Irish Water

Lead in Drinking Water Mitigation Plan – 044 Rosses Regional Public WSZ

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 Crolly Water Treatment Plant (WTP) in Co. Donegal to Rosses Water Supply Zone (WSZ).

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

1.1 PURPOSE OF THIS REPORT

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

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

1.2 THE PLAN

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

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

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] 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

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 Rosses WSZ will be 1.1 mg/l P for treated water supplied from Crolly WTP.

1.3 PROJECT BACKGROUND

Phosphorus (P) can influence water quality status through the process of nutrient enrichment and promotion of excessive plant growth (eutrophication). It is therefore necessary to quantify any potential environmental impact and the pathways by which the added (OP) may reach environmental receptors and to evaluate the significance of any such effects on European Sites. To facilitate the assessment of any significant effect to the receiving environment an Environmental Assessment Methodology (EAM) has been developed based on a conceptual model of P transfer (from the water distribution and wastewater collection systems), using the source-pathway-receptor framework.

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

2. APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

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

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

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

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

Article 6(4) states:

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

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

European and National Legislation:

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

Guidance / Case Law:

- *Article 6 of the Habitats Directive – Rulings of the European Court of Justice*. Final Draft September 2014;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. DEHLG (2009, revised 10/02/10);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission (2002);
- *Communication from the Commission on the Precautionary Principle*. European Commission (2000b);
- *EC study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC*. European Commission (2013);
- *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission*. European Commission (2007); and
- *Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission (2000a).

Departmental/NPWS Circulars:

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

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

According to European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive, the assessment requirements of Article 6 establish a four-staged approach as described below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The four stages are as follows:

- Stage 1 – Screening of the proposed plan or project for AA;

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

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

Stage 1: Screening for a likely significant effect

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

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

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

Stage 3: Assessment of Alternative Solutions

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

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

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

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

2.4 INFORMATION SOURCES CONSULTED

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

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 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 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 15 km 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 to 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 within the WSZ (**Figure 5**).

2.5.2 Conservation Objectives

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

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

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

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

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; The status of EU protected Habitats and Species in Ireland (NPWS 2019 a, b & c) and on information contained in Ireland's most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity; the Water Framework Directive SAC water dependency list (NPWS, December 2015) was used as part of the criteria of screening of European Sites.

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

The Crolly WTP typically supply 4,448 m^3/day to the Rosses Regional Public Water Supply Zone (WSZ) (0600PUB1060), through a number of reservoirs. Based on an assessment of the risk of lead exceedances, the recommended Plumbosolvency Control Plan for the Rosses WSZ is for universal OP dosing. Approximately 47% of the flow is accounted for and a fixed rate of water mains leakage of 53% is assumed for the WSZ. Specifically, 1.1 mg/l P will be dosed at Crolly WTP (Figure 1).

The WSZ boundaries cover urban centres including Dungloe, Burtonport, Kincaslough, Rinnafarset, Bunbed and Gweedore and is served by agglomerations (Annagary WWTP; Burtonport WWTP; Cottain Housing Scheme WWTP; Dungloe WWTP; Loughanure Housing Scheme WWTP; Meenanillar Housing Scheme WWTP; Meenlaragh Housing Scheme WWTP; and Stranacorcragh Housing Scheme WWTP). There are an estimated 5,461 properties across the WSZ that are served by DTS (i.e. septic tanks) and water discharged per person is assigned as 105 litres per day with an average of 2.7 persons per household assumed.

Figure 1 Location of the Crolly Water Treatment Plant site, Co. Donegal.

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

3.1.1Construction Works

Proposed construction works involves installation of Orthophosphate dosing unit and post treatment pH correction facility as detailed below.

The scope of the **construction** works for Orthophosphate dosing unit at Crolly WTP will include:

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;
- Re-purposing the old disused fluorine building and install an orthophosphate dosing unit, chemical storage including 1500L Storage tank (capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply), dosing equipment including duty standby pumps, and control panel. Extractor fans, replacement roller door, eyewash and all ancillary pipe works.
- Dosing prior to plant reservoir.
- Dosing pipelines, carrier water pipework and electrical cables shall typically be installed within 100mm diameter ducts, placed in trenches. The ducts will be installed at approximately 700mm below ground level and following installation the trench will be backfilled and the surface reinstated to match the existing surface. Where pipework and cables are routed through existing structures, they shall be surface mounted within trunking.
- In addition, safety equipment shall be provided where concentrated orthophosphoric acid is stored, filled or dosed. The equipment will include; free standing emergency shower and eyewash, provision of a potable water supply to safety shower/eyewash and safety signage.
- No site clearance or building demolition is required;
- Works duration will not extend beyond 20 working days.

Figure 2: Disused Fluorine Room

The scope of the **construction** works for post treatment pH correction facility at Inishowen West WTP will include:

- Installation of bicarbonate of soda unit handling and storage area in the existing chemical room to increase alkalinity level leaving the plant and stabilise pH variation in the network. Bicarbonate of soda is to be installed along with the existing caustic soda dosing at the plant.
- The dosing point is post plant and prior to reservoir.
- Pallet mechanical lifting equipment will also be provided for offloading pallets of bicarbonate of soda at plant.

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 1.1 mg/l P for treated water from Rosses WSZ 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 effects 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 assessment of any proposed orthophosphate treatment and provides a methodology to determine the potential loading 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 waterbodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from domestic wastewater treatment systems.

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

3.2.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 4**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of phosphorus is defined as the OP dosing at water treatment plants which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- *Pathways* include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from Domestic Wastewater Treatment Systems (DWWTS).
- *Receptors*, and their sensitivity, is of key consideration in the EAM. A waterbody may be more sensitive to additional 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 5** 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 EAM risk assessment process.

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

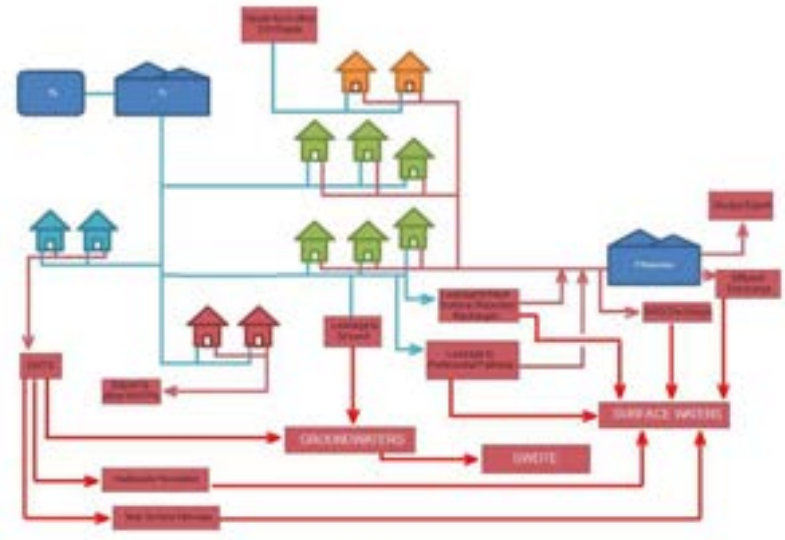

Figure 3 Conceptual Model of P Transfer

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

Step 1 – Stage 1 Appropriate Assessment Screening
- Identify downstream European Sites and qualifying features using water dependent database (Appendix B)
- Determine if qualifying features are nutrient sensitive from list of nutrient sensitive qualifying features.
- Apply the EAM in the context of conservation objectives for European Sites.

Application of EAM

Step 2 – Direct Discharges to Surface Water

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

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

Calculate Effluent P Loads and Concentrations Post Dosing

New WWTP effluent TP-load **NLP**

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

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

Where

Ê Load as per above

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

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

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

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

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

and

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

Step 3 – Assess Potential Impact on Receiving Waterbodies

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

Step 4 – Sub Surface Pathways

Calculate Load from Mains Leakage

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

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

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

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

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

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

Calculate Load from Domestic Wastewater Treatment Systems

Additional Loading from DWTS

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

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

Load reaching groundwater

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

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

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

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

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

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

Step 6 – Assessment of Potential Impact of Surface and Sub surface Pathways on the receptors. **Combine loads from direct discharges, DWTS and leakage and assess potential impact based on the existing status, trends and capacity of the water bodies to assimilate additional P loads. For European Sites the assessment will also be based on the Site Specific Conservation Objectives**

Figure 4 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

Crolly WTP is located approximately 1.2 km from the nearest European Sites, Cloghernagore Bog and Glenveagh National Park SAC and Derryveagh and Glendowan Mountains SPA (as per Figure 6). There are no direct hydrological links between the works and any European site. The closest watercourse is Keel Lough Stream_010 (IE_NW_38K010200) which is located 47.5m west of the WTP site boundary. Keel Lough Stream flows into the Gweedore_020 river waterbody which flows into Gweedore Bay and Islands SAC, 3 km downstream of the Crolly WTP site. Given the location and taking account of the scale of the construction of the OP Dosing Unit for the proposed scheme, there is no potential for direct or indirect impacts during construction at Crolly WTP site to have a significant effect on any European Site and are henceforth screened out. Consideration of potential impact is in the absence of mitigation and with the acknowledgement that the Dosing Units are within the existing IW site and the construction elements do not include any designated European Sites within the Zone of Influence. Therefore, construction impacts are not assessed further.

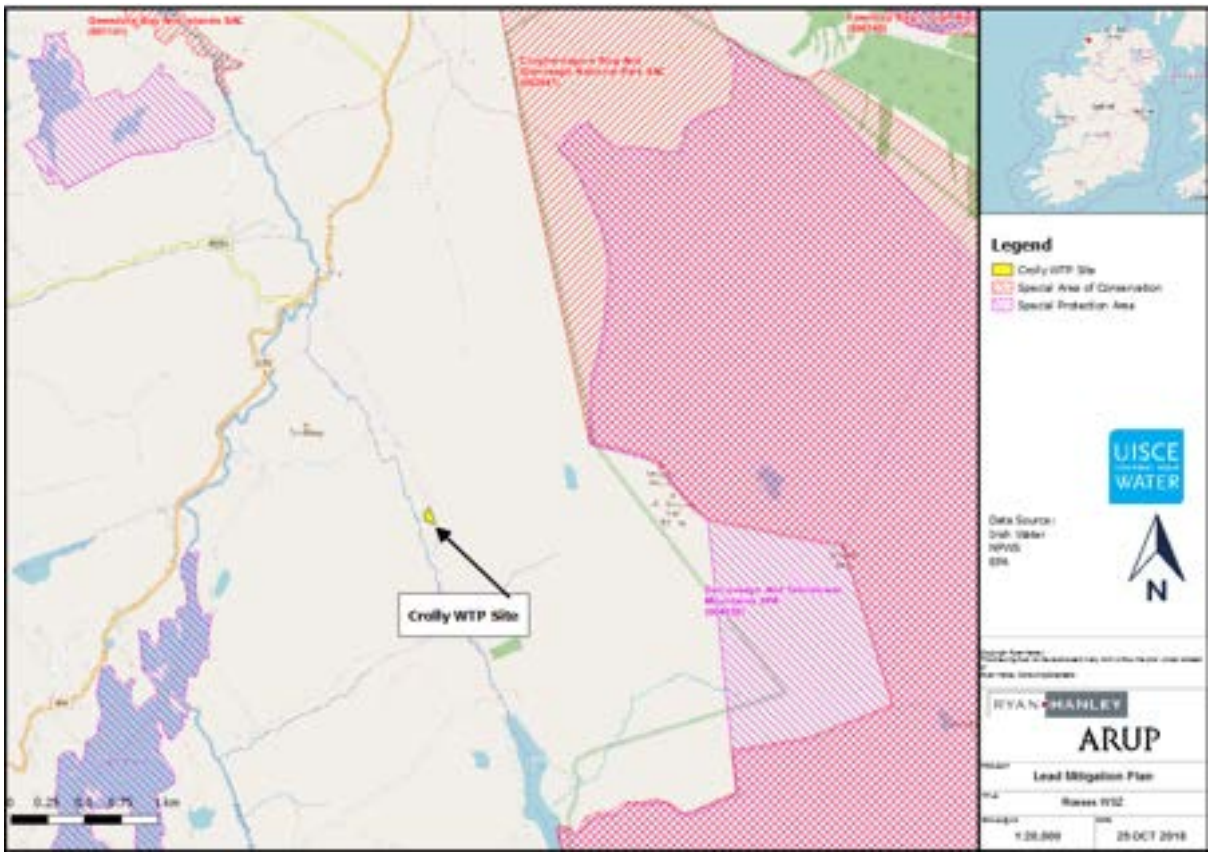

Figure 5 Location of the Crolly Water Treatment Plant site with respect to European Sites

4.1.2 Operational Phase

With regard to the operation of the proposed project, the pathways by which the added OP may reach and / or affect environmental receptors is considered by means of an operational ZoI, which was determined by establishing the potential for hydrological and hydrogeological connectivity between the Crolly WTP and associated WSZ and European Sites. This operational ZoI was therefore defined by the surface water sub-catchments and groundwater bodies that are hydrologically and hydrogeologically connected with the Project. European Sites within the operational ZoI are listed in **Table 1** and are displayed in **Figure 7**.

The EAM process identified 17 river waterbodies, 19 lake waterbodies, 5 transitional waterbodies and 3 coastal waterbodies (highlighted in bold) potentially impacted following OP dosing of drinking water. This AA Screening identifies the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites:

- Bun Na Leaca_010 (IE_NW_38B280640) river waterbody flows into Veigha ake waterbody (IE_NW_38_278) and Lough Aninver lake waterbody before flowing into the Gweedore Bay coastal waterbody (IE_NW_160_0000)

- Catheen_010 (IE_NW_38C030200) river waterbody flows into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- Clady (Donegal)_010 (IE_NW_38C040150) river waterbody flows into the Nacung Upper (IE_NW_38_26) lake waterbody and the Clady (Donegal)_020 (IE_NW_38C040300) river waterbody, which flows into Meenaclady (IE_NW_160_0500) transitional waterbody and from there, into the Gweedore Estuary (IE_NW_160_0200) transitional waterbody which discharges into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- Corveen_010 (IE_NW_38C050200) river waterbody flows into the Owencronahulla_010 (IE_NW_38O090300) river waterbody which flows into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- An_Céideadh_010 (IE_NW_38C250960) river waterbody flows into Lough Nafuullanlany, Lough Nagreagh, Lough Waskel and Lough Nawaugh lake waterbodies before flowing directly into the Northwestern Atlantic Seaboard (HAs 37;38) (IE_NW_100_0000) Coastal waterbody.

- Cnoc_Fola_010 (IE_NW_38C540200) river waterbody flow into the Northwestern Atlantic Seaboard (HAs 37;38) (IE_NW_100_0000) Coastal waterbody.

- Dungloe_010 (IE_NW_38D020020) river waterbody flows into the Sallagh lake waterbody (IE_NW_38_349), Adreen lough (IE_NW_38_652) and the Meenlecknalore (IE_NW_38_62) lake waterbody before entering the Dungloe_020 (IE_NW_38D020250) river waterbody which flows into the Fad Dunglow (IE_NW_38_543) lake waterbody, the Namuck (IE_NW_38_606) lake waterbody, the Cushkeeragh (IE_NW_38_571) lake waterbody, the Craghy (IE_NW_38_82) lake waterbody and the Dunglow (IE_NW_38_692) lake waterbody before discharging to the Dungloe Bay (IE_NW_140_0000) Coastal waterbody.

- Min Doire Eidhinn_010 (IE_NW_38M100990) river waterbody flows into the Aleck More (IE_NW_38_55) lake waterbody before flowing directly into the Trawena Bay (IE_NW_130_0000) and Gweebarra Bay (IE_NW_120_0000) coastal waterbodies.

- Gweedore_010 (IE_NW_38G030100) river waterbody flows into the Nagilly (IE_NW_38_477) lake waterbody and the Anure (IE_NW_38_83) lake waterbody before entering the Gweedore_020 (IE_NW_38G030300) river waterbody, which flows into the Gweedore Estuary (IE_NW_160_0200) transitional waterbody which discharges into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- Glais Bheagáin_010 (IE_NW_38G180970) river waterbody flows into the Meela (IE_NW_38_69) lake waterbody before flowing into the and Sallys Lough (IE_NW_150_0100), Dungloe Bay (IE_NW_140_0000) and Rutland Sound (IE_NW_150_0000) coastal waterbodies.

- Keel Lough Stream_010 (IE_NW_38K010200) river waterbody flows into the Gweedore_020 (IE_NW_38G030300) river waterbody, which flows into the Gweedore Estuary (IE_NW_160_0200) transitional waterbody which discharges into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- Loughanure_010 (IE_NW_38L150630) river waterbody flows into the Lough Nagapole, Lough Nagladary, Heather Lough and Lough Awillin lake waterbodies before flowing into the Moorlagh (IE_NW_160_0300) transitional waterbody which enters the Gweedore Estuary (IE_NW_160_0200) transitional waterbody which discharges into the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

- Mullaghderg_010 (IE_NW_38M190990) river waterbody flows into the Mullaghderg East (IE_NW_38_81) lake waterbody, the Mullaghderg West (IE_NW_38_85) lake waterbody, Lough Ibby lake waterbody, Lough Naweeloge lake waterbody and Lough Fadda lake waterbody before flowing into the Loch Chionn Caslach (Kincas Lough) (IE_NW_160_0100) transitional waterbody and the Gweedore Bay (IE_NW_160_0000) coastal waterbody.

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

- Northwest Donegal (IE_NW_G_049).

Northwest Donegal is a large groundwater body (1451 km^2) accounting for approximately one third of the county. The main discharges are to rivers and streams crossing the GWB, reflecting short groundwater flow paths (30-300m) and overall flow direction is expected to be to the northwest as determined by topography (Groundwater Body Descriptions, Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300m radius are considered in the ZoI. European Sites within the ZoI are listed in **Table 1** and are displayed in **Figure 7**.

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
Aran Islands (Donegal) Cliffs SAC	000111	Yes	Yes	Yes
Fawnboy Bog/ Lough Nacung SAC	000140	Yes	Yes	Yes
Gannivegil Bog SAC	000142	Yes	Yes	Yes
Horn Head and Rinclevan SAC	000147	Yes	Yes	No
Rathlin O'Birne Island SAC	000181	Yes	Yes	No
Slieve League SAC	000189	Yes	Yes	No
Slieve Tooey/ tormore Island/ Loughros Beag Bay SAC	000190	Yes	Yes	No
Tranarossan and Melmore Lough SAC	000194	Yes	Yes	No
West of Ardara/ Mass Road SAC	000197	Yes	Yes	No
Ballyness Bay SAC	001090	Yes	Yes	No
Gweedore Bay and Islands SAC	001141	Yes	Yes	Yes
Termon Strand SAC	001195	Yes	Yes	Yes
Ballyhoorisky Point to Fanad Head SAC	001975	Yes	Yes	No
North Inishowen Coast SAC	002012	Yes	Yes	No
Cloghernagore Bog and Glenveagh National Park SAC	002047	Yes	Yes	Yes
Mulroy Bay SAC	002159	Yes	Yes	No
Rutland Island and Sound SAC	002283	Yes	Yes	Yes
Derryveagh and Glendowan Mountains SPA	004039	Yes	Yes	Yes
Inishbofin, Inishdooey and Inishbeg SPA	004083	Yes	Yes	No
Rathlin O'Birne Island SPA	004120	Yes	Yes	No
Roaninish SPA	004121	Yes	Yes	No
Illancrone and Inishkeeragh SPA	004132	Yes	Yes	No
West Donegal Coast SPA	004150	Yes	Yes	Yes
Horn Head to Fanad Head SPA	004194	Yes	Yes	No

West Donegal Islands SPA	**004230**	**Yes**	**Yes**	**Yes**

Horn Head and Rinclevan SAC (000147) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744km^2 and the aforementioned site is 14.6km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300m), the potential for risk can be screened out and this site not assessed further.

Rathlin O'Birne Island SAC (000181) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is 39.4 km distance from the dosing area therefore potential risk can be screened out here. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Slieve League SAC (000189) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37; 38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is 36.2 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Slieve Tooey/ Tormore Island/ Loughros Beag Bay SAC (000190) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is 19 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Tranarossan and Melmore Lough SAC (000194) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is 26.6 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

West of Ardara/ Mass Road SAC (000197) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is 6.9 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300m), the potential for risk can be screened out and this site not assessed further.

Ballyhoorisky Point to Fanad Head SAC (001975) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning

744 km² and the aforementioned site is 35 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

North Inishowen Coast SAC (002012) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is 47.7 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Mulroy Bay SAC (002159) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is 30 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Rathlin O'Birne Island SPA (004120) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is 42 km distance from the dosing area therefore potential risk can be screened out here. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Horn Head to Fanad Head SPA (004194) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is 14.4 km distance from the dosing area therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Ballyness Bay SAC (001090) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is located approximately 6 km east of the dosing area and taking into consideration the dilution factor in this coastal waterbody it is considered that OP dosing will not impact on this site and therefore potential risk can be screened out here. The site also has potential hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. Given the considerable distance to the site, and the short flowpaths of the groundwater body (30-300 m), the potential for risk can be screened out and this site not assessed further.

Inishbofin, Inishdooey and Inishbeg SPA (004083) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km² and the aforementioned site is located approximately 5.7 km northeast of the dosing area and taking into consideration the dilution factor in this coastal waterbody it is considered that OP dosing will not impact on this site and therefore potential risk can be screened out here.

Roaninish SPA (004121) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is located approximately 12.1 km southwest of the dosing area and taking into consideration the dilution factor in this coastal waterbody it is considered that OP dosing will not impact on this site and therefore potential risk can be screened out here.

Illancrone and Inishkeeragh SPA (004132) has potential hydrological connectivity to the OP dosing area via the Northwestern Atlantic Seaboard (Has 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km^2 and the aforementioned site is located approximately 4.4 km southwest of the dosing area and taking into consideration the dilution factor in this coastal waterbody it is considered that OP dosing will not impact on this site and therefore potential risk can be screened out here.

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. A number of sites have been excluded from further assessment in Section 5 and 6, due to the absence of hydrological/hydrogeological connectivity to at least one nutrient sensitive and water-dependant QI or SCI. The remaining sites are included for further assessment in order to determine whether the Project is likely to give rise to significant effects; these sites are detailed in **Table 2** and are displayed in **Figure 7**.

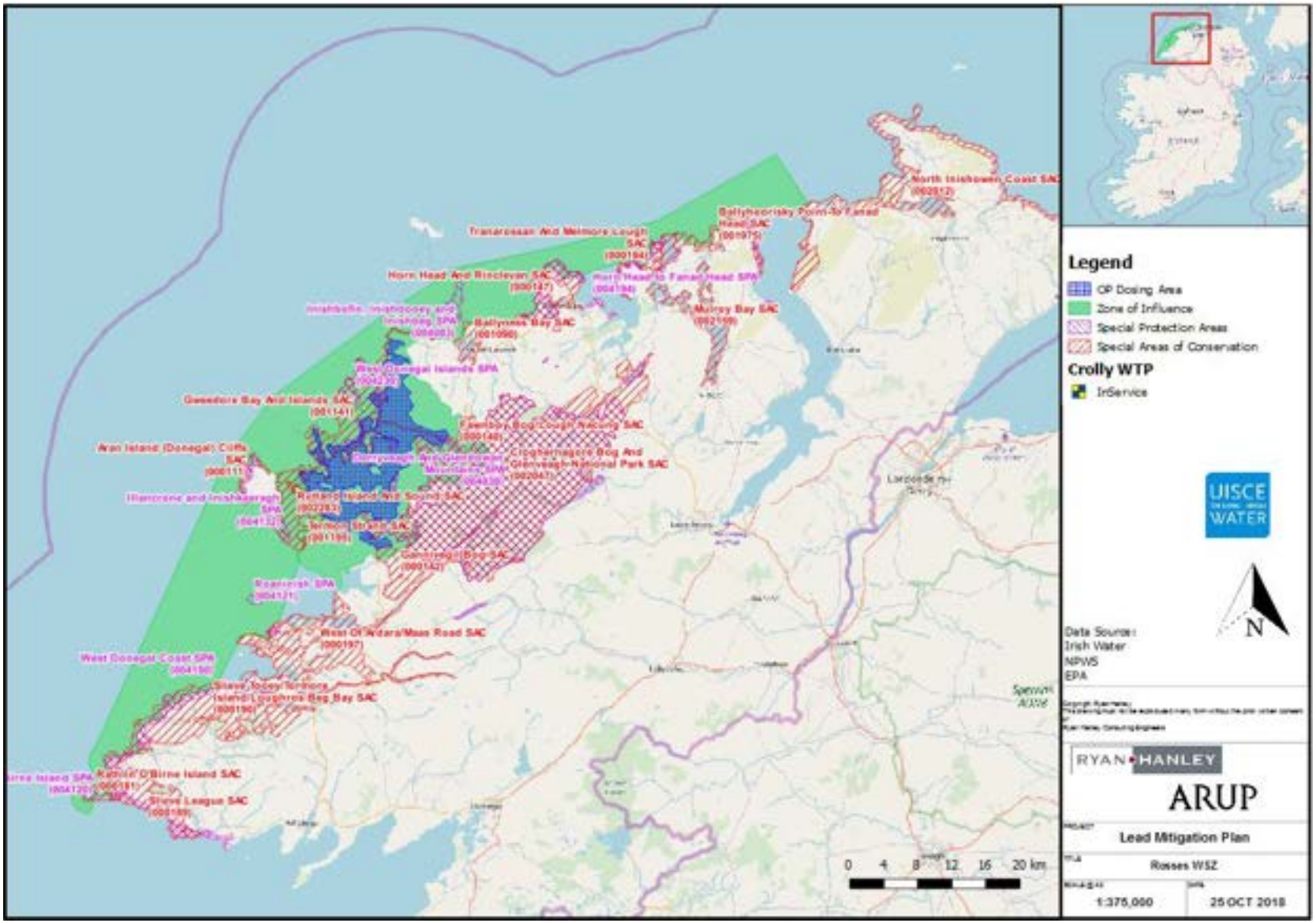

Figure 6 European Sites within the ZoI of the Proposed Project

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

* indicates a priority habitat under the Habitats Directive

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
Aran Islands (Donegal) Cliffs	**SAC 000111**	**21/11/2016**	1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	Yes	Yes	Yes for operational impacts
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	No	No	
			8210	Calcareous rocky slopes with chasmophytic vegetation	No	No	
			8220	Siliceous rocky slopes with chasmophytic vegetation	No	No	
			8330	Submerged or partially submerged sea caves	Yes	Yes	
Fawnboy Bog/ Lough Nacung	**SAC 000140**	**13/09/2016**	1029	Freshwater Pearl mussel (*Margaritifera margaritifera*)	Yes	Yes	Yes for operational impacts
			4010	Northern Atlantic wet heaths with *Erica tetralix*	Yes	Yes	
			7130	Blanket bogs (* if active bog)	Yes	Yes	
			7150	Depressions on peat substrates of the *Rhynchosporion*	Yes	Yes	
Gannivegil Bog	**SAC 000142**	**15/05/2017**	3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes	Yes	Yes for operational impacts
			4010	Northern Atlantic wet heaths with *Erica tetralix*	Yes	Yes	
			7130	Blanket bogs (* if active bog)	Yes	Yes	
Gweedore Bay and Islands	**SAC 001141**	**03/03/2015**	1150	Coastal lagoons	Yes	Yes	Yes for operational impacts
			1170	Reefs	Yes	Yes	
			1220	Perennial vegetation of stony banks	Yes	No	
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	
			1355	Otter (*Lutra lutra*)	Yes	Yes	
			1395	Petalwort (*Petalophyllum ralfsii*)	Yes	Yes	
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	
			1833	Slender naiad (*Najas flexilis*)	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	
			2140	Decalcified fixed dunes with *Empetrum nigrum*	Yes	Yes	
			2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	Yes	Yes	
			2170	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	Yes	Yes	
			2190	Humid dune slacks	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
			3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes	Yes	
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	No	No	
			5130	*Juniperus* communis formations on heaths or calcareous grasslands	No	No	
			21A0	Machairs (* in Ireland)	Yes	Yes	
Termon Strand	**SAC 001195**	**06/09/2016**	1150	Coastal lagoons	Yes	Yes	Yes for operational impacts
Cloghernagore Bog and Glenveagh National Park	**SAC 002047**	**24/07/2017**	1029	Freshwater Pearl mussel (*Margaritifera margaritifera*)	Yes	Yes	Yes for operational impacts
			1106	Atlantic salmon (*Salmo salar*)	Yes	Yes	
			1355	Otter (*Lutra lutra*)	Yes	Yes	
			1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes	
			3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes	Yes	
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis and Callitricho-Batrachion* vegetation	Yes	Yes	
			4010	Northern Atlantic wet heaths with *Erica tetralix*	Yes	Yes	
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	No	No	
			6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	
			7130	Blanket bogs (* if active bog)	Yes	Yes	
			7150	Depressions on peat substrates of the *Rhynchosporion*	Yes	Yes	
			91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	No	Yes	
Rutland Island and Sound	**SAC 002283**	**09/10/2013**	1365	Harbour seal (*Phoca vitulina*)	Yes	Yes	Yes for operational impacts
			1150	Coastal Lagoons	Yes	Yes	
			1160	Large Shallow inlets and Bays	Yes	Yes	
			1170	Reefs	Yes	Yes	
			1210	Annual vegetation of drift lines			
			2110	Embryonic Shifting dunes	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
			2120	Shifting dunes along the shoreline with *Ammophilia arenaria* (white dunes)	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes	Yes	
			2190	Humid dune slacks	Yes	Yes	
Derryveagh and Glendowan Mountains	**SPA 004039**	**21/02/2018**	A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes	Yes for operational impacts
			A098	Merlin (*Falco columbarius*)	Yes	Yes	
			A103	Peregrine (*Falco peregrinus*)	Yes	Yes	
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes	
			A466	Dunlin (*Calidris alpine schinzii*)	Yes	Yes	
West Donegal Coast	**SPA 004150**	**21/02/2018**	A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes	Yes for operational impacts
			A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes	
			A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes	
			A103	Peregrine (*Falco peregrinus*)	Yes	Yes	
			A184	Herring Gull (*Larus argentatus*)	Yes	Yes	
			A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes	
			A200	Razorbill (*Alca torda*)	Yes	Yes	
			A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes	
West Donegal Islands	**SPA 004230**	**21/02/2018**	A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes	Yes for operational impacts
			A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes	
			A122	Corncrake (*Crex crex*)	Yes	Yes	
			A182	Common Gull (*Larus canus*)	Yes	Yes	
			A184	Herring Gull (*Larus argentatus*)	Yes	Yes	

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

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

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

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

Operational Phase

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

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication; with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent effects on these habitats and species, and therefore will be subject to an evaluation of the significance of any such effect;
- The discharge of additional phosphorus 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 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).

5.4 ASSESSMENT OPERATIONAL 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 on the site in view of the site's conservation objectives.

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

- European sites included for assessment;
- Waterbodies hydrologically or hydrogeologically connected to the European Sites;
- Existing OP indicative water quality and trend of each waterbody;
- The baseline OP concentration of each waterbody;
- 75% of the upper threshold;
- Cumulative OP load to surface from leakage, DWWTS and agglomerations;
- The modelled OP concentration following dosing at the WTP; and,
- The OP potential baseline concentration (mg/l) following dosing at the WTP.

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

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

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

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to GWB with statistically significant trends according to the WFD App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in orthophosphate concentration is lower than the absolute value of the Sens Slope, then the test passes. This assessment has been carried out using existing WFD App data (downloaded December 2021).

Baseline OP monitoring data and associated thresholds are available for the RWBs Clady (Donegal)_020 and Gweedore_020. Where existing monitoring data is not available, a surrogate status is derived from the OP indicative quality of adjacent RWBs. The mid-range of that surrogate status is used as baseline concentration.

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

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] P Conc.[7,8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)	Evaluation
Fawnboy Bog/ Lough Nacung SAC (000140)	Clady (Donegal)_010 IE_NW_38C040150	RWB	*High*	0.0042	0.0188	6.6	0.00004	0.0042	No risk of deterioration to OP indicative WQ.
	Clady (Donegal)_020 IE_NW_38C040300	RWB	High	0.0066	0.0188	36.7	0.0002	0.0068	No risk of deterioration to OP indicative WQ.
	Nacung Upper IE_NW_38_26	LWB	*High*	0.0050	0.0075	6.6	0.00004	0.0050	No risk of deterioration to OP indicative WQ.
	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.
Gannivegil Bog SAC (000142)	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.
	Meenlecknalore IE_NW_38_62	LWB	*High*	0.0050	0.0075	0.8	0.00004	0.0050	No risk of deterioration to OP indicative WQ.
	Sallagh IE_NW_38_349	LWB	*High*	0.0050	0.0075	0.0	0.0000	0.0050	No risk of deterioration to OP indicative WQ.
	Dungloe_010 IE_NW_38D020020	RWB	*High*	0.0125	0.0188	0.8	0.00004	0.0125	No risk of deterioration to OP indicative WQ.
Gweedore Bay and Islands SAC (001141)	An_Céideadh_010 IE_NW_38C250960	RWB	*High*	0.0125	0.0188	23.3	0.0016	0.0141	No risk of deterioration to OP indicative WQ.
	Mullaghderg_010 IE_NW_38M190990	RWB	*High*	0.0125	0.0188	6.7	0.0005	0.0130	No risk of deterioration to OP indicative WQ.
	Loughanure_010 IE_NW_38L150630	RWB	*High*	0.0125	0.0188	33.9	0.0018	0.0143	No risk of deterioration to OP indicative WQ.

