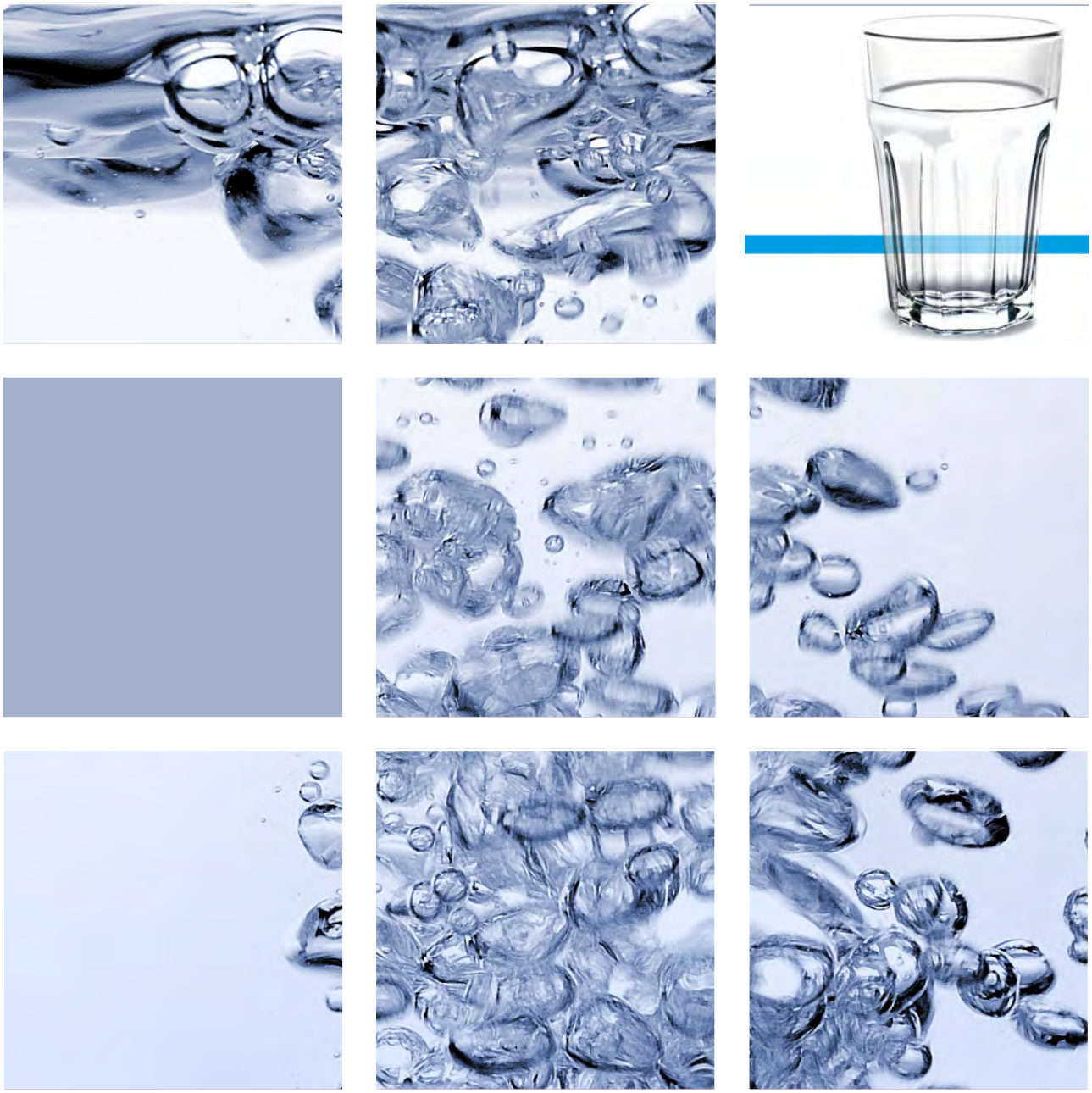
Uisce Éireann - Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

058 Ballinasloe WTP – Ballinasloe Public Supply (1200PUB1004)



Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment 058 Ballinasloe Public Supply (1200PUB1004)- Ballinasloe Town WTP

Document Control Sheet

Client:	Uisce Éireann
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 058 Ballinasloe Public Supply (1200PUB1004) – Ballinasloe Town WTP
Document No:	MDW0766Rp_5.3_Screening_058_Ballinasloe_F03

Text Pages:	97	Appendices:	3

Rev	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	17th Jan 2019	LC		LE		DC	
F02	Final	23rd Jun 2023	AW	Aaron Ward	MM		MM	
F03	Final	6th Dec 2023	AW	Aaron Ward	MM		MM	

TABLE OF CONTENTS

APPENDICES

Appendix A **European Sites - Conservation Objectives**

Appendix B **Nutrient Sensitive Qualifying Interests**

Appendix C **EAM Summary Report for Ballinasloe WSZ**

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 Uisce Éireann (UE) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate dosing (herein referred to as the proposed project) of drinking water supplied by Ballinasloe Town Water Treatment Plant (WTP), Ballinasloe, Co. Galway.

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

Uisce Éireann, as the national public water utility, prepared a Lead in Drinking Water Mitigation Plan (LDWMP) in 2016 (here after referred to as the Plan). The Plan provides a framework of measures for implementation to effectively address the currently elevated levels of lead in drinking water experienced by some UE 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 UE'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 (UE, 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 UE's ownership in private properties (UE, 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] Uisce Éireann (UE) (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 UE 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 (UE, 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. UE 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 UE. 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.

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

Orthophosphate 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 UE will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Ballinasloe Town WTP orthophosphate will be added at a rate of 1.2 mg/l.

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.

Ballinasloe Town WTP lies in the vicinity of the Suck River in the Suck sub-catchment of the Upper Shannon catchment (HA26). The EAM process identified 40 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: All Saints Bog and Esker SAC, Ardgraigue Bog SAC, Arragh More (Derrybreen) Bog SAC, Aughrim (Aghrane) Bog) SAC, Ballinturly Turlough SAC, Ballyduff/Clonfinane Bog SAC, Barroughter Bog SAC, Camderry Bog SAC, Carrownagappul Bog SAC, Castlesampson Esker SAC, Cloonmoylan Bog SAC, Coolcam Turlough SAC, Corliskea/Trien/Cloonfeliv Bog SAC, Croaghill Turlough SAC, Curraghlehanagh Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Derrycrag Wood Nature Reserve SAC, Four Roads Turlough SAC, Glenloughaun Esker SAC, Killeglan Grassland SAC, Kilsallagh Bog SAC, Lisduff Turlough SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Croan Turlough SAC, Lough Lurgeen Bog/Glenmaddy Turlough SAC, Loughatorick South Bog SAC, Pollnaknockaun Wood Nature Reserve SAC, Redwood Bog SAC, River Shannon Callows SAC, Rosturra Wood SAC, Shankill West Bog SAC and Williamstown Turlough SAC; and
- SPA sites: All Saints Bog SPA, Dovegrove Callows SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Middle Shannon Callows SPA, River Little Brosna Callows SPA, River Suck Callows SPA and Slieve Aughty Mountains 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 UE, RPS, NPWS, IFI, EPA etc. as part of Plan development.

3 Information provided by UE as part of the project;

4 Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;

5 Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;

6 Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);

7 National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;

8 National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);

9 Article 17 Overview Report Volume 1 (NPWS, 2019a);

10 Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);

11 Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);

12 EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);

13 River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;

14 Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;

15 National Summary for Article 12 (Cummins et al., 2019); and

16 Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

16.1 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: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_reportbodyenglish_web_version_final_0.pdf

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

The Ballinasloe Town WTP supplies Ballinasloe town and areas to the south and south east of the town including Clontuskert, Laurencetown, Eyrecourt and Clonfert Co. Galway (1200PUB1004). The distribution input for the WTP is 3,719 m^3/day (56% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000. The non-domestic demand is 14% of the distribution point. The area is served by Ballinasloe agglomeration (D0032-01) licensed in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 (as amended) and the potential 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 a smaller agglomeration with a population equivalent of less than 500, Eyrecourt WWTP and the estimated additional load from this plant from the orthophosphate dosing is considered at the water body level via the surface water pathways. There is an estimated 679 properties in the WSZ that are serviced by a domestic wastewater treatment system (DWWTS) (see **Appendix C**).

Ballinasloe Town WTP lies in the vicinity of the Suck River in the Suck sub-catchment of the Upper Shannon catchment (HA26). The EAM process identified 40 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: All Saints Bog and Esker SAC, Ardgraigue Bog SAC, Arragh More (Derrybreen) Bog SAC, Aughrim (Aghrane) Bog) SAC, Ballinturly Turlough SAC, Ballyduff/Clonfinane Bog SAC, Barroughter Bog SAC, Camderry Bog SAC, Carrownagappul Bog SAC, Castlesampson Esker SAC, Cloonmoylan Bog SAC, Coolcam Turlough SAC, Corliskea/Trien/Cloonfeliv Bog SAC, Croaghill Turlough SAC, Curraghlehanagh Bog SAC, Derrinlough (Cloonkeenleananode) Bog SAC, Derrycrag Wood Nature Reserve SAC, Four Roads Turlough SAC, Glenloughaun Esker SAC, Killeglan Grassland SAC, Kilsallagh Bog SAC, Lisduff Turlough SAC, Lisnageeragh Bog and Ballinastack Turlough SAC, Lough Croan Turlough SAC, Lough Lurgeen Bog/Glenmaddy Turlough SAC, Loughatorick South Bog SAC, Pollnaknockaun Wood Nature Reserve SAC, Redwood Bog SAC, SAC, River Shannon Callows SAC, Rosturra Wood SAC, Shankill West Bog SAC and Williamstown Turlough SAC; and

- SPA sites: All Saints Bog SPA, Dovegrove Callows SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Middle Shannon Callows SPA, River Little Brosna Callows SPA, River Suck Callows SPA and Slieve Aughty Mountains SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

The corrective water treatment works at Ballinasloe WTP will involve the provision of orthophosphate dosing and associated safety equipment.

There are two possible locations for the orthophosphate dosing system at Ballinasloe WTP both of which will be located within the confines of the existing WTP boundary. The surrounding landscape is dominated by agricultural grassland. The location of the works is shown on Error! Reference source not found..

The implementation of orthophosphate dosing at the Ballinasloe WTP will require the following elements:

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

The bulk storage tanks (2 no. tanks, each with a working volume of 500 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 (Error! Reference source not found.).

Each storage tank will be self-bunded to accommodate greater than 110% of the tank working volume. The tanks shall conform to Uisce Éireann 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.

A stable pH is critical to facilitate effective plumbosolvency control. Currently, the Ballinasloe Town WTP has a capital delivery project in the construction phase which includes the provision of a caustic dosing line for final water pH correction and as such will not require additional works to the proposed pH correction infrastructure as part of the Lead Mitigation project.

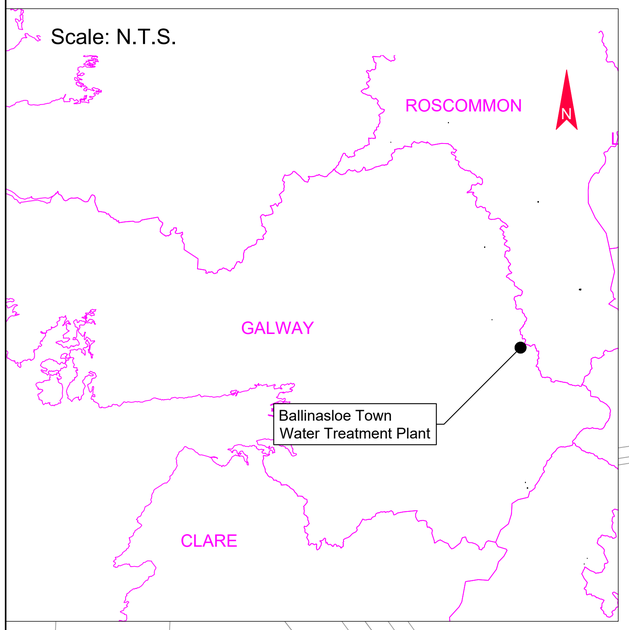
Dosing pipelines, carrier water pipework and electrical cables shall be installed within 100mm diameter ducts, placed in trenches constructed within existing made ground at the Ballinasloe Town WTP. The ducts will be installed at approximately 700mm below ground level and following installation the trench 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.

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.

CO. GALWAY

Ballinasloe Town Water Treatment Plant

Scale: N.T.S.



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

Client

Uisce Éireann
Irish Water

No.	Date	Drn.	Chk.	Amendment / Issue	App
F01	Jan'19	JR	BR	ISSUED FOR INFORMATION	DC

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	JR
Checked	BR
Approved	DC
Date	28/01/2019
Scale	1:500 @ A1
	1:1,000 @ A3

Project

LEAD MITIGAITON PLAN

BALLINASLOE TOWN WATER TREATMENT PLANT - SITE LAYOUT

Job No.	File Ref.	Drg. No.	Rev.
MDW0766		SK0058 WTP	F01

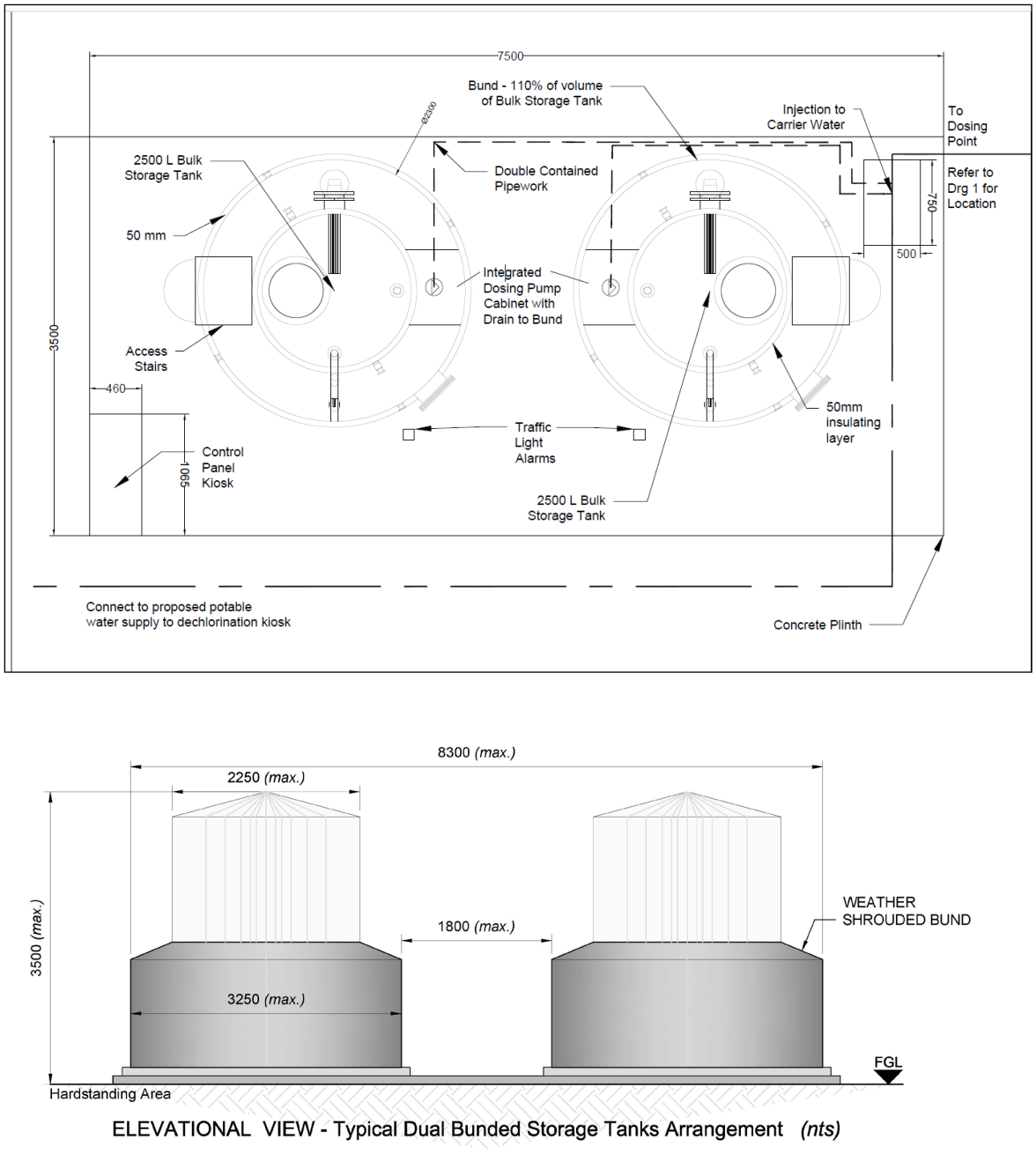


Figure 3-2: Plan and Elevation Drawings of a typical Orthophosphate Dosing Unit

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 Ballinasloe Town WTP on an area of made ground.

