IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 112 ARDEE WSZ AA SCREENING

SCREENING TO INFORM APPROPRIATE ASSESSMENT

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GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

Scoping: the process of deciding the content and level of detail to be included in the Screening for AA, including the key environmental 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 Ardee Water Treatment Plant (WTP) and the boreholes in Co. Louth to Slieve Breagh Reservoir and the Ardee Water Supply Zone (WSZ) (2100PUB1001).

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 quantity of OP that IW will be required to add to treated water at Slieve Breagh Reservoir is 1.2 mg/l P.

1.3 PROJECT BACKGROUND

Phosphorus (P) can influence impact 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, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*".

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

2.5.1 Identification of European Sites

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

"*A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects*".

A buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential effects. With regard to the current project, the 15km distance is considered

inappropriate to screen all likely pathways 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.

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

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

The Ardee WTP and Ardee Boreholes typically supply 2,455 m^3/day to the Slieve Breagh Reservoir which distributes treated water to the Ardee WSZ via three outlets 1) Ardee town, 2) Stikillen and 3) Blakestown. The WSZ boundary encompasses two WWTP agglomerations (Ardee WWTP and Tallanstown WWTP). There are an estimated 669 properties across the WSZs that are serviced by DWWTS and water discharged per person is assigned as 105 litres per day with an average of 2.7 persons per household assumed. Mains leakage across the WSZ is assumed to be 49%.

The Plumbosolvency Control Plan for Ardee WSZ recommends that high risk areas will receive OP dosed water. Specifically, 1.2 mg/l P will be dosed at the Ardee town outlet of the Slieve Breagh Reservoir (Figure 1) for a daily production rate of 1,665 m^3/day to this area.

Slieve Breagh Reservoir is located south of Ardee on the Mulladrillen Road. The site is surrounded by improved agricultural grassland.

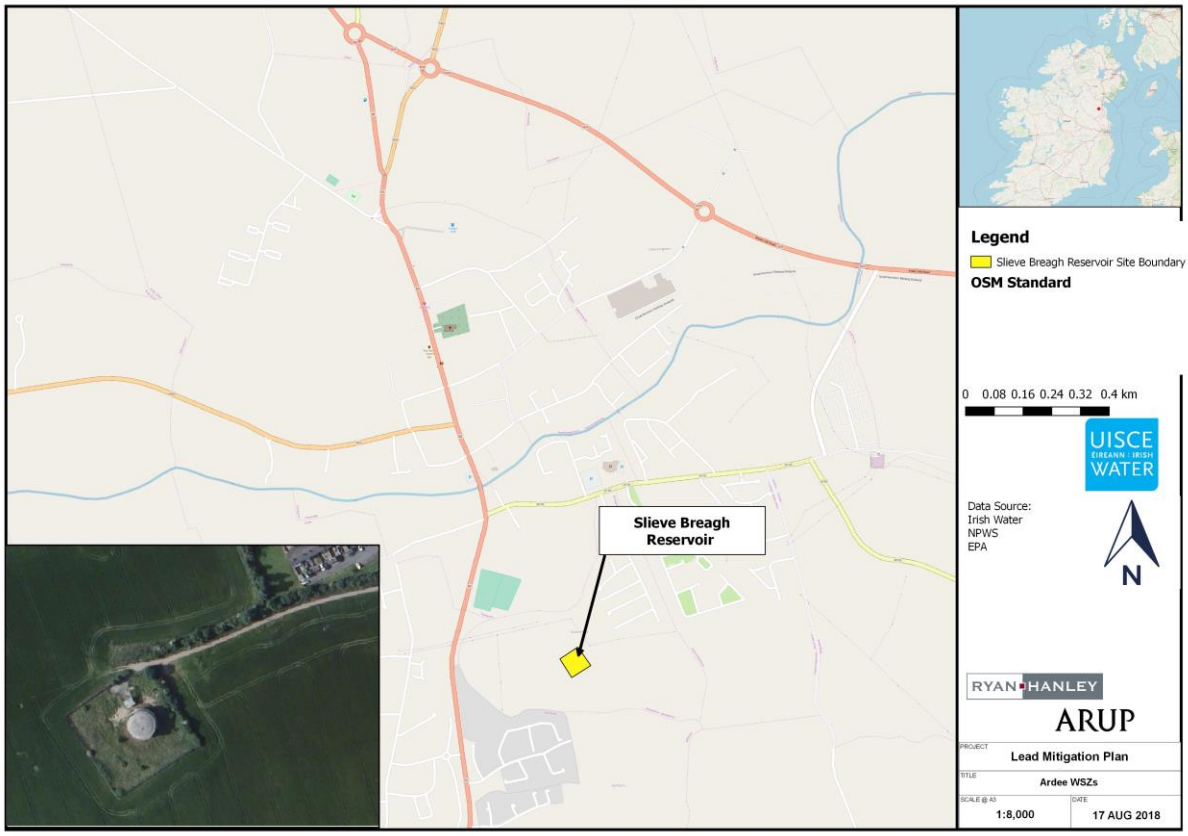

Figure 1 Location of the Slieve Breagh Reservoir site boundary, Co. Louth.

The proposed works will comprise **construction** and **operational** activities.

3.1.1Construction Works

The Plumbosolvency Report has proposed that a bunded phosphoric acid storage tank (with capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply) and dosing installations housed in kiosks, will be installed on constructed concrete ground slabs, located within the site of the existing Slieve Breagh Reservoir site. The required 60 days storage volume at the reservoir site corresponds to 0.25m^3.

Furthermore, the Plumbosolvency Report has proposed that facilities for post treatment pH correction be provided for Ardee WSZ and utilised as part of the Slieve Breagh Reservoir site prior to OP dosing. Recommended pH for Slieve Breagh Reservoir is pH of 8.0. These facilities will consist of three free standing storage or dry chemical dilution tanks (with capacity for a minimum of 60 days dosing of sodium hydroxide or sodium carbonate) with dosing pumps and control panel and an allowance for dry product storage (pallets / silos) plus conveying equipment. The three free standing storage tanks will hold between 0.25m^3 to 9m^3 each and will be located within the existing Slieve Breagh Reservoir site.

The scope of the **construction** works for the reservoir site will include:

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;
- Installation of the OP dosing unit may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works (a typical dosing unit is shown in **Figure 2** and **Figure 3**). The exact location will be confirmed following initial site assessment and investigations. A kiosk will be required to house the OP dosing unit as there is insufficient storage space within the existing buildings. The kiosk will be housed on concrete ground slabs, located within the reservoir site. An estimated area require for provision of OP dosing kiosk is 30m^2, including a1.0m wide concrete apron around the kiosk;
- Installation of pH correction facilities with an area of approximately 120m^2 (a typical installation is shown in Figure 4). Exact locations will be confirmed following initial site assessment and investigations.

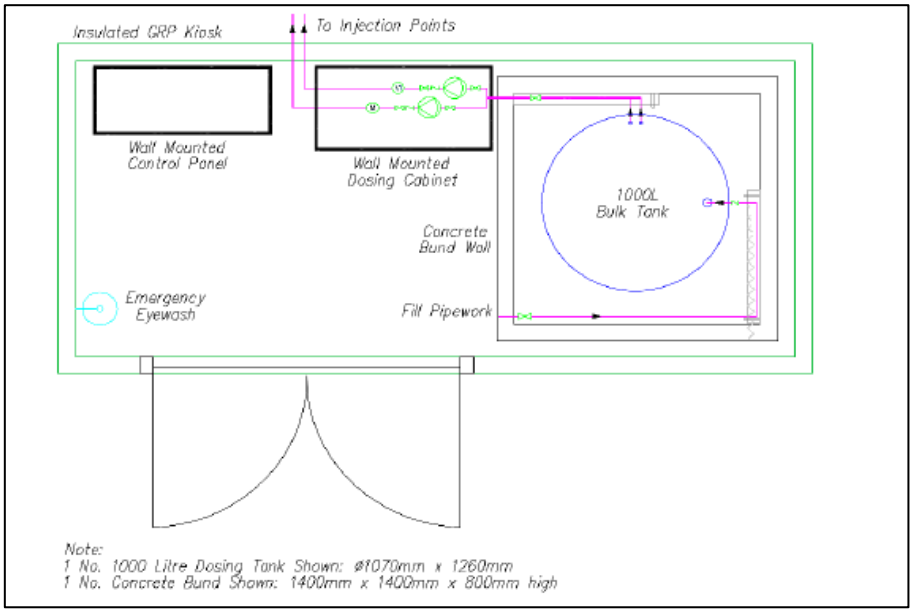

Figure 2 IW schematic of a bulk tank kiosk layout in H3PO4 Installation with 500 litres< bulk storage ≤ 6,000 litres.

Figure 3 Typical orthophosphate dosing unit

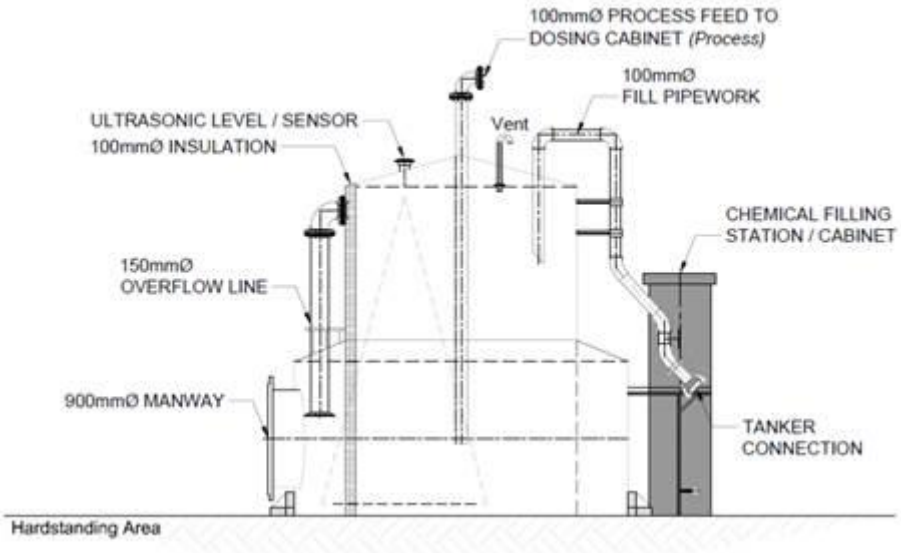

Figure 4 Sectional view of typical circular free-standing chemical storage tank.

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 1.2 mg/l P for treated water from the Ardee town outlet of the Slieve Breagh Reservoir 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. Similarly, pH correction will involve dosing NaOH/ Na_2CO_3 to treated water.

3.2 LDWMP APPROACH TO ASSESSMENT

3.2.1 Work Flow Process

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

- **Impact Prediction** – where the likely potential impacts of this project (impact source and impact pathways) are examined.

- **Assessment of Effects** - where project impacts are assessed on the basis of best scientific knowledge (the EAM); in order to identify whether they are likely to give rise to significant effect on any European sites, in view of their COs;

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

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

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

3.2.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 5**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of phosphorus is defined as the orthophosphate dosing at water treatment plants which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.

- *Pathways* include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from Domestic Wastewater Treatment Systems (DWWTS).

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

A flow chart of the methodology applied in the EAM is provided in **Figure 6** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance. For each WSZ where orthophosphate treatment is proposed the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process.

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

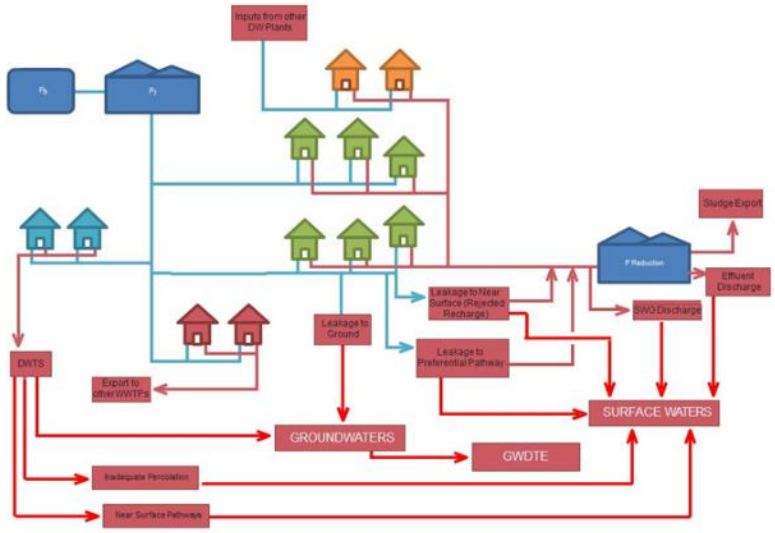

Figure 5 Conceptual Model of P Transfer

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

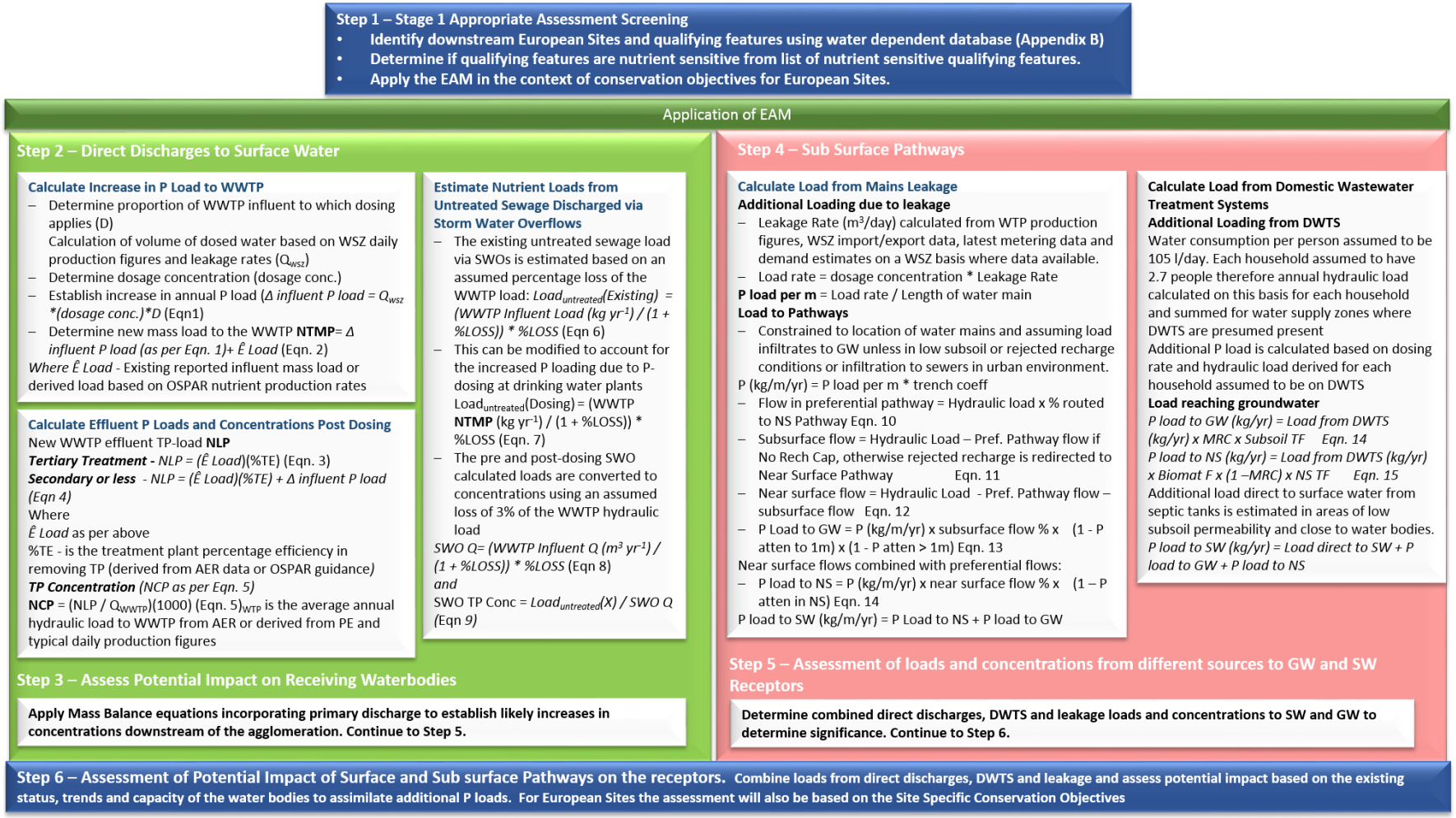

Figure 6 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 CONSTRUCTION PHASE

