Irish Water-Lead in Drinking Water Mitigation Plan

Screening for Appropriate Assessment

138 Thurles WTP - Thurles (Zone 1) WSZ (2800PUB1012)

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GLOSSARY OF TERMS & ABBREVIATIONS

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

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

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

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

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

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

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

Screening: The determination of whether implementation of a plan or project would be likely to have significant environmental effects on the Natura 2000 network.

Special Area for Conservation (SAC): An SAC designation is an internationally important site, protected for its habitats and species. It is designated, as required, under the EC Habitats Directive (1992).

Special Protection Area (SPA): An SPA is a site of international importance for breeding, feeding and roosting habitat for bird species. It is designated under the EC Birds Directive (1979).

Statutory Instrument: Any order, regulation, rule, scheme or byelaw made in exercise of a power conferred by statute.

1 INTRODUCTION

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

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

1.1 PURPOSE OF THIS REPORT

The overall purpose of the Screening for AA, as a first step in determining the requirement for AA, is to determine whether the Project is likely to have a significant effect on any European Site within the zone of influence (ZoI) of the Water Supply Zone (WSZ), either individually or in combination with other plans or projects, in view of the site's conservation objectives. This Screening report complies with the requirements of Article 6 of the Habitats Directive transposed in Ireland principally through the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations, S.I. No. 477 of 2011 (as amended). In the context of the proposed project, the governing legislation is the EC Birds and Habitats Regulations 2011 (as amended).

1.2 THE PLAN

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

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

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] Irish Water (IW) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

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

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

The World Health Organisation (WHO), Environmental Protection Agency (EPA) and Health Service Executive (HSE) recommend lead pipe replacement (both lead service connections in the public supply, and lead supply pipes and internal plumbing in private properties) as the ultimate goal in reducing long-term exposure to lead. It is recognised that this will inevitably take a considerable period of time. In recognition of this, short to medium term proposals to mitigate the risk are being examined.

The Plan sets out the short, medium and longer term actions that IW intends to undertake, subject to the approval of the economic regulator, the Commission for Regulation of Utilities (CRU). It is currently estimated that 85% to 95% of properties meet the lead compliance standards when sampled at the customer's tap. The goal is to increase this compliance rate to 98% by end of 2021 and 99% by the end of 2027 (IW, 2016). This is subject to a technological alternative to lead replacement being deemed environmentally viable.

The permanent solution to the lead issue is to replace all water mains that contain lead. IW proposes that a national programme of replacement of public lead service pipes is required. However, replacing the public supply pipe or the private pipe on its own will not resolve the problem. Research indicates that unless both are replaced, lead levels in the drinking water could remain higher than the Regulation standards. Where lead pipework or plumbing fittings occur within a private property, it is the responsibility of the property owner to replace it.

The Plan assesses a number of other lead mitigation options available to IW. Other measures, including corrective water treatment in the form of pH adjustment and orthophosphate treatment, are being considered as an interim measure for the reduction of lead concentrations in drinking water in some WSZs.

IW 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 IW will be required to add to treated water is between 0.5 mg/l to 1.5 mg/l. At Thurles WTP orthophosphate will be added at a rate of 1.4 mg/l.

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

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

1.3 PROJECT BACKGROUND

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

The first step of the EAM is to identify the European Sites that have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed orthophosphate dosing. The EAM recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) and connectivity to the WSZ that this 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 22 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Helvick Head SAC, Ballyteige Burrow SAC, Bannow Bay SAC, Lady's Island Lake SAC, Saltee Islands SAC, Tacumshin Lake SAC, Hook Head SAC, Kilduff Devilsbit Mountain SAC, Ardmore Head SAC , Anglesey Road SAC, Lower River Suir SAC, River Barrow And River Nore SAC, Moanour Mountain SAC, Carnsore Point SAC.
- SPA sites: Ballyteigue Burrow SPA, Bannow Bay SPA, Helvick Head to Ballyquin SPA, Keeragh Islands SPA, Lady's Island Lake SPA, Mid-Waterford Coast SPA, Saltee Islands SPA, Slievefelim to Silvermines Mountains SPA.

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

2 APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora better known as the "Habitats Directive" provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

The obligation to undertake appropriate assessment derives from Articles 6(3) and 6(4) of the Habitats Directive and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3), which is concerned with the strict protection of sites, establishes the requirement for AA:

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

Article 6(4) states:

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

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

The assessment completed has had regard to the following legislation and guidance documents:

European and National Legislation:

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

Guidance / Case Law:

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

Departmental/NPWS Circulars:

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

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

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

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)/ Derogation.

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

Stage 1: Screening for a likely significant effect

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

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

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

Stage 3: Assessment of Alternative Solutions

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

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

This stage of the AA process is undertaken where no alternative solutions exist and where adverse impacts remain. At this stage of the AA process, it is the characteristics of the plan or project itself that

will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

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

2.4 INFORMATION SOURCES CONSULTED

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

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

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

Ireland aims to conserve habitats and species, through designation of conservation areas under both European and Irish law. The focus of this Screening 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**).

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,

[3] DHPLG (2018) Public consultation on The River Basin Management Plan for Ireland (2018-2021). Available at: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf

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 2013 a, b &c) and on information contained in Ireland's most recent Article 12 submission to the EU on *the Status and Trends of Birds Species* (NPWS 2013d). Water dependent 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

Thurles WTP supplies Thurles town, County Tipperary, located on the banks of the river Suir, the WTP has been upgraded and now supplies 5 water supply zones, as listed below. The distribution input for Thurles Regional PWS and associated extensions is 7,681 m3/day (55 % of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000.

- Dundrum Regional (2900PUB0113)
- Horse and Jockey PWS (2800PUB1011)
- Littleton PWS (2800PUB1014)
- Two Mile Borris (2800PUB1020)
- Thurles Regional PWS (3700PUB1042)

The area is served by Thurles WWTP (D0026), Borrisoleigh (D0323), Littleton (D0480), Twomileborris (D0474) and Holycross (D0478) which are licensed in accordance with the requirements of the Wastewater Discharge (Authorisation) Regulations 2007 as amended and the impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are also WWTPs with a population equivalent of less than 500; namely Drom (A0190), Bouladuff (A0202), Clonoulty (A0415) and Boherlahan (A0429), which have received a Certificate of Authorisation in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing and the estimated additional load from this plant is considered at the water body level via the surface water pathways. It is estimated that there are 3,576 properties across the WSZ that are serviced by a DWWTS. (see **Appendix C**).

Thurles WTP lies adjacent to the River Suir, in the Suir catchment. The EAM process identified 22 European Sites with potential hydrological or hydrogeological connectivity to the WSZ:

- SAC sites: Helvick Head SAC, Ballyteige Burrow SAC, Bannow Bay SAC, Lady's Island Lake SAC, Saltee Islands SAC, Tacumshin Lake SAC, Hook Head SAC, Kilduff, Devilsbit Mountain SAC, Ardmore Head SAC, Anglesey Road SAC, LOWER RIVER SUIR SAC, River Barrow And River Nore SAC, Moanour Mountain SAC, Carnsore Point SAC; and,
- SPA sites: Ballyteigue Burrow SPA, Bannow Bay SPA, Helvick Head to Ballyquin SPA, Keeragh Islands SPA, Lady's Island Lake SPA, Mid-Waterford Coast SPA, Saltee Islands SPA, Slievefelim to Silvermines Mountains SPA

3.2 CONSTRUCTION OF CORRECTIVE WATER TREATMENT WORKS

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

The orthophosphate dosing system will be located within the confines of the existing Thurles Water Tower Reservoir Site boundary. Dosing infrastructure will be located within the existing site; no new pipework is required outside of the site. The surrounding landscape consists of residential settlements, roadways, agricultural grassland and broadleaved woodland. The grounds of the WTP consist of built

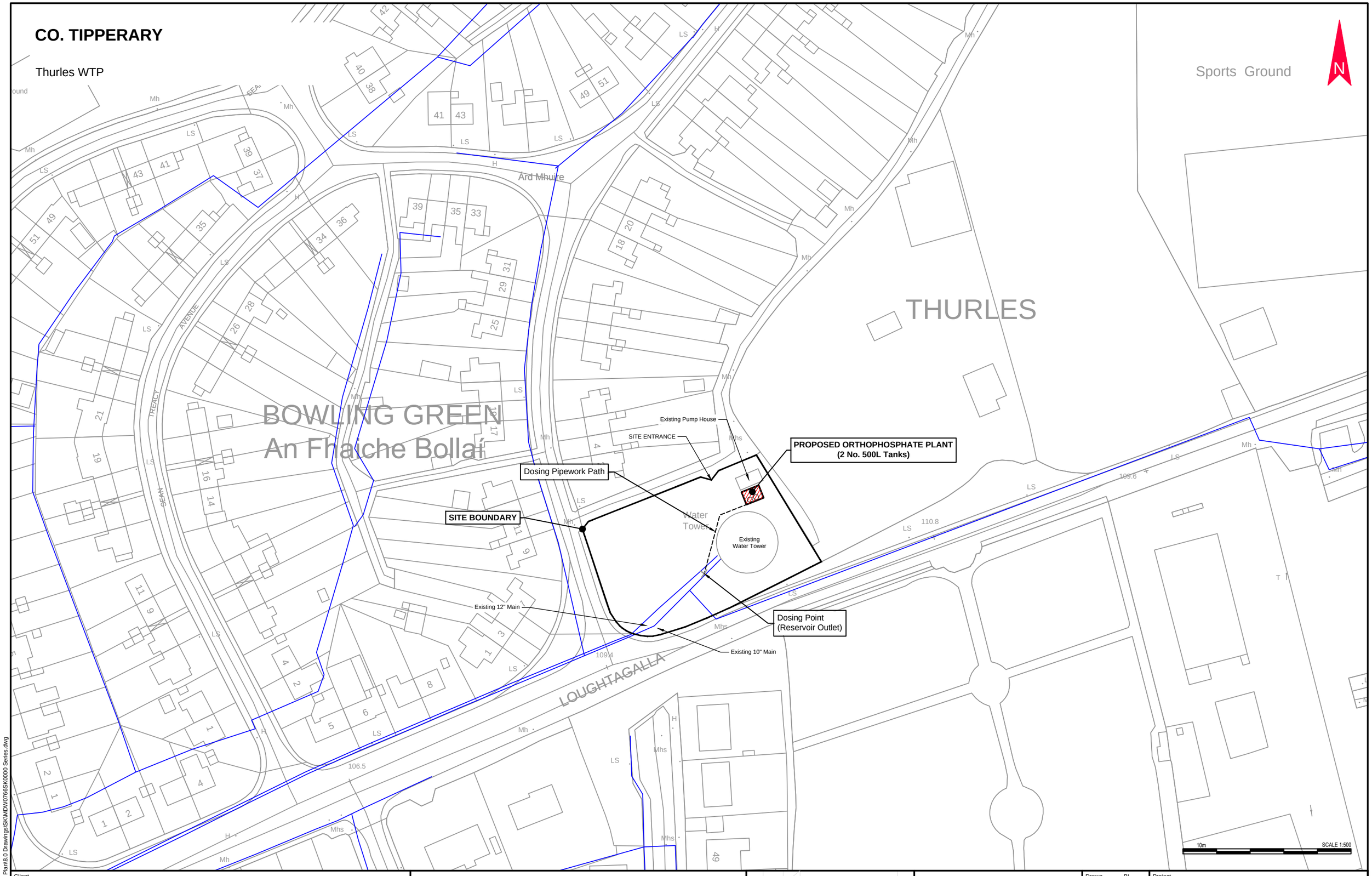
infrastructure, amenity grassland, broadleaved woodland and scrub. The location of the works is shown on **Figure 3-1.**

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

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

CO. TIPPERARY

Thurles WTP



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Client

UISCE EIREANN WATER

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No.	Date	Drn. Chk.	Amendment / Issue	App
F01	Nov'18	BL BR	ISSUED FOR INFORMATION	DC

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Drawn	BL
Checked	BR
Approved	DC
Date	06/11/2018
Scale	1:500 @ A1
	1:1,000 @ A3
Job No.	MDW0766
File Ref.	
Drg. No.	SK0138 WTP
Rev.	F01

Project

LEAD MITIGATION PLAN

Fig 3-1 THURLES WATER TREATMENT PLANT - SITE LAYOUT

The bulk storage tanks (2 no. tanks, each with a working volume of 500 l) will sit upon an above ground reinforced concrete plinth, designed to support the combined weight of the storage tanks, equipment and total volume of chemical to be stored (**Figure 3-2**).

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

There are no pH correction works required at the Thurles Water Tower Reservoir Site.

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

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

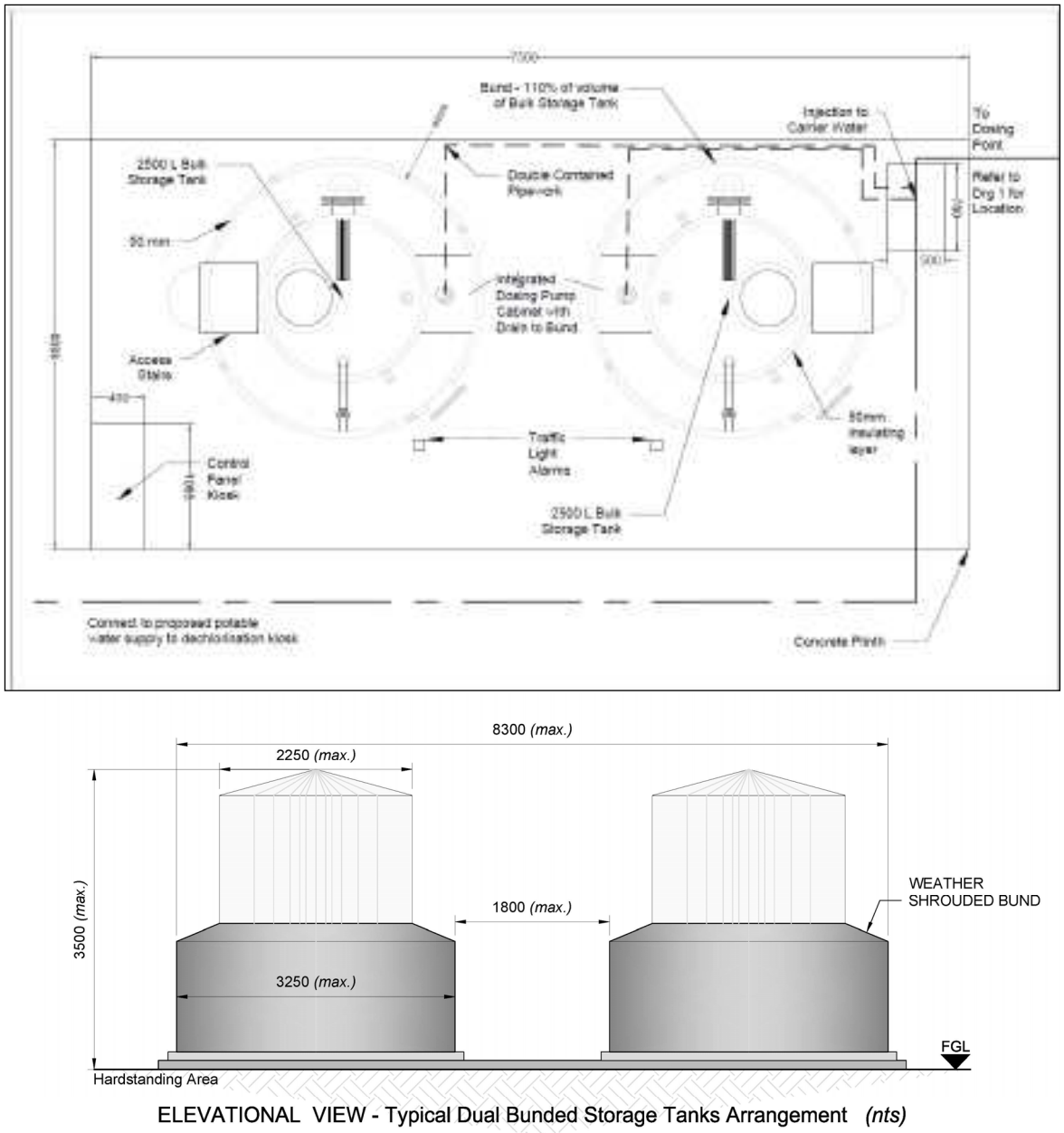


Figure 3-2: Plan and Elevation Drawings of a Typical Orthophosphate Dosing Unit

3.3 CONSTRUCTION METHODOLOGY

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

3.4 OPERATION OF CORRECTIVE WATER 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 Thurles, orthophosphate will be added to treated water at a rate of 1.4 mg/l. The onsite storage tanks have been designed to provide 60 days of storage so it is anticipated that deliveries will be approximately once every two months. All deliveries will be via existing access roads within the boundary of the WTP.

3.5 LDWMP APPROACH TO ASSESSMENT

3.5.1 Work Flow Process

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

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

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

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

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 phosphorus 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.