3.4 OPERATION OF CORRECTIVE WATER TREATMENT WORKS

The operational phase for the corrective water treatment works 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 Ballinasloe Town 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 potential 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, UE 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, UE 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 (DWWTS).

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 Scrreening 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 orthophosphate trends and capacity in receiving waters and the risk to WFD objectives from any increase in P load from orthophosphate dosing.

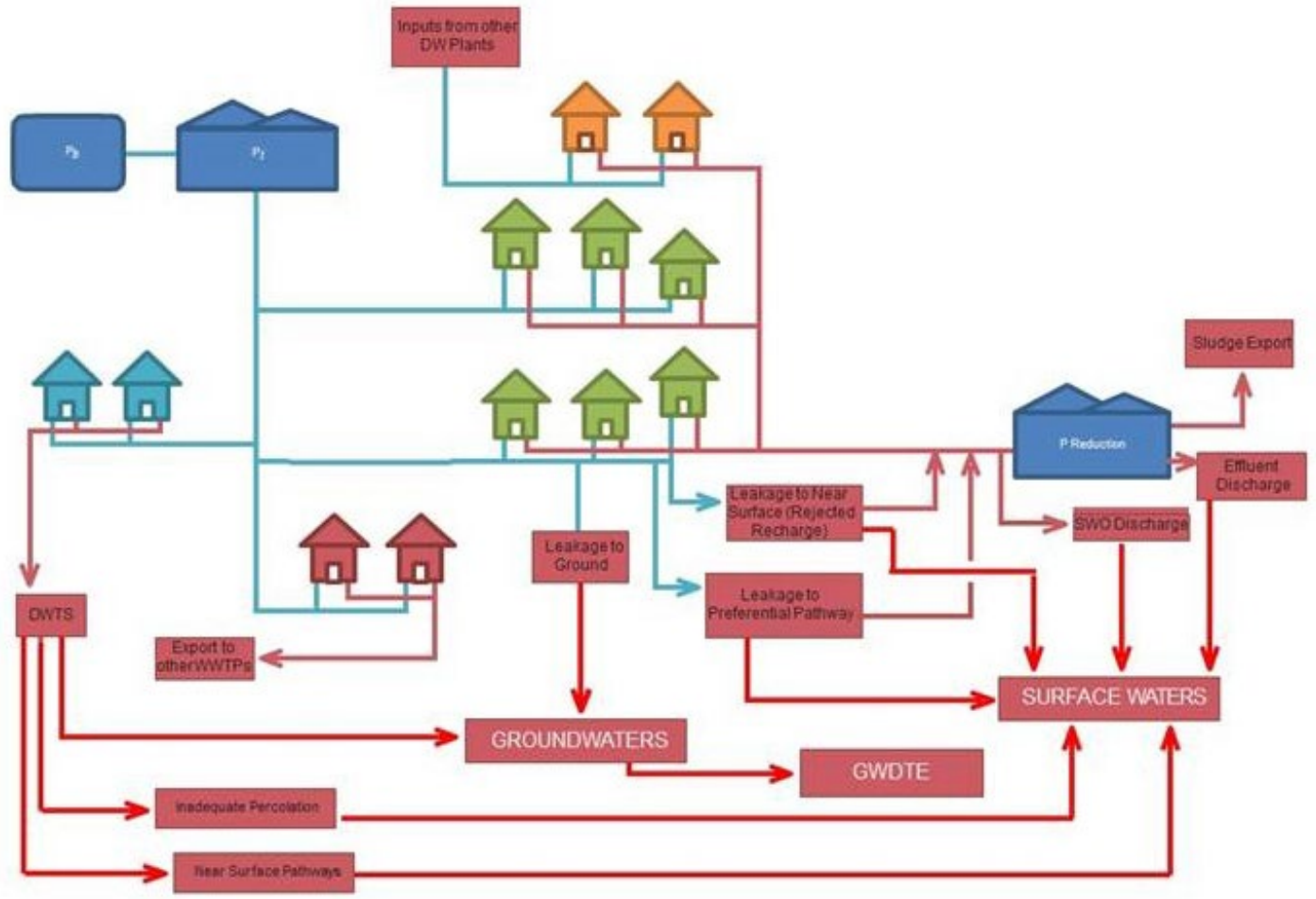


Figure 3-3: Conceptual Model of P Transfer

(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.)

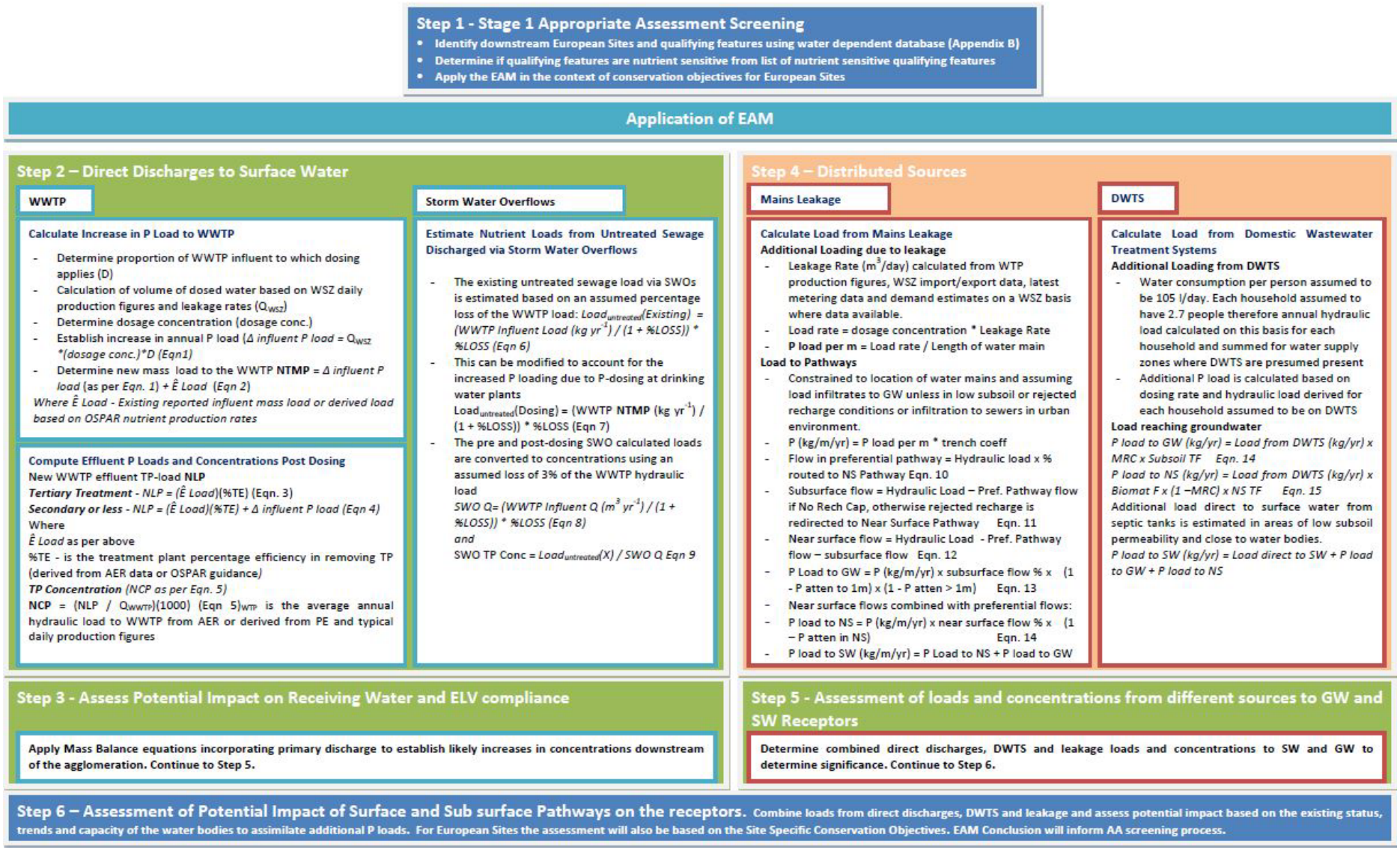


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

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 Ballinasloe WTP. The WTP is not located within a European Site but is located adjacent to the River Suck Callows SPA. Given the small-scale nature of construction works, the ZoI was considered to include the footprint of the existing Ballinasloe 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[4,5]	Potential Source Pathway Receptor
1	River Shannon Callows	SAC 000216	No	Yes	Yes-RWB (Suck)	No	Yes
2	Middle Shannon Callows	SPA 004096	No	Yes	Yes-RWB (Suck)	No	Yes
3	River Suck Callows	SPA 004097	No	Yes	Yes-RWB (Suck)	Yes - (South Suck)	Yes
4	Kileglan Grassland	SAC 002214	No	No	No	Yes - (South Suck)	No
5	Castlesampson Esker	SAC 001625	No	Yes	No	Yes - (South Suck)	No
6	Ballinturly Turlough	SAC 000588	No	Yes	No	Yes - (South Suck)	No
7	Camderry Bog	SAC 002347	No	Yes	No	Yes - (South Suck)	No
8	Carrownagappul Bog	SAC 001242	No	Yes	No	Yes - (South Suck)	No
9	Castlesampson Esker	SAC 001625	No	Yes	No	Yes - (South Suck)	No
10	Coolcam Turlough	SAC 000218	No	Yes	No	Yes - (South Suck)	No
11	Corliskea/Trien/Cloonfeliv Bog	SAC 002110	No	Yes	No	Yes - (South Suck)	No

[4] Ballinasloe WTP overlies the South Suck groundwater body. All European sites overlying or supporting connectivity to this GWB have been assessed to determine potential source impact pathways. South Suck is a large karstic GWB. Sites 4-24 in Table 4-1 above are all located approximately 10km – 45km away from the WTP and have no surface water connectivity. Water tracing was conducted in the South Suck groundwater body by GSI. A review of the tracer lines indicates that the groundwater flow is in a downstream direction following the topography and surface waters. Therefore, as there are no hydrological connections, and given the confirmed direction of groundwater flow from GSI data, the European sites (4-24) within the South Suck groundwater body were excluded from the assessment.

[5] South Suck GWB: Summary of Initial Characterisation

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity[4,5]	Potential Source Pathway Receptor
12	Croaghill Turlough	SAC 000255	No	Yes	No	Yes - (South Suck)	No
13	Curraghlehanagh Bog	SAC 002350	No	Yes	No	Yes - (South Suck)	No
14	Derrinlough (Cloonkeenleananode) Bog	SAC 002197	No	Yes	No	Yes - (South Suck)	No
15	Four Roads Turlough	SAC 001637	No	Yes	No	Yes - (South Suck)	No
16	Kilsallagh Bog	SAC 000285	No	Yes	No	Yes - (South Suck)	No
17	Lisduff Turlough	SAC 000609	No	Yes	No	Yes - (South Suck)	No
18	Lisnageeragh Bog & Ballinastack Turlough	SAC 000296	No	Yes	No	Yes - (South Suck)	No
19	Lough Croan Turlough	SAC 000610	No	Yes	No	Yes - (South Suck)	No
20	Lough Lurgeen Bog/Glenmaddy Turlough	SAC 000301	No	Yes	No	Yes - (South Suck)	No
21	Shankill West Bog	SAC 000326	No	Yes	No	Yes - (South Suck)	No
22	Williamstown Turlough	SAC 002296	No	Yes	No	Yes - (South Suck)	No
23	Four Roads Turlough	SPA 004140	No	Yes	No	Yes - (South Suck)	No
24	Lough Croan Turlough	SPA 004139	No	Yes	No	Yes - (South Suck)	No

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 Ballinasloe Town 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 intersecting the WSZs 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 4-3** 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	All Saints Bog & Esker	SAC 000566	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Banagher)	Yes
2	Ardgraigue Bog	SAC 002356	Yes	Yes	No	Yes - (Tynagh)	Yes
3	Arragh More (Derrybreen) Bog	SAC 002207	Yes	Yes	No	Yes - (Banagher)	Yes
4	Aughrim (Aghrane) Bog	SAC 002200	Yes	Yes	No	Yes - (Suck South)	Yes
5	Ballinturly Turlough	SAC 000588	Yes	Yes	No	Yes - (Suck South)	Yes
6	Ballyduff/Clonfinane Bog	SAC 000641	Yes	Yes	No	Yes - (Banagher)	Yes
7	Barroughter Bog	SAC 000231	Yes	Yes	Yes - RWB (Kilcrow)	Yes - (Tynagh)	Yes
8	Camderry Bog	SAC 002347	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
9	Carrownagappul Bog	SAC 001242	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
10	Castlesampson Esker	SAC 001625	Yes	Yes	No	Yes - (Suck South)	Yes
11	Cloonmoylan Bog	SAC 000248	Yes	Yes	No	Yes - (Tynagh)	Yes
12	Coolcam Turlough	SAC 000218	Yes	Yes	No	Yes - (Suck South)	Yes
13	Corliskea/Trien/ Cloonfeliv Bog	SAC 002110	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
14	Croaghill Turlough	SAC 000255	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
15	Curraghlehanagh Bog	SAC 002350	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
16	Derrinlough (Cloonkeenleananode) Bog	SAC 002197	Yes	Yes	No	Yes - (Suck South)	Yes
17	Derrycrag Wood Nature Reserve	SAC 000261	No	Yes	No	Yes - (Tynagh)	Yes
18	Four Roads Turlough	SAC 001637	Yes	Yes	No	Yes - (Suck South)	Yes
19	Glenloughaun Esker	SAC 002213	No	Yes	Yes - RWB (Ballinure)	Yes - (Aughrim)	Yes
20	Killeglan Grassland	SAC 002214	No	Yes	No	Yes - (Suck South)	Yes
21	Kilsallagh Bog	SAC 000285	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
22	Lisduff Turlough	SAC 000609	Yes	Yes	No	Yes - (Suck South)	Yes
23	Lisnageeragh Bog & Ballinastack Turlough	SAC 000296	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes

	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
24	Lough Croan Turlough	SAC 000610	Yes	Yes	No	Yes - (Suck South)	Yes
25	Lough Lurgeen Bog/ Glenmaddy Turlough	SAC 000301	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
26	Loughatorick South Bog	SAC 000308	Yes	Yes	No	Yes - (Tynagh)	Yes
27	Pollnaknockaun Wood Nature Reserve	SAC 000319	No	Yes	No	Yes - (Tynagh)	Yes
28	Redwood Bog	SAC 002353	Yes	Yes	Yes - RWB (Shannon [Lower])	Yes - (Banagher)	Yes
29	River Shannon Callows	SAC 000216	Yes	Yes	Yes - RWB (Suck)	Yes - (Aughrim, Tynagh, Banagher)	Yes
30	Rosturra Wood	SAC 001313	No	Yes	No	Yes - (Tynagh)	Yes
31	Shankill West Bog	SAC 000326	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Suck South)	Yes
32	Williamstown Turlough	SAC 002296	Yes	Yes	No	Yes - (Suck South)	Yes
33	All Saints Bog	SPA 004103	Yes	Yes	Yes – RWB (U/S of WSZ)	Yes - (Banagher)	Yes
34	Dovegrove Callows	SPA 004137	Yes	Yes	No	Yes - (Banagher)	Yes
35	Four Roads Turlough	SPA 004140	Yes	Yes	No	Yes - (Suck South)	Yes
36	Lough Croan Turlough	SPA 004139	Yes	Yes	No	Yes - (Suck South)	Yes
37	Middle Shannon Callows	SPA 004096	Yes	Yes	Yes - RWB (Shannon [Lower])	Yes - (Tynagh)	Yes
38	River Little Brosna Callows	SPA 004086	Yes	Yes	Yes - RWB (Shannon [Lower])	Yes - (Banagher)	Yes
39	River Suck Callows	SPA 004097	Yes	Yes	Yes - (Suck)	Yes - (Suck South)	Yes
40	Slieve Aughty Mountains	SPA 004168	Yes	Yes	No	Yes - (Tynagh)	Yes

