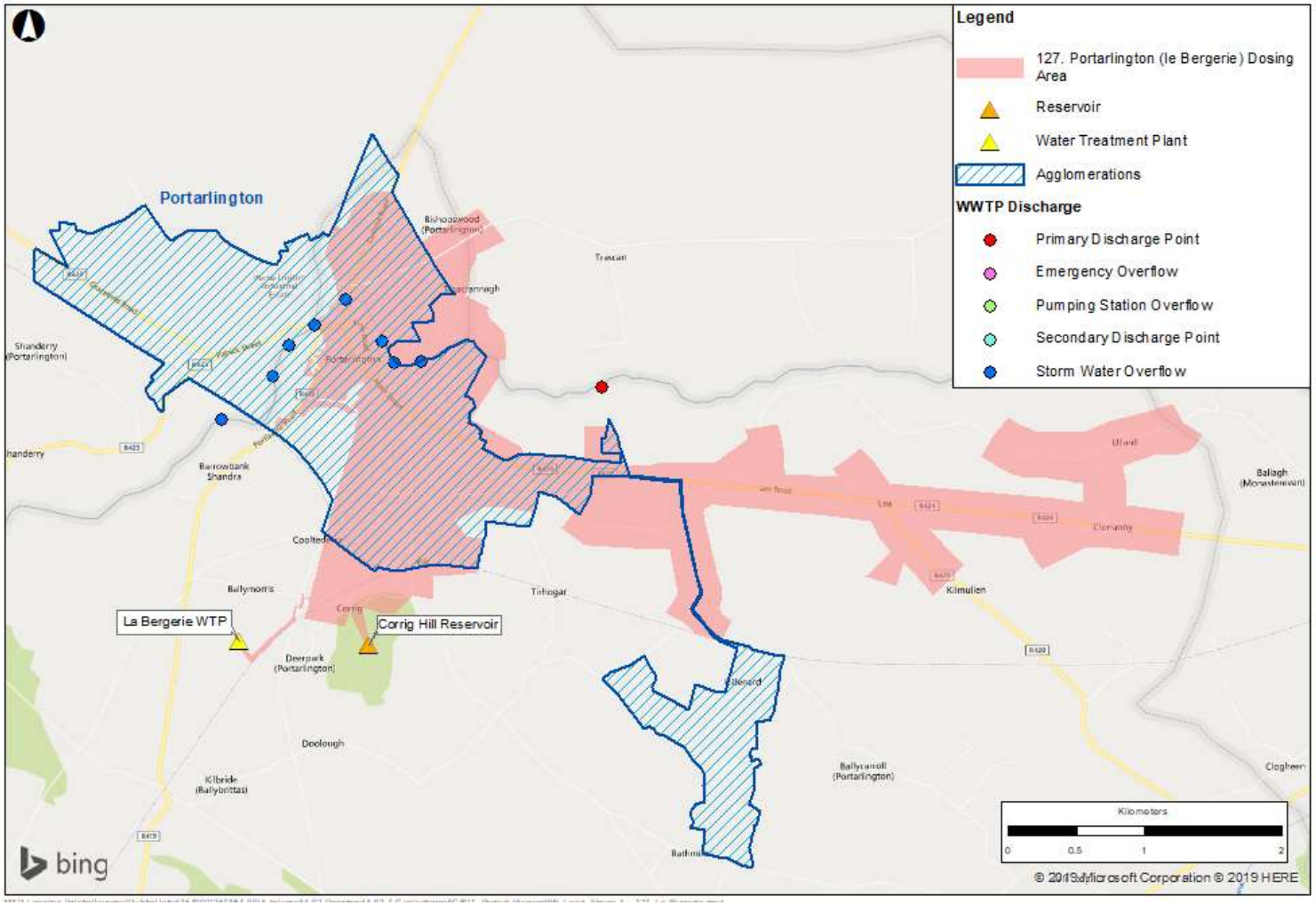

Figure 2: RWB Cumulative Loading Assessment

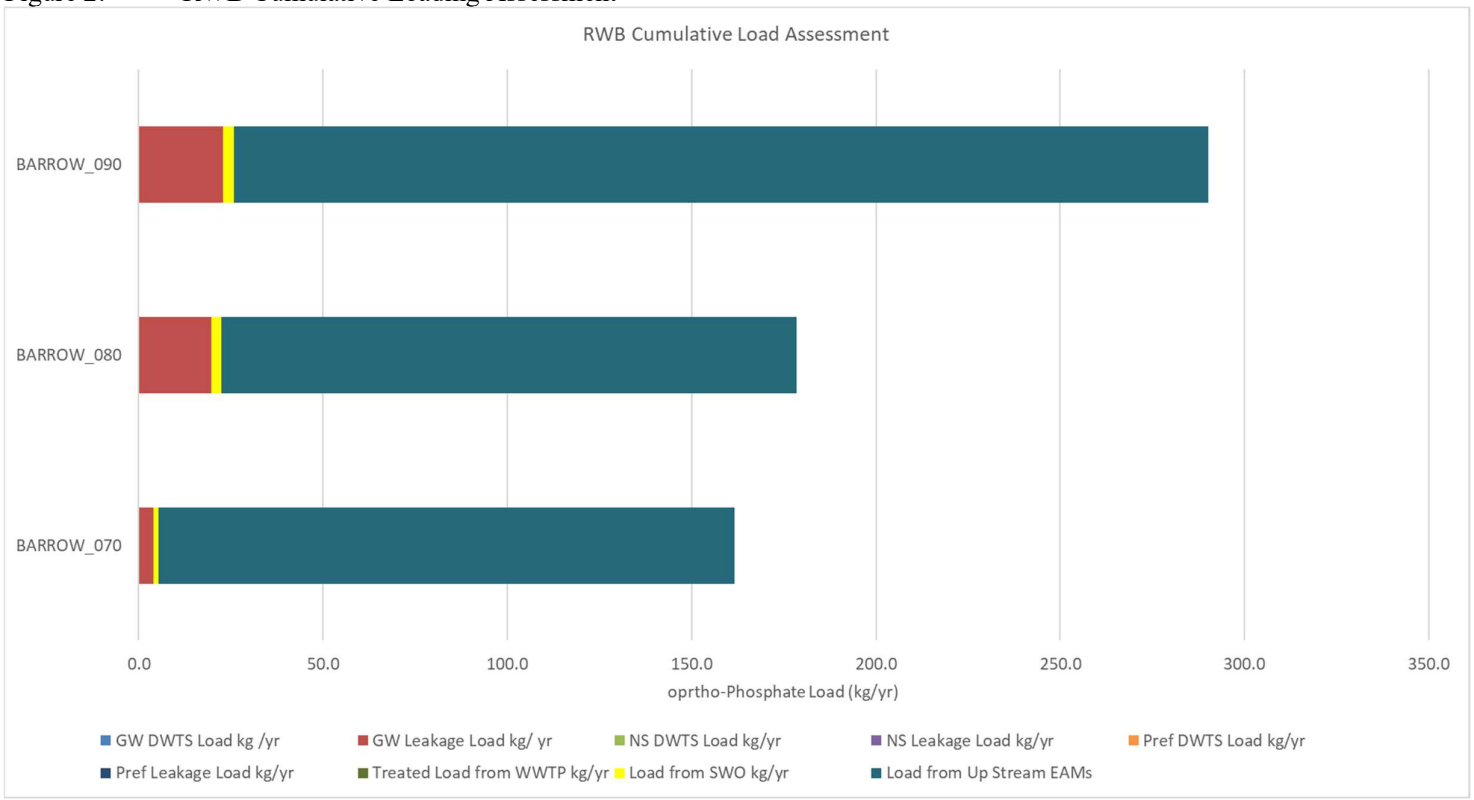

