Uisce Éireann

Lead in Drinking Water Mitigation Plan – 023 Carlow NR, Carlow Town and Tullow WSZs

Screening to inform Appropriate Assessment

January 2022

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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 issues, likely significant 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 Uisce Éireann (UÉ) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate (OP) dosing (herein referred to as the Project) of drinking water supplied by of drinking water supplied by Rathvilly, Sion Cross, Oak Hill and Tullow Water Treatment Plants (WTPs) in Co. Carlow to Carlow North Region (NR), Carlow Town and Tullow Water Supply Zones (WSZs).

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 Uisce Éireann, 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

Uisce Éireann, 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 UÉ 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 UÉ'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 (UÉ, 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 UÉ's ownership in private properties (UÉ, 2016). Lead can be dissolved in water as it travels through lead supply pipes and internal lead plumbing. When lead is in contact with water it can slowly dissolve, a process known as plumbosolvency. The degree

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] Uisce Éireann (UÉ) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

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 UÉ 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 (UÉ, 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. UÉ 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 UÉ. 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.

UÉ 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 Carlow NR and Tullow WSZs will be 0.5 mg/l P for treated water supplied from Rathvilly WTP and the OP dose rate for Carlow Town WSZ and two DMAs in Carlow North WSZ (Tinryland Kernanstown and Mortarstown) will be 0.8 mg/l P for treated water supplied from Oak Park WTP and Brownhill Reservoir (fed from Rathvilly and Sion Cross WTPs).

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 Sites. To facilitate the assessment of ant significant effect to 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 UÉ, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by UÉ 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, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- 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, 2017) 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 2019 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 2019d). 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 in European Sites.

3. DESCRIPTION OF THE PROJECT
3.1 DESCRIPTION OF THE PROPOSAL

Rathvilly WTP supplies 6,560 m^3/day to Carlow NR WSZ and Tullow WSZ. The average combined flow from Oak Park WTP and Brownshill Reservoir (fed from Rathvilly and Sion Cross WTPs) which supplies Carlow Town WSZ and two DMAs in Carlow North WSZ (Tinryland Kernanstown and Mortarstown) is 8,210 m^3/day. Brownshill Reservoir receives 3,270 m^3/day from Sion Cross WTP and supplies 1,200 m^3/day back into Carlow NR WSZ, 3,910 m^3/day direct to Carlow Town WSZ and 2,000 m^3/day to Oak Park Reservoir. Oak Park WTP supplies a further 1,100 m^3/day into Oak Park Reservoir, which supplies 3,100 m^3/day to Carlow Town WSZ. Carlow NR WSZ supplies water to Rathvilly, Rathoe, Ballon and parts of Tullow in Co. Carlow and Castledermot, Co. Kildare. Furthermore, the existing Tullow WTP is to be decommissioned and the Tullow WSZ is to be supplied with 1.2 MLD treated water from Rathvilly WTP – this report proceeds on this basis and assumes that the current Tullow WSZ will be supplied with water from Rathvilly WTP.

Approximately 54% of the flow is accounted for and this fixed rate for water mains leakage is assumed in all the WSZ. The Carlow NR, Carlow Town and Tullow WSZs boundaries collectively cover rural areas which are serviced by domestic wastewater treatment systems and a number of urban centres, including Carlow and Tullow, which are served by a number of WWTP agglomerations (Carlow WWTP, Palatine WWTP, Rathvilly WWTP, Castledermot WWTP, Tullow WWTP, Castleroe West WWTP, Timryland WWTP, Rathoe WWTP, Ballon WWTP and Nurney WWTP). The density of water mains is relatively low across the rural areas. There are an estimated 2,500 properties across the WSZs that are serviced by DWWTS.

Based on an assessment of the risk of lead exceedances, high plumbosolvency risk areas were identified in Carlow Town, Castledermot and Tullow. It is therefore recommended in the Plumbosolvency Control Plan for Carlow NR and Carlow Town WSZs that water from all three WTPs be OP dosed. Specifically, 0.5 mg/l P will be dosed at Rathvilly WTP (Figure 1) and 0.8 mg/l P for Sion Cross (Figure 2) and Oak Park (Figure 3) WTPs.

Figure 1: Location of Rathvilly Water Treatment Plant site, Co. Carlow

Figure 2: Location of the Sion Cross Water Treatment Plant site, Co.Carlow

Figure 3: Location of the Oak Park Water Treatment Plant site, Co. Carlow

3.1.1 Construction Works

The Plumbosolvency Control Plan Report has proposed that facilities for post pH correction be provided and utilised as part of the WTP works prior to OP dosing at Rathvilly WTP and Oak Park WTP. There are existing pH correction facilities at Sion Cross WTP.

The Pb Report has proposed that a bunded phosphoric acid storage tank (with internal heater and a storage capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply) and dosing installations housed in kiosks, should be installed on constructed concrete ground slabs, located within the site of the Rathvilly WTP, Sion Cross and Oak Park WTP sites. The required 60 days storage volume at the Rathvilly, Sion Cross and Oak Park WTPs corresponds to; 0.83 m^3, 0.42 m^3 and 0.14 m^3, respectively.

Facilities to raise the pH of the water to the recommended pH of 8.0 will also be installed at the WTPs. These facilities will consist of three / four free standing storage/ dilution tanks (with capacity for a minimum of 60 days dosing of sodium hydroxide/ sodium carbonate) with dosing pumps and control panel and an allowance for dry product storage (pallets / silos) plus conveying equipment, at each of the two proposed sites. The pH correction storage requirements for the plants are outlined here:

- Rathvilly: Two bulk storage tanks will hold c 14m^3 each and one batching tank of c 0.5m^3.
- Oak Park: Two bulk storage tanks will hold c 3.5m^3.

The scope of the **construction** works for the Rathvilly WTP, Sion Cross and Oak Park WTP sites will include:

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;
- Installation of pH correction facilities with an area of approximately 75 m^2 at Rathvilly WTP, and Oak Park WTP (a typical installation is shown in **Figure 4**). Exact locations will be confirmed following initial site assessment and investigations. Space for the construction of pH correction facilities available at Oak Park WTPs is limited within the existing site boundaries. The site has a total area of approximately 0.2 hectares. The boundary of the Rathvilly WTP site encompasses an area of approximately 3 hectares.

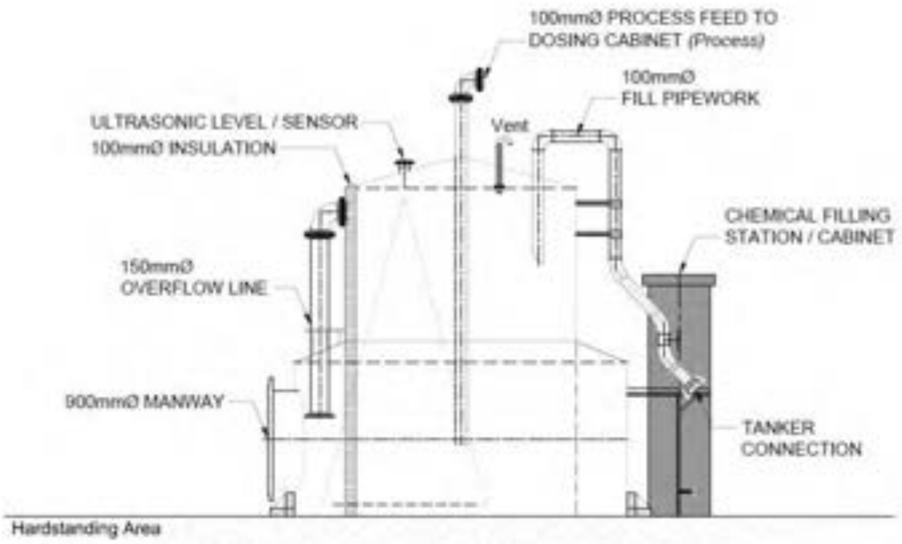

Figure 4 Sectional view of typical circular free-standing chemical storage tank.

- Installation of OP dosing units may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works; and will have an area of approximately 30 m² (a typical dosing unit is shown in **Figure 5** and **Figure 6**). Exact locations will be confirmed following initial site assessment and investigations.

- Kiosks will be required to house the OP dosing unit as there is insufficient storage space within the existing buildings. Kiosks will be housed on a concrete base with cast in ducts within the Reservoir site boundaries. A 1.0m wide concrete apron shall extend around the kiosk;

- Installation of the OP dosing units may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works; and

- Ancillary works may include, site clearance and demolition.

- It is proposed that the bunded phosphoric storage tanks (with internal heater and a storage capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply) and dosing units housed in a kiosk, will be installed on constructed concrete ground slabs, located within the site boundaries.

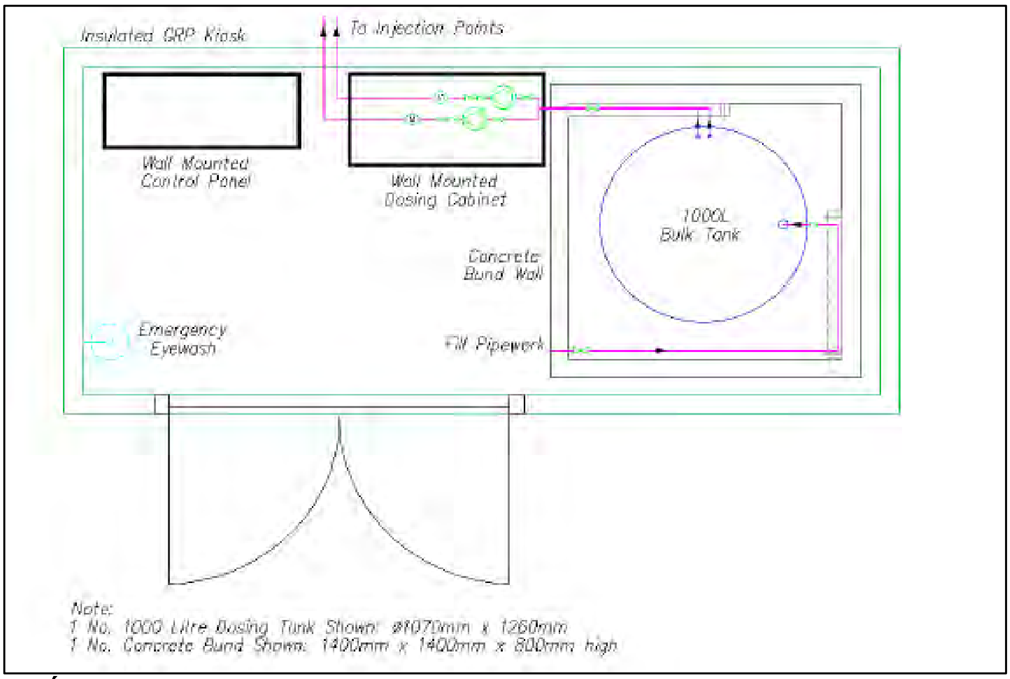

Figure 5: UÉ schematic of a bulk tank kiosk layout in H3PO4 Installation with 500 liters < bulk storage ≤ 6,000 litres.

Figure 6: Typical orthophosphate dosing unit

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 0.5 mg/l P for treated water from Rathvilly WTP to Carlow North WSZ and Tullow WSZ and 0.8 mg/l P for supply from Sion Cross and Oak Park to Carlow Town WSZ in a process similar to the addition of chlorine for disinfection. Similarly, pH correction will involve dosing NaOH/ Na_2CO_3 to treated water.

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, UÉ 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, UÉ 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 7**), 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 8** 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 orthophosphate dosing.

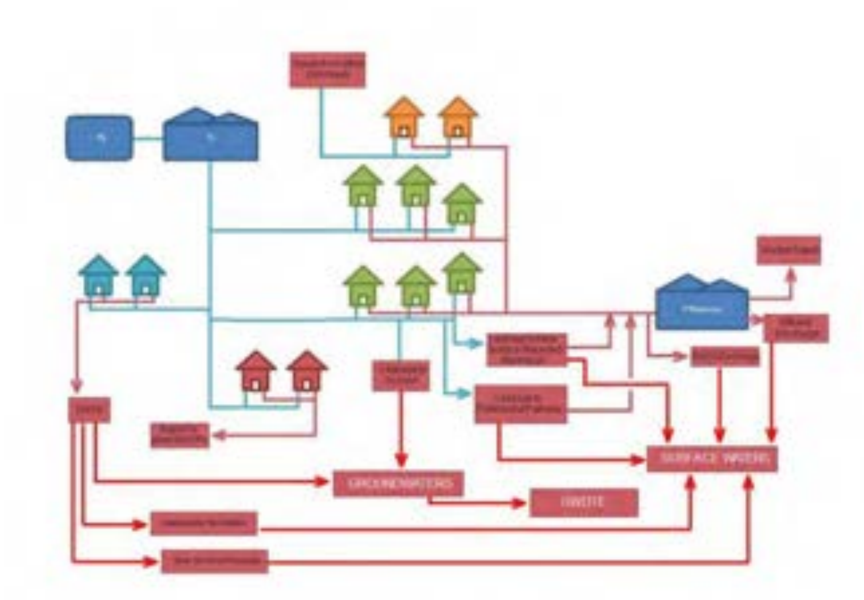

Figure 7 Conceptual Model of P Transfer

(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.)

Step 1 – Stage 1 Appropriate Assessment Screening

- **Identify downstream European Sites and qualifying features using water dependent database (Appendix B)**
- **Determine if qualifying features are nutrient sensitive from list of nutrient sensitive qualifying features.**
- **Apply the EAM in the context of conservation objectives for European Sites.**

Application of EAM

Step 2 – Direct Discharges to Surface Water

Calculate Increase in P Load to WWTP

- Determine proportion of WWTP influent to which dosing applies (D)
  Calculation of volume of dosed water based on WSZ daily production figures and leakage rates (Q_{wsz})
- Determine dosage concentration (dosage conc.)
- Establish increase in annual P load (*Δ influent P load* = Q_{wsz} **(dosage conc.)*D* (Eqn1)
- Determine new mass load to the WWTP **NTMP**= *Δ influent P load (as per Eqn. 1)+ Ê Load* (Eqn. 2)

Where Ê Load - Existing reported influent mass load or derived load based on OSPAR nutrient production rates

Calculate Effluent P Loads and Concentrations Post Dosing

New WWTP effluent TP-load **NLP**

Tertiary Treatment *- NLP = (Ê Load)*(%TE) (Eqn. 3)

Secondary or less *- NLP = (Ê Load)(%TE) + Δ influent P load (Eqn 4)*

Where

Ê Load as per above

%TE - is the treatment plant percentage efficiency in removing TP (derived from AER data or OSPAR guidance)

TP Concentration *(NCP as per Eqn. 5)*

NCP = (NLP / Q_{WWTP})(1000) (Eqn. 5)$_{WTP}$ is the average annual hydraulic load to WWTP from AER or derived from PE and typical daily production figures

Estimate Nutrient Loads from Untreated Sewage Discharged via Storm Water Overflows

- The existing untreated sewage load via SWOs is estimated based on an assumed percentage loss of the WWTP load: *Load$_{untreated}$(Existing) = (WWTP Influent Load (kg yr^{-1}) / (1 + %LOSS)) * %LOSS* (Eqn 6)
- This can be modified to account for the increased P loading due to P-dosing at drinking water plants Load$_{untreated}$(Dosing) = (WWTP **NTMP** (kg yr^{-1}) / (1 + %LOSS)) * %LOSS (Eqn. 7)
- The pre and post-dosing SWO calculated loads are converted to concentrations using an assumed loss of 3% of the WWTP hydraulic load

*SWO Q= (WWTP Influent Q (m^3 yr^{-1}) / (1 + %LOSS)) * %LOSS* (Eqn 8)

and

SWO TP Conc = *Load$_{untreated}$(X) / SWO Q (Eqn 9)*

Step 3 – Assess Potential Impact on Receiving Waterbodies

Apply Mass Balance equations incorporating primary discharge to establish likely increases in concentrations downstream of the agglomeration. Continue to Step 5.

Step 4 – Sub Surface Pathways

Calculate Load from Mains Leakage

Additional Loading due to leakage

- Leakage Rate (m^3/day) calculated from WTP production figures, WSZ import/export data, latest metering data and demand estimates on a WSZ basis where data available.
- Load rate = dosage concentration * Leakage Rate

P load per m = Load rate / Length of water main

Load to Pathways

- Constrained to location of water mains and assuming load infiltrates to GW unless in low subsoil or rejected recharge conditions or infiltration to sewers in urban environment.

P (kg/m/yr) = P load per m * trench coeff

- Flow in preferential pathway = Hydraulic load x % routed to NS Pathway Eqn. 10
- Subsurface flow = Hydraulic Load – Pref. Pathway flow if No Rech Cap, otherwise rejected recharge is redirected to Near Surface Pathway Eqn. 11
- Near surface flow = Hydraulic Load - Pref. Pathway flow – subsurface flow Eqn. 12
- P Load to GW = P (kg/m/yr) x subsurface flow % x (1 - P atten to 1m) x (1 - P atten > 1m) Eqn. 13

Near surface flows combined with preferential flows:

- P load to NS = P (kg/m/yr) x near surface flow % x (1 – P atten in NS) Eqn. 14

P load to SW (kg/m/yr) = P Load to NS + P load to GW

Calculate Load from Domestic Wastewater Treatment Systems

Additional Loading from DWTS

Water consumption per person assumed to be 105 l/day. Each household assumed to have 2.7 people therefore annual hydraulic load calculated on this basis for each household and summed for water supply zones where DWTS are presumed present

Additional P load is calculated based on dosing rate and hydraulic load derived for each household assumed to be on DWTS

Load reaching groundwater

P load to GW (kg/yr) = Load from DWTS (kg/yr) x MRC x Subsoil TF Eqn. 14

P load to NS (kg/yr) = Load from DWTS (kg/yr) x Biomat F x (1 –MRC) x NS TF Eqn. 15

Additional load direct to surface water from septic tanks is estimated in areas of low subsoil permeability and close to water bodies.

P load to SW (kg/yr) = Load direct to SW + P load to GW + P load to NS

Step 5 – Assessment of loads and concentrations from different sources to GW and SW Receptors

Determine combined direct discharges, DWTS and leakage loads and concentrations to SW and GW to determine significance. Continue to Step 6.

Step 6 – Assessment of Potential Impact of Surface and Sub surface Pathways on the receptors.

Combine loads from direct discharges, DWTS and leakage and assess potential impact based on the existing status, trends and capacity of the water bodies to assimilate additional P loads. For European Sites the assessment will also be based on the Site Specific Conservation Objectives

Figure 8 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

Rathvilly WTP site boundary borders the Slaney River (Slaney_070 river waterbody), which is part of the River Slaney SAC (Figure 9). However, the existing WTP site is made up entirely of hard standing surface and amenity grassland and has no habitat or species for which the SAC is designated within its footprint. All proposed works are within the footprint of the WTP site. The construction works are limited to the placement of a concrete plinth no more than 15 m^2 within the existing hardstanding surface thus requiring minimal excavation. The extent of excavation for pipework is further limited in scale.

It is considered that, given the scale (~15 m^2) of the construction of a concrete base for the prefabricate OP Dosing Units, pH correction facilities and associated pipework, the short duration of the works and the nature of the works that there is no potential for significant effects arising during the construction phase of the project. Consideration of potential construction impacts and pathways for significant effects on the proximate SAC is in the absence of mitigation and with the acknowledgement that the Dosing Units are within the existing WTP site compound. The potential for effects on the individual qualifying interests and the conservation objectives of the River Slaney SAC is discussed further in Section 5 and 6 of this report.

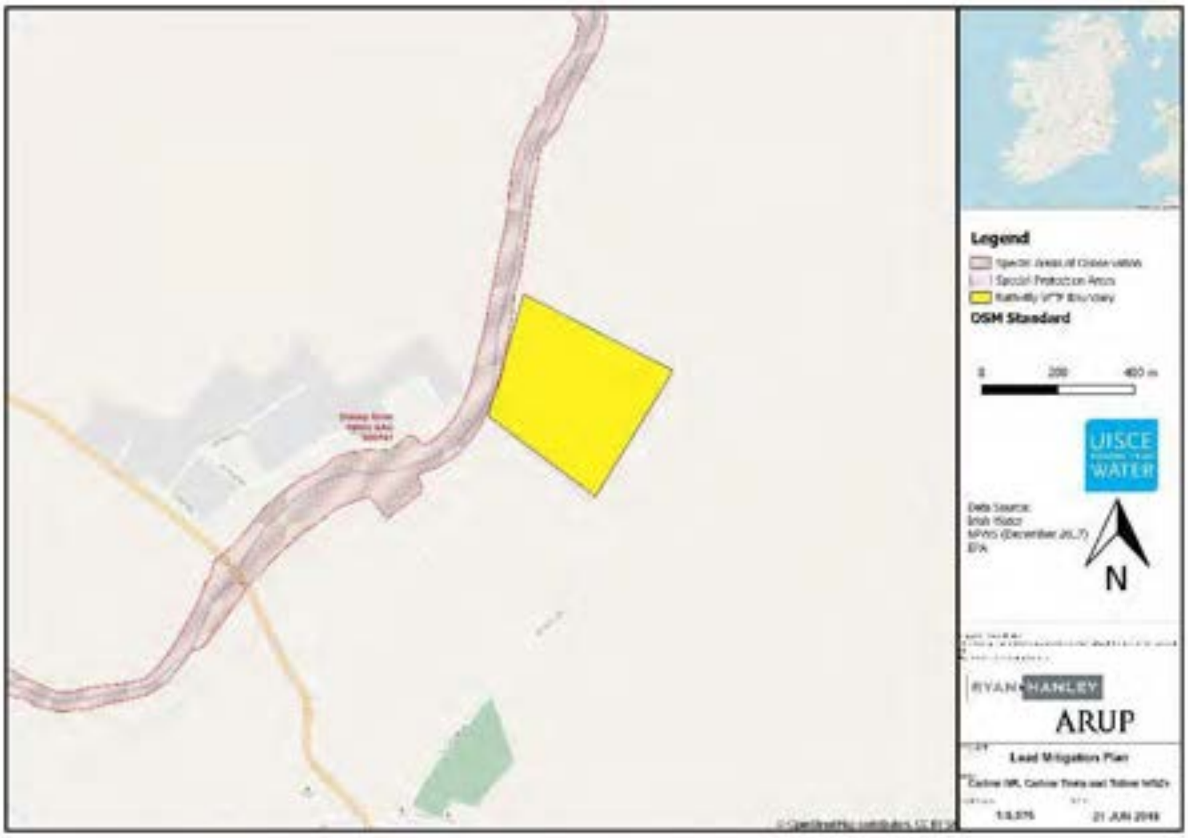

Figure 9: Location of the Rathvilly Water Treatment Plant site with respect to European Sites

Sion Cross WTP site boundary is located approximately 3.5km north of the River Burren (Burren_060 river waterbody). This river waterbody flows into the main channel of the River Barrow approximately 4.4 km downstream. The River Barrow forms part of the River Barrow and River Nore SAC at this point (Figure 10). Given the location (outside of any European Site boundary, a significant distance upstream of the European Site and located entirely within the Sion Cross WTP site boundary), and taking account of the scale (~30 m^2) of the construction of the OP Dosing Unit for the proposed scheme, the potential for direct or indirect impacts during construction at Sion Cross WTP can be screened out at an early stage.

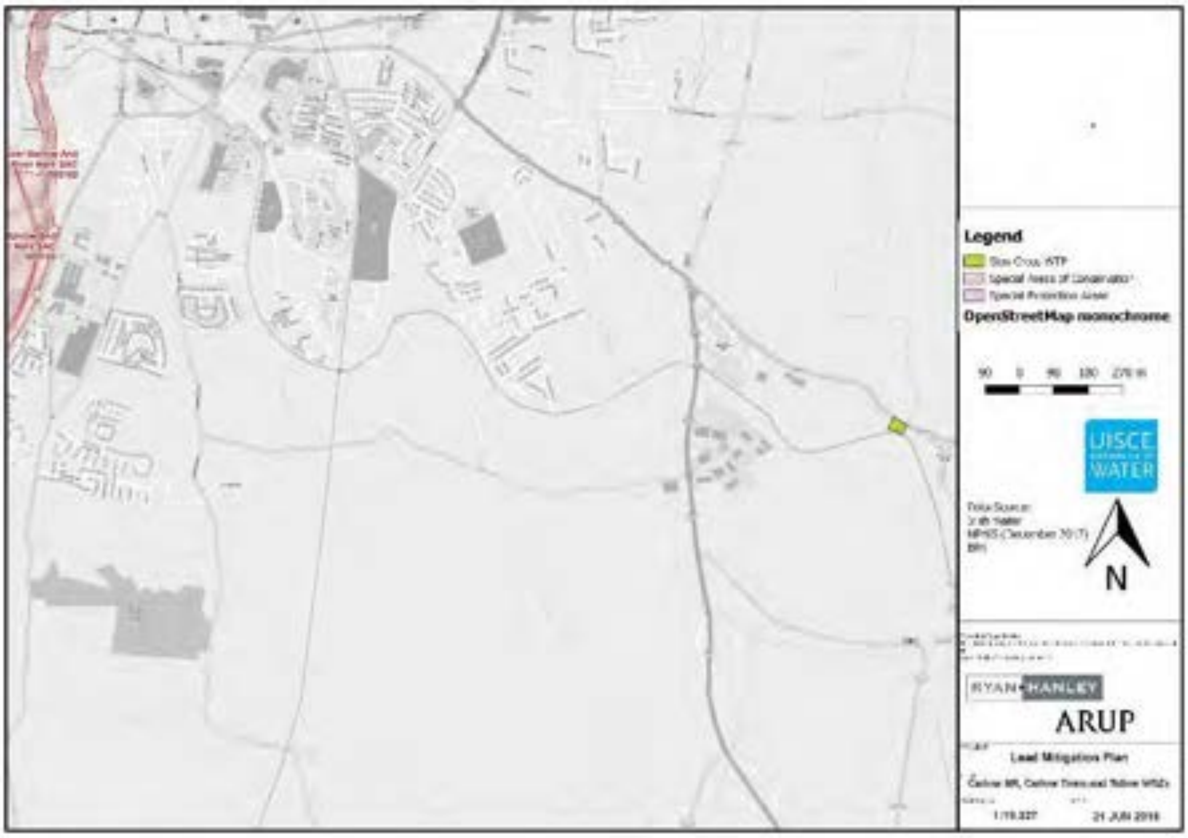

Figure 10 Location of the Sion Cross Water Treatment Plant site with respect to European Sites

Oak Park WTP site boundary is located approximately 706 m east of the main channel of the River Barrow (Barrow_160 river waterbody). The River Barrow forms part of the River Barrow and River Nore SAC at this point (Figure 11). There will be direct and indirect impacts within the construction works ZoI. However, given the location and taking account of the scales of the construction of the OP dosing unit for the proposed scheme, these direct and indirect construction impacts at Oak Park WTP will not have a significant adverse effect on European Sites, and are henceforth screened out. Consideration of potential impact is in the absence of mitigation and with the acknowledgement that the Dosing Units are within the existing UÉ site and the construction elements do not include any designated European Sites within the Zone of Influence. Therefore construction impacts are not assessed further.

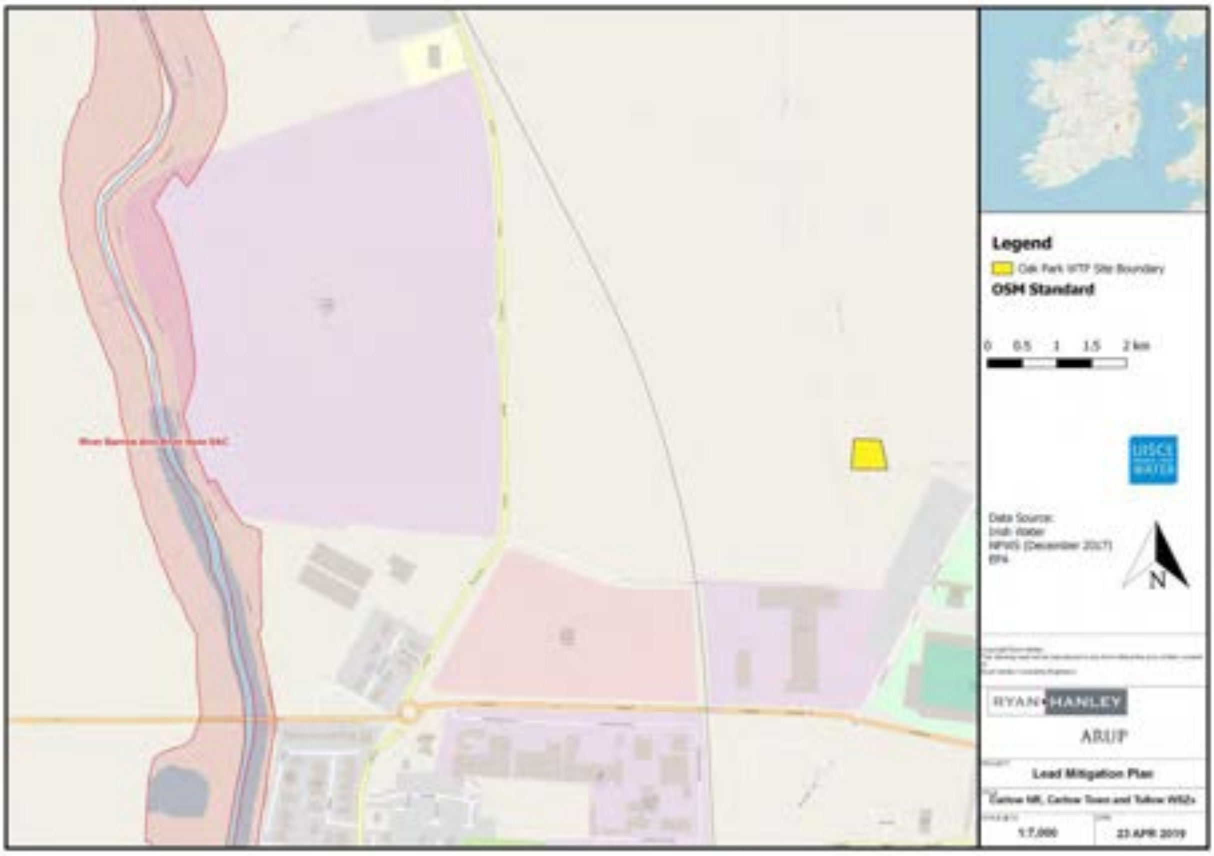

Figure 11 Location of the Oak Park Water Treatment Plant site with respect to European Sites

4.1.2 Operational Phase

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 activities ZoI, which was determined by establishing the potential for hydrological and hydrogeological connectivity between the Rathvilly, Sion Cross and Oak Park WTPs 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 12**.

The EAM process identified 32 river waterbodies and 2 transitional waterbodies (highlighted in bold) potentially impacted following OP dosing of drinking water. This AA Screening identifies the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites:

- Slaney_070 (IE_SE_12S021010) river waterbody flowing into the Slaney_080 (IE_SE_12S021100), the Slaney_090 (IE_SE_12S021200), the Slaney_100 (IE_SE_12S021400), the Slaney_110 (IE_SE_12S021600), the Slaney_120, the Slaney_130, the Slaney_140, the Slaney_150, the Slaney_160, the Slaney_170 river waterbodies and into the Upper Slaney Estuary (IE_SE_040_0300) transitional waterbody, the Lower Slaney Estuary transitional waterbody and Wexford Harbour coastal waterbody.
- Dereen_70 (IE_SE_12D010500) river waterbody flowing into the Dereen_80 (IE_SE_12D010550), Dereen_90 (IE_SE_12D010600), Dereen_100 (IE_SE_12D010800), Slaney_080 (IE_SE_12S021100), Slaney_090 (IE_SE_12S021200), Slaney_100 (IE_SE_12S021400), Slaney_110 (IE_SE_12S021600), Slaney_120, Slaney_130, Slaney_140, Slaney_150, Slaney_160, Slaney_170 river waterbodies and into the Upper Slaney Estuary

(IE_SE_040_0300) transitional waterbody, the Lower Slaney Estuary transitional waterbody and Wexford Harbour coastal waterbody.

- Blacklion Stream (Carlow)_010 (IE_SE_12B040250) river waterbody flowing into the Blacklion Stream (Carlow)_020 (IE_SE_12B040400), Dereen_100 (IE_SE_12D010800), Slaney_080 (IE_SE_12S021100), Slaney_090 (IE_SE_12S021200), Slaney_100 (IE_SE_12S021400), Slaney_110 (IE_SE_12S021600), Slaney_120, Slaney_130, Slaney_140, Slaney_150, Slaney_160, Slaney_170 river waterbodies and into the Upper Slaney Estuary (IE_SE_040_0300) transitional waterbody, the Lower Slaney Estuary transitional waterbody and Wexford Harbour coastal waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody flowing into the Lerr_020 (IE_SE_14L010155), Lerr_030 (IE_SE_14L010250), Lerr_040 (IE_SE_14L010300), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 river waterbodies, the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Greese_060 (IE_SE_14G040600) river waterbody flowing into the Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230 and the Barrow_240 river waterbodies the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Aghalona_010 (IE_SE_14A020100) river waterbody flowing into the Aghalona_020 (IE_SE_14A020200), Burren_050 (IE_SE_14B050400), Burren_060 (IE_SE_14B050500), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Roscat_010 (IE_SE_14R330970), Burren_050 (IE_SE_14B050400), Burren_060 (IE_SE_14B050500), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Burren_040 (IE_SE_14B050310), Burren_050 (IE_SE_14B050400), Burren_060 (IE_SE_14B050500), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Ballynaboley Stream_010 (IE_SE_14B080700), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Graney (Lerr)_010 (IE_SE_14G070200), Graney (Lerr)_020 (IE_SE_14G070310), Lerr_020 (IE_SE_14L010155), Lerr_030 (IE_SE_14L010250), Lerr_040 (IE_SE_14L010300), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Palatine Stream_010 (IE_SE_14P040200), Lerr_030 (IE_SE_14L010250), Lerr_040 (IE_SE_14L010300), Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Barrow_190, Barrow_200, Barrow_210, Barrow_220, Barrow_230, Barrow_240 the Upper Barrow Estuary (IE_SE_100_0300) transitional waterbody, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint), Barrow Suir Nore Estuary transitional waterbodies and Waterford Harbour coastal waterbody.

- Clonmore Stream_010 (IE_SE_12C050100), Dereen_80 (IE_SE_12D010550), Dereen_90 (IE_SE_12D010600), Dereen_100 (IE_SE_12D010800), Slaney_080 (IE_SE_12S021100), Slaney_090 (IE_SE_12S021200), Slaney_100 (IE_SE_12S021400), Slaney_110 (IE_SE_12S021600), Slaney_120, Slaney_130, Slaney_140, Slaney_150, Slaney_160, Slaney_170 and into the Upper Slaney Estuary (IE_SE_040_0300) transitional waterbody, the Lower Slaney Estuary transitional waterbody and Wexford Harbour coastal waterbody.

- Ballaghmore Distributary (IE_SE_12B120990), Douglas (Ballon) (IE_SE_12D030400), Slaney_110 (IE_SE_12S021600), Slaney_120, Slaney_130, Slaney_140, Slaney_150, Slaney_160, Slaney_170 and into the Upper Slaney Estuary (IE_SE_040_0300) transitional waterbody, the Lower Slaney Estuary transitional waterbody and Wexford Harbour coastal waterbody

The EAM process identified 7 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:

- **Athy-Bagnelstown Gravels (IE_SE_G_160)**;
- **Bagenalstown Lower (IE_SE_G_157)**;
- **Ballyglass (IE_SE_G_011)**;
- **Burren Valley Gravels (IE_SE_G_023)**;
- **New Ross (IE_SE_G_152)**.

Ballyglass (IE_SE_G_023) is the largest groundwater body (1397 km^2) in the South East River Basin District accounting for approximately one third of the county. The discharge of groundwater will be focused to the surface water bodies as baseflow. Discharge may be higher in granite areas where baseflow analysis has shown a higher contribution of groundwater to river flow. In general, over the whole of the groundwater body flow paths are considered to be short and probably only extend to the closest surface water body. As a result of this only those European Sites within a 300m radius of Ballyglass are considered in the ZoI, specifically Wicklow Mountains SAC and SPA are not considered further. European Sites within the ZoI are listed in **Table 1** and are displayed in **Figure 11**.

Blackstairs Mountains SAC and Holdenstown Bog SAC are situated upstream of the dosing area and so are not considered further.