Williamstown Turloughs SAC (002296)
Croaghill Turlough SAC (000255)
Corliskea/Trien/Cloonfelliv Bog SAC (002110)
Kilsallagh Bog SAC (000285)
Derrinlough (Cloonkeenleananode) Bog SAC (002197)
Shankill West Bog SAC (000326)
Lisnageeragh Bog and Ballinastack Turlough SAC (000296)
Lough Croan Turlough SAC (000610)
Coolcam Turlough SAC (000218)
Ballinturly Turlough SAC (000588)
Four Roads Turlough SAC (001637)
Four Roads Turlough SPA (004140)
River Suck Callows SPA (004097)
Camderry Bog SAC (002347)
Lisduff Turlough SAC (000609)
Lough Croan Turlough SPA (004139)
Killeglan Grassland SAC (002214)
Curraghlehanagh Bog SAC (002350)
Lough Lurgeen Bog/Glenamaddy Turlough SAC (000301)
Carrownagappul Bog SAC (001242)
Castlesampson Esker SAC (001625)
Middle Shannon Callows SPA (004096)
ASHFORD
DERRYCULLEAN
Ennis
Nenagh
Ballina
Shannon
LIMERICK

Zone of Influence (ZoI) for Construction Phase

Boyle Regional WSS
Corliskea/Trien/Cloonfelliv Bog SAC (002110)
Williamstown Turloughs SAC (002296)
Lisnageeragh Bog and Ballinastack Turlough SAC (000296)
Aughrim (Aghrane) Bog SAC (002200)
Kilsallagh Bog SAC (000285)
Derrinlough (Cloonkeenleananode) Bog SAC (002197)
Shankill West Bog SAC (000326)
Longford Central
Ballinturly Turlough SAC (000588)
Croaghill Turlough SAC (000255)
Four Roads Turlough SAC (001637)
River Suck Callows SPA (004097)
Four Roads Turlough SPA (004140)
Lough Croan Turlough SAC (000610)
Coolcam Turlough SAC (000218)
Lisduff Turlough SAC (000609)
River Shannon Callows SAC (000216)
Lough Croan Turlough SPA (004139)
Ballany High Level Reservoir
Kells-Oldcastle
Ardonagh Reservoir
SRRWSS - Lisbrock
Athlone WSS
Camderry Bog SAC (002347)
Killeglan Grassland SAC (002214)
All Saints Bog And Esker SAC (000566)
Middle Shannon Callows SPA (004096)
Curraghlehanagh Bog SAC (002350)
Lough Lurgeen Bog/Glenamaddy Turlough SAC (000301)
Carrownagappul Bog SAC (001242)
Glenloughaun Esker SAC (002213)
Slieve Aughty Mountains SPA (004168)
River Little Brosna Callows SPA (004086)
Tuam RWSS
Barroughter Bog SAC (000231)
Castlesampson Esker SAC (001625)
All Saints Bog SPA (004103)
Ballyduff/Clonfinane Bog SAC (000641)
Rosturra Wood SAC (001313)
Dovegrove Callows SPA (004137)
Pollnaknockaun Wood Nature Reserve SAC (000319)
Ardgraigue Bog SAC (002356)
Borrisokane
Redwood Bog SAC (002353)
Cloughjordan
Arragh More (Derrybreen) Bog SAC (002207)
Derrycrag Wood Nature Reserve SAC (000261)
Loughatorick South Bog SAC (000308)
Cloonmoylan Bog SAC (000248)
W. Clare RWS (New WTP)
Ennis PWS
Shannon/Sixmilebridge RWSS
Kiladysart PWS
CappamoreFoileen Water Supply
Croom Water Supply
Limerick City Water Supply
IRONMILLS
Rathkeale Water Supply
Ballingarry Water Supply
Galtee Regional
Zone4 Allow Regional
Killarney
WATERFORD

Zone of Influence (ZoI) for Operational Phase

Legend

LEMA Emission Type

- Emergency Overflow
- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Ballinasloe Town 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 (Jan. 2019)
EPA

N

0 5 10 20 Kilometres

Client: Uisce Éireann Irish Water

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title: Fig. 4-1

Ballinasloe Public Supply

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:900,000 @ A3	Date: 01/02/2019
File Ref: MDW0766Arc0014aF03	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 at this stage of the process and those included, are detailed in **Table 4-3** and are displayed in **Figure 4-2.** Seven sites are included for further assessment with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Ballinasloe WTP. There is potential for surface water connectivity to the River Shannon Callows SAC, Middle Shannon Callows SPA and River Suck Callows SPA. The WTP is located within the South Suck groundwater body (IE_SH_G_225) and there is also potential hydrogeological connectivity between the proposed development site and the River Suck Callows SPA.

For the operational phase, the main WSZ lies in close proximity to the River Suck and Lower River Shannon, a second smaller WSZ intersects with the Kilcrow River. As a result three European Sites are intersected via river pathways i.e. River Shannon Callows SAC, Middle Shannon Callows SPA and River Suck Callows SPA and are included Section 5 and Section 6 the assessment.

Barroughter Bog SAC, Redwood Bog SAC, River Little Brosna Callows SPA, are all included for further assessment in Section 6 due to groundwater interactions and surface water connectivity via Kilcrow_020 (IE_SH_25K010060) for Barroughter Bog SAC and via Derrymullan Stream_020 (IE_SH_26D070700), Laurencetown Stream_010 (IE_SH_26L070200), Shannon (Lower)_020 (IE_SH_26S012060), Shannon (Lower)_030 (IE_SH_26S012350), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400) for Redwood Bog SAC and River Little Brosna Callows SPA.

Glenloughaun Esker SAC does not contain water dependent habitats/species but does have a nutrient sensitive habitat i.e. semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*). There is a hydrological connection from the WSZ to this SAC via Ballinure_010 (IE_SH_26B010300) and a groundwater connection via Aughrim (IE_SH_G_019) groundwater body. Flooding of this river could potentially bring nutrients into the habitat and taking a precautionary approach this site was also included for further assessment.

The WZS also intersects three groundwater bodies; South Suck (IE_SH_G225), Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236) (**Table 3, Appendix C**). For European Sites which are hydrogeologically connected an assessment was made on 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 of 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 Geological Survey Ireland (GSI)[6], and was consulted in making the assessment.

The Suck South is a large karstic groundwater body located upstream of the WSZ. As a result the following 21 European Sites have no surface water connection but are connected via the groundwater body and were initially included for further assessment: Aughrim Bog SAC, Ballinturly Turlough SAC, Camderry Bog SAC, Carrownagappul Bog SAC, Castlesampson Esker SAC, Coolcam Turlough SAC, Corliskea Bog SAC, Croaghill Turlough SAC, Curraghlehanagh SAC, Derrinlough SAC, Kileglan Grassland SAC, Four Roads Turlough SAC, Kilsallagh Bog SAC, Lisduff Turlough SAC, Lisnagearagh Bog SAC, Lough Croan Turlough SAC, Lough Lurgeen SAC, Shankhill West Bog SAC, Williamstowm Turlough SAC , Four Roads Turlough SPA and Lough Croan Turlough SPA. These European Sites are located 10 km or greater upstream of the WSZ. Water tracing was conducted in the South Suck groundwater body by GSI. A review of the tracer lines indicates that the groundwater flow is in a downstream direction following the topography and surface waters. Therefore, as there are no hydrological connections, and given the confirmed direction of groundwater flow from GSI data, the 21 European Sites within the South Suck groundwater body were excluded from the assessment.

Ardgraigue Bog SAC, Cloonmoylan Bog SAC, Derrycraig Wood SAC, Loughatorick SAC, Poulnaleckan SAC, Rostura Wood SAC and Slieve Aughty SPA do not receive any surface water from the WSZ as they are located in tributaries of the Shannon River in the case of Ardgraigue Bog SAC or tributaries of Lough Derg for the remaining European Sites and they are not connected to the WSZ. In the case of Slieve Aughty SPA, surface water flows from the mountain top down gradient via tributaries at the western side of Lough Derg and discharge into this lake. There is therefore no interaction between river water bodies potentially affected by dosing at Ballinasloe WTP and this SPA. The sites are, however, connected to the Tynagh GWB (IE_SH_G_236). A review of the Tynagh GWB[7] indicates that groundwater discharges to springs, or to the streams and rivers that traverse the aquifer. Groundwater flow paths can be up to several kilometres long, but may be significantly shorter where the water table is close to the surface. Due to the shallow groundwater flow in the Tynagh GWB, the groundwater and surface waters are closely linked. The Tynagh GWB is poorly productive and flow paths are relatively short (≤300m) and flow directions are expected to approximately follow the local surface water catchments. These European Sites are all >8km downstream from the WSZ. Given the short flow path for groundwater and that it follows surface water flow; these European Sites were excluded from further assessment.

The Mouth of the Shannon HA23;27 (IE_SH_060_000) coastal water body is downstream of the WSZ. The WSZ is hydrologically connected to this coastal water body via surface water bodies discharging from the WSZ and into transitional water bodies. These water bodies include; Shannon Lower_030 (IE_SH_25S012350) which discharges into Lough Derg (IE_SH_25_191a), Shannon Lower_060 (IE_SH_25S012600), Limerick Dock (IE_SH_060_0900), Upper Shannon Estuary (IE_SH_060_0800) and Lower Shannon Estuary (IE_SH_060_0300). The modelled cumulative increase in orthophosphate concentration associated with the in combination effects of the Limerick City Water Supply (1800PUB1001), Frewin Hill High Level Reservoir (3200PUB1005), West Clare RWS (New WTP) (0300PUB1066), (1200PUB1004) Athlone WSS (3200PUB1001) and Ennis WSZ (0300PUB1009) have been assessed with the Ballinasloe Public Supply WSZ (

[6] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
[7] Tynagh Groundwater Body: Summary of Initial Characterisation

Table 5-5). The modelled concentration is undetectable (0.0000 mg/l) at Shannon Lower_030 (IE_SH_25S012350), before it discharges into Lough Derg and concentrations are also undetectable (0.0000 mg/l) at both Lower Shannon Estuary (IE_SH_060_0300) and at the Mouth of the River Shannon coastal water body. The potential modelled cumulative increase at Shannon Lower_060 (IE_SH_25S012600) downstream of Lough Derg is 0.0003 mg/l while Limerick Dock (IE_SH_06_0900) and Upper Shannon Estuary (IE_SH_060_0800) are both 0.0010 mg/l. The additional loading to Lough Derg combined (IE_SH_25_191) as a result of the cumulative effects of orthophosphate dosing will represent a 0.9% increase in the estimated existing loading to the lake (Table 5-6). An assessment of the OECD trophic status of Lough Derg (IE_SH_25_191) pre and post dosing suggests that the annual maximum chlorophyll levels (8 mg/m^3/yr) are indicative of mesotrophic status with a low level of impact; this is consistent with the phytoplankton status which is classified as good. The dosing results in a minor increase in the maximum chloropyll levels and this will not have a significant impact based on the trophic status of Lough Derg (IE_SH_25_191).

The increase in orthophosphate concentration due to cumulative impacts is undetectable to low (0.0000 - 0.0002 mg/l) in river water body upstream of Lough Derg (Shannon Lower_030 IE_SH_25S012350). Within Lough Derg, the proposed dosing will not impact the trophic status and concentrations are undetectable (0.0000 mg/l) in the Mouth of the Shannon coastal water body. In light of this, the European Sites hydrologically connected to the WSZ from Lough Derg and downstream to the Mouth of the Shannon Coastal water body are excluded for potential impacts. The sites excluded from further assessment are: Lough Derg North East Shore SAC, Lower River Shannon SAC, River Shannon & River Fergus Estuaries SPA, Kerry Head SPA and Lough Derg (Shannon) SPA.

On this basis, three 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. River Shannon Callows SAC, Middle Shannon Callows SPA and River Suck Callows SPA. Seven sites have been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Barroughter Bog SAC, Glenloughan Esker SAC, Redwood Bog SAC, River Shannon Callows SAC, Middle Shannon Callows SPA, River Little Brosna Callows SPA and River Suck Callows SPA.

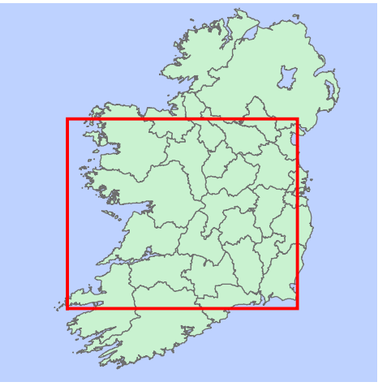
Table 4-3: European Sites Hydrologically or Hydrogeologically Connected to or Downstream of the WTP and WSZ

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 Operational Phases								
River Shannon Callows SAC	SAC 000216	21st Feb 2018 Generic	1355	Otter *(Lutra lutra)*	Yes	Yes	Yes	Yes
			6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes		
			6510	Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)	No** (flood risk)	Yes		
			8240	*Limestone pavements	No	Yes		
			91E0	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes		
Middle Shannon Callows SPA	SPA 004096	21st Feb 2018 Generic	A038	Whooper Swan *(Cygnus cygnus)*	Yes	Yes	Yes	Yes
			A050	Wigeon *(Anas penelope)*	Yes	Yes		
			A122	Corncrake *(Crex crex)*	Yes	Yes		
			A140	Golden Plover *(Pluvialis apricaria)*	Yes	Yes		
			A142	Lapwing *(Vanellus vanellus)*	Yes	Yes		
			A156	Black-tailed Godwit *(Limosa limosa)*	Yes	Yes		
			A179	Black-headed Gull *(Chroicocephalus ridibundus)*	Yes	Yes		
			A999	Wetland and Waterbirds	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
River Suck Callows SPA	SPA 004097	21st Feb 2018 Generic	A038	Whooper Swan (*Cygnus cygnus)*	Yes	Yes	Yes	Yes
			A050	Wigeon (*Anas Penelope)*	Yes	Yes		
			A140	Golden Plover (*Pluvialis apricaria)*	Yes	Yes		
			A142	Lapwing (*Vanellus vanellus)*	Yes	Yes		
			A395	Greenland White-fronted Goose *(Anser albifrons flavirostris)*	Yes	Yes		
			A999	Wetland and Waterbirds	Yes	Yes		
Operation Phase Only								
Barroughter Bog SAC	SAC 000231	06th Nov 2015 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 *Rhynchosporion*	Yes	Yes		
Glenloughaun Esker SAC	SAC 002213	19th Jun 2018 Version 1	6210	*Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (* important orchid sites)	No** (flood risk)	Yes	Yes	Yes
Redwood Bog SAC	SAC 002353	17th Dec 2015 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 Rhynchosporion	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
River Little Brosna Callows SPA	SPA 004086	21st Feb 2018 Generic	A038	Whooper Swan (*Cygnus Cygnus*)	Yes	Yes	Yes	Yes
			A050	Wigeon (*Anas penelope)*	Yes	Yes		
			A052	Teal (*Anas crecca)*	Yes	Yes		
			A054	Pintail (*Anas acuta)*	Yes	Yes		
			A056	Shoveler (*Anas clypeata)*	Yes	Yes		
			A140	Golden Plover (*Pluvialis apricaria)*	Yes	Yes		
			A142	Lapwing (*Vanellus vanellus)*	Yes	Yes		
			A156	Black-tailed Godwit (*Limosa limosa)*	Yes	Yes		
			A999	Wetland and Waterbirds	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.



