Irish Water-Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

128 Longford Springs WTP - Zone 3 Castlerea WSS (2600PUB1028)

Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 128 Longford Springs WTP – Castlerea WSS WSZ (2600PUB1028)

Document Control Sheet

Client:	Irish Water
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 128 Longford Springs WTP - Castlerea WSS WSZ (2600PUB1028)
Document No:	MDW0766Rp_5.3_Screening_128_Longford Springs_F02

Text Pages:	81	Appendices:	3

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
D01	Draft	21st January 2019	SOH		LC		DC	
A01	For Client Approval	26th March 2019	SOH		LC		DC	
F01	Final	16th June 2019	LC		LC		GJG	
F02	Final	26th May 2023	CM	Caoimhe Murray	MM		MM	

TABLE OF CONTENTS

APPENDICES

Appendix A **European Sites - Conservation Objectives**

Appendix B **Nutrient Sensitive Qualifying Interests**

Appendix C **EAM Summary Report for Castlerea WSS**

LIST OF FIGURES

LIST OF TABLES

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 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.

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

RPS was commissioned by Irish Water (IW) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate dosing (herein referred to as the proposed project) of drinking water supplied by Longford Springs Water Treatment Plant (WTP), Castlerea, Co. Roscommon.

This report comprises information to support the Screening for AA 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 likely significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from orthophosphate 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 phosphorus.

1.1 PURPOSE OF THIS REPORT

The overall purpose of the 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 site's 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, S.I. No. 477 of 2011 (as amended). In the context of the proposed project, the governing legislation is the EC Birds and Habitats Regulations 2011 (as amended).

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

[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

plumbosolvency. The degree to which lead dissolves varies with the length of lead pipe, local water chemistry, temperature and the amount of water used at the property.

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

IW initially assessed 400 water treatment plants for the introduction of corrective water treatment. Following this process 138 priority plants have been identified and corrective water treatment will be rolled out during the Lead in Drinking Water Mitigation 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 is added in the form of Phosphoric acid, which is 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 phosphorus every day as part of the normal diet. The quantity of orthophosphate that IW will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Longford Springs WTP orthophosphate will be added at a rate of 1.2 mg/ l, with seasonal variation in the proposed dose, as set out within the Preliminary Design Report for the proposed dosing.

The typical concentration of phosphorus ingested from drinking 3 litres of water per day that has been treated with food grade phosphoric acid at 1.5 mg/l phosphorus, would be 4.5 milligrams.

The orthophosphate is dosed into the water at a rate which is dependent on raw water chemistry in a similar process to the addition of chlorine for disinfection. Orthophosphate dosing takes a period of 6-12 months to develop a full coating, after which dosing must be maintained in order to sustain the protective coating.

1.3 PROJECT BACKGROUND

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

The first step of the EAM is to identify the European Sites that have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed orthophosphate dosing. The EAM recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) and connectivity to the WSZ indicates that pathways for effects exist. The project effects on these European Sites, and an evaluation as to whether these are potentially significant, are the subject of the Screening for AA. The Screening report applies objective scientific information from the EAM as outlined in this document in the context of the Site Specific Conservation Objectives (SSCO) as published on the NPWS website.

The EAM process identified 58 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Cloonchambers Bog SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Kilsallagh Bog SAC, Carrowbehy/Chaer Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Annaghmore Lough (Roscommon) SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Lurgeen Bog/Glenamaddy Turlough SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Callow Bog SAC, Camderry Bog SAC, Curraghlehanagh Bog SAC, Shankill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, Aughrim (Aghrane) Bog SAC, River Shannon Callows SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Lough Croan Turlough SAC, Killeglan Grassland SAC, Castlesampson Esker SAC, Lough Forbes Complex SAC, Lough Ree SAC, Pilgrim's Road Esker SAC (flood risk), Mongan Bog SAC (flood risk), Lough Derg, North-east Shore SAC, Lower River Shannon SAC, Magharee Islands SAC, Akeragh, Banna and Barrow Harbour SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Kerry Head Shoal SAC and Mount Brandon SAC.

- SPA sites: Bellanagare Bog SPA, Lough Gara SPA, River Suck Callows SPA, Middle Shannon Callows SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Ballykenny-Fishertown Bog SPA, Lough Ree SPA, Mongan Bog SPA (flood risk), Lough Derg (Shannon) SPA, River Shannon

and River Fergus Estuaries SPA, Kerry Head SPA, Loop Head SPA, Magharee Islands SPA, Tralee Bay Complex SPA and Dingle Peninsula SPA.

Each of these European Sites includes habitats and/or species identified as nutrient sensitive. Following the precautionary principle the potential for likely significant effects arising from the proposed project requires assessment, due to connectivity to each of the identified European Sites, in light of their nutrient sensitive Qualifying Interests.

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 an EU-wide network of sites known as Natura 2000. 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 obligation to undertake appropriate assessment derives from Articles 6(3) and 6(4) of the Habitats Directive and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3), which is concerned with the strict protection of sites, 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".

The results of each step must be documented and recorded so there is full traceability and transparency of the decisions made.

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 has 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 likely 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 should be noted that this is not an exhaustive list and does not reflect liaison and/ or discussion with technical and specialist parties from IW, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (Cummins et al., 2019); 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 report 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 if the integrity of designated sites is to be maintained/restored.

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water related environmental supporting conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[3]) the characterisation assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES), or High Ecological Status (HES) where required. GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS. A number of lake habitats (e.g. oligotrophic lakes) and species (e.g. the freshwater pearl mussel) will require a more stringent environmental objective i.e. high status. Where this applies, this has been taken into account in the EAM and evaluated within the context of this Screening report.

2.5.1 Identification of European Sites

Current guidance (DEHLG, 2010) on the ZoI to be considered during the Screening for AA 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".

As stated above, a buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan or project, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential impacts. With regard to the current project, the 15km distance is considered inadequate to screen all likely significant effects that might impact upon European Sites. This is primarily due to the need to consider the potential for likely significant effects on European Sites with regard to aquatic and water dependent receptors. Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies (**Figure 4-2**).

[3] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021). Available at: https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021-0

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 have been prepared for a number of individual Sites to take account of the specific QIs/ SCIs of that Site. Both the generic and site specific COs 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 site specific COs 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. Web links for COs for the European Sites relevant for this Screening report, are included in **Appendix A**.

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; *The Status of EU Protected Habitats and Species in Ireland* (NPWS 2013a, 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 habitats and species were identified as having the greatest sensitivity to the proposed dosing activities, and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening European Sites.

There are 60 habitats, 25 species and 68 bird species which are water dependent and / or where nutrients are a key pressure or threat and where compliance with the Environmental Quality Standards for nutrient levels (including orthophosphate) will contribute to achieving or maintaining favourable conservation status. These are listed in **Appendix B**.

3 DESCRIPTION OF THE PROJECT

3.1 OVERVIEW OF THE PROPOSAL

Longford Springs WTP supplies the town of Castlerea, County Roscommon, which is located in the west of the county, on the banks of River Suck and River Francis. The distribution input for Castlerea WSS is 1870m^3 (54% of which is accounted for) serving a population of approximately 3,900. The non-domestic demand is 30% of the distribution input. The area is served by Castlerea (A0118) WWTP, licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended, and the impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There is also one WWTP with a population equivalent of less than 500, namely Ballintober (A0290) WWTP. The impact of the orthophosphate dosing and the estimated additional load from this plant is considered at the water body level via the surface water pathways. There are an estimated 1093 properties across the WSZ that are serviced by a DWWTS (see **Appendix C**).

Longford Springs WTP lies within the upper catchment of the River Suck, and lies adjacent to the Suck and in close proximity to the village of Castlerea. The EAM process identified 58 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Cloonchambers Bog SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Kilsallagh Bog SAC, Carrowbehy/Chaer Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Annaghmore Lough (Roscommon) SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Lurgeen Bog/Glenamaddy Turlough SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Callow Bog SAC, Camderry Bog SAC, Curraghlehanagh Bog SAC, Shankill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, Aughrim (Aghrane) Bog SAC, River Shannon Callows SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Lough Croan Turlough SAC, Killeglan Grassland SAC, Castlesampson Esker SAC, Lough Forbes Complex SAC, Lough Ree SAC, Pilgrim's Road Esker SAC (flood risk), Mongan Bog SAC (flood risk), Lough Derg, North-east Shore SAC, Lower River Shannon SAC, Magharee Islands SAC, Akeragh, Banna and Barrow Harbour SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC, Kerry Head Shoal SAC and Mount Brandon SAC.

- SPA sites: Bellanagare Bog SPA, Lough Gara SPA, River Suck Callows SPA, Middle Shannon Callows SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Ballykenny-Fishertown Bog SPA, Lough Ree SPA, Mongan Bog SPA (flood risk), Lough Derg (Shannon) SPA, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA, Loop Head SPA, Magharee Islands SPA, Tralee Bay Complex SPA and Dingle Peninsula SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER WTP

The corrective water WTP will involve the provision of orthophosphate dosing, pH control works and associated safety equipment.

The treatment of water within the Castlerea regional WSS is split between the Longford Springs WTP and Mullaghadoey Reservoir sites. The Longford Springs WTP site itself is operated by Veolia currently where the water undergoes CFC and UV treatment however chlorination occurs at the Mullaghdoey reservoir. IW specifications dictate that orthophosphate should be introduced after the chlorination time (Ct) has been achieved therefore it was deemed that the Mullaghadoey Reservoir site would be the most suitable location for the corrective water treatment. As such the proposed orthophosphate dosing system will not be located within Longford Springs WTP and will instead be located within the confines of the Mullaghdoey reservoir WTP. The proposed dosing point is within the present dosing and metering house, following dosing of fluoride and chlorine, prior to distribution to the water network. The surrounding landscape is dominated by agricultural grassland and residential properties. The grounds of the Mullaghdoey Reservoir site consist of built infrastructure and amenity grassland. The location of the works is shown on **Figure 3-1.**

The implementation of orthophosphate dosing at the Mullaghdoey Reservoir will require the following elements:

- Bulk Storage Tanks for phosphoric acid;
- Dosing pumps;
- Dosing pipework and carrier water pipework; and
- Associated electrical installations.

CO. ROSCOMMON

Longford Springs WTP

N

Proposed Dosing Points
(NaOH dosing into reservoir inlet)
(ortho-P dosing into Castlerea distribution)

Valve Building (Fluoride and Chlorine Dosing Point)

250mm Castlerea Discharge

Proposed Dosing Pipwork

SITE BOUNDARY

2,500 cubic meter dual cell treated water storage reservoir

Proposed Location of Sodium Hydroxide Bulk Storage Tanks

Proposed Location of Orthophosphate Dosing Facility

100mm Mewlaghadooey Discharge

Fluoride and Chlorine Bunded Bulk Storage Tanks

250mm Reservoir Inlet Pipe

Existing Emergency Shower

5m SCALE 1:250

R:\MDW0766_Lead Mitigation Plan\8.0 Drawings\SK\MDW0766SK0000 Series.dwg

Client

UISCE EIREANN : IRISH WATER

No.	Date	Drn	Chk	Amendment / Issue	App
F01	APR 19	BL	BR	ISSUED FOR INFORMATION	GJG
D01	APR 19	BL	BR	DRAFT	GJG

RPS
West Pier Business Campus
Dun Laoghaire
Co Dublin
T +353 1 4882900
F +353 1 2835676
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Drawn	BL
Checked	BR
Approved	GJG
Date	01/04/2019
Scale	1:250 @ A1 1:500 @ A3
Job No.	MDW0766
File Ref.	MDW0766SK0000 Series.dwg
Drg. No.	SK0128 WTP
Rev.	F01

Project **LEAD MITIGATION PLAN**

Figure 3.1 LONGFORD SPRINGS WATER TREATMENT PLANT - MEWLAGHADOOEY SITE LAYOUT

The bulk storage tanks (2 no. tanks, each with a working volume of 250 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-2**).

Each storage tank will be self-bunded to accommodate greater than 110% of the tank working volume. The tanks shall conform to IW design guidelines and will include the following environmental safety design features; level detection sensors, visual level indicators and alarms and a bund leak detection system. All materials and associated equipment, fixtures and fittings shall be compatible with 75% phosphoric acid.

There is no existing pH correction system at the Mullaghdoey Reservoir WTP. A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to ensure a stable pH of the final water. As such a pH correction system will be installed at the Mullaghdoey Reservoir WTP.

Dosing pipelines, carrier water pipework and electrical cables shall be installed within 100mm diameter ducts, placed in trenches constructed within existing made ground at the Mullaghdoey Reservoir WTP. The ducts will be installed at approximately 700mm below ground level and following installation the trench will be backfilled and the surface reinstated to match the existing surface. Where pipework and cables are routed through existing structures, they shall be surface mounted within trunking. All spillages / leaks from storage tanks, valve connections and dosing pumps shall be contained within bunded areas.

A suitable kiosk will be installed on an above ground concrete plinth to house all electrical and control equipment required for the orthophosphate system. This control system will be incorporated into the existing supervisory control and data acquisition (SCADA) system on site. The proposed automation solution will be managed using a new programmable logic computer (PLC) / human machine interface (HMI) controller.

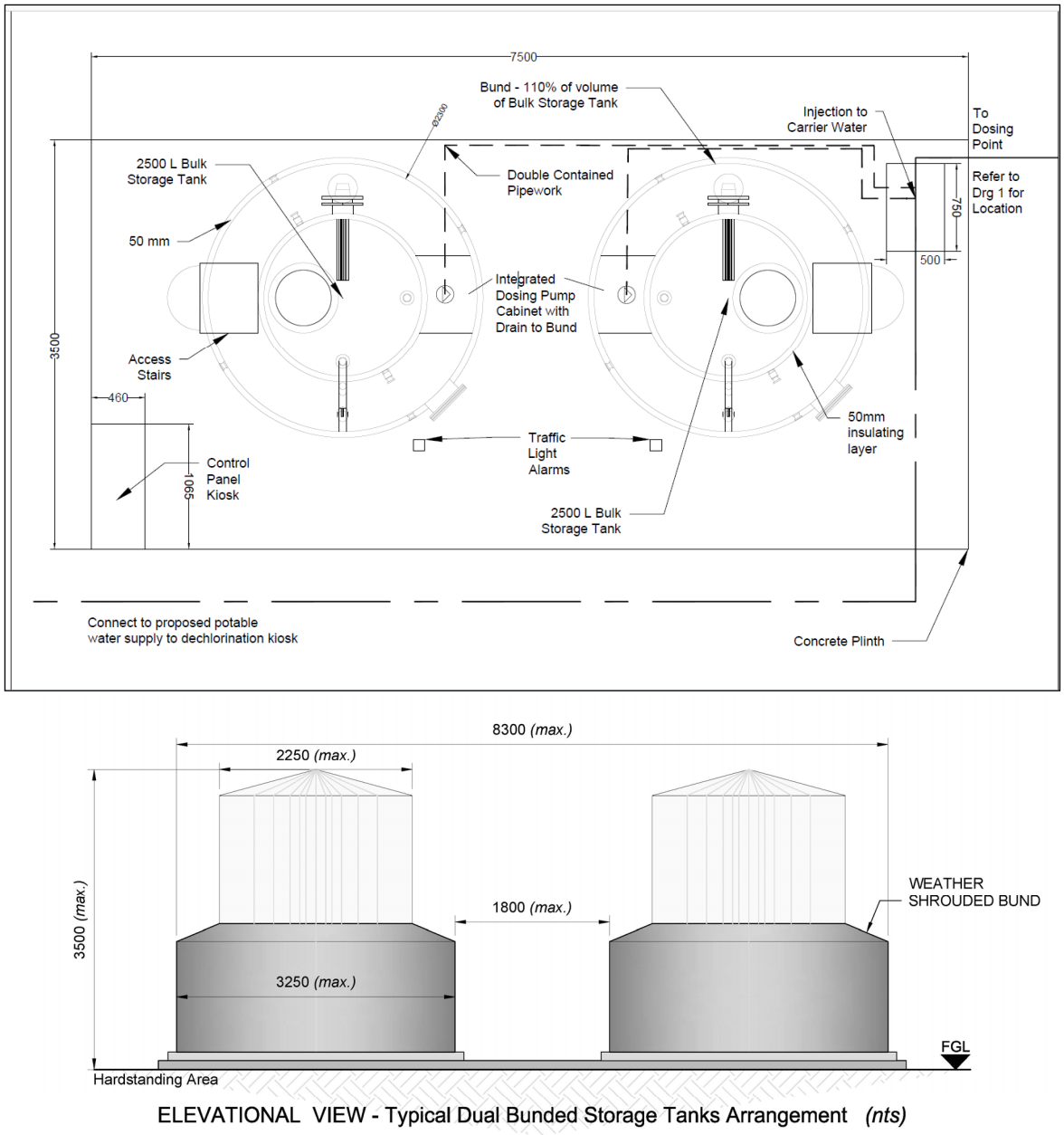


Figure 3-2: Plan and Elevation Drawings of a Typical Orthophosphate Dosing Unit

3.3 CONSTRUCTION METHODOLOGY

The proposed works will be carried out by suitably qualified contractors. The proposed dosing unit will be located within the bounds of the existing Mullaghdoey Reservoir WTP on an area of made ground.

3.4 OPERATION OF CORRECTIVE WATER WTP

The operational stage for the corrective water WTP will be a part of the day to day activities of the WTP and will be operated in accordance with the SOPs.

The orthophosphate dosing system will be controlled by the site SCADA system, whereby, orthophosphoric acid will be dosed proportional to the flow of the water being distributed to the network. At Mullaghdoey Reservoir WTP, orthophosphate will be added to treated water at a rate of 1.2 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

In line with the relevant guidance, the Screening report for AA comprises of two steps:

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

At the early stages of consideration, IW identified the requirement to evaluate environmental impact and 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 EAM conceptual model, 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 water bodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from 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 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 3.5.2** below.

3.5.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 3-3**), 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 the water treatment plant 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 DWWTSs.
- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity, is of key consideration in the EAM. A water body 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 a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 3-4** 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 results is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters and the risk to WFD objectives from any increase in P load from orthophosphate dosing.

