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Re: Appropriate Assessment – DO139-01 Youghal

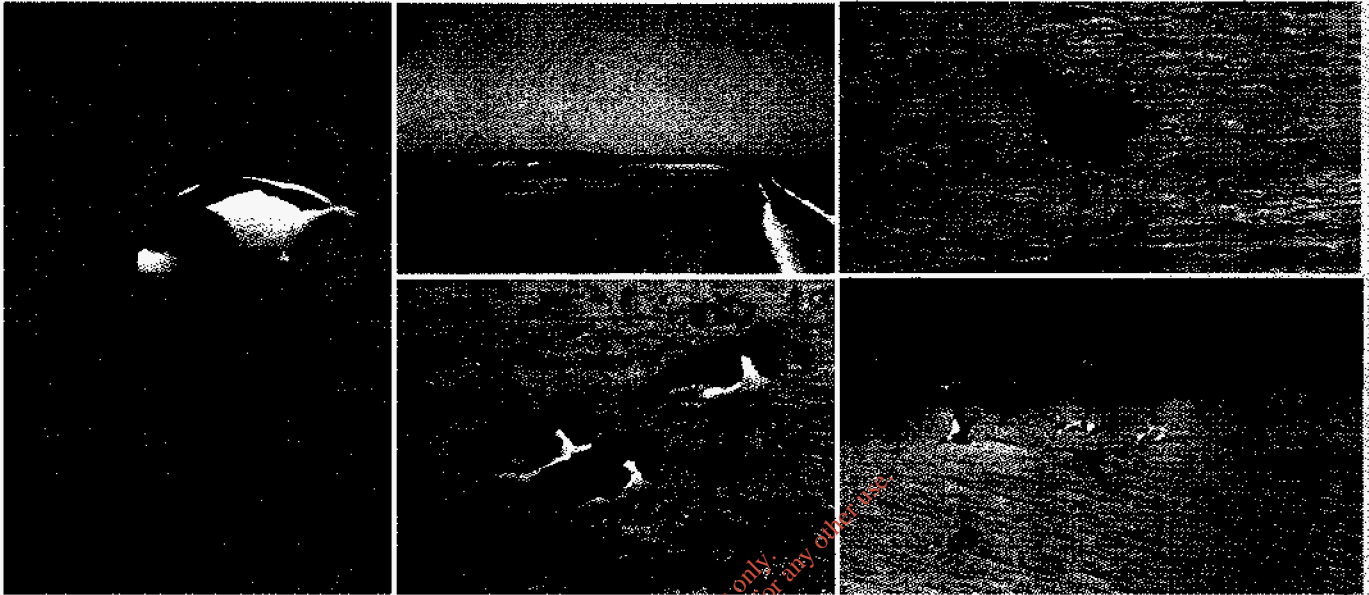
Cork County Council has previously responded to EPA Regulation 18(3)(b) request dated 13 Sep 2011. A number of queries were received from Mr Stuart Huskisson of the EPA in relation to the Appropriate Assessment included with our submission. The document enclosed has been revised to address these queries:

1. Where conservation objectives are listed in paragraphs 3.18 - 3.19 details have been added to confirm that for both the SAC and SPA the objective is to maintain in favourable conservation status.
2. Paragraphs 4.95 & 4.96 have been added to address discharges to the Blackwater upstream of Youghal to supplement Paragraph 4.94 which discusses the cumulative impacts on the Blackwater.
3. Paragraph 4.98 has been corrected.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Noel O'Keeffe', written over a horizontal line.
Noel O'Keeffe,
Co. Engineer & Director of Water Services.





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Cork County Council

Youghal Main Drainage

Appropriate Assessment under Article 6(3) of the 'Habitats Directive'

November 2011

Plan Design Enable

Youghal Main Drainage

Appropriate Assessment under Article 6(3) of the ‘Habitats Directive’

25th November 2011

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1. Introduction and Methods

Introduction

- 1.1 Youghal Town Council has successfully applied for planning approval for the construction of a wastewater treatment plant and associated pipe network on the Mudlands, north of Youghal, Co. Cork. Atkins is currently acting on behalf of the Local Authority to procure its construction as a Design Build Operate & Maintain (DBOM) project. As part of this project, Atkins is currently completing a wastewater discharge licence application to the Environmental Protection Agency (EPA). An *Ecological Report and Article 6 Appropriate Assessment Screening Report (2794DG22; Atkins, 2009)* was submitted in support of the wastewater discharge licence application.
- 1.2 In February 2011, the EPA issued a request for further information with respect to the wastewater discharge license application. Item 9 in the EPA letter is concerned with Appropriate Assessment of impacts to Natura 2000 sites: -

With regard to the additional information submitted in relation to the Ecological Report & 'Article 6' Appropriate Assessment Screening Report, demonstrate how the Department of the Environment, Heritage and Local Government circular L8/08 dealing with Appropriate Assessments has been addressed in relation to the discharge to surface water. Submit the results of the L8/08 screening, detailing the response to each question. If the result of the screening is to 'Assess Impacts' submit the relevant updated information

- 1.3 This report addresses the above request for information. Specifically, this report assesses whether significant impacts are likely on Natura 2000 sites as a result of treated waste water discharges from the Youghal wastewater treatment plant, in particular the Blackwater River Special Area of Conservation (SAC) and the River Blackwater Estuary Special Protection Area (SPA).
- 1.4 Special Areas of Conservation (SACs) and Special Protection Areas for birds (SPAs) are sites that form part of a network, known as Natura 2000 sites, designated across Europe in order to protect biodiversity within the EU. SACs are designated under the EU Habitats Directive (92/43/EEC and as amended), as transcribed into Irish law by the European Communities (Natural Habitats) Regulations, 1997, while SPAs are designated under the EU Birds Directive (79/4089/EEC and amendments as consolidated in 2009/47/EC).
- 1.5 Article 6(3) of the EU Habitats Directive states that: "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 subject to appropriate assessment of its implications for the site in view of the site's conservation objectives." Such an assessment is known as an Appropriate Assessment (AA).

Methodology

- 1.6 The Appropriate Assessment process begins with Stage 1 - Screening to determine if a plan or project is likely to have an impact on a Natura 2000 site. If impacts are likely or uncertain, Stage 2 – Appropriate Assessment is required. Methodology used to complete this Appropriate Assessment process follows best practice guidance, including: -
- European Commission (2000). Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

- European Commission (2001). 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.
- European Commission (2007). Guidance document on Article 6(4) of the ‘Habitats Directive’ 92/49/EEC; clarification of the concepts of: Alternative solutions, Imperative reasons of overriding public interest, Compensatory Measures, Overall Coherence, Opinion of the Commission.
- Environmental Protection Agency (2009). Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007(S.I. No. 684 of 2007).
- Department of the Environment Heritage and Local Government (2008). Circular L8/08 Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments.
- Department of the Environmental Heritage and Local Government (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities.

- 1.7 Locations and boundaries of all Natura 2000 sites within the immediate environs of the proposed development were identified using the National Parks and Wildlife Service (NPWS) online map viewer (www.npws.ie). Boundary *shapefiles* were also downloaded from this site. NPWS were contacted to obtain information on conservation objectives, conditions and threats to the Natura 2000 sites. Natura 2000 site synopses prepared by NPWS were also reviewed.
- 1.8 Additional information is available from previous studies, including an Environmental Impact Statement, including a full Ecological Impact Assessment (EclA), which was published in 2001. This included consideration of terrestrial and marine ecology. A habitat / botanical survey of the site was undertaken by *Roger Goodwillie & Associates* in April 2001; this included some consideration of fauna, including terrestrial mammals and birds. A marine ecology assessment of the coastal areas adjacent to Youghal was undertaken by *Ecological Consultancy Services Ltd. (EcoServe)* in May 2001. Whilst predating Irish guidance on Appropriate Assessment noted above, the EIS did consider the potential for negative impacts on adjoining Natura 2000 sites. Best practice guidance at the time stated that “*Where an assessment for the purposes of Article 6(3) takes the form of an assessment under Directive 85/337/EEC (i.e. the EIS Directive), this will provide obvious assurances in terms of records and transparency*”.
- 1.9 Further surveys were completed in 2009, including a full Ecological Report and an AA screening report (Natura Impact Screening Statement) (Atkins, 2009). This document was prepared prior to the publication by the DoEHLG in 2009 of *Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. The Appropriate Assessment did, however, assess the impacts of the project against the conservation objectives of the nearby Natura 2000 sites, i.e. the Blackwater River SAC and the Blackwater Estuary SPA and to ascertain whether it would adversely affect the integrity of those designated sites. The March 2011 document was compiled in order to present the original assessment in a format and structure compatible with guidance published by the EPA and DoEHLG; as noted these were published following preparation of the original AA by Atkins in 2009 (Atkins, 2009).

Report Structure

1.10 For simplicity of presentation the Appropriate Assessment has been split into two sections;

- Chapter 3 deals with the physical structures to be built in the development of the proposed waste water treatment plant and the impacts that these might have on the Conservation Objectives of Natura 2000 site within Youghal Bay / the Blackwater Estuary;
- Chapter 4 deals with the result emissions – water quality impacts – arising from operation of the plant and the potential this might have on the Conservation Objectives of Natura 2000 site within Youghal Bay / the Blackwater Estuary;
- A consensus / finding is presented in Chapter 5.