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
Raven Point Nature Reserve SAC	000710	Yes	Yes	Yes
Hook Head SAC	000764	Yes	Yes	Yes
Slaney River Valley SAC	000781	Yes	Yes	Yes
River Barrow And River Nore SAC	002162	Yes	Yes	Yes
The Raven SPA	004019	Yes	Yes	Yes
Wexford Harbour and Slobs SPA	004076	Yes	Yes	Yes

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 and construction 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.**

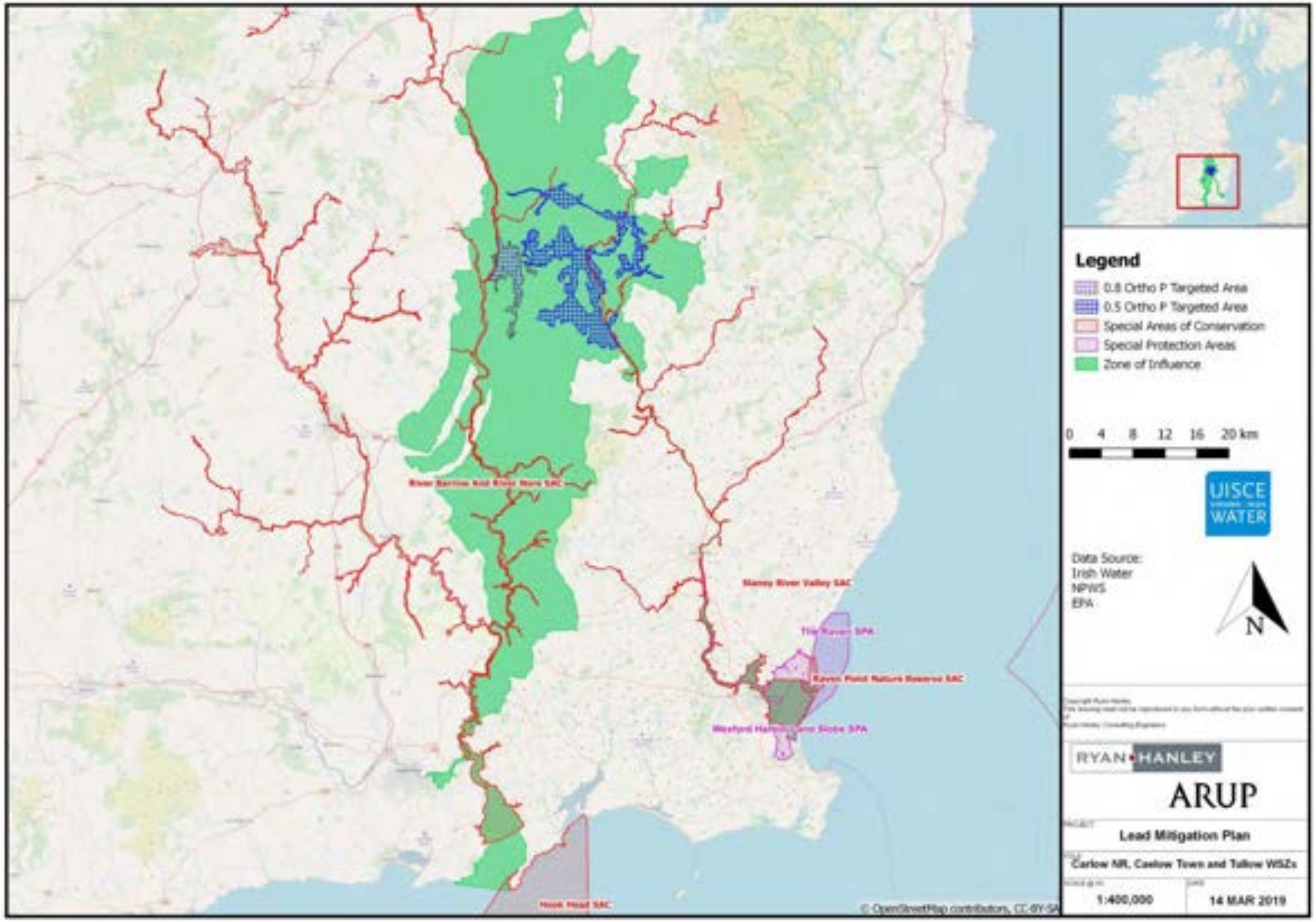

Figure 12 European Sites within the ZoI of the Proposed Project

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
Raven Point Nature Reserve	**SAC 000710**	**2nd Dec 2011**	1140	Tidal mudflats	Yes	Yes	Yes for Operational ZoI
			1210	Annual vegetation of drift lines	Yes	Yes	
			1330	Atlantic salt meadows	Yes	Yes	
			2110	Embryonic shifting dunes	Yes	Yes	
			2120	Marram dunes (white dunes)	Yes	Yes	
			2130	Fixed dunes (grey dunes)*	Yes	Yes	
			2170	Dunes with creeping willow	Yes	Yes	
			2190	Humid dune slacks	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	Sea cliffs	Yes	Yes	
Slaney River Valley	**SAC 000781**	**21st Oct 2011**	1029	Freshwater Pearl Mussel *Margaritifera margaritifera*	Yes	Yes	Yes for Construction and Operational ZoI
			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	
			1355	Otter Lutra lutra	Yes	Yes	
			1365	Harbour Seal Phoca vitulina	Yes	Yes	
			3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Yes	Yes	
			91A0	Old oak woodlands	No	Yes	
			91E0	Residual alluvial forests*	Yes	Yes	
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	

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
			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	
The Raven	**SPA 004019**	**21st Mar 2012**	A001	Red-throated Diver *Gavia stellata*	Yes	Yes	Yes for Operational ZoI
			A017	Cormorant *Phalacrocorax carbo*	Yes	Yes	
			A065	Common Scoter *Melanitta nigra*	Yes	Yes	
			A141	Grey Plover *Pluvialis squatarola*	Yes	Yes	
			A144	Sanderling *Calidris alba*	Yes	Yes	
			A395	Greenland White-fronted goose *Anser albifrons flavirostris*	Yes	Yes	
			A999	Wetlands	Yes	Yes	
Wexford Harbour and Slobs	**SPA 004076**	**21st Mar 2012**	A004	Little Grebe *Tachybaptus ruficollis*	Yes	Yes	Yes for Operational ZoI
			A005	Great Crested Grebe *Podiceps cristatus*	Yes	Yes	
			A017	Cormorant *Phalacrocorax carbo*	Yes	Yes	
			A028	Grey Heron *Ardea cinerea*	Yes	Yes	
			A037	Bewick's Swan *Cygnus columbianus*	Yes	Yes	
			A038	Whooper Swan *Cygnus cygnus*	Yes	Yes	

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
			A046	Light-bellied Brent Goose *Branta bernicla hrota*	Yes	Yes	
			A048	Shelduck *Tadorna tadorna*	Yes	Yes	
			A050	Wigeon *Anas penelope*	Yes	Yes	
			A052	Teal *Anas crecca*	Yes	Yes	
			A053	Mallard *Anas platyrhynchos*	Yes	Yes	
			A054	Pintail *Anas acuta*	Yes	Yes	
			A062	Scaup *Aythya marila*	Yes	Yes	
			A067	Goldeneye *Bucephala clangula*	Yes	Yes	
			A069	Red-breasted Merganser *Mergus serrator*	Yes	Yes	
			A082	Hen Harrier *Circus cyaneus*	Yes	Yes	
			A125	Coot *Fulica atra*	Yes	Yes	
			A130	Oystercatcher *Haematopus ostralegus*	Yes	Yes	
			A140	Golden Plover *Pluvialis apricaria*	Yes	Yes	
			A141	Grey Plover *Pluvialis squatarola*	Yes	Yes	
			A142	Lapwing *Vanellus vanellus*	Yes	Yes	
			A143	Knot *Calidris canutus*	Yes	Yes	
			A144	Sanderling *Calidris alba*	Yes	Yes	
			A149	Dunlin *Calidris alpina*	Yes	Yes	
			A156	Black-tailed Godwit *Limosa limosa*	Yes	Yes	
			A157	Bar-tailed Godwit *Limosa lapponica*	Yes	Yes	
			A160	Curlew *Numenius arquata*	Yes	Yes	
			A162	Redshank *Tringa totanus*	Yes	Yes	
			A179	Black-headed Gull *Chroicocephalus ridibundus*	Yes	Yes	
			A183	Lesser Black-backed Gull *Larus fuscus*	Yes	Yes	
			A195	Little Tern *Sterna albifrons*	Yes	Yes	
			A395	Greenland White-fronted goose *Anser albifrons flavirostris*	Yes	Yes	
			A999	Wetlands	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

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).

Construction Phase

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

- Increases in suspended sediment and hydrocarbons to receiving waterbodies during site works and connectivity to European Sites;
- Direct habitat loss;
- Disturbance of species during construction; and
- Potential for spread of invasive species.

These construction phase impacts and the potential for significant effects are assessed further in Section 5.3 and again in Section 6.

Operational Phase

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 to any such effect;

- The discharge of additional P loads to the environment (through surface and sub-surface pathways) may have implications for on 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 orthophosphate;
- 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 CONSTRUCTION IMPACTS

Rathvilly WTP site borders the River Slaney (Slaney_070 waterbody) and forms part of the River Slaney SAC boundary (Figure 9). There will be no direct habitat loss associated with the proposed project as the existing WTP site is made up entirely of hard standing surface and has no habitat or species for which the SAC is designated within its footprint. All proposed works are within the WTP site boundary. Similarly, there will be no potential for disturbance to species during the construction and the site does not provide a corridor to suitable wildlife habitat, as the site boundary is already defined and utilised as a WTP and construction activities are limited to within the site boundary. In order to prevent the introduction and spread of invasive species as a result of importation of material contaminated with invasive species, all works will be carried out in line with standard UÉ protocols for management of invasive species within their property holdings. The significance of any construction related impacts leading to increases in suspended sediment and hydrocarbons to receiving waterbodies will be evaluated further in section 6.1.

5.4 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 Rathvilly, Oak Park and Sion Cross WTPs. 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 P. River waterbodies with mean phosphate concentrations of 0.0275 mg/l P have 75% capacity left, i.e. high capacity, while river waterbodies with a mean of 0.0325 mg/l P 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 for significant effects 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. This assessment has been carried out using existing WFD App data (2014).

Baseline Orthophosphate monitoring data and associated thresholds are available for all RWBs with the exception of seven RWBs (Ballynaboley Stream_010, Derreen_070, Graney (Lerr)_010, Graney (Lerr)_020, Lerr_030, Roscat_010 and Slaney_090). Where existing monitoring data is not available, a surrogate status is derived from the OP indicative quality of adjacent RWBs. The mid-range of that surrogate status is used as baseline concentration.

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[4] and Trends[5]	Baseline[6] Ortho P Conc.[7] (mg/l)	75% of Status Threshold (mg/l)	Cumulative P load to SW[8]	Modelled Conc.[9] (mg/l)	Baseline Conc. @ 0.8 mg/l dosing rate	Evaluation
Raven Point Nature Reserve SAC (000710)	Wexford Harbour	CWB	Summer High/ Winter High	0.0025/ 0.0240	0.0188	74.4	0.00005	0.0025/ 0.0240	No risk of deterioration in status.
Hook Head SAC (000764)	Waterford Harbour	CWB	Summer High/ Winter High	0.0060/ 0.0230	0.0188	669.3	0.0001	0.0061/ 0.0231	No risk of deterioration in status.
Slaney River Valley SAC (000781)	Ballyglass	GWB	Good	0.0258	0.02625	1.1	0.00001	0.0258	No risk of deterioration in status.
	Derreen_070	RWB	*Good*	0.0300	0.0325	0.8	0.00001	0.0300	No risk of deterioration in status.
	Derreen_080	RWB	Good	0.0263	0.0325	1.4	0.00001	0.0263	No risk of deterioration in status.
	Derreen_090	RWB	Good	0.0317	0.0325	3.9	0.00002	0.0317	No risk of deterioration in status.
	Derreen_100	RWB	Good	0.0277	0.0325	5.3	0.00002	0.0277	No risk of deterioration in status.
	Slaney_070	RWB	High	0.0123	0.0188	1.3	0.00001	0.0123	No risk of deterioration in status.
	Slaney_080	RWB	High	0.0188	0.0188	2.5	0.00001	0.0188	No risk of deterioration in status.
	Slaney_090	RWB	*High*	0.0125	0.0188	2.6	0.00001	0.0125	No risk of deterioration in status.
	Slaney_100	RWB	High	0.0195	0.0188	65.3	0.0003	0.0197*	No risk of deterioration in status.
	Slaney_110	RWB	High	0.0226	0.0188	74.4	0.0002	0.0227*	No risk of deterioration in status.
	Slaney_120	RWB	High	0.0237	0.0188	74.6	0.0001	0.0238*	No risk of deterioration in status.
	Slaney_130	RWB	Good	0.0306	0.0325	74.6	0.0001	0.0307	No risk of deterioration in status.
	Slaney_140	RWB	High	0.0237	0.0188	74.6	0.0001	0.0238*	No risk of deterioration in status.
	Slaney_150	RWB	High	0.0173	0.0188	74.6	0.0001	0.0174	No risk of deterioration in status.
	Slaney_160	RWB	High	0.0125	0.0188	91.8	0.0001	0.0126	No risk of deterioration in status.
	Slaney_170	RWB	High	0.0246	0.0188	115.1	0.0001	0.0247*	No risk of deterioration in status.

[3] Monitoring period is annual unless specified.
[4] Surrogate Status indicated in italic.
[5] Distance to threshold in parentheses.
[6] Baseline year is 2021.
[7] Surrogate concentration is given in italic mg/l
[8] Cumulative P load to SW from Upstream Dosing Areas, Leakage, DWWTS and agglomerations (kg/yr)
[9] Values above 5% of Good / High boundary (0.00125 mg/l P) for SW or 5% of Good / Fail boundary (0.00175 mg/l P) for GW highlighted in yellow.
*Baseline concentration > 75% of threshold but dosing concentration is insignificant.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] Ortho P Conc.[7] (mg/l)	75% of Status Threshold (mg/l)	Cumulative P load to SW[8]	Modelled Conc.[9] (mg/l)	Baseline Conc. @ 0.8 mg/l dosing rate	Evaluation
	Upper Slaney Estuary	TWB	Summer High/ Winter High	0.0210 0.0220	0.0188	74.4	0.0001	0.0211/ 0.0221	No risk of deterioration in status.
	Lower Slaney Estuary	TWB	Summer High/ Winter Good	0.0140/ 0.0280	0.0188 / 0.0363	74.4	0.00005	0.0140/ 0.0280	No risk of deterioration in status.
	Wexford Harbour	CWB	Summer High/ Winter High	0.0025/ 0.0240	0.0188	74.4	0.00005	0.0025/ 0.0240	No risk of deterioration in status.
River Barrow and River Nore SAC (002162)	New Ross	GWB	Good	0.0095	0.02625	2.0	0.00002	0.0095	No risk of deterioration in status.
	Bagenalstown Lower	GWB	Good	0.0050	0.02625	22.4	0.0007	0.0057	No risk of deterioration in status.
	Athy-Bagenalstown Gravels	GWB	Good	0.0141	0.02625	5.8	0.0002	0.0143	No risk of deterioration in status.
	Barrow_160	RWB	Good	0.0278	0.0325	639.8	0.0006	0.0284	No risk of deterioration in status.
	Barrow_170	RWB	Good	0.0262	0.0325	660.0	0.0005	0.0267	No risk of deterioration in status.
	Barrow_180	RWB	High	0.0246	0.0188	669.3	0.0005	0.0250*	No risk of deterioration in status.
	Lerr_010	RWB	Moderate	0.0491	0.0508	1.5	0.0001	0.0492	No risk of deterioration in status.
	Lerr_020	RWB	Poor	0.0613	0.0868	7.4	0.0002	0.0615	No risk of deterioration in status.
	Lerr_030	RWB	*Moderate*	0.0455	0.0508	11.5	0.0002	0.0457	No risk of deterioration in status.
	Lerr_040	RWB	Moderate	0.0526	0.0508	11.7	0.0002	0.0528*	No risk of deterioration in status.
	Barrow_190	RWB	Good	0.0337	0.0325	671.5	0.0005	0.0342*	No risk of deterioration in status.
	Barrow_200	RWB	Good	0.0252	0.0325	904.3	0.0007	0.0259	No risk of deterioration in status.
	Barrow_210	RWB	Good	0.0255	0.0325	906.1	0.0006	0.0261	No risk of deterioration in status.
	Barrow_220	RWB	High	0.0227	0.0188	906.1	0.0006	0.0233*	No risk of deterioration in status.
	Barrow_230	RWB	High	0.0241	0.0188	906.1	0.0005	0.0246*	No risk of deterioration in status.
	Barrow_240	RWB	High	0.0213	0.0188	906.1	0.0005	0.0218*	No risk of deterioration in status.
	Upper Barrow Estuary	TWB	Summer High/ Winter Good	0.0150/ 0.0270	0.0188 / 0.0363	669.3	0.0004	0.0154/ 0.0274	No risk of deterioration in status.
	Barrow Nore Estuary Upper	TWB	Summer High/ Winter Good	0.0235/ 0.0315	0.0188 /	669.3	0.0002	0.0237/ 0.0317	No risk of deterioration in status.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] Ortho P Conc.[7] (mg/l)	75% of Status Threshold (mg/l)	Cumulative P load to SW[8]	Modelled Conc.[9] (mg/l)	Baseline Conc. @ 0.8 mg/l dosing rate	Evaluation
					0.0363				
	New Ross Port	TWB	Summer Good Winter Good	0.0320	0.0363	669.3	0.0002	0.0322	No risk of deterioration in status.
	Lower Suir Estuary (Little Island Cheekpoint)	TWB	Summer Good Winter Good	0.0375/0.0380	0.0363	669.3	0.0001	0.0376/ 0.0381	No risk of deterioration in status.
	Barrow Suir Nore Estuary	TWB	Sumer High/ Winter Good	0.0235/ 0.0315	0.0188 / 0.0363	669.3	0.0001	0.0236/ 0.0316	No risk of deterioration in status.
The Raven SPA (004019)	Wexford Harbour	CWB	Summer High/ Winter High	0.0025/ 0.0240	0.0188	74.4	0.00005	0.0025/ 0.0240	No risk of deterioration in status.
Wexford Harbour and Slobs SPA (004076)	Wexford Harbour	CWB	Summer High/ Winter High	0.0025/ 0.0240	0.0188	74.4	0.00005	0.0025/ 0.0240	No risk of deterioration in status.

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 Orthophosphate indicative water quality the existing situation prior to OP 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 = 0.5 mg/l P at Rathvilly WTP and 0.8 mg/l P at Oak Park and Sion Cross WTPs

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%)*		
				0.5	*0.4*	*0.68*
Ardattin No 2 Agglom	**No ELVs**	Existing	27	3.74	2.99	5.08
		Post Dosing	33	4.52	3.62	6.15
		% Increase	21%	21%	21%	21%
Ballon Primary Discharge	**Total Phosphate 1mg/l**	Existing	15	0.13	0.10	0.18
		Post Dosing	15	0.13	0.10	0.18
		% Increase	0%	0%	0%	0%
Ballon SWO (1 No.)		Existing	13	0.55	0.44	0.75
		Post Dosing	13	0.55	0.44	0.75
Castledermot Primary Discharge	**Total Phosphate 0.7mg/l Ortho-phosphate 0.3mg/l**	Existing	62	0.15	0.12	0.21
		Post Dosing	62	0.15	0.12	0.21
		% Increase	0%	0%	0%	0%
Castledermot SWOs (2 No.)		Existing	27	0.32	0.26	0.44
		Post Dosing	28	0.34	0.27	0.47
Castleroe Primary Discharge	**No ELV**	Existing	77	3.74	2.99	5.08
		Post Dosing	93	4.54	3.63	6.17
		% Increase	22%	22%	22%	22%
Palatine Primary Discharge	**Ortho-phosphate 0.6mg/l**	Existing	64	0.42	0.33	0.57
		Post Dosing	64	0.42	0.33	0.57
		% Increase	0%	0%	0%	0%
Palatine SWO (1 No.)		Existing	12	0.37	0.29	0.50
		Post Dosing	13	0.40	0.32	0.54

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%)		
				0.5	0.4	0.68
Rathoe Primary Discharge	Total Phosphate 1mg/l Ortho-phosphate 0.38mg/l	Existing	6	0.16	0.13	0.21
		Post Dosing	6	0.16	0.13	0.21
		% Increase	0%	0%	0%	0%
Rathoe SWO (1 No.)		Existing	7	0.97	0.77	1.32
		Post Dosing	8	1.02	0.81	1.38
Rathvilly Primary Discharge	Total Phosphate 1mg/l Orthophosphate 0.8mg/l	Existing	25	0.15	0.12	0.20
		Post Dosing	25	0.15	0.12	0.20
		% Increase	0%	0%	0%	0%
Rathvilly SWO (1 No.)		Existing	17	0.50	0.40	0.69
		Post Dosing	19	0.55	0.44	0.75
Tullow Primary Discharge	Ortho-phosphate 1mg/l – Non Compliant	Existing	763	0.73	0.59	1.00
		Post Dosing	872	0.84	0.67	1.14
		% Increase	14%	15%	14%	14%
Tullow SWOs discharging to Slaney_100 (6 No.) and Derreen_090 (1 No.)		Existing	105	0.50	0.40	0.67
		Post Dosing	108	0.51	0.41	0.69
Carlow Primary Discharge	Total Phosphate 1mg/l Orthophosphate 0.8mg/l	Existing	1516	0.19	0.16	0.26
		Post Dosing	1516	0.19	0.16	0.26
		% Increase	0%	0%	0%	0%
Carlow SWOs discharging to Barrow_160 (7 No.) and Burren_010 (2 No.)		Existing	1370	0.86	0.69	1.17
		Post Dosing	1405	0.88	0.71	1.20
Nurney Primary Discharge	No ELV	Existing	41	3.74	2.99	5.08
		Post Dosing	45	4.11	3.29	5.59
		% Increase	10%	10%	10%	10%
Tinryland Primary Discharge	No ELV	Existing	85	3.74	2.99	5.08
		Post Dosing	94	4.14	3.31	5.63
		% Increase	11%	11%	11%	11%
Ballyconnell Primary Discharge	No ELV	Existing	19	5.34	4.27	7.26
		Post Dosing	22	6.14	4.91	8.35
		% Increase	15.8%	15%	15%	15%

Ardattin No. 2 Agglomeration

Ardattin No. 2 Agglomeration provides secondary treatment and has no ELVs, therefore it is assumed that there will be **no** removal of the additional P load. There are no SWOs associated with this WWTP. WWTP effluent OP concentration will increase from 3.74 mg/l P to 4.52 mg/l P (21%). The WWTP discharges into the Ballyglass (IE_SE_G_011) groundwater body at approximate coordinates E287299 N167956. This groundwater body is known to have short flow paths (300m) so it is considered in this report that additional P loading at this discharge location will result in cumulative loading that is limited to within a 300m zone. There are no designated sites within 300 m of this discharge location. The closest surface waterbody to the discharge point is the Slaney_110 (IE_SE_12S021600) which is located approximately 17m away. This tributary flows into the main channel of the River Slaney approximately 1.7 km downstream witch forms part of the **Slaney River Valley SAC.**

Ballon Agglomeration

Ballon Agglomeration provides tertiary treatment, and the ELV is set at 1 mg/l P. The WWTP does not exceed the ELV and it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP and there will be **no** increase in the effluent P concentration, i.e. post dosing concentrations will be 0.13 mg/l P. SWO concentration will not increase as a result of the OP dosing and will remain at 0.55 mg/l P. Ballon Agglomeration discharges to Ballaghmore Distributary_010 river waterbody which has a 'Moderate' Indicative OP status (0.042 mg/l

P baseline concentration). Ballaghmore Distributary_010 flows into Douglas (Ballon)_020 which discharges to the Slaney_110 which forms part of the **Slaney River Valley SAC**.

Castledermot Agglomeration

Castledermot WWTP provides tertiary treatment, and has an ELV for TP of 0.7 mg/l P and OP of 0.3 mg/l P. The most recent AER (2017) has shown that the WWTP is compliant for TP, it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP and there will be ***no*** increase in the effluent P concentration. The existing effluent of 0.15 mg/l P is assumed before and after OP dosing. The SWO concentration will however increase form 0.32 mg/l P to 0.34 mg/l P (6%) as a result of OP dosing. Castledermot WWTP discharges to the Lerr_020 river waterbody. The Lerr_020 river waterbody has a 'Poor' Indicative OP status (0.077 mg/l P baseline concentration). Lerr_020 river waterbody forms part of the **River Barrow and River Nore SAC**.

Castleroe Agglomeration

Castleroe WWTP provides secondary treatment and has no ELV set for it. As per the EAM methodology **no** removal of additional P is assumed. The effluent concentration will increase from 3.74 mg/l P to 4.54 mg/l P (22%) as a result of the OP dosing. There are no SWOs associated with the WWTP. Castleroe WWTP discharges directly to the Greese_060 river waterbody. The Greese_060 river waterbody has a 'Good' Indicative OP status (0.030 mg/l P) and is directly connected to the Barrow_160 which forms part of the **River Barrow and River Nore SAC**.

Palatine Agglomeration

Palatine WWTP Agglomeration provides tertiary treatment, and has an ELV for OP of 0.6 mg/l P. Palatine WWTP is currently compliant for OP (2017 AER). The existing effluent OP concentration is 0.42 mg/l P and it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP, and therefore no increase in the primary effluent concentration is estimated. The SWO concentration will increase from 0.37 mg/l P to 0.40 mg/l P (9%) as a result of the OP dosing. Palatine WWTP discharges directly to Palatine Stream_010 which has a 'Moderate' Indicative OP status (0.044 mg/l P baseline concentration). Palatine Stream_010 is connected to Lerr_030 river waterbody which forms part of the **River Barrow and River Nore SAC**. Lerr_030 river waterbody has '*Good*' Indicative OP status (0.030 mg/l P baseline concentration).

Rathoe Agglomeration

Rathoe WWTP Agglomeration provides tertiary treatment, and has an ELV for TP of 1 mg/l P and OP of 0.38 mg/l P. Rathoe WWTP is compliant with its ELVs for OP (2017 AER). The existing effluent prior to OP dosing is 0.16 mg/l P and it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP. The SWO concentration will increase from 0.97 mg/l P to 1.02 mg/l P (5%) as a result of the OP dosing. Rathoe WWTP discharges directly to the Burren_040 river waterbody which has 'Good' Indicative OP status (0.030 mg/l P baseline concentration). The Burren_040 flows into the Burren_050 and the Burren_060 river waterbodies. The Burren_060 is connected directly to Barrow_160 which forms part of the **River Barrow and River Nore SAC**.

Rathvilly Agglomeration

Rathvilly WWTP Agglomeration provides tertiary treatment and has an ELV for TP of 1 mg/l P and OP of 0.8 mg/l P. The WWTP is currently compliant with its ELVs (2017) and it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP. The existing effluent prior to OP dosing is 0.15 mg/l P and it is assumed this will be unchanged. The SWO concentration will increase from 0.50 mg/l P to 0.55 mg/l P (10%) as a result of the OP dosing. Rathvilly WWTP discharges directly to the Slaney_070 river waterbody which has 'High' Indicative OP status (0.020 mg/l P baseline concentration). The Slaney_070 is in the **Slaney River Valley SAC.**

Tullow Agglomeration

Tullow WWTP provides tertiary treatment and has an ELV for OP of 1 mg/l P. The WWTP is not currently compliant with its ELVs (2017). ELV exceedances at Tullow WWTP are attributed to an increase in PE since the original design of the plant in the late 1980s, i.e. 4,000 PE to 6,000 PE. Uisce Éireann have advised that the plant does not have the treatment capacity for any additional Phosphorus. The EAM adopted this plant as providing secondary treatment for the purpose of this assessment and this is assumed as worst-case scenario. The existing effluent prior to OP dosing for secondary treatment is 0.73 mg/l P, this will increase to 0.84 mg/l P post dosing (15%). The SWO concentration will increase from 0.50 mg/l P to 0.51 mg/l P (2%) as a result of the OP dosing. Tullow WWTP discharges directly to the Slaney_100 river waterbody which has 'Good' Indicative OP status (0.029 mg/l P baseline concentration). The Slaney_100 forms part of the **Slaney River Valley SAC**. Tullow SWOs discharge to the Slaney_100 river waterbody and Dereen_090 which has 'Good' Indicative OP status (0.032 mg/l P baseline concentration). Dereen_090 is connected directly to the **Slaney River Valley SAC**.

Carlow Agglomeration

Carlow WWTP Agglomeration provides tertiary treatment and has an ELV for TP of 1 mg/l P and OP of 0.8 mg/l P. The WWTP is currently compliant with its ELVs (2017) and it has been assumed that additional OP loading can be entirely removed within the current operational management regime at the WWTP. The existing effluent prior to OP dosing is 0.19 mg/l P and it has been assumed that this will be unchanged post OP dosing. The SWO concentration will increase from 0.86 mg/l P to 0.88 mg/l P (3%) as a result of the OP dosing. Carlow WWTP discharges directly to the Barrow_160 river waterbody which has 'Good' Indicative OP status (0.033 mg/l P baseline concentration). The Barrow_160 river waterbody forms part of the **River Barrow and River Nore SAC**. Carlow SWOs discharge to the Barrow_160 river waterbody and Burren_060 which has 'Good' Indicative OP status (0.028 mg/l P baseline concentration). The Burren_060 is connected directly to the **River Barrow and River Nore SAC**.

Nurney Agglomeration

Nurney WWTP Agglomeration provides secondary treatment and has no ELV set for it. As per the EAM methodology, it has been assumed that none of the additional P load will be removed by the plant. The effluent OP concentration will increase from 3.74 mg/l P to 4.11 mg/l P (10%) as a result of the OP dosing. There are no SWOs associated with the WWTP. Nurney WWTP discharges directly to Ballynaboley Stream_010 river waterbody which has 'Moderate' Indicative OP status (0.046 mg/l P baseline concentration). Ballynaboley Stream_010 river waterbody is directly connected to the Barrow_180 which forms part of the **River Barrow and River Nore SAC**.

Tinryland Agglomeration

Tinryland WWTP Agglomeration provides secondary treatment and has no ELV set for it. As per the EAM methodology, it has been assumed that none of the additional P load will be removed by the plant. The effluent OP concentration will increase from 3.74 mg/l P to 4.14 mg/l P (11%) as a result of the OP dosing. There are no SWOs associated with the WWTP. Tinryland WWTP discharges directly to Burren_050 river waterbody which has 'High' Indicative OP status (0.022 mg/l P baseline concentration). Burren_050 river waterbody flows into Burren_060 river waterbody which discharges to the Barrow_160 which forms part of the **River Barrow and River Nore SAC**.

Ballyconnell Agglomeration

Ballyconnell WWTP Agglomeration provides primary treatment and has no ELV set for it. As per the EAM methodology, it has been assumed that none of the additional P load will be removed by the plant. The effluent OP concentration will increase from 5.34 mg/l P to 6.14 mg/l P (15%) as a result of the OP dosing. There are no SWOs associated with the WWTP. The WWTP discharges into the Ballyglass (IE_SE_G_011) groundwater body. This groundwater body is known to have short flow paths (300m) so it is considered in this report that additional P loading at this discharge location will result in cumulative loading that is limited to within a 300m zone. There are no designated sites within 300 m of this discharge location.

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the result of the EAM regarding the combined loading as a result of increased OP dosing from the WWTP discharge, seepage from mains and DWWTS. There will be upstream dosing areas to Rathvilly, Sion Cross and Oak Park WTPs, and the cumulative effect of these upstream dosing areas has been considered in the EAM and the results presented here reflect this.

River waterbodies

- Derreen_070 (IE_SE_12D010500), Derreen_080 (IE_SE_12D010550), Derreen_090 (IE_SE_12D010600), Derreen_100 (IE_SE_12D010800), Slaney_070 (IE_SE_12S021010), Slaney_080 (IE_SE_12S021100), Slaney_090 (IE_SE_12S021200), Slaney_100 (IE_SE_12S021400), Slaney_110 (IE_SE_12S021600), Slaney_120 (IE_SE_12S021800), Slaney_130 (IE_SE_12S021850), Slaney_140 (IE_SE_12S022000), Slaney_150 (IE_SE_12S022100), Slaney_160 (IE_SE_12S022200) and Slaney_170 (IE_SE_12S022300) river waterbodies are connected directly to the **Slaney River Valley SAC (000781)**.

- Barrow_160 (IE_SE_14B012460), Barrow_170 (IE_SE_14B012600), Barrow_180 (IE_SE_14B012700), Lerr_010 (IE_SE_14L010080), Lerr_020 (IE_SE_14L010155), Lerr_030 (IE_SE_14L010250), Lerr_040 (IE_SE_14L010300), 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 connected directly to the **River Barrow and River Nore SAC (002162)**.

A significant proportion of the OP loading to river waterbodies arises from primary discharges and SWOs from WWTPs and mains seepage through near surface pathway. The increase in OP concentrations in river waterbodies following dosing is estimated to be as much as 0.0005 mg/l P. These increases do not cause a deterioration in the status of any river waterbody. All RWBs will receive a predicted dosing concentration below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and are within the 75% of upper threshold of their respective WFD OP indicative water quality and therefore there is no risk of deterioration in the status of these RWBs.

Groundwater bodies

- Ballyglass groundwater body (IE_SE_G_011) is hydrologically linked to **Slaney River Valley SAC (000781)**.

- New Ross (IE_SE_G_152) Athy-Bagenalstown Gravels (IE_SE_G_160) and Bagenalstown Lower (IE_SE_G_157) groundwater bodies are hydrologically linked to the **River Barrow and River Nore SAC (002162)**.

The increase in OP concentrations in the GWBs as a result of the OP dosing is up to 0.0007mg/l P (Table 3). Impact from OP dosing on groundwater bodies does not lead to a reduction in GWB status. All GWBs have predicted dosing concentrations below the 5% of Good/ Fail boundary (0.00175mg/l P) (as highlighted in Table 3) and are within the 75% of upper threshold of the WFD status and therefore there is no risk of deterioration in the WFD OP indicative water quality of these GWBs.

Transitional waterbodies

- Upper Slaney Estuary (IE_SE_040_0300) and Lower Slaney Estuary (IE_SE_040_0200) are hydrologically linked to **Slaney River Valley SAC (000781)**.

- 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 (IE_SE_100_0500), Barrow Suir Nore Estuary (IE_SE_100_0100) are hydrologically linked to the **River Barrow and River Nore SAC (002162)**.

Available results from upstream dosing areas in the **Slaney** (i.e. Wexford, Fardystown (Mayglass), Kilmallock Bridge and Enniscorthy) and in the **Barrow/Nore** (i.e. Srowland, Kilminchy, Troyswood, New Ross, Toberdaly, Derryguile, Le Bergerie, Clough Castlecomber, Bagenalstown, Ballyragget and Mountfinn) are included in the cumulative assessment. The increase in OP concentrations in the downstream TWBs as a result of the dosing is up to 0.0005 mg/l P. The increase in dosing concentration does not deteriorate the status of any transitional water bodies for both the summer and winter seasons. All TWBs will receive a predicted dosing concentration below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and are within the 75% of upper threshold of their respective WFD OP indicative water quality and therefore there is no risk of deterioration in the status of these TWBs.

Coastal waterbodies

Coastal waterbodies do not have an OP limit defined in the Surface Water Regulations (2009) however the threshold adopted in the WFD App is applied here.

- Wexford Harbour (IE_SE_040_0000) coastal waterbody is hydrologically linked to **Raven Point Nature Reserve SAC (000710), Slaney River Valley SAC (000781), Wexford Harbour and Slobs SPA (004076)** and **The Raven SPA (004019)**.

- Waterford Harbour (IE_SE_100_0000) is hydrologically linked to **Hook Head SAC (000764)**.

Available results from upstream dosing areas in the **Slaney** (i.e. Wexford, Fardystown (Mayglass), Kilmallock Bridge and Enniscorthy) and in the **Barrow/Nore** (i.e. Srowland, Kilminchy, Troyswood, New Ross, Toberdaly, Derryguile, Le Bergerie, Clough Castlecomber, Bagenalstown, Ballyragget and Mountfinn) are included in the cumulative assessment. The increase in OP concentrations in the downstream CWBs as a result of the dosing is up to 0.0005 mg/l P. The increase in dosing concentration does not deteriorate the status of any coastal water bodies for both the summer and winter seasons. All CWBs will receive a predicted dosing concentration below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and are within the 75% of upper threshold of their respective WFD OP indicative water quality and therefore there is no risk of deterioration in the status of these CWBs.