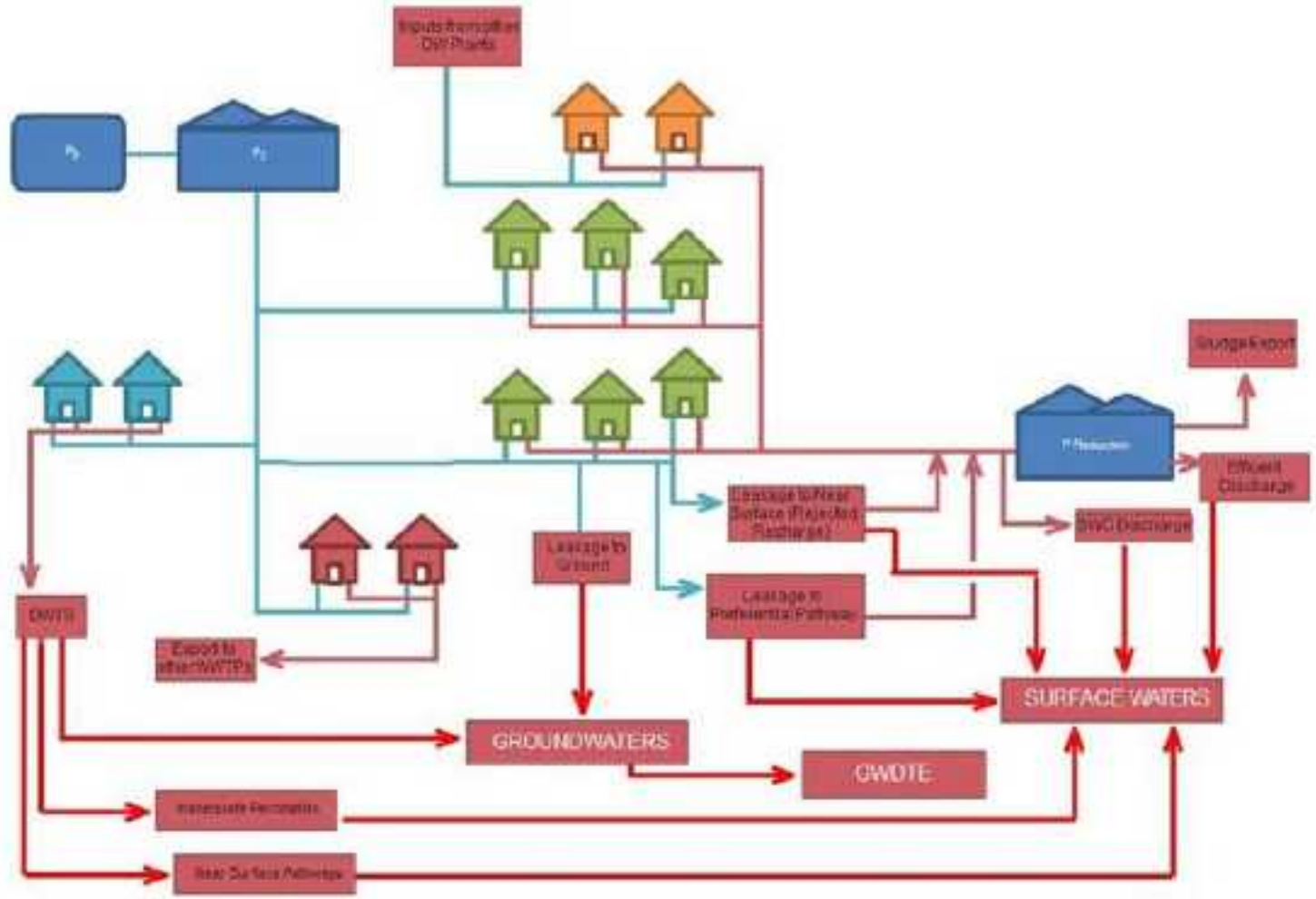


Figure 3-3: Conceptual Model of P Transfer

(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.)

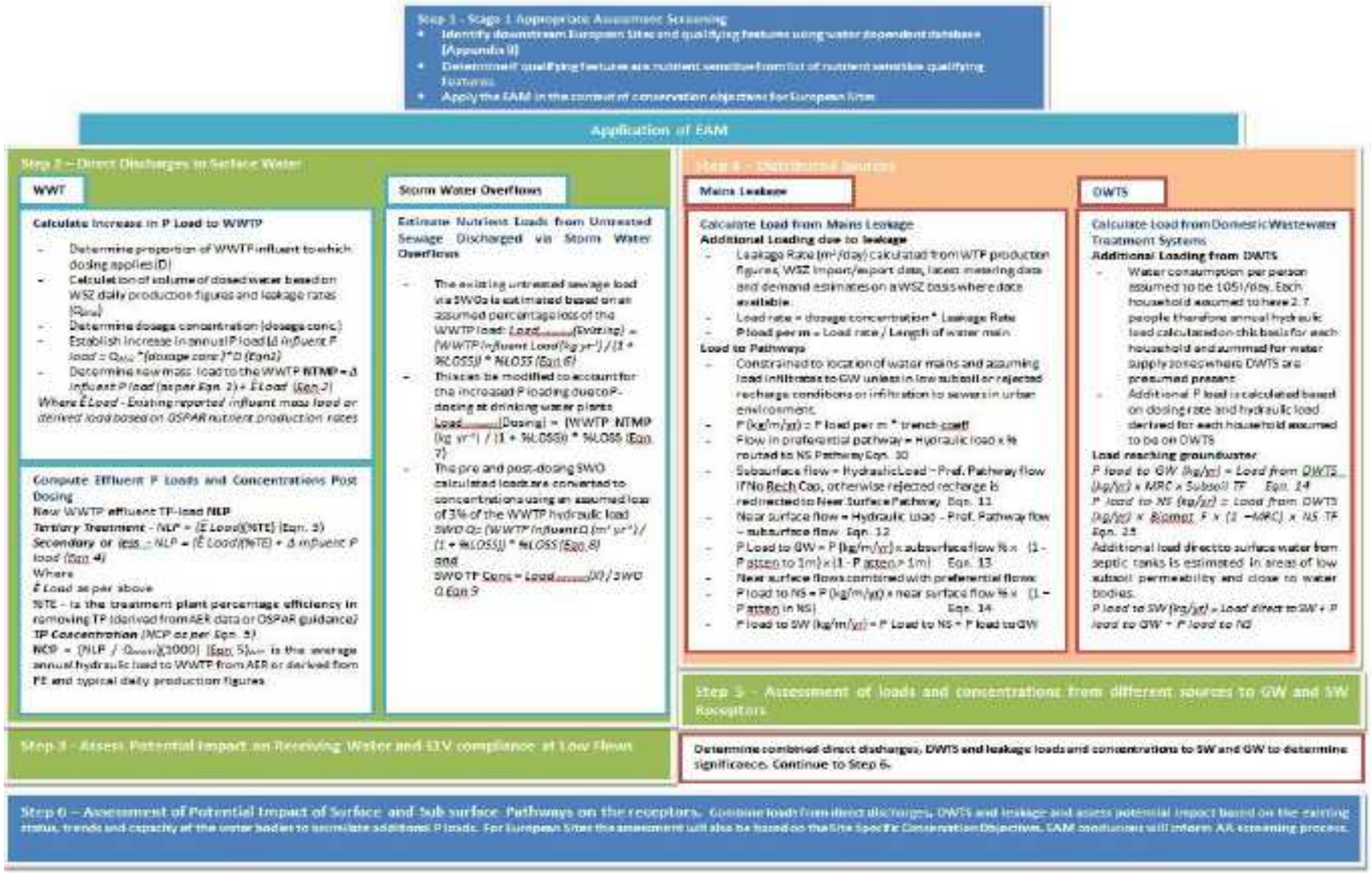


Figure 3-4: Stepwise Approach to the Environmental Assessment Methodology

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

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

	Site Name	SAC / SPA Code	Direct Impact	Water Dependent Species / Habitats	Surface Water Connectivity	Groundwater Connectivity[4,5]	Potential Source Pathway Receptor
1	Lower River Suir	SAC 002137	No	Yes	No	Yes	Yes

4.1.2 Operational Phase

The ZoI for the proposed Project was determined by establishing the potential for hydrological and hydrogeological connectivity between the Thurles WTP and associated WSZ and European Sites. The ZoI was therefore defined by the surface and groundwater bodies that are hydrologically and hydrogeologically connected with the Project.

In the EAM, all water bodies linked to the WSZ have been identified. Downstream water bodies to the estuary and coastal water bodies have also been identified. Groundwater bodies touching or intersecting the 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**.

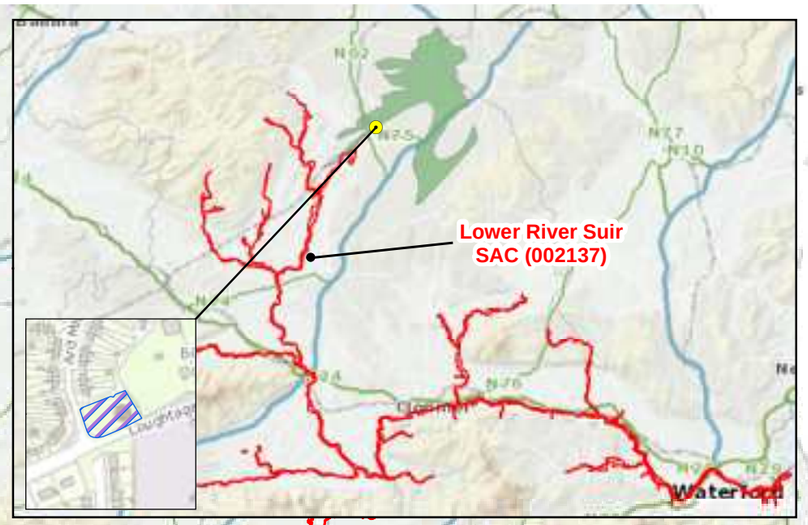
[4]Thurles WTP overlies the Thurles (IE_SE_G_158) groundwater body. All European Sites overlying or supporting connectivity to this Groundwater Body have been assessed to determine potential source impact pathways. This groundwater body comprises regionally important fractured aquifer and locally important aquifer and flow is generally from the north-east to the south-west. Recharge to the aquifer is directly from rainfall and discharge is via a series of large springs in the southwest near Thurles. The low drainage density indicates little interaction between surface and groundwaters. The WTP is > 6km (approx.) from the SAC.

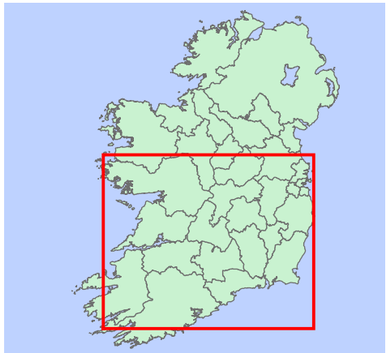
[5] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/ThurlesGWB.pdf

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

No.	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
1	Helvick Head	SAC 000665	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
2	Ballyteige Burrow	SAC 000696	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
3	Bannow Bay	SAC 000697	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
4	Lady's Island Lake	SAC 000704	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
5	Saltee Islands	SAC 000707	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
6	Tacumshin Lake	SAC 000709	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
7	Hook Head	SAC 000764	Yes	Yes	Yes (Waterford Harbour)	No	Yes
8	Kilduff, Devilsbit Mountain	SAC 000934	No	Yes	No	Yes	Yes
9	Ardmore Head	SAC 002123	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
10	Anglesey Road	SAC 002125	No	No	No	Yes	Yes
11	Lower River Suir	SAC 002137	Yes	Yes	Yes (River Suir)	Yes	Yes
12	River Barrow & River Nore	SAC 002162	Yes	Yes	Yes (River Suir)	No	Yes
13	Moanour Mountain	SAC 002257	No	No	No	Yes	Yes
14	Carnsore Point	SAC 002269	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
15	Lower River Shannon SAC	SAC 002165	Yes	Yes	Yes (Cappawhite Stream_010)	Yes	Yes
16	Philipston Marsh SAC	SAC 001847	Yes	Yes	Yes (Cappawhite Stream_010	Yes	Yes
17	Keeper Hill SAC	SAC 001197	Yes	Yes	No	Yes	Yes
18	Bolingbrook Hill SAC	SAC 002124	Yes	Yes	No	Yes	Yes
19	Silvermines Mountains West SAC	SAC 002258	Yes	Yes	No	Yes	Yes
20	Clare Glen SAC	SAC 000930	No	No	No	Yes	Yes
21	Glenstal Wood SAC	SAC 001432	No	No	No	Yes	Yes
22	Silvermine Mountains SAC	SAC 000939	Yes	Yes	No	Yes	Yes
23	Saltee Islands	SPA 004002	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes

No.	Site Name	SAC / SPA Code	Water Dependent Species / Habitats	Nutrient Sensitive	Surface Water Connectivity	Groundwater Connectivity	Potential Source Pathway Receptor
24	Lady's Island Lake	SPA 004009	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
25	Ballyteige Burrow	SPA 004020	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
26	Bannow Bay	SPA 004033	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
27	Keeragh Islands	SPA 004118	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
28	Slievefelim to Silvermines Mountains	SPA 004165	Yes	Yes	No	Yes	Yes
29	Helvick Head to Ballyquin	SPA 004192	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
30	Mid-Waterford Coast	SPA 004193	Yes	Yes	Yes (Eastern Celtic Sea)	No	Yes
31	River Shannon and River Fergus Estuaries SPA	SPA 004077	Yes	Yes	Yes (Cappawhite Stream_010	Yes	Yes
32	Kerry Head SPA	SPA 004189	Yes	Yes	Yes (Cappawhite Stream_010	Yes	Yes
33	Loops Head SPA	SPA 004119	Yes	Yes	Yes (Cappawhite Stream_010	Yes	Yes





Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (February 2023)
EPA

N

0 5 10 20 Kilometres

Client

Project: Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 1 Thurles

European Sites within the ZoI of the Proposed Project

Scale: 1:830,000 @ A3	Date: 14/03/2023
File Ref: MDW0766Arc0043aA03	Map Projection: Irish National Grid (TM65)

Zone of Influence (ZoI) for Construction Phase

Zone of Influence (ZoI) for Operational Phase

Silvermine Mountains SAC (000939)
Silvermines Mountains West SAC (002258)
Kilduff, Devilsbit Mountain SAC (000934)
Bolingbrook Hill SAC (002124)
Keeper Hill SAC (001197)
Slievefelim to Silvermines Mountains SPA (004165)
Anglesey Road SAC (002125)
Lower River Shannon SAC (002165)
River Shannon and River Fergus Estuaries SPA (004077)
Loop Head SPA (004119)
Clare Glen SAC (000930)
Glenstal Wood SAC (001432)
Philipston Marsh SAC (001847)
Moanour Mountain SAC (002257)
Kerry Head SPA (004189)
Springmount Source Galtee Regional
Ardfinnan Regional
Glenary
Carrick-on-Suir Lingaun River
Mooncoin Regional WS
Portlaw Water Intake
East Waterford Regional
Lower River Suir SAC (002137)
River Barrow And River Nore SAC (002162)
Keeragh Islands SPA (004118)
Ballyteige Burrow SAC (000696)
Ballyteigue Burrow SPA (004020)
Bannow Bay SAC (000697)
Bannow Bay SPA (004033)
Tacumshin Lake SAC (000709)
Lady's Island Lake SPA (004009)
Carnsore Point SAC (002269)
Lady's Island Lake SAC (000704)
Saltee Islands SPA (004002)
Saltee Islands SAC (000707)
Hook Head SAC (000764)
Mid-Waterford Coast SPA (004193)
Helvick Head SAC (000665)
Helvick Head to Ballyquin SPA (004192)
Ardmore Head SAC (002123)

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 for both the construction and operational phases, with justification provided below.

The construction phase of the proposed project will take place within the confines of the existing Thurles WTP. There is no potential for surface water connectivity as the WTP is separated from the Suir_060 by residential areas, a network of residential roads, and a series of agricultural grasslands including some strips of broadleaved woodland. The Lower River Suir SAC (002137) is situated approximately 6-7 km south of the WTP. The WTP is located within the Thurles groundwater body (IE_SE_G_158) and potential hydrogeological connectivity between the proposed development site and the Lower River Suir SAC have been included for further assessment in Section 5.

Thirty seven river water bodies are directly intersected by the WSZ, 36 of which are hydrologically connected to the Lower River Suir SAC downstream of the WSZ. The other river water body is within the Shannon catchment and is hydrologically connected to the Lower River Shannon SAC.

A number of European sites located downstream of the WSZ are hydrologically connected to the WSZ via the River Suir, the transitional water bodies Middle Suir Estuary (IE_SE_100_0550); Lower Suir Estuary (Little Island – Cheekpoint) (IE_SE_100_0500); Barrow Suir Nore Estuary (IE_SE_100_0100); and the coastal water bodies: Waterford Harbour (IE_SE_100_0000); and Eastern Celtic Sea (Has 13;17) (IE_SE_050_0000). These sites include: Helvick Head SAC, Ballyteige Burrow SAC, Bannow Bay SAC, Lady's Island Lake SAC, Saltee Islands SAC, Tacumshin Lake SAC, Hook Head SAC, Ardmore Head SAC, Carnsore Point SAC, Saltee Islands SPA, Lady's Island Lake SPA, Ballyteige Burrow SPA, Bannow Bay SPA, Keeragh Islands SPA, Helvick Head to Ballyquin SPA and Mid-Waterford Coast SPA. The EAM results indicate that there is a potential increase in orthophosphate concentration of 0.0001 mg/l in the Suir_110 (IE_SE_16S021500) (downstream of the WSZ) due to the dosing at Thurles WTP. As these European Sites are located >100 km downstream of the Suir_080 (IE_SE_16S021100), there is no potential for the proposed dosing to impact the European sites and therefore, they are excluded from further assessment in Section 6.