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2. Screening

2.1 The AA presented below follows the EPA's (2009) *Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)* and DEHLG's circular L8/08. AA is completed over two stages: Screening and Appropriate Assessment: -

- Stage 1 – Screening
 - Step 1 – Management of the Site
 - Step 2 – Description of Plan or Project
 - Step 3 – Characteristics of Site
 - Step 4 – Assessment of Significance
- Stage 2 – Appropriate Assessment
 - Step 1 – Information Required
 - Step 2 – Impact Prediction
 - Step 3 – Conservation Objectives
 - Step 4 – Mitigation Measures

Step 1 – Management of the Site

2.2 The project is not directly connected with or necessary to the management of a Natura 2000 site.

Step 2 – Description of Plan or Project

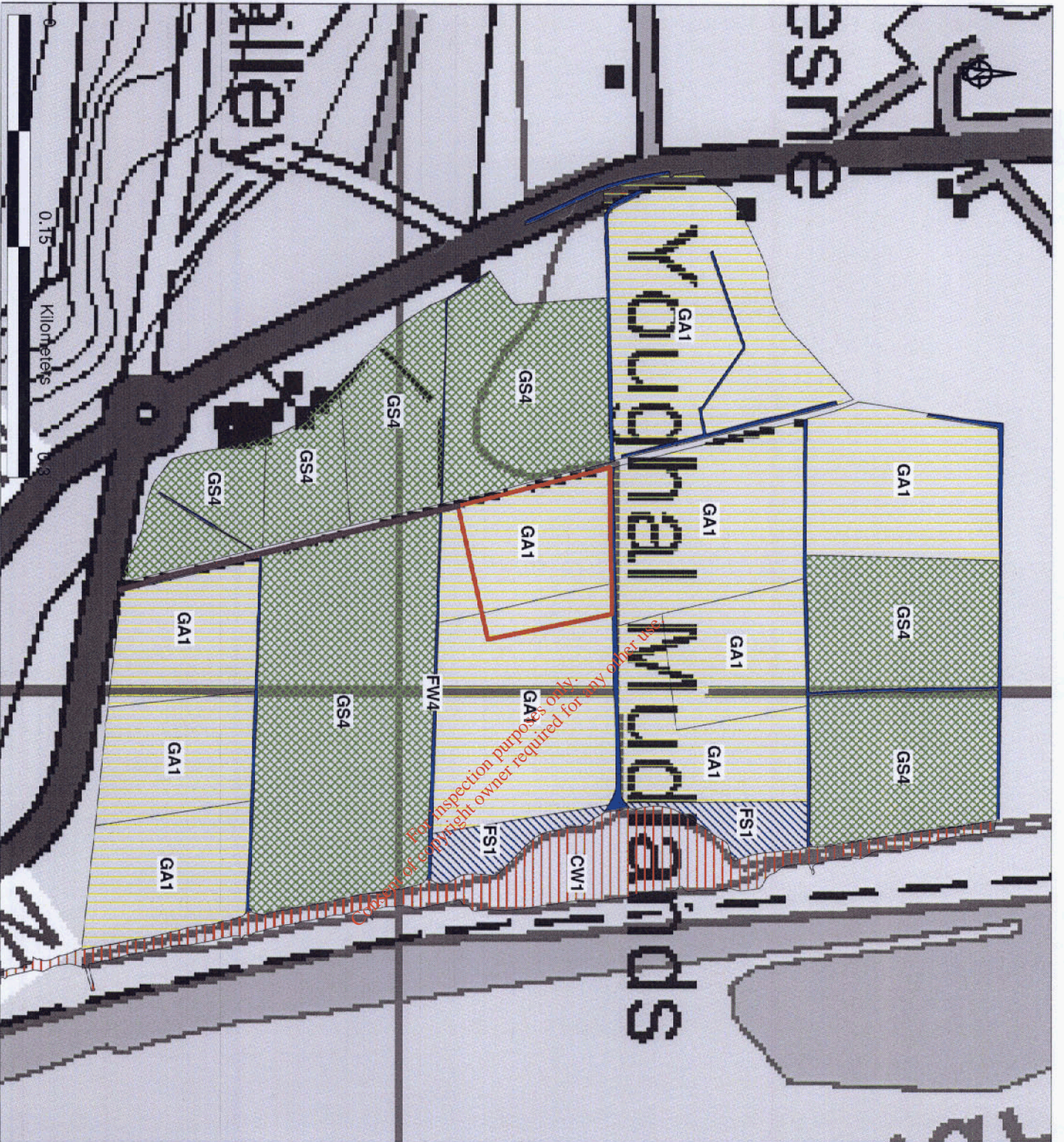
2.3 Following an appraisal of a number of sites in the vicinity of Youghal, the Mudlands area to the north of the town was selected as the most suitable site for the location of the proposed WWTP for the town with a discharge of the final treated effluent to the estuary (Atkins McCarthy, 2001). The WWTP will be procured using a Design Build Operate & Maintain contract. Thus all design proposals herein are subject to confirmation at detailed design stage. However, the proposed development comprises the following elements: -

- Site on the Youghal Mudlands for the proposed waste water treatment plant to be located in the western side of Field R3 as shown in Figure 3.1 of the 2009 the ecology assessment (Atkins, 2009) and reproduced here as Figure 2.2.
- An inflow & outflow pipe with an associated access road servicing the plant will run south from the plant to the public road, along the western side of fields R1 & R2 (see Figures 2.1 and 2.2; reproduced from Atkins, 2009).

2.4 Work on Mudlands is outside but adjacent to the Blackwater River SAC (site code 2170) and the Blackwater Estuary SPA (site code 4028) (Figures 2.3 and 2.4). The proposed development is located approximately 5 km north of Ballymacoda Bay SPA and Ballymacoda (Clonpriest and Pillmore) SAC, both of which are located on the western shores of Youghal Bay (Figures 2.3 and

- 2.4). Note that Ballyvergan Marsh is a proposed Natural Heritage Area (pNHA) proposed for designation under the Wildlife Acts 1976 and 2000 and is therefore not considered under appropriate assessment or this report.
- 2.5 Proposed discharge from the created wastewater treatment plant would run through the Blackwater River SAC and Blackwater Estuary SPA close to Ferry Point (exact location / extent to be confirmed at detailed design).
- 2.6 The Youghal Main Drainage Scheme will see the closure of three no. existing municipal overflows; most will, however, be retained to act as stormwater overflows. Approximately 6 no. private outfalls onto the shoreline will also remain. The proposed development will ensure that sewage will receive primary and secondary treatment as well as nutrient reduction for nitrogen. Provision will be made for phosphorus removal should it be required at a future date if studies indicate that it would be beneficial.
- 2.7 The proposed outfall will be located approximately 300m offshore and will consist of a 600mm diameter pipe. The outfall location is opposite Ferry Point, Youghal over 1km south of the WWTP site. Further dispersal modelling is underway to inform the selection of the final location of the proposed outfall, and the design of the diffuser. The pipeline will be buried throughout its length.
- 2.8 The construction period for the entire collection network upgrade works is estimated to be 12-18 months – including the construction of the WWTP and outfall pipeline. Details of the construction programme for individual project elements will not become available until the Design & Build contract has been awarded.

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- Habitat map following Fossitt (2000)
- CW1 Lagoons and saline lakes
 - FS1 Reed and large sedge swamps
 - FW4 Drainage ditch
 - GA1 Improved agricultural grassland
 - GS4 Wet grassland

- Site Boundary
- Proposed Access Road & Route of Pipeline

Project Name: Youghal Main Drainage

Project Number: 2794

Figure No: 2.1

Title: Habitat Map

Issue Number: 1

Date: 29.03.2011

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Bird Study count by field numbers