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 river waterbody or groundwater body listed in **Table 3**. Concentrations from other dosing areas with regard to cumulative loading on downstream waterbodies has been considered in this assessment. Section 6 evaluates the WFD OP indicative water quality 'no deterioration' in the context of AA and the QIs of the European Sites.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

Impact pathways arising from the proposed construction and operational phases of the project have been investigated. Given the location of the proposed construction works in relation to European sites, potential construction impact pathways are assessed in the context of significant effect for each of the qualifying interests / conservation objective for the River Slaney SAC.

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**). Six European sites remain for evaluation of potential for significant effect: **Raven Point Nature Reserve (000710)**, **Hook Head (000764)**, **Slaney River Valley (000781)** and **River Barrow and River Nore (002162)** SACs and **The Raven (004019)** and **Wexford Harbour and Slobs (004076)** SPAs. Pressures associated with construction activities as identified in Section 5.4 are relevant only to the River Slaney SAC and so are discussed in Section 6.3 only. The potential for the proposed OP 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 CONSTRUCTION PHASE

Impact pathways arising during the construction phase have been identified and are limited to surface water linkages and potential for increased suspended sediment and hydrocarbons in the Slaney_070 river waterbody, in the immediate vicinity of the WTP. Qualifying interests of the River Slaney SAC with ecological dependence on this section of river waterbody include (1095) sea lamprey, (1096) brook lamprey, (1099) River Lamprey, (1103) Twaite shad, (1106) salmon and (1355) otter.

The conservation objectifies identify that water quality targets of at least Q4 should be maintained and the habitat heterogeneity must remain intact for fish fauna. The proposed construction works (to facilitate both the orthophosphate and pH dosing units) will be localised and contained to the immediate development area which supports buildings and artificial surfaces. Works such as excavations, will be contained to the defined working area, located on made ground within the WTP site; any necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source. Therefore, there is no potential for significant effects on the water quality in the Slaney_070 river waterbody. As there is no potential for significant effects on the water quality there is no potential for significant effects on the QIs supported by this watercourse within the River Slaney SAC.

6.2 OPERATIONAL PHASE

6.2.1 Raven Point Nature Reserve SAC 000710

6.2.1.1 (1140) Mudflats and sandflats not covered by seawater at low tide

'Mudflats and sandflats not covered by seawater at low tide' are found exclusively between the low water and mean high water marks and contain sediment ranging from around 1 μ to 2 mm. Finer silt and clay sediments are dominant in mud flats and associated with rivers and the larger sand fractions are associated with areas exposed to significant wave energy.

SSCOs are to maintain the favourable conservation condition of the habitat and while the SSCOs (NPWS, 2011a) do not specifically mention nutrient pressure, Article 17 (NPWS, 2013b) lists pollution to surface water as a main pressure with high importance. The SSCOs attribute and target with specific relevance are to maintain the Sand dominated by polychaetes community complex (65 hectares); Estuarine muds dominated by polychaetes and crustaceans community complex (8 hectares). Pressures and threats to this habitat associated with the current project include nutrient/ P enrichment which can be associated with accelerated growth of macroalgae/ phytoplankton or reduced concentrations of dissolved oxygen.

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 tidal mudflat habitat in the

Raven Point Nature Reserve SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.00005 mg/l P. The resulting OP concentrations following dosing ranges from 0.0025 mg/l P in summer and 0.0240 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to tidal mudflats in Raven Point Nature Reserve SAC. Therefore potential for significant effects on this habitat in Raven Point Nature Reserve SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.1.2. (1210) Annual vegetation of drift lines

Habitat area at the site, consisted of a number of separate patches near Raven Point, amounting to 0.37 hectares. The habitat was absent from the entire stretches where erosion has taken place in recent times. This type of vegetation occurs on sandy, shingle or stony substrate at the upper part of the strand, around the high tide mark. Water-borne material including organic matter is deposited on the shore and provides nutrients and a seed source for vegetation. SSCOs are to maintain the favourable conservation condition of the habitat and while the SSCOs (NPWS, 2011a) do not specifically mention nutrient pressure, attributes and targets set out in the SSCO (NPWS, 2011a) relevant to the proposed project are: to maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and Orache (*Atriplex* spp.); and that negative indicator species inclusive of species indicative of changes in nutrient status, are to represent < 5% cover (NPWS, 2011a).

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 'Annual vegetation of drift lines' habitat in the Raven Point Nature Reserve SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.00005 mg/l P. The resulting OP concentrations following dosing ranges from 0.0025 mg/l P in summer and 0.0240 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to 'Annual vegetation of drift lines' in Raven Point Nature Reserve SAC. Therefore potential for significant effects on this habitat in Raven Point Nature Reserve SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.1.3 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Only a small area of salt meadow (0.22 hectares) was identified at this site, and is believed to be of recent origin and naturally very dynamic (NPWS, 2011a). The SSCOs (NPWS, 2011a) for the site found no nutrient specific targets for this habitat; however, the target to maintain the natural tidal regime with specific regard to the regular ebb and flow of the tide and associated concentrations of salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

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 'Atlantic salt meadows' habitat in the Raven Point Nature Reserve SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.00005 mg/l P. The resulting OP concentrations following dosing ranges from 0.0025 mg/l P in summer and 0.0240 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to 'Atlantic salt meadows' in Raven Point Nature Reserve SAC. Therefore potential for significant effects on this habitat in Raven Point Nature Reserve SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.1.4 (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes'), (2130) *Fixed coastal dunes with herbaceous vegetation ('grey dunes'), (2170) Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*), (2190) Humid dune slacks

Of the nine sand dune habitats listed under Annex I of the EU Habitats Directive, five have been reported present at Raven Point Nature Reserve SAC. Embryonic dunes are low accumulations of sand that form above the strandline. They are characterised by the presence of salt-tolerant dune grasses (*Elytrigia juncea* and *Leymus arenarius*) which trap airborne sand. Fixed dunes, located in the shelter of mobile dune ridges are characterised by sand-binding species. Dunes with *Salix repens* form where creeping willow forms a dense ground cover. Area identified for Embryonic shifting dunes (1.087 hectares), Shifting dunes (5.231 hectares), Fixed dunes (26.937 hectares), Dunes with *Salix repens* (0.112 hectares) and Humid dune slacks (0.743).

The SSCO (NPWS, 2011a) for the dune habitats in Raven Point Nature Reserve SAC with specific relevance to the current project include the attributes 'Vegetation composition: typical species and sub-communities' and 'Vegetation composition: negative indicator species'. The nutrient-poor status is crucial for the survival of certain vegetation types and so the target for 'Vegetation composition' is to maintain structural variation within the sward. Species diversity and plant distribution in dunes is reliant on specific nutrient gradients and so the target is to maintain a typical flora for the particular sand dune habitat. Negative indicators (including non-native species), such as sea buckthorn, should represent <5% of the vegetation cover.

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 these dune habitats in the Raven Point Nature Reserve SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.00005 mg/l P. The resulting OP concentrations following dosing ranges from 0.0025 mg/l P in summer and 0.0240 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to these dune habitats in Raven Point Nature Reserve SAC. Therefore potential for significant effects on this habitat in Raven Point Nature Reserve SAC can be excluded.

Furthermore, dosing will not prevent the restoration/ maintenance of the favourable conservation condition of the dune habitats / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.2 Hook Head SAC 000764

6.2.2.1 (1160) Large shallow inlets and bays

There are no nutrient specific targets in the SSCO (NPWS, 2011b). 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, 2011c) 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 the Hook Head SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Waterford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.0001 mg/l P. The resulting OP concentrations following dosing ranges from 0.0060 mg/l P in summer to 0.0230 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to this habitat in Hook Head SAC. Therefore potential for significant effects on this habitat in Hook Head SAC can be excluded.

Furthermore, dosing will not prevent the restoration/ maintenance of the favourable conservation condition of 'Large shallow inlets and bays' habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.2.2 (1170) Reefs

There are no nutrient specific targets in the SSCO (NPWS, 2011b). 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, 2011c) 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 reef habitat in the Hook Head SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Waterford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.0001 mg/l P. The resulting OP concentrations following dosing ranges from 0.0060 mg/l P in summer to 0.0230 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to reef habitat in Hook Head SAC. Therefore potential for significant effects on this habitat in Hook Head SAC can be excluded.

Furthermore, dosing will not prevent the restoration/ maintenance of the favourable conservation condition of reef habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.2.3 (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts

There are nutrient specific targets in the SSCO (NPWS, 2011b) however they relate to groundwater influences and there are no groundwater bodies hydrologically connected to Hook Head SAC associated with OP dosing at Rathvilly, Oak Park and Sion Cross WTPs 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 of the favourable conservation condition of this habitat / no deterioration of its favourable conservation condition is identified.

6.2.3 Slaney River Valley SAC 000781

6.2.3.1 (1029) Freshwater Pearl Mussel *Margaritifera margaritifera*

According to the SSCOs for the Slaney River Valley SAC the status of *Margaritifera margaritifera* is currently 'under review' in the Slaney river (NPWS, 2011). However, the approach adopted here is that the attributes and targets employed for *Margaritifera durrovensis* in the River Barrow and River Nore SAC be utilised for *Margaritifera margaritifera* in the areas relevant to the River Slaney designated by the S.I. 296 of 2009 Freshwater Pearl Mussel Regulations. The Freshwater Pearl Mussel Regulations make reference to the Derreen River population however, low numbers of adult FPM have also been found in the River Slaney main channel downstream of the River Derreen confluence (Moorkens, 2000).

Review of the SSCOs for the River Barrow and River Nore SAC have highlighted that the conservation objective for *Margaritifera durrovensis* is to 'restore' to favourable conservation condition and this conservation objectives is employed here also. Specific targets/ environmental quality objectives defined demonstrate how the restoration to favourable conservation condition can be achieved. Targets and attributes relevant to the proposed OP dosing project include:

- 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); and

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

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 Slaney River Valley SAC. Habitat extent for *Margaritifera margaritifera* is limited to the Dereen catchment, and any additional stretches necessary for salmonid spawning within the River Slaney SAC including downstream of the Dereen/ Slaney confluence.

The water quality targets for *Margaritifera margaritifera* habitat as defined by the SSCOs are to restore to 'high water quality' and 'oligotrophic' conditions to the stretches where the population resides and 'good' water quality to 'stretches of river suitable and utilised for salmonid spawning within the SAC'. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on river waterbodies including sub-surface pathways and so only river waterbodies identified in the ZoI and connected to the Dereen catchment and river within the SAC suitable/ utilised for salmonid spawning are considered further:

- Derreen_070 (IE_SE_12D010500) river waterbody and estimated an increase in OP concentration of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0300 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. *Good*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in OP indicative water quality following dosing.

- Derreen_080 (IE_SE_12D010550) river waterbody and estimated an increase in OP concentration of up to 0.00001 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. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is not risk of deterioration in OP indicative water quality following dosing.

- Derreen_090 (IE_SE_12D010600) river waterbody and estimated an increase in OP concentration of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0317 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting FPM however, the modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is not risk of deterioration in OP indicative water quality following dosing and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_100 (IE_SE_12D010800) river waterbody and estimated an increase in OP concentration of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0317 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting FPM however, the modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is not risk of deterioration in OP indicative water quality following dosing and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_110 (IE_SE_12S021600) river waterbody and estimated an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0227 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. High. The baseline is not conducive to supporting FPM however, the modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is not risk of deterioration in OP indicative water quality following dosing and dosing will not prevent the restoration of this waterbody to High status.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs on OP indicative water quality have demonstrated that there will be no change in the OP indicative water quality of waterbodies connected to freshwater pearl mussel from the proposed project. Therefore, potential for significant effects on these species can be excluded.

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

6.2.3.2 (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)

The conservation objective 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 fish fauna in the Slaney River Valley SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Derreen_070 (IE_SE_12D010500) river waterbody and estimated an increase in OP concentration of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0300 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. *Good*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in OP indicative water quality following dosing.

- Derreen_080 (IE_SE_12D010550) river waterbody and estimated an increase in OP concentration of up to 0.00001 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. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is not risk of deterioration in OP indicative water quality following dosing.

- Derreen_090 (IE_SE_12D010600) river waterbody and estimated an increase in OP concentration of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0317 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting FPM however, the modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is not risk of deterioration in OP indicative water quality following dosing and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_100 (IE_SE_12D010800) river waterbody and estimated an increase in OP concentration of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0317 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality status is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting FPM however, the modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is not risk of deterioration in OP indicative water quality following dosing and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_070 (IE_SE_12S021010) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0123 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_080 (IE_SE_12S021100) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0188 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_090 (IE_SE_12S021200) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting OP concentrations following dosing is 0.0125 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_100 (IE_SE_12S021400) river waterbody and estimates an increase in OP concentration of up to 0.0003 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0197 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_110 (IE_SE_12S021600) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0227 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_120 (IE_SE_12S021800) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0238 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_130 (IE_SE_12S021850) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0307 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_140 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0238 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_150 (IE_SE_12S022100) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0174 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_160 (IE_SE_12S022200) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0126 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_170 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0247 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Ballyglass (IE_SE_G_011) groundwater body and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing increases to 0.0258 mg/l P (**Table 3, Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/fail boundary (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross water treatment plants have demonstrated that there will be no change in the WFD OP indicative water quality of waterbodies connected to the Slaney River Valley SAC, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the nutrient conditions that support these species within this site. Therefore, potential for significant effects on these species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of these species in the Slaney River Valley SAC/ no deterioration of its favourable conservation condition is identified.

6.2.3.3 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Slaney River Valley 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, 2011d). The SSCOs attribute and target with specific relevance are to maintain the Mixed sediment community complex (200 hectares); Estuarine muds dominated by polychaetes and crustaceans community complex (1269 hectares); and Sand dominated by polychaetes community complex (27 hectares). Pressures and threats to this habitat associated with the current project include nutrient/ P enrichment which can be associated with accelerated growth of macroalgae/ phytoplankton or reduced concentrations of dissolved oxygen.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrologically or hydrogeologically connectivity to this habitat in the Slaney River Valley SAC. Estuarine habitat is associated with estuaries, and in this case:

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.0210 mg/l P in summer and 0.0220 mg/l P in winter, a cumulative load of 74.4 kg/yr and a potential concentration of 0.0211 mg/l P in summer and 0.0221 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to this habitat in Slaney River Valley SAC. Therefore, potential for significant effects on this habitat in Slaney River Valley SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.3.4 (1140) Mudflats and sandflats not covered by seawater at low tide

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Slaney River Valley 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, 2011d). Specifically, Estuarine muds dominated by polychaetes and crustaceans community complex (587 hectares); and Sand dominated by polychaetes community complex (441 hectares). Pressures and threats to this habitat associated with the current project include nutrient/ P enrichment which can be associated with accelerated growth of macroalgae/ phytoplankton or reduced concentrations of dissolved oxygen.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrologically or hydrogeologically connectivity to this habitat in the Slaney River Valley SAC. Estuarine habitat is associated with estuaries, and in this case:

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.0210 mg/l P in summer and 0.0220 mg/l P in winter, a cumulative load of 74.4 kg/yr and a potential concentration of 0.0211 mg/l P in summer and 0.0221 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to this habitat in Slaney River Valley SAC. Therefore, potential for significant effects on this habitat in Slaney River Valley SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.3.5 (1355) Otter *Lutra lutra*

A review of the SSCOs for otter (NPWS, 2011d) 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, categorised 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. A nutrient quality target of 'good' status is adopted here, to align with that outlined for fish fauna that form part of the diet of otter in the Slaney River Valley SAC. The conservation objective for otter in the Slaney River Valley SAC is to 'restore' to 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 Slaney River Valley SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Derreen_070 (IE_SE_12D010500) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0125 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_080 (IE_SE_12D010550) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0243 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_090 (IE_SE_12D010600) river waterbody and estimates an increase in OP concentration of up to 0.00002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0317 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_100 (IE_SE_12D010800) river waterbody and estimates an increase in OP concentration of up to 0.00002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0312 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_070 (IE_SE_12S021010) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0136 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_080 (IE_SE_12S021100) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0139 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_090 (IE_SE_12S021200) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting OP concentrations following dosing is 0.0300 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Good*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_100 (IE_SE_12S021400) river waterbody and estimates an increase in OP concentration of up to 0.0003 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0260 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_110 (IE_SE_12S021600) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0264 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_120 (IE_SE_12S021800) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0224 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_130 (IE_SE_12S021850) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0286 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_140 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0213 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_150 (IE_SE_12S022100) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0160 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_160 (IE_SE_12S022200) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0190 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_170 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0199 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Ballyglass (IE_SE_G_011) groundwater body and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing increases to 0.0249 mg/l P (**Table 3, Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/fail boundary (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.010 mg/l P in summer and 0.025 mg/l P in winter, a cumulative load of 549.5 kg/yr and a potential concentration of 0.0104 mg/l P in summer and 0.0254 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross water treatment plants have demonstrated that there will be no change in the WFD OP indicative water quality of waterbodies connected to the Slaney River Valley SAC, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the nutrient conditions that support otter within this site. Therefore, potential for significant effects on these species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of otter in the Slaney River Valley SAC/ no deterioration of its favourable conservation condition is identified.

6.2.3.6 (1365) Harbour Seal *Phoca vitulina*

The harbour seal is the smaller of two species of the Phocidae genus that commonly breed around the coast of Ireland. Harbour seals in Slaney River Valley SAC occupy both aquatic habitats and intertidal shorelines that become exposed during the tidal cycle with a preference for enclosed sheltered coastal bays and estuaries. 17 seals were recorded in August 2003, 22 in September 2007 and 27 in September 2009. Attributes and targets set out by the SSCO which bear specific relevance to this project are: to conserve the breeding sites in a natural condition; to conserve the moult haul-out sites in a natural condition; to conserve the resting haul-out sites in a natural condition; and that human activities should occur at levels that do not adversely affect the harbour seal population at the site. The OP dosing has the potential to alter the natural condition of the sites by increasing the P concentrations.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrologically or hydrogeologically connectivity to harbour seal in the Slaney River Valley SAC. Harbour seal are associated with estuaries and coastal waterbodies, and in this case:

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.010 mg/l P in summer and 0.025 mg/l P in winter, a cumulative load of 549.5 kg/yr and a potential concentration of 0.0104 mg/l P in summer and 0.0254 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.0005 mg/l P. The resulting OP concentrations following dosing ranges from 0.0030 mg/l P in summer and 0.0285 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of the above listed waterbodies, connected to harbour seal in Slaney River Valley SAC. Therefore potential for significant effects on harbour seal in Slaney River Valley SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this species / no deterioration of its favourable conservation condition is identified as no change to the WFD indicative water quality for these waterbodies has been demonstrated.

6.2.3.7 (3260) Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

SSCOs which bear specific relevance to this project are to maintain the concentration of nutrients in the water column at sufficiently low levels to prevent changes in species composition or habitat condition. Water quality should reach WFD good status, in terms of nutrient standards and macroinvertebate and phytobenthos quality elements. The targets specified in the SSCOs refer only to 12.6 km of the tidal-sub type.

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 habitat 3260 in the Slaney River Valley SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.010 mg/l P in summer and 0.025 mg/l P in winter, a cumulative load of 549.5 kg/yr and a potential concentration of 0.0104 mg/l P in summer and 0.0254 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to habitat 3260 in the Slaney River Valley SAC. Therefore, potential for significant effects on this habitat in Slaney River Valley SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.3.8 (91E0) * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae)*

A review of the SSCOs for this habitat found no nutrient specific targets. The habitat is assessed based on woodland structure, and requires periodic flooding to maintain alluvial woodlands along river floodplains. The main threats to this habitat are drainage and reclamation, together with non-native and invasive species encroachment. The target is for no decline based on 7 surveyed locations identified in the SSCOs. The restoration conservation objective is for existing woodland to be increased to reduce fragmentation. Of the 7 areas surveyed, 3 have hydrological connectivity to the proposed project, areas identified as 157, 209 and 211 (Site codes) (Appendix A - Slaney River Valley SAC SSCOs, pg33).

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 aforementioned 3 surveyed areas of alluvial forests in the Slaney River Valley SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Derreen_070 (IE_SE_12D010500) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0125 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_080 (IE_SE_12D010550) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0243 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_090 (IE_SE_12D010600) river waterbody and estimates an increase in OP concentration of up to 0.00002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0317 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Derreen_100 (IE_SE_12D010800) river waterbody and estimates an increase in OP concentration of up to 0.00002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0312 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_070 (IE_SE_12S021010) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0136 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_080 (IE_SE_12S021100) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0139 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_090 (IE_SE_12S021200) river waterbody and estimates an increase in OP concentration of up to 0.00001 mg/l P. The resulting OP concentrations following dosing is 0.0300 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Good*. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_100 (IE_SE_12S021400) river waterbody and estimates an increase in OP concentration of up to 0.0003 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0260 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_110 (IE_SE_12S021600) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0264 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_120 (IE_SE_12S021800) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0224 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_130 (IE_SE_12S021850) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0286 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and dosing will not prevent the restoration of this waterbody to High status.

- Slaney_140 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0213 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_150 (IE_SE_12S022100) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0160 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_160 (IE_SE_12S022200) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0190 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Slaney_170 (IE_SE_12S022000) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0199 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Ballyglass (IE_SE_G_011) groundwater body and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing increases to 0.0249 mg/l P (**Table 3, Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold of the 5% good/fail boundary (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Slaney Estuary (IE_SE_040_0300) which has 'High' OP Indicative Quality for both summer and winter, a baseline concentration of 0.010 mg/l P in summer and 0.025 mg/l P in winter, a cumulative load of 549.5 kg/yr and a potential concentration of 0.0104 mg/l P in summer and 0.0254 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to alluvial woodland in Slaney River Valley SAC. Therefore, potential for significant effects on alluvial woodland in Slaney River Valley SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD OP indicative water quality for these waterbodies has been demonstrated.

6.2.4 River Barrow and River Nore SAC 002162

6.2.4.1 (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) highlight 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. Borris Bridge is situated on the River Nore outside of the ZOI; and Boston Bridge is situated on the River Barrow. Boston Bridge is located downstream of the proposed dosing area, in the event of flooding there would be potential for hydrological connectivity to the proposed OP dosing ZoI.

The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Barrow_230 (IE_SE_14B013514) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting Orthophosphate concentrations following dosing is 0.0246 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed river waterbody, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to Desmoulin's whorl snail in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC / no deterioration of its favourable conservation condition is identified.

6.2.4.2 (1029) Freshwater pearl mussel (*Margaritifera margaritifera*) and (1990), Nore freshwater pearl mussel (*Margaritifera durrovensis*)

Examination of the SSCOs for the River Barrow and River Nore SAC have highlighted that the conservation objective for *Margaritifera durrovensis* is to 'restore' to favourable conservation condition. The *Margaritifera durrovensis* population resides in the upper Nore catchment and upstream of the dosing area for this project, therefore the proposed project will not impact directly on *Margaritifera durrovensis*. The host fish that the *Margaritifera durrovensis* population rely on for part of their life cycle will spawn in the Nore catchment, also upstream of this project, therefore it can be stated that there is no potential for significant effect on *Margaritifera durrovensis* within the River Barrow and River Nore SAC.

Examination of the SSCOs for the River Barrow and River Nore SAC have shown that the status of *Margaritifera margaritifera* is currently 'under review'. However, the approach adopted here is that the attributes and targets above employed for *Margaritifera durrovensis* be utilised for *Margaritifera margaritifera* in the areas designated by the S.I. 296 of 2009 Freshwater Pearl Mussel Regulations in the River Barrow (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. These populations are located upstream of river waterbodies impacted upon by the proposed project, however, hydrological connectivity to stretches of river suitable and utilised for salmonid spawning within the SAC have been identified. The target for salmonid spawning habitat is Q4/ 'Good' OP status.

The water quality targets for 1029 and 1099 habitat as defined by the SSCOs are to restore to 'high water quality' and 'oligotrophic' conditions. However, as the habitat relevant to the current project only includes 'stretches of river suitable and utilised for salmonid spawning within the SAC', water quality targets employed for Atlantic salmon (1106) are adopted here, i.e. Q-value of at least 4, which equates to 'good' ecological status. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on water quality and nutrient conditions on river waterbodies including sub-surface pathways and so only river waterbodies identified in the ZoI and suitable/ utilised for salmonid spawning are considered further.

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 freshwater pearl mussels in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.
- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.
- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed river waterbody, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to Freshwater Pearl Mussel species in the River Barrow and River Nore SAC. Therefore, potential for significant effects on these species can be excluded.

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

6.2.4.3 (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 extending downstream as far as Thomastown.

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_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3**, **Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3**, **Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.
- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.
- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.
- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to white clawed crayfish in the River Barrow and River Nore SAC. Therefore, potential for significant effects on habitats for white clawed crayfish in River Barrow and River Nore SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of white clawed crayfish habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.4.4 (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 above mentioned fish fauna 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_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the WFD indicative water quality of transitional waterbodies, connected to the above listed species in the River Barrow and River Nore SAC. Therefore, potential for significant effects on habitats for these species in River Barrow and River Nore SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition to the above listed species habitat / no deterioration of its favourable conservation condition is identified as no change to the WFD indicative water quality for these waterbodies has been demonstrated.

6.2.4.5 (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, 2011e). 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 Orthophosphate indicative water quality on:

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed transitional and coastal waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to estuarine habitat in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this species can be excluded.

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

6.2.4.6 (1170) Reefs

Reefs are not included in the SSCOs for River Barrow and River Nore SAC however CO supporting documents for marine habitats of other SACs have been considered here. These documents 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. Reef 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 (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good.

The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed transitional waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to reef habitat in the River Barrow and River Nore SAC. Therefore potential for significant effects on this habitat can be excluded.

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

6.2.4.7 (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 transitional waterbody Upper Barrow Estuary (IE_SE_100_0300). 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 habitats are associated with transitional waterbodies, in this case the Nore Estuary transitional waterbody has been assessed. Other surface waterbodies are not connected to these 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 Orthophosphate indicative water quality on:

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed transitional waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the above listed habitats in the River Barrow and River Nore SAC. Therefore potential for significant effects on these habitats can be excluded.

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

6.2.4.8 (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 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 (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 3260 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_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD

OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- New Ross groundwater body (IE_SE_G_152) which has a 'Good' OP indicative water quality, a baseline concentration of 0.0095 mg/l P, a cumulative OP load of 2.0 kg/yr and a potential concentration of 0.0095 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Bagenalstown Lower groundwater body (IE_SE_G_157) which a 'Good' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative OP load of 22.4 kg/yr and a potential concentration of 0.0057 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Athy-Bagenalstown Gravels (IE_SE_G_160) groundwater body which has a 'Good' OP indicative water quality, a baseline concentration of 0.0141 mg/l P, a cumulative OP load of 5.8 kg/yr and a potential concentration of 0.0143 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the above listed habitat in the River Barrow and River Nore SAC. Therefore, potential for significant effects on these habitats can be excluded.

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

6.2.4.9 (1355) Otter (Lutra lutra)

A review of the SSCOs for otter (NPWS, 2011e) 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. A nutrient quality target of 'good' status is adopted here, to align with that outlined for fish fauna that form part of the diet of otter in the River Barrow and River Nore 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 above listed otter in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Barrow_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3**, **Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3**, **Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- New Ross groundwater body (IE_SE_G_152) which has a 'Good' OP indicative water quality, a baseline concentration of 0.0095 mg/l P, a cumulative OP load of 2.0 kg/yr and a potential concentration of 0.0095 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Bagenalstown Lower groundwater body (IE_SE_G_157) which a 'Good' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative OP load of 22.4 kg/yr and a potential concentration of 0.0057 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Athy-Bagenalstown Gravels (IE_SE_G_160) groundwater body which has a 'Good' OP indicative water quality, a baseline concentration of 0.0141 mg/l P, a cumulative OP load of 5.8 kg/yr and a potential concentration of 0.0143 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to otter in the River Barrow and River Nore SAC. Therefore, potential for significant effects on otters can be excluded.

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

6.2.4.10 (1421) Killarney fern (*Trichomanes speciosum*)

A review of the SSCOs for Killarney fern (NPWS, 201151) 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. In the River Barrow the two locations are in the vicinity of Graiguenamanagh. The target is for no decline in the current distribution.

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 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:

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed river waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to Killarney fern in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this species can be excluded.

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

6.2.4.11 (6430) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

The SSCOs (NPWS, 2011e) 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 6430 habitat in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Barrow_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- New Ross groundwater body (IE_SE_G_152) which has a 'Good' OP indicative water quality, a baseline concentration of 0.0095 mg/l P, a cumulative OP load of 2.0 kg/yr and a potential concentration of 0.0095 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Bagenalstown Lower groundwater body (IE_SE_G_157) which a 'Good' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative OP load of 22.4 kg/yr and a potential concentration of 0.0057 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Athy-Bagenalstown Gravels (IE_SE_G_160) groundwater body which has a 'Good' OP indicative water quality, a baseline concentration of 0.0141 mg/l P, a cumulative OP load of 5.8 kg/yr and a potential concentration of 0.0143 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to this habitat in the River Barrow and River Nore SAC. Therefore, potential for significant effects on otters can be excluded.

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

6.2.4.12 (7220) * Petrifying springs with tufa formation (*Cratoneurion*)

The SSCOs (NPWS, 2011e) 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.

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 petrifying spring habitat in the River Barrow and River Nore SAC. Waterbodies identified that are likely to be connected to this habitat include the groundwater bodies listed below. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Bagenalstown Lower groundwater body (IE_SE_G_157) which a 'Good' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative OP load of 22.4 kg/yr and a potential concentration of 0.0057 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Athy-Bagenalstown Gravels (IE_SE_G_160) groundwater body which has a 'Good' OP indicative water quality, a baseline concentration of 0.0141 mg/l P, a cumulative OP load of 5.8 kg/yr and a potential concentration of 0.0143 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed transitional and river waterbodies or groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to petrifying spring habitat in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this habitat can be excluded.

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

6.2.4.13 (91E0) * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*

The SSCOs (NPWS, 2011e) 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 forests in the River Barrow and River Nore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Barrow_160 (IE_SE_14B012460) river waterbody and estimates an increase in OP concentration of up to 0.0006 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0284 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_170 (IE_SE_14B012600) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0267 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_180 (IE_SE_14B012700) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0250 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Lerr_010 (IE_SE_14L010080) river waterbody and estimates an increase in OP concentration of up to 0.0001 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0492 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_020 (IE_SE_14L010155) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0615 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Poor. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Lerr_030 (IE_SE_14L010250) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0457 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the modelled loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies supporting a QI receptor that requires high status.

- Lerr_040 (IE_SE_14L010300) river waterbody and estimates an increase in OP concentration of up to 0.0002 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0528 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Moderate. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of High water quality in this river body.

- Barrow_190 (IE_SE_14B012820) river waterbody and estimates an increase in OP concentration of up to 0.0005 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0342 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_200 (IE_SE_14B012920) river waterbody and estimates an increase in OP concentration of up to 0.0007 mg/l P. The resulting OP indicative water quality concentrations following dosing is 0.0259 mg/l P (**Table 3, Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The baseline is not conducive to supporting white-clawed crayfish however the modelled increase is below the significance threshold of the 5% good/high boundary (<0.00125 mg/l P).Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody and will not prevent the restoration of this waterbody to High status.

- Barrow_210 (IE_SE_14B013100) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0261 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_220 (IE_SE_14B013300) river waterbody and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0233 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_230 (IE_SE_14B013514) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0246 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- Barrow_240 (IE_SE_14B013600) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0218 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this river waterbody.

- New Ross groundwater body (IE_SE_G_152) which has a 'Good' OP indicative water quality, a baseline concentration of 0.0095 mg/l P, a cumulative OP load of 2.0 kg/yr and a potential concentration of 0.0095 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Bagenalstown Lower groundwater body (IE_SE_G_157) which a 'Good' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative OP load of 22.4 kg/yr and a potential concentration of 0.0057 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Athy-Bagenalstown Gravels (IE_SE_G_160) groundwater body which has a 'Good' OP indicative water quality, a baseline concentration of 0.0141 mg/l P, a cumulative OP load of

5.8 kg/yr and a potential concentration of 0.0143 mg/l P following dosing. The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this groundwater body.

- Upper Barrow Estuary (IE_SE_100_0300). The Upper Barrow Estuary has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0150 mg/l P in summer and 0.0270 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0154 mg/l P in summer and 0.0274 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Nore Estuary Upper (IE_SE_100_0250). The Barrow Nore Estuary Upper has a 'High' OP indicative water quality for summer and a 'Good' OP indicative water quality for winter, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0237 mg/l P in summer and 0.0317 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good respectively. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- New Ross Port (IE_SE_100_0200). The New Ross Port has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0320 mg/l P in summer and in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0322 mg/l P in summer and in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Lower Suir Estuary (Little Island Cheekpoint) (IE_SE_100_0500). The Lower Suir Estuary has a 'Good' OP indicative water quality for both summer and winter, a baseline concentration of 0.0375 mg/l P in summer and 0.0380 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0376 mg/l P in summer and 0.0381 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

- Barrow Suir Nore Estuary (IE_SE_100_0100). The Barrow Suir Nore Estuary has a 'High' in summer and 'Good' in winter OP indicative water quality, a baseline concentration of 0.0235 mg/l P in summer and 0.0315 mg/l P in winter, a cumulative load of 669.3 kg/yr and a potential concentration of 0.0236 mg/l P in summer and 0.0316 mg/l P in winter following dosing. The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High and Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Rathvilly, Oak Park and Sion Cross WTPs for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed transitional and river waterbodies or groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to this habitat in the River Barrow and River Nore SAC. Therefore, potential for significant effects on this habitat can be excluded.

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

6.2.5 The Raven SPA 004019 and Wexford Harbour and Slobs SPA 004076

The SSCOs for The Raven SPA (NPWS, 2012a) and Wexford Slobs SPA (NPWS, 2012b) list targets for each species (**Table 2**), specifically:

- Population trend: long term population trends should be stable or increasing; and
- Distribution: there should be no significant decrease in the range, timing or intensity of use of areas by the listed species, other than that occurring from natural patterns of variation.

The Raven SPA extends from north of Rosslare Point to Blackwater Harbour on the coast of Co. Wexford. The seaward boundary of the site extends a maximum distance of approximately 4.5 km from the shoreline to encompass important areas of shallow water utilised by some of the species of special conservation interest. Wexford Harbour is a shallow harbour with extensive mud and sand flats. The main freshwater input is the River Slaney which flows out through Wexford Town. The designated site is complex and encompasses the natural estuarine habitats of Wexford Harbour, the polderland known as the North and South 'Slobs', and the tidal section of the River Slaney as far north as Enniscorthy. Nutrient inputs (from agriculture) were identified as a risk to water quality.

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 bird species in The Raven SPA and Wexford Slobs SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Wexford Harbour coastal waterbody and estimated an increase in OP concentrations up to 0.00005 mg/l P. The resulting concentrations following dosing is 0.0025 mg/l P in summer to 0.0240 mg/l P in winter (**Appendix C**) which does not lead to a reduction in coastal waterbody status. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Charlestown WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Rathvilly, Oak Park and Sion Cross WTPs have demonstrated that there will be no change in the OP WFD indicative water quality of the above listed waterbodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the species in The Raven SPA and Wexford Harbour and Slobs SPA. Therefore, potential for significant effects on these species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat in The Raven SPA and Wexford Harbour and Slobs SPA / no deterioration of its 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. Impact 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.

Carlow County Council Development Plan was reviewed 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
Carlow County Council Development Plan 2022 – 2028. The objectives of relevance in the Carlow County Development Plan include under Environmental Management, Infrastructure and Water Services (Water Services): Ensure wastewater treatment and storage systems comply with relevant guidelines; Consideration to the Groundwater Protection Scheme in control of developments and activities; Actively participate in implementation of WFD; Ensure protection of sources of potable water and monitoring of quality of water resources;	▪ N/A	The Carlow County Council Development Plan 2022-2028 emphasises 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 River Basin Management Plan for Ireland 2022-2027 and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.
River Basin Management Plan for Ireland 2022 – 2027 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 Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ 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.