Slieve Breagh Reservoir site boundary is located approximately 5.5km from the nearest European Site, the Stabannan-Braganstown SPA (004091) (Figure 7). The closest watercourse to the Reservoir site is the Dee_070 RWB which is located approximately 108 m south of the site. The Dee River flows in a north-westerly direction to outer Dundalk Bay which forms part of the Dundalk Bay SAC (000455) and SPA (004026). There are no direct hydrological connections between the works and the Stabannan-Braganstown SPA as the River Dee delineates the SPA and the reservoir site and they lie in different groundwater bodies. There are no direct hydrological connections between the works and Dundalk Bay SAC/SPA, as the works are located a significant distance (approximately 21 km upstream) from these sites and the scale of the construction works are not considered significant. There will be direct and indirect impacts within the construction works Zone of Influence, however given the location and taking account of the scale of the construction of the OP Dosing Unit and pH correction facility for the proposed scheme, these direct and indirect construction impacts and the reservoir will not 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 site within the Zone of Influence. Therefore, construction impacts are not assessed further.

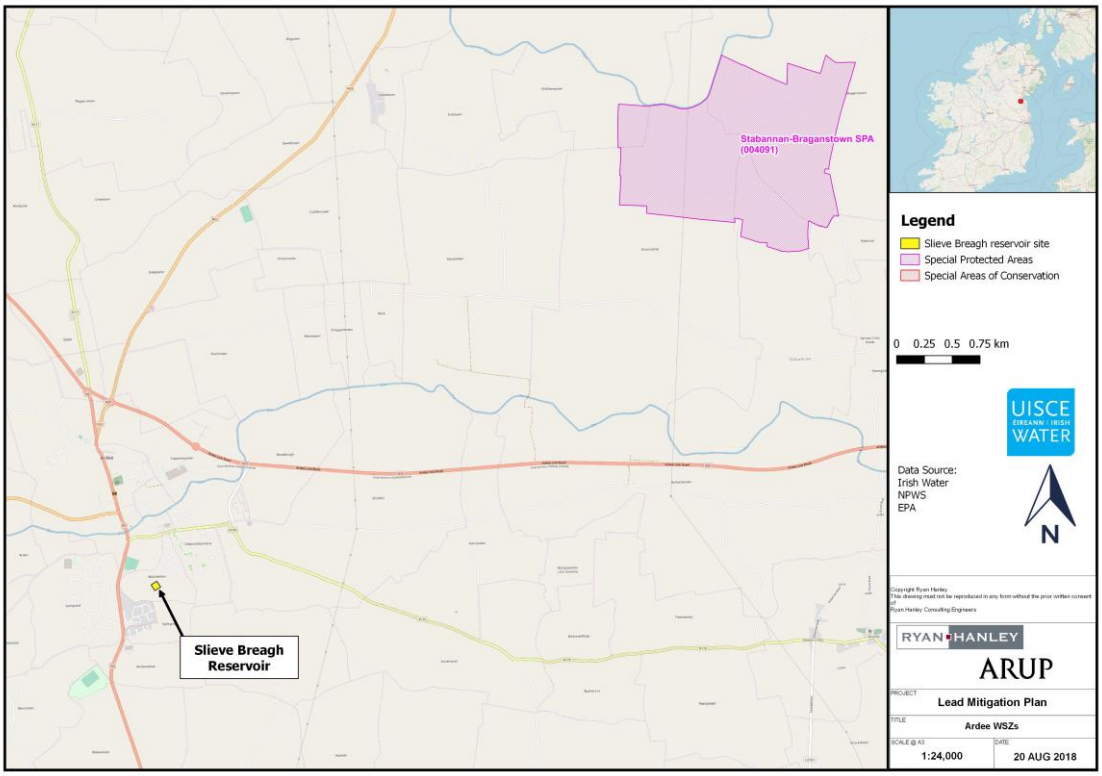

Figure 7 Location of the Slieve Breagh Reservoir site with respect to European Sites

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 Slieve Breagh Reservoir site 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 8**.

The EAM process identified 9 river waterbodies 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:

- Glyde_050 (IE_NB_06G020700) and the Mapastown_010 (IE_NB_06M170410) river waterbodies flow into the Glyde_060 (IE_NB_06G020900), Glyde_070 (IE_NB_06G021230) river waterbodies, Glyde Estuary (IE_NB_040_0500) transitional waterbody and Outer Dundalk Bay coastal waterbody.

- Bawn_010 (IE_NB_06B280720) river waterbody flows into the Glyde_070 (IE_NB_06G021230) river waterbody, Glyde Estuary (IE_NB_040_0500) transitional waterbody and Outer Dundalk Bay coastal waterbody.

- Dee_060 (IE_NB_06D010670) river waterbody flows into the Dee_070 (IE_NB_06D010710), Dee_080 (IE_NB_06D011000) and the Dee_090 (IE_NB_06D011100) river waterbodies, Glyde Estuary (IE_NB_040_0500) transitional waterbody and Outer Dundalk Bay coastal waterbody.

- Kilincoole_010 (IE_NB_06K210970) river waterbody flows into the Fane_060 (IE_NB_06F010950) river waterbody, the Fane Estuary (IE_NB_040_0400) and Inner Dundalk Bay (IE_NB_040_0100) transitional waterbodies.

The EAM process identified 2 groundwater bodies. Groundwater bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are considered:

- Ardee (IE_NB_G_018)

- Louth (IEGBNI_NB_G_019)

Ardee (IE_NB_G_018) groundwater body discharges locally to rivers and streams crossing the GWB, reflecting short flow paths. Flow paths are likely to be between 30-300 m owing to the poor productivity of this aquifer (Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300 m radius of the dosing zone within this groundwater body are considered in the ZoI.

Louth (IEGBNI_NB_G_019) groundwater body discharges to rivers and streams crossing the GWB, reflecting short flow paths. Flow paths are likely to be between 30-300 m owing to the poor productivity of this aquifer (Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300 m radius of the dosing zone within this groundwater body 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
Dundalk Bay SAC	**000455**	**Yes**	**Yes**	**Yes**
Carlingford Shore SAC	**002306**	**Yes**	**Yes**	**Yes**
Dundalk Bay SPA	**004026**	**Yes**	**Yes**	**Yes**
Stabannan-Braganstown SPA	**004091**	**Yes**	**Yes**	**Yes**

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

Each European Site was assessed for the presence of water dependent habitats and species, nutrient sensitivity and hydrological/hydrogeological connectivity (operational and construction ZoI), and on this basis, the potential for risk from the proposed Project was identified (**Table 2**).

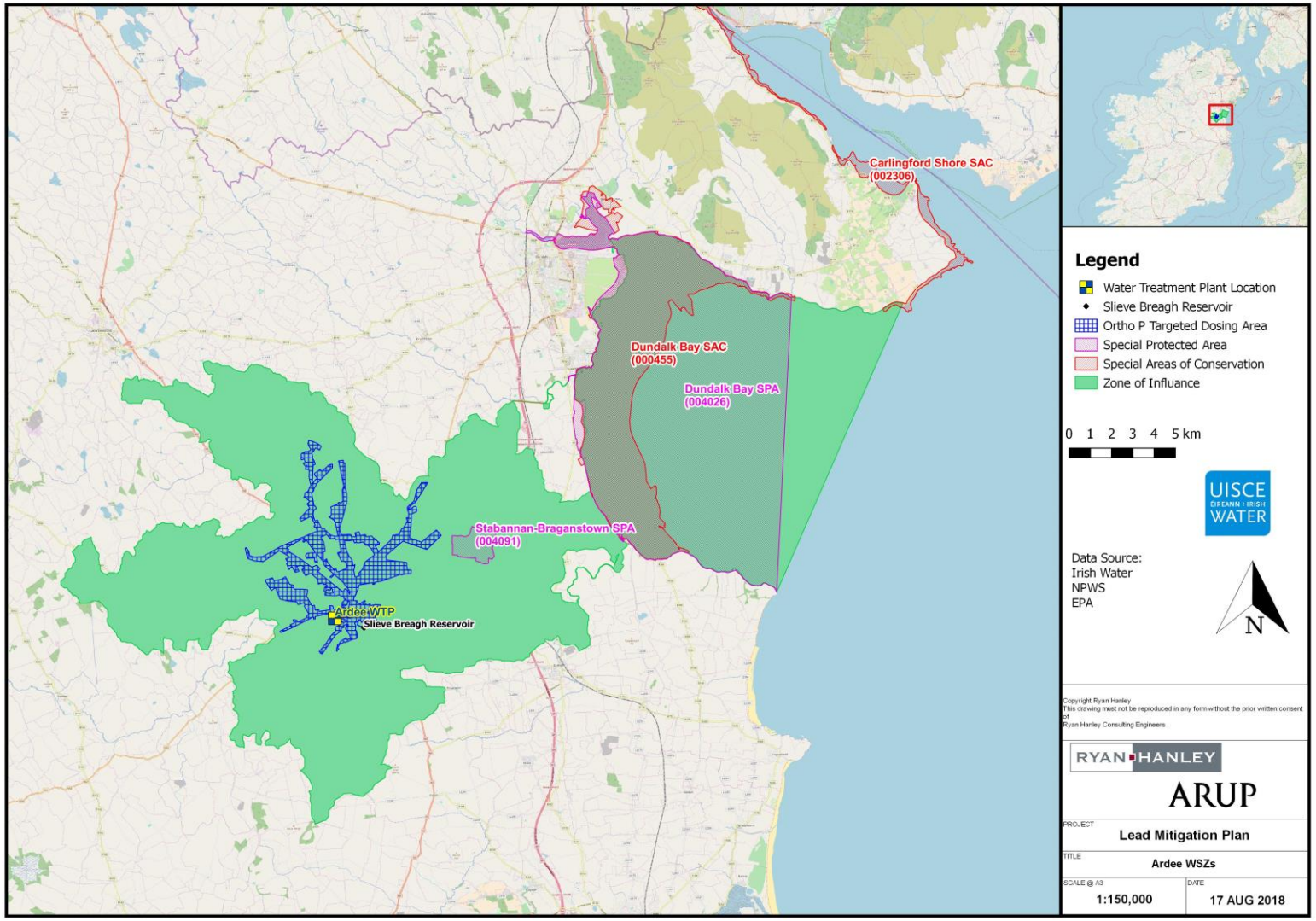

Figure 8 European Sites within the ZoI of the Proposed Project

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

Site Name	SAC/ SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species /Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
Dundalk Bay	**SAC 000455**	**19th July 2011**	1130	Estuaries	Yes	Yes	Yes for Operational Impacts
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	
			1220	Perennial vegetation of stony banks	Yes	No	
			1310	*Salicornia* and other annuals colonizing mud and sand	Yes	Yes	
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	
Carlingford Shore	**SAC 002306**	**15th Jul 2013**	1210	Annual vegetation of drift lines	Yes	Yes	Yes for Operational Impacts
			1220	Perennial vegetation of stony banks	Yes	No	
Dundalk Bay	**SPA 004026**	**19th July 2011**	A005	Great Crested Grebe *Podiceps cristatus*	No	No	Yes for Operational Impacts
			A043	Greylag Goose *Anser anser*	Yes	Yes	
			A046	Light-bellied Brent Goose *Branta bernicla hrota*	Yes	Yes	
			A048	Shelduck *Tadorna tadorna*	Yes	Yes	
			A052	Teal *Anas crecca*	Yes	Yes	
			A053	Mallard *Anas platyrhynchos*	Yes	Yes	
			A054	Pintail *Anas acuta*	Yes	Yes	
			A065	Common Scoter *Melanitta nigra*	Yes	Yes	
			A069	Red-breasted Merganser *Mergus serrator*	Yes	Yes	
			A130	Oystercatcher *Haematopus ostralegus*	Yes	Yes	
			A137	Ringed Plover *Charadrius hiaticula*	Yes	Yes	
			A140	Golden Plover *Pluvialis apricaria*	Yes	Yes	
			A141	Grey Plover *Pluvialis squatarola*	Yes	Yes	
			A142	Lapwing *Vanellus vanellus*	Yes	Yes	
			A143	Knot *Calidris canutus*	Yes	Yes	
			A149	Dunlin *Calidris alpina*	Yes	Yes	
			A156	Black-tailed Godwit *Limosa limosa*	Yes	Yes	
			A157	Bar-tailed Godwit *Limosa lapponica*	Yes	Yes	
			A160	Curlew *Numenius arquata*	Yes	Yes	
			A162	Redshank *Tringa totanus*	Yes	Yes	
			A179	Black-headed Gull *Chroicocephalus ridibundus*	Yes	Yes	

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
			A182	Common Gull *Larus canus*	Yes	Yes	
			A184	Herring Gull *Larus argentatus*	Yes	Yes	
			A999	Wetlands & Waterbirds	Yes	Yes	
Stabannan-Braganstown	**SPA 004091**	**21st February, 2018**	A043	Greylag Goose *Anser anser*	Yes	Yes	Yes for Operational Impacts

* indicates a priority habitat under the Habitats Directive

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

Operational Phase

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

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

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

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

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

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

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

5.3 ASSESSMENT OF IMPACTS RELATING TO OPERATIONAL ACTIVITIES

Article 6 of the Habitats Directive states that:

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

The focus of this section of the Screening to inform AA is the potential significant effects arising from the additional OP load due to OP dosing at Slieve Breagh Reservoir. 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 P) 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 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.