East Mudflat
Foxhole Field

L1
L2
L3
L4

Main Mudflat
Pool 1
Pool 2
Pool 3
Pool 4
Pool 5

R1
R2
R3
R4
R5

Site Boundary

Proposed Access Road
& Route of Pipeline

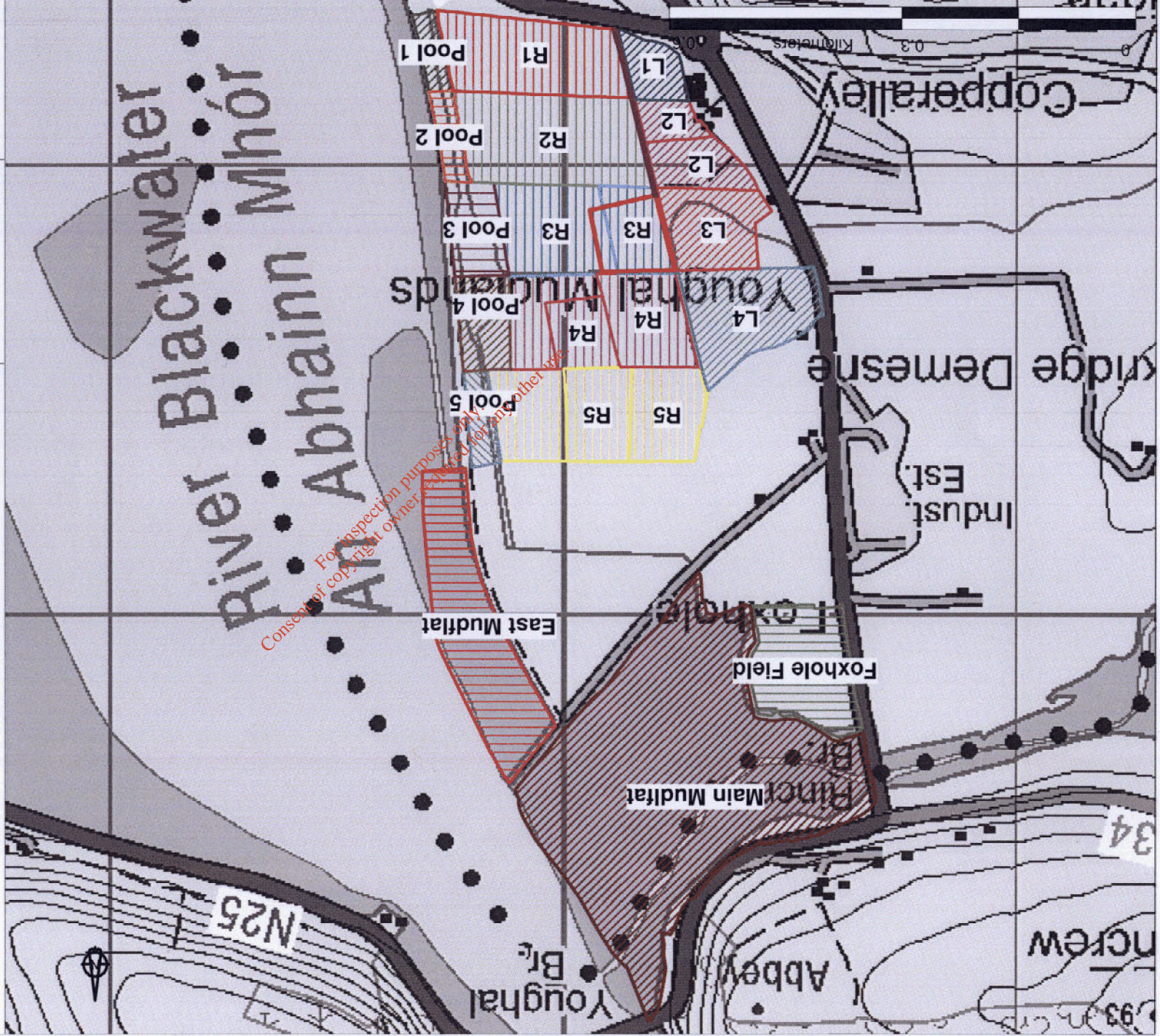
Project Name: Youghal Main Drainage

Figure No: 2.2
Title: Bird Study

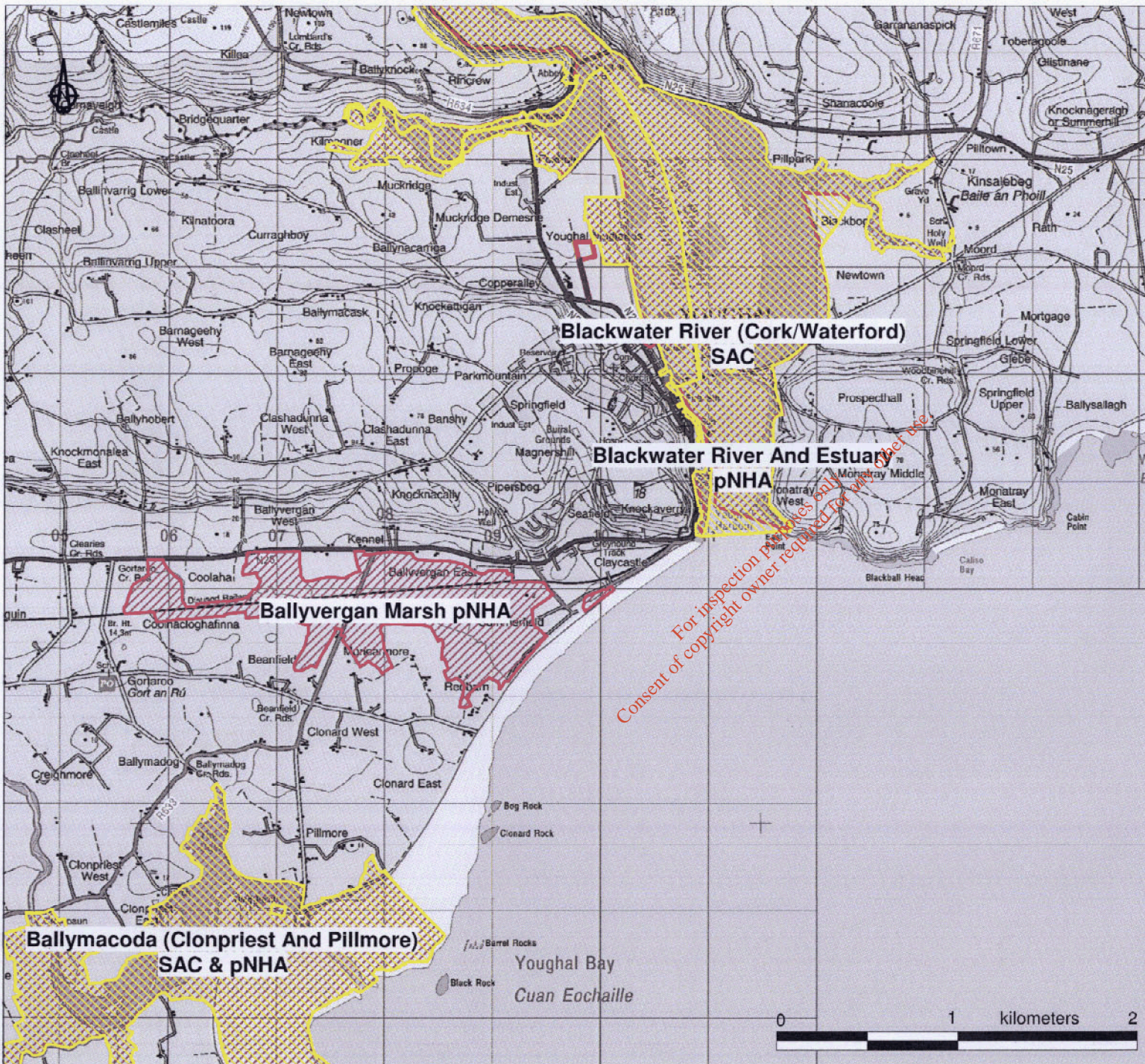
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Legend

-  Special Area of Conservation (SAC)
-  Proposed National Heritage Area (pNHA)
-  Site Boundary
-  Proposed Access Road & Route of Pipeline

Project Name: Youghal Main Drainage

Project Number: 2794

Figure No: 2.3
Title: Special Areas of Conservation & Natural Heritage Areas

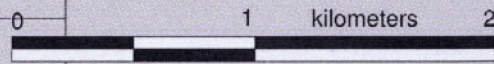
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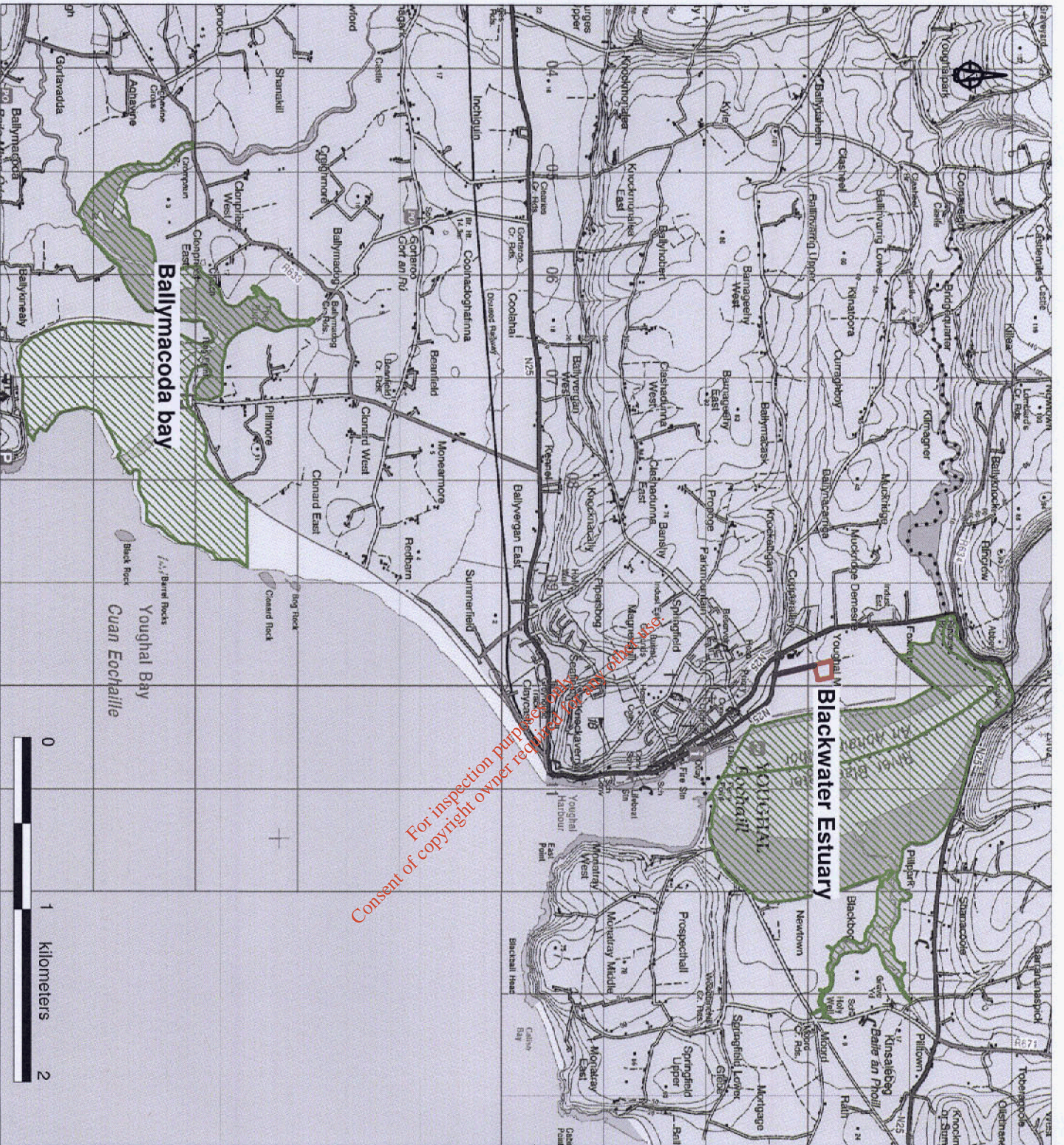
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- Legend**
- Special Protection Area for Birds (SPA)
 - Site Boundary
 - Proposed Access Road & Route of Pipeline

