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28th February 2017.

IW-ER-LT0327

Dear Karen,

**RE: Youghal Waste Water Discharge Licence : Technical Amendment Application
D0139-01**

The Agency issued a Wastewater Discharge Licence for the Youghal Agglomeration (D0139-01) on the 13th June 2012. Irish Water now requests a Technical Amendment under Section 33 (1) of the Waste Water Discharge (Authorisation) Regulations 2007, as amended, to alter *Schedule A.1 Primary Waste Water Discharge, A.2 Secondary Waste Water Discharge, A.3 Discharges to be discontinued, A.4 Storm Water Overflows, Schedule B and Schedule C.1 Improvement Programme for Primary Discharge*:

Irish Water has had regard to the EPA's publication *EPA Guidance for Irish Water on Requests for Alterations to a Waste Water Discharge Licence or Certificate of Authorisation* in compiling this submission for a Technical Amendment.

Currently there is no wastewater treatment plant servicing the Youghal agglomeration and wastewater is discharged to the lower Blackwater Estuary via three main outfalls (SW000, SW002 and SW003). A new wastewater treatment plant is due to be commissioned and operational by the 30th November 2017. The construction of the proposed primary discharge outfall at 210852E, 078125N (SW001) has been delayed due to legal issues. Irish Water is therefor applying to the Agency to seek authorisation for the discharge of treated wastewater via the existing discharge point SW000, in order to permit the operation of the new WwTP and cease discharge of untreated wastewater.

Irish Water plan to construct and make operational the proposed primary discharge point SW001 once the legal issues are concluded.

Impact of the proposed change.

In 2009 UCC were commissioned to undertake modelling of the impact of the treated wastewater discharge from the proposed WWTP primary outfall. In 2016 Irish Water commissioned UCC to review the existing model to examine a number of outfall scenarios. The study included remodelling the existing scenario (no treatment) in order to provide a new baseline for the Blackwater Estuary using the latest EPA monitoring data.

In addition the following scenario (treatment + new outfall) and an interim scenario (treatment + discharge via Dunnes Park outfall) were modelled for comparison.

Key findings:

- The model shows the EQS values are achieved for Lower Blackwater Estuary for both the interim and proposed final scenarios;
- The model shows a significant improvement in E-Coli and Intestinal Enterococci concentrations for both the interim and proposed final scenarios at Youghal, Claycastle and Redbarn Beaches;
- The general conclusion of modelling exercise is that the interim discharge yields pollutant concentrations of a similar concentration to the proposed discharge location with both interim and proposed discharge scenarios yielding significantly lower pollutant concentrations than the existing situation.

A screening report for Appropriate Assessment was undertaken in relation to SW000 that determined that a Stage 2 Appropriate Assessment is not required.

The receiving waterbody, Lower Blackwater Estuary, is currently classified as achieving *Moderate* status under the Water Framework Directive. The current river Basin Management Plan has set a target date of 2021 to achieve good status.

Requested Technical Amendment

Irish Water requests that the following amendments are made to Schedule A, B and C to read as follows:

A.1 Primary Waste Water Discharge: (Applies to both SW000 and SW001)

Change from:

Note 1: Emission limit values shall apply until 31st December 2015 or until completion of the proposed WWTP (whichever is sooner).

Change to:

Note 1: Emission limit values shall apply until construction of proposed primary outfall (SW001) at 210852E, 078125N, or an alternative location as may be agreed by the Agency.

A.2 Secondary Waste Water Discharge: (Applies to both SW002 and SW003)

Change from:

Note 1: Discharge as secondary discharge shall cease on or before 31st December 2015.

Note 2: Emission limit values shall apply until 31st December 2015 or until completion of the proposed WWTP (whichever is sooner).

Change to:

Note 1: Discharge as secondary discharge shall cease on or before 30th November 2017.

Note 2: Emission limit Values for SW002 and SW003 shall apply until operation of the proposed WWTP.

A.3 Discharges to be discontinued:

Discharge Point Code	Location & Change in Classification	Name of Receiving Water	Discharge shall cease or change on or before
SW000	Dunn's Park Discharge to cease as Primary Discharge and to operate as a SWO	Lower Blackwater Estuary	On construction and commissioning of proposed primary outfall (SW001)
SW002	Paxe's Lane Discharge as a Secondary Discharge to cease and discharge point to operate as an Emergency Overflow	Lower Blackwater Estuary	30/11/2017
SW003	Foxhole Discharge as a Secondary Discharge to cease and discharge point to be decommissioned	Lower Blackwater Estuary	30/11/2017
SW007	Dunn's Park Discharge as a SWO to cease and discharge point to operate as an Emergency Overflow	Lower Blackwater Estuary	31/12/2019
SW008	Foxhole Discharge as a SWO to cease and discharge point to operate as an Emergency Overfla	Lower Blackwater Estuary	30/11/2017

SW009	<i>Kilcoran Discharge as a SWO to cease and discharge point and discharge point to operate as an Emergency Overflow</i>	<i>Youghal Bay</i>	<i>30/11/2017-- Note Convert to Emergency Overflow now.</i>
SW010	<i>Summerfield B Discharge as a SWO to cease and discharge point to be decommissioned</i>	<i>Youghal Bay</i>	<i>30/11/2017</i>

A.4 Storm Water Overflows,

Change from:

Note 2: To operate as a SWO on or before 31st December 2015.

Change to:

Note 2: to operate as a SWO after the construction and commissioning of proposed primary outfall (SW001).

B.1 Monitoring of Primary Waste Water Discharge

Change from:

Note 1: The monitoring requirements of this schedule shall only apply after 31st December 2015 or upon completion of the proposed WWTP, whichever is the sooner.

Change to:

Note 1: The monitoring requirements of this schedule shall only apply to discharge point SW000 until such time that the proposed primary outfall at SW001 is operational and then shall apply solely to discharge point SW001.

(Propose to move the note to the "Primary Discharge Point Code: SW001)

C. 1 Improvement Programme for Primary Discharge

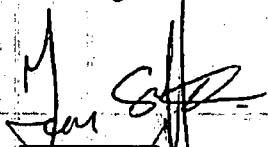
Proposed to amend as follows:

Specified Improvement	Completion date
New wastewater treatment plant	30/11/2017
Cease secondary discharges in the agglomeration.	As A.3 above
Upgrade of drainage network	31/12/2017.
Installation of a new pumping station at Green Park	30/11/2017

Please find enclosed:

1. Appropriate Assessment Screening

Best Regards,



Dr. Tom Stafford
Environmental Regulation Manager

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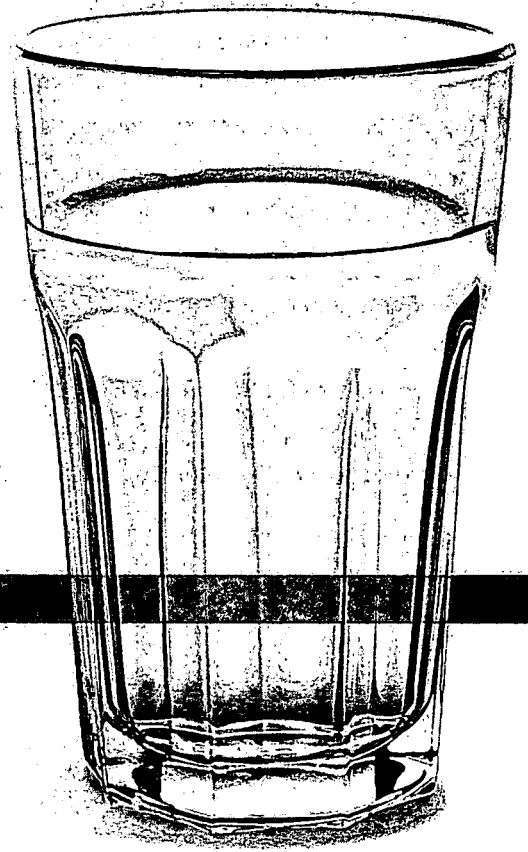
Appendix 1. Appropriate Assessment Screening

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Irish Water Report

Appropriate Assessment Screening for the relocation of a
discharge point from Youghal WwTP

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Introduction

This report provides an Appropriate Assessment (AA) Screening for the temporary relocation of the primary discharge point (SW001) for Youghal WwTP to an existing discharge point (SW000). The proposed relocation forms part of a proposed technical amendment to the existing discharge license for Youghal (D0139-01). It assesses whether the proposed relocation of the discharge point, which will discharge tertiary and UV treated water, is likely to have significant effects on a Natura 2000 Site(s) in view of best scientific knowledge and the conservation objectives of the site(s). Natura 2000 Sites are those identified as sites of European Community importance designated as Special Areas of Conservation under the Habitats Directive or as Special Protection Areas under the Birds Directive.