Legend

LEMA Emission Type

- Emergency Overflow
- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- Ballinasloe Town 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 (Jan. 2019)
EPA

N

0 5 10 20 Kilometres

Client

Uisce Éireann
Irish Water

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title Fig. 4-2

Ballinasloe Public Supply

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

RPS

Scale: 1:850,000 @ A3	**Date:** 01/02/2019
File Ref: MDW0766Arc0014bF03	**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 treatment works at Ballinsloe Town 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; and
- 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 treatment works at Ballinasloe Town 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 phosphorus 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 treatment works at Ballinasloe Town WTP.

5.3.1 Construction Phase

There are two possible locations for the orthophosphate dosing system both of which will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking the whole Ballinasloe Town WTP into account and therefore included both possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Ballinasloe Town WTP is presented in Error! Reference source not found. and is based on a desktop study using the following information:

- Design descriptions and drawings for the proposed corrective water treatment works at Ballinasloe Town 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; and
- 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 treatment works

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation of Potential Significant Effects
River Suck Callows SPA (004097)	South Suck (IE_SH_G225)	GWB	The construction works will be located within the confines of the existing Ballinasloe WTP. Ballinasloe WTP is not located within a European Site. The River Suck Callows SPA is located approximately 80m from the WTP. **Surface Water** There are no surface water bodies within the confines of Ballinasloe WTP. However the footprint of the WTP is proximal to the River Suck (80m to the north (IE_SH_26S071400). The River Suck flows east of the WTP site and intersects the Middle Shannon Callows SPA and River Shannon Callows SAC (approximately 26km downstream). The proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure of Ballinalsoe WTP. The existing WTP environment includes buildings, artificial ground and associated WTP infrastructure. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section** Error! Reference source not found. with existing built surfaces and hedgerows acting as a barrier to pathways to the River Suck, Suck_140 (IE_SH_26S071400). The works will be localised and contained to the immediate development area which supports buildings and artificial surfaces. Works such as excavations will be contained to the defined working area and necessary works with cast
River Shannon Callows SAC (000216)	Suck_140 (IE_SH_26S071400)	RWB	
	Suck_150 (IE_SH_26S071500)	RWB	
	Suck_160 (IE_SH_26S071550)	RWB	
	Shannon (Upper)_130 (IE_SH_226S021920)	RWB	
Middle Shannon Callows SPA (004096)	Suck_140 (IE_SH_26S071400)	RWB	
	Suck_150 (IE_SH_26S071500)	RWB	
	Suck_160 (IE_SH_26S071550)	RWB	
	Shannon (Upper)_130 (IE_SH_226S021920)	RWB	

			in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source. Owing to the small-scale nature of the proposed works and separation from direct impact pathways there is no potential for likely significant effects upon River Suck Callows SPA, River Shannon Callows SAC and Middle Shannon Callows SAC through sediment laden run-off, dust emissions or environmental incidents. In addition, the WTP is also proximal to the River Suck Callows SPA, works are small-scale in nature and confined to within the WTP boundary which does not contain any habitats to support SCIs form the SPA. Therefore, there is no potential for likely significant effects to these European sites. **Groundwater** The WTP overlies the South Suck (IE_SH_G_225)_ groundwater body, which is a large karstic groundwater body. 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. Overall groundwater flow will be towards the River Suck, but the highly karstified nature of the bedrock means that locally groundwater flow directions can be highly variable[8]. 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 feature and subsequently those European Sites included for further assessment, as a result of the construction of the corrective water treatment works at Clonakilty RWSS WTP. There is no potential for likely significant effects on the River Shannon Callows SAC and Middle Shannon Callows SPA located 25km downstream, as a result of the construction of the corrective water treatment works at Ballinasloe WTP.

[8] 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 Ballinasloe Town WTP, 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 inputting water bodies or pressures acting 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.

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.

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.

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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
Barroughter Bog SAC (000231)	IE_SH_25K010060 Kilcrow_020	RWB	*Good*	*0.030*	*0.033*	*0.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25K010100 Kilcrow_030	RWB	*Moderate*	*0.046*	*0.051*	*0.7*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_236 Tynagh	GWB	Good	0.006	0.026	1.8	0.0000	0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Glenloughaun Esker SAC (002213)	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*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_019 Aughrim	GWB	*Good*	*0.018*	*0.026*	*13.1*	*0.0004*	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[9] Monitoring period is annual unless specified.
[10] Surrogate indicative quality in italic.
[11] Distance to threshold.
[12] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[13] Surrogate concentration is given in italic mg/l
[14] 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.
[15] 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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
Redwood Bog SAC (002353)	IE_SH_26D070700 Derrymullan Stream_020	RWB	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010400 Ballinure_020	RWB	Good Far	0.030	0.033	3.2	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070200 Laurancetown Stream_010	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070500 Laurancetown Stream_020	RWB	Moderate Far	0.047	0.051	21.2	0.0018	0.049	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is 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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_25E010200 Eyrecourt Stream_010	RWB Multiple monitoring points	Good Upwards Far	0.033	0.033	5.1	0.0005	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.030	0.033			0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012000 Shannon (Lower)_010	RWB	High Upwards Near	0.024	0.019	1.2	0.0000	0.024	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012060 Shannon (Lower)_020	RWB	*Moderate*	*0.046*	*0.051*	*9.7*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012350 Shannon (Lower)_030	RWB	High Upwards Near	0.011	0.019	10.5	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071400 Suck_140	RWB (Multiple Monitoring Points)	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									indicative quality or of preventing the achievement of WFD objectives
			High upwards Far	0.014	0.019			0.014	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Near	0.010	0.019			0.010	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_26S071500 Suck_150	RWB	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	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*	*43.8*	*0.0000*	*0.030*	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
River Shannon Callows SAC (000216)	IE_SH_26D070700 Derrymullan Stream_020	RWB	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071400 Suck_140	RWB	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Far	0.014	0.019			0.014	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is 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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
			High upwards Near	0.010	0.019			0.010	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_26S071500 Suck_150	RWB	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	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*	*43.8*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010400 Ballinure_020	RWB	Good Far	0.030	0.033	3.2	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070200 Laurancetown Stream_010	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070500 Laurancetown Stream_020	RWB	Moderate Far	0.047	0.051	21.2	0.0018	0.049	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_25E010200 Eyrecourt Stream_010	RWB Multiple monitoring points	Good Upwards Far	0.033	0.033	5.1	0.0005	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.030	0.033			0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012000 Shannon (Lower)_010	RWB	High Upwards Near	0.024	0.019	1.2	0.0000	0.024	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012060 Shannon (Lower)_020	RWB	*Moderate*	*0.046*	*0.051*	*9.7*	*0.0000*	*0.046*	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_25S012350 Shannon (Lower)_030	RWB	High Upwards Near	0.011	0.019	10.5	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_019 Aughrim	GWB	*Good*	*0.018*	*0.026*	*13.1*	*0.0004*	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_236 Tynagh	GWB	*Good*	*0.006*	*0.026*	*1.8*	*0.0000*	*0.006*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Middle Shannon Callows SPA (004096)	IE_SH_26D070700 Derrymullan Stream_020	RWB	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071400 Suck_140	RWB (Multiple Monitoring Points)	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									indicative quality or of preventing the achievement of WFD objectives
			High upwards Far	0.014	0.019			0.014	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Near	0.010	0.019			0.010	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_26S071500 Suck_150	RWB	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	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*	*43.8*	*0.0000*	*0.030*	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010400 Ballinure_020	RWB	Good Far	0.030	0.033	3.2	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070200 Laurancetown Stream_010	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070500 Laurancetown Stream_020	RWB	Moderate Far	0.047	0.051	21.2	0.0018	0.049	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_25E010200 Eyrecourt Stream_010	RWB Multiple monitoring points	Good Upwards Far	0.033	0.033	5.1	0.0005	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.030	0.033			0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012000 Shannon (Lower)_010	RWB	High Upwards Near	0.024	0.019	1.2	0.0000	0.024	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012060 Shannon (Lower)_020	RWB	*Moderate*	*0.046*	*0.051*	*9.7*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012350 Shannon (Lower)_030	RWB	High Upwards Near	0.011	0.019	10.5	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_019 Aughrim	GWB	*Good*	*0.018*	*0.026*	*13.1*	*0.0004*	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_236 Tynagh	GWB	Good	0.006	0.026	1.8	0.0000	0.006	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
River Little Brosna Callows SPA(004086)	IE_SH_26D070700 Derrymullan Stream_020	RWB	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071400 Suck_140	RWB (Multiple Monitoring Points)	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Far	0.014	0.019			0.014	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is 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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
			High upwards Near	0.010	0.019			0.010	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_26S071500 Suck_150	RWB	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	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*	*43.8*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010400 Ballinure_020	RWB	Good Far	0.030	0.033	3.2	0.0001	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070200 Laurancetown Stream_010	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070500 Laurancetown Stream_020	RWB	Moderate Far	0.047	0.051	21.2	0.0018	0.049	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_25E010200 Eyrecourt Stream_010	RWB Multiple monitoring points	Good Upwards Far	0.033	0.033	5.1	0.0005	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.030	0.033			0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012000 Shannon (Lower)_010	RWB	High Upwards Near	0.024	0.019	1.2	0.0000	0.024	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012060 Shannon (Lower)_020	RWB	*Moderate*	*0.046*	*0.051*	*9.7*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_25S012350 Shannon (Lower)_030	RWB	High Upwards Near	0.011	0.019	10.5	0.0000	0.011	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_G_019 Aughrim	GWB	*Good*	*0.018*	*0.026*	*13.1*	*0.0004*	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_236 Tynagh	GWB	*Good*	*0.006*	*0.026*	*1.8*	*0.0000*	*0.006*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
River Suck Callows SPA (004097)	IE_SH_26D070700 Derrymullan Stream_020	RWB	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	The post dosing conc. exceeds the 75% upper indicative quality threshold; however this is due to the baseline ortho P conc. The modelled additional conc. is 0.0000mg/l therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26S071400 Suck_140	RWB	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Far	0.014	0.019			0.014	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does

Site Name (Code)	Contributing WB Code_Name	WB Type[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
									not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
			High upwards Near	0.010	0.019			0.010	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives
	IE_SH_26S071500 Suck_150	RWB	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	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*	*43.8*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010300 Ballinure_010	RWB	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26B010400 Ballinure_020	RWB	Good Far	0.030	0.033	3.2	0.0001	0.030	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
	IE_SH_26L070200 Laurancetown Stream_010	RWB	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_26L070500 Laurancetown Stream_020	RWB	Moderate Far	0.047	0.051	21.2	0.0018	0.049	While the 5% High / Good indicative quality boundary is exceeded, the post-dosing Ortho P baseline does not exceed 75% of the indicative quality upper threshold and therefore there is 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 Multiple monitoring points	*Good*	*0.012*	*0.026*	*3.2*	*0.0000*	*0.012*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good	*0.024*	*0.026*			*0.024*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good	*0.022*	*0.026*			*0.022*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good	*0.019*	*0.026*			*0.019*	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[9]	Ortho P Indicative Quality[10] and Trends[11]	Baseline[12] Ortho P Conc.[13] (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.[14] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[15]	Evaluation
			Good	*0.024*	*0.026*			*0.024*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good	*0.006*	*0.026*			*0.006*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good	*0.011*	*0.026*			*0.011*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SH_G_019 Aughrim	GWB	*Good*	*0.018*	*0.026*	*13.1*	*0.0004*	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

‡ Load from WWTP / SWO following treatment added
* Trends are Statistically Significant

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 5-3**). 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 5-3 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 5-4**, 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 5-3: 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*
Ballinasloe Primary Discharge	0.5 mg/l (ortho P) Compliant with ELV for ortho P in 2017 AER	**Existing**	629.6	0.235	0.188	0.319
		Post-dosing	629.6	0.235	0.188	0.319
Ballinasloe SWOs (3 no.)	n/a	**Existing**	183.4	2.348	1.878	3.193
		Post-dosing	204.7	2.621	2.097	3.564

Table 5-4 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. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post-dosing (mg/l)	% Inc
Ballinasloe	IE_SH_26S071400 Suck_140	0.0242	0.0245	0.0245	0.03

Ballinasloe Agglomeration

Ballinasloe agglomeration discharges into Suck_140 (IE_SH_26S071400) which is hydrologically connected to the River Suck Callows SPA. As Ballinasloe receives tertiary treatment, i.e. chemical dosing for nutrient removal, and is compliant with ELV concentrations, it is assumed that the additional P loading to the plant can be dealt with and managed within the treatment process. The modelled concentrations for both existing and post dosing scenarios are compliant with total phosphorus ELVs set in WWDL (**Table 5-3**). When mean flows are taken into account the increase in the receiving water is negligible (0.03%) (**Table 5-4**). Therefore, there is no risk of failing to achieve WFD objectives for the Suck_140 (IE_SH_26S071400) and its hydrologically connected European Sites as a result of dosing at Ballinasloe Town WTP.

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

5.3.2.1 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 for most river water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies).

For Suck_140 (IE_SH_26S071400), the modelled increase in concentration exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline to exceed 75% of the indicative quality upper threshold at any of the monitoring points.

The remaining river water body, Laurencetown Stream_020 (IE_SH_26L070500) has a predicted concentration above 5% of the Good / High boundary (0.00125 mg/l) (see **Step 4, Appendix C**). The modelled increase in concentration in this river is 0.0018 mg/l. The baseline concentration is 0.047 mg/l. The total post-dosing modelled concentration of 0.049 mg/l and is within 75% of the ortho P upper threshold, therefore the waterbody is not at risk of deterioration in ortho P indicative quality.

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

Therefore there is 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.

5.3.2.2 Groundwater Assessment

The predicted loads and concentrations to groundwater bodies (GWBs) are undetectable (i.e. <0.00175 mg/l = 5% of the Good / Fail indicative quality boundary) as shown in **Table 3 of Appendix C**.

The groundwater body with the highest potential increase in orthophosphate concentration due to dosing is Aughrim (IE_SH_G_019). In this case the potential increase is 0.0004 mg/l which does not exceed 5% of the Good / Fail indicative quality boundary. The modelled increase in the remaining groundwater bodies is not detectable (0.0000 mg/l).

Therefore, there is no risk of deterioration in the Ortho P 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 4 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 for the majority of river water bodies, 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**.**

For Suck_140 (IE_SH_26S071400) and Laurencetown Stream_020 (IE_SH_26L070500) the modelled increases in concentration exceed 5% of the High / Good indicative quality boundary; however the increases do not cause the post-dosing baseline concentrations to exceed 75% of the indicative quality upper threshold.

The existing baseline concentrations for SHANNON (LOWER)_010 (IE_SH_25S012000) and DERRYMULLAN STREAM_020 (IE_SH_26D070700) exceeds 75% of the indicative quality upper threshold. However the modelled increase due to dosing is not detectable (0.0000 mg/l). Therefore, dosing poses no risk of deterioration in the orthophosphate indicative quality of the river water bodies

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

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative effects from other dosed WTPs and associated water supply zones in the Shannon catchments (HAs 24,25,26 and 27) have been assessed. The cumulative loads to water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in

Table 5-5 and **Table 5-6** below.

- 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
- 068 Rockingham WTP - Boyle Regional WSS
- 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme
- 128 Longford Springs WTP Future Supply - Castlerea WSS
- 140 Lisbrock WTP - SRRWSS Lisbrock
- 161 Freemount WTP – Zone 4 Allow Regional
- 178 Clavin's Bridge WTP – Kells /Oldcastle WS
- 184 Foileen WTP – Cappamore Foileen 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 existing baseline concentration for Upper Shannon Estuary exceeds 75% of the indicative quality upper threshold during summer. However the modelled cumulative increases due to dosing do not exceed 5% of the High / Good indicative quality boundary.

The impact to the remaining receiving waters is also not significant as outlined in **Table 5, Appendix C** and **Table 5-5** 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.

