IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 057 FOXES DEN & LOUGH GILL WSZS

SCREENING TO INFORM APPROPRIATE ASSESSMENT

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GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

Scoping: the process of deciding the content and level of detail to be included in the Screening for AA, including the key environmental 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 Irish Water (IW) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate (OP) dosing (herein referred to as the Project) of drinking water supplied by Foxes Den Water Treatment Plant (WTP), Co. Sligo, to Foxes Den and Lough Gill (Cairns Hill) 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 Irish Water, specifically:

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

1.2 THE PLAN

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

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

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

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

most significant portion of the lead pipework lying outside of IW's ownership in private properties (IW, 2016). Lead can be dissolved in water as it travels through lead supply pipes and internal lead plumbing. When lead is in contact with water it can slowly dissolve, a process known as plumbosolvency. The degree to which lead dissolves varies with the length of lead pipe, local water chemistry, temperature and the amount of water used at the property.

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

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

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

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

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

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

Orthophosphate (OP) is added in the form of Phosphoric acid - a clear, odourless liquid that is safe for human consumption. Phosphoric acid is already approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of P every day as part of the normal diet. The OP dose rate for Foxes Den will be 0.7 mg/l P.

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 any siginificant 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 (2000);
- *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.

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 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 impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

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

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

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

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

2.4 INFORMATION SOURCES CONSULTED

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

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - 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 Screening 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 15 km 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 and SSCOs 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 OP loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; The status of EU protected Habitats and Species in Ireland (NPWS 2013 a, b &c) and on information contained in Ireland's most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity, and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening of European Sites.

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

Foxes Den WSZ (2700PUB2701) and Lough Gill (Cairns Hill) WSZ (2700PUB2711), located in Co. Sligo are supplied by Foxes Den WTP following rationalisation and decommissioning of Cairns Hill WTP. An average of 10,500 m^3 of potable water per day is distributed to the network from Foxes Den WTP. The WSZs cover a large rural area and the Sligo urban centre. Based on an assessment of the risk of lead exceedances, the recommended Plumbosolvency Control Plan for Foxes Den and Lough Gill (Cairns Hill) WSZs is for universal dosing at Foxes Den WTP. Approximately 56% of the flow is accounted for and this fixed rate (44%) of water mains leakages has been assumed for both WSZs.

The Foxes Den and Lough Gill (Cairns Hill) WSZs boundaries are served by six wastewater treatment plant (WWTP) agglomerations (Ballysadare WWTP, Sligo WWTP, Ballintogher WWTP, Ballybeg WWTP, Collooney WWTP, and Strandhill WWTP). All six agglomerations are licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended and the impact of the OP on the Emission Limit Values (ELVs) and the receiving water body downstream of the point of discharge are assessed).

Figure 1: Location of the Foxes Den Water Treatment Plant site, Co. Sligo

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

The scope of the **operational** works include the dosing of OP to treated water at a rate of 0.7 mg/l P in a process similar to the addition of chlorine for disinfection. Waste from the phosphate analyser will

be routed to a public sewer on site where available and if not, waste shall be stored for a maximum of 60 days prior to removal by a transport vehicle.

3.2 LDWMP APPROACH TO ASSESSMENT

3.2.1 Work Flow Process

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

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

At the early stages of consideration, IW identified the pathways by which the added OP may reach and / or affect environmental receptors including European Sites. In order to carry out a robust and defensible environmental assessment and to ensure a transparent and consistent approach, IW devised a conceptual model based on the 'source – pathway – receptor' framework. This sets out a specific environmental risk assessment of any proposed OP 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 OP susceptibility output mapping for subsurface pathways; the nutrient risk assessment for water bodies; 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 DWWTS.

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 OP 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 OP treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent P levels related to the OP treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.2.2** below.

3.2.2 Environmental Assessment Methodology

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

- The *source* of P is defined as the OP dosing at WTPs 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 DWWTS.
- *Receptors*, and their sensitivity, is of key consideration in the EAM. A water body may be more sensitive to additional P loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where an

SAC/SPA is hydrologically connected to dosing from more than one WSZ, the potential for cumulative impacts on OP indicative water quality are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 3** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance. For each WSZ where OP 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. It also sets out the risk to OP indicative water quality status from an increase in OP loading arising from the proposed OP dosing.

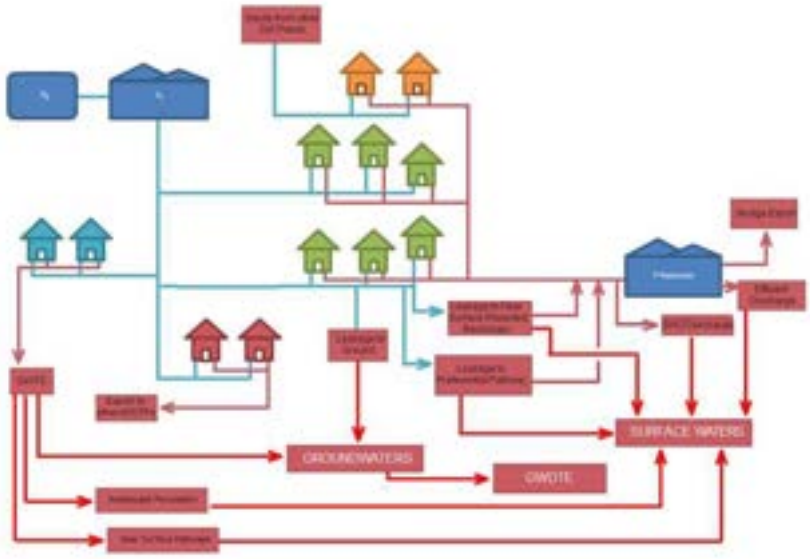

Figure 2: Conceptual Model of P Transfer

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

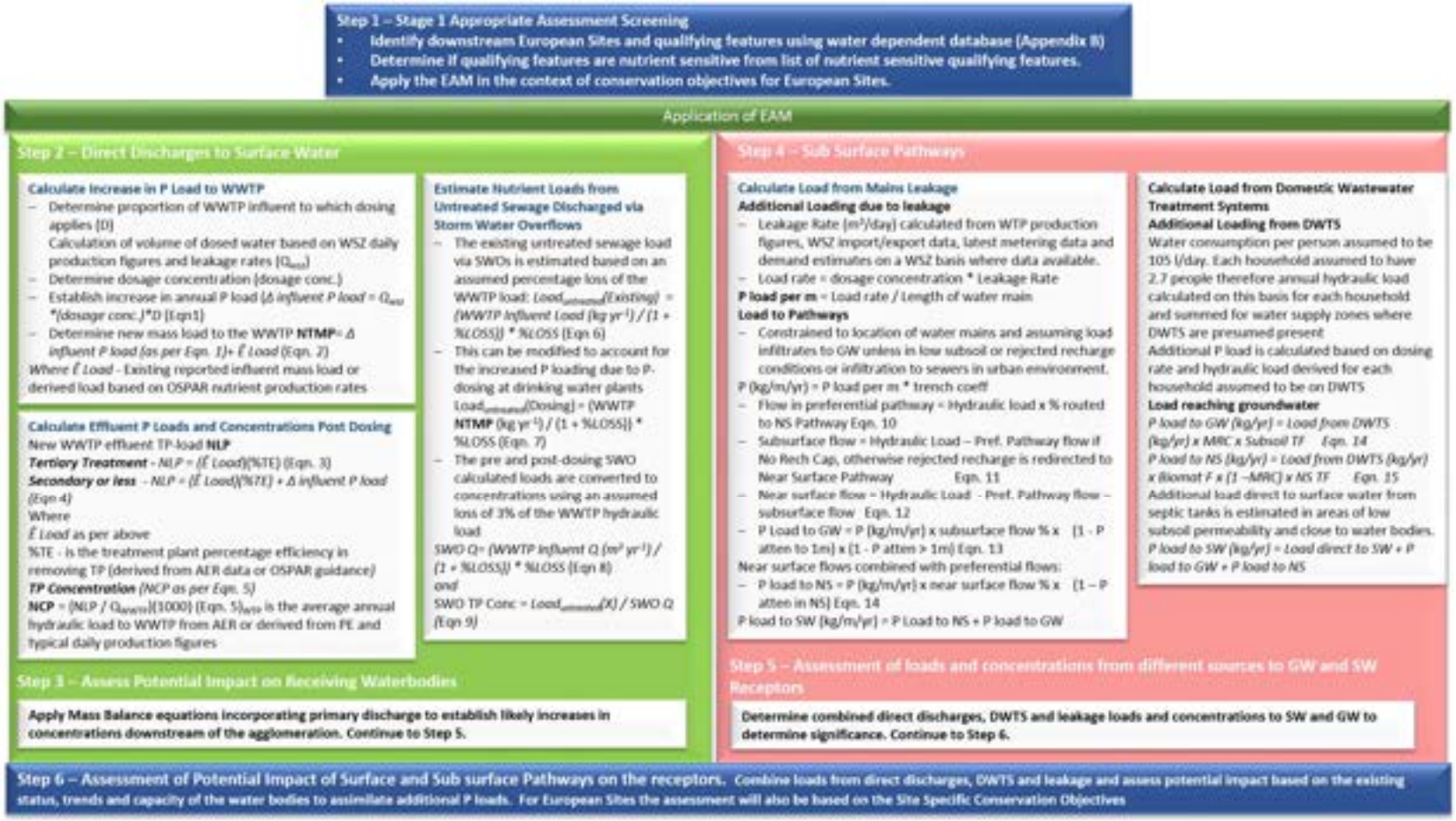

Figure 3: Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

The ZoI for the proposed Project was determined by establishing the potential for hydrological and hydrogeological connectivity between Foxes Den WTP and Foxes Den and Lough Gill (Cairns Hill) WSZs and European Sites. The 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 ZoI are listed in **Table 1** and are displayed in **Figure 4**.

The EAM process identified 10 river waterbodies, 2 lake waterbodies and 2 transitional waterbodies and 1 coastal waterbody 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:

- Owenmore (Sligo)_080 (IE_WE_35O060900) river waterbody drains into Ballysodare_010 (IE_WE_35B0501000) river waterbody which drains into Ballysadare Estuary (IE_WE_460_0300) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

- Barnabrack_010 (IE_WE_35B300790) river waterbody drains into Ballysadare Estuary (IE_WE_460_0300) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

- Killanummery_020 (IE_WE_35K030900) drains into Bonet_050 (IE_WE_35B060630) river waterbody and Garavogue_010 (IE_WE_35G010200) river waterbody; which drains into and out of Gill SO lake (IE_WE_35_158) waterbody prior to discharging to Garavoge Estuary (IE_WE_470_0100) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

- Knappagh (Sligo)_010 (IE_WE_35K420630) discharges to Garavoge Estuary (IE_WE_470_0100) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

- Knocknahur_010 (IE_WE_35K430740) river waterbody drains into Ballysadare Estuary (IE_WE_460_0300) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

- Unshin_030 (IE_WE_35U010400) river waterbody drains into Unshin_040 (IE_WE_35U010500) river waterbody and Unshin_050 (IE_WE_35U010600) river waterbody before flowing into Ballysodare_010 (IE_WE_35B0501000) river waterbody which drains into Ballysadare Estuary (IE_WE_460_0300) transitional waterbody and Sligo Bay (IE_WE_450_0000) coastal waterbody.

The EAM process identified 10 groundwater bodies. Groundwater bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are taken into account:

- Ballymote (IE_WE_G_0037);
- Lavagh-Ballintougher (IE_WE_G_0038);
- Ballygawley (IE_WE_G_0039);

- Carrowmore West (IE_WE_G_0040);
- Carrowmore East (IE_WE_G_0042);
- Drumcliff-Strandhill (IE_WE_G_0044);
- Collooney (IE_WE_G_0048);
- Ballintougher (IE_WE_G_0051);
- Dromahair (IE_WE_G_0054); and
- Killarga (IE_WE_G_0055)

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
Doocastle Turlough	SAC 000492	Yes	Yes	No
Ballysadare Bay	SAC 000622	Yes	Yes	Yes
Ben Bulben, Gleniff & Glenade Complex	SAC 000623	Yes	Yes	No
Cummeen Strand/Drumcliff Bay (Sligo Bay)	SAC 000627	Yes	Yes	Yes
Templehouse & Cloonacleigha Loughs	SAC 000636	Yes	Yes	No
Union Wood SAC	SAC 000638	No	Yes	No
Bricklieve Mountains & Keishcorran	SAC 001656	Yes	Yes	No
Knockalongy & Knockachree Cliffs	SAC 001669	Yes	Yes	No
Lough Arrow	SAC 001673	Yes	Yes	No
Unshin River	SAC 001898	Yes	Yes	Yes
Cloonakillina Lough	SAC 001899	Yes	Yes	No
Lough Gill SAC	SAC 001976	Yes	Yes	Yes
Ox Mountains Bogs	SAC 002006	Yes	Yes	No
Drumcliff Bay SPA	SPA 004013	Yes	Yes	Yes
Cummeen Strand	SPA 004035	Yes	Yes	Yes
Lough Arrow	SPA 004050	Yes	Yes	No
Ballysadare Bay	SPA 004129	Yes	Yes	Yes
Aughris Head	SPA004133	Yes	Yes	No
Ardboline Island & Horse Island	SPA 004135	Yes	Yes	Yes
Sligo/ Leitrim Uplands	SPA 004187	Yes	Yes	No
Ballintemple and Ballygilgan	SPA 004234	Yes	Yes	Yes

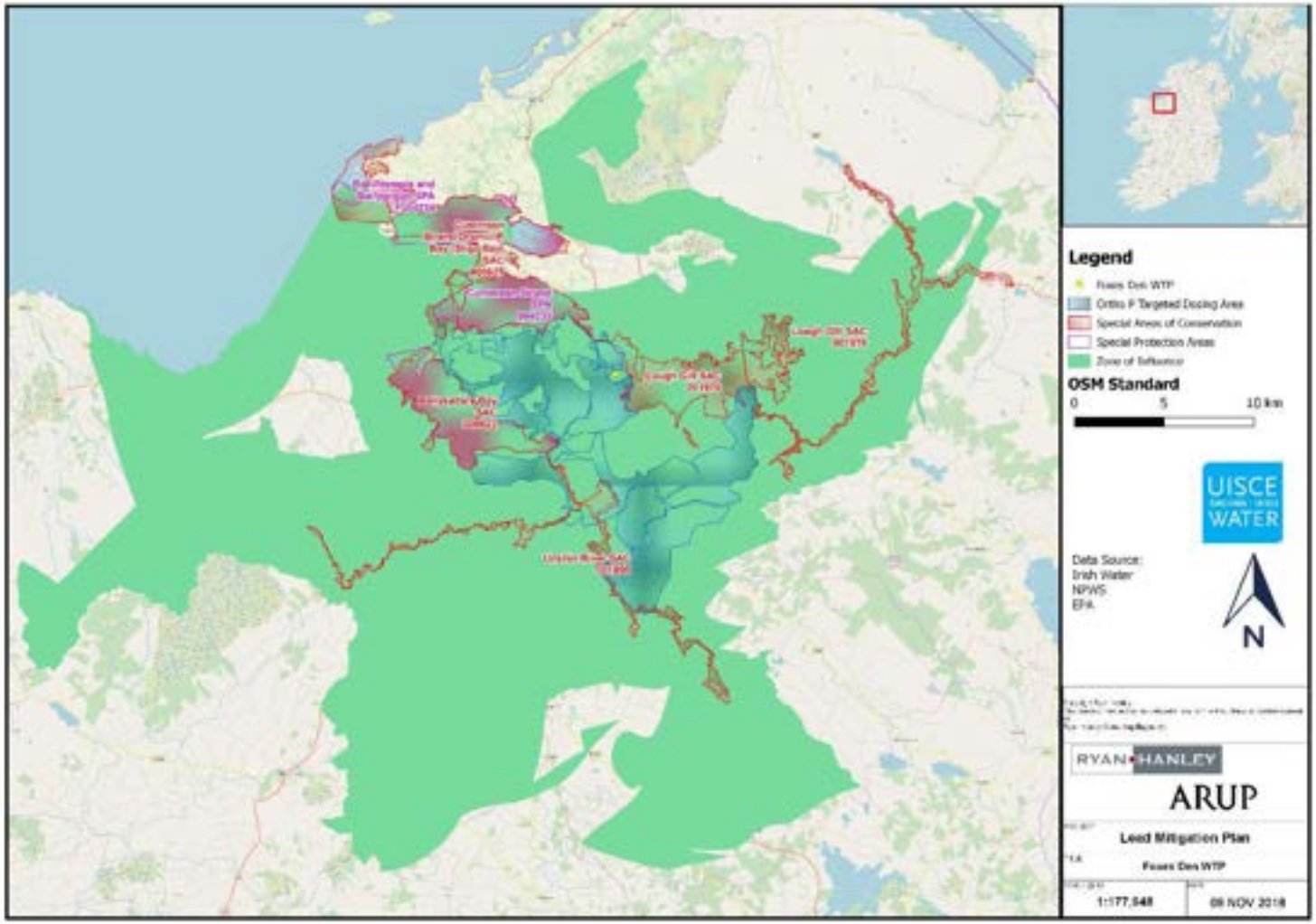

Figure 4: European Sites within the ZoI of the Proposed Project

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 sites that screened out because of absence of water dependent habitats/ species and nutrient sensitivity included:

- Union Wood SAC;

Sites that screened out owing to absence of hydrological/ hydrological connectivity were:

- Doocastle Turlough SAC (000492) – has groundwater connectivity but surface water river system divides OP dosing area from the SAC;
- Ben Bulben, Gleniff & Glenade Complex SAC (000623) - has groundwater connectivity but surface water river system divides OP dosing area from the SAC;
- Templehouse & Cloonacleigha Loughs SAC (000636) - has groundwater connectivity but surface water river system divides OP dosing area from the SAC;
- Bricklieve Mountains & Keishcorran SAC (001656) – is potentially hydrologically connected to the OP dosing via the Ballymote groundwater body, however a surface water river system divides OP dosing area from the SAC and groundwater flow direction is generally in a northerly direction towards the dosing area;
- Knockalongy & Knockachree Cliffs SAC (001669) – is potentially hydrologically connected to the OP dosing via the Collooney groundwater body but is a distance of 18 km upgradient of the OP dosing targeted area and flow paths are known to be short (300 m), with groundwater discharging rapidly to nearby streams and small springs[3];
- Lough Arrow SAC (001673) and SPA (004133) are upstream from the OP dosing area;
- Cloonakillina Lough SAC (001899) - has groundwater connectivity but a surface water river system divides OP dosing area from the SAC;
- Ox Mountains Bogs SAC (002006) - has groundwater connectivity but surface water river system divides OP dosing area from the SAC; and
- Sligo/ Leitrim Uplands SPA (004187) - has groundwater connectivity but surface water river system divides OP dosing area from the SPA.

The remaining sites are included in this Screening assessment in order to determine whether the Project is likely to give rise to significant effects; these sites are detailed in **Table 2** and are displayed in **Figure 5**.