Baseline OP monitoring data and associated thresholds were not available to Bawn 010 RWB, Killincoole 010 RWB, Mapastown 010 RWB, Ardee GWB, Glyde Estuary TWB, Fane TWB and Outer Dundalk Bay (Winter) CWB, and so a surrogate status is derived from the OP indicative quality of adjacent WBs. The mid-range of the surrogate status is used as the baseline concentration

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

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

Site Name (Code)	Contributing WB Code_Name	WB Type	Ortho P Status[2] and Trends[3]	Baseline[4] Ortho P Conc.[5] (mg/l P)	75% of Status Threshold (mg/l P)	Cumulative Ortho P load to SW and GW[5]	Modelled Conc.[6] (mg/l P)	Baseline Conc. at 1.2 mg/l P dosage rate	Evaluation
Dundalk Bay SAC (000455)	Glyde Estuary (IE_NB_040_0500)	TWB	*Moderate*	0.050	0.055	180.9	0.0005	0.0505	No deterioration to OP indicative WQ
	Fane Estuary (IE_NB_040_0400)	TWB	Summer High/Winter Moderate	0.0125/0.0500	0.0188/0.0550	1.4	0.00001	0.0125/0.0500	No deterioration to OP indicative WQ
	Inner Dundalk Bay (IE_NB_040_0100)	TWB	Summer High	0.0110	0.0188	1.4	0.000001	0.0110	No deterioration to OP indicative WQ
			Winter Moderate	0.0450	0.0550			0.0450	
	Outer Dundalk Bay	CWB	Summer High	0.0025	0.0188	182.3	0.0001	0.0026	No deterioration to OP indicative WQ
			Winter *High*	0.0125	0.0188			0.0126	
	Bawn_010 (IE_NB_06B280720)	RWB	*Moderate*	0.0455	0.0508	1.8	0.0002	0.0457	No deterioration to OP indicative WQ
	Dee_060 (IE_NB_06D010670)	RWB	Moderate	0.0433	0.0508	15.0	0.0001	0.0434	No deterioration to OP indicative WQ
	Dee_070 (IE_NB_06D010710)	RWB	Moderate	0.0489	0.0508	156.8	0.0010	0.0500	No deterioration to OP indicative WQ
	Dee_080 (IE_NB_06D011000)	RWB	Poor	0.0814	0.0868	162.7	0.0008	0.0822	No deterioration to OP indicative WQ
	Glyde_050 (IE_NB_06G020700)	RWB	Moderate	0.0358	0.0508	1.2	0.00001	0.0358	No deterioration to OP indicative WQ
	Glyde_060 (IE_NB_06G020900)	RWB	Moderate	0.0351	0.0508	11.3	0.0001	0.0351	No deterioration to OP indicative WQ

[1] Distance to threshold in parentheses.
[2] Baseline year is 2011.
[3] Surrogate concentration is given in italic mg/l P
[4] Values above 5% of Good / High boundary (0.00125 mg/l) for SW or 5% of Good / Fail boundary (0.00175 mg/l P) for GW highlighted in yellow.
[5] No monitoring data available in WFD for Winter for this Water Body
[6] Cumulative P load to SW and GW from upstream and downstream dosing areas, leakage, SWWTS and agglomerations (kg/yr)

Site Name (Code)	Contributing WB Code_Name	WB Type	Ortho P Status[2] and Trends[3]	Baseline[4] Ortho P Conc.[5] (mg/l P)	75% of Status Threshold (mg/l P)	Cumulative Ortho P load to SW and GW[5]	Modelled Conc.[6] (mg/l P)	Baseline Conc. at 1.2 mg/l P dosage rate	Evaluation
	Glyde_070 (IE_NB_06G021230)	RWB	Moderate	0.0449	0.0508	18.2	0.0001	0.0450	No deterioration to OP indicative WQ
	Killincoole_010 (IE_NB_06K21230)	RWB	*Moderate*	0.0455	0.0508	1.4	0.0003	0.0458	No deterioration to OP indicative WQ
	Mapastown_010 (IE_NB_06M170410)	RWB	*Moderate*	0.0455	0.0508	4.1	0.0009	0.0464	No deterioration to OP indicative WQ
Carlingford SAC (002306)	Outer Dundalk Bay	CWB	Summer High	0.0025	0.0188	182.3	0.0001	0.0026	No deterioration to OP indicative WQ
			Winter *High*	0.0125	0.0188			0.0126	
Dundalk Bay SPA (004026)	Glyde Estuary (IE_NB_040_0500)	TWB	*Moderate*	0.050	0.055	180.9	0.0005	0.0505	No deterioration to OP indicative WQ
	Fane Estuary (IE_NB_040_0400)	TWB	Summer High/Winter Moderate	0.0125/0.0500	0.0188/0.0550	1.4	0.00001	0.0125/0.0500	No deterioration to OP indicative WQ
	Inner Dundalk Bay (IE_NB_040_0100)	TWB	Summer High	0.0110	0.0188	1.4	0.000001	0.0110	No deterioration to OP indicative WQ
			Winter Moderate	0.0450	0.0550			0.0450	
	Outer Dundalk Bay	CWB	Summer High	0.0025	0.0188	182.3	0.0001	0.0026	No deterioration to OP indicative WQ
			Winter *High*	0.0125	0.0188			0.0126	
	Bawn_010 (IE_NB_06B280720)	RWB	*Moderate*	0.0455	0.0508	1.8	0.0002	0.0457	No deterioration to OP indicative WQ
	Dee_060 (IE_NB_06D010670)	RWB	Moderate	0.0433	0.0508	15.0	0.0001	0.0434	No deterioration to OP indicative WQ
	Dee_070 (IE_NB_06D010710)	RWB	Moderate	0.0489	0.0508	156.8	0.0010	0.0500	No deterioration to OP indicative WQ
	Dee_080 (IE_NB_06D011000)	RWB	Poor	0.0814	0.0868	162.7	0.0008	0.0822	No deterioration to OP indicative WQ
	Glyde_050 (IE_NB_06G020700)	RWB	Moderate	0.0358	0.0508	1.2	0.00001	0.0358	No deterioration to OP indicative WQ

Site Name (Code)	Contributing WB Code_Name	WB Type	Ortho P Status[2] and Trends[3]	Baseline[4] Ortho P Conc.[5] (mg/l P)	75% of Status Threshold (mg/l P)	Cumulative Ortho P load to SW and GW[5]	Modelled Conc.[6] (mg/l P)	Baseline Conc. at 1.2 mg/l P dosage rate	Evaluation
	Glyde_060 (IE_NB_06G020900)	RWB	Moderate	0.0351	0.0508	11.3	0.0001	0.0351	No deterioration to OP indicative WQ
	Glyde_070 (IE_NB_06G021230)	RWB	Moderate	0.0449	0.0508	18.2	0.0001	0.0450	No deterioration to OP indicative WQ
	Killincoole_010 (IE_NB_06K21230)	RWB	Moderate	0.0455	0.0508	1.4	0.0003	0.0458	No deterioration to OP indicative WQ
	Mapastown_010 (IE_NB_06M170410)	RWB	Moderate	0.0455	0.0508	4.1	0.0009	0.0464	No deterioration to OP indicative WQ
Stabannan-Braganstown SPA (004091)	Bawn_010 (IE_NB_06B280720)	RWB	Moderate	0.0455	0.0508	1.8	0.0002	0.0457	No deterioration to OP indicative WQ
	Glyde_070 (IE_NB_06G021230)	RWB	Moderate	0.0449	0.0508	18.2	0.0001	0.0450	No deterioration to OP indicative WQ
	Louth (IEGBNI_NB_G_019)	GWB	Good	0.0062	0.0263	4.7	0.00005	0.0063	No 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 the potential direct impacts are:

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

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

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

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

Table 4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.2 mg/l P at Slieve Breagh Reservoir, Outlet to Ardee town only.

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%)*[1]		
				0.5	*0.4*	*0.68*
Ardee Primary Discharge	**Orthophosphate 0.5 mg/l Commencement date of ELV is 31/12/2019**	Existing	2112	1.75.	1.40	2.37
		Post Dosing	2381	1.97	1.57	2.68
		% Increase	13%	13%	13%	13%
Ardee SWOs (4 No.)		Existing	132	0.53	0.43	0.73
		Post Dosing	140	0.57	0.45	0.77
Tallanstown Primary Discharge	**Orthophosphate 2 mg/l**	Existing	61	0.70	0.56	0.95
		Post Dosing	61	0.70	0.56	0.95
		% Increase	0%	0%	0%	0%
Tallanstown SWOs (2 No.)		Existing	18	1.00	0.80	1.36
		Post Dosing	18	1.02	0.82	1.39

[1] Cells highlighted in amber are exceeding ELV

Ardee WWTP Agglomeration

The Ardee WWTP Agglomeration provides secondary treatment. There are no ELVs set for this WWTP agglomeration, however, an ELV of 0.5 mg/l OP is set to commence on the 31st of December 2019. As this WWTP provides secondary treatment it has been assumed that 0% of the additional OP load will be removed by the treatment plant. As a result of dosing OP concentrations in the effluent will increase from 1.75 mg/l P to 1.97 mg/l P (13%). There are 4 No. SWOs associated with this WWTP. The SWO concentration will increase from 0.53 mg/l P to 0.57 mg/l P as a result of the dosing (6%). The Ardee WWTP and three of its SWOs discharge into the Dee_070 RWB while the other SWO discharges into the Dee_080 which eventually flows into the Dundalk Bay, a designated SAC and SPA, i.e. **Dundalk Bay SAC** and **Dundalk Bay SPA**.

Tallanstown WWTP Agglomeration

The Tallanstown WWTP agglomeration provides tertiary treatment and so the EAM has assumed that 100% of the additional OP load will be removed by the WWTP. The WWTP has an ELV of 2 mg/l P OP and this was exceeded 2 out of 7 samples exceeded the ELV in 2017, however, IW has indicated there is additional capacity at the WWTP to remove the additional OP load. The EAM has calculated the pre- and post-dosing concentration as 0.70 mg/l P. There are 2 No. SWOs associated with this WWTP. The SWO concentration will increase from 1.00 mg/l P to 1.02 mg/l P (2%) as a result of dosing. The Tallanstown WWTP and its SWO discharge into the Glyde_050 RWB which flows through the **Stabannan-Braganstown SPA** and eventually flows into the Dundalk Bay which is designated as the **Dundalk Bay SAC** and **Dundalk Bay SPA**.

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

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

River waterbodies

- Bawn_010 (IE_NB_06B280720) and Glyde_070 (IE_NB_06G021230) river waterbodies are directly connected to the **Stabannan-Braganstown SPA (004091).**

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 357 kg/yr P of which 325 kg/yr is assumed to be attenuated along flowpaths. The hydraulic loading from the DWWTS is 82.8 kg/yr P, all of which is assumed to be attenuated along the flowpaths.

A significant proportion of load is anticipated to be delivered from upstream dosing areas however this has not of yet been assessed by the EAM. This will be incorporated in the subsequent draft.

The increase in Orthophosphate concentrations due to dosing is up to 0.001 mg/l P. The baseline concentrations of the Bawn_010 and Glyde_070 rivers range from 0.0286 to 0.0604 mg/l P (see Table 3 above) and their WFD status remain unchanged as moderate. The modelled increases are below the 5% of the Good / Fail boundary (0.00175 mg/l P) for RW, and do not result in a change of WFD OP indicative water quality, i.e. the status remains at 'Good'.

Groundwater bodies

- Louth (IEGBNI_NB_G_019) groundwater body is hydrologically linked to the **Stabannan-Braganstown SPA (004091).**

The OP dosing contributes OP load to receiving GWBs via subsurface and surface pathways. The increase in Orthophosphate concentrations due to dosing is up to 0.0004 mg/l P. The baseline

concentrations of the Louth GWB range from 0.0076 to 0.179 mg/l P and the WFD status remains unchanged, i.e. Good (See Table 3 above). The modelled increases are below the 5% of the Good / Fail boundary (0.00175 mg/l P) for GW, and do not result in a change of WFD OP indicative water quality, i.e. the status remains at 'Good'.

Transitional waterbodies

- Glyde Estuary transitional waterbody is hydrologically linked to **Dundalk Bay SAC (000455)** and **Dundalk Bay SPA (004026).**
- Fane Estuary transitional waterbody is hydrologically linked to **Dundalk Bay SAC (000455)** and **Dundalk Bay SPA (004026).**
- Inner Dundalk Bay transitional waterbody is hydrologically linked to **Dundalk Bay SAC (000455)** and **Dundalk Bay SPA (004026).**

The OP dosing contributes OP load to receiving TWBs via subsurface and surface pathways. The increase in Orthophosphate cumulative concentrations due to dosing is up to 0.0012 mg/l P. The baseline concentrations following dosing ranges from 0.0208mg/l P to 0.0504 mg/l P and the WFD status remains unchanged, i.e. High *Good* and *Moderate* (See Table 3 above). The modelled increases are below the 5% of the Good / Fail boundary (0.00175 mg/l P) for TW, and do not result in a change of WFD OP indicative water quality, i.e. the status remains at 'Good'.

Coastal waterbodies

- Outer Dundalk bay coastal waterbody is hydrologically linked to the **Dundalk Bay SAC (000455), Dundalk Bay SPA (004026)** and **Carlingford SAC (002306).**

The OP dosing contributes OP load to receiving CWBs via subsurface and surface pathways. The increase in Orthophosphate concentrations due to dosing is 0.0007 mg/l P. The baseline concentrations following dosing is 0.0071 mg/l P in summer and 0.0132 mg / l P in winter and the WFD status remains unchanged, i.e. *High* (See Table 3 above). The modelled increases are below the 5% of the Good / Fail boundary (0.00175 mg/l P) for TW, and do not result in a change of WFD OP indicative water quality, i.e. the status remains at 'Good'.

