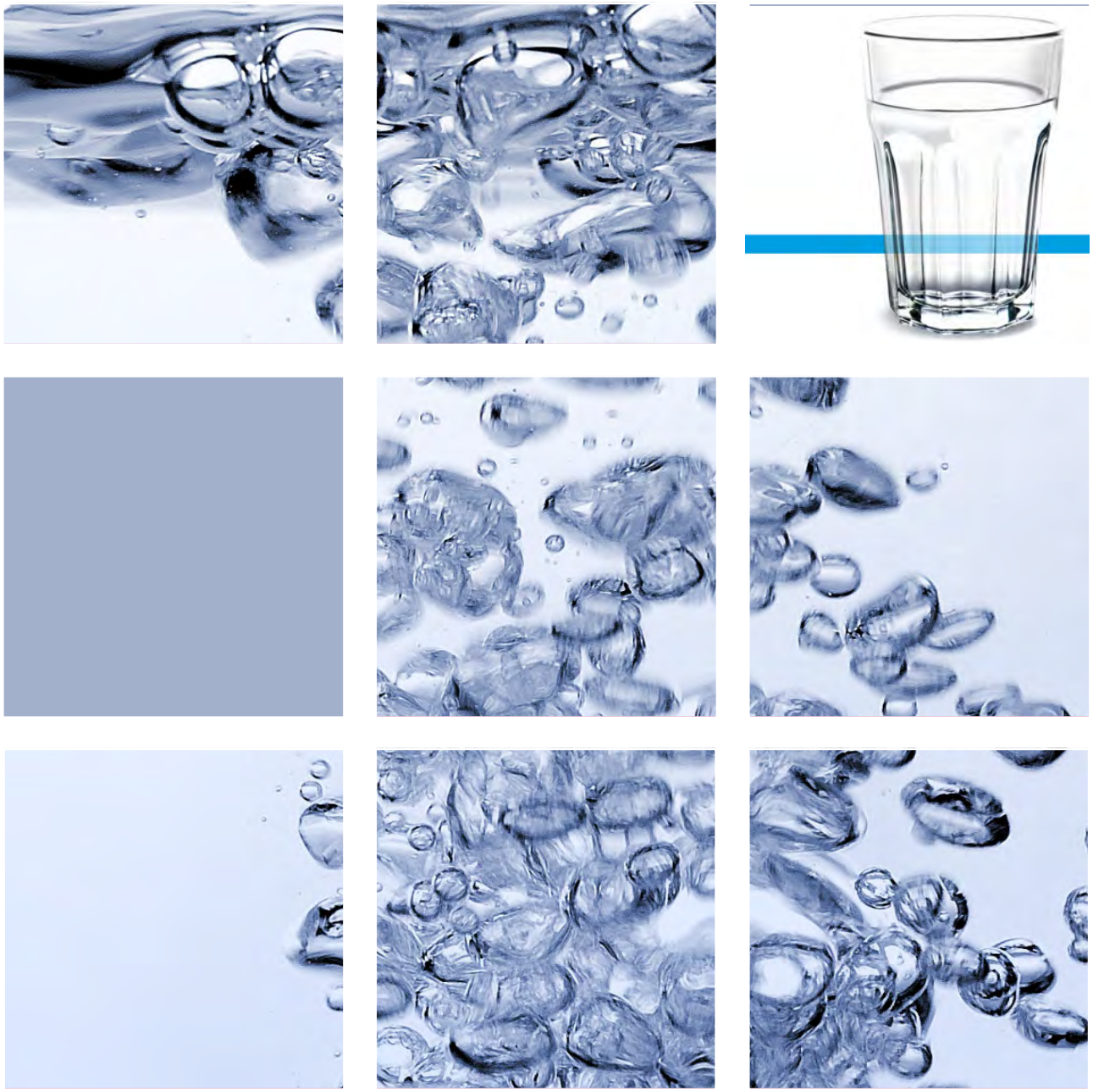
Uisce Éireann - Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

370 LCB Cappoquin (3100PUB1074) WSZ – LCB Cappoquin Pump Station



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Document Control Sheet

Client:	Uisce Éireann
Project Title:	Lead in Drinking Water Mitigation Plan
Document Title:	Screening for Appropriate Assessment 370 LCB Cappoquin (3100PUB1074) – LCB Cappoquin Pump Station
Document No:	MDW0766Rp_5.3_Screening_370_LCB Cappoquin_F04

Text Pages:	73	Appendices:	3

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	12th Nov 2018	LC		LE		DC	
F02	Final	14th Nov 2018	LC		LE		DC	
F03	Final	28th Nov 2018	LC		LE		DC	
F04	Final	4th June 2019	JM		LC		GJG	
F05	Final	17th Jul 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 LCB Cappoquin 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 LCB Cappoquin Pump Station (PS), Co. Waterford.

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 LCB Cappoquin PS orthophosphate will be added at a rate of 0.8 mg/l, with seasonal variation in the proposed dose, as set out within the Preliminary Design Report for the proposed dosing.

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

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

1.3 PROJECT BACKGROUND

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

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

The EAM process identified 24 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore) SAC; Lough Hyne Nature Reserve And Environs SAC; Roaringwater Bay And Islands SAC; Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC; Helvick Head SAC; Barley Cove To Ballyrisode Point SAC; Ardmore Head SAC; Blackwater River (Cork/Waterford) SAC; Glendine Wood SAC; Castletownshend SAC; Clonakilty Bay SAC; Comeragh Mountains SAC; Courtmacherry Estuary SAC; and, Kilkeran Lake and Castlefreke Dunes.
- SPA sites: Ballymacoda Bay SPA; Blackwater Estuary SPA; Dungarvan Harbour SPA; Blackwater Callows SPA; Sovereign Islands SPA; Sheep's Head to Toe Head SPA; Mullaghanish to Musheramore; Mountains SPA; Galley Head to Duneen Point SPA; Seven Heads SPA; and, Helvick Head to Ballyquin 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.

- Information provided by UE as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- Third Cycle Draft River Basin Management Plan 2022-2027 Consultation Report - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (Cummins et al., 2019); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National

Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*".

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

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

2.5.1 Identification of European Sites

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

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

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

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

2.5.2 Conservation Objectives

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

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

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats;

- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

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

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

3 DESCRIPTION OF THE PROJECT

3.1 OVERVIEW OF THE PROPOSAL

LCB Cappoquin PS supplies an area of approximately 19km² in the west of Co. Waterford. LCB Cappoquin WSZ covers the town of Cappoquin and a large portion of Lismore. The distribution input for LCB Cappoquin WSZ is 515.95 m^3/day, 79% of which is provided by LCB Cappoquin PS serving a population of approximately 3,000. The accounted water supply from LCB Cappoquin PS is estimated to be 477 m^3/day. The non-domestic demand is 15.6% of the distribution input. The area is served by Cappoquin (D0272) and Lismore (D0176) WWTPs which are licenced 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. It is estimated that there are 284 properties across the WSZ that are serviced by a DWWTS (see **Appendix C**).

LCB Cappoquin WSZ lies upstream of the Blackwater Estuary. It intersects the Colligan_SC_010; Finisk_SC_010; Blackwater [Munster]_SC_130 and _140 sub-catchments and Blackwater (Munster) and Colligan-Mahon catchments. The EAM process identified 24 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Ballymacoda (Clonpriest and Pillmore) SAC; Lough Hyne Nature Reserve And Environs SAC; Roaringwater Bay And Islands SAC; Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC; Helvick Head SAC; Barley Cove To Ballyrisode Point SAC; Ardmore Head SAC; Blackwater River (Cork/Waterford) SAC; Glendine Wood SAC; Castletownshend SAC; Clonakilty Bay SAC; Comeragh Mountains SAC; Courtmacherry Estuary SAC; and Kilkeran Lake and Castlefreke Dunes.
- SPA sites: Ballymacoda Bay SPA; Blackwater Estuary SPA; Dungarvan Harbour SPA; Blackwater Callows SPA; Sovereign Islands SPA; Sheep's Head to Toe Head SPA; Mullaghanish to Musheramore; Mountains SPA; Galley Head to Duneen Point SPA; Seven Heads SPA; and, Helvick Head to Ballyquin SPA.

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

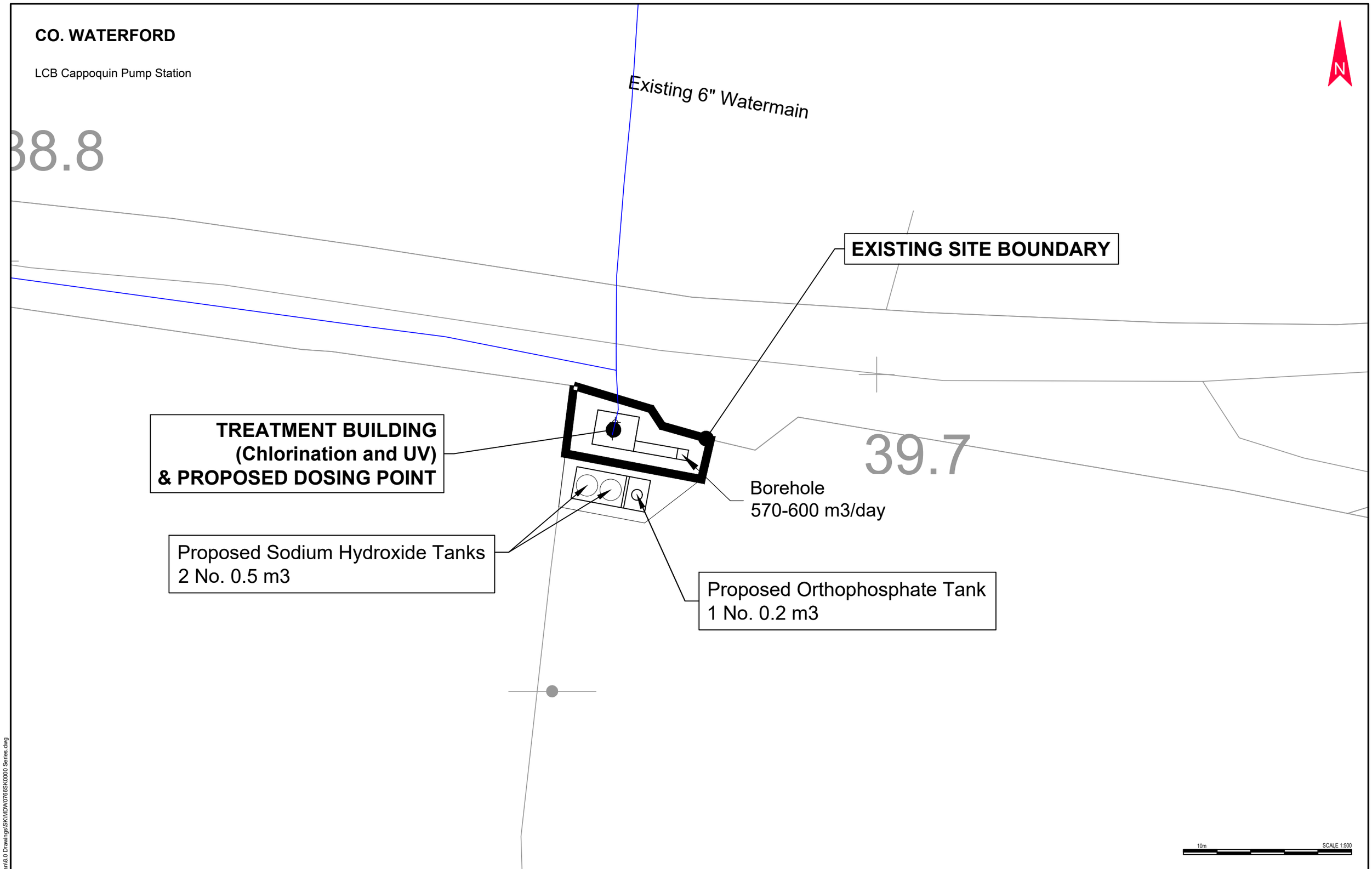
The corrective water treatment works at LCB Cappoquin PS will involve the provision of orthophosphate dosing, pH control works and associated safety equipment.

LCB Cappoquin PS is a small (approximately 38m^2) pumping station surrounded by paladin fencing. To facilitate corrective water treatment, the site boundary will need to be extended to the south into surrounding agricultural land. The surrounding landscape is dominated by agricultural grassland and tillage. The grounds of the PS consist of built infrastructure and hard standing. The location of the works is shown on **Figure 3-1.** The implementation of orthophosphate dosing at the LCB Cappoquin PS will require the following elements:

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

CO. WATERFORD

LCB Cappoquin Pump Station



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

Client

Uisce Éireann Irish Water

No.	Date	Dr. Chk.	Amendment / Issue	App
F01	Mar'19	BL BR	ISSUED FOR INFORMATION	GJG
D01	Nov'18	BL BR	DRAFT	DC

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Checked	BR
Approved	GJG
Date	13/03/2019
Scale	1:250 @ A1
	1:500 @ A3
Job No.	MDW0766

Project
LEAD MITIGATION PLAN

Figure 3.1
LCB CAPPOQUIN
PUMP STATION - SITE LAYOUT

File Ref. MDW0766SK0000 Series.dwg

Drg. No. SK0370 WTP

Rev. F01

The bulk storage tanks (1 no. tanks, each with a working volume of 150 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-2**).

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

There is no existing pH correction system in operation at the LCB Cappoquin PS. A stable pH is critical to facilitate effective plumbosolvency control. With implementation of orthophosphate dosing it is necessary to ensure a stable pH of the final water. A new pH dosing unit will need to be installed to implement final water pH correction at the LCB Cappoquin PS.

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 LCB Cappoquin PS. The ducts will be installed at approximately 700mm below ground level and following installation the trench will be backfilled and the surface reinstated to match the existing surface. Where pipework and cables are routed through existing structures, they shall be surface mounted within trunking. All spillages / leaks from storage tanks, valve connections and dosing pumps shall be contained within bunded areas.