This report follows the guidance for AA published by the Environmental Protection Agency's (EPA) 'Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)' (EPA, 2009); and takes account of the Department of the Environment, Heritage and Local Government's guidelines 'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities' (DoEHLG, 2009) and Circular L8/08 'Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments' (DoEHLG, 2008).

This Screening for Appropriate Assessment was carried out by a qualified ecologist working for Irish Water.

Legislative Context

The 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.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect Natura 2000 sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment (AA):

Any plan or project not directly connected with or necessary to the management of the [Natura 2000] 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 [Natura 2000] 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.

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Methodology

Guidance Followed

Both EU and national guidance exists in relation to Member States fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this AA Screening has had regard to the following guidance:

- Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007). Environmental Protection Agency, (EPA, 2009).
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of Environment, Heritage and Local Government, (DoEHLG, 2010).
- Circular L8/08 – Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments. Department of Environment, Heritage and Local Government, (DoEHLG, 2008).
- Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg, (EC, 2000a).
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg, (EC, 2000b).
- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Brussels (EC, 2001).
- 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. Office for Official Publications of the European Communities, Luxembourg, (EC, 2007).
- Nature and biodiversity cases: Ruling of the European Court of Justice. Office for Official Publications of the European Communities, Luxembourg (EC, 2006).
- Marine Natura Impact Statements in Irish Special Areas of Conservation: A working document, National Parks and Wildlife Service, Dublin (NPWS, 2012).
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No.477 of 2011).

- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission (EC, 2013).

Stages Involved in the Appropriate Assessment Process

Stage 1: Screening / Test of Significance

This process identifies whether the WwTP discharge point relocation is directly connected to or necessary for the management of a Natura 2000 Site(s); and identifies whether the discharge point relocation is likely to have significant impacts upon a Natura 2000 Site(s) either alone or in combination with other projects or plans.

The output from this stage is a determination for each Natura 2000 Site(s) of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2.

Stage 2: Appropriate Assessment

This stage considers the impact of the WwTP discharge point relocation on the integrity of a Natura 2000 Site(s), either alone or in combination with other projects or plans, with respect to (1) the site's conservation objectives; and (2) the site's structure and function and its overall integrity. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts

The output from this stage is a Natura Impact Statement (NIS). This document must include sufficient information for the EPA to carry out the appropriate assessment. If the assessment is negative, i.e. adverse effects on the integrity of a site cannot be excluded, then the process must consider alternatives (Stage 3) or proceed to Stage 4.

Stage 3: Assessment of Alternatives

This process examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 Site. This assessment may be carried out concurrently with Stage 2 in order to find the most appropriate solution. If no alternatives exist or all alternatives would result in negative impacts to the integrity of the Natura 2000 Sites then the process either moves to Stage 4 or the project is abandoned.

Stage 4: Assessment Where Adverse Impacts Remain

An assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

Stage 1: Screening / Test of Significance

In complying with the obligations under Article 6(3) and following the appropriate guidelines, this AA Screening has been structured as a stage by stage approach as follows:

- Description of the project;
- Identification of Natura 2000 sites potentially affected;
- Identification and description of individual and cumulative impacts likely to result;
- Assessment of the likely significance of the effects on the Natura 2000 site;
- Exclusion of sites where it can be objectively concluded that there will be no significant effects; and
- Screening conclusion.

With regard to the Screening process the DoEHLG (2010) Guidance on Appropriate Assessment Screening states the following:

"The task of establishing whether the plan or project is likely to have an effect on a Natura 2000 site or sites is based on a preliminary impact assessment using available information and data, including that outlined above, and other available environmental information (e.g. water quality data), supplemented as necessary by local site information and ecological surveys. This is followed by a determination of whether there is a risk that the effects identified could be significant."

If the effects identified are determined to be potentially significant, then the project is Screened in for a Stage 2 Appropriate Assessment.

Screening

Background to the Project

Background information on the ongoing Youghal WwTP project is provided, followed by a description of the proposed discharge point relocation.

The Youghal WwTP Project

The Youghal WwTP and network upgrade project is currently under construction. The WwTP was granted planning in 2001 by An Bord Pleanála (Atkins McCarthy, 2001¹). Further to planning approval a discharge licence was granted by the EPA in 2012, and a foreshore licence for relevant works was granted in 2013.

A site selection process identified the optimal location for the WwTP and the discharge point, and these locations were assessed for potential construction and operational impacts in the EIS submitted for planning, and in the reports submitted for the discharge and foreshore licence.

Selection of the Primary Discharge Point

Two discharge points were initially considered – one within Youghal Estuary and a longer sea outfall outside of the estuary in Youghal Bay. Factors considered when selecting the preferred discharge point were UWWT standards, Bathing water quality (Youghal main beach and Claycastle outside of Youghal Estuary) and Shellfish water quality in Youghal Bay. The preferred option based on these considerations was an outfall within Youghal estuary (SW001).

As described in Section 2.4.2 of the 2001 EIS, the discharge point selected was to be located in the vicinity of Ferry Point. The EIS noted:

"There is a large trench in the area of Ferry Point and extends for some distance down stream. This is likely to be as a result of the narrowing of the estuary due to the spit at Ferry Point. Discharging to this location would provide significant volumes of water to dilute the effluent, even at low tide, and due to increased currents at this location would provide good mixing and dispersion in the receiving waters."

A dye trace and drogoue tracking study was conducted in the Blackwater estuary, which provided more detailed and up to date information on water current directions and velocity. Details of his survey are given in Appendix D of the EIS (Atkins, 2001). The report noted that dispersion and dilution characteristics in the estuary appeared to be good, with low concentrations of dye recorded before the dye reached the estuary mouth on the ebb releases and Youghal bridge on the flood releases.

Cork County Council carried out a CORMIX model to assess the bacteriological affects of a secondary treated discharge (at the proposed outfall location) on receiving water quality and found that bacteriological standards at relevant bathing and shellfish locations² could be met

¹ Atkins McCarthy (2001) Youghal Main Drainage Scheme Environmental Impact Statement. Report prepared for Youghal Urban District Council. September 2001.

² When the planning and licensing documents were prepared Youghal Bay (outside the estuary from Knockadoon to Knockavery) was not classified as a shellfish production area but a precautionary approach was taken as it had been a production area in the past. Currently in 2017, it is listed as a production area.

(2001 EIS Appendix D). Updated bacteriological modelling was carried out in 2009, with additional data used to generate a 'worst case scenario' of no wind, low river flows and maximum discharges from the WwTP. This model concluded that disinfection of the effluent would ensure Blue Flag water quality standards at beaches in proximity would be achieved for all river flow and effluent discharge, at all stages of the tide (AA Report dated November 2011, Chapter 4. EPA Regulation 18 – Reply No. 3.).

Proposed level of treatment

The 2001 EIS notes that secondary treatment with nutrient removal was required at Youghal in order to meet the requirements of the UWWT Regulations 2001. The Blackwater Estuary downstream of Dromana Ferry, to near East Point, Youghal Harbour is designated as a "Sensitive Area" in Part 2 of the third schedule under the UWWT Regulations, 2001 and therefore nutrient reduction (Clauses 4(2)(a) and 4(3)) for one or both parameters (Nitrogen and Phosphorus) is required.