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 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 WFD '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**). Four European sites remain for evaluation of potential for significant effect with respect to operational effects: **Dundalk Bay SAC (000455), Carlingford SAC (002306), Dundalk Bay SPA (004026),** and the **Stabannan-Braganstown SPA (004091).** The potential for the proposed orthophosphate dosing to give rise to significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.1 DUNDALK BAY SAC 000455

6.1.1 (1130) Estuaries, (1140) Mudflats and sandflats not covered by seawater at low tide

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

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the Dundalk Bay SAC. Estuarine, Mudflats and Sandflat habitats are associated with coastal waterbodies, in this case transitional and coastal waterbodies have been assessed. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Glyde Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing of 0.0505 mg/l P (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *Moderate*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Fane Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0125 mg/l P in summer and 0.0500 mg/l P in winter. (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *high in summer and moderate in winter*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Inner Dundalk Bay transitional waterbody and estimated an increase in OP concentrations of up to 0.000001 mg/l P for both summer and winter. The resulting OP concentration following dosing is. 0.0110 mg/l P in summer and 0.0450 mg/l P in winter (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. High in summer and Moderate in winter. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Outer Dundalk Bay coastal waterbody and estimated an increase in OP concentration of up to 0.0001 mg/l P for both summer and winter. The resulting OP concentration following dosing is 0.0026 mg/l P in summer and 0.0126 mg/l P in winter. (Table 3, Appendix C). The CWB OP indicative water quality is unchanged following dosing i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Slieve Breagh Reservoir on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies and all dosing concentrations are within the 5% good/high significance threshold and there will be no alteration to water quality meaning there will be no potential for significant effects on these habitats in Dundalk Bay SAC.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of estuarine and mudflat/ sandflat habitat in Dundalk Bay SAC/ no deterioration of the favourable conservation condition is identified.

6.1.2 (1310) *Salicornia* and other annuals colonizing mud and sand (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Mudflat habitat was estimated at 528 hectares and communities present include Muddy estuarine community complexes and Sand to muddy fine sand community complexes. *Salicornia* habitat was estimated at 34.84 hectares; Atlantic salt meadows at 330.15 hectares and Mediterranean salt meadows 0.04 hectares. These habitats are located downstream of the Glyde Estuary transitional waterbody. SSCOs require no significant disturbance to communities. Disturbance can be in the form of nutrients, as in a change to the current input which are central to the development, growth and survival of the habitats and communities that exist there.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the Dundalk Bay SAC. The above listed mud and sand habitats (1310) and salt meadow habitats (1330 and 1410) are associated with transitional waterbodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Glyde Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing of 0.0505 mg/l P (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *Moderate*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Fane Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0125 mg/l P in summer and 0.0500 mg/l P in winter. (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *high in summer and moderate in winter*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Inner Dundalk Bay transitional waterbody and estimated an increase in OP concentrations of up to 0.000001 mg/l P for both summer and winter. The resulting OP concentration following dosing is. 0.0110 mg/l P in summer and 0.0450 mg/l P in winter (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. High in summer and Moderate in winter. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Outer Dundalk Bay coastal waterbody and estimated an increase in OP concentration of up to 0.0001 mg/l P for both summer and winter. The resulting OP concentration following dosing is 0.0026 mg/l P in summer and 0.0126 mg/l P in winter. (Table 3, Appendix C). The CWB OP indicative water quality is unchanged following dosing i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Slieve Breagh Reservoir on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effects on these habitats in Dundalk Bay SAC.

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

6.2. CARLINGFORD SHORE SAC (002306)

6.2.1 (1210) Annual vegetation of drift lines

The conservation objective for this site is to maintain the favourable conservation condition of Annual vegetation of drift lines in Carlingford Shore SAC, which is defined by the following list of attributes and targets: area stable or increasing, subject to natural processes, including erosion and succession; no decline, or change in habitat distribution, subject to natural processes; maintain the natural circulation of sediment and organic matter, without any physical obstructions; maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession, maintain the presence of species-poor communities with typical species: sea rocket (*Calike maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and orache (*Atriplex* spp.); and negative indicator species (including non-natives) to represent less than 5% cover.

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

- Outer Dundalk Bay coastal waterbody and estimated an increase in OP concentration of up to 0.0001 mg/l P for both summer and winter. The resulting OP concentration following dosing is 0.0026 mg/l P in summer and 0.0126 mg/l P in winter. (Table 3, Appendix C). The CWB OP indicative water quality is unchanged following dosing i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Slieve Breagh on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effects on this habitat in Carlingford Shore SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of Annual vegetation of drift lines in Carlingford Shore SAC / no deterioration of its favourable conservation condition is identified.

6.3 DUNDALK BAY SPA 004026

The SSCOs for Dundalk Bay SPA is to maintain the favourable conservation conditions of the wetland habitat as a resourse for the regularly-occurring migratory waterbirds: (A043) Greylag Goose *Anser anser*, (A048) Shelduck *Tadorna tadorna* (A052) Teal *Anas crecca*, (A054) Pintail *Anas acuta*, (A065) Common Scoter *Melanitta nigra*, (A069) Red-breasted Merganser *Mergus serrator*, (A140) Golden Plover *Pluvialis apricaria*, (A141) Grey Plover *Pluvialis squatarola*, (A142) Lapwing *Vanellus vanellus*, (A143)

Knot *Calidris canutus*, (A149) Dunlin *Calidris alpina*, (A156) Black-tailed Godwit *Limosa limosa*, (A157) Bar-tailed Godwit *Limosa lapponica*:

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

Dundalk Bay is a large open shallow sea bay with extensive saltmarshes and intertidal sand/mudflats, extending some 16km from Castletown River on the Cooley Peninsula, in the north, to Annagassan/Salterstown in the south.

- Glyde Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing of 0.0505 mg/l P (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *Moderate*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Fane Estuary transitional waterbody and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0125 mg/l P in summer and 0.0500 mg/l P in winter. (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. *high in summer and moderate in winter*. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Inner Dundalk Bay transitional waterbody and estimated an increase in OP concentrations of up to 0.000001 mg/l P for both summer and winter. The resulting OP concentration following dosing is. 0.0110 mg/l P in summer and 0.0450 mg/l P in winter (Table 3, Appendix C). The TWB OP indicative water quality is unchanged following dosing, i.e. High in summer and Moderate in winter. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

- Outer Dundalk Bay coastal waterbody and estimated an increase in OP concentration of up to 0.0001 mg/l P for both summer and winter. The resulting OP concentration following dosing is 0.0026 mg/l P in summer and 0.0126 mg/l P in winter. (Table 3, Appendix C). The CWB OP indicative water quality is unchanged following dosing i.e. High. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Slieve Breagh Reservoir on WFD OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on the aforementioned bird species the Dundalk Bay SPA.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of birds in Dundalk Bay SPA/ no deterioration of their favourable conservation condition is identified.

6.4 STABANNAN-BRAGANSTOWN SPA 004091

The SSCOs for the Stabannan-Braganstown SPA list targets for (A043) Greylag Goose *Anser anser*. Population trend: long term population trends should be stable or increasing; and

- Distribution: there should be no significant decrease in the range, timing or intensity of use of areas by the listed species, other than that occurring from natural patterns of variation.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrological or hydrogeological connectivity to Greylag Goose in Stabannan-Braganstown SPA:

- Bawn_010 river waterbody and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0457 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this river waterbody.

- Glyde_070 river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0450 mg/l P (Table 3, Appendix C). The RWB OP indicative water quality is unchanged following dosing, i.e. Moderate. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this river waterbody.

- Louth groundwater body and estimated an increase in OP concentrations of up to 0.00005 mg/l P. The resulting OP concentration following dosing is 0.0063 mg/l P (Table 3, Appendix C). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in OP indicative water quality following dosing in Slieve Breagh Reservoir for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Slieve Breagh Reservoir on OP statuses have demonstrated that there will be no change in the OP indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effects to Greylag Goose in Stabannan-Braganstown SPA.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of Greylag Goose in Stabannan-Braganstown SPA/ no deterioration of their favourable conservation condition is identified.

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

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

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

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

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

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

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

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

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

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Louth County Development Plan 2021 – 2027. The policies of relevance in the Louth County Development Plan include under Chapter 8, section 4 Water Quality: To develop, protect, improve and extend, water wastewater, surface water and flood alleviation services throughout the county and to prioritise the provision of water services infrastructure to complement the overall strategy for economic and population growth and to achieve improved environmental protection.	▪ N/A	The Louth County Development Plan 2021 – 2027 outlines the importance of compliance with the Eastern River Basin Management Plan and the Neagh Bann River Basin District Management Plan(now replaced by the national River Basin Management Plan 2018-2021), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.
River Basin Management Plan For Ireland 2018 – 2021 Public Consultation on the River Basin Management Plan (RBMP) for Ireland (2018 – 2021), began in February 2017. The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. Nationally, both monitored river waterbodies and lakes at 'high' or 'good' ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river waterbodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each waterbody that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of waterbodies nationally, which had been characterised at the time. 1,517 waterbodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake waterbodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each waterbody. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives.

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

objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2022 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2022 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting waterbodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' waterbodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes are focused on productivity for farmers but have the ability to contribute towards a reduction in point and diffuse source pollution through improved nutrient management.	▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination effects on Natura 2000 sites.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP.	▪ 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 network and a Stage 2 AA was not required. It concluded that the NAP was an environmental

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	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. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative effects with the proposed project.
Water Services Strategic Plan (WSSP, 2015) 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	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

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

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 Slieve Breagh Reservoir, within the Ardee WSZ ZoI. The potential for significant effects is evaluated with regard to the qualifying interests/species of conservation interests and associated conservation status.

The potential for direct, indirect and cumulative impacts affecting **Dundalk Bay SAC (000455)**, **Carlingford Shore SAC (002306)**, **Dundalk Bay SPA (004026)**, and the **Stabannan-Braganstown SPA (004091)** have been assessed. The appraisal undertaken in this Screening report has been informed by an EAM (see **Appendix C**) with reference to the ecological communities and habitats potentially affected by the proposed project, in order to provide a scientific basis for the evaluations. The Screening for AA has determined that there is not potential for significant direct, indirect or cumulative impacts which could affect the qualifying interests/special conservation interests of the European sites within the study area. It is therefore concluded, beyond reasonable scientific doubt, that the proposed project will not give rise to significant effects, either individually or in combination with other plans and projects, within the identified European Site(s).

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

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http://www.wfduk.org/resources%20/reporting-confidence-groundwater-status-ssessments

Appendix A

European Sites - Conservation Objectives

National Parks and Wildlife Service

Conservation Objectives

Dundalk Bay SAC 000455
Dundalk Bay SPA 004026

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

Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

000455 Dundalk Bay SAC

QI	Description
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1220	Perennial vegetation of stony banks
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1410	Mediterranean salt meadows (*Juncetalia maritimi*)

004026 Dundalk Bay SPA

QI	Description	
A005	Great Crested Grebe *Podiceps cristatus*	wintering
A043	Greylag Goose *Anser anser*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A052	Teal *Anas crecca*	wintering
A053	Mallard *Anas platyrhynchos*	wintering
A054	Pintail *Anas acuta*	wintering
A065	Common Scoter *Melanitta nigra*	wintering
A069	Red-breasted Merganser *Mergus serrator*	wintering
A130	Oystercatcher *Haematopus ostralegus*	wintering
A137	Ringed Plover *Charadrius hiaticula*	wintering
A140	Golden Plover *Pluvialis apricaria*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A142	Lapwing *Vanellus vanellus*	wintering
A143	Knot *Calidris canutus*	wintering
A149	Dunlin *Calidris alpina*	wintering
A156	Black-tailed Godwit *Limosa limosa*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	wintering
A182	Common Gull *Larus canus*	wintering
A184	Herring Gull *Larus argentatus*	wintering
A999	Wetlands & Waterbirds	

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

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

Title: Dundalk Bay SPA (004026): Conservation objectives supporting document [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Dundalk Bay SAC (000455): Conservation objectives supporting document - marine habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Dundalk Bay SAC (000455): Conservation objectives supporting document - coastal habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: A subtidal soft sediment survey of Dundalk Bay
Year: 2009
Author: Aquatic Services Unit
Series: Unpublished Report to NPWS

Title: Saltmarsh Monitoring Report 2007-2008
Year: 2009
Author: McCorry, M.; Ryle, T.
Series: Unpublished Report to NPWS

Title: A survey of mudflats and sandflats in Ireland. An intertidal soft sediment survey of Dundalk Bay
Year: 2008
Author: Aquatic Services Unit
Series: Unpublished Report to NPWS

Title: A survey of mudflats and sandflats [Dundalk Bay]
Year: 2007
Author: Aquatic Services Unit
Series: Unpublished Report to NPWS

Title: Saltmarsh Monitoring Report 2006
Year: 2007
Author: McCorry, M.
Series: Unpublished Report to NPWS

Title: National Shingle Beach Survey of Ireland 1999
Year: 1999
Author: Moore, D.; Wilson, F.
Series: Unpublished Report to NPWS

Spatial data sources

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

Year:	Interpolated 2011
Title:	Mudflat and sandflat surveys 2007, 2008; subtidal soft sediment survey 2009
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data
Used for:	Marine community types, 1140

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

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary
Used for:	1310, 1330, 1410

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; saltmarsh data for site combined to HWM and LWM polygon feature class; resulting polygon feature class unioned with SPA boundary; resulting polygon feature class clipped to SPA boundary; bird use zone attributes assigned to each polygon
Used for:	Bird use zones (map 6)

1130 Estuaries

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area was estimated at 2799ha using OSI data and the defined Transitional Water Body area under the Water Framework Directive. See marine habitats supporting document for further information
Community distribution	Hectares	The Subtidal fine sand community complex should be conserved in a natural condition. See map 4	Habitat structure was elucidated from intertidal core and dig sampling undertaken in 2007 and 2008 combined with data obtained from subtidal grab samples obtained in 2009. See marine habitats supporting document for further information

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide at Dundalk Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated at 4375ha using OSI data. See marine habitats supporting document for further information
Community distribution	Hectares	The Muddy fine sand community and Intertidal fine sand community complex should be conserved in a natural condition. See map 4	Habitat structure was elucidated from intertidal core and dig sampling undertaken in 2007 and 2008 combined with data obtained from subtidal grab samples obtained in 2009. See marine habitats supporting document for further information

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Dundalk Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to natural processes, including erosion and succession	Exact current area unknown, but shingle is known to occur almost continuously from Salterstown to Lurgan White House in the south bay and from Jenkinstown to east of Giles Quay in the north bay. Shingle is estimated to cover 12ha. Probably less than 25% of this would be vegetated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	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 the national shingle beach survey conducted in 1999 (Moore and Wilson, 1999). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on data from Moore and Wilson (1999). 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 presence of species-poor communities with characteristic species: *Honckenya peploides*, *Beta vulgaris* ssp. *maritima*, *Crithmum maritimum*, *Tripleurospermum maritimum*, *Glaucium flavum* and *Silene uniflora*	Based on data from Moore and Wilson (1999). 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). See coastal habitats supporting document for further details