[3] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/CollooneyGWB.pdf

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
Ballysadare Bay	**SAC 000622**	**20th Nov 2013**	1014	Narrow-mouthed whorl snail *Vertigo angustior*	Yes	Yes	**Yes**
			1130	Estuaries	Yes	Yes	
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	
			1365	Harbour seal *Phoca vitulina*	Yes	Yes	
			2110	Embryonic shifting dunes	Yes	Yes	
			2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Yes	Yes	
			2190	Humid dune slacks	Yes	Yes	
Cummeen Strand/ Drumcliff Bay (Sligo Bay)	**SAC 000627**	**18th Sept 2013**	1014	Marsh Snail *Vertigo angustior*	Yes	Yes	**Yes**
			1095	Sea Lamprey *Petromyzon marinus*	Yes	Yes	
			1099	River Lamprey *Lampetra fluviatilis*	Yes	Yes	
			1130	Estuaries	Yes	Yes	
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	
			1365	Harbour seal *Phoca vitulina*	Yes	Yes	
			2110	Embryonic shifting dunes	Yes	Yes	
			2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Yes	Yes	
			5130	*Juniperus communis* formations on heath or calcareous grasslands	No	No	
			7220	Petrifying springs with tufa formation (Cratoneurion)*	Yes	Yes	
Unshin River	**SAC 0001898**	**21st Feb 2018**	3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachiono vegetation	Yes	Yes	**Yes**
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)(*important orchid sites)	No	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
			6410	*Molina* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Yes	Yes	
			91E0	Alluvial forests with *Alnus glutinousa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*	Yes	Yes	
			1106	Salmon *Salmo salar*	Yes	Yes	
			1355	Otter *Lutra lutra*	Yes	Yes	
Lough Gill	**SAC 001976**	**21st Feb 2018**	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation	Yes	Yes	**Yes**
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)(*important orchid sites)	No	Yes	
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No	Yes	
			91E0	Alluvial forests with *Alnus glutinousa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*	Yes	Yes	
			1092	White-clawed Crayfish *Austropotamobius pallipes*	Yes	Yes	
			1095	Sea Lamprey Petromyzon marinus	Yes	Yes	
			1096	Brook Lamprey *Lampetra planeri*	Yes	Yes	
			1099	River Lamprey Lampetra fluviatilis	Yes	Yes	
			1106	Salmon *Salmo salar*	Yes	Yes	
			1355	Otter *Lutra lutra*	Yes	Yes	
Drumcliff Bay	**SPA 004013**	**4th Sept 2013**	A144	Sanderling *Calidris alba*	Yes	Yes	**Yes**
			A157	Bar-tailed Godwit *Limosa lapponica*	Yes	Yes	
			A999	Wetlands	Yes	Yes	
Cummeen Strand	**SPA 004035**	**10th Sept 2013**	A046	Brent Goose *Branta bernicla hrota*	Yes	Yes	**Yes**
			A130	Oystercatcher *Haematopus ostralegus*	Yes	Yes	
			A162	Redshank *Tringa tetanus*	Yes	Yes	
			A999	Wetlands	Yes	Yes	
Ballysadare Bay	**SPA 004129**	**25th Oct 2013**	A046	Light-bellied Brent Goose *Branta bernicla hrota*	Yes	Yes	**Yes**
			A141	Grey Plover *Pluvialis squatarola*	Yes	Yes	
			A149	Dunlin *Calidris alpine*	Yes	Yes	
			A157	Bar-tailed Godwit *Limosa lapponica*	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
			A162	Redshank *Tringa tetanus*	Yes	Yes	
			A999	Wetland and Waterbirds	Yes	Yes	
Ardboline Island & Horse Island	**SPA 004135**	**21st Feb 2018**	A017	Cormorant *Phalacrocorax carbo*	Yes	Yes	
			A045	Barnacle Goose *Branta leucopsis*	Yes	Yes	**Yes**
Ballintemple and Ballygilgan	**SPA 004234**		A045	Barnacle Goose *Branta leucopsis*	Yes	Yes	**Yes**

* indicates a priority habitat under the Habitats Directive

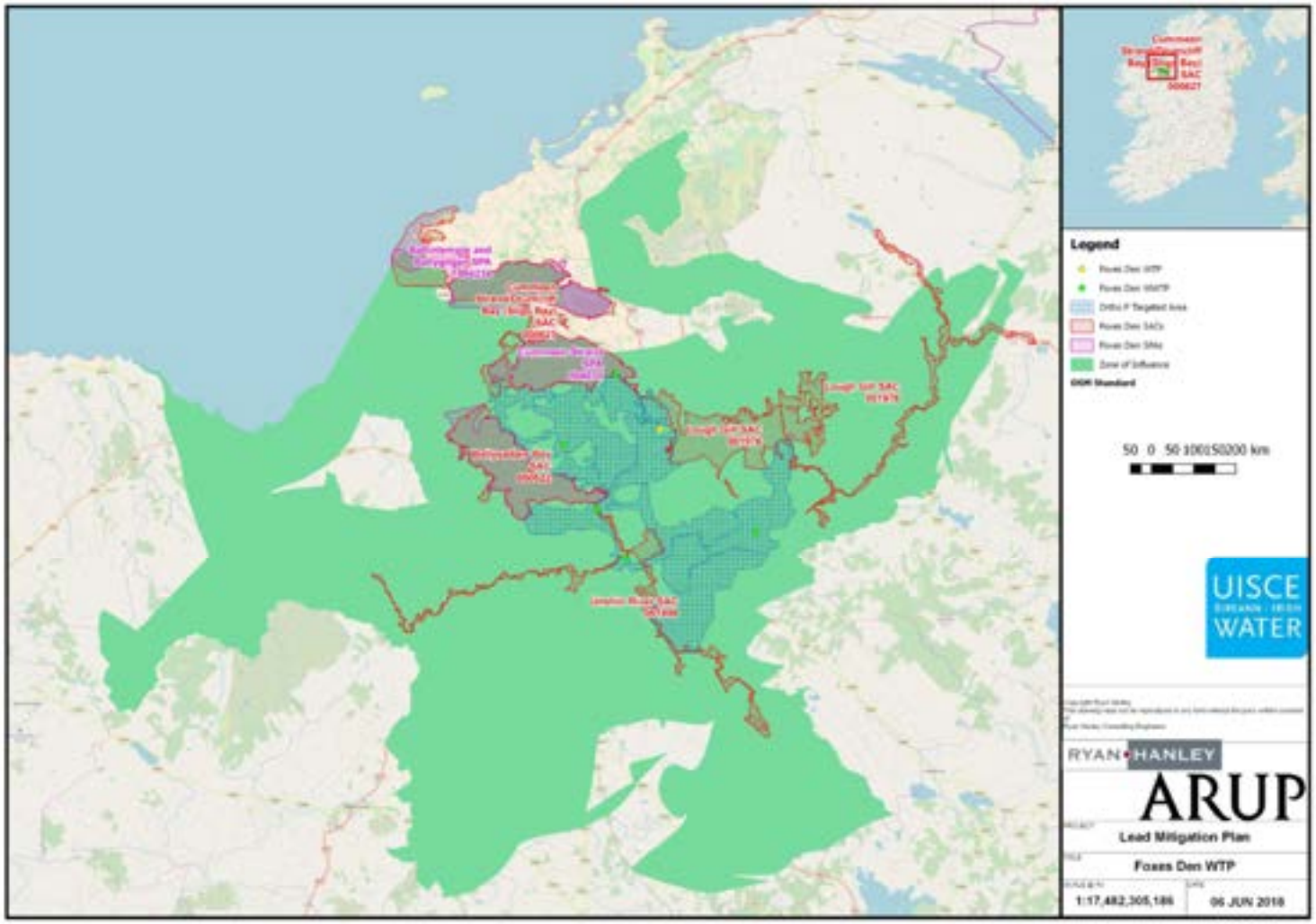

Figure 5: European Sites within the ZoI of the Proposed Project which are hydrologically or hydrogeologically connected

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

Operational Phase

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

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

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

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

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication; with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent effects on these habitats and species; and therefore will be subject to an evaluation of the significance of any such effect;
- The discharge of additional P loads to the environment (through surface and sub surface pathways) may have implications for nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish.
- Phosphorus (P) in wastewater collection systems is the result of drinking water and derived from a number of other sources, including P imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of P removed in

wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;

- Leakage of phosphates from the drinking water supply network to the environment from use of OP;
- Direct discharges of increased P to waterbodies from the wastewater treatment plant licensed discharges; and
- Potential discharges to waterbodies of untreated effluent potentially high in OP Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS

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

- European sites included for assessment;
- Waterbodies hydrologically or hydrogeologically connected to the European Sites;
- Existing OP indicative water quality status 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 water body is a measure of its ability to absorb extra pressures before its status changes. For example, a river water body at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l P. River water bodies with mean phosphate concentrations of 0.0275 mg/l P have 75% capacity left, i.e. high capacity, while river water bodies 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 OP 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 OP 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 water body will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be

far. Where the water body baseline concentration is "Near" to the threshold before the effect of orthophosphate 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 water bodies 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 used the EPA WFD App data relating to waterbody monitoring and characterisation downloaded in November 2021.

Baseline OP monitoring data and associated thresholds are available for half of the RWBs; those without monitoring data include Barnabrack_010, Killanummery_020, Knappagh (Sligo)_010, Knocknahur_010 and Unshin_040. 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. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, the 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 with QI receptors that require high status.

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[4]	Ortho-P/ TP Status[5] and Trends[6]	Baseline[7] Ortho-P Conc.[8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
Ballysadare Bay SAC 000622 & Ballysadare Bay SPA 004129	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ
	IE_WE_460_0300 Ballysadare Estuary	TWB	Summer High Winter High	0.0057/ 0.0210	0.0188	224.3	0.0003	0.0060/ 0.0213	No risk of deterioration to OP indicative WQ
	IE_WE_G_0048 Collooney	GWB	*Good*	*0.0175*	0.0263	5.0	0.0001	0.0175	No risk of deterioration to OP indicative WQ
	IE_WE_G_0040 Carrowmore West	GWB	*Good*	*0.0175*	0.0263	23.8	0.0011	0.0186	No risk of deterioration to OP indicative WQ
	IE_WE_G_0044 Drumcliff-Strandhill	GWB	*Good*	*0.0175*	0.0263	4.1	0.0002	0.0177	No risk of deterioration to OP indicative WQ
	IE_WE_35B300790 Barnabrack_010	RWB	*High*	0.0125	0.0188	1.4	0.00004	0.0125	No risk of deterioration to OP indicative WQ
	IE_WE_35K430740 Knocknahur_010	RWB	*High*	0.0125	0.0188	26.6	0.0009	0.0134	No risk of deterioration to OP indicative WQ

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

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Ortho-P/ TP Status[5] and Trends[6]	Baseline[7] Ortho-P Conc.[8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_WE_35B_050100 Ballysodare_010	RWB	High	0.0138	0.0188	409.7	0.0006	0.0144	No risk of deterioration to OP indicative WQ
Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC 000627	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ
	IE_WE_470_0100 Garavoge Estuary	TWB	Summer High Winter High	0.0066/ 0.0120	0.0188	166.9	0.0002	0.0068/ 0.0122	No risk of deterioration to OP indicative WQ
	IE_WE_G_0055 Drumcliff-Strandhill	GWB	*Good*	*0.0175*	0.0263	4.1	0.0002	0.0175	No risk of deterioration to OP indicative WQ
	IE_WE_35K420630 Knappagh (Sligo)_010	RWB	*High*	*0.0125*	0.0188	11.3	0.0007	0.0132	No risk of deterioration to OP indicative WQ
	IE_WE_35G010200 Garavogue_010	RWB	High	0.0100	0.0188	83.8	0.0001	0.0101	No risk of deterioration to OP indicative WQ
Unshin River SAC 0001898	IE_WE_460_0300 Ballysadare Estuary	TWB	Winter High Summer High	0.0057/ 0.0210	0.0188	224.3	0.0003	0.0060/ 0.0213	No risk of deterioration to OP indicative WQ
	IE_WE_G_0048 Collooney	GWB	*Good*	*0.0175*	0.0263	5.0	0.0001	0.0175	No risk of deterioration to OP indicative WQ
	IE_WE_G_0040 Carrowmore West	GWB	*Good*	*0.0175*	0.0263	23.8	0.0011	0.0186	No risk of deterioration to OP indicative WQ
	IE_WE_G_0039 Ballygawley	GWB	*Good*	*0.0175*	0.0263	7.6	0.0015	0.0190	No risk of deterioration to OP indicative WQ
	IE_WE_G_0038 Lavagh-Ballintougher	GWB	*Good*	*0.0175*	0.0263	1.8	0.0004	0.0179	No risk of deterioration to OP indicative WQ

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Ortho-P/ TP Status[5] and Trends[6]	Baseline[7] Ortho-P Conc.[8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_WE_G0037 Ballymote	GWB	Good	0.0166	0.0263	0.6	0.00001	0.0166	No risk of deterioration to OP indicative WQ
	IE_WE_35B_050100 Ballysodare_010	RWB	High	0.0138	0.0188	409.7	0.0006	0.0144	No risk of deterioration to OP indicative WQ
	IE_WE_35U010600 Unshin_030	RWB	High	0.0149	0.0188	17.8	0.0001	0.0150	No risk of deterioration to OP indicative WQ
	IE_WE_35U010500 Unshin_040	RWB	*High*	0.0125	0.0188	54.0	0.0002	0.0127	No risk of deterioration to OP indicative WQ
	IE_WE_35U010400 Unshin_050	RWB	High	0.0141	0.0188	88.5	0.0004	0.0144	No risk of deterioration to OP indicative WQ
	IE_WE_35O060900 Owenmore (Sligo)_080	RWB	High	0.0144	0.0188	316.8	0.0007	0.0151	No risk of deterioration to OP indicative WQ
Lough Gill SAC 001976	IE_WE_G_0042 Carrowmore East	GWB	Good	0.0203	0.0263	14.5	0.0004	0.0207	No risk of deterioration to OP indicative WQ
	IE_WE_G_0054 Dromahair	GWB	*Good*	*0.0175*	0.0263	7.1	0.0007	0.0182	No risk of deterioration to OP indicative WQ
	IE_WE_G_0051 Ballintougher	GWB	*Good*	*0.0175*	0.0263	2.6	0.0005	0.018	No risk of deterioration to OP indicative WQ
	IE_WE_G_0055 Killarga	GWB	*Good*	*0.0175*	0.0263	0.1	0.00002	0.0175	No risk of deterioration to OP indicative WQ
	IE_WE_35_158 Gill SO	LWB	Good	0.0204	0.0213	83.8	0.0001	0.0205	No risk of deterioration to OP indicative WQ

Site Name (Code)	Contributing WB Code_Name	WB Type[4]	Ortho-P/ TP Status[5] and Trends[6]	Baseline[7] Ortho-P Conc.[8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_WE_35G010200 Garavogue_010	RWB	High	0.0100	0.0188	83.8	0.0001	0.0101	No risk of deterioration to OP indicative WQ
	IE_WE_35K030900 Killanummery_020	RWB	*High*	*0.0125*	0.0188	2.3	0.0001	0.0126	No risk of deterioration to OP indicative WQ
Drumcliff Bay SPA 004013	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ
	IE_WE_G_0044 Drumcliff-Strandhill	GWB	*Good*	*0.0175*	0.0263	4.1	0.0002	0.0177	No risk of deterioration to OP indicative WQ
Cummeen Strand SPA 004035	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ
	IE_WE_470_0100 Garavoge Estuary	TWB	Summer High Winter High	0.0066/ 0.0120	0.0188	166.9	0.0002	0.0068/ 0.0122	No risk of deterioration to OP indicative WQ
	IE_WE_G_0044 Drumcliff-Strandhill	GWB	*Good*	*0.0175*	0.0263	4.1	0.0002	0.0177	No risk of deterioration to OP indicative WQ
	IE_WE_35G010200 Garavogue_010	RWB	High	0.0100	0.0188	83.8	0.0001	0.0101	No risk of deterioration to OP indicative WQ
	IE_WE_35K420630 Knappagh (Sligo)_010	RWB	*High*	*0.0125*	0.0188	11.3	0.0007	0.0132	No risk of deterioration to OP indicative WQ
Ardboline Island & Horse Island SPA 004135	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ
Ballintemple and Ballygilgan SPA 004234	IE_WE_450_0000 Sligo Bay	CWB	Summer High Winter High	0.0025/ 0.0125	0.0188	399.0	0.0004	0.0029/ 0.0129	No risk of deterioration to OP indicative WQ

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 OP can reach receptors. In the case of these pathways, factors contributing to the potential direct impacts are:

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

For the purposes of assessing the potential impact on the receiving environment within the EAM, a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 4**). The baseline OP indicative water quality 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 = 0.7 mg/l P

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*
Ballysadare Primary Discharge	**No ELV**	**Existing**	2155	10.18	8.14	13.84
		Post Dosing	2155	10.18	8.14	13.84
		% Increase	0%	0%	0%	0%
Ballysadare SWOs (4 No)		**Existing**	88	2.04	1.63	2.77
		Post Dosing	91	2.10	1.68	2.86
Ballintogher Primary Discharge	**No ELV**	**Existing**	123	3.74	2.99	5.08
		Post Dosing	140	4.27	3.42	5.81
		% Increase	14%	14%	14%	14%
Ballintogher SWOs (1 No.)		**Existing**	8	1.14	0.91	1.55
		Post Dosing	8	1.22	0.98	1.66
Ballybeg Primary Discharge	**No ELV**	**Existing**	2	3.74	2.99	5.08
		Post Dosing	2	4.27	3.41	5.80
		% Increase	14%	14%	14%	14%
Collooney Primary Discharge	**OP (1.5 mg/l) – Compliant AER 2017**	**Existing**	142	0.52	0.41	0.71
		Post Dosing	210	0.77	0.61	1.04
		% Increase	48%	48%	48%	48%
Collooney SWOs (4 No.)		**Existing**	266	4.76	3.81	6.47
		Post Dosing	268	4.80	3.84	6.52
Sligo Primary Discharge	**TP (2mg/l)-Non-**	**Existing**	32828	2.40	1.92	3.26
		Post Dosing	32828	2.40	1.92	3.26
		% Increase	0%	0%	0%	0%

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*
Sligo SWOs (7 No.)	**compliant AER 2017**	**Existing**	2792	1.00	0.80	1.36
		Post Dosing	2820	1.01	0.81	1.37
Strandhill Primary Discharge	**No ELV**	**Existing**	808	1.46	2.99	5.08
		Post Dosing	921	1.66	3.40	5.79
		% Increase	14%	14%	14%	14%
Sligo SWOs (1 No)		**Existing**	50	0.45	0.91	1.55
		Post Dosing	54	0.47	0.97	1.66

Ballintogher WWTP Agglomeration

Ballintogher WWTP Agglomeration provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM has assumed that the additional load receives no treatment (Appendix C). The effluent is predicted to increase from 3.74 mg/l of P to 4.27 mg/l P (14%) after OP dosing. The SWO concentration will increase from 1.14 mg/l P to 1.22 mg/l P (7%) as a result of the OP dosing. Ballintogher WWTP discharges to the Garavogue_010 river waterbody. The Garavogue_010 river waterbody has a 'High' Indicative OP status (0.007 mg/l P baseline concentration). Ballintogher WWTP discharges to Garavogue_010 upstream of **Lough Gill SAC**.

Ballybeg WWTP Agglomeration

Ballybeg WWTP Agglomeration provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM has assumed that the additional load receives no treatment (Appendix C). The effluent is predicted to increase from 3.74 mg/l of P to 4.27 mg/l P (14%) after OP dosing. Ballybeg WWTP discharges to groundwater, specifically, Carrowmore West groundwater body. Carrowmore West groundwater body has a 'Good' Indicative OP status (0.018 mg/l P baseline concentration) and is hydrologically connected to **Ballysadare Bay SAC**, **Ballysadare Bay SPA** and **Unshin River SAC**.

Ballysadare WWTP Agglomeration

Ballysadare WWTP Agglomeration provides tertiary treatment for P removal however there are ***no*** ELVs for P associated with this plant. The WWTP currently achieves a reduction of 29% P removal however the EAM has assumed that all of the additional P load will be removed following OP dosing. WWTP effluent OP concentration remain at 10.18 mg/l P (0%). There are 4 No. SWOs associated with this WWTP. The annual average Storm Water Overflow (SWO) effluent concentration will increase from 2.04 mg/l P to 2.10 mg/l P as a result of the drinking water dosing (3% increase). Ballysadare WWTP discharges to Ballysodare_010 river waterbody which has a 'High' Indicative OP status (0.011 mg/l P baseline concentration) and is part of **Unshin River SAC**. Furthermore, Ballysodare_010 river waterbody discharges to Ballysadare Estuary transitional waterbody which forms **Ballysadare SAC and SPA**.

Collooney WWTP Agglomeration

Collooney WWTP Agglomeration provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM has assumed that the additional load receives no treatment (Appendix C). The plant has an ELV for OP of 1.5 mg/l which it was compliant with in 2017. The effluent is predicted to increase from 0.52 mg/l of P to 0.77 mg/l P (48%) after OP dosing. The SWO concentration will increase from 4.76 mg/l P to 4.80 mg/l P (0.7%) as a result of the OP dosing. Collooney WWTP discharges to the Owenmore (Sligo)_080 river waterbody. The Owenmore (Sligo)_080 river waterbody has a 'High' Indicative OP status (0.012 mg/l P baseline concentration) and is part of **Unshin River SAC**.

Strandhill WWTP Agglomeration

Strandhill WWTP Agglomeration provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM has assumed that the additional load receives no treatment (Appendix C). The effluent is predicted to increase from 1.46 mg/l of P to 1.66 mg/l P (14%) after OP dosing. The 2017 AER lists one SWO within the agglomeration however the WFD app does not record where this SWO is discharging, thus the SWO has been excluded from the EAM assessment. Collooney WWTP discharges to Sligo Bay coastal waterbody in **Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC**.

Sligo WWTP Agglomeration

Sligo WWTP Agglomeration provides tertiary treatment for P removal and has an ELV for TP of 2 mg/l. The WWTP currently achieves a reduction of 66% P removal and was ***not*** compliant with its ELV for TP in 2017, however the EAM has assumed that all of the additional P load will be removed following OP dosing. WWTP effluent OP concentration remain at 2.4 mg/l P (0%). Irish Water has assessed the WWTP performance and has determined that, the additional P load to the WWTP resulting from this project will not disimprove the performance of the plant, and that no additional P will be discharged in the effluent as a result of the proposed project. There are 7 No. SWOs associated with this WWTP. The annual average Storm Water Overflow (SWO) effluent concentration will increase from 1.00 mg/l P to 1.01 mg/l P as a result of the drinking water dosing (1% increase). Sligo WWTP discharges to Garavoge Estuary transitional waterbody which has a 'High' Indicative OP status (0.010 mg/l P in summer and 0.020 mg/l P in winter baseline concentration) and is part of **Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC and Cummeen Strand SPA**.

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the results of the EAM regarding the combined loading as a result of increased orthophosphate load from WWTP discharges, seepage from mains and DWWTS. Upstream dosing areas to Foxes Den and Lough Gill WSZs, are incorporated into the EAM and the cumulative impacts have been considered in the EAM and are assessed herein.

River waterbodies

- The Barnabrack_010 (IE_WE_35B300790), Knocknahur_010 (IE_WE_35K430740) and Ballysodare_010 (IE_WE_35B_050100) river waterbodies are hydrologically connected to **Ballysadare Bay SAC (000622)** and **Ballysadare Bay SPA (004129)** (Table 3).

- Knappagh (Sligo)_010 (IE_WE_35K420630) and Garavogue_010 (IE_WE_35G010200) river waterbodies are hydrologically connected to **Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627)**.

- Ballysodare_010 (IE_WE_35B_050100), Unshin_050 (IE_WE_35U010600), Unshin_040 (IE_WE_35U010500), Unshin_030 (IE_WE_35U010400) and Owenmore (Sligo)_080 (IE_WE_35O060900) river waterbodies are hydrologically connected to **Unshin River SAC (0001898)**.

- Garavogue_010 (IE_WE_35G010200) and Killanummery_020 (IE_WE_35K030900) river waterbodies are hydrologically connected to **Lough Gill SAC (001976)**.

- Garavogue_010 (IE_WE_35G010200) and Knappagh (Sligo)_010 (IE_WE_35K420630) river waterbodies are hydrologically connected to **Cummeen Strand SPA (004035)**.

For most RWBs majority significant proportion of the load comes from mains seepage though the near surface pathways. Ballintogher WWTP and Sligo WWTP SWOs discharge to Garavogue_010 river waterbody; Ballysadare WWTP discharges to Ballysodare010 and Collooney WWTP discharges to the Owenmore (Sligo)_080 river. The increase in OP concentrations in RWBs with hydrological connectivity to the OP dosing is up to 0.0009 mg/l P. All RWBs have predicted dosing concentrations below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and are within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of these RWBs.