In EPA Regulation 18 – Reply No. 1, Cork County Council stated under 'Assessment of Impacts of Waste Water Discharges on Receiving Waters' (Items 7 and 8) that, based on the level of treatment and the results of modelling of relevant substances for transitional waters, the discharge would comply with the European Communities (Surface Waters) Regulations 2009 (SI. No. 272 of 2009) and the mixing zone would be confined to the immediate vicinity of the discharge.

Appropriate Assessment submitted to the EPA for the Ferry Point Outfall

The latest version (Nov 2011 AA) states concludes:

Based upon the above assessments and adherence to the Effluent Quality Standards to be imposed on the operator it is not anticipated that the proposed development would negatively impact on the conservation objectives of the Blackwater River SAC.

There are no adverse impacts identified and no mitigation measures proposed that relate the treatment/discharge, with the level of treatment and dispersion/dilution available considered sufficient to avoid any negative impact.

Project Description

The Project under consideration in this Appropriate Assessment Screening is the relocation of the primary discharge point from the proposed Ferry Point outfall (SW001) to Dunn's Park outfall (SW000).

The Ferry Point outfall is currently listed as the primary discharge point in the Waste Water Discharge Licence for Youghal. While the WwTP is under construction, the construction of the outfall at Ferry Point (SW001), which was due to operate from 31/12/2015, has been delayed due to a legal case. In order to ensure that the WwTP can start operating once construction is complete, it will be necessary to use one of the existing discharge points on an interim basis to discharge the treated effluent. Due to the location of the network, the only option is to use the existing Dunns Park outfall (SW000) to discharge the treated effluent. Currently, untreated effluent from the agglomeration is discharged primarily from the Dunn's Park and Paxes Lane (SW002) outfalls, with 60% through the former and 40% through the latter. It is anticipated that once the legal case is concluded, that the proposed Ferry Point discharge point will be constructed and used as the primary discharge point (for 100% of the treated effluent) as planned.

In order to inform this Screening for Appropriate Assessment, revised water quality modelling was undertaken to determine the implications for water quality of discharging 100% of the treated effluent from the Dunn's Park outfall relative to the existing scenario, and the proposed Ferry Point outfall (SW001 in current licence).

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Description of the Receiving Environment and Monitoring Results

EPA 2014 monitoring data is provided below. Station BR220 is located north of the existing Dunn's park outfall in the centre of the channel west of red bank. Station BR230 is located just south of the existing Paxes Lane outfall.

Table 1.0: EPA 2014 Monitoring Data Youghal Estuary

Station	Date Surveyed	Salinity	DO%	BOD	PO ₄ ²⁻	chl _a	DIN
SW EQS			80-120	≤4.0 ²	≤40µg/l (35 psu), ≤60µg/l (0-17 psu) ³	≤10µg/l median, ≤20µg/l 90percentile	0.25-2.6 mg/l ⁴
BR220B	04/03/2014	25.78	95.5	-	43	5.4	0.83
BR220S	04/03/2014	16.46	93.7	-	34	3.2	1.887
BR220B	10/06/2014	27.97	105.8	1.3	12	6.3	0.554
BR220S	10/06/2014	24.61	106.4	1.1	12	6.7	0.898
BR220B	08/07/2014	33.21	113.3	2.9	7	12	0.1
BR220S	08/07/2014	30.11	118.6	3.2	8	18	0.25
BR220BR	02/09/2014	28.86	110.8	-	14	2.9	0.441
BR220C	02/09/2014	31.56	93.5	-	15	2.1	0.183
BR220C	02/09/2014	31.13	91	-	15	2.1	0.183
BR220SR	02/09/2014	26.09	112.1	-	10	1.8	0.641
BR230B	04/03/2014	28.07	95.4	-	39	10.1	0.835
BR230S	04/03/2014	23.36	94.7	-	35	3.5	1.324
BR230B	10/06/2014	33.65	96.1	-	10	7.7	0.077
BR230S	10/06/2014	27.26	109.2	-	25	8.6	0.575
BR230B	08/07/2014	34.05	115.5	1.5	2.5	4.3	0.025
BR230S	08/07/2014	32.11	121.1	2	6	11.5	0.144
BR230B	02/09/2014	34.03	92.4	0.5	14	1.8	0.121
BR230BR	02/09/2014	32.04	101.8	-	13	3.1	0.228
BR230S	02/09/2014	32.87	94	0.5	13	1.6	0.188
BR230SR	02/09/2014	27.32	111	-	11	2.9	0.555

Note 1: Sample location and sample type. S= surface sample. B= bottom sample. C= composite sample, equal volume surface and bottom. R= return sample, second sample at same location per sampling visit.

Note 2: Value for transitional waters.

Note 3: Ortho-P compared to EQS limit value for Molybdate Reactive Phosphorus (MRP) for transitional water body. Note that Orthophosphate measured on unfiltered samples may give a slightly higher reading than MRP. Linear interpolation to be used to establish limit value for water bodies between these salinity levels.

Note 4: The Surface Water Regulations specify standards for Dissolved Inorganic Nitrogen (DIN) in seawater (34.5psu) as follows: Good status <0.25mg/l; and <2.6mg/l (Good status) for 0 psu salinity water, with linear interpolation between these salinity levels.

Additional monitoring data is available for 2015 for stations upstream and downstream of the discharges (Table 2.0). The upstream samples are taken from Youghal Bridge, while the downstream samples are taken near the Lifeboat station at the mouth of the estuary.

Table 2.0: 2015 Monitoring Data Youghal Estuary

Date Surveyed	DO %	BOD	Orthophosphate	Ammonia	Total Nitrogen
SW EQS	80-120	≤4.0 ²	≤0.04mg/l (35 psu), ≤0.06mg/l (0-1.7 psu) ³		
Upstream @ Youghal Bridge (IW38003144BR2001)					
10/03/2015	95.8	0.5	0.025	0.032	1.4
07/05/2015	99	1.3	0.024	0.06	3.71
22/07/2015	-	1.5	0.024	0.082	1.86
21/10/2015	75	1.1	0.016	0.059	1.1
Downstream @ Mouth of estuary(IW38003144BR2002)					
10/03/2015	100.9	0.5	0.021	0.033	0.5
07/05/2015	92.8	0.5	0.028	0.098	1.66
22/07/2015	-	1.3	0.014	0.035	0.55
21/10/2015	76.5	0.5	0.009	0.054	0.48

The data demonstrates that the water quality in the receiving water body is in compliance with Schedule 5 of the European Communities Environmental Objectives (Surface Water) Regulations 2009 (S.I. No. 272 of 2009) for relevant parameters.

With regard to Water Framework Directive (WFD) status, the Youghal estuary currently (2010-2015) has Moderate ecological status overall, with Moderate 'biological status or potential' and High 'supporting chemistry conditions'. The requirement to restore Good status for this waterbody has been extended to 2021. The transitional waterbody of Youghal estuary, and the coastal waters of Youghal Bay are classed as Unpolluted by the EPA (2010-2012 Surface Water Quality).

Phytoplankton growth in the estuary is limited by Phosphorus and light levels, with a potential shift towards Nitrogen limitation in the summer months when salinity increases (O'Boyle, 2015).³ Ni Longphuirt et al (2015)⁴ identified that decreasing fertilizer application rates in the Blackwater catchment have resulted in reductions in Phosphorus concentrations in the Blackwater estuary, however Nitrogen concentrations have remained high due to the complex interaction between N and P load reductions and biochemical processes within the estuary.

³ O'Boyle, S; Wilkes, R; McDermott, G; Ni Longphuirt, S and C. Murray (2015) Factors affecting the accumulation of phytoplankton biomass in Irish estuaries and nearshore coastal waters: A conceptual model. *Estuarine, Coastal and Shelf Science* 155: 75-88

⁴ Ni Longphuirt, S; O'Boyle, S and DB Stengel (2015) *Environmental response of an Irish estuary to changing land management practices*. *Science of the Total Environment* 521/522: 388-399.

Brief Description of the Natura 2000 Sites

This section of the screening process describes the Natura 2000 sites within a 15km radius of the original and proposed discharge locations. A 15km buffer zone has been chosen as a precautionary measure, to ensure that all potentially affected Natura 2000 sites are included in the screening process, which is in line with Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities produced by the Department of the Environment, Heritage and Local Government.