Table 5-5: Cumulative assessment of the increased loading and concentrations to receiving water bodies common to the WSZs within the Shannon catchment

NAME / EU_CD	Water body/Period	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality in *italic*	Baseline Year 2014 and Conc. Surrogate Conc given in *italic* mg/l	75% of Indicative Quality Upper Threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	PO_4 Potential Baseline Conc. following dosing mg/l
IE_SH_25S012000 Shannon (Lower)_010	RWB	High Upwards Near	0.011	0.019	1021.2	0.0002	0.011
IE_SH_25S012000 Shannon (Lower)_020	RWB	*Moderate*	*0.046*	*0.051*	*1029.7*	*0.0002*	*0.046*
IE_SH_25S012350 SHANNON (LOWER)_030	RWB	High Upwards Near	0.011	0.019	1040.8	0.0002	0.011
IE_SH_25SO12500 Shannon Lower_050	RWB	High	0.012	0.019	1283.8	0.0002	0.012
IE_SH_25SO12600 Shannon Lower_060	RWB	High	0.013	0.019	2023.7	0.0003	0.013
		High	0.018	0.019			0.018
		Good	0.030	0.033			0.030
		High	0.014	0.019			0.014
		High	0.010	0.019			0.010
IE_SH_060_0900 Limerick Dock	TWB Summer	High (S) Far	0.008	0.019	7516.7	0.0010	0.008
	TWB Winter	High (W) Far	0.012	0.019			0.012
IE_SH_060_0800 Upper Shannon Estuary	TWB Summer	High (S) Near	0.020	0.019	8848.1	0.0010	0.020
	TWB Winter	High (W) Near	0.011	0.019			0.011
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_000 Mouth of River Shannon	CWB Summer	High	0.008	0.019	13317.6	0.0001	0.008
	CWB Winter	*Good*	*0.033*	*0.040*			*0.033*

Table 5-6: Vollenweider assessment of cumulative load to Lakes within the WSZs

EU_CD / NAME Lakes	Parameter	TP Indicative Quality and Trends (Distance to Threshold. Surrogate Status in *italic*	Baseline 2014 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)	Post -dosing Aerial Load (mg/m²/yr)
IE_SH_25_191 Lough Derg (combined)	TP	Good Upwards Far	0.015	882.2	1105.9	1115.8	735.1	0.9

5.4 CONCLUSIONS

The modelled increased orthophosphate dosing concentrations as a result of direct discharges do not result in a noticeable effect with orthophosphate concentrations in the receiving Suck_140 (IE_SH_26S071400) 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 for most 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.

For Suck_140 (IE_SH_26S071400) and Laurencetown Stream_020 (IE_SH_26L070500) the modelled increases in concentration exceed 5% of the High / Good indicative quality boundary; however the increases do not cause the post-dosing baseline concentrations to exceed 75% of the indicative quality upper threshold. Hence, 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. In relation to Laurencetown Stream_020 (IE_SH_26L070500), while the WFD status of the river will not be affected by the proposed dosing, the potential implications on qualifying interests are discussed in Section 6.

The post dosing concentration for Shannon (Lower)_010 (IE_SH_25S012000) and Derrymullan Stream_020 (IE_SH_26D070700) exceeds 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in Ortho P concentration is undetectable (0.0000mg/l). 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 predicted loads to groundwater bodies are not significant (i.e. < 0.00175 mg/l = 5% of the Good / Fail boundary) with the largest modelled increase of 0.0010mg/l exhibited in Limerick Dock and Upper Shannon Estuary. Increases in concentration for all remaining water bodies are within the 5% Good / High indicative quality boundary threshold following dosing. There are no transitional or coastal water bodies directly affected by the Ballinasloe Town WTP.

The cumulative assessment of dosing at Ballinasloe Town 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

Ballinasloe WTP is not located within the boundary of any European Site. The WTP is located adjacent to the boundary of the River Suck Callows SPA (004097). The River Suck (IE_SH_26S071400) is located immediately north of Ballinasloe WTP and forms part of the River Suck Calllows SPA. The River Shannon Callows SAC and Middle Shannon Callows SPA are located approximately 25km downstream of the WTP boundary and are hydrologically connected via the following surface water bodies; Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550) and Shannon (Upper)_130 (IE_SH_226S021920). The proposed construction works will be localised and contained to the immediate development area which supports amenity buildings and artificial surfaces. The WTP is approximately 80m of the River Suck with built surfaces and existing hedgerows acting as a barrier to pathways to the River Suck_140 (IE_SH_26S071400). It is unlikely, in the absence of pathways, that impacts will occur as a result overland flow and surface water run-off to the River Suck_140 (IE_SH_26S071400). In addition, works are small-scale in nature and confined to within the WTP boundary which does not contain any habitats to support SCIs from the SPA. Therefore, there is no potential for likely significant effects on the River Suck Callows SPA as a result of the construction of the corrective water treatment works at Ballinasloe WTP.

The WTP also overlies the South Suck GWB (IE_SH_G_225) and intersects the River Suck Callows SPA, Middle Shannon Callows SPA and River Shannon SAC. Potential source impact pathways have been ruled out for the Middle Shannon Callows and River Shannon SAC. For the remaining European Site, (River Suck Callows SPA) the interference with the underlying water table will be unlikely to occur owing to the nature of the construction works. Any interference would be localised, minor and temporary.

Therefore, it can be concluded on the basis of objective scientific information that the construction of the corrective water treatment works at Ballinasloe WTP, individually or in combination with other plans or projects, will not to have a significant effect 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 and the potential to impact upon 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. Throughout the following assessment of impacts, where status is listed this refers to orthophosphate status (as per **Table 5-2**) unless otherwise stated.

6.2.1 BARROUGHTER BOG SAC 000231

6.2.1.1 (7110) *Active raised bogs

The supporting document to Barroughter Bog SAC (NPWS 2015[16]) describes raised bog habitats as naturally nutrient poor systems. The surface of a relatively intact raised bog is typically wet, acid, deficient in plant nutrients, and supports specialised plant communities that are low in overall diversity and comprising species adapted to the biologically harsh conditions. Within the Site Specific Conservation Objectives (SSCOs) for Barroughter Bog SAC (NPWS 2015[17]), the attributes and targets that will maintain the favourable conservation condition of this habitat indicate that the main source of nutrient enrichment to raised bogs is from the atmospheric deposition of nitrogen. In terms of water quality, the water chemistry in raised bogs is influenced by atmospheric inputs (rainwater). However, within soak systems, water chemistry is influenced by other inputs such as focused flow or interaction with underlying substrates. The supporting document further states that in the marginal areas there may be increased mineral and nutrient content of the water due to regional groundwater influences, runoff from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Barroughter Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Kilcrow_020 (IE_SH_25K010060), Kilcrow_030 (IE_SH_25K010100), Kilcrow_040 (IE_SH_25K010300), Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700); and
- The groundwater body hydrogeologically connected is: Tynagh (IE_SH_G_236).

Active raised bog habitat is confined to two locations in the northern section of the high bog. Although the habitat does not receive direct discharges from the proposed activities, there is a hydrological connection between the WSZ and the eastern boundary of the SAC.

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 post-dosing concentrations 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 increase in concentration for both Kilcrow_020 (IE_SH_25K010060) and Kilcrow_030 (IE_SH_25K010100) is not detectable (0.0000 mg/l), therefore it will remain undetectable for Kilcrow_040 (IE_SH_25K010300), Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700) moving downstream.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l), therefore does not exceed 5% of the Good / Fail indicative quality boundary

[16] NPWS 2015 Barroughter Bog SAC 000231 Conservation Objectives Supporting Document - Raised Bog
[17] NPWS 2015 Barroughter Bog SAC 000231 Conservation Objectives

for groundwaters (0.00175 mg/l). The post dosing concentration also does not exceed 75% of the upper indicative quality threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

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

6.2.1.2 (7120) Degraded raised bogs still capable of natural regeneration

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. No SSCOs for this habitat within Barroughter Bog SAC are set. The Conservation Objective (CO) document (NPWS 2015[17]) states that the long-term aim for degraded raised bogs still capable of natural regeneration is that its peat-forming capability is re-established; therefore, the CO for this habitat is inherently linked to that of active raised bogs (7110) and a separate CO has not been set in Barroughter Bog SAC. 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 degraded raised bog would also be achieved.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Barroughter Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Kilcrow_020 (IE_SH_25K010060), Kilcrow_030 (IE_SH_25K010100), Kilcrow_040 (IE_SH_25K010300), Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700); and
- The groundwater body hydrogeologically connected is: Tynagh (IE_SH_G_236).

Degraded raised bog is the dominant habitat on the uncut high bog surface at this site. It is generally associated with the more marginal areas of the high bog where drainage effects, due to peripheral peat-cutting, are most pronounced. Although the habitat does not receive direct discharges from the proposed activities, there is a hydrological connection between the WSZ and the eastern boundary of the SAC.

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 post-dosing concentrations 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 increase in concentration for both Kilcrow_020 (IE_SH_25K010060) and Kilcrow_030 (IE_SH_25K010100) is not detectable (0.0000 mg/l), therefore it will remain undetectable for Kilcrow_040 (IE_SH_25K010300),

Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700) moving downstream.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l), therefore does not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration also does not exceed 75% of the upper indicative quality threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.1.3 (7150) Depressions on peat substrates of the *Rhynchosporion*

SSCOs for this habitat within Barroughter Bog SAC are not set. The CO document (NPWS 2015[17]) states that depressions on peat substrates of the *Rhynchosporion* is an integral part of good quality active raised bogs (7110) and thus a separate conservation objective has not been set for the habitat. 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 depressions on peat substrates of the *Rhynchosporion* would also be achieved.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Barroughter Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Kilcrow_020 (IE_SH_25K010060), Kilcrow_030 (IE_SH_25K010100), Kilcrow_040 (IE_SH_25K010300), Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700); and
- The groundwater body hydrogeologically connected is: Tynagh (IE_SH_G_236).

Rhynchosporion depressions typically occur along pool edges and on flats underlain by deep, wet and quaking peat. *Rhynchosporion* habitat at Barroughter Bog has been recorded in both the Active Raised Bog, and supporting high bog habitats. Although the habitat does not receive direct discharges from the proposed works, there is a hydrological connection between the WSZ and the eastern boundary of the SAC.

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 post-dosing concentrations 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 increase in

concentration for both Kilcrow_020 (IE_SH_25K010060) and Kilcrow_030 (IE_SH_25K010100) is not detectable (0.0000 mg/l), therefore it will remain undetectable for Kilcrow_040 (IE_SH_25K010300), Kilcrow_050 (IE_SH_25K010360), Kilcrow_060 (IE_SH_25010500) and Kilcrow_070 (IE_SH_25K010700) moving downstream.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l), therefore does not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration also does not exceed 75% of the upper indicative quality threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.2 GLENLOUGHAN ESKER SAC 002213

6.2.2.1 (6210) * Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (* important orchid sites)

Glenloughaun Esker is a fine example of dry, mostly unimproved, orchid-rich calcareous grassland on an esker ridge. Although this habitat is not water dependent it is considered nutrient sensitive. There are SSCOs for this SAC however they do not detail any attributes or site specific targets in relation to water quality (NPWS 2018[18]). Areas of the SAC have been improved through fertilization resulting in lower plant diversity. The Ballinure River flows along the southern border of the SAC and flooding has the potential to bring nutrients into the grassland. A review of OPW flood risk mapping[19] details a historic flood in the Shannon impacting Ballinasloe Town in 2009, but the Ballinure River which is a tributary downstream of the Shannon is not mentioned in reports.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Glenloughan Esker SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water body hydrologically connected to the site is: Ballinure_010 (IE_SH_26B010300); and
- The groundwater body hydrogeologically connected is: Aughrim (IE_SH_G_019).

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**.

[18] NPWS 2018 Glenloughaun Esker SAC 002213 Conservation Objectives
[19] www.floodmaps.ie

The modelled post-dosing concentration in the Ballinure_010 river water body does not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). The modelled increase in concentration is not detectable (0.0000 mg/l). The post dosing concentration also does not exceed 75% of the indicative quality upper threshold.

For the hydrogeologically connected groundwater body, Aughrim (IE_SH_G_019), the modelled increase in concentration is 0.0004 mg/l which does not exceed 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) for groundwaters. The post dosing concentration also does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

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

6.2.3 REDWOOD BOG SAC 002353

6.2.3.1 (7110) *Active raised bogs

The supporting document to Redwood Bog SAC (NPWS 2015[20]) describes raised bog habitats as nutrient poor ecosystems with acidic, waterlogged and exposed conditions. As a consequence they are relatively poor both in terms of species diversity and population densities. Within the SSCOs (NPWS 2015[21]), the attributes and targets that will maintain the favourable conservation condition of this habitat indicate that the main source of nutrient enrichment in raised bogs is from the atmospheric deposition of Nitrogen. In terms of water quality, the water chemistry in raised bogs is influenced by atmospheric inputs (rainwater) and water chemistry in areas surrounding the high bog varies due to influences of different water types (bog water, regional groundwater, and run-off from surrounding mineral lands). The supporting document further states that in the marginal areas there may be increased mineral and nutrient content of the water due to regional groundwater influences, runoff from surrounding mineral soils, and the release of nutrients through oxidation of peat resulting from reduced water levels. In addition the national target for the attribute 'high bog' habitat is to ensure no decline in extent of high bog to support the development and maintenance of active raised bog.

Table 5-2 identifies the surface water bodies that are hydrologically connected to the Redwood Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030

[20] NPWS 2015 Redwood Bog SAC 002353 Supporting Document-Raised Bog Habitats
[21] NPWS 2015 Redwood Bog SAC 002353 Conservation Objectives

(IE_SH_25S012350), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550).

Active raised bog habitat is composed solely of the sub-central ecotope (area of actively accumulating peat conditions) on Redwood Bog. This sub-central ecotope covers 12.1ha and is found at eleven locations dotted around the SAC. Four sites are located in the South-west corner, two in the Northern part, two in the Southern part and a further three in the Northern-central part of the SAC. High bog habitat is found in three sections covering the majority of the SAC. Although the habitat does not receive direct discharges from the proposed activities, there is a hydrological connection between the WSZ and the northern boundary of the SAC which borders the Lower River Shannon (IE_SH_25S012350).

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. Redwood Bog SAC is located adjacent to the River Shannon Callows SAC. The Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020

(IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350) all have undetectable modelled increases in concentration of 0.0000mg/l. Therefore, due to lack of direct connectivity, the distance of the SAC downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on any of the QIs for which Redwood Bog SAC is designated.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

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

6.2.3.2 (7120) Degraded raised bogs still capable of natural regeneration

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. No SSCOs for this habitat within Redwood Bog SAC are set. The CO document (NPWS 2015[21]) states that the long-term aim for degraded raised bogs still capable of natural regeneration is that its peat-forming capability is re-established; therefore, the CO for this habitat is inherently linked to that of Active raised bogs (7110) and a separate CO has not been set in Redwood Bog SAC. 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 Degraded Raised Bog would also be achieved.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Redwood Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550).

Degraded raised bog is generally associated with the more marginal areas of the high bog where drainage effects, due to peripheral peat-cutting, are most pronounced. Within the SAC, degraded bog is estimated to cover 51.8ha and represents the area of high bog which does not contain active raised bog. High bog habitat is found in three sections covering the majority of the SAC. Although the habitat does not receive direct discharges from the proposed activities, there is a hydrological connection between the WSZ and the northern boundary of the SAC which borders the Lower River Shannon IE_SH_25S012350.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. Redwood Bog SAC is located adjacent to the River Shannon Callows SAC. The Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350) all have undetectable modelled increases in concentration of 0.0000. Therefore, due to lack of direct connectivity, the distance of the SAC downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on any of the QIs for which Redwood Bog SAC is designated.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.3.3 (7150) Depressions on peat substrates of the *Rhynchosporion*

SSCOs for this habitat within Redwood Bog SAC are not set. The CO document (NPWS 2015[21]) states that depressions on peat substrates of the *Rhynchosporion* is an integral part of good quality Active raised bogs (7110) and thus a separate conservation objective has not been set for the habitat. 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 Depressions on Peat Substrates of the *Rhynchosporion* would also be achieved.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Redwood Bog SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550).