Project Name: Youghal Main Drainage
Project Number: 2794

Figure No: 2.4
Title: Special Protection Areas for Birds
Issue Number: 1
Date: 29.03.2011

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Step 3 – Characteristics of the Site

- 2.9 The proposed development of a waste water treatment plant (WWTP) and associated network at the Mudlands, north of Youghal is not located within a site designated as being of conservation importance; however it does adjoin a section of the Blackwater River SAC and Blackwater Estuary SPA, which in this location is characterised as rush-dominated improved agricultural grassland (GA1) (Figures 2.3 and 2.4). As noted above, the proposed outflow from the WWTP will be located opposite Ferry Point, Youghal, within the Blackwater River SAC and the Blackwater Estuary SPA. Both these designations form part of the Natura 2000 network. Site synopses are reproduced in Appendix A.
- 2.10 The Blackwater River SAC is of considerable conservation significance and is one of the largest rivers in Ireland, draining a major part of Co. Cork and five ranges of mountains. The peaty nature of the upper reaches of the river and some of its tributaries give the water a pronounced dark colour. The mouth of the river occurs at Youghal Harbour, where the river empties into the Atlantic Ocean. The site synopsis is reproduced in Appendix A.2.
- 2.11 The Blackwater Estuary SPA is of high ornithological importance for wintering waterfowl and provides good quality feeding areas for an excellent diversity of waterfowl species. The site supports an internationally important population of Black-tailed Godwit (634), and has a further seven species with nationally important population of Wigeon (834), Golden Plover (3,098), Lapwing (3988), Dunlin (1,430), Curlew (1,041), Redshank (489) and Greenshank (25) (Crowe, 2005; 5 year average counts from 1994/95 to 2000/01). A population of Bar-tailed Godwit (peak count of 286) has also on occasion exceeded the threshold for national importance. This site has been well studied, with detailed monthly counts extending back to 1974. Boland *et al.* (2008) report a summed annual maxima of each species (excluding gulls and terns) of 7,739 birds counted during I-WeBS bird counts within the Blackwater Estuary. Totals are derived from across all months September – March inclusive in each year (Boland *et al.*, 2008). Under IWeBS the Blackwater Estuary site includes the Tourig Estuary. The site synopsis is reproduced in Appendix A.1.
- 2.12 The bird species found at the Youghal Mudlands during a site visit in April 2001 as part of the original EIS are shown in Table 3.1 of Atkins (2009). In order to provide a thorough analysis on the importance of Youghal Mudlands to birds and to assess the impact of the proposed development on the Blackwater Estuary SPA, a targeted bird survey was carried out. Bird counts were carried out in both January (15th & 16th) and March (2nd & 3rd) of 2009. These counts were carried out by Mr. Pat Smiddy to a standard agreed with Dr. O'Donoghue, Ornithologist and Principal Ecologist with Atkins (Ecology) Ireland. This included consideration of the Mudlands (including wetland birds, land birds and use of pools), adjoining mudflats and the Foxhole field. Counts were also undertaken at the Tourig Estuary for completeness.
- 2.13 The bird survey was designed in such a way as to evaluate usage of the site across the full tidal cycle in order to determine whether birds might be moving in and out of the Mudlands from elsewhere within the SPA. Consideration was given to the species, number and conservation status of birds observed. By targeting different tidal heights in January and March the survey also attempted to determine whether patterns of site use would alter depending on how much of the saltmarsh in the Tourig Estuary was exposed (as roosting areas) during high tide. Furthermore consideration was also given to use of the Foxhole (to the north), adjoining mudflats in the Blackwater Estuary and the pools inside the seawall. In this way the relationship between the Mudlands and the adjoining Blackwater Estuary SPA could be examined in full.

- 2.14 The data indicate that Fields R3 and R4 host the greatest diversity and number of birds; key species include Lapwing and Black-tailed Godwit, with maximum counts of 950 and 360, respectively. The national threshold for Lapwing is 2,100, while that of Black-tailed Godwit is 140 (Boland and Crowe, 2007). The 5-year average for Black-tailed Godwit in the Blackwater Estuary / Tourig Estuary is 634 (1996-2000) (Crowe, 2005). These birds were generally recorded close to high tide and concentrated very close to the pools along the sea wall away from the area proposed for development. No land birds of conservation concern were noted within the study area.
- 2.15 At high tide the birds roost along the shoreline and salt marsh fringe, especially in the Kinsalebeg area. A low-lying field at Blackbog, east of the Mudlands across the Blackwater River, is a favoured roost. These should however be sufficiently distant from proposed works to prevent negative impacts through disturbance.
- 2.16 As noted above, the proposed development is located approximately 5 km north of Ballymacoda Bay SPA and Ballymacoda (Clonpriest and Pillmore) SAC, both of which are located on the western shores of Youghal Bay. The proposed development will not pose any impacts either direct or indirect on the latter two designated sites as surface water impacts are highly unlikely to be transmitted 5 km across the bay.

Step 4 – Assessment of Significance

- 2.17 According to the EPA (2009) guidelines, the assessment of the likelihood of significant effects of a proposed or existing wastewater discharge project on a European Site should be completed by referring to the department of the Environment Circular L8/08 '*Water Services Investment and Rural Water Programmes –Protection of Natural Heritage and National Monuments*'.
- 2.18 Figure 2.5 displays the flow diagram from Circular L8/08. If the conclusion of the below process is to "ASSESS IMPACTS", then an Appropriate Assessment must be completed. Table 2.1 outlines the workings of the flow chart in Figure 2.5.

Figure 2.5 - Flow chart for screening water services infrastructure projects (Source: DoELHG, 2008).