Similarly a number of European sites in the Shannon catchment located downstream of the WSZ are hydrologically connected to the WSZ via the Cappawhite Stream, the river water bodies, Dead_020 (IE_SH_25D010200), the Mulkear (Limerick)_010 (IE_SH_25M040100), Mulkear (Limerick)_020 (IE_SH_25M040200), Mulkear (Limerick)_030 (IE_SH_25M040300), Mulkear (Limerick)_040 (IE_SH_25M040400), Mulkear (Limerick)_050 (IE_SH_25M040590), Shannon (Lower)_060 (IE_SH_25S012600), the transitional water bodies Limerick Dock (SH_060_0900), Upper Shannon Estuary (IE_SH_060_0800), Lower Shannon Estuary (IE_SH_060_0300), the Maigue Estuary (IE_SH_060_0700), the Fergus Estuary (SH_060_1100) and the coastal water body, Mouth of the Shannon (IE_SH_060_0000). These include: Philipston Marsh SAC, Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, Kerry Head SPA and Loop Head SPA. The EAM results indicate that there is a potential increase in orthophosphate concentration of 0.0000 mg/l in the Cappawhite Stream_010 (IE_SH_25C100200) (downstream of the WSZ) due to the dosing at Thurles WTP. As these European Sites are located downstream of the Cappawhite Stream_010 (IE_SH_25C100200) and the increase in concentration is 0.0000 mg/l in this river water body, there is no potential for the proposed

dosing to impact these European sites and therefore, they are excluded from further assessment in Section 6.

The WSZ also intersects five groundwater bodies – Templemore (IE_SW_G_131), Thurles (IE_SW_G_158), Slieve Phelim (IE_SH_G_213), Clonmel (IE_SE_G_040), Tipperary (IE_SE_G_145), (**Table 3, Appendix C**). The following five European Sites overlay or intersect these groundwater bodies – Lower River Suir SAC, Lower River Shannon SAC, Kilduff, Devilsbit Mountain SAC, Anglesey Road SAC, Moanour Mountain SAC, Keeper Hill SAC, Bolingbrook Hill SAC, Glenstal Wood SAC, Clare Glen SAC, Silvermines Mountains West SAC and Slievefelim to Silvermines Mountains SPA.

Groundwater flows through voids such as connected pore spaces in sand and gravel aquifers and through fissures, faults, joints and bedding planes in bedrock aquifers. Regional groundwater flows tend to follow the regional topography and generally discharge towards main surface water bodies including rivers, lakes and coastal water bodies. In areas of karstified limestones, high permeability zones give rise to rapid groundwater velocities with more complex flow directions, which may vary seasonally and are difficult to predict with certainty. In this case, the assumption is that groundwater flow direction is from areas of higher elevations to lower elevations, unless groundwater specific information indicates otherwise. Groundwater body specific information relating to flow and discharge is available from the GSI[6], and was consulted in making the assessment.

Templemore (IE_SW_G_131) is poorly productive bedrock. Groundwater flow is considered to take place in the upper weathered zone of the aquifer and the direction of the groundwater flow will be strongly dependent on the slope. Discharge from the groundwater body will be to the overlying rivers and streams and also to the adjacent GWB[7]. The Lower River Suir SAC; Kilduff, Devilsbit Mountain SAC, Anglesey Road SAC, Moanour Mountain SAC and Slievefelim to Silvermines Mountains SPA intersect Templemore (IE_SW_G_131). The Lower River Suir SAC is previously included for further assessment in Section 6 due to its connectivity to the WSZ via river pathways. The EAM results show that the modelled increase in orthophosphate concentration in Templemore (IE_SW_G_131) following dosing at Thurles WTP is 0.0002mg/l, therefore, there is potential for the proposed dosing to impact Kilduff, Devilsbit Mountain SAC, Anglesey Road SAC, Moanour Mountain SAC and Slievefelim to Silvermines Mountains SPA. The Kilduff, Devilsbit Mountain SAC, Moanour Mountain SAC and Slievefelim to Silvermines Mountains SPA are all upgradient (north, west and south west respectively) of the area where the WSZ intersects this groundwater body and given that groundwater flow is strongly dependent on the slope there is no potential for the dosing to impact on these European Sites as the direction of groundwater flow from the WSZ is away from these designations. For this reason these three European Sites have been excluded from any further assessment. Anglesey Road SAC has one qualifying feature , i.e. species-rich Nardus grasslands, on siliceous substrates in mountain areas. This habitat is neither water dependent nor nutrient sensitive and therefore this site is excluded from any further assessment.

Thurles (IE_SW_G_158) is a karstic GWB. The flow of groundwater is from east to west. Flow is likely to occur though fractures, which have been enlarged by karstification and dolomitisation. Recharge to the aquifer is directly from rainfall and the discharge is via springs in the southwest near Thurles[8].

[6] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
[7] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/TemplemoreAGWB.pdf
[8] https://jetstream.gsi.ie/iwdds/delivery/GSI_Transfer/Groundwater/GWB/ThurlesGWB.pdf

The Lower River Suir SAC is the only European Site to also intersect Thurles (IE_SW_G_158). The site is previously included for further assessment due to its connectivity to the WSZ via river pathways.

Slieve Phelim (IE_SH_G_213) is poorly productive bedrock. Groundwater flow is considered to take place in the upper weathered zone of the aquifer and the direction of the groundwater flow will be strongly dependent on the slope. Flow directions are expected to approximately follow the local surface water catchments. Groundwater discharges to springs and to the numerous streams and rivers crossing the aquifer[9]. The Lower River Shannon SAC; Silvermines Mountain West SAC, Silvermines Mountain SAC, Glenstal Wood SAC, Clare Glen SAC, Keeper Hill SAC, Bolingbrook Hill SAC, Philipstwon Marsh SAC and Slievefelim to Silvermines Mountains SPA intersect Slieve Phelim (IE_SH_G_213). The EAM results show that the modelled increase in orthophosphate concentration in Slieve Phelim (IE_SH_G_213) following dosing at Thurles WTP is undetectable (0.0000mg/l), therefore, there is no potential for the proposed dosing to impact the Lower River Shannon SAC; Silvermines Mountain West SAC, Silvermines Mountain SAC, Glenstal Wood SAC, Clare Glen SAC, Keeper Hill SAC, Bolingbrook Hill SAC, Philipstwon Marsh SAC and Slievefelim to Silvermines Mountains SPA they are excluded from further assessment in Section 6.

Clonmel (IE_SE_G_040) is a karstic GWB. Most of the groundwater moves relatively rapidly along short flow paths and discharges into the streams which cross the aquifers. Flow in the karstified systems tends to be conduit flow along the fault zones[10]. Most recharge to the aquifers in the north takes place through the Quaternary deposits of limestone gravel. The Lower River Suir SAC is the only European Site to intersect Clonmel (IE_SE_G_040). The EAM results show that the modelled increase in orthophosphate concentration in Clonmel (IE_SE_G_040) following dosing at Thurles WTP is undetectable (0.0000mg/l), therefore, there is no potential for the proposed dosing to impact the Lower River Suir SAC from groundwater surface water interactions. The site is previously included for further assessment due to its connectivity to the WSZ via river pathways.

Tipperary (IE_SE_G_145),is a karstic GWB. Most recharge to this aquifer is through the thin gravels and outcrop areas where rainwater can easily percolate down through the epikarst to the water table. There may also be some indirect recharge from the surrounding poor aquifers, via fractures in the bedrock. The Lower River Suir SAC is the only European Site to intersect Tipperary (IE_SE_G_145). The site is previously included for further assessment due to its connectivity to the WSZ via river pathways.

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. Lower River Suir SAC. One European Site has been included for further assessment for the operational phase in Section 6 below i.e. Lower River Suir SAC.

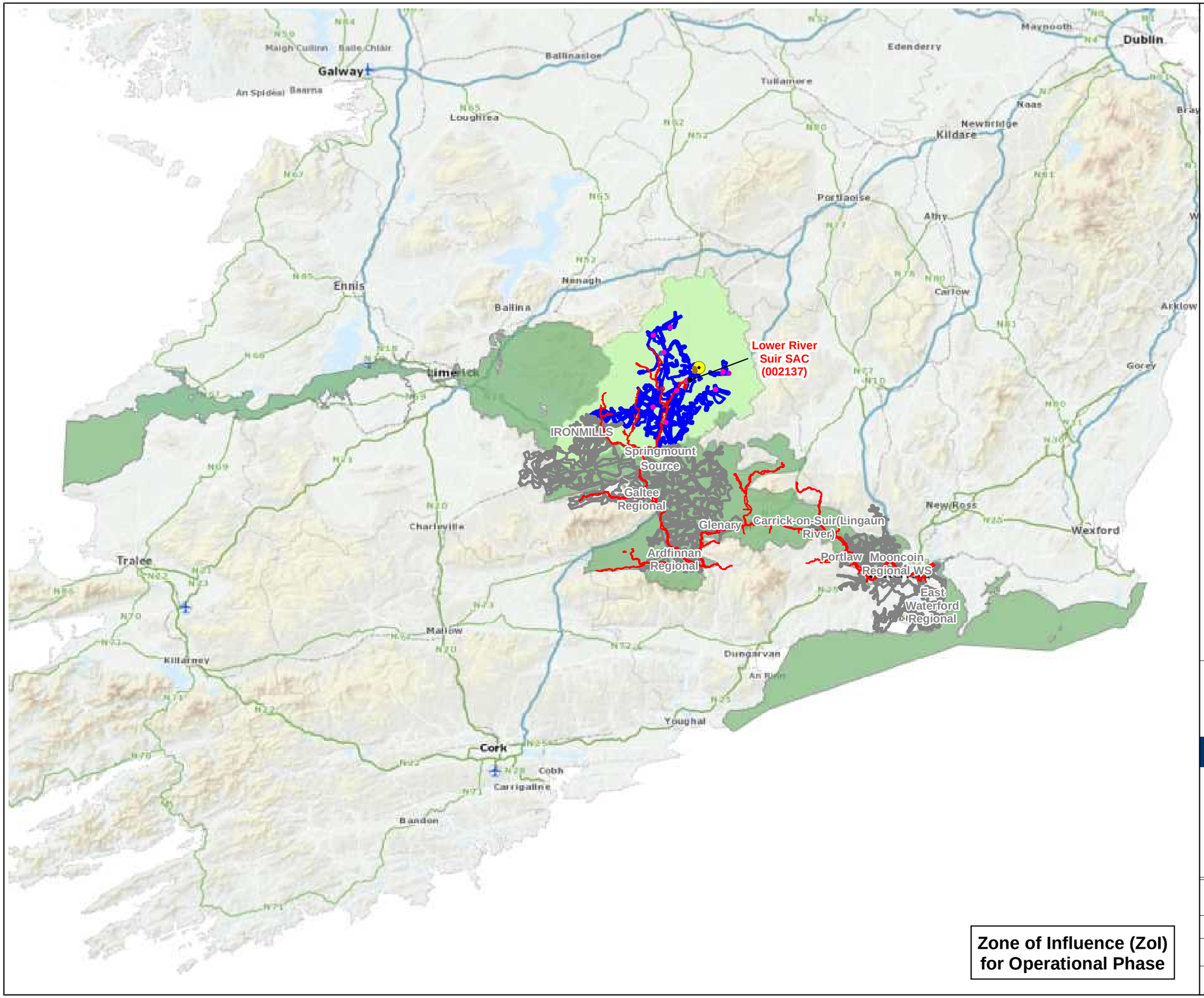
[9] https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/SlievePhelimGWB.pdf
[10] https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/ClonmelGWB.pdf

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

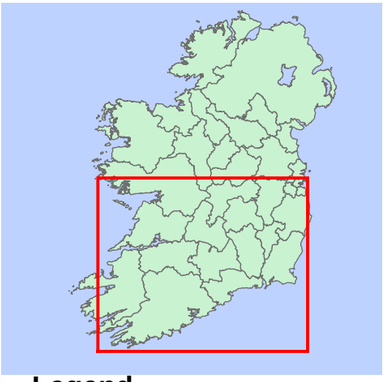
Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
Construction and Operational Phase								
Lower River Suir	SAC 002137	28 Mar 2017 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		
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes		
			1355	Otter (*Lutra lutra*)	Yes	Yes		
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes		
			3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Yes	Yes		
			6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Yes	Yes		
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	No	Yes		

Site Name	SAC / SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species / Habitats	Nutrient Sensitive	Potential Hydrological / Hydrogeological Connectivity	Potential Source Pathway Receptor
			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		
Operational Phase only								
Moanour Mountain SAC	SAC 002257	29 April 2019 Version 1	4010	Northern Atlantic wet heaths with *Erica tetralix*	Yes	Yes	No	No
			4030	European dry heaths	No	Yes		
Anglesey Road SAC	SAC 002125	03 December 2021	6230	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No	No	Yes	No
Kilduff, Devilsbit Mountain SAC	SAC 000934	05 July 2018	4030	European dry heaths	No	Yes	No	No
			6230	Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	No	No		
Slievefelim to Silvermines Mountains SPA	SPA 004165	23 September 2022	A082	Hen Harrier *Circus cyaneus*	Yes	Yes	No	No

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



Zone of Influence (ZoI) for Operational Phase



Legend

LEMA Emission Type

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

Data Source:
Irish Water
NPWS (February 2023)
EPA

N

0 5 10 20 Kilometres

Client Uisce Éireann - Irish Water

Project Lead Mitigation Plan
Corrective Water Treatment Works

Title

Zone 1 Thurles

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

RPS

Scale: 1:827,736 @ A3	**Date:** 14/03/2023
File Ref: MDW0766Arc0043bA03	**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 Thurles WTP. These will be evaluated with regard to the potential for likely significant effects on European Sites. These are potential effects and in the absence of pathways (which is evaluated in **Section 5.3.1** below) the construction phase may not give rise to these effects.

- Sediment laden run-off from excavation areas (trenches for dosing pipelines, carrier water pipework and electrical cables) and the introduction of fine sediments to watercourses connected to the works area causing a deterioration in water quality;
- Dust and noise emissions from excavation (trenches for dosing pipelines, carrier water pipework and electrical cables and transportation of material and equipment close to watercourses causing a deterioration in water quality or disturbance to species (e.g. birds);

- Environmental incident or accident during the construction phase e.g. spillage of a contaminant such as diesel or phosphoric acid causing a deterioration in water quality;
- Groundwater level drawdown through the excavation of trenches for dosing pipelines, carrier water pipework and electrical cables.

5.2.2 Operational Phase

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

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

5.3 ASSESSMENT OF IMPACTS

Article 6 of the Habitats Directive states that:

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

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

5.3.1 Construction Phase

The locations for the orthophosphate dosing system will be located within the confines of the existing WTP boundary. The assessment of potential significant effects associated with construction of the corrective water treatment works was conducted taking the whole Thurles WTP site into account and therefore including all possible locations. The assessment of impacts associated with the construction of the corrective water treatment works at Thurles WTP 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 Thurles WTP;
- A review of hydrological connectivity between the proposed works and European Sites using the EPA Mapping Resources: http://gis.epa.ie/; www.Catchments.ie;
- Ordnance Survey Ireland Map viewer: http://maps.osi.ie/publicviewer/#V1,591271,743300,0,10
- Site synopses, conservation objectives and qualifying interest data for European Sites.

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

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation
Lower River Suir SAC (002137)	Thurles (IE_SE_G_158)	GWB	The construction works will be located within the confines of the existing Thurles WTP, which is not located within or adjacent to a European Site. The WTP is located over 1 km east of the Suir_060 (IE_SE_16S020600) at its nearest point, which flows south to the Lower River Suir SAC (002137). The River Suir main channel provides connectivity to those transitional and coastal water bodies located downstream including the Middle Suir Estuary (IE_SE_100_0550), Lower Suir Estuary (IE_SE_100_0500), Barrow Suir Nore Estuary (IE_SE_100_0100) and the Waterford Harbour (IE_SE_100_0000). The Barrow Suir Nore Estuary supports the River Barrow and River Nore SAC while Waterford Harbour supports Hook Head SAC. **Surface Water** The WTP is separated from the Suir_060 by residential areas, a network of residential roads, and a series of agricultural grasslands including some strips of broadleaved woodland. The Lower River Suir SAC (002137) is situated approximately 6-7 km south of the WTP. In addition, the proposed construction works are small scale in nature and will be undertaken within the confines of the existing built infrastructure associated with Thurles WTP. There will be no aspects of the proposed works that will result in the release of potential impacts sources identified in **Section 5.2.1**. The works will be localised and contained to the immediate development area which supports buildings and artificial surfaces associated within the in-situ built infrastructure of Thurles WTP. Works such as excavations will

Site Name (Code)	Contributing WB Code_Name	WB Type	Evaluation
			be contained to the defined working area and necessary works with cast in place concrete will be undertaken within sealed shuttered units. Such works practices will retain all potential construction related pollutants at source. The Thurles WTP is bordered to the south by a roadway, to the west and north by residential development and to the east by football pitches. There is a wall enclosing the site on the southern and western borders. The WTP ground consists of built infrastructure, amenity grassland, some broadleaved woodland and scrub. These features comprise a boundary of separation, isolating any surface water pathway from the works area to the European Sites and Suir_060 river. **Groundwater** Thurles WTP overlies the Thurles (IE_SE_G_158) groundwater body. The Lower River Suir SAC is the only European Site that is underlain by this groundwater body. The connectivity to this groundwater body has been assessed to determine potential source impact pathways. This groundwater body comprises regionally important fractured aquifer and locally important aquifer and flow is generally from the north-east to the south-west. Recharge to the aquifer is directly from rainfall and discharge is via a series of large springs in the southwest near Thurles. The low drainage density indicates little interaction between surface and groundwaters. The WTP is > 6km (approx.) from the SAC. The excavation of trenches to install dosing pipelines, carrier water pipework and electrical cables to 700mm below ground level has the potential to interfere with the water table potentially causing groundwater drawdown. As the excavation works will not be extensive (up to c. 75m in length for pipework and to an approximate depth of 700mm) and upon made ground, interference with water table will be unlikely to occur. Any interference would be localised, minor and temporary. Therefore, there is no potential for likely significant effects to the underlying groundwater body, the receiving surface water features and subsequently the hydrologically and hydrogeologically connected European Site included for further assessment, as a result of the construction of the corrective water treatment works at Thurles WTP. Therefore, there is no potential for likely significant effects on the Lower River Suir SAC as a result of the construction of the corrective water treatment works at Thurles WTP.