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[10]. 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 2021 – 2025 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) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while	Overgrazing; Land use change or intensification; Water pollution;	The RDP for 2021 – 2025 has been subject to SEA[8], and AA[9]. 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,

[10]http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf

improvements are sought in relation to water 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 2021-2025 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.	Nitrogen deposition; and Disturbance to habitats / species;	consultations with key stakeholders during detailed 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 effects 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	▪ Land use change or intensification; ▪ Water pollution;	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[11]. It concluded that the NAP was an

[11] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF

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.	▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	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 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 loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[12]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the 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) Uisce Éireann 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 Uisce Éireann 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	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and	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.

[12]https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturalImpactStatement290914.pdf

Uisce Éireann'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 Uisce Éireann 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 Uisce Éireann owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Nutrient enrichment /eutrophication.	
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 Uisce Éireann 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. There is substantial OP dosing upstream of Carlow NR, Carlow Town and Tullow WSZ and the cumulative effect of dosing has been taken into account in the EAMs model.

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 the Rathvilly, Oak Park and Sion Cross WTP and 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 **Raven Point Nature Reserve (000710)**, **Hook Head (000764)**, **Slaney River Valley (000781)** and **River Barrow and River Nore (002162)** SACs and **The Raven (004019)** and **Wexford Harbour and Slobs (004076)** SPAs has 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 potentially affected by the proposed project, in order to provide a scientific basis for the evaluations. The Screening for AA has determined that there is not 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 Site(s).

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.

8. REFERENCES

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Appendix A

European Sites - Conservation Objectives

National Parks and Wildlife Service

Conservation Objectives Series

Raven Point Nature Reserve SAC 000710

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

National Parks and Wildlife Service

Conservation Objectives Series

Wexford Harbour and Slobs SPA 004076

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

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

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E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2012) Conservation Objectives: Wexford Harbour and Slobs SPA 004076. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

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***

004076 Wexford Harbour and Slobs SPA

A004	Little Grebe *Tachybaptus ruficollis*	wintering
A005	Great Crested Grebe *Podiceps cristatus*	wintering
A017	Cormorant *Phalacrocorax carbo*	wintering
A028	Grey Heron *Ardea cinerea*	wintering
A037	Bewick's Swan *Cygnus columbianus*	wintering
A038	Whooper Swan *Cygnus cygnus*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A050	Wigeon *Anas penelope*	wintering
A052	Teal *Anas crecca*	wintering
A053	Mallard *Anas platyrhynchos*	wintering
A054	Pintail *Anas acuta*	wintering
A062	Scaup *Aythya marila*	wintering
A067	Goldeneye *Bucephala clangula*	wintering
A069	Red-breasted Merganser *Mergus serrator*	wintering
A082	Hen Harrier *Circus cyaneus*	post-breeding/roost
A125	Coot *Fulica atra*	wintering
A130	Oystercatcher *Haematopus ostralegus*	wintering
A140	Golden Plover *Pluvialis apricaria*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A142	Lapwing *Vanellus vanellus*	wintering
A143	Knot *Calidris canutus*	wintering
A144	Sanderling *Calidris alba*	wintering
A149	Dunlin *Calidris alpina*	wintering
A156	Black-tailed Godwit *Limosa limosa*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	wintering
A183	Lesser Black-backed Gull *Larus fuscus*	wintering
A195	Little Tern *Sterna albifrons*	breeding
A395	Greenland White-fronted goose *Anser albifrons flavirostris*	wintering
A999	Wetlands	

Please note that this SPA is adjacent to The Raven SPA 004019. These SPAs partially overlap with Raven Point Nature Reserve SAC 000710 and Slaney River Valley SAC 000781. See map 2. The conservation objectives for this site should be used in conjunction with those for adjacent and overlapping designations as appropriate.

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

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

Title: BirdLife International Seabird Ecology and Foraging Range Database

Year: 2012

Author: BirdLife International

Series: http://seabird.wikispaces.com

Title: Seabird Monitoring Programme (SMP) Database

Year: 2012

Author: JNCC

Series: http://jncc.defra.gov.uk/smp/Default.aspx

Title: Wexford Harbour and Slobs SPA (004076) and the Raven SPA (004019): Conservation Objectives Supporting Document [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Guidelines for Winter Roost Watching

Year: 2011

Author: O'Donoghue, B.G.

Series: Unpublished NPWS Guidance Note

Title: Seabird Populations of Britain and Ireland

Year: 2004

Author: Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.

Series: Poyser, London

Title: Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.

Year: 1995

Author: Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.

Series: JNCC, Peterborough

Spatial data sources

Year:	2012
Title:	NPWS SPA boundary data
GIS operations:	SPA boundary polygons divided into two classifications (wetlands, terrestrial) based on line identified by expert judgement. Expert opinion used as necessary to resolve any issues arising
Used for:	Wetlands and waterbirds (map 3)

A004 Little Grebe *Tachybaptus ruficollis*

To maintain the favourable conservation condition of Little Grebe in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A005 Great Crested Grebe *Podiceps cristatus*

To maintain the favourable conservation condition of Great Crested Grebe in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A028 Grey Heron *Ardea cinerea*

To maintain the favourable conservation condition of Grey Heron in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A037 Bewick's Swan *Cygnus columbianus*

To maintain the favourable conservation condition of Bewick's Swan in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A053 Mallard *Anas platyrhynchos*

To maintain the favourable conservation condition of Mallard in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A067 Goldeneye *Bucephala clangula*

To maintain the favourable conservation condition of Goldeneye in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A069 Red-breasted Merganser *Mergus serrator*

To maintain the favourable conservation condition of Red-breasted Merganser in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A082 Hen Harrier *Circus cyaneus*

To maintain the favourable conservation condition of Hen Harrier in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Roost attendance: individual hen harriers	Number	No significant decline	Wexford Harbour and Slobs SPA contains an important winter roost site for hen harriers. The five year mean peak recorded for this roost (based on the period 2005/06 - 2009/10) equates to five hen harriers. Measure based on standard survey methods (see O'Donoghue, 2011)
Suitable foraging habitat	hectares	No significant decline	Key prey items: broad diet encompassing birds and mammals. Key habitats: Wetlands, scrub, tillage, hedgerows. Estimated potential foraging area within the SPA is calculated from terrestrial areas plus aquatic (terrestrial) habitat 1889.5ha (see the conservation objectives supporting document (for waterbirds) for further information on wetland habitats). Adjacent areas outside of the SPA are also used by hen harrier during the non-breeding season albeit to an unknown extent
Roost site: condition	Area (hectares); structure	The roost site should be maintained in a suitable condition	A winter roost site occurs within Wexford Harbour and Slobs SPA and is estimated to be 14.1ha in size
Disturbance at the roost site	Level of impact	Human activities should occur at levels that do not adversely affect the Hen Harrier winter roost population	Hen Harriers are senstive to distubance at roost sites during the non-breeding season

A125 Coot *Fulica atra*

To maintain the favourable conservation condition of Coot in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A183 Lesser Black-backed Gull *Larus fuscus*

To maintain the favourable conservation condition of Lesser Black-backed Gull in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A195 Little Tern *Sterna albifrons*

To maintain the favourable conservation condition of Little Tern at Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information for Wexford. The Seabird Monitoring Programme (SMP) also provides background data (JNCC, 2012)
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995)
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	Little tern nest in well-camouflaged shallow scapes on sand and shingle beaches, spits or inshore islets (Mitchell et al., 2004). Due to the dymanic nature of Wexford Harbour, colony locations can vary from year to year
Prey biomass available	Kilogrammes	No significant decline	Key prey items: Mainly small, often juvenile, fish; invertebrates, especially crustaceans and insects. Key habitats: Very shallow water, advancing or receding tidelines, brackish lagoons and saltmarsh creeks, sand-banks close to the coast. Foraging range: Max 11 km, mean max 6.94 km, mean 4.14 km (BirdLife International Seabird Database (Birdlife International, 2012))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: Max 11 km, mean max 6.94 km, mean 4.14 km (BirdLife International Seabird Database (Birdlife International, 2012))
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding little tern population	Little tern nest in well-camouflaged shallow scapes on sand and shingle beaches, spits or inshore islets (Mitchell et al., 2004). Due to the dymanic nature of Wexford Harbour, colony locations can vary from year to year

A395 Greenland White-fronted goose *Anser albifrons flavirostris*

To maintain the favourable conservation condition of Greenland White-fronted Goose in Wexford Harbour and Slobs SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in Wexford Harbour and Slobs SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	Hectares	The permanent area occupied by the wetland habitat (see map 3) should be stable and not significantly less than the area of 4,241ha, other than that due to natural patterns of variation	The wetland habitat area was estimated as 4,241ha using OSi data and relevant orthophotographs. For further information see parts three and five of the conservation objectives supporting document

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Department of Arts, Heritage and the Gaeltacht

MAP 1:
WEXFORD HARBOUR AND SLOBS SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

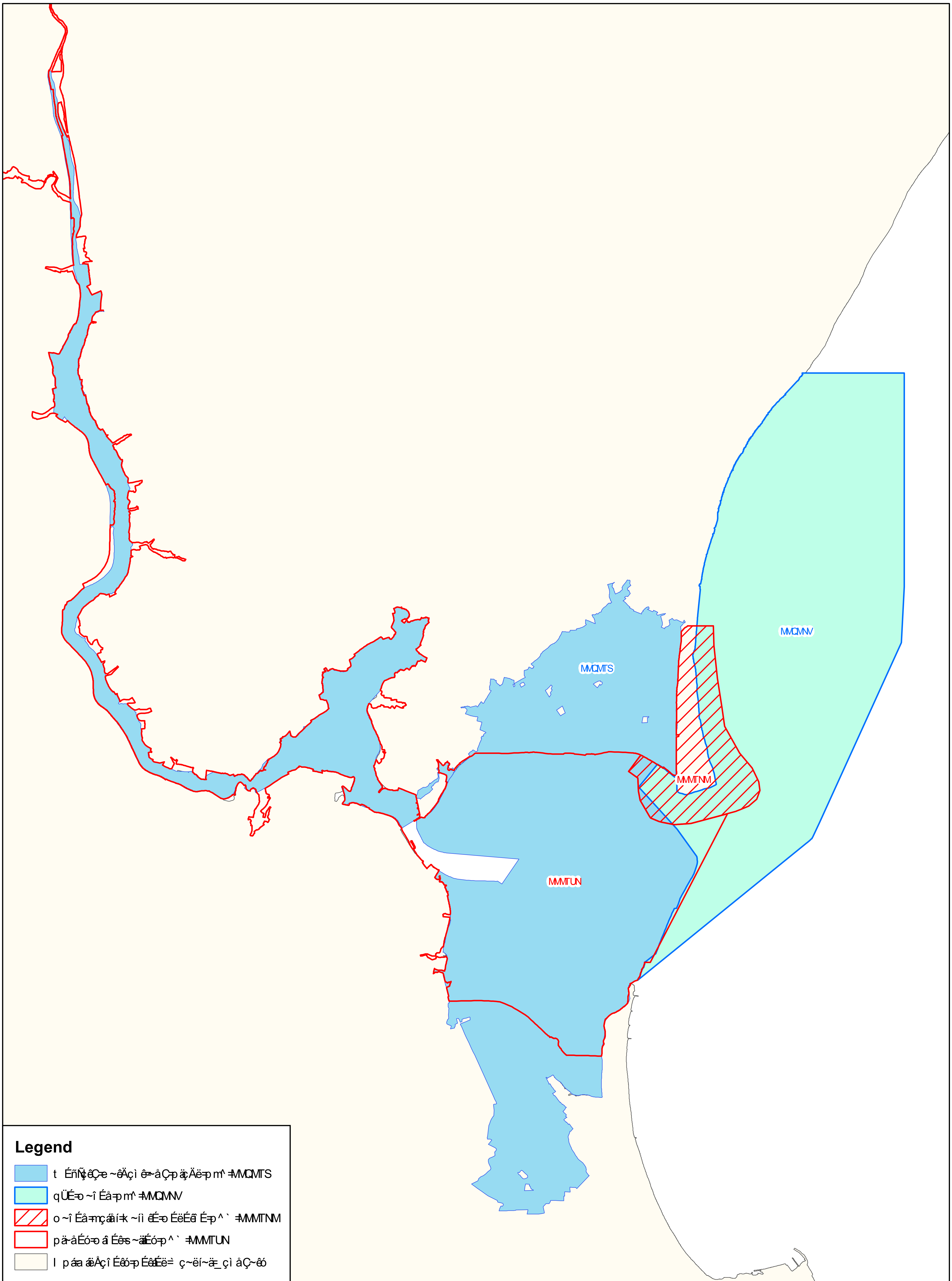
CO. WEXFORD

N

SITE CODE

SPA 004076
Version 2.04

Map Version 1
Date: March 2012



MAP 2:
WEXFORD HARBOUR AND SLOBS SPA
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

SITE CODE: SPA 004019 CO. WEXFORD; version 1.02
SPA 004076 CO. WEXFORD; version 2.04
SAC 000710 CO. WEXFORD; version 1
SAC 000781 CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

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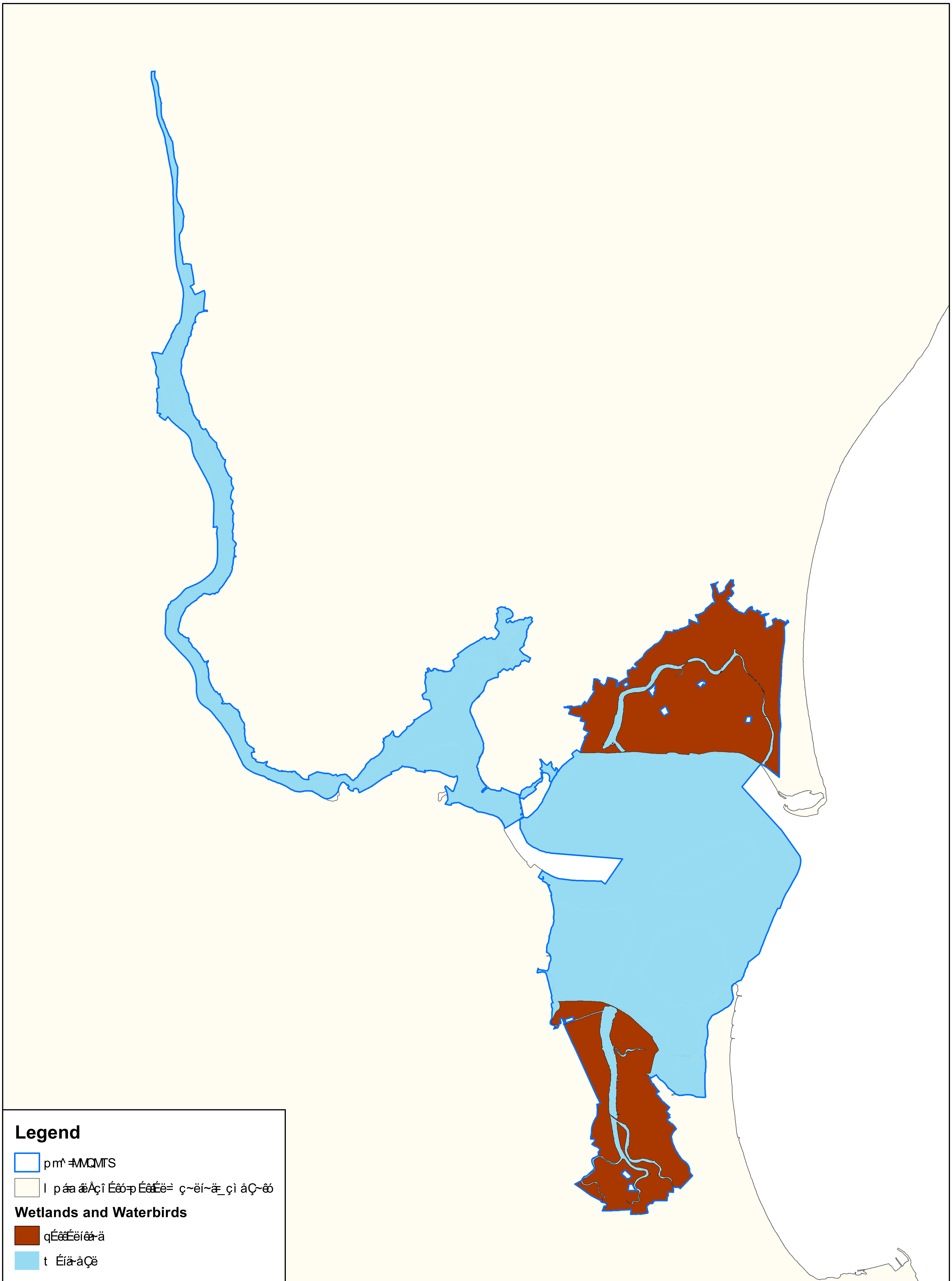

MAP 3:
WEXFORD HARBOUR AND SLOBS SPA
CONSERVATION OBJECTIVES
WETLANDS AND WATERBIRDS

CO. WEXFORD

SITE CODE

SPA 004076
Version 2.04

Map Version 1
Date: March 2012

National Parks and Wildlife Service

Conservation Objectives Series

The Raven SPA 004019

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

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

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E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2012) Conservation Objectives: The Raven SPA 004019. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

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***

004019 The Raven SPA

A001	Red-throated Diver *Gavia stellata*	wintering
A017	Cormorant *Phalacrocorax carbo*	wintering
A065	Common Scoter *Melanitta nigra*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A144	Sanderling *Calidris alba*	wintering
A395	Greenland White-fronted goose *Anser albifrons flavirostris*	wintering
A999	Wetlands	

Please note that this SPA is adjacent to Wexford Harbour and Slobs SPA 004076. These SPAs partially overlap with Raven Point Nature Reserve SAC 000710 and Slaney River Valley SAC 000781. See map 2. The conservation objectives for this site should be used in conjunction with those for adjacent and overlapping designations as appropriate.

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

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

Title:	Wexford Harbour and Slobs SPA (004076) and the Raven SPA (004019): Conservation Objectives Supporting Document [Version 1]
Year:	2011
Author:	NPWS
Series:	Unpublished Report to NPWS

A001 Red-throated Diver *Gavia stellata*

To maintain the favourable conservation condition of Red-throated Diver in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A065 Common Scoter *Melanitta nigra*

To maintain the favourable conservation condition of Common Scoter in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A395 Greenland White-fronted goose *Anser albifrons flavirostris*

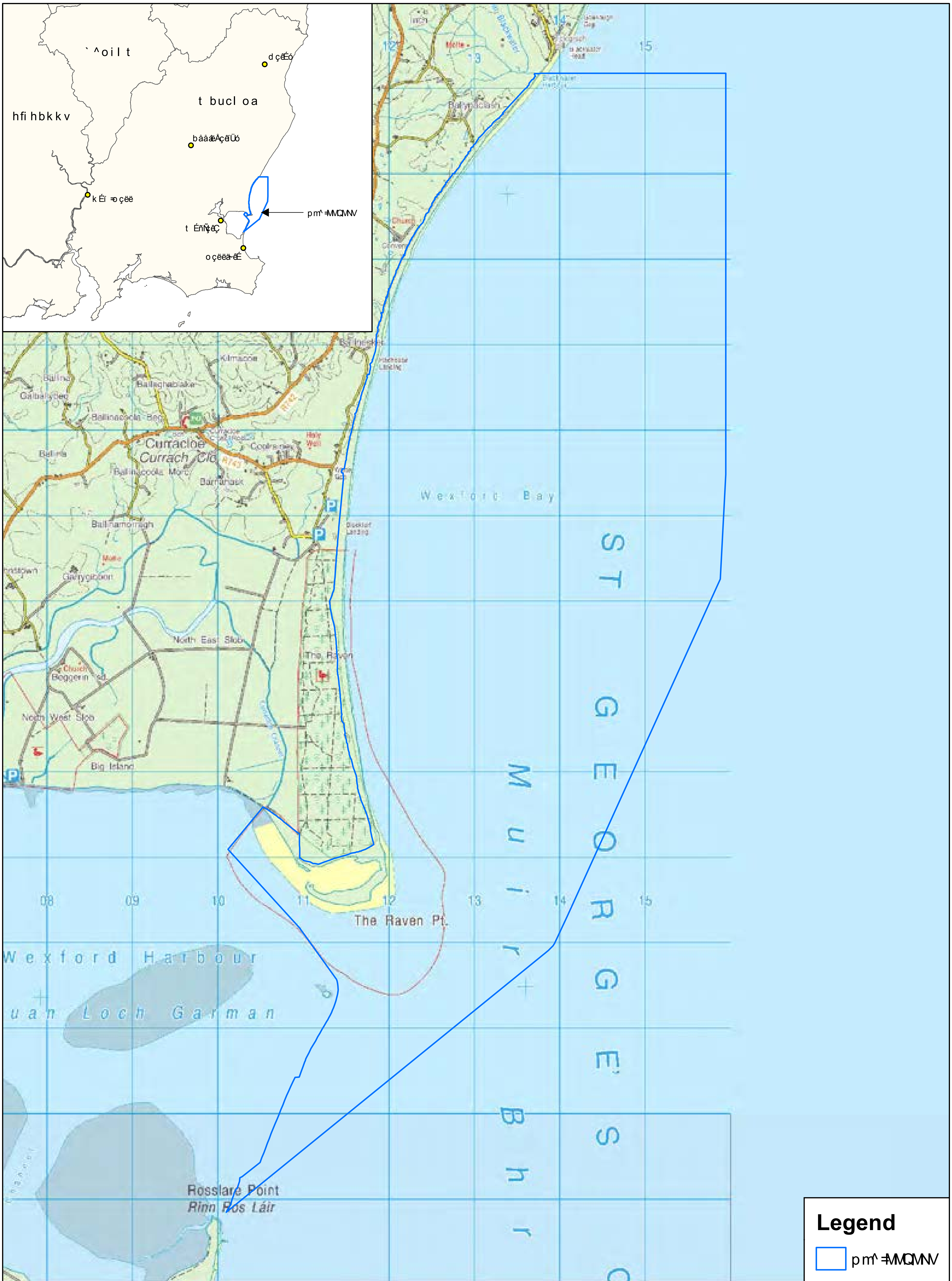
To maintain the favourable conservation condition of Greenland White-fronted Goose in The Raven SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in The Raven SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 4,207ha, other than that due to natural patterns of variation	The wetland habitat area was estimated as 4,207ha using OSi data and relevant orthophotographs. For further information see parts three and five of the conservation objectives supporting document



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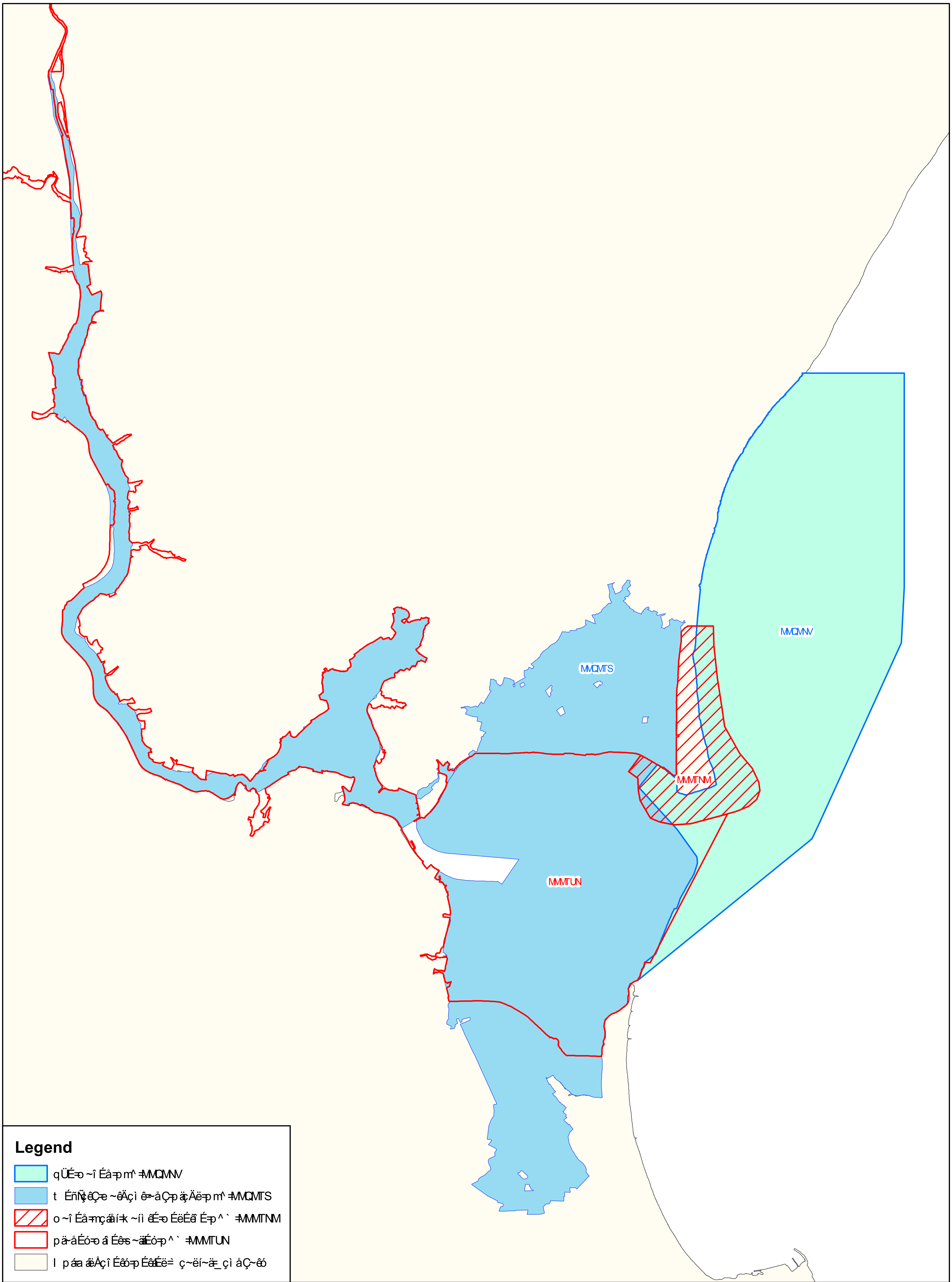
MAP 1:
THE RAVEN SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

CO. WEXFORD

SITE CODE
SPA 004019
Version 1.02

Map Version 1
Date: March 2012



MAP 2:
THE RAVEN SPA
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

SITE CODE: SPA 004019 CO. WEXFORD; version 1.02
SPA 004076 CO. WEXFORD; version 2.04
SAC 000710 CO. WEXFORD; version 1
SAC 000781 CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

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Map Version 1
Date: March 2012

National Parks and Wildlife Service

Conservation Objectives

River Barrow and River Nore SAC 002162

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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.

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- its natural range, and area it covers within that range, are stable or increasing, and
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- 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.
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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

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/m^2	Juvenile density at least 1/m^2	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	m^2 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/m^2	Mean catchment juvenile density of brook/river lamprey at least 2/m^2	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m^2 in optimal conditions and more than 2/m^2 on a catchment basis
Extent and distribution of spawning habitat	m^2 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*)

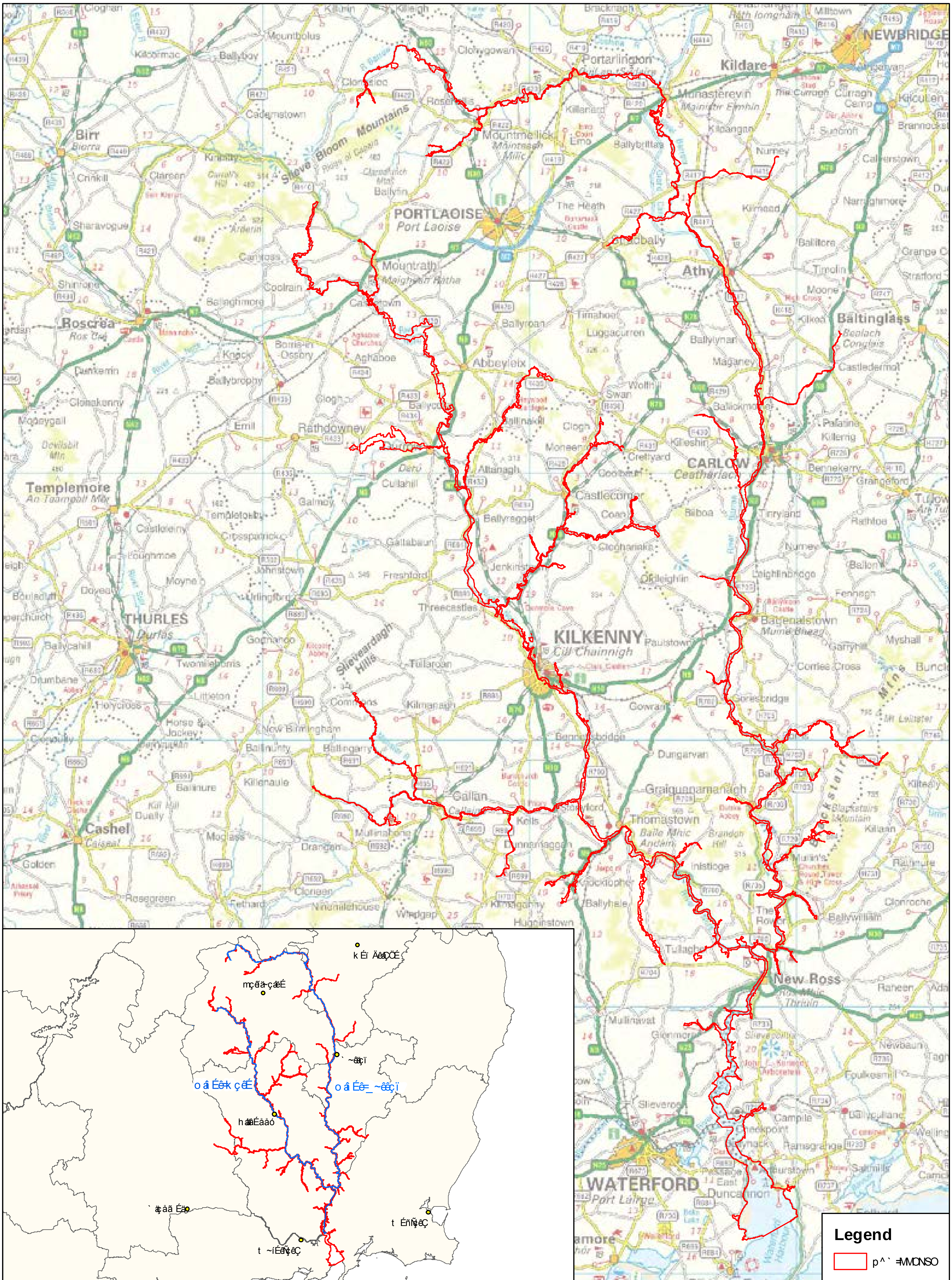
To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in the River Barrow and River Nore SAC, which is defined by the following list of attributes and targets:

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*)



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

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

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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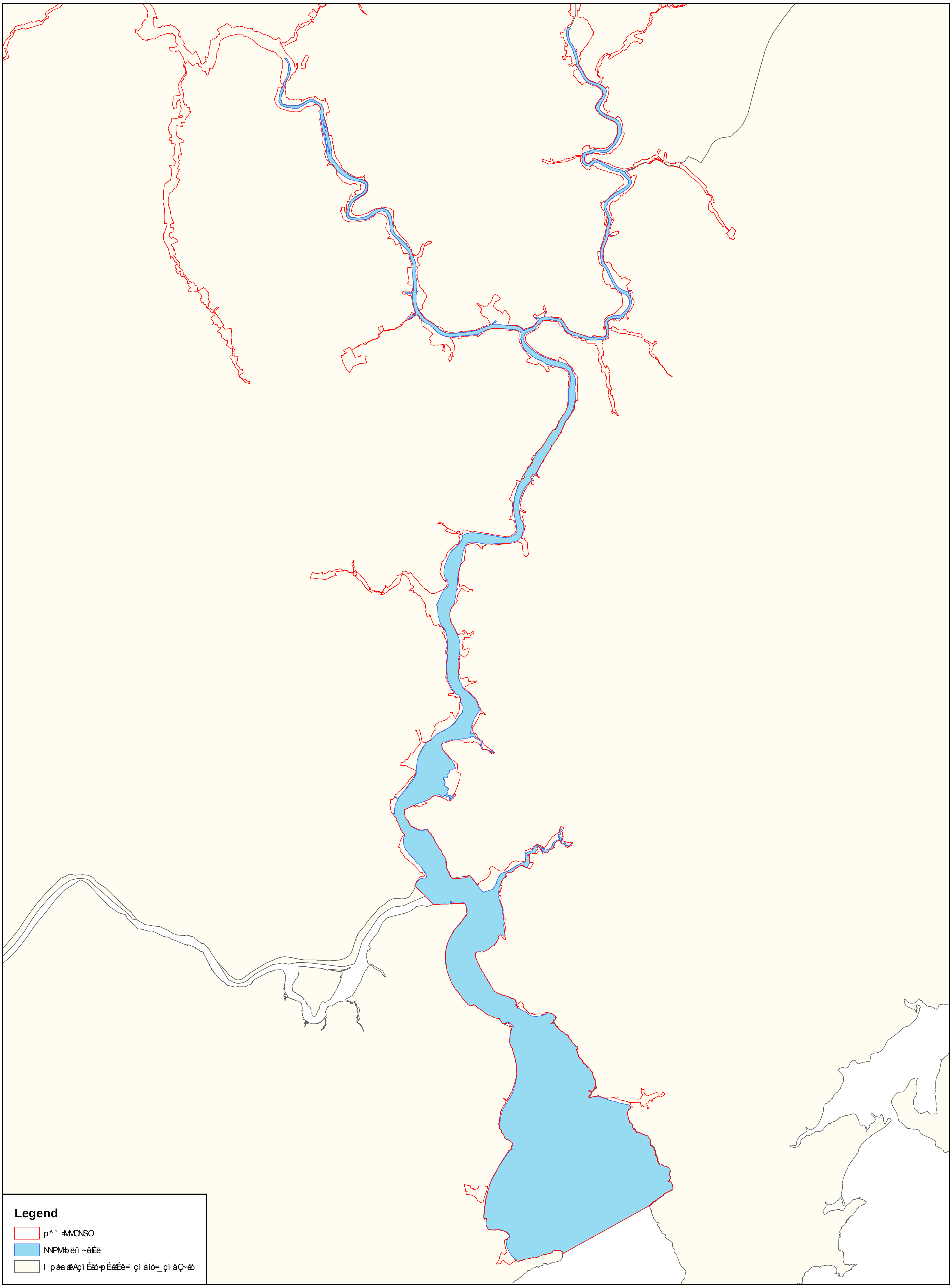
Map Version 1
Date: April 2011



MAP 2:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES ESTUARIES

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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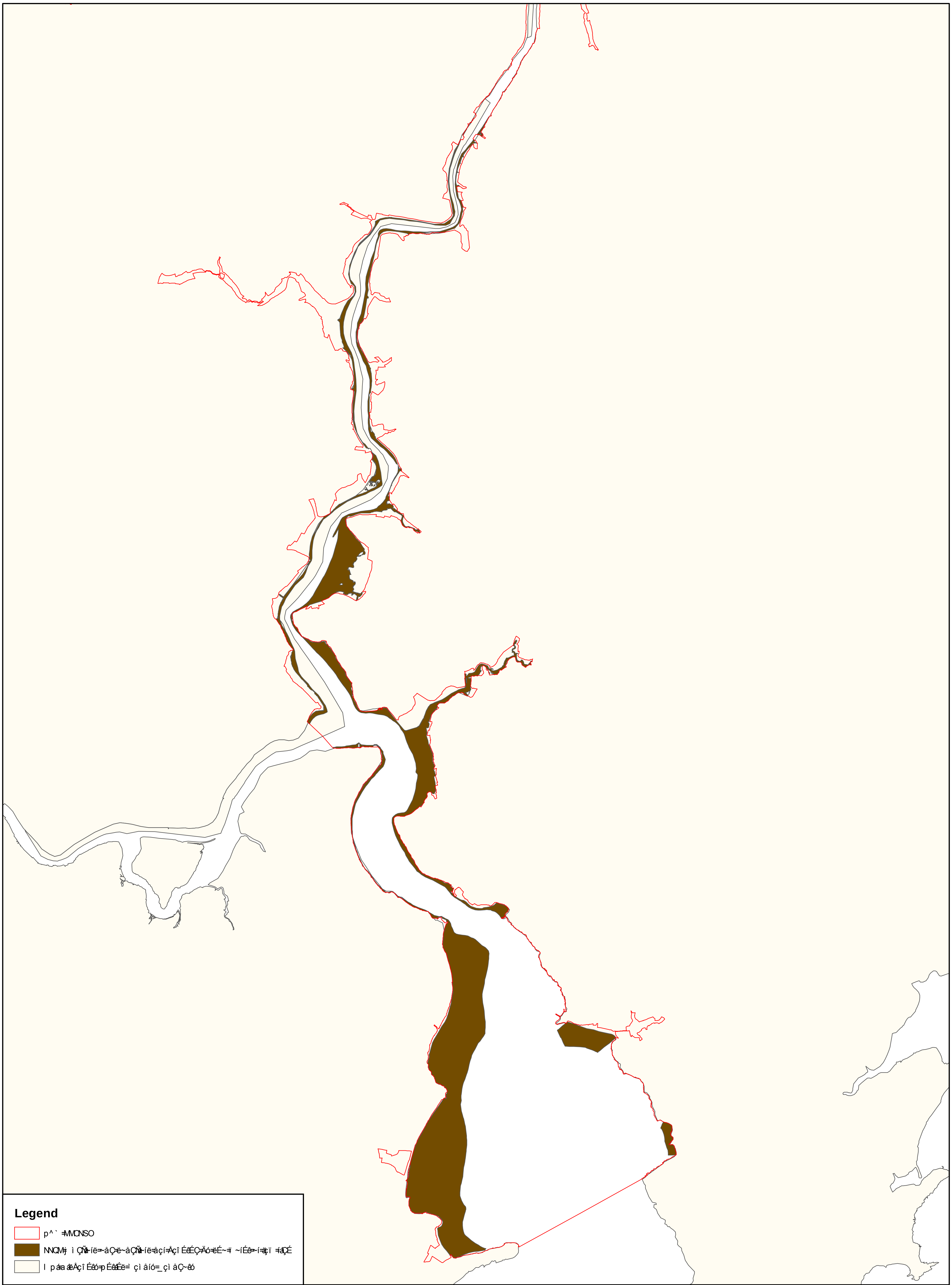
Map Version 1
Date: April 2011