Lake waterbodies

- Gill SO Lake Waterbody (IE_WE_35_158) is hydrologically connected to **Lough Gill SAC (001976).**

The increase in OP concentrations in Gill SO lake waterbody is 0.0002 mg/l P. This is adopted as Total Phosphorus to assess the potential impact on lakes. This increases the baseline TP from 0.21 to 0.212 mg/l TP and does not deterioration the TP indicative water quality of the lake, i.e. it remains at 'good' status (see **Table 3; Appendix C**).

Groundwater bodies

- Collooney (IE_WE_G_0048), Carrowmore West (IE_WE_G_0040) and Drumcliff-Strandhill (IE_WE_G_0044) groundwater bodies are hydrologically connected to **Ballysadare Bay SAC (000622)** and **Ballysadare Bay SPA (004129)** (**Table 3**).

- Drumcliff-Strandhill (IE_WE_G_0044) groundwater body is hydrologically connected to **Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627), Drumcliff Bay SPA (004013) and Cummeen Strand SPA 004035**.

- Collooney (IE_WE_G_0048), Carrowmore West (IE_WE_G_0040), Ballygawley (IE_WE_G_0039), Lavagh-Ballintougher (IE_WE_G_0038) and Ballymote (IE_WE_G0037) groundwater bodies are hydrologically connected to **Unshin River SAC (0001898)**.

- Carrowmore East (IE_WE_G_0042), Dromahair (IE_WE_G_0054), Ballintougher (IE_WE_G_0051) and Killarga (IE_WE_G_0055) groundwater bodies are hydrologically connected to **Lough Gill SAC (001976).**

The increase in OP concentrations in the GWBs as a result of the OP dosing is up to 0.0015 mg P/l. 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 and therefore there is no risk of deterioration in the OP indicative water quality of these GWBs.

Transitional waterbodies

The rivers within the Foxes Den dosing area ultimately drain into the following transitional waterbodies:

- Ballysadare Estuary (IE_WE_460_0300) which is hydrologically connected to **Ballysadare Bay SAC (000622), Ballysadare Bay SPA (004129), Unshin River SAC (0001898)**; and

- Garavoge Estuary (IE_WE_470_0100) which is hydrologically connected to **Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627) and Cummeen Strand SPA (004035).**

The increase in OP concentrations in the downstream TWBs as a result of dosing is up to 0.0003 mg/l P. This TWB has a predicted dosing concentration below the 5% of Good/ High boundary (0.00125 mg/l P) (as highlighted in Table 3) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of these TWB.

Coastal waterbodies

Ballysadare and Garavoge estuaries ultimately drain into Sligo Bay coastal waterbody.

- Sligo Bay (IE_WE_450_0000) is hydrologically connected to **Ballysadare Bay SAC (000622) and Ballysadare Bay SPA (004129), Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627), Drumcliff Bay SPA (004013), Cummeen Strand SPA (004035), Ardboline Island & Horse Island SPA, (004135) and Ballintemple and Ballygilgan SPA (004234).**

The increase in OP concentrations in the downstream coastal WBs as a result of dosing is 0.0003 mg/l P. This CWB has a predicted dosing concentration below the 5% of Good/ High boundary (0.00125 mg/l P) (as highlighted in **Table 3**) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this CWB.

5.3.3 Conclusions

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

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and the potential to impact upon the qualifying interest (habitats and species) identified in **Table 1** that are both water dependent and nutrient sensitive (**Appendix C**). Nine European sites remain for evaluation of potential for significant effect Ballysadare Bay SAC (000622), Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627), Unshin River SAC (001898), Lough Gill SAC (001976), Drumcliff Bay SPA (004013), Cummeen Strand SPA (004035), Ardboline Island & Horse Island SPA (004135), Ballintemple and Ballygilgan SPA (004234) and Ballysadare Bay SPA (004129). 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 BALLYSADARE BAY SAC 000622

6.1.1 (1014) Marsh snail *Vertigo angustior*

Vertigo angustior is a terrestrial groundwater-dependent species. There is one known location for this species in this SAC (NPWS, 2013[11]) in the vicinity of Culleenamore Strand Mussel Point. The target is to ensure 'no decline'. A review of the SSCOs targets and measures for *Vertigo angustior* found no nutrient specific targets and measures for the species (NPWS, 2013). However, the IUCN Red List[12] of threatened species lists eutrophication as a 'main threat' to this species. Increases in P levels would allow higher vegetation to grow and outcompete the yellow sedge and moss habitat that is required by the snail.

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 '*Vertigo angustior*' in Ballysadare Bay SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

[11] NPWS (2013) Conservation Objectives: Ballysadare Bay SAC 000622. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

[12] Moorkens, E., Killeen, I., Seddon, M. (2012). Vertigo angustior. The IUCN Red List of Threatened Species 2012: e.T22935A16658012.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Barnabrack_010 river waterbody (IE_WE_35B300790) and estimated an increase in OP concentrations of 0.00004 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0125 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Knocknahur_10 river water body (IE_WE_35K430740) and estimated an increase in OP concentrations of 0.0009 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0134 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to '*Vertigo angustior*' habitat in Ballysadare Bay 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 '*Vertigo angustior*' species / no deterioration of its favourable conservation condition is identified.

6.1.2 (1130) Estuaries and (1140) Mudflats and sandflats not covered by seawater at low tide

'Estuaries' habitats are defined as the downstream part of a river valley, subject to the tide and extending from the limit of brackish water with a significant freshwater influence. Estuarine habitat was estimated as 1703 ha. '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. Mudflat area was estimated as 1345 hectares.

The attributes and targets set out in the SSCOs are: to maintain the extent of Zostera-dominated community, to conserve the high quality of the Zostera-dominated community and to conserve community

types (Intertidal sand with *Angulus tenuis* community complex; Muddy sand to sand with *Hediste diversicolor*, *Corophium volutator* and *Peringia ulvae* community complex; Fine sand with polychaetes community complex; Sand with bivalves, nematodes and crustaceans community complex; Intertidal reef community complex; Subtidal reef community complex). 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 estuarine and mudflat habitat in Ballysadare Bay SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Barnabrack_010 river waterbody (IE_WE_35B300790) and estimated an increase in OP concentrations of 0.00004 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0125 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Knocknahur_10 river water body (IE_WE_35K430740) and estimated an increase in OP concentrations of 0.0009 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0134 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality

is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to estuarine and mudflat habitat in Ballysadare Bay 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 estuarine and mudflat habitat / no deterioration of its favourable conservation condition is identified.

6.1.3 (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 and has a preference for inhabiting sheltered coastal bays and estuaries. Harbour seals in Ballysadare Bay SAC occupy both aquatic habitats and intertidal shorelines that become exposed during the tidal cycle (NPWS, 2013[13]). The species is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (May to July approx.), moulting (August to September approx.) and non-breeding foraging and resting phases. Comparatively limited information is available at this site from the last period of the annual cycle spanning the months of October to May. In acknowledging the limited understanding of aquatic habitat use by the species within the site, it should be noted that all suitable aquatic habitat is considered relevant to the species range and ecological requirements at the site and is therefore of potential use by harbour seals.

Attributes and targets set out by the SSCO which bear specific relevant 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 affect the harbour seal population at the site. The OP dosing has the potential to alter the natural condition of the sites by increasing baseline P concentrations.

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 harbour seals in Ballysadare Bay SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

[13] NPWS (2013). Conservation Objectives Marine Supporting Document. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Barnabrack_010 river waterbody (IE_WE_35B300790) and estimated an increase in OP concentrations of 0.00004 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0125 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Knocknahur_10 river water body (IE_WE_35K430740) and estimated an increase in OP concentrations of 0.0009 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0134 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to harbour seal habitat in Ballysadare Bay 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 harbour seals / no deterioration of its favourable conservation condition is identified.

6.1.4 (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)* and (2190) Humid dune slacks

There are no nutrient specific targets in the SSCO (NPWS, 2013). 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 Coastal habitats (NPWS, 2013[14]) 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. Furthermore, the CO supporting document states that there should be no increased nutrient inputs in the groundwater and that nutrient poor status is crucial for the survival of certain vegetation types and changes in nutrient status can incur negative indicator species.

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 dune habitats in Ballysadare Bay SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of

[14] NPWS (2013). Conservation Objectives Coastal Supporting Document. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Barnabrack_010 river waterbody (IE_WE_35B300790) and estimated an increase in OP concentrations of 0.00004 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0125 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Knocknahur_10 river water body (IE_WE_35K430740) and estimated an increase in OP concentrations of 0.0009 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0134 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to dune habitats in Ballysadare Bay 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 embryonic shifting dune habitats or restoration of the other dune habitats status/ no deterioration of its favourable conservation condition is identified.

6.2 CUMMEEN STRAND/ DRUMCLIFF BAY (SLIGO BAY) SAC 000627

6.2.1 (1014) Marsh Snail *Vertigo angustior*

Vertigo angustior is a terrestrial groundwater-dependent species. There is one known location for this species in this SAC (NPWS, 2013[15]) in the vicinity of Strandhill and Maguins Island. The target is to ensure 'no decline'. A review of the SSCOs targets and measures for *Vertigo angustior* found no nutrient specific targets and measures for the species (NPWS, 2013). However, the IUCN Red List[16] of threatened species lists eutrophication as a 'main threat' to this species. Increases in P levels would allow higher vegetation to grow and outcompete the yellow sedge and moss habitat that tis required by the snail.

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 *Vertigo angustior* in Cummeen

[15] NPWS (2013) Conservation Objectives: Cummeen Strand SAC 000627. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[16] Moorkens, E., Killeen, I., Seddon, M. (2012). Vertigo angustior. The IUCN Red List of Threatened Species 2012: e.T22935A16658012.

Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to *Vertigo angustior* in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 *Vertigo angustior* / no deterioration of its favourable conservation condition is identified.

6.2.2 (1095) Sea Lamprey *Petromyzon marinus* and (1099) River Lamprey *Lampetra fluviatilis*

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. However, the SSCO (NPWS, 2013) for sea and river lamprey in Cummeen Strand SAC highlight that the SAC only covers marine/ estuarine habitat and it is

not anticipated that it contains suitable spawning or nursery habitat. Nevertheless, estuarine sediments could be impacted upon by increased nutrients causing oxygen depletion.

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 lamprey in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to sea and river lamprey in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 river lamprey or the restoration of sea lamprey / no deterioration of their favourable conservation condition is identified.

6.2.3 (1130) Estuaries and (1140) Mudflats and sandflats not covered by seawater at low tide

The Annex I habitat estuaries is a large physiographic feature that may wholly or partly incorporate other Annex I habitats including mudflats and sandflats within its area. The attributes and targets set out in the SSCOs are: to maintain the extent of Zostera-dominated community, to conserve the high quality of the Zostera-and Mytilidae-dominated community and to conserve community types (Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex; Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex; Fine sand with *Angulus* spp. and *Nephtys* spp. community complex; Sand to mixed sediment with amphipods community;Intertidal reef community). 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 estuarine and mudflat habitat in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to estuarine and mudflat habitat in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 estuarine and mudflat habitat / no deterioration of their favourable conservation condition is identified.

6.2.5 (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 and has a preference for inhabiting sheltered coastal bays and estuaries. Harbour seals in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC occupy both aquatic habitats and intertidal shorelines that become exposed during the tidal cycle (NPWS, 2013[17]). The species is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (May to July approx.), moulting (August to September approx.) and non-breeding foraging and resting phases. Comparatively limited information is available at this site from the last period of the annual cycle spanning the months of October to May. In acknowledging the limited understanding of aquatic habitat use by the species within the site, it should be noted that all suitable aquatic habitat is considered relevant to the species range and ecological requirements at the site and is therefore of potential use by harbour seals.

Attributes and targets set out by the SSCO which bear specific relevant 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 affect the harbour seal population at the site. The OP dosing has the potential to alter the natural condition of the sites by increasing baseline P concentrations.

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 harbour seals in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

[17] NPWS (2013). Conservation Objectives Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC Marine Supporting Document 000627. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to harbour seals in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 harbour seals / no deterioration of its favourable conservation condition is identified.

6.2.6 (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila (restore) arenaria* (white dunes), (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)* restore

The SSCO supporting document for Coastal habitats (NPWS, 2013[18]) requires 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. Furthermore, the CO supporting document states that there should be no increased nutrient inputs in the groundwater and that nutrient poor status is crucial for the survival of certain vegetation types and changes in nutrient status can incur negative indicator species.

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 dunes habitats in Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer

[18] NPWS (2013). Conservation Objectives Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (site code 627) Coastal Supporting Document. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

(**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to dune habitats in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 embryonic shifting dunes or restoration of 2120 and 2130 habitat / no deterioration of their favourable conservation condition is identified.

6.2.7 (7220) Petrifying springs with tufa formation (*Cratoneurion*)*

This habitat occurs along a seepage line in low clay sea cliffs near Ballincar (~150m^2 along the cliff face). Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources and this site appears to be fed from water seeping through clay sea cliffs (NPWS, 2013). Water chemistry conditions are currently unknown for the site, however typically this habitat tends towards oligotrophic conditions. Any increase in OP would infringe on this target.

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 springs in Cummeen

Strand/ Drumcliff Bay (Sligo Bay) SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to petrifying spring habitat in Cummeen Strand/ Drumcliff Bay (Sligo Bay) 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 habitats/ no deterioration of their favourable conservation condition is identified.

6.3 UNSHIN RIVER SAC 0001898

6.3.1 (3260) Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachiono* vegetation

There are no SSCOs for this SAC (NPWS, 2018[19]) however SSCOs for this habitat in other SACs 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 good status, in terms of nutrient standards and macroinvertebate 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 habitat 3260 in Unshin River SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballygawley groundwater body (IE_WE_G_0039) and estimated an increase in OP concentrations of 0.0015 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0190 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Lavagh-Ballintougher groundwater body (IE_WE_G_0038) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, 0.0179 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

[19] NPWS (2018) Conservation objectives for Unshin River SAC (001898). Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

- Ballymote groundwater body (IE_WE_G0037) and estimated an increase in OP concentrations of 0.00001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0166 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_050 river waterbody (IE_WE_35U010600) and estimated an increase in OP concentrations of 0.0004 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_040 river water body (IE_WE_35U010500) and estimated an increase in OP concentrations of 0.0002 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_030 river water body (IE_WE_35U010400) and estimated an increase in OP concentrations of 0.0001 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Owenmore (Sligo)_080 river water body (IE_WE_35O060900) and estimated an increase in OP concentrations of 0.0007 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to 3260 habitat in Unshin River 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 3260 river habitat/ no deterioration of its favourable conservation condition is identified.

6.3.2 (6410) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

There are no SSCOs for this SAC (NPWS, 2018) however SSCOs for this habitat in other SACs refer to alteration to species composition. This habitat is associated with a fluctuating water table, often with seasonal flooding and so may be impacted upon by groundwater nutrient enrichment.

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 *Molinia* meadows in Unshin River SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballygawley groundwater body (IE_WE_G_0039) and estimated an increase in OP concentrations of 0.0015 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0190 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Lavagh-Ballintougher groundwater body (IE_WE_G_0038) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, 0.0179 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballymote groundwater body (IE_WE_G0037) and estimated an increase in OP concentrations of 0.00001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0166 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_050 river waterbody (IE_WE_35U010600) and estimated an increase in OP concentrations of 0.0004 mg/l P (**Table3; Appendix C**). The increase is below the 5%

significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_040 river water body (IE_WE_35U010500) and estimated an increase in OP concentrations of 0.0002 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_030 river water body (IE_WE_35U010400) and estimated an increase in OP concentrations of 0.0001 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Owenmore (Sligo)_080 river water body (IE_WE_35O060900) and estimated an increase in OP concentrations of 0.0007 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to *Molinia* meadows in Unshin River 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 *Molinia* meadow habitat/ no deterioration of its favourable conservation condition is identified.

6.3.3 (91E0) Alluvial forests with *Alnus glutinousa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)*

There are no SSCOs for this SAC (NPWS, 2018) however SSCO supporting documents for this habitat in other SACs refer to 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.

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 Unshin River SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballygawley groundwater body (IE_WE_G_0039) and estimated an increase in OP concentrations of 0.0015 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0190 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Lavagh-Ballintougher groundwater body (IE_WE_G_0038) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, 0.0179 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballymote groundwater body (IE_WE_G0037) and estimated an increase in OP concentrations of 0.00001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0166 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_050 river waterbody (IE_WE_35U010600) and estimated an increase in OP concentrations of 0.0004 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_040 river water body (IE_WE_35U010500) and estimated an increase in OP concentrations of 0.0002 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_030 river water body (IE_WE_35U010400) and estimated an increase in OP concentrations of 0.0001 mg/l P (**Table3; Appendix C**). The increase is below the 5%

significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Owenmore (Sligo)_080 river water body (IE_WE_35O060900) and estimated an increase in OP concentrations of 0.0007 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to Alluvial forests in Unshin River 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 Alluvial forest habitat/ no deterioration of its favourable conservation condition is identified.

6.3.4 (1106) Salmon *Salmo salar*

There are no SSCOs for this SAC (NPWS, 2018) however SSCOs for other SACs with this salmon refer to 'no reduction in spawning habitat', deterioration in water quality having 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. SSCOs for salmon require 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 salmon in Unshin River SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_050 river waterbody (IE_WE_35U010600) and estimated an increase in OP concentrations of 0.0004 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_040 river water body (IE_WE_35U010500) and estimated an increase in OP concentrations of 0.0002 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_030 river water body (IE_WE_35U010400) and estimated an increase in OP concentrations of 0.0001 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Owenmore (Sligo)_080 river water body (IE_WE_35O060900) and estimated an increase in OP concentrations of 0.0007 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to salmon in Unshin River 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 salmon/ no deterioration of its favourable conservation condition is identified.

6.3.5 (1355) Otter *Lutra lutra*

There are no SSCOs for this SAC (NPWS, 2018) 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.

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 Unshin River SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is

unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballygawley groundwater body (IE_WE_G_0039) and estimated an increase in OP concentrations of 0.0015 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0190 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Lavagh-Ballintougher groundwater body (IE_WE_G_0038) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, 0.0179 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballymote groundwater body (IE_WE_G0037) and estimated an increase in OP concentrations of 0.00001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0166 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_050 river waterbody (IE_WE_35U010600) and estimated an increase in OP concentrations of 0.0004 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_040 river water body (IE_WE_35U010500) and estimated an increase in OP concentrations of 0.0002 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Unshin_030 river water body (IE_WE_35U010400) and estimated an increase in OP concentrations of 0.0001 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Owenmore (Sligo)_080 river water body (IE_WE_35O060900) and estimated an increase in OP concentrations of 0.0007 mg/l P (**Table3; Appendix C**). The increase is below the 5% significance threshold (0.00125 mg/l P). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to otter in Unshin River 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 salmon/ no deterioration of its favourable conservation condition is identified.

6.4 LOUGH GILL SAC 001976

6.4.1 (3150) Natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation

There are no SSCOs for this site (NPWS, 2018) however the SSCOs for this habitat in other SACs refer to pressures and threats including nutrient/ P enrichment which can be associated with accelerated growth of macroalgae/ phytoplankton or reduced concentrations of dissolved oxygen and alterations to the plant communities that reside here.

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 natural eutrophic lakes in Lough Gill SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carrowmore East groundwater body (IE_WE_G_0042) and estimated an increase in OP concentrations of 0.0004mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0207 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Dromahair groundwater body (IE_WE_G_0054) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0182 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballintougher groundwater body (IE_WE_G_0051) and estimated an increase in OP concentrations of 0.0005 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0180 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Killarga groundwater body (IE_WE_G_0055) and estimated an increase in OP concentrations of 0.00002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0175 mg/l P (**Table3; Appendix C**). The GWB OP

indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Gill SO lake waterbody (IE_WE_35_158) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0205 mg/l P (**Table3; Appendix C**). The LWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this lake waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Killanummery_020 river waterbody (IE_WE_35K030900) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0126 mg/l P (**Table3; Appendix C**). The RW OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to natural eutrophic lakes in Lough Gill 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 eutrophic lakes/ no deterioration of its favourable conservation condition is identified.

6.4.2 (91E0) Alluvial forests with *Alnus glutinousa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)*

There are no SSCOs for this SAC (NPWS, 2018) however SSCO supporting documents for this habitat in other SACs refer to 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.

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 Lough Gill SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carrowmore East groundwater body (IE_WE_G_0042) and estimated an increase in OP concentrations of 0.0004mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0207 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Dromahair groundwater body (IE_WE_G_0054) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0182 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballintougher groundwater body (IE_WE_G_0051) and estimated an increase in OP concentrations of 0.0005 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0180 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Killarga groundwater body (IE_WE_G_0055) and estimated an increase in OP concentrations of 0.00002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0175 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Gill SO lake waterbody (IE_WE_35_158) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0205 mg/l P (**Table3; Appendix C**). The LWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this lake waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Killanummery_020 river waterbody (IE_WE_35K030900) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0126 mg/l P (**Table3; Appendix C**). The RW OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to alluvial forests in Lough Gill 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 alluvial forests/ no deterioration of its favourable conservation condition is identified.

6.4.3 (1092) White-clawed Crayfish *Austropotamobius pallipes*

There is no nutrient specific target for white-clawed crayfish in the Lough Gill SAC COs (NPWS, 2018). However, white-clawed crayfish have a general water quality requirement of Q3-4 or better, which

equates to moderate ecological status (NPWS, 2013). Any reduction in water quality as a result of P loading would be contrary to the conservation objectives for this species.