5.3.2 Operational Phase

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

- European Sites included for assessment;
- Water bodies hydrologically or hydrogeologically connected to the European Sites;
- Existing orthophosphate indicative quality and trend of each water body as presented in the EPA's WFD APP or derived from the latest monitoring information available from the WFD monitoring programme;
- 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, or derived from the latest monitoring information available from the WFD monitoring programme, 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 values in the range 0.025 to 0.035 mg/l. River water bodies with mean orthophosphate concentrations of 0.0275 mg/l have 75% capacity left, i.e. high capacity, while river water bodies with a mean of 0.0325 mg/l have lower capacity (25%) as the baseline concentrations are closer to the Good/Moderate indicative quality boundary.

When assessing the increase in orthophosphate concentrations as a result of proposed dosing, an increase which is <5% of the Good / High indicative quality boundary, i.e. 0.00125mg/l, is excluded from further assessment and is assumed to result in no significant impact to a water body. If the baseline orthophosphate concentration in addition to the potential increase in orthophosphate concentration as a result of dosing is less than the 75% upper threshold of the indicative quality band for a water body, this also results in no significant impact.

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 water body is unassigned and therefore 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 water body but the

more conservative freshwater orthophosphate limits for the different indicative quality bands are applied[11].

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 and WFD monitoring programme 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 by 2021 even where the distance to threshold is currently assessed to be far. Where the water body baseline indicative quality concentration is "Near" to the threshold before the effect of orthophosphate dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to orthophosphate is very low (i.e. below 5% of the Good/Moderate indicative quality this test will pass as the orthophosphate dosing itself can be defined as having no risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

The identification of statistically and environmentally significant trends for water bodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Ecological Status will not be achieved within two future river basin cycles, i.e. within the next 12 years. For surface water bodies, the environmental significance is evaluated until 2021 in the WFD App.

This test applies only when the trend for orthophosphate concentration for the water body is considered statistically significant in the WFD App. For surface water bodies, the predicted concentration for 2021 is given and, assuming dosing is started in 2016, the additional concentration due to orthophosphate dosing is added, multiplied by five. If the new calculated predicted concentration prevents the achievement of good indicative quality, then this test fails.

This assessment assumes a dosing rate of 1.4 mg/l; this test could be reassessed in the future.

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.

[11] 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.

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 project monitoring provides more recent baseline concentrations than that available from the WFD monitoring programme these can be used instead of the WFD baseline information, particularly if the most recent WFD monitoring is not available.

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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_16A040100 ARGLO_010	RWB	Moderate Upwards Far	0.042	0.051	1.2	0.0001	0.042	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16A040200 ARGLO_020	RWB	High Upwards Near	0.025	0.019	9.2	0.0006	0.025	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16A050100 AUGHNAGLANNY_010	RWB	*Good*	*0.030*	*0.033*	*0.4*	*0.0000*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16B010100 BLACK (TWOMILEBORRIS)_010	RWB	High Downwards Far	0.017	0.019	1.4	0.0001	0.017	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16B030200 BREAGAGH (TIPPERARY)_010	RWB	Good Downwards Far	0.026	0.033	2.7	0.0003	0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16B030400 BREAGAGH (TIPPERARY)_020	RWB	Good Downwards Near	0.034	0.033	5.4	0.0002	0.034	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16B050100 BLACK STREAM (CASHEL)_010	RWB	Poor Upwards Near	0.061	0.087	3.9	0.0010	0.062	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

[12] Monitoring period is annual unless specified.
[13] Surrogate Indicative Quality indicated in italic.
[14] Distance to threshold.
[15] Baseline year is 2014 for surface water bodies and 2012 for groundwater bodies.
[16] Surrogate concentration is given in italic mg/l
[17] 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.
[18] 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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_16B060600 BORRISOLEIGH STREAM_010	RWB (multiple monitoring points)	Moderate Downwards Far	0.032	0.051	6.3	0.0004	0.032	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Downwards Far	0.028	0.051			0.028	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Downwards Far	0.026	0.051			0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16C020200 CLODIAGH (TIPPERARY)_030	RWB	High Downwards Near	0.024	0.019	13.0	0.0001	0.025	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16C020600 CLODIAGH (TIPPERARY)_040	RWB	High Downwards Near	0.023	0.019	40.4	0.0002	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16C040300 CLOVER_020	RWB	*Moderate*	*0.046*	*0.051*	*0.4*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D020200 DRISH_050	RWB (multiple monitoring points)	High Downwards Near	0.023	0.019	4.1	0.0001	0.023	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Downwards Far	0.029	0.033			0.029	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Moderate Downwards Far	0.036	0.051			0.036	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16D020400 Drish_060	RWB	High Downwards Near	0.023	0.019	9.6	0.0001	0.023	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F020200 FARNEYBRIDGE_010	RWB	*Poor*	*0.077*	*0.087*	*0.5*	*0.0001*	*0.077*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

Site Name (Code)	Contributing WB Code_Name	WB Type[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_16F020500 FARNEYBRIDGE_020	RWB	*Poor*	*0.077*	*0.087*	*4.6*	*0.0003*	*0.077*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F020600 Farneybridge_030	RWB	*Moderate*	*0.046*	*0.051*	*16.9*	*0.0005*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F020700 FARNEYBRIDGE_040	RWB	High Downwards Near	0.024	0.019	17.7	0.0005	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F030040 FISHMOYNE_010	RWB	*Poor*	*0.077*	*0.087*	*0.2*	*0.0000*	*0.077*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F030200 FISHMOYNE_020	RWB	High Downwards Far	0.017	0.019	2.7	0.0001	0.017	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F030300 FISHMOYNE_030	RWB	High Downwards Far	0.014	0.019	10.2	0.0002	0.014	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16F200470 FANA_010	RWB	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0005*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16L230480 LISNAGONOGE_010	RWB	*Moderate*	*0.046*	*0.051*	*5.8*	*0.0007*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16M020780 MULTEEN_020	RWB	*Good*	*0.030*	*0.033*	*1.9*	*0.0001*	*0.030*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16M020900 MULTEEN_030	RWB	Good Upwards Near	0.033	0.033	2.2	0.0000	0.033	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16M021100 MULTEEN_050	RWB	Good Upwards Far	0.028	0.033	0.6	0.0000	0.028	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_16M080300 MULTEEN (EAST)_020	RWB	High Downwards Near	0.024	0.019	0.4	0.0000	0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16M080400 MULTEEN (EAST)_030	RWB	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0001*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16O020700 OWENBEG (TIPPERARY)_010	RWB	*Moderate*	*0.046*	*0.051*	*0.9*	*0.0000*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16P260500 PIERCETOWN_010	RWB	*Moderate*	*0.046*	*0.051*	*2.9*	*0.0005*	*0.046*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S020300 SUIR_030	RWB (multiple monitoring points)	Moderate Upwards Far	0.040	0.051	1.3	0.0000	0.040	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.
			Good Downwards Far	0.029	0.033			0.029	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S020600 Suir_060	RWB	High Downwards Far	0.026	0.033	1.4	0.0000	0.026	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S020900 Suir_070	RWB (multiple monitoring points)	High Downwards Far	0.026	0.033	12.7	0.0000	0.026	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Downwards Far	0.025	0.033			0.025	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_16S021100 Suir_080	RWB (multiple monitoring points)	High Downwards Near	0.025	0.033	34.9	0.0001	0.025	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Downwards Far	0.027	0.033			0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.032	0.033			0.032	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S021300 SUIR_090	RWB (multiple monitoring points)	Good Upwards Far	0.030	0.033	90.1	0.0002	0.030	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.028	0.033			0.028	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Downwards Near	0.024	0.019			0.024	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S021400 SUIR_100	RWB	High Downwards Near	0.025	0.019	102.9	0.0002	0.025	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_16S021500 SUIR_110	RWB (multiple monitoring points)	Good Downwards Far	0.027	0.033	109.3	0.0001	0.027	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Downwards Far	0.019	0.019			0.019	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			High Upwards Far	0.016	0.019			0.016	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
Lower River Suir SAC (002137)	IE_SE_G_158 Thurles	GWB	Good Upwards Far	0.010	0.026	3.4	0.0001	0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_145 Tipperary	GWB	*Good*	*0.018*	*0.026*	*19.0*	0.0008	*0.018*	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_040 Clonmel	GWB	Good None Far	0.005	0.026	7.6	0.0000	0.005	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.008	0.026			0.008	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.012	0.026			0.012	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.005	0.026			0.005	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
	IE_SE_G_131 Templemore	GWB (multiple monitoring points)	Good None Far	0.020	0.026	2.4	0.0000	0.020	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Downwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	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[12]	Ortho P Indicative Quality[13] and Trends[14]	Baseline[15] Ortho P Conc.[16] (mg/l)	75% of Indicative Quality Upper Threshold (mg/l)	Cumulative Ortho P load to SW from Leakage, DWWTS & Agglom. (kg/yr)	Modelled Conc.[17] (mg/l)	Post-dosing Ortho P Potential Baseline Conc. (mg/l)[18]	Evaluation
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.
			Good Upwards Far	0.010	0.026			0.010	No risk of deterioration in the Ortho P indicative quality or of preventing the achievement of WFD objectives.

‡ Load from WWTP / SWO following treatment added
*Trend is statistically significant

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

The conceptual model developed for orthophosphate 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 (**Thurles Agglomeration**

Thurles WWTP which discharges to the Suir_080 (IE_SE_16S021100) which is part of the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Thurles WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in **Table 5-4.** Therefore, there is no risk of failing to achieve the WFD objectives for the Suir_080 (IE_SE_16S021100), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Table 5-3). The existing baseline prior to orthophosphate dosing is established and compared to the potential impact on the receiving waters post-dosing. In-combination effects of the operation of the SWO and the continuous discharge from the WWTP were also assessed.

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

Thurles Agglomeration

Thurles WWTP which discharges to the Suir_080 (IE_SE_16S021100) which is part of the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Thurles WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in **Table 5-4.** Therefore, there is no risk of failing to achieve the WFD objectives for the Suir_080 (IE_SE_16S021100), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

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.

Thurles Agglomeration

Thurles WWTP which discharges to the Suir_080 (IE_SE_16S021100) which is part of the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Thurles WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in **Table 5-4**. Therefore, there is no risk of failing to achieve the WFD objectives for the Suir_080 (IE_SE_16S021100), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Table 5-3: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.4 mg/l

Agglom. and Discharge Type	ELV from WWDL	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*
Thurles Primary Discharge	**0.3**	**Existing**	576.66	0.14	0.11	0.18
		Post Dosing	576.66	0.14	0.11	0.18
Thurles SWOs (4 no.)	**n/a**	**Existing**	239.94	1.93	1.55	2.63
		Post Dosing	268.70	2.16	1.73	2.94
Borrisoleigh Primary Discharge	**0.25**	**Existing**	66.58	0.20	0.16	0.28
		Post Dosing	66.58	0.20	0.16	0.28
Borrisoleigh SWOs (no.)	**n/a**	**Existing**	19.39	2.02	1.62	2.75
		Post Dosing	21.91	2.28	1.83	3.11
Littleton Primary Discharge	**0.35**	**Existing**	31.97	0.14	0.11	0.19
		Post Dosing	31.97	0.14	0.11	0.19
Littleton SWOs (no.)	**n/a**	**Existing**	9.31	1.42	1.14	1.93
		Post Dosing	10.51	1.60	1.28	2.18
Twomileborris Primary Discharge	**0.8**	**Existing**	43.14	0.19	0.15	0.25
		Post Dosing	43.14	0.19	0.15	0.25
Twomileborris SWOs (2 no.)	**n/a**	**Existing**	12.57	1.86	1.49	2.53
		Post Dosing	14.08	2.08	1.67	2.83
Holycross Primary Discharge	**3**	**Existing**	41.03	0.48	0.38	0.65
		Post Dosing	41.03	0.48	0.38	0.65
Holycross SWOs (4 no.)	**n/a**	**Existing**	11.95	4.81	3.85	6.54
		Post Dosing	13.46	5.42	4.34	7.37

Table 5-4: Mass balance assessment based on 1.4 mg/l dosing using available background concentrations and mean flow information.

Agglom.	RWB Name / Code for Primary Discharge	Background Conc.[19] (mg/l)	Resultant Conc. Existing (mg/l)	Resultant Conc. Post Dosing (mg/l)	% Inc
Thurles (D0026)	Suir_080 IE_SE_16S021100	0.0250	0.0264	0.0265	0.2%
Borrisoleigh (D0323)	Borrisoleigh Stream_010 IE_SE_16B060600	0.0317	0.0356	0.0356	0.0%
Littleton (D0480)	Breaghagh (Tipperary)_020 IE_SE_16B030400	0.0339	0.0352	0.0352	0.0%
Twomileborris (D0474)	Drish_050 IE_SE_16D020200	0.0230	0.0243	0.0244	0.2%
Holycross (D0478)	Suir_090 IE_SE_16S021300	0.0295	0.0296	0.0296	0.0%

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

Borrisoleigh

Borrisoleigh WWTP discharges to the Borrisoleigh Stream_010 (IE_SE_16B060600) which is hydrologically connected to the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Borrisoleigh WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in Table 5-4. Therefore, there is no risk of failing to achieve the WFD objectives for the Borrisoleigh Stream_010 (IE_SE_16B060600), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Littleton

Littleton WWTP discharges to the Breagagh (Tipperary)_020 (IE_SE_16B030400) which is hydrologically connected to the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Littleton WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in Table 5-4. Therefore, there is no risk of failing to achieve the WFD objectives for the Breagagh (Tipperary)_020 (IE_SE_16B030400), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Twomileborris

Twomileborris WWTP discharges to the Drish_050 (IE_SE_16D020200) which is hydrologically connected to the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Littleton WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in Table 5-4. Therefore, there is no risk of failing to achieve the WFD objectives for the Drish_050 (IE_SE_16D020200), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Holycross

Holycross WWTP discharges to the Suir_090 (IE_SE_16S021300) which is part of the Lower River Suir SAC. The plant's effluent concentrations are modelled as compliant with ELVs. The 2021 AER also indicates that the final effluent at the primary discharge is compliant with the ELVs and therefore the plant is operating well in the context of orthophosphate removal. As Holycross WWTP receives tertiary treatment i.e. chemical dosing for nutrient removal, the EAM assumes that the additional orthophosphate loading to the plant can be dealt with and managed within the treatment process

therefore there is no impact on the existing effluent quality. Effect is negligible as shown by the mass balance assessment in Table 5-4. Therefore, there is no risk of failing to achieve the WFD objectives for the Suir_090 (IE_SE_16S021300), and its hydrologically connected European Sites as a result of dosing at Thurles WTP.

Summary

The dosing at Thurles WTP will therefore have an undetectable effect on the direct discharges to surface water from agglomerations within the WSZ. Therefore, there is no risk of failing to achieve the WFD objectives for the water bodies affected and the hydrologically connected European Sites as a result of dosing at Thurles WTP.

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 river water bodies from subsurface pathways (**Appendix C**). The modelled increments in concentrations in the subsurface pathways are insignificant for all river water bodies (i.e. <0.00125 mg/l, which is 5% of the Good/High indicative quality boundary for surface water bodies), with the highest increase equal to 0.0010 mg/l in Black Stream (Cashel)_010 (IE_SE_16B050100). Therefore, there is no risk of deterioration in the status of river water bodies as a result of dosing at Thurles WTP.

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

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

5.3.4.2 Groundwater assessment

The predicted loads and modelled concentrations to groundwater bodies (GWBs) are very low or undetectable (i.e. <0.00175 mg/l = 5% of the Good / Fail indicative quality boundary) as shown in **Table 3 of Appendix C**. Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) were the only GWB with detectable increases in orthophosphate concentration (0.0001 mg/l, 0.0002 mg/l and 0.0008 mg/l respectively) following dosing at Thurles WTP. As concentrations were well below the 5% Good / Fail indicative quality boundary, there is no risk of deterioration in the Ortho P indicative quality of the GWBs or of preventing the achievement of WFD objectives

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 Bad indicative quality, there is no risk of impact on groundwater receptors due to orthophosphate dosing at Thurles WTP.