[3] Monitoring period is annual unless specified.
[4] Surrogate Status indicated in italic.
[5] Distance to threshold in parentheses.
[6] Baseline year is 2021.
[7] Surrogate concentration is given in italic mg/l
[8] Ortho P in RWBs, TWBs, CWBs and GWBs; TP in LWBs.
[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[3]	Ortho P Status[4] and Trends[5]	Baseline[6] P Conc.[7,8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)	Evaluation
	Gweedore_020 IE_NW_38G030300	RWB	*High*	0.0125	0.0188	27.0	0.0003	0.0128	No risk of deterioration to OP indicative WQ.
	Clady (Donegal)_020 IE_NW_38C040300	RWB	High	0.0066	0.0188	36.7	0.0002	0.0068	No risk of deterioration to OP indicative WQ.
	Catheen_010 IE_NW_38C030200	RWB	*Poor*	0.0833	0.0868	37.1	0.0034	0.0867	No risk of deterioration to OP indicative WQ.
	Owencronahulla_010 IE_NW_38O090300	RWB	*Good*	0.0125	0.0188	21.0	0.0012	0.0137	No risk of deterioration to OP indicative WQ.
	Bun Na Leaca_010 IE_NW_38B280640	RWB	*High*	0.0125	0.0188	17.8	0.0020	0.0145	No risk of deterioration to OP indicative WQ.
	Cnoc_Fola_010 IE_NW_38C540200	RWB	*High*	0.0125	0.0188	5.0	0.0006	0.0131	No risk of deterioration to OP indicative WQ.
	Mullaghderg West IE_NW_38_85	LWB	*High*	0.0050	0.0075	6.7	0.0005	0.0055	No risk of deterioration to OP indicative WQ.
	Mullaghderg East IE_NW_38_81	LWB	*High*	0.0050	0.0075	6.7	0.0005	0.0055	No risk of deterioration to OP indicative WQ.
	Chapel Lough IE_NW_38_408	LWB	*High*	0.0050	0.0075	6.7	0.0005	0.0055	No risk of deterioration to OP indicative WQ.
	Ibby Lough IE_NW_38_579	LWB	*High*	0.0050	0.0075	6.7	0.0005	0.0055	No risk of deterioration to OP indicative WQ.
	Carnboy Lough IE_NW_38_14	LWB	*High*	0.0050	0.0075	6.7	0.0005	0.0055	No risk of deterioration to OP indicative WQ.
	Unnamed lake IE_NW_38_483	LWB	*High*	0.0050	0.0075	23.3	0.0016	0.0066	No risk of deterioration to OP indicative WQ.
	Gweedore Estuary IE_NW_160_0200	TWB	Summer *High* Winter *High*	*0.0125*	0.0188	115.7	0.0004	0.0129	No risk of deterioration to OP indicative WQ.
	Moorlagh IE_NW_160_0300	TWB	Summer *High* Winter *High*	*0.0125*	0.0188	33.9	0.0018	0.0143	No risk of deterioration to OP indicative WQ.
	Loch Chionn Caslach (Kincas Lough) NW_160_0100	TWB	*Summer High* Winter *High*	*0.0125*	0.0188	6.7	0.0005	0.0130	No risk of deterioration to OP indicative WQ.
	Meenaclady IE_NW_160_0500	TWB	Summer *High* Winter *High*	*0.0125*	0.0188	36.7	0.0002	0.0127	No risk of deterioration to OP indicative WQ.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] P Conc.[7,8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)	Evaluation
	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.
	Rutland Sound IE_NW_150_0000	CWB	Summer *High* Winter *High*	*0.0125*	0.0188	29.3	0.0021	0.0146	No risk of deterioration to OP indicative WQ.
	Gweedore Bay IE_NW_160_0000	CWB	*Summer High* Winter *High*	*0.0125*	0.0188	214.9	0.0006	0.0131	No risk of deterioration to OP indicative WQ.
Termon Strand SAC (001195)	Dungloe Bay IE_NW_140_0000	CWB	*Summer High* Winter *High*	*0.0125*	0.0188	97.1	0.0015	0.0140	No risk of deterioration to OP indicative WQ.
Cloghernagore Bog and Glenveagh National Park SAC (002047)	Clady (Donegal)_010 IE_NW_38C040150	RWB	*High*	0.0042	0.0188	6.6	0.00004	0.0042	No risk of deterioration to OP indicative WQ.
	Dungloe_010 IE_NW_38D020020	RWB	*High*	0.0125	0.0188	0.8	0.00004	0.0125	No risk of deterioration to OP indicative WQ.
	Dungloe_020 IE_NW_38D020250	RWB	*High*	0.0250*	0.0188	43.9	0.0011	0.0261	No risk of deterioration to OP indicative WQ.
	Fad Dunglow IE_NW_38_543	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Craghy IE_NW_38_82	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Cushkeeragh IE_NW_38_571	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Namuck IE_NW_38_606	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.
Rutland Island and Sound SAC (002283)	Glais Bheagáin_010 IE_NW_38G180970	RWB	*High*	0.0125	0.0188	23.0	0.0017	0.0142	No risk of deterioration to OP indicative WQ.
	Dungloe Bay IE_NW_140_0000	CWB	*Summer High* Winter *High*	*0.0125*	0.0188	97.1	0.0015	0.0140	No risk of deterioration to OP indicative WQ.
	Rutland Sound IE_NW_150_0000	CWB	Summer *High* Winter *High*	*0.0125*	0.0188	29.3	0.0021	0.0146	No risk of deterioration to OP indicative WQ.
	Sally's Lough NW_150_0100	TWB	*Summer High* Winter *High*	*0.0125*	0.0188	23.0	0.0017	0.0142	No risk of deterioration to OP indicative WQ.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] P Conc.[7,8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)	Evaluation
Derryveagh and Glendowan Mountains SPA (004039)	Dungloe_020 IE_NW_38D020250	RWB	*High*	0.0250*	0.0188	43.9	0.0011	0.0261	No risk of deterioration to OP indicative WQ.
	Gweedore_010 IE_NW_38G030100	RWB	High	0.0058	0.0188	8.4	0.0001	0.0059	No risk of deterioration to OP indicative WQ.
	Clady (Donegal)_010 IE_NW_38C040150	RWB	*High*	0.0042	0.0188	6.6	0.00004	0.0042	No risk of deterioration to OP indicative WQ.
	Nacung Upper IE_NW_38_26	LWB	*High*	0.0050	0.0075	6.6	0.00004	0.0050	No risk of deterioration to OP indicative WQ.
	Fad Dunglow IE_NW_38_543	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Craghy IE_NW_38_82	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Cushkeeragh IE_NW_38_571	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Namuck IE_NW_38_606	LWB	*High*	0.0050	0.0075	43.9	0.0011	0.0061	No risk of deterioration to OP indicative WQ.
	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.
	Anure IE_NW_38_83	LWB	Good	0.0077*	0.0075	8.4	0.0001	0.0078	No risk of deterioration to OP indicative WQ.
	Lough Fad IE_NW_ 38_646	LWB	High	0.0050	0.0075	33.9	0.0018	0.0068	No risk of deterioration to OP indicative WQ.
West Donegal Coast SPA (004150)	Gweedore Bay IE_NW_160_0000	CWB	*Summer High* Winter *High*	0.0125	0.0188	115.7	0.0004	0.0129	No risk of deterioration to OP indicative WQ.
	Gweedore Estuary IE_NW_160_0200	TWB	*Summer High* Winter *High*	0.0125	0.0188	214.9	0.0006	0.0131	No risk of deterioration to OP indicative WQ.
	Mullaghderg_010 IE_NW_38M190990	RWB	*High*	0.0125	0.0188	6.7	0.0005	0.0130	No risk of deterioration to OP indicative WQ.
	Bun Na Leaca_010 IE_NW_38B280640	RWB	*High*	0.0125	0.0188	17.8	0.0020	0.0145	No risk of deterioration to OP indicative WQ.
	Northwest Donegal IE_NW_G_049	GWB	*Good*	0.0175	0.0263	51.6	0.0004	0.0179	No risk of deterioration to OP indicative WQ.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho P Status[4] and Trends[5]	Baseline[6] P Conc.[7,8] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[9]	Modelled Conc.[10] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)	Evaluation
West Donegal Islands SPA (004230)	Gweedore Bay IE_NW_160_0000	CWB	Summer *High* Winter *High*	*0.0125*	0.0188	214.9	0.0006	0.0131	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 orthophosphate can reach receptors. In the case of these pathways, factors contributing to potential direct impacts are:

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

For the purposes of assessing the potential impact on the receiving environment within the EAM, a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 4**). The baseline OP indicative water quality in the existing situation prior to OP dosing is established and compared to the potential loading to the receiving waters post-dosing. In-combination impacts of the operation of any SWOs 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 OP Dosing – Dosing rate = 1.1 mg/l P at Crolly WTP

Agglom. & Discharge Type	ELV from WWDL		TP Load Kg/yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Annagary Primary Discharge	**No ELVs**	Pre-Dosing	230	5.34	4.27	7.26
		Post Dosing	253	5.87	4.69	7.98
		% Increase	10%	10%	10%	10%
Burtonport Primary Discharge	**No ELVs**	Pre-Dosing	192	8.00	6.40	10.88
		Post Dosing	205	8.53	6.82	11.60
		% Increase	7%	7%	7%	7%
Cottain Primary Discharge	**No ELVs**	Pre-Dosing	29	5.34	4.27	7.26
		Post Dosing	32	5.86	4.69	7.98
		% Increase	10%	10%	10%	10%
Dungloe Primary Discharge	**Orthophosphate 1.1mg/l – Compliant**	Pre-Dosing	594	1.25	1.00	1.70
		Post Dosing	674	1.42	1.14	1.93
		% Increase	14%	14%	14%	14%
Dungloe SWOs (1 No.)		Pre-Dosing	37	0.38	0.31	0.52
		Post Dosing	39	0.41	0.33	0.55
Loughanure Primary Discharge	**No ELVs**	Pre-Dosing	16	3.74	2.99	5.08
		Post Dosing	19	4.26	3.41	5.80
		% Increase	19%	19%	19%	19%
Meenanillar Primary Discharge	**No ELVs**	Pre-Dosing	31	3.74	2.99	5.08
		Post Dosing	35	4.26	3.41	5.80
		% Increase	13%	13%	13%	13%
	No ELVs	Pre-Dosing	15	5.34	4.27	7.26

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*
Meenlaragh Primary Discharge		Post Dosing	16	5.86	4.69	7.98
		% Increase	7%	7%	7%	7%
Stranacorcragh Primary Discharge	**No ELVs**	Pre-Dosing	30	5.42	4.33	7.37
		Post Dosing	33	5.95	4.76	8.09
		% Increase	10%	10%	10%	10%

Annagarry Wastewater Treatment Plant

The Annagary WWWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 473. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 5.34 mg/l P to 5.87 mg/l P (10% increase). There are no SWOs associated with the WWTP. The Primary discharges flows to Gweedore Estuary (IE_NW_160_0200) within the **Gweedore Bay and Islands SAC**.

Burtonport WWTP

The Burtonport WWTP provides no treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 263. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 8.0 mg/l P to 8.53 mg/l P (7% increase). There are no SWOs associated with this WWTP. The primary discharge point from Burtonport WWTP is direct to sea at Burtonport pier, which is Rutland Sound Coastal Waterbody and Rutland Island and Sound SAC.

Cottain WWTP

The Cottain WWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 60. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 5.34 mg/l P to 5.86 mg/l P (10% increase). There are no SWOs at the WWTP. The primary discharge is to the Northwest Donegal (IE_NW_G_049) groundwater body through the percolation area. This is located 31 m from the Gweedore Bay And Islands SAC (001141).

Dungloe WWTP

The Dungloe WWTP provides secondary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 1,743. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 1.25 mg/l P to 1.42 mg/l P (14% increase). The modelled dosing concentrations are above the values specified for the ELV. The method relies on OSPAR document guidelines which don't necessarily match the observed average concentrations. The observed average concentrations are in compliant with the ELV (0.6 mg/l). The annual average SWO effluent concentration will increase from 0.38 mg/l to 0.41 mg/l (8% increase) as a result of the drinking water dosing. The primary discharge is to Dungloe_020 river waterbody and into Dungloe Bay (IE_NW_140_0000) CWB. The discharge point is approximately 550 m east and upstream of the Rutland Island And Sound SAC (002283). The SWO is located a further 90 m upstream on the Dungloe_020 (IE_NE_38D020250) river waterbody.

Loughanure WWTP

The Loughanure WWTP provides secondary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 48. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 3.74 mg/l P to 4.26 mg/l P (19% increase). There are no

SWOs at the WWTP. The primary discharge is to the Northwest Donegal (IE_NW_G_049) groundwater body through the percolation area. The primary discharge at Loughanure is c.100 m for Anure Lake water body which is part of the Derryveagh and Glendowan Mountains SPA.

Meenanillar WWTP

The Meenaillar WWTP provides secondary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 90. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 3.74 mg/l P to 4.26 mg/l P (13% increase). There are no SWOs at the WWTP. The primary discharge is to the Northwest Donegal (IE_NW_G_049) groundwater body through the percolation area. This primary discharge is c. 100m from Catheen_010 river waterbody which flows into Gweedore Bay and Island SAC (680 m downstream).

Meenlaragh WWTP

The Meenlaragh WWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 30. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 5.34 mg/l P to 5.86mg/l P (7% increase). There are no SWOs at the WWTP. The discharge location for this WWTP is located on the Cnoc_Fola_010 (IE_NW_38C540200) river waterbody. The Cnoc_Fola_10 river water body flows into Gweedore Bay and Island SAC (1km downstream).

Stranacorcragh Housing Scheme WWTP

The Stranacorcragh WWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore, the assessment assumes the additional load receives no treatment as described by the EAM. The organic loadings equate to a PE of 60. As a result of dosing of drinking water with OP, the annual average effluent OP concentration will increase from 5.42 mg/l P to 5.95 mg/l P (10% increase). There are no SWOs at the WWTP. The primary discharge is to the Northwest Donegal (IE_NW_G_049) groundwater body through the percolation area. The Owencronahulla_010 river waterbody is located just north of the WWTP (c.20 m). This river waterbody flows into the Gweedore Bay and Islands SAC (0.6 km downstream).

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the results of the EAM regarding the combined loading as a result of increased OP dosing from the WWTP discharge, seepage from mains and DWWTS. Upstream dosing areas have been considered and cumulatively assessed by the EAM.

River waterbodies

- Bun Na Leaca_010 (IE_NW_38B280640) river waterbody is connected directly to **Gweedore Bay and Islands SAC (001141)** and **West Donegal Coast SPA (004150)**

- Catheen_010 (IE_NW_38C030200) river waterbody, An_Céideadh_010 (IE_NW_38C250960) river waterbody, Cnoc_Fola_010 (IE_NW_38C540200) river waterbody,Gweedore_020 (IE_NW_38G030300) river waterbody, Owencronahulla_010 (IE_NW_38O090300) and Loughanure_010 (IE_NW_38L150630) river waterbody are connected directly to **Gweedore Bay and Islands SAC (001141)**

- Clady (Donegal)_010 (IE_NW_38C040150) river waterbody is connected directly to **Fawnboy Bog/ Lough Nacung SAC (000140)**, and **Derryveagh and Glendowan Mountains SPA (004039).**

- Clady (Donegal)_020 (IE_NW_38C040300) river waterbody is connected directly to **Fawnboy Bog/ Lough Nacung SAC (000140), Gweedore Bay and Islands SAC (001141),**

Cloghernagore Bog and Glenveagh National Park SAC (002047) and **Derryveagh and Glendowan Mountains SPA (004039).**

- Dungloe_010 (IE_NW_38D020020) river waterbody is connected directly **Gannivegil Bog SAC (000142)**

- Gweedore_010 (IE_NW_38G030100) river waterbody is connected directly the **Derryveagh and Glendowan Mountains SPA (004039)**

- Glais Bheagáin_010 (IE_NW_38G180970) river waterbody is connected directly **Rutland Island and Sound SAC (002283).**

- Mullaghderg_010 (IE_NW_38M190990) river waterbody is indirectly linked to **Gweedore Bay and Islands SAC (001141)** and **West Donegal Coast SPA (004150).**

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways. Loading from mains leakage is estimated at 946 kg/yr P of which 251kg/yr P is assumed to be attenuated along flowpaths. The hydraulic loading from the DWWTS is 628kg/yr P, 601 kg/yr P of which is assumed to be attenuated along the flowpaths. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Meenlaragh WWTP- Cnoc_Fola_010 and Dungloe WWTP- Dungloe_020.

The increase in OP concentrations in receiving river waterbodies due to dosing is up to 0.0034 mg/l P (**Table 3; Appendix C**). Bun na Leaca_010, Catheen_010, An Céideadh_010, Glais Bheagáin_010 and Loughanure_010 have predicted dosing concentrations above the 5% of Good/ High boundary (0.00125 mg/l P) but are within the 75% of upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of any RWBs. Catheen_010 is at poor OP indicative water quality status. The modelled dosing concentration is 0.0034 mg/l P, within the significance threshold for poor status waterbodies (0.00485 mg/l P). Baseline concentrations pre and post dosing are within the 75% upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of this RWB. Furthermore, dosing at 0.0019 mg/l P will not prevent the restoration of this waterbody to good status.

Lake water bodies

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

- Nacung Upper (IE_NW_38_26) Lake waterbody is connected directly to **Fawnboy Bog/ Lough Nacung SAC (000140).**

- Meenlecknalore (IE_NW_38_62) and Lough Sallagh (IE_NW_38_62) lake waterbodies are connected directly **Gannivegil Bog SAC (000142) .**

- Fad Dunglow (IE_NW_38_543), Craghy (IE_NW_38_82), Cushkeeragh (IE_NW_38_571) and Namuck (IE_NW_38_606) lake waterbodies are connected directly **Cloghernagore Bog and Glenveagh National Park SAC (002047).**

- Anure (IE_NW_38_83), Lough Fad (IE_NW_ 38_646), Namuck (IE_NW_38_571), Cushkeeragh (IE_NW_38_571), Craghy (IE_NW_38_82), Fad Dunglow (IE_NW_38_543) and Nacung Upper (IE_NW_38_26) lake waterbodies are hydrologically connected to **Derryveagh and Glendowan Mountains SPA (004039).**

- Mullaghderg West (IE_NW_38_85), Mullaghderg East (IE_NW_38_81), Chapel Lough (IE_NW_38_408), Ibby Lough (IE_NW_38_579), Carnboy Lough (IE_NW_38_14) and

Unnamed lake (IE_NW_38_483) lake waterbodies are connected directly to **Gweedore Bay and Islands SAC (001141).**

The increase in OP concentrations in the LWBs as a result of the drinking water dosing is up to 0.0020 mg/l P. This is adopted as Total Phosphorus to assess the potential impact on lakes. The resulting Total Phosphorus concentrations in the lakes following dosing ranges from 0.0050 mg/l P to 0.0119 mg/l P. All LWBs, except for the Unnamed Lake (IE_NW_38_483) have predicted dosing concentrations below the 5% of Good/ High boundary (0.00125 mg/l P) for surface waterbodies and are below the 75% of upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of any of these LWBs. The Unnamed Lake (IE_NW_38_483) is at '*High*' status and receives a modelled dosing concentration of 0.0016 mg/l P which is above the significance threshold for 'High' indicative water quality status waterbodies (0.00125 mg/l P). However, pre and post dosing concentrations are within the 75% upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of this LWB.

Groundwater bodies

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

- Northwest Donegal (IE_NW_G_049) groundwater body is hydrologically linked to **Fawnboy Bog/ Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), Gweedore Bay and Islands SAC (001141), Cloghernagore Bog and Glenveagh National Park SAC (002047, Derryveagh and Glendowan Mountains SPA (004039) and West Donegal Coast SPA (004150)**

The entire dosing area is underlain by one groundwater body (Northwest Donegal GWB). The increase in OP concentrations in the GWB as a result of the P drinking water dosing is 0.0004 mg/l P. The resulting OP concentrations following dosing is 0.0179 mg/l P. Monitoring data is not available for the groundwater body, a surrogate status is derived from the OP indicative quality of adjacent GWBs or based on the OP characterisation of groundwater in the WFD app. The mid-range of that surrogate status is used as baseline concentration. The Northwest Donegal GWB has a predicted dosing concentration below the 5% of Good/ Fail boundary (0.00175 mg/l P) and within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this waterbody or any other GWBs.

Transitional waterbodies

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

- Moorlagh (IE_NW_160_0300) transitional waterbody is connected directly to **Gweedore Bay and Islands SAC (001141).**
- Meenaclady (IE_NW_160_0500) transitional waterbody is connected directly to **Gweedore Bay and Islands SAC (001141).**
- Gweedore Estuary (IE_NW_160_0200) transitional waterbody is connected directly to **Gweedore Bay and Islands SAC (001141)**
- Loch Chionn Caslach (Kincas Lough) (IE_NW_160_0100) transitional waterbody is connected directly to **Gweedore Bay and Islands SAC (001141).**
- Sally's Lough TWB (IE_NW_150_0100) transitional waterbody is connected directly to **Rutland Island and Sound SAC (002283)**

The increase in OP concentrations in the downstream Transitional Waterbodies (TWB) as a result of drinking water dosing is up to 0.0018 mg/l P. The resulting Orthophosphate concentrations following dosing ranges from 0.0127 mg/l P to 0.0143 mg/l P. Predicted dosing concentrations from this project are below the 5% Good/ High boundary (0.00125 mg/l P) for SW. Potential concentrations following dosing are within the 75% of upper threshold for all TWBs in summer and in winter and therefore there is no risk of deterioration in the OP indicative water quality of these transitional and coastal waterbodies.

Coastal waterbodies

Baseline OP monitoring data and associated thresholds are not available for any of the transitional or coastal water bodies. A surrogate 'High' indicative quality was attributed to these water bodies based on the information available from adjacent water bodies. The mid-range of that surrogate status is used as baseline concentration for both the summer and winter seasons. The drinking water dosing with OP does not deteriorate the status of transitional water bodies for both the summer and winter seasons. The EAM process identified four Coastal water bodies (highlighted in bold). Coastal water bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are taken into account:

- **Gweedore Bay (IE_NW_160_0000)** Coastal waterbody is connected directly to **Gweedore Bay and Islands SAC (001141)**, and **West Donegal Islands SPA (004230).**

- **Dungloe Bay (IE_NW_140_0000)** Coastal waterbody is connected directly to **Termon Strand SAC (001195)** and **Rutland Island and Sound SAC (002283).**

- **Rutland Sound (IE_NW_150_0000)** Coastal waterbody is connected directly to and **Rutland Island and Sound SAC (002283).**

Northwestern Atlantic Seaboard (HAs 37;38) (IE_NW_100_0000) coastal waterbody is connected directly to **Aran Islands (Donegal) Cliffs SAC (000111), Ballyness Bay SAC (001090), Gweedore Bay and Islands SAC (001141), Inishbofin, Inishdooey and Inishbeg SPA (004083), Roaninish SPA (004121), Illancrone and Inishkeeragh SPA (004132), West Donegal Coast SPA (004150), West Donegal Islands SPA (004230)** and **Rutland Island and Sound SAC (002283;** however the EAM has determined that there will be no impact on the North-western Atlantic Seaboard (IE_NW_100_0000) due to the dilution available in the Atlantic Ocean (Appendix C).

The increase in OP concentrations in the downstream coastal waterbodies (CWB) as a result of drinking water dosing is up to 0.0021 mg/l P. The resulting OP concentrations following dosing ranges from 0.0131 mg/l P to 0.0146 mg/l P. Predicted dosing concentrations from this project are below the 5% Good/ High boundary (0.00125 mg/l) for SW. Potential concentrations following dosing are within the 75% of upper threshold for all CWBs in summer and in winter and therefore there is no risk of deterioration in the OP indicative water quality of these coastal waterbodies.

Baseline OP monitoring data and associated thresholds are not available for any of the transitional or coastal water bodies. A surrogate 'High' indicative quality was attributed to these water bodies based on the information available from adjacent water bodies. The mid-range of that surrogate status is used as baseline concentration for both the summer and winter seasons. The drinking water dosing with OP does not deteriorate the status of either transitional water bodies or the coastal water bodies for both the summer and winter seasons.

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 OP indicative water quality 'no deterioration' in the context of AA and the QIs of the European Sites.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and the connectivity to the qualifying interests (habitats and species) identified in **Table 2** that are both water dependent and nutrient sensitive (**Appendix B**). Ten European sites remain for evaluation of potential for significant effect: **Aran Islands (Donegal) Cliffs SAC (000111), Fawnboy Bog/ Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), Gweedore Bay and Islands SAC (001141), Termon Strand SAC (001195), Cloghernagore Bog and Glenveagh National Park SAC (002047), Rutland Island and Sound SAC (002283), Derryveagh and Glendowan Mountains SPA (004039), West Donegal Coast SPA (004150) and West Donegal Islands SPA (004230). Aran Islands (Donegal) Cliffs SAC (000111)** is not considered further owing to connectivity being limited to the Northwestern Atlantic Seaboard and the EAM determining that there is significant dilution in the Atlantic Ocean to result in no impact; therefore 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 FAWNBOY BOG/ LOUGH NACUNG SAC 000140

6.1.1 (1029) Freshwater Pearl mussel (*Margaritifera margaritifera*)

Mussels are distributed in the Clady River from near to Lough Nacung to the tidal limits downstream of Bunbeg. Mussels are occasional in the upper stretches near Lough Nacung, becoming frequent - common after 300 m and abundant from 1 km downstream of Gweedore to Bunbeg (NPWS, 2016b). At present, the Clady population is unsustainable owing to lack of survival of juvenile mussels.

Examination of the SSCOs for the Fawnboy bog/ Lough Nacung SAC (NPWS< 2016b) have highlighted that the conservation objective for *Margaritifera margaritifera* is to: 'restore' to favourable conservation condition. This will be achieved through a number of objectives, the main two being to restore the restore sufficient habitat in suitable condition (siltation and nutrient enrichment are key pressures on pearl mussel habitat) and to restore water quality macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93. These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions).

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Freshwater pearl mussel in the Fawnboy bog/ Lough Nacung SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Clady (Donegal) _010 (IE_NW_38C040150) river waterbody has '*High*' OP status, a baseline concentration of *0.0042* mg/l P, a cumulative load of 6.6kg/yr, a baseline following dosing of 0.0042 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Clady (Donegal) _020 (IE_NW_38C040300) river waterbody has 'High' OP status, a baseline concentration of 0.0066 mg/l P, a cumulative load of 36.7 kg/yr, a baseline following dosing of 0.0068 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore, there is no deterioration in water quality from the proposed project on this river waterbody.

- Nacung Upper (IE_NW_38_26) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.6 kg/yr, a baseline following dosing of *0.0050* mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no

deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of 0.0175 mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to freshwater pearl mussel in Fawnboy Bog/Lough Nacung SAC. Therefore potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of freshwater pearl mussel in Fawnboy Bog/Lough Nacung SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these surface water and groundwater bodies has been demonstrated.

6.1.2 (4010) Northern Atlantic wet heaths with *Erica tetralix*, (7130) Blanket bogs (* if active bog), (7150) Depressions on peat substrates of the *Rhynchosporion*

The aforementioned peat habitats occur in mosaics together and have not been mapped in detail for this SAC (NPWS, 2016b). The SSCO's for these habitats include an attribute which relates to Ecosystem function and specifically to soil nutrients, with a target to maintain soil nutrient status within the natural range. Relevant nutrients and their natural ranges are yet to be defined. A further attribute is Vegetation Composition: negative indicator species and a percentage cover threshold for negative indicator species, including those indicating nutrient enrichment, has been set.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to peat habitats in the Fawnboy bog/ Lough Nacung SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Clady (Donegal) _010 (IE_NW_38C040150) river waterbody has '*High*' OP status, a baseline concentration of *0.0042* mg/l P, a cumulative load of 6.6kg/yr, a baseline following dosing of 0.0042 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Clady (Donegal) _020 (IE_NW_38C040300) river waterbody has 'High' OP status, a baseline concentration of 0.0066 mg/l P, a cumulative load of 36.7 kg/yr, a baseline following dosing of 0.0068 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore, there is no deterioration in water quality from the proposed project on this river waterbody.

- Nacung Upper (IE_NW_38_26) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.6 kg/yr, a baseline following dosing of *0.0050* mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no

deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of 0.0175 mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to peatland habitats in Fawnboy Bog/Lough Nacung SAC. Therefore potential for significant effects on these habitats can be excluded

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of peatland habitats in Fawnboy Bog/Lough Nacung SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.2 GANNIVEGIL BOG SAC 000142

6.2.1 (3110) Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

Habitat 3110, the oligotrophic lake habitat (in the Directive entitled 'Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)' typically occurs in soft-water, nutrient poor lakes frequently associated with acid bedrock catchments (notably granite and old red sandstone) overlain by peatland (NPWS, 2013b). All larger lakes (<1ha) within the Gannivegil Bog SAC have been mapped as potential 1130 habitat; this includes Loch mhin Leic na Leabhar (Meenlecknalore) and Lough Sallagh, both of which are in the OP dosing area (NPWS, 2017a)

The Gannevegil Bog SAC SSCO's (NPWS, 2017a) for lake habitat 3110, includes the attribute Water Quality: nutrients. The target for this attribute is to: maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species. It is noted that for this habitat type WFD 'high' status applies. Specifically, annual average Total Phosphorus (TP) concentration should be ≤ 10 µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. The objectives also discuss the appropriate Chlorophyll *a* levels within the waterbodies, specifically during the average growing season (March – October) Chlorophyll *a* concentration should be < 2.5 µg/l and the annual peak chlorophyll a concentration should be ≤ 8 µg/l.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Oligotrophic waters (Habitat 3110) in Gannivegil Bog SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe_010 (IE_NW_38D020020) river waterbody has '*High*' OP status, a baseline concentration of *0.0125* mg/l P, a cumulative load of 0.8 kg/yr, a baseline following dosing of 0.0125 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Meenlecknalore (IE_NW_38_62) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 0.8kg/yr, a baseline following dosing of 0.0050 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Lough Sallagh (IE_NW_38_349) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 0.0 kg/yr, a baseline following dosing of 0.0050 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to oligotrophic waters in Gannivegil Bog SAC. Therefore potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of oligotrophic waters in Gannivegil Bog SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.2.2 (4010) Northern Atlantic wet heaths with *Erica tetralix*, (7130) Blanket bogs (* if active bog)

The aforementioned peat habitats occur in mosaics together and have not been mapped in detail for this SAC (NPWS, 2017b). The SSCO's for these habitats include an attribute which relates to Ecosystem function and specifically to soil nutrients, with a target to maintain soil nutrient status within the natural range. Relevant nutrients and their natural ranges are yet to be defined. A further attribute is Vegetation Composition: negative indicator species and a percentage cover threshold for negative indicator species, including those indicating nutrient enrichment, has been set.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to blanket bog and wet heath habitats in the Gannivegil Bog SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe_010 (IE_NW_38D020020) river waterbody has '*High*' OP status, a baseline concentration of *0.0125* mg/l P, a cumulative load of 0.8 kg/yr, a baseline following dosing of 0.0125 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Meenlecknalore (IE_NW_38_62) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 0.8kg/yr, a baseline following dosing of 0.0050 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Lough Sallagh (IE_NW_38_349) lake waterbody has '*High*' OP status, a baseline concentration of *0.0050* mg/l P, a cumulative load of 0.0 kg/yr, a baseline following dosing of 0.0050 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the WFD status of surface and groundwater bodies connected to blanket bog and wet heath habitats in Gannivegil Bog SAC. Therefore potential for significant effects on these habitats can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of blanket bog and wet heath habitat in Gannivegil Bog SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3 GWEEDORE BAY AND ISLANDS SAC 001141

6.3.1 (1150) Coastal lagoons

The main attributes and targets associated with this habitat and relevant to this project are to maintain the annual median chlorophyll *a* within natural ranges and <5 µg/L; to maintain annual median MRP < 0.1 mg/L; Annual median DIN within natural ranges and < 0.15 mg/L; to maintain/increase the depth of submergent macrophyte colonisation of the lagoon to at least 2 m; to maintain number and extent of listed flora and fauna lagoonal specialists, subject to natural variation; and that negative indicator species be kept absent or under control (NPWS, 2015b). With regard to negative indicator species, increased P could give rise to eutrophication which would favour phytoplankton blooms at the expense of submerged macrophytes. SSCOs supporting document for coastal lagoons indicates that two lagoons are listed for this SAC, Kincas Lough and Moorlagh, however there may be further lagoons within the SAC. These lagoons are reported to be in unfavourable – inadequate conservation condition (NPWS, 2013). NPWS, 2013 (Article 17 Report habitats) finds that main pressures and threats are pollution to surface waters, erosion, fertilisation, modification to hydrographic functioning and reclamation.

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 coastal lagoon habitat in Gweedore Bay and Islands SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Moorlagh (IE_NW_160_0300) transitional waterbody has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in both summer and winter, a cumulative load of 33.9 kg/yr in summer and winter, a baseline following dosing of 0.0143 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Loch Chionn Caslach (Kincas Lough) (NW_160_0100) transitional water body has '*High*' OP status in summer and winter, a baseline concentration of 0.0125 mg/l P in summer and winter, a cumulative load of 6.7 kg/yr in summer and winter, a baseline following dosing of 0.0130 mg/l P. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface waterbodies and groundwater bodies connected to coastal lagoon habitat in Gweedore Bay and Islands SAC. Therefore potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of coastal lagoon habitats in Gweedore Bay and Islands SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.2 (1170) Reefs

Subtidal reef habitat is estimated at 369ha in Gweedore Bay and Islands SAC (NPWS, 2015b). The conservative objective for this site is: to maintain the favourable conservation condition of Reefs in to Gweedore Bay and Islands SAC. The SSCOs describe the main attributes and targets associated with this habitat and relevant to this project. A main attribute relates to reef distribution where the target is to retain a stable distribution subject to natural processes. A further attribute is community structure where the target is to conserve community types in their natural condition.

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

- Meenaclady transitional water body (IE_NW_160_0500) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 36.7 kg/yr in summer and winter, a baseline following dosing of 0.0127 mg/l P for summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good

status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Estuary transitional waterbody (IE_NW_160_0200) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 115.7 kg/yr in summer and winter, a baseline following dosing of 0.0129 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Bay coastal waterbody (IE_NW_160_0000) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 214.9 kg/yr in summer and winter, a baseline following dosing of 0.0131 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Reef habitat in Gweedore Bay and Islands 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 Reefs habitat in Gweedore Bay and Islands SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.3 (1355) Otter (*Lutra lutra*)

Otter are considered likely to occur throughout the Gweedore Bay and Island SAC. A review of the SSCOs (NPWS, 2015b) found no specific attributes or targets relating to water quality. However, the National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS, 2009), provides a review of and response to the pressures and threats to otters in Ireland. Three principal risks to otters were categorized : i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. The risk of water pollution is relevant to this project.

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

- An_Céideadh_010 river water body (IE_NW_38C250960) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 23.3 kg/yr, a baseline following dosing of 0.0141 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Mullaghderg_010 river water body (IE_NW_38M190990) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 6.7kg/yr, a baseline following dosing of 0.0130 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Loughanure_010 river water body (IE_NW_38L150630) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 33.9 kg/yr, a baseline following dosing of 0.0143 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Gweedore_020 river water body (IE_NW_38G030300) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 27.0kg/yr, a baseline following dosing of 0.0128 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Clady (Donegal)_020 river water body (IE_NW_38C040300) has 'High' OP indicative water quality, a baseline concentration of 0.0066 mg/l P, a cumulative load of 36.7 kg/yr, a baseline following dosing of 0.0068 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

- Catheen_010 river waterbody (IE_NW_38C030200) has '*Poor*' OP indicative water quality, a baseline concentration of 0.0833 mg/l P, a cumulative load of 37.1 kg/yr, a baseline following dosing of 0.0867 mg/l P. While the predicted dosing concentration for Catheen_010 is above the 5% Good/High boundary, baseline concentrations pre and post dosing are within the 75% upper threshold. Furthermore, Catheen_010 river waterbody has a modelled dosing concentration below the 0.00485 mg/l P significance threshold for Poor status river waterbodies (i.e. 0.0034 mg/l P) and therefore dosing will not prevent the restoration of this waterbody from achieving good status.

  SSCOs for otter in Gweedore Bay and Islands SAC specify no significant decline of freshwater habitat and no significant decline to the fish biomass that form the diet for otter. Fish specified include salmonids, eels and sticklebacks. Salmon require 'good' status however salmonids are not listed as a qualifying interest in this SAC.

- Owencronahulla_010 river waterbody (IE_NW_38O090300) has '*Good*'' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 21.0 kg/yr, a baseline following dosing of 0.0137 mg/l P. The WFD OP indicative water quality does not change, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

- Bun Na Leaca_010 river water body (IE_NW_38B280640) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 17.8 kg/yr, a baseline following dosing of 0.0145 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

- Cnoc_Fola_010 river water body (IE_NW_38C540200) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 5.0 kg/yr, a baseline following dosing of 0.0131 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

- Mullaghderg West lake waterbody (IE_NW_38_85) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Mullaghderg East lake waterbody (IE_NW_38_81) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Chapel Lough (IE_NW_38_408) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Ibby Lough (IE_NW_38_579) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Carnboy Lough [IE_NW_38_14] has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Meenaclady transitional water body (IE_NW_160_0500) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 36.7 kg/yr in summer and winter, a baseline following dosing of 0.0127 mg/l P for summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Estuary transitional waterbody (IE_NW_160_0200) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 115.7 kg/yr in summer and winter, a baseline following dosing of 0.0129 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Bay coastal waterbody (IE_NW_160_0000) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 214.9 kg/yr in summer and winter, a baseline following dosing of 0.0131 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Loch Chionn Caslach (Kincas Lough) (NW_160_0100) transitional water body has '*High*' OP status in summer and winter, a baseline concentration of 0.0125 mg/l P in summer and winter, a cumulative load of 6.7 kg/yr in summer and winter, a baseline following dosing of 0.0130 mg/l P. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the WFD status of surface and ground water bodies connected to Otter in Gweedore Bay and Islands 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 Otter in Gweedore Bay and Islands SAC / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.3.5 (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes), (2140) Decalcified fixed dunes with *Empetrum nigrum*, (2150) Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), (2170) Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*), (2190) Humid dune slacks, (21A0) Machairs (* in Ireland), (1395) Petalwort (*Petalophyllum ralfsii*)

Gweedore Bay and Islands SAC is designated for a range of coastal dune and grassland habitats and species as listed above that are usually found in close association with each other. The SSCOs (NPWS, 2015b) and coastal supporting document (NPWS, 2015b) set out the conservation objectives for these habitats and species which are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. Vegetation composition includes the target to maintain a typical flora (species and sub communities; including the Annex II plant species Petalwort) for the particular sand dune habitat and the target that negative indicators (e.g. nettles indicative of change in nutrient status) should make up less than 5% vegetation cover. This OP dosing project has the potential to impact on the vegetation composition of these habitats where there is a change in nutrient inputs.

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

- Meenaclady transitional water body (IE_NW_160_0500) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 36.7 kg/yr in summer and winter, a baseline following dosing of 0.0127 mg/l P for summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Estuary transitional waterbody (IE_NW_160_0200) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 115.7 kg/yr in summer and winter, a baseline following dosing of 0.0129 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Moorlagh (IE_NW_160_0300) transitional waterbody has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in both summer and winter, a cumulative load of 33.9 kg/yr in summer and winter, a baseline following dosing of 0.0143 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Loch Chionn Caslach (Kincas Lough) (NW_160_0100) transitional water body has '*High*' OP status in summer and winter, a baseline concentration of 0.0125 mg/l P in summer and winter, a cumulative load of 6.7 kg/yr in summer and winter, a baseline following dosing of 0.0130 mg/l P. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to dune habitats and associated species in Gweedore Bay and Islands SAC. Therefore potential for significant effects on these habitats and species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats and related species in Gweedore Bay and Islands SAC / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.6 (1833) Slender naiad (*Najas flexilis*)

Gweedore Bay and Islands SAC contains three freshwater lakes with populations of *Najas flexilis*: Mullaghderg West lake, Mullaghderg East lake and Lough Ibby. All three are located in the dosing zone of influence. *Najas flexilis* is typically associated with high water quality, i.e. the absence of eutrophication impacts and eutrophication is considered to have a significant negative impact on *Najas flexilis* (NPWS, 2015). An annual mean TP of < 10 µg l^{-1} is considered necessary for *Najas flexilis* lakes. Where the mean TP concentrations are lower than this standard, there should be no increase in annual mean, i.e. no upward trends (NPWS, 2015b)

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

- Mullaghderg West lake waterbody (IE_NW_38_85) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Mullaghderg East lake waterbody (IE_NW_38_81) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Ibby Lough (IE_NW_38_579) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Slender naiad habitat in Gweedore Bay and Islands 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 these habitats and related species in Gweedore Bay and Islands SAC / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.7 (3110) Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

Habitat 3110, the oligotrophic lake habitat (in the Directive entitled 'Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)' typically occurs in soft-water, nutrient poor lakes

frequently associated with acid bedrock catchments (notably granite and old red sandstone) overlain by peatland.

The selection of this SAC for habitat 3110 was based on data for Mullaghderg West lake and Mullaghderg East lake. However re-examination of these data and the occurrence of Slender naiad suggest that their vegetation is more closely aligned to habitat 3130 (NPWS, 2015b) (non-qualifying interest for the SAC). It is considered possible that lake habitat 3110 may occur in the small lake in Derrybeg townland; it is highly unlikely to occur in lakes influenced by calcareous sand and the sea, both of which are prevalent in this SAC (NPWS, 2015b).

For lake habitat 3110, annual average Total Phosphorus (TP) concentration should be ≤ 10 µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. The objectives also discuss the appropriate Chlorophyll *a* levels within the waterbodies, specifically during the average growing season (March – October) Chlorophyll *a* concentration must be < 5.8 µg/l, annual Chlorophyll *a* concentration must be < 2.5 µg/l and the annual peak chlorophyll a concentration should be ≤ 8 µg/l.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Habitat 3110 in Gweedore Bay and Islands SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Mullaghderg West lake waterbody (IE_NW_38_85) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Mullaghderg East lake waterbody (IE_NW_38_81) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Chapel Lough (IE_NW_38_408) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Ibby Lough (IE_NW_38_579) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Carnboy Lough [IE_NW_38_14] has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 6.7 kg/yr, a baseline following dosing of 0.0055 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Unnamed lake (IE_NW_38_483) lake waterbody has '*High*' OP indicative water quality, a baseline concentration of 0.0050 mg/l P, a cumulative load of 23.3 kg/yr, a baseline following dosing of 0.0066 mg/l P. Although this waterbody is exceeding the 5% Good/High boundary (0.0015 mg/l P) it is still significantly below the 75% status threshold and therefore there will be no deterioration in OP indicative water quality.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

6.3.8 (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Gweedore Bay and Islands SAC supports one sub site with Mediterranean salt meadow habitat (0.09ha) with a number of potential additional areas identified (9.66ha). The SSCOs (NPWS, 2015) and coastal supporting document (NPWS, 2015) set out the conservation objectives for this habitat and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. The target for vegetation composition is to ensure that a typical flora of saltmarshes is maintained, as are the range of sub-communities within the different tidal zones. The composition of the saltmarsh community may be affected by changes in water quality where they result in changes to nutrient inputs.