Table 3.0 list the SACs that are within 15km of the WwTP discharge location, while Table 4.0 lists the SPA's, and Figure 1.0 shows their location in relation to the Youghal WwTP discharge locations. The qualifying interests/special conservation interests of each of the identified Natura 2000 Sites is also provided.

Table 3.0: SAC's located within 15km of the Youghal WwTP discharge

Site Code	Site Name	Qualifying Habitats	Qualify/Species
002170	Blackwater River (Cork/Waterford) SAC	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Perennial vegetation of stony banks [1220]</p> <p>Salicornia and other annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) [1330]</p> <p>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]</p> <p>Water courses of plain to montane levels with the <i>Ranuncion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation [3260]</p> <p>Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0]</p>	<p><i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029]</p> <p><i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092]</p> <p><i>Petromyzon marinus</i> (Sea Lamprey) [1095]</p> <p><i>Lampetra planeri</i> (Brook Lamprey) [1096]</p> <p><i>Lampetra fluviatilis</i> (River Lamprey) [1099]</p> <p><i>Alosa fallax fallax</i> (Twaite Shad) [1103]</p> <p><i>Salmo salar</i> (Salmon) [1106]</p> <p><i>Lutra lutra</i> (Otter) [1355]</p> <p><i>Trichomanes speciosum</i> (Killarney Fern) [1421]</p>
000077	Ballymacoda (Clonpreist and Pillmore) SAC	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Salicornia and other annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) [1330]</p> <p>Mediterranean salt meadows</p>	

Site Code	Site Name	Qualifying Habitats	Qualify Species
		(<i>Juncetalia maritimi</i>) [1410]	
002123	Ardmore Head SAC	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]	

Table 4.0: SPAs located within 15km of the Youghal WwTP discharge

Site Code	Site Name	Special Conservation Interests
004028	Blackwater Estuary SPA	<p>Wigeon (<i>Anas penelope</i>) [A050]</p> <p>Golden Plover (<i>Pluvialis apricaria</i>) [A140]</p> <p>Lapwing (<i>Vanellus vanellus</i>) [A142]</p> <p>Dunlin (<i>Calidris alpina</i>) [A149]</p> <p>Black-tailed Godwit (<i>Limosa limosa</i>) [A156]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Curlew (<i>Numenius arquata</i>) [A160]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Wetland and Waterbirds [A999]</p>
004023	Ballymacoda Bay SPA	<p>Wigeon (<i>Anas penelope</i>) [A050]</p> <p>Teal (<i>Anas crecca</i>) [A052]</p> <p>Ringed Plover (<i>Charadrius hiaticula</i>) [A137]</p> <p>Golden Plover (<i>Pluvialis apricaria</i>) [A140]</p> <p>Grey Plover (<i>Pluvialis squatarola</i>) [A141]</p> <p>Lapwing (<i>Vanellus vanellus</i>) [A142]</p> <p>Sanderling (<i>Calidris alba</i>) [A144]</p> <p>Dunlin (<i>Calidris alpina</i>) [A149]</p> <p>Black-tailed Godwit (<i>Limosa limosa</i>) [A156]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Curlew (<i>Numenius arquata</i>) [A160]</p> <p>Redshank (<i>Tringa totanus</i>) [A162]</p> <p>Turnstone (<i>Arenaria interpres</i>) [A169]</p> <p>Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179]</p> <p>Common Gull (<i>Larus canus</i>) [A182]</p> <p>Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]</p> <p>Wetland and Waterbirds [A999]</p>

Site Code	Site Name	Special Conservation Interests
004022	Ballycotton Bay SPA	<p>Teal (<i>Anas crecca</i>) [A052]</p> <p>Ringed Plover (<i>Charadrius hiaticula</i>) [A137]</p> <p>Golden Plover (<i>Pluvialis apricaria</i>) [A140]</p> <p>Grey Plover (<i>Pluvialis squatarola</i>) [A141]</p> <p>Lapwing (<i>Vanellus vanellus</i>) [A142]</p> <p>Black-tailed Godwit (<i>Limosa limosa</i>) [A156]</p> <p>Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157]</p> <p>Curlew (<i>Numenius arquata</i>) [A160]</p> <p>Turnstone (<i>Arenaria interpres</i>) [A169]</p> <p>Common Gull (<i>Larus canus</i>) [A182]</p> <p>Lesser Black-backed Gull (<i>Larus fuscus</i>) [A183]</p> <p>Wetland and Waterbirds [A999]</p>
004192	Helvick Head to Ballyquin SPA	<p>Cormorant (<i>Phalacrocorax carbo</i>) [A017]</p> <p>Peregrine (<i>Falco peregrinus</i>) [A103]</p> <p>Herring Gull (<i>Larus argentatus</i>) [A184]</p> <p>Kittiwake (<i>Rissa tridactyla</i>) [A188]</p> <p>Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346]</p>

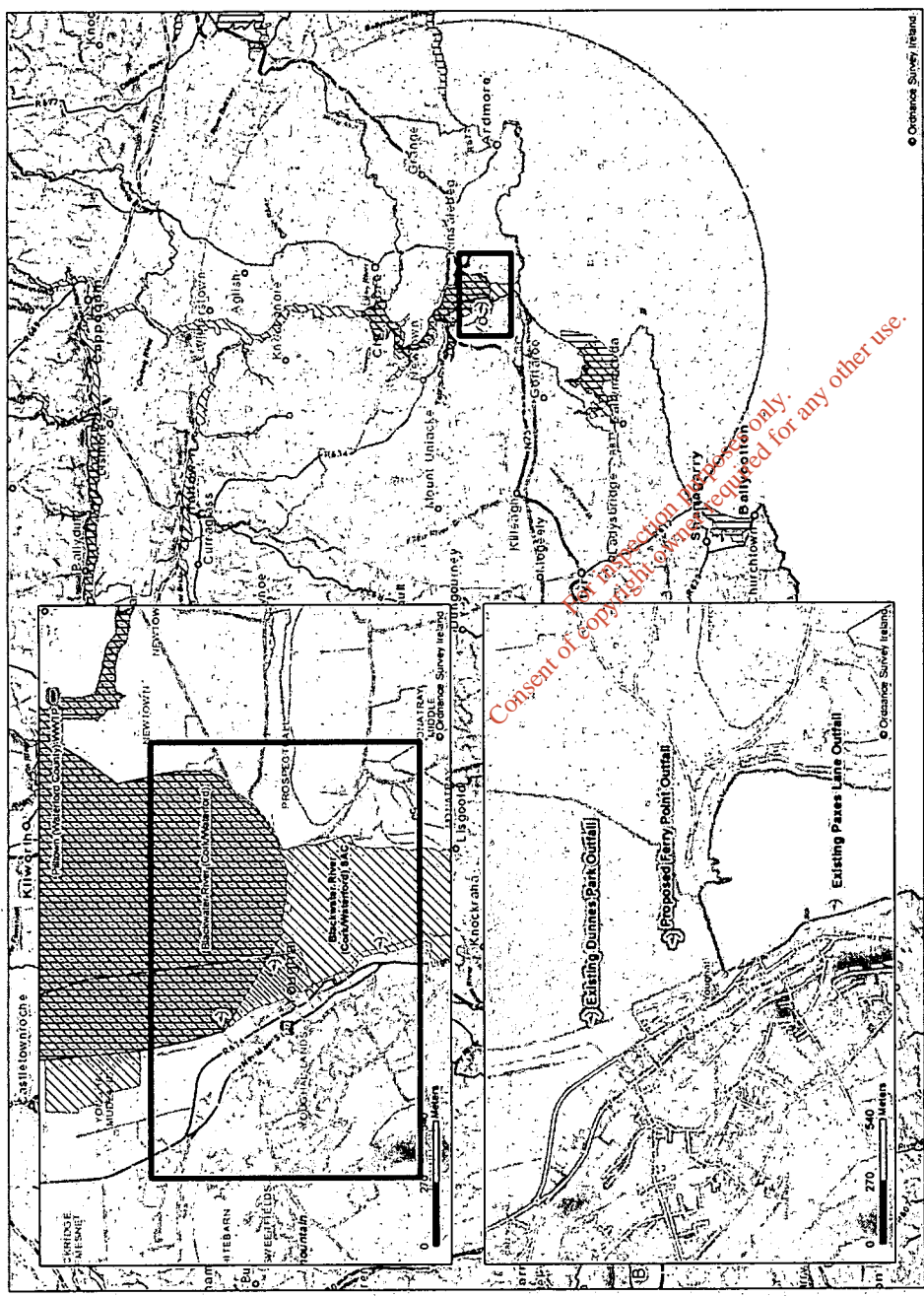
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Legend