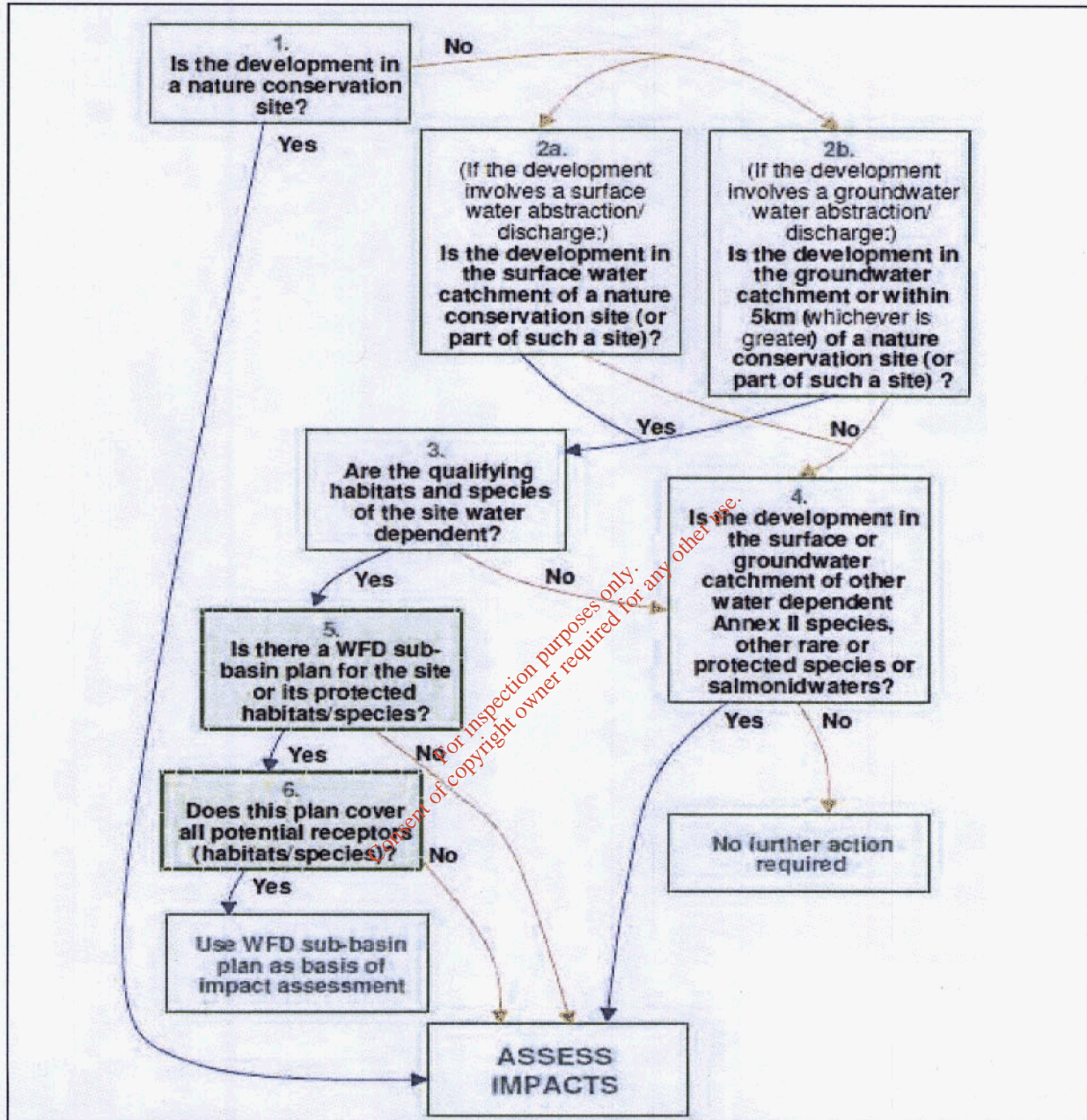


Table 2.1 – Flow chart stages for Youghal Main Drainage Scheme.

Flow chart stage	Answer
Stage 1 - Is the development in a nature conservation site?	No
Stage 2a - Is the development in the surface water catchment of a nature conservation site (or part of such as site)?	Yes
Stage 3 - Are the qualifying habitats and species of the site water dependent?	Yes
Stage 5 – Is there a WFD Sub-basin plan for the site or its protected species?	Yes ¹
Stage 6 –Does this plan cover all potential receptors?	No
As the answer to Stage 6 was “No” it is now needed to Assess Impacts on the Natura 2000 site(s).	

2.19 Given the fact that the results from the above flow chart have indicated that impacts must be assessed, it is deemed that Stage 2 Appropriate Assessment be completed.

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¹ NS2 (2010) *Freshwater Pearl Mussel – Munster Blackwater Sub-Basin Management Plan*. 2nd draft. .

3. Appropriate Assessment - WWTP

Step 1 - Information Required

- 3.1 Information regarding the proposed WWTP is outlined in Step 2 of the Screening assessment above (Sections 2.3-2.8); the treatment process is described in Section 4.1 to 4.49, below. Further information on the nature of the discharges is included in the main wastewater discharge license application and is also addressed in Chapter 4.
- 3.2 Information on Natura 2000 sites was acquired from NPWS, including standard Natura 2000 Data Forms for each site and up-to-date conservation objectives for each site. Further information is available in the original EIS (Atkins McCarthy, 2001) and the Ecological Report (Atkins, 2009). This information is outlined below as required.

Step 2 - Impact Prediction

Land-take/ distance from Natura 2000 site: -

- 3.3 The land take for the proposed WWTP is not located within a Natura 2000 site (Figures 2.3 and 2.4). Thus, work on the Mudlands will be entirely outside the SAC / SPA boundaries. Habitats within the Mudlands which would be impacted include wet grassland (GS4), dry grassland (GA1, GS2) and hedgerows (WL1) - none of these are comparable to habitats of European importance (Annex I of the EU Habitats Directive), nor are they habitats for which the Natura 2000 sites have been designated. In order to lay the outfall, a pipe will be laid in a buried trench through the Natura 2000 site. A trench will be dug for the pipeline during the construction phase. Once the pipeline is installed, this will be backfilled and it is expected that the habitat will return to its natural state in the short to medium term. Littoral and sublittoral habitats that would be impacted will include up to twenty biotopes, recorded from the littoral survey (Atkins McCarthy, 2001). The majority of these biotopes occurred on the narrow sea wall, vertical harbour walls and bedrock which back the shore along the western coast of the estuary. The wall along the Youghal Mudlands was found to support a range of biotopes. At the site of the proposed outfall (referred to as Option 1 in the original EIS, (Atkins McCarthy, 2001)) the vertical wall was covered by barnacles and limpets (ELR.BPat) with mussels and barnacles (ELR.MytB) in the zone below. The lower shore was dominated by serrated wrack (*Fucus serratus*) with mussels and green algae (*Enteromorpha* sp.) and red algae (*Chondrus crispus* and *Ceramium* sp.) on mixed gravel, boulders and mud (MLR.Myt.FR).
- 3.4 A total of nine dredges were taken in the Blackwater Estuary. Twenty-four species of higher taxa were recorded. The fauna was dominated by hydroids, polychaetes, crustaceans and molluscs. Opposite Youghal Town and adjacent to the north and centre of the Youghal Mudlands, the substratum was very soft anoxic mud with some sand, organic matter and shell debris. Few macrofauna species were recorded from these sites, although polychaetes, in particular tube worms were characteristic. To the north, south and opposite Ferrypoint the substratum was very coarse shell debris with sand. At the mouth of the harbour the substrata again changed and consisted of cobbles, pebbles and rocks and with a different macro-faunal community, characterised by hydroids, crustaceans and seaweeds.
- 3.5 None of these habitats are of marine conservation importance. The only Annex I habitat directly impacted by the proposed development that represents a conservation objective of the Blackwater River SAC is Estuaries (1130) (see Step 3 below). No Mudflats or Sandflats (1140) are expected to be disturbed. As noted above, once the pipeline is installed, this will be backfilled and it is

expected that the habitat will return to its natural state in the short to medium term. Furthermore, the habitats through which the pipe will run do not represent areas of intertidal or sub-tidal habitat of significance for foraging waders / wildfowl for which the Blackwater Estuary SPA for birds has been designated.

Disturbance/excavations:

- 3.6 The use of the Mudlands and pools adjoining the sea wall by wintering birds is discussed at length in Chapter 3 of the Ecological Report (Atkins, 2009). These include Lapwing and Black-tailed Godwit; conservation objectives of the Blackwater Estuary SPA (see Step 3 below). The bird survey data therefore support the findings of the 2001 EIS with respect to the site. Broadly speaking, development of the plant at the western side of field R3 (and associated access track) should not result in a significant impact on bird species for which the Blackwater Estuary has been designated provided appropriate mitigation measures are put in place and the plant is adequately screened. As timing of works outside the winter months to effectively avoid disturbance of wintering birds is unlikely to be possible, some level of disturbance on wintering birds using the Mudlands is likely during construction of the WWTP. Over the longer term, as noted in the Ecological Report (Atkins, 2009), the Mudlands are not within the Blackwater Estuary SPA nor do they support significant concentrations of waders / wildfowl. The completed site is likely to be visually screened by a flood protection wall or berm (to be finalised at detailed design stage).
- 3.7 The successful Contractor shall be required to seek the advice of an appropriately qualified ecologist when finalising the timing of works and nature of screening in order to minimise impacts on waders and wildfowl using the site.

Emissions: -

- 3.8 Currently, sewage is discharged untreated into Youghal Harbour from a number of locations. Following completion of works, effluent will be treated effectively prior to discharge at a single sub-tidal outfall likely to be located opposite Ferry Point. Thus, the proposed WWTP will reduce emissions into the Natura 2000 sites.
- 3.9 During the course of works best practice will be followed with respect to site works and in particular how surface water runoff from the site is addressed. The successful Contractor will be required to prepare a Construction / Mitigation Method Statement (with input from an appropriately qualified ecologist) to be agreed with Cork County Council and NPWS in order to prevent any negative impacts on adjoining Natura 2000 sites.

Interference with the key relationships that define the structure & function of the site: -

- 3.10 In the medium term, there will be a reduced level of nutrient enrichment within the estuary as a whole due to more efficient treatment of discharge from Youghal and unrelated water quality improvement as required under the Water Framework Directive in watercourses contributing to the estuary. This may have medium to long term impacts on the carrying capacity of the estuary / SPA for species for which it has been designated. However, any such changes would arise from compliance with a number of EU Directives.