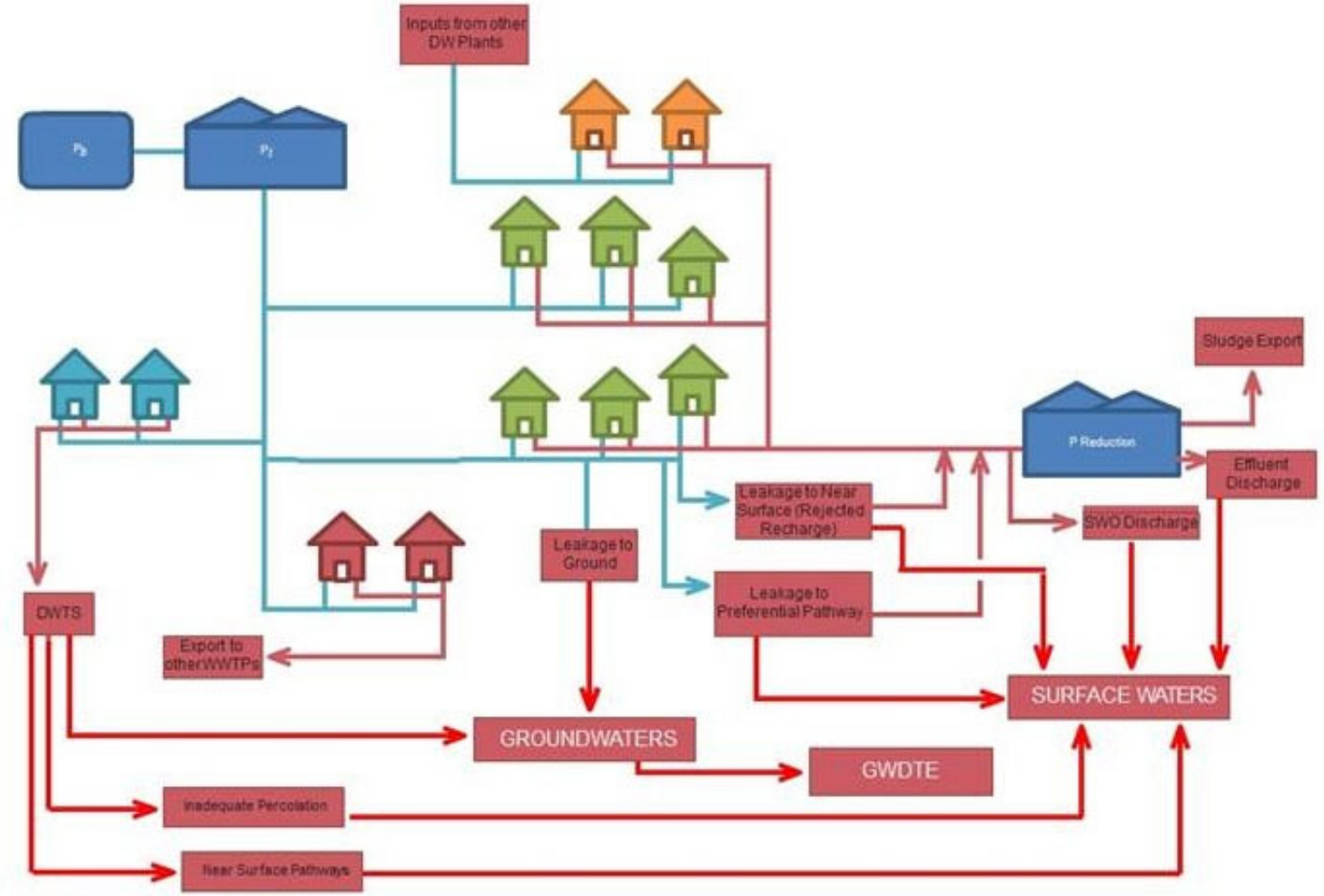


Figure 3-3: Conceptual Model of P Transfer

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

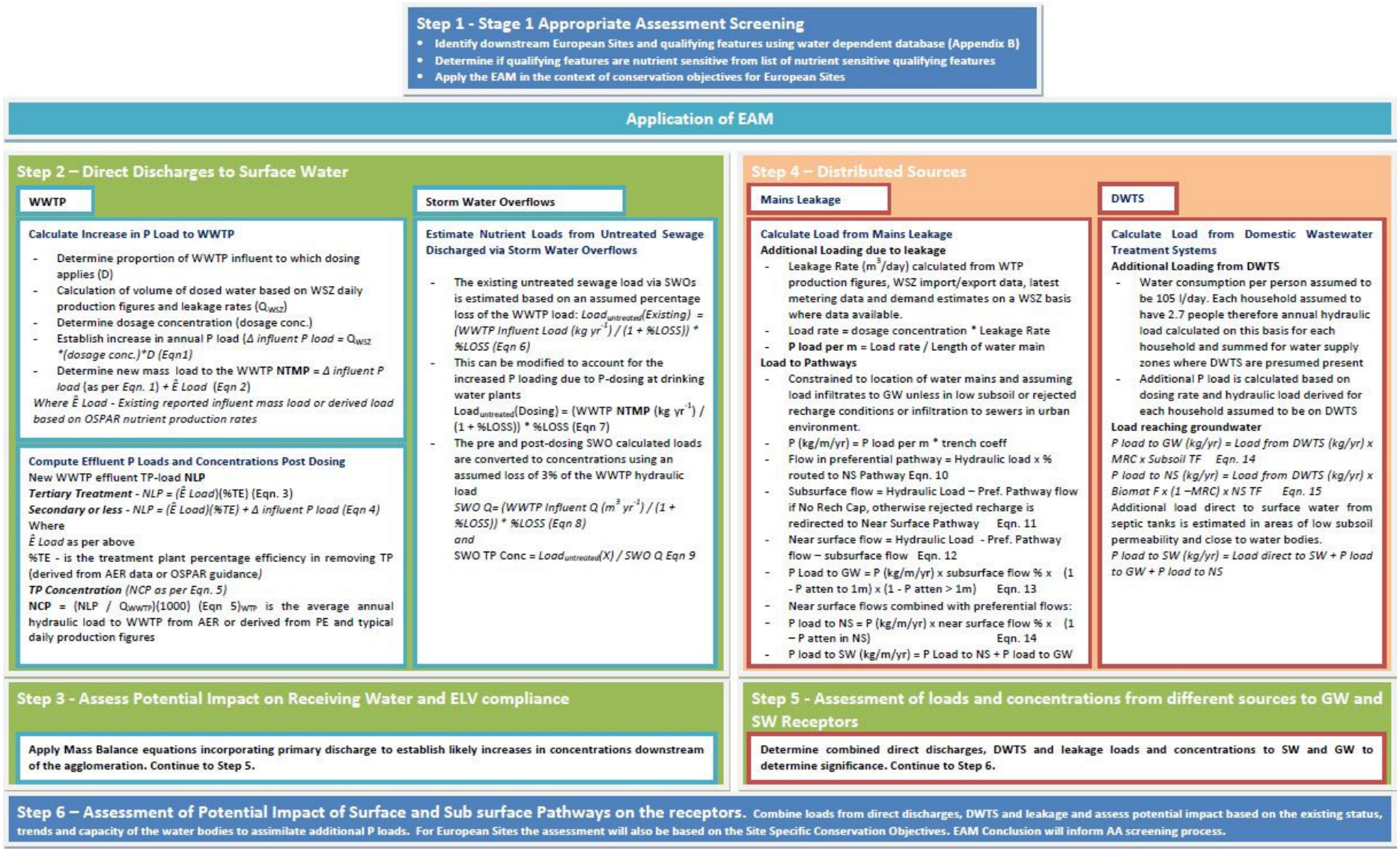


Figure 3-4 Stepwise Approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing Mullaghdoey Reservoir WTP. The site is not located within or directly adjacent to the boundary of any European Site. Given the small-scale nature of construction works, the ZoI was considered to include the footprint of the existing Mullaghdoey Reservoir WTP followed by a review of hydrological and hydrogeological connectivity between the proposed development site and European Sites. The ZoI for the construction phase of the project are listed in **Table 4-1** and displayed in **Figure 4-1.**

Table 4-1: European Sites within the ZoI of the Proposed Project – Construction Phase

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Corliskea/Trien/Cloonfelliv Bog SAC	SAC 002110	No	Yes	No	Yes (Suck South)	Yes
2	Mullygollan Turlough SAC	SAC 000612	No	Yes	No	Yes (Carrick on Shannon)	Yes
3	Kilsallagh Bog SAC	SAC 000285	No	Yes	No	Yes (Suck South)	Yes
4	Croaghill Turlough SAC	SAC 000255	No	Yes	No	Yes (Suck South)	Yes
5	Coolcam Turlough SAC	SAC 000218	No	Yes	No	Yes (Suck South)	Yes
6	Williamstown Turloughs SAC	SAC 002296	No	Yes	No	Yes (Suck South)	Yes
7	Lisnageeragh Bog and Ballinastack Turlough SAC	SAC 000296	No	Yes	No	Yes (Suck South)	Yes
8	Lough Lurgeen Bog/Glenamaddy Turlough SAC	SAC 000301	No	Yes	No	Yes (Suck South)	Yes
9	Camderry Bog SAC	SAC 002347	No	Yes	No	Yes (Suck South)	Yes
1	Curraghlehanagh Bog SAC	SAC 002350	No	Yes	No	Yes (Suck South)	Yes
1	Shankhill West Bog SAC	SAC 000326	No	Yes	No	Yes (Suck South)	Yes
1	Derrinlough (Cloonkeenleananode) Bog SAC	SAC 002197	Yes	Yes	No	Yes (Suck South)	Yes
1	Carrownagappul Bog SAC	SAC 001242	No	Yes	No	Yes (Suck South)	Yes
1	River Suck Callows SPA	SPA 004097	No	Yes	No	Yes (Suck South)	Yes
1	Aughrim (Aghrane) Bog SAC	SAC 002200	No	Yes	No	Yes (Suck South)	Yes
1	Ballinturly Turlough SAC	SAC 000588	No	Yes	No	Yes (Suck South)	Yes
1	Lisduff Turlough SAC	SAC 000609	No	Yes	No	Yes (Suck South)	Yes

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Four Roads Turlough SAC	SAC 001367	No	Yes	No	Yes (Suck South)	Yes
1	Four Roads Turlough SPA	SPA 004140	No	Yes	No	Yes (Suck South)	Yes
2	Lough Croan Turlough SAC	SAC 000610	No	Yes	No	Yes (Suck South)	Yes
2	Lough Croan Turlough SPA	SPA 004139	No	Yes	No	Yes (Suck South)	Yes
2	Killeglan Grassland SAC	SAC 002214	No	Yes	No	Yes (Suck South)	Yes
2	Castlesampson Esker SAC	SAC 001625	No	Yes	No	Yes (Suck South)	Yes

4.1.2 Operational Phase

The ZoI for the operational phase of the proposed Project was determined by establishing the potential for hydrological and hydrogeological connectivity between the Mullaghdoey Reservoir, Longford Springs WTP and associated WSZ and European Sites. The ZoI was therefore defined by the surface and groundwater bodies that are hydrologically and hydrogeologically connected with the project.

In the EAM, all water bodies linked to the WSZ have been identified. Downstream water bodies to the estuary and coastal water bodies have also been identified. Groundwater bodies touching or intersecting the WSZ are also included in the ZoI. Hydrogeological linkages in karst areas have also been taken into account. European Sites within the ZoI are listed in **Table 4-2** and are displayed in **Figure 4-1**.

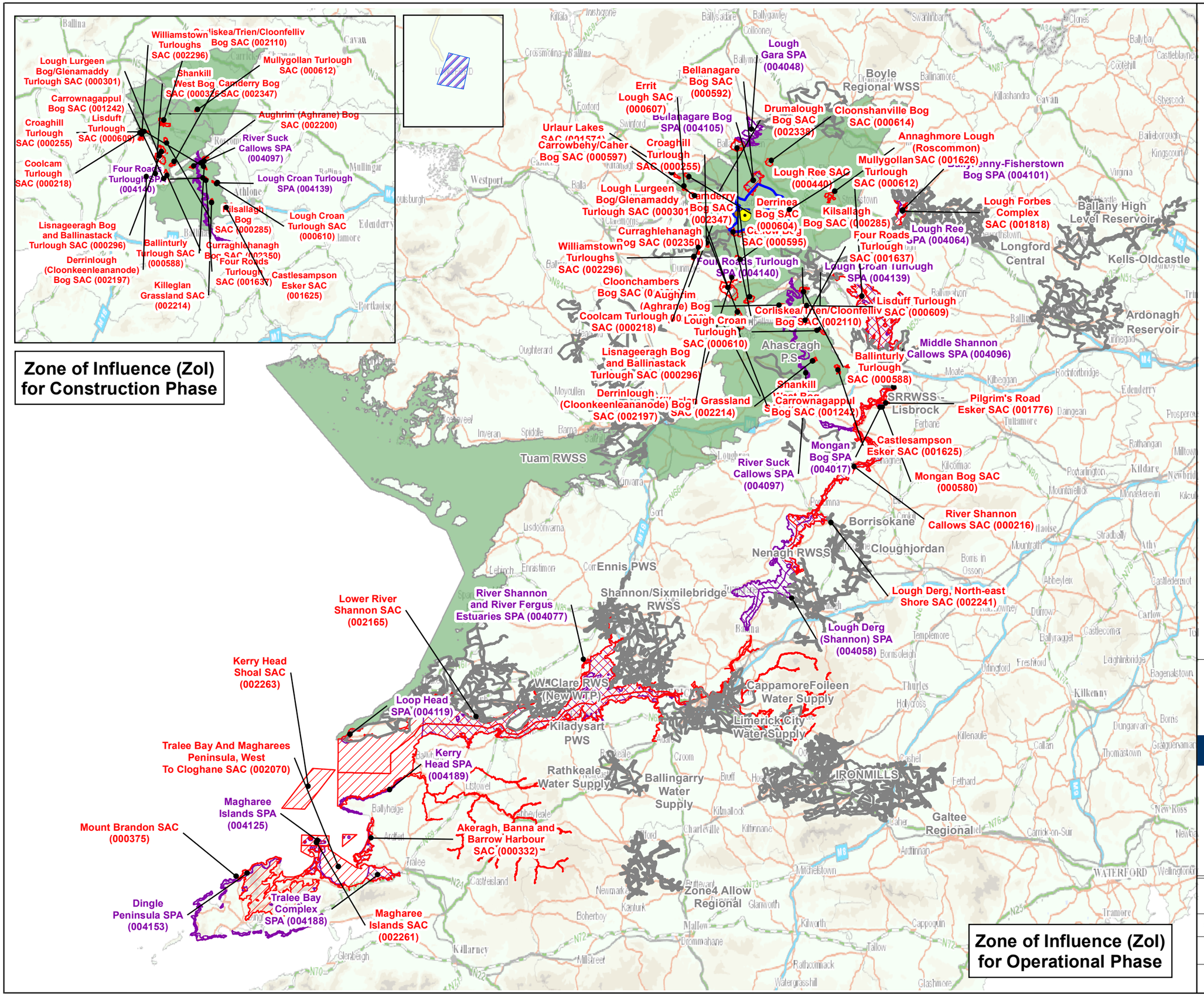
Table 4-2: European Sites within the ZoI of the Proposed Project – Operational Phase

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Corliskea/Trien/Cloonfelliv Bog SAC	SAC 002110	Yes	Yes	No	Yes (Castlerea, Suck South)	Yes
2	Mullygollan Turlough SAC	SAC 000612	Yes	Yes	No	Yes (Carrick on Shannon)	Yes
3	Bellanagare Bog SAC	SAC 000529	Yes	Yes	Yes –RWB (Termon Stream)	Yes (GWDTE – Bellanagare Bog)	Yes
4	Bellanagare Bog SPA	SPA 004105	Yes	Yes	Yes –RWB (Termon Stream)	Yes (GWDTE – Bellanagare Bog)	Yes
5	Cloonchambers Bog SAC	SAC 000600	Yes	Yes	No	Yes (Suck North)	Yes
6	Drumalough Bog SAC	SAC 002338	Yes	Yes	No	Yes (Suck North, Carrick on Shannon)	Yes
7	Cloonshanville Bog SAC	SAC 000614	Yes	Yes	Yes – RWB (Breedoge)	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
8	Kilsallagh Bog SAC	SAC 000285	Yes	Yes	No	Yes (Suck South)	Yes
9	Carrowbehy/Chaer Bog SAC	SAC 000597	Yes	Yes	No	Yes (Suck North)	Yes
10	Croaghill Turlough SAC	SAC 000255	Yes	Yes	No	Yes (Suck South)	Yes
11	Coolcam Turlough SAC	SAC 000218	Yes	Yes	No	Yes (Suck South)	Yes
12	Annaghmore Lough (Roscommon) SAC	SAC 001626	Yes	Yes	No	Yes (Carrick on Shannon)	Yes
13	Williamstown Turloughs SAC	SAC 002296	Yes	Yes	No	Yes (Suck South)	Yes
14	Lough Gara SPA	SPA 004048	Yes	Yes	Yes- RWB (Breedoge)	Yes (Carrick on Shannon)	Yes
15	Lisnageeragh Bog and Ballinastack Turlough SAC	SAC 000296	Yes	Yes	No	Yes (Suck South)	Yes
16	Lough Lurgeen Bog/Glenamaddy Turlough SAC	SAC 000301	Yes	Yes	No	Yes (Suck South)	Yes
17	Urlaur Lakes SAC	SAC 001571	No	Yes	No	Yes (Carrick on Shannon)	Yes
18	Derrinea Bog SAC	SAC 000604	No	Yes	No	Yes (Carrick on Shannon)	Yes
19	Errit Lough SAC	SAC 000607	No	Yes	No	Yes (Carrick on Shannon)	Yes
20	Callow Bog SAC	SAC 000595	No	Yes	No	Yes (Carrick on Shannon)	Yes
21	Camderry Bog SAC	SAC 002347	Yes	Yes	No	Yes (Suck South)	Yes
22	Curraghlehanagh Bog SAC	SAC 002350	Yes	Yes	No	Yes (Suck South)	Yes
23	Shankhill West Bog SAC	SAC 000326	Yes	Yes	No	Yes (Suck South)	Yes
24	Derrinlough (Cloonkeenleanan ode) Bog SAC	SAC 002197	Yes	Yes	No	Yes (Suck South)	Yes
25	Carrownagappul Bog SAC	SAC 001242	Yes	Yes	No	Yes (Suck South)	Yes
26	River Suck Callows SPA	SPA 004097	Yes	Yes	Yes-RWB (Suck,Samaghraan)	Yes (Suck South)	Yes
27	Aughrim (Aghrane) Bog SAC	SAC 002200	Yes	Yes	No	Yes (Suck South)	Yes
28	River Shannon Callows SAC	SAC 000216	Yes	Yes	Yes-RWB (Suck, Samaghraan,Owennaforeesha)	No	Yes
29	Middle Shannon Callows SPA	SPA0 04096	Yes	Yes	Yes- RWB (Suck, Samaghraan,Owennaforeesha)	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
30	Ballinturly Turlough SAC	SAC 000588	Yes	Yes	No	Yes (Suck South)	Yes
31	Lisduff Turlough SAC	SAC 000609	Yes	Yes	No	Yes (Suck South)	Yes
32	Four Roads Turlough SAC	SAC 001367	Yes	Yes	No	Yes (Suck South)	Yes
33	Four Roads Turlough SPA	SPA 004140	Yes	Yes	No	Yes (Suck South)	Yes
34	Lough Croan Turlough SAC	SAC 000610	Yes	Yes	No	Yes (Suck South)	Yes
35	Lough Croan Turlough SPA	SPA 004139	Yes	Yes	No	Yes (Suck South)	Yes
36	Killeglan Grassland SAC	SAC 002214	Yes	Yes	No	Yes (Suck South)	Yes
37	Castlesampson Esker SAC	SAC 001625	Yes	Yes	No	Yes (Suck South)	Yes
38	Ballykenny-Fishertown Bog SPA	SPA 004101	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
39	Lough Forbes Complex SAC	SAC 001818	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
40	Lough Ree SAC	SAC 000440	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
41	Lough Ree SPA	SPA 004064	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
42	Pilgrims Road Esker SAC	SAC 001776	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
43	Mongan Bog SAC	SAC 000580	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
44	Mongan Bog SPA	SPA 004017	Yes	Yes	Yes – RWB (Scramoge)	No	Yes
45	Lough Derg, North-east Shore SAC	SAC 002241	Yes	Yes	Yes- RWB (,Owennaforeesha	No	Yes
46	Lough Derg (Shannon) SPA	SPA 004058	Yes	Yes	Yes- RWB (Owennaforeesha)	No	Yes
47	Lower River Shannon SAC	SAC 002165	Yes	Yes	Yes- RWB (Owennaforeesha)	No	Yes
48	River Shannon and River Fergus Estuaries SPA	SPA 004077	Yes	Yes	Yes (Owennaforeesha)	No	Yes
49	Kerry Head SPA	SPA 004189	Yes	Yes	Yes – RWB & LWB Multiple CWB (Mouth of the Shannon)	No	Yes
50	Loop Head SPA	SPA 004119	Yes	Yes	Yes – RWB & LWB Multiple CWB (Mouth of the Shannon)	No	Yes
51	Magharee Islands SAC	SAC 002261	Yes	Yes	Yes – RWB & LWB Multiple ,CWB (Southwestern Atlantic Seaboard)	No	Yes
52	Magharee Islands SPA	SPA 004125	No	Yes	Yes – RWB & LWB Multiple, CWB (Southwestern Atlantic Seaboard)	No	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
53	Akeragh, Banna and Barrow Harbour SAC	SAC 000332	Yes	Yes	Yes – RWB & LWB Multiple ,CWB (Outer Tralee Bay)	No	Yes
54	Tralee Bay Complex SPA	SPA 004188	Yes	Yes	Yes – RWB & LWB Multiple, CWB (Outer Tralee Bay)	No	Yes
55	Tralee Bay and Magharees Peninsula, West to Cloghane SAC	SAC 002070	Yes	Yes	Yes – RWB & LWB Multiple, CWB (Outer Tralee Bay)	No	Yes
56	Kerry Head Shoal SAC	SAC 002263	Yes	Yes	Yes – RWB & LWB Multiple , CWB (Southwestern Atlantic Seaboard)	No	Yes
57	Mount Brandon SAC	SAC 000375	Yes	Yes	Yes – RWB & LWB Multiple, CWB (Southwestern Atlantic Seaboard)	No	Yes
58	Dingle Peninsula SPA	SPA 004153	Yes	Yes	Yes – RWB & LWB Multiple, CWB (Southwestern Atlantic Seaboard)	No	Yes