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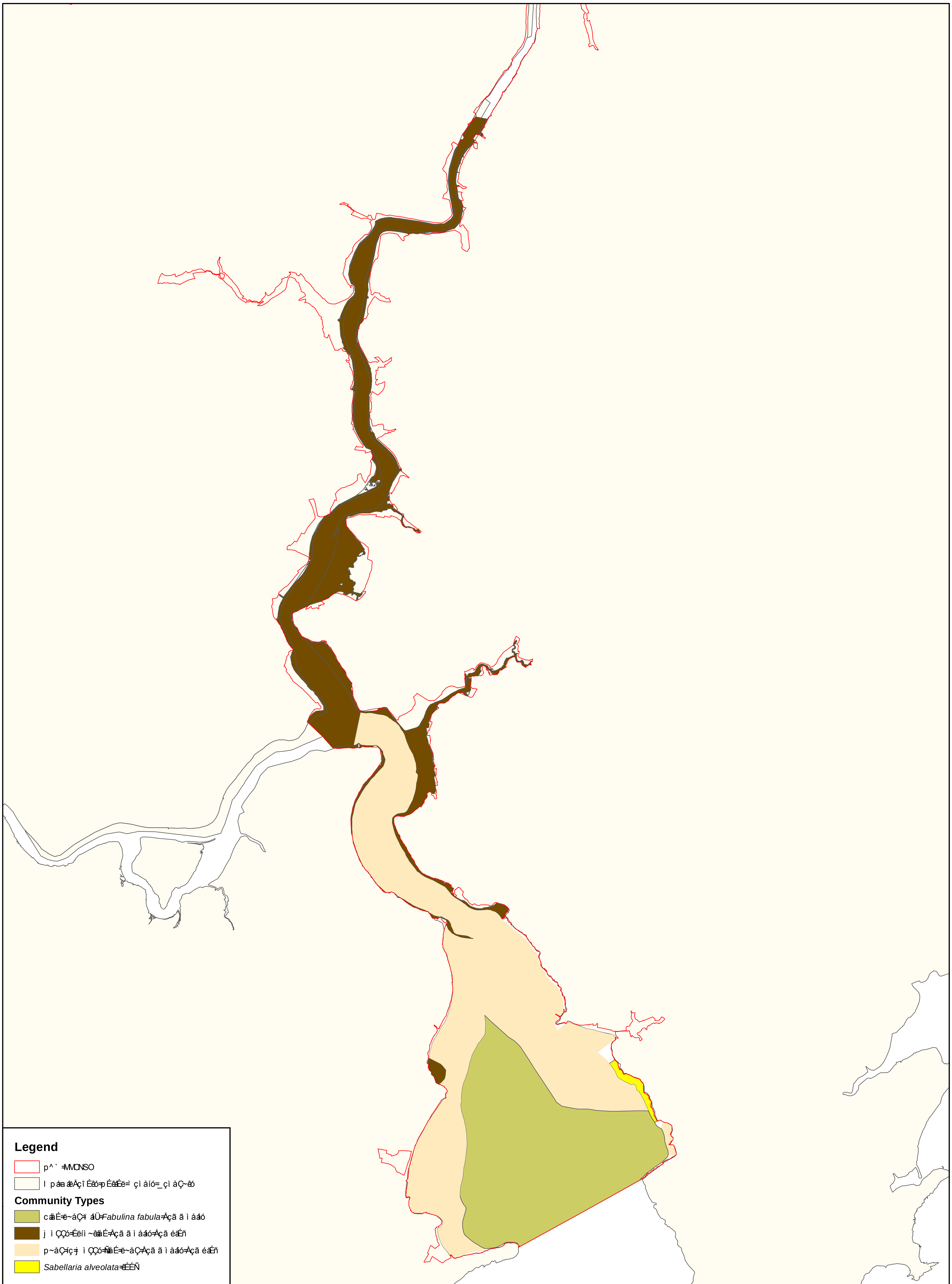
MAP 3:
RIVER BARROW AND RIVER NORE
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

N

Map Version 1
Date: April 2011

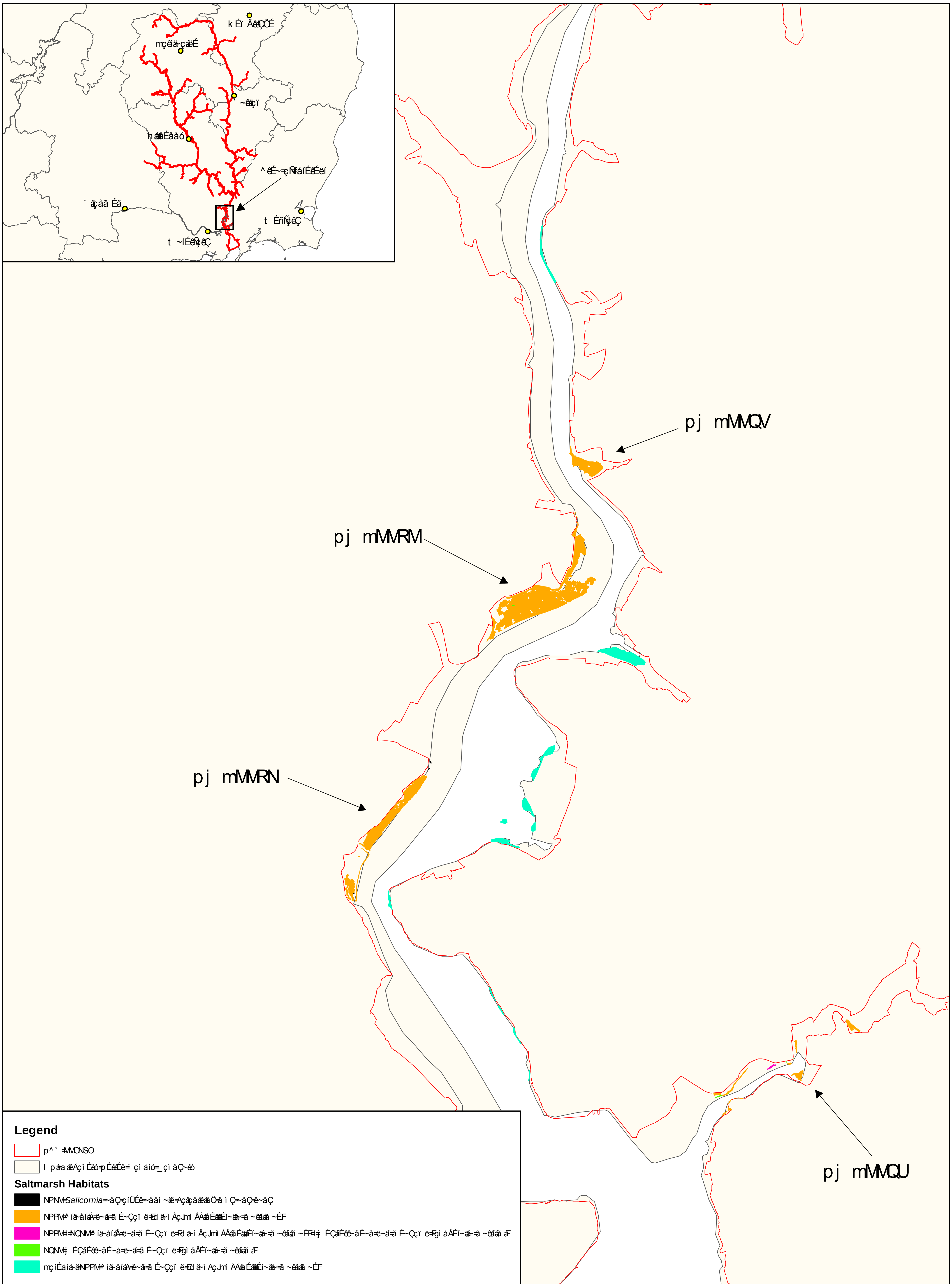


MAP 4:
RIVER BARROW AND RIVER NORE
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

N

Map Version 1
Date: April 2011



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

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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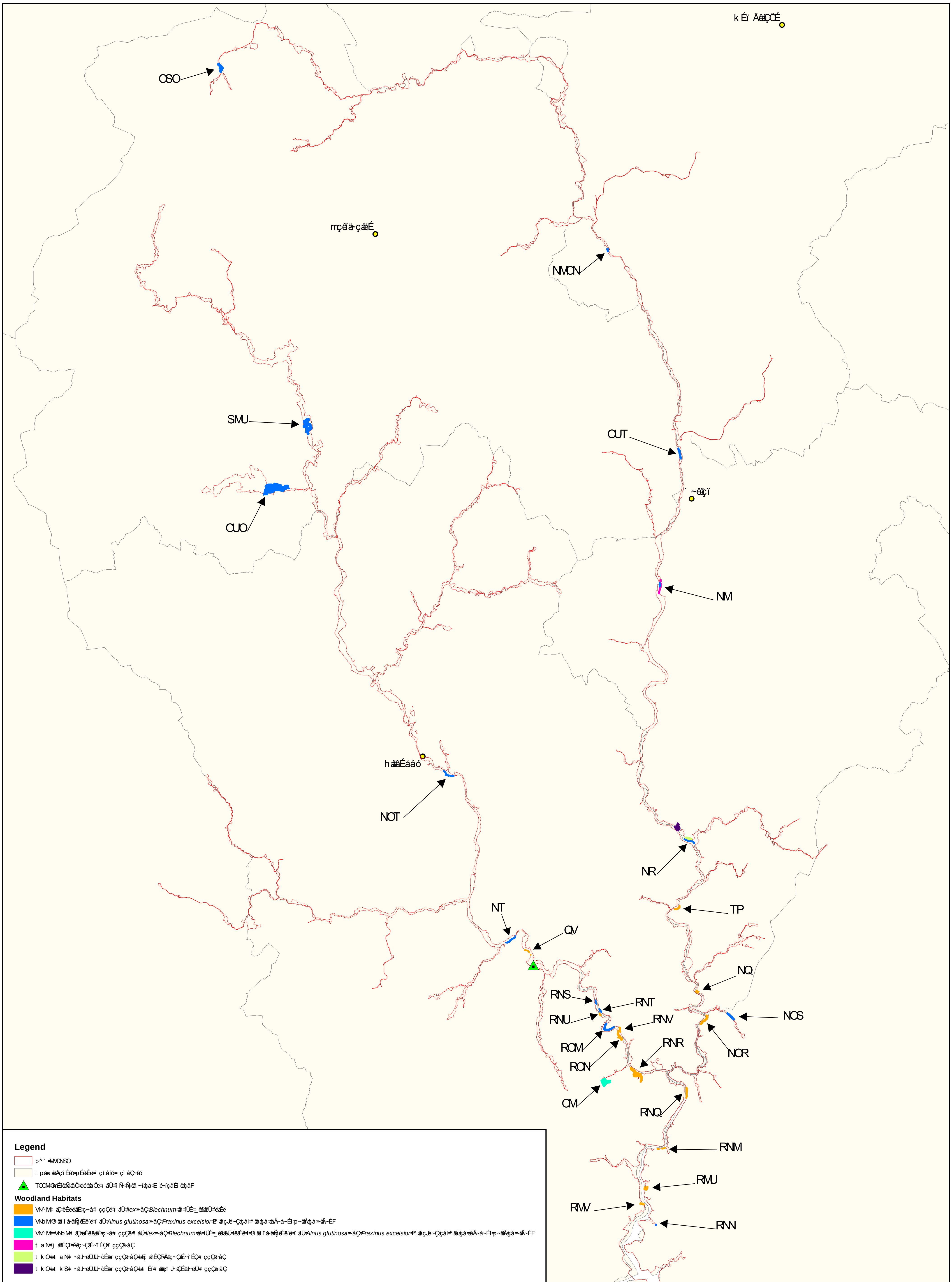
Map Version 1
Date: April 2011



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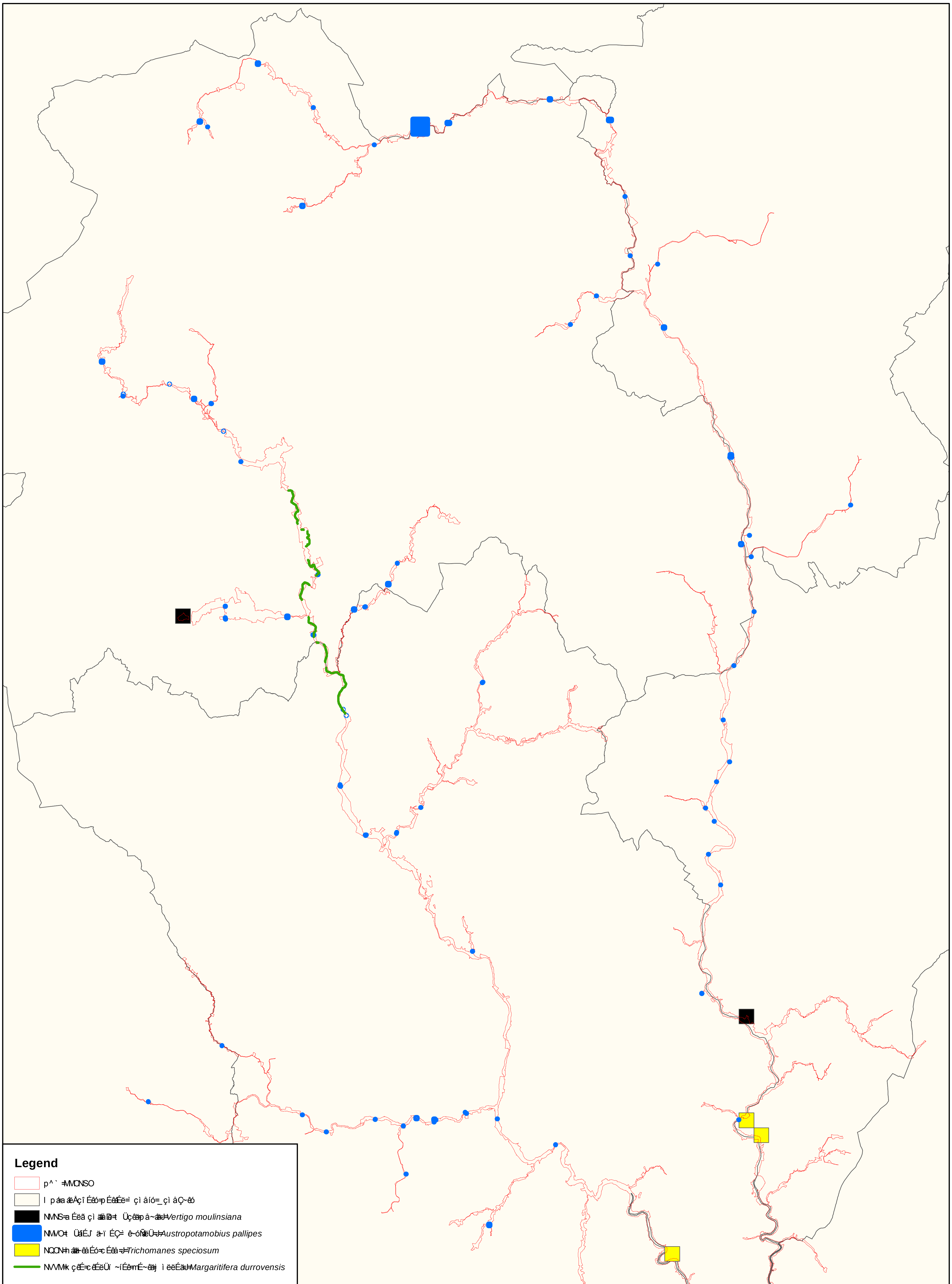
MAP 6:
RIVER BARROW AND RIVER NORE CONSERVATION OBJECTIVES OLD OAK WOODLANDS, ALLUVIAL FORESTS & PETRIFYING SPRINGS

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

N

Map Version 1
Date: April 2011



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

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

N

Map Version 1
Date: April 2011

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

Produced by: National Parks and Wildlife Service,
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7 Ely Place, Dublin 2, Ireland.
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Citation:

NPWS (2011) Conservation Objectives: River Barrow and River Nore SAC 002162. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Slaney River Valley SAC 000781

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

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

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Series Editors: Rebecca Jeffrey & Naomi Kingston

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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***

000781 Slaney River Valley SAC

1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
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
1355	Otter *Lutra lutra*
1365	Harbour Seal *Phoca vitulina*
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
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*)

Please note that this SAC is adjacent to/overlaps with Raven Point Nature Reserve SAC 000710; The Raven SPA 004019; and Wexford Harbour and Slobs SPA 004076. See map 2.

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

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

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Year: in press
Author: Gargan, P.G.; Roche, W.K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series: Journal of Applied Ichthyology

Title: Slaney River Valley SAC (000781). Conservation objectives supporting document - marine habitats and species [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: NPWS Rare and Threatened Species Database
Year: 2011
Author: NPWS
Series: Unpublished NPWS Dataset

Title: Slaney River Valley SAC (000781). Conservation objectives supporting document - woodland habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Slaney River Valley cSAC (000781) and Wexford Harbour and Slobs SPA (004076) Co. Wexford
Year: 2010
Author: Aquafact
Series: Unpublished Report to NPWS & MI

Title: Otter tracking study of Roaringwater Bay
Year: 2010
Author: De Jongh, A.; O'Neill, L.
Series: Unpublished Draft 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: 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: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Wexford Harbour
Year: 2009
Author: ASU
Series: Unpublished Report to NPWS

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: Aspects of anadromous Allis shad (*Alosa alosa* Linnaeus) and Twaite shad (*Alosa fallax* Lacépède) biology in four Irish Special Areas of Conservation (SACs): status, spawning indications and implications for consŜǊØl·ǘʎ2ƴ ŘŜăʎ∃ƴl·ǘʎ2ƴ

Year: 2008

Author: King, J.J.; Roche, W.K.

Series: Hydrobiologia 602, 145–154

Title: Water-starworts, *Callitriche*, of Europe

Year: 2008

Author: Lansdown, R.V.

Series: BSBI Handbook, No. 11, London

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: 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: 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: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: Harbour seal population assessment in the Republic of Ireland: August 2003
Year: 2004
Author: Cronin, M.; Duck, C.; Ó Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.
Series: Irish Wildlife Manuals No. 11

Title: The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs
Year: 2004
Author: King, J.J.; Linnane, S.M.
Series: Irish Wildlife Manuals No. 14

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

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: Pondweeds of Great Britain and Ireland
Year: 2003
Author: Preston, C.D.
Series: BSBI Handbook, No. 8, London

Title: Reversing the habitat fragmentation of British woodlands
Year: 2002
Author: Peterken, G.
Series: WWF-UK, London

Title: Aquatic Plants in Britain and Ireland
Year: 2001
Author: Preston, C.D.
Series: Harley Books, Colchester

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: The spatial organization of otters (*Lutra lutra*) in Shetland
Year: 1991
Author: Kruuk, H.; Moorhouse, A.
Series: J. Zool, 224: 41-57

Title: CORINE Biotopes Database - Ireland

Year: 1989

Author: NPWS

Series: Unpublished NPWS Dataset

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

Title: The distribution of grey and common seals on the coasts of Ireland

Year: 1966

Author: Lockley, R.M.

Series: Irish Naturalists' Journal 15: 136-143

Spatial data sources

Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary
Used for:	1130 (map 3)
Year:	Interpolated 2011
Title:	2008 intertidal survey data; 2010 subtidal survey data
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, 1140 (maps 4 and 5)
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; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 5)
Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	91A0, 91E0 (map 6)
Year:	Derived 2011
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial references contained in files
Used for:	3260 (map 6)
Year:	2011
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (map 7)
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. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (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 terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WDF Waterbodies data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data. Overlapping regions investigated and resloved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the Slaney River Valley SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea lamprey in the Slaney River Valley 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. In this site, some barrier modification is required (e.g. Clohamon weir) to permit sea lamprey passage (Gargan et al., in press)
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on Harvey and Cowx (2003)
Juvenile density in fine sediment	Juveniles/m^2	Juvenile density at least 1/m^2	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	m^2 and occurrence	No decline in extent and distribution of spawning beds. Improved dispersal of spawning beds into areas upstream of barriers	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). Lampreys spawn in clean gravels
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	Target based on studies by Central Fisheries Board (CFB)/IFI; Ecofact for NPWS (e.g. King and Linnane, 2004; O'Connor, 2007)

1096 Brook Lamprey *Lampetra planeri*

To restore the favourable conservation condition of Brook lamprey in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. Barrier modification required to facilitate passage of adult fish within channels (Gargan et al., in press)
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 & Cowx (2003). 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/m^2	Mean catchment juvenile density of brook/river lamprey at least $2/m^2$	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey & Cowx (2003) who state 10/m^2 in optimal conditions and more than $2/m^2$ on a catchment basis
Extent and distribution of spawning habitat	m^2 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
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	Target based on studies by Central Fisheries Board (CFB)/IFI; Ecofact for NPWS (e.g. King and Linnane, 2004; O'Connor, 2007)

1099 River Lamprey *Lampetra fluviatilis*

To restore the favourable conservation condition of River lamprey in the Slaney River Valley 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. Barrier modification required to facilitate passage of adult fish within channels (Gargan et al., in press)
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 & Cowx (2003). 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/m^2	Mean catchment juvenile density of brook/river lamprey at least $2/m^2$	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey & Cowx (2003) who state $10/m^2$ in optimal conditions and more than $2/m^2$ on a catchment basis
Extent and distribution of spawning habitat	m^2 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
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	Target based on studies by Central Fisheries Board (CFB)/IFI; Ecofact for NPWS (e.g. King and Linnane, 2004; O'Connor, 2007)

1103 Twaite Shad *Alosa fallax*

To restore the favourable conservation condition of Twaite shad in the Slaney River Valley 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. Barrier modification required to facilitate passage of adult fish within channels (Gargan et al., in press)
Population structure- age classes	Number of age classes	More than one age class present	Regular breeding has not been confirmed in the River Slaney in recent years (King and Roche, 2008)
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	

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

To restore the favourable conservation condition of Salmon in the Slaney River Valley 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 can block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
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 fish counter at Clohamon is used to assess the run of salmon on the Slaney. The Slaney is currently (2011) below its CL for both 1SW salmon (meeting 54%) & MSW salmon (meeting 34%)
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, hydroelectric schemes, 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
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 Slaney River Valley 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 as 1,905ha using OSi data and the defined Transitional Water Body area under the Water Framework Directive. See marine supporting document for further information
Community distribution	Hectares	The following community types should be maintained in, or restored to, a natural condition: Mixed sediment community complex; Estuarine muds dominated by polychaetes and crustaceans community complex; and Sand dominated by polychaetes community complex. See map 5	The likely area of sediment communities was derived from a combination of intertidal and subtidal surveys undertaken in 2008 and 2010 (ASU, 2009; Aquafact, 2010). See marine supporting document for further information

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Slaney River Valley 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 4	Habitat area was estimated as 1,027ha using OSi data. See marine supporting document for further information
Community distribution	Hectares	The following community types should be maintained in a natural condition: Estuarine muds dominated by polychaetes and crustaceans community complex; and Sand dominated by polychaetes community complex. See map 5	The likely area of sediment communities was derived from a intertidal surveys undertaken in 2008 (ASU, 2009). See marine supporting document for further information

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in the Slaney River Valley 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 64.7ha above high water mark (HWM); 453.4ha 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 534.7ha	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 264.1km	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/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 0.4ha	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)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh & O'Neill, 2010). It is important that such commuting routes are not obstructed

1365 Harbour Seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 7	See marine supporting document for further details
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition. See map 7	Attribute and target based on background knowledge of Irish breeding populations and review of data from unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition. See map 7	Attribute and target based on background knowledge of Irish populations, review of data from Lockley (1966), Cronin et al. (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition. See map 7	Attribute and target based on background knowledge of Irish populations and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site. See map 7	See marine supporting document for further details

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 Slaney River Valley 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. See map 6 for mapped known extent	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 asssemblage associated with tidal reaches of large rivers between Enniscorthy and Polladerg townland (see map 6). This sub-type is characterised by the presence of the rare and protected species short-leaved water-starwort (*Callitriche truncata*) and Opposite-leaved pondweed (*Groenlandia densa*). Other sub-types of the habitat were recorded in two tributaries of the Slaney: *Scapanietum undulatae* and *Pellietum epiphyllae scapanietosum* (Derreen River) and *Callitricho-Batrachionthe* (Derreen and Derry Rivers) (Heuff, 1987). Other examples of these or other sub-types may be present within the SAC
Habitat area	Kilometres	Area stable at 12.6km or increasing, subject to natural processes. See map 6	The full extent of this habitat in this site is currently unknown. The target of 12.6km applies to the tidal sub-type only
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: tidal influcence	Daily water level fluctuations - metres	Maintain natural tidal regime	The disturbance associated with the tidal regime is the primary driver of the tidal sub-type and rare associated species (see Lansdown, 2008; Preston, 2003; Preston and Croft, 2001)

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 Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum composition: particle size range	Millimetres	For the tidal sub-type, the substratum of the channel must be dominated by particles of sand to gravel, with silt at the river margins	Target applies to tidal sub-type only. The size and distribution of substratum particles is largely determined by the river flow and tidal regime. Short-leaved water-starwort (*Callitriche truncata*) has been recorded from gravel-dominated substratum in the centre of the channel, as well as muds in marginal inlets and at the rivers' edge (J. Ryan, pers. comm., NPWS Rare and Threatened Species Database, 2011). Opposite-leaved pondweed (*Groenlandia densa*) is typically found on silts, sometimes sands, while needle spike-rush (*Eleocharis acicularis*) requires the marginal fine muds
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column must be sufficiently low to prevent changes in species composition or habitat condition	The Environmental Protection Agency (EPA) do not monitor the tidal stretch of the Slaney. However, the data from upstream of Enniscorthy suggest the water quality for the tidal stretch is at good status (2007-2009). It is likely that the rare species associated with the tidal sub-type are tolerant of some nutrient enrichment, but may be sensitive to severe enrichment (Preston, 2003). Consequently, water quality should reach Water Framework Directive good status, in terms of nutrient standards, and macroinvertebrate and phytobenthos quality elements (see S.I. 272 of 2009)

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 Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type reach favourable status	The sub-types of this habitat are poorly understood and their typical species have not yet been defined. Additional typical species and appropriate targets may emerge. The typical species of the tidal sub-type in the Slaney include short-leaved water-starwort (*Callitriche truncata*), opposite-leaved pondweed (*Groenlandia densa*), spiked water-milfoil (*Myriophyllum spicatum*), other pondweeds (*Potamogeton* spp.), as well as pioneer vegetation of bare mud, e.g. needle spike-rush (*Eleocharis acicularis*) (NPWS Rare and Threatened Species Database, 2011; NPWS, 1989; J. Ryan, pers. comm.). The tidal stretch also supports important reed beds (including common reed (*Phragmites australis*), greater pond-sedge (*Carex riparia*), reed canary-grass (*Phalaris arundinacea*) and common club-rush (*Schoenoplectus lacustris*)), marginal swamp vegetation and freshwater marsh. The invasive macrophyte Nuttall's waterweed (*Elodea nuttallii*) is also known to occur in the tidal stretch of the Slaney (R. Goodwillie, pers. comm.). The typical species may include higher plants, bryophytes, macroalgae and microalgae
Floodplain connectivity: area	Hectares	The area of active floodplain at and upstream of the habitat must be maintained	River connectivity with the floodplain must be maintained. The site of the tidal sub-type in the Slaney River is within an area of floodplain. Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition

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

To restore the favourable conservation condition of old sessile oakwoods with *Ilex* and *Blechnum* in the Slaney River Valley 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 146.17ha for sub-sites surveyed. See map 6	Minimum area, based on 10 sites surveyed by Perrin et al. (2008) - site codes 1, 8, 26, 158, 172, 180, 210, 310, 749 and 988. 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 SAC
Woodland size	Hectares	Area stable or 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 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). 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). 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
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list sites 1, 26, 158, 172, 180, 310, 749 as potential ancient/long-established woodlands

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

To restore the favourable conservation condition of old sessile oakwoods with *Ilex* and *Blechnum* in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
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)
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*)

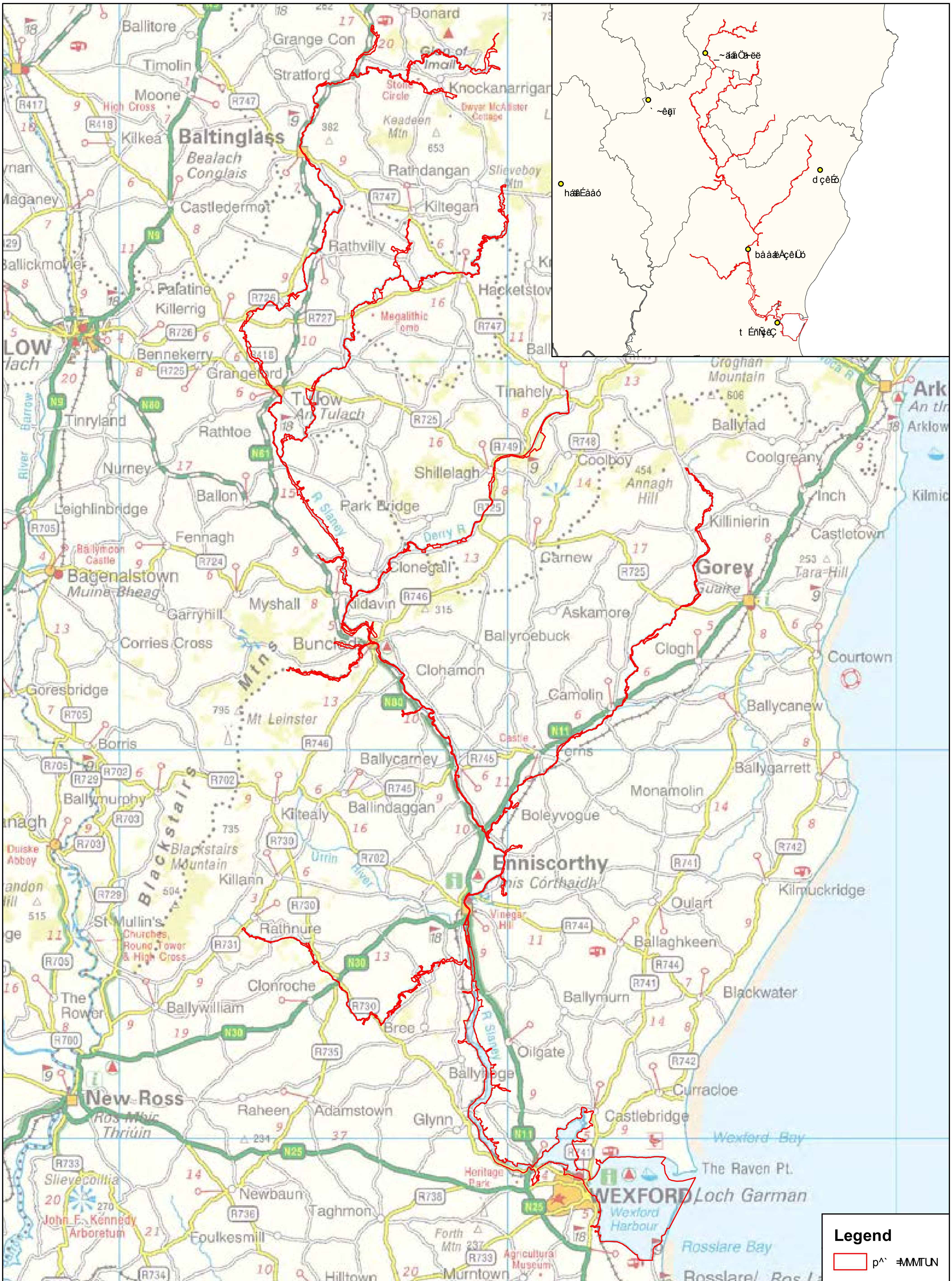
To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*) in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 18.7ha for sites surveyed. See map 6	Minimum area, based on 7 sites surveyed by Perrin et al. (2008) - site codes 1, 157, 208, 209, 211, 875, 988. 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 SAC
Woodland size	Hectares	Area stable or 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). 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). 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 floodplains
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*) in the Slaney River Valley 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-data and other rare or localised species. Perrin & Daly (2010) list site 1as containing 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)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008)
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*) and Himalayan balsam (*Impatiens glandulifera*)



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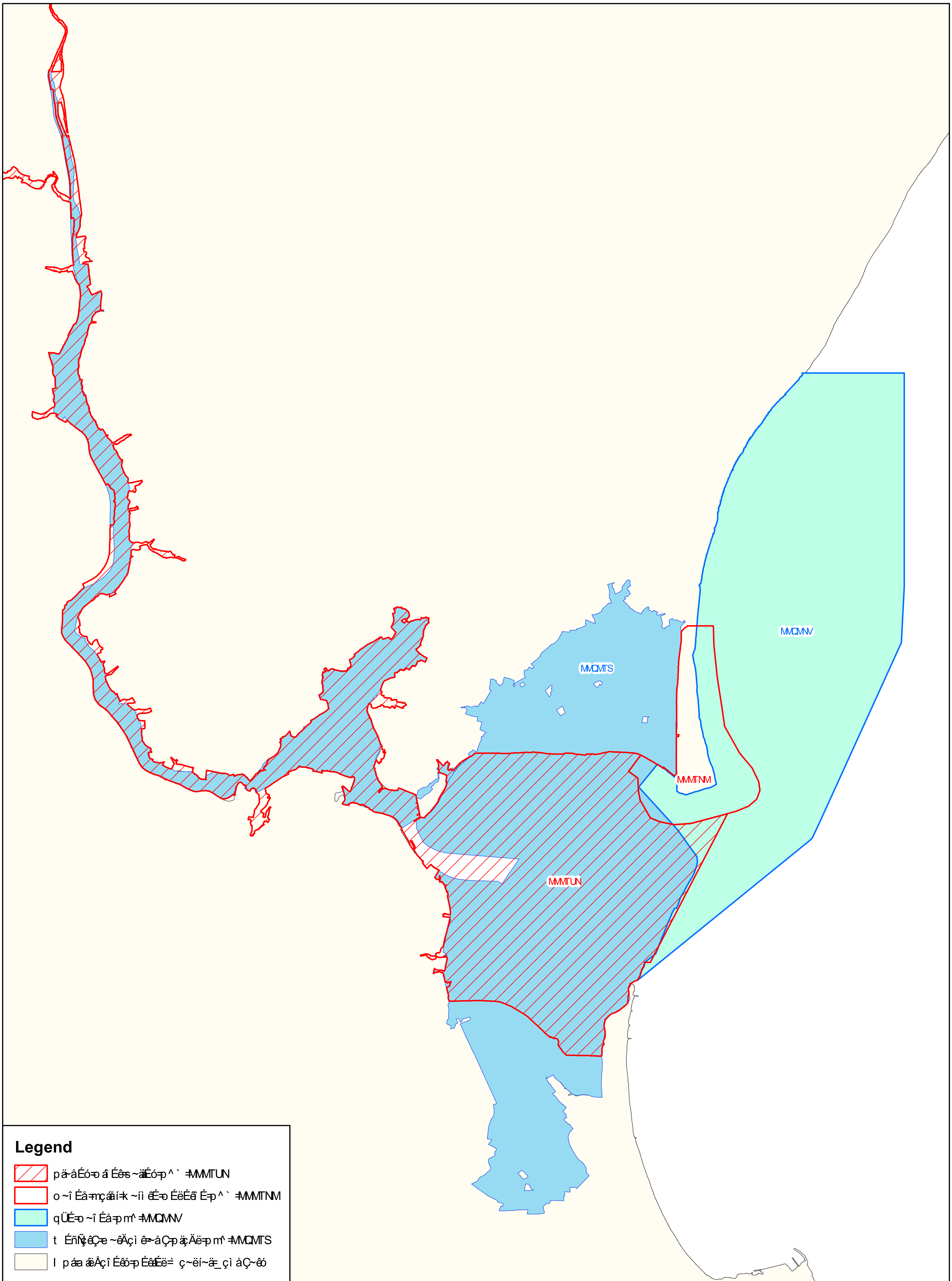
Department of Arts, Heritage and the Gaeltacht