5.3.5 Combined Assessment

Table 4 of Appendix C gives the loads and modelled concentrations for the combined assessment to rivers. The increased loads due to orthophosphate dosing are predicted to be insignificant, i.e. are equal or below 0.00125 mg/l with the highest increase equal to 0.0010 mg/l in Black Stream (Cashel)_010 (IE_SE_16B050100). The dosing therefore poses no risk of deterioration in status the orthophosphate indicative quality of the river water bodies identified in **Table 5-2**, or of preventing their achievement of WFD objectives.

In ten river water bodies (Arglo_020 (IE_SE_16A040200), Breagagh (Tipperary)_020 (IE_SE _16B030400), Clodiagh (Tipperary)_030 (IE_SE _16C020200), Clodiagh (Tipperary)_040 (IE_SE _16C020600), Drish_050 (IE_SE _16D020200), Drish_060 (IE_SE _16D020400), Farneybridge_040 (IE_SE _16F020700), Multeen (East)_020 (IE_SE _16M080300), Suir_090 (IE_SE _16S021300), Suir_100 (IE_SE _16S021400)), the existing baseline is higher than 75% of the upper orthophosphate indicative quality threshold, but since the increase in concentration is insignificant at worst and undetectable at best, dosing will impose no risk of impact.

The increased load due to the WWTP also has a negligible impact due to the nutrient removal included in the treatment process. Therefore, there will be no likely significant effect to the receiving water bodies as a result of dosing at Thurles WTP.

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

5.3.6 Assessment of Cumulative Impacts from other WSZs

The cumulative loads to water bodies in the Suir Catchment (HA 16) associated with phosphate dosing from the following additional WTPs, in addition to loads impacting on the Ballyteigue-Bannow (HA 13), Barrow (HA 14), Nore (HA 15) and Colligan-Mahon (HA 17) catchments are summarised in **Table 5-5** below:

- 010 Adamstown WTP - East Waterford Regional (3800PUB1110)
- 021 Rossadrehid WTP - Galtee Regional (2900PUB0130)
- 041 Glenary WTP – Glenary (2000PUB1009)
- 047 Goatenbridge WTP - Ardfinnan Regional (2900PUB0102)
- 098 Mooncoin WTP - Mooncoin Regional WS 1012 (1500PUB1012)
- 115 Springmount Pump Station - Springmount Source (2900PUB_TEMP_002)
- 177 Linguan WTP - Carrick-on-Suir [Linguan River] (2900PUB0108)
- 190 Ironmills Pump Station – Ironmills (2900PUB0146)
- 399 Portlaw WTP – Portlaw (3100PUB1081)

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

Table 5-5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 138 Thurles (Zone 1) and other WSZs proposed for corrective water treatment in the upstream catchment

NAME / EU_CD	Period	Ortho P Indicative Quality & Trends (distance to threshold) Surrogate Status Indicative Quality indicated in *italic)*	Baseline Year 2014 and 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 & Agglom.	Conc. Using Flows (30%ile tidal or gauged) mg/l	Potential Baseline for Ortho P Conc. following Dosing (mg/l)
IE_SE_16S021300 SUIR_090	n/a	Good Upwards Far	0.030	0.033	91.5	0.0002	0.030‡
		Good Upwards Far	0.028	0.033			0.028‡
		High Downwards Near	0.024	0.019			0.024‡
IE_SE_16S021400 SUIR_100	n/a	High Downwards Near	0.025	0.019	104.3	0.0002	0.025‡
IE_SE_16S021500 SUIR_110	n/a	Good Downwards Far	0.027	0.033	178.6	0.0002	0.028‡
		High Downwards Far	0.019	0.019			0.019‡
		High Upwards Far	0.016	0.019			0.017‡
IE_SE_16S021600 SUIR_120	n/a	Good Upwards Near	0.035	0.033	179.3	0.0002	0.035‡
IE_SE_16S021700 SUIR_130	n/a	Good Upwards Far	0.028	0.033	215.5	0.0002	0.028‡
IE_SE_16S022400 SUIR_180	n/a	Good Upwards Far	0.027	0.033	349.1	0.0003	0.027‡
IE_SE_16S022600 SUIR_190	n/a	High Downwards Far	0.018	0.018	385.1	0.0003	0.018
		High Downwards Far	0.015	0.018			0.015
		High Upwards Near	0.024	0.018			0.024
IE_SE_16S022850 SUIR_220	n/a	High Downwards Near	0.023	0.019	414.4	0.0002	0.023‡
		Moderate Downwards Far	0.042	0.051			0.042‡

NAME / EU_CD	Period	Ortho P Indicative Quality & Trends (distance to threshold) Surrogate Status Indicative Quality indicated in *italic)*	Baseline Year 2014 and 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 & Agglom.	Conc. Using Flows (30%ile tidal or gauged) mg/l	Potential Baseline for Ortho P Conc. following Dosing (mg/l)
		High Upwards Near	0.025	0.019			0.025‡
		Good Upwards Far	0.028	0.033			0.028‡
		Good Upwards Far	0.027	0.033			0.027‡
		Good Upwards Far	0.027	0.033			0.027‡
		Moderate Upwards Far	0.035	0.051			0.035‡
IE_SE_100_0600 Upper Suir Estuary	Summer	High (S) None Far	0.006	0.019	535.9	0.0002	0.006‡
	Winter	High (W) None Near	0.023	0.019			0.023‡
IE_SE_100_0550 Middle Suir Estuary	Summer	High (S) Upwards Near	0.029	0.023	2618.7	0.0010	0.030‡
	Winter	Good (W) Downwards Far	0.037	0.053			0.038‡
IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	Summer	High (S) Upwards Near	0.026	0.023	2648.9	0.0010	0.027‡
	Winter	Good (W) Downwards Near	0.053	0.053			0.054‡
IE_SE_100_0100 Barrow Suir Nore Estuary	Summer	High (S) Upwards Far	0.019	0.020	3752.2	0.0004	0.020‡
	Winter	Good (W) None Far	0.045	0.042			0.046‡
IE_SE_100_0000 Waterford Harbour	Summer	High (S) Downwards Far	0.005	0.019	3851.9	0.0003	0.006‡
	Winter	High (W) Downwards Far	0.020	0.019			0.020‡
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	n/a	*Good*	*0.033*	*0.036*	*4716.3*	*0.0000*	*0.033‡*

‡ Load from WWTP / SWO following treatment added

5.3.7 Conclusions

There is no potential for likely significant effects on the Lower River Suir SAC as a result of the construction of the corrective water treatment works at Thurles WTP given the scale of the construction works and the limited impact of the Thurles groundwater body. There are no surface water pathways between the WTP and the Suir River.

The increased orthophosphate dosing concentrations are not resulting in a noticeable impact on the quality of the effluent from agglomerations within the WSZ with negligible increases in the orthophosphate concentrations in the receiving waters, as shown by the mass balance assessment in **Table 5.4**.

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

The predicted increase in concentration to groundwater bodies are insignificant (i.e. < 0.00175 mg/l = 5% of the Good / Fail boundary) in Templemore (IE_SE_G_131), Thurles (IE_SE_G_158) and Tipperary (IE_SE_G_145) whilst they are undetectable (0.0000 mg/l) in Slieve Phelim (IE_SH_G_213) and Clonmel (IE_SE_G_040). Therefore, there is no risk of deterioration in the orthophosphate indicative quality of the water bodies as a result of the proposed Project.

All remaining river, ground and transitional water bodies have a predicted increase in concentration that is less than the 5% Good / High indicative quality boundary threshold following dosing. There are no coastal or transitional water bodies directly affected by the Thurles WTP.

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

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

6 EVALUATION OF POTENTIAL FOR LIKELY SIGNIFICANT EFFECTS

6.1 CONSTRUCTION PHASE

6.2 OPERATIONAL PHASE

The key pressure associated with the proposed orthophosphate dosing is the potential for increased orthophosphate levels in the receiving waters 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 Lower River Suir SAC 002137

6.2.1.1 (1029) Freshwater Pearl Mussel (*Margaritifera margaritifera*)

Conservation objectives for the species in the Lower River Suir 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 the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

The freshwater pearl mussel population for which this SAC is designated is located in the Clodiagh River (Portlaw), which discharges into the Middle Suir Estuary. However the species also occurs in the Multeen and Clodiagh (Tipperary) rivers and whilst these populations are not designated, they should be maintained. The Clodiagh Portlaw population is designated under the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. No. 296 of 2009. The distribution of the freshwater pearl mussel in the Clodiagh catchment is presented in **Figure 6-1** below[20]. The freshwater pearl mussel was found to be present almost continually but in low numbers from Clonea to Portlaw[20] in a 2006 survey and were not abundant in any stretch, but ranged from occasional to frequent or common. No juvenile mussels were recorded during the survey. The Thurles WSZ lies

[20] Clodiagh Freshwater Pearl Mussel Sub-basin Management Plan 2009 – 2015. Final. August 2010.

adjacent to the River Suir which discharges to the Upper Suir Estuary. The River Suir (Suir_SC_140) and the Clodiagh River (Clodiagh [Portlaw]_SC_010) lie in two separate sub-catchments and there is no interaction between the river water bodies.

The Multeen and Clodiagh (Tipperary) populations are located within the WSZ and have the potential to be impacted by the dosing form Thurles WTP.

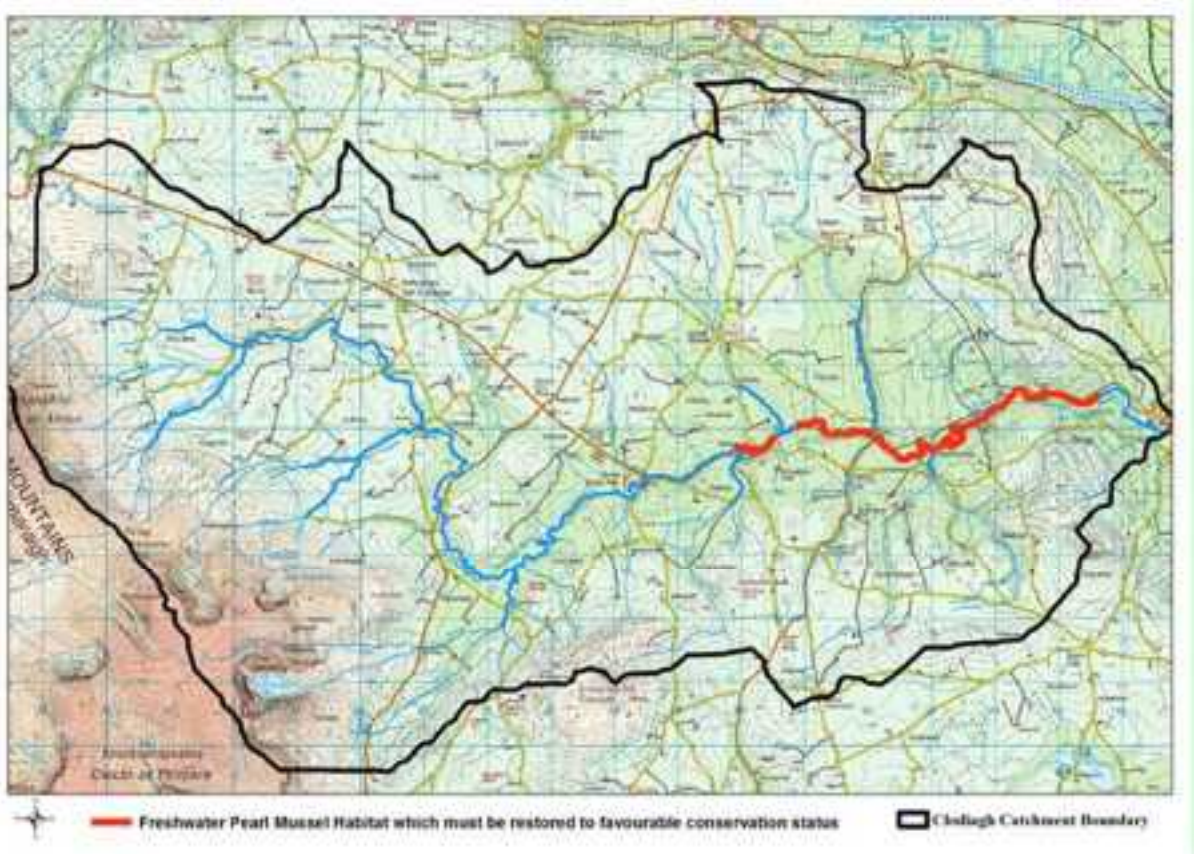


Figure 6-1: Freshwater pearl mussel habitat within the Clodiagh Catchment

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 are provided in **Appendix C**. The assessment has modelled very low increases in orthophosphate for water bodies intersected by the WSZ. The assessment of the distance to threshold is based on the existing indicative quality of each water body, rather than the WFD environmental objective assigned to a given water body.

With respect to the freshwater pearl mussel habitat, there is no risk of direct likely significant effects as a result of orthophosphate dosing at Thurles WTP, as discussed above. The WSZ is hydrologically connected to the Middle Suir Estuary via the River Suir and Upper Suir Estuary. The EAM results indicate that there is a potential increase in orthophosphate concentration of 0.0001 mg/l in the Suir_110 (IE_SE_16S021500) (immediately downstream of the WSZ) due to the dosing at Thurles WTP. As the Middle Suir Estuary is located >90km downstream of the Suir_110 (IE_SE_16S021500), there is no potential for indirect effects to the species via transitional water body pathways e.g. via Atlantic salmon as a host to freshwater pearl mussel larval glochidia.

For the non SAC FPM populations in the Multeen and the Clodiagh (Tipperary) river water bodies the predicted increase in concentration is 0.0001 mg/l and 0.0002 mg/l respectively which is not significant and does not present any risk of deterioration in the orthophosphate indicative quality in these rivers and will not impact on the ability of these populations to be maintained in these rivers.

6.2.1.2 (1092) White-clawed Crayfish (*Austropotamobius pallipes*)

A review of the targets and measures for the white-clawed crayfish found no nutrient specific targets for the species (NPWS, 2017[21]). However, white-clawed crayfish have a general water quality requirement for moderate to good water quality (i.e. Q3-4 or higher; NPWS, 2013[22]), therefore any reduction in water quality as a result of orthophosphate dosing 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 the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected to the SAC with the furthest downstream water body being the Suir_110 (IE_SE_16S021500). Tributaries within which the white-clawed crayfish population are located include the Owenbeg, Clodiagh and Multeen Rivers; and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

White-clawed crayfish occurs extensively in the River Suir and in many of its tributaries. On the river Suir main channel, the species has been recorded in almost the entire length of non-tidal river from the most upstream point at Cabragh, near Thurles, to downstream of Kilsheelan. It is also present in the following tributaries: Anner and Clashawley, Clodiagh and Owenbeg, Multeen, Tar, Nier and Clodiagh Lower.

The White-clawed crayfish population in the River Suir was decimated by and outbreak of the Crayfish Plague in 2017[23]. Crayfish Plague positive locations were recorded along the main channel of the Suir, from above Clonmel to Carrick-on-Suir. White-clawed crayfish is also present on the following tributaries: Anner and Clashawley, Clodiagh and Owenbeg, Multeen, Tar, Nier, and Clodiagh Lower.

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 all hydrologically connected river water bodies are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There

[21] NPWS (2017) Lower River Suir 002137 Conservation Objectives
[22] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife
[23] http://www.biodiversityireland.ie/crayfish-plague-2017/

is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on the white-clawed crayfish can be excluded. Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this species.

6.2.1.3 (1095) Sea lamprey (*Petromyzon marinus*), (1096) Brook lamprey (*Lampetra planeri*), (1099), River lamprey (*Lampetra fluviatilis*), (1103), Twaite shad (*Alosa fallax*) and (1106), Atlantic salmon (*Salmo salar*) (only in fresh water)

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[24]) highlights the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to these species and includes the potential effects from municipal discharges. The SSCO (NPWS, 2017[21]) 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 SSCO 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 the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- The river water bodies that are hydrologically connected include: Suir_060 (IE_SE_16S020600), Suir_070 (IE_SE_16S020900) and Suir_080 (IE_SE_16S021100); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158) and Templemore (IE_SE_G_031).

The distribution of sea lamprey; brook lamprey; river lamprey; twaite shad; and Atlantic salmon (only in fresh water) are not provided in the SSCO for the Lower River Suir SAC.

The River Suir and its tributaries are surveyed for fish as part of the WFD surveillance monitoring programme in rivers. The most recent fish survey of the River Suir was carried out in 2016. Six sites

[24] 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.

between Templemore and Thurles were surveyed. All survey sites were located upstream of Thurles WSZ. Lamprey species were not recorded at any of the survey sites however lamprey was previously recorded at Thurles during 2010 and 2014 fish surveys. Salmon were recorded at three of the survey sites.

The Aherlow River is a large tributary of the River Suir and is located between Co. Limerick and Co. Tipperary. It flows eastwards, joining the River Suir just north of Caher approximately 35km downstream of Thurles WSZ. The IFI carried out fish surveys at 19 sites on the Aherlow River in July 2016. Salmon were recorded at 16 of the 19 survey sites. Lamprey species were recorded at three sites.