Rhynchosporion depressions typically occur along pool edges and on flats underlain by deep, wet and quaking peat. The location of *Rhynchosporion* habitat at Redwood Bog has not been identified in the CO or supporting document. *Rhynchosporion* is known from other SACs to occur in both active and degraded bogs and supporting bog habitats; therefore it has been assumed for the purposes of this assessment that this habitat may occur in association with these bog types at this site. Although the SAC does not receive direct discharges from the proposed activities, there is a hydrological connection between the WSZ and the northern boundary of the SAC which borders the Lower River Shannon IE_SH_25S01_2350.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. Redwood Bog SAC is located adjacent to the River Shannon Callows SAC. The Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350) all have undetectable modelled increases in concentration of 0.0000. Therefore, due to lack of direct connectivity, the distance of the SAC downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on any of the QIs for which Redwood Bog SAC is designated.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.4 RIVER SHANNON CALLOWS SAC 000216

6.2.4.1 (1355) Otter *(Lutra lutra)*

The River Shannon Callows is a long and diverse site which consists of seasonally flooded, semi-natural, lowland wet grassland, along and beside the river between the towns of Athlone and Portumna. It is approximately 50 km long and averages about 0.75 km wide (reaching 1.5 km wide in places). There are no SSCOs published for this SAC (NPWS 2018[22]). A search of other SACs containing this species show there are no water quality or nutrient specific targets, however, there is a target to ensure that there should be no significant decline in fish biomass.

In addition, the National Parks and Wildlife Service's 'Threat Response Plan for the Otter' (NPWS 2009[23]), which comprised a review of and response to the pressures and threats to otters in Ireland,

[22] NPWS 2018 River Shannon Callows SAC 000216 Conservation Objectives
[23] NPWS 2009 Threat Response Plan: Otter Lutra lutra 2009-2011

categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. Water pollution may influence otters either indirectly or directly. Indirect effects include damage to food supply or habitat, thus lowering the carrying capacity of an affected area. Direct effects impact the animal itself, resulting in either rapid death (acute toxicity) or in lowered fitness (sub-lethal toxicity), reducing the animal's ability to reproduce successfully or to survive in inclement conditions. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater and crayfish locally. Poorly treated effluents can wipe out fish populations for long distances downstream of the discharge, making otherwise ideal habitat unsuitable for otter.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the River Shannon Callows SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350); and
- The groundwater bodies hydrogeologically connected include: Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236).

The distribution of otter has not been identified within the SSCOs for the River Shannon Callows SAC. It is assumed that otter have the potential to interact with all water bodies within the SAC (river, lakes & wetlands) and the Supporting Document, A Preliminary Study of the Upper Shannon Floodplain (Brown et al., 2002[24]), assumes otter to be common.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

[24] Browne et al., 2002 Lower River Shannon Callows 000216 Supporting Document - Preliminary Study of the Upper Shannon Callows

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. The SAC is approximately 5 km downstream of Laurencetown Stream_020 (IE_SH_26L070500). The modelled increase in concentration remains undetectable (0.0000 mg/l) in the Shannon (Lower). As stated above, the otter has the potential to interact with all water bodies within the River Shannon Callows SAC, and though Laurencestown Stream_020 is not within the SAC itself, it is indirectly connected and therefore there is potential for otter to utilise it. However as the modelled increase in concentration will not alter the WFD status of Laurencetown Stream_020 (IE_SH_26L070500), the distance from the river to the SAC and orthophosphate concentration within the SAC itself being undetectable, it is concluded that there will be no likely significant effect on the otter, its habitat or its food sources within or outside the SAC.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). In both groundwater bodies, the post dosing concentration does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment, the additional orthophosphate loading from dosing at Ballinasloe Town WTP will not impact fish species, the main food source for the otter in this SAC. Therefore, there will be no likely significant effects to the otter as a result of this project and will not prevent the maintenance or restoration of its favourable conservation condition.

6.2.4.2 (6410) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) and (6510) Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)

The River Shannon Callows SAC is mainly comprised of lowland wet grassland. Different plant communities occur depending on elevation, and therefore flooding patterns. Two habitats listed on Annex I of the Habitats Directive are well-represented within the site; *Molinia* meadows and lowland hay meadows (NPWS, 2013[25]). *Molinia* meadow is a semi-natural grassland listed on Annex I of the Habitats Directive. Areas of *Molinia-Succisa* grassland are often seasonally flooded and can be managed as rough grazing or through a traditional regime of mowing during the drier summer months. Lowland hay meadow habitat has also been mapped downstream of the WSZ within the floodplain of the callows. The main negative impacts recorded for Annex I grassland habitats are species composition change (succession) and problematic native species (e.g. bracken). There are no SSCOs published for this SAC (NPWS 2018[22]). A search of other SACs containing this habitat show there are no water quality or nutrient specific targets for this habitat. *Molinia* meadows are a groundwater dependent terrestrial ecosystem (GWDTE) and have low to moderate sensitivity to changes in groundwater quantity and quality[26].

Semi-natural grasslands are an extremely vulnerable habitat in Ireland. Areas of semi-natural grassland that are accessible to machinery are particularly vulnerable to agricultural improvement. They are nutrient sensitive with the addition of fertiliser to semi-natural grasslands resulting in a change of sward composition and a loss of plant species diversity (Martin *et al*., 2007[27]). While the conservation designation of these areas of callow grassland aids their conservation, it is the regular flooding of callow grasslands that has protected these habitats from pressures such as commercial development in the past, and will continue to contribute to their protection in the future (Martin *et al*., 2007).

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the River Shannon Callows SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350); and
- The groundwater bodies hydrogeologically connected include: Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236).

Molinia habitat is well represented and distributed throughout the Shannon Callows. Given the SACs location, it receives water from all water bodies affected by the proposed orthophosphate dosing.

[25] NPWS 2013 River Shannon Callows SAC 000216 Site Synopsis

[26] http://www.wfdireland.net/Documents/Characterisation%20Report/Background%20Information/Review%20of%20Env%20Impacts/Groundwater%20Risk%20Assessment/GW11%20Guidance%20on%20Ecosystems.pdf

[27] Martin, Gabbett, Perrin, Delaney 2007 Semi-natural Grassland Survey of Counties Roscommon and Offaly

Lowland hay meadow habitat has also been mapped downstream of the WSZ within the floodplain of the callows.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both exhibit post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. The SAC is approximately 5 km downstream of Laurencetown Stream_020 (IE_SH_26L070500). The modelled increase in concentration remains undetectable (0.0000 mg/l) in the Shannon (Lower). As stated above, habitat is well represented and distributed throughout the Shannon Callows and therefore receives water from all water bodies within the WSZ. However, due to lack of direct connectivity, the distance of the SAC downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on the habitat *Molinia* meadows.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality

boundary for groundwaters (0.00175 mg/l). The post dosing concentration in both groundwater bodies does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.4.3 (91E0) *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

Alluvial forest is a priority habitat within the River Shannon Callows SAC. There are no SSCOs published for this SAC (NPWS 2018[22]). A search of other SACs containing this habitat show there are no water quality or nutrient specific target for this habitat. There is a target to maintain the appropriate hydrological regime necessary for maintenance of alluvial vegetation. Periodic flooding is essential to maintain alluvial woodlands along river floodplains. For the Lower Shannon SAC there is a Supporting Document for Woodlands (NPWS 2012[28]) which lists potential threats to this habitat type including an indirect threat from agriculture through fertiliser drift and water pollution, which may increase the trophic status of the wood leading to the stronger growth of nitrophilous species and loss of less vigorous species. However, as these are naturally eutrophic systems the impact is likely to be minimal. In addition, discharge of sewage effluent and slurry will pollute the water and have an indirect impact on the woodlands.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the River Shannon Callows SAC and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350); and
- The groundwater bodies hydrogeologically connected include: Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236).

Alluvial forest occurs on a series of alluvial islands just below the ESB weir near Meelick. Given the SACs location, it receives water from all water bodies affected by the proposed orthophosphate dosing.

[28] NPWS 2012 Lower River Shannon SAC 002165 Supporting Document -Woodland Habitat

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both exhibit post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC. The SAC is approximately 5 km downstream of Laurencetown Stream_020 (IE_SH_26L070500). The modelled increase in concentration remains undetectable (0.0000 mg/l) in the Shannon (Lower). Due to the location of this QI on a series of alluvial islands just below the ESB weir near Meelick, it therefore receives water from all water bodies within the WSZ. However, due to lack of direct connectivity, the distance of the SAC downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on the habitat as a result of dosing.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration in both groundwater bodies does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at Ballinasloe Town WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat.

6.2.5 MIDDLE SHANNON CALLOWS SPA 004096

The Middle Shannon Callows SPA is a long and diverse site which extends for approximately 50 km from the town of Athlone to the town of Portumna; it lies within Counties Galway, Roscommon, Westmeath, Offaly and Tipperary. The site averages about 0.75 km in width though in places is up to 1.5 km wide. Water levels on the site are greatly influenced by the very small fall between Athlone and Portumna and by the weir at Meelick. The site has extensive areas of callow, or seasonally flooded, semi-natural, lowland wet grassland, along both sides of the river. There are seven bird species of SCI; Whooper Swan, Wigeon, Corncrake, Golden Plover, Lapwing, Black-tailed Godwit and Black-headed Gull. It is also of SCI for holding an assemblage of over 20,000 wintering waterbirds and 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 2018[29]); 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 Middle Shannon 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 draft RBMP (2018-2021) (DHPLG, 2018[30]) 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.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the Middle Shannon Callows SPA and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400),

[29] NPWS 2018 Middle Shannon Callows SPA Conservation Objectives

[30] 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

Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350); and

- The groundwater bodies hydrogeologically connected include: Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236).

The callow grasslands provide optimum feeding grounds for various species of waterfowl, while many of the birds also roost or rest within the site. Black-tailed Godwit, a very rare breeding species in Ireland, nests or attempts to nest in small numbers each year within the site. A further scarce breeding species, Shoveler, also nests in small numbers each year. The Middle Shannon Callows SPA supports a breeding population of Corncrake. They require the cover of tall vegetation throughout their breeding cycle and are strongly associated with meadows which are harvested annually, where they nest and feed. Annual cutting of these meadows creates a sward which is easy for the birds to move through.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon

(Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the Middle Shannon Callows SPA. The SPA is approximately 5 km downstream of Laurencetown Stream_020 (IE_SH_26L070500). The modelled increase in concentration remains undetectable (0.0000 mg/l) in the Shannon (Lower). However, due to lack of direct connectivity, the distance of the SPA downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on the SCIs as a result of dosing.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration in both groundwater bodies does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment which has determined that there is no risk of deterioration in the orthophosphate indicative quality of the water bodies that support the structure and function of the SPA, or of preventing their achievement of WFD objectives. The additional loading from the orthophosphate dosing is not likely to have significant effects on the favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

6.2.6 RIVER LITTLE BROSNA CALLOWS SPA 004086

The River Little Brosna Callows SPA follows the River Brosna from its confluence with the River Shannon for approximately 9 km south-eastwards to just beyond New Bridge on the R438 road. The site extends along both sides of the river within counties Offaly and Tipperary. The main habitat present is the extensive area of low-lying callow grassland along the floodplain of the river. These grasslands are subject to prolonged flooding in winter, early spring and occasionally in summer. There are nine bird species of SCI; Whooper Swan, Wigeon, Teal, Pintail, Shoveler, Golder Plover, Lapwing, Black-tailed Godwit, Black-headed Gull 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 2018[31]) 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 Little Brosna 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 draft RBMP (2018-2021) (DHPLG, 2018[30]) 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

[31] NPWS 2018 River Little Brosna Callows SPA 004086 Conservation Objectives

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.

Table 5-2 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the River Little Brosna Callows SPA and will receive inputs from the proposed dosing at Ballinasloe Town WTP:

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200), Laurencetown Stream_020 (IE_SH_26L070500), Eyrecourt Stream_010 (IE_SH_25E010200), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350); and
- The groundwater bodies hydrogeologically connected include: Aughrim (IE_SH_G_019) and Tynagh (IE_SH_G_236).

The River Little Brosna Callows is an internationally important site for wintering waterfowl, being notable both for numbers and diversity of species. Of particular note is the internationally important Greenland White-fronted Goose flock that is based along the Brosna. The populations of Golden Plover and Black-tailed Godwit are also of international importance. The River Little Brosna Callows is an important spring passage site and the Black-tailed Godwit flock, which is the largest in the country, exceeds over 4,000 birds on some occasions. The populations of Wigeon, Teal and Golden Plover are consistently among the largest in the country. The callows are also of importance for some breeding waders such as Lapwing.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060), Shannon (Lower)_030 (IE_SH_25S012350), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Eyrecourt Stream_010 (IE_SH_25E010200) and Laurencetown Stream_010 (IE_SH_26L070200) have insignificant modelled increases in concentration of 0.0005 mg/l and 0.0006 mg/l respectively.

Derrymullan Stream_020 and the Shannon (Lower)_010 both have post dosing concentrations which exceed 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for both river waterbodies is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550). As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). The Suck_160 (IE_SH_26S071550) then joins the Shannon (Upper)_130 (IE_SH_26S021920) at its most southern point, prior to becoming the Shannon (Lower)_010 (IE_SH_25S012000). The confluence of the River Suck and River Shannon (Upper & Lower) overlaps with the River Shannon Callows SAC/Middle Shannon Callows SPA. River Little Brosna Callows SPA is located adjacent to the River Shannon Callows SAC/Middle Shannon Callows SPA. The Shannon (Lower)_010 (IE_SH_25S012000), Shannon (Lower)_020 (IE_SH_25S012060) and Shannon (Lower)_030 (IE_SH_25S012350) all have undetectable modelled increases in concentration of 0.0000mg/l. Therefore, due to lack of direct connectivity, the distance of the SPA downstream of Laurencetown Stream_020 and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on any of the SCIs for which the SPA is designated. In addition, the site is upstream of the Shannon (Lower), however has been included for further assessment due to the nature of the callows.

For the groundwater body Tynagh (IE_SH_G_236), the modelled increase in concentration is also not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration in both groundwater bodies does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment which has determined that there is no risk of deterioration in the orthophosphate indicative quality of the water bodies that support the structure and function of the SPA, or of preventing their achievement of WFD objectives. The additional loading from the orthophosphate dosing is not likely to have significant effects on the favourable conservation status of its SCIs; either in terms of individual bird species or wetland habitats.

6.2.7 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. 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; Whopper 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 2018[32]), 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 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 draft RBMP (2018-2021) (DHPLG, 2018[30]) 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.

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

- The river water bodies hydrologically connected to the site include: Derrymullan Stream_020 (IE_SH_26D070700), Suck_140 (IE_SH_26S071400), Suck_150 (IE_SH_26S071500), Suck_160 (IE_SH_26S071550), Ballinure_010 (IE_SH_26B010300), Ballinure_020 (IE_SH_26B010400), Laurencetown Stream_010 (IE_SH_26L070200) and Laurencetown Stream_020 (IE_SH_26L070500); and
- The groundwater bodies hydrogeologically connected include: Suck South (IE_SH_G_225) and Aughrim (IE_SH_G_019).

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.

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**.

For most river water bodies, the modelled increases in concentration as a result of dosing at Ballinasloe Town WTP do not exceed 5% of the High / Good indicative quality boundary (0.00125 mg/l). For the following water bodies, the modelled increase in concentration is not detectable (0.0000 mg/l): Derrymullan Stream_020 (IE_SH_26D070700), Ballinure_010 (IE_SH_26B010300), Suck_150 (IE_SH_26S071500) and Suck_160 (IE_SH_26S071550). For Ballinure_020 (IE_SH_26B010400), the modelled increase in concentration is negligible (0.0001 mg/l). Laurencetown Stream_010 (IE_SH_26L070200) has an insignificant modelled increase in concentration of 0.0006 mg/l.

[32] NPWS 2018 River Suck Callows SPA 004097 Conservation Objectives

Derrymullan Stream_020 exhibits a post dosing concentration which exceeds 75% of the indicative quality upper threshold. However, this is due to the baseline concentration as the modelled increase in concentration for this river waterbody is 0.0000mg/l which is non detectable.

Suck_140 (IE_SH_26S071400) has a modelled post-dosing increase in concentration that exceeds 5% of the High / Good indicative quality boundary (0.00125 mg/l), at 0.0014 mg/l. However this does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold.