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 crayfish in Lough Gill SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carrowmore East groundwater body (IE_WE_G_0042) and estimated an increase in OP concentrations of 0.0004mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0207 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Dromahair groundwater body (IE_WE_G_0054) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0182 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballintougher groundwater body (IE_WE_G_0051) and estimated an increase in OP concentrations of 0.0005 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0180 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Killarga groundwater body (IE_WE_G_0055) and estimated an increase in OP concentrations of 0.00002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0175 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Gill SO lake waterbody (IE_WE_35_158) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0205 mg/l P (**Table3; Appendix C**). The LWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this lake waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Killanummery_020 river waterbody (IE_WE_35K030900) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0126 mg/l P (**Table3; Appendix C**). The RW OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to crayfish in Lough Gill 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 crayfish/ no deterioration of its favourable conservation condition is identified.

6.4.4 (1095) Sea Lamprey *Petromyzon marinus*, (1096) Brook Lamprey *Lampetra planeri*, (1099) River Lamprey *Lampetra fluviatilis*, (1106) Salmon *Salmo salar*

There is no nutrient specific target for white-clawed crayfish in the Lough Gill SAC COs (NPWS, 2018). However, 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. SSCO for these species in other SACs 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. Also, 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 aforementioned fish fauna in Lough Gill SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carrowmore East groundwater body (IE_WE_G_0042) and estimated an increase in OP concentrations of 0.0004mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0207 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Dromahair groundwater body (IE_WE_G_0054) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0182 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballintougher groundwater body (IE_WE_G_0051) and estimated an increase in OP concentrations of 0.0005 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0180 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Killarga groundwater body (IE_WE_G_0055) and estimated an increase in OP concentrations of 0.00002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0175 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of

deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Gill SO lake waterbody (IE_WE_35_158) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0205 mg/l P (**Table3; Appendix C**). The LWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this lake waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Killanummery_020 river waterbody (IE_WE_35K030900) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0126 mg/l P (**Table3; Appendix C**). The RW OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to fish fauna in Lough Gill 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 the above mentioned fish fauna/ no deterioration of their favourable conservation condition is identified.

6.4.5 (1355) Otter *Lutra lutra*

There are no SSCOs for this SAC (NPWS, 2018) 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.

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 Lough Gill SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carrowmore East groundwater body (IE_WE_G_0042) and estimated an increase in OP concentrations of 0.0004mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0207 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Dromahair groundwater body (IE_WE_G_0054) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0182 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballintougher groundwater body (IE_WE_G_0051) and estimated an increase in OP concentrations of 0.0005 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0180 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Killarga groundwater body (IE_WE_G_0055) and estimated an increase in OP concentrations of 0.00002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0175 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Gill SO lake waterbody (IE_WE_35_158) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged following dosing, i.e. 0.0205 mg/l P (**Table3; Appendix C**). The LWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this lake waterbody.

- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Killanummery_020 river waterbody (IE_WE_35K030900) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0126 mg/l P (**Table3; Appendix C**). The RW OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to otter in Lough Gill SAC. Therefore potential for significant on this species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of otter/ no deterioration of its favourable conservation condition is identified.

6.5 DRUMCLIFF BAY SPA 004013

6.5.1 (A144) Sanderling Calidris alba, (A157) Bar-tailed Godwit *Limosa lapponica*, (A999) Wetlands

The SSCOs for Drumcliff Bay SPA (NPWS, 2013[20]) do not list nutrient specific targets for these bird species however, these species are listed as water dependent and nutrient sensitive (Appendix B). Targets here specifically are:

- 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.

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 bird species in Drumcliff Bay SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.
- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the abovementioned bird species in Drumcliff Bay 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 these bird species/ no deterioration of their favourable conservation condition is identified.

[20] NPWS (2013) Conservation Objectives: Drumcliff Bay SPA 004013. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

6.6 CUMMEEN STRAND SPA 004035

6.6.1 (A046) Brent Goose *Branta bernicla hrota*, (A130) Oystercatcher *Haematopus ostralegus*, (A162) Redshank *Tringa tetanus*, (A999) Wetlands

The SSCOs for Cummeen Strand SPA (NPWS, 2013[21]) do not list nutrient specific targets for these bird species however, these species are listed as water dependent and nutrient sensitive (Appendix B). Targets here specifically are:

- 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.

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 bird species in Cummeen Strand SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.
- Garavoge Estuary transitional waterbody (IE_WE_470_0100) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0122 mg/l P in winter and 0.0068 mg/l P in summer (**Table3; Appendix C**). The TWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.
- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.
- Knappagh river waterbody (IE_WE_35K420630) and estimated an increase in OP concentrations of 0.0007 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0132 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.
- Garavogue_010 river water body (IE_WE_35G010200) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the river waterbody

[21] NPWS (2013) Conservation Objectives: Cummeen Strand SPA 004035. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

following dosing is unchanged, i.e. 0.0101 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the abovementioned bird species in Cummeen Strand 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 these bird species/ no deterioration of their favourable conservation condition is identified.

6.7 BALLYSADARE BAY SPA 004129

6.7.1 (A046) Light-bellied Brent Goose *Branta bernicla hrota*, (A141) Grey Plover *Pluvialis squatarola*, (A149) Dunlin *Calidris alpine*, (A157) Bar-tailed Godwit *Limosa lapponica*, (A162) Redshank *Tringa tetanus*, (A999) Wetland and Waterbirds

The SSCOs for Ballysadare Bay SPA (NPWS, 2013[22]) do not list nutrient specific targets for these bird species however, these species are listed as water dependent and nutrient sensitive (Appendix B). Targets here specifically are:

- 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.

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 bird species in Ballysadare Bay SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.
- Ballysadare Estuary transitional waterbody (IE_WE_460_0300) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the transitional waterbody following dosing is unchanged, i.e. 0.0216 mg/l P in winter and 0.0063 mg/l P in summer (**Table3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this transitional waterbody.

[22] NPWS (2013) Conservation Objectives: Ballysadare Bay SPA 004129. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- Collooney groundwater body (IE_WE_G_0048) and estimated an increase in OP concentrations of 0.0001 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0176 mg/l P (**Table3; Appendix C**). The GWB surrogate OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Carrowmore West groundwater body (IE_WE_G_0040) and estimated an increase in OP concentrations of 0.0011 mg/l P. The resulting OP concentrations in the groundwater body following dosing is 0.0186 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Drumcliff-Strandhill groundwater body (IE_WE_G_0044) and estimated an increase in OP concentrations of 0.0002 mg/l P. The resulting OP concentrations in the groundwater body following dosing is unchanged, i.e. 0.0177 mg/l P (**Table3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this groundwater body.

- Ballysodare_010 river waterbody (IE_WE_35B_050100) and estimated an increase in OP concentrations of 0.0006 mg/l P. The resulting OP concentrations in the river waterbody following dosing is 0.0144 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Barnabrack_010 river waterbody (IE_WE_35B300790) and estimated an increase in OP concentrations of 0.00004 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0125 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

- Knocknahur_10 river water body (IE_WE_35K430740) and estimated an increase in OP concentrations of 0.0009 mg/l P. The resulting OP concentrations in the river waterbody following dosing is unchanged, i.e. 0.0134 mg/l P (**Table3; Appendix C**). The RWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the abovementioned bird species Ballysadare Bay SPA. Therefore potential for significant effects on these species and habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these bird species / no deterioration of their favourable conservation condition is identified.

6.8 ARDBOLINE ISLAND & HORSE ISLAND SPA 004135

6.8.1 (A017) Cormorant *Phalacrocorax carbo* and (A045) Barnacle Goose *Branta leucopsis*

The COs for the Ardboline Island & Horse Island SPA (NPWS, 2018[23]) do not list nutrient specific targets for these species however, they are listed as water dependent and nutrient sensitive (Appendix b). Targets have been adopted here from other SSCOs here, 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.

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 bird species in Ardboline Island & Horse Island SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the abovementioned bird species in Ardboline Island & Horse Island SPA. Therefore potential for significant on these species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these bird species / no deterioration of their favourable conservation condition is identified.

6.9 BALLINTEMPLE AND BALLYGILGAN SPA 004234

6.9.1 (A045) Barnacle Goose *Branta leucopsis*

The COs for the Ballintemple and Ballygilgan SPA (NPWS, 2018[24]) do not list nutrient specific targets for this species however, it is listed as water dependent and nutrient sensitive (Appendix b). Targets have been adopted here from other SSCOs here, 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

[23] NPWS (2018) Conservation objectives for Ardboline Island and Horse Island SPA [004135]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.
[24] NPWS (2018) Conservation objectives for Ballintemple and Ballygilgan SPA [004234]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

areas by the listed species, other than that occurring from natural patterns of variation.

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 Barnacle goose in Ballintemple and Ballygilgan SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Sligo Bay coastal waterbody (IE_WE_450_0000) and estimated an increase in OP concentrations of 0.0004 mg/l P. The resulting OP concentrations in the coastal waterbody following dosing is unchanged, i.e. 0.0129 mg/l P in winter and 0.0029 mg/l P in summer (**Table3; Appendix C**). The CWB OP indicative water quality is unchanged following dosing, i.e. High. Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Foxes Den WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Foxes Den WTP have demonstrated that there will be no change in the OP indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to Barnacle goose in Ballintemple and Ballygilgan SPA. Therefore potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this bird species / no deterioration of its favourable conservation condition is identified.

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

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

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative effects are likely to be significant.

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

Based on this search and the Project Teams knowledge of the study area a list of those projects and Plans which may potentially contribute to cumulative or in-combination effects with the proposed project was generated and listed in **Table 4** below.

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Sligo County Development Plan 2017 – 2023 The Sligo County Development Plan 2017-2023 addresses drinking water and water quality in Sections Environmental Infrastructure and Section 10 Environmental Quality respectively. The rationalisation of Cairns Hill WTP and Foxes Den WTP is included in the objectives. Specific drinking water policies outlined by Sligo County Council and relevant to the current include: **P-WS-1** Co-operate with Irish Water to ensure an adequate, sustainable and economic supply of good quality water for domestic, commercial and industrial use, in order to promote the development of County Sligo's settlements as set out in the Core Strategy. **P-WS-3** Support the implementation of the Irish Water's Capital Investment Programmes (CIP) and Minor Works Programmes (MWP) subject to compliance with the Habitats Directive. **P-WS-4** Facilitate the inclusion of water conservation and sustainability measures so as to minimise the use of potable water in new developments. With regard to wastewater policies: **P-WW-2** Require sustainable collection, treatment and discharge of wastewater effluent generated within the County, and ensure that effluent/sludge is treated and disposed of in accordance with the required EU standards. With regard to Surface water drainage policies: **P-SWD-2** Ensure that developments are kept at an appropriate distance from watercourses, to protect them from contamination, allow for natural drainage and facilitate channel clearing maintenance subject to compliance with the Habitats Directive. **P-SWD-3** Preserve and protect the water quality of natural surface water storage sites, such as wetlands, where these help to regulate stream flows, recharge groundwater and screen pollutants (such features also provide important habitat functions). With regard to water quality policies:	▪ N/A	The Sligo County Development Plan 2017-2023 emphasises the objectives of its role in water services and water quality. The plan also outlines the importance of compliance with the Western River Basin Management Plan (now replaced by the Draft National Plan 2018-2011[25]), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans. It is the role of Sligo County Council to control developments and activities, through planning policies and through the enforcement of national water quality legislation, to ensure that water quality is not adversely affected.

[25] DHPLG (2016) Public Consultation on the River Basin Management Plan for Ireland (2018-2021)

P-WQ-1 Ensure that all development proposals have regard to the Sligo Groundwater Protection Scheme, in order to protect groundwater resources and groundwater-dependent habitats and species. P-WQ-2 Strictly limit and control new development in or near the catchment areas of water bodies, particularly salmonid rivers and those that are the source of the following drinking water supplies: Lough Gill, Lough Easky, Lough Arrow, Gortnaleck and Lyle streams, Kilsellagh Source catchment, Riverstown Source Catchment, Lough Talt, GWS Source Catchments.		
River Basin Management Plan For Ireland 2022 – 2027 Public Consultation on the River Basin Management Plan (RBMP) for Ireland (2022 – 2027), began in September 2022. The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2018 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 water body 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 water bodies nationally, which had been characterised at the time. 1,603 waterbodies were classed *At Risk* out of a total of 4,842, or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 river and lake water bodies 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	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement;	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 water bodies. The establishment of how flooding may be contributing

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.	▪ Disturbance; and ▪ In-combination impacts within the same scheme	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[26]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination effects are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2022 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2022 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	The RDP for 2014 – 2022 has been subject to SEA[27], and AA[28]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such

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

[27] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf

[28] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 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.		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 to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[29]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020	▪ Habitat loss or destruction;	Ireland's Forestry Programme 2014 – 2020 has undergone AA[30]. A key recommendation is that all proposed forestry

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

[30] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturaImpactStatement290914.pdf

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 water bodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be considered when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative effects with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

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

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects on European Sites arising from the proposed OP dosing at Foxes Den WTP, for the Foxes Den and Cairns Hill WSZs 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 Ballysadare Bay SAC (000622), Cummeen Strand/ Drumcliff Bay (Sligo Bay) SAC (000627), Unshin River SAC (001898), Lough Gill SAC (001976), Drumcliff Bay SPA (004013), Cummeen Strand SPA (004035), Ardboline Island & Horse Island SPA (004135), Ballintemple and Ballygilgan SPA (004234) and Ballysadare Bay SPA (004129) 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. 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.

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NPWS (2013) Ballysadare Bay SAC (000622) Conservation objectives supporting document- Coastal habitats (Version 1). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

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Appendix A

European Sites - Conservation Objectives

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National Parks and Wildlife Service

Conservation Objectives Series

Ballysadare Bay SAC 000622

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
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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***

000622	Ballysadare Bay SAC
1014	Narrow-mouthed whorl snail *Vertigo angustior*
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1365	Harbour seal *Phoca vitulina*
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2190	Humid dune slacks

Please note that this SAC overlaps with Ballysadare Bay SPA (004129) and adjoins Unshin River SAC (001898). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

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

NPWS Documents

Year :	1990
Title :	1989 survey of breeding herds of common seal (*Phoca vitulina*) with reference to previous surveys
Author :	Harrington, R.
Series :	Unpublished report to Wildlife Service
Year :	2004
Title :	Harbour seal population assessment in the Republic of Ireland: August 2003
Author :	Cronin, M.; Duck, C.; O'Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.
Series :	Irish Wildlife Manual No. 11
Year :	2004
Title :	Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003
Author :	Lyons, D.O.
Series :	Irish Wildlife Manual No. 13
Year :	2007
Title :	A Survey of Intertidal Mudflats and Sandflats in Ireland
Author :	Aquatic Services Unit
Series :	Unpublished report to NPWS
Year :	2010
Title :	Harbour seal population monitoring 2009-2012: Report no. 1. Report on a pilot monitoring study carried out in southern and western Ireland, 2009
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2011
Title :	Monitoring and condition assessment of populations of *Vertigo geyeri*, *Vertigo angustior* and *Vertigo moulinsiana* in Ireland
Author :	Moorkens, E.A.; Killeen, I.J.
Series :	Irish Wildlife Manual No. 55
Year :	2011
Title :	Harbour seal pilot monitoring project, 2010
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2012
Title :	Harbour seal pilot monitoring project, 2011
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2013
Title :	Ballysadare Bay SAC (site code 622) Conservation objectives supporting document- marine habitats and species V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M.; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75

Year :	2013
Title :	Ballysadare Bay SAC (site code 622) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1980
Title :	An assessment of the status of the common seal (*Phoca vitulina vitulina*) in Ireland
Author :	Summers, C.F.; Warner, P.J.; Nairn, R.G.W.; Curry, M.G.; Flynn, J.
Series :	Biological Conservation 17: 115-123
Year :	2011
Title :	Subtidal benthic investigations Ballysadare Bay cSAC (site code IE000622) Co. Sligo
Author :	Aquafact
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2011
Title :	A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Ballysadare Bay
Author :	Aquatic Services Unit
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	2010
Title :	EPA WFD transitional waterbody data
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1130 (map 3)
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 :	Interpolated 2013
Title :	2007, 2010 intertidal surveys; 2010 subtidal 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 :	1140, Marine community types (maps 4 and 5)
Year :	2013
Title :	Sand Dune Monitoring Project 2011. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with saltmarsh data investigated and resolved with expert opinion as necessary
Used For :	2110, 2120, 2130, 2190 (map 6)
Year :	2013
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 :	1014, 1365 (maps 7 and 8)
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 8)

Conservation Objectives for : Ballysadare Bay SAC [000622]

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Ballysadare Bay 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 1703ha using OSi data and the defined Transitional Water Body area under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Angulus tenuis* community complex; Muddy sand to sand with *Hediste diversicolor*, *Corophium volutator* and *Peringia ulvae* community complex; Fine sand with polychaetes community complex; Sand with bivalves, nematodes and crustaceans community complex; Intertidal reef community complex; Subtidal reef community complex. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011) and a subtidal survey in 2010 (Aquafact, 2011). See marine habitats 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 Ballysadare Bay 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 using OSi data as 1345ha
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011). See marine supporting document for further information
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Angulus tenuis* community complex; Muddy sand to sand with *Hediste diversicolor*, *Corophium volutator* and *Peringia ulvae* community complex. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2011). See marine supporting document for further information

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Ballysadare Bay 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-site mapped: Strandhill - 1.08ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Embryo dunes were surveyed and mapped at one sub-site, giving a total estimated area of 1.08ha. 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 or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Delaney et al. (2013). Embryo dunes are concentrated around the growing tip of Strandhill dunes. 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	Based on data from Delaney et al. (2013). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Coastal protection works in the form of rock armour have been installed on the seaward edge of the carpark and golf course. 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 Delaney et al. (2013). Transitional communities occur between a range of sand dune habitats and some saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 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 Delaney et al. (2013). 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: sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Delaney et al. (2013). Embryo dunes at Strandhill support a typical flora. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Delaney et al. (2013). 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* ('white dunes') in Ballysadare Bay 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-site mapped: Strandhill-5.47ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Marram dunes were surveyed and mapped at one sub-site, giving a total estimated area of 5.47ha. 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, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Delaney et al. (2013). Mobile dunes occur the seaward side of the spit in the southern part of Strandhill and are particularly well developed at the growing tip. 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	Based on data from Delaney et al. (2013). 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 encouraging further accretion. There are coastal protection works in place at Strandhill. 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 Delaney et al. (2013). Transitional communities occur between a range of sand dune habitats and some saltmarsh habitats. 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 Delaney et al. (2013). The mobile dune habitat at the tip of the spit is in good condition and is actively accreting. 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 Delaney et al. (2013). The mobile dunes at Strandhill support a characteristic dune flora. 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 Delaney et al. (2013). 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 Ballysadare Bay 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-site mapped: Strandhill - 56.07ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Fixed dunes were surveyed and mapped at one sub-site, giving a total estimated area of 56.07ha. 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	Based on data from Delaney et al. (2013). Fixed dune habitat covers an extensive area at Strandhill. 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	Based on data from Delaney et al. (2013). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. There are coastal protection works at Strandhill. 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 Delaney et al. (2013). Transitional communities occur between a range of sand dune habitats and some saltmarsh habitats. 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 Delaney et al. (2013). There is a large blowout in Strandhill dunes known locally as Shelly Valley, which covers 5.4ha. Trampling has created tracks in the vicinity of this blowout. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Delaney et al. (2013). The fixed dunes at Strandhill are subject to low level grazing by rabbits (*Oryctolagus cuniculus*). Grazing by cattle or sheep is absent. This has led to the reduction in species richness of the site as well as a potential problem of the spread of sycamore (*Acer pseudoplatanus*) and wild clematis (*Clematis vitalba*). 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 range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Delaney et al. (2013). 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. At Strandhill, negative indicator species common ragwort (*Senecio jacobaea*) and creeping thistle (*Cirsium arvense*) occur occasionally. Sycamore (*Acer pseudoplatanus*) and wild clematis (*Clematis vitalba*) have also been noted from the fixed dunes. 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 Delaney et al. (2013). Creeping willow (*Salix repens*) is abundant within the fixed dunes at Strandhill. Sycamore (*Acer pseudoplatanus*) has also been noted. See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Ballysadare Bay 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-site mapped: Strandhill - 1.83ha. See map 6	Based on data from the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Dune slacks were surveyed and mapped at one sub-site, giving a total estimated area of 1.83ha. 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	Based on data from Delaney et al. (2013). One large slack and one small slack have been recorded from the southern part of Strandhill dunes. 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	Based on data from Delaney et al. (2013). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. There are coastal protection works at Strandhill. 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 Delaney et al. (2013). The slacks are showing some signs of drying out, which may be accelerated by human interference with the local hydrology. 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 Delaney et al. (2013). Transitional communities occur between a range of sand dune habitats and some saltmarsh habitats. 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 Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Delaney et al. (2013). The dunes at Strandhill are subject to low level grazing by rabbits (*Oryctolagus cuniculus*). Grazing by cattle or sheep is absent. This has led to the reduction in species richness of the site as well as a potential problem of the spread of sycamore (*Acer pseudoplatanus*) and wild clematis (*Clematis vitalba*). 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 range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008) and Delaney et al. (2013). At Strandhill, typical pioneer bryophyte species are frequent, and the locally important marsh helleborine (*Epipactis palustris*) also occurs. See coastal habitats supporting document for further details
Vegetation composition: cover of *Salix repens*	Percentage cover; centimetres	Maintain less than 40% cover of creeping willow (*Salix repens*)	Based on data from Delaney et al. (2013). 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. It is abundant within the fixed dunes at Strandhill but is notably absent from the dune slacks. 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 Delaney et al. (2013). 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 Delaney et al. (2013).. See coastal habitats supporting document for further details