The Anner River is another large tributary of the River Suir and is located on the south-eastern corner of Co. Tipperary. It joins the River Suir just east of Clonmel approximately 55km downstream of Thurles WSZ. Five sites were surveyed on the Anner River, near Fethard, in August 2016. Salmon was among the most commonly encountered fish species recorded at the five sites. The highest density of salmon was recorded at the most downstream site. Lamprey species were only recorded at the most downstream site.

The Ara River is also a large tributary of the River Suir. It is located in south Co. Tipperary and flows eastwards, first joining the Aherlow River and then River Suir near Caher. Five sites were surveyed on the Ara River, near Bansha, Co. Tipperary in August 2016. Salmon were among the most commonly encountered fish species recorded in the Ara catchment and were present at all five sites. Lamprey species were only recorded at the most downstream site.

The Cromoge River is a tributary of the River Suir. It is located in North Co. Tipperary, near Borrisoleigh and flows southwards, to first joining with the Clodiagh River and then the River Suir, north of Cashel. Two sites were surveyed on the Cromoge River and its tributary, near Borrisoleigh, Co. Tipperary in September 2016. No salmon or lamprey species were recorded at either site.

It is noted that artificial barriers can block or cause difficulties to all listed species' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas or in the case of brook and river lamprey, also creating genetically isolated populations[25]. For twaite shad, there is no distribution provided for the River Suir. In some catchments, artificial barriers block twaite shads' upstream migration. It is assumed for the purposes of this assessment, that all species have access to the water bodies which may potentially be affected by the proposed dosing at Thurles WTP, thereby providing a conservative assessment of effects.

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 maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). The predicted increase in concentrations in the Clodiagh (Tipperary)_040 is 0.0002 mg/l. These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative

[25] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002137.pdf

quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on these Annex II species can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of these species.

6.2.1.4 (1330) Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

A review of the SSCOs (NPWS, 2017[21]) for the site found no nutrient specific targets for this habitat; however, one attribute common to both habitats under physical structure is flooding regime. The target is to maintain the natural tidal regime. The Conservation Objectives supporting document on coastal habitats (NPWS, 2017[26]) for the Lower River Suir 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.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

The habitat Atlantic salt meadow is located at Belmont House at the north-west end of the Kings Channel; in low-lying land to the north of the Little Island slipway (Ballynakill House); and distributed along the southern side of the Kings Channel. The habitat is located within the transitional water body Lower Suir Estuary (Little Island - Cheekpoint) (IE_SE_100_0500) which is downstream of the all water bodies identified in **Table 5-2**.

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.**

[26] NPWS (2017) Lower River Suir 002137 Conservation Objectives supporting document - coastal habitats

The maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitat.

6.2.1.5 (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

A review of the SSCOs (NPWS, 2017[21]) for the site found no nutrient specific targets for this habitat; however, one attribute common to both habitats under physical structure is flooding regime. The target is to maintain the natural tidal regime. The CO supporting document on coastal habitats (NPWS, 2017[26]) for the Lower River Suir 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.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

Mediterranean salt meadows habitat was not recorded in Lower River Suir SAC during the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009[27]). Thus, the total area of the qualifying habitat in the SAC is unknown. An NPWS survey in the 1990s noted stands of sea rush (*Juncus maritimus*), indicative of Mediterranean salt meadows, on the saltmarsh at Grantstown but the habitat was not recorded in the Little Island sub-site during the SMP in 2007 (McCorry and Ryle, 2009). Unsurveyed

[27] McCorry, M. and Ryle, T. (2009) Saltmarsh monitoring project 2007-2008. Unpublished report to NPWS.

areas may be present within the SAC. On this basis, a conservative assessment has been undertaken and has assumed that this habitat may be present downstream of the WSZ.

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 maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitat.

6.2.1.6 (1355) Otter (*Lutra lutra*)

A review of the SSCOs (NPWS, 2017[21]) 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[28]), 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.

There will be no interference with the terrestrial, marine or freshwater habitat of the species as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and

[28] NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

The distribution of otter terrestrial habitat in the SAC is calculated as 116.17ha above high water mark (HWM) and 726.61ha along river banks. The area of marine habitat is calculated as 712.27ha and the length of freshwater (river) calculated is 382.31km. It is therefore assumed that otter have the potential to interact with all surface water bodies identified **Table 5-2**.

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 maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water bodies, or of preventing the achievement of WFD objectives.

The modelled concentrations for surface water bodies show that increases in orthophosphate levels will be within acceptable limits and that the overall impact is low. In the absence of any significant effects on water quality or fish species, the main food source for the otter in this SAC, there will be no likely significant on the conservation status of otter as a result of this project.

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

6.2.1.7 (6430) Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

A review of the SSCOs (NPWS, 2017[21]) for this site do not contain nutrient specific water quality targets for this habitat, however an important attribute for the habitat is hydrological regime, namely flooding depth/height of the water table. The habitat relies on winter inundation, which results in deposition of naturally nutrient-rich sediment.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

The location of this habitat has not been mapped in detail for the Lower River Suir SAC and therefore the total area of the qualifying habitat in the SAC is unknown. It is assumed that the habitat has the potential to be hydrologically connected to all surface water bodies identified **Table 5-2**.

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 maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitat.

6.2.1.8 (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.

Table 5-2 identifies the surface and groundwater bodies which are hydrologically or hydrogeologically connected to the Lower River Suir SAC and will receive inputs from the proposed orthophosphate dosing at Thurles WTP:

- There are a total of 36 river water bodies that are hydrologically connected with the furthest downstream water body being the Suir_110 (IE_SE_16S021500); and
- The groundwater bodies hydrogeologically connected to the site include: Thurles (IE_SE_G_158), Tipperary (IE_SE_G_158), Clonmel (IE_SE_G_040) and Templemore (IE_SE_G_031).

Alluvial forest was surveyed in Lower River Suir SAC by Perrin *et al*. (2008[29]) as part of the National Survey of Native Woodlands (NSNW) at Fiddown (NSNW site code: 0022), Mountbolton (NSNW site code: 1823) and Ballycanvan Big (NSNW site code: 1839). The area of alluvial woodlands in the surveyed sites within the SAC is estimated to be 32.9ha. It is important to note that further unsurveyed areas of alluvial forest are present within the SAC, for example at islands below Carrick-on-Suir, at Shanbally (Coillte LIFE project site), Tibberaghny Marshes, along the lower stretches of the more westerly of the Suir tributaries and along both banks of the Suir as far east as the Dawn River. Alluvial woodlands occur in the IE_SE_100_0550 Middle Suir Estuary. Given the location of the woodland and the potential for further surveyed areas, it is assumed that the habitat has the potential to be hydrologically connected to all surface water bodies identified **Table 5-2**.

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 maximum modelled increase in orthophosphate concentration in the River Suir following dosing at Thurles WTP is 0.0002 mg/l in the Suir_090 (IE_SE_16S021300) and the Suir_100 ((IE_SE_16S020400). These concentrations are within 5% of the Good / High indicative quality boundary (0.00125 mg/l) threshold. There is therefore no risk of deterioration in the orthophosphate indicative quality of these water bodies as a result of proposed dosing at Thurles WTP, or of preventing the achievement of WFD objectives.

The modelled increase in orthophosphate concentration in the groundwater body Clonmel (IE_SE_G_040) is not detectable (0.0000 mg/l). While the modelled increase in concentration for Thurles (IE_SE_G_158), Templemore (IE_SE_G_131) and Tipperary (IE_SE_G_145) is 0.0001 mg/l, 0.002 mg/l and 0.0008 mg/l respectively which are all less than 5% of the Good / Fail indicative quality boundary (0.00175 mg/l) threshold. Therefore, there is no risk of deterioration in the good orthophosphate indicative quality of these water 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 Thurles WTP, it has been demonstrated that the potential for likely significant effects on this habitat can be excluded. Furthermore, dosing will not prevent the restoration of the favourable conservation condition of the habitat.

[29] Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A. National survey of native woodlands 2003-2008. Unpublished report to NPWS

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

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

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative impacts are likely to be significant.

A search of Tipperary 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 e with the proposed project was generated as listed in **Table 6.1** below.

Table 6.1: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Draft Tipperary County Development Plan 2022 – 2028. The policies, objectives and zonings of relevance in both Development Plans include under Infrastructure and Water Services: **Planning Policy 11.1 -** In assessing proposals for new development to balance the need for new development with the protection and enhancement of the natural environment and human health. No plans, programmes, etc. or projects giving rise to significant cumulative, direct, indirect or secondary impacts on European sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan (either individually or in combination with other plans, programmes, etc. or projects). **Planning Policy 11.2 -** Ensure the protection, integrity and conservation of European Sites and Annex I and II species listed in EU Directives. Where it is determined that a development may individually, or cumulatively, impact on the integrity of European sites, the Council will require planning applications to be accompanied by a NIS in accordance with the Habitats Directive and transposing Regulations, 'Appropriate Assessment of Plans and Projects, Guidelines for Planning Authorities', (DEHLG 2009) or any amendment thereof and relevant EPA and European Commission guidance documents. **Planning Policy 11.7** - a) Ensure the protection of water quality in accordance with the EU WFD, and support the objectives and facilitate the implementation of the associated Programme of Measures of the River Basin Management Plan 2018-2021 and any successor. This includes contributing towards the protection of blue-dot catchments and drinking water resources. Also, have cognisance of the EU's Common Implementation Strategy Guidance Document No. 20 and 36 which provide guidance on exemptions to the environmental objectives of the WFD. b) Support an integrated and collaborative approach to catchment management in accordance with the River Basin Management Plan 2018-2021 and any successor. c) Require an undisturbed edge or buffer zone to be maintained, where appropriate, between new developments and riparian zones of water bodies to maintain the natural function of existing ecosystems associated with water courses and their riparian zones, and to enable sustainable public access.	▪ N/A	The Tipperary 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 (2018-2021), 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.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Planning Policy 11.8 - Provide for the sustainable development of fisheries, in compliance with the Habitats and Birds Directives, and other ecological protection objectives. New infrastructure should be positioned at already modified locations where feasible; and sedimentation and siltation issues should be considered, with floating infrastructure used where feasible. Fishery related developments may necessitate the preparation of a Visitor/Habitat Management Plan that includes requirements in relation to: sustainable fishing practices that would not affect the ecological site integrity; and invasive species. **Planning Objective 15-A** - Work in partnership with Irish Water in the performance of its functions and in the implementation of the Water Services Strategic Plan, Investment Plan and National Water Resources Plan (and any amendment thereof), to ensure that water infrastructure complies with appropriate regulations and to ensure and support the sustainable development of the county.		
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. The 3rd cycle of River Basin Management Plan (RBMP) for the period of 2022-2027 is currently being prepared by Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). The document (Chapter 3) sets out the condition of Irish waters and a summary of status for all monitored waters in the 2013 – 2018 period, including a description of the changes since 2007 – 2009 and 2010-2015. A large number of river waterbodies are still declining and unless this is addressed, sustained and progressive improvements in water quality will be difficult to achieve. Overall, 53% of surface waters are in good or high ecological status while the remaining 47% are in unsatisfactory ecological status. For groundwater bodies, 92% are in good chemical and quantitative status. Chapter 3 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate	▪ N/A	The objectives of the RBMP are to • Prevent deterioration; • Restore good status; • Reduce chemical pollution; and • Achieve water related protected areas objectives The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each 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.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
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.		
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 AA. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of water bodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	Foodwise 2025 was subject to its own AA[30]. 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-

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

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		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 Policy 2014 – 2020 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a 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.	▪ Overgrazing; ▪ Land use change or ▪ intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	The RDP for 2014 – 2020 has been subject to SEA[31], and AA[32]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed 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.

[31]

[32] 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
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.		
National Nitrates Action Programme Article 28 of the Good Agricultural Practice Regulations, in line with the Nitrates Directive (91/676/EEC), requires the Minister for Housing, Local Government and Heritage, in consultation with the Minister for Agriculture, Food and the Marine, to review the Nitrates Action Programme every four years. Ireland has published the Fifth Nitrates Action Programme on the 11th March 2022. The Programme sets out new measures that have been introduced since the Fourth Programme. This iteration of the NAP is developed in the context of significantly greater environmental ambition in the Programme for Government and at EU level. The key issues considered in the fifth iteration of the NAP include: ▪ Better Policy Alignment; ▪ Compliance and Enforcement; ▪ Climate Action Measures. ▪ Biodiversity Measures; and ▪ Nitrates Derogation.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; ▪ Disturbance to habitats / species.	In accordance with the Directive 2001/42/EC on the assessment of effects of certain plans and programmes, as transposed into Irish law, a Strategic Environmental Assessment (SEA) is being undertaken and an Environmental Report has been prepared. Appropriate Assessment under EU Directive 92/43/EEC, as transposed into Irish law, is also being undertaken and a Natura Impact Statement (NIS) has been prepared It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. Consultation and submission on the 5th NAP have been considered in the SEA Statement and the Natura Impact Statement of the adopted fifth Nitrates Action Programme. These documents provide information on the decision-making process and documents how environmental considerations, the views of consultees/stakeholders and the recommendations of the SEA Environmental Report and the assessment carried out under Article 6 of the Habitats Directive have influenced the final adopted Plan. Adherence to the recommendations in these documents and incorporation into the Plan will ensure that there is no potential for cumulative impacts with the proposed project.

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
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[33]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative impacts with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity;	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.

[33] 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
be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Nutrient enrichment /eutrophication.	
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
National Water Resources Plan – Framework Plan This Framework will deliver a sustainable water supply on a catchment and water resource zone basis, meeting growth and demand requirements through drought and critical periods. The resources plan takes account of WFD objectives and the programme of measures proposed in the relevant catchments and water resource zones. Specific measures in the plan with relevance to Irish Water include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.	▪ Increased abstractions leading to changes / pressure on existing hydrology / hydrogeological regimes.	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods when assimilation capacity for diffuse runoff may be reduced. The SEA Environmental Report for the Framework Plan has made mitigation recommendations for the implementation of the Framework Plan which are included in the Environmental Action Plan (EAP), and the EAP will provide a basis for tracking recommendations from the SEA and NIS during the Framework Plan implementation and Regional Plan development. A Monitoring Plan has also been developed which covers the integration of environmental and sustainability considerations throughout implementation of the Framework Plan and the options development methodology and provides a framework for future long-

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		term monitoring. Therefore, no likely significant in-combination effects are envisaged.
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[34]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020 Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to water	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[35]. 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.

[34] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF
[35] 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
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.		
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	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.
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
National Water Resources Plan (in prep.)	▪ Increased abstractions	The plan will seek to develop sustainable water supplies but must consider particularly critical drought periods

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
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 Irish Water include those for urban wastewater and urban runoff and also as part of other measures in relation to the lead in drinking water.	leading to changes / pressure on existing hydrology / hydrogeological regimes.	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, pending or recently approved within the Thurles WSZ, particularly within the town is Thurles itself. The applications are predominantly for the construction of new infrastructure or renovations to existing infrastructure. These include for housing, commercial facilities etc.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	Adherence to the overarching policies and objectives of the County Development Plan will ensure that local planning applications and subsequent grant of planning will comply with the requirements of relevant environmental legislation including the WFD and Habitats Directive. Effluent from proposed and new infrastructure connected to the drainage systems will be treated prior to discharge, negating the potential for cumulative impacts in the receiving environment.
Integrated Pollution Control (IPC) Licensing Thurles has no active Industrial Emission licence (IEL) and no IPC licensed facilitates. Under the Industrial Emissions Directive 2010/75/EU and Environmental Protection Agency Act, 1992 (as amended) industrial activities (e.g. pharmaceutical) are licensed by the EPA to prevent or reduce emissions to air, water and land, reduce water and use energy/resources efficiently. An IPC licence is a single integrated licence which covers all emissions from the facility and its environmental management. All related operations that the licence holder carries in connection with the activity are controlled by this licence.	▪ Changes to water quality or quantity; ▪ Nutrient enrichment /eutrophication.	The EPA is responsible for monitoring emissions and dealing with any infringements on IPC licences. All emissions must be within set limits which must not be contravened. Limits are set for phosphorus where relevant. Compliance with the limits set for phosphorus will ensure that there will be no significant in-combination impacts on 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 Thurles WTP, within the Thurles 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 Thurles WTP the potential for direct, indirect and cumulative impacts affecting European Sites within the ZoI (i.e. Lower River Suir SAC) has been assessed. There will be no significant direct, indirect or cumulative impacts that will result in likely significant effects to the Qualifying Interests/special conservation interests of the European Sites within the ZoI.