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 saltmarsh habitat in Gweedore Bay and Islands SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Gweedore Estuary transitional waterbody (IE_NW_160_0200) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 115.7 kg/yr in summer and winter, a baseline following dosing of 0.0129 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter, therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Gweedore Bay coastal waterbody (IE_NW_160_0000) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 214.9 kg/yr in summer and winter, a baseline following dosing of 0.0131 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to saltmarsh habitat in Gweedore Bay and Islands 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 these habitats in Gweedore Bay and Islands SAC / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.4 CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC 002047

6.4.1 (1029) Freshwater pearl mussel *Margaritifera margaritifera*

The conservation objective for this SAC is to restore the Glaskeelan and Owencarrow freshwater pearl mussel populations (NPWS, 2017b). These populations do not lie within the OP dosing zone of influence. The Clady population does lie within the zone of influence and this population is part of the Fawnboy Bog/Lough Nacung SAC (Section 6.2). The freshwater pearl mussel populations of this SAC do not interact with the zone of influence of the dosing area and this species is not considered further.

6.4.2 (1106) Atlantic salmon *Salmo salar*

The SSCOs for salmon in the Cloghernagore Bog and Glenveagh National Park SAC (NPWS, 2017b) are to 'maintain' favourable conservation condition. The distribution target refers to '% river accessible'. Water quality is a particular threat to salmon. King *et al*. (2011) highlight the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to salmon including the potential effects from municipal discharges. The SSCO (NPWS, 2017b) requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

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

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded

because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Salmon in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this species can be excluded.

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

6.4.3 (1355) Otter *Lutra lutra*

A review of the SSCOs for otter (NPWS, 2017b) found no specific attributes or targets relating to water quality. However the National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS, 2009), provides a review of and response to the pressures and threats to otters in Ireland. Three principal risks to otters are categorised: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. There will be no interference with the terrestrial, marine or freshwater habitat of the species as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater. The current FCS target is for 88% however, the current range is 93.6% and so the CO for otter in the Cloghernagore Bog and Glenveagh National Park SAC is to maintain the favourable conservation condition. A nutrient quality target of 'good' status is adopted here, to align with that outlined for fish fauna that form part of the diet of otter in the Cloghernagore Bog and Glenveagh National Park SAC.

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

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Otter in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this species can be excluded.

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

6.4.4 (1421) Killarney fern (*Trichomanes speciosum*)

Killarney fern is currently known from one location in Cloghernagore Bog and Glenveagh National Park SAC, within hectad B91. A review of the SSCOs for Killarney fern (NPWS, 2017) found no specific attributes or targets relating to nutrients or water quality. Hectad B91 is upstream of the dosing area; it is therefore considered that dosing will not prevent the maintenance or restoration of favourable conservation condition of Killarney fern in the Cloghernagore Bog and Glenveagh National Park SAC / no deterioration of its favourable conservation condition is identified.

6.4.5 (3110) Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

Habitat 3110, the oligotrophic lake habitat (in the Directive entitled 'Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)' typically occurs in soft-water, nutrient poor lakes frequently associated with acid bedrock catchments (notably granite and old red sandstone) overlain by peatland (NPWS, 2013b).

All lakes larger than 1ha were mapped as potential 3110 habitat. SSCO's (NPWS, 2017b) for lake habitat 3110, include attributes and targets related to water quality and specifically nutrients where: annual average Total Phosphorus (TP) concentration should ≤ 10µg/l TP.. Targets for phytoplankton biomass are also specified where: during the average growing season (March – October) Chlorophyll *a* concentration must be < 5.8 µg/l; the annual Chlorophyll *a* concentration must be < 2.5 µg/l and the annual peak chlorophyll a concentration should be ≤ 8 µg/l.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to oligotrophic waters (habitat 3110) in Cloghernagore Bag and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to Oligotrophic waters in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of otter in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated

6.4.6 (3260) Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

The EU definition of this habitat is very broad. This habitat type can occur over a wide range of physical conditions, from acid, oligotrophic, flashy upland streams to more eutrophic slow flowing streams (NPWS, 2017b). The distribution of water courses of plain to montane levels habitat and their sub-types has not been fully determined in the Cloghernagore Bog and Glenveagh National Park SAC. The SSCO attributes and targets relevant to the current project are 'water quality: various' and to 'maintain appropriate water quality to support the natural structure and functioning of the habitat'. While specific targets will vary with sub types it is noted (SSCO, NPWS, 2017b) that the rivers within this SAC are naturally very nutrient poor and therefore typically require WFD high status in terms of nutrient and oxygenation standards.

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 water courses of plain to montane levels (Habitat 3260) in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this habitat can be excluded.

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

6.4.7 (4010) Northern Atlantic wet heaths with *Erica tetralix*, (7130) Blanket bogs (*if active bog), (7150) Depressions on peat substrates of the Rhynchosporion, (4030) European dry heaths, (4060) Alpine and Boreal Heaths.

The aforementioned peat habitats occur in mosaics together and have not been mapped in detail for this SAC. The SSCO's for these habitats include an attribute which relates to Ecosystem function and specifically to soil nutrients, with a target to maintain soil nutrient status within the natural range suited to the habitat. Relevant nutrients and their natural ranges are yet to be defined however, Appendix B lists these habitats as water sensitive and nutrient dependent for the purposes of this OP dosing project.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to peat habitats in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to the abovementioned peat habitats in Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on these habitats can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of favourable conservation condition of the above-mentioned peat habitats in this SAC/ no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.4.8 (6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

The Annex I habitat 6410 is represented in Ireland by both fen and grassland communities on nutrient poor soils. Within Ireland Molinia meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a Marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2013b). Molinia meadows have not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC (SSCO's), however they are known to occur in areas that are subjected to occasional flooding in the SAC. An attribute for this habitat relates to vegetation composition and specifically: typical species and negative indicator species, both of which may be affected by changes in nutrient inputs arising from water quality changes. The target for these attributes is to maintain at least seven positive indicator species and to control negative indicator species.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Molinia meadow habitats in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore

there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to the above mentioned Molinia meadow habitat in Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this habitat can be excluded.

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

6.5 RUTLAND ISLAND AND SOUND SAC 002283

6.5.1 (1150) Coastal lagoons,

This site encompasses 1 mapped lagoon/ lagoon complexes (NPWS, 2013e). The main attributes and target associated with this habitat and relevant to this project are to maintain the annual median chlorophyll a within natural ranges and <5 µg/L; to maintain annual median MRP < 0.1 mg/L; to maintain/increase the depth of submergent macrophyte colonisation of the lagoon at least 2 m; to maintain number and extent of listed flora and fauna lagoonal specialists, subject to natural variation; and that negative indicator species be kept absent or under control (NPWS, 2013). With regard to negative indicator species, increased orthophosphate would favour phytoplankton blooms at the expense of submerged macrophtyes; the potential for this effect is evaluated below.

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 coastal lagoon habitat in Rutland Island and Sound SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Glais Bheagáin_010 (IE_NW_38G180970) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 23 kg/yr, a baseline following dosing of 0.0142 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this groundwater body.

- Sallys Lough TWB (IE_NW_150_0100) transitional waterbody has a 'High' OP indicative water quality, a baseline concentration of 0.0125 mg/l P for both summer and winter, a cumulative load of 0.0017 kg/yr, a potential concentration of 0.0142 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to coastal lagoon habitat in Rutland Island and Sound SAC. Therefore potential for significant effects on this habitat can be excluded.

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

6.5.2 (1160) Large shallow inlets and bays, (1170) Reefs

This site contains 5 recorded community types (NPWS, 2013): Coarse sediment with crustaceans community complex (1160), Sand with *Tellina* sp. and *Perioculodes longimanus* community complex (1160), *Zostera*-dominated community (1160), Intertidal reef community (1160 and 1170) and *Laminaria*-dominated community complex (1160 and 1170).

SSCOs (NPWS, 2013e) for these habitats are to: maintain the extent and high quality of the *Zostera*-dominated communities subject to natural processes; and to conserve the Coarse sediment with crustaceans community complex (1160), Sand with *Tellina* sp. and *Perioculodes longimanus* community complex (1160), Intertidal reef community (1160 and 1170) and *Laminaria*-dominated community complexes (1160 and 1170), in a natural condition. Increased nutrients could negatively impact these communities by encouraging development of unfavourable sediment conditions.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to large shallow inlet and bay and reef habitats in Rutland Island and Sound SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe Bay (IE_NW_140_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 97.1 kg/yr (summer and winter), a potential concentration of 0.0140 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Rutland Sound (IE_NW_150_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 29.3 kg/yr (summer and winter), a potential concentration of 0.0146 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Large shallow inlets and bays (1160) and Reef (1170) habitats in Rutland Island and Sound SAC. Therefore, potential for significant effects on these habitats can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats / no deteriorations of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.5.3 (1210) Annual vegetation of drift lines, (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

Rutland Island and Sound SAC is designated for a range of coastal habitats and species as listed above that are usually found in close association with each other. The SSCOs (NPWS, 2013e) and coastal supporting document (NPWS, 2013) set out the conservation objectives for these habitats and species and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. Vegetation composition includes the target to maintain a typical flora (species and sub communities) for the particular coastal and sand dune habitat and the target that negative indicators (e.g. nettles indicative of change in nutrient status) should make up less than 5% vegetation cover.This OP dosing project has the potential to impact on the vegetation composition of these habitats where there is a change in nutrient inputs.

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

- Dungloe Bay (IE_NW_140_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 97.1 kg/yr (summer and winter), a potential concentration of 0.0140 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Rutland Sound (IE_NW_150_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 29.3 kg/yr (summer and winter), a potential concentration of 0.0146 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to (1210) Annual vegetation of drift lines, (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 habitats in Rutland Island and Sound SAC. Therefore, potential for significant effects on these habitats can be excluded.

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

6.5.4 (1365) Harbour Seal *Phoca vitulina*

The harbour seal is the smaller of two species of the Phocidae genus that commonly breed around the coast of Ireland. Harbour seals in the Rutland Island and Sound SAC occupy both aquatic habitats and intertidal shorelines that become exposed during the tidal cycle with a preference for enclosed sheltered coastal bays and estuaries. Attributes and targets set out by the SSCO which bear specific relevance to this project are: to conserve the breeding sites in a natural condition; to conserve the moult haul-out sites

in a natural condition; to conserve the resting haul-out sites in a natural condition; and that human activities should occur at levels that do not adversely affect the harbour seal population at the site. This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour seals depend. The OP dosing has the potential to cause deterioration in water quality, a key resource upon which harbour seals depend.

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

- Dungloe Bay (IE_NW_140_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 97.1 kg/yr (summer and winter), a potential concentration of 0.0140 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

- Rutland Sound (IE_NW_150_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 29.3 kg/yr (summer and winter), a potential concentration of 0.0146 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to harbour seal in the Rutland Island and Sound SAC. Therefore, potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of harbour seal in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.6 DERRYVEAGH AND GLENDOWAN MOUNTAINS SPA 004039

Derryveagh and Glendowan Mountains SPA in north-west Donegal, is an extensive upland area (300 – 678 m) comprising Glenveagh National Park, a substantial part of the Derryveagh and Glendowan Mountains and a number of the surrounding lakes. The site is a SPA for its breeding populations of (A001) Red-throated Diver, (A098) Merlin, (A103) Peregrine, (A140) Golden Plover, and (A466) Dunlin. Red-throated diver breed on small (<5 Ha) bog loughs within the SAC (Cromie, 2002) and feed away from their nest site on nearby lakes or coastal waters. Ireland holds a small population of under 10 pairs (Cromie, 2002). Changes in water quality may affect the foraging resources available to Red-throated diver. The COs (NPWS, 2016) are to maintain or restore the favourable conservation condition of the above listed bird species.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the above listed bird species in Derryveagh and Glendowan Mountains SPA. It is assumed that bird species have the potential to interact with all surface waterbodies and groundwater bodies (via seepages) identified in **Table 3**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Clady (Donegal) _010 (IE_NW_38C040150) river waterbody has '*High*' OP status, a baseline concentration of *0.0042* mg/l P, a cumulative load of 6.6kg/yr, a baseline following dosing of

0.0042 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Gweedore_010 river waterbody (IE_NW_38G030100) has 'High' OP status, a baseline concentration of 0.0058 mg/l P, a cumulative load of 8.4kg/yr, a baseline following dosing of 0.0059 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

- Dungloe_020 (IE_NW_38D020250) river waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0250* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0261mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Fad Dunglow lake waterbody (IE_NW_38_543) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Craghy Lake waterbody (IE_NW_38_82) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Cushkeeragh lake waterbody (IE_NW_38_571) has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Namuck (IE_NW_38_606] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 43.9 kg/yr, a baseline following dosing of 0.0061 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this lake waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Lough Fad [IE_NW_ 38_646] lake waterbody has '*High*' OP indicative water quality, a baseline concentration of *0.0050* mg/l P, a cumulative load of 33.9 kg/yr and a baseline following dosing of 0.0068 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody.

- Anure (IE_NW_38_83) lake waterbody has 'Good' OP indicative water quality, a baseline concentration of 0.0077 mg/l P, a cumulative load of 8.4 kg/yr and a baseline following dosing of 0.0078 mg/l P and a 'High' OP status following dosing. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this lake waterbody

- Northwest Donegal (IE_NW_G_049) groundwater body has '*Good*' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to habitats associated with the above-mentioned bird species in Derryveagh and Glendowan Mountains SPA. Therefore, potential for significant effects on these species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of habitats associated with the above-mentioned bird species in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.7 WEST DONEGAL COAST SPA 004150

West Donegal Coast SPA comprises separate sections of the Co. Donegal coastline and extends from Muckros Head in the south, northwards to Slieve League, Malin Beg, Rocky Point, Glen Head, Slieve Tooey, Maghera, Loughros Point, Dunmore Head, Aran Island, Magheradrumman, Carrickfin, Carnboy, Bunbeg, Magheragallan, Lunniagh, as far as Carrick, to the south of Bloody Foreland. The site includes the high coast areas and sea cliffs of the mainland and Aran Island, the land adjacent to the cliff, areas of sand dunes/machair at Maghera, Mullaghderg, Braade/Carrickfin/Carnboy, Magheragallan and Lunniagh/Carrick, and also several areas further inland of the coast at Croaghmuckros and Slieve League, north of Glencolumbkille and south of Dunmore Head (NPWS, 2018d).

The site is an SPA for its breeding populations of (A009) Fulmar (*Fulmarus glacialis*), (A017) Cormorant (*Phalacrocorax carbo*), (A018) Shag (*Phalacrocorax aristotelis*), (A184) Herring Gull (*Larus argentatus*), (A188) Kittiwake (*Rissa tridactyla*), (A200) Razorbill (*Alca torda*), A346 Chough (*Pyrrhocorax pyrrhocorax*) and (A103) Peregrine (*Falco peregrinus*), Aside from Chough and Peregrine, these breeding birds rely on coastal and for some freshwater (Cormorant) habitats for foraging. Changes in water quality may affect their foraging resources. The COs (NPWS, 2018d) are to maintain or restore the favourable conservation condition of the above listed bird species.

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

habitats used by the abovementioned bird species within the West Donegal Coast SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, a baseline concentration of *0.0175* mg/l P, a cumulative load of 51.6 kg/yr, a baseline following dosing of 0.0179 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Mullaghderg_010 river water body (IE_NW_38M190990) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 6.7kg/yr, a baseline following dosing of 0.0130 mg/l P. The WFD OP indicative water quality does not change, i.e. High, therefore there is no deterioration in water quality from the proposed project on this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because 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.

- Bun Na Leaca_010 river water body (IE_NW_38B280640) has '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 17.8 kg/yr, a baseline following dosing of 0.0145 mg/l P. The WFD OP indicative water quality does not change, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is no deterioration in water quality from the proposed project on this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to West Donegal Coast SPA. Therefore, potential for significant effects on the above mentioned species can be excluded

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species in West Donegal Coast SPA / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.8 WEST DONEGAL ISLANDS SPA 004230

This site is a SPA for its wintering population of Barnacle Goose (*Branta leucopsis*) and its breeding populations of (A018) Shag (*Phalacrocorax aristotelis*), (A045) (A122) Corncrake (*Crex crex*), (A182) Common Gull (*Larus canus*) and (A184) Herring Gull (*Larus argentantus*). Changes in water quality may affect the foraging resources available to these species. The COs (NPWS, 2018e) are to maintain or restore the favourable conservation condition of the above listed bird species.

Table 3 identifies the surface water and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are potentially further connected to habitat used by the abovementioned bird species within the West Donegal Coast SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Gweedore Bay coastal waterbody (IE_NW_160_0000) has '*High*' OP status in summer and winter, a baseline concentration of *0.0125* mg/l P in summer and winter, a cumulative load of 214.9 kg/yr in summer and winter, a baseline following dosing of 0.0131 mg/l P for both summer and winter. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good

status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to West Donegal Islands SPA. Therefore, potential for significant effects on the above mentioned species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species in West Donegal Islands SPA / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.9 TERMON STRAND SAC 001195

6.9.1 (1150) Coastal lagoons

Termon Strand supports Maghery Lough coastal lagoon. This is connected to the sea by an inlet between it and Maghery Bay. SSCOs supporting document (NPWS, 2016) for coastal lagoons indicates that in Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution. NPWS, 2013 (Article 17 Report) finds that main pressures and threats are pollution to surface waters, erosion, fertilisation, modification to hydrographic functioning and reclamation. The main attributes and target associated with this habitat and relevant to this project are to maintain the annual median chlorophyll a within natural ranges and <5 µg/L; to maintain annual median MRP < 0.1 mg/L; to maintain/increase the depth of submergent macrophyte colonisation of the lagoon at least at 2m; to maintain number and extent of listed flora and fauna lagoonal specialists, subject to natural variation; and that negative indicator species be kept absent or under control (NPWS, 2016c). With regard to negative indicator species, increased P could give rise to eutrophication which would favour phytoplankton blooms at the expense of submerged macrophtyes.

Table 3 identifies the surface water and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are potentially further connected to habitat used by the abovementioned habitat within the Termon Strand SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Dungloe Bay (IE_NW_140_0000) coastal waterbody has a '*High*' OP indicative water quality, a baseline concentration of *0.0125* mg/l P for both summer and winter, a cumulative load of 97.1 kg/yr (summer and winter), a potential concentration of 0.0140 mg/l P for both summer and winter following dosing. The WFD OP indicative water quality does not change, i.e. High, in summer and winter. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P), therefore there is not deterioration in water quality from the proposed project on this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Crolly WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Coastal lagoon habitat in Termon Strand 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 coastal lagoon habitat in this SAC / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

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. Impact identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative effects are likely to be significant.

Donegal County Council Development Plan was reviewed for developments that may have in-combination effects on European Sites with the ZoI. Plans relevant to the area were searched in order to identify any elements of the plans that may act cumulatively or in-combination with the proposed development.

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Donegal County Council Development Plan 2012 – 2018. The objectives of relevance in the Donegal County Development Plan include under Infrastructure (Water and Environmental Services): **WES-0-1** Provision of adequate and secure supply of clean and wholesome drinking water to existing supply areas and to those areas identified for growth; Protection and improvement of existing water quality supply; protection and conservation of the County's water resources through minimisation of leakage and promotion of public awareness and involvement in water conservation; provision of adequate wastewater treatment for public collection systems and adequate capacity. **WES-0-4** Maintain, protect, improve and enhance surface waters and groundwater quality in accordance with the River Basin Management Plan For Ireland 2018-2021. **WES-0-5** Provision of environmental protection of surface water and groundwater from pollution in accordance with the River Basin Management Plan, Groundwater Protection Scheme and Source Protection Plans for public water supplies; protection against soil contamination; ensuring full compliance with relevant National and European Regulations, Statutes and Directives through monitoring and control of relevant activities. The exact nature and location of the majority of the developments under the **County Donegal Development Plan 2018 -2024** are, as yet, undefined, however any developments, in the form of individual projects and plans will be subjected, during the early planning and application stages to assessments to investigate their impacts, either alone or in combination with other plans or projects on Natura 2000 sites. Specific and targeted mitigation measures will be proposed for individual projects and plans as they evolve and are brought through the planning process. This approach will ensure that the content, policies and objectives of the	▪ N/A	The Donegal County Council Development Plan 2014 – 2020 emphasises the objectives of its water services which include enhancement and improved quality of the service to its customers. The plan also outlines the importance of compliance with the North Western River Basin Management Plan (now replaced by the Draft National Plan 2018-2011[11]), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.

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

Donegal County Development Plan 2018 to 2024 adequately protects, conserves or restores the Natura 2000 network.		
River Basin Management Plan For Ireland 2018 – 2021 Public Consultation on the River Basin Management Plan (RBMP) for Ireland (2018 – 2021), began in February 2017. The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. Nationally, both monitored river waterbodies and lakes at 'high' or 'good' ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river waterbodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each waterbody that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of waterbodies nationally, which had been characterised at the time. 1,517 waterbodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake waterbodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each waterbody. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and	▪ 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 waterbodies. The establishment of how flooding may be contributing to

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	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[12]. 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 impacts 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 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and	The RDP for 2014 – 2020 has been subject to SEA[13], and AA[14]. 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

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

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

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

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 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.	▪ Disturbance to habitats / species;	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 measures in place, it was concluded that there would be no significant in-combination impacts on Natura 2000 sites.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and	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

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.	▪ Disturbance to habitats / species	network and a Stage 2 AA was not required[15]. 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 Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to waterbodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[16]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.

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

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

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	▪ Changes to water quality or quantity; and	The plan is subject to SEA and AA which have also been published and are available at http://www.water.ie. Upstream dosing areas have been considered in the EAM

standard for lead due to lead pipework. This strategy has been realised in the 2016 Lead Mitigation Plan.	▪ Nutrient enrichment /eutrophication.	and the cumulative effect of dosing has been taken into account in the EAMs model.

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects on European Sites arising from the proposed OP dosing at Crolly WTP, within the Rosses WSZ 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 **Fawnboy Bog/ Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), Ballyness Bay SAC (001090), Gweedore Bay and Islands SAC (001141), Termon Strand SAC (001195), Cloghernagore Bog and Glenveagh National Park SAC (002047), Rutland Island and Sound SAC (002283), Derryveagh and Glendowan Mountains SPA (004039), West Donegal Coast SPA (004150) and West Donegal Islands SPA (004230)** 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. 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 (at this stage) that an AA is not required.

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NPWS (2016b) Conservation Objectives: Fawnboy Bog/Lough Nacung SAC 000140. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2016c) Conservation Objectives: Termon Strand SAC 001195. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017a) Conservation Objectives: Gannivegil Bog SAC 000142. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017b) Conservation Objectives: Cloghernagore Bog and Glenveagh National Park SAC 002047. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2018a) Conservation objectives for Inishbofin, Inishdooey and Inishbeg SPA [004083]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2018b) Conservation objectives for Roaninish SPA [004121]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

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Appendix A

European Sites - Conservation Objectives

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Aran Island (Donegal) Cliffs SAC 000111

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe 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***

000111	Aran Island (Donegal) Cliffs SAC
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
4030	European dry heaths
4060	Alpine and Boreal heaths
8210	Calcareous rocky slopes with chasmophytic vegetation
8220	Siliceous rocky slopes with chasmophytic vegetation
8330	Submerged or partially submerged sea caves

Please note that this SAC overlaps with West Donegal Coast SPA (004150). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site 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 :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2012
Title :	Ireland Red List no. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Aran Island (Donegal) Cliffs SAC (site code: 111) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2016
Title :	Aran Island (Donegal) Cliffs SAC (site code: 111) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F.; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	2005
Title :	National inventory of sea cliffs and coastal heaths
Author :	Browne, A.
Series :	Unpublished Report to NPWS

Spatial data sources

Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 3)
Year :	Derived 2016
Title :	Coast of Ireland Oblique Imagery Survey 2003
GIS Operations :	Point dataset created from visual inspection of survey
Used For :	8330 (map 4)

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Aran Island (Donegal) Cliffs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For the sub-site mapped (Ballintra, Aran Island), total length of cliff sections: 18.06km. See map 3	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Cliffs are linear features and are therefore measured in kilometres. The sub-site Ballintra, Aran Island (site ID: 03058) was identified using a combination of aerial photos and the DCENR helicopter viewer. The length of cliff was measured (in sections) to give a total estimated area of 18.06km within the SAC. The length of cliff is likely to be underestimated. See the Aran Island (Donegal) Cliffs SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3	Sea cliffs are known to occur along the coastline from Cladaghlahan Bay to Bellachreesh Bay. Only hard cliffs have been noted in this SAC and it is thought that all of the cliffs are of the hard type (Browne, 2005; Barron et al., 2011). See the coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes, including groundwater quality, due to artificial structures	Based on data from Barron et al. (2011). Maintaining natural geomorphological processes, including natural erosion, is important for the health of vegetated sea cliffs. Hydrological processes maintain flushes, and in some cases tufa formations, that can be associated with sea cliffs. Hydrological features such as gullies, streams and cascades were identified by the ISCS as occurring at Aran Island (Donegal) Cliffs SAC. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from Barron et al. (2011). Dry heath and maritime grassland occur adjacent to sea cliff vegetation at Aran Island (Donegal) Cliffs SAC. See the coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Barron et al. (2011). The dry heath and coastal grassland communities at Aran Island (Donegal) Cliffs SAC have been damaged due to overgrazing by sheep. See the 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 the Irish Sea Cliff Survey (Barron et al., 2011)	The vegetation of Aran Island (Donegal) Cliffs SAC is varied. Few plants survive on the sheer cliffs, while an interesting flora occurs on the fissures of limestone and siliceous cliffs. All the plants present are tolerant of saline exposure and are typical species of splash zone and maritime grassland of hard cliffs. In addition, the very rare Hart's Saxifrage (*Saxifraga rosacea* subsp. *hartii*; synonym *S. hartii*), an Alpine plant listed in Curtis and McGough (1988) and on the Flora (Protection) Order, 2015, occurs on the cliffs. This is the only known location for this plant, which is endemic to Ireland (NPWS internal files). See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details

Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from Barron et al. (2011). Bracken has not been recorded on the sea cliffs at Aran Island (Donegal) Cliffs SAC. See the coastal habitats supporting document for further details

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Aran Island (Donegal) Cliffs 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	European dry heaths has not been mapped in detail for Aran Island (Donegal) Cliffs SAC and thus the total area of the qualifying habitat is unknown. Dry heath merges with the vegetation of vegetated sea cliffs (1230), Alpine and Boreal heath (4060) and coastal grassland at the west of the SAC and with bog at the east (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See note on area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of dry heath communities within this SAC is unknown. Information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Attribute and target based on Perrin et al. (2014). Dry heath is not necessarily rich in lichen and bryophyte species, but a minimum amount should still be present
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented. Bell heather (*Erica cinerea*) and ling (*Calluna vulgaris*) are listed as present in the dry heath in this SAC (NPWS internal files)
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	Attribute and target based on Perrin et al. (2014). Bog-myrtle is indicative of flushed conditions and is more characteristic of wet heaths and blanket bogs. Creeping willow is more characteristic of dune heaths. Western gorse is a component of dry heath, but high proportions of it may indicate a history of undesirable levels of grazing
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014). High cover of native trees and shrubs would indicate that the habitat may be succeeding towards scrub or woodland due to lack of grazing
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of bracken would indicate that the habitat may be succeeding towards a dense bracken community

Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of soft rush would suggest undesirable hydrological conditions. Note however, that poor flushes dominated by soft rush can naturally occur in mosaic with this habitat. Discrete areas of this separate habitat should not be considered here
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Attribute and target based on Perrin et al. (2014). Senescence is part of the natural cycle of ling, but a dominance of ling in the senescent phase would indicate a lack of management (appropriate grazing or burning) to promote ling regeneration
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids showing signs of browsing	Attribute and target based on Perrin et al. (2014). Overgrazing has been cited as damaging to the habitat within the SAC (NPWS internal files)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas is also presented. Fires can be part of the natural cycle of dry heath and may also be used as a valuable management tool to promote a diversity of growth phases in ling (*Calluna vulgaris*). However, currently most hill fires in Ireland are intentionally started to encourage grass growth for livestock. Fires which are too intense, too frequent, too extensive or which occur in sensitive areas are damaging to the habitat
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas is also presented. The growth phases of ling are pioneer (<10cm high), building (10-30cm high) and mature (<30cm high). As burning is undesirable in sensitive areas, it is not reasonable to require the stated diversity of growth phases within these areas
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints and vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Curtis and McGough, 1988; Lockhart et al., 2012)

4060 Alpine and Boreal heaths

To maintain the favourable conservation condition of Alpine and Boreal heaths in Aran Island (Donegal) Cliffs 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	Alpine and Boreal heath has not been mapped in detail for Aran Island (Donegal) Cliffs SAC and thus the total area of qualifying habitat is unknown. It is found along the top of the cliffs, particularly east of Torneady Point, and also occurs in association with the vegetation of the vegetated sea cliffs (1230), dry heath (4030) and dry grassland (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See note on area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of Alpine and Boreal heath communities within this SAC is unknown. Information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014). Alpine and Boreal heath is not necessarily rich in lichen and bryophyte species, but a minimum amount should still be present
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 66%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Bearberry (*Arctostaphylos uva-ursi*), crowberry (*Empetrum nigrum*) and juniper (*Juniperus communis*) are listed as present in the Alpine and Boreal heath in this SAC (NPWS internal files)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrub species at least 10%	Attribute and target based on Perrin et al. (2014). A lower cover of dwarf shrubs could indicate that the habitat is transitioning to grassland or another vegetation type
Vegetation composition: negative indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 10%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Number of species at a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation structure: signs of grazing	Percentage of leaves grazed at a representative number of 2m x 2m monitoring stops	Less than 10% collectively of the live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). The specific graminoids are stiff sedge (*Carex bigelowii*), wavy hair-grass (*Deschampsia flexuosa*), sheep's-fescue (*Festuca ovina*) and viviparous sheep's-fescue (*Festuca vivipara*). High levels of grazing of these species would be undesirable as grazing is not required to maintain this habitat
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning within the habitat	Attribute and target based on Perrin et al. (2014). Alpine and Boreal heath does not require burning for the maintenance of the habitat

Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints and vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Curtis and McGough, 1988; Lockhart et al., 2012). The very rare Hart's Saxifrage (*Saxifraga rosacea* subsp. *hartii*; synonym *S. hartii*), an Alpine plant listed in Curtis and McGough (1988) and on the FPO, occurs on the cliff element of the Alpine and Boreal heath. This is the only known location for this plant, which is endemic to Ireland (NPWS internal files)

8210 Calcareous rocky slopes with chasmophytic vegetation

To maintain the favourable conservation condition of Calcareous rocky slopes with chasmophytic vegetation in Aran Island (Donegal) Cliffs 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	Calcareous rocky slopes with chasmophytic vegetation has not been mapped in detail for Aran Island (Donegal) Cliffs SAC and thus the total area of qualifying habitat is unknown. It occurs in association with siliceous rocky slopes with chasmophytic vegetation (8220) and the vegetation of the vegetated sea cliffs (1230), and also with Alpine and Boreal heath (4060) at the top of the cliff (NPWS internal files). Conservation objectives for these habitats should be used in conjunction with each other as appropriate
Habitat distribution	Occurrence	No decline, subject to natural processes	See note on area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Vegetation composition: positive indicator fern and *Saxifraga* species	Number of species in local vicinity of a representative number of monitoring stops	Number of ferns and *Saxifraga* indicators at each monitoring stop is at least one	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: positive indicator species	Number of species in local vicinity of a representative number of monitoring stops	Number of positive indicator species at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover in local vicinity of a representative number of monitoring stops	Proportion of vegetation composed of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: bracken, native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of bracken (*Pteridium aquilinum*), native trees and shrubs less than 25%	Attribute and target based on Perrin et al. (2014). High cover of bracken, native trees and shrubs would indicate that the rocky slopes are becoming more vegetated which would impact on the niches of the chasmophytic vegetation
Vegetation structure: grazing and browsing	Percentage of leaves/ shoots grazed/browsed in local vicinity of a representative number of monitoring stops	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Curtis and McGough, 1988; Lockhart et al., 2012). The very rare Hart's Saxifrage (*Saxifraga rosacea* subsp. *hartii*; synonym *S. hartii*), an Alpine plant listed in Curtis and McGough (1988) and on the FPO occurs on the cliffs. This is the only known location for this plant, which is endemic to Ireland (NPWS internal files)

8220 Siliceous rocky slopes with chasmophytic vegetation

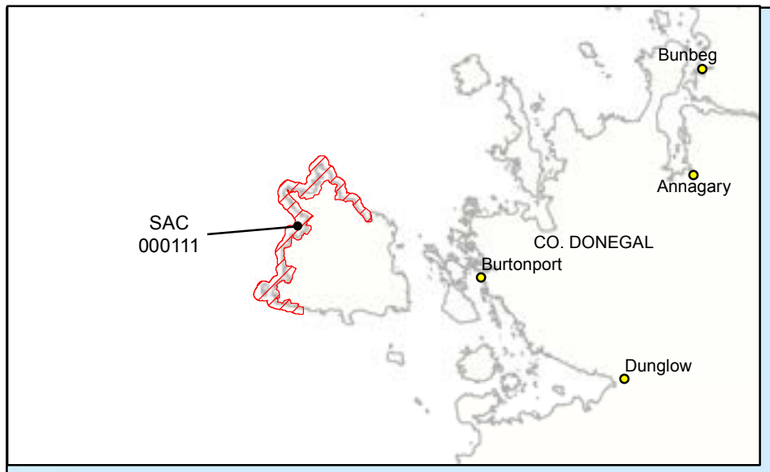
To maintain the favourable conservation condition of Siliceous rocky slopes with chasmophytic vegetation in Aran Island (Donegal) Cliffs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Siliceous rocky slopes with chasmophytic vegetation has not been mapped in detail for Aran Island (Donegal) Cliffs SAC and thus the total area of qualifying habitat is unknown. It occurs in association with calcareous rocky slopes with chasmophytic vegetation (8210) and the vegetation of the vegetated sea cliffs (1230), and also with Alpine and Boreal heath (4060) at the top of the cliff (NPWS internal files). Conservation objectives for these habitats should be used in conjunction with each other as appropriate
Habitat distribution	Occurrence	No decline, subject to natural processes	See note on area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Vegetation composition: positive indicator species	Number of species in local vicinity of a representative number of monitoring stops	At least one positive indicator species present in vicinity of each monitoring stop	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover in local vicinity of a representative number of monitoring stops	Proportion of vegetation composed of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: bracken, native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of bracken (*Pteridium aquilinum*), native trees and shrubs less than 25%	Attribute and target based on Perrin et al. (2014). High cover of bracken, native trees and shrubs would indicate that the rocky slopes are becoming more vegetated which would impact on the niches of the chasmophytic vegetation
Vegetation structure: grazing and browsing	Percentage of leaves/ shoots grazed/browsed in local vicinity of a representative number of monitoring stops	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Curtis and McGough, 1988; Lockhart et al., 2012). The very rare Hart's Saxifrage (*Saxifraga rosacea* subsp. *hartii*; synonym *S. hartii*), an Alpine plant listed in Curtis and McGough (1988) and on the FPO occurs on the cliffs. This is the only known location for this plant, which is endemic to Ireland (NPWS internal files)

8330 Submerged or partially submerged sea caves

To maintain the favourable conservation condition of Submerged or partially submerged sea caves in Aran Island (Donegal) Cliffs SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of sea caves occurring in the SAC is stable, subject to natural processes. See map 4 for potential cave distribution	Sea cave distribution at this SAC was derived from an oblique aerial survey and therefore only detects apparent sea caves visible in the flight path. NB other sea caves may occur within the SAC
Community structure	Biological composition	Conserve the community types in a natural condition	The sea cave communities within this SAC have not been surveyed. See marine supporting document for further details
Community structure	Biological composition	Human activities should occur at levels that do not adversely affect the ecology of sea caves in this SAC	See marine supporting document for further details



ÁRAINN MHÓR
ARAN ISLAND

Legend

Aran Island (Donegal) Cliffs SAC 000111

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
ARAN ISLAND (DONEGAL) CLIFFS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