1014 Marsh Snail *Vertigo angustior*

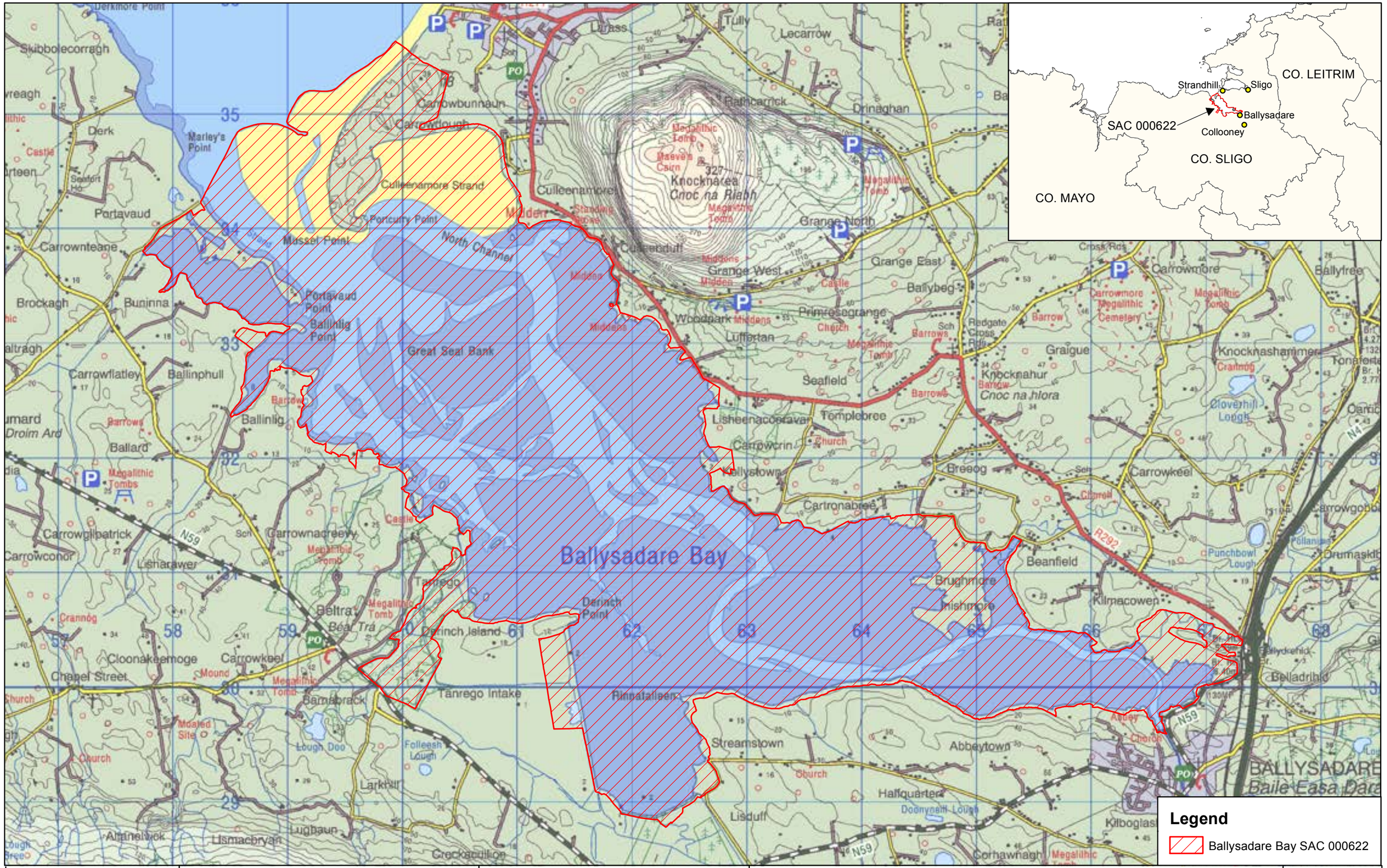
To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Ballysadare Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known location for this species in this SAC (which overlaps two 1km squares). See map 7	From Moorkens and Killeen (2011) (site code Va CAM20)
Presence on transect	Occurrence	Adult or sub-adult snails are present in all three of the habitat zones on the transect (minimum four samples)	Transect established as part of condition assessment monitoring at this site (Moorkens and Killeen, 2011). See habitat area target below for definition of optimal and suboptimal habitat
Presence	Occurrence	Adult or sub-adult snails are present in at least six other places at the site with a wide geographical spread (minimum of eight sites sampled)	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	At least 50m of habitat along the transect is classed as optimal and the remainder as at least sub-optimal	From Moorkens and Killeen (2011). See habitat extent target below for definition of optimal and sub-optimal habitat. See habitat area target below for definition of optimal and suboptimal habitat
Transect optimal wetness	Metres	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m along the transect	From Moorkens and Killeen (2011)
Habitat extent	Hectares	At least 45ha of the site in at least optimal/sub-optimal condition. Optimal habitat is defined as fixed dune, species-rich grassland dominated by red fescue (*Festuca rubra*) and marram (*Ammophila arenaria*), with sparse oxeye daisy (*Leucanthemum vulgare*), dandelion (*Taraxacum* sp.), ribwort plantain (*Plantago lanceolata*) and other low growing herbs. Vegetation height 20-50cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal habitat is defined as above but either vegetation height is less than 10cm or above 50cm; or the soil is dry and sandy; or the thatch is wetter with a denser structure	From Moorkens and Killeen (2011). See also the conservation objective for fixed dunes (2130)

1365 Harbour seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Ballysadare Bay 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 8	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 8	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980); Harrington (1990); Lyons (2004) and unpublished NPWS records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve the moult haul-out sites in a natural condition. See map 8	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004); Cronin et al. (2004); NPWS (2010); NPWS (2011); NPWS (2012) and unpublished NPWS records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve the resting haul-out sites in a natural condition. See map 8	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004) and unpublished NPWS 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 marine supporting document for further details



Legend

Ballysadare Bay SAC 000622

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Department of Arts, Heritage and the Gaeltacht

MAP 1: BALLYSADARE BAY SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sept 2013

SAC 000622

SPA 004129

SAC 001898

Legend

- Ballysadare Bay SAC 000622
- Unshin River SAC 001898
- Ballysadare Bay SPA 004129
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 2:
BALLYSADARE BAY SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE: SAC 000622; version 3,
SAC 001898; version 3.
SPA 004129; version 1.03. CO. SLIGO

0 1 2 3 4 5 km

N

Map Version 1
Date: Sept 2013

Legend

- Ballysadare Bay SAC 000622
- 1130 Estuaries
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 3:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
ESTUARIES

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

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sept 2013

Legend

- Ballysadare Bay SAC 000622
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundary

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MAP 4:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

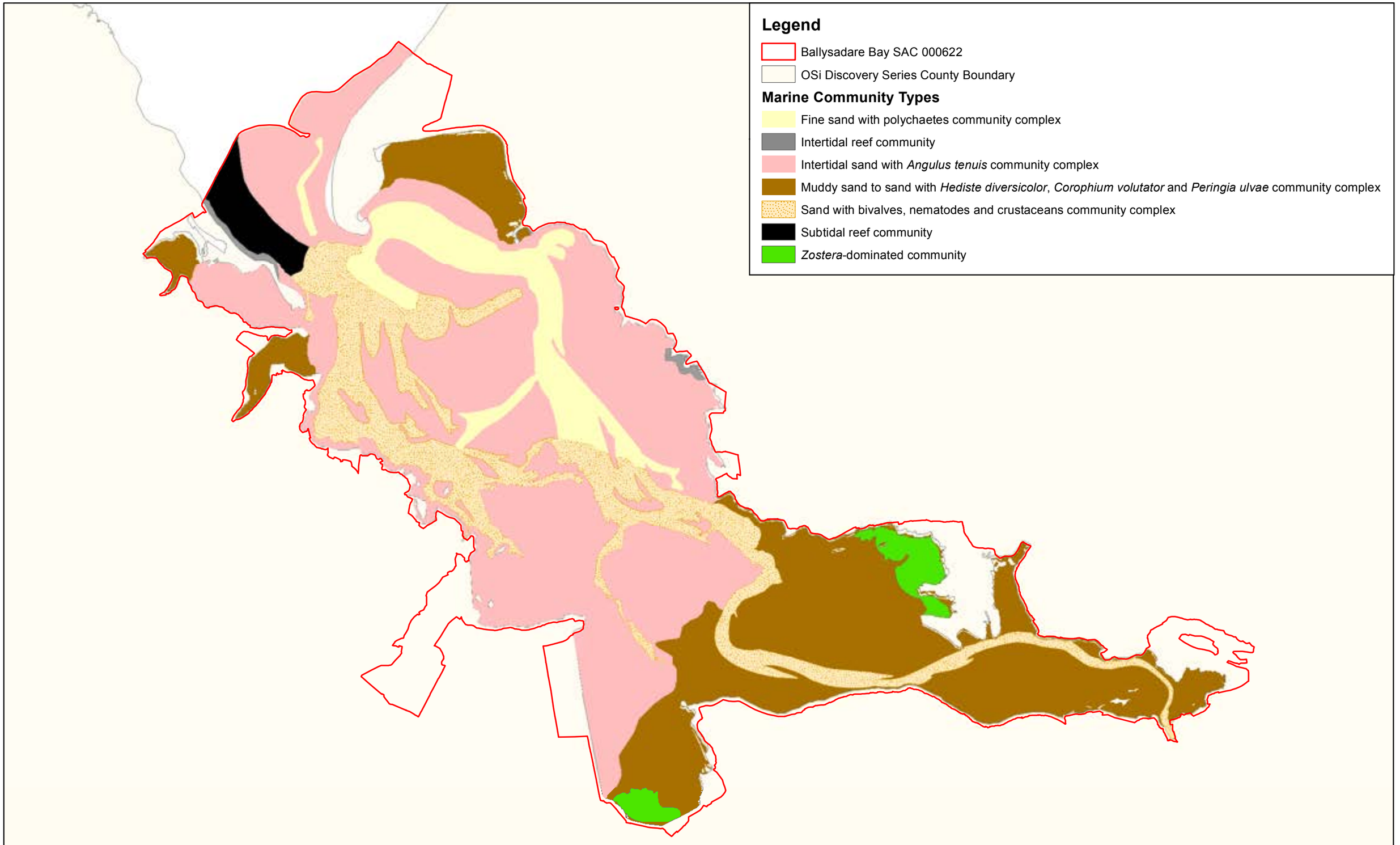
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sept 2013



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Department of Arts, Heritage and the Gaeltacht

MAP 5:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

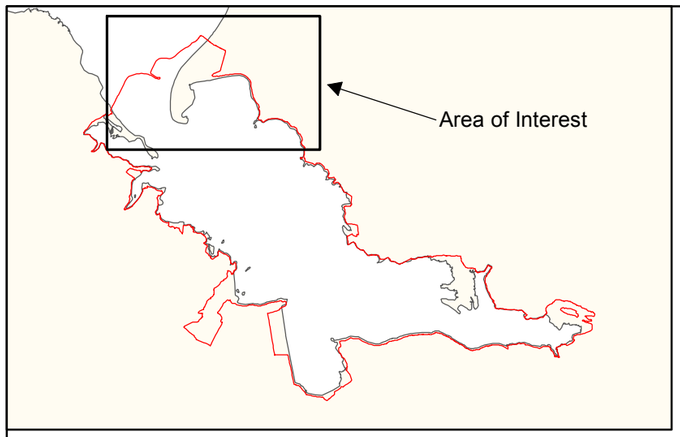
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sept 2013



Legend

Ballysadare Bay SAC 000622

OSi Discovery Series County Boundary

SDM: 133 Sand Dune Monitoring Project Site Codes

Sand Dune Habitats

Qualifying Interests

2110 Embryonic shifting dunes

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

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

2190 Humid dune slacks

Non-Qualifying Interests

1220 Perennial vegetation of stony banks

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

SDM: 133

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Department of Arts, Heritage and the Gaeltacht

MAP 6:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

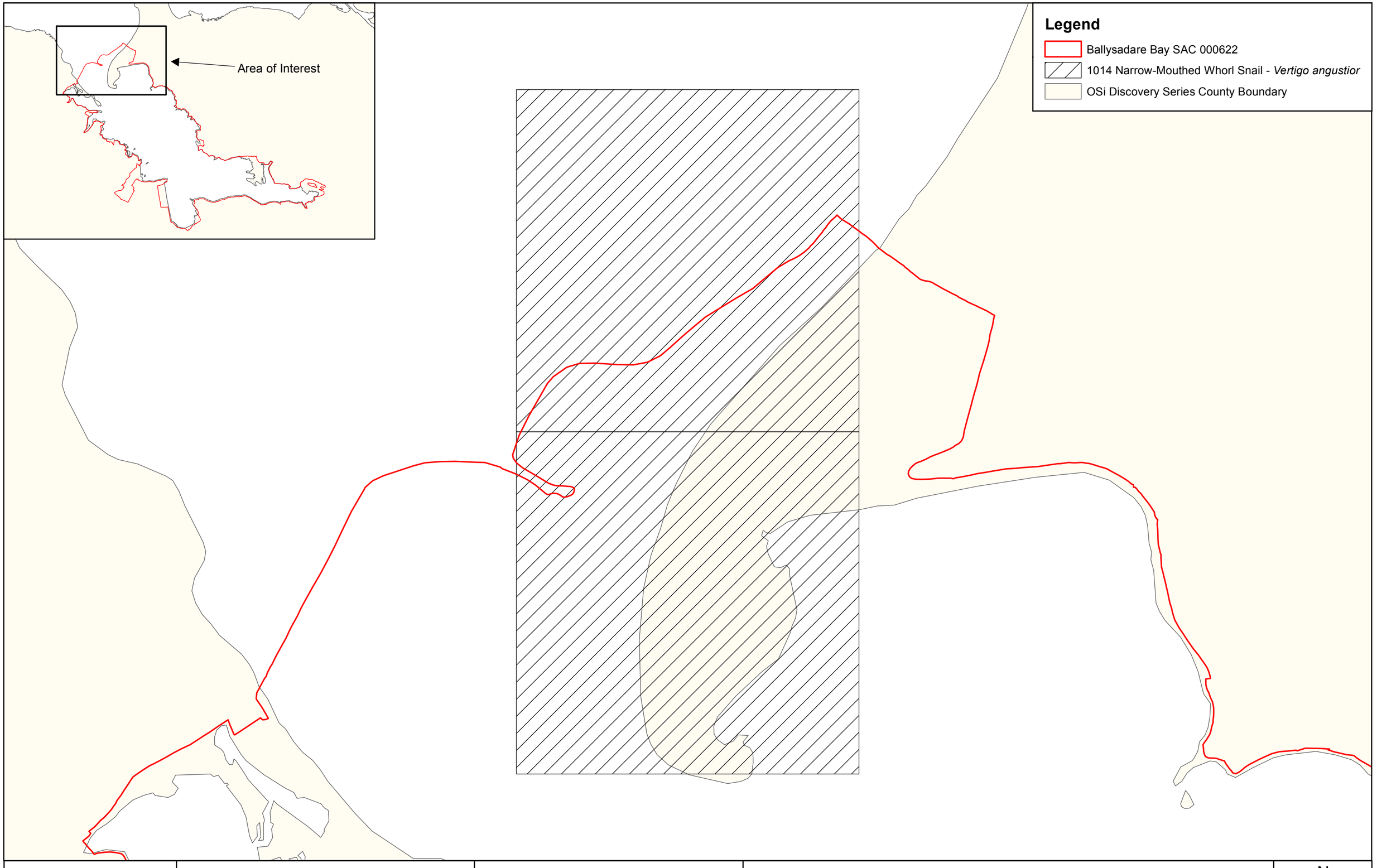
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 100 200 300 400 500 m

N

Map Version 1
Date: Sept 2013



Legend

- Ballysadare Bay SAC 000622
- 1014 Narrow-Mouthed Whorl Snail - *Vertigo angustior*
- OSi Discovery Series County Boundary

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MAP 7:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
NARROW-MOUTHED WHORL SNAIL

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

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 100 200 300 400 500 m

N

Map Version 1
Date: Sept 2013

Legend

- Ballysadare Bay SAC 000622
- 1365 Harbour Seal - *Phoca vitulina* breeding sites
- 1365 Harbour Seal - *Phoca vitulina* moulting sites
- 1365 Harbour Seal - *Phoca vitulina* resting sites
- 1365 Harbour Seal - *Phoca vitulina* habitat
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 8:
BALLYSADARE BAY SAC
CONSERVATION OBJECTIVES
HARBOUR SEAL

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

SITE CODE:
SAC 000622; version 3. CO. SLIGO

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sept 2013

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC 000627

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

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Series Editor: Rebecca Jeffrey
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***

000627	Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC
1014	Marsh Snail *Vertigo angustior*
1095	Sea Lamprey *Petromyzon marinus*
1099	River Lamprey *Lampetra fluviatilis*
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1365	Harbour seal *Phoca vitulina*
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
5130	*Juniperus communis* formations on heaths or calcareous grasslands
7220	Petrifying springs with tufa formation (Cratoneurion)*

Please note that this SAC overlaps with Drumcliff Bay SPA (004013), Cummeen Strand SPA (004035), Ardboline Island and Horse Island SPA (004135) and Ballintemple and Ballygilgan SPA (004234). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping sites as appropriate.

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

NPWS Documents

Year :	1990
Title :	1989 survey of breeding herds of common seal (*Phoca vitulina*) with reference to previous surveys
Author :	Harrington, R.
Series :	Unpublished report to Wildlife Service
Year :	2004
Title :	Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003
Author :	Lyons, D.O.
Series :	Irish Wildlife Manual No. 13
Year :	2007
Title :	A Survey of Intertidal Mudflats and Sandflats in Ireland
Author :	Aquatic Services Unit
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, C.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2011
Title :	Monitoring and condition assessment of populations of *Vertigo geyeri*, *Vertigo angustior* and *Vertigo moulinsiana* in Ireland
Author :	Moorkens, E.A.; Killeen, I.J.
Series :	Irish Wildlife Manual No. 55
Year :	2012
Title :	The Conservation Status of Juniper Formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manual No. 63
Year :	2013
Title :	Conservation status assessment for petrifying springs
Author :	Lyons, M.D.; Kelly, D.L.
Series :	Unpublished report to NPWS
Year :	2013
Title :	Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (site code 627) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (site code 627) Conservation objectives supporting document- marine habitats and species V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1980
Title :	An assessment of the status of the common seal (*Phoca vitulina vitulina*) in Ireland
Author :	Summers, C.F.; Warner, P.J.; Nairn, R.G.W.; Curry, M.G.; Flynn, J.
Series :	Biological Conservation 17: 115-123
Year :	1983
Title :	An assessment of the breeding populations of common seals (*Phoca vitulina vitulina* L.) in the Republic of Ireland during 1979
Author :	Warner, P.J.
Series :	Irish Naturalists' Journal 21: 24-26
Year :	2007
Title :	Interpretation manual of European Union habitats- EUR 27
Author :	DG Environment- European Commission
Series :	Published reference document
Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished PhD thesis, National University of Ireland, Dublin
Year :	2011
Title :	Subtidal benthic investigations: Cummeen Strand/Drumcliff Bay cSAC (site code IE000627) Co. Sligo
Author :	Aquafact
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2012
Title :	A survey of mudflats and sandflats in Ireland
Author :	Aquatic Services Unit
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	2010
Title :	EPA WFD transitional waterbody data
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1130 (map 3)
Year :	Interpolated 2013
Title :	Intertidal surveys, 2007 and 2010; subtidal survey, 2010
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 :	1140, marine community types (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 :	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 :	2110, 2120, 2130 (map 6)
Year :	Derived 2013
Title :	Internal NPWS files
GIS Operations :	Dataset created from spatial reference contained in files
Used For :	7220 (map 7)
Year :	2012
Title :	The conservation status of juniper formations in Ireland
GIS Operations :	Juniper survey centroids clipped to SAC boundary
Used For :	5130 (map 7)
Year :	2013
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 :	1014, 1365 (maps 7 and 8)
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 8)

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Cummeen Strand/Drumcliff Bay (Sligo Bay) 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 1258ha using OSi data and the defined Transitional Water Body area under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community and the Mytilidae-dominated community complex, subject to natural processes. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012) and subtidal survey in 2010 (Aquafact, 2011). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further details
Community structure: *Mytilus edulis* density	Individuals/m²	Conserve the high quality of the Mytilidae-dominated community complex, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012) and subtidal survey in 2010 (Aquafact, 2011). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex; Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex; Fine sand with *Angulus* spp. and *Nephtys* spp. community complex; Sand to mixed sediment with amphipods community; Intertidal reef community. See map 5	Based on intertidal and subtidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012; Aquafact, 2011) and an intertidal walkover undertaken in 2013. 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 Cummeen Strand/Drumcliff Bay (Sligo Bay) 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 using OSi data as 2288ha
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community and the Mytilidae-dominated community complex, subject to natural processes. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further details
Community structure: *Mytilus edulis* density	Individuals/m²	Conserve the high quality of the Mytilidae-dominated community complex, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex; Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex; Fine sand with crustaceans and *Scololepis* (*Scololepis*) *squamata* community complex; Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further information