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

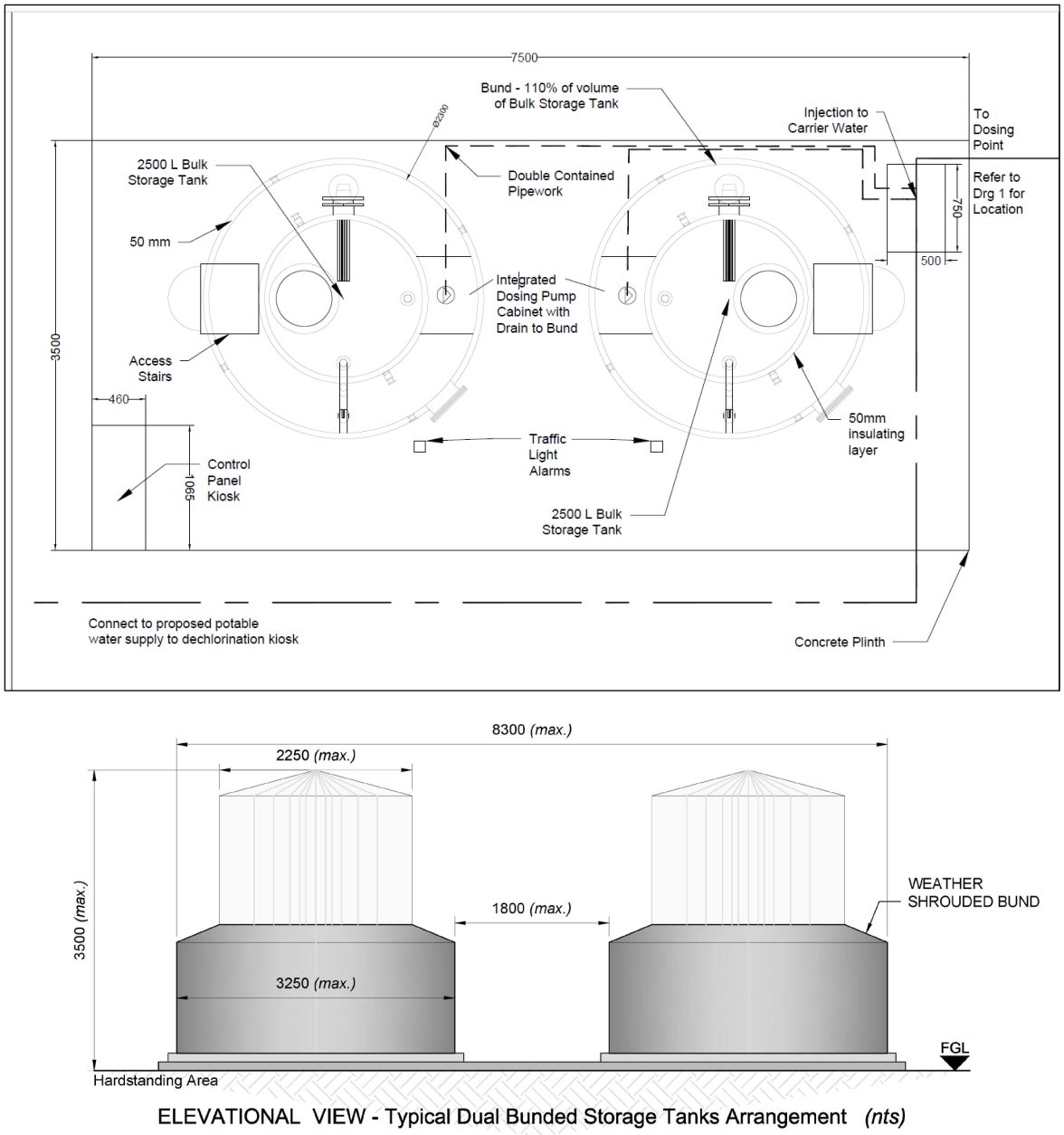


Figure 3-2: Plan and elevation drawings of a typical orthophosphate dosing unit

3.3 CONSTRUCTION METHODOLOGY

The proposed works will be carried out by suitably qualified contractors. The proposed dosing unit will be located within the bounds of the existing LCB Cappoquin PS on an area of made ground and also extend into the surrounding agricultural land.

3.4 OPERATION OF CORRECTIVE TREATMENT WORKS

The operational stage 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 LCB Cappoquin PS, orthophosphate will be added to treated water at a rate of 0.8 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

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

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

At the early stages of consideration, 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.

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.5.2** below.

3.5.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 3-3**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The source of phosphorus is defined as the orthophosphate dosing at the water treatment plant which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- Pathways include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from DWWTSs.
- Receptors refer to SACs and SPAs which may receive orthophosphate dosed water via the pathway examples outlined above. Receptors and their sensitivity, is of key consideration in the EAM. A water body may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where a SAC/SPA could receive orthophosphate dosing inputs at more than one WSZ, the cumulative effects are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 3-4** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance.

For each WSZ where orthophosphate treatment is proposed, the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process. A summary report outlining the EAM results is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters and the risk to WFD objectives from any increase in P load from orthophosphate dosing.

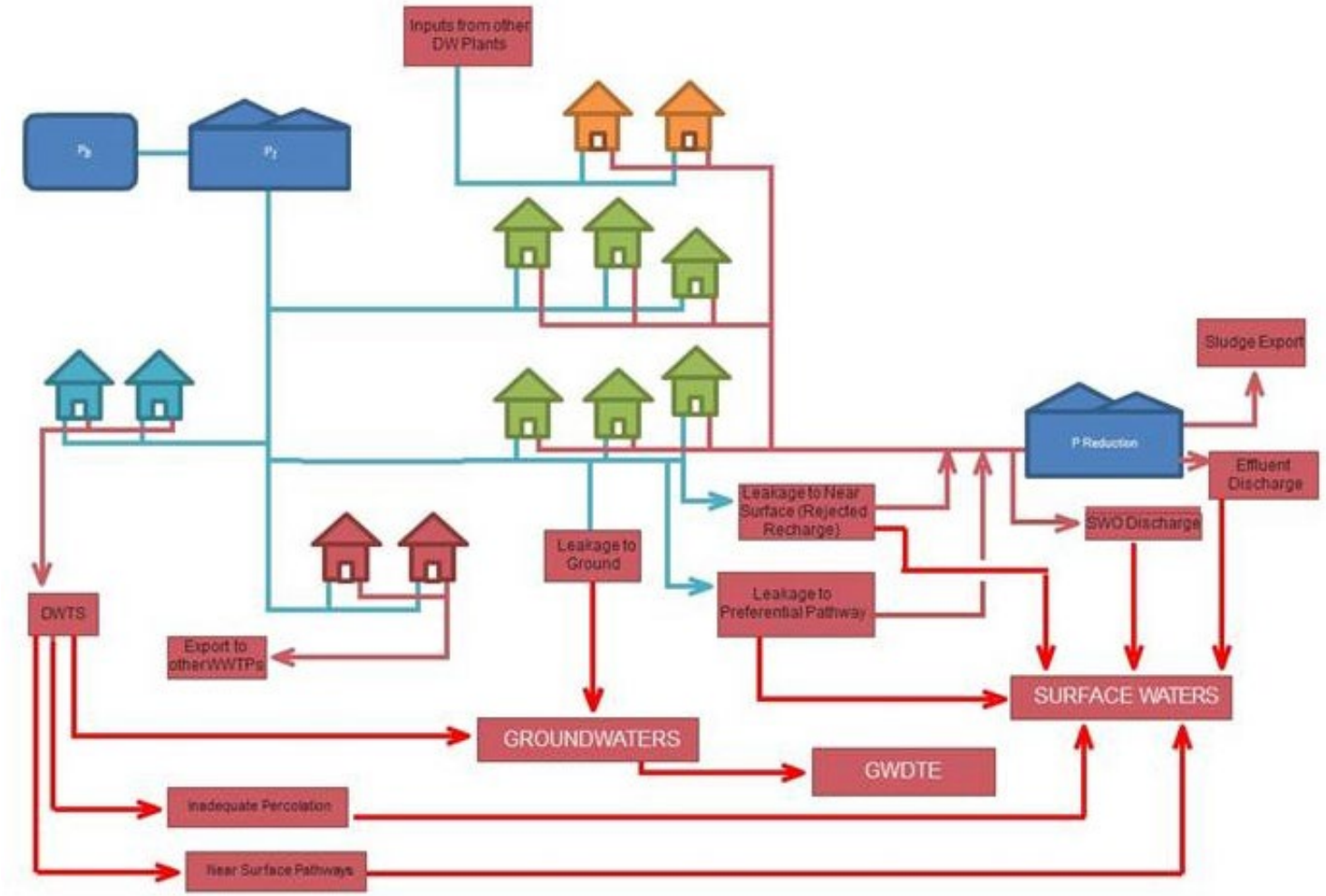


Figure 3-3: Conceptual model of P transfer

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

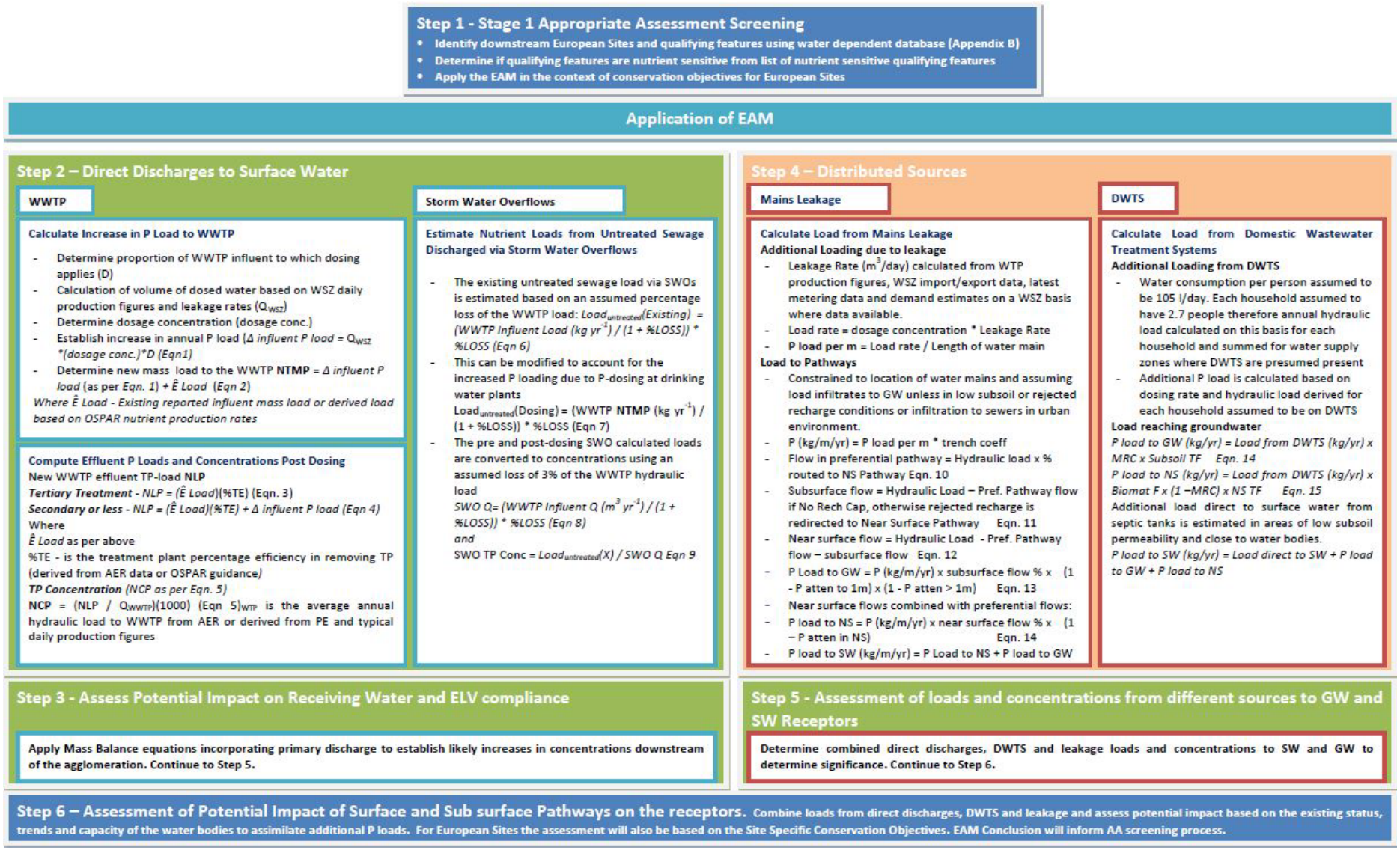


Figure 3-4: Stepwise approach to the Environmental Assessment Methodology

4 PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The construction phase of the proposed project will take place within the confines of the existing LCB Cappoquin PS and extend into the surrounding agricultural land which consists of recolonising bare ground along the boundary of an arable crop field. The PS is not located within a European Site but is in close proximity to the boundary of the Blackwater River (Cork/Waterford) SAC approximately 200m to the south. Given the small-scale nature of construction works, the ZoI was considered to include the footprint of the existing LCB Cappoquin PS as well as the proposed extended boundary 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	Blackwater River (Cork / Waterford) SAC	SAC 002170	No	Yes	No	Yes (Lismore)	Yes
2	Blackwater Callows SPA	SPA 004094	No	Yes	No	Yes (Lismore)	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 LCB Cappoquin and associated WSZ and European Sites. The ZoI was therefore defined by the surface and groundwater bodies that are hydrologically and hydrogeologically connected with the project.

In the EAM, all water bodies linked to the WSZ have been identified. Downstream water bodies to the estuary and coastal water bodies have also been identified. Groundwater bodies touching or intersecting the 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 4-2** and are displayed in **Figure 4-1**.

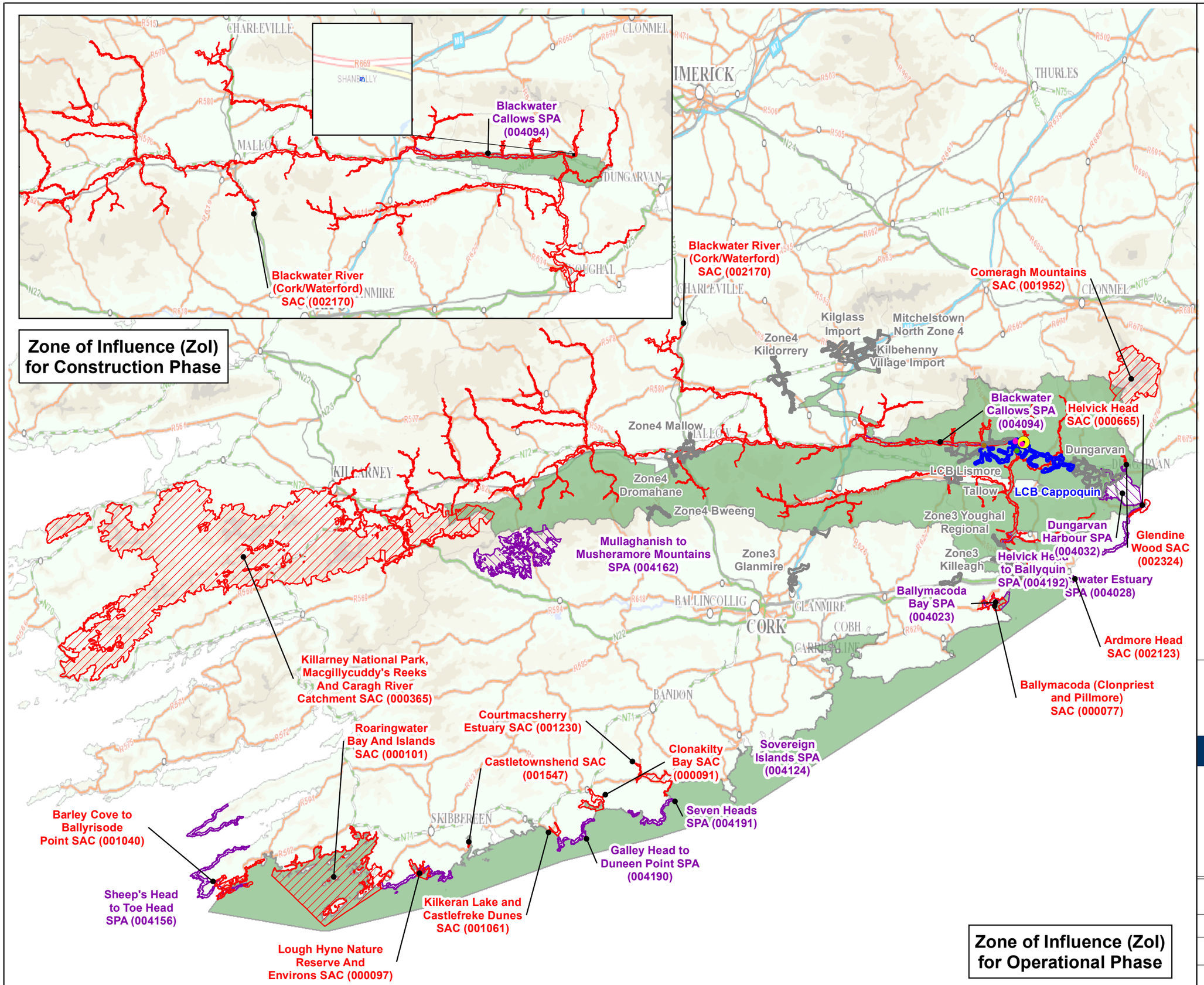
[4] LCB Cappoquin overlies the Lismore (IE_SW_G_050) groundwater body. All European sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source receptor pathways. Lismore is a karstic groundwater body and groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is very close to the surface. Regional groundwater flow is towards the rivers draining the valley to the east and groundwater is discharged to surface as springs or as baseflow to rivers crossing the groundwater body. Site 2 Blackwater Callows SPA is located 7km to the west of the PS within the main channel of the Munster Blackwater which is upstream of the proposed works at the PS. As a result site 2 is considered to have no hydrogeological connectivity to the PS given the location and distance of the SPA.