Reduction of habitat area: -

- 3.11 Temporary habitat loss will occur during the installation of the proposed outfall pipeline. Following back-filling of the trench accommodating the discharge pipe it is envisaged that natural estuarine behaviour is such that areas of disturbed sub-tidal habitat will be rapidly recolonised and revert to

natural condition. As noted above none of these habitats are of marine conservation importance. The only Annex I habitat directly impacted by the proposed development that represents a conservation objective of the Blackwater River SAC is Estuaries (1130) (see Step 3 below). No Mudflats or Sandflats (1140) are expected to be disturbed. No significant changes to the Conservation objectives of the Natura 2000 site are therefore envisaged in this regard.

- 3.12 None of the works within the Mudlands are within the Natura 2000 sites.

Disturbance of key species: -

- 3.13 The proposed WWTP is located in close proximity to the SAC boundary. With the possible exception of otter, no disturbance of the key species for which the SAC was designated is expected. Disturbance of key species within the Natura 2000 site will occur during the installation of the proposed pipeline. This will particularly affect bird species in the area which are typically sensitive to disturbance; though as noted this area does not support significant populations of birds which comprise the conservation objectives of the SPA.
- 3.14 No significant loss of feeding grounds for avifauna in the vicinity of the pipeline laying works is likely to occur.
- 3.15 During the installation of the proposed pipeline within the estuary, there will be an increase in turbidity of the water during the construction of the pipeline trench due to release of sediment from the works area. However estuarine environments are typically sedimentary and species living in these environments have adapted to these conditions.

Reduction in species density: -

- 3.16 Some reduction in avian species density on the Mudlands adjoining the SAC / SPA is likely to occur during the construction phase due to disturbance. If the works are carried out during the summer period when the bird species for which the SPA was designated are absent, then no such disturbance impacts to the conservation objectives of the site will occur. However, we understand that it is unlikely that works can be restricted in such a way.

Cumulative impacts: -

- 3.17 Planning permission had been previously granted by Youghal Town Council for a marina at Green's Quay located immediately north of the likely outfall from the proposed WWTP. Planning on this has since lapsed but a new grant of planning may be pursued. If construction is carried out simultaneously, cumulative impacts may accrue in the short term as a result of this project in the absence of suitable mitigation. These would be in the form of disturbance to birds, if construction takes place during winter, or estuarine habitats. Such disturbances, however, would be temporary and relatively minor, and therefore not significant. As the proposed WWTP will result in a short to medium term positive impact on the adjacent Natura 2000 sites (due to the removal or upgrading of many outfalls supporting untreated water and the discharge of treatment of effluent into River Blackwater Estuary), this would cancel out any increases in emissions that may arise from the marina.

Step 3 - Conservation Objectives

3.18 The site is designated for a number of habitats and species listed on Annexes I and II, respectively, of the EU Habitats Directive. The conservation objectives of the Blackwater River SAC, according to NPWS (2011a), are²:

- Freshwater pearl mussel (*Margaritifera margaritifera*) (1029);
- White clawed crayfish (*Austropotamobius pallipes*) (1092);
- Sea lamprey (*Petromyzon marinus*) (1095);
- Brook lamprey (*Lampetra planeri*) (1096);
- River lamprey (*Lampetra fluviatilis*) (1099);
- Twaite shad (*Alosa fallax*) (1103);
- Atlantic Salmon (*Salmo salar*, only in fresh water) (1106);
- Estuaries (1130);
- Mudflats and sandflats not covered by seawater at low tide (1140);
- Perennial vegetation of stony banks (1220);
- Salicornia and other annuals colonizing mud and sand (1310);
- Atlantic salt meadows (*Glaucocystis Puccinellietalia maritima*) (1330);
- Otter *Lutra lutra* (1355);
- Mediterranean salt meadows (*Juncetalia maritimi*) (1410);
- Killarney fern (*Trichomanes speciosum*) (1421);
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260);
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0);
- * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) (91E0);
- * *Taxus baccata* woods of the British Isles (91J0).

3.19 The objective is to "maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the [Blackwater River] SAC has been selected". Other than the generic conservation objectives outlined above, currently there is no Natura 2000

² Priority habitats are indicated with an asterisk (*).

Conservation Objectives Supporting Document(s) in which a detailed discussion of conservation objectives for the River Blackwater SAC is presented.

3.20 The site is designated for a number of wintering waterfowl and wader species listed on Annex I of the EU Birds Directive. The conservation objectives of the Blackwater Estuary SPA, according to NPWS (2011b), are:

- Wigeon (*Anas penelope*);
- Golden plover (*Pluvialis apricaria*);
- Lapwing (*Vanellus vanellus*);
- Dunlin (*Calidris alpina*);
- Black-tailed Godwit (*Limosa limosa*);
- Bar-tailed Godwit (*Limosa lapponica*);
- Curlew (*Numenius arquata*);
- Redshank (*Tringa totanus*)

3.21 The objective is to "maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this [Blackwater Estuary] SPA". Other than the generic conservation objectives outlined above, currently there is no Natura 2000 Conservation Objectives Supporting Document(s) in which a detailed discussion of conservation objectives for the Blackwater Estuary SPA is presented.

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Step 4 -Mitigation Measures

Habitat Loss

- 3.22 The footprint of the proposed wastewater treatment plant will be fenced off during the pre-construction period. This will negate the possibility of needless disturbance and loss to habitats outside of the proposed construction area.

Water Quality

- 3.23 Best practice will be employed to ensure that no pollution impacts arise during the construction phase of the proposed development. The biggest threats of the proposed development potentially reside during the construction phase where sediments and hydrocarbons may be liberated, in particular in connection with soil excavation and storage in addition to sand and gravel storage. In order to ensure that no sediments or pollutants such as silt or hydrocarbons generated on site are transported to the nearby Natura 2000 sites, the successful contractor will be required to prepare a working Method Statement to outline how such impacts will be mitigated in line with industry best practice. Mitigation measures to be implemented to deal with the construction phase impacts and to alleviate any threats to the adjacent Natura 2000 sites should include the following. However, as noted in paragraph 3.23 the successful contractor will be required to prepare Construction Method Statement in agreement with Cork County Council, National Parks & Wildlife Service and Inland Fisheries Ireland. This shall prepare a full schedule of mitigation to minimise negative impacts.

- There is the potential for the mobilisation of suspended solids or particulate matter such as sand and silt following prolonged or heavy rainfalls. As a result, under no circumstances should works such as soil excavation, soil depositing or soil stripping be conducted during or immediately following periods of heavy or prolonged rainfall.
- Stockpile areas of sand, gravel and clay will be only be stored near the eastern and southern sections of the site on gently sloping ground. All stockpile areas of sand, gravels and soils will be covered during heavy rainfall periods in order to prohibit the mobilisation of sediment into the estuarine area.
- Works with concrete must be done during dry conditions for a period sufficient to cure the concrete (at least 48 hours). Concrete pours will occur in contained areas. Washing out of concrete trucks will not be permitted on or near the site.
- Fuels will be stored in bunded areas throughout the construction period. Refuelling will only be carried out within pre-determined hardstanding areas where all fuels will remain bunded.

Avifauna

- 3.24 It is our understanding that it will not be possible to complete construction phase works during the summer months (i.e. between April 1st and October 31st) to avoid disturbance impacts on over-wintering birds that may be using the nearby areas of the SAC and the SPA. However, in designing the programme of works, every effort shall be made to maximise works during the summer months and to use this time to erect suitable screening to minimise disturbance from winter works. Programming works during the drier summer months would also help with control of surface water run-off to adjoining Natura 2000 sites.

Construction Method Statement

- 3.25 A Construction Method Statement will be drawn up by a suitably qualified ecologist and agreed by with the site contractor prior to the initiation of construction works. This will outline detailed mitigation measures and protocols to be carried out over the duration of the construction period. The above mentioned Method Statement will be prepared in agreement with Cork County Council, National Parks & Wildlife Service and Inland Fisheries Ireland.

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4. Appropriate Assessment – Water Treatment & Quality

Treatment Processes

- 4.1 As this project is being progressed as a *Design Build* project, the final treatment package will be determined by the *Design Build Contractor*. Presented below is an overview of how the Contractor might go about achieving the required effluent standards. It should, however, be noted that the package chosen will have to achieve the required effluent standards as specified by Cork County Council and the eventual Discharge Licence.

Preliminary Treatment

- 4.2 Before undertaking secondary treatment, Preliminary treatment of raw sewage is necessary to remove gross material (including solids, rags etc.) in order to avoid damage or blockage to the downstream equipment. Preliminary treatment is normally located at the inlet to the proposed works in advance of the other processes. Generally this involves a combination of the following processes: -

- a) Screenings removal – coarse and fine screens;
- b) Grit removal; and
- c) Fat, oil and grease removal.

- 4.3 These processes will be required for all downstream process options being considered as described below.

Storm water Treatment

- 4.4 The purpose of storm water treatment is to balance the flow to full treatment (FTFT) which will be restricted in accordance with the design. During periods of wet weather flows in excess of the FTFT will be diverted to the storm tank where they will be stored temporarily until the storm has receded. The wastewater is then returned at a low rate into the main treatment process for full treatment with flushing of the tanks with wash-water to ensure settled solids are returned. The Dunn's Park outfall is discussed in detail in the waste licence application.