- Proposed Ferry Point Outfall
- Existing Dunnes Park Outfall
- Existing Pases Lane Outfall
- Buffer 15 km from Dunnes Park Outfall
- Special Area of Conservation
- Special Protection Area
- Chestnut Special Area of Conservation & Protection Areas
- Blackwater River (Cont/Waterford)
- SPA
- Blackwater River (Cont/Waterford)
- SAC

0	1.5	3	6	Km
Geographic Position: 2015 Irish Grid				
Projection: Transverse Mercator				
Scale @ A3:	1:200,000			
Drawing No.:	M-ACC-2118-432			
Drawn By:	MBS			
Checked By:	FR			
Approved By:	MH			
Drawn Date:	23/1/2018			
Checked Date:	23/1/2018			
Approved Date:	30/1/2018			



Natura 2000 Sites
within 15k of Dunnes Park Outfall
Co. Cork

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Figure 1: Natura 2000 Sites

Potential Impacts of the Primary Discharge Relocation and Likely Significant Effects on Natura 2000 Sites

The purpose of this section of the screening is to examine the possibility that the proposed primary discharge relocation to an existing discharge point, either individually or in combination with other plans and projects, may result in significant negative effects on the Conservation Objectives and the integrity of the Natura 2000 Sites identified.

The most apparent potential risk to a Natura 2000 Site(s) from a WwTP discharge is to the water quality of the receiving environment, and the assessment therefore needs to consider whether the receiving environments water quality has the potential to interact with the qualifying interests of the Natura 2000 Sites identified. Using the source-pathway-receptor model, only the qualifying interests and special conservation interests of the Blackwater River (Cork/Waterford) SAC and Blackwater Estuary SPA were considered to have potential connectivity to Dunn's Park discharge point. Sites at a further distance are not considered further in this assessment as they were either unconnected, or they are at a sufficient distance such that significant dilution/dispersion is considered available in intervening coastal waters.

The Conservation Objectives of these relevant sites were reviewed as part of this Screening Assessment:

- NPWS (2012) Conservation Objectives: Blackwater River (Cork/Waterford) SAC 002170. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2012) Conservation Objectives: Blackwater Estuary SPA 004028. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

The relocation of the discharge point is not directly connected with or necessary to the management of the site for nature conservation.

Potential Impacts on Water Quality

Revised water quality monitoring was undertaken using Mike21 Software (Results provided in Appendix A). This included the remodelling of the existing scenario (no treatment) to provide a new baseline using the latest EPA monitoring data to provide inputs to the Blackwater Estuary. The proposed scenario (treatment + new outfall SW001) and an interim scenario (treatment + discharge via Dunnes Park outfall SW000) were modelled for comparison.

The three scenarios modelled are outlined below:

- Scenario 1: The Existing 2017 scenario – inputs to this model were based on latest available municipal and catchment load figures. Untreated wastewater discharged from Dunnes Park outfall(SW000) and Paxes Lane outfall (SW002).
- Scenario 2: The Proposed Outfall scenario – Future loads discharged from the new WWTP via the proposed outfall at Ferrypoint (SW001). Treated wastewater.
- Scenario 3: Interim Option 1 (Dunnes Park) - Loads discharged from the new WWTP via the existing outfall at Dunnes Park (SW000). Treated wastewater.

The key findings were as follows:

- The model shows Surface Water Regulation EQS values are achieved for Lower Blackwater Estuary for both interim and proposed scenarios.
- The model shows dramatic improvement in E-Coli and Intestinal Enterococci concentrations to excellent standard for both interim and proposed scenarios at Youghal, Claycastle and Redbarn Beaches
- The general conclusion of modelling exercise is that the interim discharge yields pollutant concentrations of a similar order of magnitude as the proposed discharge location with both interim and proposed discharge scenarios yielding significantly lower pollutant concentrations than the existing situation.

Potential Impacts on Qualifying Interests of the SAC and SPA

The existing untreated discharge (SW000) has not had observable adverse effects on the nearest designated habitats – 'Mudflats and sandflats' and 'Estuaries'. The habitats were surveyed as part of the EIS studies in 2001, and resurveyed in 2010 as part of NPWS conservation assessment surveys⁵. The area around Dunn's Park outfall comprises 'sand and mixed sediment with polychaetes and crustaceans community complex' extending into 'sand and mixed sediment with polychaetes and crustaceans community complex'. These are typical estuarine habitats and found throughout the estuary. Neither benthic study identified any specific habitat biotope or signs of habitat deterioration in the vicinity of any of the outfalls from the existing untreated discharges. It is also important to note that Mudflats and sandflats and Estuaries are currently at Favourable conservation status in the SAC.

The Annex II species that move through the estuary are salmon, river lamprey, sea lamprey and twaite shad. The relocation of a treated discharge point does not have the potential to impact these species as the relocation will result in no deterioration in water quality. There are records of otter from the estuary (NBDC website) where they are likely to forage in intertidal habitats. As water quality will not be affected, there is no potential for the relocation of the discharge point to impact otter either directly, or indirectly due to reduced food sources. The estuary is also designated as an SPA for a range of wetland bird species, chiefly waders, and the wetlands that support them. As water quality will not be affected by the discharge relocation, there is no potential to impact on the wintering bird species for which the SPA is designated, either directly, or indirectly due to reduced or altered food sources.

It is noted that the Natura 2000 data form for the SAC identifies the key high pressures as fertilisation, moving/cutting grass and grazing. 'Discharges - Disposal of household and recreational waste' is listed as a low threat/pressure, which is likely to refer to the current untreated discharges.

The relevant habitats have maintained favourable conservation status despite untreated waste being discharged into the estuary. The current proposal, which involves the use of one of the current outfalls to discharge highly-treated effluent, is therefore considered to have no potential

⁵ NPWS (2012) Blackwater River (Cork/Waterford) Site Code 2170. Conservation objectives supporting document – marine habitats. Version 1. January 2012.

to result in adverse effects to the conservation status of these habitats. While it is acknowledged that the optimal discharge point is the proposed discharge point at Ferry Point (SW001), it has been demonstrated through updated modelling that discharging the treated effluent at Dunn's Park outfall (SW000) will not cause any deterioration in water quality in the estuary relative to the proposed discharge point. This further strengthens the conclusion that the conservation objectives of the relevant habitats will be maintained.

Considering the objective information provided above, it is concluded that the discharge is not likely to significantly affect the qualifying interests of the River Blackwater (Cork/Waterford) SAC or the Blackwater Estuary SPA.

In accordance with the Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007) the relocation of the Youghal WwTP discharge point does not have the potential to impact the relevant qualifying interests identified, and therefore will not affect the conservation objectives of the River Blackwater (Cork/Waterford) SAC or the Blackwater Estuary SPA. No significant adverse impacts on any Annex I habitat, Annex II species, or Annex I Bird Species are anticipated as a result of the discharge point relocation.

No significant adverse impacts on the qualifying interests of the remaining Natura 2000 Sites identified within 15km of the discharge point is considered likely due to lack of hydrological connection between the discharge point and the relevant terrestrial SACs and SPAs, or the dilution and dispersion provided by intervening coastal waters for remote coastal/marine SACs and SPA sites.