[5] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/LismoreGWB.pdf

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	Ground-water Connectivity	Potential Source Pathway Receptor
1	Ballymacoda (Clonpriest and Pillmore)	SAC 000077	Yes	Yes	Yes	No	Yes
2	Lough Hyne Nature Reserve And Environs	SAC 000097	Yes	Yes	Yes	No	Yes
3	Roaringwater Bay And Islands	SAC 000101	Yes	Yes	Yes	No	Yes
4	Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment	SAC 000365	Yes	Yes	No	Yes	Yes
5	Helvick Head	SAC 000665	Yes	Yes	Yes	No	Yes
6	Barley Cove To Ballyrisode Point	SAC 001040	Yes	Yes	Yes	No	Yes
7	Ardmore Head	SAC 002123	Yes	Yes	Yes	Yes	Yes
8	Blackwater River (Cork/Waterford)	SAC 002170	Yes	Yes	Yes	Yes	Yes
9	Glendine Wood	SAC 002324	Yes	Yes	No	Yes	Yes
10	Castletownshend	SAC 001547	Yes	Yes	Yes	No	Yes
11	Clonakilty Bay	SAC 000091	Yes	Yes	Yes	No	Yes
12	Comeragh Mountains	SAC 001952	Yes	Yes	No	No	No
13	Courtmacherry Estuary	SAC 001230	Yes	Yes	Yes	No	Yes
14	Kilkeran Lake and Castlefreke Dunes	SAC 001061	Yes	Yes	Yes	No	Yes
15	Ballymacoda Bay	SPA 004023	Yes	Yes	Yes	No	Yes
16	Blackwater Estuary	SPA 004028	Yes	Yes	Yes	Yes	Yes
17	Dungarvan Harbour	SPA 004032	Yes	Yes	No	Yes	Yes
18	Blackwater Callows	SPA 004094	Yes	Yes	No	Yes	Yes
19	Sovereign Islands	SPA 004124	Yes	Yes	Yes	No	Yes
20	Sheep's Head to Toe Head	SPA 004156	Yes	Yes	Yes	No	Yes

	Site Name	SAC/SPA Code	Water Dependent Species/ Habitats	Nutrient Sensitive	Surface Water Connectivity	Ground-water Connectivity	Potential Source Pathway Receptor
21	Mullaghanish to Musheramore Mountains	SPA 004162	Yes	Yes	No	Yes	Yes
22	Galley Head to Duneen Point	SPA 004190	Yes	Yes	Yes	No	Yes
23	Seven Heads	SPA 004191	Yes	Yes	Yes	No	Yes
24	Helvick Head to Ballyquin	SPA 004192	Yes	Yes	Yes	No	Yes



Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- LCB Cappoquin Pump Station
- 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

Figure 4.1

LCB Cappoquin

European Sites within the ZoI of the Proposed Project

RPS

Scale: 1:600,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0027aF01	Map Projection: Irish National Grid (TM65)

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

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

The construction phase of the proposed project will take place within the confines of the existing LCB Cappoquin PS and also within the agricultural land adjacent to the PS site boundary to the south of the PS boundary. There are no surface water connections to the Blackwater River (Cork / Waterford) SAC or Blackwater Estuary SPA. The PS is located within the Lismore groundwater body (IE_SW_G_050). The potential hydrogeological connectivity between the proposed development site and Blackwater Estuary SPA have been excluded in **Table 4-1** above, there is potential hydrogeological connectivity with the proposed project and the Blackwater River (Cork / Waterford) SAC.

For the operational phase, the WSZ for LCB Cappoquin PS is located adjacent to the Blackwater Estuary / Youghal Harbour. Two transitional water bodies, the Upper Blackwater M Estuary (IE_SW_020_0500) and the Lower Blackwater M Estuary/ Youghal Harbour (IE_SW_020_0100), are directly intersected by the WSZ and extend downstream of the WSZ before entering Youghal Bay (IE_SW_020_0000) and the Western Celtic Sea coastal water body. Both transitional water bodies are designated as part of the Blackwater River (Cork/ Waterford) SAC. This SAC is also directly intersected by the WSZ and therefore is included for further assessment in Section 6. The Blackwater Estuary SPA is located in the Lower Blackwater M Estuary/ Youghal Harbour (IE_SW_020_0100). The EAM results show that there is no detectable increase in orthophosphate concentration (0.0000mg/l) in the Lower Blackwater M Estuary/ Youghal Harbour (IE_SW_020_0100) (see **Table 4.B** in **Appendix C**). Therefore, there is no potential for the proposed dosing to impact the Blackwater Estuary SPA or the following European sites (via surface pathways) which are located downstream of the Lower Blackwater M Estuary/ Youghal Harbour transitional water body: Ballymacoda (Clonpriest and Pillmore) SAC; Lough Hyne Nature Reserve And Environs SAC; Roaringwater Bay And Islands SAC; Helvick Head SAC; Barley Cove To Ballyrisode Point SAC; Ardmore Head SAC; Kilkeran Lake and Castlefreke Dunes SAC; Clonakilty Bay SAC; Courtmacherry Estuary SAC; Castletownshend SAC; Ballymacoda Bay SPA; Dungarvan Harbour SPA; Sovereign Islands SPA; Sheep's Head to Toe Head; Galley Head to Duneen Point SPA; Seven Heads SPA; and, Helvick Head to Ballyquin SPA.

The WSZ also intersects five groundwater bodies – Ballyknock (IE_SE_G_014); Glenville zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[1], and was consulted in making the assessment.

Ballyknock GWB (IE_SE_G_014) is productive fissured bedrock. Groundwater flow in this water body is concentrated along fractures and joints in the rock. Groundwater flow is influenced by topography and a groundwater recharge mound is present to the north of the groundwater body. The general

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

groundwater flow direction in the groundwater body is therefore south towards the valley[6]. The WSZ intersects a small area to the west of the Ballyknock GWB (IE_SE_G_014). Glendine Wood SAC also intersects the GWB approximately 10km east of the WSZ. As groundwater flows in the GWB are south towards the valley, there will be no movement of orthophosphate west (WSZ) to the east (SAC) of the GWB and the site is therefore excluded from further assessment in Section 6.

Glenville GWB (IE_SW_G_037) is poorly productive bedrock. Groundwater flow in this GWB occurs in faults and joints. Most groundwater flow probably occurs in an upper shallow weathered zone. Below this in the deeper zones water-bearing fractures and fissures are less frequent and less well connected. The water table is generally within 10 m of the surface. Groundwater in this GWB is generally unconfined. Local groundwater flow is towards the rivers and streams, and flow path will not usually exceed a few hundred metres in length[7]. The WSZ intersects a small area to the north of the Glenville GWB (IE_SW_G_037). Ardmore Head SAC; Blackwater River (Cork/Waterford) SAC; Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC; Mullaghanish to Musheramore Mountains SPA; and Blackwater Estuary SPA also intersect the GWB. The Blackwater River (Cork/Waterford) SAC is previously included for further assessment in Section 6 for its hydrological connectivity to the WSZ. Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC and Mullaghanish to Musheramore Mountains SPA are located approximately 70km up gradient of the WSZ. As local groundwater flow is towards the rivers and streams, and flow path will not usually exceed a few hundred metres in length, the SAC and SPA are excluded from further assessment in Section 6. The Blackwater Estuary SPA and Ardmore Head SAC are located 12km and 24km down-gradient of the WSZ, respectively, and therefore are also excluded from further assessment in Section 6.

Dungarvan (IE_SE_G_052) is a karstic GWB. The upper weathered and fractured zone of bedrock acts as a zone of high permeability; large fissures or karstic conduits are often present within the bedrock, through which a large proportion of groundwater flow takes place; and where sand and gravel is present above the bedrock (e.g. at Ballynamuck), increased groundwater storage will be available to the well. The groundwater gradient is flatter in the more permeable limestone and flow direction in the vicinity of Ballynamuck is eastward toward the sea. A groundwater divide is present to the west of the public supply well in the Whitechurch area. Water to the west of the divide flows toward the Munster Blackwater. Water to the east flows toward Dungarvan Harbour. The WSZ intersects this GWB at its western end. Glendine Wood SAC and Dungarvan Harbour SPA intersect the eastern section of the GWB. Given the east/west divide in the GWB flows, there is no potential for the transfer of orthophosphate from the WSZ to Glendine Wood SAC and Dungarvan Harbour SPA and therefore both sites are excluded from further assessment in Section 6.

Lismore (IE_SW_G_050) is a karstic GWB. Groundwater in this GWB is generally unconfined. The highly permeable aquifer supports a regional scale flow system. Groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is very close to the surface. Regional groundwater flow is towards the rivers draining the valley to the east[8]. The WSZ intersects a large section in the centre of this GWB. The Blackwater River (Cork/Waterford) SAC and Blackwater Callows SPA also intersect this GWB. The Blackwater River (Cork/Waterford) SAC is directly intersected by the WSZ and previously included for further assessment in Section 6. The Blackwater Callows SPA is located within 700m of the WSZ. As the groundwater paths can be up to several

[6] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/BallyknockGWB.pdf
[7] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/GlenvilleGWB.pdf
[8] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/LismoreGWB.pdf

kilometres long in this GWB, the Blackwater Callows SPA is also included for further assessment in Section 6.

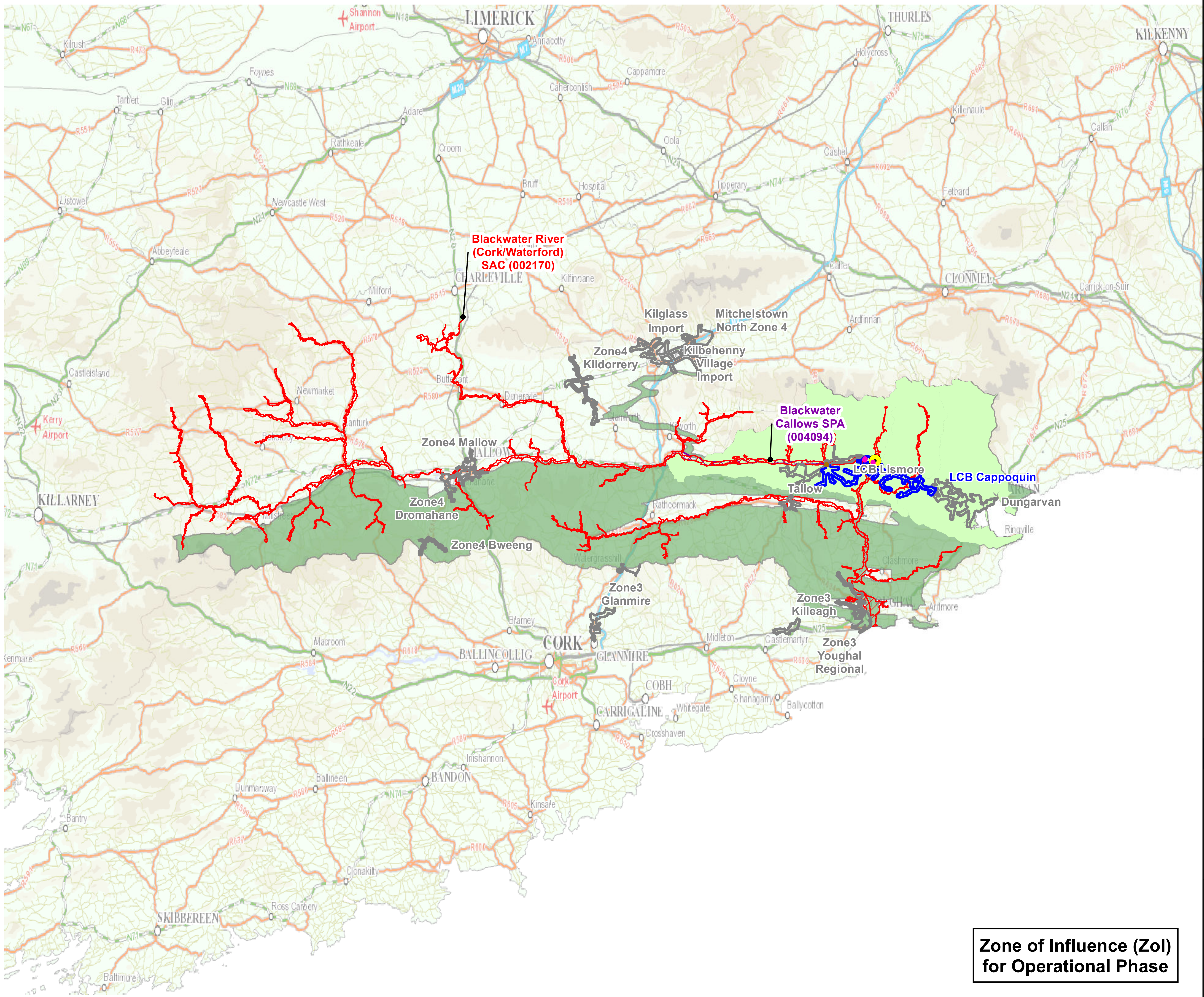
Cappoquin Kiltorcan GWB (IE_SW_G_025) is productive fissured bedrock. In general groundwater flow is concentrated in the upper 30 m of the aquifer, but deeper inflows can be encountered. The aquifer is unconfined at outcrop but becomes confined as it dips beneath the 'Lower Limestone Shale' and Ballysteen Formation at the margins of the synclinal valleys. Where confined, active groundwater circulation is expected to be much more limited, but some deep flow has been inferred from mineral exploration boreholes at depths of over 200 m. Groundwater flow will be to the south and west away from the higher ground towards the valleys. The WSZ intersects a small area of this GWB to the east. The Blackwater River (Cork/Waterford) SAC and Blackwater Callows SPA also intersect this GWB. Both sites are previously included for further assessment in Section 6.