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Cummeen Strand/Drumcliff Bay (Sligo Bay) 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: Coney Island - 0.67ha, Rosses Point - 32.27ha, Strandhill - 0.18ha, Yellow Strand - 0.83ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Habitat is very difficult to measure in view of its dynamic nature. It was recorded at four sub-sites, giving an estimated total area of 33.95ha. NB further unsurveyed areas maybe present within this SAC. 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). Additional dune habitats noted to occur at Lissadell Strand and on Maguin's Island. 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	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. There are coastal protection works at both Strandhill and Rosses Point. 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). At Rosses Point, saltmarsh habitats occur in association with sand dune habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 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-native species) 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. This species has not been recorded from this SAC. 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* ('white dunes') in Cummeen Strand/Drumcliff Bay (Sligo Bay) 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. For sub-sites mapped: Coney Island - 0.46ha, Rosses Point - 0.17ha, Strandhill - 0.10ha, Yellow Strand - 0.47ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Habitat is very difficult to measure in view of its dynamic nature. It was recorded at four sub-sites, giving an estimated total area of 1.20ha. NB further unsurveyed areas maybe present within this SAC. 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	Based on data from Ryle et al. (2009). Additional dune habitats noted to occur at Lissadell Strand and on Maguin's Island. 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	Based on data from Ryle et al. (2009). 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 encouraging further accretion. There are hard coastal protection works at both Strandhill and Rosses Point. 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). At Rosses Point, saltmarsh habitats occur in association with sand dune habitats. 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 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. This species has not been recorded from this SAC. 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 Cummeen Strand/Drumcliff Bay (Sligo Bay) 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. For sub-sites mapped: Coney Island - 15.06ha; Rosses Point - 21.89ha; Strandhill - 40.14ha; Yellow Strand - 19.16ha. See map 6	Based on data from Coastal Monitoring Project (CMP) (Ryle et al., 2009). Habitat was recorded at four sub-sites, giving an estimated total area of 96.26ha. NB further unsurveyed areas maybe present within this SAC. 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	Based on data from Ryle et al. (2009). Additional dune habitats noted to occur at Lissadell Strand and on Maguin's Island. 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	Based on data from Ryle et al. (2009). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. There are coastal protection works at both Strandhill and Rosses Point. 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). At Rosses Point, saltmarsh habitats occur in association with sand dune habitats. 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). At both Yellow Strand and Coney Island, overgrazing and rabbit burrowing have contributed to creating large areas of bare sand. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). Vegetation is quite rank in places at Strandhill and Rosses Point due to undergrazing, while at Coney Island and Yellow Strand, overgrazing is an issue. 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 (including *Hippophae rhamnoides*)	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. This species has not been recorded from this SAC. The main negative indicators recorded are creeping thistle (*Cirsium arvense*), spear thistle (*C. vulgare*), ragwort (*Senecio jacobaea*) and perennial rye grass (*Lolium perenne*) (Ryle et al., 2009). 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). At Strandhill, pine trees planted at low density occur within the fixed dune habitat. Isolated individual sycamore (*Acer pseudoplatanus*) trees are present in the northern part of the fixed dunes at Rosses Point. See coastal habitats supporting document for further details

5130 *Juniperus communis* formations on heaths or calcareous grasslands

To restore the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Formation area	Hectares	Area stable or increasing, subject to natural processes	Four areas of juniper vegetation were identified within the SAC (three at Rosses Point and one at Knocklane- SO01, SO04, SO08, SO16) by a national juniper survey (Cooper et al., 2012), although not all are classified as formations (see below). NB Further unsurveyed areas maybe present within the SAC
Habitat distribution	Occurrence	No decline. Known locations shown on map 7	Map shows sites identified in Cooper et al. (2012)- SO01, SO04, SO08, SO16. NB Further unsurveyed areas maybe present within the SAC
Juniper population size	Number	At least 50 plants per population	To classify as a juniper formation, at least 50 plants should be present (Cooper et al., 2012). Further work is required to confirm which sites, identified by Cooper et al. (2012) at Rosses Point, should be classified as formations. These three sites probably form a single breeding population (J. Cross, pers. comm.). The Knocklane population (SO04) is not currently classified as a formation (Cooper et al., 2012)
Formation structure: cover and height	Percentage and metres	Well-developed structure with an open to closed cover of juniper up to or exceeding 0.45m in height with associated species	The populations in the SAC are composed mainly of low-growing (0.2-0.7m high) plants of sub-species *nana* (Cooper et al., 2012)
Formation structure: community diversity and extent	Hectares	Appropriate community diversity and extent	See Cooper et al. (2012) for further details
Formation structure: cone-bearing plants	Percentage	At least 10% of plants bearing cones	Target based on Cooper et al. (2012). 55% of the SO01 population was bearing cones at time of survey (Cooper et al., 2012)
Formation structure: seedling recruitment	Percentage	At least 10% of juniper plants within the formation are seedlings	Target based on Cooper et al. (2012). 21% of the SO01 population were seedlings according to Cooper et al. (2012)
Formation structure: amount of each plant dead	Mean percentage	Mean percentage of each juniper plant dead not more than 10%	Target based on Cooper et al. (2012)
Vegetation composition: typical species	Occurrence	A variety of typical native species with a minimum of 10 species present (excluding negative indicator species	According to Cooper et al. (2012), juniper stands within the SAC fall into either vegetation group 4 (*Calluna vulgaris-Erica cinerea* group) or 5 (*Galium verum-Pilosella officinarum* group). See Cooper et al. (2012) for typical species
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Non-native cotoneaster (*Cotoneaster integrifolius*) was recorded at Rosses Point by Cooper et al. (2012)

7220 Petrifying springs with tufa formation (Cratoneurion)

To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in Cummeen Strand/Drumcliff Bay (Sligo Bay) 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	The area of this habitat at Ballincar is recorded as 150m2 along c.200m of cliff (internal NPWS files). NB futher areas of the habitat may occur within this SAC
Habitat distribution	Occurrence	No decline. See map 7 for recorded location	This habitat occurs along a seepage line in low (generally less than 10m in height) clay sea cliffs near Ballincar (internal NPWS files). Lyons and Kelly (2013) recognise three main subtypes of spring. This site falls into the coastal springs subtype (the other two being woodland springs and inland non-wooded springs) NB further areas of the habitat may occur within this SAC
Hydrological regime: height of water table; water flow	Metres; metres per second	Maintain appropriate hydrological regimes	The hydrological regime is currently unknown at this site. Petrifying springs rely on permanent irrigation, usually from upwelling groundwater sources or seepage sources. This site appears to be fed from water seeping through clay sea cliffs (internal NPWS files)
Water quality	Water chemistry measures	Maintain oligotrophic and calcareous conditions	Water chemistry is currently unknown for this site. Characteristically, petrifying spring water has high values for pH, alkalinity and dissolved calcium and is oligotrophic (Lyons and Kelly, 2013)
Vegetation composition: typical species	Occurrence	Maintain typical species	The bryophytes *Palustriella commutata* (*Cratoneuron commutatum*) and *Eucladium verticillatum* are diagnostic of this habitat (EC, 2007). Both are found at the location described above (internal NPWS files). Other bryophyte species listed here are *Didymodon tophaceus* and *Trichostomium crispulum* (internal NPWS files)

1014 Marsh Snail *Vertigo angustior*

To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known location for this species in this SAC (which overlaps two 1km squares). See map 7	From Moorkens and Killeen (2011) (site code Va CAM21)
Presence on transect	Occurrence	Adult or sub-adult snails are present in four of the grassland zones on the transect where optimal or sub-optimal habitat occurs (minimum 5 samples)	Transect established as part of condition assessment monitoring at this site (Moorkens and Killeen, 2011). See habitat extent target below for definition of optimal and sub-optimal habitat
Presence	Occurrence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	At least 75m of habitat along the transect is classed as optimal and 150m of habitat along the transect is classed as sub-optimal or optimal	From Moorkens and Killeen (2011). See habitat extent target below for definition of optimal and sub-optimal habitat
Transect optimal wetness	Metres	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for more than 130m along the transect	From Moorkens and Killeen (2011)
Habitat extent	Hectares	12-15ha of the site optimal and a further 11-14ha sub-optimal. Optimal habitat is defined as fixed dune, species-rich grassland dominated by red fescue (*Festuca rubra*), with sparse marram grass (*Ammophila arenaria*), lady's bedstraw (*Galium verum*), eyebright (*Euphrasia* sp.), mouse-ear-hawkweed (*Pilosella officinarum*) and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal habitat is defined as for optimal but either vegetation height is less than 10cm or between 30 and 50cm; or the vegetation contains mounds of moss or willow (*Salix* spp.) scrub; or the soil is dry and sandy; or the thatch is wetter with a denser structure	From Moorkens and Killeen (2011)

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of estuary accessible	No barriers for migratory life stages of lamprey moving from freshwater to marine habitats and vice versa	This SAC only covers marine/estuarine habitat and it is not anticipated that it contains suitable spawning or nursery habitat. Migrating adult lamprey pass through the site en route to/from the Garavogue River, which flows out of Lough Gill. Lough Gill SAC (site code: 1976), which is adjacent to this SAC, encompasses the freshwater elements of sea lamprey habitat. Potential barriers for migrating lamprey include anthropogenic physical barriers and chemical barriers e.g. oxygen depletion or discharge of noxious pollutants

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of estuary accessible	No barriers for migratory life stages of lamprey moving from freshwater to marine habitats and vice versa	This SAC only covers marine/estuarine habitat and it is not anticipated that it contains suitable spawning or nursery habitat. Migrating adult lamprey pass through the site en route to/from the Garavogue River, which flows out of Lough Gill. Lough Gill SAC (site code: 1976), which is adjacent to this SAC, encompasses the freshwater elements of river lamprey habitat. Potential barriers for migrating lamprey include anthropogenic physical barriers and chemical barriers e.g. oxygen depletion or discharge of noxious pollutants

1365 Harbour seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Cummeen Strand/Drumcliff Bay (Sligo Bay) 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 8	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 8	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980), Warner (1983), Harrington (1990), Lyons (2004), and unpublished NPWS records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve the moult haul-out sites in a natural condition. See map 8	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004), Cronin et al. (2004), and unpublished NPWS records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve the resting haul-out sites in a natural condition	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004) and unpublished NPWS 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 marine supporting document for further details

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MAP 1:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

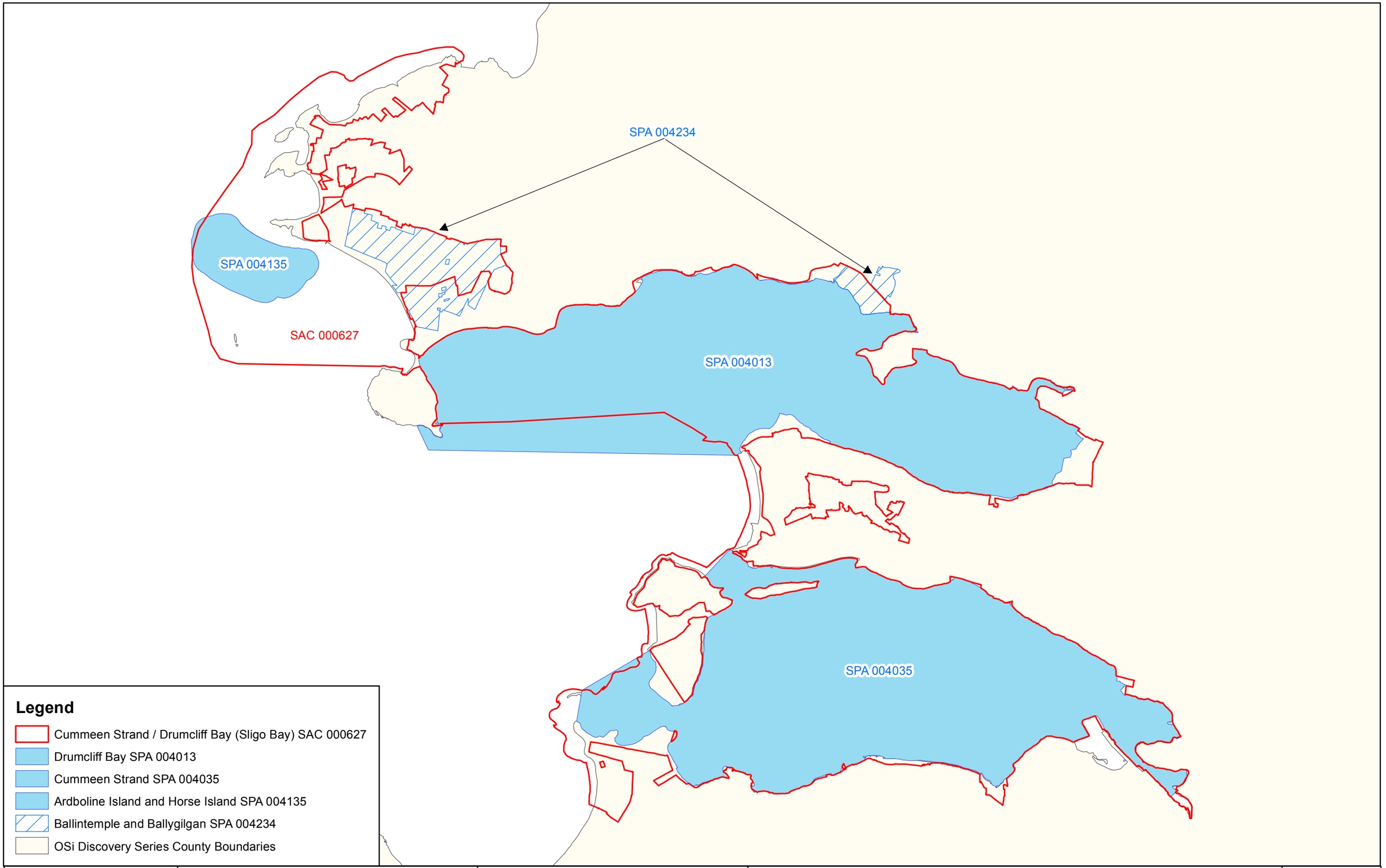
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013



Legend

- Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC 000627
- Drumcliff Bay SPA 004013
- Cummeen Strand SPA 004035
- Ardboline Island and Horse Island SPA 004135
- Ballintemple and Ballygilgan SPA 004234
- OSi Discovery Series County Boundaries

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MAP 2:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE: SAC 000627; version 3
SPA 004013 CO.SLIGO; version 2.02 SPA 004035 CO.SLIGO; version 1.03
SPA 004135 CO. SLIGO; version 2 SPA 004234 CO. SLIGO; version 1

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

Legend

- SAC 000627
- 1130 Estuaries
- OSi Discovery Series County Boundaries

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MAP 3:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
ESTUARIES

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

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

Legend

- SAC 000627
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundaries

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MAP 4:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

Legend

- SAC 000627
- OSi Discovery Series County Boundaries

Marine Community Types

- Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex
- Fine sand with *Angulus* spp. and *Nephtys* spp. community complex
- Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex
- Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex
- Intertidal reef community
- Mytilidae-dominated community complex
- Sand to mixed sediment with amphipods community
- Subtidal reef community
- *Zostera*-dominated community

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MAP 5:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

CMP: 136

CMP: 135

CMP: 134

CMP: 133

Legend

SAC 000627

OSi Discovery Series County Boundaries

CMP:135 Coastal Monitoring Project Site Codes

Sand Dune Habitats

Qualifying Interests

2110 Embryonic shifting dunes

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

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

Non-Qualifying Interests

1210 Annual vegetation of drift lines

1220 Perennial vegetation of stony banks

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

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MAP 6:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

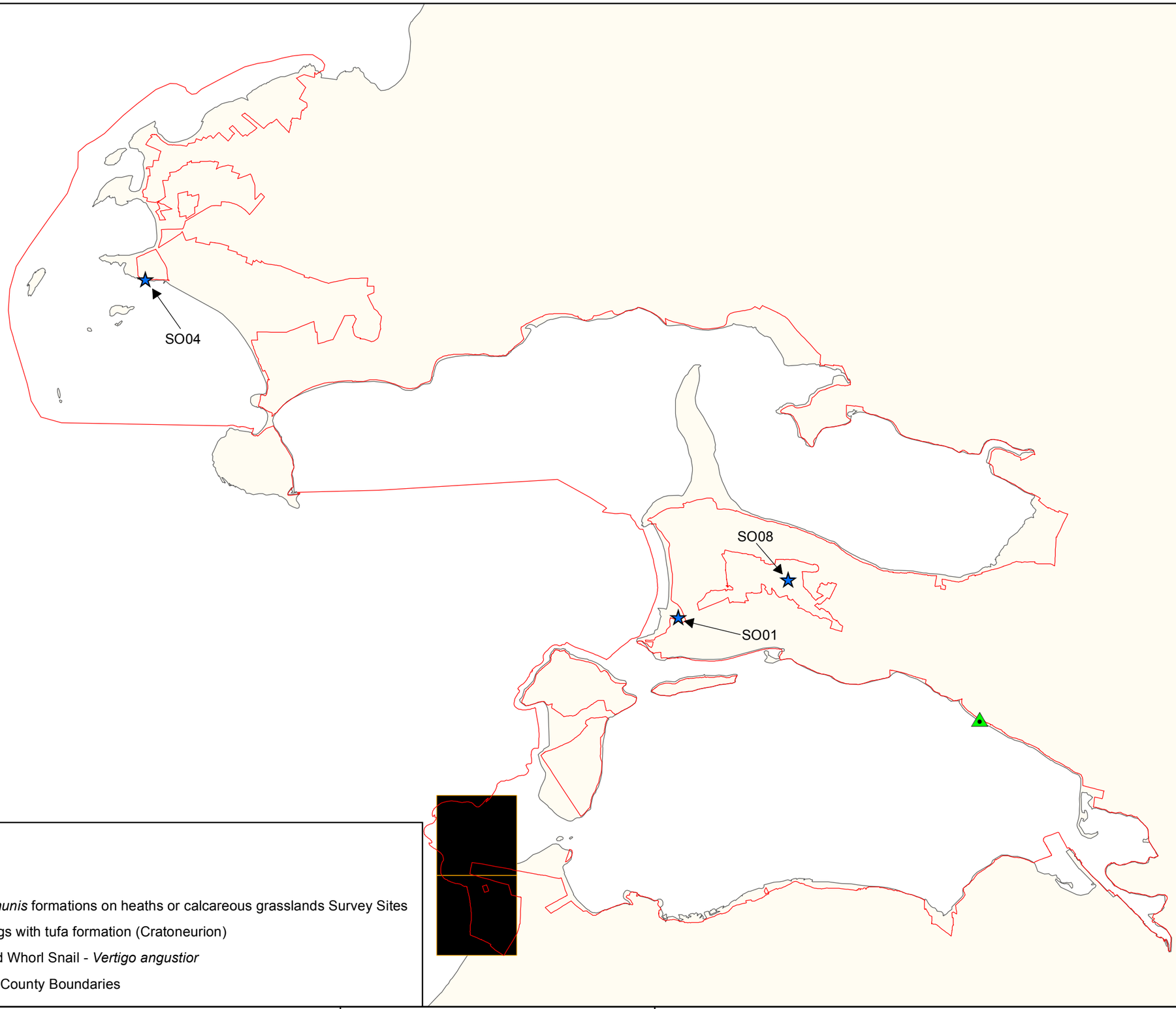
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013



Legend

- SAC 000627
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands Survey Sites
- 7220 *Petrifying springs with tufa formation (Cratoneurion)
- 1014 Narrow-Mouthed Whorl Snail - *Vertigo angustior*
- OSi Discovery Series County Boundaries

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MAP 7:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
NARROW-MOUTHED WHORL SNAIL, PETRIFYING SPRINGS & JUNIPER FORMATIONS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

Legend

- SAC 000627
- 1365 Harbour Seal - *Phoca vitulina* Breeding Sites
- 1365 Harbour Seal - *Phoca vitulina* Resting Sites
- 1365 Harbour Seal - *Phoca vitulina* Habitat
- OSi Discovery Series County Boundaries

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MAP 8:
CUMMEEN STRAND / DRUMCLIFF BAY (SLIGO BAY) SAC
CONSERVATION OBJECTIVES
HARBOUR SEAL

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

SITE CODE: SAC 000627; version 3
County Sligo

0 1 2 3 km

N

Map Version 1
Date: Aug 2013

Conservation objectives for Lough Gill SAC [001976]

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	**Description**
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
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)*

* denotes a priority habitat

Code	**Common Name**	**Scientific Name**

1092	White-clawed Crayfish	*Austropotamobius pallipes*
1095	Sea Lamprey	*Petromyzon marinus*
1096	Brook Lamprey	*Lampetra planeri*
1099	River Lamprey	*Lampetra fluviatilis*
1106	Salmon	*Salmo salar*
1355	Otter	*Lutra lutra*

Citation: *NPWS (2018) Conservation objectives for Lough Gill SAC [001976]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Unshin River SAC [001898]

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*

* denotes a priority habitat

Code	Common Name	Scientific Name
1106	Salmon	*Salmo salar*
1355	Otter	*Lutra lutra*

Citation: *NPWS (2018) Conservation objectives for Unshin River SAC [001898]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Ballintemple and Ballygilgan SPA [004234]

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.