Legend

LEMA Emission Type

- Primary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Longford Springs WTP
- Water Supply Zone Boundary (WSZ)
- Additional WSZ considered for dosing
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Zone of Influence

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 5 10 20 Kilometres

Client: UISCE ÉIREANN : IRISH WATER

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Castlerea WSS

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:900,000 @ A3	Date: 29/07/2019
File Ref: MDW0766Arc0057aF02	Map Projection: Irish National Grid (TM65)

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

For the construction and operational phase of the project, each European Site was assessed for the presence of water dependent habitats and species, their associated nutrient sensitivity, together with the hydrological/hydrogeological connectivity of each site to the proposed project. A number of sites are excluded from further assessment in Section 6. Those included, are detailed in **Table 4-3** and are displayed in **Figure 4-2.** Eight sites are included for further assessment in respect of the operational phase with two European sites included for further assessment in respect to the construction phase of the proposal, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Mullaghdoey Reservoir WTP. The reservoir is located in the upper catchment of the River Suck and there is no potential for surface water connectivity to any European sites. The Mullaghdoey Reservoir is located within the Suck South groundwater body (IE_SH_G_225) and potential hydrogeological connectivity between the proposed development site and the European Sites has been assessed. . Flow paths in this groundwater body are described as being up to several kilometres in length and generally directed towards the River Suck, however local flows may be variable. Water tracing was conducted in the South Suck groundwater body by GSI[4]. A review of the tracer lines indicates that north of the reservoir (500m approx.) groundwater flow is in a downstream direction following the topography and surface waters towards the River Suck. To the east of the reservoir (2.5km) groundwater flows from the Smearlagh River towards Mullygollan Turlough SAC. On this basis, the local flow paths, distance separating Mullaghdoey Reservoir WTP and the location of the following sites is considered to rule out hydrogeological connectivity or any effects associated with the proposed construction works at Mullaghdoey Reservoir: Kilsallagh Bog SAC (11.4km to south-west), Croaghill Turlough SAC (15km to south-west), Coolcam Turlough SAC (16.2km to south-west), Williamstown Turloughs SAC (17.5km to south-west), Lisnageeragh Bog and Ballinastack Turlough SAC (15km to south-west), Lough Lurgeen Bog/Glenamaddy Turlough SAC (18km to south-west), River Suck Callows SPA (18km to south), Camderry Bog SAC (20km to south), Curraghlehanagh Bog SAC (24km to south), Shankhill West Bog SAC (27km to south), Derrinlough (Cloonkeenleananode) Bog SAC (28km to south), Carrownagappul Bog SAC (17.5km to south), Aughrim (Aghrane) Bog SAC (22.5km to south-east), Ballinturly Turlough SAC (20.5km to south-east), Lisduff Turlough SAC (24km to south-east), Four Roads Turlough SAC (28km to south-east), Four Roads Turlough SPA (28km to south-east), Lough Croan Turlough SAC (31km to south-east), Lough Croan Turlough SPA (31km to south-east), Killeglan Grassland SAC (38km to south-east) and Castlesampson Esker SAC (41.5km to south-east). All the above European sites, which share groundwater connectivity with the Mullaghdoey Reservoir site, have therefore been excluded from further assessment. On a precautionary basis, given its relative proximity to the Mullaghdoey Reservoir WTP, Corliskea/Trien/Cloonfelliv Bog SAC (5.2km to south-west) has been included for further assessment. Given the direction of groundwater flow to the east of the reservoir, Mullygollan Turlough SAC (6.5km to the east) has also been included for further assessment on the basis of potential groundwater connectivity and any associated potential effects.

The WSZ for the operational phase, Castlerea WSS (2600PUB1028) is largely located within the sub-catchment of the River Suck and includes the village of Castlerea, with part of the WSZ lying within the Breedoge and Scramoge sub-catchments. As a result a number of European Sites are intersected via river pathways or overlain by the WSZ itself i.e. the Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan

[4] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/SuckSouthGWB.pdf

Turlough SAC, Bellanagare Bog SAC, Bellanagare Bog SPA, Cloonshanville Bog SAC and River Suck Callows SPA and are included for further assessment in Sections 5 and Section 6.

The WSZ also intersects six groundwater bodies – Suck South (IE_SH_G_225), Suck North (IE_SH_G_224), Carrick on Shannon (IE_SH_G_048), GWDTE – Bellanagare Bog (IE_SH_G_241)), Castlerea Bellanagare (IE_SH_G_054) and Castlerea (IE_SH_G_053) (**Table 3, Appendix C**). The following 35 European Sites overlay or intersect these groundwater bodies –

- SAC sites: Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Cloonchambers Bog SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Kilsallagh Bog SAC, Carrowbehy/Chaer Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Annaghmore Lough (Roscommon) SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Lurgeen Bog/Glenamaddy Turlough SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Callow Bog SAC, Camderry Bog SAC, Curraghlehanagh Bog SAC, Shankill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, Aughrim (Aghrane) Bog SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Lough Croan Turlough SAC, Killeglan Grassland SAC and Castlesampson Esker SAC;

- SPA sites: Bellanagare Bog SPA, Lough Gara SPA, River Suck Callows SPA, Four Roads Turlough SPA and Lough Croan Turlough SPA.

Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Bellanagare Bog SPA, Cloonshanville Bog SAC, Lough Gara SPA and River Suck Callows SPA are all included for further assessment in Section 6 due to surface water connectivity via a number of river water bodies and through direct connectivity with the WSZ itself. For European Sites which have only hydrogeological connections, i.e. the majority of sites listed within **Table 4-2**, an assessment was made of the direction of flow in the groundwater body forming the connection.

Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[5], and was consulted in making the assessment.

Of the six groundwater bodies overlain by the Castlerea WSZ, one does not intersect any European sites, that being Castlerea Bellanagare (IE_SH_G_054). As such this GWB is not afforded any further consideration within this assessment.

Castlerea (IE_SH_G_053) is a poorly productive bedrock aquifer, while Suck South (IE_SH_G_225), Suck North (IE_SH_G_224), Carrick on Shannon (IE_SH_G_048) and GWDTE – Bellanagare Bog (IE_SH_G_241 GWDTE –) are karst aquifers. The WSZ lies predominately within the Suck South

[5] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx

groundwater body, with smaller areas around the margins of the WSZ lying within the Suck North, Carrick on Shannon and GWDTE – Bellanagare Bog groundwater bodies.

The South Suck is a large karstic groundwater body in which the majority of Castlerea WSZ is located. As a result the following 20 European Sites have no surface water connection but are connected via the groundwater body: Kilsallagh Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Lurgeen Bog/Glenamaddy Turlough SAC, Camderry Bog SAC, Curraghlehanagh Bog SAC, Shankhill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, Aughrim (Aghrane) Bog SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Four Roads Turlough SPA, Lough Croan Turlough SAC, Lough Croan Turlough SPA, Killeglan Grassland SAC and Castlesampson Esker SAC.

Water tracing was conducted in the South Suck groundwater body by GSI[6]. A review of the tracer lines indicates that the groundwater flow is in a downstream direction following the topography and surface waters. Flow paths are described as being up to several kilometres in length and generally directed towards the River Suck, however local flows may be variable. On this basis, the local flow paths and the distance separating Castlerea WSZ and the following sites is considered to rule out hydrogeological connectivity or any effects associated with the proposed dosing at Mullaghdoey Reservoir: Lisnageeragh Bog and Ballinastack Turlough SAC (10km to south), Lough Lurgeen Bog/Glenamaddy Turlough SAC (14km to south), Camderry Bog SAC (15.5km to south), Curraghlehanagh Bog SAC (19km to south), Shankhill West Bog SAC (22km to south), Derrinlough (Cloonkeenleananode) Bog SAC (23km to south), Carrownagappul Bog SAC (23km to south), Aughrim (Aghrane) Bog SAC (16km to south-east), Ballinturly Turlough SAC (13km to south-east), Lisduff Turlough SAC (16.5km to south-east), Four Roads Turlough SAC (20km to south-east), Four Roads Turlough SPA (20km to south-east), Lough Croan Turlough SAC (23km to south-east), Lough Croan Turlough SPA (23km to south-east), Killeglan Grassland SAC (30km to south-east) and Castlesampson Esker SAC (33.5km) to south-east.

While the following European sites lie within relative proximity of the Castlerea WSZ they lie upstream of WSZ and on the basis that flows will generally move toward the River Suck it is considered that there is no potential hydrogeological connectivity supported between these sites and the Castlerea WSZ: Kilsallagh Bog SAC (6km to south), Croaghill Turlough SAC (6.5km to south-west), Coolcam Turlough SAC (8km to south-west) and Williamstown Turloughs SAC (9km to south-west). Therefore, as there are no hydrological connections, and given the confirmed direction of groundwater flow from GSI data, the 20 European Sites within the South Suck groundwater body were excluded from further assessment.

Carrick on Shannon is a large Karstic groundwater body, which is overlain by the eastern portion of the Castlerea WSZ. As such Annaghmore Lough (Roscommon) SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Callow Bog SAC, Drumalough Bog SAC and Lough Gara SPA are hydrogeologically connected to the WSZ via this groundwater body. Carrick on Shannon supports unpredictable and variable local groundwater flows, with evidence of the presence of sizeable conduits recorded. Flow paths are described as being up to several kilometres in length[7]. On this basis it is considered that the considerable linear distance between Annaghmore Lough (Roscommon) SAC (9km), Urlaur Lakes SAC (14km), Derrinea Bog SAC (12km), Errit Lough SAC (11.5km), Callow Bog SAC (9.5km), Drumalough Bog SAC (7.72km, within the Carrick on Shannon GWB) and Lough Gara SPA (9.5km) and the Castlerea WSZ

[6] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/SuckSouthGWB.pdf
[7] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/CarrickOnShannonGWB.pdf

in addition to their locations, which lie largely upstream of the surface water and groundwater flows which are connected to the WSZ, rules out the potential for hydrogeological connectivity between the sites. As such Annaghmore Lough (Roscommon) SAC, Urlaur Lakes SAC, Derrinea Bog SAC, Errit Lough SAC, Callow Bog SAC, Drumalough Bog SAC and Lough Gara SPA were excluded from further assessment on the basis of hydrogeological connectivity via this groundwater body.

The North Suck is a small karstic groundwater body in which a small portion of the northern area of Castlerea WSZ is situated. The following three European sites have no surface water connectivity with the Castlerea WSZ but are connected via the North Suck groundwater body: Cloonchambers Bog SAC, Drumalough Bog SAC and Carrowbehy/Chaer Bog SAC. Groundwater flows within this water body are up to several kilometres in length and generally towards the rivers crossing the water body, with highly variable local flows. Groundwater flow paths between the Suck North and Suck South GWBs are separated by areas of impermeable rock within Castlerea and Rabbitburrow GWBS[8]. On the basis of the distance between the WSZ and these European sites it is considered that there is no potential for hydrogeological connectivity between the WSZ and Carrowbehy/Chaer Bog SAC (7.5km to the north-west). As such this site has been excluded from further assessment. Two sites, Cloonchambers Bog SAC and Drumalough Bog SAC, lies in close proximity (0.7km and 2.5km) to the WSZ and while located upstream of the WSZ, have been included for assessment in Section 5 and Section 6 on the basis of potential hydrogeological connectivity.

GWDTE – Bellanagare Bog is a small karstic groundwater body which encompasses a small northern portion of the Castlerea WSZ. While little information is available in respect of the characteristics of this GWB, it is largely comprised of Bellanagar Bog SAC and SPA and supports no other European Sites. As the Castlerea WSZ intersects both of these European sites, they are included for further assessment at Section 5 and 6 below. This assessment includes for consideration of potential groundwater effects associated with the proposed dosing at Mullaghdoey Reservoir.

The accompanying EAM (**Appendix C**) includes, at **Table 4**, the modelled increased loading and concentrations of orthophosphate within river water bodies which lie within and connected to the WSZ. On the basis of the concentrations modelled for the River Suck (IE_SH_26S071550 SUCK_160), downstream of the WSZ, which demonstrate an undetectable increase in concentration (0.0000 mg/l), it is considered that there is no potential for any significant effects as a result of the proposed dosing to any water bodies or associated European sites which lie downstream of the River Suck and as such the zone of influence (ZoI) is deemed to end at the River Suck Callows SPA, prior to its confluence with the River Shannon. On this basis the following sites have been excluded from further assessment: River Shannon Callows SAC, Middle Shannon Callows SPA, Lough Derg, North-east Shore SAC, Lough Derg (Shannon) SPA, Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA, Loop Head SPA, Magharee Islands SAC, Magharee Islands SPA, Akeragh, Banna and Barrow Harbour SAC, Tralee Bay Complex SPA, Tralee Bays and Maghera Peninsula, West to Cloghane SAC, Kerry Head Shoal SAC, Mount Brandon SAC and Dingle Peninsula SPA.

Furthermore on the basis of the modelled concentrations for the River Breedoge (IE_SH_26B090300 Breedoge_010), which are also undetectable (0.0000 mg/l)m, there is no potential for any significant effects to water bodies and associated European sites downstream of this RWB and as such Lough Gara SPA has been excluded from further assessment.

As shown at **Table 4** of the accompanying EAM (**Appendix C**), the modelled increased loading and concentrations of orthophosphate within the Scramoge (Scramoge_010 and Scramoge_020) are

[8] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/SuckNorthGWB.pdf

0.0001 mg/l and after flowing through Lough Nafulla is undetectable (0.0000 mg/l) respectively. On this basis it is considered that there is no potential for a significant effect to arise to any European Site which lies downstream of the Scramoge_020 and as such the following sites have been excluded from further assessment: Ballykenny-Fishertown Bog SPA, Lough Forbes Complex SAC, Lough Ree SAC, Lough Ree SPA, Pilgrims Road Esker SAC, Mongan Bog SAC and Mongan Bog SPA.

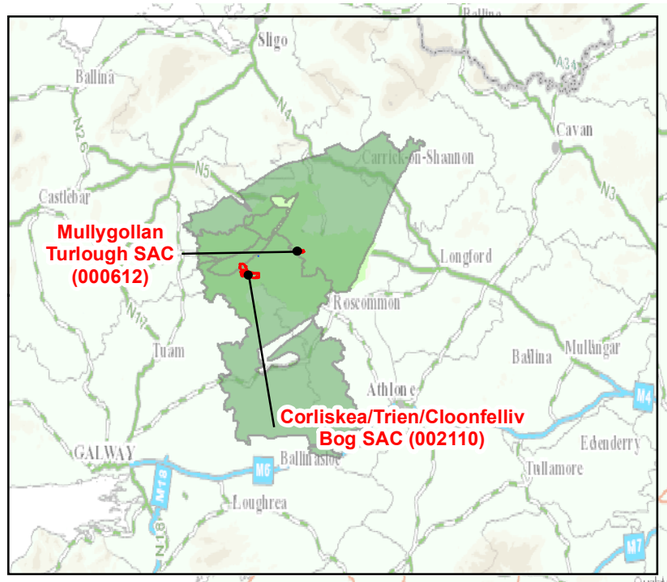
On this basis, two sites have been included for further assessment in order to evaluate the significance of potential effects arising during construction phase in Section 5 below i.e. Corliskea/Trien/Cloonfelliv Bog SAC and Mullygollan Turlough SAC. Eight sites have been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Bellanagare Bog SPA, Cloonshanville Bog SAC and River Suck Callows SPA

Table 4-3: European Sites Hydrologically or Hydrogeologically Connected to or Downstream of the WTP and WSZ

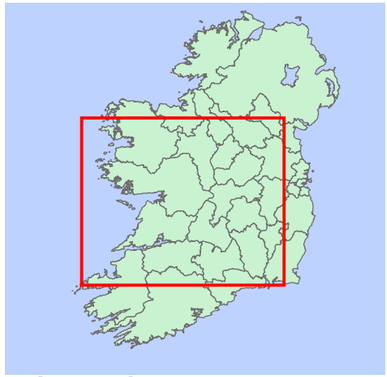
Site Name	SAC/SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Construction and Operation Phase								
Corliskea/Trien/ Cloonfelliv Bog SAC	SAC 002110	17 Feb 2016 Version 1	7110	Active Raised Bogs*	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the Rynchosporion	Yes	Yes		
			91D0	Bog woodland*	Yes	Yes		
Mullygollan Turlough SAC	SAC 000612	29 Jan 2018 Version 1	3180	Turloughs	Yes	Yes	Yes	Yes
Operation Phase Only								
Bellanagare Bog SAC	SAC 000529	27 Nov 2015 Version 2	7110	Active Raised Bogs*	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the *Rynchosporion*	Yes	Yes		
Cloonchambers Bog SAC	SPA 000600	18 Jan 2016 Version 1	7110	Active Raised Bogs*	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the Rynchosporion	Yes	Yes		
Drumalough Bog SAC	SAC 002338	3 Aug 2016 Version 1	7110	Active Raised Bogs*	Yes	Yes	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	Potential Source Pathway Receptor
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the Rynchosporion	Yes	Yes		
Bellanagare Bog SPA	SPA 004105	21 Feb 2018 Generic	A395	Greenland White-fronted Goose *Anser albifrons flavirostris*	Yes	Yes	Yes	Yes
Cloonshanville Bog SAC	SAC 000614	21 Jan 2016 Version 1	7110	Active Raised Bogs*	Yes	Yes	Yes	Yes
			7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes		
			7150	Depressions on peat substrates of the Rynchosporion	Yes	Yes		
			91D0	Bog woodland*	Yes	Yes		
River Suck Callows SPA	SPA 004097	21 Feb 2018 Generic	A038	Whooper Swan *Cygnus*	Yes	Yes	Yes	Yes
			A050	Wigeon *Anas penelope*	Yes	Yes		
			A140	Golden Plover *Puvialis apricaria*	Yes	Yes		
			A142	Lapwing *Vanellus*	Yes	Yes		
			A395	Greenland White-fronted Goose *Anser albifrons flavirostris*	Yes	Yes		

*Indicates a priority habitat under the habitats directive.
**While this habitat is determined to be non-water dependent, it is incuded in the assessment sections below in terms of flood risk.



Zone of Influence (ZoI) for Construction Phase



Legend

LEMA Emission Type

- Primary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Longford Springs WTP
- Water Supply Zone Boundary (WSZ)
- Additional WSZ considered for dosing
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Subcatchments intersecting Water Supply Zone(s) related to the WTP
- Zone of Influence

Data Source:
Irish Water
NPWS (June 2019)
EPA

N

0 5 10 20 Kilometres

Client UISCE ÉIREANN : IRISH WATER

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title

Castlerea WSS

European Sites within the ZoI which are hydro(geo)logically connected

RPS

Scale: 1:800,000 @ A3	**Date:** 29/07/2019
File Ref: MDW0766Arc0057bF02	**Map Projection:** Irish National Grid (TM65)

Zone of Influence (ZoI) for Operational Phase

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 effects;
- Short and long-term effects;
- Construction, operational and decommissioning effects; and
- Isolated, interactive and cumulative effects.

5.2 IMPACT IDENTIFICATION

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

The Screening for AA has considered the potential for the following likely significant effects:

- 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).

5.2.1 Construction Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the construction of orthophosphate WTP at Mullaghdoey Reservoir WTP. These will be evaluated with regard to the potential for likely significant effects on European Sites. These are potential effects and in the absence of pathways (which is evaluated in **Section 5.3.1** below) the construction phase may not give rise to these effects.