1310 *Salicornia* and other annuals colonizing mud and sand

To restore the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Dundalk Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site surveyed: 35.00ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). One sub-site (Dundalk Bay) was mapped, giving a total estimated area of 35ha for Salicornia mudflat, which is one of the largest areas of this habitat in the country. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details.
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore 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	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009)
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009)
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with characteristic species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Atlantic salt meadows in Dundalk Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the sub-site (357.57ha) and potential areas (22.42ha) mapped: 379.98ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). One sub-site (Dundalk Bay) was mapped and additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area for Atlantic salt meadow of 379.98ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further information
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore 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	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009)
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009)
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with characteristic species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows in Dundalk Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: 0.045ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). One sub-site (Dundalk Bay) was mapped, giving a total estimated area of 0.045ha for Mediterranean salt meadow. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore 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	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009)
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009)
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with characteristic species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

A005 Great Crested Grebe *Podiceps cristatus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A043 Greylag Goose *Anser anser*

To maintain the favourable conservation condition of Greylag Goose in Dundalk Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys.See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in section 5 of the SPA conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Geese in Dundalk Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A048 Shelduck *Tadorna tadorna*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A052 Teal *Anas crecca*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A053 Mallard *Anas platyrhynchos*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A054 Pintail *Anas acuta*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A065 Common Scoter *Melanitta nigra*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method. See Section 4 of the SPA conservation objectives supporting document for more details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A069 Red-breasted Merganser *Mergus serrator*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A130 Oystercatcher *Haematopus ostralegus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in Dundalk Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A140 Golden Plover *Pluvialis apricaria*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A141 Grey Plover *Pluvialis squatarola*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A143 Knot *Calidris canutus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A149 Dunlin *Calidris alpina*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A156 Black-tailed Godwit *Limosa limosa*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A160 Curlew *Numenius arquata*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A162 Redshank *Tringa totanus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method. See Section 4 for more details of the SPA conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A182 Common Gull *Larus canus*

To maintain the favourable conservation condition of Common Gull in Dundalk Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method. See Section 4 of the SPA conservation objectives supporting document for more details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A184 Herring Gull *Larus argentatus*

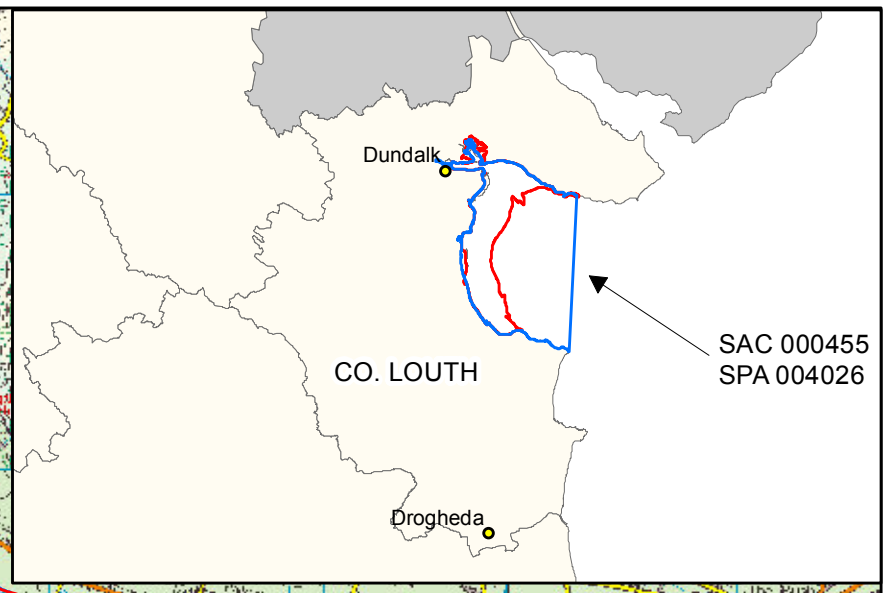
To maintain the favourable conservation condition of Herring Gull in Dundalk Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method. See Section 4 for more details of the SPA conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5 of the SPA conservation objectives supporting document

A999 Wetlands & Waterbirds

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat is stable and not significantly less than the areas of 8136, 4374 and 649 hectares respectively for subtidal, intertidal, and supratidal habitats, other than that occurring from natural patterns of variation. See map 6	As defined by SPA boundary to MLWM; MLWM to MHWM; and MHWM to SPA boundary (the latter value is minus the area of Lurgangreen Fields)



DUNDALK
Dún Dealgan
Dundalk Harbour
North Bul
South Bul
BLACKROCK
Na Creagacha Dubha
DUNDALK BAY
Cuan Dhún Dealgan
Castlebellingham
Baile an Ghearlánaigh
River Glyde
Dunany Point
Rinn Dhún Aine
IRISH S
Muir Éir

Legend

- SAC 000455
- SPA 004026

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Department of Arts, Heritage and the Gaeltacht

MAP 1: DUNDALK BAY CONSERVATION OBJECTIVES SAC & SPA DESIGNATIONS

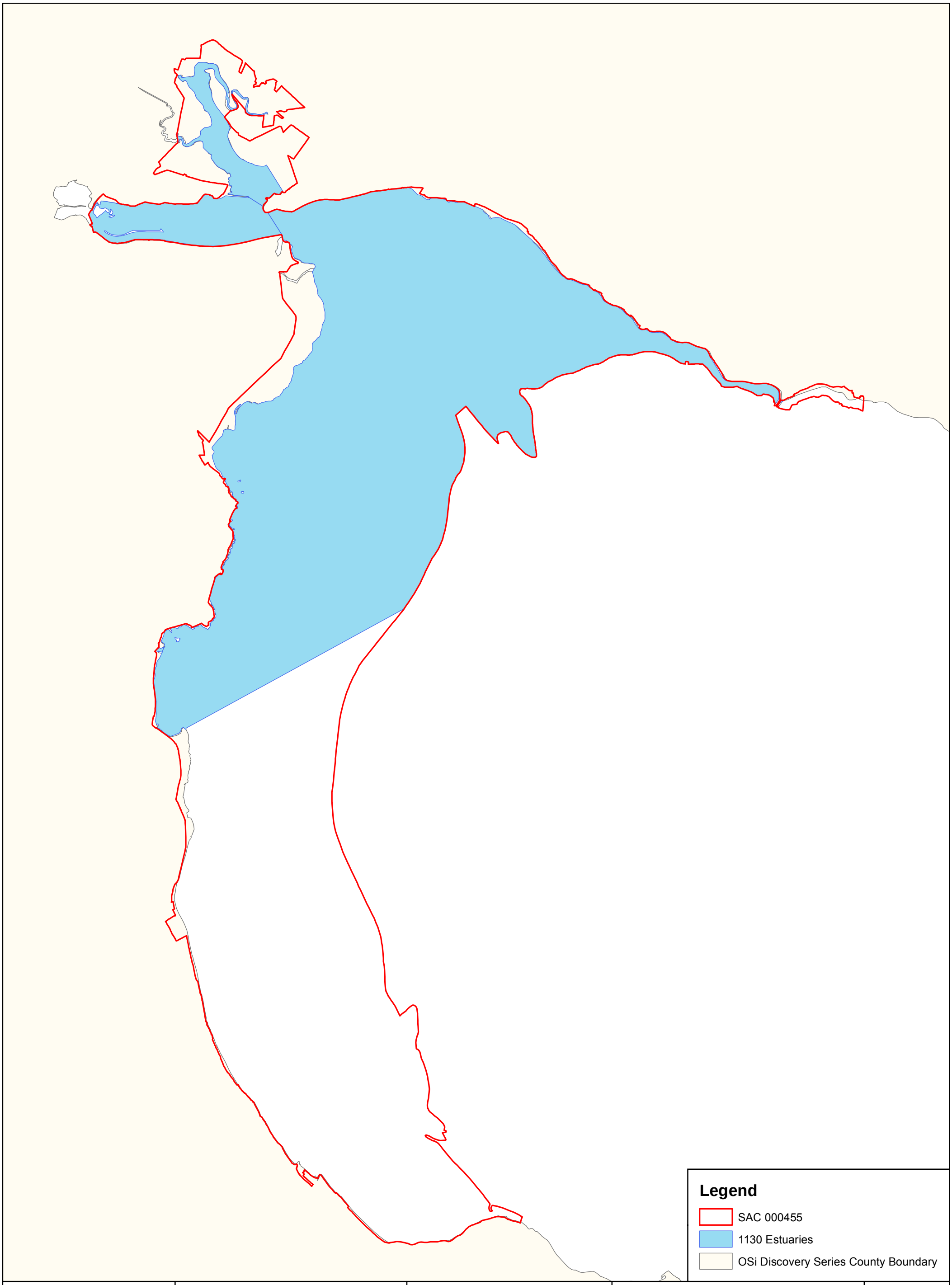
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. LOUTH

0 0.5 1 1.5 2 km

N

SITE CODE
SAC 000455
Version 1.02
SPA 004026
Version 1.02
Map Version 1
Date: March 2011



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MAP 2:
DUNDALK BAY
CONSERVATION OBJECTIVES
ESTUARIES

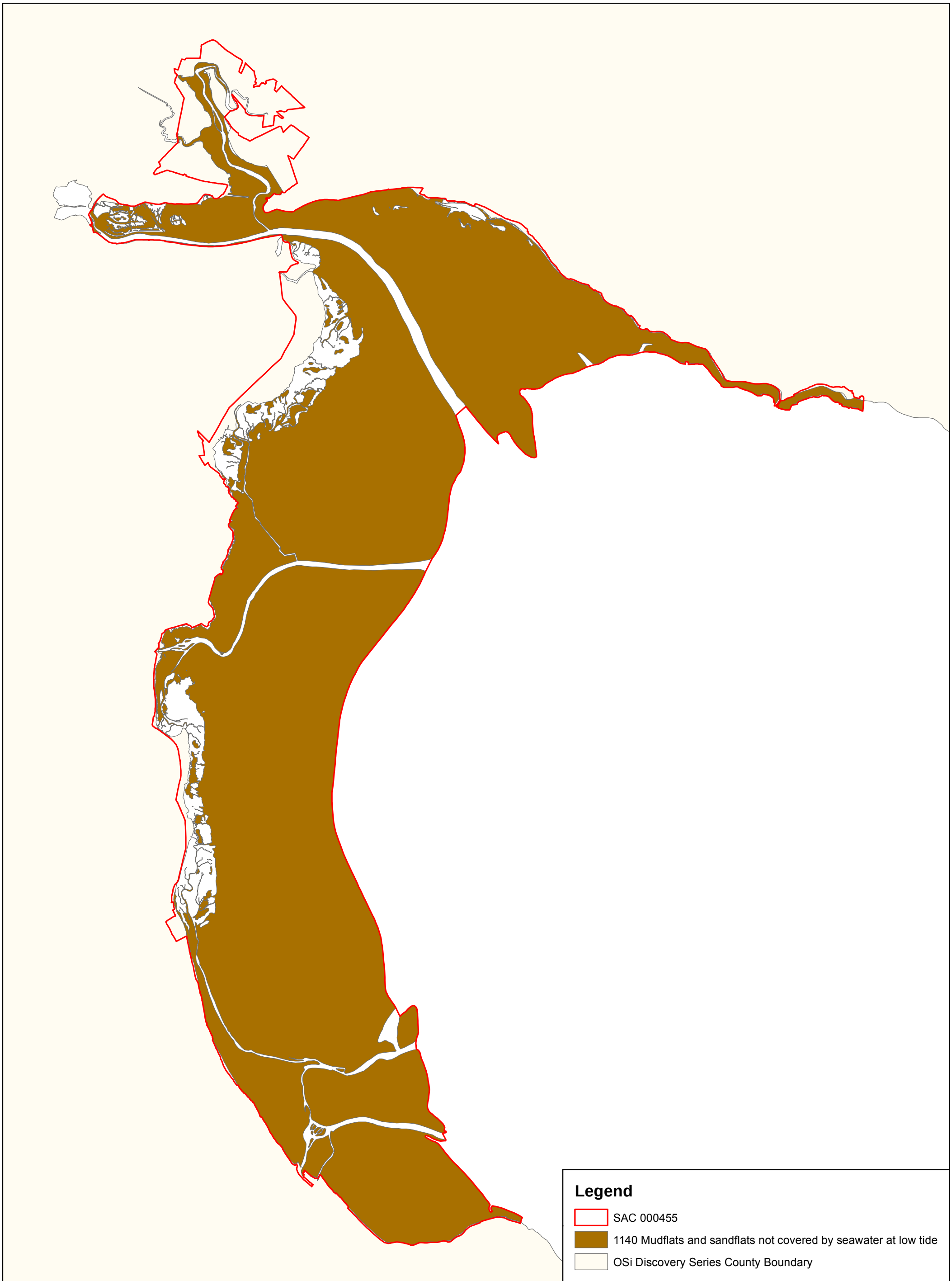
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. LOUTH

SITE CODE

SAC 000455
Version 1.02

Map Version 1
Date: March 2011



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MAP 3: DUNDALK BAY CONSERVATION OBJECTIVES MUDFLATS AND SANDFLATS

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

CO. LOUTH

SITE CODE

SAC 000455
Version 1.02

Map Version 1
Date: March 2011

Legend

- SAC 000455
- SPA 004026
- OSi Discovery Series County Boundary

Marine Community Types

- Fine sand community complex
- Muddy fine sand community
- Gravel dominated by Polychaetes

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Department of Arts, Heritage and the Gaeltacht