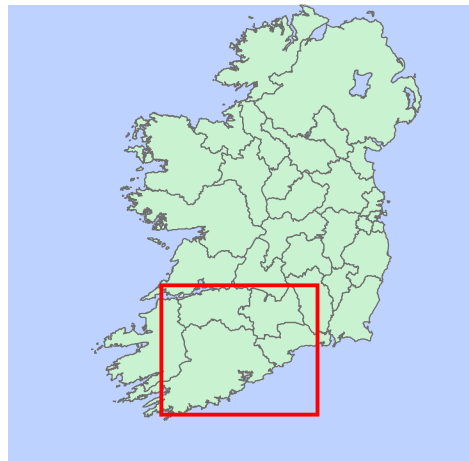
On this basis, one site has been included for further assessment in order to evaluate the significance of potential effects arising during construction phase in Section 5 below i.e. Blackwater River (Cork / Waterford) SAC. Two sites have been included for further assessment for the operational phase in Sections 5 and 6 below i.e. Blackwater River (Cork / Waterford) SAC and the Blackwater 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/Hydro-geological Connectivity	Potential Source Receptor Pathway
Construction and Operation Phase								
Blackwater River (Cork / Waterford) SAC	SAC 002170	31 July 2012 Version 1	1029	Freshwater pearl mussel (*Margaritifera margaritifera*)	Yes	Yes	Yes	Yes
			1092	White-clawed Crayfish (*Austropotamobius pallipes*)	Yes	Yes		
			1095	Sea lamprey (*Petromyzon marinus*)	Yes	Yes		
			1096	Brook lamprey (*Lampetra planeri*)	Yes	Yes		
			1099	River lamprey (*Lampetra fluviatilis*)	Yes	Yes		
			1103	Twaite shad (*Alosa fallax*)	Yes	Yes		
			1106	Atlantic salmon (*Salmo salar*) (only in fresh water)	Yes	Yes		
			1130	Estuaries	Yes	Yes		
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes		
			1220	Perennial vegetation of stony banks	Yes	No		
			1310	Salicornia and other annuals colonising mud and sand Spartina swards (*Spartinion maritimae*)	Yes	Yes		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	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/Hydro-geological Connectivity	Potential Source Receptor Pathway
			1355	Otter (*Lutra lutra*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			1421	Killarney fern (*Trichomanes speciosum*)	Yes	Yes		
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes	Yes		
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No	Yes		
			91E0	* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Yes	Yes		
			91J0	* *Taxus baccata* woods of the British Isles	No	No		
Operation Phase Only								
Blackwater Callows SPA	SPA 004094	21 February 2018 (Generic)	A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	Yes	Yes
			A050	Wigeon (*Anas penelope*)	Yes	Yes		
			A052	Teal (*Anas crecca*)	Yes	Yes		
			A156	Black-tailed Godwit (*Limosa limosa*)	Yes	Yes		





Legend

LEMA Emission Type

- Primary Discharge Point
- Secondary Discharge Point
- Storm Water Overflow
- Waste Water Treatment Plant
- LCB Cappoquin Pump Station
- 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

Figure 4.2

LCB Cappoquin

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

RPS

Scale: 1:500,000 @ A3	Date: 07/06/2019
File Ref: MDW0766Arc0027bF01	Map Projection: Irish National Grid (TM65)

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 LCB Cappoquin. These will be evaluated with regard to the potential for likely significant effects on European Sites. These are potential effects and in the absence of pathways (which is evaluated in **Section 5.3.1** below) the construction phase may not give rise to these effects.

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

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

5.2.2 Operational Phase

The source-pathway-receptor approach has identified a number of impact pathways associated with the operation of orthophosphate treatment works at LCB Cappoquin PS. These will be evaluated with regard to the potential for likely significant effects on European Sites in relation to:

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent impacts for these habitats and species;
- The discharge of additional orthophosphate loads to the environment (through surface and sub surface pathways) may have potentially negative effects on nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish;
- Phosphorus in wastewater collection systems is the result of drinking water and derived from a number of other sources, including phosphorus imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of phosphorus removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;
- Leakage of phosphates from the drinking water supply network to the environment from use of orthophosphate;
- Direct discharges of increased orthophosphate to water bodies from the wastewater treatment plant licensed discharges; and
- Potential discharges to water bodies of untreated effluent potentially high in orthophosphate from Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS

Article 6 of the Habitats Directive states that:

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

The focus of this Screening to inform AA is the evaluation of the potential for likely significant effects associated with the additional orthophosphate load due to orthophosphate dosing and the construction of treatment works LCB Cappoquin PS.

5.3.1 Construction Phase

The orthophosphate dosing system will be located adjacent to the existing PS boundary within the agricultural land to the south of the PS boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking these areas into account. The assessment of impacts associated with the construction of the corrective water treatment works at LCB Cappoquin PS is presented in **Table 5-1** and is based on a desktop study using the following information:

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

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

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation of Potential Significant Effects
Blackwater River (Cork / Waterford) SAC (002170)	Lismore (IE_SW_G_050)	GWB	The construction works will be located within the confines of the existing LCB Cappoquin PS and also extend to the south into the surrounding agricultural land in an area of recolonising bare ground and with little ecological value. LCB Cappoquin PS is not located within a European Site, it is adjacent (approx. 200m) to the Glennafallia River which forms part of the Blackwater River (Cork/Waterford) SAC. **Surface Water** The PS is separated from the Glennafallia_020 river by arable agricultural land and a broadleaved riparian woodland strip (approx. 30m in width). The PS ground is small consisting of built infrastructure and hardstanding. The area which corrective treatment works will extend into consists of recolonised bare ground which borders the arable field. There are no surface water connections from the PS to the Glennafallia river. The arable field and broadleaf riparian strip comprise a boundary of separation, isolating the works area to the Glennafallia_020 River and connected European Sites. **Groundwater** LCB Cappoquin overlies the Lismore (IE_SW_G_050) groundwater body. All European sites overlying or supporting connectivity to this groundwater body have been assessed to determine potential source receptor

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation of Potential Significant Effects
			pathways. Lismore is a karstic groundwater body and groundwater flow paths can be up to several kilometres long, but may be significantly shorter in areas where the water table is very close to the surface. Regional groundwater flow is towards the rivers draining the valley to the east and groundwater is discharged to surface as springs or as baseflow to rivers crossing the groundwater body. The Blackwater Callows SPA was excluded from further assessment (see **Table 4-1**). The Blackwater River (Cork/Waterford) SAC is located 200m south of the PS. 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 and subsequently those hydrologically connected European Sites included for further assessment, as a result of the construction of the corrective water treatment works at LCB Cappoquin PS.

5.3.2 Operational Phase

In the case of the additional orthophosphate load due to dosing at LCB Cappoquin PS, 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. 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.

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[9].

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

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

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 a future river basin cycle, i.e. within the next 6 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 baseline 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 0.8 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 the most up to date baseline data from the WFD monitoring programme. 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[10]	Ortho P Indicative Quality[11] and Trends[12]	Baseline[13] Ortho P Conc.[14] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[15] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[16]	Evaluation
Blackwater River (Cork/Waterford) SAC (002170)	IE_SW_18L220930 LYRENACALLEE_EAST_010	RWB	*Good*	*0.030*	*0.033*	*0.6*	*0.0001*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18B022700 BLACKWATER (MUNSTER)_220	RWB Multiple Monitoring Points	Good Downwards Near	0.033	0.033	1.1	0.0000	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.037	0.051			0.037	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.044	0.051			0.044	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.050	0.051			0.050	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18F020500 FINISK_030	RWB	Good Upwards Far	0.031	0.033	2.6	0.0000	0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18G100200 GLENNAFALLIA_020	RWB	Good Upwards Far	0.030	0.033	1.0	0.0000	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18M260940 MONEYGORM_010	RWB	*Good*	*0.030*	*0.033*	*0.9*	*0.0002*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[10] Monitoring period is annual unless specified.
[11] Surrogate Indicative Quality in italic.
[12] Distance to threshold.
[13] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[14] Surrogate concentration is given in italic mg/l
[15] 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.
[16] 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[10]	Ortho P Indicative Quality[11] and Trends[12]	Baseline[13] Ortho P Conc.[14] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[15] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[16]	Evaluation
	IE_SW_18O020400 OWBEG (WATERFORD)_010	RWB	*Moderate*	*0.046*	*0.051*	*0.4*	*0.0001*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_18O020800 OWBEG (WATERFORD)_020	RWB	Good Upwards Far	0.029	0.033	3.3	0.0003	0.029	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	TWB Summer	High (S) Downwards Far	0.021	0.023	6.8	0.0000	0.021	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W) Upwards Near	0.034	0.053			0.034	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_020_0500 Upper Blackwater M Estuary	TWB Summer	High (S) Downwards Far	0.019	0.023	24.7	0.0000	0.019	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
		TWB Winter	Good (W) Upwards Near	0.031	0.053			0.031	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_037 Glenville	GWB Multiple Monitoring Points	Good None Far	0.006	0.026	0.0	0.0000	0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.009	0.026			0.009	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_050 Lismore	GWB Multiple Monitoring Points	Good Upwards Far	0.005	0.026	6.4	0.0002	0.005	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.006	0.026			0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_025 Cappoquin Kiltorcan	GWB Multiple	Failing to achieve	0.055	-	0.8	0.0000	0.055	Failing to achieve good orthoP indicative quality however the

Site Name (Code)	Contributing WB Code_Name	WB Type[10]	Ortho P Indicative Quality[11] and Trends[12]	Baseline[13] Ortho P Conc.[14] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[15] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[16]	Evaluation
		Monitoring Points	good Upwards Far						modelled concentration is 0.0000mg/l, and there is no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.011	0.026	0.8	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
Blackwater Callows SPA (004094)	IE_SW_18B022700 BLACKWATER (MUNSTER)_220	RWB	Good Downwards Near	0.033	0.033	1.1	0.0000	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.037	0.051			0.037	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.044	0.051			0.044	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Upwards Far	0.050	0.051			0.050	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_050 Lismore	GWB Multiple Monitoring Points	Good Upwards Far	0.005	0.026	6.4	0.0002	0.005	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.006	0.026			0.006	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SW_G_025 Cappoquin Kiltorcan	GWB Multiple Monitoring Points	Failing to achieve good Upwards Far	0.055	-	0.8	0.0000	0.055	Failing to achieve good orthoP indicative quality however the modelled concentration is 0.0000mg/l, and 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[10]	Ortho P Indicative Quality[11] and Trends[12]	Baseline[13] Ortho P Conc.[14] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Increase in Conc.[15] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[16]	Evaluation
			Good Upwards Far	0.011	0.026	0.8	0.0000	0.011	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

* Trends are Statistically Significant.

2014 baseline used

‡ Load from WWTP / SWO following treatment added

NB: Cumulative load assessment using 2014 baseline data has confirmed that the water bodies are not at Risk of failing WFD Objectives.

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 evaluationof 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.

Cappoquin Agglomeration

Cappoquin WWTP (D0272-01) discharges into Upper Blackwater M Estuary (IE_SW_020_0500) which is located within the Blackwater River (Cork/ Waterford) SAC. The plant is currently operating with secondary treatment processes and is compliant with the ELV standards in terms of existing and post dosing modelled effluent orthophosphate concentrations. When mean flows are taken into account the modelled increase in orthophosphate concentration levels is undetectable 0.0% in the receiving water (**Table 5-4**). Therefore, there is no risk to the achievement of WFD objectives of the Upper Blackwater M Estuary (IE_SW_020_0500), and its hydrologically connected European Sites as a result of dosing at LCB Cappoquin PS.

Lismore Agglomeration

Lismore WWTP (D0176-01) discharges into the Blackwater (Munster)_220 (IE_SW_18B022700) which is hydrologically connected to the Blackwater River (Cork/ Waterford) SAC and Blackwater Callows

SPA. The plant's effluent concentrations are compliant with ELVs. As Lismore WWTP receives tertiary treatment, i.e. chemical dosing for nutrient removal and is compliant with the ELVs set in the discharge licence, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process. When mean flows are taken into account the modelled increase in orthophosphate concentration is undetectable 0.0% in the receiving water (**Table 5-4**). Therefore, there is no risk to the achievement of WFD objectives of the Blackwater (Munster)_220 (IE_SW_18B022700) and its hydrologically connected European Sites as a result of dosing at LCB Cappoquin PS.

Table 5-3: Increased loading/concentration due to orthophosphate dosing – Dosing rate = 0.8 mg/l

Agglom. and Discharge Type	ELV from WWDL (OrthoP 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*
Cappoquin Primary Discharge	**5.0** Compliant with total phosphorus ELVs set in the WWDL 2017.	**Existing**	80.0	0.370	0.296	0.504
		Post Dosing	122.8	0.568	0.455	0.773
Cappoquin SWOs (2 no.)	**n/a**	**Existing**	14.6	2.314	1.851	3.147
		Post Dosing	15.8	2.512	2.010	3.417
Lismore Primary Discharge	**3.0** Compliant with total phosphorus ELVs set in the WWDL 2017.	**Existing**	241.5	0.472	0.378	0.642
		Post Dosing	241.5	0.472	0.378	0.642
Lismore SWOs (1 no.)	**n/a**	**Existing**	23.4	1.573	1.422	2.418
		Post Dosing	25.3	1.700	1.524	2.591

Table 5-4: Mass balance assessment based on 0.8 mg/l dosing using available background concentrations and mean flow information.

Agglom.	RWB Name / Code for Primary Discharge	Background Conc.[17] (mg/l)	Modelled Conc. Existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc
Cappoquin (D0272)	Upper Blackwater M Estuary IE_SW_020_0500	0.0301	0.0302	0.0302	0.0
Lismore (D0176)	Blackwater (Munster)_220 IE_SW_18B022700	0.0280	0.0281	0.0281	0.0

5.3.4 Assessment of Potential Indirect Impact from Subsurface Flow

5.3.4.1 Sub surface flows from leakage and DWWTP

Step 4 of the EAM model assesses the distributed inputs to surface water bodies from subsurface pathways (**Appendix C**). In the case river water bodies affected by the WSZ, the modelled

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

concentrations due to subsurface pathways are insignificant in all water bodies (i.e. < 0.00125 mg/l (5% of the Good/ High indicative quality boundary for surface water bodies) with the highest modelled increase equal to 0.0003mg/l occurring in the Owbeg (Waterford)_020 (IE_SW_18O020800).

There are also two transitional water bodies intersected by the WSZ, the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) and Upper Blackwater M Estuary (IE_SW_020_0500). Modelled potential increases in Ortho P are undetectable (0.0000mg/l) for both transitional water bodies.

Therefore there will be no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives within waterbodies. hydrologically/ hydrogeologically connected to European Sites as a result of dosing at LCB Cappoquin PS.