- Sediment laden run-off from excavation areas (trenches for dosing pipelines, carrier water pipework and electrical cables) and the introduction of fine sediments to watercourses connected to the works area causing a deterioration in water quality;
- Dust and noise emissions from excavation (trenches for dosing pipelines, carrier water pipework and electrical cables and transportation of material and equipment close to watercourses causing a deterioration in water quality or disturbance to species (e.g. birds);
- Environmental incident or accident during the construction phase e.g. spillage of a contaminant such as diesel or phosphoric acid causing a deterioration in water quality;

- Groundwater level drawdown through the excavation of trenches for dosing pipelines, carrier water pipework and electrical cables.

5.2.2 Operational Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the operation of orthophosphate WTP at Mullaghdoey Reservoir WTP. These will be evaluated with regard to the potential for likely significant effects on European Sites in relation 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 impacts for these habitats and species;
- The discharge of additional orthophosphate loads to the environment (through surface and sub surface pathways) may have potentially negative effects on nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish;
- Phosphorus in wastewater collection systems is the result of drinking water and derived from a number of other sources, including phosphorus imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of phosphorus removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;
- Leakage of phosphates from the drinking water supply network to the environment from use of orthophosphate;
- Direct discharges of increased orthophosphate to water bodies from the wastewater treatment plant licensed discharges; and
- Potential discharges to water bodies of untreated effluent potentially high in orthophosphate from Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS

Article 6 of the Habitats Directive states that:

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

The focus of this Screening to inform AA is the evaluation of the potential for likely significant effects associated with the additional orthophosphate load due to orthophosphate dosing and the construction of WTP at Mullaghdoey Reservoir WTP.

5.3.1 Construction Phase

The proposed orthophosphate dosing system will be located within the confines of the existing WTP at Mullaghdoey Reservoir within an area of made ground and amenity grassland. The assessment of impacts associated with the construction of the corrective water WTP at Mullaghdoey Reservoir is presented in

and is based on a desktop study using the following information:

- Design descriptions and drawings for the proposed corrective water WTP at Mullaghdoey Reservoir WTP;
- A review of hydrological connectivity between the proposed works and European Sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10
- Site synopses, conservation objectives and qualifying interest data for European Sites.

Table 5-1: Likely significant effects to European Sites arising as a result of the construction of the corrective water WTP

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation of Potential Significant Effects
Corliskea/Trien/ Cloonfelliv Bog SAC (002110)	Suck South (IE_SH_G_225)	GWB	The construction works will be located within the confines of the existing Mullaghdoey Reservoir WTP which is not located within or adjacent to a European Site. The WTP is located approximately 1.6km north of the River Suck (Suck_030) to the west and 1.7 km from the Smaghrann_020 to the east. These RWBs discharge to the main channel of the Suck and as such supports connectivity with a number of European sites. **Surface Water** The WTP is separated from the nearest watercourse (Suck_030) by 1.6km and Smaghrann_020 by 1.7km of largely agricultural land. The Mullaghdoey Reservoir is bordered to the east, south and west by a large expanse of agricultural grassland and to the north by the Mewlaghmore Road. These features comprise a boundary of separation, isolating any surface water pathway from the works area to these watercourses Owing to the small scale nature of the proposed works, the significant distance between the Mullaghmore Reservoir and the closest watercourse and any European Sites, absence of hydrological connections as well as existing natural and built barriers there is no potential for likely significant effects on these
Mullygollan Turlough SAC (000612)	Carrick on Shannon (IE_SH_G_048)	GWB	

			sites through sediment laden run-off, dust emissions or environmental incidents. **Groundwater** Mullaghdoey Reservoir WTP overlies the Suck South (IE_SH_G_225) groundwater body. All European Sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source impact pathways. This groundwater body is a productive Karst aquifer[9]. Local groundwater flow is highly variable with general flows following the pathways of surface waters and typically towards the River Suck with further tracer data indicating that the groundwater flows may also be directed into the adjacent Carrick on Shannon GWB. As a result Corliskea/Trien/Cloonfelliv Bog SAC and Mullygollan Turlough SAC were considered to have potential connectivity to the WTP. The Suck South and Carrick on Shannon groundwater bodies comprise regionally important fractured aquifer and locally important aquifer and flow is generally toward the River Suck. The WTP is located 5.5km from Corliskea/Trien/Cloonfelliv Bog SAC and 6.5 km (approx.) from Mullygollan Turlough SAC The excavation of trenches to install dosing pipelines, carrier water pipework and electrical cables to 700mm below ground level has the potential to interfere with the water table potentially causing groundwater drawdown. As the excavation works will not be extensive (up to c. 75m for pipework and to an approximate depth of 700mm) and upon made ground, interference with water table will be unlikely to occur. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water features and subsequently those hydrogeologically connected European Sites included for further assessment, as a result of the construction of the corrective water WTP at Mullaghdoey Reservoir WTP. Therefore, there is no potential for likely significant effects on the Corliskea/Trien/Cloonfelliv Bog SAC or Mullygollan Turlough SAC as a result of the construction of the corrective water WTP at Mullaghdoey Reservoir.

[9] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/SuckSouthGWB.pdf

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at Mullaghdoey Reservoir, the EAM conceptual model developed for orthophosphate transfer identified the surface and groundwater bodies that have the potential to be affected by the orthophosphate dosing and for which hydrological or hydrogeological pathways to the European Sites exist. These water bodies are listed in **Table 5-2.** The table identifies the following:

- European Sites included for assessment;
- Water bodies hydrologically or hydrogeologically connected to the European Sites;
- Existing orthophosphate indicative quality and trend of each water body as presented in the EPA's WFD APP;
- The baseline orthophosphate concentration of each water body;
- 75% of the upper threshold for the indicative quality;
- Cumulative orthophosphate load to surface from leakage, DWWTS and agglomerations;
- The modelled orthophosphate concentration following dosing at the WTP; and,
- The orthophosphate potential baseline concentration (mg/l) following dosing at the WTP.

The EAM has been undertaken assuming the capacity of a water body is a measure of its ability to absorb extra pressures before its indicative quality changes. In order to do this the indicative quality as presented in the EPA's WFD APP is used as the baseline concentration for the different monitoring points within a water body. For example, a river water body with Good orthophosphate indicative quality will have mean orthophosphate value in the range 0.025 to 0.035 mg/l. River water bodies with mean orthophosphate concentrations of 0.0275 mg/l have 75% capacity left, i.e. high capacity, while river water bodies with a mean of 0.0325 mg/l have lower capacity (25%) as the baseline concentrations are closer to the Good/Moderate indicative quality boundary.

When assessing the increase in orthophosphate concentrations as a result of proposed dosing, an increase which is <5% of the Good / High indicative quality boundary, i.e. 0.00125mg/l, is excluded from further assessment and is assumed to result in no significant impact to a water body. If the baseline orthophosphate concentration in addition to the potential increase in orthophosphate concentration as a result of dosing is less than the 75% upper threshold of the indicative quality band for a water body, this also results in no significant impact. Where a water body does not have monitored orthophosphate concentrations, a conservative approach is used whereby the surrogate indicative quality is calculated based on the ecological status assigned to that water body by the EPA.

For significance threshold band (i.e. 75% of the upper threshold for the indicative quality band) in transitional and coastal water bodies, a sliding linear scale is used depending on median salinity. The EAM determines if the dosing will result in a baseline concentration that exceeds the relevant 75% threshold for the indicative quality bands (based on salinities) in order to evaluate whether there could be an increased risk of deterioration in indicative quality.

Where a transitional or coastal water body does not have monitored orthophosphate concentrations or salinity levels, a conservative approach is used whereby the surrogate indicative quality is calculated

based on the ecological status assigned to that water body by the EPA but the more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[10].

Therefore, in assessing the additional loads from the proposed orthophosphate dosing, the capacity of the water body will be assessed. This information is available on the WFD App on a national basis using the "Distance to Threshold" parameter, where water bodies with high capacity are termed "Far" from the threshold and those with low capacity are "Near" the threshold.

It is predicted that orthophosphate dosing will not have a significant effect on water bodies (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 orthophosphate indicative quality 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 orthophosphate dosing and statistically significant trends for a water body will not result in deterioration in status even where the distance to threshold is currently assessed to be far. Where the water body baseline indicative quality concentration is "Near" to the threshold before the effect of orthophosphate dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to orthophosphate is very low (i.e. below 5% of the Good/Moderate indicative quality this test will pass as the orthophosphate dosing itself can be defined as having no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

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

This test applies only when the trend for orthophosphate concentration for the water body is considered statistically significant in the WFD App. For surface water bodies, the predicted concentration is given and the additional concentration due to orthophosphate dosing is added and assessed as appropriate. If the new calculated predicted concentration prevents the achievement of good indicative quality then this test fails.

This assessment assumes a dosing rate of 1.2 mg/l orthophosphate at Mullaghdoey Reservoir.

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

The initial assessment is automated using existing WFD App data. If tests fail and more investigation is required, more recent data can be used and the assessment rerun. For example, if 2019 - 2021 concentrations for a river water body are available, the 2019 – 2021 average can be used instead of the 2017 baseline provided in the WFD App.

[10] The conservative thresholds in transitional and coastal water bodies for orthophosphate indicative quality in unassigned water bodies i.e. upper limits are: High 0.025 mg/l; Good 0.04 mg/l; Moderate 0.06 mg/l; Poor 0.09 mg/l; Bad – N/A. The higher range for transitional and coastal water bodies with a median salinity ≤ 17mg/l are: High 0.03 mg/l; Good 0.06 mg/l; Moderate 0.1 mg/l; Poor 0.2 mg/l; Bad N/A.

Table 5-2: 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 [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
Corliskea / Trien/ Cloonfelliv Bog SAC	IE_SH_G_225 SUCK SOUTH	GWB	Good Upwards Far	0.012	0.026	29.4	0.0001	0.012	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.024	0.026			0.024	
			Good Upwards Far	0.022	0.026			0.022	
			Good Upwards Far	0.019	0.026			0.019	
			Good Upwards Far	0.024	0.026			0.024	

[11] Monitoring period is annual unless specified.
[12] Surrogate Indicative Quality in italic.
[13] Distance to threshold.
[14] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[15] Surrogate concentration is given in italic mg/l
[16] Values above 5% of Good / High indicative quality boundary (0.00125 mg/l) for SW or 5% of Good / Fail indicative quality boundary (0.00175 mg/l) for GW highlighted in yellow.
[17] Green cells signify that there is no risk of deterioration in indicative quality of the water body following dosing at the WTP.

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
			Good Upwards Far	0.006	0.026			0.006	
			Good None Far	0.011	0.026			0.011	
	IE_SH_G_053 CASTLEREA	GWB	*Good*	*0.018*	*0.026*	1.6	0.0003	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Mullygollan Turlough SAC	IE_SH_G_048 CARRICK ON SHANNON	GWB	Good Upwards Far	0.027	0.026	4.5	0.0000	0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Bellanagare Bog SAC	IE_SH_26T030300 TERMON STREAM_010	RWB	Good	0.030	0.033	14.8	0.0005	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_241 GWDTE-BELLANAGARE BOG (SAC000592)	GWB	*Good*	*0.018*	*0.026*	1.2	0.0002	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
Cloonchambers Bog SAC	IE_SH_G_224 SUCK NORTH	GWB	*Good*	*0.018*	*0.026*	0.3	0.0000	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Drumalough Bog SAC	IE_SH_G_224 SUCK NORTH	GWB	*Good*	*0.018*	*0.026*	0.3	0.0000	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Bellanagare Bog SPA	IE_SH_26T030300 TERMON STREAM_010	RWB	Good	0.030	0.033	14.8	0.0005	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_241 GWDTE-BELLANAGARE BOG (SAC000592)	GWB	Good	0.018	0.026	1.2	0.0002	0.018	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Cloonshanville Bog SAC	IE_SH_26O040100 OWENNAFOREESHA_010	RWB	Good Downwards Far	0.030	0.033	2.5	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B090300 BREEDOGE_010	RWB	High Downwards Near	0.024	0.019	2.5	0.0000	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
									the achievement of WFD objectives.
River Suck Callows SPA (004097)	IE_SH_26F050050 FRANCIS_010	RWB	*Good*	*0.030*	*0.033*	0.0	0.0000	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26F050300 FRANCIS_020	RWB	*Good*	*0.030*	*0.033*	19.3	0.0003	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S010050 SCRAMOGE_010	RWB	*Moderate*	*0.046*	*0.051*	3.9	0.0001	0.046	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S010200 SCRAMOGE_020	RWB	*Good*	*0.030*	*0.033*	3.9	0.0000	0.013	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S040200 SMAGHRAAN 26_020	RWB	*Poor*	*0.077*	*0.087*	9.3	0.0001	0.077	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
	IE_SH_26S070300 SUCK_030	RWB	High Upwards Far	0.020	0.019	28.0	0.0002	0.020‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S070400 SUCK_040	RWB	*High*	*0.013*	*0.019*	33.1	0.0002	0.013‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S070500 SUCK_050	RWB	High Downwards Near	0.015	0.019	52.5	0.0002	0.015‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26T030300 TERMON STREAM_010	RWB	*Good*	*0.030*	*0.033*	14.8	0.0005	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26I030400 ISLAND_030	RWB	High Upwards Near	0.011	0.019	0.7	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S070600 SUCK_060	RWB	*High*	*0.013*	*0.019*	52.5	0.0001	0.013‡	No risk of deterioration in the Ortho P indicative quality or of preventing

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
									the achievement of WFD objectives.
	IE_SH_26S070650 SUCK_070	RWB	Good	0.030	0.033	61.7	0.0001	0.030‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071550 SUCK_160	RWB	Good	0.030	0.033	61.7	0.0000	0.030‡	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_225 Suck South	GWB	Good Upwards Far	0.012	0.026	29.4	0.0001	0.012	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.024	0.026			0.024	
			Good Upwards Far	0.022	0.026			0.022	
			Good Upwards Far	0.019	0.026			0.019	
			Good Upwards Far	0.024	0.026			0.024	
			Good Upwards Far	0.006	0.026			0.006	

Site Name (Code)	Contributing WB Code_Name	WB Type [11]	Ortho P Indicative Quality[12] and Trends[13]	Baseline [14] Ortho P Conc.[15] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Total Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[16] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[17]	Evaluation
			Good None Far	0.011	0.026			0.011	

‡ Load from WWTP / SWO following treatment added
* Trends are statistically significant

The assessment of discharges from the wastewater collection system and WWTPs and the loading from leakage and DWWTSs to lakes is based on the Vollenweider equation. This is an empirical equation which aims to predict the critical total P loading to a lake where eutrophic conditions can occur. It is calculated based on area, mean depth, and hydraulic outflow of lake (Vollenweider, 1968[18]) (**Table 5-3**). Lough Nafulla discharges to Scramoge_020 and is located >100km upstream of River Suck Callows SPA. The ZoI for this hydrological pathway was terminated at Scramoge_020.

Table 5-3 Vollenweider Assessment of Lakes within the WSZs

Site Name (Code)	Contributing WB Code_Name	WB Type	TP Indicative Quality and Trends[19]	Baseline[20] Ortho P Conc.[21] (mg/l)	TP Total Dosing Load (kg/yr)	Est. Existing Areal Loading Based on Vollenweider (mg/m²/yr)	Est. Post Dosing Areal Loading Based on Vollenweider (mg/m²/yr)	Lc – Critical Load (mg/m²/yr)	%Increase
River Suck Callows SPA (004097)	IE_SH_26_281 Lough Nafulla	LWB	*Moderate*	0.038	3.9	102,835	103,133	28,024	0.3

[18] Vollenweider, R. A. (1968) *Scientific fundamentals of stream and lake eutrophication with particular reference to nitrogen and phosphorus*. OECD Technical Report DAF/DST/88. Organisation of Economic Cooperation and Development, Paris.
[19] Distance to Threshold. Surrogate indicative quality in *italic*.
[20] Baseline year is 2014.
[21] Surrogate concentrations given in *italic*.

5.3.3 Assessment of Potential Direct Impacts from WWTPs and Storm Water Overflows

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

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

For the purposes of assessing the potential impact on the receiving environment a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 5-4**). The existing baseline prior to orthophosphate dosing is established and compared to the potential impact on the receiving waters post-dosing. In-combination effects of the operation of the SWO and the continuous discharge from the WWTP were also assessed.

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

Table 5-4 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. The resultant concentration in the waters downstream of the discharge point from the agglomerations is provided in **Table 5-5,** assuming mean flows

The quantification of loads in a mass balance calculation was carried out using the standardised approach developed in the EAM which was devised using national data sets and applying a series of conservative and robust assumptions. The model was prepared in discussion with and utilises data supplied by the EPA, NPWS and the DHPLG to ensure that a robust model simulation is provided.

Table 5-4: Increased loading / concentration due to Orthophosphate Dosing – Dosing rate = 1.2 mg/l

Agglom. and Discharge Type	ELV from WWDL (mg/l)	Scenario	TP Load Kg/Yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Castlerea Primary Discharge	1 Compliant with ELV for orthoP set in the WWDL in the 2021 AER.	**Existing**	373.7	0.339	0.271	0.461
		Post Dosing	373.7	0.339	0.271	0.461
Castlerea SWO	n/a	**Existing**	544.3	16.952	13.561	23.054
		Post Dosing	553.0	17.225	13.780	23.426

Table 5-5: Mass balance assessment based on 1.2 mg/l dosing using available background concentrations and mean flow information from Hydrotool.

Agglom.	RWB Name / Code for Primary Discharge	Background Conc.[22] (mg/l)	Modelled conc. Existing (mg/l)	Modelled conc. Post Dosing (mg/l)	% Inc
Castlerea (D0118)	River Suck IE_SH_26S070300	0.0200	0.0237	0.0237	0.2

Castlerea Agglomeration

The Castlerea agglomeration (D0118) receives tertiary treatment i.e. nutrient removal is assumed to remove any additional orthophosphate load to the WWTP during the treatment process. This is based on the assumption that there is adequate capacity in the chemical dosing system to effectively manage the removal of the additional phosphorus without affecting the performance of the treatment process at the WWTP or the quality of the effluent discharged under the current operating regime. The agglomeration discharges into the River Suck (IE_SH_26S070300), which is hydrologically connected to the River Suck Callows SPA. The AER for the Castlerea WWTP indicates the plant was compliant with ELV for orthophosphate in 2021. When mean flows are taken into account the increase in the receiving water is negligible (0.2%) (**Table 5-5**). Therefore, there is no risk of failing to achieve WFD objectives for the River Suck (IE_SH_26S070300), and its hydrologically connected European Sites as a result of dosing at Mullaghdoey Reservoir.

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to river water bodies from subsurface pathways (**Appendix C**). The modelled concentrations due to subsurface pathways are insignificant in all water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies).

The highest concentration modelled for receiving water bodies is 0.005 mg/l to IE_SH_26T030300 Termon Stream_010 which intersects the River Suck and consequently the River Suck Callows SPA.

There are no lake, transitional or coastal water bodies directly affected by the WSZ. Therefore there will be no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within waterbodies hydrologically/ hydrogeologically connected surface water bodies due to orthophosphate dosing.

Groundwater Assessment

The predicted loads and concentrations to groundwater bodies (GWBs) are undetectable or insignificant for all groundwater bodies; Suck South (IE_SH_G_225), Suck North (IE_SH_G_224), Carrick on Shannon (IE_SH_G_048), GWDTE – Bellanagare Bog (IE_SH_G_241), Castlerea Bellanagare (IE_SH_G_054) and Castlerea (IE_SH_G_053) (i.e. <0.00175 mg/l = 5% of the Good / Fail indicative quality boundary) as shown in **Table 3 of Appendix C**.

[22] Annual mean from AER u/s monitoring point

The groundwater body with the highest potential increase in orthophosphate concentration due to dosing is IG_SH_G_053_Castlerea. In this case the potential increase is 0.0003 mg/l which is well below the 5% Good / Fail indicative quality boundary.