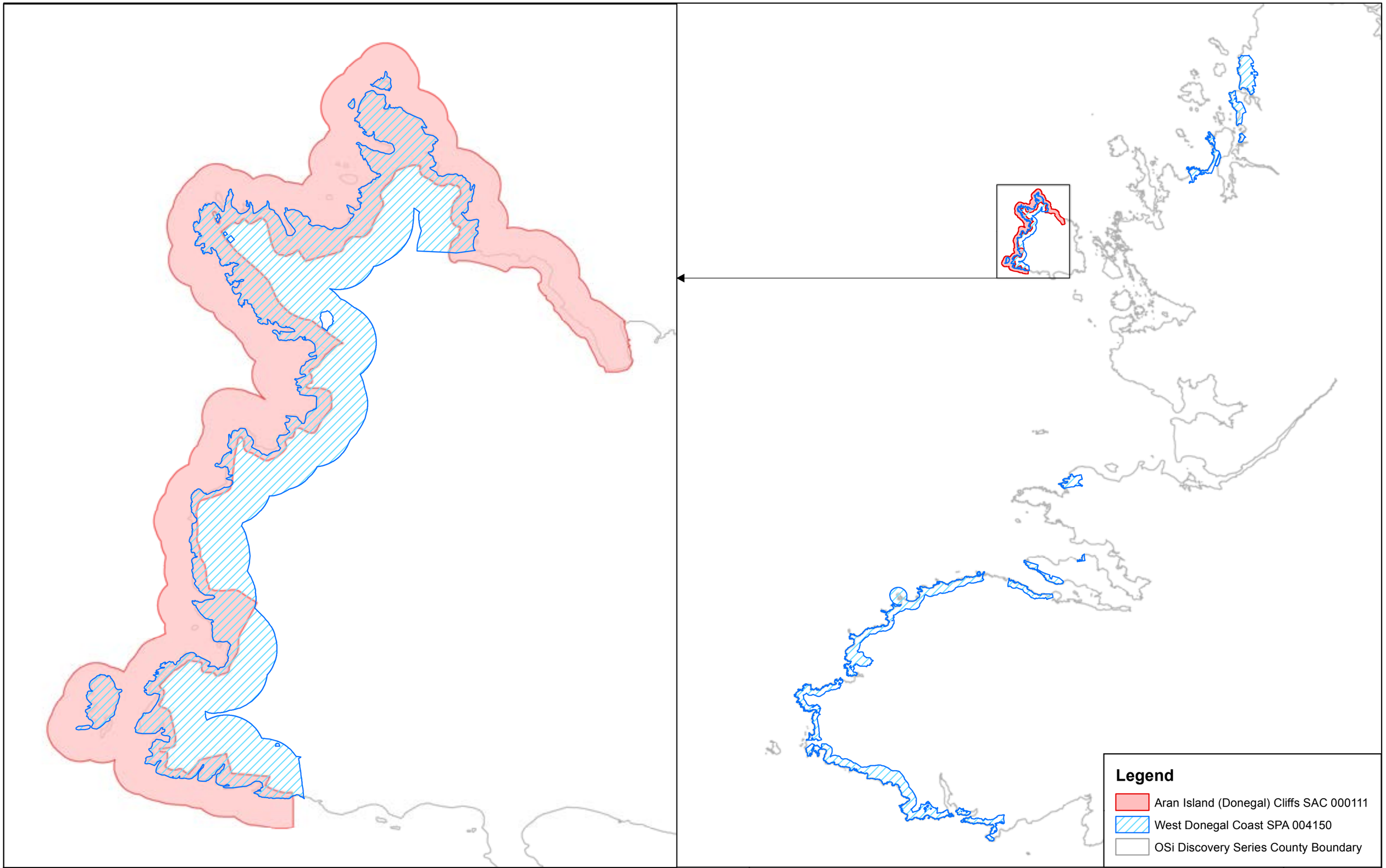
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000111; version 3. CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: Sept 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
ARAN ISLAND (DONEGAL) CLIFFS SAC
CONSERVATION OBJECTIVES
ADJOINING / ADJACENT AND
OVERLAPPING DESIGNATIONS

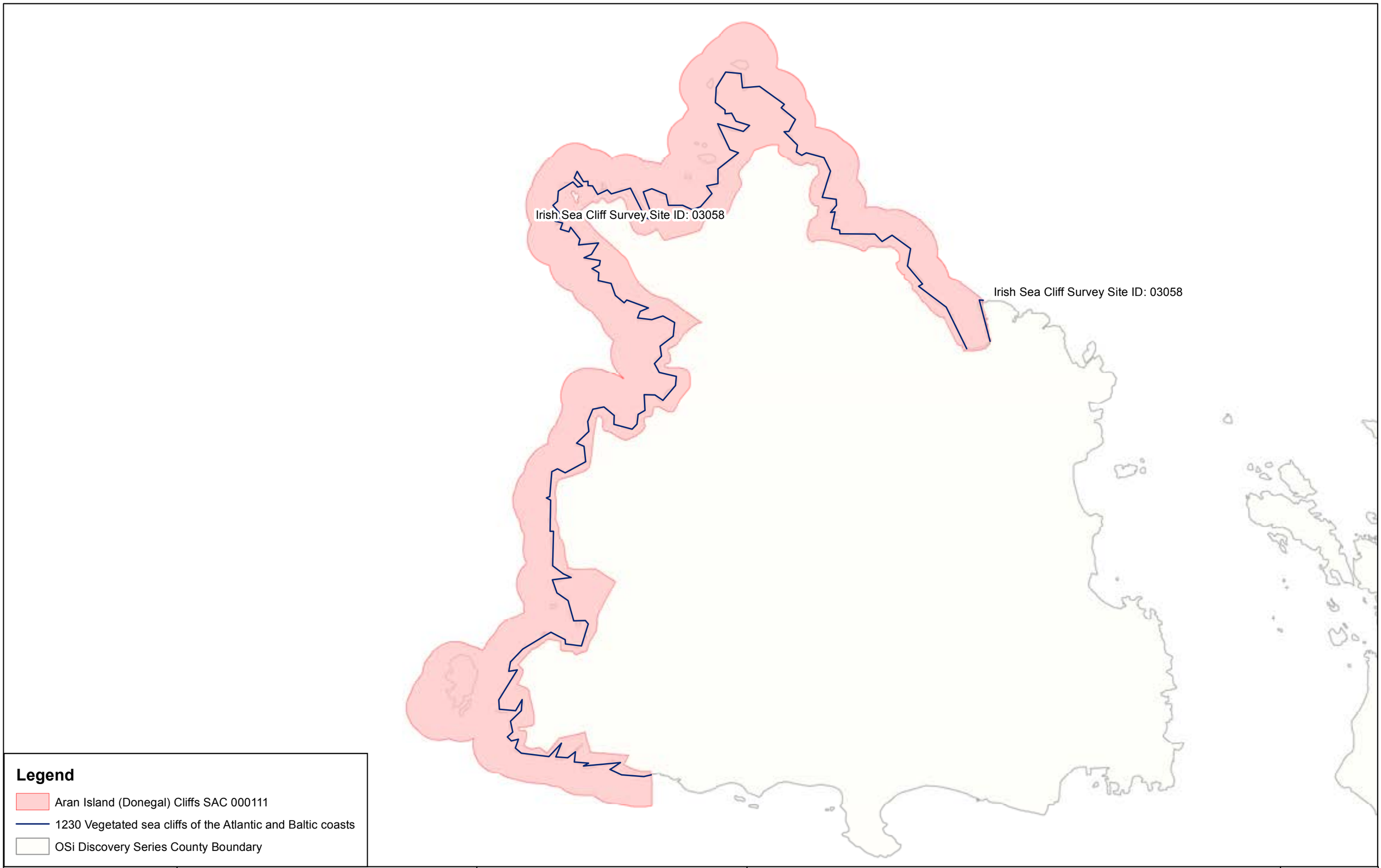
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000111; version 3. SPA 004150; version 3.
CO. DONEGAL

0 4 8 12 16 km

N

Map Version 1
Date: Sept 2016



Legend

- Aran Island (Donegal) Cliffs SAC 000111
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
ARAN ISLAND (DONEGAL) CLIFFS SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

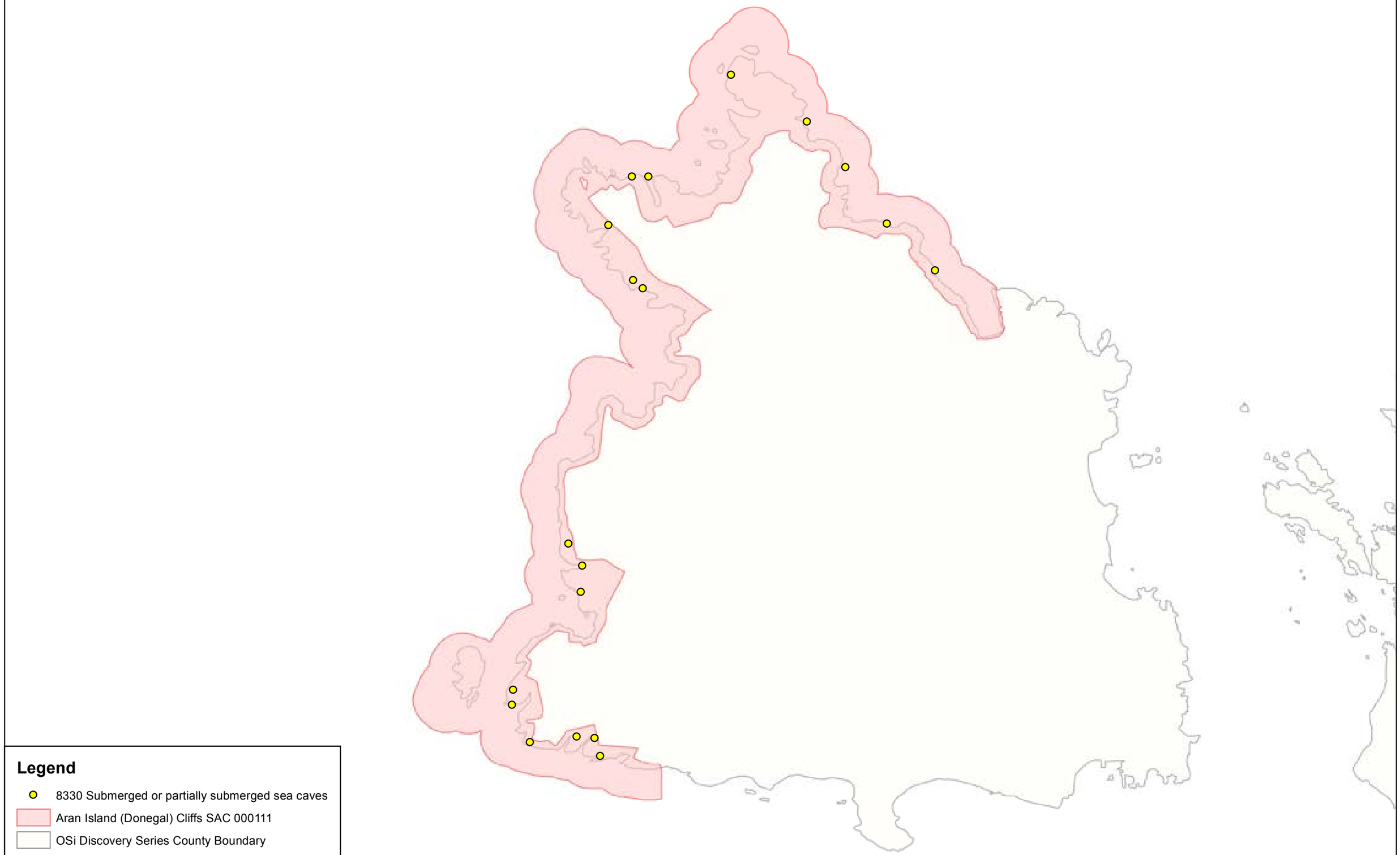
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000111; version 3. CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: Oct 2016



Legend

- 8330 Submerged or partially submerged sea caves
- Aran Island (Donegal) Cliffs SAC 000111
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 4:
ARAN ISLAND (DONEGAL) CLIFFS SAC
CONSERVATION OBJECTIVES
SEA CAVES

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

SITE CODE:
SAC 000111; version 3. CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: Oct 2016

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Fawnboy Bog/Lough Nacung SAC 000140

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

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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***

000140	Fawnboy Bog/Lough Nacung SAC
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and adjoins Cloghernagore Bog and Glenveagh National Park SAC (002047). 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 :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: monitoring of the freshwater pearl mussel in the Clady
Author :	Moorkens, E.
Series :	unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: phytobenthos monitoring of the Clady catchment, Co. Donegal
Author :	Ni Chathain, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans. Report on biological monitoring of surface water quality in the Clady catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2010
Title :	Second draft Clady freshwater pearl mussel sub-basin management plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to the Department of Environment, Heritage and Local Government
Year :	2012
Title :	Ireland Red List no. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79

Year :	2015
Title :	Monitoring populations of the freshwater pearl mussel *Margaritifera margaritifera*. 2014 monitoring survey of the river Clady, Co. Donegal
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2016
Title :	Fawnboy Bog/Lough Nacung SAC (site code: 140) Conservation objectives supporting document- upland habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	2006
Title :	The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Author :	Geist, J.; Porkka, M.; Kuehn, R.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 251-266
Year :	2010
Title :	Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the Republic of Ireland within the framework of the habitats and species directive
Author :	Moorkens, E.
Series :	Journal of Conchology, 40: 339
Year :	2014
Title :	Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems 24(6), 853-862

Spatial data sources

Year :	Revision 2012
Title :	Margaritifera Sensitive Areas data
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 3)
Year :	2016
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 :	1029 (map 3)

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Fawnboy Bog/Lough Nacung 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	Northern Atlantic wet heaths with *Erica tetralix* habitat has not been mapped in detail for Fawnboy Bog/Lough Nacung SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 150ha. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Areas of wet heath appear to be most extensive in the areas of the SAC north of Lough Nacung; information from the GIS files associated with NPWS (2013). Further information can be found within this source and the uplands supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of wet heath communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of 2m x 2m monitoring stops	Cross-leaved heath (*Erica tetralix*) present near each monitoring stop	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Further details can be found in the uplands supporting document
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species is also presented. Further details can be found in the uplands supporting document
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of 2m x 2m monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. Further details can be found in the uplands supporting document
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Percentage cover in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details. The red data book species *Erica mackaiana* is noted as being present within wet heath in the SAC (NPWS internal files)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs in Fawnboy Bog/Lough Nacung 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	Blanket bog has not been mapped in detail for Fawnboy Bog/Lough Nacung SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 250ha. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Extensive areas of blanket bog were recorded by Douglas et al. (1990). Further information can be found within this source and the uplands supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the uplands supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the uplands supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Douglas et al. (1990) recorded a variety of blanket bog vegetation communities at this site, one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least seven	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Based on Perrin et al. (2014). See the uplands supporting document for further details, including the list of potentially dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details. The non-native species *Campylopus introflexus* was recorded by Douglas et al. (1990) within areas of fire damaged blanket bog in the SAC
Vegetation composition: native trees and scrub	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: erosion	Occurrence in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details. The red data book species *Erica mackaiana* has been recorded within blanket bog in the SAC (Douglas et al., 1990)

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Fawnboy Bog/Lough Nacung 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	Depressions on peat substrates of the Rhynchosporion habitat has not been mapped in detail for Fawnboy Bog/Lough Nacung SAC and thus total area of the qualifying habitat is unknown. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Further information can be found within Douglas et al. (1990) and the uplands supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least five	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: *Rhynchospora* spp.	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of white beaked sedge (*Rhynchospora alba*) and brown beaked sedge (*R. fusca*) at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 35%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and scrub	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details

Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Occurrence in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: erosion	Occurrence in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

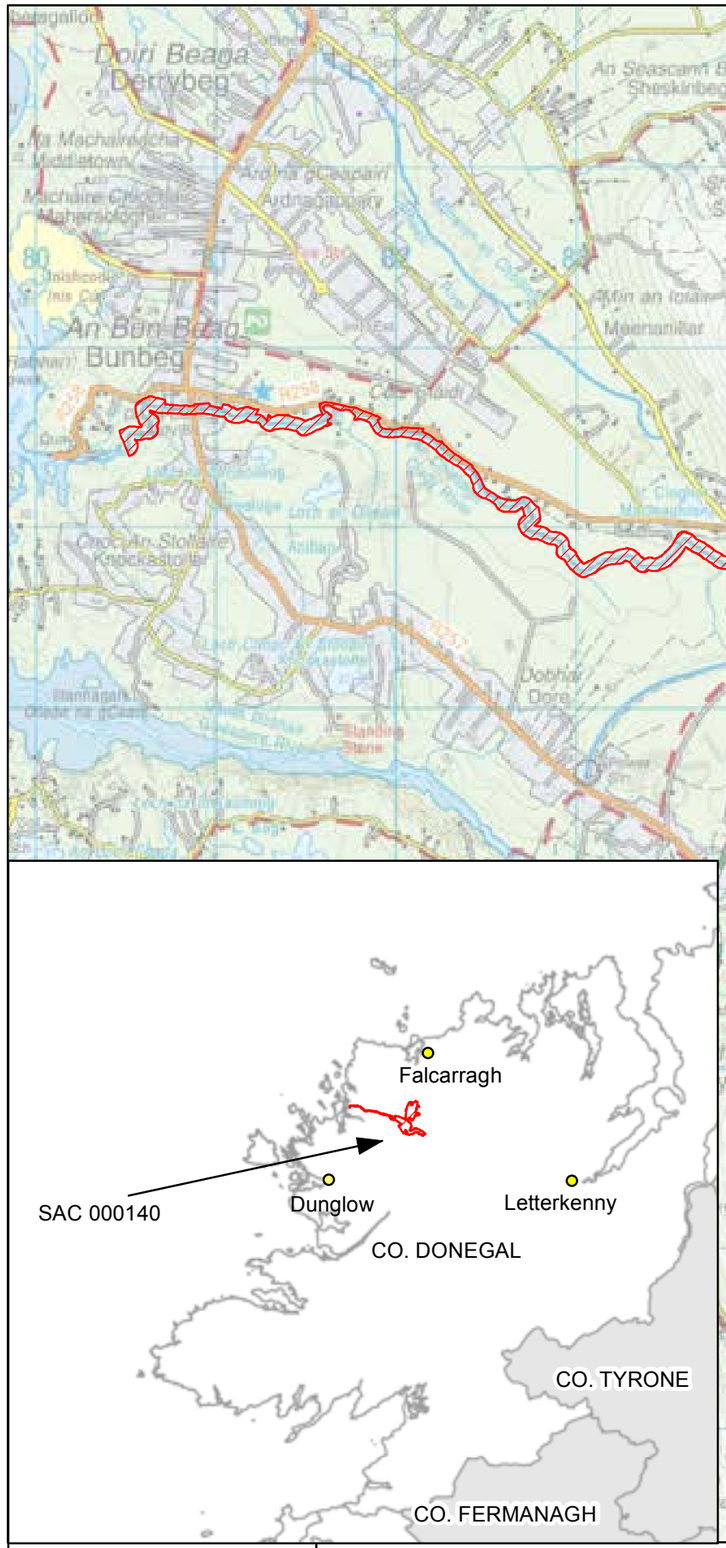
To restore the favourable conservation condition of Freshwater Pearl Mussel in Fawnboy Bog/Lough Nacung SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7.81km. See map 3	The conservation objective applies to the Clady freshwater pearl mussel (*Margaritifera margeritifera*) population, which is listed on SI 296 of 2009. The distribution and abundance of the freshwater pearl mussel in the Clady was mapped in 2006, as part of full, baseline monitoring (Moorkens, 2007). Mussels are distributed in the Clady River from near to Lough Nacung to the tidal limits downstream of Bunbeg. Mussels are occasional in the upper stretches near Lough Nacung, becoming frequent to common after 300m and abundant from 1km downstream of Gweedore to Bunbeg. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Clady system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore Clady population to at least 250,000 adult mussels	Moorkens (2007) estimated the Clady population as at least 250,000. No elevated losses of adult mussels have been recorded since that baseline (Moorkens, 2009, 2015). As noted above, mussels were abundant from c.1km downstream of Gweedore to Bunbeg, and in one stretch downstream of Bunbeg (Moorkens, 2007). In 2006, mussel density of more than 100/m² was recorded in places, while maximum density in transects was 58/m² (Moorkens, 2007). The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Clady system
Population structure: recruitment	Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length.	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Clady is a steadily ageing population with no evidence for successful recruitment in recent times. In 2006, the Clady failed both targets and no mussels under 71mm were found (Moorkens, 2007). It failed both targets again in 2009, with no mussels under 75mm (Moorkens, 2009; NPWS, 2010). In 2014, no mussels under 81mm were found (Moorkens, 2015). The Clady population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. There is no evidence for unnatural levels of mortality in the Clady since the baseline survey in 2006, and it passed both targets in 2009 and 2014 (Moorkens, 2007, 2009, 2015; NPWS, 2010). The Clady population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Clady system

Suitable habitat: extent	Kilometres	Restore suitable habitat in more than 7.81km in the Clady system (see map 3) and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Clady River is from downstream of Lough Nacung to the tidal limits (Moorkens, 2007, 2009; NPWS, 2010). Flow regulation and associated hydromorphological impacts are key issues for the mussel habitat in the Clady (Moorkens, 2007, 2009, 2015; NPWS, 2010). The mussel habitat also suffers from siltation and nutrient-enrichment, and drainage and other disturbance to peatland is a significant pressure. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Suitable habitat: condition	Kilometres	Restore condition of suitable habitat	The species' habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those spawning areas that can regularly contribute juvenile fish to areas occupied by adult mussels should be considered. The availability of mussel and fish spawning/nursery habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures from throughout the catchment (map 3) contribute to such impacts. The habitat in the Clady cannot support sufficient juvenile survival. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality- macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in the Clady system failed the macroinvertebrate target, but passed the diatom target, however, the diatom coating was quite heavy in places (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality- filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	The Clady failed both targets in 2009 (NPWS, 2010). High cover abundance of filamentous algae (up to 100%) and macrophytes (up to 75%) was recorded in the mussel quadrats (Moorkens, 2009). Plant abundance varied spatially and temporally, but failed the targets throughout the Clady system (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). There was evidence of significant enrichment just upstream of Bunbeg Bridge, including 50% *Myriophyllum* cover (Williams, 2009). The Clady failed the targets again in 2014, with both living and dead filamentous algae throughout the mussel habitat and very dense cover in most quadrats sampled (Moorkens, 2015). *Myriophyllum* cover was up to 10% in some quadrats (Moorkens, 2015). The poor condition of the river substratum is preventing sufficient recruitment of juvenile mussels. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system

Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Clady failed the target for the Sub-basin Management Plan (NPWS, 2010), with significant silt plumes in mussel habitat (Moorkens, 2009). Siltation impacts were patchily distributed throughout the Clady in both 2006 and 2009 (Moorkens, 2007; Williams, 2009). The Clady passed the target in 2014, when surface siltation was not evident (Moorkens, 2015). Siltation impacts in the Clady may be episodic and linked to flow regulation and/or damage to peatland. Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The Clady failed the redox target in 2009, with an average loss of 29% redox potential at 5cm (Moorkens, 2009; NPWS, 2010). It failed again (marginally) in 2014, when the average redox loss was 20% (Moorkens, 2015). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable habitat is largely determined by flow (catchment geology being the other important factor). To restore habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased causing excessive scour of mussel habitat; 3) low flows do not exacerbate deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to substratum contributes to water-cycling. Low flows appear to be impacting mussels in the Clady. The effects of the ESB HEP scheme and peatland degradation require investigation. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and, thus, are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, because of habitat overlaps and the development of immunity with age in fish. Fish presence is considered sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In May 2009, glochidia were found on salmon, but not on trout in the Clady (Johnston et al., 2009; NPWS, 2010)

Fringing habitat	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats assist in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter such as leaf fall), and provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system



MAP 1:
FAWNBOY BOG / LOUGH NACUNG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000140; version 3. CO. DONEGAL.

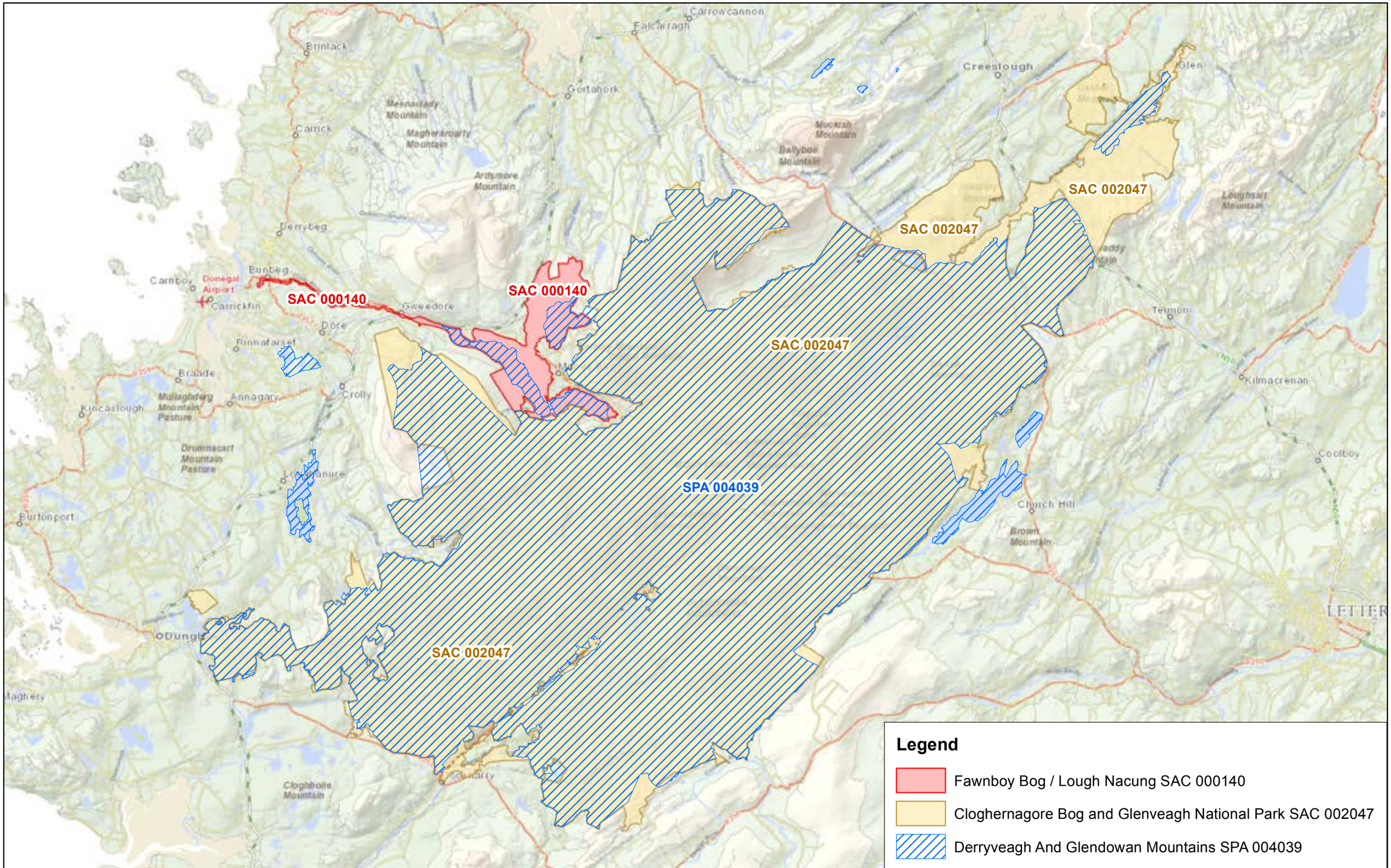
0 0.35 0.7 1.05 1.4 1.75 km

N

Map Version 1
Date: July 2016

Legend

Fawnboy Bog/Lough Nacung SAC 000140



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MAP 2:
FAWNBOY BOG / LOUGH NACUNG SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING & OVERLAPPING DESIGNATIONS

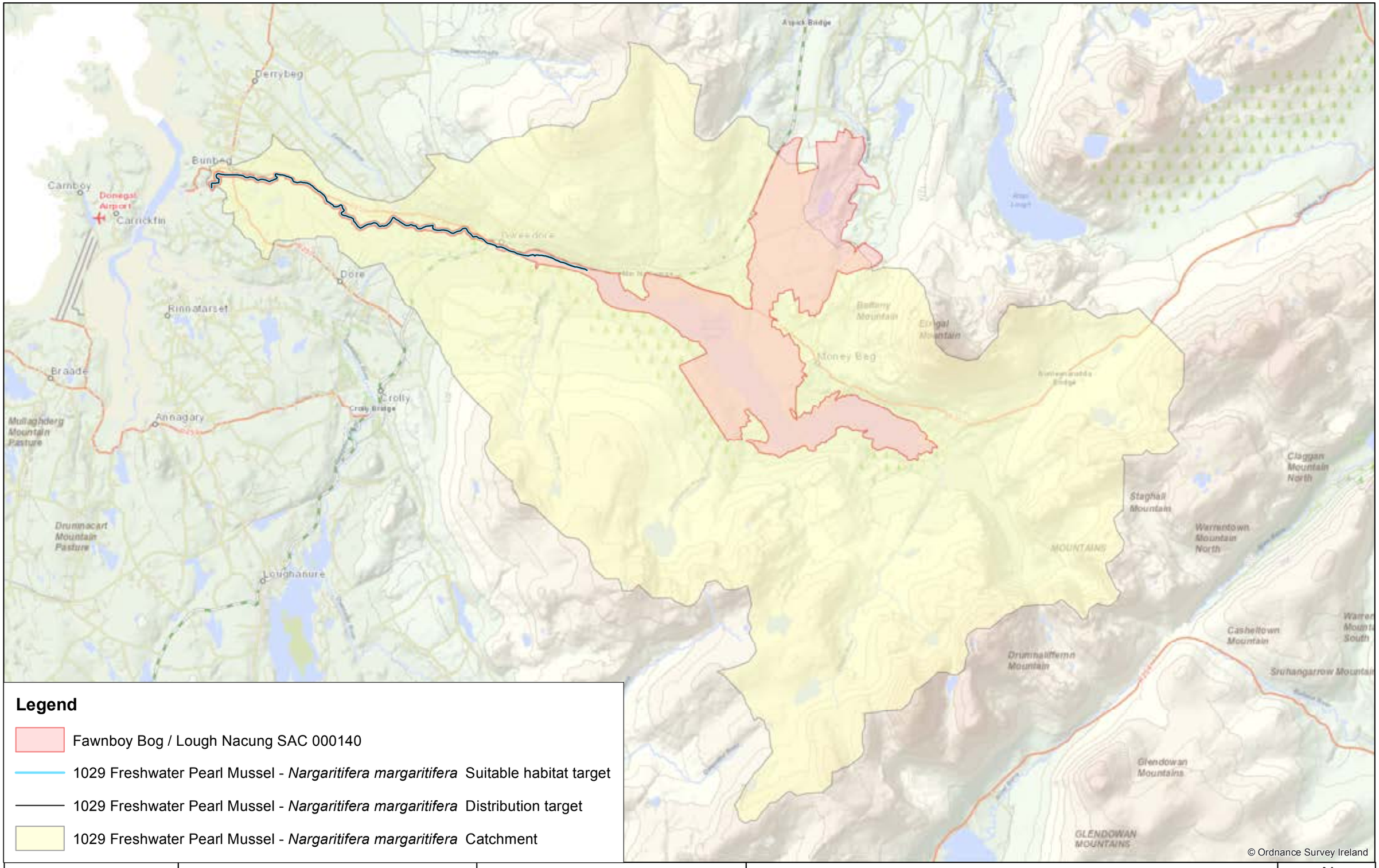
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000140; version 3. SAC 002047; version 3.
SPA 004039; version 3. CO. DONEGAL.

0 1 2 3 4 5 km

N

Map Version 1
Date: July 2016



Legend

- Fawnboy Bog / Lough Nacung SAC 000140
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Suitable habitat target
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Distribution target
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Catchment

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Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
FAWNBOY BOG / LOUGH NACUNG SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

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

SITE CODE:
SAC 000140 ; version 3. CO. DONEGAL.

0 0.6 1.2 1.8 2.4 3 km

N

Map Version 1
Date: July 2016

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Gannivegil Bog SAC 000142

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Gnóthaí Réigiúnacha, Tuaithe 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***

000142	Gannivegil Bog SAC
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and is adjacent to Cloghernagore Bog and Glenveagh National Park SAC (002047). 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, relevant reports & publications

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

NPWS Documents

Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Gannivegil Bog SAC (site code: 142) Conservation objectives supporting document- blanket bog and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623

Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19 (3): 264–273
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 3)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Gannivegil Bog 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	Lake habitat 3110 is considered to occur in the larger lakes in Gannivegil Bog SAC, such as Loughs Gannivegil, Meenlecknanore and Nanuarragh. Its exact distribution in the SAC is unknown however, as no specific information on the lake vegetation is currently available. Lake habitat 3110 is likely to co-occur with lake habitat 3160 in most/all lakes. Lake habitat 3160 is also likely to occur in smaller lakes and ponds. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha have been mapped as 'potential 3110' (see map 3). Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, the exact distribution of lake habitat 3110 in the SAC is not known. In map 3, all lakes larger than 1ha (based on 1:5,000 data) have been mapped as potential 3110
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for 3110 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). Douglas et al. (1990) recorded the following species in lakes in the SAC (Cloghbolie, site 32; Galwolie, site 31): *Carex rostrata*, *C. lasiocarpa*, *C. nigra*, *Cladium mariscus*, *Eleocharis multicaulis*, *Eriocaulon aquaticum*, *Juncus bulbosus*, *Littorella uniflora*, *Lobelia dortmanna*, *Myriophyllum alterniflorum*, *M. spicatum*, *Nymphaea alba*, *Potamogeton natans* and *Phragmites australis*
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Water clarity is expected to be high in upland 3110 lakes, resulting in a large maximum depth of vegetation
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced

Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Douglas et al. (1990) state several of the lakes (Cloghbolie, site 32) have rock basins
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for this Annex I lake habitat (O Connor, 2015). Habitat 3110 is associated with very clear water, particularly upland examples. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and Water Framework Directive (WFD) 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average Total Phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The Environmental Protection Agency (EPA) has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3110 requires WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, lake habitat 3110 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lakes with habitat 3110, where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet-woodland that intergrade with and support the structure and functions of the lake habitat. In this SAC, active blanket bog and heath communities dominate lake shorelines. Transition mire, fen, flush and grassland may also occur. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Gannivegil Bog 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	Northern Atlantic wet heaths with *Erica tetralix* have not been mapped in detail for Gannivegil Bog SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 678ha, covering 32% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Gannivegil Bog SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur throughout the SAC, being particularity abundant on hillsides in the south of the SAC, including the slopes of Croaghleconnel and Galwolie Hill. Elsewhere, it occurs in a mosaic with blanket bog on areas of higher ground and exposed rock. Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of wet heath communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)

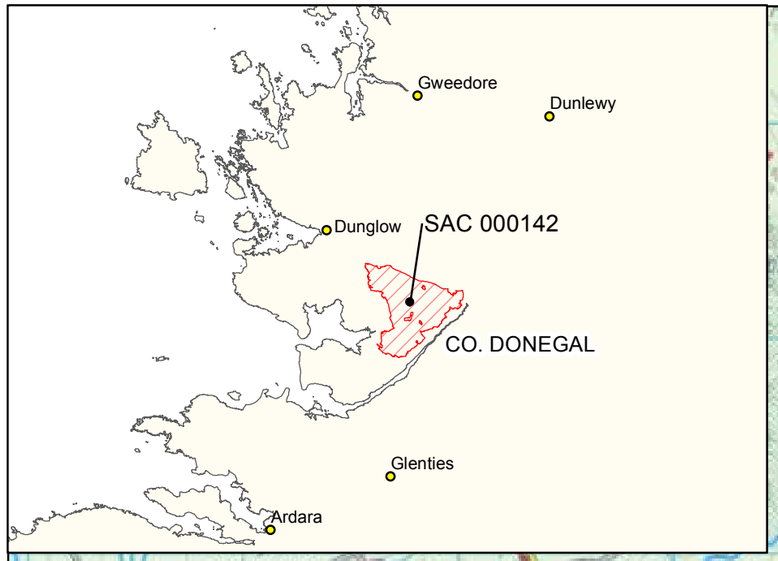
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Gannivegil Bog 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	Blanket bog has not been mapped in detail for Gannivegil Bog SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 680ha, covering 32% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Gannivegil Bog SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog occurs throughout the SAC particularly in the north, central and the south-western areas. Further information can be found in Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), six of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Localised rhododendron (*Rhododendron ponticum*) has been recorded within turbary in the north-east of the SAC (NPWS internal files)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)

Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)



MAP 1:
GANNIVEGIL BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000142; version 1.03. Co. Donegal

0 0.5 1 1.5 2 km

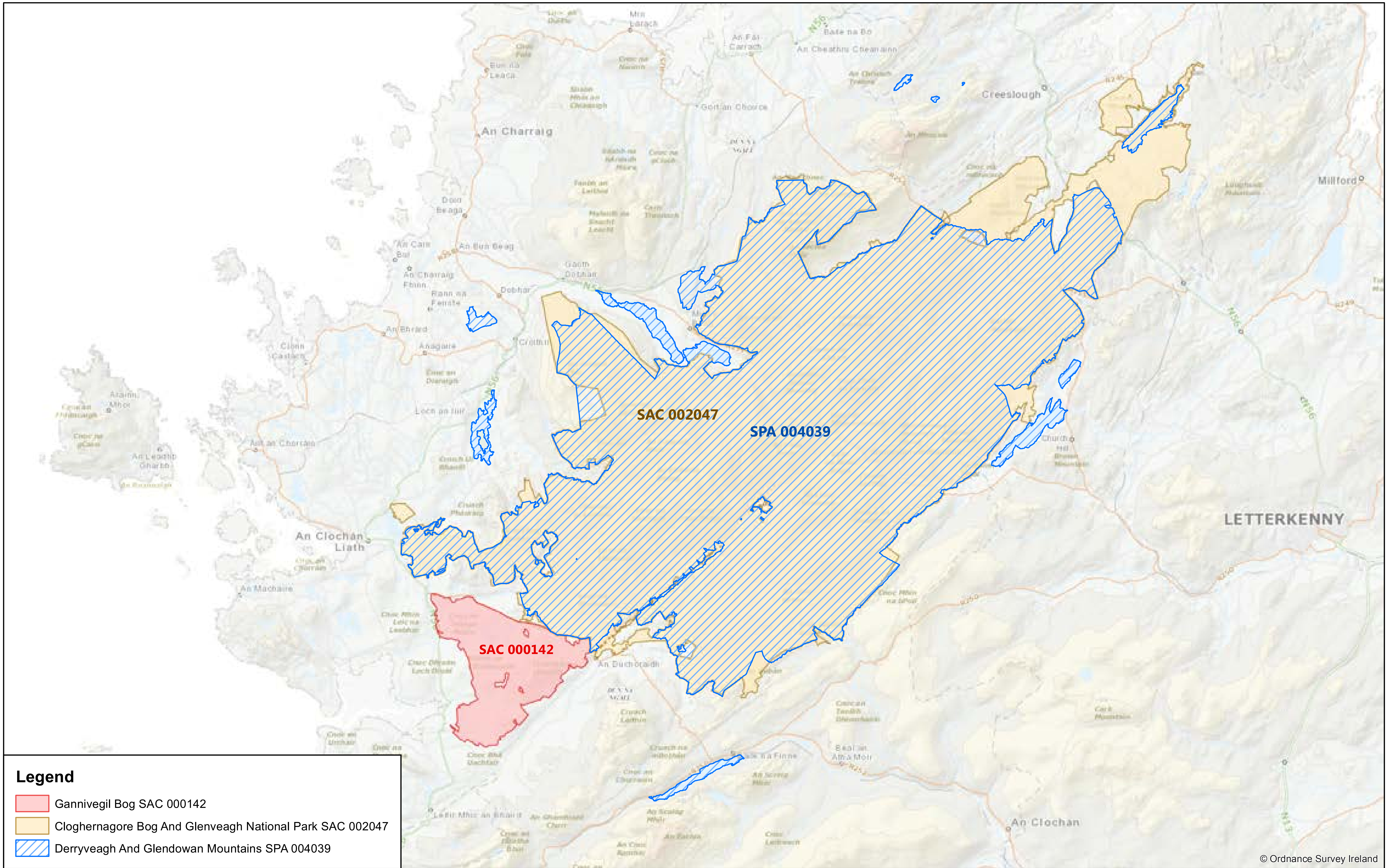
Legend

Gannivegil Bog SAC 000142

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

N

Map Version 1
Date: Feb 2017



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
GANNIVEGIL BOG SAC CONSERVATION OBJECTIVES ADJACENT AND OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 000142; version 1.03, SAC 002047; version 1.09
SPA 004039, version 1.13
Co. Donegal