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

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

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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
Lower River Suir SAC (002137)	https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002137.pdf

APPENDIX B

Nutrient Sensitive Qualifying Interests

Water dependant and nutrient sensitive SAC species

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

Water dependant and nutrient sensitive SAC habitats

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

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

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

Water dependant and nutrient sensitive SPA birds

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes
A003	Great Northern Diver (*Gavia immer*)	Yes	Yes
A004	Little Grebe (*Tachybaptus ruficollis*)	Yes	Yes
A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes
A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes
A013	Manx Shearwater (*Puffinus puffinus*)	Yes	Yes
A014	Storm Petrel (*Hydrobates pelagicus*)	Yes	Yes
A015	Leach's Storm-petrel (*Oceanodroma leucorhoa*)	Yes	Yes
A016	Gannet (*Morus bassanus*)	Yes	Yes
A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes
A018	Shag (*Phalacrocorax aristotelis*)	Yes	Yes
A028	Grey Heron (*Ardea cinerea*)	Yes	Yes
A037	Bewick's Swan (*Cygnus columbianus bewickii*)	Yes	Yes
A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes
A043	Greylag Goose (*Anser anser*)	Yes	Yes
A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes
A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes
A048	Shelduck (*Tadorna tadorna*)	Yes	Yes
A050	Wigeon (*Anas penelope*)	Yes	Yes
A051	Gadwall (*Anas strepera*)	Yes	Yes
A052	Teal (*Anas crecca*)	Yes	Yes
A053	Mallard (*Anas platyrhynchos*)	Yes	Yes
A054	Pintail (*Anas acuta*)	Yes	Yes
A056	Shoveler (*Anas clypeata*)	Yes	Yes
A059	Pochard (*Aythya ferina*)	Yes	Yes
A061	Tufted Duck (*Aythya fuligula*)	Yes	Yes
A062	Scaup (*Aythya marila*)	Yes	Yes
A063	Eider (*Somateria mollissima*)	Yes	Yes
A065	Common Scoter (*Melanitta n*igra)	Yes	Yes
A067	Goldeneye (*Bucephala clangula*)	Yes	Yes
A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes
A082	Hen Harrier (*Circus cyaneus*)	Yes	Yes
A098	Merlin (*Falco columbarius*)	Yes	Yes
A103	Peregrine (*Falco peregrinus*)	Yes	Yes
A122	Corncrake (*Crex crex*)	Yes	Yes
A125	Coot (*Fulica atra*)	Yes	Yes
A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes
A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes
A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes
A141	Grey Plover (*Pluvialis squatarola*)	Yes	Yes

Code	Species of special conservation interest	Water dependant	Nutrient sensitive
A142	Lapwing (*Vanellus vanellus*)	Yes	Yes
A143	Knot (*Calidris canutus*)	Yes	Yes
A144	Sanderling (*Calidris alba*)	Yes	Yes
A148	Purple Sandpiper (*Calidris maritima*)	Yes	Yes
A149	Dunlin (*Calidris alpina*) (non-breeding)	Yes	Yes
A156	Black-tailed Godwit (*Limosa limosa*)	Yes	Yes
A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes
A160	Curlew (*Numenius arquata*)	Yes	Yes
A162	Redshank (*Tringa totanus*)	Yes	Yes
A164	Greenshank (*Tringa nebularia*)	Yes	Yes
A169	Turnstone (*Arenaria interpres*)	Yes	Yes
A179	Black-headed Gull (*Larus ridibundus*)	Yes	Yes
A182	Common Gull (*Larus canus*)	Yes	Yes
A183	Lesser Black-backed Gull (*Larus fuscus*)	Yes	Yes
A184	Herring Gull (*Larus argentatus*)	Yes	Yes
A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes
A191	Sandwich Tern (*Sterna sandvicensis*)	Yes	Yes
A192	Roseate Tern (*Sterna dougallii*)	Yes	Yes
A193	Common Tern (*Sterna hirundo*)	Yes	Yes
A194	Arctic Tern (*Sterna paradisaea*)	Yes	Yes
A195	Little Tern (*Sterna albifrons*)	Yes	Yes
A199	Guillemot (*Uria aalge*)	Yes	Yes
A200	Razorbill (*Alca torda*)	Yes	Yes
A204	Puffin (*Fratercula arctica*)	Yes	Yes
A229	Kingfisher (*Alcedo atthis*)	Yes	Yes
A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes
A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes
A466	Dunlin (*Calidris alpina schinzii*) (breeding)	Yes	Yes

APPENDIX C

EAM Summary Report

Irish Water - Lead in Drinking Water Mitigation Plan

Environmental Assessment Methodology (EAM) Summary Report

138 Thurles WTP – Thurles (ZONE 1) (2800PUB1012)

National Lead in Water Mitigation Strategy

Environmental Assessment Methodology Report: 138 Thurles WTP [Thurles (ZONE 1)] (2800PUB1012)

Document Control Sheet

Client:	Irish Water
Project Title:	National Lead in Water Mitigation Strategy
Document Title:	Environmental Assessment Methodology Report: 138 Thurles WTP – Thurles (ZONE 1) (2800PUB1012)
Document No:	MDW0766RP_5.1_EAM_138_Thurles_F02

Text Pages:	13	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
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A01	Review	5th Jun 2018	YE		IP MM		DC	
F01	Final	9th Oct 2018	YE		IP		DC	
F02	Final	13th Mar 2023	YE		IP		MM	

138 Thurles WTP – Thurles Regional PWS (3700PUB1042)

Supporting spreadsheet: 138_Thurles WTP_Thurles Regional PWS_V09

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

Thurles WTP supplies Thurles town, County Tipperary, located on the banks of the river Suir, the WTP has been upgraded and now supplies 5 water supply zones, as listed in the table below. The distribution input for Thurles Regional PWS and associated extensions is 7,681 m^3/day (55 % of which is accounted for, with the remainder assumed to be lost through leakage) serving a population of approximately 8,000.

The area is served by Thurles WWTP (D0026), Borrisoleigh (D0323), Littleton (D0480), Twomileborris (D0474) and Holycross (D0478) which are licensed in accordance with the requirements of the Wastewater Discharge (Authorisation) Regulations 2007 as amended and the impact of the orthophosphate dosing on the emission limit values and the receiving water body downstream of the point of discharge are assessed. There are also WWTPs with a population equivalent of less than 500; namely Drom (A0190), Bouladuff (A0202), Clonoulty (A0415) and Boherlahan (A0429), which have received a Certificate of Authorisation in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended. The impact of the orthophosphate dosing and the estimated additional load from this plant is considered at the water body level via the surface water pathways. It is estimated that there are 3,576 properties across the WSZ that are serviced by a DWWTS.

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

Water Treatment Plant	**Thurles**	
Water Supply Zone	**Dundrum Regional (2900PUB0113)** **Horse and Jockey PWS (2800PUB1011)** **Littleton PWS (2800PUB1014)** **Two Mile Borris (2800PUB1020)** **Thurles Regional PWS (3700PUB1042)**	
Step 1 Appropriate Assessment Screening	**European Sites within Zone of Influence**	
	SACs	
	Helvick Head SAC Ballyteige Burrow SAC Bannow Bay SAC Lady's Island Lake SAC Saltee Islands SAC Tacumshin Lake SAC Hook Head SAC Clare Glen SAC Philipston Marsh SAC	Kilduff, Devilsbit Mountain SAC Ardmore Head SAC Anglesey Road SAC Lower River Suir SAC River Barrow and River Nore SAC Moanour Mountain SAC Carnsore Point SAC Silvermine Mountains SAC Silver Mountains West SAC

	Bolingbrook Hill SAC Keeper Hill SAC	Lower River Shannon SAC Glenstal Wood SAC
	SPAs	
	Ballyteigue Burrow SPA Bannow Bay SPA Helvick Head to Ballyquin SPA Keeragh Islands SPA Kerry Head SPA River Shannon and River Fergus Estuaries SPA	Lady's Island Lake SPA Mid-Waterford Coast SPA Saltee Islands SPA Slievefelim to Silvermines Mountains SPA Loops Head SPA
	Nutrient Sensitive Qualifying Interests present – Yes **Appropriate Assessment Screening Required – Yes**	

Step 2 – Direct Inputs to Surface Water

Table 1: Increased loading/concentration to agglomerations due to Orthophosphate Dosing – Dosing rate = 1.4 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*
Thurles Primary Discharge	0.3	Existing	576.66	0.14	0.11	0.18
		Post Dosing	576.66	0.14	0.11	0.18
Thurles SWOs (4 no.)	n/a	Existing	239.94	1.93	1.55	2.63
		Post Dosing	268.70	2.16	1.73	2.94
Borrisoleigh Primary Discharge	0.25	Existing	66.58	0.20	0.16	0.28
		Post Dosing	66.58	0.20	0.16	0.28
Borrisoleigh SWOs (no.)	n/a	Existing	19.39	2.02	1.62	2.75
		Post Dosing	21.91	2.28	1.83	3.11
Littleton Primary Discharge	0	Existing	31.97	0.14	0.11	0.19
		Post Dosing	31.97	0.14	0.11	0.19
Littleton SWOs (no.)	n/a	Existing	9.31	1.42	1.14	1.93
		Post Dosing	10.51	1.60	1.28	2.18
Twomileborris Primary Discharge	0.35	Existing	43.14	0.19	0.15	0.25
		Post Dosing	43.14	0.19	0.15	0.25
Twomileborris SWOs (2 no.)	n/a	Existing	12.57	1.86	1.49	2.53
		Post Dosing	14.08	2.08	1.67	2.83
Holycross Primary Discharge	3	Existing	41.03	0.48	0.38	0.65
		Post Dosing	41.03	0.48	0.38	0.65
Holycross SWOs (4 no.)	n/a	Existing	11.95	4.81	3.85	6.54
		Post Dosing	13.46	5.42	4.34	7.37

Note: The effluent concentrations are modelled as compliant with ELVs for Ortho Phosphate.

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

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

Table 2: Mass balance assessment based on 1.4 mg/l dosing using available background concentrations and mean flow information

Agglom.	RWB Name / Code for Primary Discharge	Background Conc. (mg/l) (Annual mean from AER u/s monitoring point)	Modelled Conc. existing (mg/l)	Modelled Conc. Post Dosing (mg/l)	% Inc.
Thurles (D0026)	Suir_080 IE_SE_16S021100	0.0250	0.0264	0.0265	0.2%
Borrisoleigh (D0323)	Borrisoleigh Stream_010 IE_SE_16B060600	0.0317	0.0356	0.0356	0.0%
Littleton (D0480)	Breaghagh (Tipperary)_020 IE_SE_16B030400	0.0339	0.0352	0.0352	0.0%
Twomileborris (D0474)	Drish_050 IE_SE_16D020200	0.0230	0.0243	0.0244	0.2%
Holycross (D0478)	Suir_090 IE_SE_16S021300	0.0295	0.0296	0.0296	0.0%

Surface Assessment

Thurles - Suir_080 (IE_SE_16S021100) – The effluent concentrations from Thurles WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the mass balance assessment in Table 2.

Borrisoleigh - Borrisoleigh Stream_010 (IE_SE_16B060600) – The effluent concentrations from Borrisoleigh WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is undetectable as shown by the mass balance assessment in Table 2.

Littleton - Breaghagh (Tipperary)_020 (IE_SE_16B030400) – The effluent concentrations from Littleton WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is undetectable as shown by the mass balance assessment in Table 2.

Twomileborris - Drish_050 (IE_SE_16D020200) – The effluent concentrations from Twomileborris WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is negligible as shown by the mass balance assessment in Table 2.

Holycross - Suir_090 (IE_SE_16S021300) – The effluent concentrations from Holycross WWTP are compliant with ELVs. Tertiary treatment is assumed to remove any additional orthophosphate from the effluent due to dosing and impact due to SWOs is undetectable as shown by the mass balance assessment in Table 2.

The dosing will therefore have an undetectable 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 increments in concentrations in the subsurface pathways are insignificant for all river water bodies (less than 0.00125 mg/l, which is 5% of the Good/High boundary for surface water bodies), with highest increase equal to 0.001 mg/l, taking place in BLACK STREAM (CASHEL)_010 (IE_SE_16B050100).

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

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

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Ortho P Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P load to GW kg/yr	Potential Increase in Ortho P Conc. due to Dosing mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_G_158 Thurles	Good Upwards Far	0.010	0.026	3.0	0.0001	0.010	
	Good Upwards Far	0.006	0.026			0.006	
IE_SE_G_131 Templemore	Good Upwards Far	0.005	0.026	31.0	0.0002	0.005	
	Good Upwards Far	0.006	0.026			0.006	
	Good Upwards Far	0.008	0.026			0.008	
	Good Upwards Far	0.011	0.026			0.011	
	Good Upwards Far	0.010	0.026			0.010	

		Good Upwards Far	0.005	0.026			0.005	
	IE_SH_G_213 Slieve Phelim	Good Upwards Far	0.008	0.026	0.0	0.0000	0.008	
		Good Upwards Far	0.005	0.026			0.005	
	IE_SE_G_040 Clonmel	Good None Far	0.005	0.026	7.6	0.0000	0.005	
		Good Upwards Far	0.008	0.026			0.008	
		Good Upwards Far	0.012	0.026			0.012	
		Good Upwards Far	0.005	0.026			0.005	
	IE_SE_G_145 Tipperary	*Good*	*0.018*	*0.026*	*19.0*	*0.0008*	*0.018*	

Step 5 and 6: Combined Inputs to Surface Water Bodies

Combined Assessment

Table 4 gives the loads and modelled concentrations for the combined assessment to rivers. The increased loads due to orthophosphate dosing are predicted to be below significant levels, i.e. are equal or below 0.00125 mg/l.

The existing baseline is higher than 75% of the Indicative Quality upper Ortho P threshold for at least one monitoring point in the following waterbodies, but since the increase in concentration is insignificant, dosing will impose no risk of impact to WFD objectives.

ARGLO_020 (IE_SE_16A040200)

BREAGAGH (TIPPERARY)_020 (IE_SE_16B030400)

CLODIAGH (TIPPERARY)_030 (IE_SE_16C020200)

CLODIAGH (TIPPERARY)_040 (IE_SE_16C020600)

DRISH_050 (IE_SE_16D020200)

DRISH_060 (IE_SE_16D020400)

FARNEYBRIDGE_040 (IE_SE_16F020700)

MULTEEN (EAST)_020 (IE_SE_16M080300)

SUIR_090 (IE_SE_16S021300)

SUIR_100 (IE_SE_16S021400)

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

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *[Surrogate Indicative Quality indicated in italic]*	Baseline Conc. mg/l *[Surrogate Conc. given in italic]*	75% of Ortho P Indicative Quality upper threshold mg/l	Total Ortho P Load in receiving waters kg/ yr	Potential Increase in Ortho P Conc. due to Dosing (30%ile or gauged) mg/l	Potential Baseline for Ortho P Conc. following dosing mg/l	Notes
IE_SE_16A040100 ARGLO_010	Moderate Upwards Far	0.042	0.051	1.2	0.0001	0.042	
IE_SE_16A040200 ARGLO_020	High Upwards Near	0.025	0.019	9.2	0.0006	0.025	
IE_SE_16A050100 AUGHNAGLANNY_010	*Good*	*0.030*	*0.033*	*0.4*	*0.0000*	*0.030*	
IE_SE_16B010100 BLACK (TWOMILEBORRIS)_010	High Downwards Far	0.017	0.019	1.4	0.0001	0.017	
IE_SE_16B030200 BREAGAGH (TIPPERARY)_010	Good Downwards Far	0.026	0.033	2.7	0.0003	0.027	
IE_SE_16B030400 BREAGAGH (TIPPERARY)_020	Good Downwards Near	0.034	0.033	5.4	0.0002	0.034	‡
IE_SE_16B050100 BLACK STREAM (CASHEL)_010	*Poor Upwards Near*	*0.061*	*0.087*	*3.9*	*0.0010*	*0.062*	
IE_SE_16B060600 BORRISOLEIGH STREAM_010	Moderate Downwards Far	0.032	0.051	6.3	0.0004	0.032	MP1 ‡
	Moderate Downwards Far	0.028	0.051			0.028	MP2 ‡
	Moderate Downwards Far	0.026	0.051			0.027	MP3 ‡
IE_SE_16C020200 CLODIAGH (TIPPERARY)_030	High Downwards Near	0.024	0.019	13.0	0.0001	0.025	‡ *
IE_SE_16C020600 CLODIAGH (TIPPERARY)_040	High Downwards Near	0.023	0.019	40.4	0.0002	0.024	‡ *
IE_SE_16C040300 CLOVER_020	*Moderate*	*0.046*	*0.051*	*0.4*	*0.0000*	*0.046*	