MAP 1:
SLANEY RIVER VALLEY CONSERVATION OBJECTIVES SAC DESIGNATION

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

N

Map Version 1
Date: Sept 2011



MAP 2:
SLANEY RIVER VALLEY SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

SITE CODE: SAC 000710 CO. WEXFORD; version 1
SAC 000781 CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07
SPA 004019 CO. WEXFORD; version 1.02
SPA 004076 CO. WEXFORD; version 2.04

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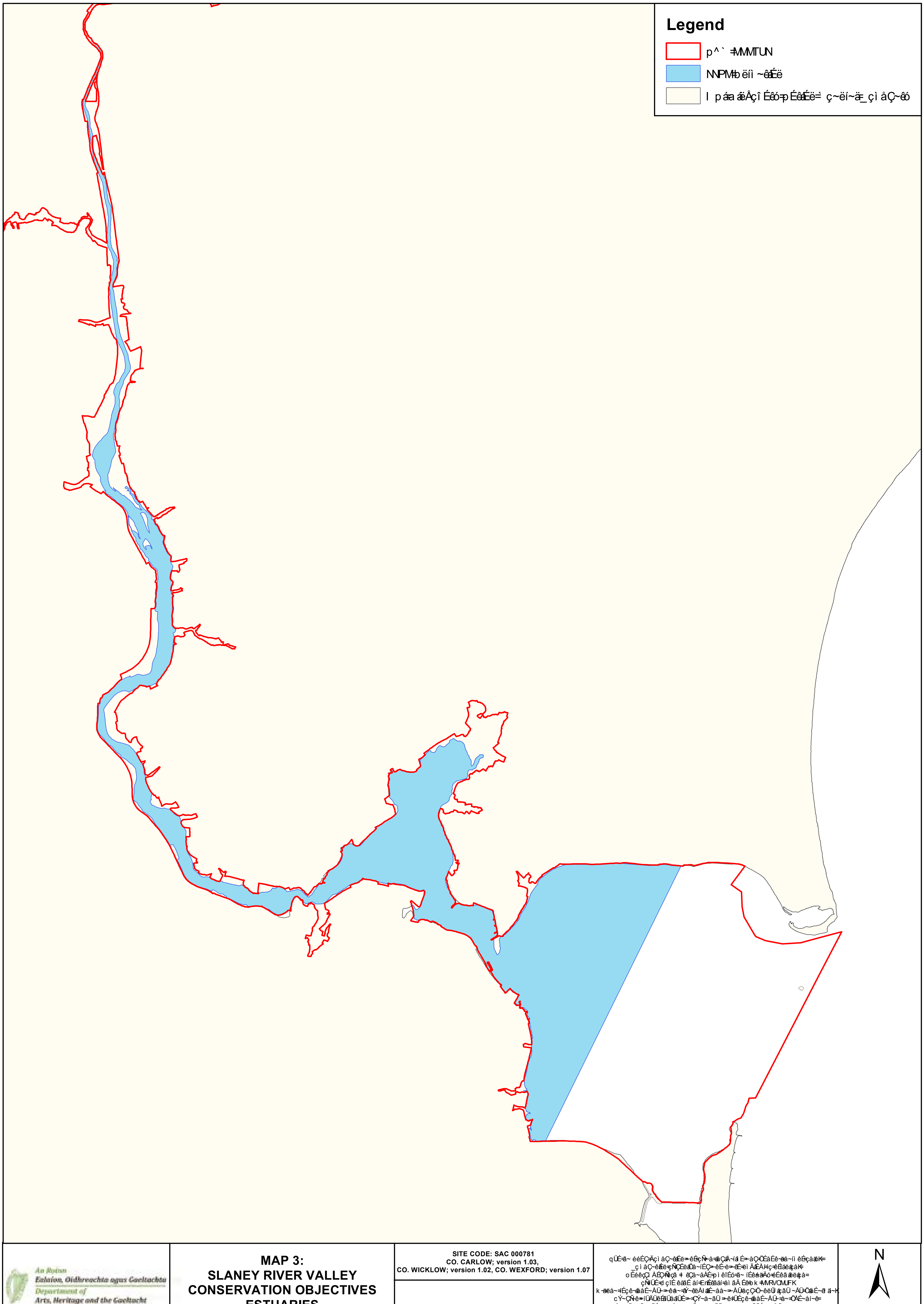
Map Version 1
Date: Sept 2011



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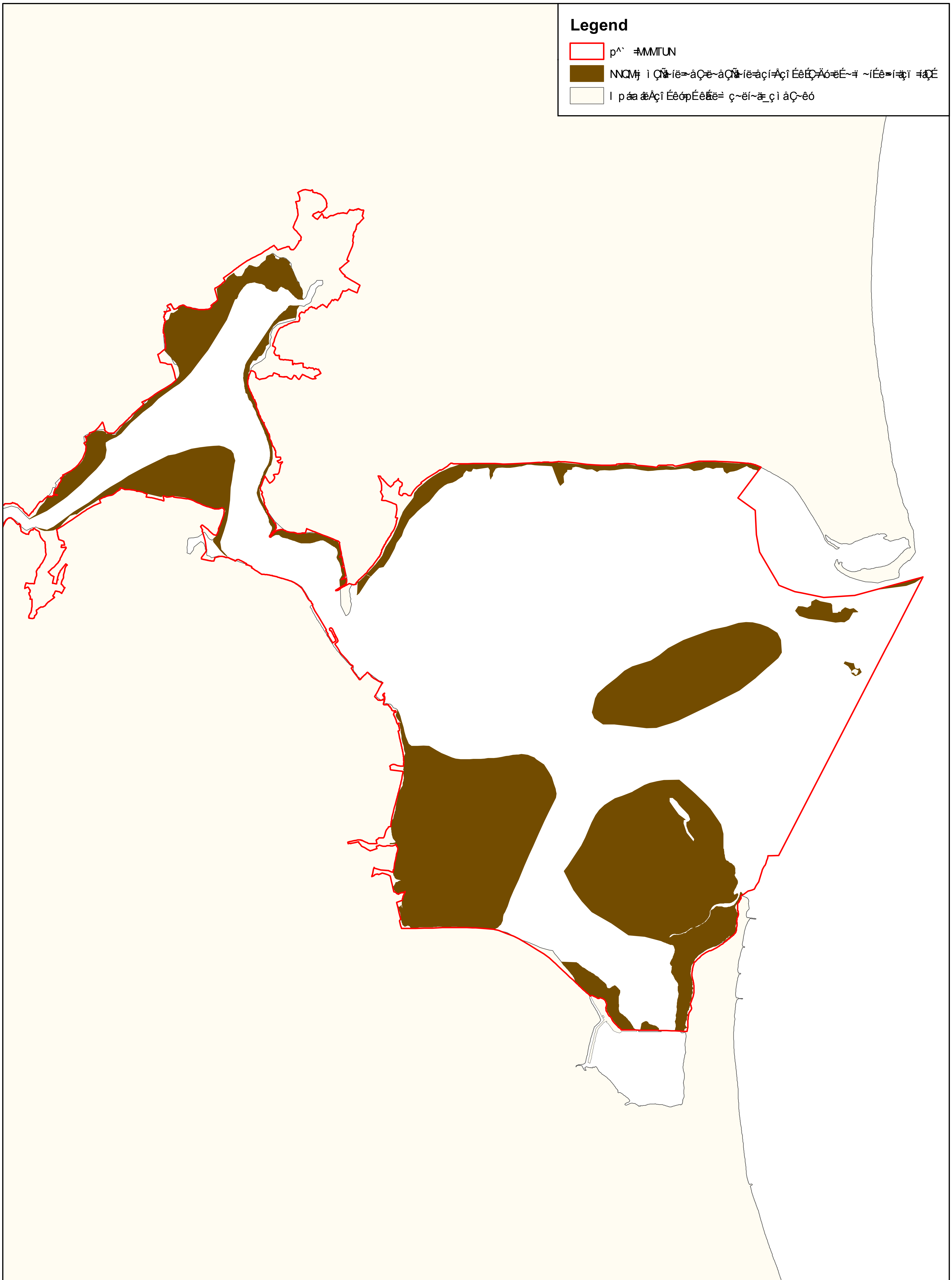
MAP 3:
SLANEY RIVER VALLEY
CONSERVATION OBJECTIVES
ESTUARIES

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

N

Map Version 1
Date: Sept 2011



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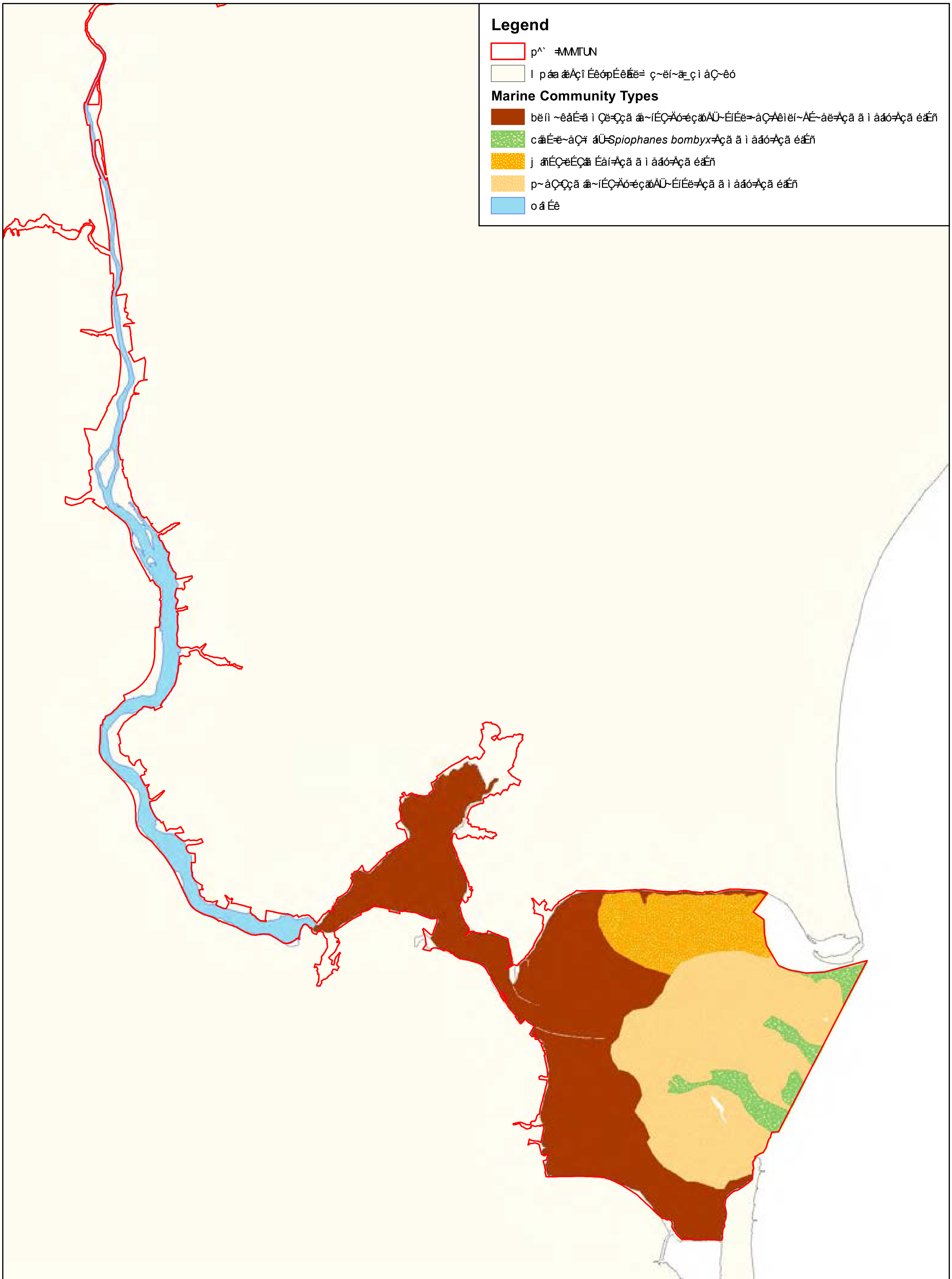
MAP 4:
SLANEY RIVER VALLEY
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

N

Map Version 1
Date: Sept 2011



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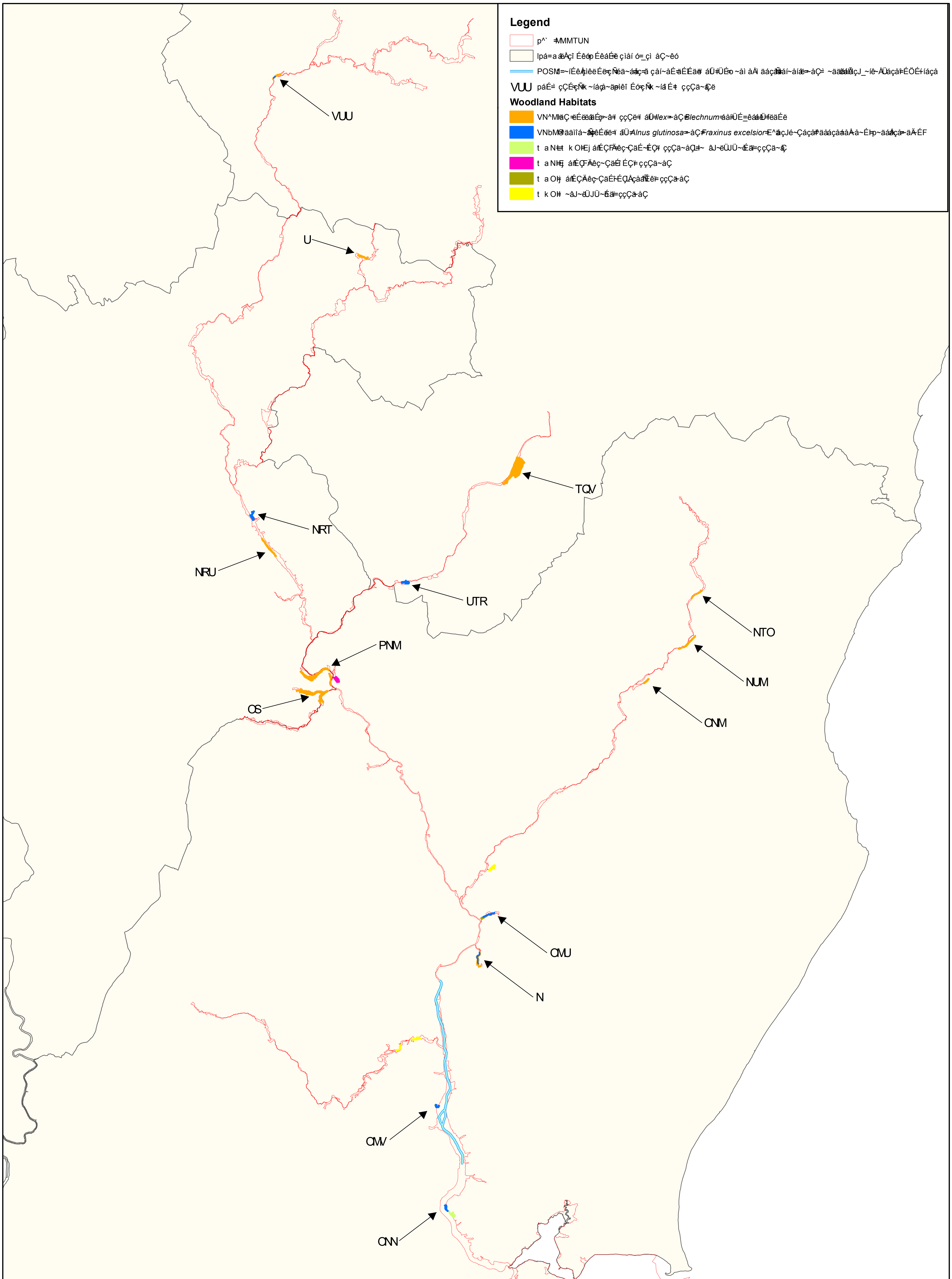
MAP 5:
SLANEY RIVER VALLEY
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

N

Map Version 1
Date: Sept 2011



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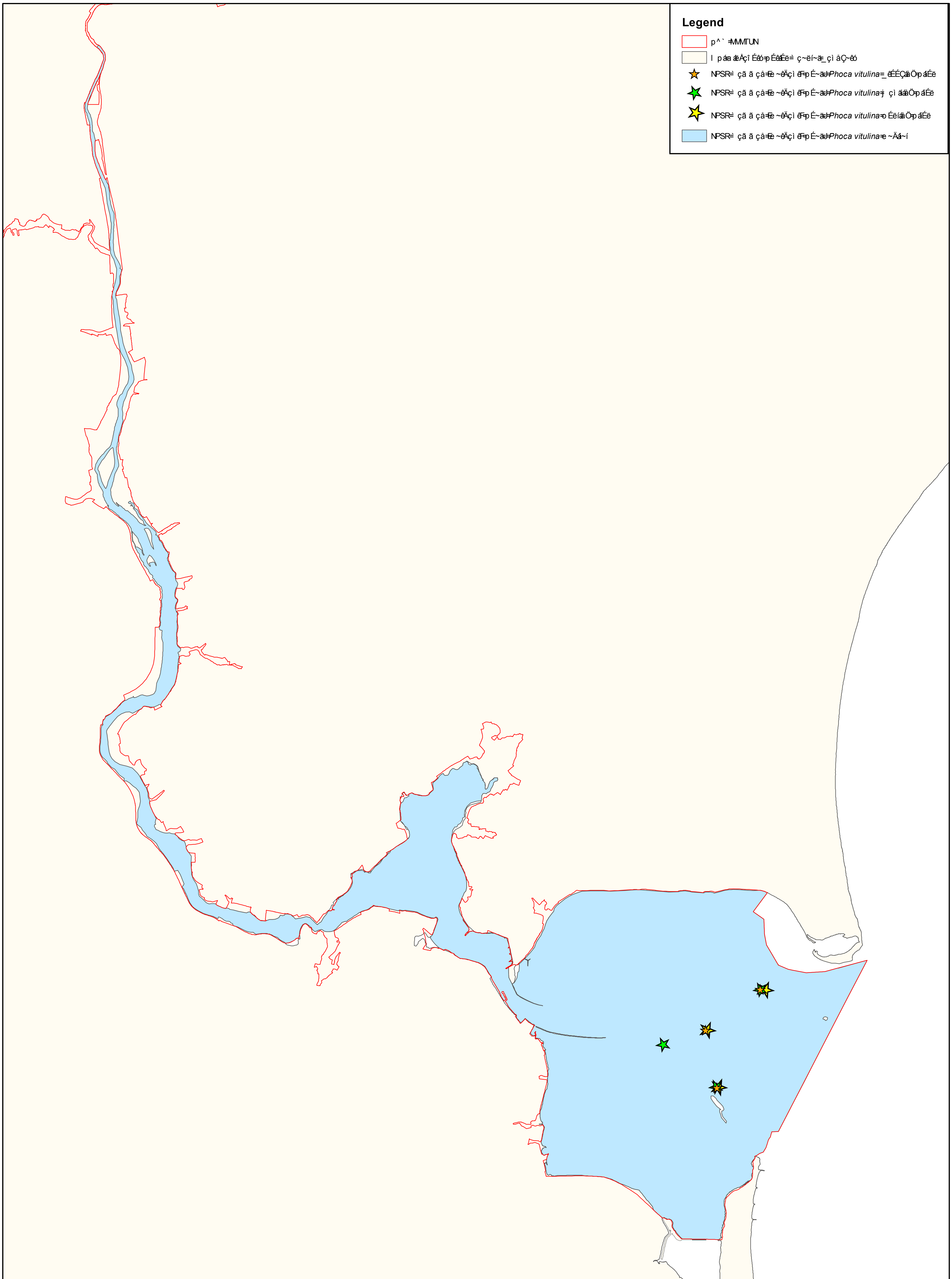
MAP 6:
SLANEY RIVER VALLEY
CONSERVATION OBJECTIVES
OLD OAK WOODLANDS,
ALLUVIAL FORESTS &
FLOATING RIVER VEGETATION

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

N

Map Version 1
Date: Sept 2011



MAP 7:
SLANEY RIVER VALLEY
CONSERVATION OBJECTIVES
COMMON HARBOUR SEAL

SITE CODE: SAC 000781
CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07

Map Version 1
Date: Sept 2011

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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Citation:

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

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

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

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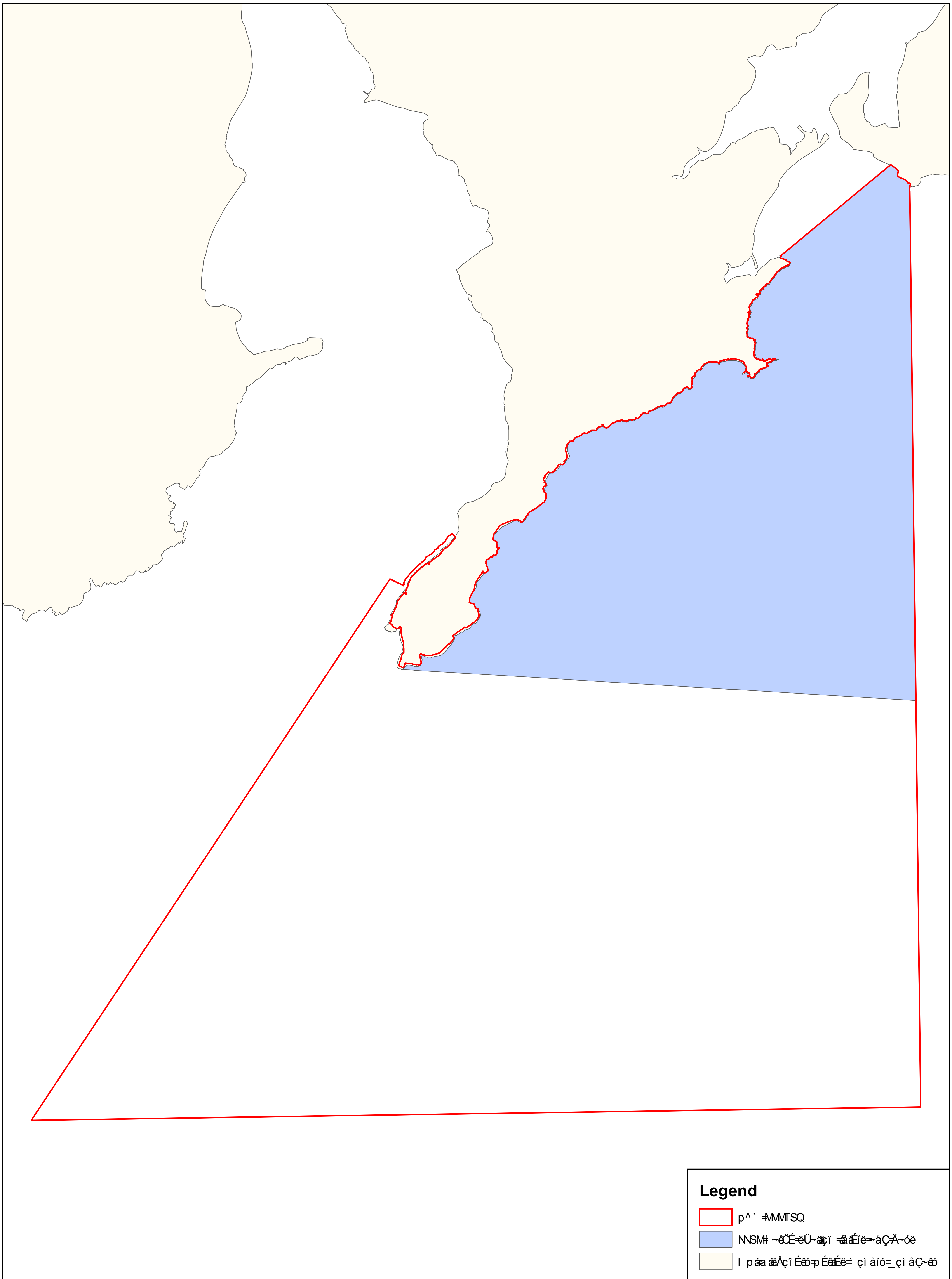
MAP 1: HOOK HEAD CONSERVATION OBJECTIVES SAC DESIGNATION

COUNTY WEXFORD

SITE CODE
SAC 000764
Version 1

Map Version 1
Date: July 2011



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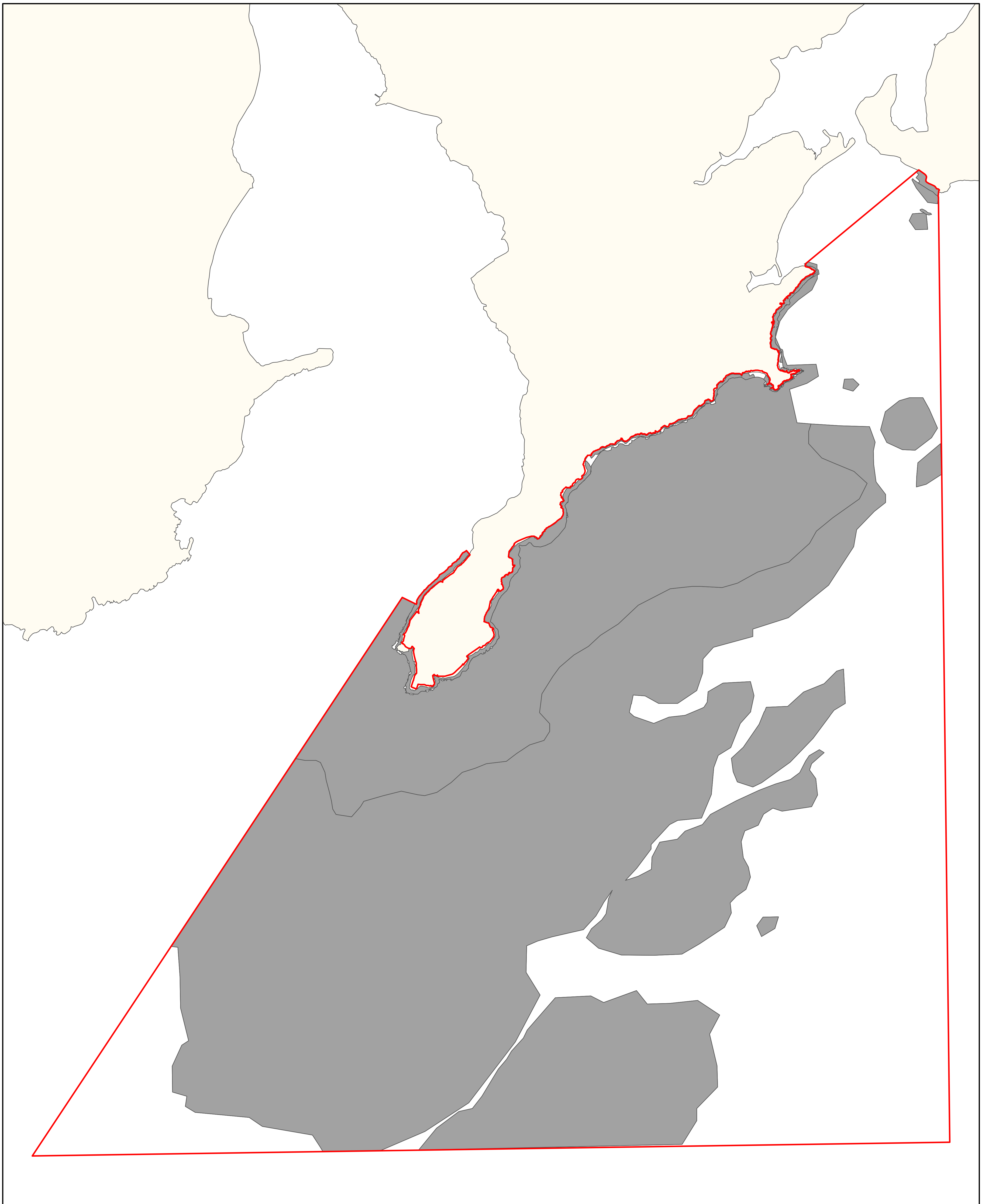
MAP 2:
HOOK HEAD
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS & BAYS

COUNTY WEXFORD

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011



Legend

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MAP 3:
HOOK HEAD
CONSERVATION OBJECTIVES
REEFS

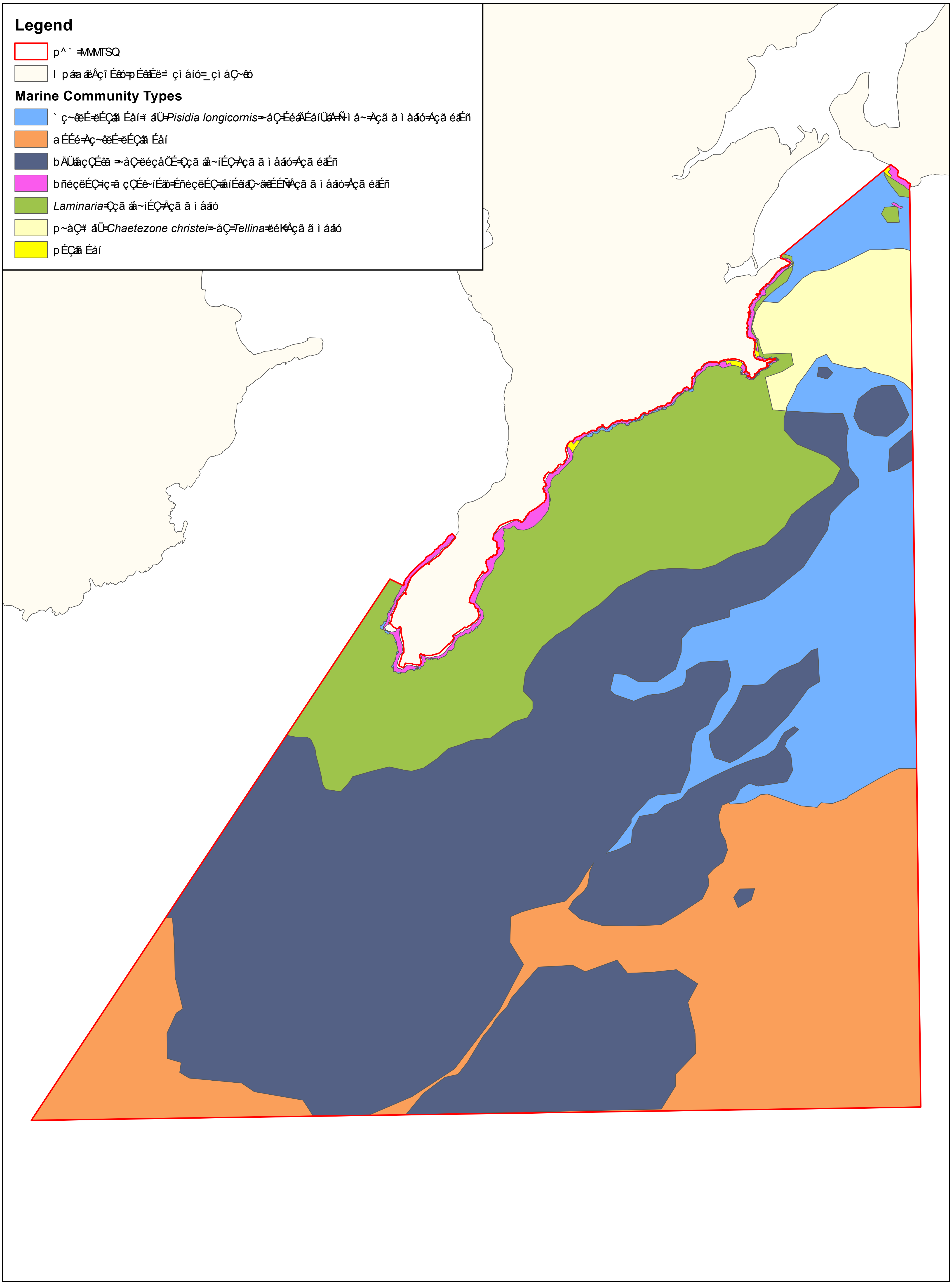
COUNTY WEXFORD

N

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011



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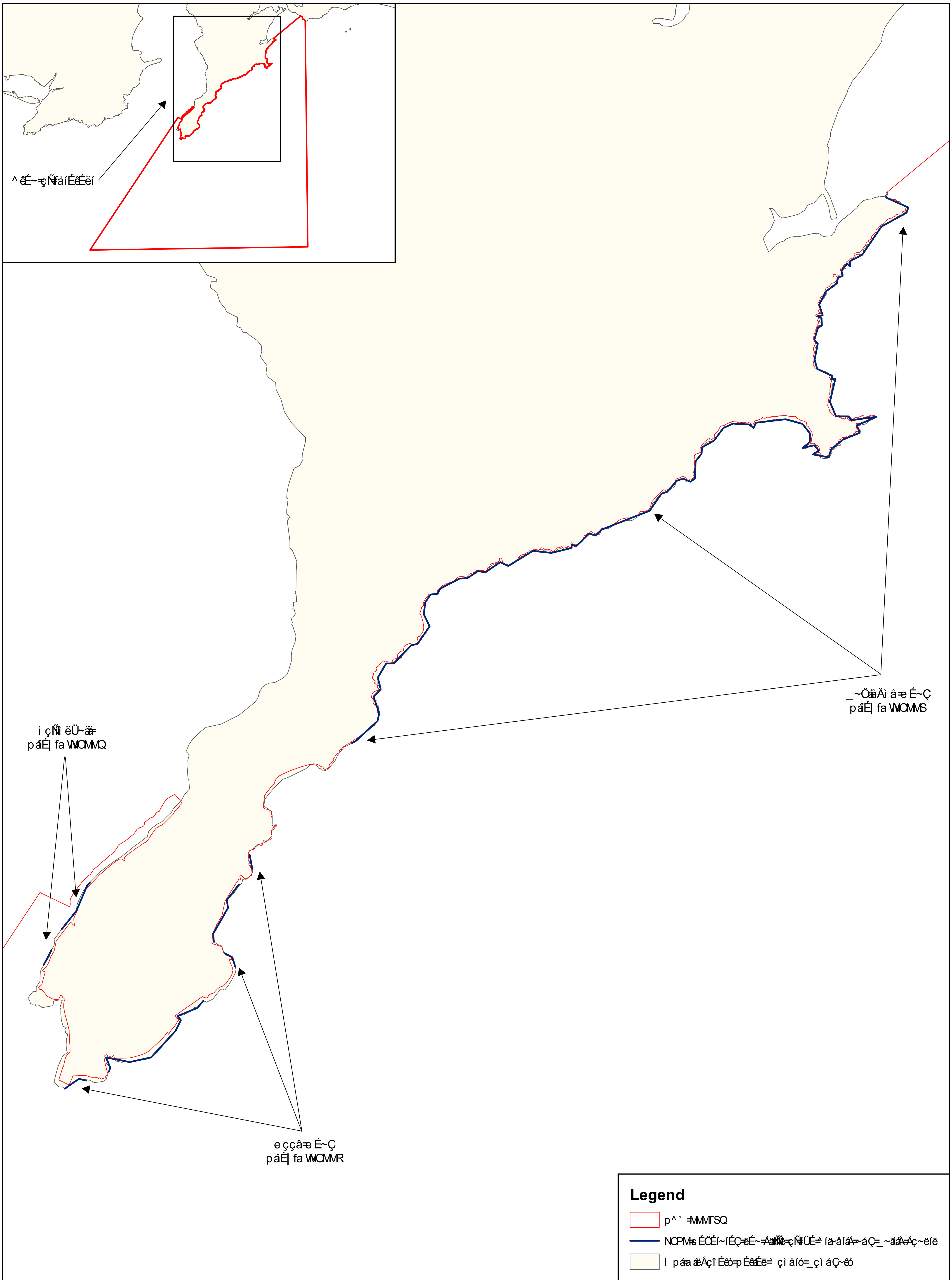
**MAP 4:
HOOK HEAD
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES**

COUNTY WEXFORD

SITE CODE

**SAC 000764
Version 1**

**Map Version 1
Date: July 2011**



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Department of Arts, Heritage and the Gaeltacht

MAP 5:
HOOK HEAD
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

COUNTY WEXFORD

SITE CODE

SAC 000764
Version 1

Map Version 1
Date: July 2011

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2011) Conservation Objectives: Raven Point Nature Reserve SAC 000710. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

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***

000710 Raven Point Nature Reserve SAC

1140	Mudflats and sandflats not covered by seawater at low tide
1210	Annual vegetation of drift lines
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
2130	*Fixed coastal dunes with herbaceous vegetation ('grey dunes')
2170	Dunes with *Salix repens* ssp. *argentea (Salicion arenariae*)
2190	Humid dune slacks

Please note that this SAC is adjacent to/overlaps with Slaney River Valley SAC 000781; The Raven SPA 004019; and Wexford Harbour and Slobs SPA 004076. See map 2.