0 2.5 5 7.5 10 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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N

Map Version 1
Date: Feb 2017

Lough Sallagh
Lough Altaderry
Loch mhin Leic na Leabhar
Loch Abhainn na Marbh
Lough Nabrackmore
Lough Gannevegil
Lough Achreeve
Lough Naclogh
Lough Beg
Lough More
Lough Namurrig
Lough Analtsallagh
Lough Nanuarragh
Lough Carnbeg
Lough Acloghbolie
Lough Garrive
An Loch Garbh
Lough Anillan
Loch an Bhaile Dhuibh
Lough Machugh

Legend

Gannivegil Bog SAC 000142

Indicative Lake Habitats

Potential 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
GANNIVEGIL BOG SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

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

SITE CODE:
SAC 000142; version 1.03. CO. DONEGAL

0 0.45 0.9 1.35 1.8 km

N

Map Version 1
Date: Feb 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Gweedore Bay and Islands SAC 001141

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Ealaíon, Oidhreachta agus Gaeltachta
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Arts, Heritage and the Gaeltacht

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Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

001141	Gweedore Bay and Islands SAC
1150	Coastal lagoons*
1170	Reefs
1220	Perennial vegetation of stony banks
1355	Otter *Lutra lutra*
1395	Petalwort *Petalophyllum ralfsii*
1410	Mediterranean salt meadows (Juncetalia maritimi)
1833	Slender Naiad *Najas flexilis*
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2140	Decalcified fixed dunes with *Empetrum nigrum**
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
2170	Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)
2190	Humid dune slacks
21A0	Machairs (* in Ireland)
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
4030	European dry heaths
4060	Alpine and Boreal heaths
5130	*Juniperus communis* formations on heaths or calcareous grasslands

Please note that this SAC overlaps with West Donegal Coast SPA (004150) and West Donegal Islands SPA (004230). It adjoins Rutland Island and Sound SAC (002283). 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, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1996
Title :	Biomar survey of Irish machair sites
Author :	Crawford, I.; Bleasdale, A.; Conaghan, J.
Series :	Irish Wildlife Manual No. 3
Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
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 :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	A survey of the benthic macrophytes of three hard-water lakes: Lough Bunny, Lough Carra and Lough Owel
Author :	Roden, C.; Murphy, P.
Series :	Irish Wildlife Manual No. 70

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 :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2015
Title :	Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- coastal lagoons V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2015
Title :	Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- marine habitat V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2015
Title :	Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- *Najas flexilis* V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	J. Zool, 224: 41-57

Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie. 27: 2620-2623
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	The vegetation of Irish machair
Author :	Gaynor, K.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, vol 106B, No. 3: 311-321
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
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 :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems 19 (3): 264–273
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2011
Title :	Reef investigations in Gweedore Bay and Islands cSAC (site code:IE001141)
Author :	Aquafact
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin

Year :	2013
Title :	Monitoring and assessment of Irish lagoons for the purposes of the EU Water Framework Directive, 2009-2011. Parts 1 and 2
Author :	Roden, C.M; Oliver, G.A.
Series :	Unpublished report to the Environmental Protection Agency
Year :	in prep.
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, A.
Series :	Unpublished report to NPWS
Year :	in prep.
Title :	Monitoring of hard-water lakes in Ireland using charophytes and other macrophytes
Author :	Roden, C.; Murphy, P.
Series :	Unpublished report to NPWS

Spatial data sources

Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)
Year :	Interpolated 2014
Title :	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 :	1170, 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 :	Revision 2010
Title :	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used For :	1410 (map 6)
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 :	1220, 2110, 2120, 2130, 2140, 2150, 2170, 2190, 21A0 (map 7)
Year :	2013
Title :	Sand Dune Monitoring Project 2011. 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, 2140, 2150, 2170, 2190, 21A0 (map 7)
Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 7)
Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 8)
Year :	2012
Title :	The conservation status of juniper formations in Ireland
GIS Operations :	Juniper formations polygons clipped to SAC boundary
Used For :	5130 (map 9)

Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used For :	1355 (map 10)
Year :	2010
Title :	EPA WFD Waterbodies data
GIS Operations :	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resloved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 10)
Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 10)
Year :	2015
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 :	1395 (map 11)
Year :	2013
Title :	*Najas flexilis* data
GIS Operations :	Lake habitat for species clipped to SAC boundary
Used For :	1833 (map 12)

1150 Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to slight natural variation. Favourable reference area 10.0ha for mapped lagoons. See map 3	Areas calculated from spatial data derived from Oliver (2007). Site codes IL082 (Kincas Lough) and IL083 (Moorlagh). See lagoons supporting document for further details. NB there may be additional, unsurveyed lagoons within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for mapped lagoons	Sites IL082 and IL083 in Oliver, 2007. See lagoons supporting document for further details. NB there may be additional, unsurveyed lagoons within the SAC
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	Kincas Lough and Moorlagh are recorded as euhaline to oligohaline lagoons. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Kincas Lough is recorded as 5m and Mooragh is less than 1m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	Kincas Lough and Moorlagh are described as rock/peat lagoons. See lagoons supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to at least 2m depth	Where a lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to the full depth. See lagoons supporting document for further details
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutriennt levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details

1170 Reefs

To maintain the favourable conservation condition of Reefs in Gweedore Bay and Islands 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 for mapped area	Habitat area estimated as 369ha from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 4 for mapped distribution	Based on information from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012
Community structure	Biological composition	Conserve the following community types in a natural condition: Reef community complex; *Laminaria*-dominated community complex. See map 5	Reef mapping based on information from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012. See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Gweedore Bay and Islands 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	Current area unknown. It was recorded as being present, but extent was not mapped, from two sub-sites during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999): Coastline from Port ui Chuirean to Bunaninver, and Port bun an Inbhir. A small area of this habitat was also recorded on Gola Island by the Coastal Monitoring Project (CMP) (Ryle et al., 2009). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for surveyed locations	Distribution unknown at present, although the habitat has been recorded at Port ui Chuirean to Bunaninver and Port bun an Inbhir by Moore and Wilson (1999) and at Gola Island by Ryle et al. (2009). Donegal is noted for its raised beaches and habitat is likely to be more widespread. 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	Moore and Wilson (1999) noted the presence of rock armour at the coastline from Port Ui Chuirean to Bunaninver sub-site, which may be compromising the supply and natural circulation of sediment. Shingle features are relatively stable in the long term. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). Lichens are present at both subsites visited by the NSBS, indicating a degree of stability. 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 the typical vegetated shingle flora including the range of sub-communities within the different zones	Based on data from Moore and Wilson (1999). Both sub-sites support good quality vegetated shingle 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 Moore and Wilson (1999) and 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. No negative indicator species were recorded at the sub-sites by the NSBS or CMP. See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To maintain the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in Gweedore Bay and Islands 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: Keadew - 0.09ha. See map 6	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). One sub-site that supports Mediterranean Salt Meadows was mapped (0.09ha) and additional areas of potential MSM habitat (9.66ha) were identified from an examination of aerial photographs, giving a total estimated area of 9.75ha. NB further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped distribution	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadows is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). At Keadew, embryonic dunes, fixed dunes and blanket bog were recorded on the upper boundary of the saltmarsh. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from McCorry and Ryle (2009). The overall grazing intensity of the saltmarsh at Keadew is low. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Trails from pedestrian and vehicular traffic criss-cross the saltmarsh habitat particularly at the western end of the sub-site. 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 characteristic species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	Common cordgrass (*Spartina anglica*) has not been recorded in this SAC and its establishment should be prevented	Based on data from McCorry and Ryle (2009). *Spartina* swards were not recorded in this SAC by SMP. See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Gweedore Bay and Islands 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: Keadew - 0.46ha; Cruit Lower - 1.29ha; Kincaslough - 0.14ha; Carnboy - 1.39ha; Derrybeg - 0.69ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat mapped at five sub-sites to give a total estimated area of 3.97ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Shifting dunes were recorded at all sub-sites except for Gola Island and Lunniagh. 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) and Delaney et al. (2013). 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. At Derrybeg, rock armour has been placed on the edge of a walkway and pier in the north west of the site. 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (*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) and Delaney et al. (2013). 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 grass (*Elytrigia juncea*) and/or lyme grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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) and 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 maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in Gweedore Bay and Islands 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: Keadew - 0.73ha; Cruit Lower - 1.88ha; Kincaslough - 1.59ha; Carnboy - 2.41ha; Derrybeg - 3.96ha; Gola Island - 0.54ha; Lunniagh - 3.68ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat mapped at seven sub-sites to give a total estimated area of 14.79ha. 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 7 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Shifting dunes were recorded at all sub-sites. The shifting dunes at Keadew are undergoing natural erosion. The shifting dunes at Cruit Lower are functioning well with sand accretion noted. At Kincaslough the shifting dunes are eroding at the western side of the sub-site while at the eastern end of the beach they are functioning well. At Carnboy this habitat had been eroded in the past but was rebuilding at time of CMP survey. At Derrybeg the shifting dunes have eroded behind the rock armour. At Lunniagh, dune accretion is occurring on the north side of the river and dunes measure up to 50m wide in places. 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) and 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. At Derrybeg, rock armour has been placed on the edge of a walkway and pier in the north west of the site. Sand extraction occurs at Lunniagh. 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 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) and 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 dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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) and 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 Gweedore Bay and Islands 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: Keadew -14.74ha; Cruit Lower - 30.55ha; Kincaslough - 79.90ha; Carnboy - 56.83ha; Derrybeg - 30.74ha; Gola Island - 3.38ha; Lunniagh - 186.32ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat mapped at all seven sub-sites to give a total estimated area of 402.46ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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) and 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. 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) and Delaney et al. (2013). At Keadew, Derrybeg and Lunniagh, the sand dune habitats occur alongside 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Overgrazing was noted at Lunniagh, while fixed dune was undergrazed or lightly grazed in parts at Keadew, Cruit Lower, Carnboy, Derrybeg and Gola Island. 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), Ryle et al. (2009) and Delaney et al. (2013). An abundance of orchid species was noted at Kincaslough including frog orchid (*Coeloglossum viride*), common twayblade (Listera ovata), pyramidal orchid (*Anacamptis pyramidalis*) and fragrant orchid (*Gymnodenia conopsea*) and are indicators of local distinctiveness. 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) and 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. This species is known to occur at Cruit Lower and bracken (*Pteridium aquilinum*) at Derrybeg. 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) and Delaney et al. (2013). Burnet rose (*Rosa pimpinellifolia*) was recorded at Derrybeg. See coastal habitats supporting document for further details

2140 Decalcified fixed dunes with Empetrum nigrum

To maintain the favourable conservation condition of Decalcified fixed dunes with *Empetrum nigrum* in Gweedore Bay and Islands 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: Keadew - 0.47ha. See map 7	Current area unknown. Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was recorded at one sub-site, giving a total estimated area of 0.47ha. However, habitat is difficult to map as it occurs in a mosaic with fixed dunes. Likely to be more widespread. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Exact distribution unknown. Based on data from Ryle et al. (2009) and Delaney et al. (2013). This habitat was recorded at two sub-sites: Keadew and Cruit lower, but was only mapped at the Keadew sub-site. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009) and 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. 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) and Delaney et al. (2013). At Keadew the coastal heath occurs in close association with fixed dune habitat. 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: sward height	Centimeters	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). At Keadew and Cruit Lower, the dunes are undergrazed. 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), Ryle et al. (2009) and Delaney et al. (2013). 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) and 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. This species is known to occur at Cruit Lower. 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) and Delaney et al. (2013). See coastal habitats supporting document for further details

2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)

To maintain the favourable conservation condition of Atlantic decalcified fixed dunes (Calluno-Ulicetea) in Gweedore Bay and Islands 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: Cruit Lower - 3.57ha. See map 7	Current area unknown. Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was recorded at one sub-site, giving a total estimated area of 3.57ha. Habitat is difficult to map as it occurs in a mosaic with fixed dunes. Likely to be more widespread. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7 for mapped distribution	Exact distribution unknown. Based on data from Ryle et al., (2009) and Delaney et al. (2013). This habitat was recorded at one sub-site: Cruit Lower. 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) and 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. 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) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: sward height	Centimeters	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). At Cruit Lower, both the fixed dune and machair are ungrazed resulting in a tall sward with low species diversity. 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), Ryle et al. (2009) and Delaney et al. (2013). 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) and 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. This species is known to occur at Cruit Lower. 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) and Delaney et al. (2013). See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) in Gweedore Bay and Islands 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: Cruit Lower - 0.94ha; Kincaslough - 0.03ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was recorded at two sub-sites, giving a total estimated area of 0.97ha. Habitat is difficult to map as it can be confused with humid dune slacks. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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) and 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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% cover, subject to natural processes	Based on data from Ryle et al. (2009) 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), Ryle et al. (2009) and Delaney et al. (2013). At Cruit Lower the fixed dunes are ungrazed. 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 Delaney et al. (2013)	See coastal habitats supporting document for further details
Vegetation composition: cover and height of *Salix repens*	Percentage cover; centimetres	Maintain more than 10% cover of creeping willow (*Salix repens*); vegetation height should be in the average range 5 - 20cm	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Cover of creeping willow (*Salix repens*) should be maintained (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative sample of monitoring stops	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009) and 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. This species is known to occur at Cruit Lower. See coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	For trees and scrub other than creeping willow (*Salix repens*), there should be no more than 5% cover or their presence should be under control	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Gweedore Bay and Islands 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: Keadew - 0.01ha; Cruit Lower - 0.34ha; Carnboy - 0.38ha; Kincaslough - 1.09ha; Derrybeg - 0.19ha; Lunniagh - 5.68ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat mapped at six sub-sites to give a total estimated area of 7.69ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped distribution	Based on data from Ryle et al., (2009) and Delaney et al. (2013). 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) and 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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). It appears that there has been some drying out of some of the slacks at Cruit Island, which may be due to anthropogenic activities. 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) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). At Lunniagh, dune slacks are affected by overgrazing and poaching was noted. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Ryle et al., (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative numberof monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). Butterfly orchid (*Platanthera* spp.) was noted at Kincaslough. Petalwort (*Petalophyllum ralfsii*), a species on Annex II of the Habitats Directive, is recorded from the dune slacks in this SAC. See the conservation objective for *Petalophyllum ralfsii* (1395) and the 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 Ryle et al., (2009) and 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. 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) and 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. This species is known to occur at Cruit Lower. 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) and Delaney et al. (2013). Bunet rose (*Rosa pimpilellifolia*) was recorded at Derrybeg. See coastal habitats supporting document for further details

21A0 Machairs (* in Ireland)

To restore the favourable conservation condition of Machairs in Gweedore Bay and Islands 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: Keadew - 28.31ha; Cruit Lower - 9.65ha; Derrybeg - 92.13ha; Lunniagh - 39.69ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was mapped at four sub-sites, giving a total estimated area of 169.78ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Machair was recorded at all sub-sites except Gola Island, Carnboy and Kincaslough. 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) and 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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Ryle et al. (2009), Delaney et al. (2013), Crawford et al. (1996) and Gaynor (2006). 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) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of Machair habitat, subject to natural processes	Based on data from Ryle et al., (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	Based on data from Ryle et al., (2009) and Delaney et al. (2013). Overgrazing was noted at Lunniagh, while fixed dune and machair habitats were undergrazed or lightly grazed in parts at Keadew, Cruit Lower and Derrybeg. 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 Ryle et al., (2009) and Delaney et al. (2013). Petalwort (*Petalophyllum ralfsii*), a species listed on Annex II of the Habitats Directive, was recorded in machair habitat in this SAC. See the conservation objective for *Petalophyllum ralfsii* (1395) and the 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) and 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. This species is known to occur at Cruit Lower and bracken (*Pteridium aquilinum*) has been recorded at Derrybeg. See coastal habitats supporting document for further details
Vegetation composition: bryophytes	Percentage cover	Should always be at least an occasional component of the vegetation	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Gweedore Bay and Islands 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	The selection of the SAC for habitat 3110 was based on data for Mullaghderg Loughs. Re-examination of these data and the occurrence of *Najas flexilis* in Mullaghderg East and West suggest, however, that their vegetation is more closely aligned to habitat 3130. It is possible that habitat 3110 occurs elsewhere within the SAC. It may occur in the small lake in Derrybeg townland (see map 8), but this requires field confirmation. The habitat is highly unlikely to occur in lakes influenced by calcareous sand or by the sea, both of which are prevalent in the SAC. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. For further information on all attributes see the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, in prep.)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, it is unlikely that the habitat occurs in the SAC. If the habitat is found, further information on the attribute for distribution can be found in O Connor (in prep.)
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see Article 17 habitat assessment for 3110 (NPWS, 2013) and the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, in prep.)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	The characteristic zonation of lake habitat 3140 has been described (Roden and Murphy, 2013; in prep.), however significant further work is necessary to describe the characteristic zonation and other spatial patterns in the other lake habitats
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. An indicative target of >6 m has been developed for hard water lakes (3140) (see Roden and Murphy, 2013; in prep.). Indicative targets will be developed for the other lake habitats with time
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that the oligotrophic soft water habitat is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake

Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. A target has been set for hard water lakes (3140), however targets have yet to be established for the remaining lake habitats. Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥ 3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species	As a nutrient poor habitat, oligotrophic and Water Framework Directive (WFD) 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For the oligotrophic soft water lake habitat, annual average TP concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. For further information see the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to the oligotrophic soft water habitat (3110). Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8 µg/l. The annual average chlorophyll a concentration should be <2.5 µg/l and the annual peak chlorophyll *a* concentration should be <8.0 µg/l. For further information see the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3110 requires WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/ absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in the oligotrophic soft water habitat should, therefore, be trace/ absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3110 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for the oligotrophic soft water lake habitat is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥ 0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For oligotrophic soft water lakes (3110), and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5. Maximum pH should be <9.0, in line with the surface water standards established for soft waters (where water hardness is ≤100 mg/l CaCO3). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38 mg/l PtCo (Free, et al., 2000) and 33 mg/l PtCo (Free et al. 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50 mg/l PtCo. Water colour can be very low (<20 mg/l PtCo or even <10 mg/l PtCo) in oligotrophic soft water lakes (3110), where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through factors such as shading and competition
Turbidity	nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat area	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet-woodland that intergrade with and support the structure and functions of the lake habitat. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in Gweedore Bay and Islands 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	Total area of this habitat has not been calculated although it is known to be distributed thoughout the SAC, usually occurring in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (NPWS internal files)
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	See note above. The heath in this SAC is widely distributed and is a good example of a maritime variant in the western part of its Irish and European range (NPWS internal files)
Ecosystem function: soil nutrient status	Soil pH and nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Changes to soil nutrient status can occur from high stock densities or supplementary feeding above appropriate levels
Vegetation composition: positive indicator species	Number and percentage cover at a representative number of monitoring stops	At least two positive indicator species, as listed in Perrin et al. (2014), with combined cover of at least 50%	Attribute and target based on Perrin et al. (2014). Bell heather (*Erica cinerea*), cross-leaved heath (*Erica tetralix*) and ling (*Calluna vulgaris*) are listed for the heath in this SAC (NPWS internal files)
Vegetation composition: bryophyte and non-crustose lichen species	Number at a representative number of monitoring stops	At least three bryophyte or non-crustose lichen species present, excluding *Campylopus* and *Polytrichum* moss species	Percentage cover at a representative number of monitoring stops
Vegetation composition: rare/scarce species	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order 1999 and/or the red data book (Curtis and McGough, 1988)
Vegetation structure: dwarf shrub species	Percentage cover at a representative number of monitoring stops	Cover of bog myrtle (*Myrica gale*), creeping willow (*Salix repens*) and Western gorse (*Ulex gallii*) collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator weed species	Percentage cover at a representative number of monitoring stops	Cover of negative indicator weedy species collectively less than 1%	Attribute and target based on Perrin et al. (2014), where weed species are also listed
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops and in local vicinity	Cover of non-native species less than 1%.	Attribute and target based on Perrin et al. (2014)
Vegetation composition: native trees and shrubs	Pecentage cover in local vicinity	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). Dense areas of soft rush can indicate disturbance
Vegetation structure: senescent ling	Percentage cover at a representative number of monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Percentage cover at a representative number of monitoring stops

Vegetation structure: growth phases of ling	Percentage cover in local vicinity	Outside boundaries of sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in mature phase	Attribute and target based on Perrin et al. (2014), where sensitive areas and growth phases are defined
Vegetation structure: signs of browsing	Percentage at a representative number of monitoring stops	Last complete growing season's shoots of ericoids showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning within sensitive areas	Attribute and target based on Perrin et al. (2014) where sensitive areas are also defined
Physical structure: disturbed bare ground	Percentage cover at a representative number of monitoring stops and in local vicinity	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)

4060 Alpine and Boreal heaths

To maintain the favourable conservation condition of Alpine and Boreal heaths in Gweedore Bay and Islands 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	Total area of this habitat has not been calculated. It occurs in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for area above
Ecosystem function: soil nutrient status	Soil pH and nutrient levels at a representative number of monitoring stops	Maintain soil chemical status within natural range	Changes to soil nutrient status can occur from high stock densities or supplementary feeding above appropriate levels
Vegetation composition: lichens and bryophytes	Number at a representative number of monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is least three	Based on Perrin et al. (2014). Alpine and boreal heaths are not necessarily rich in lichen and bryophyte species, but a minimum number should still be present
Vegetation composition: positive indicator species	Percentage cover at a representative number of monitoring stops	Cover of positive indicator species at least 66%	Based on Perrin et al. (2014). A positive species criterion is set to ensure that vegetation remains representative of this habitat and is not degrading or succeeding to a different habitat. Bearberry (*Actostaphylos uva-ursi*), Crowberry (*Empetrum nigrum*), bell heather (*Erica cinerea*) and ling (*Calluna vulgaris*) are recorded from this SAC (NPWS internal files)
Vegetation composition: dwarf-shrub species	Percentage cover at a representative number of monitoring stops	Cover of dwarf-shrub species at least 10%	Based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of monitoring stops	Total cover of negative indicator species less than 10%	Based on Perrin et al. (2014) where negative species are listed
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation
Vegetation structure: signs of grazing	Percentage at a representative number of monitoring stops	Less than 10% collectively of live leaves of specific graminoids showing signs of grazing	Based on Perrin et al. (2014). High levels of grazing of these species would indicate undesirable levels of livestock/other grazers
Vegetation structure: signs of browsing	Percentage at a representative number of monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Based on Perrin et al. (2014). High levels of browsing of these dwarf shrubs would indicate undesirable levels of livestock/other grazers
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning within the habitat	Based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion

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 Gweedore Bay and Islands 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	Total area of this habitat has not been calculated although it is known to be distributed thoughout the SAC, usually occurring in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (NPWS internal files). Cooper el al. (2012) surveyed and mapped four sub-sites containing juniper formations that occur completely or partially within the SAC. See map 9. Further areas of the habitat are likely to be present
Habitat distribution	Occurrence	No decline. See map 9 for surveyed locations	See notes for area above
Juniper population size	Number per formation	At least 50 plants per formation	To classify as a juniper formation, at least 50 plants should be present (Cooper et al., 2012)
Vegetation composition: typical species	Number per formation	At least 50% of the listed positive indicator species for the relevant vegetation group present	Cooper et al. (2012) lists positive indicator species for five vegetation groups
Vegetation composition: negative indicator species	Occurrence per formation	Negative indicator species, particularly non-native invasive species, absent or under control	Negative indicator species listed by Cooper et al. (2012)
Vegetation structure: cone-bearing plants	Percentage per formation	At least 10% of plants are bearing cones	Attribute and target based on Cooper et al. (2012)
Vegetation structure: seedling recruitment	Percentage per formation	At least 10% of juniper plants are seedlings	Attribute and target based on Cooper et al. (2012)
Vegetation structure: dead juniper	Percentage per formation	Mean percentage of each juniper plant dead less than 10%	Attribute and target based on Cooper et al. (2012)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 154ha above high water mark (HWM); 40ha along river banks/ around lakes and ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 1,192ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 12.1km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 82ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 10	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

1395 Petalwort *Petalophyllum ralfsii*

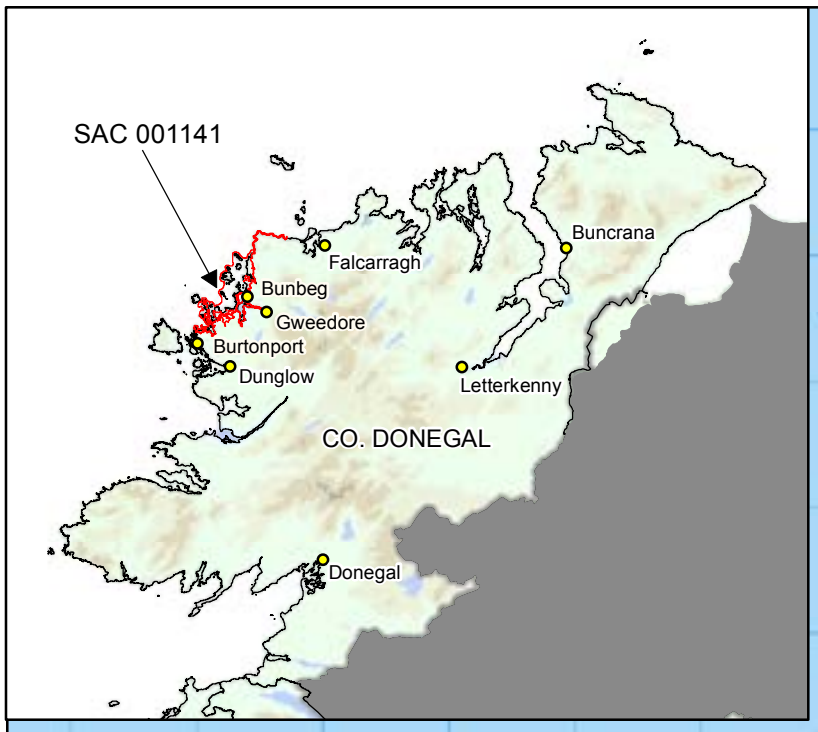
To maintain the favourable conservation condition of Petalwort in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution of populations	Number and geographical spread of populations	No decline. See map 11 for known locations	There are currently three known populations: (4a) Damph Beg, in slack area and on gravelly sand of small low bank above track into small disused sand-quarry, above edge of dune slack; (4b) Derrybeg, on low NW-facing part of bank just above edge of dune slack and (4c) Keadew Point, at three locations. The population at Damph Beg has not been seen since 2002. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. Population at (4a) Damph Beg: c.10 thalli; (4b) Derrybeg: c.8 thalli; (4c) Keadew Point: c.88 thalli. Total: c.100 thalli	Counts of thalli: for Damph Beg, from mean number of thalli recorded by Holyoak in 1999 and 2002 (24 and 7 thalli) and Lockhart in 2006 (0 thalli) = 10.33; for Derrybeg, from mean number of thalli recorded by Holyoak in 2002 (3 thalli) and Lockhart in 2006 (12 thalli) = 7.5 thalli; for Keadew Point, from mean of number of thalli in two 1 x 1m plots, from three counts between early April 2009 and April 2011 (Campbell, 2013) = 4.2 thalli per m^2 in $21m^2$ = c.88 thalli
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Damph Beg and Derrybeg currently unknown, but thought to be very small, c.0.5m^2 each. Area of suitable habitat at Keadew Point estimated at c.21m^2. Total = c.0.002ha	The extents of suitable habitat at Damph Beg and at Derrybeg has not been measured by GPS, but are known to be very small (c.0.5m^2 each). Main area of occupancy at Keadew Point is on a layer of humus-rich sand c.1cm thick overlying pure sand on a rocky outcrop above the shoreline, measured by GPS co-ordinates = 24.3m^2 (Campbell, 2013). Only about 80% of this area is actually suitable habitat for *Petalophyllum ralfsii* (c.19m^2). Two outlying records (1m^2 each) from Keadew Point were also reported by Lockhart in 1998 and Holyoak in 2002 giving a total of c.21m^2 for Keadew Point
Hydrological conditions: soil moisture	Occurrence of damp soil conditions	Maintain hydrological conditions so that substrate is kept moist and damp throughout the year, but not subject to prolonged inundation by flooding in winter	*Petalophyllum ralfsii* grows in damp sand. Based on Campbell (2013)
Vegetation: open structure	Height and percentage cover of vegetation	Maintain open, low vegetation, with a high percentage cover of bryophytes (small acrocarps and liverwort turf) and bare ground	*Petalophyllum ralfsii* grows in compacted, sandy ground, maintained by rabbit (*Oryctolagus cuniculus*) and sheep grazing and some trampling (by walkers). Recorded at Damph Beg with low moss and patchy low phanaerogams (Holyoak, 2002), not refound there by Lockhart in 2006 who reported that the prospects for survival are reasonable, but small available niche is vulnerable; recorded at Derrybeg on wet humic sand with very low, patchy moss-rich grassland (2.4cm high) (by Holyoak in 2002); at Keadew Point, Campbell (2013) recorded a mean height of vegetation of 6cm, with bryophyte cover c.34-75% and bare ground c.4-25% (based on two 1 x 1m plots from 2009 and 2011)

1833 Slender Naiad *Najas flexilis*

To maintain the favourable conservation condition of Slender Naiad in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population extent	Hectares and distribution	No change to the spatial extent of *Najas flexilis* within each lake, subject to natural processes. See map 12 for known locations	See *Najas flexilis* supporting document for further details
Population depth	Metres	No change to the depth range of *Najas flexilis* within each lake, subject to natural processes	See *Najas flexilis* supporting document for further details
Population viability	Plant traits	No decline in plant fitness, subject to natural processes	See *Najas flexilis* supporting document for further details
Population abundance	Square metres	No change to the cover abundance of *Najas flexilis*, subject to natural processes	See *Najas flexilis* supporting document for further details
Species distribution	Occurrence	No decline, subject to natural processes	See *Najas flexilis* supporting document for further details
Habitat extent	Hectares	No decline, subject to natural processes	See *Najas flexilis* supporting document for further details
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat for the species	See *Najas flexilis* supporting document for further details
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the populations of the species	See *Najas flexilis* supporting document for further details
Water quality	Various	Maintain appropriate water quality to support the populations of the species	See *Najas flexilis* supporting document for further details
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the populations of *Najas flexilis*, subject to natural processes	See *Najas flexilis* supporting document for further details
Water colour	mg/L PtCo	Maintain appropriate water colour to support the populations of *Najas flexilis*	See *Najas flexilis* supporting document for further details
Associated species	Species composition and abundance	Maintain appropriate associated species and vegetation communities to support the populations of *Najas flexilis*	See *Najas flexilis* supporting document for further details
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the populations of *Najas flexilis*	See *Najas flexilis* supporting document for further details



Legend

Gweedore Bay and Islands SAC 001141

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Department of Arts, Heritage and the Gaeltacht

MAP 1:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015

SPA 004230

SPA 004150

SAC 001141

SAC 002283

Legend

- Gweedore Bay and Islands SAC 001141
- Rutland Island and Sound SAC 002283
- West Donegal Coast SPA 004150
- West Donegal Islands SPA 004230
- OSi Discovery Series County Boundary

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MAP 2: GWEEDORE BAY AND ISLANDS SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 001141; version 3.01, SAC 002283; version 3.01.
SPA 004150; version 2.01, SPA 004230; version 1.01.
CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Jan 2015

Map Extent

IL082 Kincas L.