MAP 4:
DUNDALK BAY
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

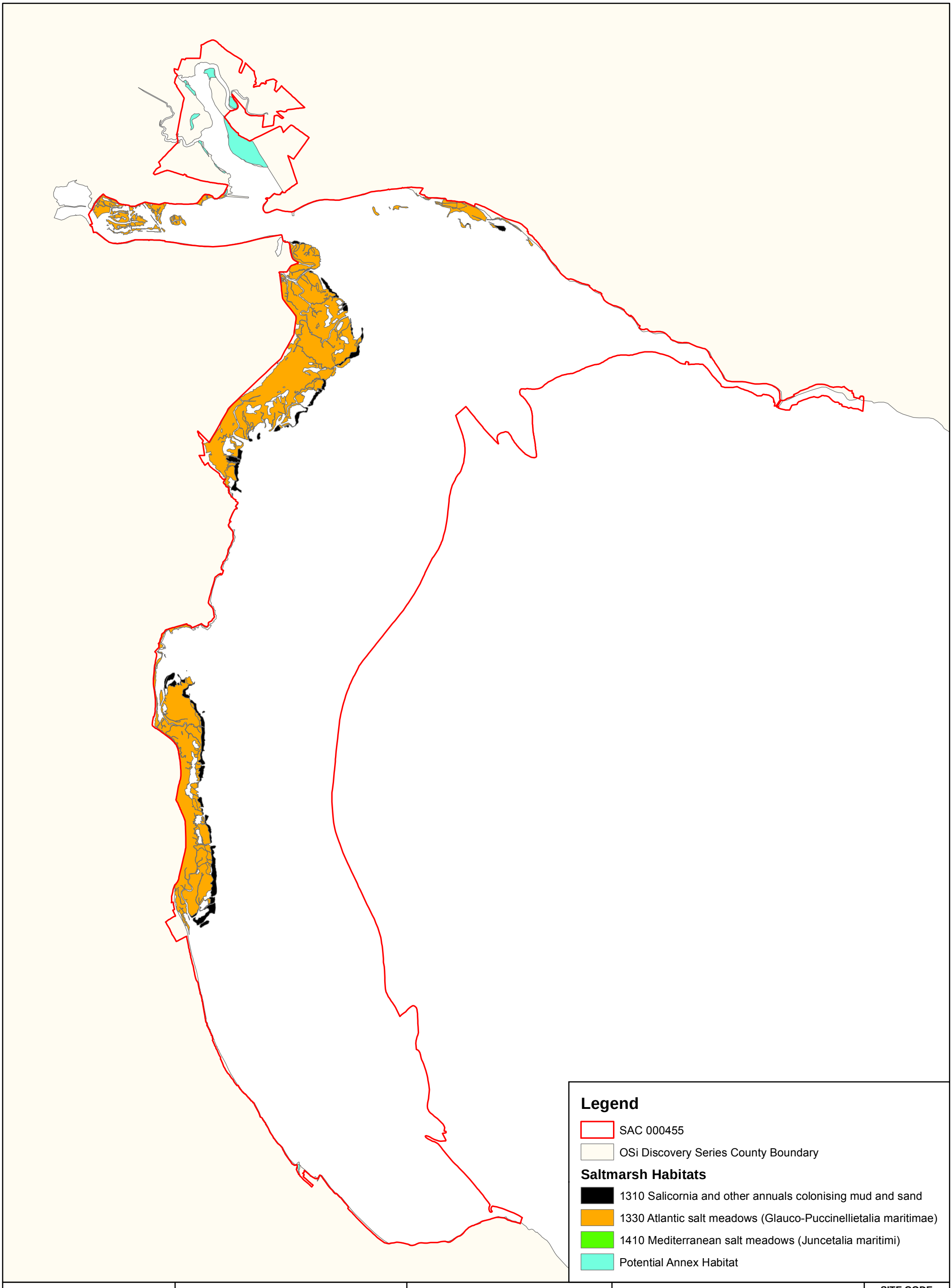
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. LOUTH

0 0.5 1 1.5 2 km

N

SITE CODE
SAC 000455
Version 1.02
SPA 004026
Version 1.02
Map Version 1
Date: March 2011



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MAP 5: DUNDALK BAY CONSERVATION OBJECTIVES SALTMARSH HABITATS

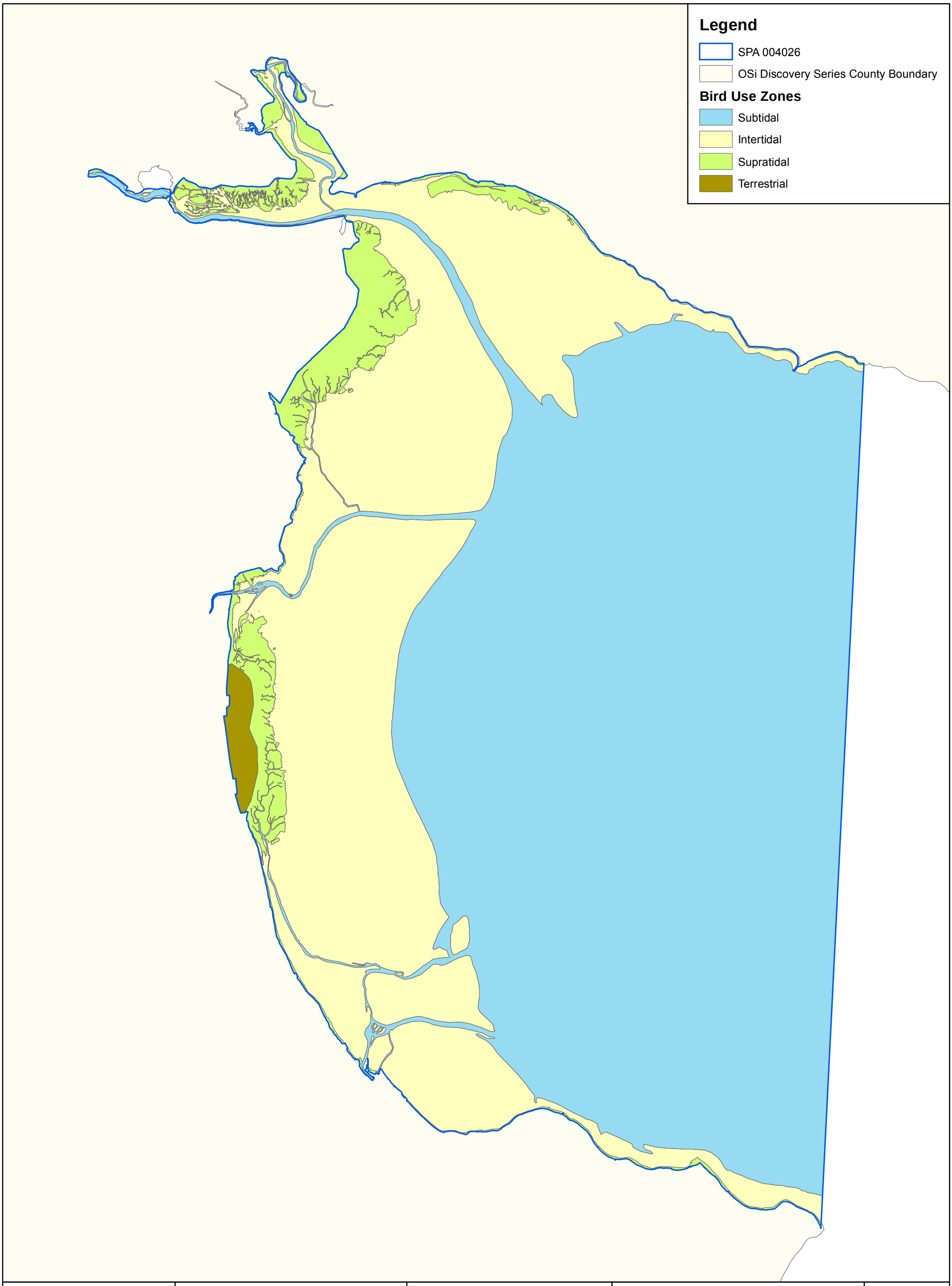
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. LOUTH

SITE CODE

SAC 000455
Version 1.02

Map Version 1
Date: March 2011



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MAP 6:
DUNDALK BAY
CONSERVATION OBJECTIVES
WETLANDS AND WATERBIRDS
BIRD USE ZONES

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

CO. LOUTH

0 0.5 1 1.5 2 km

N

SITE CODE

SPA 004026
Version 1.02

Map Version 1
Date: March 2011

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Department of
Arts, Heritage and the Gaeltacht

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Conservation Objectives Series

Carlingford Shore SAC 002306

An Roinn
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Department of
Arts, Heritage and the Gaeltacht

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Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

002306	Carlingford Shore SAC
1210	Annual vegetation of drift lines
1220	Perennial vegetation of stony banks

Please note that this SAC overlaps with Carlingford Lough SPA (004078). 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 :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
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 :	Carlingford Shore SAC (site code 2306) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished PhD thesis, National University of Ireland, Dublin

Spatial data sources

Year :	Revision 2013
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 3)

1210 Annual vegetation of drift lines

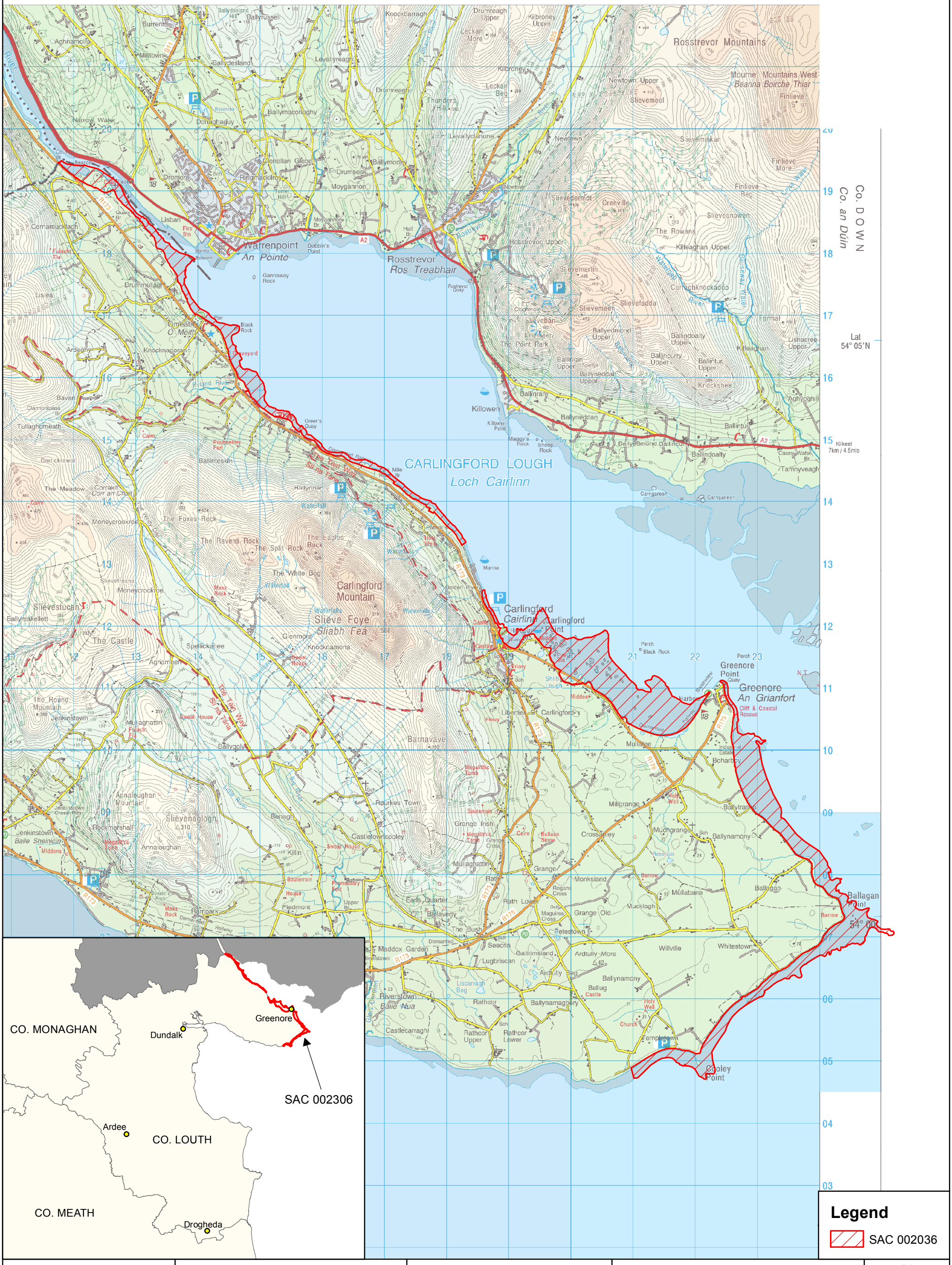
To maintain the favourable conservation condition of Annual vegetation of drift lines in Carlingford Shore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Current area unknown, but thought to occur in a mosaic with perennial vegetation of stony banks (1220). 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 unknown, but thought to occur in a mosaic with perennial vegetation of stony banks (1220). 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	Accumulation of organic matter in tidal litter is essential for trapping sand. Rock armour is present at Ballagan Point and Greenore. These physical barriers will 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	Thought to occur in a mosaic with perennial vegetation of stony banks (1220). 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 the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Gaynor (2008). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Carlingford Shore 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. Habitat recorded during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999) from three sub-sites: Whitestown to Cooley Point, Ballagan Point and Greenore. Although extent was not mapped, these contiguous sites extend for 3.5km along the coastline. Area of vegetated shingle is estimated to cover 130ha. NB Further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 3 for mapped locations	Based on data from Moore and Wilson (1999). Exact current distribution unknown, although the habitat has been recorded along a 3.5km stretch of coastline from Greenore, extending south to Cooley Point (Moore and Wilson, 1999). 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 Moore and Wilson (1999). West of Cooley Point there has been a lot of development at Templetown beach, including the installation of a car park. The NSBS noted two areas of coastal defences (rock armour), one in an area south of Ballagan Point and another in an area south of Greenore (approx. 200m in length). A number of tourism-related developments, including a promenade protected with rock armour, have been constructed at Greenore. 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). At Ballagan Point the shingle vegetation is backed by cobble-based grassland. Elsewhere along the Carlingford shore, gradations to inland habitats are disrupted by a road. Habitat is thought to occur in a mosaic with annual vegetation of drift lines (1210). 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). 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). 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



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Department of Arts, Heritage and the Gaeltacht

MAP 1: CARLINGFORD SHORE SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

SITE CODE: SAC 002306; version 3

0 1 2 km

N

Map Version 1
Date: June 2013

SPA 004078

SAC 002306

Legend

- Carlingford Shore SAC 002306
- Carlingford Lough SPA 004078
- OSi Discovery Series County Boundaries

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MAP 2:
CARLINGFORD SHORE SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