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.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	**Common Name**	**Scientific Name**
A045	Barnacle Goose	*Branta leucopsis*

Citation: *NPWS (2018) Conservation objectives for Ballintemple and Ballygilgan SPA [004234]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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National Parks and Wildlife Service

Conservation Objectives Series

Ballysadare Bay SPA 004129

An Roinn
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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***

004129	Ballysadare Bay SPA
A046	Brent Goose *Branta bernicla hrota*
A141	Grey Plover *Pluvialis squatarola*
A149	Dunlin *Calidris alpina alpina*
A157	Bar-tailed Godwit *Limosa lapponica*
A162	Redshank *Tringa totanus*
A999	Wetlands

Please note that this SPA overlaps with Ballysadare Bay SAC (000622) and is adjacent to Drumcliff Bay SPA (004013) and Cummeen Strand SPA (004035). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2013
Title :	Ballysadare Bay SPA (site code 4129) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

A046 Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in Ballysadare Bay 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	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by light-bellied brent goose, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 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 Ballysadare Bay 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by grey plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina alpina*

To maintain the favourable conservation condition of Dunlin in Ballysadare Bay 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by dunlin, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 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 Ballysadare Bay 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by bar-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 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 Ballysadare Bay SPA, which is defined by the following list of attributes and targets:

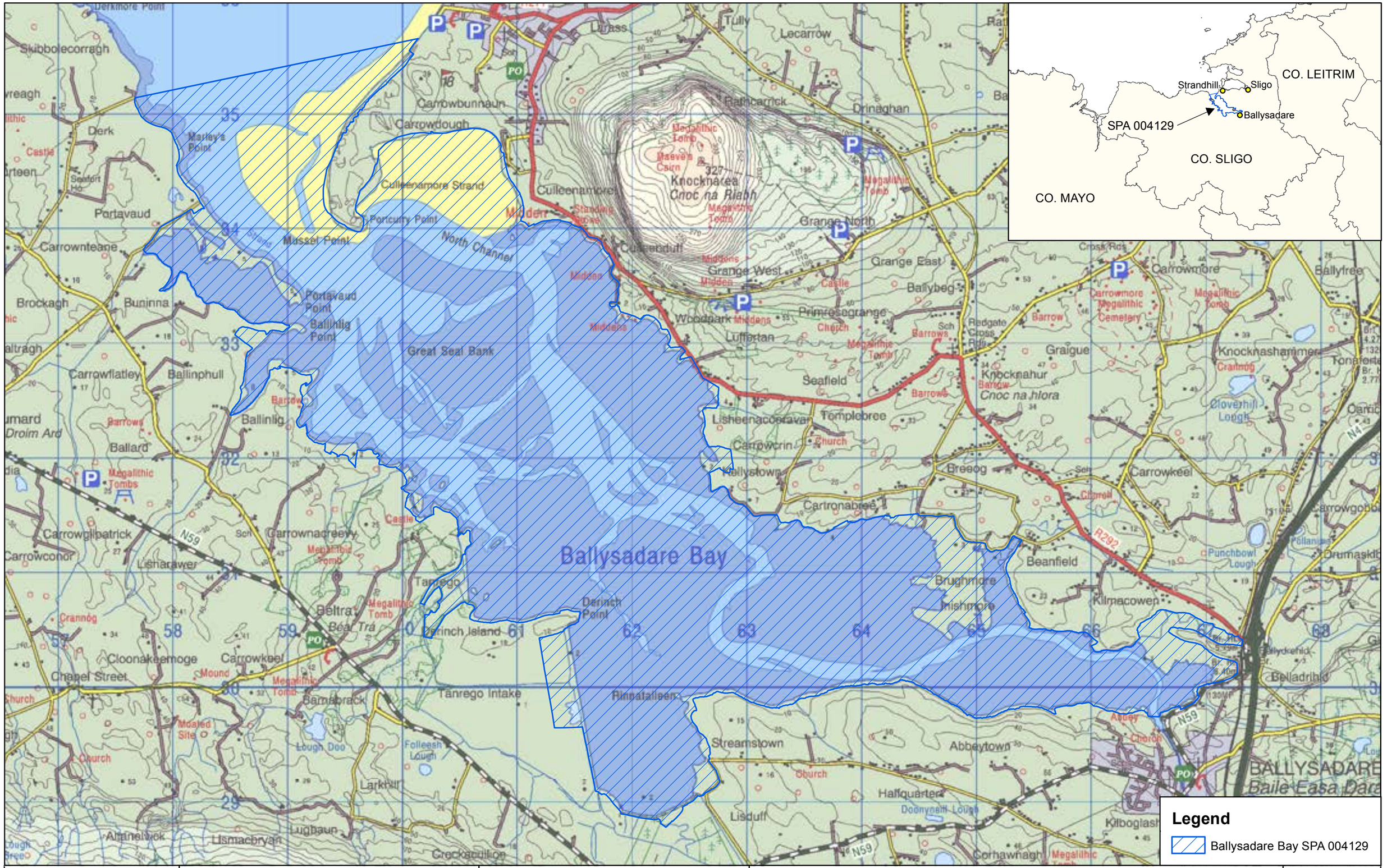
Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Ballysadare Bay SPA [004129]

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in Ballysadare Bay 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
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2130 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 2130ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



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Arts, Heritage and the Gaeltacht

MAP 1:
BALLYSADARE BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

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

SITE CODE:
SPA 004129; version 1.03. CO. SLIGO

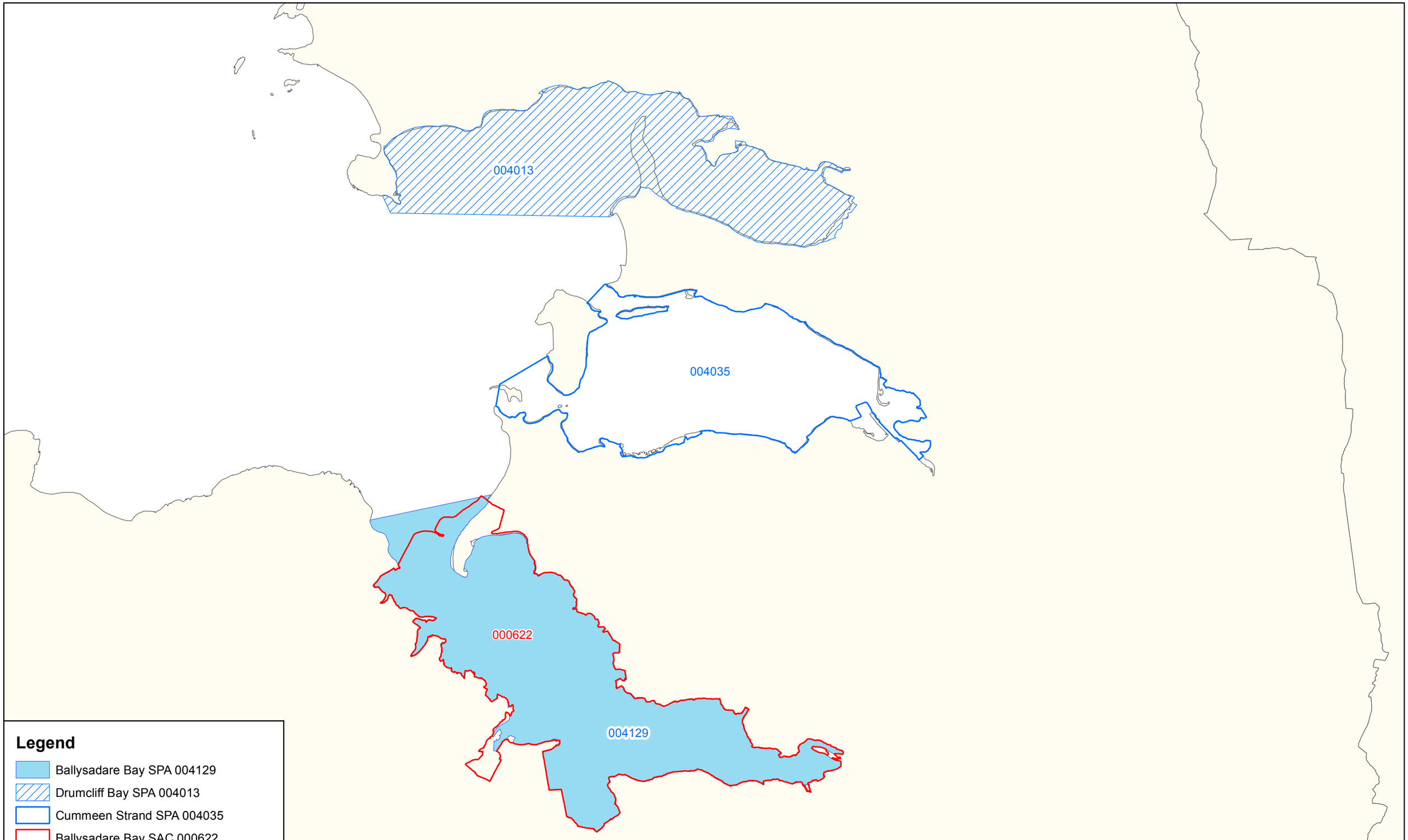
0 0.5 1 1.5 2 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: Oct 2013



Legend

- Ballysadare Bay SPA 004129
- Drumcliff Bay SPA 004013
- Cummeen Strand SPA 004035
- Ballysadare Bay SAC 000622
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 2:
BALLYSADARE BAY SPA CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE: SPA 004129; version 1.03
SPA 004013; version 2.02, SPA 004035; version 1.03,
SAC 000622; version 3. CO. SLIGO.

0 1 2 3 4 km

N

Map Version 1
Date: Oct 2013

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Cummeen Strand SPA 004035

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Department of Arts, Heritage and the Gaeltacht,

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Citation:

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Series Editor: Rebecca Jeffrey
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***

004035	Cummeen Strand SPA
A046	Brent Goose *Branta bernicla hrota*
A130	Oystercatcher *Haematopus ostralegus*
A162	Redshank *Tringa totanus*
A999	Wetlands

Please note that this SPA overlaps with Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627) and is adjacent to Drumcliff Bay SPA (004013) and Ballysadare Bay SPA (004129). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2013
Title :	Cummeen Strand SPA (site code 4035) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

A046 Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in Cummeen Strand 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	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by light-bellied brent goose, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 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 Cummeen Strand 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by oystercatcher, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part four of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

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

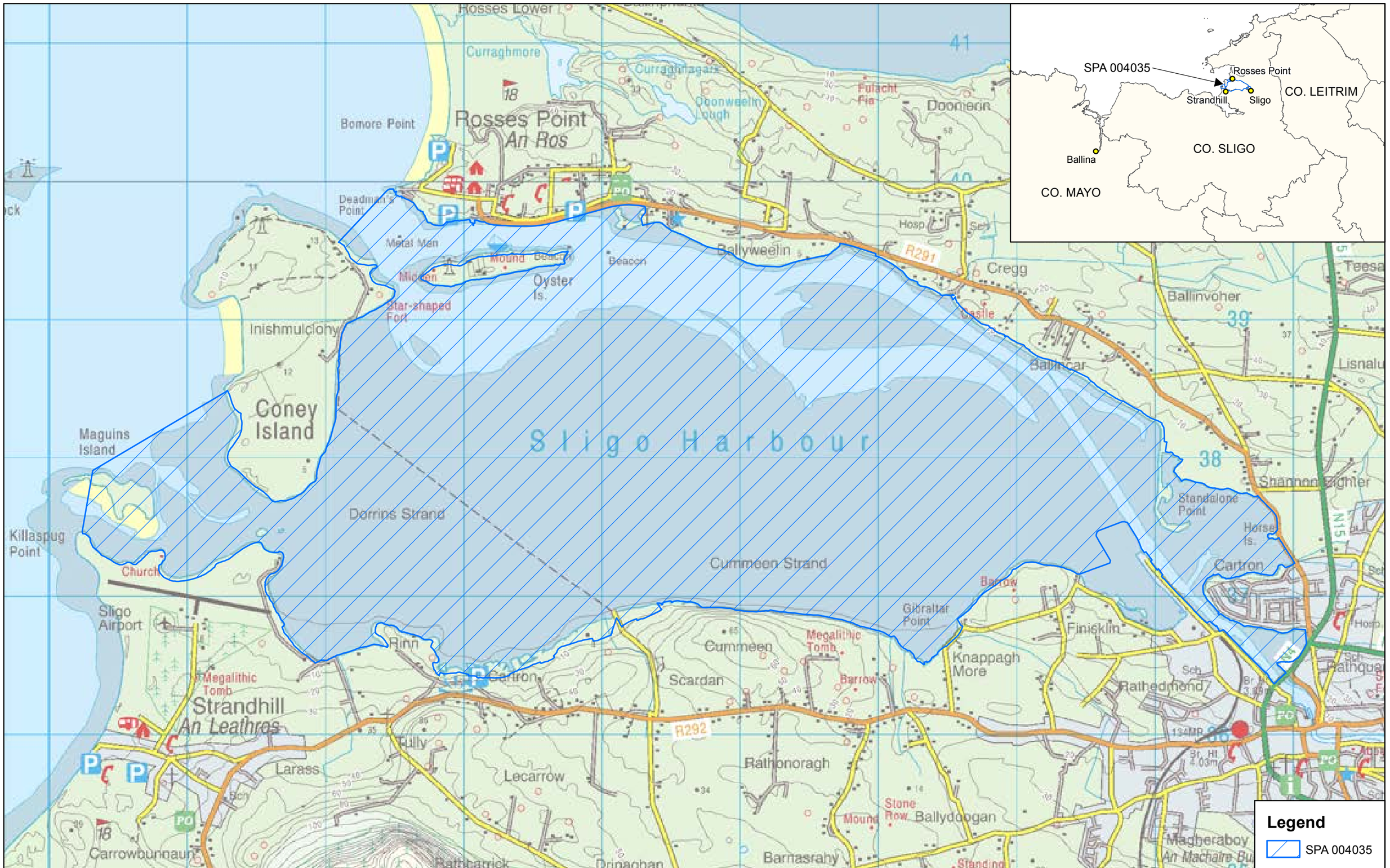
Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Cummeen Strand SPA [004035]

A999 Wetlands

To maintain the favourable conservation condition of wetland habitat in Cummeen Strand 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
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than 1732 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 1732ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



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Department of Arts, Heritage and the Gaeltacht

MAP 1: CUMMEEN STRAND SPA CONSERVATION OBJECTIVES SPA DESIGNATION

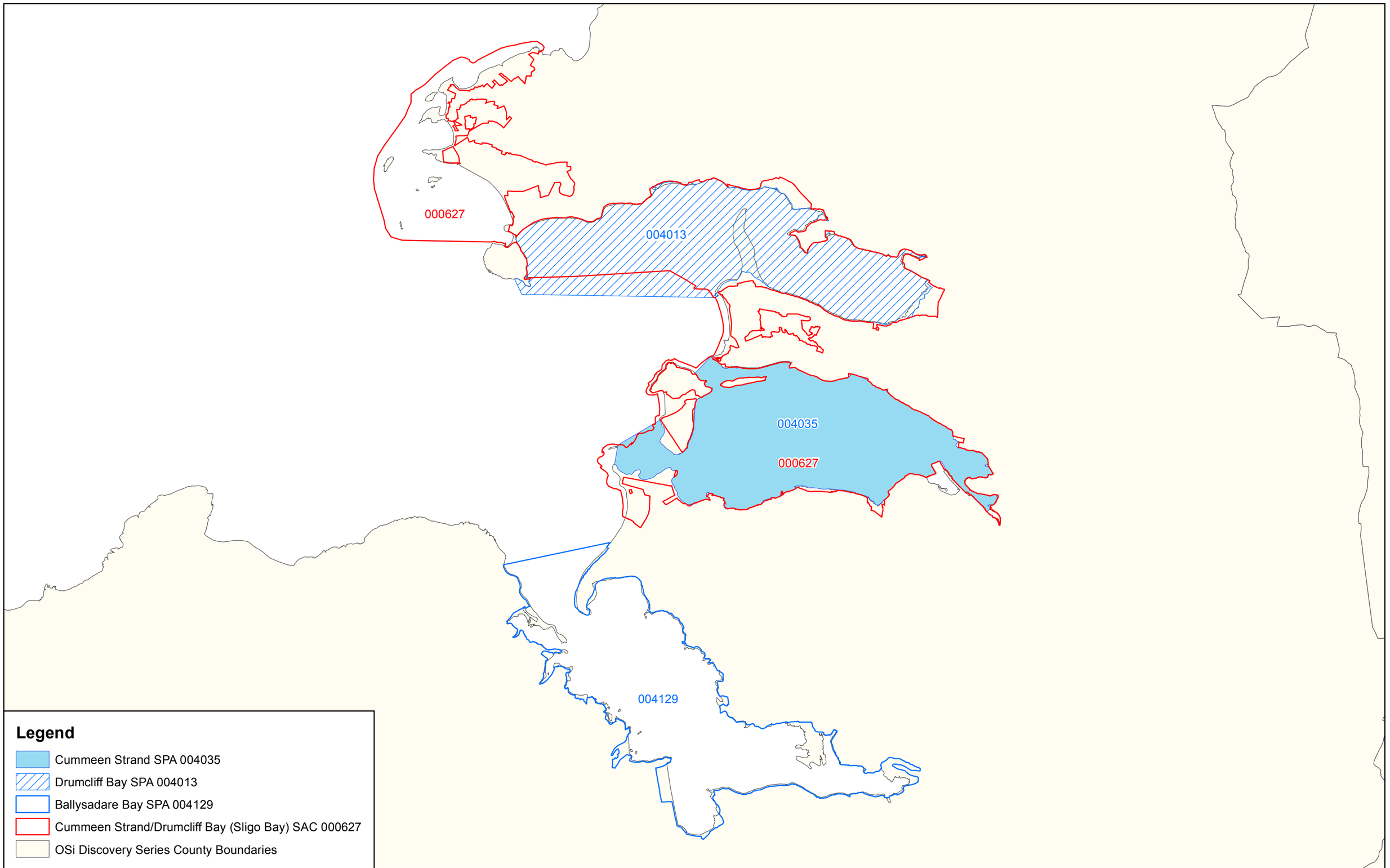
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SPA 004035; version 1.03
County Sligo

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: June 2013



Legend

- Cummeen Strand SPA 004035
- Drumcliff Bay SPA 004013
- Ballysadare Bay SPA 004129
- Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC 000627
- OSi Discovery Series County Boundaries

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

MAP 2:
CUMMEEN STRAND SPA
CONSERVATION OBJECTIVES
ADJOINING, OVERLAPPING &
NEARBY DESIGNATIONS

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

SITE CODE: SPA 004035; version 1.03
SPA 004013; version 2.02, SPA 004129; version 1.03,
SAC 000627; version 3

0 1 2 3 4 km

N

Map Version 1
Date: June 2013

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Drumcliff Bay SPA 004013

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
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Citation:

NPWS (2013) Conservation Objectives: Drumcliff Bay SPA 004013. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
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***

004013	Drumcliff Bay SPA
A144	Sanderling *Calidris alba*
A157	Bar-tailed Godwit *Limosa lapponica*
A999	Wetlands

Please note that this SPA overlaps with Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627) and is adjacent to Cummeen Strand SPA (004035), Ballysadare Bay SPA (004129) and Ballintemple and Ballygilgan SPA (004234). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2013
Title :	Drumcliff Bay SPA (site code 4013) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in Drumcliff Bay 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	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by sanderling, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 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 Drumcliff Bay 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by bar-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Drumcliff Bay SPA [004013]

A999 Wetlands

To maintain the favourable conservation condition of wetland habitat in Drumcliff Bay 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
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1843 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 1843ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

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

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

MAP 1: DRUMCLIFF BAY SPA CONSERVATION OBJECTIVES SPA DESIGNATION

SITE CODE: SPA 004013; version 2.02
County Sligo

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

Níl sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: June 2013

004234

004234

000627

004013

000627

004035

000627

004129

Legend

- Drumcliff Bay SPA 004013
- Cummeen Strand SPA 004035
- Ballysadare Bay SPA 004129
- Ballintemple and Ballygilgan SPA 004234
- Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC 000627
- OSi Discovery Series County Boundaries

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

MAP 2:
DRUMCLIFF BAY SPA
CONSERVATION OBJECTIVES
ADJOINING, OVERLAPPING &
NEARBY DESIGNATIONS

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

SITE CODE: SPA 004013; version 2.02
SPA 004035; version 1.03, SPA 004129; version 1.03,
SPA 004234; version 1, SAC 000627; version 3

0 1 2 3 4 km

N

Map Version 1
Date: June 2013

Conservation objectives for Ardboline Island and Horse Island SPA [004135]

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.

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.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A017	Cormorant	*Phalacrocorax carbo*
A045	Barnacle Goose	*Branta leucopsis*

Citation: *NPWS (2018) Conservation objectives for Ardboline Island and Horse Island SPA [004135]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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 057 Foxes Den and Lough Gill WSZs

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Foxes Den EAM

Issue 05 | 19 January 2022

Job number 257367

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1 Introduction

This document presents the results of the implementation of the Lead Mitigation Environmental Assessment Methodology (EAM) to assess the impact of dosing Foxes Den and Lough Gill (Cairns Hill) Water Source Zones (WSZ) with orthophosphate.

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

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

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

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

2 Abbreviations & Glossary

- AER – Annual Environmental Report
- Agglomeration- the catchment of the WWTP
- DWWTS -Domestic Waste Water Treatment System
- EAM – Environmental Assessment Method
- ELV – Emission Limit Values
- EPA- Environmental Protection Agency
- FSU – Flood studies Update Portal – website hosted
- GIS - Graphic Information Systems
- GWB- Ground Water Body
- IW – Irish Water
- LWB – Lake Water Body
- OP- Orthophosphate
- PE- Population Equivalent or unit per capita loading in waste-water treatment. PE can be considered the estimated number of people required to produce a measured load (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 Foxes Den and Lough Gill (Cairns Hill) Water Supply Zones

Foxes Den (2700PUB2701) and Lough Gill (Cairns Hill) (2700PUB2711) Water Supply Zones (WSZs) are located in County Sligo. The two WSZ have been amalgamated following Phase 1 upgrades on Foxes Den WTP that facilitated the decommissioning of Cairns Hill WTP. Foxes Den Water Treatment Plant (WTP) supplies a large area of County Sligo with water.

The Draft Plumbosolvency Control Plan for the Water Supply Zone (WSZ) proposes universal dosing of Orthophosphate takes place at the outlet from Foxes Den WTP. Figure 1, at the end of this report, shows the location of the proposed area to receive Orthophosphate dosed water.

The average flows from Foxes Den WTP to supply the water zone is 10,500 m^3/day. Approximately 56% of the flow is accounted for, and this fixed rate for water mains leakage (44%) is assumed in all the WSZs. The WSZ boundaries cover a large rural area and the Sligo urban centre which are served by six WWTP agglomerations. There are an estimated 1,874 properties across the WSZs that are serviced by Domestic Wastewater Treatment Systems (DWWTS).