Therefore, there is no risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of WFD objectives within the hydrogeologically connected groundwater bodies due to orthophosphate dosing as indicated in **Table 3, Appendix C**.

5.3.5 Combined Assessment

Table 4A of Appendix C provides details of the combined orthophosphate inputs to river water bodies from direct discharges, DWWTSs and leakage loads. The increased loads due to orthophosphate dosing are not predicted to be significant i.e. are <0.00125 mg/l (5% of High / Good indicative quality boundary). The dosing therefore poses no risk of deterioration in the orthophosphate indicative quality of the river water bodies identified in **Table 5-2**, or of preventing their achievement of WFD objectives**.**

The baseline for lake water body, Lough Nafulla (IE_SH_26_281) is at Moderate (surrogate) total phosphorus indicative quality and is therefore mesotrophic, exceeding the critical loading for oligotrophic lakes. An assessment of the trophic status, based on the OECD methodology, supports this with the lake classified as mesotrophic. The additional loading will not result in a significant increase in the trophic status increasing the loading by only a fraction of one percent, therefore the orthophosphate dosing will not significantly impact on the total phosphorus indicative quality or trophic status of this lake.

The dosing therefore poses no risk of deterioration in the orthophosphate indicative quality of the river water bodies identified in **Table 5-2**, or lake water body identified in **Table 5-3** or of preventing their achievement of WFD objectives**.**

There are no transitional or coastal water bodies directly affected by the WSZ.

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative load to the Shannon Catchments (HAs 24, 25, 26, 27)) from WTPs associated with the orthophosphate dosing have been assessed in combination with the Castlerea Regional Public Supply WSZ. The common water bodies evaluated within the WSZs supplied by these WTPs have been summarised in Table 5.6 below. WTPs included within the cumulative assessment are:

- 005 Clareville WTP – Limerick City Water Supply
- 012 Tuam WTP – Tuam RWSS
- 013 Portloman WTP – Ardonagh Reservoir
- 017 Drumcliffe WTP - Ennis PWS
- 019 New Doolough WTP - W.Clare RWS (New WTP)
- 020 Castle Lake WTP - Shannon/Sixmilebridge RWSS
- 021 Rossadrehid WTP – Galtee Regional
- 027 Athlone WTP – Athlone WSS
- 034 Lough Forbes WTP – Longford Central
- 040 Coolbawn WTP _ Nenagh RWSS
- 049 Ballany WTP – Ballany High Level Reservoir

- 058 Ballinasloe Town WTP - Ballinasloe Public Supply
- 068 Rockingham WTP - Boyle Regional WSS
- 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 161 Freemount WTP – Zone 4 Allow Regional
- 178 Clavin's Bridge WTP – Kells/Oldcastle WS
- 184 Foileen WTP - CappamoreFoileen Water Supply
- 185 Ballinlough/ Loughglynn (Ballybane Springs) - Ballinlough/Loughglynn
- 190 Ironmills Pump Station - Ironmills
- 216 Kylebeg WTP – Borrisokane
- 237 Killadysert WTP - Killadysert PWS
- 238 Williamstown WTP - Williamstown PS3
- 246 Ballingarry Spring WTP - Ballingarry Water Supply
- 260 Kilcolman PS - Rathkeale Water Supply
- 267 Cloughjordan Pump Station – Cloughjordan
- 321 Ahascragh WTP - Ahascragh P.S.

355 Croom Bypass Pump Station - Croom Water Supply The impact to the receiving waters is not significant as outlined in **Table 5, Appendix C** and Table 5.6 below given that predicted increased in orthophosphate as a result of dosing are all <5% of the Good / High indicative quality boundary, i.e. 0.00125mg/l, and will not cause a deterioration in the orthophosphate indicative quality or prevent the achievement of the WFD objectives of the water bodies.

The baseline summer sample concentrations for the Upper Shannon Estuary (IE_SH_060_0800) exceeds the 75% of the upper orthophosphate indicative quality threshold. However, as outlined above, the modelled increase in concentration is less than 0.00125 mg/l and therefore not significant (5% of the high/good indicative quality boundary). There is no risk of deterioration in the orthophosphate indicative quality of this water body as a result of cumulative dosing effects, or of preventing the achievement of WFD objectives.

A single coastal water body, Mouth of the Shannon (IE_SH_060_0000) was subject to cumulative assessment. Modelled additional inputs were however negligible (0.0001 mg/l) and as such it is not considered that the cumulative effects of dosing across the catchment will cause deterioration in the orthophosphate indicative quality of the water bodies or prevent its achievement of WFD objectives.

The impact to the remaining receiving waters is also not significant as outlined in **Table 5, Appendix C** and given that predicted increased in orthophosphate as a result of dosing are all <5% of the Good / High indicative quality boundary i.e. 0.00125mg/l and will not cause a deterioration in orthophosphate indicative quality or prevent the achievement of the WFD objectives of water bodies.

Table 5-6: Cumulative assessment of the increased loading and concentrations from Castlerea WSS and other WSZs proposed for corrective water treatment in the upstream catchments

NAME / EU_CD	Water body/ Period	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year 2014 and Conc. Surrogate Conc given in *italic*	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Modelled increase in Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
IE_SH_26I030400 ISLAND_030	RWB	High Upwards Near	0.011	0.019	45.7	0.0004	0.012‡
		High Downwards Near	0.012	0.019			0.012‡
IE_SH_26F050300 FRANCIS_020	RWB	*Good*	*0.030*	*0.033*	*30.9*	*0.0004*	*0.030*
IE_SH_26S040200 SMAGHRAAN_020	RWB	*Poor*	*0.077*	*0.087*	*10.3*	*0.0001*	*0.077*
IE_SH_26B090300 BREEDOGE_010	RWB	High Downwards Near	0.024	0.019	40.4	0.0003	0.024‡
IE_SH_26S070300 SUCK_030	RWB	High Upwards Far	0.020	0.019	78.3	0.0005	0.021‡
IE_SH_26S070400 SUCK_040	RWB	*High*	*0.013*	*0.019*	*94.1*	*0.0005*	0.014‡
IE_SH_26S070500 SUCK_050	RWB	High Downwards Far	0.015	0.019	158.2	0.0005	0.016‡
IE_SH_26S071200 SUCK_130	RWB	Moderate Upwards Far	0.036	0.051	213.0	0.0002	0.036‡
		Good Downwards Far	0.029	0.033			0.029‡
		High None Far	0.013	0.019			0.013‡
IE_SH_26S071400 SUCK_140	RWB	Good Far	0.030	0.033	247.5	0.0002	0.030‡
		High Far	0.014	0.019			0.014‡
		High Far	0.010	0.019			0.010‡
IE_SH_26S071550 SUCK_160	RWB	*Good*	*0.030*	*0.033*	*276.2*	*0.0002*	0.030‡
IE_SH_060_0900 Limerick Dock	TWB Summer	High (S) Far	0.008	0.019	7516.7	0.0010	0.009‡

	TWB Winter	High (W) Far	0.012	0.019			0.013‡
IE_SH_060_0800 Upper Shannon Estuary	TWB Summer	High (S) Near	0.020	0.019	8848.1	0.0010	0.021‡
	TWB Winter	High (W) Far	0.011	0.036			0.012‡
IE_SH_060_0700 Maigue Estuary	TWB Summer	High (S) Far	0.017	0.019	382.4	0.0011	0.018‡
	TWB Winter	Poor (W) Far	0.069	0.102			0.070‡
IE_SH_060_0600 Deel Estuary	TWB Summer	Good Upwards Far	0.037	0.053	1304.5	0.0020	0.039‡
	TWB Winter	Moderate Upwards Far	0.065	0.090			0.067‡
IE_SH_060_0300 Lower Shannon Estuary	TWB Summer	High (S) Far	0.012	0.020	12412.9	0.0002	0.012‡
	TWB Winter	Good (W) Far	0.025	0.036			0.025‡
IE_SH_060_1100 Fergus Estuary	TWB Summer	*Good (S)*	*0.042*	0.049	1333.5	0.0001	0.042‡
	TWB Winter	*Good (W)*	*0.045*	0.053			0.053‡
IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	CWB Summer	High (S) Far	*0.008*	*0.019*	13317.6	0.0001	0.008‡
	CWB Winter	*Good (W)*	*0.033*	*0.036*			0.033‡

‡ Load from WWTP / SWO following treatment added.

5.3.7 Conclusions

The modelled increased orthophosphate dosing concentrations from direct inputs to receiving waters from agglomerations within the WSZ do not result in a noticeable effect with orthophosphate concentrations in the receiving River Suck (IE_SH_26S070300) a fraction of 1%, as shown by the mass balance assessment in **Table 2 Appendix C**.

The modelled concentrations due to subsurface pathways are insignificant in all river water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies) and therefore there is no risk of deterioration in the orthophosphate indicative quality of the river water bodies, or of preventing the achievement of their WFD objectives.

The highest concentration modelled for receiving water bodies is 0.0005 mg/l to IE_SH_26T030300 Termon Stream_010, which does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l).

The predicted loads to groundwater bodies are undetectable or negligible (i.e. < 0.00175 mg/l = 5% of the Good / Fail boundary), as such the additional potential concentration to both water bodies is undetectable, and the overlaying surface water bodies are not at risk of failing.

There are no transitional or coastal water bodies directly affected by the Mullaghdoey Reservoir WTP and associated Castlerea WSZ.

The cumulative assessment of dosing at Mullaghdoey Reservoir WTP together with other WTPs which may be subject to dosing in the same catchments, has demonstrated that there will not be a significant effect on receiving water bodies. These WTPs are also subject to their own Screening for AA.

Therefore, there is no risk of deterioration in the orthophosphate indicative quality of the water bodies as a result of the proposed project and the dosing will not prevent the achievement of the WFD objectives for these water bodies.

6 EVALUATION OF LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

Mullaghdoey Reservoir is not located within or directly adjacent to the boundary of any European Site. The closest site with connectivity to the proposal is Corliskea/Trien/Cloonfelliv Bog SAC and Mullygollan Turlough SAC located approximately 5.5km and 6.5 km from the reservoir. Therefore, there is no potential for direct impacts to the European Sites as a result of the construction of the corrective water WTP at Mullaghdoey Reservoir WTP.

The Mullaghdoey Reservoir site lies 1.6km north of the River Suck (Suck_030) and 1.7 km west from the Smaghrann_020. These RWBs discharge to the main channel of the Suck and as such supports connectivity with a number of European sites.
From the minor scale of the proposed construction works, the existing habitats surrounding the WTP will act to isolate any surface water flow paths from the works area to the river and as outlined in the impact assessment presented in **Section 5.3.1** above; there are no impact pathways identified which give rise to connectivity between the proposed construction works and any other European Sites.

In addition, Mullaghdoey Reservoir overlies the Suck South (IE_SH_G_225) groundwater body. This is a large groundwater body that intersects a large number of European Sites: Corliskea/Trien/Cloonfelliv Bog SAC, Kilsallagh Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Camderry Bog SAC, Curralehanagh Bog SAC, Shankhill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, River Suck Callows SPA, Aughrim (Aghrane) Bog SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Four Roads Turlough SPA, Lough Croan Turlough SAC, Lough Croan Turlough SPA, Killeglan Grassland SAC and Castlesampson Esker SAC.

Potential source receptor pathways have been ruled out for; Kilsallagh Bog SAC, Croaghill Turlough SAC, Coolcam Turlough SAC, Williamstown Turloughs SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Camderry Bog SAC, Curralehanagh Bog SAC, Shankhill West Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Carrownagappul Bog SAC, River Suck Callows SPA, Aughrim (Aghrane) Bog SAC, Ballinturly Turlough SAC, Lisduff Turlough SAC, Four Roads Turlough SAC, Four Roads Turlough SPA, Lough Croan Turlough SAC, Lough Croan Turlough SPA, Killeglan Grassland SAC and Castlesampson Esker SAC. For the remaining European Sites, the interference with the underlying water table will be unlikely to occur owing to the nature of the construction works. The proposed construction works will be localised and contained within the WTP development boundary which is comprised of buildings, hardstanding and amenity grassland. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects on the receiving ground or surface water bodies and by extension those European Sites as a result of the construction of the corrective water WTP at Mullaghdoey Reservoir WTP.

Therefore, it can be concluded on the basis of objective scientific information that the construction of the corrective water WTP at Mullaghdoey Reservoir WTP, individually or in combination with other plans or projects, will not to have likely significant effects on European Sites.

6.2 OPERATIONAL PHASE

The key pressure associated with the proposed orthophosphate dosing is the potential for increased orthophosphate levels in the receiving waters which support the qualifying interests (habitats and species) identified in **Table 4-3** that are both water dependent and nutrient sensitive (**Appendix B**). The likelihood of significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.2.1 Corliskea/Trien/Cloonfelliv Bog SAC 002110

6.2.1.1 (7110) Active Raised Bogs, Degraded raised bogs still capable of natural regeneration, (7150) Depressions on peat substrates of the *Rhynchosporion* and (91D0) Bog woodland

Corliskea/Trien/Cloonfelliv Bog SAC is comprised of a complex of three separate raised bogs located approximately 5km south of Castlerea and straddling the Roscommon/Galway county border. The bog supports a large and wet raised bog ecosystem with well-developed pool and hummock systems, large diverse flushes, subterranean streams with swallow holes and lakes. The site is designated for the Annex I habitats: active raised bogs; degraded raised bogs, depressions on peat substrates of the *Rhynchosporion* and bog woodland.

Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*) (NPWS, 2013[23]). Bog woodland is present within wooded flushes which support thick carpets of S*phagnum* at the ground layer. Based on the close ecological relationship between these four habitats types, it is not necessary to set SSCOs for these habitats individually. It is considered that should favourable conservation condition for active raised bogs be achieved on the site, then, as a consequence, favourable conservation condition for the other two habitats would also be achieved (NPWS, 2016[24]).

Ombrotophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. There is some evidence of calcareous regional groundwater influences in

[23] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002110.pdf

[24] https://www.npws.ie/sites/default/files/publications/pdf/Corliskea%20Trien%20Cloonfelliv%20Bog%20SAC%20(002110)%20Conservation%20objectives%20supporting%20document%20-%20Raised%20Bog%20habitats%20[Version%201].pdf

cutover areas surrounding the high bog. The SSCOs for these habitats includes a target for the attribute water quality i.e. *Water quality on the high bog and in transitional areas close to natural reference conditions* (NPWS, 2016[25]).

Table 5-2 identifies the groundwater body which is hydrologically connected to the Corliskea/Trien/Cloonfelliv Bog SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The groundwater body connected to the site are: Suck South (IE_SH_G_225) and Castlerea (IE_SH_G_053)

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the groundwater body, Suck South (IE_SH_G_225) and Castlerea (IE_SH_G_053) is negligible, (0.0001 mg/l and 0.0003mg/l respectively) . As this concentration does not exceed 5% of the Good / Fail indicative quality boundary (i.e. <0.00175mg/l) there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

6.2.2 Mullygollan Turlough SAC 000612

6.2.2.1 (3180) Turloughs*

Mullygollan Turlough SAC is located between Castleplunket and Tulsk in Co. Roscommon (NPWS, 2014)[26]. The site comprises a basin with rocky outcrops to the north and sloped drift-covered fields to the south. The site supports a range of contrasting wet and dry areas with a semi-permanent stream and swallow hole, providing habitat for a diverse range of plant species, including those associated with bog habitats in the centre and more marginal and emergent vegetation around the edges. Notable plants include the scarce water sedge *Carex aquatilis* and lesser water-parsnip *Berula erecta*. The site is subject to cattle grazing which, in places, has led to a degradation of the supported habitats.

The SSCO for the habitat turloughs in Mullygollan Turlough SAC (NPWS, 2016)[27] are to restore the favourable conservation condition of the habitat. According to NPWS (2013)[28], turloughs are a depression in karst limestone that temporarily and/or seasonally floods from groundwater. There is usually winter flooding, and recession of flood water during summer, though this varies greatly with rainfall and groundwater dynamics, and there is considerable variation in flooding regime among different turloughs. Turloughs lack a permanent overland outflow, though sometimes there is

[25] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002110.pdf
[26] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000612.pdf
[27] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000612.pdf
[28] https://www.npws.ie/sites/default/files/publications/pdf/Art17-Vol1-web.pdf

overland inflow. They are entirely restricted to well-bedded, relatively pure karst Carboniferous limestone. Turloughs typically contain wetland vegetation communities in their lower zones, and communities more characteristic of drier limestone soils in their upper zones. Turloughs therefore do not generally contain unique vegetation types and in some cases may not be easy to distinguish from other wetlands. Among the pressure and threats causing impacts in turloughs is diffuse groundwater pollution due to non-sewered population.

Turloughs, being groundwater fed, are typically associated with high water quality. This is demonstrated by naturally low dissolved nutrients, clear water and low algal growth. O'Connor (2017[29]) provides indicative targets for Total Phosphorus (TP) in turloughs. O'Connor states that while it may ultimately be necessary to set site-specific TP targets for turloughs, a target of ≤10µg/l TP can be applied for more oligotrophic sites containing marl lake communities and/or dominated by fen and other sedge-rich vegetation of low-fertility and high species diversity. For less oligotrophic turloughs, where study demonstrates it can maintain favourable condition for the long-term, a target of ≤20µg/l TP can be applied. Where nutrient concentrations are lower than the targets, there should be no upward trend in concentrations (O'Connor, 2017). There is no orthophosphate-specific targets provided for turloughs.

Table 5-2 identifies the groundwater bodies which are hydrologically or hydrogeologically connected to Mullygollan Turlough SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The groundwater body hydrogeologically connected to the site is Carrick on Shannon (IE_SH_G_048).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

The modelled orthophosphate concentration in Carrick on Shannon (IE_SH_G_048) is undetectable i.e. 0.0000 mg/l. As such there is no risk of deterioration in the indicative quality of the groundwater body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that there will be no likely significant effects on this habitat. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.3 Bellanagare Bog SAC 000529

6.2.3.1 (7110) Active Raised Bogs, Degraded raised bogs still capable of natural regeneration, (7150) and Depressions on peat substrates of the *Rhynchosporion*

Bellanagare Bog SAC is a large bog situated approximately 6km north-east of Castlerea in Co. Roscommon. The bog is classified as a western or intermediate raised bog due to it supporting features

[29] NPWS (2017) Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation.

which are typically associated with upland blanket bog, in addition to the more typical lowland raised bog features. The bog supports an undulating surface with peat ridges and flushes located within the adjacent furrows, a number of streams are also present within the site. The site is designated for the Annex I habitats: active raised bogs; degraded raised bogs and depressions on peat substrates of the *Rhynchosporion*.

Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*) (NPWS, 2013[30]). Bog woodland is present within wooded flushes which support thick carpets of S*phagnum* at the ground layer. Based on the close ecological relationship between these four habitats types, it is not necessary to set SSCOs for these habitats individually. It is considered that should favourable conservation condition for active raised bogs be achieved on the site, then, as a consequence, favourable conservation condition for the other two habitats would also be achieved (NPWS, 2016[31]).

Ombrotophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. There is some evidence of calcareous regional groundwater influences in cutover areas surrounding the high bog. The SSCOs for these habitats includes a target for the attribute water quality i.e. *Water quality on the high bog and in transitional areas close to natural reference conditions* (NPWS, 2016[32]).

Table 5-2 identifies the surface and groundwater bodies which are hydrologically connected to the Bellanagare Bog SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The river water bodies include: Termon Stream_010 (IE_SH_26T030300)
- The groundwater body connected to the site is: GWDTE-Bellanagare Bog (SAC000592) IE_SH_G_241

[30] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000592.pdf

[31] https://www.npws.ie/sites/default/files/publications/pdf/Bellanagare%20Bog%20SAC%20(000592)%20Conservation%20objectives%20supporting%20document%20-%20Raised%20Bog%20habitats%20[Version%201].pdf

[32] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000592.pdf

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the river water body: Termon Stream_010 (IE_SH_26T030300) is 0.0005 mg/l. Therefore, there is no risk of deterioration in the current status of the water bodies due to dosing at Mullaghdoey Reservoir WTP (**Appendix C**).