IL083 Moorlagh

Legend

- Gweedore Bay and Islands SAC 001141
- 1150 *Coastal lagoons
- OSi Discovery Series County Boundary

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MAP 3:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

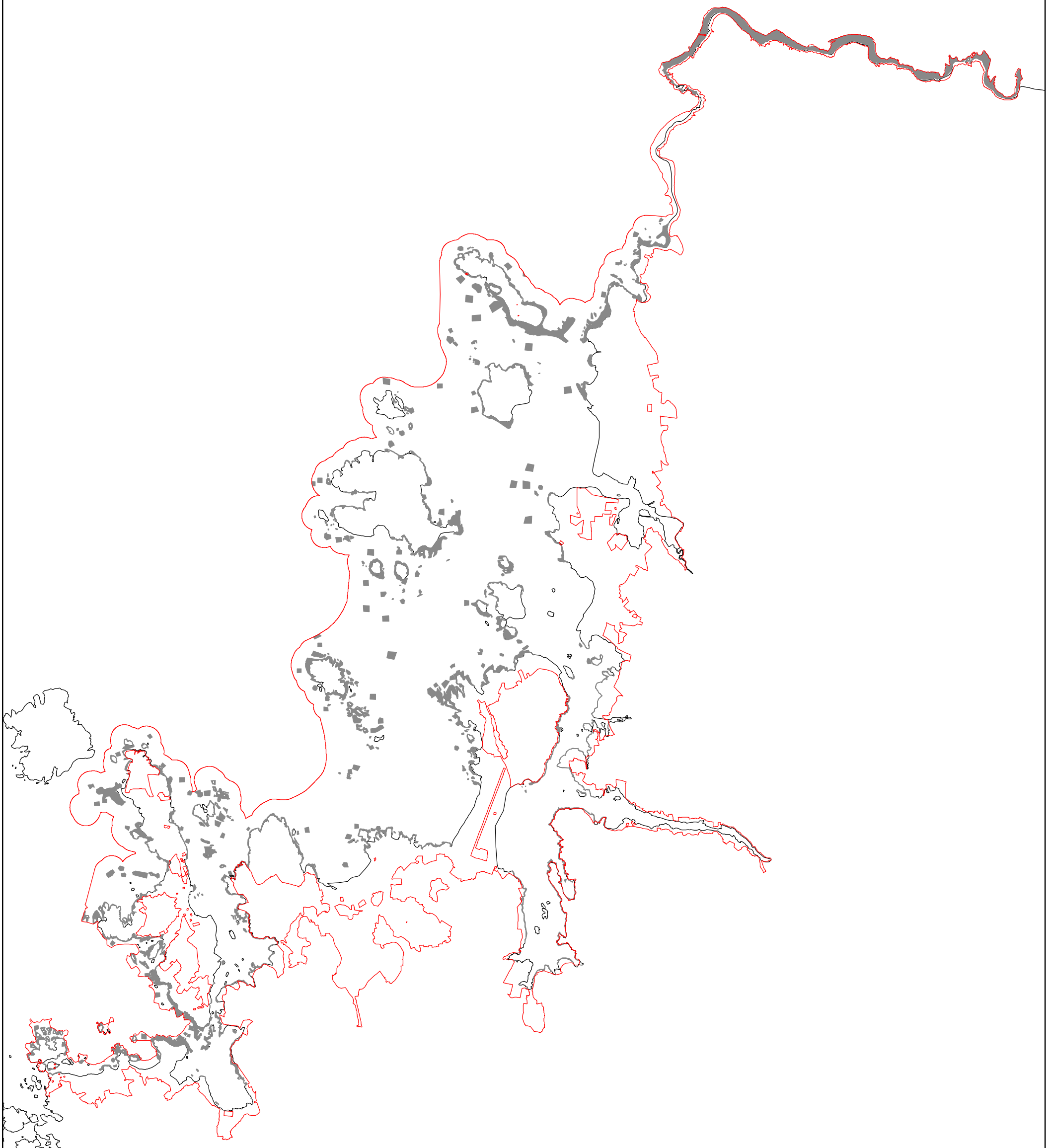
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Jan 2015



Legend

- Gweedore Bay and Islands SAC 001141
- 1170 Reefs
- OSi Discovery Series County Boundary

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MAP 4:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
REEFS

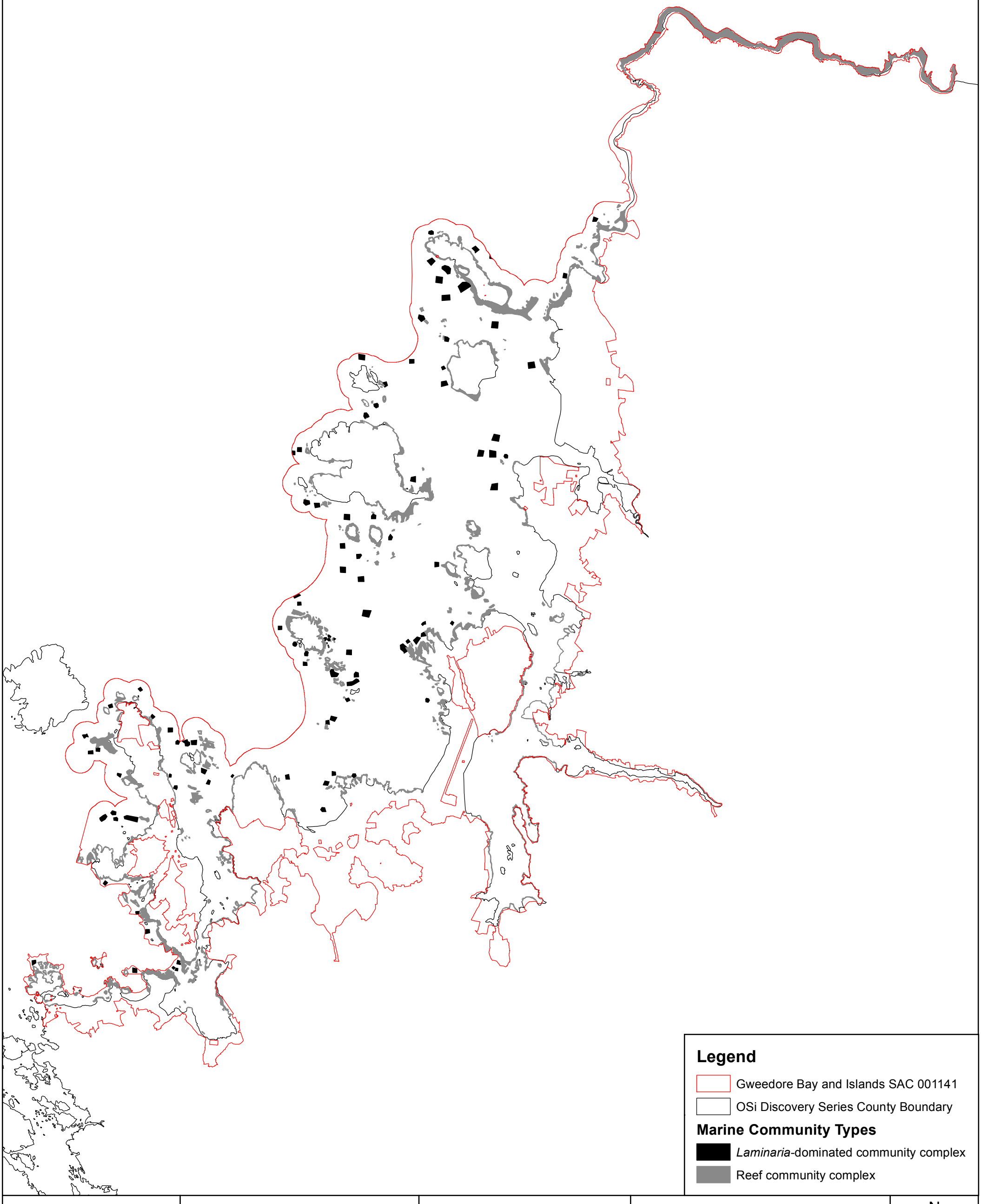
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015



Legend

Gweedore Bay and Islands SAC 001141

OSi Discovery Series County Boundary

Marine Community Types

Laminaria-dominated community complex

Reef community complex

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MAP 5:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015

Map Extent

SMP: 0129

Legend

Gweedore Bay and Islands SAC 001141

OSi Discovery Series County Boundary

SMP: 0129 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

1410 Mediterranean salt meadows (Juncetalia maritimi)

Potential 1330 / Potential 1410. Potential Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Potential Mediterranean salt meadows (Juncetalia maritimi)

Non Qualifying Interests

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

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MAP 6:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Jan 2015

Legend

- Gweedore Bay and Islands SAC 001141
- OSi Discovery Series County Boundary
- National Shingle Beach Survey sub-sites

CMP: 153 Coastal Monitoring Project Site Codes

SDM: 155 Sand Dunes Monitoring Project Site Codes

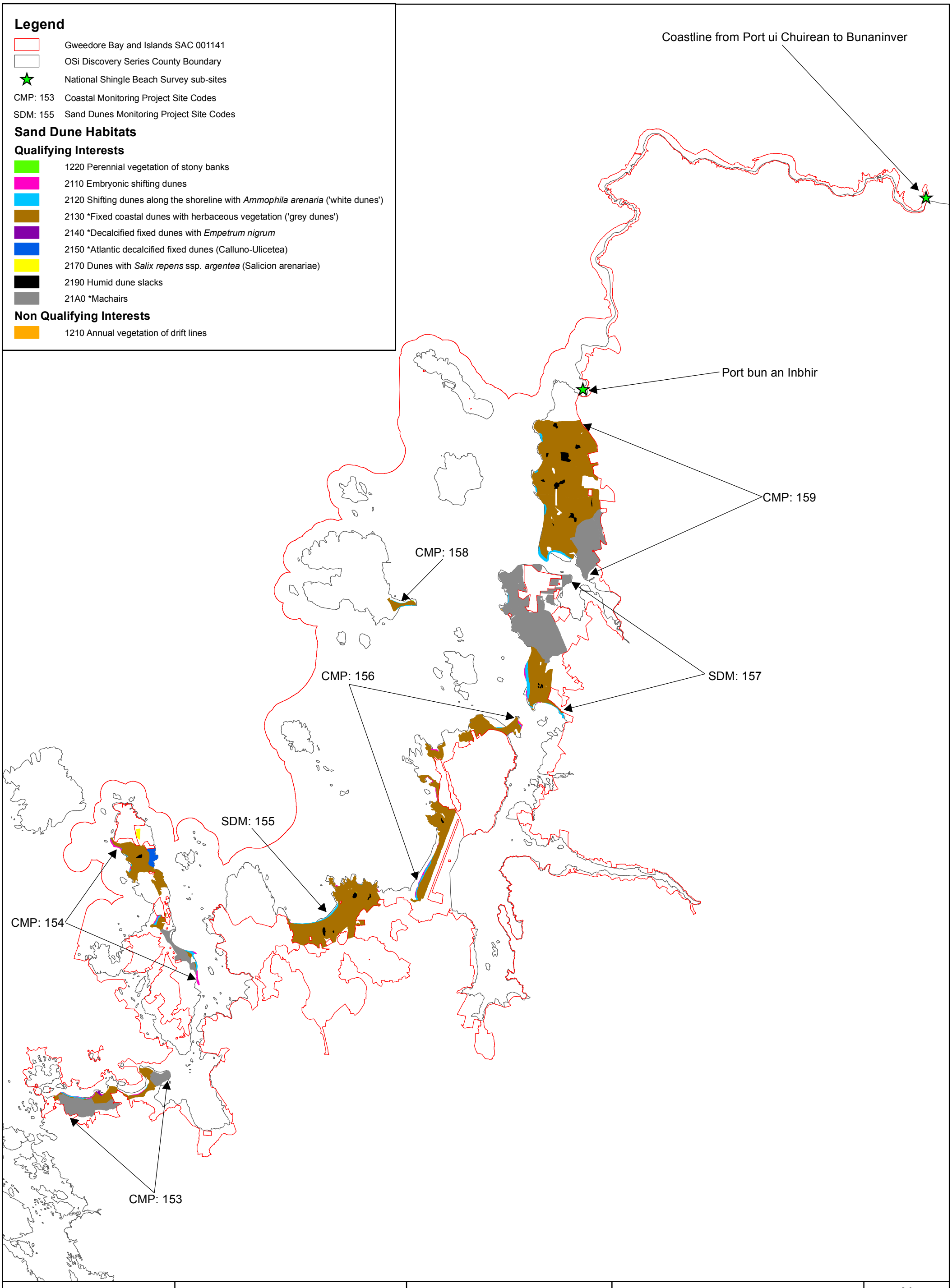
Sand Dune Habitats

Qualifying Interests

- 1220 Perennial vegetation of stony banks
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')
- 2140 *Decalcified fixed dunes with *Empetrum nigrum*
- 2150 *Atlantic decalcified fixed dunes (Calluno-Ulicetea)
- 2170 Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)
- 2190 Humid dune slacks
- 21A0 *Machairs

Non Qualifying Interests

- 1210 Annual vegetation of drift lines



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MAP 7:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS &
PERENNIAL VEGETATION OF STONY BANKS

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015

Legend

Gweedore Bay and Islands SAC 001141

OSi Discovery Series County Boundary

Lake Habitats

Qualifying Interests

Potential 3110 / Potential 3130. Potential Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorarae) / Potential Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorarae and/or Isoeto-Nanojuncetea

Non Qualifying Interests

3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorarae and/or Isoeto-Nanojuncetea

Potential 3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorarae and/or Isoeto-Nanojuncetea

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MAP 8:
GWEEDORE BAY AND ISLANDS SAC CONSERVATION OBJECTIVES LAKE HABITATS

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015

Legend

- Gweedore Bay and Islands SAC 001141
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands Survey Sites
- OSi Discovery Series County Boundary

DL14

DL12

DL11

DL15

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MAP 9:
GWEEDORE BAY AND ISLANDS SAC CONSERVATION OBJECTIVES JUNIPER FORMATIONS

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015

Legend

- Gweedore Bay and Islands SAC 001141
- 1355 Otter-*Lutra lutra* Commuting 250m HWM buffer
- OSi Discovery Series County Boundary

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MAP 10:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

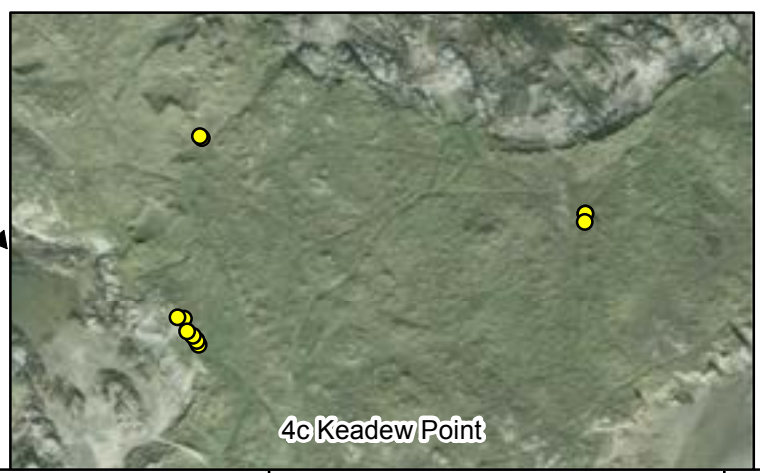
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015



Legend

- Gweedore Bay and Islands SAC 001141
- 1395 Petalwort - *Petalophyllum ralfsii*
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 11: GWEEDORE BAY AND ISLANDS SAC CONSERVATION OBJECTIVES PETALWORT

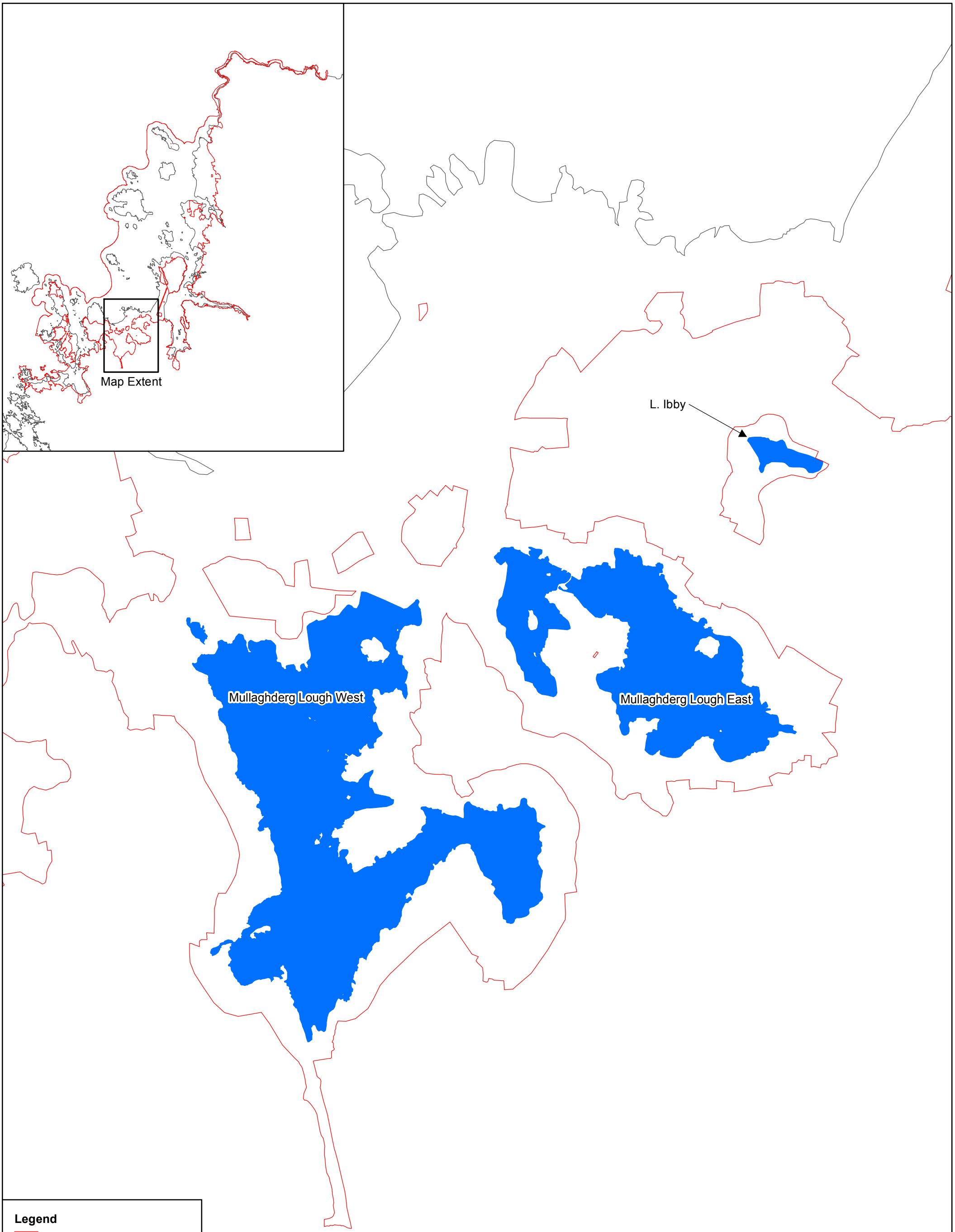
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 1 2 3 km

N

Map Version 1
Date: Jan 2015



Legend

- Gweedore Bay and Islands SAC 001141
- 1833 Slender Naiad - *Najas flexilis*
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 12: GWEEDORE BAY AND ISLANDS SAC CONSERVATION OBJECTIVES SLENDER NAIAD

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

SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL

0 100 200 300 400 500 m

N

Map Version 1
Date: Jan 2015

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Termon Strand SAC 001195

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

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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***

001195	Termon Strand SAC
1150	Coastal lagoons*

Please note that this SAC adjoins Rutland Island and Sound SAC (002283). See map 2. The conservation objective for this site should be used in conjunction with those for the adjacent site 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 :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
Series :	Unpublished report to NPWS
Year :	2016
Title :	Termon Strand SAC (site code: 1195) Conservation objectives supporting document- coastal lagoons V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2010
Title :	Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive
Author :	Roden, C.M.; Oliver, G.
Series :	EPA

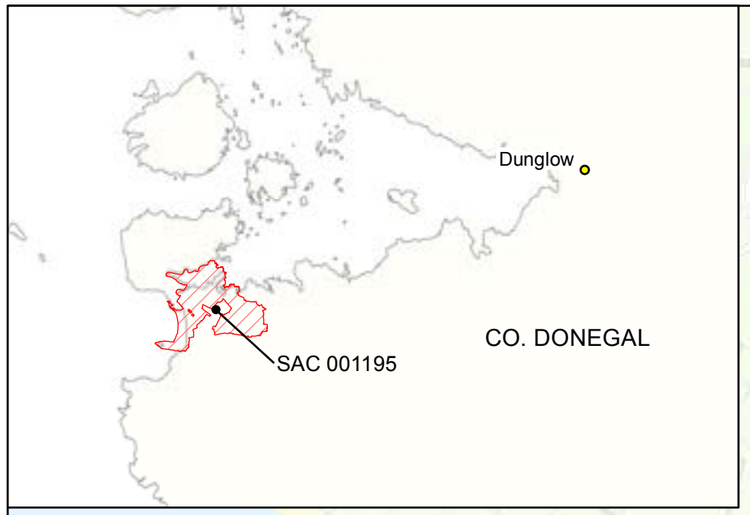
Spatial data sources

Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)

1150 Coastal lagoons

To maintain the favourable conservation condition of Coastal lagoons in Termon Strand SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to slight natural variation. Favourable reference area 15.3ha. See map 3	Area calculated from spatial data derived from Oliver (2007). Site code IL080 (Maghery Lough). See lagoons supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3	Site IL080 in Oliver (2007). See lagoons supporting document for further details
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	Maghery Lough is described as a meso-polyhaline lagoon. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Maghery Lough is recorded as less than 2m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	Maghery Lough is described as a natural rock/peat lagoon with a modified sluiced outlet. See lagoons supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural range and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural range and not more than 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural range and not more than 0.15mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to maximum depth of lagoon	Increased depth of colonisation increases both the extent and diversity of submergent macrophytes. Where a lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to the full depth of the lagoon. See lagoons supporting document for further details
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Negative indicator species	Number and percentage cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details



Legend

Termon Strand SAC 001195

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
TERMON STRAND SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

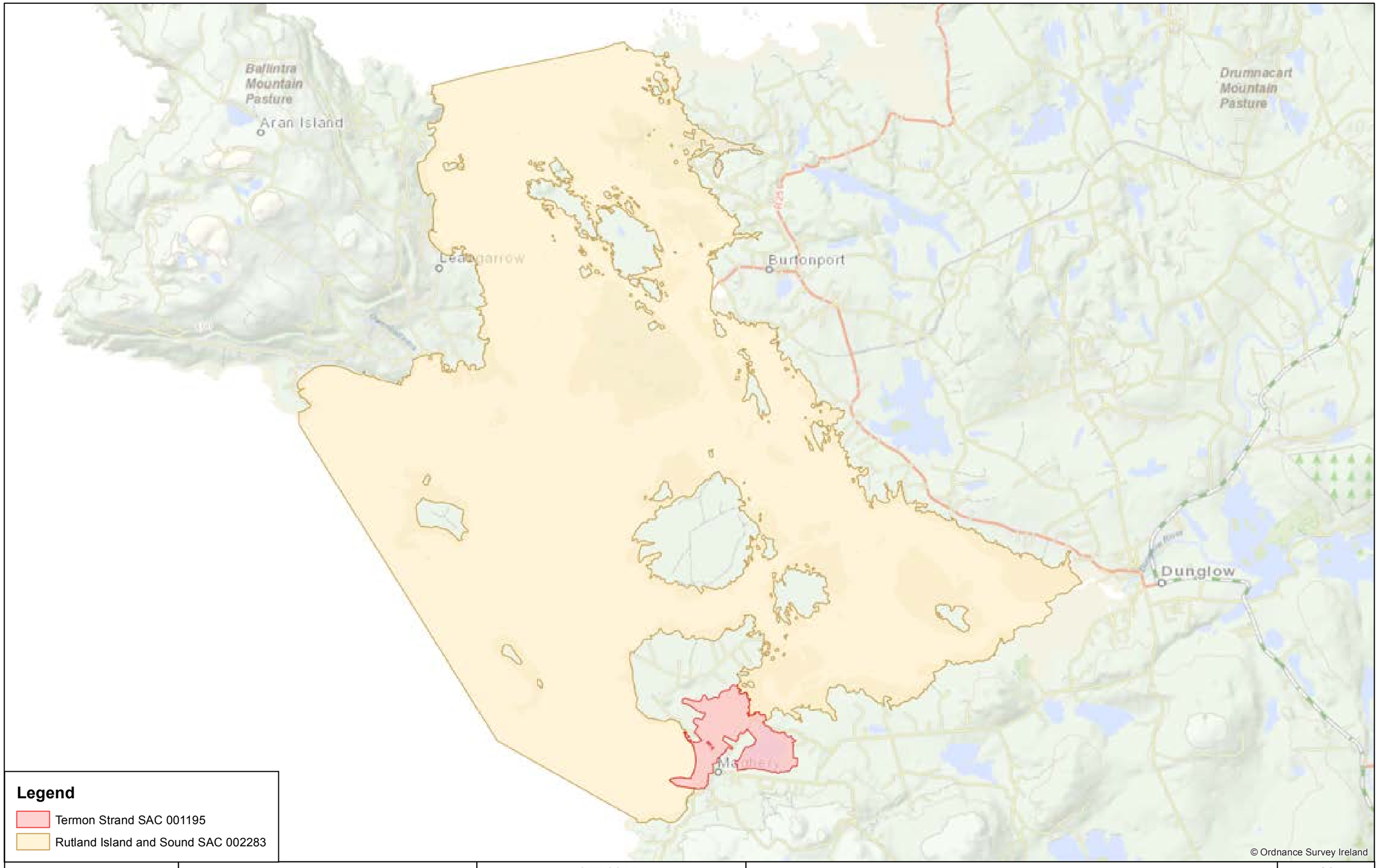
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001195; version 3.
CO. DONEGAL

0 0.07 0.14 0.21 0.28 0.35 km

N

Map Version 1
Date: Aug 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
TERMON STRAND SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND
OVERLAPPING DESIGNATIONS

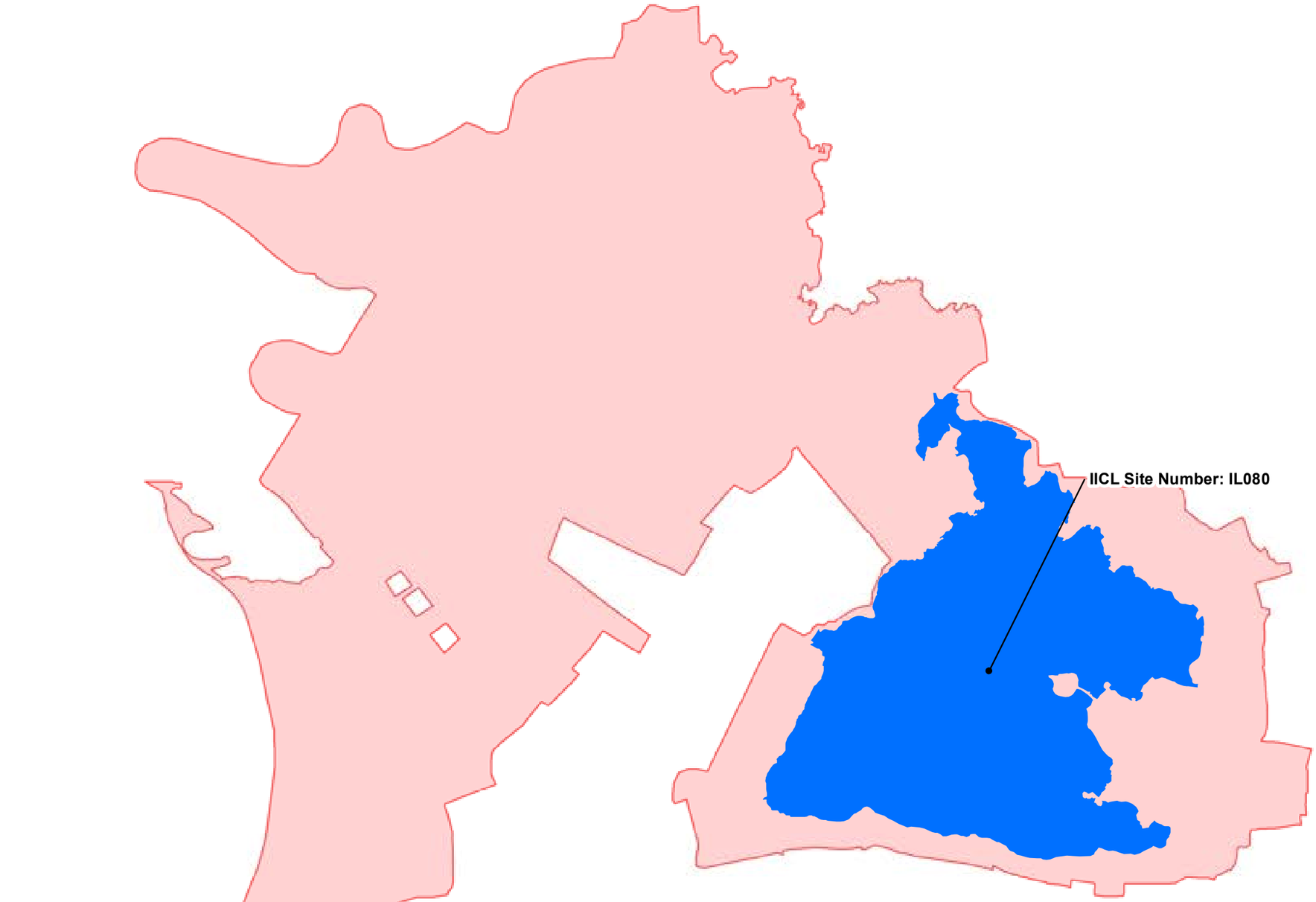
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001195; version 3.
SAC 002283; version 3.02.
CO. DONEGAL

0 0.5 1 1.5 2 2.5 km

N

Map Version 1
Date: Aug 2016



Legend

- Termon Strand SAC 001195
- 1150 Coastal Lagoons

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
TERMON STRAND SAC
CONSERVATION OBJECTIVES
LAGOON HABITATS

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

SITE CODE:
SAC 001195; version 3.
CO. DONEGAL

0 0.055 0.11 0.165 0.22 0.275 km

N

Map Version 1
Date: Aug 2016

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Conservation Objectives Series

Cloghernagore Bog and Glenveagh National Park SAC 002047

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe 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***

002047	Cloghernagore Bog and Glenveagh National Park SAC
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
1421	Killarney Fern *Trichomanes speciosum*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
4060	Alpine and Boreal heaths
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and is adjacent to Fawnboy Bog/Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), West of Ardara/Maas Road SAC (000197), Sheephaven SAC (001190), Leannan River SAC (002176) and River Finn SAC (002301). 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 :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1987
Title :	The vegetation of Irish rivers
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1990
Title :	A vegetation survey of Glenveagh National Park and the An Taisce property, Co. Donegal
Author :	Weekes, L.C.
Series :	Unpublished report to the OPW
Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	1995
Title :	Mapping of proposed SAC rivers for *Margaritifera margaritifera*. A report for the National Parks and Wildlife Service on work carried out from August to October 1995 (in two volumes) Volume 1
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	1996
Title :	A study of woodland exclosures in Glenveagh National Park, Co. Donegal
Author :	Bleasdale, A.; Conaghan, J.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Rapid Assessment of rivers with prior records of *Margaritifera margaritifera*
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS

Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: report on biological monitoring of surface water quality in Glaskeelan catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: report on biological monitoring of surface water quality in the Owencarrow catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS2 Freshwater pearl mussel sub-basin management plans. phytobenthos monitoring of the Glaskeelan catchment, Co. Donegal (NWIRBD). April 2009
Author :	Ní Chatháin, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS2 Freshwater pearl mussel sub-basin management plans. phytobenthos monitoring of the Owencarrow catchment, Co. Donegal (NWIRBD). April 2009
Author :	Ní Chatháin, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: monitoring of the freshwater pearl mussel in the Glaskeelan
Author :	Moorkens, E.A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II Freshwater pearl mussel sub-basin management plans: monitoring of the freshwater pearl mussel in the Owencarrow
Author :	Moorkens, E.A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manual No. 46
Year :	2010
Title :	Irish semi-natural grasslands survey. Annual report No.3: Counties Donegal, Dublin, Kildare and Sligo
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	Second Draft Glaskeelan Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to Department of the Environment, Heritage and Local Government

Year :	2010
Title :	Second Draft Owencarrow Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to Department of the Environment, Heritage and Local Government
Year :	2012
Title :	Monitoring populations of the freshwater pearl mussel *Margaritifera margaritifera*. A condition assessment survey of the freshwater pearl mussel in the Glaskeelan River, Co. Mayo.
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2013
Title :	Results of a monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manual No. 71
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2015
Title :	Monitoring methods for the Killarney fern (*Trichomanes speciosum* Willd.) in Ireland
Author :	Ní Dhúill, E.; Smyth, N.; Waldren, S.; Lynn, D.
Series :	Irish Wildlife Manual No. 82

Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Survey and condition assessment of the population of the freshwater pearl mussel *Margaritifera margaritifera* in the Glaskeelan River, County Donegal
Author :	Moorkens, E.
Series :	Unpubished report to NPWS
Year :	2017
Title :	Cloghernagore Bog and Glenveagh National Park SAC (site code: 2047) Conservation objectives supporting document- blanket bogs and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1990
Title :	A phytosociological study and map of the vegetation of Glenveagh National Park and the An Taisce property, Co. Donegal
Author :	Weekes, L.C.
Series :	Unpublished M.Sc. Thesis, National University of Ireland, Galway
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	1996
Title :	Studies on the biology and ecology of *Margaritifera* in Ireland
Author :	Moorkens, E.
Series :	Unpublished Ph.D. thesis, University of Dublin, Trinity College.
Year :	1996
Title :	The distribution and ecology of the freshwater pearl mussel, *Margaritifera margaritifera* L. 1758, in County Donegal, Ireland and implications for its conservation
Author :	Beasley, C.R.
Series :	Unpublished Ph.D. Thesis, The Queen's University of Belfast
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623

Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2003
Title :	Ecology of watercourses characterised by Ranunculion fluitantis and Callitricho-Batrachion vegetation
Author :	Hatton-Ellis, T.W.; Grieve, N.
Series :	Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Author :	Geist, J.; Porkka, M.; Kuehn, R.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 251-266
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19(3): 264–273
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the Republic of Ireland within the framework of the habitats and species directive
Author :	Moorkens, E.
Series :	Journal of Conchology, 40: 339

Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland
Year :	2012
Title :	A study of the ecology of the oceanic montane vegetation of western Ireland and its potential response to climate change
Author :	Hodd, R.
Series :	Unpublished Ph.D. thesis, National University of Ireland, Galway
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2014
Title :	Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 24(6): 853-862
Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford
Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2016
Title :	The Status of Irish Salmon Stocks in 2015 with Precautionary Catch Advice for 2016
Author :	SSCS (Standing Scientific Committee on Salmon)
Series :	Independent Scientific Report to Inland Fisheries Ireland

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 3)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 4)
Year :	2017
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 :	1029 (map 5)
Year :	2012
Title :	Margaritifera Sensitive Areas data revision
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 5)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 10m buffer on the terrestrial side of river banks data; creation of 20m buffer applied to canal centreline data. Creation of a 20m buffer applied to river and stream centreline data; These datasets combined with derived OSI 1:5000 vector lake buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets combined with the derived OSi Discovery Series river and canal datasets. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Cloghernagore Bog and Glenveagh National Park 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	Lake habitat 3110 is likely to occur in Loughs Barra, Veagh, Altan, Glentornan, Muck, Nambradden, Inshagh and others in Cloghernagore Bog and Glenveagh National Park SAC. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha were mapped as potential 3110 (see map 3). In lakes at higher altitude (above 200m), lake habitat 3160 may occur. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, all lakes larger than 1ha have been mapped as potential 3110 (see map 3)
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for lake habitat 3110 (NPWS, 2013) and O Connor (2015). Lough Veagh was investigated by Heuff (1984) and Free et al. (2006). Free et al. (2006) also studied Lough Barra. Loughs Barra, Glen, Upper Veagh, Nasnanida and Keel are Water Framework Directive (WFD) monitoring lakes and regular macrophyte surveys are conducted by the Environmental Protection Agency (EPA)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Maximum depth should naturally be large in the SAC, as many of the lakes are deep and the water should be very clear. Information on vegetation depth may be available for the WFD monitoring lakes in the SAC
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Information on substratum may be available for the WFD monitoring lakes in the SAC

Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. High altitude and deep lakes, such as those found in the SAC, are expected to have high transparency. Heuff (1984) recorded transparency of 3m in Lough Veagh
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and WFD 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for nutrient status in the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See Clabby et al. (2008), McGarrigle et al. (2010) and Bradley et al. (2015) for chlorophyll *a* status in the WFD monitoring lakes in the SAC during the 2004-06, 2007-09 and 2010-12 reporting periods. Lough Barra failed the high chlorophyll *a* status target in 2010-12 (Bradley et al., 2015)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3110 requires WFD high status. See Bradley et al. (2015) for phytoplankton composition status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3110 requires high phytobenthos status. See Bradley et al. (2015) for phytobenthos status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period

Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/restore high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for macrophyte status in the WFD monitoring lakes in the SAC for the 2007-09 and 2010-12 reporting periods. Glen and Keel Loughs failed to reach the high macrophyte status in 2010-12 (Bradley et al., 2015)
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for acidification status for the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 45mg/l, 60mg/l, 34mg/l and 42mg/l PtCo in Loughs Barra, Glen, Keel and Veagh, respectively
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. Damage to peatland may be resulting in increased DOC and colour in lakes within Cloghernagore Bog and Glenveagh National Park SAC

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In Cloghernagore Bog and Glenveagh National Park SAC, lake shorelines are likely to have low-nutrient grassland, swamp, heath, blanket bog and rock communities. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

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

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The description of habitat 3260 covers upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. The selection of this SAC used this broad interpretation. Conservation objectives for habitat 3260 concentrate on the high conservation value sub-types; however, little is known of its distribution or its sub-types in the SAC. There are a large number of upland streams and rivers, as well as associated springs and headwaters. Lowland rivers include the Gweebarra, Cloghernagore, Owencarrow and Calabber. All are likely to be macroalgal and bryophyte dominated. Note: rooted macrophytes should be absent or trace (<5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Glaskeelan and Owencarrow Rivers within this SAC because the mussel requires environmental conditions closer to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish sub-types and their conservation value to interpret the broad description of 3260 (European Commission, 2013). As noted above, little is known about the distribution of the habitat and its sub-types in Cloghernagore Bog and Glenveagh National Park SAC. The Vulnerable moss *Schistidium agassizii* (Lockhart et al., 2012) is found by the Lackagh River. Heuff (1987) surveyed three sites on the Barra/Gweebarra River and noted it as an excellent, oligotrophic system of high conservation interest. The rivers and streams are generally fast-flowing, with cascades and waterfalls, and are likely to be dominated by macroalgae and bryophytes, with limited submerged or emergent higher plants
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Any high conservation value sub-types in the SAC will be associated with natural hydrology. A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For many of the sub-types of this habitat, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology. Peatlands also have slow-flowing or ponded streams and rivers, with biotic communities likely to resemble those in associated lakes
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	The groundwater contribution to rivers in the SAC is likely to be small, owing to the geology and dominance of blanket peat soils. Even small groundwater contributions, however, can significantly alter the hydrochemistry, particularly where there is basic bedrock and/or subsoils

Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes	Many of the high conservation value sub-types are dominated by coarse substrata, and bedrock, boulders, cobbles and coarse gravels are likely to be common in this SAC. The size and distribution of particles is largely determined by the river flow. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver for rooted plant communities. Note: increased fine sediment is contributing to the unfavourable status of the freshwater pearl mussel (*Margaritifera margaritifera*) in the Glaskeelan and Owencarrow Rivers. See the freshwater pearl mussel (1029) conservation objective
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. The rivers within Cloghernagore Bog and Glenveagh National Park SAC are considered to be naturally very nutrient-poor and, therefore, to typically require Water Framework Directive high status, in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos
Vegetation composition: typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance	The sub-types of this habitat are poorly understood and their typical species have not yet been fully defined. The typical species may include higher plants, bryophytes, macroalgae and microalgae, and invertebrates
Floodplain connectivity: area	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat and its sub-types	River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors, connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone et al., 2016)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of marginal fringing habitats that support the typical species and vegetation composition of the habitat and its sub-types	Riparian habitats (including those along lake shores), particularly natural/semi-natural woodlands and wetlands, are an integral part of the structure and functioning of river systems, even where they do not form part of a natural floodplain. Fringing habitats can contribute to the aquatic food web (e.g. allochthonous matter such as leaf fall), provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates, assist in the settlement of fine suspended material, protect banks from erosion and contribute to nutrient cycling. Shade may also be important in suppressing algal growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The rivers and streams in this SAC are likely to be fringed by upland grassland, blanket bog, heath, flush/poor fen and riparian woodland

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Cloghernagore Bog and Glenveagh National Park 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	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 3,396ha, covering 10% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs in an intimate mosaic with blanket bog particularly on the lower slopes of hills, where peat is shallower. Good examples of wet heath can be found on the south-eastern slopes of Errigal and in the area around Croangar (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files; R. Hodd, pers. comm.), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Pirri-pirri-bur (*Acaena novae-zelandiae*) (R. Hodd, pers. comm.) and rhododendron (*Rhododendron ponticum*) (NPWS internal files) are present within wet heaths in the SAC
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable liverworts *Scapania ornithopodioides* and *Bazzania pearsonii* (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Cloghernagore Bog and Glenveagh National Park 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	European dry heaths habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 5,744ha, covering 17% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat typically occurs on slopes above 300m in the SAC. Examples of this habitat can be found at Grogan More, Crocknafarragh, Crookglass, Croaghdoo, Addernymore, Staghall Mountain, Farscallop, Kinnaveagh, Leahanmore, and the area between Dooish and Kingarrow (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of dry heath vegetation communities have been recorded in this SAC (NPWS internal files; R. Hodd, pers. comm.), two of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Attribute and target based on Perrin et al. (2014)
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) is present within dry heaths in the SAC (R. Hodd, pers. comm.)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Vulnerable small-white orchid (*Pseudorchis albida*) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to dry heaths. The FPO listed and Vulnerable liverworts *Scapania ornithopodioides*, *Bazzania pearsonii* and *Adelanthus lindenbergianus* (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