5.3.4.2 Groundwater assessment

The predicted loads and modelled concentrations to Glenville (IE_SW_G_037) and Lismore (IE_SW_G_050) groundwater bodies are undetectable (0.0000mg/l) and insignificant (0.0002mg/l) respectively (i.e. <0.00175 mg/l = 5% of the Good / Fail boundary) as shown in **Table 5-2** and **Table 3 of Appendix C**.

At a monitoring point for Cappoquin Kiltorcan (IE_SW_G_025), it is failing to achieve good status but the modelled concentration is undetectable 0.0000mg/l

The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, and none of the overlying surface water bodies are at risk of deterioration in ortho P indicative quality or of failing WFD objectives, there is no risk of impact on groundwater receptors due to orthophosphate dosing.

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

Table 4.B of Appendix C provides details of the combined orthophosphate inputs to transitional water bodies i.e. the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) and Upper Blackwater M Estuary (IE_SW_020_0500). The modelled increase in orthophosphate concentrations in the subsurface pathways are undetectable (0.0000mg/l) for both transitional 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 coastal and transitional water bodies identified in **Table 5-2**, or of preventing their achievement of WFD objectives.

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative impacts on the Colligan-Mahon Catchment (HA 17); Blackwater (Munster) (HA 18) catchment; Lee, Cork Harbour & Youghal (HA 19) Catchment and 20 Bandon-Ilen (HA 20) Catchment associated with the orthophosphate dosing have been assessed with the LCB Cappoquin WSZ. The common water bodies that are impacted by the WSZs supplied by these WTPs have been summarised in **Table 5-5** below.

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour
- 26 Glashaboy WTP – Zone 3 Glashaboy
- 30 Innishannon WTP – Zone 2 Innishannon
- 36 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty
- 54 Mallow WTP (Ballyellis WTP) – Zone 4 Mallow
- 59 Glendine WTP - Zone3 Youghal Regional
- 60 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty
- 72 Kilva Reservoir Site – Zone 3 Whitegate Regional
- 78 Midleton WTP – Zone 3 Midleton
- 83 Tibbetstown WTP - Tibbotstown
- 118 Macroom WTP – Zone 2 Macroom
- 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne
- 161 Freemount WTP – Zone 4 Allow Regional
- 165 Knockraha WTP -Zone3 Glanmire
- 180 Mitchelstown South WTP – Zone 4 Mitchelstown South
- 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply
- 236 Mountnorth Reservoir – Zone 4 Mount North
- 324 Killdorrery WTP – Zone 4 Kildorrery
- 333 Shrone WTP - Shrone PWSS 078A
- 359 Ballymacoda Road Borehole – Zone 3 Killeagh
- 363 Hammond Place Pump Station - Zone 4 Dromahane
- 371 LCB Lismore WTP – LCB Lismore
- 376 Tallow WTP - Tallow
- 386 Drimoleague WTP, Deelish - Zone1 Drimoleague
- 400 Bweeng WTP – Zone4 Bweeng

Table 5-5: Cumulative assessment of the increased loading and concentrations to water bodies from 370 LCB Cappoquin PS and other WSZs proposed for corrective water treatment in the Blackwater (Munster) catchment

NAME / EU_CD	Period	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year and Conc. Surrogate Conc given in *italic* mg/l	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
IE_SE_17B010050 BRICKEY_010		Good Upwards Near	0.024	0.033	1.0	0.0002	0.024
IE_SE_17B010090 BRICKEY_020	RWB	High Upwards Near	0.022	0.019	4.1	0.0001	0.022
		Good Downwards Far	0.029	0.033			0.029
IE_SE_17C010300 COLLIGAN_040	RWB	High Upwards Far	0.014	0.019	14.6	0.0002	0.014
		High Upwards Far	0.015	0.019			0.015
		Good	*0.030*	*0.033*			*0.030*
IE_SW_18B022700 BLACKWATER (MUNSTER)_220	RWB Multiple Monitoring Points	Good Downwards Near	0.033	0.033	338.3	0.0002	0.033
		Moderate Upwards Far	0.037	0.051			0.037
		Moderate Upwards Far	0.044	0.051			0.044
		Moderate Upwards Far	0.050	0.051			0.050
IE_SW_18F020500 FINISK_030	RWB	Good Upwards Far	0.031	0.033	5.3	0.0001	0.031
IE_SW_18G100200 GLENNAFALLIA_020	RWB	Good Upwards Far	0.030	0.033	1.3	0.0000	0.030
IE_SW_18L220930 LYRENACALLEE_EAST_010	RWB	*Good*	*0.030*	*0.033*	*4.5*	*0.0008*	*0.031*
IE_SW_18M260940 MONEYGORM_010	RWB	*Good*	*0.030*	*0.033*	*6.7*	*0.0012*	*0.031*

NAME / EU_CD	Period	Ortho P Indicative Quality and Trends (distance to threshold) Surrogate Indicative Quality indicated in *italic*	Baseline Year and Conc. Surrogate Conc given in *italic* mg/l	75% of Ortho P Indicative Quality Upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. Using Flows (30%ile tidal or gauged) mg/l	PO4 Potential Baseline Conc. following dosing mg/l
IE_SW_18O020400 OWBEG (WATERFORD)_010	RWB	*Moderate*	*0.046*	*0.051*	*3.0*	*0.0003*	*0.046*
IE_SW_18O020800 OWBEG (WATERFORD)_020	RWB	Good Upwards Far	0.029	0.033	6.8	0.0005	0.030
IE_SE_140_0200 Brickey Estuary	TWB	*High*	*0.013*	*0.019*	*4.1*	*0.0002*	*0.013*
IE_SE_140_0100 Colligan Estuary	TWB Winter	High Upwards Far	0.008	0.019	20.3	0.0000	0.008
	TWB Summer	High Downwards Far	0.021	0.019			0.021
IE_SE_140_0000 Dungarvan Harbour	TWB Winter	High Downwards Far	0.004	0.019	394.5	0.0000	0.004
	TWB Summer	High Downwards Far	0.022	0.019			0.022
IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	TWB Summer	High (S) Far	0.021	0.023	506.3	0.0001	0.021
	TWB Winter	Good (W) Far	0.034	0.053			0.034
IE_SW_020_0500 Upper Blackwater M Estuary	TWB Summer	High (S) Far	0.019	0.023	380.9	0.0002	0.019
	TWB Winter	Good (W) Far	0.031	0.053			0.031
IE_SW_020_0000 Youghal Bay	CWB Summer	High Far	0.009	0.019	517.9	0.0000	0.009
	CWB Winter	High Far	0.014	0.019			0.014
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	CWB	High (W)	0.013	0.019	4715.3	0.0000	0.013
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	CWB	*High*	*0.013*	*0.019*	*9694.9*	*0.0001*	*0.013*

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

5.3.7 Conclusions

When mean flows are taken into account the modelled increase in orthophosphate concentration levels is undetectable 0.0% within the water Blackwater M Estuary (IE_SW_020_0500) and Blackwater (Munster)_220 (IE_SW_18B022700) which receive direct discharges from Cappoquin WWTP and Lismore WWTP, respectively.

The modelled orthophosphate concentrations due to subsurface pathways are insignificant in all river water bodies, i.e. < 0.00125 mg/l (5% of the High / Good indicative quality boundary for surface water bodies) and therefore there is no risk of deterioration in the orthophosphate indicative quality of the river water bodies, or of preventing the achievement of their WFD objectives. The largest modelled increase in Ortho P concentration occurs in the Moneygorm_010 (IE_SW_18M260940) river waterbody.

The modelled increased loads due to orthophosphate dosing in river water bodies hydrologically connected to the European Sites are not predicted to be significant i.e. are <0.00125 mg/l (5% of High / Good indicative quality boundary). The dosing therefore poses no risk of deterioration in the orthophosphate indicative quality of the river water bodies identified in Table 5 2, or of preventing their achievement of WFD objectives.

The predicted loads and modelled concentrations to GWBs are undetectable in most cases (i.e. <0.00175 mg/l = 5% of the Good / Fail boundary). The orthophosphate concentration following dosing at LCB Cappoquin PS for Lismore (IE_SW_G_050) is negligible 0.0002 mg/l) which is well below the 5% Good / Fail boundary and the overlaying surface water bodies are not at risk of deterioration in the orthophosphate indicative quality or of preventing the achievement of their WFD objectives.

The cumulative assessment of dosing at LCB Cappoquin PS 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. Both the Colligan Estuary (IE_SE_140_0100) and Dungarvan Harbour (IE_SE_140_0000) display post dosing concentrations which exceed 75% of the indicative quality upper threshold during winter. However, this is due to the baseline concentration as the modelled concentration increase in both transitional waterbodies is not detectable (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.

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

LCB Cappoquin PS is not located within a European Site, it is proximal (approx. 200m) to the Glennafallia River which forms part of the Blackwater River (Cork/Waterford) SAC. The construction works will be located within the confines of the existing LCB Cappoquin PS and also extend to the south into the surrounding agricultural land in an area of recolonising bare ground and with little ecological value.

From the minor scale of the proposed construction works, the existing habitats surrounding the WTP will act to isolate any surface water flow paths from the works area to the river and as outlined in the impact assessment presented in **Section 5.3.1** above; there are no hydrological pathways identified which give rise to connectivity between the proposed construction works and European Sites.

In addition, LCB Cappoquin PS overlies the Lismore (IE_SW_G_050) groundwater body. Two European sites overly this groundwater body, the Blackwater River (Cork/Waterford) SAC and Blackwater Callows SPA. Potential source receptor pathways have been ruled out for the Blackwater Callows SPA. For the Blackwater River (Cork/Waterford) SAC, interference with the underlying water table will be unlikely to occur owing to the nature of the construction works. The proposed construction works will be localised and contained which comprises of artificial building, hard standing and recolonising bare ground of little ecological value. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects on the receiving ground or surface water bodies and by extension those European Sites as a result of the construction of the corrective water treatment works at LCB Cappoquin PS.

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

6.2 OPERATIONAL PHASE

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

6.2.1 Blackwater River (Cork / Waterford) SAC 002170

6.2.1.1 (1029) Freshwater Pearl Mussel

Conservation Objectives for the species in the Blackwater River SAC have been set; however an orthophosphate specific level is not defined. In addition, the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations S.I. No. 296 of 2009, set ecological quality objectives for the freshwater pearl mussel habitat, which are the equivalent of High status. The European Communities Environmental Objectives (Surface Water) Regulations S.I. No. 272 of 2009 (as amended) set a limit of ≤0.025 (mean) or ≤0.045 (95%ile) mg/l for Molybdate Reactive Phosphorus (MRP) (mg P/l) for High status waters, however the level required is likely to be even lower than this standard. These objectives have framed the impact assessment for this species within this SAC for this proposed project.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

The freshwater pearl mussel in this SAC is known from the main Munster Blackwater River, two of its tributaries (Owentaraglin and Allow) and the Licky River which discharges into the Upper Blackwater Estuary. The Munster Blackwater population (including the Owentaraglin), the Allow population and the Licky population, are designated under the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. No. 296 of 2009. 168 km encompasses the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels.

The Munster Blackwater population extends as far as Ballyduff, while the Allow population lies upstream of Kanturk in North Cork, both of which are upstream of the LCB Cappoquin PS WSZ. The Licky River discharges to the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) downstream of the LCB Cappoquin PS WSZ. The Licky River is located in a separate sub-catchment to

the WSZ and there is no hydrological pathway linking the WSZ to river. Therefore the freshwater pearl mussel in the Blackwater River SAC will not be affected by this project. The Atlantic salmon, which act as a host species to freshwater pearl mussel larval glochidia is discussed below.

6.2.1.2 (1092) White-clawed crayfish

A review of the targets and measures for the white-clawed crayfish found no nutrient specific targets for the species (NPWS, 2012[18]). However, white-clawed crayfish have a general water quality requirement for moderate to good water quality (i.e. Q3-4 or higher; NPWS, 2013[19]), therefore any reduction in water quality as a result of orthophosphate loading would be contrary to the conservation objectives for this species.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

Within the Munster Blackwater River system, white-clawed crayfish is present only in the Awbeg River. There have been some records from other parts of the river system e.g. downstream of the confluence of the Awbeg and Munster Blackwater and upstream of Mallow[20]. All known and potential locations of the species are a considerable distance upstream of the LCB Cappoquin PS WSZ, and there is no intersection between the river and groundwater bodies which intersect the WSZ and the Awbeg white-clawed crayfish population. Therefore, the white-clawed crayfish will not be affected by this Project.

6.2.1.3 (1095) Sea lamprey, (1096) Brook lamprey, (1099) River lamprey, (1103) Twaite shad and (1106) Atlantic salmon (freshwater only)

Water quality is a particular threat to all fish fauna listed as qualifying interests. The latest Red List of Irish amphibians, reptiles and freshwater fish (King *et al*., 2011[21]) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes

[18] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

[19] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife

[20] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

[21] 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) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

the potential effects from municipal discharges. The SSCOs (NPWS, 2012[22]) for these fish species requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCOs for salmon also requires a Q-value of at least 4, which equates to Good ecological status.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

Sea lamprey, river lamprey and brook lamprey have a mapped distribution throughout the SAC, including some tributaries (as per Map 10, NPWS, 2012[23]). The distribution of Atlantic salmon is not provided in the SSCO report. The Munster Blackwater River and its tributaries are surveyed for fish as part of the WFD surveillance monitoring programme in rivers. The most recent fish survey of the Munster Blackwater was carried out in 2013 at Lismore Bridge (0km), Killavullen Br. (46km upstream of WSZ) and Nohaval Bridge (100km upstream of WSZ). At Lismore Bridge, salmon was the most abundant fish species recorded during the survey. No lamprey species were recorded. Salmon and lamprey were both previously recorded during a 2010 survey of the site. At Killavullen Bridge, lamprey species and salmon were among the fish species recorded. Salmon were also observed during a 2009 survey of the site. At the Nohaval Bridge, salmon was the most abundant fish species recorded during the 2013. Lamprey species were also recorded. Salmon were also observed during a 2010 and 2009 survey of the site. While lamprey species were observed during the 2010 survey only (Kelly *et al*., 2014[24]).

A WFD fish survey of the Finisk River (tributary of the Munster Blackwater) was carried out in 2014. The survey site was located downstream of Modelligo Bridge, approximately 4km of the Cappoquin WSZ. Salmon was the most abundant fish species recorded at this site. Lamprey species were not recorded during the 2014 survey however both lamprey and salmon were previously recorded at this location in 2010 (Kelly *et al*., 2015[25]).

[22] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[23] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[24] Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2014) Water Framework Directive Fish Stock Survey of Rivers in the South Western River Basin District. Inland Fisheries Ireland, 3044 Lake
[25] Kelly, F.L., Connor, L., Matson, R., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2015) Sampling Fish for the Water Framework Directive, Rivers 2014. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2011/11/Rivers_report_2014.pdf

IFI also surveyed two sites on the River Funshion, one at Brackbaun Bridge and another at Kilbeheny Bridge, in 2014. The Funshion is a tributary of the Munster Blackwater and confluences with the Munster Blackwater approximately 20km upstream of the Cappoquin WSZ. Salmon was observed at both survey sites and it was one of the most abundant fish species recorded at the Kilbeheny Bridge. Lamprey species were not recorded at either survey site (Kelly et al., 2015[26]). The River Funshion was also surveyed in 2013 upstream of Ballyfean Bridge, approximately 1km upstream of the Munster Blackwater river confluence. Salmon was the most common species recorded. Lamprey species were also recorded. Salmon and lamprey were previously observed during the 2010 survey of the site (Kelly et al., 2014[27]).