The modelled increase in orthophosphate concentration in the groundwater body GWDTE-Bellanagare Bog (SAC000592) IE_SH_G_241 is negligible, (0.0002 mg/l). As this concentration does not exceed 5% of the Good / Fail indicative quality boundary there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

6.2.4 Cloonchambers Bog SAC 000600

6.2.4.1 (7110) Active Raised Bogs, Degraded raised bogs still capable of natural regeneration, (7150) and Depressions on peat substrates of the *Rhynchosporion*

Cloonchambers Bog SAC is a large relatively intact bog situated approximately 6km west of Castlerea in Co. Roscommon. The Bog supports two elongated peat-filled basins separated by a band of mineral fen. The site is designated for the Annex I habitats: active raised bogs; degraded raised bogs and depressions on peat substrates of the *Rhynchosporion*.

Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*) (NPWS, 2013[33]). Bog woodland is present within wooded flushes which support thick carpets of S*phagnum* at the ground layer. Based on the close ecological relationship between these four habitats types, it is not necessary to set SSCOs for these habitats individually. It is considered that should favourable conservation condition for active raised bogs be achieved on the site, then, as a consequence, favourable conservation condition for the other two habitats would also be achieved (NPWS, 2016[34]).

[33] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000600.pdf

[34] https://www.npws.ie/sites/default/files/publications/pdf/Cloonchambers%20Bog%20SAC%20(000600)%20Conservation%20objectives%20supporting%20document%20-%20Raised%20Bog%20habitats%20[Version%201].pdf

Ombrotophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. There is some evidence of calcareous regional groundwater influences in cutover areas surrounding the high bog. The SSCOs for these habitats includes a target for the attribute water quality i.e. *Water quality on the high bog and in transitional areas close to natural reference conditions* (NPWS, 2016[35]).

Table 5-2 identifies the groundwater body which is hydrologically connected to the Cloonchambers Bog SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The groundwater body connected to the site is: Suck North (IE_SH_G_224)

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the groundwater body Suck North (IE_SH_G_224) is undetectable, (0.0000 mg/l). As such there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

6.2.5 Drumalough Bog SAC 002338

6.2.5.1 (7110) Active Raised Bogs, Degraded raised bogs still capable of natural regeneration, (7150) and Depressions on peat substrates of the *Rhynchosporion*

Drumalough Bog SAC is located approximately 5km north-west of Castlerea in Co. Roscommon and comprises three separate sub-sites which were once adjoin but are now separated by areas of cutover bog. Two of these sites support high bog and associated cutover with the third supporting open water and associated marginal vegetation. The site is designated for the Annex I habitats: active raised bogs; degraded raised bogs and depressions on peat substrates of the *Rhynchosporion*.

Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following

[35] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000600.pdf

features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*) (NPWS, 2013[36]). Bog woodland is present within wooded flushes which support thick carpets of S*phagnum* at the ground layer. Based on the close ecological relationship between these four habitats types, it is not necessary to set SSCOs for these habitats individually. It is considered that should favourable conservation condition for active raised bogs be achieved on the site, then, as a consequence, favourable conservation condition for the other two habitats would also be achieved (NPWS, 2016[37]).

Ombrotophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. There is some evidence of calcareous regional groundwater influences in cutover areas surrounding the high bog. The SSCOs for these habitats includes a target for the attribute water quality i.e. *Water quality on the high bog and in transitional areas close to natural reference conditions* (NPWS, 2016[38]).

Table 5-2 identifies the groundwater body which is hydrologically connected to the Drumalough Bog SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The groundwater body connected to the site is: Suck North (IE_SH_G_224)

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the groundwater body Suck North (IE_SH_G_224) is undetectable, (0.0000 mg/l). As such there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

[36] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002338.pdf
[37] https://www.npws.ie/sites/default/files/publications/pdf/Drumalough%20Bog%20SAC%20(002338)%20Conservation%20objectives%20supporting%20document%20-%20[Version%201].pdf
[38] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002338.pdf

6.2.6 Cloonshanville Bog SAC 000614

6.2.6.1 (7110) Active Raised Bogs, Degraded raised bogs still capable of natural regeneration, (7150) Depressions on peat substrates of the *Rhynchosporion* and (91D0) Bog woodland

Cloonshanville Bog SAC is located approximately 4km east of Frenchpark in Co. Roscommon. The bog developed in a shallow basin, within a groundwater discharge zone and is underlain by low-permeability clayey limestone. The site is designated for the Annex I habitats: active raised bogs; degraded raised bogs, depressions on peat substrates of the *Rhynchosporion* and bog woodland.

Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The *Rhynchosporion* habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*) (NPWS, 2013[39]). Bog woodland is present within a large flush in the centre of the bogs dome. Based on the close ecological relationship between these four habitats types, it is not necessary to set SSCOs for these habitats individually. It is considered that should favourable conservation condition for active raised bogs be achieved on the site, then, as a consequence, favourable conservation condition for the other two habitats would also be achieved (NPWS, 2016[40]).

Ombrotophic peat waters found on the surface of raised bogs are characterised by low pH values (pH < 4.5) and also have low values of electrical conductivity. This is due to the fact that the raised bog system derives its mineral supply from precipitation, which is usually acidic and low in nutrients. Raised bog vegetation exchanges cations with protons to further reduce the pH. Hydrochemistry varies in the areas surrounding a raised bog. Locally, conditions may be similar to the high bog due to a dominance of water originating from the bog. However, elsewhere in the marginal areas, there may be increased mineral and nutrient content of the water due to regional groundwater influences, run-off from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. There is some evidence of calcareous regional groundwater influences in cutover areas surrounding the high bog. The SSCOs for these habitats includes a target for the attribute water quality i.e. *Water quality on the high bog and in transitional areas close to natural reference conditions* (NPWS, 2016[41]).

Table 5-2 identifies the surface water bodies which are hydrologically connected to the Cloonshanville Bog SAC and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey WTP:

- The river water bodies include: Owennaforeesha_010 (IE_SH_26O040100) and Breedoge_010 (IE_SH_26B090300).

[39] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000614.pdf

[40] https://www.npws.ie/sites/default/files/publications/pdf/Cloonshanville%20Bog%20SAC%20(000614)%20Conservation%20objectives%20supporting%20document%20-%20Raised%20Bog%20habitats%20[Version%201].pdf

[41] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000614.pdf

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the river water bodies: Owennaforeesha_010 (IE_SH_26O040100) (0.0001 mg/l) and and Breedoge_010 (IE_SH_26B090300) (undetectable i.e. 0.0000 mg/l). Therefore, there is no risk of deterioration in the current status of the water bodies due to dosing at Mullaghdoey Reservoir WTP (**Appendix C**).

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

6.2.7 Bellanagare Bog SPA 004105

Bellanagare Bog is a large bog situated approximately 6km north-east of Castlerea in Co. Roscommon. The bog is classified as a western or intermediate raised bog due to it supporting features which are typically associated with upland blanket bog, in addition to the more typical lowland raised bog features. The bog is underlain by muddy carboniferous limestone with low permeability. At the time of the sites designation its feature of interest was its use by an internationally important population of Greenland white-fronted goose however in recent years this population has abandoned its use of the bog and instead utilises grassland fields within the locality. Red grouse *Lagopus lagopus scotica* are also known to occur at the site. A single bird species is listed as an SCI; Greenland White-Fronted Goose this SCI is considered to be nutrient sensitive (**Appendix B**) and water dependent.

There are no specific targets for each species/habitat within the COs (NPWS 2016[42]), however, the main objective is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. In addition, wetlands form part of this SPA and there is an objective to maintain or restore the favourable conservation condition of the wetland habitat at Bellanagare Bog SPA as a resource for the Greenland white-fronted geese that utilise it.

As such the habitats comprising Bellanagare Bog SPA, as discussed above in respect of Bellanagare SAC, are largely Active raised bog and its associated communities: Degraded raised bogs still capable of natural regeneration and depressions on peat substrates of the *Rynchosporion.*

Table 5-2 identifies the surface and groundwater bodies which are hydrologically connected to the Bellanagare Bog SPA and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The river water bodies include: Termon Stream_010 (IE_SH_26T030300)
- The groundwater body connected to the site is: GWDTE-Bellanagare Bog (SAC000592) IE_SH_G_241

[42] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004105.pdf

The EAM has assessed the potential for impact on water quality and nutrient conditions and has based this assessment on a conservative basis using all available riverine flows. Full details of the assessment are provided in **Appendix C** and discussed above in **Section 5**.

The modelled increase in orthophosphate concentration in the river water body: Termon Stream_010 (IE_SH_26T030300) is 0.0005 mg/l. Therefore, there is no risk of deterioration in the current status of the water bodies due to dosing at Mullaghdoey Reservoir WTP (**Appendix C**).

The modelled increase in orthophosphate concentration in the groundwater body GWDTE-Bellanagare Bog (SAC000592) IE_SH_G_241 is negligible, (0.0002 mg/l). As this concentration does not exceed 5% of the Good / Fail indicative quality boundary there is no risk of deterioration in the indicative quality of the water body, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Mullaghdoey Reservoir WTP, it has been demonstrated that the potential for likely significant effects on these habitats can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitats.

6.2.8 River Suck Callows SPA 004097

The River Suck Callows SPA is a linear, sinuous site comprising a section of the River Suck from Castlecoote, Co. Roscommon to its confluence with the River Shannon close to Shannonbridge, a distance of approximately 70 km along the course of the river[43]. The river forms part of the boundary between Counties Galway and Roscommon. The site includes the River Suck itself and the adjacent areas of seasonally-flooded semi-natural lowland wet callow grassland. There are five bird species listed as SCIs; Whooper Swan, Wigeon, Golden Plover, Lapwing and Greenland White-Fronted Goose. It is also of SCI for wetland habitat. All SCIs are considered nutrient sensitive (**Appendix B**) and water dependent.

There are no specific targets for each species/habitat within the COs (NPWS 2016[44]), however, the main objective is to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. In addition, wetlands form part of this SPA and there is an objective to maintain or restore the favourable conservation condition of the wetland habitat at River Suck Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[45]) the risk assessment carried out by the EPA for these water dependent European Site protected areas has focussed on looking at the risks to the water standards/objectives established for the purpose of supporting Good Ecological Status (GES). GES, which is the default objective of the WFD, is considered adequate for supporting many water dependent European Site protected areas where site specific environmental supporting conditions have not been defined within SSCOs by the NPWS.

[43] NPWS 2014 River Suck Callows SPA 004097 Site Synopsis
[44] NPWS 2016 River Suck Callows SPA 004097 Conservation Objectives
[45] DHPLG (2018) The River Basin Management Plan for Ireland (2018-2021)

The River Suck Callows SPA is an important site for wintering waterfowl. Of particular note is the nationally important Greenland White-fronted Goose flock which congregates mainly in the middle reaches of the river. The other four species occur in populations of national importance.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to River Suck Callows SPA and will receive inputs from the proposed orthophosphate dosing at Mullaghdoey Reservoir WTP:

- The river water bodies hydrologically connected to the site include: Francis_010 (IE_SH_26F050050), Francis_020 (IE_SH_26F050300), Smaghraan 26_020 (IE_SH_26S040200), Suck_030 (IE_SH_26S070300), Suck_040 (IE_SH_26S070400), Suck_050 (IE_SH_26S070500), Termon Stream_010 (IE_SH_26T030300), Island_030 (IE_SH_26I030400), Suck_060 (IE_SH_26S070600), Suck_070 (IE_SH_26S070650) and Suck_160 (IE_SH_26S071550).
- The groundwater body hydrogeologically connected include: Suck South (IE_SH_G_225).

The EAM has assessed the potential for impact on orthophosphate indicative quality and has based this assessment on a conservative basis using all available flows data. Full details of the assessment results are provided in **Appendix C** and discussed above in **Section 5**.

The hydrological connection via the Scramoge River has been excluded as the modelled additional concentration within the Scramoge_020 is undetectable (0.0000mg/l) and this water body is located >100km upstream of the SPA. The modelled increase in post-dosing concentration in the river water bodies connected to the SAC do not exceed 5% of the High / Good indicative quality boundary (<0.00125 mg/l). The modelled post-dosing increase in concentration in Francis_010 (IE_SH_26F050050) (0.0000 mg/l), FRANCIS_020 (IE_SH_26F050300) (0.0003 mg/l), Smaghraan 26_020 (IE_SH_26S040200) (0.0001 mg/l), Suck_030 (IE_SH_26S070300) (0.0002 mg/l), Suck_040 (IE_SH_26S070400) (0.0002 mg/l), SUCK_050 (IE_SH_26S070500) (0.0002 mg/l), Termon Stream_010 (IE_SH_26T030300) (0.0005 mg/l), Island_030 (IE_SH_26I030400) (0.0000 mg/l), Suck_060 (IE_SH_26S070600) (0.0001 mg/l), SUCK_070 (IE_SH_26S070650) (0.0001 mg/l) and Suck_160 (IE_SH_26S071550) (0.0000 mg/l). There is therefore no risk of deterioration of the orthophosphate indicative quality of these river water bodies, or of preventing the achievement of WFD objectives.

The modelled post-dosing increase in concentration in Suck South (IE_SH_G_225) groundwater body is negligible (0.0001 mg/l) (see **Table 5-2**). Therefore orthophosphate dosing at Mullaghdoey Reservoir WTP will not result in deterioration of the indicative quality of this water body, or prevent the achievement of WFD objectives.

In light of the EAM assessment which has determined that there is no risk of deterioration in the indicative quality of the water bodies that support the structure and function of the SPA; the additional loading from the orthophosphate dosing will therefore have no likely significant effect on the maintenance or restoration of favourable conservation status of its SCIs, either in terms of individual bird species or wetland habitats.

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

In order to ensure all potential impacts upon European Sites within the project's ZoI were considered, including those direct and indirect impacts 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 impacts are likely to be significant.

A search of Roscommon County Council's planning enquiry system was conducted for developments that may have in-combination effects on European Sites with the ZoI. Plans and projects relevant to the area were searched in order to identify any elements of the plans and projects 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 as listed in **Table 6-1** below.

Table 6-1: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Draft Roscommon County Development Plan 2021-2027[46] Some key aspects of the Plan include, *inter alia*: **Strategic Aim 11** of the plan it to protect and enhance assets of County Roscommon, including clean water, biodiversity, landscape, green infrastructure, heritage and agricultural land. **PPH 3.18** aims to promote the provision of serviced sites, supported by Irish Water infrastructure, in order to provide opportunity for people to build their own home and live within the existing footprint of the villages. **RD 5.6** relates to the protection of natural watercourses and wildlife habitats from forestry pollution. **ITC 7.29 to 7.45** aim to develop and upgrade the water supply, eliminate deficiencies, ensure compliance with relevant standards and legislation, promote water conservation and sustainability measures, promote better design, planning and management of water supply schemes. **ITC 7.48 to 7.49 aims** to ensure protection and enhancement of the water environment in locations where flood risk management works are undertaken. **NH 10.4 to 10.5** aims to ensure that Article 6(3) is implemented and where necessary Article 6(4) of the Habitats Directive and ensure that Appropriate Assessment is carried out in relation to works, plans and projects likely to impact on European sites. **NH10.15 to 10.16** aims to ensure that the county's watercourses are retained for their biodiversity and flood protection values and to conserve and enhance where possible, the wildlife habitats of the County's rivers and riparian zones, lakes, canals and streams which occur outside of designated areas to provide a network of habitats and biodiversity corridors throughout the county. To protect waterbodies and watercourses from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains.	▪ N/A	The County Development Plan includes objectives for the provision of adequate services and aims to continue the development and improvement of water supply and drainage systems to meet the anticipated requirements of the county. In terms of water supply, it is important to ensure an adequate, potable and clean supply of water to all people, in accordance with applicable quality standards. Policy relating to water services must have regard to the requirements of the WFD and Groundwater Directive and to the Urban Wastewater Directive. GW and major SW sources are important to the development of the county. The protection of these resources is of major concern to the Council. The Plan takes cognisance of the GW Protection Plans and GW vulnerability in the county and shall adopt a Water Quality Management Plan for the county. It is the council's aim to protect waterbodies and watercourses (both inside and outside of designations) from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains.
River Basin Management Plan For Ireland 2022 – 2027 The Third Cycle Draft River Basin Management Plan 2022-2027 Consultation Report has been published. This report presents a summary of the issues raised in the submissions reviewed from the public consultation on the draft River Basin Management Plan for Ireland 2022-2027.	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and

[46] Draft Roscommon County Development Plan 2021-2027

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
The 3rd cycle of River Basin Management Plan (RBMP) for the period of 2022-2027 is currently being prepared by Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). The document (Chapter 3) sets out the condition of Irish waters and a summary of status for all monitored waters in the 2013 – 2018 period, including a description of the changes since 2007 – 2009 and 2010-2015. A large number of river waterbodies are still declining and unless this is addressed, sustained and progressive improvements in water quality will be difficult to achieve. Overall, 53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2027. This work was presented in the RBMP for 4,842 water bodies nationally. 1,603 water bodies were classed *At Risk* or 33%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 1,000 water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		• 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 water body. 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 given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.
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; ▪ 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 water bodies. 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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts 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; ▪ Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[47]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the 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	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[48], and AA[49]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed

[47] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[48] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[49] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

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

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		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 water bodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[51]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	The overarching strategy was subject to Appropriate Assessment 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.

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
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; ▪ 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.
National Water Resources Plan – Framework Plan This Framework will deliver a sustainable water supply on a catchment and water resource zone basis, meeting growth and demand requirements through drought and critical periods. The resources plan takes account of WFD objectives and the programme of measures proposed in the relevant catchments and water resource zones. Specific measures in the plan with relevance to Irish Water include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The SEA Environmental Report for the Framework Plan has made mitigation recommendations for the implementation of the Framework Plan which are included in the Environmental Action Plan (EAP), and the EAP will provide a basis for tracking recommendations from the SEA and NIS during the Framework Plan implementation and Regional Plan development. A Monitoring Plan has also been developed which covers the integration of environmental and sustainability considerations throughout implementation of the Framework Plan and the options development

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		methodology and provides a framework for future long-term monitoring. Therefore, no likely significant in-combination effects are envisaged.
Planning Applications There are a relatively limited number of planning applications approved, pending or recently approved within the Castlerea WSZ, with these largely focussed within Castlerea town itself. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure, including residential dwellings and associated garages, agricultural structures and change of use applications.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	Adherence to the overarching policies and objectives of the Roscommon County Development Plan 2014-2020 will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive. Effluent from proposed and new infrastructure connected to the Castlerea Drainage systems will be treated prior to discharge, negating the potential for cumulative impacts in the receiving environment.
Integrated Pollution Control (IPC) Licensing Roscommon has a number of Industrial Emission licences (IEL) and IPC licensed facilitates including Alkermes Pharma Ireland Ltd., Arran Chemical Company Ltd. and Jazz Pharmaceuticals located at Monksland, south of Lough Ree, Kepak Athleague located south of the WSZ, Dawn Country Meats Ltd. and Aurivo Dairy Ingredients Ltd. in north Roscommon, Glanbia (FP) Ltd., Irish Rubber Components Ltd., Knockhall Farms Ltd. and Laragan Farms Ltd. north of Lough Ree. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities (e.g. pharmaceutical) are licensed by the EPA to prevent or reduce emissions to air, water and land, reduce water and use energy/resources efficiently. An IPC licence is a single integrated licence which covers all emissions from the facility and its environmental management. All related operations that the licence holder carries in connection with the activity are controlled by this licence.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The EPA is responsible for monitoring emissions and dealing with any infringements on IPC licences. All emissions must be within set limits which must not be contravened. Limits are set for phosphorus where relevant. Compliance with the limits set for phosphorus will ensure that there will be no significant in-combination impacts on European Sites.

7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and orthophosphate dosing at the Mullaghdoey Reservoir WTP, associated with the Longford Springs WTP, within the Castlerea WSS WSZ and the in combination with other plans or projects, is likely to have a significant effect on European Sites.