Laurencetown Stream_020 (IE_SH_26L070500) also has a modelled increase in concentration that exceeds 5% of the High / Good indicative quality boundary, modelled at 0.0018 mg/l. However this increase does not cause the post-dosing baseline concentration to exceed 75% of the indicative quality upper threshold, therefore there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives

Laurencetown Stream_020 (IE_SH_26L070500) is a tributary of the Suck_160 (IE_SH_26S071550), within which the SPA is located. As discussed above, the modelled increase in concentration for the Suck_160 (IE_SH_26S071550) is 0.0000 mg/l, indicating that sufficient dilution has occurred just downstream of the Laurencetown Stream_020 (IE_SH_26L070500). Therefore, due to lack of direct connectivity and the dilution which has allowed the modelled concentrations to become undetectable, there will be no likely significant effect on any of the SCIs for which the SPA is designated.

For the groundwater body Suck South (IE_SH_G_225), the modelled increase in concentration is also not detectable (0.0000 mg/l). For Aughrim (IE_SH_G_019) the modelled increase in concentration is 0.0004 mg/l. The modelled increases therefore do not exceed 5% of the Good / Fail indicative quality boundary for groundwaters (0.00175 mg/l). The post dosing concentration in both groundwater bodies does not exceed 75% of the indicative quality upper threshold.

Therefore there is no risk of deterioration in the indicative quality of any water body that is connected to the SAC as a result of dosing at Ballinasloe Town WTP, or of preventing the achievement of WFD objectives.

In light of the EAM assessment which has determined that there is no risk of deterioration in the orthophosphate indicative quality of the water bodies that support the structure and function of the SPA, or of preventing their achievement of WFD objectives. The additional loading from the orthophosphate dosing is not likely to have significant effects on the 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 Galway 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 and Mitigation
Galway County Development Plan 2022-2028 In terms of water supply the plan lists 8 water objectives: - WS-1: **Enhancement of Water Supply Infrastructure** Liaise with Irish Water [Uisce Éireann], to maximise the potential of existing capacity and to facilitate the timely delivery of new water services infrastructure, to facilitate existing and future growth. - WS-2: **Protection of Water Supplies** Collaborate with Irish Water [Uisce Éireann] and the Group Water Federation Scheme to protect, conserve and enhance all existing and potential water resources in the County to ensure compliance with the European Union (Drinking Water) Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations. - WS-3: **River Basin Management Plan for Ireland 2018-2021** Support the implementation of the relevant recommendations and measures as outlined in the relevant River Basin Management Plan 2018-2021, and associated Programme of Measures, or any such plan that may supersede same during the lifetime of this plan. - WS-4: **Requirement to Liaise with Irish Water [Uisce Éireann]–Water Supply** Ensure that new developments are adequately serviced with a suitable quantity and quality of drinking water supply and require that all new developments intending to connect to a public water supply liaise with Irish Water [Uisce Éireann] with regard to the water (and wastewater) infrastructure required. - WS-5: **Private Water Supply** Support the provision of a private water supply in instances where there is no public water supply or where the existing supply does not have sufficient capacity to serve the proposed development. This will only be considered where it can be demonstrated that the proposed water supply meets the standards set out in the EU and national legislation and guidance including adherence to Article 6 of the EU Habitats Directive, and	▪ N/A	The Galway County Development Plan emphasis the objectives for water services in the county which include the enhancement and improved quality of the service to its consumers. The plan also outlines the importance of compliance with the River Basin Management Plan 2022-2027 and emphasises compliance with environmental objectives. There is no potential for cumulative impacts with these plans.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
would not be prejudicial to public health or would not significantly impact negatively on the source or yield of an existing supply. - WS-6: **Water Framework Directive** Support the preparation of Drinking Water Safety Plans and Source Protection Plans to protect sources of public water supply, in accordance with the requirements of the Water Framework Directive. - WS-7: **Water Quality** Require that new development proposals would ensure that there would not be an unacceptable impact on water quality and quantity including surface water, ground water, designated source protection areas, river corridors and associated wetlands. - WS-8: **Proliferation of Septic Tanks** Encourage the use of high standard treatment plants to minimise the risk of groundwater pollution.. The CDP also outlines 3 policy objectives for conservation of water supply. CWS-1: **Water Conservation with all Developments** To ensure all developments incorporate water conservation measures such as rainwater harvesting to minimise wastage of water supply. CWS-2: **Water Mains Rehabilitation** To assist Irish Water [Uisce Éireann] in their commitment to water conservation and support efforts to tackle leakage through find and fix (active leakage control) and water mains rehabilitation. CWS-3: **Promotion of Water Conservation** To support Irish Water [Uisce Éireann] in promoting public awareness and involvement in water conservation measures by households, business and industry.		
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	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status;

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
in the submissions reviewed from the public consultation on the draft River Basin Management Plan for Ireland 2022-2027. 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 waters in Ireland 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.		• Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each 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	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance;	CFRAM Studies and their product Flood Risk Management Plans, will each undergo AA. 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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.	▪ In-combination impacts within the same scheme.	achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative 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[33]. 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	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[34], and AA[35]. 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

[33] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[34] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[35] 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 and Mitigation
management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2014-2020 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting 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.		projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination impacts on Natura 2000 sites.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition;	This programme has been subject to a Screening for AA 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[36]. 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

[36] 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 and Mitigation
a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Disturbance to habitats / species.	and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020 Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to 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[37]. 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) Uisce Éireann has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and	▪ Habitat loss and disturbance from new / upgraded infrastructure;	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

[37] 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 and Mitigation
WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Uisce Éireann prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Uisce Éireann's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Uisce Éireann Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Uisce Éireann owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ 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 Uisce Éireann 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 (in prep.) 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 will need to take 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 Uisce Éireann include those for urban wastewater and urban runoff and 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 potential for in-combination impacts are unclear as the plan is not sufficiently developed at this stage.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
Planning Applications There are a number of planning applications pending or recently approved in Ballinasloe Town. The applications are predominantly for the change of use of a structure or renovations/extensions to an existing structure. In the case of renovation/extension the applications seek to connect to the existing public water and wastewater infrastructure.	▪ 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 Galway County Development Plan 2015-2021 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 towns foul and storm drainage systems will be treated prior to discharge, negating the potential for cumulative impacts in the receiving environment.
Integrated Pollution Control (IPC) Licensing There are no IPC licenced facilities within Ballinasloe town but there are four within the ZOI, these facilities are licensed under energy, metals and food. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities are licenced 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 Natura 2000 sites.

7 SCREENING CONCLUSION STATEMENT

This Screening to inform the AA process has considered whether the proposed construction works and orthophosphate dosing at the Ballinalsloe Town WTP, within the Ballinasloe Public Supply WSZ, 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 of 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 treatment works at Ballinasloe Town WTP, the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. River Shannon Callows SAC, Middle Shannon Callows SPA and River Suck Callows SPA) 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 European Sites within the ZoI including; Barroughter Bog SAC, Glenloughan Esker SAC, Redwood Bog SAC, River Shannon Callows SAC, Middle Shannon Callows SPA, River Little Brosna Callows SPA and River Suck Callows SPA have been assessed. Due to the low orthophosphate inputs following dosing at Ballinasloe WTP and no risk of deterioration in the status of the receiving water bodies, 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).

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

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 Ballinasloe Town 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 (2019a) Article 17 Overview Report (Vol. 1) The Status of EU Protected Habitats and Species in Ireland.

NPWS (2019b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

NPWS (2019c) 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

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.

APPENDIX A

European Sites

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
Barroughter Bog SAC (000231)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000231.pdf
Glenloughaun Esker SAC (002213)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002213.pdf
Redwood Bog SAC (002353)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002353.pdf
River Shannon Callows SAC (000216)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000216.pdf
Middle Shannon Callows SPA (004096)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004096.pdf
River Little Brosna Callows SPA (004086)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004086.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

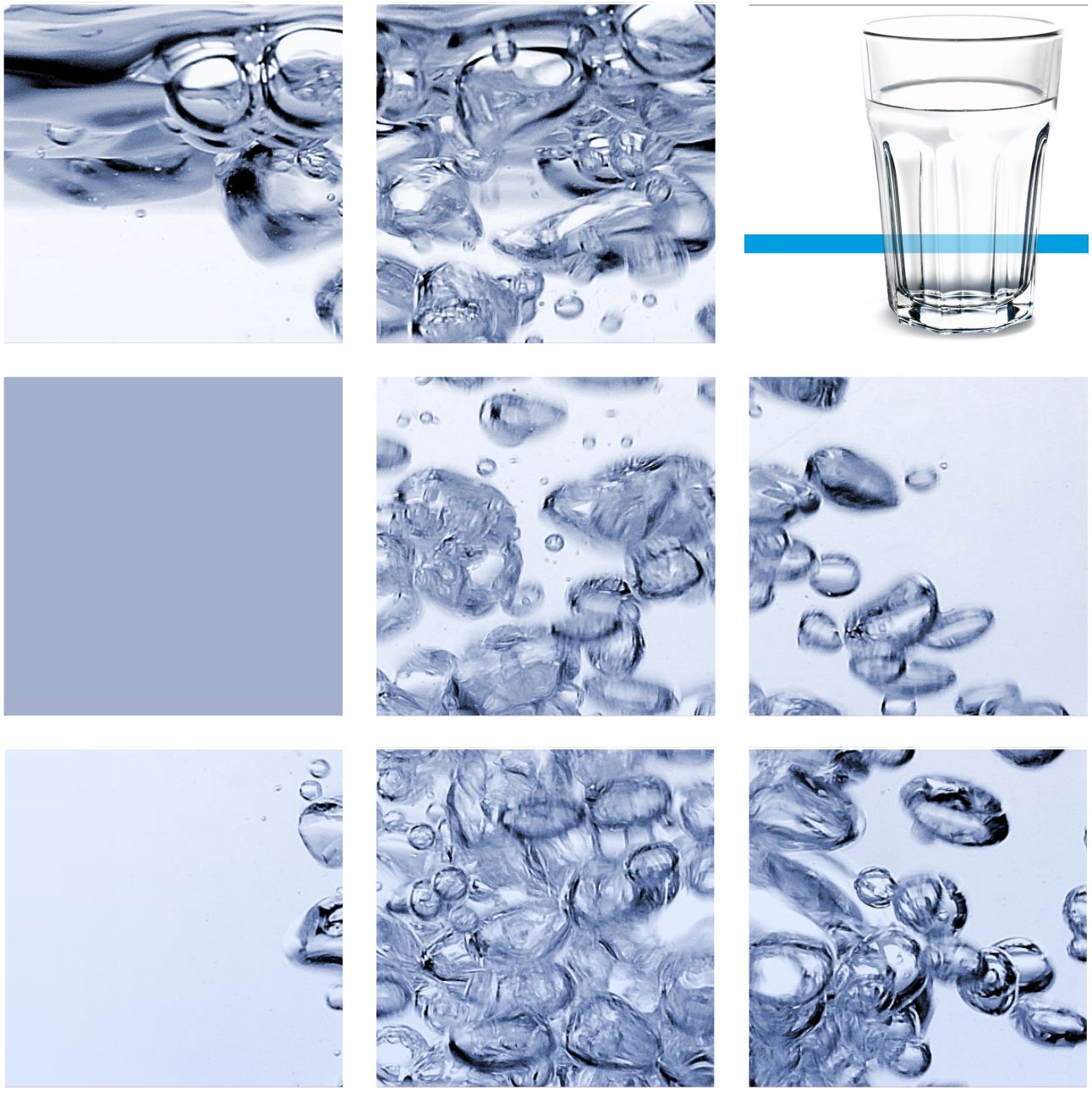
APPENDIX C

EAM Summary Report

Uisce Éireann - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

058 Ballinasloe WTP – Ballinasloe Public Supply (1200PUB1004)



National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 058 Ballinasloe Town WTP - Ballinasloe Public Supply (1200PUB1004)

Document Control Sheet

Client:	Uisce Éireann
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report 058 Ballinasloe Town WTP - Ballinasloe Public Supply (1200PUB1004)
Document No:	MDW0766RP_5.1_EAM_058_Ballinasloe_F05

Text Pages:	10	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F02	Final	23rd Jan 2019	IP		MM		DC	
F03	Final	15th Aug 2019	IP		MM		GJG	
F04	Final	20th Jan 2023	YE		MM		IP	
F05	Final	23rd Jun 2023	YE		MM		IP	

058 Ballinasloe Town WTP – Ballinasloe Public Supply (1200PUB1004)

Supporting spreadsheet: 058 Ballinasloe Town WTP - Ballinasloe Public Supply V23

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

Ballinasloe Town WTP supplies Ballinasloe Town and areas to the south and south east of the town including Clontuskert, Laurencetown, Eyrecourt and Clonfert. The distribution input for the Ballinasloe Public Supply is 3,719 m^3/day (56% of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000. The non-domestic demand is 14% of the distribution input. The area is served by Ballinasloe (D0032-01) agglomeration 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 is assessed. The agglomeration at Eyrecourt has a population equivalent of less than 500 and the estimated additional load from the agglomeration due to orthophosphate dosing is considered at the water body level via the surface water pathways. There are an estimated 679 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 Tables 5.A and 5.B).

<table>
<tr><td>Water Treatment Plant</td><td colspan="2">Ballinasloe Town WTP</td></tr>
<tr><td>Water Supply Zone(s)</td><td colspan="2">Ballinasloe Public Supply (1200PUB1004)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="3">Step 1 Appropriate Assessment Screening</td><td colspan="2">European Sites within Zone of Influence</td></tr>
<tr><td colspan="2">SACs</td></tr>
<tr><td>• Lough Derg, North-East Shore SAC
• All Saints Bog and Esker SAC
• Ardgraigue Bog SAC
• Arragh More (Derrybreen) Bog SAC
• Aughrim (Aghrane) Bog) SAC
• Ballinturly Turlough SAC
• Ballyduff/Clonfinane Bog SAC
• Barroughter Bog SAC
• Camderry Bog SAC
• Carrownagappul Bog SAC
• Castlesampson Esker SAC
• Cloonmoylan Bog SAC
• Coolcam Turlough SAC
• Corliskea/Trien/Cloonfeliv Bog SAC</td><td>• Croaghill Turlough SAC
• Curraghlehanagh Bog SAC
• Derrinlough (Cloonkeenleananode) Bog SAC
• Derrycrag Wood Nature Reserve SAC
• Four Roads Turlough SAC
• Glenloughaun Esker SAC
• Killeglan Grassland SAC
• Kilsallagh Bog SAC
• Lisduff Turlough SAC
• Lisnageeragh Bog and Ballinastack Turlough SAC
• Lough Croan Turlough SAC
• Lough Lurgeen Bog/Glenmaddy Turlough SAC</td></tr>
</table>

		• Loughatorick South Bog SAC • Pollnaknockaun Wood Nature Reserve SAC • Redwood Bog SAC • River Shannon Callows SAC • Rosturra Wood SAC • Shankill West Bog SAC • Williamstown Turlough SAC
	SPA	
	• All Saints Bog SPA • Dovegrove Callows SPA • Four Roads Turlough SPA • Lough Croan Turlough SPA	• Middle Shannon Callows SPA • River Little Brosna Callows SPA • River Suck Callows SPA • Slieve Aughty Mountains SPA .
	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

Agglom. 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*
Ballinasloe Primary Discharge	0.5	Existing	629.6	0.235	0.188	0.319
		Post Dosing	629.6	0.235	0.188	0.319
Ballinasloe SWOs (3 no.)	n/a	Existing	183.4	2.348	1.878	3.193
		Post Dosing	204.7	2.621	2.097	3.564

Note – Ballinasloe WWTP (D0032-01) provides tertiary treatment. As a result the effluent P concentration remains constant irrespective of input. The plant is compliant with orthophosphate ELVs set in WWDL for both existing and post dosing concentrations. As a result the only potential impact on water quality will be from SWO discharges.