It is noted that large weirs on the Munster Blackwater may delay salmon upstream migration in certain water conditions but do not generally prevent access to spawning areas. For twaite shad, there is no distribution provided in the SSCO for the site and the species is also impacted by large weirs on the Munster Blackwater which prevents potential exploitation of adult spawning grounds[28]. It is assumed for the purposes of this assessment, that all species have access to the water bodies which may potentially be impacted by the proposed dosing at LCB Cappoquin PS, thereby providing a conservative assessment of impacts.

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

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400). Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High

[26] Kelly, F.L., Connor, L., Matson, R., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2015) Sampling Fish for the Water Framework Directive, Rivers 2014. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2011/11/Rivers_report_2014.pdf

[27] Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2014) Water Framework Directive Fish Stock Survey of Rivers in the South Western River Basin District. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2011/11/SWRBD_rivers_report_2013.pdf

[28] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, or of preventing the achievement of WFD objectives.

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

6.2.1.4 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Blackwater River SAC do not make specific reference to water quality and nutrient conditions; however, there is a requirement to conserve community types in their natural conditions (NPWS, 2012[29]). The COs supporting document for Marine habitats (NPWS, 2012[30]) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context - specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

The habitat area for estuaries is estimated as 1,208ha using OSi data and the transitional water body area as defined under the Water Framework Directive[31]. The designated estuary habitat incorporates both transitional water bodies connected to the LCB Cappoquin PS WSZ. The river water bodies

[29] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[30] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20SAC%20Marine%20Supporting%20Doc_V1.pdf
[31] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

identified above discharge into the SAC at different points along the Munster Blackwater estuary and therefore act as a pathway from the WSZ to the site.

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

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400). Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at LCB Cappoquin PS, 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.

6.2.1.5 (1140) Mudflats and sandflats not covered by seawater at low tide

The attributes and targets that will maintain the favourable conservation condition of this habitat in the Blackwater River SAC do not make specific reference to water quality and nutrient conditions however there is a requirement to conserve community types in their natural conditions (NPWS,

2012[32]). The COs supporting document for Marine habitats (NPWS, 2012[33]) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

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

The habitat area for Mudflats and sandflats not covered by seawater at low tide in this SAC is estimated using OSi data as 284ha. The habitat distribution is confined to the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) transitional water body. The river water bodies identified above discharge into the SAC at different points along the Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) and therefore act as a pathway from the WSZ to the site.

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400).

[32] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[33] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20SAC%20Marine%20Supporting%20Doc_V1.pdf

Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at LCB Cappoquin PS, 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.

6.2.1.6 (1310) *Salicornia* and other annuals colonising mud and sand, (1330) Atlantic salt meadows and (1410) Mediterranean salt meadows

There are no nutrient specific targets in the SSCOs for these saltmarsh habitats (NPWS, 2012[34]); however there is a target relevant to all three habitats to maintain the natural tidal regime i.e. regular tidal inundation. The CO supporting document on coastal habitats (NPWS, 2012[35]) for the Blackwater River SAC was reviewed, and discusses the flooding regime attribute and associated target in further detail. The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and survival of saltmarshes.

Salicornia habitat was not recorded by McCorry and Ryle (2009) during the Saltmarsh Monitoring Project at Kinsalebeg estuary, but is known to occur at Foxhole (above Youghal), Blackbog, and Tourig estuary (Curtis and Sheehy-Skeffington, 1998)[36]. However, the full extent is un-mapped and further surveyed areas maybe present within the site. It is estimated that the Kinsalebeg sub-site represents less than 10% of the total area of saltmarsh within this SAC[37].

For Atlantic salt meadows, and based on the Saltmarsh Monitoring Project, one sub-site that supports the habitat was mapped (Kinsalebeg) (2.77ha) and additional areas of potential saltmarsh (28.13ha) were identified from an examination of aerial photographs. The habitat also occurs at Tourig Hall and

[34] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[35] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20SAC%20Coastal%20Supporting%20Doc_V1.pdf
[36] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[37] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20SAC%20Coastal%20Supporting%20Doc_V1.pdf

Ballintray House (Curtis and Sheehy-Skeffington, 1998). As with *Salicornia* habitat, further unsurveyed areas maybe present within the site.

For Mediterranean salt meadows, one sub-site supporting the habitat was mapped as part of the Saltmarsh Monitoring Project (1.36ha) (Kinsalebeg) and additional areas of potential saltmarsh (8.67ha) were identified from an examination of aerial photographs. Further unsurveyed areas maybe present within the site.

On the basis of the information above, and using a precautionary approach, it was determined that the three habitat types have the potential to occur along any part of the coastline that is covered by the tide (following McCorry and Ryle, 2009[38]).

The overall objective for *Salicornia* and other annuals colonising mud and sand, and Mediterranean salt meadows is to maintain favourable conservation status. For Atlantic salt meadows, it is to restore the favourable conservation status of the habitat.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

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

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400).

38 https://www.npws.ie/sites/default/files/publications/pdf/McCorry_%26_Ryle_2009_Saltmarsh_survey_V1.pdf

Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All modelled concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, or of preventing the achievement of WFD objectives.

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

6.2.1.7 (1355) Otter

A review of the SSCOs (NPWS, 2012[39]) found no specific attributes or targets relating to water quality. The National Parks and Wildlife Service's 'Threat Response Plan for the Otter' (NPWS, 2009[40]), which comprised a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution.

The extent of terrestrial, marine and freshwater (river) habitat within the site includes all areas within a 10m terrestrial buffer along the shoreline (above the high water mark and along river banks) identified as critical for otters; areas within 80m of the shoreline (high water mark) and river length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (NPWS, 2012[41]). The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010

[39] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[40] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.
[41] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

(IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and

- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

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

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400). Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All modelled concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, or of preventing the achievement of WFD objectives.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at LCB Cappoquin PS, 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 species.

6.2.1.8 (1421) Killarney fern

Killarney fern is a type of filmy fern. It grows in deeply shaded, humid situations such as dripping caves, crevices and overhands on cliffs and rocky slopes, in stream gullies, by waterfalls and in woodlands,

and occasionally occurs under fallen trees and on the floor of damp woodlands[42]. A review of the SSCOs for Killarney fern (NPWS, 2012[43]) found no specific attributes or targets relating to nutrients or water quality; however it is threatened by a variety of activities and impacts, including indirectly by water pollution.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

There are currently two locations known within the SAC where this species occurs: one near Glendine, adjacent to Glendine Estuary, and the second site at Glengarra. The Glengarra site is located upstream of the WSZ and therefore it is not at risk of impacts from the dosing at LCB Cappoquin PS. The Glendine site is located upstream of the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) in a separate sub-catchment to the WSZ. There is no hydrological pathway connecting the WSZ and the Glendine site and therefore, there is no risk of impacts to the species as a result of dosing at LCB Cappoquin PS.

6.2.1.9 (3260) Watercourses of plain to montane levels

The full distribution of this habitat and its sub-types in this site are currently unknown. The basis of the selection of the SAC for the habitat was the presence of plant species listed in the Interpretation Manual (European Commission, 2007), recorded during the Natural Heritage Area (NHA) survey of the river (internal NPWS files)[44]. The dominant floating-leaved species appears to be the common and widespread stream water-crowfoot (*Rannunculus penicillatus* subsp. *Penicillatus*) (Green, 2008; O'Mahoney, 2009)[45]. No high conservation value sub-types are known to occur in the SAC and further survey is required to determine whether any such are present. Only one rare / threatened vascular plant species is known to occur in the SAC, the protected opposite-leaved pondweed (*Groenlandia densa*), which is abundant in the tidal stretches around Cappoquin (Green, 2008)[46].

The SSCOs[47] for this site include a target that the concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition. Water

[42] https://www.npws.ie/sites/default/files/publications/pdf/Art17-Vol1-web.pdf
[43] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[44] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[45] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[46] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[47] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf

quality should reach a minimum of WFD 'good status', in terms of nutrient and oxygenation standards and ecological quality ratios (EQRs) for macroinvertebrates and phytobenthos.

On the basis of the uncertainty associated with the distribution of this habitat within the Blackwater River SAC and as the WSZ directly intersects the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and the Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) at Cappoquin, it has been assumed that this habitat is hydrologically connected to all water bodies affected by the proposed dosing at LCB Cappoquin PS.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies that are hydrologically connected to the SAC include: Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); Owbeg (Waterford)_020 (IE_SW_18O020800); and
- The transitional water bodies hydrologically connected to the SAC include: Upper Blackwater M Estuary (IE_SW_020_0500); Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100); and
- The groundwater bodies hydrogeologically connected to the SAC include: Glenville (IE_SW_G_037); Lismore (IE_SW_G_050); and, Cappoquin Kiltorcan (IE_SW_G_025).

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

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400). Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

The modelled concentrations in the transitional water bodies Upper Blackwater M Estuary (IE_SW_020_0500) and Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) are 0.0000 mg/l following dosing LCB Cappoquin PS. Therefore there is no risk of deterioration of the current High orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives

For groundwater bodies, the modelled increase in orthophosphate concentration in Glenville (IE_SW_G_037) and Cappoquin Kiltorcan (IE_SW_G_025) is 0.0000 mg/l while in Lismore (IE_SW_G_050) the modelled concentration is 0.0002 mg/l. All modelled concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, 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

6.2.1.10 (91E0) * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

A review of the SSCOs for this habitat found no nutrient specific targets. The habitat is assessed based on woodland structure, and requires periodic flooding to maintain alluvial woodlands along river floodplains. The main threats to this habitat are drainage and reclamation, together with non-native and invasive species encroachment.

There are six known sites within the SAC with a minimum area of 19.2ha, although there are likely to be further unsurveyed areas present[48]. A target within the SSCOs[49] for this habitat is to maintain the appropriate hydrological regime necessary for maintenance of alluvial vegetation. The woodlands supporting document for this site lists fertiliser drift and water pollution as indirect threats to the habitat, which may increase 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[50]. On the basis of the uncertainty related to the distribution of this habitat in this SAC, it is assumed on a precautionary basis, that the habitat may occur in some or all of the river water bodies hydrologically connected to the WSZ.

Table 5-2 identifies the surface water bodies which are hydrologically connected to Blackwater River SAC and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water bodies hydrologically connected are; Lyrenacallee_East_010 (IE_SW_18L220930); Blackwater (Munster)_220 (IE_SW_18B022700); Finisk_030 (IE_SW_18F020500); Glennafallia_020 (IE_SW_18G100200); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_010 (IE_SW_18O020400); and, Owbeg (Waterford)_020 (IE_SW_18O020800).

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

[48] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[49] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
[50] https://www.npws.ie/sites/default/files/publications/pdf/002170_Blackwater%20River%20(Cork-Waterford)%20Woodland%20Supporting%20Doc_V1.pdf

For river water bodies, the modelled increase in orthophosphate concentration as a result of proposed dosing at LCB Cappoquin PS is 0.0000 mg/l in the Blackwater (Munster)_220 (IE_SW_18B022700), Finisk_030 (IE_SW_18F020500) and Glennafallia_020 (IE_SW_18G100200); 0.0001 mg/l in Lyrenacallee_East_010 (IE_SW_18L220930) and Owbeg (Waterford)_010 (IE_SW_18O020400); 0.0002 mg/l in Moneygorm_010 (IE_SW_18M260940); and, 0.0003 mg/l in Owbeg (Waterford)_020 (IE_SW_18O020800). All modelled concentrations are below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of either water body, or of preventing the achievement of WFD objectives. Current indicative quality of these water bodies which ranges from Good in Glennafallia_020 (IE_SW_18G100200); Lyrenacallee_East_010 (IE_SW_18L220930); Moneygorm_010 (IE_SW_18M260940); Owbeg (Waterford)_020 (IE_SW_18O020800); Finisk_030 (IE_SW_18F020500) and Moderate surrogate indicative quality in Owbeg (Waterford)_010 (IE_SW_18O020400). Orthophosphate indicative quality in the Blackwater (Munster)_220 (IE_SW_18B022700) ranges from Good to Moderate.

In light of the EAM assessment results, which evaluate the additional orthophosphate loading from dosing at LCB Cappoquin PS, 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.

6.2.2 BLACKWATER CALLOWS SPA 004097

The Blackwater Callows SPA comprises the stretch of the Munster Blackwater River that runs in a west to east direction between Fermoy and Lismore in Counties Cork and Waterford, a distance of almost 25 km. The site includes the river channel and strips of seasonally-flooded grassland within the flood plain. Sandstone ridges, which run parallel to the river, confine the area of flooding to a relatively narrow corridor. The site is an SPA under the E.U. Birds Directive, of special conservation interest for the following species: Whooper Swan, Wigeon, Teal and Black-tailed Godwit. Wetlands also form part of this SPA and therefore, the site and its associated waterbirds are of special conservation interest for Wetland and Waterbirds.

There are no SSCOs established for this SPA. There are general objectives to *maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA* and to *maintain or restore the favourable conservation condition of the wetland habitat at Blackwater Callows SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.*

In relation to protected water-dependent habitats and species under the Birds and Habitats Directive, the river basin management planning process contributes towards achieving water conditions that support Favourable Conservation Status. In preparing the RBMP (2018-2021) (DHPLG, 2018[51]) 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. This is the case for SPA birds and wetlands.

[51] http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf

Table 5-2 identifies the surface water bodies which are hydrologically or hydrogeologically connected to Blackwater Callows SPA and will receive inputs from the proposed orthophosphate dosing at LCB Cappoquin PS:

- The river water body hydroogically connected is the Blackwater (Munster)_220 (IE_SW_18B022700); and,
- The groundwater bodies hydrogeologically connected includes: Lismore (IE_SW_G_050); Cappoquin Kiltorcan (IE_SW_G_025).

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 increase in orthophosphate concentration in the Blackwater (Munster)_220 (IE_SW_18B022700) is 0.0000 mg/l which is below the 5% High / Good indicative quality boundary of 0.00125 mg/l, and therefore there is no risk of deterioration of the current orthophosphate indicative quality of this river water body, or of preventing the achievement of WFD objectives.