	IE_SE_16D020200 DRISH_050	High Downwards Near	0.023	0.019	4.1	0.0001	0.023	
		Good Downwards Far	0.029	0.033			0.029	
		Moderate Downwards Far	0.036	0.051			0.036	
	IE_SE_16D020400 Drish_060	High Downwards Near	0.023	0.019	9.6	0.0001	0.023	‡
	IE_SE_16F020200 FARNEYBRIDGE_010	*Poor*	*0.077*	*0.087*	*0.5*	*0.0001*	*0.077*	
	IE_SE_16F020500 FARNEYBRIDGE_020	*Poor*	*0.077*	*0.087*	*4.6*	*0.0003*	*0.077*	
	IE_SE_16F020600 Farneybridge_030	*Moderate*	*0.046*	*0.051*	*16.9*	*0.0005*	*0.046*	
	IE_SE_16F020700 FARNEYBRIDGE_040	High Downwards Near	0.024	0.019	17.7	0.0005	0.024	
	IE_SE_16F030040 FISHMOYNE_010	*Poor*	*0.077*	*0.087*	*0.2*	*0.0000*	*0.077*	
	IE_SE_16F030200 FISHMOYNE_020	High Downwards Far	0.017	0.019	2.7	0.0001	0.017	
	IE_SE_16F030300 FISHMOYNE_030	High Downwards Far	0.014	0.019	10.2	0.0002	0.014	‡
	IE_SE_16F200470 FANA_010	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0005*	*0.046*	
	IE_SE_16L230480 LISNAGONOGE_010	*Moderate*	*0.046*	*0.051*	*5.8*	*0.0007*	*0.046*	
	IE_SE_16M020780 MULTEEN_020	*Good*	*0.030*	*0.033*	*1.9*	*0.0001*	*0.030*	
	IE_SE_16M020900 MULTEEN_030	Good Upwards Near	0.033	0.033	2.2	0.0000	0.033	*
	IE_SE_16M021100 MULTEEN_050	Good Upwards Far	0.028	0.033	0.6	0.0000	0.028	
	IE_SE_16M080300 MULTEEN (EAST)_020	High Downwards Near	0.024	0.019	0.4	0.0000	0.024	
	IE_SE_16M080400 MULTEEN (EAST)_030	*Moderate*	*0.046*	*0.051*	*3.9*	*0.0001*	*0.046*	
	IE_SE_16O020700 OWENBEG (TIPPERARY)_010	*Moderate*	*0.046*	*0.051*	*0.9*	*0.0000*	*0.046*	

	IE_SE_16P260500 PIERCETOWN_010	*Moderate*	*0.046*	*0.051*	*2.9*	*0.0005*	*0.046*	ǂ
	IE_SE_16S020300 SUIR_030	Moderate Upwards Far	0.040	0.051	1.3	0.0000	0.040	
		Moderate Upwards Far	0.037	0.051			0.037	
		Good Downwards Far	0.029	0.033			0.029	
	IE_SE_16S020600 Suir_060	Good Upwards Far	0.026	0.033	1.4	0.0000	0.026	*
	IE_SE_16S020900 Suir_070	Good Upwards Far	0.026	0.033	12.7	0.0000	0.026	MP1
		Good Upwards Far	0.025	0.033			0.025	MP2 *
	IE_SE_16S021100 Suir_080	Good Upwards Far	0.025	0.033	34.9	0.0001	0.025	MP1 ǂ *
		Good None Far	0.027	0.033			0.027	MP2 ǂ
		Good None Far	0.032	0.033			0.032	MP3 ǂ
	IE_SE_16S021300 SUIR_090	Good Upwards Far	0.030	0.033	90.1	0.0002	0.030	MP1 ǂ
		Good Upwards Far	0.028	0.033			0.028	MP2 ǂ
		High Downwards Near	0.024	0.019			0.024	MP3 ǂ
	IE_SE_16S021400 SUIR_100	High Downwards Near	0.025	0.019	102.9	0.0002	0.025	ǂ
	IE_SE_16S021500 SUIR_110	Good Downwards Far	0.027	0.033	109.3	0.0001	0.027	MP1 ǂ
		High Downwards Far	0.019	0.019			0.019	MP2 ǂ
		High Upwards Far	0.016	0.019			0.016	MP3 ǂ
	IE_SH_25C100200 CAPPAWHITE STREAM_010	Moderate Downwards Far	0.050	0.051	0.3	0.0000	0.050	MP1
		Poor Upwards Far	0.083	0.087			0.083	MP2

	Poor Upwards Far	0.075	0.087			0.075	MP3

‡ Load from WWTP / SWO following treatment added.

* Trends are Statistically Significant.

MP: multiple Monitoring Points given for waterbody

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

Summary and Mitigation Proposed

Considering Thurles WTP in isolation, orthophosphate dosing is predicted to have negligible 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 fate of P loads from Thurles is depicted in Figure 1 and the breakdown from source to pathway is shown in Figure 2.

The cumulative impacts on Suir Catchment (HA 16) associated with phosphate dosing from following additional WTPs plus loads impacting on the Ballyteigue-Bannow (HA 13), Barrow (HA 14), Nore (HA 15) and Colligan-Mahon (HA 17) catchments are summarised in Table 5 below:

- 010 Adamstown WTP - East Waterford Regional (3800PUB1110)
- 021 Rossadrehid WTP - Galtee Regional (2900PUB0130)
- 041 Glenary WTP – Glenary (2000PUB1009)
- 047 Goatenbridge WTP - Ardfinnan Regional (2900PUB0102)
- 098 Mooncoin WTP - Mooncoin Regional WS 1012 (1500PUB1012)
- 115 Springmount Pump Station - Springmount Source (2900PUB_TEMP_002)
- 177 Linguan WTP - Carrick-on-Suir [Linguan River] (2900PUB0108)
- 190 Ironmills Pump Station – Ironmills (2900PUB0146)
- 399 Portlaw WTP – Portlaw (3100PUB1081)

Table 5: Cumulative assessment of the increased loading and concentrations to water bodies impacted by 138 Thurles WTP – Thurles (Zone 1) and other WSZs proposed for corrective water treatment in the upstream catchments.

EU_CD/Name	Ortho P Indicative Quality and Trends (distance to threshold) *Surrogate Indicative Quality indicated in italic*	Baseline Conc. *Surrogate Conc. given in italic* mg/l	75% of Ortho P Indicative Quality upper threshold mg/l	Cumulative Ortho P load to SW from leakage, DWWTS & agglomerations kg/yr	Conc. using 30%ile flows mg/l	PO4 Potential Baseline Conc. following dosing mg/l	Notes
IE_SE_16S021300 Suir_090	Good Upwards Far	0.030	0.033	91.5	0.0002	0.030	MP1 ‡
	Good Upwards Far	0.028	0.033			0.028	MP2 ‡
	High Downwards Near	0.024	0.019			0.024	MP3 ‡

IE_SE_16S021400 Suir_100	High Downwards Near	0.025	0.019	104.3	0.0002	0.025	‡
IE_SE_16S021500 Suir_110	Good Downwards Far	0.027	0.033	178.6	0.0002	0.028	MP1 ‡
	High Downwards Far	0.019	0.019			0.019	MP2 ‡
	High Upwards Far	0.016	0.019			0.017	MP3 ‡
IE_SE_16S021600 Suir_120	Good Upwards Near	0.035	0.033	179.3	0.0002	0.035	‡
IE_SE_16S021700 Suir_130	Good Upwards Far	0.028	0.033	215.5	0.0002	0.028	‡
IE_SE_16S022400 Suir_180	Good Upwards Far	0.027	0.033	349.1	0.0003	0.027	‡
IE_SE_16S022600 Suir_190	High Downwards Far	0.018	0.018	385.1	0.0003	0.018	‡ MP1
	High Downwards Far	0.015	0.018			0.015	MP2
	High Upwards Near	0.024	0.018			0.024	MP3
IE_SE_16S022850 Suir_220	High Downwards Near	0.023	0.019	414.4	0.0002	0.023	MP1 ‡*
	Moderate Downwards Far	0.042	0.051			0.042	MP2 ‡*
	High Upwards Near	0.025	0.019			0.025	MP3 ‡
	Good Upwards Far	0.028	0.033			0.028	MP4 ‡
	Good Upwards Far	0.027	0.033			0.027	MP5 ‡
	Good Upwards Far	0.027	0.033			0.027	MP6 ‡
	Moderate Upwards Far	0.035	0.051			0.035	MP7 ‡
IE_SE_100_0600 Upper Suir Estuary	High (S) None Far	0.006	0.019	535.9	0.0002	0.006	‡
	High (W) None Near	0.023	0.019			0.023	
IE_SE_100_0550 Middle Suir Estuary	High (S) Upwards Near	0.029	0.023	2618.7	0.0010	0.030	‡
	Good (W) Downwards Far	0.037	0.053			0.038	

IE_SE_100_0500 Lower Suir Estuary (Little Island - Cheekpoint)	High (S) Upwards Near	0.026	0.023	2648.9	0.0010	0.027	‡*
	Good (W) Downwards Near	0.053	0.053			0.054	‡
IE_SE_100_0100 Barrow Suir Nore Estuary	High (S) Upwards Far	0.019	0.020	3752.2	0.0004	0.020	‡
	Good (W) None Far	0.045	0.042			0.046	‡
IE_SE_100_0000 Waterford Harbour	High (S) Downwards Far	0.005	0.019	3851.9	0.0003	0.006	‡
	High (W) Downwards Far	0.020	0.019			0.020	‡
IE_SE_050_0000 Eastern Celtic Sea (HAs 13;17)	*Good*	*0.033*	*0.036*	*4716.3*	*0.0000*	*0.033*	‡

‡ Load from WWTP / SWO following treatment added.

* Trends are Statistically Significant.

S = Summer monitoring period, W = Winter monitoring period

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

MITIGATION OPTION – None required

RAG STATUS – GREEN

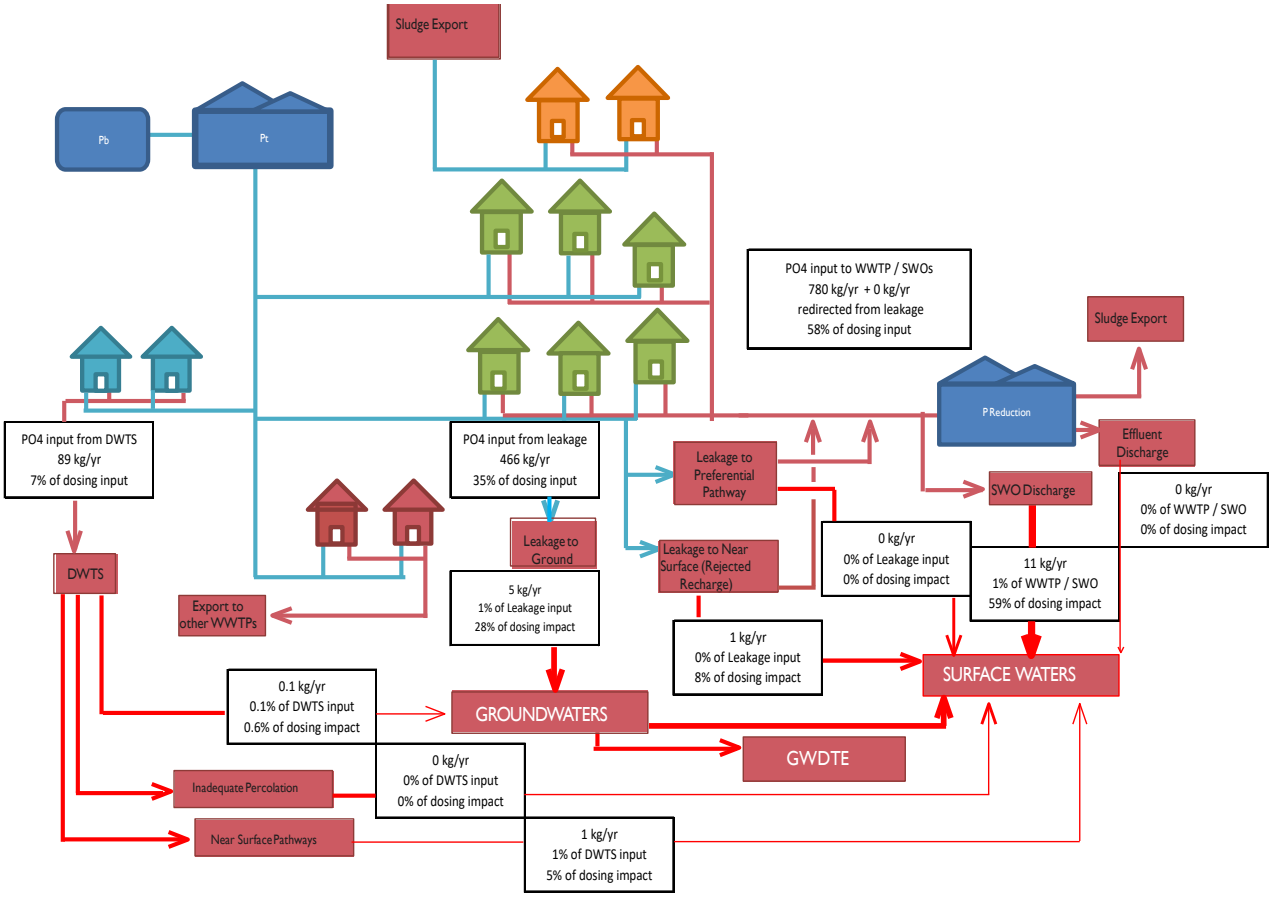
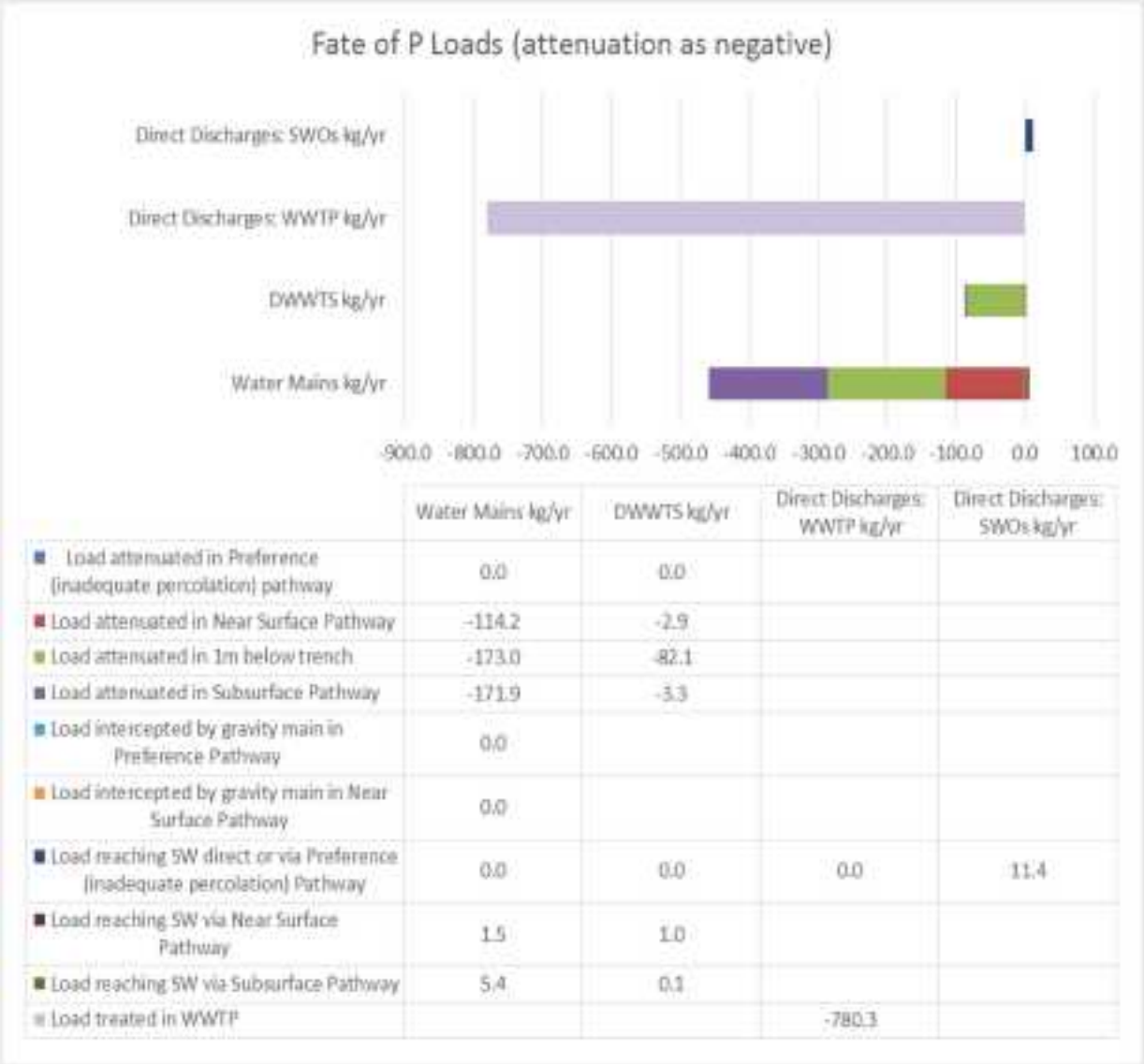


Figure 1 – Source Pathway Receptor model for Thurles WTP Regional WSZ illustrating key sources and pathways to the associated WSZs.



	Water Mains kg/yr	DWWTS kg/yr	Direct Discharges: WWTP kg/yr	Direct Discharges: SWOs kg/yr
Load attenuated in Preference (inadequate percolation) pathway	0.0	0.0		
Load attenuated in Near Surface Pathway	-114.2	-2.9		
Load attenuated in 1m below trench	-173.0	-82.1		
Load attenuated in Subsurface Pathway	-171.9	-3.3		
Load intercepted by gravity main in Preference Pathway	0.0			
Load intercepted by gravity main in Near Surface Pathway	0.0			
Load reaching SW direct or via Preference (inadequate percolation) Pathway	0.0	0.0	0.0	11.4
Load reaching SW via Near Surface Pathway	1.5	1.0		
Load reaching SW via Subsurface Pathway	5.4	0.1		
Load treated in WWTP			-780.3	

Figure 2 – Fate of orthophosphate loads modelled for Thurles WTP impacting on Suir_080 [IE_SE_16S021100] due to dosing by source type, indicating levels of attenuation in pathways and relative impact on the surface water receptor.