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 flows

Agglom.	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.
Ballinasloe	SUCK_140 / IE_SH_26S071400	0.0242	0.0245	0.0245	0.03

Surface Assessment

Ballinasloe **(IE_SH_26S071400)** – The effluent concentrations are modelled and measured to be compliant with ELVs. Tertiary treatment is assumed to remove any additional load in the effluent due to orthophosphate dosing and the impact on the receiving waters due to dosing is negligible as shown by the mass balance assessment in Table 2.

Step 4 Distributed Inputs to River Water Bodies

Subsurface Assessment

The modelled increases in concentration due to subsurface pathways are insignificant in all waterbodies, i.e. < 0.00125 mg/l (5% of the Good / High indicative quality boundary for surface water bodies), except:

- *IE_SH_26L070500 LAURENCETOWN STREAM_020*

The modelled increase in concentration in this river is 0.0018 mg/l. The 2020 baseline concentration is 0.047 mg/l (moderate Ortho P indicative quality). The total post dosing concentration of 0.049 mg/l is not within 25% of the upper threshold, so this waterbody is not At Risk of Deterioration in Ortho P indicative quality.

There are no transitional water bodies directly affected by this WSZ. Cumulative impacts of downstream waterbodies are considered in the summary section.

Step 5 and 6: Combined Inputs to Ground Water Bodies

Groundwater Bodies as receptors connected to WSZ

Table 3: Increased loadings and concentrations in Groundwater bodies (*note: where existing monitoring data is not available, a surrogate indicative quality is derived from the initial characterisation or chemical status of the WB or the Group GWBS, 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 Ortho P Indicative Quality upper threshold mg/l	Ortho P load to GW due to dosing 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_019 Aughrim	*Good*	*0.018*	0.026	13.1	0.0004	0.018	
IE_SH_G_225 Suck South	Good	0.012	0.026	3.2	0.0000	0.012	MP1
	Good	0.024	0.026			0.024	MP2
	Good	0.022	0.026			0.022	MP3
	Good	0.019	0.026			0.019	MP4
	Good	0.024	0.026			0.024	MP5
	Good	0.006	0.026			0.006	MP6
	Good	0.011	0.026			0.011	MP7

IE_SH_G_236 Tynagh	Good	0.006	0.026	1.8	0.0000	0.006	

MP: multiple Monitoring Points given for waterbody

The predicted concentration increases in groundwater bodies following orthophosphate dosing are all less than 0.00175 mg/l (5% of the Good / Fail boundary) as shown in Table 3, and are therefore considered insignificant. As a result, there is no risk of deterioration in the orthophosphate indicative quality for these groundwater bodies.

There is no significant impact on groundwater receptors due to orthophosphate dosing.

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4 gives the loads and modelled concentrations for the combined assessment to rivers. The increased loads due to orthophosphate dosing are predicted to be insignificant (below 0.00125 mg/l, which is 5% of the Good / High boundary for orthophosphate indicative quality for rivers), except in:

- IE_SH_26L070500 (LAURENCETOWN STREAM_020) – the 2020 baseline is 0.047 mg/l and the increase in modelled concentration will not bring the potential baseline following dosing above the 75% threshold for moderate orthophosphate indicative quality, therefore there is no risk to WFD objectives.
- IE_SH_26S071400 (SUCK_140) - the 2020 baseline ortho P indicative quality is good or high in the three monitoring stations in this water body. The increase in modelled concentration will not bring the potential baseline following dosing above the 75% threshold for orthophosphate indicative quality, so there is no risk to WFD objectives.

The increased load due to the WWTP in IE_SH_26S071400 (SUCK_140) also has an insignificant impact as the WWTP has nutrient removal within the treatment process.

Table 4: Increased loading and concentrations to water bodies connected to the WSZs *(note: where existing monitoring data 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 given in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Indicative Quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & Agglomerations kg/yr	Potential increase in Ortho P Conc. using flows (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SH_25C180820 Carrownafinnoge_010	*Moderate*	*0.046*	*0.051*	*0.1*	*0.0000*	*0.046*	

IE_SH_25E010200 EYRECOURT STREAM_010	Good Upwards Far	0.033	0.033	5.1	0.0005	0.033	MP1
	Good Upwards Far	0.030	0.033			0.031	MP2
IE_SH_25K010060 KILCROW_020	*Good*	*0.030*	*0.033*	*0.6*	*0.0000*	*0.030*	
IE_SH_25K010100 KILCROW_030	*Moderate*	*0.046*	*0.051*	*0.7*	*0.0000*	*0.046*	
IE_SH_25S012000 SHANNON (LOWER)_010	High Upwards Near	0.024	0.019	1.2	0.0000	0.024	
IE_SH_25S012060 SHANNON (LOWER)_020	*Moderate*	*0.046*	*0.051*	*9.7*	*0.0000*	*0.046*	
IE_SH_25S012350 SHANNON (LOWER)_030	High Upwards Near	0.011	0.019	*10.5*	*0.0000*	0.011	*
IE_SH_25Y150770 DERRYHOLMES_010	*Moderate*	*0.046*	*0.051*	*0.1*	*0.0000*	*0.046*	
IE_SH_26B010300 BALLINURE_010	*Good*	*0.030*	*0.033*	*1.6*	*0.0000*	*0.030*	
IE_SH_26B010400 BALLINURE_020	Good Far	0.030	0.033	3.2	0.0001	0.030	
IE_SH_26D070700 DERRYMULLAN STREAM_020	High Upwards Near	0.020	0.019	2.3	0.0000	0.020	
IE_SH_26L070200 LAURENCETOWN STREAM_010	*Moderate*	*0.046*	*0.051*	*3.8*	*0.0006*	*0.046*	
IE_SH_26L070500 LAURENCETOWN STREAM_020	Moderate Far	0.047	0.051	21.2	0.0018	0.049	
IE_SH_26S071400 SUCK_140	Good upwards Far	0.030	0.033	16.2	0.0014	0.032	MP1 * ‡
	High upwards Far	0.014	0.019			0.014	MP2 ‡
	High upwards Near	0.010	0.019			0.010	MP3 ‡
IE_SH_26S071500 SUCK_150	High Downwards Near	0.010	0.019	17.5	0.0000	0.010	‡
IE_SH_26S071550 SUCK_160	*Good*	*0.030*	*0.033*	*43.8*	*0.0000*	*0.030*	‡

‡ Load from WWTP / SWO following treatment added
* Trends are Statistically Significant
MP: multiple Monitoring Points given for waterbody

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

Summary and Mitigation Proposed	Considering Ballinasloe Town WTP in isolation, orthophosphate dosing is predicted to have an insignificant impact on the receiving surface waterbodies. The modelled increases in load and concentrations to both groundwater and surface water receptors is insignificant, except in: LAURENCETOWN STREAM_020 (IE_SH_26L070500) SUCK_140 (IE_SH_26S071400) For the above rivers, the increase in concentration does not raise the baseline above 75% of the upper threshold for Orthophosphate indicative quality, therefore there is no risk of deterioration in Ortho phosphate indicative quality. The breakdown from source to pathway is depicted in Figure 1 and the fate of P loads from Ballinasloe Town is shown in Figure 2. The cumulative impacts on the Shannon Catchments (HAs 24, 25, 26, 27) associated with phosphate dosing from following additional WTPs are summarised in Table 5.A and Table 5.B below: • 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 Catsle 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 • 068 Rockingham WTP - Boyle Regional WSS • 081 Ballinagard Springs WTP - Roscommon Central Water Supply Scheme • 128 Longford Springs WTP Future Supply - Castlerea WSS • 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

Table 5.A: Cumulative assessment of the increased loading and concentrations to receiving water bodies common to the WSZs within the Shannon catchment ***(note: where existing monitoring data 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 Conc. Surrogate Conc. given in *italic* mg/l	75% of Indicative Quality threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SH_25S012000 SHANNON (LOWER)_010	High Upwards Near	0.011	0.019	1021.2	0.0002	0.011	
IE_SH_25S012060 SHANNON (LOWER)_020	*Moderate*	*0.046*	*0.051*	*1029.7*	*0.0002*	*0.046*	
IE_SH_25S012350 SHANNON (LOWER)_030	High Upwards Near	0.011	0.019	*10.5*	*0.0000*	0.011	*
IE_SH_25S012500 SHANNON (LOWER)_050	High	0.012	0.019	1283.8	0.0002	0.012	‡
IE_SH_25S012600 Shannon Lower_060	High	0.013	0.019	2023.7	0.0003	0.013	MP1 ‡
	High	0.018	0.019			0.018	MP2 ‡
	Good	0.030	0.033			0.030	MP3 ‡
	High	0.014	0.019			0.014	MP4
	High	0.010	0.019			0.010	MP5
IE_SH_060_0900 Limerick Dock	High (S) Far	0.008	0.019	7516.7	0.0010	0.008	‡
	High (W) Far	0.012	0.019			0.012	
IE_SH_060_0800 Upper Shannon Estuary	High (S) Near	0.020	0.019	8848.1	0.0010	0.020	‡
	High (W) Near	0.011	0.019			0.011	
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_000 Mouth of River Shannon	High	0.008	0.019	13317.6	0.0001	0.008	‡
	Good	*0.033*	*0.040*			*0.033*	

* Trend is Statistically Significant
‡ Load from WWTP / SWO following treatment added
(S) = Summer monitoring period, (W) = Winter monitoring period
MP: multiple Monitoring Points given for waterbody

Table 5.B: Vollenweider assessment of cumulative load to Lakes within the WSZs

EU_CD / NAME Lakes	Parameter	TP Indicative Quality and Trends (Distance to Threshold. Surrogate Indicative Quality in italic	Baseline Conc. Surrogate Conc. given in italic mg/l	TP Total Dosing Load kg/yr	Estimated Existing Areal loading based on Vollenweider mg/m^2/yr)	Estimated Post dosing Areal loading based on Vollenweider(mg/m^2/yr)	Lc (mg/m^2/yr)	% increase
IE_SH_25_191 Derg (combined)	TP	Good Upwards Far	0.015	882.2	1105.9	1115.8	735.1	0.9

The additional loading to Lough Derg as a result of the cumulative effects of orthophosphate dosing will represent a 0.9 % increase in the estimated existing loading to the lake, using the Vollenweider assessment based on the estimated annual outflow from the lake and the existing concentration of TP. An assessment of the OECD trophic status of Lough Derg pre and post dosing suggests that the annual maximum chlorophyll levels (8mg/m^3/yr) are indicative of mesotrophic trophic status with a low level of impact; this is consistent with the phytoplankton status which is classified as good. The dosing results in a less than one percentage increase in the maximum chlorophyll levels and this will not have a significant impact based on the trophic status of Lough Derg.

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

MITIGATION OPTION – none required

RAG STATUS – GREEN

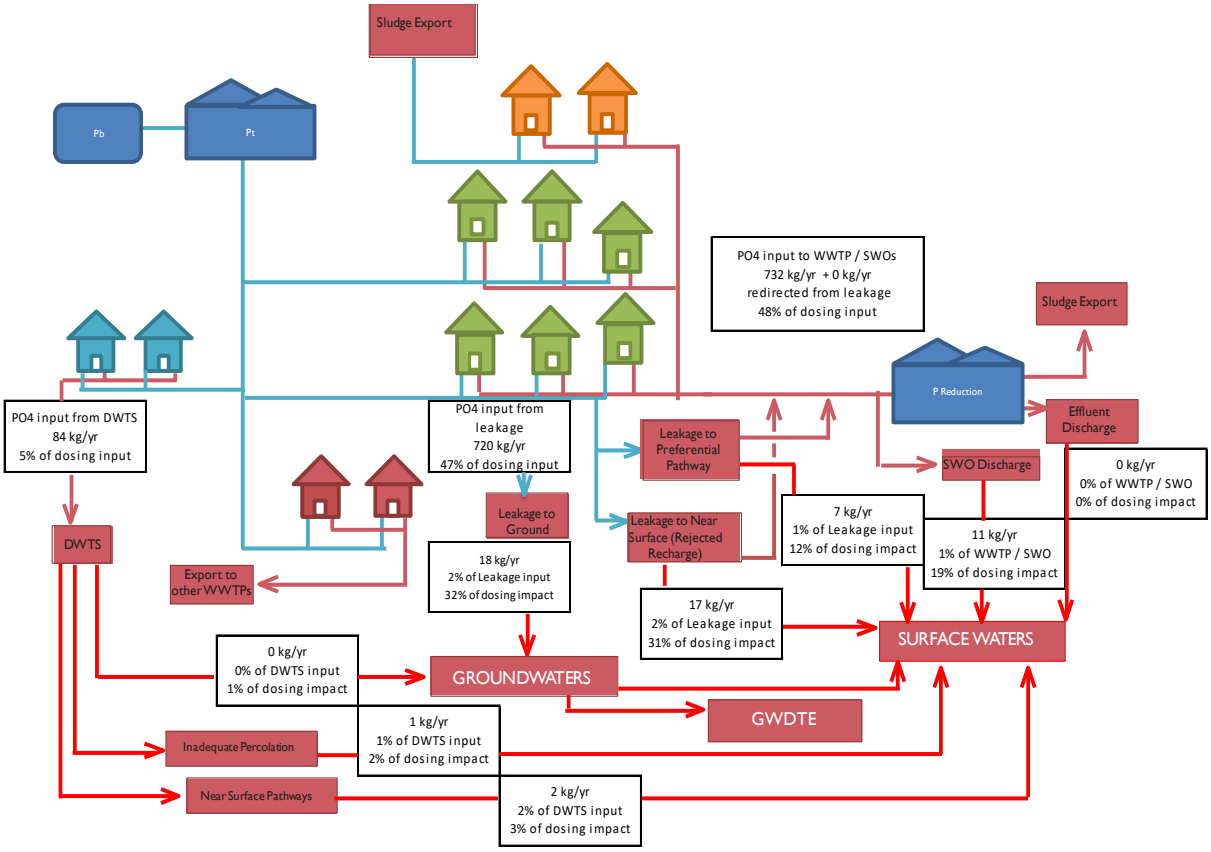
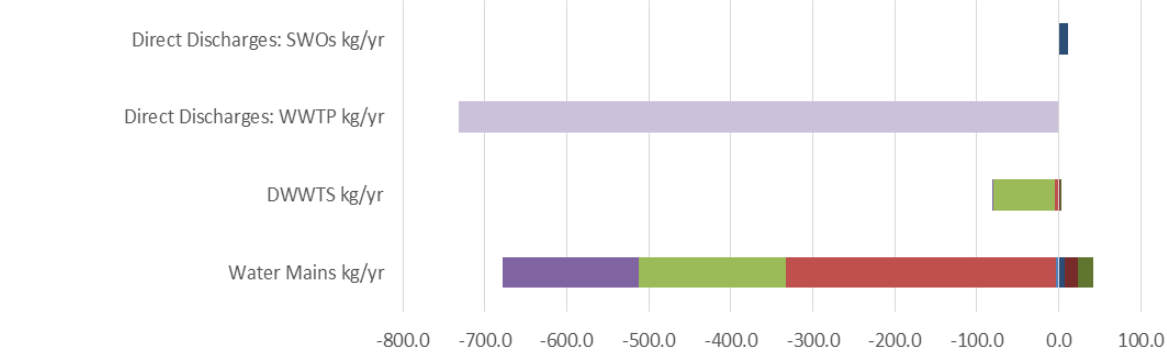


Figure 1 – Source Pathway Receptor model for Ballinasloe Town WTP illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	-3.6	-0.7		
Load attenuated in Near Surface Pathway	-329.5	-4.6		
Load attenuated in 1m below trench	-179.7	-73.8		
Load attenuated in Subsurface Pathway	-165.8	-2.4		
Load intercepted by gravity main in Preference Pathway	0.0			
Load intercepted by gravity main in Near Surface Pathway	0.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	6.9	0.9	0.0	10.7
Load reaching SW via Near Surface Pathway	17.0	1.5		
Load reaching SW via Subsurface Pathway	17.7	0.4		
Load treated in WWTP			-731.6	

Figure 2 – Fate of orthophosphate loads modelled for Ballinasloe WTP impacting on IE_SH_26S071550 SUCK_160 and IE_SH_25S012350 SHANNON (LOWER)_030 and downstream waterbodies - due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.