Potential Cumulative Impacts with other Plans and Projects in the Area

As part of Stage 1 Screening, in addition to the discharge point relocation, other relevant projects and plans in the relevant region must also be considered. This step aims to identify at this early stage any possible significant effects on the Natura 2000 Sites from the discharge point relocation in-combination or cumulative with other plans and projects. Existing plans which have been examined include:

- Cork County Development Plan 2015-2021
- Youghal Town Development Plan – Youghal Town Council 2009-2014
- Blackwater Estuary Water Management Unit Action Plan⁶
- County Cork Biodiversity Action Plan 2009-2014

The above plans have been assessed in accordance with Article 6(3) of the Habitats Directive and Part XAB of the Planning and Development Act, 2000, and are not envisaged to result in significant effects on the integrity of the Natura 2000 network. A possible future marina development is identified in the Youghal Town Development Plan, but any such development would be subject to Appropriate Assessment.

⁶ http://wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/SWRBD%20RBMP%202010/Water%20Management%20Unit%20Action%20Plans/Blackwater%20Estuary.pdf

The water quality modelling has taken full account of upstream water quality pressures in determining the predicted water quality in the estuary.

A search of Planning Applications on the Cork County Council Planning Website was undertaken for any significant developments with the potential to contribute to in-combination effects with the discharge point relocation in the Blackwater Estuary area. Numerous minor residential and commercial development have been granted or are seeking planning permission in the town, however due to their scale or location no projects with the potential to contribute to in-combination effects with the discharge point relocation were identified.

Summary of Potential Impacts and Likely Significant Effects

Table 6.0 provides a summary of the likely significant impact of the relocated discharge point on the conservation objectives of the Natura 2000 sites potentially linked to the relocated discharge points identified in Tables 4.0 and 5.0.

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Table 6.0: Potential Significant Impacts on Natura 2000 sites from the relocation of the Youghal WwTP primary discharge point

Site Name	Direct Impacts	Indirect/ Secondary	Resource Requirements (Drinking Water Abstraction Etc.)	Emissions (Disposal to Land, Water or Air)	Excavation Requirements	Transportation Requirements	Duration of Construction, Operation, Decommissioning
Blackwater River (Cork/Waterford) SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Ballymacoda (Clonpreist and Pillmore) SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Ardmore Head SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Blackwater Estuary SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Ballymacoda Bay SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Ballycotton Bay SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Helvick Head to Ballyquin SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest

Likely Changes to the Natura 2000 Site(s)

The likely changes that will arise from the relocation of the discharge point have been examined in the context of a number of factors that could potentially affect the integrity of the identified Natura 2000 Sites. Overall, it has been found that the current waste water discharge will not affect the integrity of the identified Natura 2000 Sites.

Table 7.0: Likely Affect on Natura 2000 Sites

Site Name	Reduction of Habitat Area	Disturbance to Key Species	Habitator Species Fragmentation	Reduction in Species Density	Changes in Key Indicators of Conservation Value (Water Quality, Etc.)	Climate Change
Blackwater River (Cork/Waterford) SAC	None	None	None	None	None	None
Ballymacoda (Clonpreist and Pillmore) SAC	None	None	None	None	None	None
Ardmore Head SAC	None	None	None	None	None	None
Blackwater Estuary SPA	None	None	None	None	None	None
Ballymacoda Bay SPA	None	None	None	None	None	None
Ballycotton Bay SPA	None	None	None	None	None	None
Helvick Head to Ballyquin SPA	None	None	None	None	None	None

Elements of the Project where the Impacts are Likely to be Significant

No elements of the proposed discharge point relocation are likely to cause significant impacts on NATURA 2000 Sites.

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Screening Conclusions and Statement

The likely impacts that will arise from the proposed discharge point relocation have been examined in the context of a number of factors that could potentially affect the integrity of the Natura 2000 network. None of the sites within 15km of the discharge location will be adversely affected. A finding of No Significant Effects Matrix has been completed and is presented in next section of this Screening Statement.

On the basis of the findings of this Screening for Appropriate Assessment of Natura 2000 Sites, it is concluded that the proposed temporary relocation of the primary discharge point for Youghal WwTP will not have a significant effect on the Natura 2000 network, alone or in-combination with other plans and projects, and a Stage 2 Appropriate Assessment is not required.

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Finding of No Significant Effects Report Matrix

Name of project or plan	
Name and location of Natura 2000 site	Blackwater River (Cork/Waterford) SAC; Blackwater Estuary SPA
Description of the project or plan	Relocation of primary discharge point for Youghal WwTP from the proposed Ferry point outfall SW001 (as indentified in current licence) to the interim Dunns Park outfall SW000 (current discharge point)
Is the project or plan directly connected with or necessary to the management of the site?	No.
Are there other projects or plans that together with the project or plan being assessed could affect the site?	No.
The Assessment of Significance of Effects	
Describe how the project or plan (alone or in combination) is likely to affect the European Site(s).	As Dunn's Park outfall is directly connected to the River Blackwater SAC and Blackwater Estuary SPA, the potential impacts of discharging treated effluent from this location, relative to the proposed Ferry Point outfall, need to be considered.
Explain why these effects are not considered significant.	<p>Water quality monitoring has demonstrated that there will be no deterioration in water quality due to the discharge of treated effluent from Dunns Park outfall relative to the proposed Ferry Point outfall, and that both these scenarios improve water quality relative to the current discharge of untreated waste from Dunns Park and Paxes Lane outfalls.</p> <p>The relevant habitats have maintained favourable conservation status despite untreated waste being discharged into the estuary. The current proposal, which involves the use of one of the current outfalls to discharge highly-treated waste, is therefore considered to have no potential to result in adverse effects to the conservation status of these habitats.</p> <p>Due to the lack of impact on water quality and estuarine habitats, no impact is predicted for any aquatic Annex II species of the special conservation interests of the SPA.</p>
List of agencies consulted: provide contact name and telephone or e-mail address.	N/A
Response to consultation.	N/A
Data Collected to Carry Out the Assessment	
Who carried out the assessment?	Qualified Ecologist, Irish Water

Sources of data	NPWS database; EPA database; WFD Ireland database; and Information from Irish Water.
Level of assessment completed	Desktop and Field walkover survey
Where can the full results of the assessment be accessed and viewed?	EPA
Overall Conclusion	Stage 1 Screening indicates that the relocation of the Youghal WwTP discharge will not have a significant negative impact on the Natura 2000 network. Therefore, a Stage 2 'Appropriate Assessment' under Article 6(3) of the Habitats Directive 92/43/EEC is not required.

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Appendix A - Water Quality Modelling Results