Primary Treatment

- 4.5 Primary treatment (sedimentation) follows preliminary treatment. This is a process by which the velocity of the waste water is reduced below the point at which it can transport suspended material, so that much of it settles and can be removed as sludge. The aim of primary sedimentation is to remove as much as possible of the polluting matter, in the form of readily settleable solids, from the waste water as quickly and as economically as possible. Once screenings and grit have been removed from the waste water, sedimentation is considered to be the cheapest way of removing pollution load present as suspended matter.

- 4.6 Primary settlement may be assisted through chemical addition to enhance settling characteristics. It can also be enhanced through the provision of lamellae plates in the tank which results in the reduction of the footprint of the process.
- 4.7 This process may or may not be included in the proposed treatment plant, depending on the treatment method chosen.

Secondary Treatment

- 4.8 Secondary treatment is defined as “*generally involving biological treatment with secondary settlement or other process*”. Biological processes include suspended growth and attached growth systems.

Suspended growth Systems

- 4.9 Three treatment process options were considered under the suspended growth systems all of which are based on the activated sludge system and can achieve the required effluent quality standards. The Activated Sludge process involves the production of an activated mass of microorganisms capable of aerobically stabilising the organic content of a wastewater. Waste water is introduced into an aerated tank of masses or ‘flocs’ of micro-organisms, coagulants, particles etc. which are collectively referred to as activated sludge or mixed liquor. These ‘flocs’ capture pollutants through adsorption, absorption or entrapment. The mixed liquor requires oxygen to convert the dissolved pollutant matter (measured as Biological Oxygen Demand (BOD)) through bacterial processes to additional biomass or excess sludge.
- 4.10 Aeration of the biomass is achieved by the use of submerged diffused or surface mechanical aeration or combinations thereof, which also maintain the activated sludge in suspension.
- 4.11 Following a period of contact between the waste water and the activated sludge, the outflow is separated from the sludge in a secondary settlement (secondary clarifier) tank. Important factors influencing the efficiency of the process include: -
- The concentration at which the mixed liquor is maintained in the aeration tank;
 - Characteristics of the inflow – e.g. hydraulic and organic loading rates;
 - Amount of oxygen required for respiration of micro-organisms present and maintenance of a suitable environment for these micro-organisms;
 - Control and disposal of scum and supernatants;
 - The amount of solids in the aeration tank; and
 - Sludge Age (Sludge Loading Rate).
- 4.12 The following processes are types of activated sludge: -
1. High Rate Activated Sludge
 2. Conventional Activated Sludge

3. Extended Aeration Variants of the activated sludge process are the following:

4. Sequencing Batch Reactor (SBR);

5. Submerged Membrane Bioreactor (SMBR).

1. High Rate Activated Sludge

- 4.13 These processes are generally applied to strong industrial wastes which require partial treatment in a "roughing" stage prior to further treatment. The process is operated at high loading rates (3-6kg BOD / kg MLSS) and short retention times to remove the more easily oxidised organic matter.

2. Conventional Activated Sludge

- 4.14 In conventional Activated sludge systems, waste water may be (but not necessarily) subjected to primary sedimentation followed by secondary treatment in aeration basins and secondary settlement. Nutrient reduction (N and P) can also be provided in the processes through the provision of separate aerobic and anoxic zones. A key parameter in this process is the Sludge Age or Sludge loading rate where a medium rate of between 0.2-0.1kgBOD / kgMLSS would be usual. This results in a sludge age between 10-20 days.

3. Extended aeration

- 4.15 This variant of activated sludge system does not include primary settlement and wastewaters are introduced following preliminary treatment to the aerated reaction vessel followed by secondary settlement. The key parameter for this process is the low sludge loading rate of less than 0.05 kg BOD / kg MLSS resulting in a long sludge age (more than 25 days) resulting in a nitrified effluent and stable sludge.

4. Sequencing Batch Reactors (SBR)

- 4.16 Activated sludge systems traditionally achieve biodegradation and solids separation in two separate tanks. Sequencing batch reactors allow for both processes to be carried out in one tank. This is done by operating the reactor in sequence. At least two reactors will be required to allow for continuous operation, or a flow balancing tank. The length of time for each of the sequences can be varied to optimise the plant performance. Typically the sequences are 'fill-react-settle-decant'. Depending on specific process requirements 'fill' can be broken up into fill with aeration or without aeration.

- 4.17 During the 'React' stage, the tank is charged and seeded with new waste water and is aerated until the required level of biodegradability is achieved. Different modes of operation of the 'React' sequence can be employed one of which is the inclusion of one or more 'anoxic' phases where denitrification is simulated by switching off the aeration system to induce zero dissolved oxygen conditions. During the 'settle' sequence, aeration is stopped to allow the mixed liquor to settle and the clear supernatant is decanted off. New waste water and seed (if necessary) is added and the cycle repeats itself. Hydraulic and organic loading rates and sludge ages can be controlled in SBR's so a full range of treatment objectives can be achieved. Biological or physico-chemical nutrient removal is possible.

- 4.18 The footprint for the process is significantly reduced from that of the more conventional systems previously mentioned. SBRs may also be preceded by primary treatment and can be combined with lamellae enhanced settlement to reduce plant footprint.

5. Submerged Membrane Bioreactors (SMBR)

- 4.19 Membrane bioreactors are based upon submerging membrane micro-filtration units within an activated sludge wastewater treatment tank to achieve solids separation. This is a physical separation process and eliminates problems associated with poor sludge settlement characteristics and enables Mixed Liquor Suspended Solids (MLSS) levels to be increased to between 15,000 –30,000 mg/l. This enables a low tank volume and a long sludge age to be utilised, which gives reduced sludge production.
- 4.20 The membrane pore size is in the order of 0.1 - 0.4 μm . In operation the membranes become covered by a dynamic layer of protein and cellular material which further enhances the filtration performance by providing an effective pore size of less than 0.01 microns, which is in the ultrafiltration range. This achieves disinfection by filtering out pathogenic organisms from the effluent.
- 4.21 Due to the increased MLSS levels and the elimination of the need for primary and secondary settlement, membrane bioreactors have a much smaller footprint requirement than conventional activated sludge processes. The process also provides excess sludge of > 2% thickness.

Attached Growth Systems

- 4.22 Attached growth systems are also called biofilm and fixed film systems. These processes are where bacterial growth attaches itself to a surface and the resulting film or slime contains the micro-organisms to treat the applied waste.
- 4.23 These are a number of these types of processes including the following common types: -
- Percolating or Trickling Filters
 - Rotating Biological Contactors (RBC)
 - Submerged Aerated Filters

- 4.24 All the processes are usually preceded by primary settlement (conventional or Lamellae) to remove gross settleable solids which may interfere with the oxygen transfer or block the filter media.

Percolating / trickling Filter

- 4.25 These are made up of beds of packed media of varying materials and usually plastic in more recent systems. The media provides support for the growth of micro-organisms and wastewater applied to the media in a downward flow providing food for the biomass. The biomass converts the dissolved BOD in the wastewater to biomass using bacteriological processes similar to that in suspended growth systems.

- 4.26 The growth removes itself automatically as the weight of the growing biomass is dislodged by the downward flow of wastewater. The solids are carried forward and separated in a settling or humus tank. Typical application in recent times is as "roughing" high rate filters (called biotowers) to treat, as an initial phase, high strength industrial wastewaters.

Rotating Biological Contactor

- 4.27 This process will allow growth of a biofilm on large diameter rotating discs mounted on a central rotating shaft thereby alternately submerging the growth in wastewater followed by exposition to the air. This technology comprises closely spaced discs (20-30mm apart) mounted on a central shaft which is driven by a geared motor connected to the shaft. Most RBCs are supplied as proprietary packaged plants often in conjunction with packaged primary and secondary settlement tanks.

Submerged Aerated Filters (SAF)

- 4.28 This technology has been developed over the last ten years with claims of high loading rates and low footprint requirements. They are intensive biofilm processes where large quantities of bacteria are supported inside a reactor vessel which is submerged in the wastewater and which is actively aerated using a blower and diffuser system. They combine some of the principles of the biofilm and activated sludge processes. A biofilm grows on the submerged media under active aeration with little or no natural erosion of the growing biomass such that back-washing of the filters is required at regular intervals. There are many types of media and configurations of SAF units and can be differentiated by: -

- Direction of flow (upflow or downflow)
- Hydraulic loading rates
- Sludge production and separation from liquors
- Outflow characteristics
- Requirement for secondary settling.

- 4.29 The larger submerged filters tend to be highly mechanised and engineered with significant operator control and supervision.

Disinfection

- 4.30 Disinfection refers to the process by which disease-causing organisms are selectively destroyed by chemical or physical agents. All the organisms are not destroyed during the process; this differentiates disinfection from sterilisation, which is the destruction of all organisms. Methods of disinfecting waste water include chemical (including chlorine, ozone and hydrogen peroxide), physical (e.g. membrane technology as in the case of SMBR's) and irradiation (e.g. UV). Ozone and UV treatment (as examples) are briefly discussed below.

- 4.31 Ozone gas (O₃) is a highly reactive oxidising agent and rapidly forms free radicals on reaction with water. It is generated on-site in ozone generators by passing dry air or oxygen through a high voltage electric field. The gas, which is bubbled up

through the water to be disinfected, reacts with organic matter in the waste water achieving disinfection.