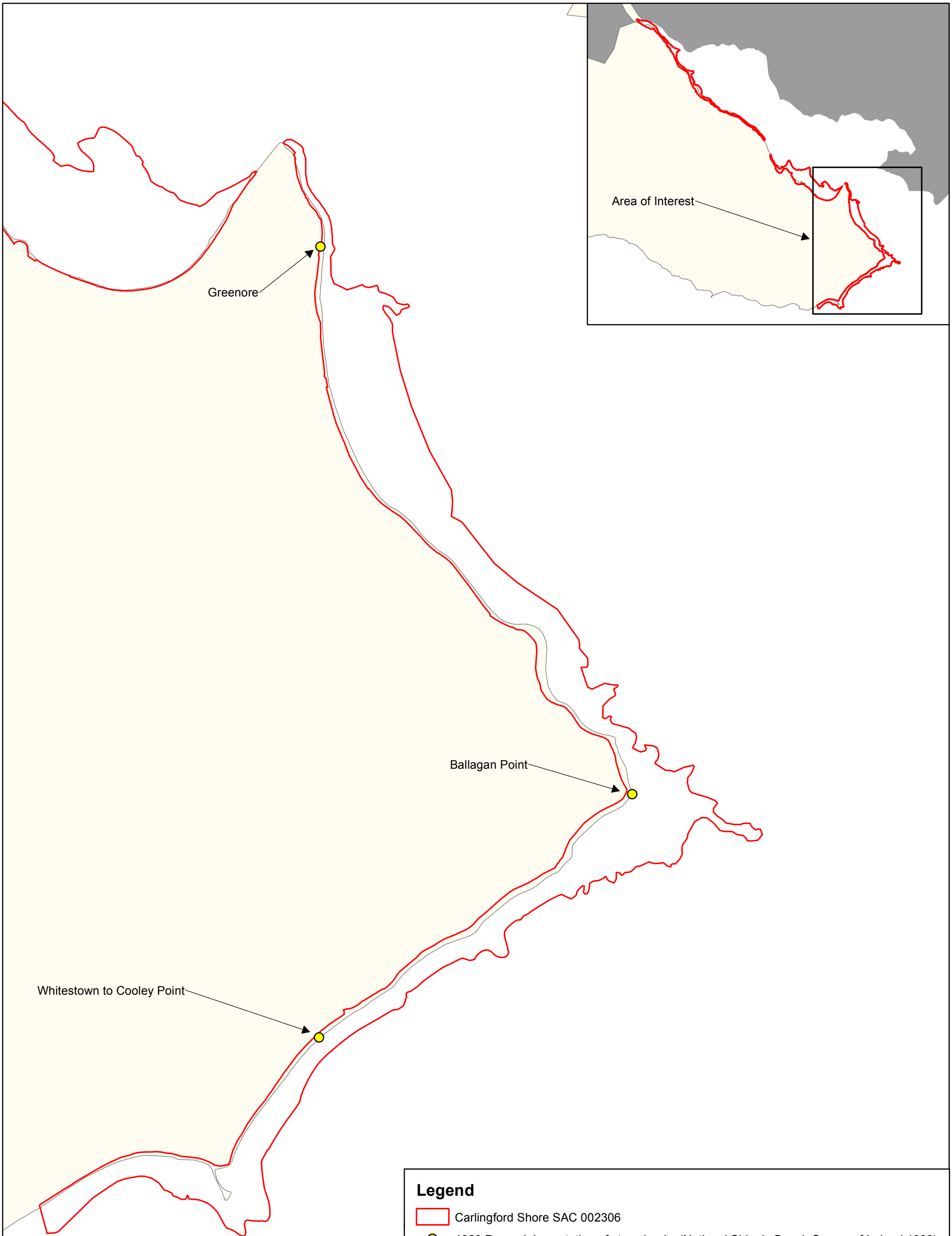
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002306; version 3
SPA 004078; version 2.01

0 1 2 km

N

Map Version 1
Date: June 2013



Legend

- Carlingford Shore SAC 002306
- 1220 Perennial vegetation of stony banks (National Shingle Beach Survey of Ireland 1999)
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 3:
CARLINGFORD SHORE SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

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

SITE CODE:
SAC 002306; version 3

0 0.5 1 km

N

Map Version 1
Date: June 2013

Conservation objectives for Stabannan-Braganstown SPA [004091]

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**
A043	Greylag Goose	*Anser anser*

Citation: *NPWS (2018) Conservation objectives for Stabannan-Braganstown SPA [004091]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Appendix B

Nutrient Sensitive Qualifying Interests

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

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

Appendix C

EAM Summary Report for 112 Ardee WSZ

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Ardee EAM

Issue 3 | 10 February 2022

Job number 257367

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Document Verification

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		Signature			
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		Name	Alison Orr	Orla Murphy	Gerry Baker
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		Description			
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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 Ardee Water Supply Zone (WSZ) with orthophosphate.

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

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

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

- Results of the Plumbosolvency reports by Ryan Hanley.
- Results of pre-processing GIS work to generate regional input files.
- Data relating to Waste Water Treatment Plants (WWTP) from Annual Environmental Reports (AER) and the Environmental Protection agency (EPA) web based WFD App which is accessed through their Eden Portal.
- Data relating to water body monitoring and characterisation from the EPA WFD App on the 24th January 2022.
- 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
- 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 Ardee WSZs

The Ardee WSZ (2100PUB1001) is located in County Louth. The WSZ is fed from Ardee WTP. The WTP supplies the Slieve Breagh Reservoir which in turn supplies the WSZ including the Blakestown Reservoir and Drumcashel Reservoir. The Draft Plumbosolvency Control Plan for the WSZ proposes that targeted dosing of Orthophosphate (OP) takes place at the outlet from Slieve Breagh Reservoir which supplies Ardee Town. Figure 1, at the end of this report, shows the location of the three areas proposed to receive Orthophosphate dosed water.

An average of 2,455 m^3/day of water is distributed to the zone, however the average flows from the Slieve Breagh Reservoir is 1,665 m^3/day, this flow is considered in the model. Approximately 51% of the flow is accounted for, and this fixed rate for water mains leakage is assumed across the WSZ. The WSZ boundaries cover the urban centres of Ardee and Tallanstown, which are served by WWTP agglomerations. The density of water mains is relatively low across the rural areas. There are an estimated 669 properties across the WSZs that are serviced by DWWTS.

Water Supply Zone	Ardee (2100PUB1001)
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	All concentration and loading units for orthophosphate (PO_4-P) are expressed as mg/l P and kg/yr P. Adopted Orthophosphate Optimum Dosing Concentration is 1.2 mg/l P. Unaccounted for water from the mains is 49%. Seepage from the mains is distributed evenly across the entire length of the WSZ network. The water consumption per person has been assigned as 125 litres per day in order to calculate the direct discharges to surface water with 2.7 people per household. The water discharge per person is assigned as 105 litres per day for the discharge to DWWTS with 2.7 persons per household. Conversion factor for Total Phosphorus to Orthophosphate for WWTP effluent is 0.5 It is assumed there will be no treatment of additional OP load for WWTPs with secondary, primary or no treatment. For plants with tertiary treatment, it is assumed all the additional load will be treated. Where a tertiary plant is in exceedance of its ELV for TP or OP then the ability of the plant to treat the additional load is confirmed with Irish Water. Where IW indicates a tertiary plant has not remaining treatment capacity it will be assumed the entire additional load is not treated.

	Where existing monitoring data is not available a surrogate status is derived from the Orthophosphate indicative quality of the waterbody in the following hierarchy: • Upstream waterbodies • Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • Ecological status of the waterbody. The mid-point of that surrogate indicative quality range is used as baseline concentration.
Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs	This section assesses the influent and effluent P loads and resultant OP dosages at WWTP within the WSZ before and after dosing. Inputs to and results of the Step 2 assessment for individual WWTP are given in Table 1. Where an agglomeration includes SWOs, discharges from this source are included. Emission Limit Value (ELVs) are assigned for WWTPs to protect the receiving River Waterbodies (RWB) from direct discharges during low flows. Where ELVs are in force these are shown in Table 1. WWTPs that are failing to comply with their ELVs are also indicated. The treatment level and PE of the WWTPs within the agglomerations are as follows; - Ardee – Secondary treatment PE 6,195 - Tallenstown – Tertiary Treatment PE 832 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 815m^3/d (357 kg/yr P). Approximately 325 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 190m^3/d (83.1 kg/yr P). Approximately 82.8 kg/yr P of the load is attenuated along the flowpaths. Flow monitoring gauge date is available for one RWB (Dee_080). Flow monitoring gauges are not available for the other eight waterbodies within the assessment area. Flows in these catchments are established using the EPA Hydrotool database or, if that is not available, using the Area-SAAR method. Baseline Orthophosphate monitoring data and associated thresholds are available for six RWBs but not available for three RWBs (Bawn_010, Killincoole_010 and Mapastown_010). Orthophosphate dosing does not lead to a deterioration in RWB status from subsurface and near surface pathways.
Step 5 and 6 - Combined Impact from direct and diffuse sources on 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 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 in most RWBs a significant proportion of the load come from leakage through the near surface and groundwater pathways to the RWB. Primary discharge from the WWTP contributes a significant load to Dee_070 and Dee_080. Figure 3 presents the total loading to the dosing area from the main sources and illustrates how much of the loading is attenuated in the subsurface, treated in WWTPs and ultimately how much is transported to the receiving RWBs. This illustrates that main leakage accounts for the largest proportion of the total load and the majority of this load is attenuated. Figure 3 also shows that almost all of the primary discharge is transported and only a small proportion is treated. The Orthophosphate concentrations in the RWBs following drinking water dosing are presented in Table 2. A small proportion of the dosing areas is within Whitecross_010 and Dee_050, however there are no DWWTS or water mains within either of these sub catchments, thus they do not receive any Orthophosphate dosed water. Orthophosphate dosing of drinking water does not lead to a deterioration in RWB status.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The increase in Orthophosphate concentrations in the GWBs as a result of the P dosing is shown in Table 3. Monitoring data is available for one GWB (Louth) but not available for the second GWB (Ardee). Orthophosphate dosing of drinking water does not lead to a deterioration in GWB status as a result of loading from the direct and diffuse sources of phosphate.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the WSZ	There are no lakes within or downstream of the dosing area.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Transitional and Coastal Waterbodies	The increase in Orthophosphate concentrations in the downstream Transitional Waterbodies and small Coastal (TraC) Waterbodies as a result of drinking water dosing is shown in Table 4. Baseline Orthophosphate monitoring data and associated thresholds are available for Inner Dundalk Bay and Outer Dundalk Bay in the summer but not for the Glyde Estuary, Fane Estuary or Outer Dundalk Bay in the winter. The drinking water dosing with Orthophosphate does not deteriorate the status of either transitional waterbodies for both the summer and winter seasons.

Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	<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. **Newry, Fane, Glyde and Dee Catchment** The following EAMs dosing areas are in the Newry, Fane, Glyde and Dee catchment and discharge to the same TraC WBs as the Ardee EAM, see Figure 4: 011 Cavanhill 031 & 055 Navan / Mid Meath 069 Lough Egish 116 Cooley Carlingford 172 Collon The increase in Orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all five EAMs with Orthophosphate is shown in Table 5. There is 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> There are no protected waterbodies downstream of the Ardee EAM which have not already been assessed in this EAM.
Conclusions	**Red, Amber, Green (RAG) STATUS: EAM Result - GREEN** The purpose of the RAG status is to indicate the waterbodies that are failing the EAM assessment on a map. Any waterbodies failing the EAM model will be marked as **Amber** in the interim while further analysis is being completed, where the further analysis confirms the water body is failing the water body will be coloured **Red**. If the EAM indicates there will not be a deterioration in the waterbody status as a result of drinking water dosing it will remain **Green**. A map of the RAG status of waterbodies is presented in Figure 5.
Recommendation	None.

Table 1: Increased loading/concentration in WWTPs due to dosing of drinking water – Dosing rate = 1.2 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		TP Load kg/yr	Ortho P Concentration mg/l P TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Ardee Primary Discharge	Secondary	Orthophosphate ELV (0.5mg/l) to commence from 31/12/2019	Dee_070	Pre-Dosing	2,112	1.75	1.40	2.37
				Post Dosing	2,381	1.97	1.57	2.68
Ardee SWOs (4 No.)				Pre-Dosing	132	0.53	0.43	0.73
				Post Dosing	140	0.57	0.45	0.77
Tallanstown Primary Discharge	Tertiary	Orthophosphate 2mg/l – Non-Compliant	Glyde_060	Pre-Dosing	61	0.70	0.56	0.95
				Post Dosing	61	0.70	0.56	0.95
Tallanstown SWOs (2 No.)				Pre-Dosing	18	1.00	0.80	1.36
				Post Dosing	18	1.02	0.82	1.39

Table 2: Orthophosphate concentrations in river water bodies 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)**
Bawn_010	IE_NB_06B280720	*Moderate*	0.0455	0.0508	1.8	0.0002	0.0457
Dee_060	IE_NB_06D010670	Moderate	0.0433	0.0508	15.0	0.0001	0.0434
Dee_070	IE_NB_06D010710	Moderate	0.0489	0.0508	156.8	0.0010	0.0500
Dee_080	IE_NB_06D011000	Poor	0.0814	0.0868	162.7	0.0008	0.0822
Glyde_050	IE_NB_06G020700	Moderate	0.0358	0.0508	1.2	0.00001	0.0358
Glyde_060	IE_NB_06G020900	Moderate	0.0351	0.0508	11.3	0.0001	0.0351
Glyde_070	IE_NB_06G021230	Moderate	0.0449	0.0508	18.2	0.0001	0.0450
Killincoole_010	IE_NB_06K210970	*Moderate*	0.0455	0.0508	1.4	0.0003	0.0458
Mapastown_010	IE_NB_06M170410	*Moderate*	0.0455	0.0508	4.1	0.0009	0.0464

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

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential Baseline conc. following dosing (mg/l P)**
Ardee	IE_NB_G_018	*Good*	0.0175	0.0263	6.4	0.0004	0.0179
Louth	IEGBNI_NB_G_019	Good	0.0062	0.0263	4.7	0.00005	0.0063

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

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Glyde Estuary	IE_NB_040_0500	Summer	*Moderate*	0.0500	0.0550	180.9	0.0005	0.0505
		Winter	*Moderate*	0.0500	0.0550	180.9	0.0005	0.0505
Fane Estuary	IE_NB_040_0400	Summer	*High*	0.0125	0.0188	1.4	0.00001	0.0125
		Winter	*Moderate*	0.0500	0.0550	1.4	0.00001	0.0500
Inner Dundalk Bay	IE_NB_040_0100	Summer	High	0.0110	0.0188	1.4	0.000001	0.0110
		Winter	Moderate	0.0450	0.0550	1.4	0.000001	0.0450
Outer Dundalk Bay	IE_NB_040_0000	Summer	High	0.0025	0.0188	182.3	0.0001	0.0026
		Winter	*High*	0.0125	0.0188	182.3	0.0001	0.0126

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

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Load, (kg/yr P) from current EAM**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Glyde Estuary	IE_NB_040_0500	Summer	*Moderate*	0.0500	0.0550	180.9	207.1	0.0005	0.0505
		Winter	*Moderate*	0.0500	0.0550	180.9	207.1	0.0005	0.0505
Fane Estuary	IE_NB_040_0400	Summer	*High*	0.0125	0.0188	1.4	123.0	0.0012	0.0137
		Winter	*Moderate*	0.0500	0.0550	1.4	123.0	0.0012	0.0512
Inner Dundalk Bay	IE_NB_040_0100	Summer	High	0.0110	0.0188	1.4	1161.2	0.0008	0.0118
		Winter	Moderate	0.0450	0.0550	1.4	1161.2	0.0008	0.0458
Outer Dundalk Bay	IE_NB_040_0000	Summer	High	0.0025	0.0188	182.3	1378.8	0.0007	0.0032
		Winter	*High*	0.0125	0.0188	182.3	1378.8	0.0007	0.0132