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

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

Title: Raven Point Nature Reserve SAC (000710): Conservation objectives supporting document - coastal habitats. [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Raven Point Nature Reserve SAC (000710): Conservation objectives supporting document - marine habitats. [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Wexford Harbour

Year: 2009

Author: ASU

Series: Unpublished Report to NPWS

Title: Coastal Monitoring Project 2004-2006

Year: 2009

Author: Ryle, T.; Murray, A.; Connolly, C.; Swann, M.

Series: Unpublished Report to NPWS

Title: The phytosociology and conservation value of Irish sand dunes

Year: 2008

Author: Gaynor, K.

Series: Unpublished PhD thesis, National University of Ireland, Dublin

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Title: A Study of The Raven, Co. Wexford

Year: 1980

Author: Anon.

Series: Joint report prepared by An Foras Forbartha and Forest and Wildlife Service, Department of Fisheries and Forestry

Spatial data sources

Year:	Interpolated 2011
Title:	Intertidal soft sediment survey, 2008
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, 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; EU Annex I Saltmarsh and Coastal data erased out if present
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 Coastal CO data investigated and resolved with expert opinion used
Used for:	1330 (map 5)
Year:	2009
Title:	Coastal Monitoring Project 2004-2006. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Saltmarsh CO data investigated and resolved with expert opinion used
Used for:	1210, 2110, 2120, 2130, 2170, 2190 (map 6)

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Raven Point Nature Reserve 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 73ha
Community distribution	Hectares	The following community types should be maintained in a natural condition: Sand dominated by polychaetes community complex; Estuarine muds dominated by polychaetes and crustaceans community complex. See map 4	The likely area of sediment communities was derived from an intertidal survey undertaken in 2008 (ASU, 2009). See marine supporting document for further details

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of driftlines in Raven Point Nature Reserve 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. Total area mapped: 0.37ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al. 2009). Habitat is very difficult to measure in view of its dynamic nature, which means that it can appear and disappear within a site from year to year and, at the time of survey in 2004, was absent from the entire east coast stretch from Raven Point to Curracloe, where erosion has taken place in recent times. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6	Based on data from Ryle et al. (2009). Majority of habitat found at southern tip of site, although there may be additional patches distributed throughout the site. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. Harbour construction works at Wexford and Rosslare have interrupted the natural flow of sediment along the coast. This has led to beach starvation and increased rates of erosion along the eastern side of the Raven. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*),sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and Orache (*Atriplex* spp.)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Atlantic salt meadows in Raven Point Nature Reserve 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. Total area mapped: 0.22ha. See map 5	The site was not surveyed by the Saltmarsh Monitoring Project (McCorry and Ryle 2009). Assessment is based on data from the Coastal Monitoring Project (Ryle et al. 2009) who mapped a small area of saltmarsh (1.52ha), of which 0.22ha was Atlantic salt meadow. The saltmarsh at the Raven is of recent origin and is naturally very dynamic. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	Based on data from Anon (1980) and Ryle et al. (2009). Saltmarsh is restricted to the southern end of the Raven. 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: creeks and pans	Occurrence	Allow creek and pan structure to develop, subject to natural processes, including erosion and succession	As the saltmarsh at Raven Point is of recent origin it has yet to develop a creek and pan network. 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
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Atlantic salt meadow is found at the southern tip of Raven Point in close association with a range of sand dune habitats. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain >90% of the saltmarsh area vegetated	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 common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To restore the favourable conservation condition of Embryonic shifting dunes in Raven Point Nature Reserve SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. Total area mapped: 1.13ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat is very difficult to measure in view of its dynamic nature. A large actively accreting area near Raven Point, at the southern tip of the site, accounted for much of the total embryonic dune area. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009). Distribution concentrated at the southern end, with patchy distribution along the eastern edge. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Harbour construction works at Wexford and Rosslare have interrupted the natural flow of sediment along the coast. This has led to beach starvation and increased rates of erosion along the eastern side of the Raven. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	>95% of sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius)* should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species: sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

To restore the favourable conservation condition of Shifting dunes along the shoreline with Ammophila arenaria in Raven Point Nature Reserve SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. Total area mapped: 9.38ha. See map 6	Habitat was mapped during the Coastal Monitoring Project (Ryle et al. 2009). Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	Significant building of mobile dunes including a number of substantial ridges has occurred at the Raven in recent years (Ryle et al. 2009). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria*) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth, thus encouraging further accretion. Harbour construction works at Wexford and Rosslare have interrupted the natural flow of sediment along the coast. This has led to beach starvation and increased rates of erosion along the eastern side of the Raven. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	>95% of marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species; species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Raven Point Nature Reserve 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. Total area mapped: 22.65ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). NB further unsurveyed areas maybe present in the site, particularly in the wooded area. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	See coastal habitats supporting document for further details
Physical structure:functionality and sediment supply	Presence/ absence of physical barriers.	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	30-70% of sward should be maintained between 2 and 20cms. Based on data from Gaynor (2008) and Ryle et al. (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 Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species; species indicative of changes in nutrient status; and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2170 Dunes with *Salix repens* ssp. *argentea (Salicion arenariae)*

To maintain the favourable conservation condition of Dunes with Salix repens ssp. argentea (Salix arenariae) in Raven Point Nature Reserve 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. Total area mapped: 0.14ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). NB further unsurveyed areas maybe present in the site, particularly in the wooded area. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% cover, subject to natural processes	Based on data from Ryle et al. (2009). NB further unsurveyed areas maybe present in the site, particularly in the wooded area. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (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 Ryle et al. (2009)	See coastal habitats supporting document for further details
Vegetation composition: cover and height of *S. repens*	% cover; centimeters	Maintain >10% cover of creeping willow (*Salix repens*); vegetation height should be in the average range of 5-20cm	Cover of creeping willow (*Salix repens*) should be maintained (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009)
Vegetation composition: negative indicator species	Percentage cover at a representative sample of monitoring stops	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species; species indicative of changes in nutrient status; and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2170 Dunes with *Salix repens* ssp. *argentea (Salicion arenariae*)

To maintain the favourable conservation condition of Dunes with Salix repens ssp. argentea (Salix arenariae) in Raven Point Nature Reserve SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: scrub/trees	Percentage cover	For trees and scrub other than creeping willow (*Salix repens*), there should be no more than 5% cover or their presence should be under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2190 Humid dune slacks

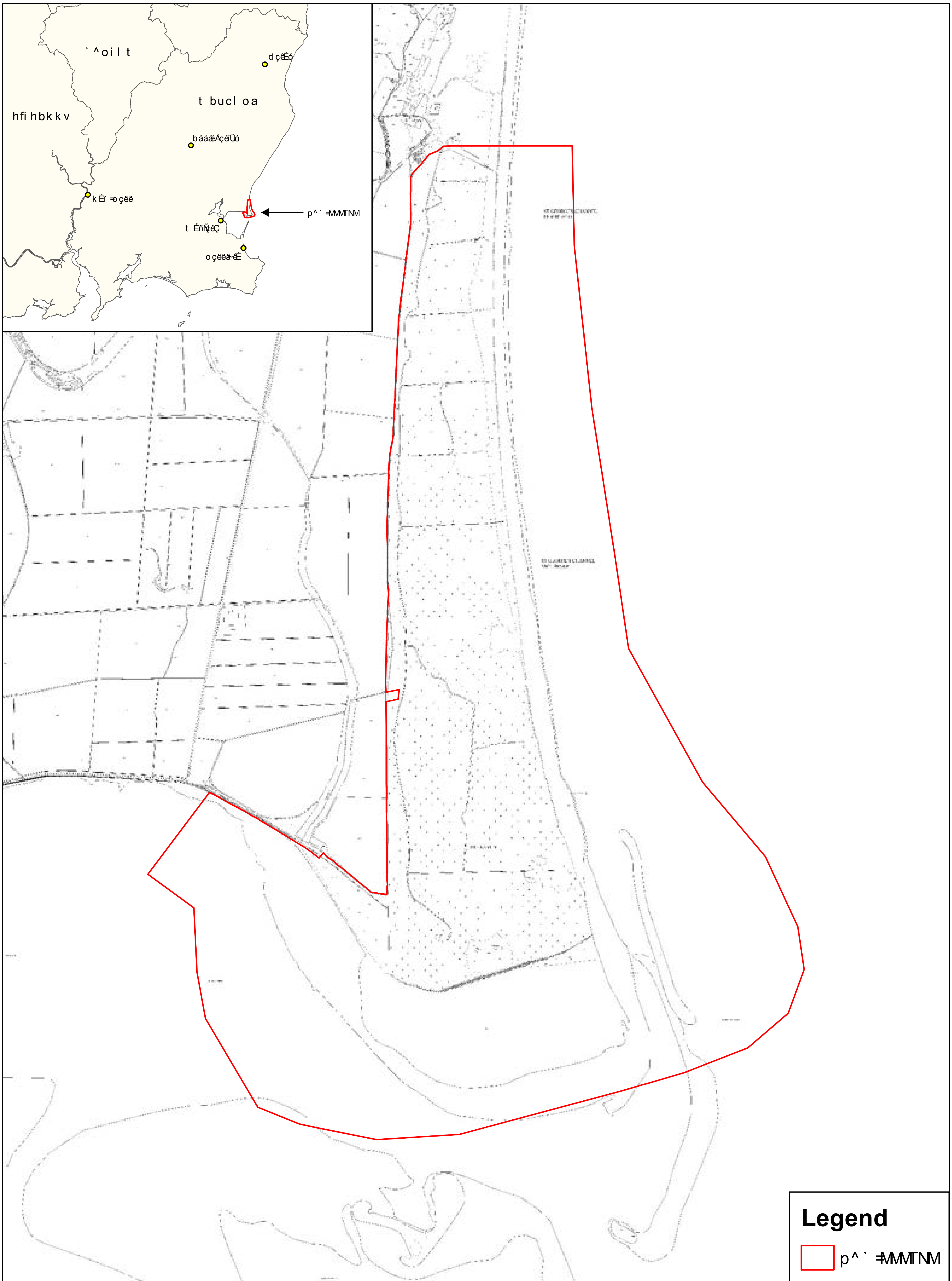
To restore the favourable conservation condition of Humid dune slacks in Raven Point Nature Reserve SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. Total area mapped: 0.75ha See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). The site was mapped, giving a total estimated area of 0.75ha. NB further unsurveyed areas maybe present in the site, particularly in the wooded area. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Slacks occur throughout The Raven site including within the afforested areas. They provide habitat for round-leaved wintergreen (*Pyrola rotundifolia* ssp. *maritima*) and natterjack toad (*Bufo calamita*). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Gaynor (2008) and Ryle et al. (2009). Some slacks at the site are believed to have dried up due to afforestation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks, which can have up to 20% bare ground	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Vegetation height will vary considerably depending on the age and wetness of the slack. Based on data from Ryle et al. (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 Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Raven Point Nature Reserve SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: cover of *Salix repens*	% cover; centimeters	Maintain <40% cover of creeping willow (*Salix repens*)	Cover of creeping willow (*Salix repens)* needs to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009).
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details



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MAP 1:
RAVEN POINT NATURE RESERVE
CONSERVATION OBJECTIVES
SAC DESIGNATION

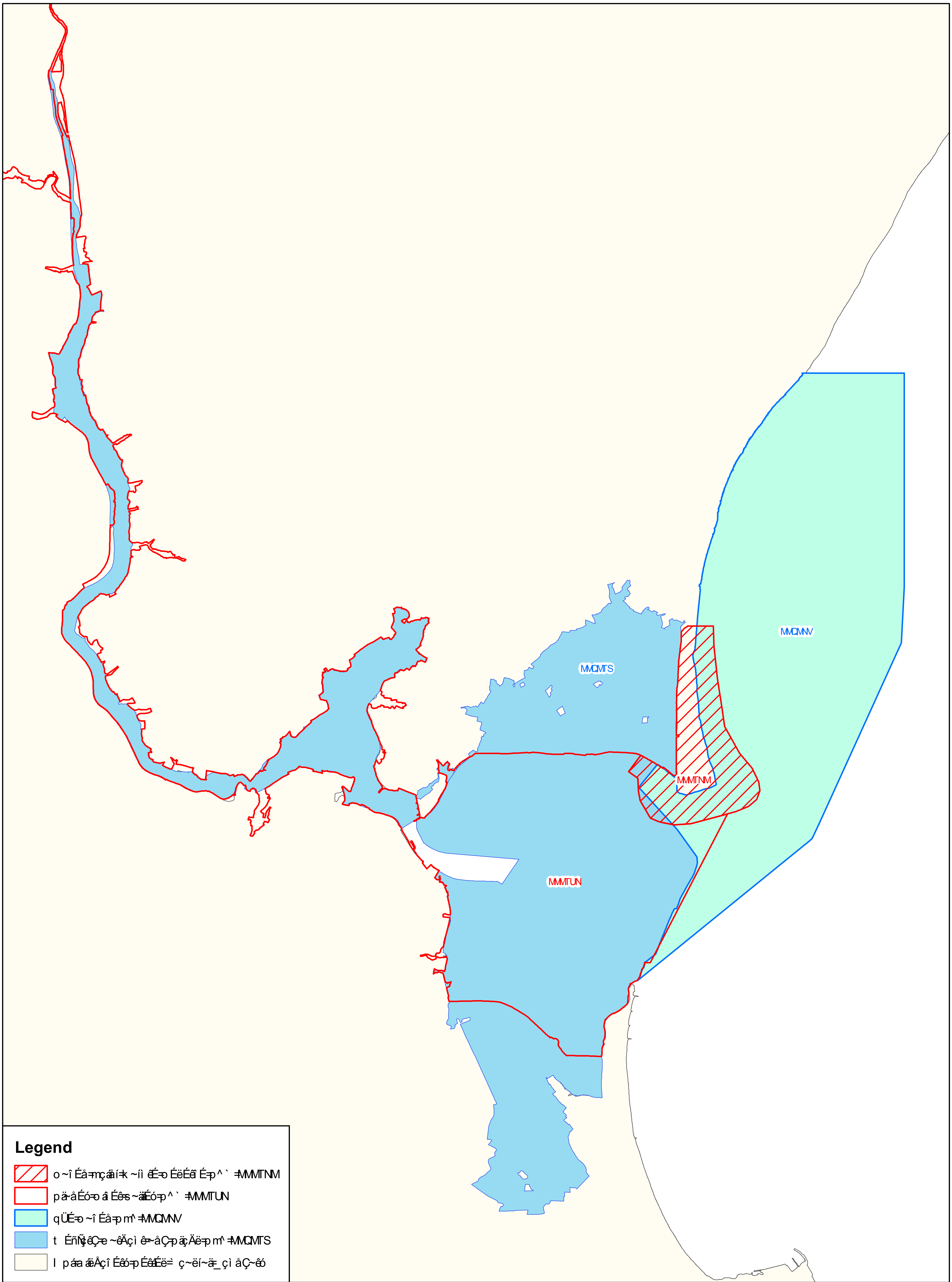
CO. WEXFORD

N

SITE CODE

SAC 000710
Version 1

Map Version 1
Date: Oct 2011



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Department of Arts, Heritage and the Gaeltacht

MAP 2:
RAVEN POINT NATURE RESERVE SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

SITE CODE: SAC 000710 CO. WEXFORD; version 1
SAC 000781 CO. CARLOW; version 1.03,
CO. WICKLOW; version 1.02, CO. WEXFORD; version 1.07
SPA 004019 CO. WEXFORD; version 1.02
SPA 004076 CO. WEXFORD; version 2.04

N

Map Version 1
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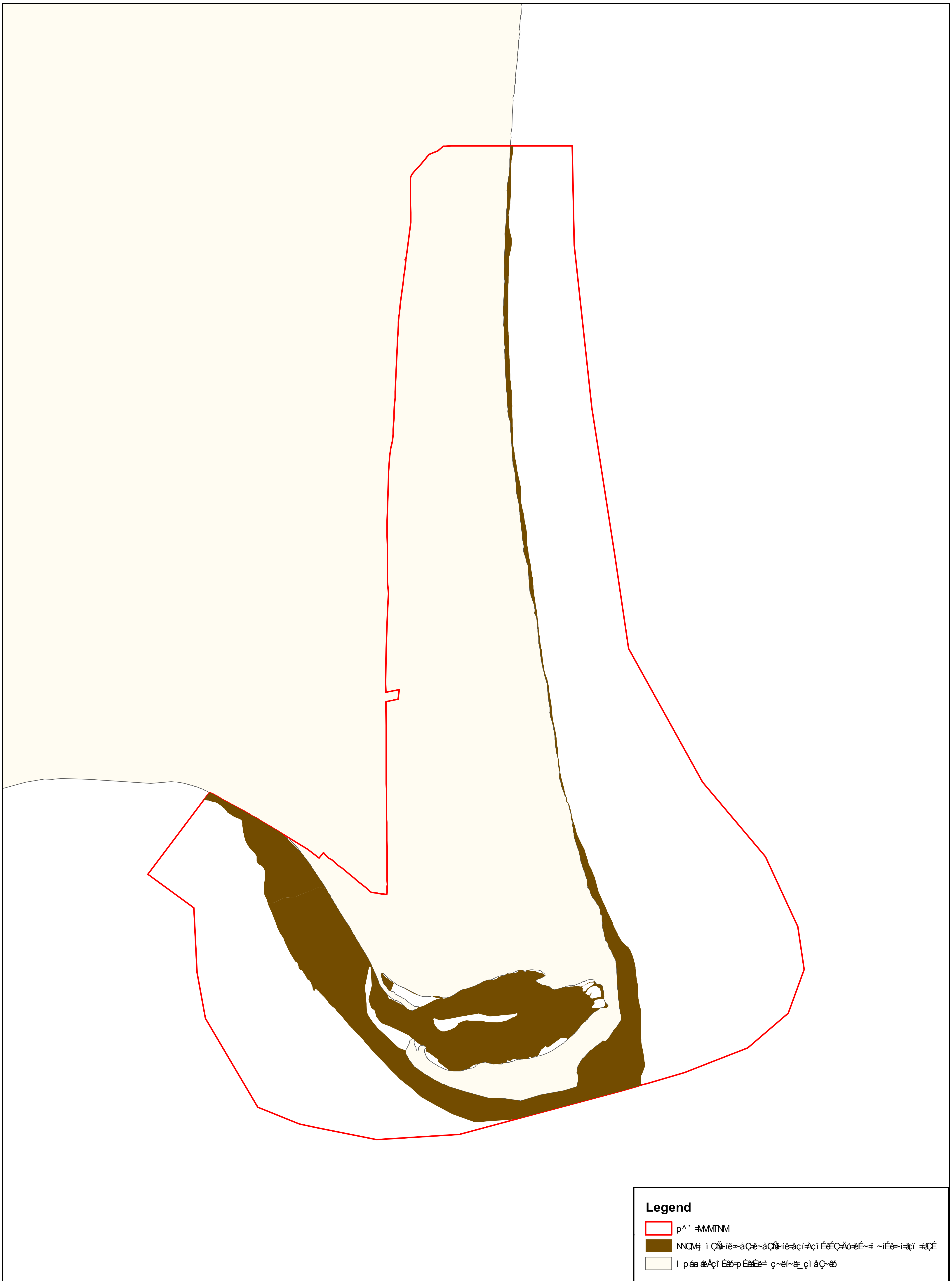

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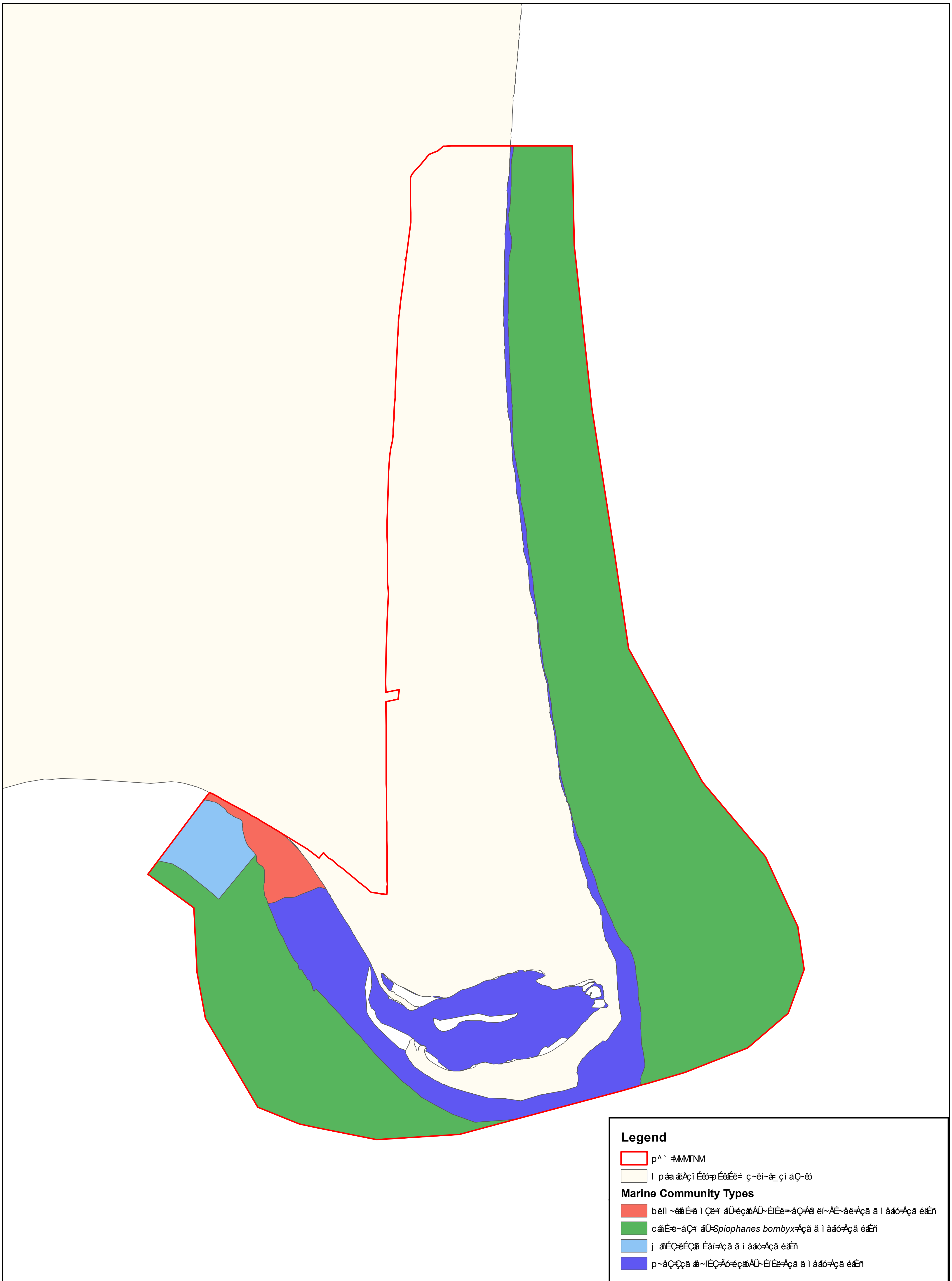
MAP 3:
RAVEN POINT NATURE RESERVE
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

CO. WEXFORD

SITE CODE

SAC 000710
Version 1

Map Version 1
Date: Oct 2011



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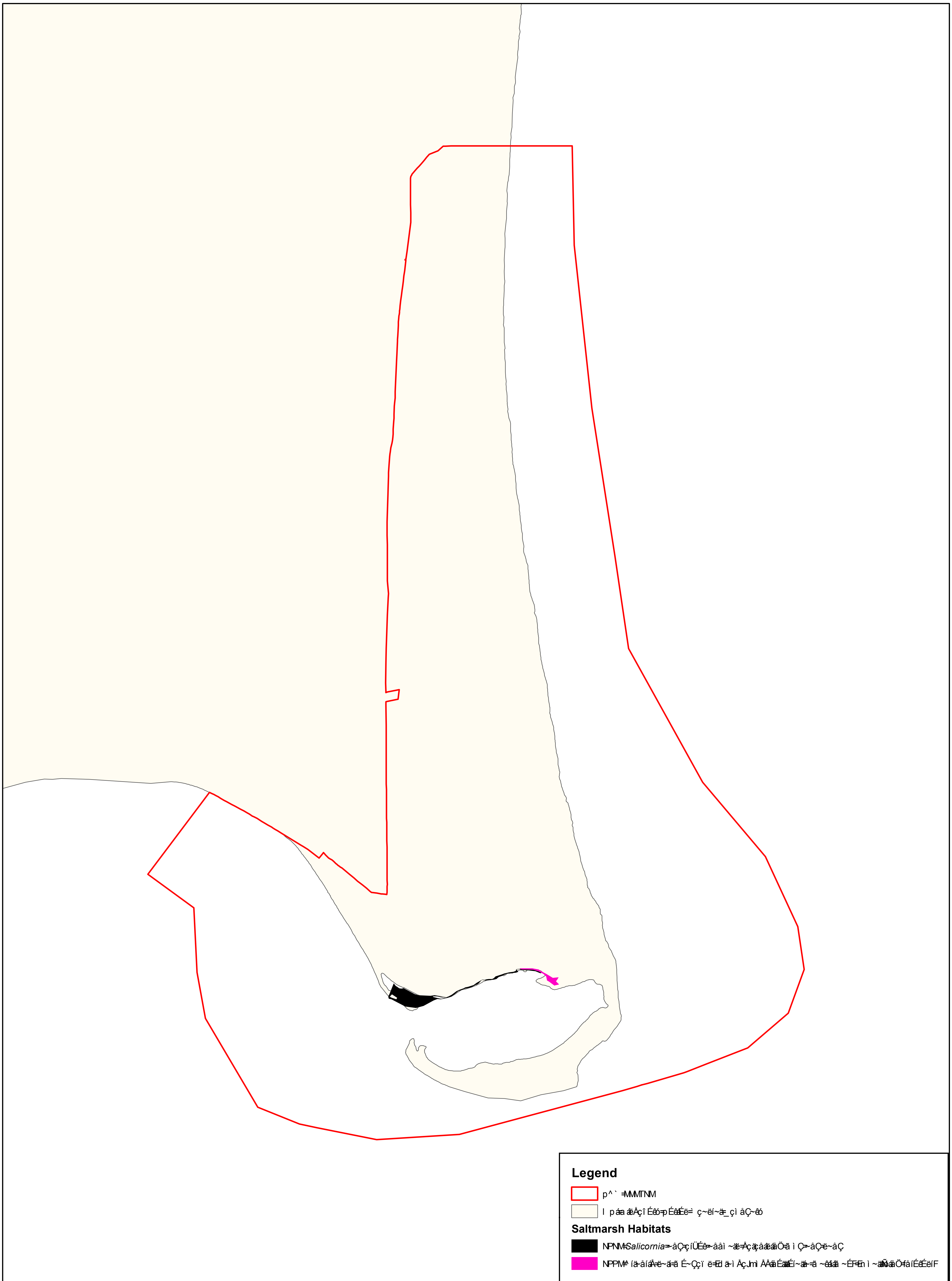
MAP 4:
RAVEN POINT NATURE RESERVE CONSERVATION OBJECTIVES MARINE COMMUNITY TYPES

CO. WEXFORD

SITE CODE
SAC 000710
Version 1

Map Version 1
Date: Oct 2011



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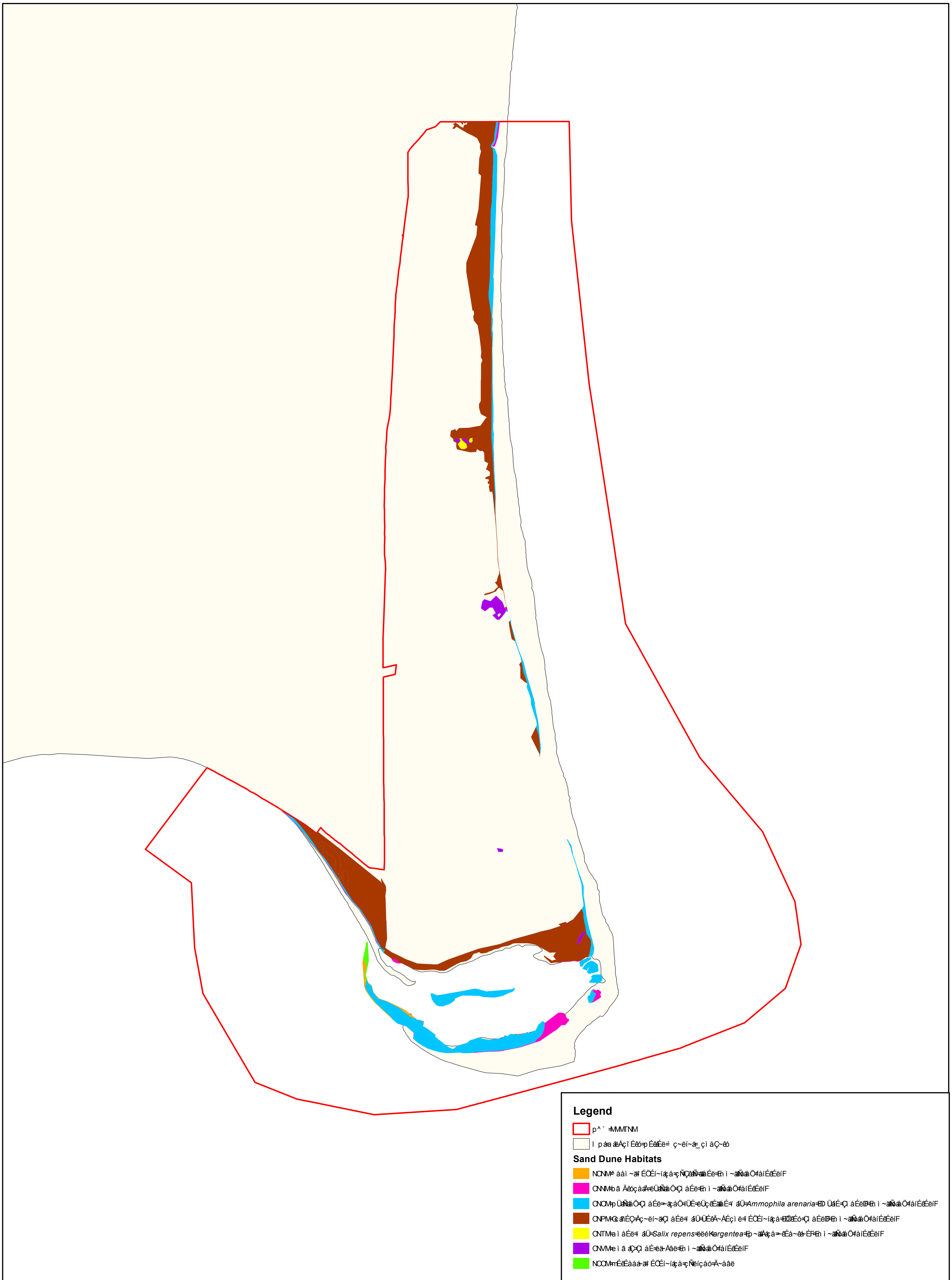
MAP 5:
RAVEN POINT NATURE RESERVE
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

CO. WEXFORD

SITE CODE
SAC 000710
Version 1

Map Version 1
Date: Oct 2011



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MAP 6:
RAVEN POINT NATURE RESERVE CONSERVATION OBJECTIVES SAND DUNE HABITATS

CO. WEXFORD

SITE CODE
SAC 000710
Version 1

Map Version 1
Date: Oct 2011

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 023 Carlow NR, Carlow Town and Tullow WSZs

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Rathvilly EAM

Issue 9 | 24 January 2022

Job number 257367

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Ireland
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ARUP

Document verification

ARUP

Job title		Lead in Drinking Water Mitigation Plan - EAM		**Job number** 257367
Document title		Rathvilly EAM		**File reference**
Document ref				
Revision	**Date**	**Filename**	023. Rathvilly EAM Arup 11122017.docx	
Draft 1	19 Dec 2017	**Description**	First draft	
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Gerry Baker	Sean Mason
		Signature			
Draft 2	27 Mar 2018	**Filename**	023. Rathvilly EAM D02.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Orla Murphy	Gerry Baker
		Signature			
Draft 3	03 Sept 2018	**Filename**	023. Rathvilly EAM D03.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Niall Gibbons	Orla Murphy	Gerry Baker
		Signature			
Draft 4	25 Sep 2018	**Filename**	023. Rathvilly EAM D04.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Orla Murphy	Gerry Baker
		Signature			

Issue Document verification with document ✓

Document Verification

Job title	Lead in Drinking Water Mitigation Plan - EAM	**Job number** 257367	
Document title	Rathvilly EAM	**File reference**	
Document ref			

Revision	**Date**	**Filename**	023. Rathvilly EAM D05.docx		
Draft 5	12 Dec 2018	**Description**			
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Gerry Baker	Gerry Baker
		Signature			
Issue	17 Dec 2018	**Filename**	023. Rathvilly EAM I01.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Gerry Baker	Gerry Baker
		Signature			
Issue 2	30 Jan 2019	**Filename**	023. Rathvilly EAM I02.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Lindsay Connolly	Gerry Baker	Gerry Baker
		Signature			
Issue 3	04 Mar 2019	**Filename**	023. Rathvilly EAM I03.docx		
		Description	Le Bergerie Flow updates		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			

Issue Document Verification with Document ✓

Document Verification

Job title	Lead in Drinking Water Mitigation Plan - EAM			Job number 257367
Document title	Rathvilly EAM			File reference
Document ref				

Revision	Date	Filename	023. Rathvilly EAM I04.docx		
Issue 4	26 Mar 2019	Description			
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
Issue 5	23 May 2019	Filename	023. Rathvilly EAM I05.docx		
		Description	Castlecomer WWTP upgrade		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
Issue 6	12 Oct 2019	Filename	023. Rathvilly EAM I06.docx		
		Description	Figure Updates		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
Issue 7	9 Jun 2020	Filename	023. Rathvilly EAM I07.docx		
		Description	WFD Data Update		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			

Issue Document Verification with Document ✓

Document Verification

Job title	Lead in Drinking Water Mitigation Plan - EAM	**Job number** 257367	
Document title	Rathvilly EAM	**File reference**	
Document ref			

Revision	**Date**	**Filename**	023. Rathvilly EAM I08.docx		
Issue 8	6 Jul 2020	**Description**	NM Review Changes		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			Gerry Baker
Issue 9	24 Jan 2022	**Filename**	023. Rathvilly EAM I09.docx		
		Description	Unverified Eden data results update		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Alison Orr	Gerry Baker
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

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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 Carlow North Water Supply Zone (WSZ), Carlow Town WSZ and Tullow WSZ with orthophosphate.