For GWBs Cappoquin Kiltorcan (IE_SW_G_025) and Lismore (IE_SW_G_050), the modelled increase in orthophosphate concentration is 0.0000 mg/l and 0.0002 mg/l, respectively. All modelled concentrations are below the 5% Good /Fail boundary i.e. <0.00175 mg/l and therefore there is no risk of deterioration in the current Good orthophosphate indicative quality of these groundwater bodies, 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 impacts, 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 Waterford 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 impacts 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
Waterford City and County Development Plan 2022 – 2028 The policies, objectives and zonings of relevance in the Waterford County Development Plan include Water Services and Water Supply : **UTL 02: Water Services** To collaborate support and work, in conjunction with Irish Water [Uisce Éireann], to ensure the timely delivery and provision, extension and upgrading of existing and new high quality, climate resilient, water services infrastructure, in order to facilitate the sustainable growth and development of our City and County, in accordance with an ecosystem services and integrated catchment management approach, and the Development Plan Core and Settlement strategies. **UTL 03: Water Supply & Drinking Water Regulations** We will collaborate with Irish Water [Uisce Éireann] in contributing towards compliance with the European Union (Drinking Water) Regulations Drinking Water Regulations 2014 (as amended) and compliance of water supplies with the parameters identified in these Regulations. All new developments must be satisfactorily served by either a mains water supply, or by a private water supply. The preferred option will always be a public water supply and drainage solution. It will be the responsibility of the developer to demonstrate that any new supply is adequate to serve the proposed development and that for domestic use; it is safe to be consumed as drinking water. Groundwater abstractions must comply with EPA policies and guidelines.	▪ N/A	The Waterford City and County Development Plan emphasises the objectives of their water services which include the enhancement and improved quality of the service to its consumers. The plans also outline the importance of compliance with the River Basin Management Plan (2022-2027) and emphasises compliance with environmental objectives. The Plan also seeks to ensure the protection, integrity and conservation of European Sites and Annex I and II species listed in EU Directives. There is no potential for cumulative impacts with these plans.
River Basin Management Plan For Ireland 2022 – 2027 The Third Cycle Draft River Basin Management Plan 2022-2027 Consultation Report has been published. This report presents a summary of the issues raised in the submissions reviewed from the public consultation on the draft River Basin Management Plan for Ireland 2022-2027.	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and • Achieve water related protected areas objectives

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
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.		The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives given the detailed assessment of the effects of dosing on water body environmental objectives under the EAM.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement; ▪ Disturbance; ▪ In-combination impacts within the same scheme.	CFRAM Studies and their product Flood Risk Management Plans, will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
		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[52]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[53], and AA[54]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects,

[52] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf
[53] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[54] 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
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.		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 a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[55]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025

[55] 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
		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[56]. 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 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	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	The overarching strategy was subject to Appropriate Assessment and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

[56] 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
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.	▪ 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 also as part of other measures in relation to the lead in drinking water.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The potential for in-combination impacts are unclear as the plan is not sufficiently developed at this stage.
Planning Applications There are a large number of planning applications approved or pending within in Cappoquin. The applications are predominantly for the construction of new dwellings or renovations to existing dwellings. There are also a number of applications for the construction of agricultural buildings such as cattle sheds with slatted tanks and the infilling of exhausted quarries.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	Adherence to the overarching policies and objectives of the Waterford County Development Plan 2011 - 2017 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.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects and Mitigation
	▪ Nutrient enrichment /eutrophication.	
Integrated Pollution Control (IPC) Licensing Cappoquin has a number of IPC licenced facilities for intensive agriculture activities, primarily poultry installations. 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 LCB Cappoquin PS within LCB Cappoquin 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 for the European Sites potentially affected by the proposed project, in order to provide a scientific basis for the evaluations.

During the construction phase of the corrective water treatment works at LCB Cappoquin PS the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Blackwater River (Cork/Waterford) SAC) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the qualifying interests/special conservation interests of the European Site within the ZoI.

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

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

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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
Blackwater River (Cork / Waterford) SAC (002170)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002170.pdf
Blackwater Callows SPA (004094)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004094.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

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
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
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

Code	Qualifying Interest	Water dependant	GWDTE	Nutrient sensitive
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

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes
A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes
A142	Lapwing (*Vanellus vanellus*)	Yes	Yes
A143	Knot (*Calidris canutus*)	Yes	Yes
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

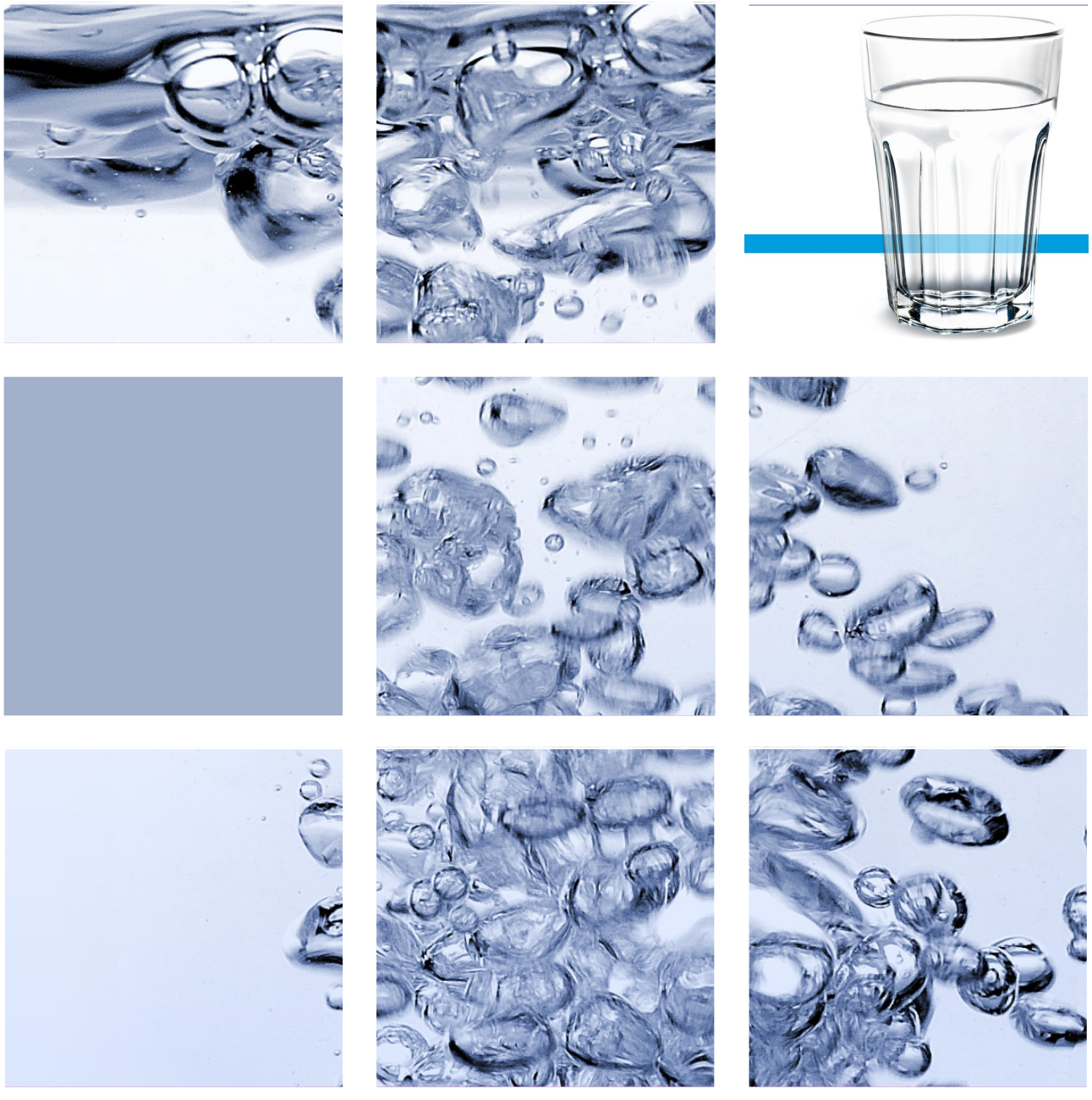
APPENDIX C

EAM Summary Report

Uisce Éireann - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

370 LCB Cappoquin Pump Station WTP – LCB Cappoquin (3100PUB1074)



National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 370 LCB Cappoquin Pump Station – LCB Cappoquin (3100PUB1074)

Document Control Sheet

Client:	Uisce Éireann
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 370 LCB Cappoquin Pump Station – LCB Cappoquin (3100PUB1074)
Document No:	MDW0766RP_5.1_EAM_370_LCB Cappoquin Pump Station_F05

Text Pages:	10	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F02	Final	4th Oct 2018	MH		MM IP		DC	
F03	Final	2nd Nov 2018	MH		IP		DC	
F04	Final	21st May 2019	YE		MM IP		DC	
F05	Final	21st Mar 2023	YE		IP		MM	

370 LCB Cappoquin Pump Station – LCB Cappoquin WSZ (3100PUB1074)

Supporting spreadsheet: 370_LCB Cappoquin Pump Station_LCB Cappoquin WSZ_V08

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

LCB Cappoquin Pump Station supplies an area of approximately 19km² in the west of Co. Waterford. LCB Cappoquin WSZ covers the town of Cappoquin and a large portion of Lismore. The distribution input for LCB Cappoquin WSZ is 515.95 m^3/day, 79% of which is provided by LCB Cappoquin Pump Station (the remaining 21% is supplied by LCB Lismore WTP) , serving a population of approximately 3,000. The accounted for water supplied from LCB Cappoquin Pump Station is estimated to be 477m^3/day, with the remainder assumed to be lost through leakage. The non-domestic demand is 15.6% of the distribution input.

The area is served by Cappoquin (D0272) and Lismore (D0176) WWTPs which are licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. It is estimated that there are 284 properties across the WSZ that are serviced by a DWWTS.

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

<table>
<tr><td>Water Treatment Plant</td><td colspan="2">LCB Cappoquin Pump Station</td></tr>
<tr><td>Water Supply Zone</td><td colspan="2">LCB Cappoquin WSZ (3100PUB1074)
See Figure 4.1 / 4.2 of the AA Screening for a map of the WSZ and ZoI</td></tr>
<tr><td rowspan="5">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>- Ballymacoda (Clonpriest and Pillmore) SAC
- Lough Hyne Nature Reserve And Environs SAC
- Roaringwater Bay And Islands SAC
- Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC
- Helvick Head SAC</td><td>- Barley Cove To Ballyrisode Point SAC
- Comeragh Mountains SAC
- Ardmore Head SAC
- Blackwater River (Cork/Waterford) SAC
- Glendine Wood SAC</td></tr>
<tr><td colspan="2">SPAs</td></tr>
<tr><td>- Ballymacoda Bay SPA
- Blackwater Estuary SPA
- Dungarvan Harbour SPA
- Blackwater Callows SPA
- Sovereign Islands SPA</td><td>- Mullaghanish to Musheramore Mountains SPA
- Galley Head to Duneen Point SPA
- Seven Heads SPA
- Helvick Head to Ballyquin SPA
- Sheep's Head to Toe Head SPA</td></tr>
<tr><td colspan="2">Nutrient Sensitive Qualifying Interests present – Yes
Appropriate Assessment Required – see AA screening report for details</td></tr>
</table>

Step 2 – Direct Inputs to Surface Water

Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 0.8 mg/l

Agglomeration and discharge type	ELV (Ortho- P unless otherwise stated) from WWDL (mg/l)	Scenario	TP Load kg/yr	Ortho P concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	***0.4***	***0.68***
Cappoquin Primary Discharge	**5**	**Existing**	80.0	0.370	0.296	0.504
		Post Dosing	122.8	0.568	0.455	0.773
Cappoquin SWOs (2 no.)	**n/a**	**Existing**	14.6	2.314	1.851	3.147
		Post Dosing	15.8	2.512	2.010	3.417
Lismore Primary Discharge	**3**	**Existing**	241.5	0.472	0.378	0.642
		Post Dosing	241.5	0.472	0.378	0.642
Lismore SWOs (1 no.)	**n/a**	**Existing**	23.4	1.573	1.422	2.418
		Post Dosing	25.3	1.700	1.524	2.591

Cappoquin WWTP is currently operating with secondary treatment processes and is compliant with the ELV standards in terms of existing and post-dosing effluent orthophosphate concentrations.

Lismore WWTP effluent concentrations are compliant with ELVs. As Lismore WWTP receives tertiary treatment, i.e. chemical dosing for nutrient removal and is compliant with the ELVs set in the discharge license, the EAM assumes that the additional P loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality.

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

Table 2: Mass balance assessment based on 0.8 mg/l dosing using available background concentrations and mean flow information

Agglom. (WWDL code)	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Cappoquin (D0272)	Upper Blackwater M Estuary IE_SW_020_0500	0.0301	0.0302	0.0302	0.0
Lismore (D0176)	Blackwater (Munster)_220 IE_SW_18B022700	0.0280	0.0281	0.0281	0.0

	Surface Assessment ***Cappoquin - Upper Blackwater M Estuary*** *(IE_SW_020_0500)* – The effluent concentrations are compliant with ELVs and the impact on the receiving waters at low flows is not significant. Impact on water bodies downstream of the WWTP due to SWOs is negligible during mean flows when SWOs are assumed to be engaged (0.1% inc.). ***Lismore – Blackwater (Munster)_220*** (*IE_SW_18B022700*) - The effluent concentrations are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing. There is no additional impact from SWOs during mean flows when SWOs are engaged (0.0%inc.). The dosing will therefore have an insignificant impact on the direct discharges to surface water from agglomerations within the WSZ.
Step 4 Distributed Inputs to surface water bodies from sub surface pathways	**Subsurface Assessment** The modelled increases in concentration in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Good/High Ortho P indicative quality boundary for surface water bodies), with highest increase equal to 0.0003 mg/l, occurring in Owbeg (Waterford) 020 (IE_SW_18O020800). There are also two transitional water bodies directly affected by this WSZ, namely, Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) and Upper Blackwater M Estuary (IE_SW_020_0500). The modelled increases in concentration in the subsurface pathways are undetectable (0.0000mg/l) for all transitional water bodies.
Step 5 and 6: Combined Inputs to Groundwater Bodies	**Groundwater Bodies as receptors connected to WSZ** Table 3 gives the loads and modelled concentrations for the assessment of groundwater bodies. The predicted increases in concentration to groundwater bodies are insignificant (less than 0.00175 mg/l, which is 5% of the Good/Failing to achieve good Ortho P indicative quality boundary for groundwater bodies) to undetectable (0.0000 mg/l). The subsurface assessment takes into account the groundwater/surface water interaction and as the potential for impact on surface water is not significant, and none of the overlying surface waterbodies are at bad ecological status, there is no risk of impact on groundwater receptors due to orthophosphate dosing. There is one monitoring point of two within the Cappoquin Kiltorcan (IE_SW_G_025) GWB which is currently “Failing to achieve good” orthophosphate indicative quality. However, this monitoring point is remote from the WSZ and due to the undetectable modelled increase in orthophosphate concentrations (0.0000mg/l), there is deemed to be no further risk posed on this GWB as a result of dosing.

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality given in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P indicative quality upper threshold mg/l	Total 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_SE_G_014 Ballyknock	*Good*	*0.018*	*0.026*	*0.0*	*0.0000*	*0.018*	
IE_SW_G_037 Glenville	Good None Far	0.006	0.026	0.0	0.0000	0.006	
	Good Upwards Far	0.009	0.026			0.009	
IE_SW_G_050 Lismore	Good Upwards Far	0.005	0.026	6.4	0.0002	0.005	
	Good Upwards Far	0.006	0.026	6.4	0.0002	0.006	
IE_SW_G_025 Cappoquin Kiltorcan	Failing to achieve good Upwards Far	0.055	-	0.8	0.0000	0.055	
	Good Upwards Far	0.011	0.026	0.8	0.0000	0.011	
IE_SE_G_052 Dungarvan	Good Upwards Far	0.009	0.026	2.9	0.0001	0.009	

* Trend is Statistically Significant.
MP: Multiple Monitoring Points given for waterbody

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4-A and Table 4-B give the loads and modelled concentrations for the combined assessment to rivers and receiving waterbodies respectively. The increases in concentration due to orthophosphate dosing are predicted to be insignificant, i.e. are below 5% of the Good / High boundary for Ortho P Indicative Quality (0.00125mg/l), with highest increase equal to 0.0003 mg/l, occurring in Owbeg (Waterford) 020 (IE_SW_18O020800).