Figure 1: Ardee WS Dosing Areas

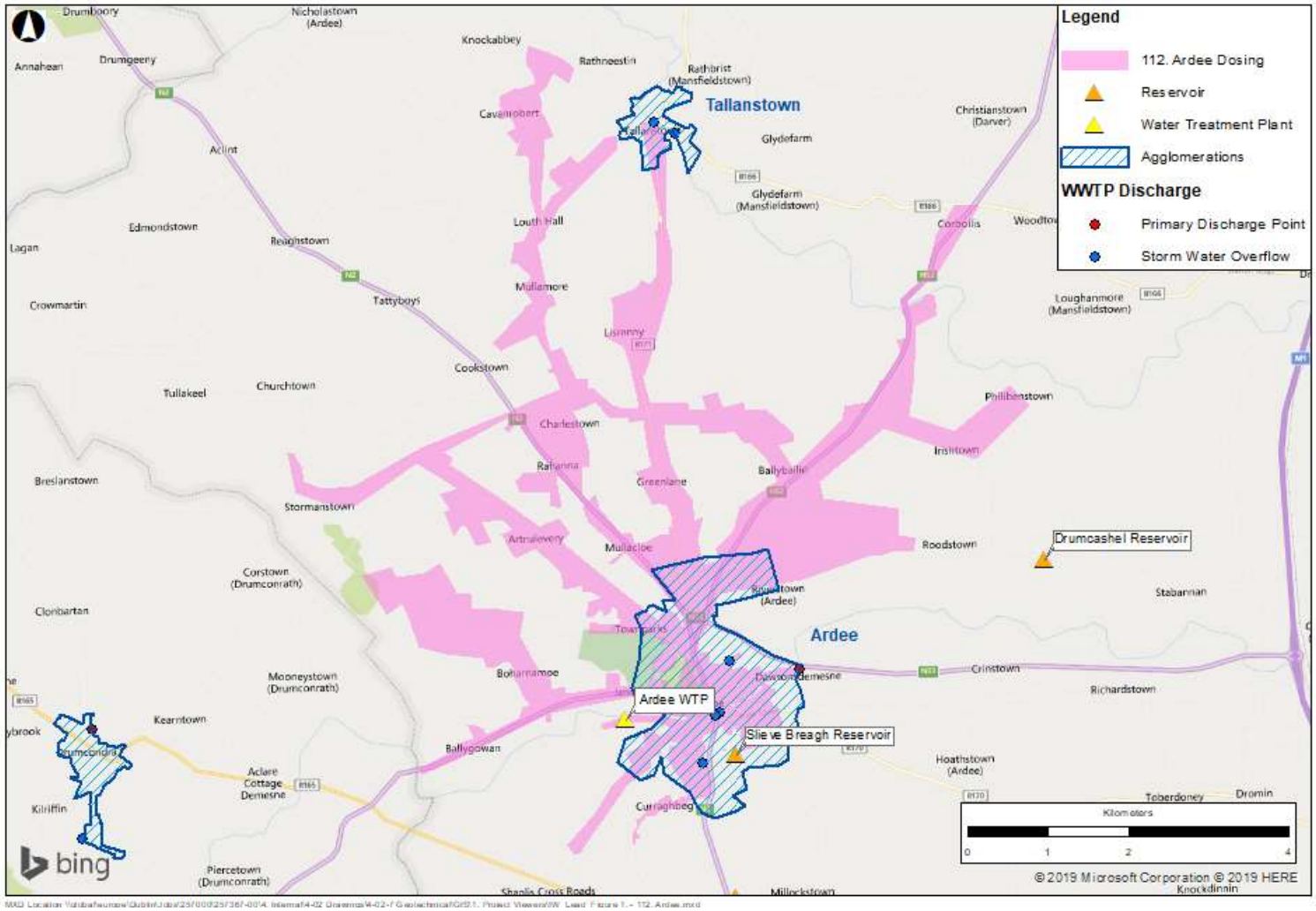

Figure 2: RWB Cumulative Loading Assessment

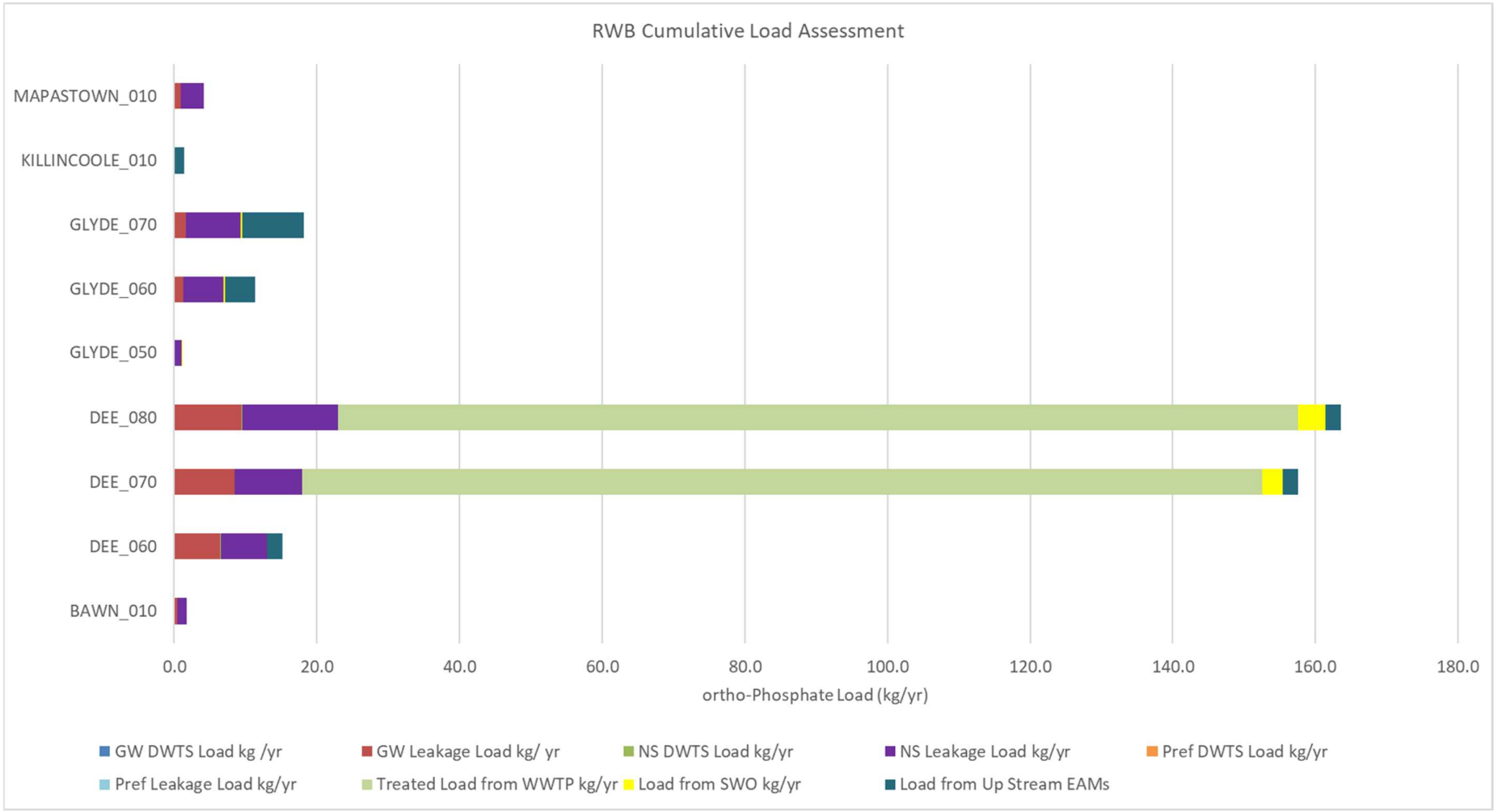

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

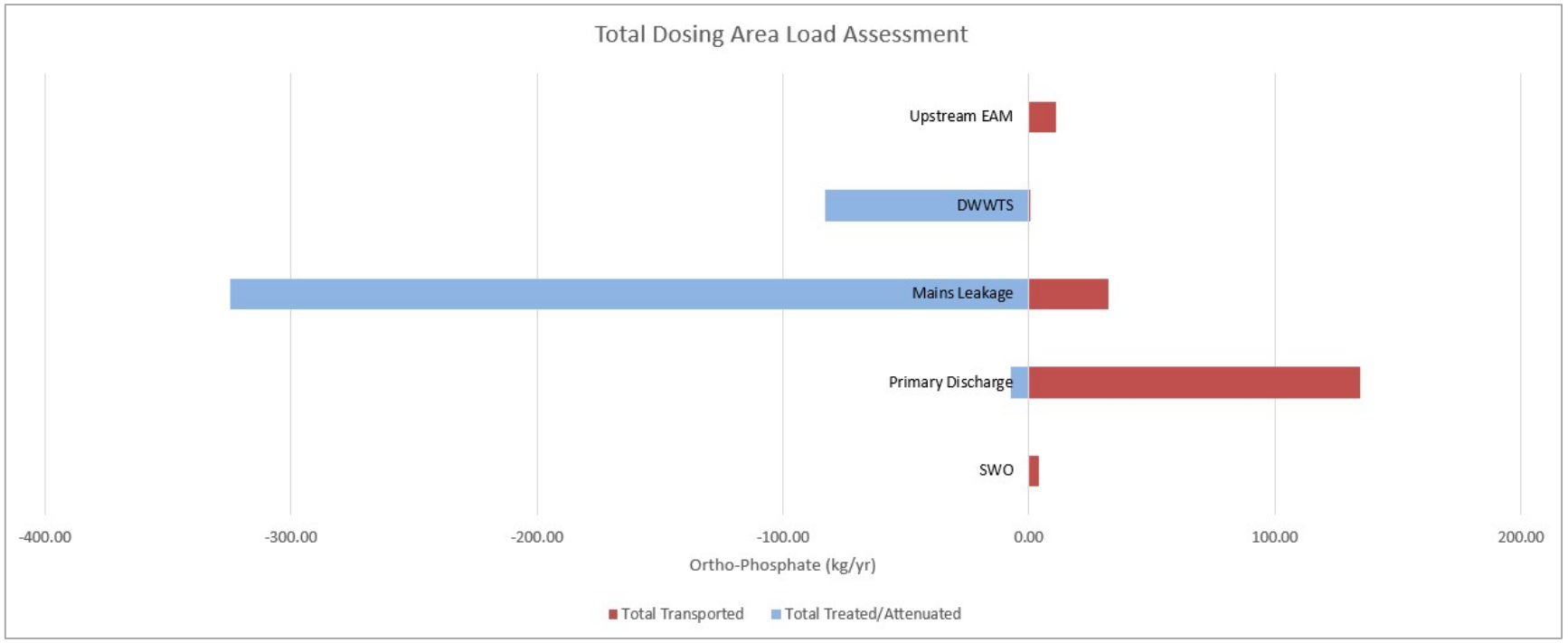

Figure 4: Upstream and downstream EAMs within WFD catchment

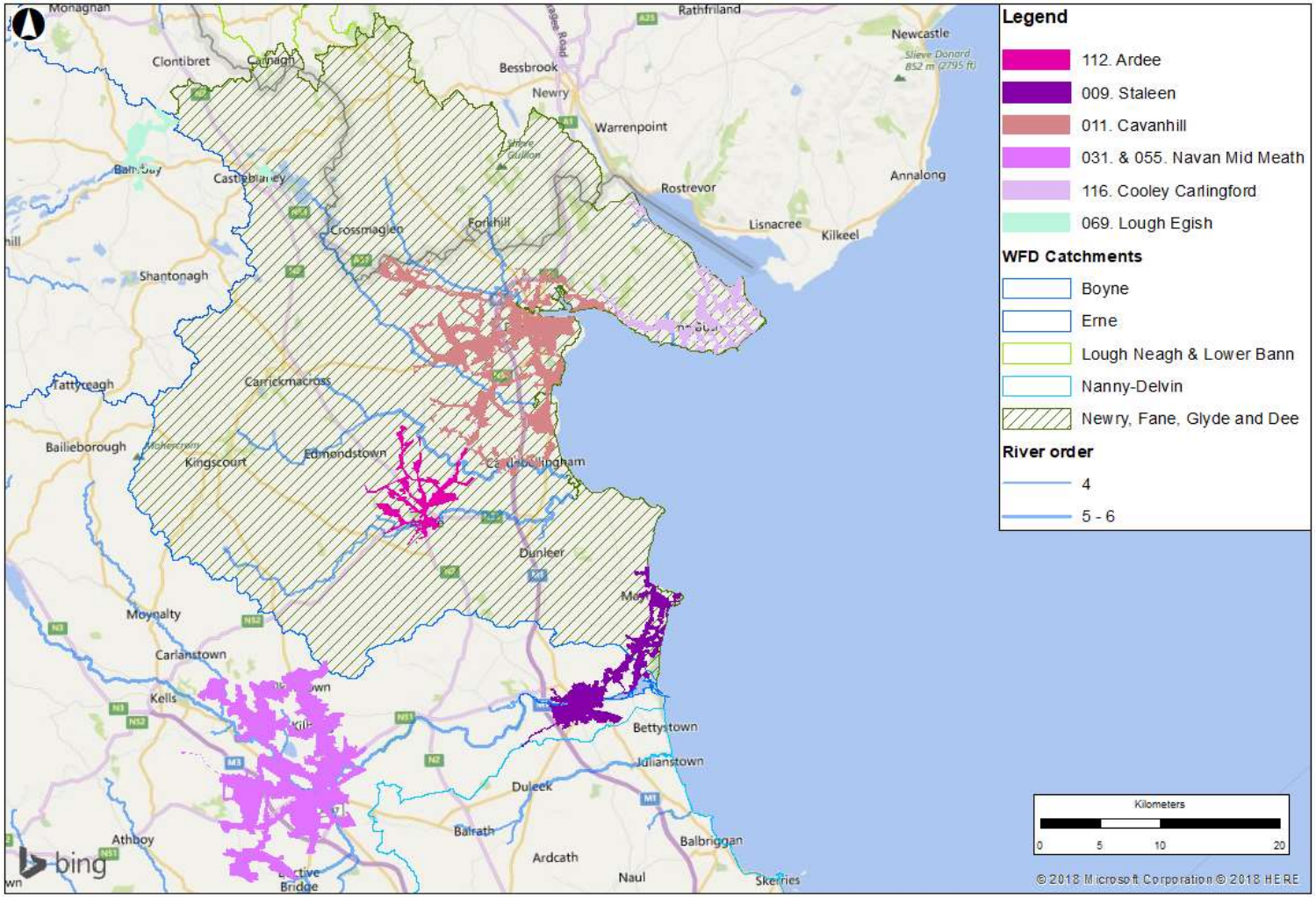

Figure 5: Red, Amber, Green (RAG) Status of waterbodies