The assessment tracks the orthophosphate dosed drinking water from source (i.e. water treatment plant), through drinking water distribution (i.e. water mains), 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 Geographic 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 on the 10th December 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 - Geographic Information Systems
- GWB- Ground Water Body
- IW – Irish Water
- LWB – Lake Water Body
- OP- Orthophosphate (measured as PO_4-P)
- 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 (eg. 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 subbasin 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 Carlow North WSZ (Rathvilly), Carlow Town WSZ and Tullow WSZ

Carlow North WSZ (Rathvilly) (0100PUB1142) is located in County Carlow with a very small section in County Laois and is supplied by Rathvilly WTP. Carlow Town WSZ (0100PUB1001) is located mostly in County Carlow with sections extending into Counties Kildare and Wicklow. Carlow Town WSZ is supplied by a combination of Rathvilly, Sion Cross and Oak Park WTPs.

Tullow WSZ (0100PUB1131) is located in County Carlow and is currently supplied by Tullow Water Treatment Plant, however recent discussions with Irish Water indicate that the Tullow WTP is to be decommissioned. Following decommission Tullow WSZ will be supplied with water from Rathvilly WTP where upgrades are proposed to accommodate the increase in supply.

The Rathvilly WTP and Sion Cross WTP waters mix in Brownshill Reservoir. The water from Brownshill Reservoir then mixes with water from Oak Park WTP at Oak Park Reservoir. The Draft Plumbosolvency Control Plan for the WSZs proposes that flow proportional targeted dosing of orthophosphate takes place at the outlet from each WTP. Figure 1, at the end of this report, shows the location of the three areas proposed to receive orthophosphate dosed water.

The average flow from the Rathvilly WTP to Carlow North WSZ and Tullow WSZ combined is 6,560 m^3/day and the orthophosphate dosing rate is 0.5 mg/l. The average combined flow from Oak Park WTP and Brownshill Reservoir (fed from Rathvilly WTP and Sion Cross WTP) which supplies Carlow Town WSZ and two DMAs in Carlow North WSZ (Tinryland Kernanstown and Mortarstown) is 8,210 m^3/day and the orthophosphate dosing rate is 0.8 mg/l. Approximately 54% of the flow is accounted for, and this fixed rate for water mains leakage is assumed in all the Water Supply Zones (WSZs). The WSZ boundaries cover rural areas which are serviced by domestic wastewater treatment systems and a number of urban centres, including Carlow and Tullow, which are served by WWTP agglomerations. The density of water mains is relatively low across the rural areas. There are an estimated 2,500 properties across the WSZs that are serviced by DWWTS.

Water Supply Zone	Carlow North WSZ (Rathvilly) (0100PUB1142) Carlow Town WSZ (0100PUB1001) Tullow WSZ (0100PUB1131)
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	Concentration and loading units for orthophosphate (as $P0_4$-P) are mg/l and kg/yr. Adopted orthophosphate optimum dosing concentration is 0.5 mg/l for supply from Rathvilly WTP to Carlow North WSZ and Tullow WSZ and 0.8mg/l for supply from Oak Park WTP and Brownshill Reservoir (fed from Rathvilly WTP and Sion Cross

	WTP) to Carlow Town WSZ and part of Carlow North WSZ (Tinryland Kernanstown and Mortarstown DMAs). Unaccounted for water from the mains is 46%. 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 orthophosphate 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 Total Phosphate or orthophosphate 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 orthophosphate 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 WWTP within the agglomerations are as follows; - Ardattin No 2 Agglom – Secondary treatment PE 80 - Ballon – Tertiary treatment PE 702 - Ballyconnell – Primary treatment PE 1,923 - Castledermot – Tertiary treatment PE 1,253

	- Castleroe – Secondary treatment PE 225 - Palatine – Tertiary treatment PE 1,000 - Rathoe – Tertiary treatment PE 355 - Rathvilly – Tertiary treatment PE 1,132 - Tullow – Tertiary* treatment PE 6,431 - Carlow – Tertiary treatment PE 34,000 - Nurney – Secondary treatment PE 120 - Tinryland – Secondary treatment PE 250 *Tullow WWTP has tertiary treatment however Irish Water have advised it does not currently have capacity to treat additional load and therefore for the purposes of this assessment no treatment of additional orthophosphate is assumed at the plant until further notification from Irish Water. 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 6,779m^3/d (1,650 kg/yr). Approximately 1,581 kg/yr of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 709 m^3/d (158 kg/yr). Approximately 157 kg/yr of the load is attenuated along the flowpaths. Flow monitoring at gauge stations are available for seven of the 33 river sub-basins outlets and flows were scaled where necessary. Where flow monitoring gauges are not available the river flows were scaled from Hydrotool data. Baseline orthophosphate monitoring data and associated thresholds are available for 25 RWBs but was not available for seven RWBs (Ballynaboley Stream_010, Derreen_070, Graney (Lerr)_010, Graney (Lerr)_020, Lerr_030, Roscat_010 and Slaney_090). 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 and SWOs and upstream dosing areas. This illustrates that a significant proportion of the loads come from primary discharges and SWOs from WWTP, mains seepage through the near surface pathway. Load from upstream dosing areas are also a significant contribution in the Barrow_160, Barrow_170 and Barrow_180.

	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 WWTPs and ultimately how much is transported to the receiving RWBs. This illustrated that the mains leakage and primary WWTP discharges account for the largest proportion of load and that there is a large proportion of both the primary discharge and the mains leakage is attenuated. The upstream EAMs account for the greatest proportion of transported load. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Ballon WWTP – Ballaghmore Distributary_010 Castledermot WWTP – Lerr_020 Castleroe – WWTP Greese_060 Palatine WWTP – Palatine Stream_010 Rathoe WWTP – Burren_040 Rathvilly WWTP – Slaney_070 Tullow WWTP – Slaney _100 and Derreen_090 (SWO only) Carlow WWTP – Barrow_160 and Burren_060 (SWO Only) Nurney WWTP – Ballynaboley Stream_010 Tinryland WWTP – Burren_050 The orthophosphate concentrations in the RWBs following dosing are presented in Table 2. The increase in orthophosphate concentrations due to 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 with the exception of Burren Valley Gravels. Where multiple monitoring points are available within a GWB the results are averaged spatially to derive a GWB average. In the case of the Burren Valley Gravels where monitoring data is not available surrogate indicative quality values were applied based on the GWB chemical status. The orthophosphate dosing does not result in a deterioration of any GWB status.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the WSZ	There are no lakes within the WSZ

Step 5 and 6 - Combined Impact from direct and diffuse sources on <u>Transitional Water Bodies</u>	The increase in orthophosphate concentrations in the downstream transitional WBs as a result of the drinking water dosing with orthophosphate is shown in Table 4. Baseline orthophosphate monitoring data and associated thresholds are available for all transitional and coastal waterbodies. The dosing of the drinking water with orthophosphate does not deteriorate the status of either transitional water body 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**	<u>Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies</u> 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. **Slaney** The following EAMs are within the Slaney catchment and discharge to the same TraC waterbodies as Rathvilly EAM: 018 Wexford 025 Fardystown (Mayglass) 050 Kilmallock Bridge 357 Enniscorthy The increase in orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all five EAMs in the Slaney catchment with orthophosphate is shown in *Baseline concentration > *75% of threshold but dosing concentration is insignificant.* Table 5. There is no deterioration in waterbody status as a result of the cumulative assessment. **Barrow/Nore** The following EAMs are within the Barrow/Nore catchment and discharge to the same TraC waterbodies as Rathvilly EAM: 016 Srowland 037 Troyswood 053 New Ross 104 Toberdaly 123 Derryguile 127 Le Bergerie 171 Clogh Castlecomber 252 Bagenalstown 296 Ballyragget 374 Mountfinn (Urlingford-Johnstown)

	The increase in orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing with orthophosphate is shown in *Baseline concentration > *75% of threshold but dosing concentration is insignificant.* 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 show 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 waterbodies is presented in Figure 5.
Recommendation	No mitigation measures are required.

Table 1: Increased loading/concentration due to Dosing – Dosing rate at Rathvilly WTP = 0.5 mg/l, at Sion Cross and Oak Park WTPs = 0.8 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	ELV from WWDL (2017)	Primary Discharge Receiving WB		Annual average TP Load kg/yr	OP Concentration mg/l TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Ardattin No 2 Agglom	Secondary	No ELVs	IE_SE_G_011 Ballyglass	Existing	27	3.74	2.99	5.08
				Post Dosing	33	4.52	3.62	6.15
Ballon Primary Discharge	Tertiary	Total Phosphate 1mg/l TP - Compliant	Ballaghmore Distributary_010	Existing	15	0.13	0.10	0.18
				Post Dosing	15	0.13	0.10	0.18
Ballon SWO (1 No.)				Existing	13	0.55	0.44	0.75
				Post Dosing	13	0.55	0.44	0.75
Ballyconnell Primary Discharge	Primary	No ELV	IE_SE_G_011 Ballyglass	Existing	19	5.34	4.27	7.26
				Post Dosing	22	6.14	4.91	8.35
Castledermot Primary Discharge	Tertiary	Total Phosphate 0.7mg/l TP– Compliant Orthophosphate 0.3mg/l P-Compliant	Lerr_020	Existing	62	0.15	0.12	0.21
				Post Dosing	62	0.15	0.12	0.21
Castledermot SWOs (2 No.)				Existing	27	0.32	0.26	0.44
				Post Dosing	28	0.34	0.27	0.47
Castleroe Primary Discharge	Secondary	No ELV	Greese_060	Existing	77	3.74	2.99	5.08
				Post Dosing	93	4.54	3.63	6.17
Palatine Primary Discharge	Tertiary	Orthophosphate 0.6mg/l - Compliant	Palatine Stream_010	Existing	64	0.42	0.33	0.57
				Post Dosing	64	0.42	0.33	0.57
Palatine SWO (1 No.)				Existing	12	0.37	0.29	0.50
				Post Dosing	13	0.40	0.32	0.54
Rathoe Primary Discharge	Tertiary	Total Phosphate 1mg/l TP- Compliant Orthophosphate 0.38mg/l TP- Compliant	Burren_040	Existing	6	0.16	0.13	0.21
				Post Dosing	6	0.16	0.13	0.21
Rathoe SWO (1 No.)				Existing	7	0.97	0.77	1.32
				Post Dosing	8	1.02	0.81	1.38

Agglomeration and Discharge Type	Effluent Treatment level	ELV from WWDL (2017)	Primary Discharge Receiving WB		Annual average TP Load kg/yr	OP Concentration mg/l TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	**0.4**	**0.68**
Rathvilly Primary Discharge	Tertiary	Total Phosphate 1mg/l TP- Compliant Orthophosphate 0.8mg/l- Compliant	Slaney_070	Existing	25	0.15	0.12	0.20
				Post Dosing	25	0.15	0.12	0.20
Rathvilly SWO (1 No.)				Existing	17	0.50	0.40	0.69
				Post Dosing	19	0.55	0.44	0.75
Tullow Primary Discharge	Tertiary however no treatment capacity available so assessed as secondary level treatment.	Orthophosphate 1mg/l- Non compliant	Slaney_100	Existing	763	0.73	0.59	1.00
				Post Dosing	872	0.84	0.67	1.14
Tullow SWOs			Slaney_100 (6 No.) and to Derreen_090 (1 No.)	Existing	105	0.50	0.40	0.67
				Post Dosing	108	0.51	0.41	0.69
Carlow Primary Discharge	Tertiary	Total Phosphate 1mg/l TP- Compliant Orthophosphate 0.8mg/l- Compliant	Barrow_160	Existing	1516	0.19	0.16	0.26
				Post Dosing	1516	0.19	0.16	0.26
Carlow SWO			Barrow_160 (7 No.) and Burren_010 (2 No.)	Existing	1370	0.86	0.69	1.17
				Post Dosing	1405	0.88	0.71	1.20
Nurney Primary Discharge	Secondary	No ELV	Ballynaboley Steam_010	Existing	41	3.74	2.99	5.08
				Post Dosing	45	4.11	3.29	5.59
Tinryland Primary Discharge	Secondary	No ELV	Burren_050	Existing	85	3.74	2.99	5.08
				Post Dosing	94	4.14	3.31	5.63

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)**
Aghalona_010	IE_SE_14A020100	Moderate	0.0503	0.0508	1.9	0.0003	0.0505
Aghalona_020	IE_SE_14A020200	Poor	0.0667	0.0868	3.2	0.0002	0.0669
Ballaghmore Distributary_010	IE_SE_12B120990	Poor	0.0606	0.0868	0.4	0.00005	0.0606
Ballynaboley Stream_010	IE_SE_14B080700	*High*	0.0125	0.0188	4.9	0.0003	0.0128
Barrow_160	IE_SE_14B012460	Good	0.0278	0.0325	639.8	0.0006	0.0284
Barrow_170	IE_SE_14B012600	Good	0.0262	0.0325	660.0	0.0005	0.0267
Barrow_180	IE_SE_14B012700	High	0.0246	0.0188	669.3	0.0005	0.0250*
Blacklion Stream (Carlow)_010	IE_SE_12B040250	Good	0.0294	0.0325	0.001	0.0000001	0.0294
Blacklion Stream (Carlow)_020	IE_SE_12B040400	Moderate	0.0431	0.0508	0.9	0.00004	0.0432
Burren_040	IE_SE_14B050310	Good	0.0278	0.0325	1.4	0.00003	0.0278
Burren_050	IE_SE_14B050400	Good	0.0303	0.0325	13.4	0.0002	0.0305
Burren_060	IE_SE_14B050500	Good	0.0292	0.0325	38.4	0.0005	0.0297
Clonmore Stream_010	IE_SE_12C050100	Moderate	0.0480	0.0508	0.0001	0.000000004	0.0480
Derreen_070	IE_SE_12D010500	*Good*	0.0300	0.0325	0.8	0.00001	0.0300
Derreen_080	IE_SE_12D010550	Good	0.0263	0.0325	1.4	0.00001	0.0263
Derreen_090	IE_SE_12D010600	Good	0.0317	0.0325	3.9	0.00002	0.0317
Derreen_100	IE_SE_12D010800	Good	0.0277	0.0325	5.3	0.00002	0.0277
Douglas (Ballon)_020	IE_SE_12D030400	Poor	0.0728	0.0868	1.3	0.00005	0.0729
Graney (Lerr)_010	IE_SE_14G070200	*Poor*	0.0770	0.0868	0.4	0.00004	0.0770
Graney (Lerr)_020	IE_SE_14G070310	*Poor*	0.0770	0.0868	2.5	0.0001	0.0771
Greese_060	IE_SE_14G040600	Moderate	0.0441	0.0508	16.5	0.0002	0.0443
Lerr_010	IE_SE_14L010080	Moderate	0.0491	0.0508	1.5	0.0001	0.0492
Lerr_020	IE_SE_14L010155	Poor	0.0613	0.0868	7.4	0.0002	0.0615
Lerr_030	IE_SE_14L010250	*Moderate*	0.0455	0.0508	11.5	0.0002	0.0457
Lerr_040	IE_SE_14L010300	Moderate	0.0526	0.0508	11.7	0.0002	0.0528*
Palatine Stream_010	IE_SE_14P040200	Good	0.0255	0.0325	2.7	0.0004	0.0258
Roscat_010	IE_SE_14R330970	*Good*	0.0300	0.0325	0.02	0.000003	0.0300

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)**
Slaney_070	IE_SE_12S021010	High	0.0123	0.0188	1.3	0.00001	0.0123
Slaney_080	IE_SE_12S021100	High	0.0188	0.0188	2.5	0.00001	0.0188
Slaney_090	IE_SE_12S021200	*High*	0.0125	0.0188	2.6	0.00001	0.0125
Slaney_100	IE_SE_12S021400	High	0.0195	0.0188	65.3	0.0003	0.0197*
Slaney_110	IE_SE_12S021600	High	0.0226	0.0188	74.4	0.0002	0.0227*

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

Table 3: Orthophosphate concentrations following dosing in groundwater 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)**
Athy-Bagnelstown Gravels	IE_SE_G_160	Good	0.0141	0.02625	5.8	0.0002	0.0143
Bagenalstown Lower	IE_SE_G_157	Good	0.0050	0.02625	22.4	0.0007	0.0057
Ballyglass	IE_SE_G_011	Good	0.0258	0.02625	1.1	0.00001	0.0258
Burren Valley Gravels	IE_SE_G_023	*Good*	0.0175	0.02625	0.03	0.00001	0.0175
New Ross	IE_SE_G_152	Good	0.0095	0.02625	2.0	0.00002	0.0095

Table 4: Orthophosphate concentrations in transitional water bodies following dosing of drinking water

Name	EU_CD	Season	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)
Upper Barrow Estuary	IE_SE_100_0300	Summer	High	0.0150	0.0188	669.3	0.0004	0.0154
		Winter	Good	0.0270	0.0363	669.3	0.0004	0.0274
Barrow Nore Estuary Upper	IE_SE_100_0250	Summer	High	0.0235	0.0188	669.3	0.0002	0.0237*
		Winter	Good	0.0315	0.0363	669.3	0.0002	0.0317
New Ross Port	IE_SE_100_0200	Summer	Good	0.0320	0.0363	669.3	0.0002	0.0322
		Winter	Good	0.0320	0.0363	669.3	0.0002	0.0322
Lower Suir Estuary (Little Island - Cheekpoint)	IE_SE_100_0500	Summer	Good	0.0375	0.0363	669.3	0.0001	0.0376*
		Winter	Good	0.0380	0.0363	669.3	0.0001	0.0381*
Barrow Suir Nore Estuary	IE_SE_100_0100	Summer	High	0.0235	0.0188	669.3	0.0001	0.0236*
		Winter	Good	0.0315	0.0363	669.3	0.0001	0.0316
Waterford Harbour	IE_SE_040_0200	Summer	High	0.0060	0.0188	669.3	0.0001	0.0061
		Winter	High	0.0230	0.0188	669.3	0.0001	0.0231*
Upper Slaney Estuary	IE_SE_040_0300	Summer	High	0.0210	0.0188	74.4	0.0001	0.0211*
		Winter	High	0.0220	0.0188	74.4	0.0001	0.0221*
Lower Slaney Estuary	IE_SE_040_0200	Summer	High	0.0140	0.0188	74.4	0.00005	0.0140
		Winter	Good	0.0280	0.0363	74.4	0.00005	0.0280
Wexford Harbour	IE_SE_040_0000	Summer	High	0.0025	0.0188	74.4	0.00005	0.0025
		Winter	High	0.0240	0.0188	74.4	0.00005	0.0240*

**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

Catchment	Name	EU_CD	Season	Indicative Quality *Surrogate Status in italic*	Baseline conc (mg/l P)	75% of status threshold (mg/l P)	Load from current EAM (Kg/yr P)	Cumulative e load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Barrow / Nore	Upper Barrow Estuary	IE_SE_100_0300	Summer	High	0.0150	0.0188	669.3	1160.9	0.0006	0.0156
			Winter	Good	0.0270	0.0363	669.3	1160.9	0.0006	0.0276
	Barrow Nore Estuary Upper	IE_SE_100_0250	Summer	High	0.0235	0.0188	669.3	1526.6	0.0004	0.0239*
			Winter	Good	0.0315	0.0363	669.3	1526.6	0.0004	0.0319
	New Ross Port	IE_SE_100_0200	Summer	Good	0.0320	0.0363	669.3	1530.3	0.0004	0.0324
			Winter	Good	0.0320	0.0363	669.3	1530.3	0.0004	0.0324
	Lower Suir Estuary (Little Island - Cheekpoint)	IE_SE_100_0500	Summer	Good	0.0375	0.0363	669.3	1530.3	0.0003	0.0378*
			Winter	Good	0.0380	0.0363	669.3	1530.3	0.0003	0.0383*
	Barrow Suir Nore Estuary	IE_SE_100_0100	Summer	High	0.0235	0.0188	669.3	1608.9	0.0003	0.0238*
			Winter	Good	0.0315	0.0363	669.3	1608.9	0.0003	0.0318
	Waterford Harbour	IE_SE_100_0100	Summer	High	0.0060	0.0188	669.3	1619.0	0.0003	0.0063
			Winter	High	0.0230	0.0188	669.3	1619.0	0.0003	0.0233*
Slaney	Upper Slaney Estuary	IE_SE_040_0300	Summer	High	0.0210	0.0188	74.4	519.9	0.0004	0.0214*
			Winter	High	0.0220	0.0188	74.4	519.9	0.0004	0.0224*
	Lower Slaney Estuary	IE_SE_040_0200	Summer	High	0.0140	0.0188	74.4	733.4	0.0005	0.0145
			Winter	Good	0.0280	0.0363	74.4	733.4	0.0005	0.0285
	Wexford Harbour	IE_SE_040_0000	Summer	High	0.0025	0.0188	74.4	759.5	0.0005	0.0030
			Winter	High	0.0240	0.0188	74.4	759.5	0.0005	0.0245*

**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)
Slaney_110	IE_SE_12S021600	High	0.0226	0.0188	74.6	0.0002	0.0227*
Slaney_120	IE_SE_12S021800	High	0.0237	0.0188	74.6	0.0001	0.0238*
Slaney_130	IE_SE_12S021850	Good	0.0306	0.0325	74.6	0.0001	0.0307
Slaney_140	IE_SE_12S022000	High	0.0237	0.0188	74.6	0.0001	0.0238*
Slaney_150	IE_SE_12S022100	High	0.0173	0.0188	74.6	0.0001	0.0174
Slaney_160	IE_SE_12S022200	*High*	0.0125	0.0188	91.8	0.0001	0.0126
Slaney_170	IE_SE_12S022300	High	0.0246	0.0188	115.1	0.0001	0.0247*
Barrow_190	IE_SE_14B012820	Good	0.0337	0.0325	671.5	0.0005	0.0342*
Barrow_200	IE_SE_14B012920	Good	0.0252	0.0325	904.3	0.0007	0.0259
Barrow_210	IE_SE_14B013100	Good	0.0255	0.0325	906.1	0.0006	0.0261
Barrow_220	IE_SE_14B013300	High	0.0227	0.0188	906.1	0.0006	0.0233*
Barrow_230	IE_SE_14B013514	High	0.0241	0.0188	906.1	0.0005	0.0246*
Barrow_240	IE_SE_14B013600	High	0.0213	0.0188	906.1	0.0005	0.0218*

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

Figure 1: Rathvilly Water Supply Dosing Areas

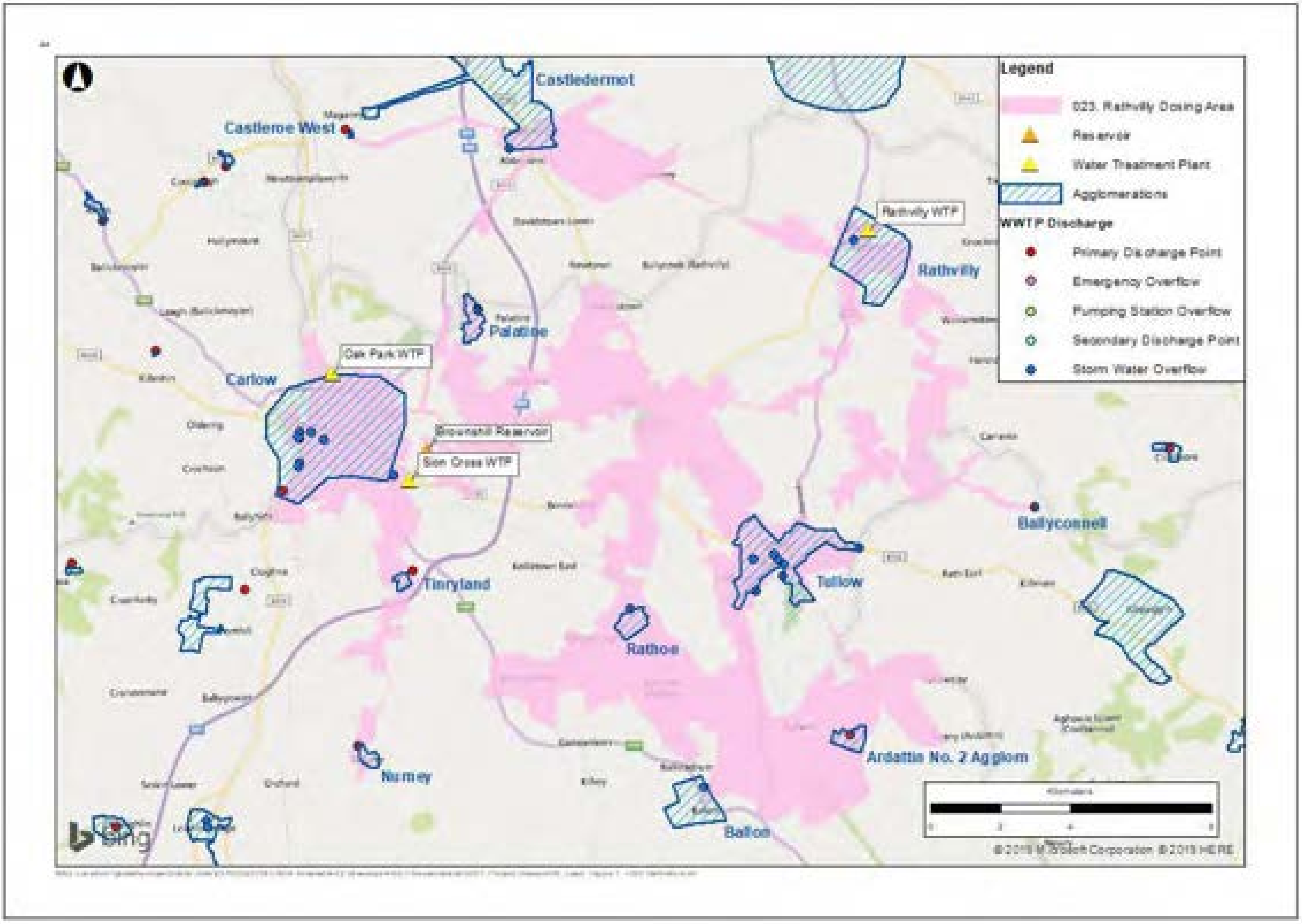

Figure 2: RWB Cumulative Loading Assessment

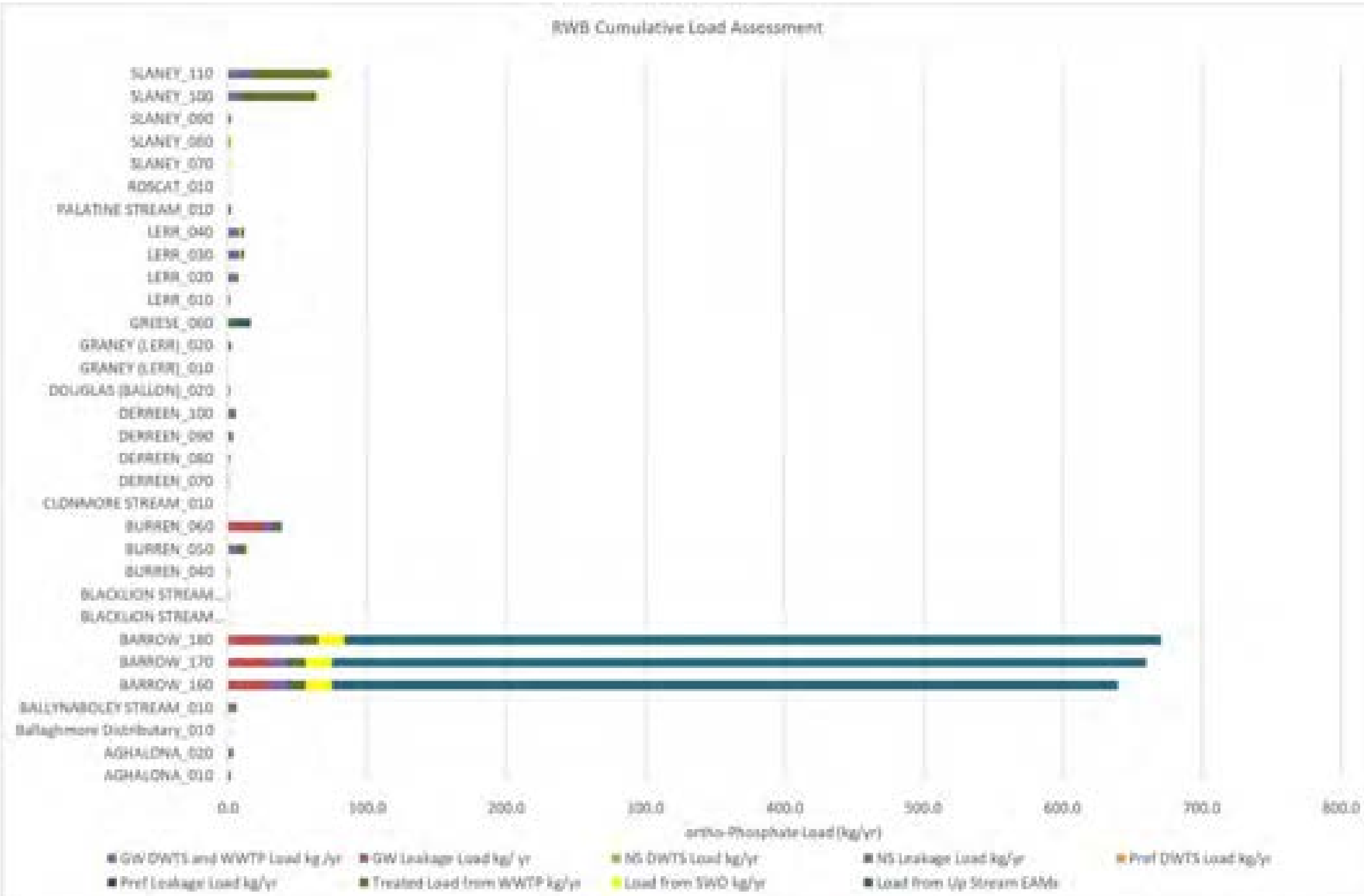

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

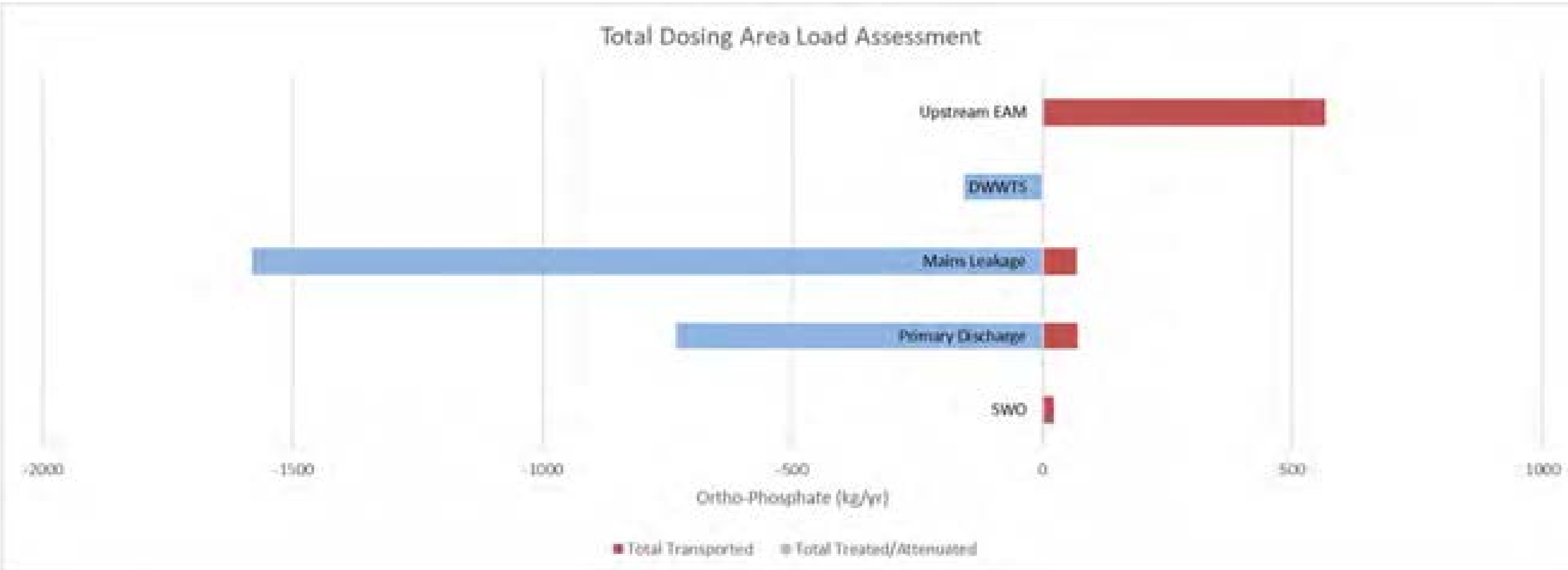

Figure 4: Upstream and downstream EAMs within WFD catchment

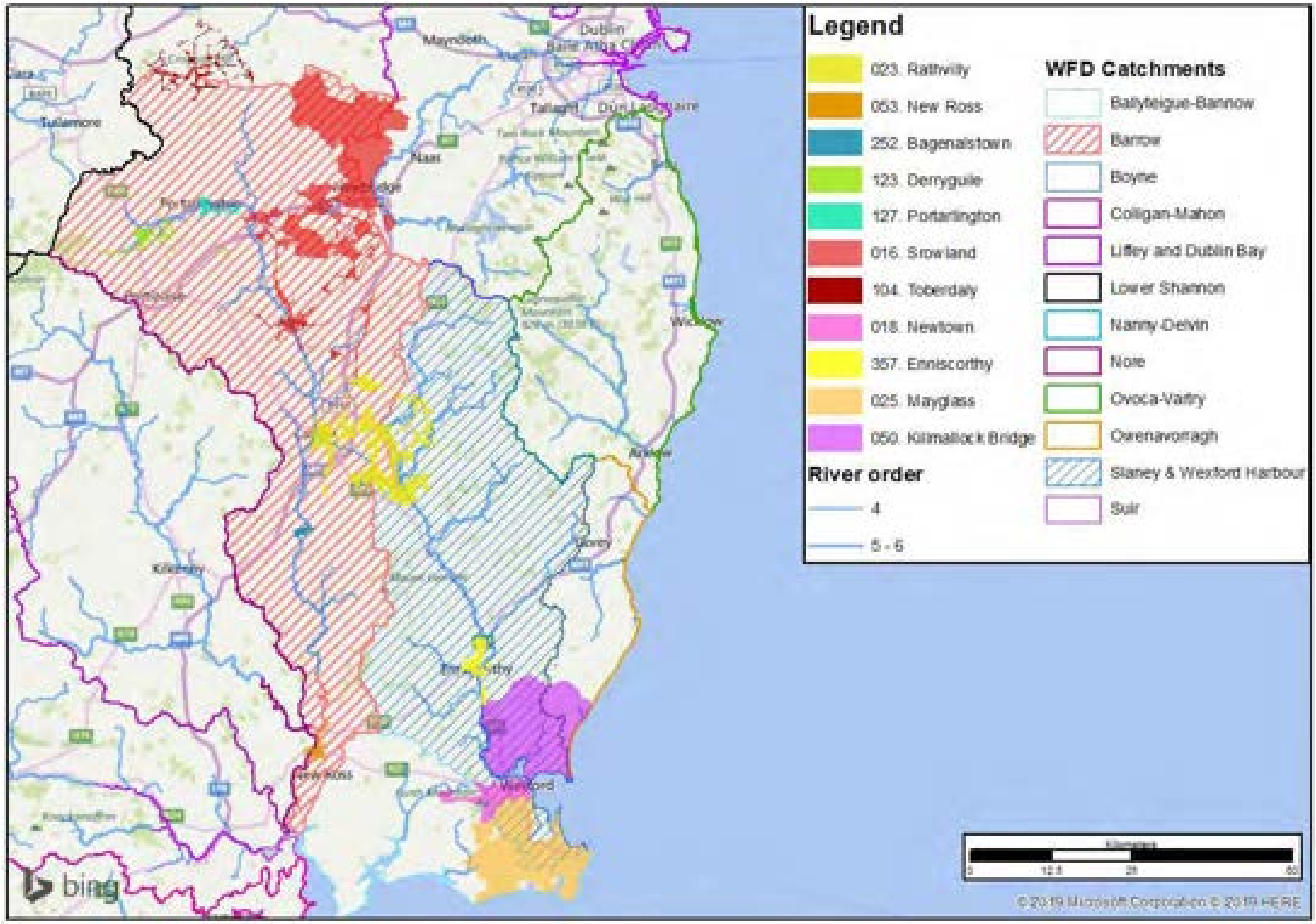

Figure 5: Red, Amber, Green (RAG) Status of waterbodies