4060 Alpine and Boreal heaths

To restore the favourable conservation condition of Alpine and Boreal heaths in Cloghernagore Bog and Glenveagh National Park 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	Alpine and Boreal heaths habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 245ha, covering 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur on all the main summits and ridges above 400-500m. The best examples of this habitat are on the higher parts of Errigal, Slieve Snaght, Dooish and Mackoght (Hodd, 2012; NPWS internal files). Further information can be found within Hodd (2012), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	R. Hodd (pers. comm.) noted a variety of Alpine and Boreal heath vegetation communities in this SAC, three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 66%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrub species at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 10%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Pirri-pirri-bur (*Acaena novae-zelandiae*) occurs in this habitat in the SAC (R. Hodd, pers. comm.)
Vegetation structure: signs of grazing	Percentage of leaves grazed at a representative number of 2m x 2m monitoring stops	Less than 10% collectively of the live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of specific graminoids

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning within the habitat	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened alpine clubmoss (*Diphasiastrum alpinum*) (Wyse Jackson et al., 2016) is present in Alpine and Boreal heaths in the SAC (R. Hodd, pers. comm.). The FPO listed and Vulnerable bryophytes *Scapania ornithopodioides*, *Bazzania pearsonii* and *Adelanthus lindenbergianus* (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

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

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Cloghernagore Bog and Glenveagh National Park 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	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caerulae) have not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC and thus the total area of the qualifying habitat is unknown. *Molinia* meadows are known to occur in areas that are subjected to occasional flooding in the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for Habitat area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	Based on O'Neill et al. (2013), where the list of positive indicator species, including high quality species, is also presented. Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat. The high quality indicator conglomerate rush (*Juncus conglomeratus*) and the positive indicators purple moor-grass and sharp-flowered rush (*Juncus acutiflorus*) have been recorded from this habitat in the SAC (Weekes, 1990; NPWS internal files)
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013), where the list of negative indicator species is also presented
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: moss species	Percentage at a representative number of monitoring stops	Hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species and bracken (*Pteridium aquilinum*) not more than 5% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 10cm and 80cm tall	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013)

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Cloghernagore Bog and Glenveagh National Park 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	Blanket bog has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 22,607ha, covering 68% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs throughout the SAC. The area around Cloghernagore constitutes the most extensive blanket bog system remaining in the north-west of Ireland (NPWS internal files). Other examples of this habitat are present at Glenveagh Bridge, Cashelnagor, Dunlewy Far, Derrybeg, Calabber Valley, Attinadague, Meenagoppoge, Carrickatimpan, Commeen and Skeagh (Douglas et al., 1990). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (NPWS internal files), six of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Rhododendron (*Rhododendron ponticum*) and the non-native moss *Campylopus introflexus* were recorded in this habitat in the SAC (NPWS internal files)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Near Threatened bog orchid (*Hammarbya paludosa*) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to blanket bogs. The FPO listed and Vulnerable liverworts *Scapania ornithopodioides* and *Bazzania pearsonii* (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Cloghernagore Bog and Glenveagh National Park 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	Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC and thus the total area of the qualifying habitat is unknown. Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat mostly occurs in areas of lowland blanket bog on wet and quaking terrain. Good examples of this habitat are present at Cloghernagore Bog and at Glenveagh Bridge Bog (NPWS internal files). It is also present at Attinadague Bog, Derrybeg Bog and Skeagh Bog (Douglas et al., 1990). Further information can be found in Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least five	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: *Rhynchospora* spp.	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of white beaked sedge (*Rhynchospora alba*) and brown beaked sedge (*R. fusca*) at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species individually less than 35%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

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

To restore the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes; at least 37.3ha, for the sub-sites (Mullangore Wood, NSNW site code 1423; Derry Beg, NSNW site code 1424) surveyed. See map 4 for surveyed areas	The main area of old oak woodland in Cloghernagore Bog and Glenveagh National Park SAC is Mullangore Wood, on the south-eastern side of Lough Veagh; other areas include Sruhanacullia Wood, Brogan's Wood, Derrybeg Wood, Upper Glen Wood and Garman Wood (Bleasdale and Conaghan, 1996; NPWS internal files). Two sites within the SAC were surveyed by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW): Mullangore Wood (NSNW site code 1423) and Derry Beg (NSNW site code 1424). Mullangore Wood (1423) was also included in a national monitoring survey (O'Neill and Barron, 2013). Map 4 shows the surveyed woodlands classified as 91A0 (37.3ha) by the NSNW. NB further unsurveyed areas are present within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. Surveyed woodland locations are shown on map 4	Distribution based on Perrin et al. (2008). It is important to note that there are additional areas of woodland, which were not mapped by the NSNW, present within this SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size.	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak (*Quercus petraea*) generally regenerates poorly. In suitable sites, ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) identified Mullangore Wood (NSNW site code 1423) as "possible ancient woodland". The Near Threatened beech fern (*Phegopteris connectilis*) (Wyse Jackson et al., 2016) and the Annex V listed fir clubmoss (*Huperzia selago*) are present in Mullangore Wood (Perrin et al., 2008)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Rhododendron (*Rhododendron ponticum*) infestation is a problem within this habitat in the SAC, although an extensive clearance programme is on-going (Perrin et al., 2008; NPWS internal files)

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	See targets below and see map 5	The conservation objective applies to the Glaskeelan and Owencarrow freshwater pearl mussel (*Margaritifera margaritifera*) populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (SI No. 296 of 2009). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems (see further information below). The Glaskeelan, owing to the relatively few pressures in the catchment, is one of eight Irish populations prioritised for conservation action. This SAC covers much of the Glaskeelan and Owencarrow catchments. It also covers upper parts of the Clady catchment, while the Glaskeelan is a sub-catchment of the Leannan (see map 5). Conservation objectives for the Clady and Leannan freshwater pearl mussel populations are detailed for SACs 000140 and 002176, respectively
Distribution: Glaskeelan	Kilometres	Maintain Glaskeelan distribution at 3.17km	As noted above, the Glaskeelan freshwater pearl mussel population is one of eight Irish populations prioritised for conservation action (Moorkens, 2010; NPWS, 2010). Information on the distribution of the freshwater pearl mussel in the Glaskeelan comes from Moorkens (1995, 1996, 2007, 2009). Mussels have been found from just downstream of the national park boundary to the mouth of the river at Gartan Lough; however, most of the population occurs between a 'large rock' at C04873 17424 and the lake. Further survey is required of the stretches from the national park boundary downstream to the 'large rock'. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Glaskeelan system. See NPWS (2010) for further information
Distribution: Owencarrow	Kilometres	Maintain Owencarrow distribution at 7.3km	The distribution of the freshwater pearl mussel is poorly known for the Owencarrow system, but is considered to be from the outflow from Lough Beagh to the New Bridge (N56) (based on records from: Beasley, 1996; Moorkens, 1995, 1996, 2007, 2009). Further survey is required of the distribution, abundance and condition of the species and its habitat in the Owencarrow. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Owencarrow system. See NPWS (2010) for further information

Population size	Number of adult mussels	Restore populations to at least: 10,000 adult mussels in the Glaskeelan and 10,000 in the Owencarrow	The 2009 population estimate for the Glaskeelan was a maximum of 10,000 (Moorkens, 2009; NPWS, 2010). NPWS (2010) provided a population estimate of 15,000 for the Owencarrow, however Moorkens (2010) considered it more likely to be less than 10,000. Pearl fishing appears to have contributed significantly to the Owencarrow population decline (Beasley, 1996; Moorkens, 2009; NPWS, 2010) and the available mussel habitat is below capacity for mussels (Moorkens, 2009). Further survey of both systems is required to provide more robust population targets. NPWS (2013) assumed the Glaskeelan, like other priority populations, had declined at a rate of 1% per year and the Owencarrow at 3% per year. Moorkens (2017), however, found that one stretch of the Glaskeelan had declined by 82% in 4 years. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. Beasley (1996) conducted age studies of Glaskeelan and Owencarrow mussels. In 2009, the smallest Glaskeelan mussel was 26mm, but it failed both targets with only 6.6% ≤65mm and 1.3% ≤30mm (Moorkens, 2009). No juvenile or young mussels were found in the Glaskeelan in 2012 or 2016 (Moorkens, 2012, 2017). No juveniles or young mussels were found in the Owencarrow in 2009 (Moorkens, 2009; NPWS, 2010). Both populations are unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Glaskeelan was assumed to pass both targets in 2009 and again in 2012, when the absence of baseline data made assessment of changes in live adults difficult (Moorkens, 2009, 2012; NPWS, 2010). In 2016, a severe decline was recorded, with an 82% drop in adults between 2012-16 in one stretch, the highest density was 3 mussels/m² and the 8 mussels tested by tongs were found to be 'Stressed'. The Owencarrow failed both targets in 2009, when more dead shells (more than 145) than large, live adults (c.110) were counted (Moorkens, 2009, 2010). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Suitable habitat: extent	Kilometres	See targets below	The habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy; 2) the area of spawning and nursery habitats host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that can regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures throughout the catchment (map 5) contribute to such impacts. Habitat in the Glaskeelan and Owencarrow is unsuitable for juvenile recruitment (NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems. See below
Suitable habitat: extent - Glaskeelan	Kilometres	Restore suitable habitat in more than 3.17km in the Glaskeelan system and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Glaskeelan, in correspondence with the species' distribution, is considered to be from just downstream of the National Park boundary to the mouth of the river at Gartan Lough (Moorkens, 1995, 1996, 2007, 2009). As noted above, however, further survey is required, particularly of the more upstream stretches, to confirm the habitat extent. Most of the mussel habitat is considered to be under carrying capacity and mussel density is particularly poor in some patches (Moorkens, 2009, 2017; NPWS, 2010). Sedimentation and organic enrichment are the key impacts on the Glaskeelan mussel habitat. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan system
Suitable habitat: extent - Owencarrow	Kilometres	Restore suitable habitat in more than 5.0km in the Owencarrow system and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Owencarrow system. The habitat polyline is likely to underestimate habitat extent downstream of Owencarrow Bridge and overestimate it above that bridge. Suitable habitat was patchy and limited in extent in the stretches surveyed in 2007 and 2009, and where found was below carrying capacity for mussels (Moorkens, 2007, 2009). Sedimentation and nutrient enrichment are impacting on the condition of the Owencarrow mussel habitat. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Owencarrow system
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQR targets correspond to high ecological status for these two Water Framework Directive (WFD) biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in both the Glaskeelan and Owencarrow systems failed the macroinvertebrate target, but passed the diatom target (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	Both the Glaskeelan and Owencarrow systems failed the macroalgal target in 2009, but (marginally) passed the macrophyte target (NPWS, 2010). Macroalgal cover of 60% and 70% was recorded in the Glaskeelan during macroinvertebrate surveys (Williams, 2009; NPWS, 2010). The macrophyte *Potamogeton* was more abundant than expected in the Glaskeelan mussel habitat (Moorkens, 2009, 2017; NPWS, 2010). *Littorella* was also abundant in 2016 (Moorkens, 2017). Bacterial and fungal growth requires further investigation in the Glaskeelan given the loading of organic matter that has entered the river (see Moorkens, 2012). Algal cover varied spatially and temporally in the Owencarrow mussel habitat, but was greatest (60%) at the bridge near the Glenveagh visitor centre (Williams, 2009; NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Substratum quality: sediment	Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Glaskeelan failed the target for the Sub-basin Management Plan, having strong silt plumes (Moorkens, 2009; Williams, 2009; NPWS, 2010). There was a clear relationship between heavy siltation and higher macrophyte cover abundance. It failed again in 2012 (high/increased silt cover (drape) and substantial silt plumes when agitated) and in 2016 (silt infiltration on all transects) (Moorkens, 2012, 2017). The Owencarrow failed the target in 2009, with slight to moderate silt plumes in mussel habitat (Williams, 2009; NPWS, 2010). Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum in both systems. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The Glaskeelan failed the redox target in 2009, with an average loss of 21.3% redox potential at 5cm (range 11-27.5%) (Moorkens, 2009; NPWS, 2010). In 2012, average redox was 30.6% and substratum condition had deteriorated significantly throughout the Glaskeelan (Moorkens, 2012). It failed again in 2016 (average of 24.9%, all readings at lower sites over 20%) (Moorkens, 2017). The Owencarrow failed the target in 2009, with average redox of 24.1% (Moorkens, 2009; NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to the substratum also contributes to water-cycling and favourable habitat condition. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and thus are essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is considered sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower densities and biomass of host fish were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In the Glaskeelan and Owencarrow, neither salmon nor trout were encysted with glochidia in May 2009 (Johnston, 2009; NPWS, 2010)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats aid in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter) and provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

1106 Salmon *Salmo salar*

To maintain the favourable conservation condition of Atlantic Salmon in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Gweebarra River is currently achieving CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

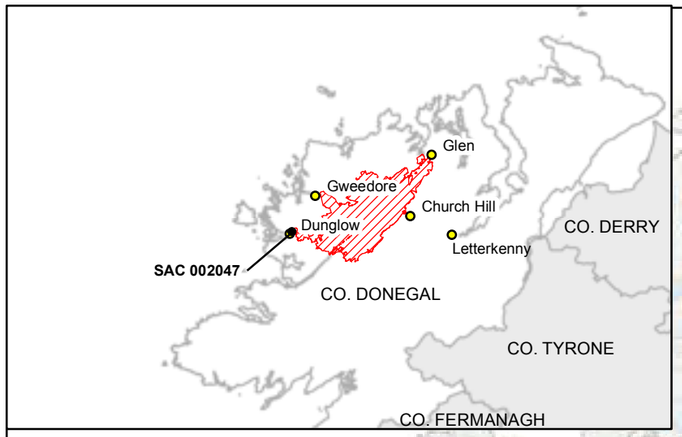
Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 1,130.1ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along rivers and around water bodies, as identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 490.3km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 745.5ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No loss in geographical spread of populations, subject to natural processes	Killarney fern (*Trichomanes speciosum*) is currently known from one location in Cloghernagore Bog and Glenveagh National Park SAC, within hectad B91. The exact location is not mapped here on account of the threat posed by illegal collecting. The species has also been recorded from a second location in the SAC but not, apparently, since 1955; recent searches of the second location have failed to record the species and it is considered likely to be no longer extant there. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Populations	Number	No decline, subject to natural processes	One population of the species is known from the SAC. It was first recorded here in 1961 and subsequently in 1976, 1993, 1995 and 2011. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Colonies	Number	No decline, subject to natural processes	The sole population of Killarney fern known from the SAC comprises a single colony. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population: life-cycle stage	Type (sporophyte or gametophyte)	Maintain life-cycle stage composition of populations, subject to natural processes	The single colony of the species known from the SAC comprises a mixture of sporophytes (frond stage) and gametophytes (filamentous stage). Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: area of occupancy	Square metres	No decline, subject to natural processes	The area of occupancy was recorded as 0.33 square metres in 2011. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: living sporophyte fronds	Number	No decline, subject to natural processes	38 fronds were recorded in 2011. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: young and unfurling fronds	Occurrence	Young (not fully expanded) and/or unfurling (crozier) fronds present in populations previously observed to have these, subject to natural processes	Young and/or unfurling fronds have been recorded from the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: fertile fronds	Occurrence	Fertile fronds present in populations previously observed to have these, subject to natural processes	Fertile fronds have not been recorded from the SAC to date. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: juvenile sporophyte fronds emerging from gametophytes	Number	No decline, subject to natural processes	Juvenile sporophyte fronds emerging from gametophytes have not been recorded from the SAC to date. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Habitat extent	Hectares	No loss of suitable habitat, subject to natural processes	The species grows in deeply shaded, humid situations - dripping caves, overhangs and crevices on cliffs, rocky slopes, by waterfalls, in stream ravines and gullies, on rock or soil banks in woodlands and, occasionally, under fallen trees and on the floor of damp woodlands. Whilst also occurring in these habitats, the gametophyte (filamentous) stage can grow in drier areas that do not suit the sporophyte. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files

Hydrological conditions: wet/damp microhabitats	Occurrence	Maintain hydrological conditions at the locations of known populations - visible water source, with dripping or seeping water present and/or substrate wet/damp to touch, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: relative humidity	Percentage	Maintain relative humidity levels at known colonies at not less than 80%, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: desiccated fronds	Number	No increase, subject to natural processes	Presence of desiccated sporophyte fronds and gametophyte mats is indicative of unsuitable conditions. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Light levels: shading	Shade index score	At least 4 for woodland sporophyte-only and mixed colonies; at least 5 for open upland sporophyte-only and mixed colonies; at least 6 for gametophyte-only colonies, subject to natural processes	Shade Index: 4. Moderate shade, e.g. light-medium deciduous canopy with sun flecks. 5. Permanently shaded from direct sunlight but otherwise open to sky. 6. Deep woodland (e.g. coniferous or in ravine) shade, no sun flecks. 7. Perpetual deep shade, e.g. cave entrance, beneath boulder. Woodland colonies have not been recorded from the SAC to date. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Woodland canopy cover	Percentage	No loss of woodland canopy at, or in the vicinity of, location of population and canopy cover here maintained at more than 33%, subject to natural processes	Woodland management at or near to locations of known populations of the species to take account of its habitat requirements, in particular, with regard to maintenance of sufficient canopy cover. Woodland colonies have not been recorded from the SAC to date. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Invasive species	Occurrence	Maintain absence of invasive non-native and vigorous native plant species at the locations of known populations or, if present, maintain vegetation cover of these at less than 10%, taking into account the habitat requirements of *T. speciosum*	In order to avoid negative impacts on *Trichomanes speciosum*, its habitat requirements (site hydrology, relative humidity, canopy cover, shading levels, etc.) must be taken into account in locations that are subject to or proposed for management actions to control invasive non-native and/or vigorous native plant species. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files



Legend

Cloghernagore Bog and Glenveagh National Park SAC 002047

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MAP 1:
CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

SITE CODE:
SAC 002047; version 3. CO. DONEGAL

0 1.5 3 4.5 6 7.5 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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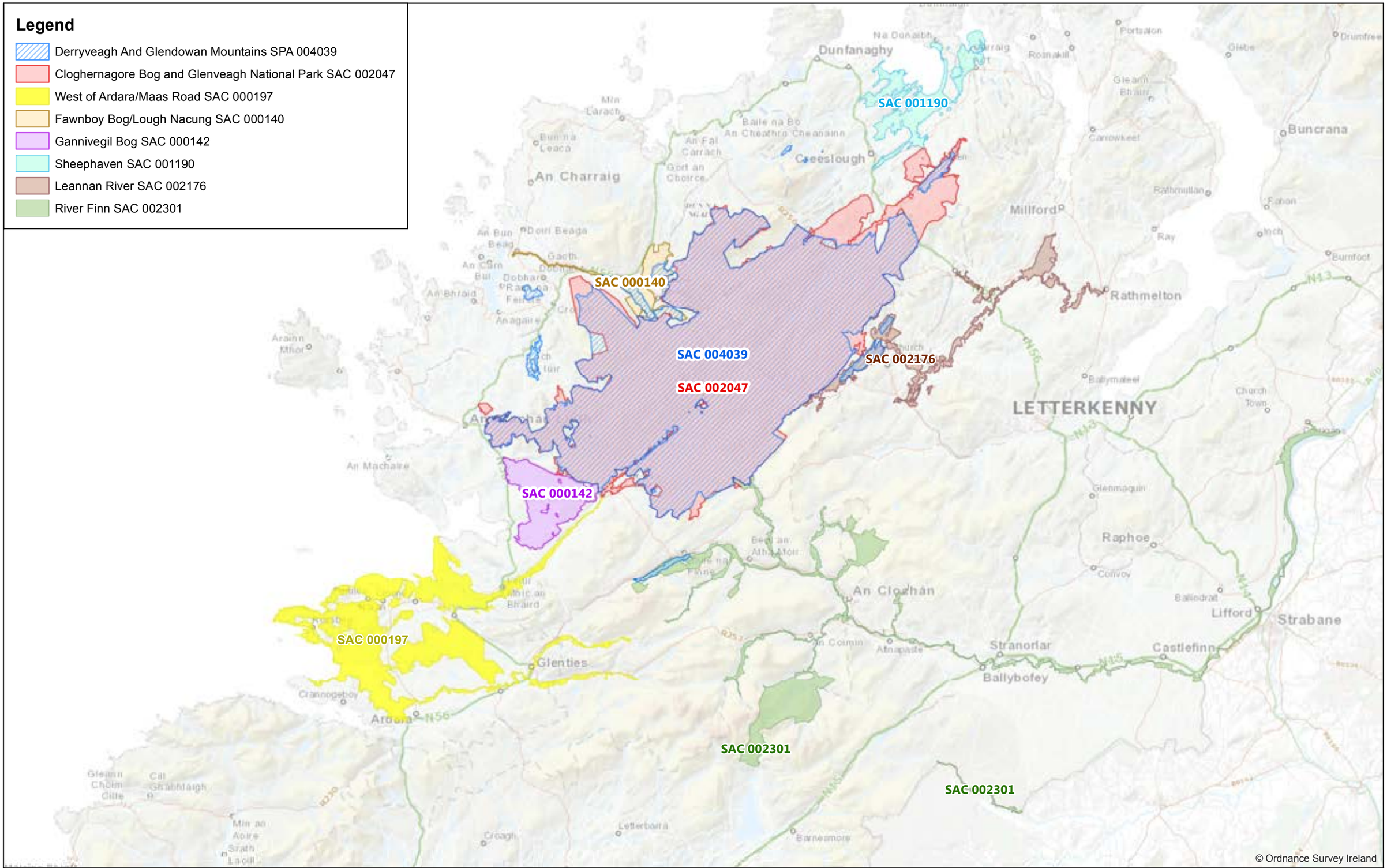
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas

N

Map Version 1
Date: May 2017

Legend

- Derryveagh And Glendowan Mountains SPA 004039
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- West of Ardara/Maas Road SAC 000197
- Fawnboy Bog/Lough Nacung SAC 000140
- Gannivegil Bog SAC 000142
- Sheephaven SAC 001190
- Leannan River SAC 002176
- River Finn SAC 002301



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

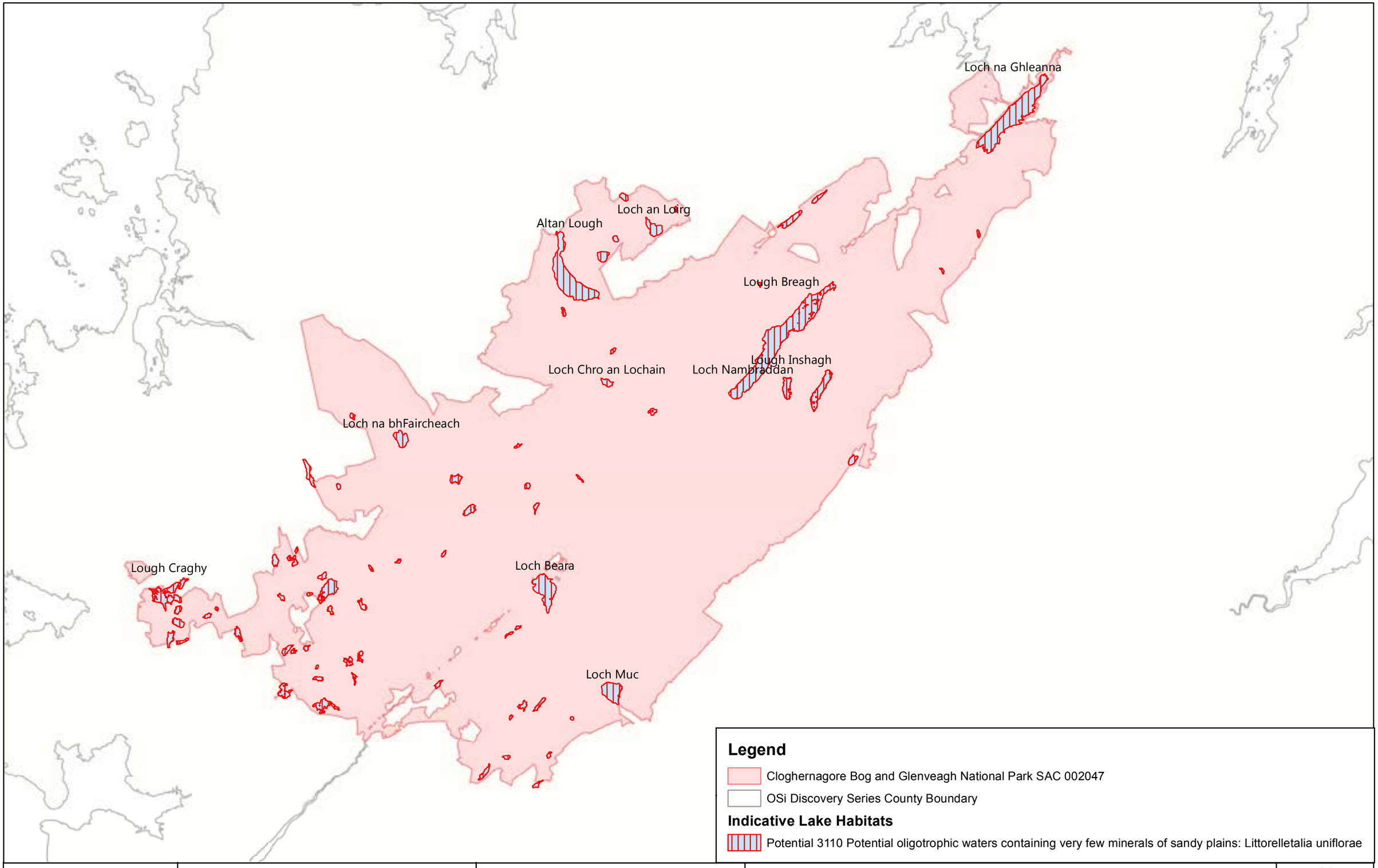
MAP 2:
CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC CONSERVATION OBJECTIVES ADJACENT, ADJOINING AND OVERLAPPING DESIGNATIONS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002047; version 3. SAC 000140; version 3. SAC 00142; version 3. SAC 000197; version 3. SAC 001190; version 3. SAC 002176; version 3.01. SAC 002301; version 3.01. SPA 004039; version 3. CO. DONEGAL

0 2 4 6 8 10 km

N

Map Version 1
Date: May 2017



Legend

Cloghernagore Bog and Glenveagh National Park SAC 002047

OSi Discovery Series County Boundary

Indicative Lake Habitats

Potential 3110 Potential oligotrophic waters containing very few minerals of sandy plains: Littorelletalia uniflorae

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Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

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

SITE CODE:
SAC 002047; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: May 2017

Legend

Annex I Woodland Habitats

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- OSi Discovery Series County Boundary

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MAP 4:
CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

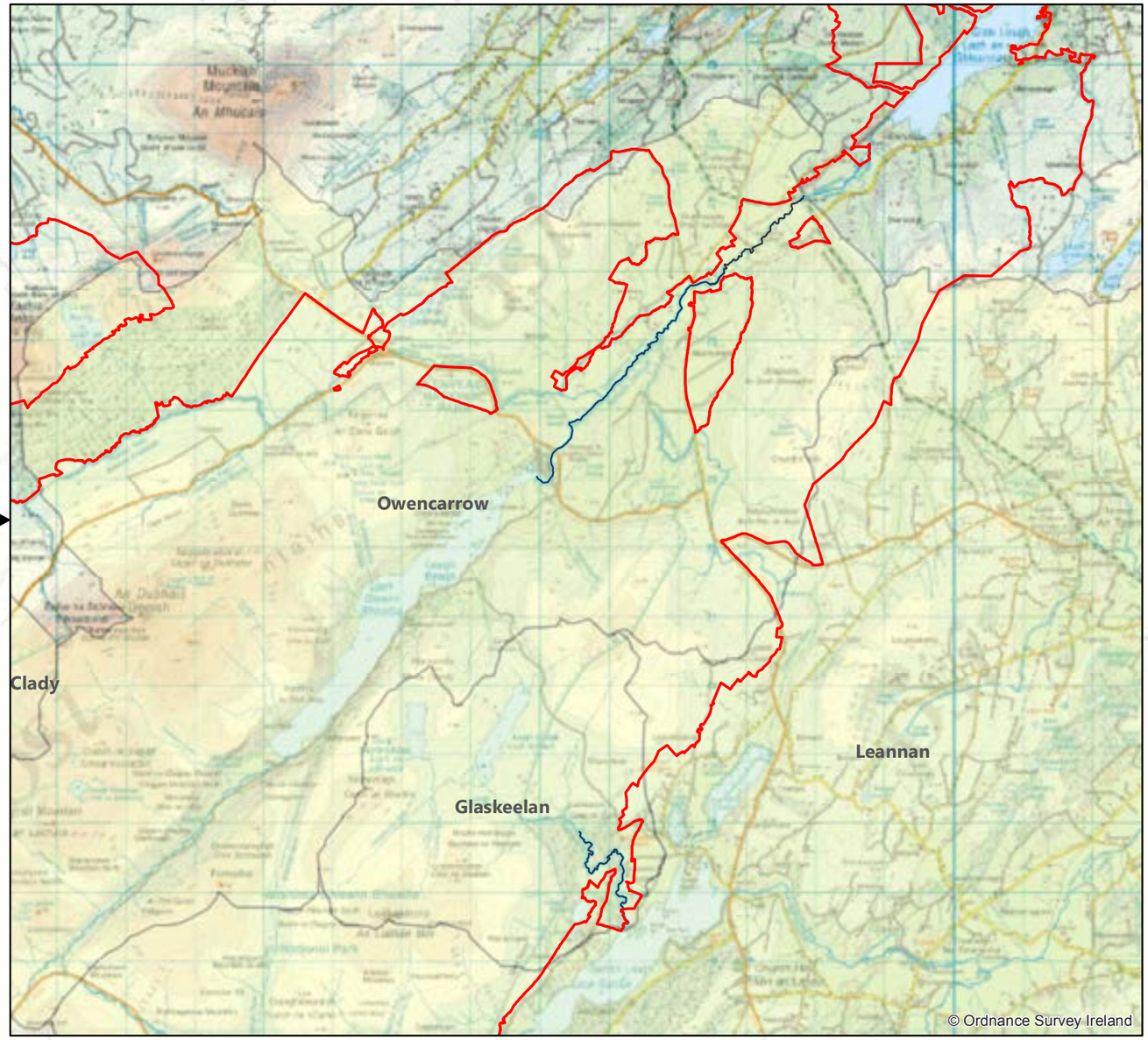
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002047; version 3. CO. DONEGAL

0 1.5 3 4.5 6 7.5 km

N

Map Version 1
Date: May 2017



Legend

- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Distribution Target
- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Suitable Habitat Target
- 1029 Freshwater Pearl Mussel *Margaritifera margaritifera* Catchment
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 5:
CLOGHERNAGORE BOG AND GLENVEAGH NATIONAL PARK SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

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

SITE CODE:
SAC 002047; version 3. CO. DONEGAL

0 3 6 9 12 15 km

N

Map Version 1
Date: May 2017

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Rutland Island and Sound SAC 002283

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

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NPWS (2013) Conservation Objectives: Rutland Island and Sound SAC 002283. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
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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***

002283	Rutland Island and Sound SAC
1150	Coastal lagoons*
1160	Large shallow inlets and bays
1170	Reefs
1210	Annual vegetation of drift lines
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 Illancrone and Inishkeeragh SPA (004132) and adjoins Gweedore Bay and Islands SAC (001141) and Termon Strand SAC (001195). 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 :	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 :	Inventory of Irish Coastal Lagoons v.2
Author :	Oliver, G.
Series :	Unpublished report to NPWS
Year :	2008
Title :	Survey of sensitive subtidal benthic marine communities in Mullet/Blacksod Bay Complex SAC, Rutland Island and Sound SAC, Mulroy Bay SAC
Author :	MERC
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 :	2013
Title :	Rutland Island and Sound SAC (site code 2283) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	Rutland Island and Sound SAC (site code 2283) Conservation objectives supporting document- marine habitats and species V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	Rutland Island and Sound SAC (site code 2283) Conservation objectives supporting document- lagoons 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 :	1997
Title :	The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Author :	Picton, B.E.; Costello, M.J.
Series :	Environmental Science Unit, Trinity College Dublin
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 in Rutland Island and Sound cSAC (cSAC site code: IE002283) Co. Donegal
Author :	Aquafact
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2011
Title :	Reef investigations in Rutland Island and Sound cSAC (cSAC site code IE002283) Co. Donegal
Author :	Aquafact
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2013
Title :	Monitoring and assessment of Irish lagoons for the purposes of the EU Water Framework Directive, 2009-2011. Parts 1 and 2
Author :	Roden, C.M; Oliver, G. A.
Series :	Unpublished report to the Environmental Protection Agency

Spatial data sources

Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)
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. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used For :	1160 (map 4)
Year :	Interpolated 2013
Title :	1996 BioMar Survey; 2008, 2010 subtidal surveys
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 :	1170, Marine community types (maps 5 and 6)
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 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 :	1365 (map 7)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1365 (map 7)

1150 Coastal lagoons

To maintain the favourable conservation condition of Coastal lagoons in Rutland Island and Sound SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to slight natural variation. Favourable reference area 4.9ha. See map 3	Area calculated from spatial data derived from Oliver, 2007. Site code IL081 (Sally's Lough). See lagoons supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3	Site IL081 in Oliver, 2007. See lagoons supporting document for further details
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural range	Sally's Lough is recorded as a polyhaline/euhaline lagoon. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Sally's Lough is recorded as less than 4m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoon and sea, including where necessary, appropriate management	Sally's Lough is described as a rock/peat lagoon with an artificial channel to the sea. See lagoons supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to at least 2m depth	Where the lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to the full depth. See lagoons supporting document for further details
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details

1160 Large shallow inlets and bays

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 3619ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 6	Based on a dive survey undertaken in 2008 (MERC, 2008). See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m^2	Conserve the high quality of *Zostera*-dominated community, subject to natural processes	Based on 2008 diver observation and underwater viewer (MERC, 2008). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Coarse sediment with crustaceans community complex; Sand with *Tellina* sp. and *Perioculodes longimanus* community complex; Intertidal reef community; *Laminaria*-dominated community complex. See map 6	Based on the BioMar survey in 1996 (Picton and Costello, 1997), subtidal data obtained in 2010 (Aquafact, 2011) and an intertidal walkover undertaken in 2013. See marine supporting document for further information

1170 Reefs

To maintain the favourable conservation condition of Reefs in Rutland Island and Sound 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 5	Habitat area estimated as 707ha from the 1996 BioMar survey (Picton and Costello, 1997), a 2010 subtidal reef survey (Aquafact, 2011), InfoMar data, orthophotographs and an intertidal walkover undertaken in 2013
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 5 for mapped distribution	Distribution derived from the 1996 BioMar survey (Picton and Costello, 1997), a 2010 subtidal reef survey (Aquafact, 2011) and an intertidal walkover undertaken in 2013
Community structure	Biological composition	Conserve the following community types in a natural condition: Intertidal reef community; *Laminaria*-dominated community complex. See map 6	Community mapping based on the 1996 BioMar survey (Picton and Costello, 1997), a 2010 subtidal reef survey (Aquafact, 2011) and an intertidal walkover undertaken in 2013. See marine supporting document for further details

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of drift lines in Rutland Island and Sound 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	Current area is unknown. Habitat is very difficult to measure in view of its dynamic nature, which means that it can appear and disappear within a site from year to year. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	Current distribution is unknown as the site was not surveyed during the Coastal Monitoring Project (Ryle et al., 2009). Thought to be present along the western flank of Rutland Island but likely to be more widespread. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. Physical barriers can affect sediment supply. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali)* and orache (*Atriplex spp.*)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Rutland Island and Sound 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	Current area is unknown. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	Current distribution is unknown as the site was not surveyed during the Coastal Monitoring Project (Ryle et al., 2009). Thought to be present along the western flank of Rutland Island but likely to be more widespread. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of *Elytrigia juncea* (sand couch) and/or *Leymus arenarius* (lyme-grass) 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: *Elytrigia juncea* (sand couch) and/or *Leymus arenarius* (lyme-grass)	Based on data from from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in Rutland Island and Sound 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	Current area is unknown. 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	Current distribution is unknown as the site was not surveyed during the Coastal Monitoring Project (Ryle et al., 2009). Thought to be present along the western flank of Rutland Island but likely to be more widespread. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria)* reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	95% of marram grass (*Ammophila arenaria*) and/or lyme-grass *(Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Gaynor (2008) and Ryle et al. (2009). Negative indicators include non-native species; species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To maintain the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation ('grey dunes') in Rutland Island and Sound 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	Current area is unknown but thought to represent a significant portion of the dune system on Rutland Island. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	Current distribution is unknown as the site was not surveyed during the Coastal Monitoring Project (Ryle et al., 2009). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from 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	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 Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Rutland Island and Sound 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	Current area is unknown. See coastal habitats supporting document for further details.
Habitat distribution	Occurrence	No decline, subject to natural processes	Current distribution is unknown as the site was not surveyed during the Coastal Monitoring Project (Ryle et al., 2009). See coastal habitats supporting document for further details.
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: cover of *Salix repens*	Percentage cover; centimetres	Maintain less than 40% cover of *Salix repens* (creeping willow)	Cover of *Salix repens* (creeping willow) needs to be maintained/controlled (e.g. through an appropriate grazing regime) which prevents the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

1365 Harbour seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Rutland Island and Sound SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 7	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 7	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 7	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. See map 7	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

ARAN ISLAND
ÁRAINN MHÓR
SAC 002283
Burtonport
Dunglow
Letterkenny
CO. DONEGAL
Donegal
BURTONPORT
Rutland Island
Inis Mhic an Doirn
Inishkeeragh
Inis Caorach
Inishfree Upper
Inis Fraoigh
Terman
An Tearmann
DUNGLOW
An Clochan Liath
Maghery Bay
Crohy Head
Ceann na Cruaiche
Legend
Rutland Island and Sound SAC 002283

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Department of
Arts, Heritage and the Gaeltacht

MAP 1:
RUTLAND ISLAND AND SOUND SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000458 version 3. 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: Sept 2013

SAC 001141

SAC 002283

SPA 004132

SAC 001195

Legend

- Gweedore Bay and Islands SAC 001141
- Termon Strand SAC 001195
- Rutland Island and Sound SAC 002283
- Illancrone and Inishkeeragh SPA 004132
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 2: RUTLAND ISLAND AND SOUND SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