Water Supply Zone	**Foxes Den (2700PUB2701) Lough Gill (Cairns Hill) (2700PUB2711)**
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	All concentration and loading units for orthophosphate (PO_4-P) are expressed as mg/l P and kg P/yr. Adopted Orthophosphate Optimum Dosing Concentration is 0.7 mg/l P. Unaccounted for water from the mains is 44%. 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 (TP) to Orthophosphate (P) for WWTP effluent is 0.5. It is assumed there will be no treatment of additional OP load for WWTPs with secondary, primary or no treatment. For plants with tertiary treatment it is assumed all the additional load will be treated. Where a tertiary plant is in exceedance of its ELV for TP or OP then the ability of the plant to treat the additional load is confirmed with Irish Water. Where IW indicates a tertiary plant

Water Supply Zone	Foxes Den (2700PUB2701) Lough Gill (Cairns Hill) (2700PUB2711)
	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 the waterbody in the following hierarchy: • Upstream waterbodies • Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • Ecological status of the waterbody. The mid-point of that surrogate indicative quality range is used as baseline concentration.
Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs	This section assesses the influent and effluent P loads and resultant OP dosages at WWTP within the WSZ before and after dosing. Inputs to and results of the Step 2 assessment for individual WWTP are given in Table 1. Where an agglomeration includes SWOs, discharges from this source are included. Emission Limit Value (ELVs) are assigned for WWTPs to protect the receiving River Waterbodies (RWB) from direct discharges during low flows. Where ELVs are in force these are shown in Table 1. WWTPs that are failing to comply with their ELVs are also indicated. The treatment level and PE of the WWTPs within the agglomerations are as follows; - Ballysadare – Tertiary treatment PE 2,348 - Ballintogher – Secondary treatment PE 360 - Ballybeg – Secondary treatment PE 5 - Collooney– Secondary treatment PE 2,078 - Sligo – Tertiary treatment PE 28,158 - Strandhill – Secondary treatment PE 2,371 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 4,588m^3/d (1,172 kg/yr P). Approximately 1024 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 532m^3/d (136 kg/yr P). Approximately 130 kg/yr P of the load is attenuated along the flowpaths. Flow monitoring gauges are available for Ballysodare_010 and Garavogue_010 within the assessment area. Where gauge data is not available, the river flows for receiving waterbodies are established from Hydrotool data or, if that is not available, using the using the Area-Standard-period Average Annual Rainfall (SAAR) method. Baseline Orthophosphate monitoring data and associated thresholds are available for half of the RWBs; those without monitoring data include Barnabrack_010, Killanummery_020, Knappagh (Sligo)_010, Knocknahur_010 and Unshin_040.

Water Supply Zone	Foxes Den (2700PUB2701) Lough Gill (Cairns Hill) (2700PUB2711)
	Orthophosphate drinking water 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 River Waterbodies (RWB)	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 drinking water dosing areas. Figure 2 illustrates the scale of Orthophosphate loading to the receiving waterbodies from mains leakage, DWWTS and direct discharges from WWTP and SWOs and upstream dosing areas. This illustrates that a significant proportion of the loads comes from primary discharges from WWTP, mains seepage through the preferential and groundwater pathways and upstream EAMs. Figure 3 presents the total loading to the drinking water 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 a large proportion of the mains leakage and primary discharge is attenuated. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Ballintogher WWTP- Garavogue_010 Ballysadare WWTP- Ballysodare_010 Collooney WWTP- Owenmore (Sligo)_080 Sligo WWTP- Garavogue_010 (SWO only) The Orthophosphate concentrations in the RWBs following drinking water dosing are presented in Table 2. The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of any RWB.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The increase in Orthophosphate concentrations in the Groundwater Waterbodies (GWBs) as a result of the P drinking water dosing is shown in Table 3. Monitoring data is not available for all the groundwater bodies. Where existing monitoring data is not available, a surrogate status is used. The mid-range of that surrogate status is used as baseline concentration. Where multiple monitoring points are available within a GWB the results are averaged spatially to derive a GWB average. Direct discharges from Ballybeg WWTP, which discharges to groundwater, is combined with diffuse discharges at the Carrowmore West.

Water Supply Zone	Foxes Den (2700PUB2701) Lough Gill (Cairns Hill) (2700PUB2711)
	The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of any GWB.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the Water Supply Zone	The increase in Orthophosphate concentrations in the Lake Waterbodies (LWB) as a result of the drinking water dosing is shown in Table 4. Monitoring data is available for Gill SO, however there is no monitoring data for lake Dargan. The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of either lake.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Transitional and Coastal Waterbodies	The increase in Orthophosphate concentrations in the downstream Transitional Waterbodies and small Coastal (TraC) Waterbodies as a result of drinking water dosing is shown in Table 5. Baseline Orthophosphate monitoring data and associated thresholds are available for all Transitional and Coastal water bodies. The drinking water dosing with Orthophosphate does not deteriorate the status of either transitional waterbodies for both the summer and winter seasons.
Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies A cumulative assessment was undertaken to assess the impact on TraC WBs from all the contributing EAMs. The assessment is carried out on a catchment scale. The following EAM dosing areas are within the Sligo Bay and Drowse Catchment and discharge to the same TraC WBs as the Foxes Den EAM, see Figure 4: 065. Kilsellagh 045. Lough Talt 068. Rockingham 071. Lough Gara The increase in Orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all four EAMs with Orthophosphate is shown in Table 6. 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

Water Supply Zone	Foxes Den (2700PUB2701) Lough Gill (Cairns Hill) (2700PUB2711)
	There are no protected waterbodies downstream of the Foxes Den EAM which have not already been assessed in this EAM.
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 from WWTPs due to dosing of drinking water – Dosing rate = 0.7 mg/l P

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load kg/yr	Ortho P Concentration mg/l P TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Ballysadare Primary Discharge	Tertiary	No ELV	Ballysodare_010	Existing	2155	10.18	8.14	13.84
				Post Dosing	2155	10.18	8.14	13.84
Ballysadare SWOs (4 No.)				Existing	88	2.04	1.63	2.77
				Post Dosing	91	2.10	1.68	2.86
Ballintogher Primary Discharge	Secondary	No ELV	Garavogue_010	Existing	123	3.74	2.99	5.08
				Post Dosing	140	4.27	3.42	5.81
Ballintogher SWOs (1 No.)				Existing	8	1.14	0.91	1.55
				Post Dosing	8	1.22	0.98	1.66
Ballybeg Primary Discharge	Secondary	No ELV	Carrowmore West	Pre-Dosing	2	3.74	2.99	5.08
				Post Dosing	2	4.27	3.41	5.80
Collooney Primary Discharge	Secondary	Orthophosphate (1.5 mg/l P) – Compliant	Owenmore (Sligo)_080	Existing	142	0.52	0.41	0.71
				Post Dosing	210	0.77	0.61	1.04
Collooney SWOs (4 No.)				Existing	266	4.76	3.81	6.47
				Post Dosing	268	4.80	3.84	6.52
Sligo Primary Discharge	Tertiary	Total Phosphate (2mg/l P)- Non-compliant	Garavoge Estuary	Existing	32828	2.40	1.92	3.26
				Post Dosing	32828	2.40	1.92	3.26
				Existing	2792	1.00	0.80	1.36

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load kg/yr	Ortho P Concentration mg/l P TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Sligo SWOs (7 No.)				Post Dosing	2820	1.01	0.81	1.37
Strandhill Primary Discharge	Secondary	No ELV	Sligo Bay	Existing	808	1.46	2.99	5.08
				Post Dosing	921	1.66	3.40	5.79
Sligo SWOs (1 No.)				Existing	50	0.45	0.91	1.55
				Post Dosing	54	0.47	0.97	1.66

Table 2: Orthophosphate concentrations in river 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)**
Ballysodare_010	IE_WE_35B050100	High	0.0138	0.0188	409.7	0.0006	0.0144
Barnabrack_010	IE_WE_35B300790	*High*	0.0125	0.0188	1.4	0.00004	0.0125
Garavogue_010	IE_WE_35G010200	High	0.0100	0.0188	83.8	0.0001	0.0101
Killanummery_020	IE_WE_35K030900	*High*	0.0125	0.0188	2.3	0.0001	0.0126
Knappagh (Sligo)_010	IE_WE_35K420630	*High*	0.0125	0.0188	11.3	0.0007	0.0132
Knocknahur_010	IE_WE_35K430740	*High*	0.0125	0.0188	26.6	0.0009	0.0134
Owenmore (Sligo)_080	IE_WE_35O060900	High	0.0144	0.0188	316.8	0.0007	0.0151
Unshin_030	IE_WE_35U010400	High	0.0149	0.0188	17.8	0.0001	0.0150
Unshin_040	IE_WE_35U010500	*High*	0.0125	0.0188	54.0	0.0002	0.0127
Unshin_050	IE_WE_35U010600	High	0.0141	0.0188	88.5	0.0004	0.0144

Table 3: Orthophosphate concentrations in groundwater waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential Baseline conc. following dosing (mg/l P)**
Ballymote	IE_WE_G_0037	Good	0.0166	0.0263	0.6	0.00001	0.0166
Lavagh-Ballintougher	IE_WE_G_0038	*Good*	0.0175	0.0263	1.8	0.0004	0.0179
Ballygawley	IE_WE_G_0039	*Good*	0.0175	0.0263	7.6	0.0015	0.0190
Carrowmore West	IE_WE_G_0040	*Good*	0.0175	0.0263	23.8	0.0011	0.0186
Carrowmore East	IE_WE_G_0042	Good	0.0203	0.0263	14.5	0.0004	0.0207
Drumcliff-Strandhill	IE_WE_G_0044	*Good*	0.0175	0.0263	4.1	0.0002	0.0177
Collooney	IE_WE_G_0048	*Good*	0.0175	0.0263	5.0	0.0001	0.0176
Ballintougher	IE_WE_G_0051	*Good*	0.0175	0.0263	2.6	0.0005	0.0180
Dromahair	IE_WE_G_0054	*Good*	0.0175	0.0263	7.1	0.0007	0.0182
Killarga	IE_WE_G_0055	*Good*	0.0175	0.0263	0.1	0.00002	0.0175

Table 4: Total Phosphorus concentrations in lake waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** ***Surrogate Status in italic***	**Baseline conc used in calculation (mg/l TP)**	**75% of status threshold (mg/l TP)**	**Cumulative TP load (kg/yr TP)**	**Modelled TP dosing conc. (mg/l TP)**	**Potential Baseline conc. following dosing (mg/l TP)**
Gill SO	IE_WE_35_158	Good	0.0204	0.0213	83.8	0.0001	0.0205
Dargan	IE_WE_35_107	*High*	0.0050	0.0075	88.5	0.0004	0.0054

Table 5: Orthophosphate concentrations in transitional waterbodies and small coastal waterbodies following dosing of drinking water

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Ballysadare Estuary	IE_WE_460_0300	Summer	High	0.0057	0.0188	224.3	0.0003	0.0060
		Winter	High	0.0210	0.0188	224.3	0.0003	0.0213*
Garavoge Estuary	IE_WE_470_0100	Summer	High	0.0066	0.0188	116.9	0.0002	0.0068
		Winter	High	0.0120	0.0188	116.9	0.0002	0.0122
Sligo Bay	IE_WE_450_0000	Summer	High	0.0025	0.0188	399.0	0.0004	0.0029
		Winter	*High*	0.0125	0.0188	399.0	0.0004	0.0129

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

Table 6: Cumulative assessment of orthophosphate concentrations in transitional and coastal water bodies following dosing of drinking water

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Load, (kg/yr P) from current EAM**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Ballysadare Estuary	IE_WE_460_0300	Summer	High	0.0057	0.0188	224.3	437.7	0.0006	0.0063
		Winter	High	0.0210	0.0188	224.3	437.7	0.0006	0.0216*
Garavoge Estuary	IE_WE_470_0100	Summer	High	0.0066	0.0188	116.9	217.6	0.0003	0.0069
		Winter	High	0.0120	0.0188	116.9	217.6	0.0003	0.0123
Sligo Bay	IE_WE_450_0000	Summer	High	0.0025	0.0188	399.0	655.4	0.0004	0.0029
		Winter	*High*	0.0125	0.0188	399.0	655.4	0.0004	0.0129

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

Figure 1: Foxes Den and Lough Gill (Cairns Hill) Public Water Supply Dosing Areas

Figure 2: RWB Cumulative Loading Assessment

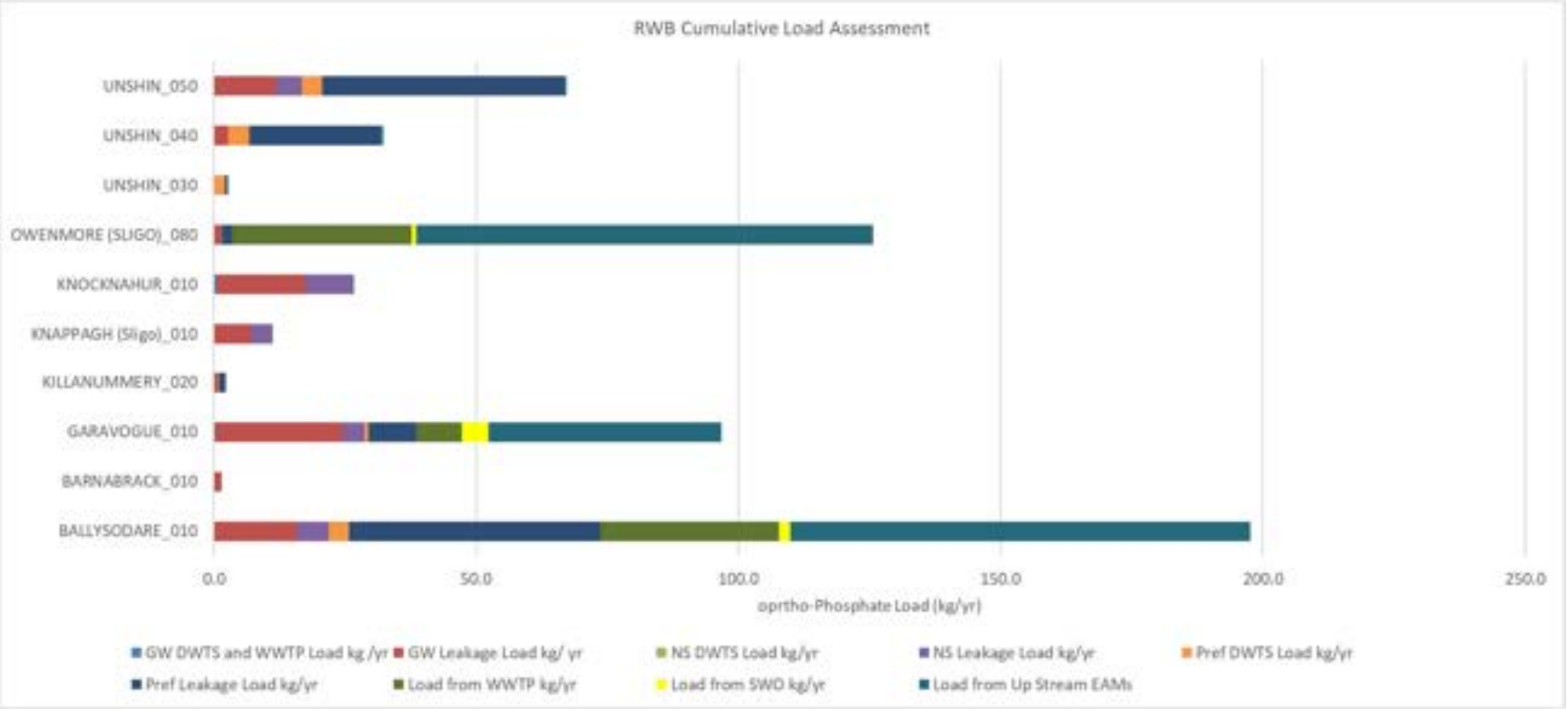

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

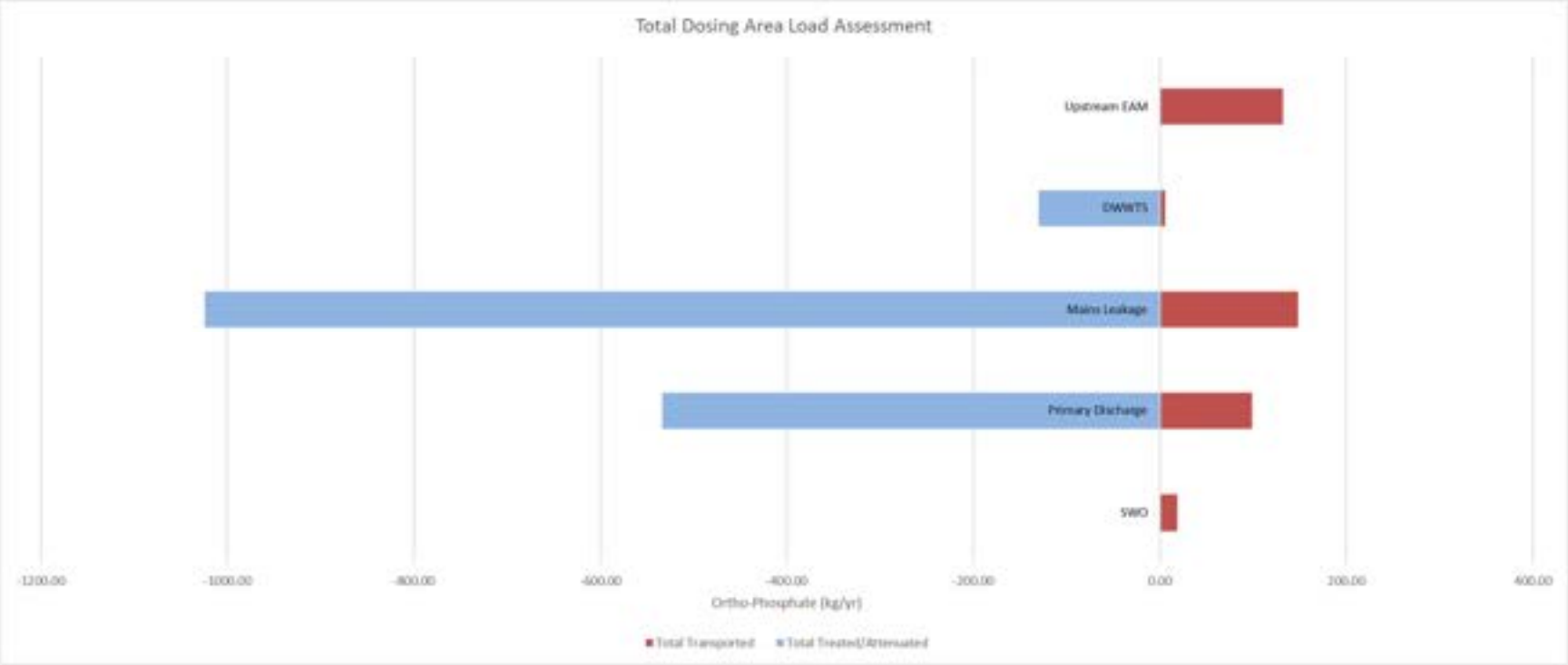

Figure 4: Upstream and downstream EAMs within WFD catchment

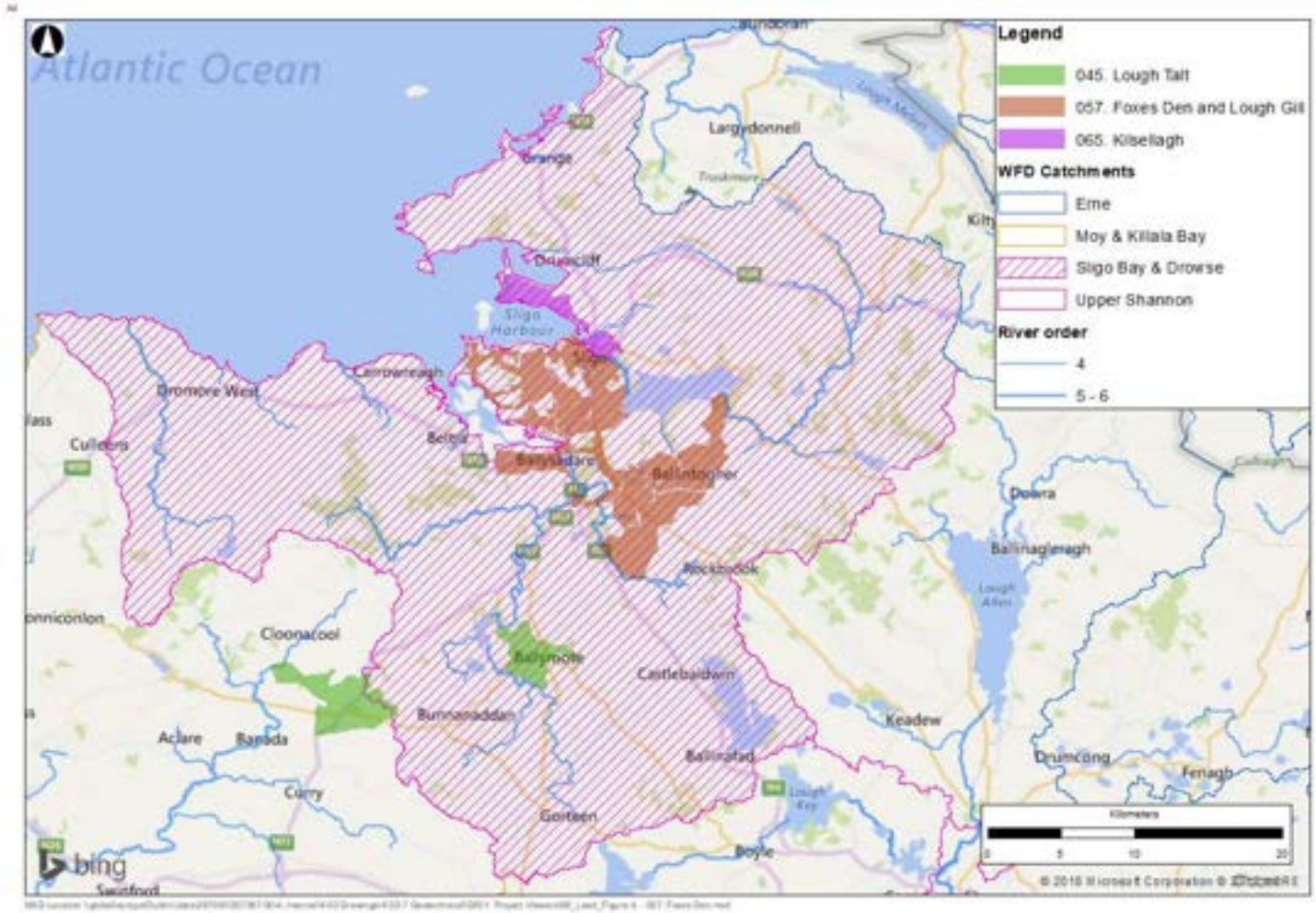

Figure 5: Red, Amber, Green (RAG) Status of waterbodies