Blackwater (Munster)_220 (IE_SW_18B022700) has a baseline concentration that is above the 75% threshold to the high/good indicative quality boundary however the predicted increase in concentration as a result of the dosing is undetectable (0.0000 mg/l) and will not increase the risk of failing the WFD objectives for this water body.

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality indicated in italic]*	Baseline and Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Total Ortho P Load in receiving waters due to dosing 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_SE_17B010050 BRICKEY_010	Good Upwards Near	0.024	0.033	0.7	0.0001	0.024	
IE_SE_17B010090 BRICKEY_020	High Upwards Near	0.022	0.019	1.3	0.0000	0.022	
	Good Downwards Far	0.029	0.033			0.029	
IE_SE_17C010300 COLLIGAN_040	High Upwards Far	0.014	0.019	1.8	0.0000	0.014	
	High Upwards Far	0.015	0.019			0.015	
	Good	*0.030*	*0.033*			*0.030*	
IE_SW_18B022700 BLACKWATER (MUNSTER)_220	Good Downwards Near	0.033	0.033	1.1	0.0000	0.033	‡
	Moderate Upwards Far	0.037	0.051			0.037	
	Moderate Upwards Far	0.044	0.051			0.044	
	Moderate Upwards Far	0.050	0.051			0.050	*
IE_SW_18F020500 FINISK_030	Good Upwards Far	0.031	0.033	2.6	0.0000	0.031	
IE_SW_18G100200 GLENNAFALLIA_020	Good Upwards Far	0.030	0.033	1.0	0.0000	0.030	
IE_SW_18L220930 LYRENACALLEE_EAST_010	*Good*	*0.030*	*0.033*	*0.6*	*0.0001*	*0.030*	
IE_SW_18M260940 MONEYGORM_010	*Good*	*0.030*	*0.033*	*0.9*	*0.0002*	*0.030*	
IE_SW_18O020400 OWBEG (WATERFORD)_010	*Moderate*	*0.046*	*0.051*	*0.4*	*0.0001*	*0.046*	
IE_SW_18O020800 OWBEG (WATERFORD)_020	Good Upwards Far	0.029	0.033	3.3	0.0003	0.029	

‡ Load from WWTP / SWO following treatment added.

MP: Multiple Monitoring Points given for waterbody

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of indicative quality upper threshold mg/l	Total Ortho P in receiving waters due to dosing 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_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	High (S) Downwards Far	0.021	0.023	6.8	0.0000	0.021	
	Good (W) Upwards Near	0.034	0.053			0.034	
IE_SW_020_0500 Upper Blackwater M Estuary	High (S) Downwards Far	0.019	0.023	24.7	0.0000	0.019	‡
	Good (W) Upwards Near	0.031	0.053			0.031	

‡ Load from WWTP / SWO following treatment added.

S = Summer monitoring period, W = Winter monitoring period

Summary and Mitigation Proposed

Considering LCB Cappoquin Pump Station in isolation, orthophosphate dosing is predicted to have insignificant impact on all waterbodies. The modelled load and concentrations to both groundwater and surface water receptors do not cause a risk to WFD objectives.

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

The cumulative impacts on Colligan-Mahon Catchment (HA 17); Blackwater (Munster) (HA 18) catchment; Lee, Cork Harbour & Youghal (HA 19) Catchment and 20 Bandon-Ilen (HA 20) Catchment associated with the corrective water treatment at the following additional WTPs have been assessed in combination with LCB Lismore WTP.

- 4 Lee Road WTP - Cork City Water Supply
- 6 Inniscarra WTP – Zone 2 Cork City and Harbour
- 26 Glashaboy WTP – Zone 3 Glashaboy
- 30 Innishannon WTP – Zone 2 Innishannon
- 36 Clonakilty RWSS WTP (Jones Bridge WTP) - Zone 1 Clonakilty
- 54 Mallow WTP (Ballyellis WTP) – Zone 4 Mallow
- 59 Glendine WTP - Zone3 Youghal Regional
- 60 Ballyhilty WTP - Zone 1 Skibbereen Ballyhilty
- 72 Kilva Reservoir Site – Zone 3 Whitegate Regional

- 78 Midleton WTP – Zone 3 Midleton
- 83 Tibbetstown WTP - Tibbotstown
- 118 Macroom WTP – Zone 2 Macroom
- 157 Carriglusky Reservoir Site, Cloyne - Zone3 Cloyne
- 161 Freemount WTP – Zone 4 Allow Regional
- 165 Knockraha WTP -Zone3 Glanmire
- 180 Mitchelstown South WTP – Zone 4 Mitchelstown South
- 192 Michelstown Galtee WTP - Cappamore Foileen Water Supply
- 236 Mountnorth Reservoir – Zone 4 Mount North
- 324 Killdorrery WTP – Zone 4 Kildorrery
- 333 Shrone WTP - Shrone PWSS 078A
- 359 Ballymacoda Road Borehole – Zone 3 Killeagh
- 363 Hammond Place Pump Station - Zone 4 Dromahane
- 371 LCB Lismore WTP – LCB Lismore
- 376 Tallow WTP - Tallow
- 386 Drimoleague WTP, Deelish - Zone1 Drimoleague
- 400 Bweeng WTP – Zone4 Bweeng

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

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 370 LCB Cappoquin Pump Station and other WSZs proposed for corrective water treatment in the Blackwater (Munster) catchment (*note: where existing monitoring data is not available, a surrogate indicative quality is derived from ecological status of the WB or Ortho P indicative quality / Ecological status of the upstream and downstream WBS, the mid-range of that indicative quality is used as Baseline Concentration).*

NAME / EU_CD	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate indicative quality given in italic]*	Baseline 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 due to dosing kg/yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_17B010050 BRICKEY_010	Good Upwards Near	0.024	0.033	1.0	0.0002	0.024	
IE_SE_17B010090 BRICKEY_020	High Upwards Near	0.022	0.019	4.1	0.0001	0.022	
	Good Downwards Far	0.029	0.033			0.029	
IE_SE_17C010300 COLLIGAN_040	High Upwards Far	0.014	0.019	14.6	0.0002	0.014	
	High Upwards	0.015	0.019			0.015	

		Far						
		Good	*0.030*	*0.033*			*0.030*	
	IE_SW_18B022700 BLACKWATER (MUNSTER)_220	Good Downwards Near	0.033	0.033	338.3	0.0002	0.033	‡
		Moderate Upwards Far	0.037	0.051			0.037	
		Moderate Upwards Far	0.044	0.051			0.044	
		Moderate Upwards Far	0.050	0.051			0.050	*
	IE_SW_18F020500 FINISK_030	Good Upwards Far	0.031	0.033	5.3	0.0001	0.031	
	IE_SW_18G100200 GLENNAFALLIA_020	Good Upwards Far	0.030	0.033	1.3	0.0000	0.030	
	IE_SW_18L220930 LYRENACALLEE_EAST_010	*Good*	*0.030*	*0.033*	*4.5*	*0.0008*	*0.031*	
	IE_SW_18M260940 MONEYGORM_010	*Good*	*0.030*	*0.033*	*6.7*	*0.0012*	*0.031*	
	IE_SW_18O020400 OWBEG (WATERFORD)_010	*Moderate*	*0.046*	*0.051*	*3.0*	*0.0003*	*0.046*	
	IE_SW_18O020800 OWBEG (WATERFORD)_020	Good Upwards Far	0.029	0.033	6.8	0.0005	0.030	
	IE_SE_140_0200 Brickey Estuary	*High*	*0.013*	*0.019*	*4.1*	*0.0002*	*0.013*	
	IE_SE_140_0100 Colligan Estuary	High Upwards Far	0.008	0.019	20.3	0.0000	0.008	
		High Downwards Far	0.021	0.019			0.021	
	IE_SE_140_0000 Dungarvan Harbour	High Downwards Far	0.004	0.019	394.5	0.0000	0.004	‡
		High Downwards Far	0.022	0.019			0.022	
	IE_SW_020_0500 Upper Blackwater M Estuary	High (S) Far	0.019	0.023	380.9	0.0002	0.019	‡
		Good (W) Far	0.031	0.053			0.031	
	IE_SW_020_0100 Lower Blackwater M Estuary / Youghal Harbour	High (S) Far	0.021	0.023	506.3	0.0001	0.021	
		Good (W) Far	0.034	0.053			0.034	
	IE_SW_020_0000 Youghal Bay	High Far	0.009	0.019	517.9	0.0000	0.009	‡
		High Far	0.014	0.019			0.014	

IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	High (W)	0.013	0.019	4715.3	0.0000	0.013	‡
IE_SW_010_0000 Western Celtic Sea (HAs 18;19;20)	*High*	*0.013*	*0.019*	*9694.9*	*0.0001*	*0.013*	‡

‡ Load from WWTP / SWO following treatment added.
S = Summer monitoring period, W = Winter monitoring period
MP: Multiple Monitoring Points given for waterbody

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

MITIGATION OPTION – None Required

RAG STATUS – GREEN

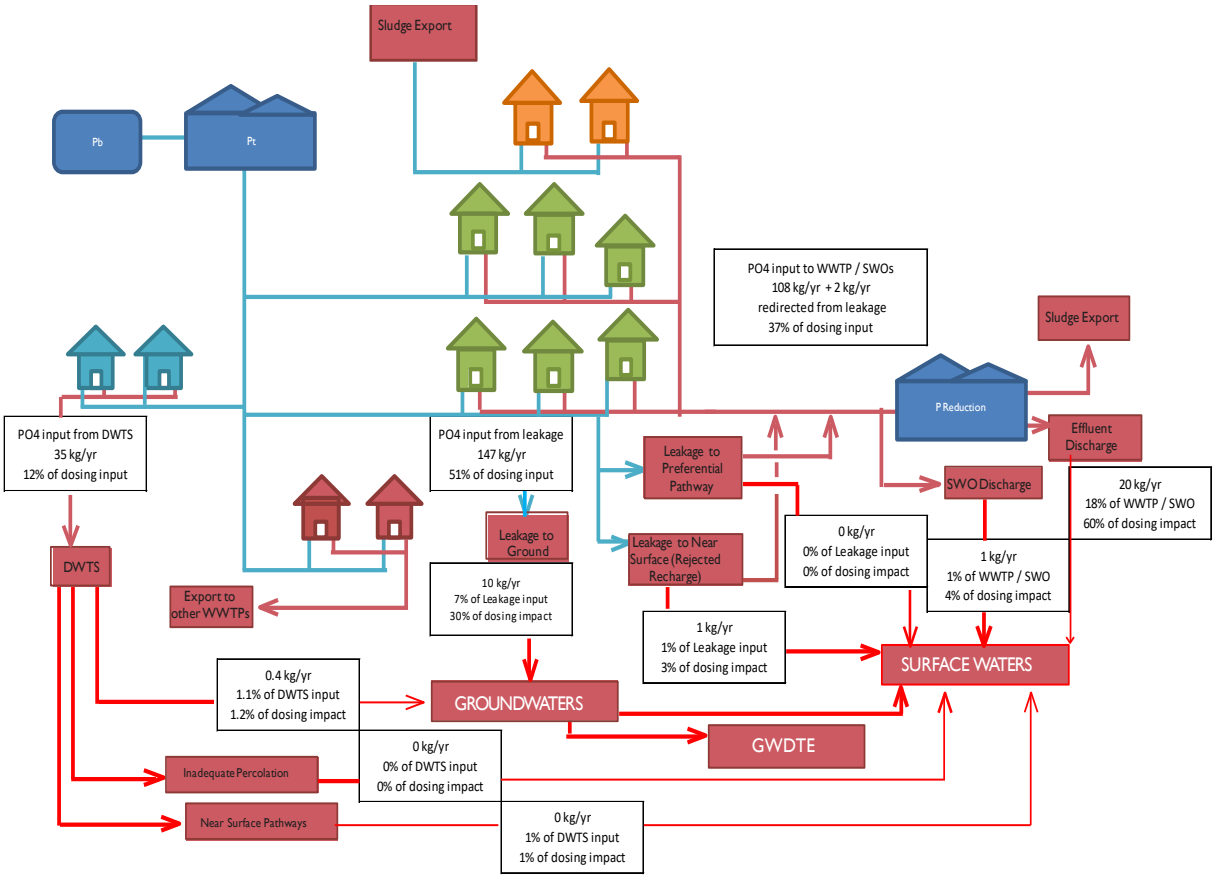
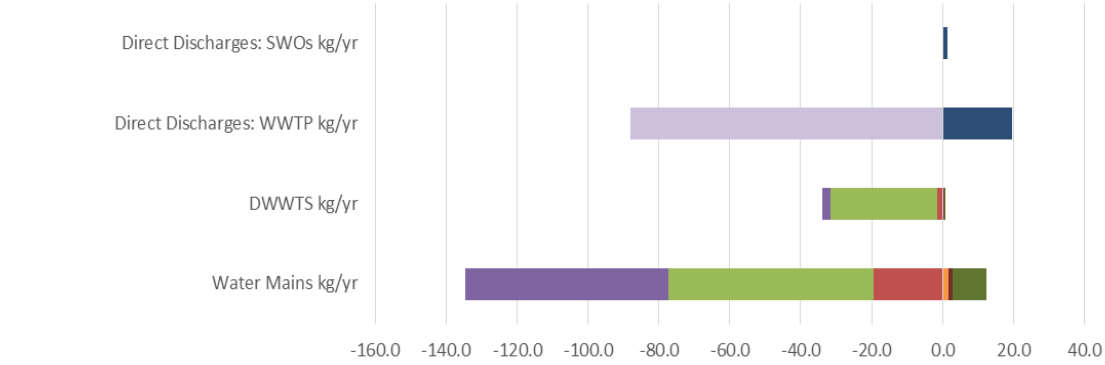


Figure 1 – Source Pathway Receptor model for LCB Cappoquin Pump Station Regional WSZ illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	0.0	0.0		
Load attenuated in Near Surface Pathway	-19.6	-1.5		
Load attenuated in 1m below trench	-57.8	-30.1		
Load attenuated in Subsurface Pathway	-57.3	-2.2		
Load intercepted by gravity main in Preference Pathway	0.0			
Load intercepted by gravity main in Near Surface Pathway	1.7			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	0.0	0.0	19.5	1.5
Load reaching SW via Near Surface Pathway	1.1	0.4		
Load reaching SW via Subsurface Pathway	9.8	0.4		
Load treated in WWTP			-88.1	

Figure 2 – Fate of orthophosphate loads modelled for LCB Cappoquin Pump Station impacting on Lower Blackwater M Estuary / Youghal Harbour (IE_SW_020_0100) due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.