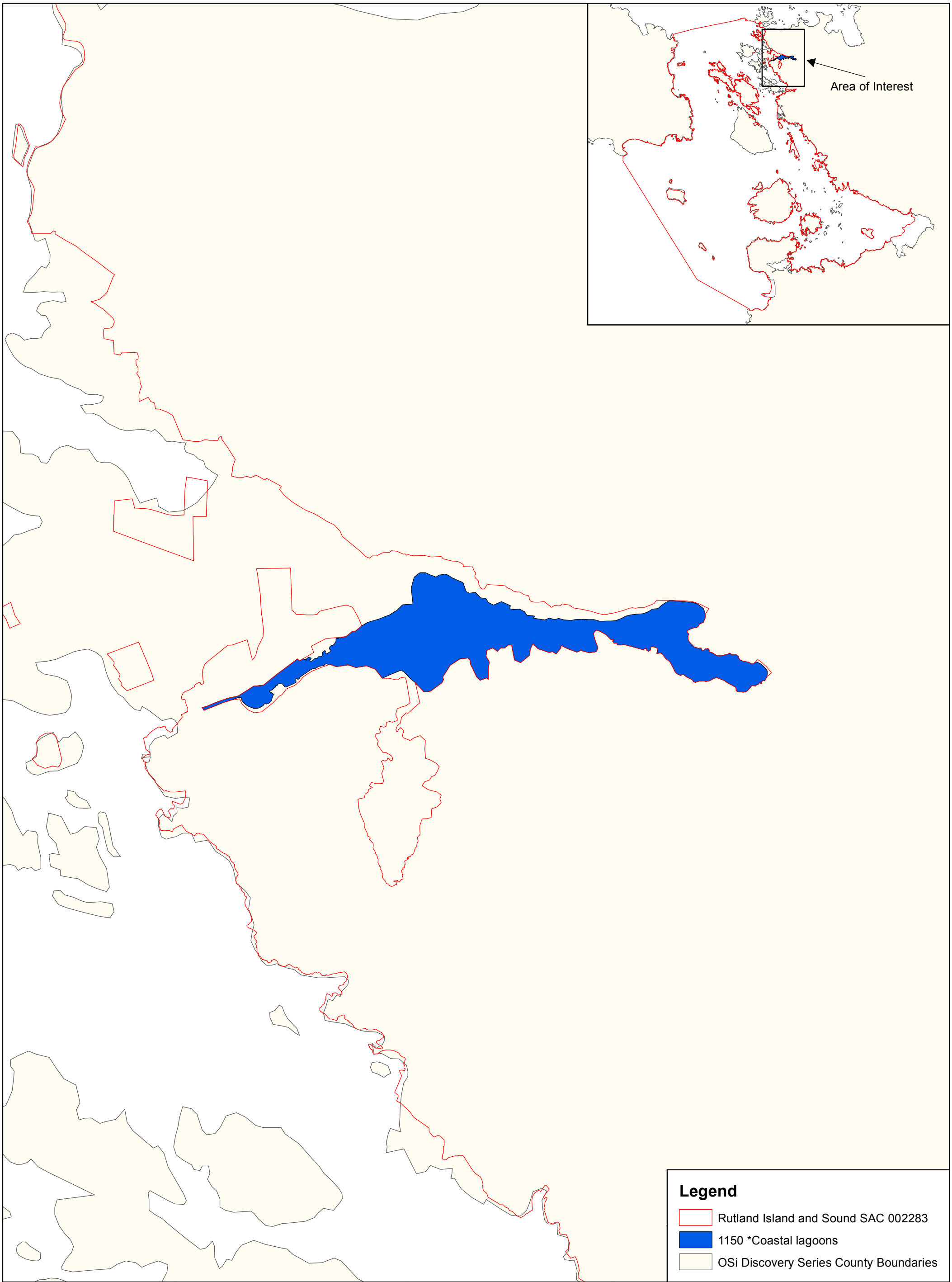
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001141; version 3, SAC 001195; version 3, SAC 002283; version 3.
SPA 004132; version 2. CO DONEGAL

0 1 2 3 4 km

N

Map Version 1
Date: Sept 2013



Legend

- Rutland Island and Sound SAC 002283
- 1150 *Coastal lagoons
- OSi Discovery Series County Boundaries

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MAP 3:
RUTLAND ISLAND AND SOUND SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

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

SITE CODE:
SAC 002283; version 3.
CO DONEGAL

0 50 100 150 200 m

N

Map Version 1
Date: Sept 2013

Legend

- Rutland Island and Sound SAC 002283
- 1160 Large shallow inlets and bays
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 4:
RUTLAND ISLAND AND SOUND SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

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

SITE CODE:
SAC 002283; version 3.
CO DONEGAL

0 0.5 1 1.5 2 Km

N

Map Version 1
Date: Sept 2013

Legend

- Rutland Island and Sound SAC 002283
- 1170 Reefs
- OSi Discovery Series County Boundaries

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MAP 5:
RUTLAND ISLAND AND SOUND SAC
CONSERVATION OBJECTIVES
REEFS

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

SITE CODE:
SAC 002283; version 3.
CO DONEGAL

0 0.5 1 1.5 2 Km

N

Map Version 1
Date: Sept 2013

Legend

Rutland Island and Sound SAC 002283

OSi Discovery Series County Boundaries

Marine Community Types

Coarse sediment with crustaceans community complex

Intertidal reef community

Laminaria-dominated community complex

Sand with *Tellina* sp. and *Perioculodes longimanus* community complex

Zostera-dominated community

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MAP 6:
RUTLAND ISLAND AND SOUND SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE:
SAC 002283; version 3.
CO DONEGAL

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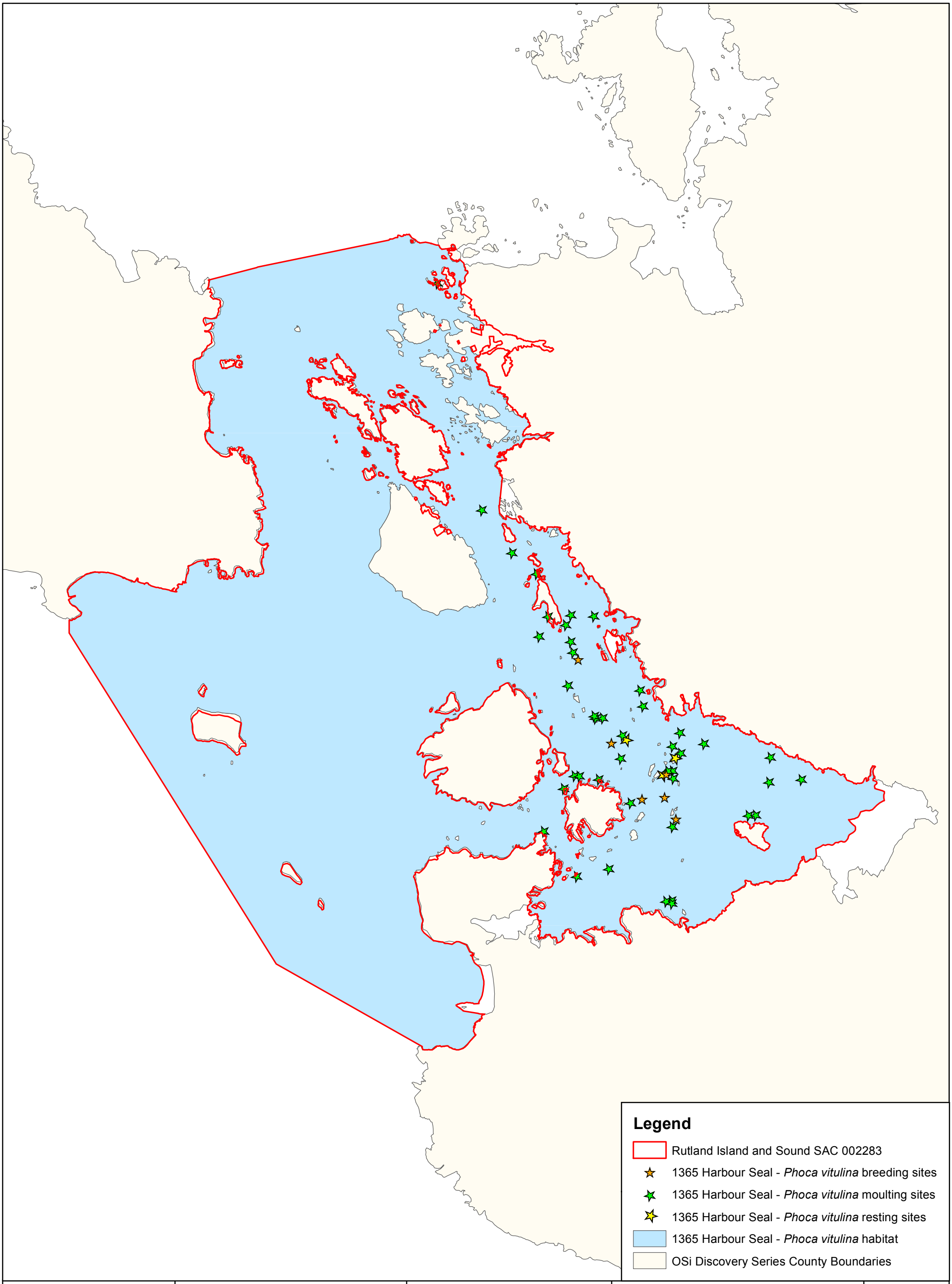
N

Map Version 1
Date: Sept 2013



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MAP 7: RUTLAND ISLAND AND SOUND SAC CONSERVATION OBJECTIVES HARBOUR SEAL

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

SITE CODE:
SAC 002283; version 3.
CO DONEGAL

0 0.5 1 1.5 2 Km

N

Map Version 1
Date: Sept 2013

Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]

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
A001	Red-throated Diver	*Gavia stellata*
A098	Merlin	*Falco columbarius*
A103	Peregrine	*Falco peregrinus*
A140	Golden Plover	*Pluvialis apricaria*
A466	Dunlin	*Calidris alpina schinzii*

Citation: *NPWS (2020) Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for West Donegal Coast SPA [004150]

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
A009	Fulmar	*Fulmarus glacialis*
A017	Cormorant	*Phalacrocorax carbo*
A018	Shag	*Phalacrocorax aristotelis*
A103	Peregrine	*Falco peregrinus*
A184	Herring Gull	*Larus argentatus*
A188	Kittiwake	*Rissa tridactyla*
A200	Razorbill	*Alca torda*
A346	Chough	*Pyrrhocorax pyrrhocorax*

Citation: *NPWS (2020) Conservation objectives for West Donegal Coast SPA [004150]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for West Donegal Islands SPA [004230]

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
A018	Shag	*Phalacrocorax aristotelis*
A045	Barnacle Goose	*Branta leucopsis*
A122	Corncrake	*Crex crex*
A182	Common Gull	*Larus canus*
A184	Herring Gull	*Larus argentatus*

Citation: *NPWS (2020) Conservation objectives for West Donegal Islands SPA [004230]. Generic Version 7.0. 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 044 Crolly WTP, Rosses WSZ

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

044 Crolly EAM

Issue 10 | 11 March 2022

Job number 257367

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Document Verification

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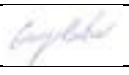
		Signature			
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Contents

Tables

Figures

1 Introduction

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

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

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

- Results of the Plumbosolvency reports by Ryan Hanley.
- Results of pre-processing GIS work to generate regional input files.
- Data relating to Waste Water Treatment Plants (WWTP) from Annual Environmental Reports (AER).
- Data relating to water body monitoring and characterisation from the Environmental Protection agency (EPA) web-based WFD App which is access through their Eden Portal downloaded on the 15th December 2021.
- Data relating to rainfall and catchment areas from the OPW Flood Studies Update (FSU) Portal.
- GIS data river segment data providing river flows from the EPA "hydrotool data".
- Gauge data providing river flows from the EPA web-based HydroNet.

2 Abbreviations & Glossary

- AER – Annual Environmental Report
- Agglomeration- the catchment of the WWTP
- DWWTS -Domestic Waste Water Treatment System
- EAM – Environmental Assessment Method
- ELV – Emission Limit Values
- EPA- Environmental Protection Agency
- FSU – Flood studies Update Portal – website hosted
- GIS – Geographic Information Systems
- GWB- Ground Water Body
- IW – Irish Water
- LWB – Lake Water Body
- OP- Orthophosphate (measured as PO_4 -P)
- PE- Population Equivalent or unit per capita loading in waste-water treatment. PE can be considered the estimated number of people required to produce a measured load (e.g. of organic matter, water or P) at the WWTP
- RWB – River Water Body
- SAAR - Standard-period Average Annual Rainfall method. The 30%ile flow for the river catchment is calculated using the catchment area and the SAAR value at the catchment outlet point. The area of the total river catchment is calculated using the Water Framework Directive App defined river 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 Rosses Regional Water Supply Zone

Rosses Regional Public Water Supply Zone (WSZ) (0600PUB1060) is located in County Donegal. Crolly Water Treatment Plant (WTP) provides a number of small towns including Dungloe, Burtonport, Kincaslough, Rinnafarset, Bunded and Gweedore as well as the surrounding rural network with water in the region. The Plumbosolvency Control Plan for the WSZs proposes universal dosing of orthophosphate takes place at the outlet from Crolly WTP. Figure 1, at the end of this report, shows the location of the proposed area to receive orthophosphate dosed water. Cruit Island, although highlighted as part of the dosing area in the plumbosolvency report, was excluded from the EAM assessment as there was no record of either watermains infrastructure or DWWTs which would lead to orthophosphate dosed water discharged into this area.

An average flow of 4,448m^3/day is distributed to the zone from the Crolly WTP through a number of reservoirs. Approximately 47% of the water is accounted for, and this fixed rate of for water mains leakage (53%) is assumed in the WSZ. There are an estimated 5,461 properties across the WSZs that are serviced by Domestic Wastewater Treatment Systems (DWWTS).

Water Supply Zone	Rosses Regional WSZ (0600PUB1060)
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	Concentration and loading units for orthophosphate (as PO_4-P) are mg/l and kg/yr. Adopted orthophosphate optimum dosing concentration is 1.1mg/l. Unaccounted for water from the mains is 53%. Seepage from the mains is distributed evenly across the entire length of the WSZ network. The water consumption per person has been assigned as 125 litres per day in order to calculate the direct discharges to surface water with 2.7 people per household. The water discharge per person is assigned as 105 litres per day for the discharge to DWWTS with 2.7 persons per household. Conversion factor for total phosphorus to orthophosphate for WWTP effluent is 0.5. It is assumed there will be no treatment of additional orthophosphate load for WWTPs with secondary, primary or no treatment. For plants with tertiary treatment it is assumed all the additional load will be treated. Where a tertiary plant is in exceedance of its ELV for total phosphorus or orthophosphate then the ability of the plant to treat the additional load is confirmed with Irish Water. Where IW indicates a tertiary plant has not remaining treatment capacity it will be assumed the entire additional load is not treated. Where existing monitoring data is not available a surrogate status is derived from the orthophosphate indicative quality of 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 phosphorus loads and resultant orthophosphate dosages at WWTP within the WSZ before and after dosing. Inputs to and results of the Step 2 assessment for individual WWTP are given in Table 1. Where an agglomeration includes SWOs, discharges from this source are included. Emission Limit Value (ELVs) are assigned for WWTPs to protect the receiving River Waterbodies (RWB) from direct discharges during low flows. Where ELVs are in force these are shown in Table 1. WWTPs that are failing to comply with their ELVs are also indicated. The treatment level and PE of the WWTPs within the agglomerations are as follows; - Annagary – Primary treatment PE 473 - Burtonport – No treatment PE 263 - Cottain – Primary Treatment PE 60 - Dungloe – Secondary treatment PE 1,743 - Loughanure - Secondary treatment PE 48 - Meenaillar - Secondary treatment PE 90 - Meenlaragh – Primary Treatment PE 30 - Stranacorcragh – Primary Treatment PE 60 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 2,357 m^3/d (946kg/yr). Approximately 251 kg/yr of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 1,549 m^3/d (628 kg/yr). Approximately 601 kg/yr of the load is attenuated along the flowpaths. Flow monitoring gauges are not available for any waterbodies within the assessment area. The river flows for receiving water bodies are established from Hydrotool data or, if that is not available, using the Area-Standard-period Average Annual Rainfall (SAAR) method. Baseline orthophosphate monitoring data and associated thresholds are available for the seven of the seventeen RWBs within the assessment areas namely; • Catheen_010 • Clady (Donegal)_010 • Clady (Donegal)_020 • Corveen_010 • Dungloe_020 • Gweedore_010 • Keel Lough Stream_010 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 water bodies from mains leakage, DWWTS and direct discharges from WWTP and SWOs and upstream dosing areas. This illustrates that a significant proportion of the loads come from mains seepage through the subsurface, near surface and preferential pathways. 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. The load from WWTP which discharge to groundwater are included in the Figure 3 as part of DWWTS load. Figure 3 illustrates that the mains leakage and DWWTS load account for the largest proportion of load and that there is a large proportion of the mains leakage and DWWTS load attenuated. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Meenlaragh WWTP- Cnoc_Fola_010 Dungloe WWTP- Dungloe_020 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 lead to a deterioration in status of any waterbodies within the assessment.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The entire dosing area is underlain by one groundwater body (Northwest Donegal GWB). The increase in orthophosphate concentrations in the GWB as a result of the orthophosphate drinking water dosing is shown in Table 3. Baseline orthophosphate monitoring data is not available for the groundwater body. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving groundwater bodies: Cottain WWTP – Northwest Donegal Loughanure WWTP- Northwest Donegal Meenanillar WWTP- Northwest Donegal Stranacorcragh WWTP- Northwest Donegal 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 as a result of drinking water dosing is adopted as total phosphorus to assess the potential impact on lakes. The increase in concentrations in the Lake Waterbody (LWB) as a result of the drinking water dosing is shown in Table 4.

	Monitoring data is available for Dunglow and Anure however there is no monitoring data for the remaining seventeen lakes in the assessment area. The following LWB was not assessed further as it will not receive any orthophosphate load as a result of the drinking water dosing because it is upgradient of water mains and premises which may have septic tanks: - IE_NW_38_544 Lough Anillan The increase in concentration as a result of the drinking water dosing with orthophosphate does not cause a deterioration in the status of any lakes.
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 (TWB) and Coastal Waterbodies (CWB) as a result of drinking water dosing is shown in Table 5. Baseline orthophosphate monitoring data and associated thresholds are not available for any of the transitional or coastal water bodies. The drinking water dosing with orthophosphate does not deteriorate the status of either transitional water bodies or the coastal water bodies for both the summer and winter seasons. There will be no impact on the North-western Atlantic Seaboard (IE_NW_100_0000) due to the dilution available in the Atlantic Ocean.
Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	<u>Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies</u> A cumulative assessment was undertaken to assess the impact on TraC WBs from all the contributing EAMs. The assessment is carried out on a catchment scale. Gweebarra Sheephaven The following EAM are within the Gweebarra Sheephaven catchment and discharges to Dungloe Bay along with the Crolly EAM see Figure 4: 205 Lettermacaward The increase in orthophosphate concentrations in Dungloe Bay as a result of the drinking water dosing in both EAMs with orthophosphate is shown in Table 6. There is was no deterioration in waterbody status as a result of the cumulative assessment <u>Step 5 and 6 Cumulative Assessment of impact from EAMs on downstream Protected Waterbodies</u> The cumulative load from this dosing area and any upstream dosing area was tracked downstream to determine the potential concentration increase in any RWBs which are Special Areas of Conservation (SAC). There were no SACs found that are downstream of the waterbodies (WBs) 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 water bodies is presented in Figure 5.
Recommendation	The dosing concentration should be maintained at the proposed level as the LWB Dunglow is sensitive to higher dosing concentrations.

Table 1: Increased loading/concentration from WWTPs due to dosing of drinking water – Dosing rate = 1.1 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load kg/yr	OP Concentration (mg/l) TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Annagary Primary Discharge	Primary	No ELV	Gweedore Estuary	Pre-Dosing	230	5.34	4.27	7.26
				Post Dosing	253	5.87	4.69	7.98
Burtonport Primary Discharge	No treatment	No ELV	Rutland Sound	Pre-Dosing	192	8.00	6.40	10.88
				Post Dosing	205	8.53	6.82	11.60
Cottain Primary Discharge	Primary	No ELV	Northwest Donegal	Pre-Dosing	29	5.34	4.27	7.26
				Post Dosing	32	5.86	4.69	7.98
Dungloe Primary Discharge	Secondary	Orthophosphate 0.6mg/l – Compliant	Dungloe Bay & Dungloe_020	Pre-Dosing	594	1.25	1.00	1.70
				Post Dosing	674	1.42	1.14	1.93
Dungloe SWOs (1 No.)				Pre-Dosing	37	0.38	0.31	0.52
				Post Dosing	39	0.41	0.33	0.55
Loughanure Primary Discharge	Secondary	No ELV	Northwest Donegal	Pre-Dosing	16	3.74	2.99	5.08
				Post Dosing	19	4.26	3.41	5.80
Meenanillar Primary Discharge	Secondary	No ELV	Northwest Donegal	Pre-Dosing	31	3.74	2.99	5.08
				Post Dosing	35	4.26	3.41	5.80
Meenlaragh Primary Discharge	Primary	No ELV	Cnoc_Fola_010	Pre-Dosing	15	5.34	4.27	7.26
				Post Dosing	16	5.86	4.69	7.98
Stranacorcragh Primary Discharge	Primary	No ELV	Northwest Donegal	Pre-Dosing	30	5.42	4.33	7.37
				Post Dosing	33	5.95	4.76	8.09

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)**
Bun Na Leaca_010	IE_NW_38B280640	*High*	0.0125	0.0188	17.8	0.0020	0.0145
Catheen_010	IE_NW_38C030200	Poor	0.0833	0.0868	37.1	0.0034	0.0867
Clady (Donegal)_010	IE_NW_38C040150	High	0.0042	0.0188	6.6	0.00004	0.0042
Clady (Donegal)_020	IE_NW_38C040300	High	0.0066	0.0188	36.7	0.0002	0.0068
Corveen_010	IE_NW_38C050200	High	0.0139	0.0188	4.1	0.0003	0.0142
An_Céideadh_010	IE_NW_38C250960	*High*	0.0125	0.0188	23.3	0.0016	0.0141
Cnoc_Fola_010	IE_NW_38C540200	*High*	0.0125	0.0188	5.0	0.0006	0.0131
Dungloe_010	IE_NW_38D020020	*High*	0.0125	0.0188	0.8	0.00004	0.0125
Dungloe_020	IE_NW_38D020250	High	0.0250*	0.0188	43.9	0.0011	0.0261
Gweedore_010	IE_NW_38G030100	High	0.0058	0.0188	8.4	0.0001	0.0059
Gweedore_020	IE_NW_38G030300	*High*	0.0125	0.0188	27.0	0.0003	0.0128
Glais Bheagáin_010	IE_NW_38G180970	*High*	0.0125	0.0188	23.0	0.0017	0.0142
Keel Lough Stream_010	IE_NW_38K010200	High	0.0101	0.0188	0.6	0.0001	0.0101
Loughanure_010	IE_NW_38L150630	*High*	0.0125	0.0188	33.9	0.0018	0.0143
Mullaghderg_010	IE_NW_38M190990	*High*	0.0125	0.0188	6.7	0.0005	0.0130
Owencronahulla_010	IE_NW_38O090300	*High*	0.0125	0.0188	21.0	0.0012	0.0137
Saltpans_010	IE_NW_38S230860	*High*	0.0125	0.0188	9.8	0.0008	0.0133

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

Table 3: Orthophosphate concentrations in groundwater 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)**
Northwest Donegal	IE_NW_G_049	*Good*	0.0175	0.0263	51.6	0.0004	0.0179

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

Name	**EU_CD**	**Indicative Quality** *Surrogate status in italics*	**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)**
Nacung Upper	IE_NW_38_26	*High*	0.0050	0.0075	6.6	0.00004	0.0050
Fad Dunglow	IE_NW_38_543	*High*	0.0050	0.0075	43.9	0.0011	0.0061
Namuck	IE_NW_38_606	*High*	0.0050	0.0075	43.9	0.0011	0.0061
Meenlecknalore	IE_NW_38_62	*High*	0.0050	0.0075	0.8	0.00004	0.0050
Meela	IE_NW_38_69	*High*	0.0050	0.0075	23.0	0.0017	0.0067
Dunglow	IE_NW_38_692	High	0.0108*	0.0075	43.9	0.0011	0.0119
Craghy	IE_NW_38_82	*High*	0.0050	0.0075	43.9	0.0011	0.0061
Anure	IE_NW_38_83	High	0.0077*	0.0075	8.4	0.0001	0.0078
Mullaghderg West	IE_NW_38_85	*High*	0.0050	0.0075	6.7	0.0005	0.0055
Veigha	IE_NW_38_278	*High*	0.0050	0.0075	17.8	0.0020	0.0070
Cushkeeragh	IE_NW_38_571	*High*	0.0050	0.0075	43.9	0.0011	0.0061
Namuck	IE_NW_38_606	*High*	0.0050	0.0075	43.9	0.0011	0.0061
Mullaghderg East	IE_NW_38_81	*High*	0.0050	0.0075	6.7	0.0005	0.0055
Sallagh	IE_NW_38_349	*High*	0.0050	0.0075	0.0	0.0000	0.0050
Chapel Lough	IE_NW_38_408	*High*	0.0050	0.0075	6.7	0.0005	0.0055
Ibby Lough	IE_NW_38_579	*High*	0.0050	0.0075	6.7	0.0005	0.0055
Carnboy Lough	IE_NW_38_14	*High*	0.0050	0.0075	6.7	0.0005	0.0055
Unnamed Lake	IE_NW_38_483	*High*	0.0050	0.0075	23.3	0.0016	0.0066
Lough Fad	IE_NW_ 38_646	*High*	0.0050	0.0075	33.9	0.0018	0.0068

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

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

Name	EU_CD	Season	Indicative Quality *Surrogate Status in italic*	Baseline conc. (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Moorlagh	IE_NW_160_0300	Summer	*High*	0.0125	0.0188	33.9	0.0018	0.0143
		Winter	*High*	0.0125	0.0188	33.9	0.0018	0.0143
Meenaclady	IE_NW_160_0500	Summer	*High*	0.0125	0.0188	36.7	0.0002	0.0127
		Winter	*High*	0.0125	0.0188	36.7	0.0002	0.0127
Gweedore Estuary	IE_NW_160_0200	Summer	*High*	0.0125	0.0188	115.7	0.0004	0.0129
		Winter	*High*	0.0125	0.0188	115.7	0.0004	0.0129
Gweedore Bay	IE_NW_160_0000	Summer	*High*	0.0125	0.0188	214.9	0.0006	0.0131
		Winter	*High*	0.0125	0.0188	214.9	0.0006	0.0131
Dungloe Bay	IE_NW_140_0000	Summer	*High*	0.0125	0.0188	97.1	0.0015	0.0140
		Winter	*High*	0.0125	0.0188	97.1	0.0015	0.0140
Rutland Sound	IE_NW_150_0000	Summer	*High*	0.0125	0.0188	29.3	0.0021	0.0146
		Winter	*High*	0.0125	0.0188	29.3	0.0021	0.0146
Sally's Lough	IE_NW_150_0100	Summer	*High*	0.0125	0.0188	23.0	0.0017	0.0142
		Winter	*High*	0.0125	0.0188	23.0	0.0017	0.0142
Loch Chionn Caslach (Kincas Lough)	IE_NW_160_0100	Summer	*High*	0.0125	0.0188	6.7	0.0005	0.0130
		Winter	*High*	0.0125	0.0188	6.7	0.0005	0.0130

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. (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)
Dungloe Bay	IE_NW_140_0000	Summer	*High*	0.0125	0.0188	97.1	98.6	0.0015	0.0140
		Winter	*High*	0.0125	0.0188	97.1	98.6	0.0015	0.0140

Figure 1: Crolly Regional Water Supply Zone Dosing Area

Figure 2: RWB Cumulative Loading Assessment

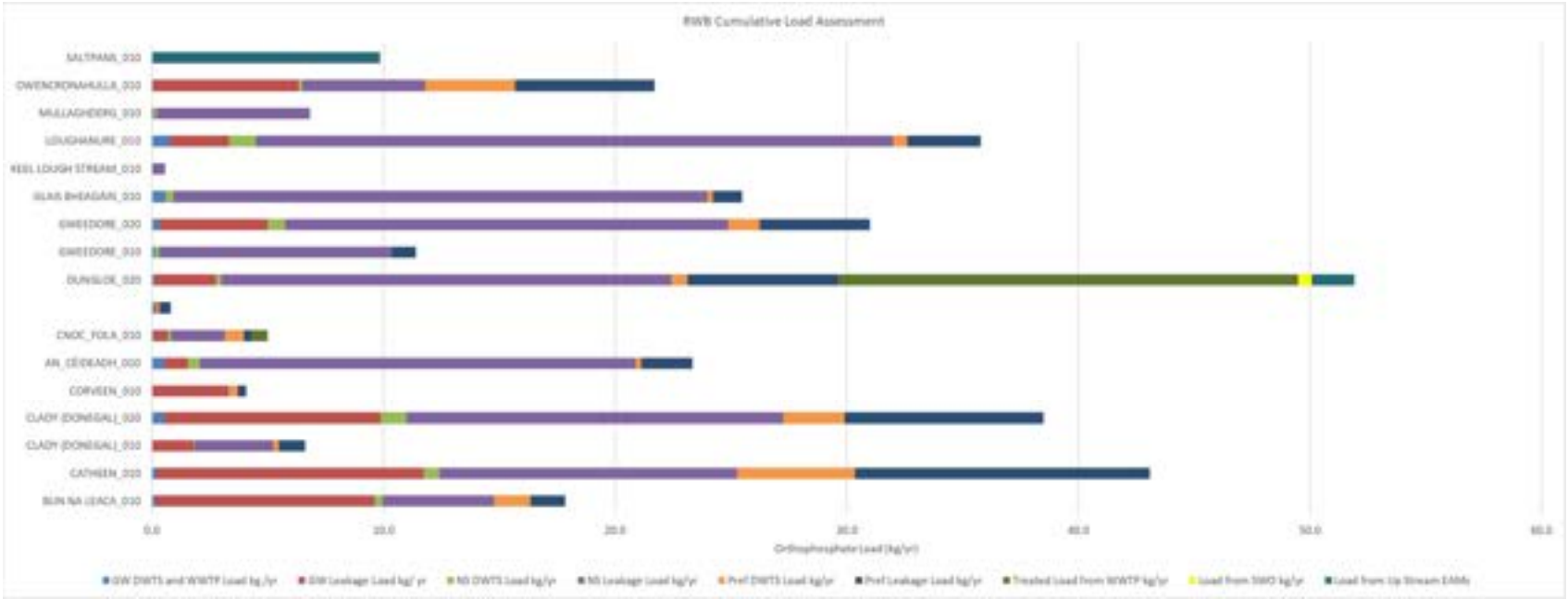

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

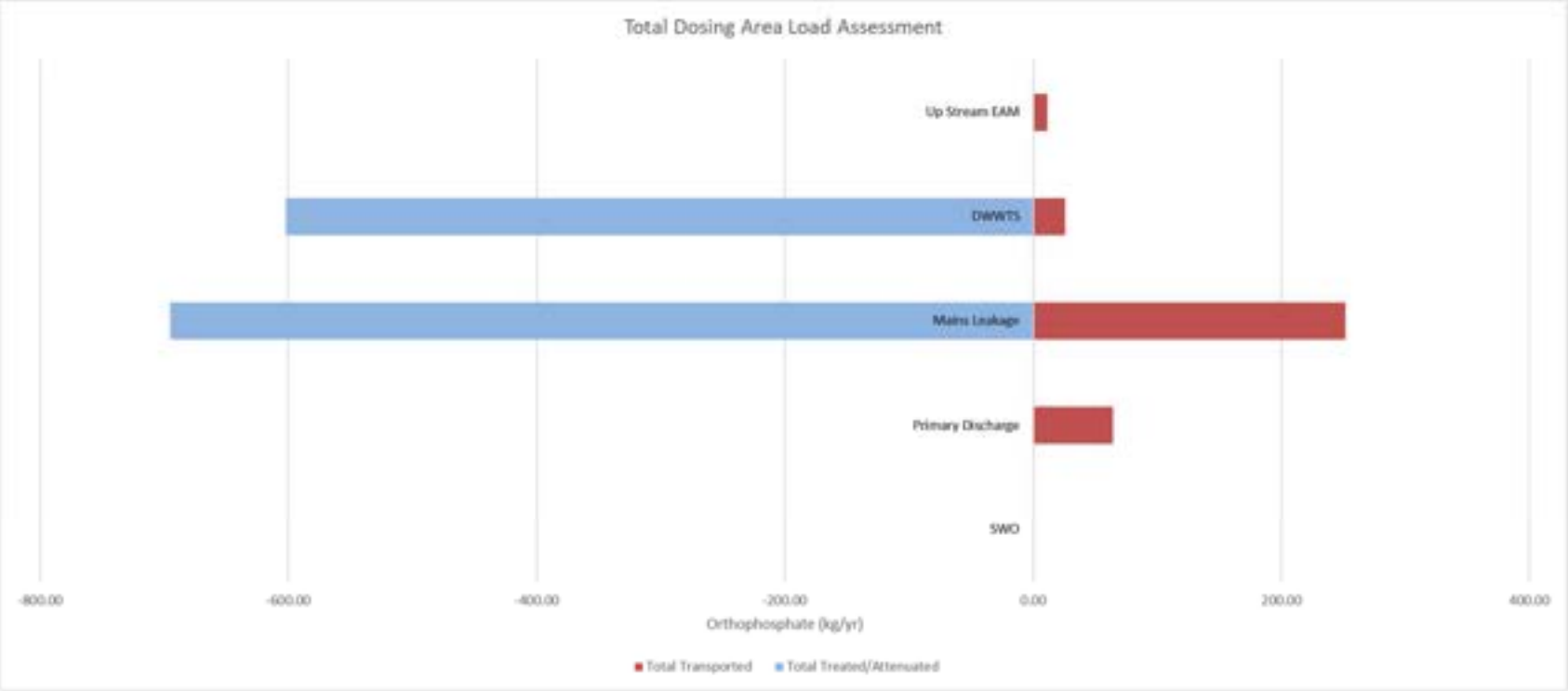

Figure 4: Upstream and downstream EAMs within WFD catchment

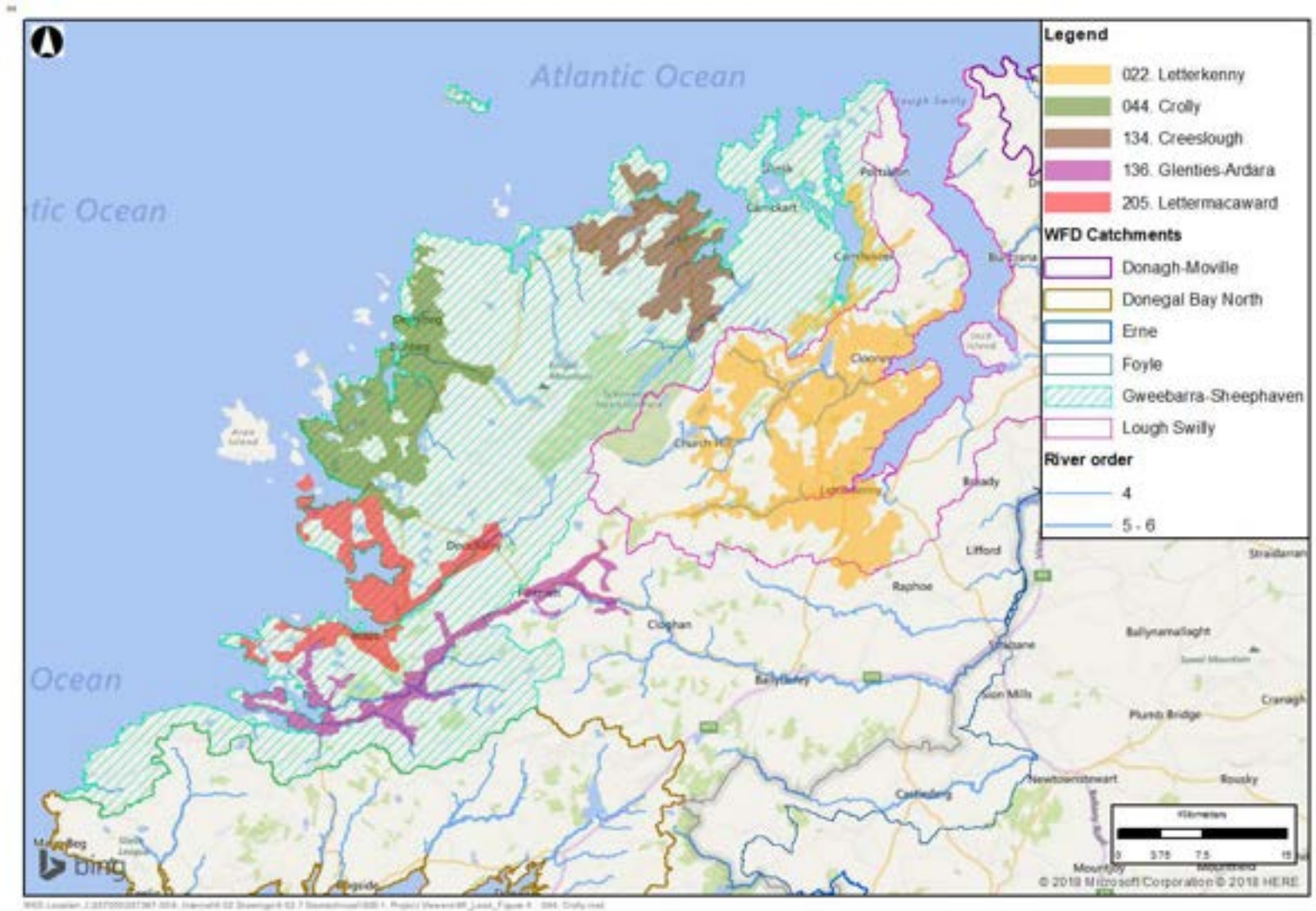

Figure 5: Red, Amber, Green (RAG) Status of waterbodies