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

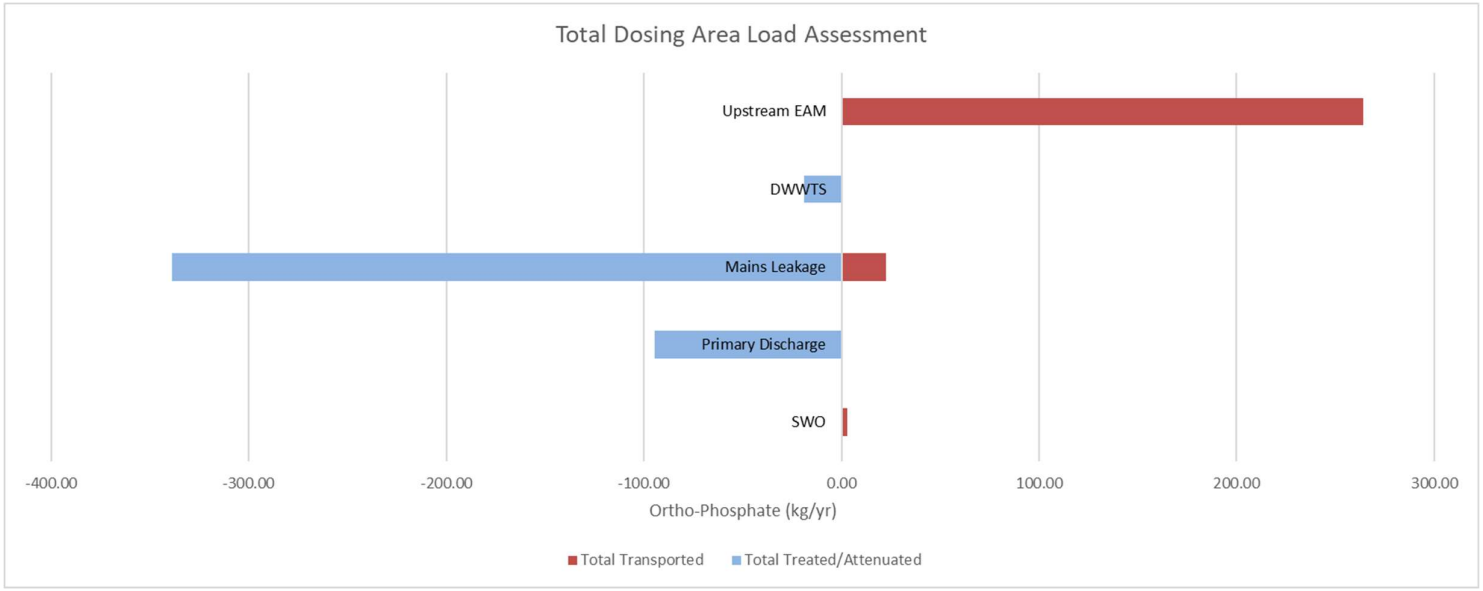

Figure 4: Upstream and downstream