The appraisal undertaken in this Screening assessment has been informed by an EAM (see **Appendix C**) with reference to qualifying interests/special conservation interests for the European Sites potentially affected by the proposed project, in order to provide a scientific basis for the evaluations.

During the construction phase of the corrective water WTP at Mullaghdoey Reservoir WTP the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Corliskea/Trien/Cloonfelliv Bog SAC and Mullygollan Turlough SAC) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI.

During the operational phase the potential for direct, indirect and cumulative impacts affecting Corliskea/Trien/Cloonfelliv Bog SAC, Mullygollan Turlough SAC, Bellanagare Bog SAC, Cloonchambers Bog SAC, Drumalough Bog SAC, Cloonshanville Bog SAC, Bellanagare Bog SPA and River Suck Callows SPA has been assessed. Due to the low orthophosphate inputs following dosing at Mullaghdoey Reservoir WTP and no risk of deterioration in the orthophosphate indicative quality of the receiving water bodies or of preventing the achievement of WFD objectives, there will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Sites within the ZoI. This is concluded with regard to the range, population densities and overall conservation status of the habitats and species for which these sites are designated (i.e. Conservation Objectives).

The screening has been carried out on the basis of the information presented in the Project Description. It has been concluded that the project it is not connected or necessary to the management of any European Site. It can be concluded on the basis of objective scientific information and in view of best scientific knowledge, the proposed orthophosphate dosing and associated construction works at the Mullaghdoey Reservoir WTP; individually or in combination with other plans or projects, will not have a significant effect on any European Sites. Therefore, AA is not required.

8 REFERENCES

Council Directive 79/409 EEC on the Conservation of Wild Birds.

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. Irish Wildlife Manuals, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland

DEHLG (2010). Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning *Authorities.* Produced by the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Environment Agency (2006). Use and design of oil separators in surface water drainage systems: PPG 3.https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf.

EPA (2010) Methodology for establishing groundwater threshold values and the assessment of chemical and quantitative status of groundwater, including an assessment of pollution trends and trend reversal. 57 pp.
http://www.epa.ie/pubs/reports/water/ground/Methodology%20for%20Groundwater%20Chemical%20&%20Quantitative%20Status%20Methology,%20TVs%20and%20Trends.pdf

European Commission (2000a) Communication from the Commission on the Precautionary Principle, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b). *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2002). *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*. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2011). *Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones, with particular attention to port development and dredging*. European Communities (Natural Habitats) Regulations (S.I. No. 477 of 2011)

King, J.L.; Marnell, F.; Kingston, N.; Rosell, R.; Boylan, P.; Caffrey, J.M.; FitzPatrick, Ú.; Gargan, P.G.; Kelly, F.L.; O'Grady, M.F.; Poole, R.; Roche, W.K.; Cassidy, D. (2011). *Red Lists Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2009). *Threat response plan: otter (2009 - 2011).* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2013a) Article 17 Overview Report (Vol. 1) The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013c) Article 17 Species Conservation Assessments (Vol. 3) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

UKTAG (2009) Reporting confidence in groundwater status assessments. 4pp.
http://www.wfduk.org/resources%20/reporting-confidence-groundwater-status-ssessments

APPENDIX A

European Sites – Conservation Objectives

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. Links to the COs for the European Sites relevant to this Screening for AA are provided below.

Site Name (Code)	Conservation Objectives Source
Corliskea/Trien/Cloonfelliv Bog SAC (002110)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002110.pdf
Mullygollan Turlough SAC (000612)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000612.pdf
Bellanagare Bog SAC (000592)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000592.pdf
Cloonchambers Bog SAC (000600)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000600.pdf
Drumalough Bog SAC (002338)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002338.pdf
Cloonshanville Bog SAC (000614)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000614.pdf
Bellanagare Bog SPA (004105)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004105.pdf
River Suck Callows SPA (004097)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004097.pdf

APPENDIX B

Nutrient Sensitive Qualifying Interests

Water dependant and nutrient sensitive SAC species

Code	Qualifying Interest	Water dependant	Nutrient sensitive
1013	Whorl snail (*Vertigo geyeri*)	Yes	Yes
1014	Whorl snail (*Vertigo angustior*)	Yes	Yes
1016	Whorl snail (*Vertigo moulinsiana*)	Yes	Yes
1024	Kerry Slug (*Geomalacus maculosus*)	No	Yes
1029	Freshwater Pearl mussel (*Margaritifera margaritifera*)	Yes	Yes
1065	Marsh Fritillary (*Euphydryas aurinia*)	Yes	No
1092	White-clawed crayfish (*Austropotamobius pallipes*)	Yes	Yes
1095	Sea lamprey (*Petromyzon marinus*)	Yes	Yes
1096	Brook lamprey (*Lampetra planeri*)	Yes	Yes
1099	River lamprey (*Lampetra fluviatilis*)	Yes	Yes
1103	Twaite shad (*Alosa fallax*)	Yes	Yes
1106	Atlantic salmon (*Salmo salar* (freshwater only))	Yes	Yes
1303	Lesser Horseshoe bat (*Rhinolophus hipposideros*)	No	Yes
1349	Bottlenose dolphin (*Tursiops truncatus*)	Yes	Yes
1351	Harbour porpoise (*Phocoena phocoena*)	Yes	Yes
1355	Otter (*Lutra lutra*)	Yes	Yes
1364	Grey seal (*Halichoerus grypus*)	Yes	Yes
1365	Common seal (*Phoca vitulina*)	Yes	Yes
1393	Shining sickle moss (*Drepanocladus vernicosus*)	Yes	No
1395	Petalwort (*Petalophyllum ralfsii*)	Yes	Yes
1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes
1528	Marsh saxifraga (*Saxifraga hirculus*)	Yes	Yes
1833	Slender naiad (*Najas flexilis*)	Yes	Yes
1990	Nore freshwater pearl mussel (*Margaritifera durrovensis*)	Yes	Yes
5046	Killarney shad (*Alosa fallax killarnensis*)	Yes	Yes

Water dependant and nutrient sensitive SAC habitats

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
1110	Sandbanks which are slightly covered by sea water all the time	Yes		Yes
1130	Estuaries	Yes		Yes
1140	Mudflats and sandflats not covered by seawater at low tide	Yes		Yes
1150	Coastal lagoons	Yes		Yes
1160	Large shallow inlets and bays	Yes		Yes
1170	Reefs	Yes		Yes
1180	Submarine structures made by leaking gases	No		No
1210	Annual vegetation of drift lines	Yes		Yes
1220	Perennial vegetation of stony banks	Yes		No
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes		Yes
1310	Salicornia and other annuals colonising mud and sand	Yes		Yes
1320	Spartina swards (*Spartinion maritimae*)	No		No
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	Yes
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	Yes
1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	Yes		Yes
2110	Embryonic shifting dunes	Yes		Yes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes		Yes
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes		Yes
2140	Decalcified fixed dunes with *Empetrum nigrum*	Yes		Yes
2150	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)	Yes		Yes
2170	Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)	Yes	Yes	Yes
2190	Humid dune slacks	Yes	Yes	Yes
21A0	Machairs (* in Ireland)	Yes	Yes	Yes
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes		Yes
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*	Yes		Yes
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	Yes		Yes
3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation	Yes		Yes
3160	Natural dystrophic lakes and ponds	Yes		Yes
3180	Turloughs	Yes	Yes	Yes
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes		Yes
3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and Bidention p.p. vegetation	Yes	Yes	Yes
4010	Northern Atlantic wet heaths with *Erica tetralix* (Flushes only)	Yes	Yes	Yes
4030	European dry heaths	No		Yes
4060	Alpine and Boreal heaths	No		No
5130	*Juniperus communis* formations on heaths or calcareous grasslands	No		No

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
6130	Calaminarian grasslands of the *Violetalia calaminariae*	No (flood risk)*		Yes
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No (flood risk)*		Yes
6230	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No		No
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	Yes
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes	Yes
6510	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	No (flood risk)*		Yes
7110	Active raised bogs	Yes	Yes	Yes
7120	Degraded raised bogs still capable of natural regeneration	Yes	Yes	Yes
7130	Blanket bogs (* if active bog)	Yes	Yes	Yes
7140	Transition mires and quaking bogs	Yes	Yes	Yes
7150	Depressions on peat substrates of the *Rhynchosporion*	Yes	Yes	Yes
7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Yes	Yes	Yes
7220	Petrifying springs with tufa formation (*Cratoneurion*)	Yes	Yes	Yes
7230	Alkaline fens	Yes	Yes	Yes
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	No		No
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	No		No
8210	Calcareous rocky slopes with chasmophytic vegetation	No		No
8220	Siliceous rocky slopes with chasmophytic vegetation	No		No
8240	Limestone pavements	No		Yes
8310	Caves not open to the public	Yes	Yes	Yes
8330	Submerged or partially submerged sea caves	Yes		Yes
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No		Yes
91D0	Bog woodland	Yes	Yes	Yes
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes	Yes
91J0	Taxus baccata woods of the British Isles	No		No

*While this habitat is determined to be non-water dependent, it is incuded in the assessment in terms of flood risk only

Water dependant and nutrient sensitive SPA birds

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes
A003	Great Northern Diver (*Gavia immer*)	Yes	Yes
A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes
A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes
A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes
A013	Manx Shearwater (*Puffinus puffinus*)	Yes	Yes
A014	Storm Petrel (*Hydrobates pelagicus*)	Yes	Yes
A015	Leach's Storm-petrel (*Oceanodroma leucorhoa*)	Yes	Yes
A016	Gannet (*Morus bassanus*)	Yes	Yes
A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes
A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes
A028	Grey Heron (*Ardea cinerea*)	Yes	Yes
A037	Bewick's Swan (*Cygnus columbianus bewickii*)	Yes	Yes
A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes
A043	Greylag Goose (*Anser anser*)	Yes	Yes
A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes
A048	Shelduck (*Tadorna tadorna*)	Yes	Yes
A050	Wigeon (*Anas penelope*)	Yes	Yes
A051	Gadwall (*Anas strepera*)	Yes	Yes
A052	Teal (*Anas crecca*)	Yes	Yes
A053	Mallard (*Anas platyrhynchos*)	Yes	Yes
A054	Pintail (*Anas acuta*)	Yes	Yes
A056	Shoveler (*Anas clypeata*)	Yes	Yes
A059	Pochard (*Aythya ferina*)	Yes	Yes
A061	Tufted Duck (*Aythya fuligula*)	Yes	Yes
A062	Scaup (*Aythya marila*)	Yes	Yes
A063	Eider (*Somateria mollissima*)	Yes	Yes
A065	Common Scoter (*Melanitta n*igra)	Yes	Yes
A067	Goldeneye (*Bucephala clangula*)	Yes	Yes
A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes
A082	Hen Harrier (*Circus cyaneus*)	Yes	Yes
A098	Merlin (*Falco columbarius*)	Yes	Yes
A103	Peregrine (*Falco peregrinus*)	Yes	Yes
A122	Corncrake (*Crex crex*)	Yes	Yes
A125	Coot (*Fulica atra*)	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

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A142	Lapwing (*Vanellus vanellus*)	Yes	Yes
A143	Knot (*Calidris canutus*)	Yes	Yes
A144	Sanderling (*Calidris alba*)	Yes	Yes
A148	Purple Sandpiper (*Calidris maritima*)	Yes	Yes
A149	Dunlin (*Calidris alpina*) (non-breeding)	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
A164	Greenshank (*Tringa nebularia*)	Yes	Yes
A169	Turnstone (*Arenaria interpres*)	Yes	Yes
A179	Black-headed Gull (*Larus ridibundus*)	Yes	Yes
A182	Common Gull (*Larus canus*)	Yes	Yes
A183	Lesser Black-backed Gull (*Larus fuscus*)	Yes	Yes
A184	Herring Gull (*Larus argentatus*)	Yes	Yes
A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes
A191	Sandwich Tern (*Sterna sandvicensis*)	Yes	Yes
A192	Roseate Tern (*Sterna dougallii*)	Yes	Yes
A193	Common Tern (*Sterna hirundo*)	Yes	Yes
A194	Arctic Tern (*Sterna paradisaea*)	Yes	Yes
A195	Little Tern (*Sterna albifrons*)	Yes	Yes
A199	Guillemot (*Uria aalge*)	Yes	Yes
A200	Razorbill (*Alca torda*)	Yes	Yes
A204	Puffin (*Fratercula arctica*)	Yes	Yes
A229	Kingfisher (*Alcedo atthis*)	Yes	Yes
A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes
A466	Dunlin (*Calidris alpina schinzii*) (breeding)	Yes	Yes

APPENDIX C

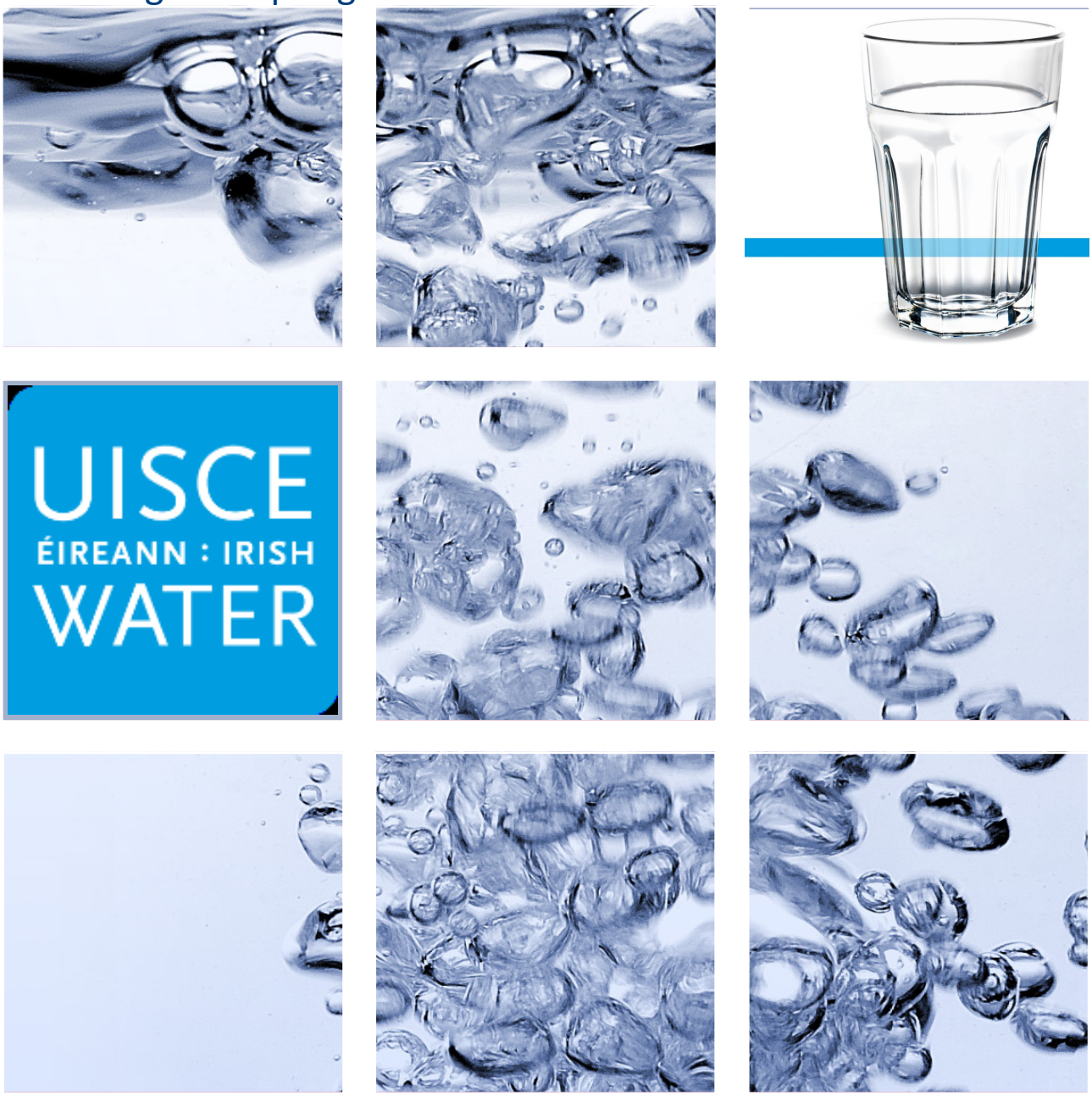
EAM Summary Report

RPS

Irish Water - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

128 Longford Springs WTP – Castlerea WSS



National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 128 Longford Springs WTP – Castlerea WSS (2600PUB1028)

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 128 Longford Springs WTP – Castlerea WSS (2600PUB1028)
Document No:	MDW0766RP_5.1_EAM_128_Longford_F04

Text Pages:	10	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	16th Nov 2018	YE		IP MM		DC	
F02	Final	23nd Jan 2019	IP		MM		DC	
F03	Final	20nd Aug 2019	IP		MM		GJG	
F04	Final	24th Apr 2023	YE		IP		MM	

128 Longford Springs WTP – Castlerea WSS (2600PUB1028)

Supporting spreadsheet: 128_Longford Springs WTP_Castlerea WSS_V03

This EAM report should be read in conjunction with the Irish Water Lead in Drinking Water Mitigation Plan – Environmental Assessment Methodology report (MDE1218Rp0005 F02).

Longford Springs WTP supplies Castlerea, in County Roscommon, which is located in the west of the county, on the banks of River Suck and River Francis. The distribution input for Castlerea WSS is 1870 m^3/day (54% of which is accounted for, the remainder is assumed to be lost through leakage) serving a population of approximately 3,900. The non-domestic demand is 30% of the distribution input.

The area is served by Castlereagh (D0118) WWTP which is licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the Orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There is also one WWTP with a population equivalent of less than 500, namely Ballintober (A0290) WWTP. The impact of the Orthophosphate dosing and the estimated additional load from Ballintober is considered at the water body level via the surface water pathways (see Table 4 in Step 5 and 6: Combined Inputs to Surface Water Bodies). It is estimated that there are 1093 properties across the WSZ that are serviced by a DWWTS.

This assessment has been undertaken for the WSZ in isolation. However, if corrective water treatment is proposed for WTPs in the same catchment area, the cumulative impact from the combined loads to downstream water bodies are assessed (see Summary, Mitigation, and Table 5).

Water Treatment Plant	**Longford Springs WTP**	
Water Supply Zone	**Castlerea WSS (2600PUB1028)** **See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI**	
Step 1 Appropriate Assessment Screening	**European Sites within Zone of Influence**	
	SACs	
	Annaghmore Lough (Roscommon) SAC Aughrim (Aghrane) Bog SAC Ballinturly Turlough SAC Bellanagare Bog SAC Black Head-Poulsallagh Complex SAC Callow Bog SAC Camderry Bog SAC Carrowbehy/Caher Bog SAC Carrowmore Dunes SAC Carrowmore Point To Spanish Point And Islands SAC Carrownagappul Bog SAC Castlesampson Esker SAC Castletaylor Complex SAC Cloonchambers Bog SAC Cloonshanville Bog SAC	- Four Roads Turlough SAC Galway Bay Complex SAC Inagh River Estuary SAC Inisheer Island SAC Inishmaan Island SAC Inishmore Island SAC Kilkee Reefs SAC Kilkieran Bay And Islands SAC Killeglan Grassland SAC Kilsallagh Bog SAC Lisduff Turlough SAC Lisnageeragh Bog and Ballinastack Turlough SAC Lough Croan Turlough SAC Lough Fingall Complex SAC Lough Lurgeen Bog/Glenamaddy

	Connemara Bog Complex SAC Coolcam Turlough SAC Corliskea/Trien/Cloonfelliv Bog SAC Cregduff Lough SAC Croaghill Turlough SAC Curraghlehanagh Bog SAC Derrinea Bog SAC Derrinlough (Cloonkeenleananode) Bog SAC Dog's Bay SAC Drumalough Bog SAC Errit Lough SA	Turlough SAC Lower River Shannon SAC Mullygollan Turlough SAC Murvey Machair SAC Rahasane Turlough SAC Rosroe Bog SAC Shankill West Bog SAC Slyne Head Islands SAC Slyne Head Peninsula SAC Urlaur Lakes SAC Williamstown Turloughs SAC
	SPAs	
	Bellanagare Bog SPA Cliffs of Moher SPA Connemara Bog Complex SPA Four Roads Turlough SPA Illaunonearaun SPA Inishmore SPA Inner Galway Bay SPA	Loop Head SPA Lough Croan Turlough SPA Lough Gara SPA Mid-Clare Coast SPA Rahasane Turlough SPA River Suck Callows SPA Slyne Head To Ardmore Point Islands
	Appropriate Assessment Required – see AA screening report for details	

Step 2 – Direct Inputs to Surface Water

Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 1.2 mg/l

Agglomeration and discharge type	ELV (Ortho P unless otherwise stated) from WWDL (mg/l)	Scenario	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Castlerea Primary Discharge	1	Existing	373.7	0.339	0.271	0.461
		Post Dosing	373.7	0.339	0.271	0.461
Castlerea SWO	n/a	Existing	544.3	16.952	13.561	23.054
		Post Dosing	553.0	17.225	13.780	23.426

Note: The effluent concentrations are compliant with ELVs set in WWDL D0118.