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Scenario 1 Existing Summary

Summer

	Simulation values										
	Youghal Bridge	Dunnes Park U/S	Dunnes Park D/S	Paxes Lane U/S	Paxes Lane D/S	New Outfall U/S	New Outfall D/S	Youghal Beach	Claycastle Beach	Redbarn Beach	Lower Estuary
Dissolved Oxygen [mg/l] - 95%-ile	8.98628072	8.453676521	8.406393102	8.290962875	8.285634132	8.402257593	8.276937773	8.165350968	8.09016819	7.826212038	9.006269041
Dissolved Oxygen [mg/l] - 5%-ile	7.83841699	7.720677915	7.704847496	7.674656784	7.678195552	7.705939842	7.68332087	7.673479498	7.67481873	7.640130915	8.415161903
Dissolved Oxygen [%] - 95%-ile	99.57%	104.88%	104.82%	104.98%	105.05%	104.88%	105.81%	106.60%	106.92%	112.89%	104.79%
Temperature [°C] - Mean	15.04667402	14.59692433	14.4998374	14.29922624	14.29419129	14.4920642	14.33881998	14.20004846	14.13179039	13.92306944	15.21022176
Ammonia [mg/l] - Median	0.008665831	0.008075624	0.008533241	0.007605408	0.008132086	0.008528815	0.008158012	0.008545918	0.008369242	0.005885712	0.013196242
Nitrate [mg/l] - Median	0.021385997	0.015584477	0.01468247	0.012970978	0.012967922	0.014634769	0.013587678	0.012499292	0.011975808	0.011079906	0.185626217
BOD susp [mg/l] - 95%-ile	0.072271991	0.074015297	0.07877647	0.070734023	0.074754728	0.078314832	0.067925446	0.073265823	0.0696262	0.046929536	0.092113811
BOD dis [mg/l] - 95%-ile	0.05591298	0.057023629	0.059326018	0.05298425	0.055693435	0.059167369	0.051509031	0.052335302	0.048691055	0.029381574	0.143947124
BOD sed [mg/l] - 95%-ile	0.073109998	0.070757624	0.074044333	0.064759728	0.061047609	0.073681534	0.062492337	0.072615208	0.070971901	0.052628752	0.091116841
Orthophosphate [mg/l] - Median	0.004027334	0.003696664	0.003987314	0.004054638	0.004198608	0.003992541	0.004005099	0.004301908	0.00432962	0.003720067	0.006449138
Particulate Phosphorus [mg/l] - Median	0.008797868	0.006759363	0.006771691	0.006297797	0.006458104	0.006737125	0.006533886	0.006432157	0.006320503	0.00507875	0.009062356
FaecalColi [no/100 ml] - Mean	11967.74163	12720.10226	13904.51913	11479.38315	12437.68669	13870.57711	12503.66513	13100.36562	12703.91852	6950.237572	5984.936297
TotColi [no/100 ml] - Mean	1077.292022	1146.463369	1269.184158	1040.264741	1133.957924	1266.113357	1140.846697	1199.708045	1163.442975	611.6964124	542.5621471
Enterococci [cfu/100 ml] - 95%-ile	71.417	48.123	104.855	54.387	85.743	106.659	94.374	96.926	60.006	0.051	28.312
E.coli [cfu/100 ml] - 95%-ile	324.413	235.871	520.803	251.010	412.604	502.033	443.028	496.257	353.973	0.572	125.852
TSS [mg/l] - Mean	3.799548361	3.236832268	3.1674508	2.988871161	2.990584522	3.158094446	3.021210218	2.901108565	2.836561618	2.622815402	4.619640623
Nitrite [mg/l] - Median	0.000447858	0.000387997	0.000373119	0.000369938	0.000336671	0.000372414	0.000348158	0.000330363	0.000318391	0.000299657	0.001854906
Chlorophyll-a [mg/l] - Median	0.003035225	0.002990881	0.003010038	0.003040771	0.00304563	0.003011554	0.003026919	0.003054888	0.003059464	0.003088621	0.003719875
DIN [mg/l] - Median	0.031697688	0.024140776	0.023600608	0.020752137	0.021016026	0.023474974	0.021927402	0.021748285	0.020875231	0.017305717	0.200622274
Salinity [PSU] - Mean	20.70336615	25.98507547	26.60065718	28.04092658	28.05505708	26.68088447	27.79158762	28.71003484	29.2213092	30.30466679	11.56547225

Winter

	Simulation values										
	Youghal Bridge	Dunnes Park U/S	Dunnes Park D/S	Paxes Lane U/S	Paxes Lane D/S	New Outfall U/S	New Outfall D/S	Youghal Beach	Claycastle Beach	Redbarn Beach	Lower Estuary
Dissolved Oxygen [mg/l] - 95%-ile	9.244843454	8.163790233	8.06689278	7.723954587	7.699228311	8.037862701	7.654691586	7.32719267	7.081835477	6.2131076	9.426319093
Dissolved Oxygen [mg/l] - 5%-ile	6.845395346	6.356943072	6.1990143	5.989856125	6.017025706	6.194252754	6.052402831	6.02054592	5.99726576	5.821481609	8.293562249
Dissolved Oxygen [%] - 95%-ile	108.38%	118.33%	119.75%	123.51%	123.18%	123.18%	125.41%	130.20%	133.86%	#VALUE!	112.41%
Dissolved Oxygen [%] - 5%-ile	146.38%	151.96%	155.83%	159.27%	158.55%	155.95%	158.61%	158.46%	158.07%	#VALUE!	127.76%
Temperature [°C] - Mean	10.39769701	10.38692279	10.37773478	10.36115456	10.35976414	10.3771396	10.36605652	10.35281845	10.34710989	10.33524002	10.31692998
Ammonia [mg/l] - Median	0.011606254	0.010921998	0.011843648	0.010574166	0.010913295	0.011839353	0.011338401	0.011574646	0.01159561	0.007921666	0.014334212
Nitrate [mg/l] - Median	0.062172139	0.039727382	0.036826114	0.030517512	0.030452642	0.036411513	0.033160283	0.028156879	0.027039444	0.024779113	0.439506364
BOD susp [mg/l] - 95%-ile	0.080562012	0.076787673	0.081800502	0.078955275	0.082910713	0.081783756	0.075542632	0.082931175	0.080596342	0.050738212	0.075576552
BOD dis [mg/l] - 95%-ile	0.06357628	0.063004714	0.06506947	0.061371367	0.064796519	0.065038362	0.060312125	0.060753513	0.057052063	0.03432015	0.119512766
BOD sed [mg/l] - 95%-ile	0.086310883	0.086004916	0.090361153	0.08333351	0.086458702	0.090251872	0.083333213	0.09231523	0.090145266	0.063259843	0.087178248
Orthophosphate [mg/l] - Median	0.010052409	0.010429252	0.010855421	0.011158848	0.011284795	0.010862062	0.011132392	0.011589617	0.011731935	0.011211363	0.01105192
Particulate Phosphorus [mg/l] - Median	0.009707967	0.008594046	0.008808407	0.008745763	0.008880756	0.008824315	0.008750523	8.90E-03	0.008853981	7.95E-03	0.009393135
FaecalColi [no/100 ml] - Mean	18101.50867	19000.89995	20012.33688	16790.88898	17942.3115	19946.34372	18160.92381	1.85E+04	1.77E+04	9.11E+03	8.32E+03
TotColi [no/100 ml] - Mean	1646.059757	1729.753712	1838.211758	1535.821185	1649.385877	1.83E+03	1.67E+03	1708.161065	1.63E+03	806.0088986	7.62E+02
Enterococci [cfu/100 ml] - 95%-ile	159.232	150.150	201.416	153.910	191.353	198.143	182.181	233.776	240.819	41.021	48.243
E.coli [cfu/100 ml] - 95%-ile	707.412	674.862	943.487	691.998	900.834	917.364	808.642	1094.809	1126.179	192.696	218.154
TSS [mg/l] - Mean	6.805656484	4.933970609	4.686111885	4.151652347	4.123865198	4.656439883	4.288362969	3.828869175	3.639226906	3.129088474	9.659856516
Nitrite [mg/l] - Median	0.000678681	0.000566418	0.000544854	0.00056275	0.00050091	0.000543279	0.000521074	0.000499887	0.000494893	0.000465595	0.002839557
Chlorophyll-a [mg/l] - Median	0.003091663	0.000285409	0.000237008	0.000198914	0.000202258	0.000234005	0.00021269	0.000208977	0.000226188	0.000209821	0.000386346
DIN [mg/l] - Median	0.076751716	0.051200269	0.048541168	0.041618747	0.041300032	0.048961366	0.044832895	0.040931487	0.038992076	0.033175791	0.45673047
Salinity [PSU] - Mean	19.75375818	25.10922873	25.80379095	27.25512416	27.34385993	25.88610005	26.88902157	27.95476445	28.43472068		10.81131316