EAMs within WFD catchment

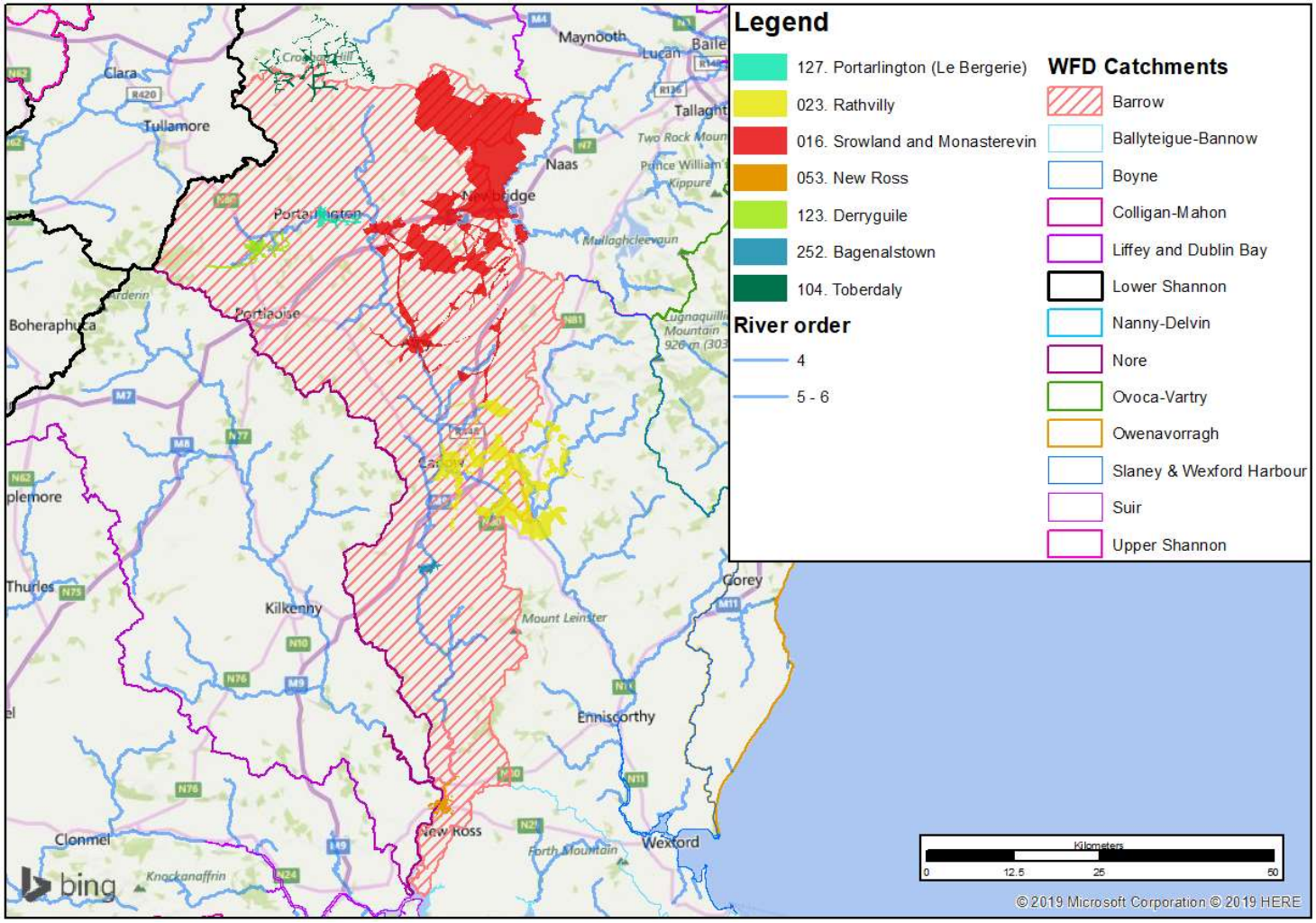

Figure 5: Red, Amber, Green (RAG) Status of waterbodies