As Castlerea WWTP (receives tertiary treatment, i.e. chemical dosing for nutrient removal, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

Step 3 – Potential impact of Direct Inputs on Receiving Water Bodies

Table 2: Mass balance assessment based on 1.2 mg/l dosing using available background concentrations and mean flow information

Agglom. (WWDL code)	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Castlerea (D0118)	IE_SH_26S070300	0.0200	0.0237	0.0237	0.2

Surface Assessment

River Suck_030 *(IE_SH_26S070300)* – The Castlerea WWTP effluent concentrations are compliant with the ELV for orthophosphate. Tertiary treatment is assumed to remove any additional orthophosphate due to dosing from the effluent and impact due to SWOs is negligible, as shown by the mass balance assessment in Table 2.

Step 4 Distributed Inputs to surface water bodies from sub surface pathways

Subsurface Assessment

The modelled increases in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Good/High boundary for surface water bodies), with highest modelled increase (0.0005 mg/l) occurring in TERMON STREAM_010 (IE_SH_26T030300).

Step 5 and 6: Combined Inputs to Groundwater Bodies

Groundwater Bodies as receptors connected to WSZ

Table 3 gives the modelled loads and concentrations for the assessment of groundwater bodies.

The predicted increases in concentrations to groundwater bodies are insignificant (below 0.00175 mg/l, which is 5% of the Good/Fail boundary for groundwater bodies). The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, and none of the overlying surface waterbodies are at Bad Ecological status, there is no risk of impact on groundwater receptors due to orthophosphate dosing.

Table 3: Increased loading and concentrations to groundwater bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from chemical status of the WB, and the mid-range of that indicative quality is used as Baseline Concentration)***

EU_CD / Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Total Ortho P load to GW kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_G_225 Suck South	Good Upwards Far	0.012	0.026	29.4	0.0001	0.012	MP1
	Good Upwards Far	0.024	0.026			0.024	MP2
	Good Upwards Far	0.022	0.026			0.022	MP3

		Good Upwards Far	0.019	0.026			0.019	MP4
		Good Upwards Far	0.024	0.026			0.024	MP5
		Good Upwards Far	0.006	0.026			0.006	MP6
		Good None Far	0.011	0.026			0.011	MP7
	IE_SH_G_053 Castlerea	*Good*	*0.018*	*0.026*	*1.6*	*0.0003*	*0.018*	
	IE_SH_G_241 GWDTE-Bellanagare Bog (SAC000592)	*Good*	*0.018*	*0.026*	*1.2*	*0.0002*	*0.018*	
	IE_SH_G_224 Suck North	*Good*	*0.018*	*0.026*	*0.3*	*0.0000*	*0.018*	
	IE_SH_G_048 Carrick on Shannon	Good Upwards Far	0.027	0.026	4.5	0.0000	0.027	
	IE_SH_G_054 Castlerea Bellanagare	*Good*	*0.018*	*0.026*	*0.0*	*0.0000*	*0.018*	

MP: multiple Monitoring Points given for waterbody.

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4 gives the modelled loads and concentrations for the combined assessment to rivers. The increased loads due to orthophosphate dosing are predicted to be insignificant, i.e. are below 5% of the Good / High boundary for Ortho P Indicative Quality (0.00125mg/l).

Additional downstream waterbodies are modelled to demonstrate undetectable increase in concentration (0.0000 mg/l) in IE_SH_26S071550 (SUCK_160) and IE_SH_26B090300 (BREEDOGE_010). Waterbodies between IE_SH_26S070650 (SUCK_070) and IE_SH_26S071550 (SUCK_160) are not shown as the increase in concentration is unchanged at negligible levels (0.0001 mg/l).

Table 4 also demonstrates that the small Ballintober WWTP has insignificant impact on IE_SH_26S070500 (SUCK_050) and downstream waterbodies as the increase in modelled concentration due to combined inputs is insignificant.

Table 4B summarises the impact of the dosing on the lake water body, Lough Nafulla (IE_SH_26_281) based on a Vollenweider assessment. Lough Nafulla is assumed to be at moderate total phosphorus indicative quality as the ecological status is classified as moderate and is therefore mesotrophic, exceeding the critical loading for oligotrophic lakes. An assessment of the trophic status, based on the OECD methodology, supports this with the lake classified as mesotrophic. The additional loading will not result in a significant increase in the trophic status increasing the loading by only a fraction of one percent, therefore the orthophosphate dosing will not significantly impact on the total phosphorus indicative quality or trophic status of this lake.

Table 4: Increased loading and concentrations to River water bodies connected to the WSZs ***(note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P / Ecological status of neighbouring WBS, the mid-range of that indicative quality is used as Baseline Concentration)***

EU_CD / Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline and Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Total Ortho P in receiving waters kg/ yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_26F050050 FRANCIS_010	*Good*	*0.030*	*0.033*	*0.0*	*0.0000*	*0.030*	
IE_SH_26F050300 FRANCIS_020	*Good*	*0.030*	*0.033*	*19.3*	*0.0003*	*0.030*	
IE_SH_26O040100 OWENNAFOREESHA_010	Good Downwards Far	0.030	0.033	2.5	0.0001	0.030	
IE_SH_26S010050 SCRAMOGE_010	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0001*	*0.046*	
IE_SH_26S040200 SMAGHRAAN_020	*Poor*	*0.077*	*0.087*	*9.3*	*0.0001*	*0.077*	
IE_SH_26S070300 SUCK_030	High Upwards Far	0.020	0.019	28.0	0.0002	0.020	‡
IE_SH_26S070400 SUCK_040	*High*	*0.013*	*0.019*	*33.1*	*0.0002*	*0.013*	‡
IE_SH_26S070500 SUCK_050	High Downwards Near	0.015	0.019	52.2	0.0002	0.015	‡
IE_SH_26T030300 TERMON STREAM_010	*Good*	*0.030*	*0.033*	*14.8*	*0.0005*	*0.030*	
IE_SH_26I030400 ISLAND_030	High Upwards Near	0.011	0.019	0.7	0.0000	0.011	
	High Downwards Near	0.012	0.019			0.012	
IE_SH_26S010200 SCRAMOGE_020	*Good*	*0.030*	*0.033*	*3.9*	*0.0000*	*0.030*	
IE_SH_26S070650 SUCK_070	*Good*	*0.030*	*0.033*	61.7	0.0001	0.030	‡
IE_SH_26S071550 SUCK_160	*Good*	*0.030*	*0.033*	61.7	0.0000	0.030	‡
IE_SH_26B090300 BREEDOGE_010	High Downwards Near	0.024	0.019	2.5	0.0000	0.024	

‡ Load from WWTP / SWO following treatment added.

Table 4.B: Vollenweider assessment of Lakes within the WSZs

EU_CD / Name Lakes	Parameter	TP Indicative Quality, Trends and Distance to Threshold *[Surrogate Indicative Quality given in italic]*	Baseline Ortho P Conc. *[Surrogate Conc. given in italic]* mg/l	TP Total Dosing Load kg/yr	Estimated Existing Areal loading based on Vollenweider mg/m²/yr)	Estimated Post dosing Areal loading based on Vollenweider(mg/m²/yr)	Lc (mg/m²/yr)	% Increase
IE_SH_26_281 Lough Nafulla	**TP**	*Moderate*	0.038	3.9	102,835	103,133	28,024	0.3

There are no transitional water bodies directly affected by this WTP.

Summary and Mitigation Proposed

Considering Longford Springs WTP in isolation, orthophosphate dosing is predicted to have an insignificant impact on any waterbody within or adjacent to the WSZ. The modelled increases in loads and concentrations to both groundwater and surface water receptors do not cause a risk to WFD objectives.

The breakdown from source to pathway is depicted in Figure 1 and the fate of P loads from Longford Springs WTP is shown in Figure 2.

The cumulative impacts on the Shannon Catchments (HAs 24, 25, 26, 27), associated with the corrective water treatment at the following additional WTPs have been assessed in combination with Longford Springs WTP:

- 005 Clareville WTP – Limerick City Water Supply
- 012 Tuam WTP – Tuam RWSS
- 013 Portloman WTP – Ardonagh Reservoir
- 017 Drumcliffe WTP - Ennis PWS
- 019 New Doolough WTP - W.Clare RWS (New WTP)
- 020 Castle Lake WTP - Shannon/Sixmilebridge RWSS
- 021 Rossadrehid WTP – Galtee Regional
- 027 Athlone WTP – Athlone WSS
- 034 Lough Forbes WTP – Longford Central
- 040 Coolbawn WTP _ Nenagh RWSS
- 049 Ballany WTP – Ballany High Level Reservoir
- 058 Ballinasloe Town WTP - Ballinasloe Public Supply
- 068 Rockingham WTP - Boyle Regional WSS
- 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 161 Freemount WTP – Zone 4 Allow Regional
- 178 Clavin's Bridge WTP – Kells/Oldcastle WS
- 184 Foileen WTP - CappamoreFoileen Water Supply
- 185 Ballinlough/ Loughglynn (Ballybane Springs) - Ballinlough/Loughglynn
- 190 Ironmills Pump Station - Ironmills
- 216 Kylebeg WTP – Borrisokane
- 237 Killadysert WTP - Killadysert PWS
- 238 Williamstown WTP - Williamstown PS3
- 246 Ballingarry Spring WTP - Ballingarry Water Supply

- 260 Kilcolman PS - Rathkeale Water Supply
- 267 Cloughjordan Pump Station – Cloughjordan
- 321 Ahascragh WTP - Ahascragh P.S.
- 355 Croom Bypass Pump Station - Croom Water Supply

The cumulative loads to water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in Table 5.

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 128 Longford Springs WTP – Castlerea WSS and other WSZs proposed for corrective water treatment in the upstream catchments.

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Year 2014 and Conc. mg/l *[Surrogate Conc. given in italic]*	75% of status threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_26I030400 ISLAND_030	High Upwards Near	0.011	0.019	45.7	0.0004	0.012	‡
	High Downwards Near	0.012	0.019			0.012	
IE_SH_26F050300 FRANCIS_020	*Good*	*0.030*	*0.033*	*30.9*	*0.0004*	*0.030*	
IE_SH_26S040200 SMAGHRAAN_020	*Poor*	*0.077*	*0.087*	*10.3*	*0.0001*	*0.077*	
IE_SH_26B090300 BREEDOGE_010	High Downwards Near	0.024	0.019	40.4	0.0003	0.024	‡
IE_SH_26S070300 SUCK_030	High Upwards Far	0.020	0.019	78.3	0.0005	0.021	‡
IE_SH_26S070400 SUCK_040	*High*	*0.013*	*0.019*	*94.1*	*0.0005*	*0.014*	‡
IE_SH_26S070500 SUCK_050	High Downwards Far	0.015	0.019	158.2	0.0005	0.016	‡
IE_SH_26S071200 SUCK_130	Moderate Upwards Far	0.036	0.051	213.0	0.0002	0.036	‡
	Good Downwards Far	0.029	0.033			0.029	
	High None Far	0.013	0.019			0.013	
IE_SH_26S071400 SUCK_140	Good Far	0.030	0.033	247.5	0.0002	0.030	‡

	High Far	0.014	0.019			0.014	
	High Far	0.010	0.019			0.010	
IE_SH_26S071550 SUCK_160	*Good*	*0.030*	*0.033*	*276.2*	*0.0002*	*0.030*	‡
IE_SH_060_0900 Limerick Dock	High (S) Far	0.008	0.019	7516.7	0.0010	0.009	‡
	High (W) Far	0.012	0.019			0.013	
IE_SH_060_0800 Upper Shannon Estuary	High (S) Near	0.020	0.019	8848.1	0.0010	0.021	‡
	High (W) Far	0.011	0.036			0.012	
IE_SH_060_0700 Maigue Estuary	High (S) Far	0.017	0.019	382.4	0.0011	0.018	‡
	Poor (W) Far	0.069	0.102			0.070	
IE_SH_060_0600 Deel Estuary	Good Upwards Far	0.037	0.053	1304.5	0.0020	0.039	‡
	Moderate Upwards Far	0.065	0.09			0.067	
IE_SH_060_0300 Lower Shannon Estuary	High (S) Far	0.012	0.020	12412.9	0.0002	0.012	‡
	Good (W) Far	0.025	0.036			0.025	
IE_SH_060_1100 Fergus Estuary	*Good (S)*	*0.042*	0.049	1333.5	0.0001	0.042	‡
	Good (W)	*0.045*	0.053			0.053	
IE_SH_060_0000 Mouth of the Shannon (HAs 23;27)	High (S) Far	*0.008*	*0.019*	13317.6	0.0001	*0.008*	‡
	Good (W)	*0.033*	*0.036*			*0.033*	

‡ Load from WWTP / SWO following treatment added.

S = Summer monitoring period, W = Winter monitoring period

The cumulative assessment has demonstrated that there will not be significant impact on the receiving waters and the dosing will not cause deterioration in indicative quality or prevent the achievement of the WFD objectives.

MITIGATION OPTION – None required

RAG STATUS – GREEN

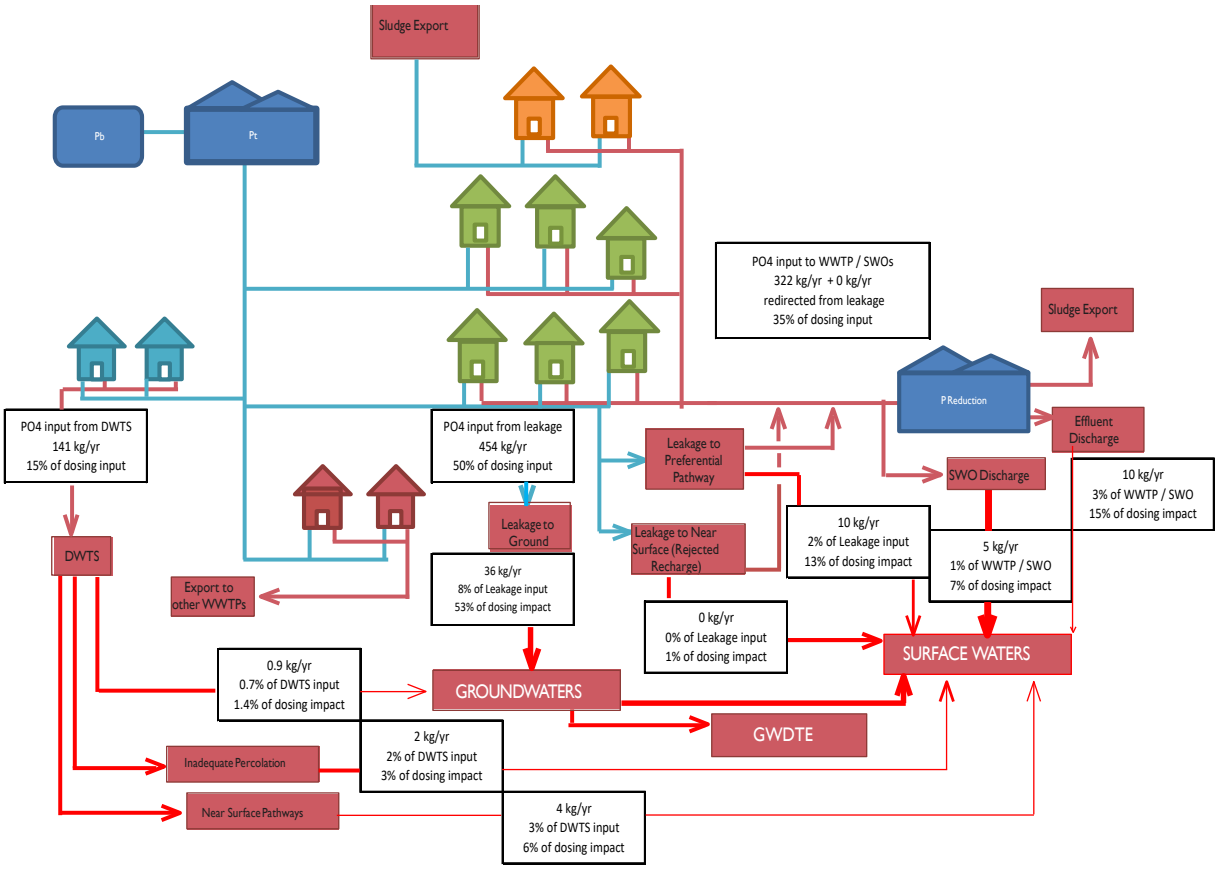
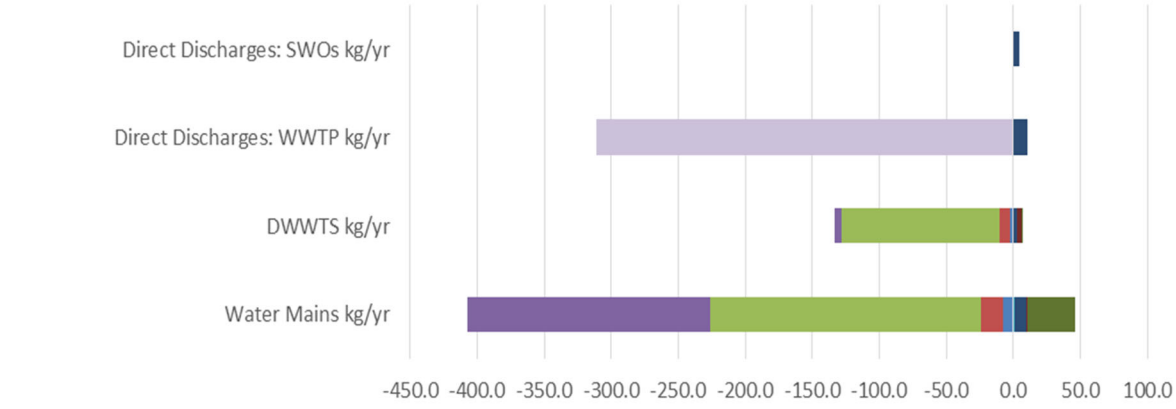


Figure 1 – Source Pathway Receptor model for Longford Springs WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-7.2	-2.1		
Load attenuated in Near Surface Pathway	-16.9	-7.7		
Load attenuated in 1m below trench	-202.1	-118.5		
Load attenuated in Subsurface Pathway	-181.1	-4.9		
Load intercepted by gravity main in Preference Pathway	0.7			
Load intercepted by gravity main in Near Surface Pathway	0.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	9.1	2.3	10.4	4.7
Load reaching SW via Near Surface Pathway	0.5	4.2		
Load reaching SW via Subsurface Pathway	35.9	0.9		
Load treated in WWTP			-311.2	

Figure 2 – Fate of orthophosphate loads modelled for Longford Springs WTP impacting on rivers IE_SH_26O040100 (OWENNAFOREESHA_010), IE_SH_26S010050 (SCRAMOGE_010), IE_SH_26S040200 (SMAGHRAAN 26_020) and IE_SH_26S070500 (Suck_050) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.