Scenario 2 Proposed Summary

Summer

	Simulation values										
	Youghal Bridge	Dunnes Park U/S	Dunnes Park D/S	Paxes Lane U/S	Paxes Lane D/S	New Outfall U/S	New Outfall D/S	Youghal Beach	Claycastle Beach	Redbarn Beach	Lower Estuary
Dissolved Oxygen [mg/l] - 95%-ile	9.039211479	8.56524448	8.521759187	8.405096542	8.403202562	8.521003912	8.387470945	8.287422008	8.210962725	7.944350529	9.043349533
Dissolved Oxygen [mg/l] - 5%-ile	7.956047976	7.817298196	7.799387422	7.752757533	7.763049567	7.800287022	7.771141443	7.769540115	7.773436189	7.747801372	8.485365898
Dissolved Oxygen [%] - 95%-ile	98.99%	102.88%	103.41%	103.56%	103.42%	104.27%	104.42%	105.03%	105.35%	111.21%	104.36%
Dissolved Oxygen [%] - 5%-ile	112.47%	112.72%	112.98%	112.20%	112.27%	112.97%	112.70%	112.03%	111.28%	114.03%	111.23%
Temperature [°C] - Mean	15.04713805	14.59745772	14.5004375	14.29881671	14.29881672	14.49266195	14.3394023	14.20079647	14.13256226	13.92391826	15.21047148
Ammonia [mg/l] - Median	0.002469569	0.002279862	0.002244769	0.002175898	0.002194074	0.002240171	0.002195473	0.002163027	0.002115336	0.001897635	0.01028918
Nitrate [mg/l] - Median	0.015100648	0.010136875	0.009568661	0.008668026	0.008666502	0.009552899	0.008939258	0.00843639	0.007954196	0.006621728	0.182818029
BOD susp [mg/l] - 95%-ile	0.024028236	0.019847786	0.020328197	0.019693733	0.019987873	0.020024824	0.019378022	0.019308633	0.018814441	0.017323961	0.07845148
BOD dis [mg/l] - 95%-ile	0.028445114	0.01730084	0.017166739	0.015291386	0.015547991	0.017044182	0.014659351	0.013270618	0.011825427	0.00715737	0.133957575
BOD sed [mg/l] - 95%-ile	0.028226676	0.02608406	0.026342436	0.022243952	0.021827879	0.025279725	0.020764748	0.026214755	0.025806913	0.023311174	0.070321613
Orthophosphate [mg/l] - Median	0.000724704	0.000620119	0.000712699	0.001047682	0.001139066	0.00072439	0.0009661	0.001387754	0.00140237	0.001129042	0.005147103
Particulate Phosphorus [mg/l] - Median	0.006480003	0.004984003	0.004928045	0.004696041	0.004714137	0.004913539	0.00449709	4.53E-03	0.004366355	0.00354827	0.008166546
FaecalColi [no/100 ml] - Mean	1.307125545	1.455550402	1.42210511	1.243797167	1.302594568	1.411034251	1.275851381	1.21E+00	1.108189122	0.55502245	1.874377838
TotColi [no/100 ml] - Mean	0.388571178	0.271936	0.25493941	0.200431322	0.206555154	0.251265804	0.210088858	0.174034689	0.150305504	0.069404373	5.221595751
Enterococci [cfu/100 mls] - 95%-ile	0.007	0.007	0.008	0.008	0.010	0.008	0.009	0.008	0.006	0.00003	0.013
E.coli [cfu/100 mls] - 95%-ile	0.039	0.034	0.039	0.038	0.047	0.041	0.015	0.042	0.050	0.00010	0.238
TSS [mg/l] - Mean	3.645429727	3.080781958	3.012315102	2.85163985	2.850046325	3.003349732	2.879430366	2.760283845	2.700105877	2.515885413	4.539737694
Nitrite [mg/l] - Median	0.000213137	0.000168101	0.0001641	0.000158486	0.00015918	0.000163842	0.000159792	0.000155823	0.000152993	0.000140406	0.001746502
Chlorophyll-a [mg/l] - Median	0.002544458	0.002516992	0.002558539	0.002626546	0.002635152	0.002650253	0.002615957	0.00267112	0.002690675	0.002739874	0.003497159
DIN [mg/l] - Median	0.017675001	0.012489243	0.011976272	0.010986179	0.011105739	0.011950664	0.01133378	0.010751061	0.010259819	0.008657515	0.195073117
Salinity [PSU] - Mean	20.73124674	26.0119986	26.0119986	28.06650958	28.08170752	26.70864752	27.81722438	28.87337664	29.40988332	31.04076816	11.58684787

Winter

	Simulation values										
	Youghal Bridge	Dunnes Park U/S	Dunnes Park D/S	Paxes Lane U/S	Paxes Lane D/S	New Outfall U/S	New Outfall D/S	Youghal Beach	Claycastle Beach	Redbarn Beach	Lower Estuary
Dissolved Oxygen [mg/l] - 95%-ile	9.311537038	8.264761438	8.19031758	7.835627675	7.824594702	8.153445756	7.766864948	7.440566585	7.112125158	6.322623212	9.467545598
Dissolved Oxygen [mg/l] - 5%-ile	6.95865049	6.464341854	6.304057367	6.082380142	6.110480066	6.299601209	6.153019823	6.133181813	6.151321697	5.946544443	8.367772369
Dissolved Oxygen [%] - 95%-ile	107.61%	116.88%	117.94%	121.75%	121.92%	118.48%	122.83%	127.41%	133.29%	148.99%	111.92%
Dissolved Oxygen [%] - 5%-ile	143.99%	149.44%	153.23%	156.85%	156.13%	153.34%	155.05%	154.57%	154.11%	158.41%	126.63%
Temperature [°C] - Mean	10.39784039	10.38708995	10.37788122	10.36129355	10.35989482	10.37727607	10.36617954	10.35291891	10.36280449	10.3353162	10.31701582
Ammonia [mg/l] - Median	0.00317768	0.003134733	0.003209657	0.003229384	0.003286577	0.003208616	0.003200415	0.003326314	0.002947957	0.003095544	0.010616012
Nitrate [mg/l] - Median	0.055848328	0.033770383	0.031453436	0.026196039	0.025652104	0.031023597	0.028254936	0.023925643	0.023818186	0.019884027	0.436524256
BOD susp [mg/l] - 95%-ile	0.021253653	0.021900849	0.022543576	0.023647156	0.023828428	0.022551837	0.023041684	0.023368118	0.018790362	0.021623829	0.061024781
BOD dis [mg/l] - 95%-ile	0.02540837	0.017982575	0.017836555	0.015903462	0.016024912	0.017785717	0.015823345	0.014028234	0.012172039	0.010737451	0.108393198
BOD sed [mg/l] - 95%-ile	0.029235599	0.029048855	0.029465334	0.029382017	0.028821889	0.029383358	0.027850105	0.030559296	0.028708558	0.028666765	0.062925508
Orthophosphate [mg/l] - Median	0.005131037	0.005502702	0.005976988	0.007093181	0.007186808	0.006935382	0.006588506	0.007387715	0.006380545	0.007760833	0.008769815
Particulate Phosphorus [mg/l] - Median	0.007477611	0.006326875	0.006503484	0.006714391	0.006732457	0.006466853	0.006571115	6.54E-03	0.005567785	6.27E-03	0.008395278
FaecalColi [no/100 ml] - Mean	2.029292413	2.184706254	2.121382138	1.833422291	1.891161433	2.108913266	1.9043755	1.76E+00	1.63E+00	7.90E-01	2.94E+00
TotColi [no/100 ml] - Mean	0.698405645	0.411201268	0.382598038	0.306334359	0.309924815	3.78E-01	3.23E-01	0.26926444	2.30E-01	0.144473739	8.79E+00
Enterococci [cfu/100 mls] - 95%-ile	0.017	0.020	0.021	0.017	0.019	0.021	0.016	0.017	0.012	0.003	0.030
E.coli [cfu/100 mls] - 95%-ile	0.084	0.096	0.108	0.080	0.091	0.103	0.078	0.079	0.051	0.011	0.599
TSS [mg/l] - Mean	6.632047062	4.756698293	4.510667297	3.996326611	3.965117734	4.481486984	4.125874003	3.670308332	3.578158031	3.01188495	9.575628349
Nitrite [mg/l] - Median	0.000369485	0.000305665	0.000301839	0.000299614	0.000300704	0.000301611	0.000298446	0.000296682	0.000276738	0.000282644	0.002719596
Chlorophyll-a [mg/l] - Median	0.000230835	0.000204353	0.000184984	0.000161425	0.000176088	0.000183036	0.000169158	0.000172964	0.000407591	0.000170844	0.000368386
DIN [mg/l] - Median	0.059366742	0.037034551	0.034859669	0.029701008	0.029235353	0.034455099	0.031704405	0.027629953	0.027147561	0.023263518	0.44462464
Salinity [PSU] - Mean	19.80918516	25.14082064	25.83691729	27.28191411	27.36926533	25.91924739	27.36926533	28.20589526	28.71994402	30.04021057	10.83717332

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