- 4.32 Ultra-violet (UV) light is produced by a special mercury discharge lamp. The effectiveness of UV radiation depends on the dose received by the micro-organisms and this depends on: -
- The intensity of the radiation (the most effective wavelength is 254nm);
 - The path length from the source to the micro-organisms;
 - The contact time at the required dose;
 - The quality of the waste water (particularly with regard to turbidity).
- 4.33 Lamps are prone to interference from chemical constituents of the waste water such as ferric and hardness salts. Periodic cleaning of the lamps is therefore required.
- 4.34 The proposed discharge at Ferry Point without disinfection has been demonstrated by modelling (ref Chapter 7 of the EIS; Atkins, 2001) to not impact on the designated beaches outside the estuary and therefore disinfection is not a mandatory requirement. However, if consideration is given to protecting the popular bathing waters in the estuary, disinfection would be required and therefore provision is made in the scheme to allow it to be fitted at a later stage if required.

Nutrient Reduction

- 4.35 Nutrient reduction relates to the reduction of nitrogen and phosphorus in the treated effluent and is required where discharges from plants will lead to enhancement of eutrophication in the receiving waters.

Nitrification/De-nitrification.

- 4.36 The most widespread method of achieving nitrogen removal is through biological nitrification and de-nitrification. This is a two stage process in which ammonia is firstly oxidised to nitrite and nitrate in an aerobic environment. Nitrates/nitrites are subsequently converted to nitrogen gas during the de-nitrification process which occurs in an anoxic zone.

Nitrification

- 4.37 This describes the process whereby ammonia is converted to nitrate and nitrite by nitrifying bacteria. Nitrifiers are slower growing bacteria than the carbonaceous bacteria and thus the hydraulic retention time and sludge age must be greater in a nitrifying plant to allow the nitrifiers time to grow and avoid washing them out of the system.
- 4.38 To achieve nitrification will require additional aeration capacity over that required to achieve carbonaceous removal requirement alone as this process is aerobic.

De-nitrification

- 4.39 De-nitrification can be achieved through the provision of an anoxic zone. Anoxic zones have low dissolved oxygen levels and typically occupy 25-40% of the total capacity of an activated sludge lane. Effluent is recycled into the anoxic zone where it comes into contact with raw influent. The influent provides the carbon and the bacteria strip oxygen from nitrates and nitrites. This process results in the reduction of the aeration capacity required for aerobic processes.

Phosphorus removal

- 4.40 The principal methods of achieving Phosphorus removal are through biological removal and chemical precipitation. Chemical precipitation is typically achieved through the addition of chemicals such as ferric sulphate or aluminium sulphate. This forms an insoluble precipitate with the phosphorous present which is removed as sludge.
- 4.41 These chemicals can be added at a number of different stages of the treatment process: before the aeration basins, in the aeration basins or after the aeration basins to achieve pre-precipitation, co-precipitation or post-precipitation respectively.
- 4.42 Alternatively phosphorous removal can be achieved using biological removal. This is achieved through various configurations of aerobic and anaerobic stages of the treatment process to promote uptake and storage of phosphorous present in the wastewater by bacteria.
- 4.43 The phosphorous is then removed from the system with the waste activated sludge.
- 4.44 Nutrient reduction processes include the Bardenpho process, A/O and UCT processes.
- 4.45 It is proposed to provide for achieving the nitrogen (limiting nutrient) standard for the estuary which will require the provision of nitrification and denitrification. Provision will be made for the inclusion of Phosphorus removal if deemed necessary at a future point in time.

Tertiary Treatment

- 4.46 Tertiary treatment can be used to further reduce the BOD and suspended solids normally discharged after conventional waste water treatment. Final effluent quality from a conventional activated sludge system is generally in the region of 20 to 25 mg/l BOD, 30 to 35 mg/l SS. There are four main types of tertiary treatment for BOD and Suspended Solids.
- 4.47 They are as follows: -
- Lagoons;
 - Land irrigation – grass plots, reed beds;
 - Straining via fabric or metal filters;

- Sand filters.

4.48 Tertiary treatment for BOD and suspended solids removal is not a requirement of the design process for Youghal Main Drainage Scheme.

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Water Quality

Receiving Waters

Historic Data

- 4.49 The estuary of the Munster Blackwater extends from the limits of tidal influence at Lismore to the mouth at Youghal Harbour (at East Point), a distance of approximately 38km. The River Blackwater is a relatively large river with a long-term mean flow rate of 80m³/s (Atkins, 2001).
- 4.50 There are also a number of significant tributaries, which discharge into the estuary; e.g. the rivers Bride, Finisk, Tourig and Lickey. The estuary has a distinctive narrowing due to a shingle spit extending from the east side of the estuary known as Ferry Point. The predicted tidal range is approximately 3.5m and currents in the estuary can be strong with tidal currents at the Ferry Point varying from 0.02 – 0.89ms⁻¹ (see Appendix D of the EIS; Atkins, 2001). Data from an EPA cruise in October 1992 (Marine Institute, 1999) indicate that the estuary is well mixed.
- 4.51 The EPA has reported (*Water Quality in Ireland, 1995-1997*) on estuarine and coastal water quality on a number of estuaries including the Blackwater at Youghal. This assessment indicated that slight de-oxygenation was observed in the upper estuary but oxygen saturation was close to 100% in both the river and tributaries and in the coastal waters outside the estuary. Oxidised Nitrogen and Phosphorus were quite high in the upper estuary but ammonia levels were generally low. Slightly elevated levels of algal growth were detected in both the 1991-1994 and 1995-1997 surveys but without serious effect on water quality. Generally satisfactory water conditions persisted over this period.
- 4.52 Water quality in the river Blackwater and its tributaries was summarised in the EIS (Atkins, 2001) as generally being very good. In 1997 over 82% of river water in the area was designated as Class A (unpolluted) with a further 13% designated as Class B (slightly polluted/eutrophic) (Doris *et al.*, 1999). Biotic Quality Indices (which use macroinvertebrates as indicators of water quality) classified most of the River Blackwater and its Tributaries to have a Q-value of 4 or 5 (Doris *et al.*, 1999; Clabby *et al.*, 2001) which indicate unpolluted water. Some tributaries were slightly polluted (Q3-4); e.g. Lickey River.
- 4.53 More recent data on water quality has demonstrated an improvement in the trophic status of the Blackwater estuary; it is one of five waterbodies no longer classified as eutrophic. (*Water Quality in Ireland, 2007-2009*; McGarrigle *et al.*, 2010). Improvements in the upper and lower parts of the Blackwater estuary are attributed to a decrease in chlorophyll levels and improved oxygen conditions (McGarrigle *et al.*, 2010). The EPA mapviewer shows water quality on the Blackwater and its tributaries in the environs of Youghal as currently being of good quality (Q4); www.epa.ie (ENVision map view for water quality data; accessed 27th October 2011).

Data collected for the EIS

- 4.54 In April of 2001, 11 water samples were collected at 7 harbour sites during high and low tide as part of the EIA process. These were analysed for a range of water quality parameters. A summary of the results is presented in Table 4.1 (copy of Table 7.1 include in the EIS); (site locations are shown in Figure 7.1 - p.81 - of the EIS, Atkins, 2001).
- 4.55 The freshwater section of the River Blackwater is designated a salmonid water (78/659/EEC). Although the estuary does not come under the remit, recommended limits given in this legislation are useful in assessing water quality in the harbour. This Directive requires total ammonia levels below 0.8 mg/l N. Values in the estuary ranged between 0.046 – 0.064 mg/l and thus were well

within the recommended limits. Under this Directive BOD levels should be below 3 mg/l. The highest BOD level recorded in this survey was only 2.0 mg/l. Nitrate levels were also low (<1.6 mg/l). Levels for these parameters were also low in the EPA survey in 1994 and 1997 (EPA, unpublished data; Lucey *et al.*, 1999).

Table 4.1 - Median concentration for water quality parameters at Youghal Harbour (2001; from EIS; Atkins, 2001).

Parameters	Units	Site1	Site2	Site4	Site6	Site7	Site8	Site9	Max	Min
B.O.D.	mgO ₂ /l	1.1	2.0	0.9	0.9	1.1	0.7	0.9	2.0	0.7
Ammonia	mgN/l	0.064	0.060	0.059	0.068	0.055	0.046	0.064	0.072	0.046
Nitrite	mg N/l	0.003	0.002	0.004	0.004	0.003	0.002	0.001	0.005	0.001
Nitrate	mgN/l	0.54	0.03	0.93	0.77	0.82	0.31	0.09	1.55	0.03
Total Nitrogen	mgN/l	0.72	0.24	1.18	1.01	1.04	0.45	0.31	1.75	0.24
Orthophosphate	mgP/l	0.002	0.000	0.006	0.006	0.007	0.001	0.000	0.013	0.000
Total P	mgP/l	0.020	0.015	0.027	0.026	0.030	0.015	0.013	0.042	0.013
Suspended Solids	mg/l	6.3	8.8	3.0	8.3	14.7	3.6	2.2	23.2	1.0
Chlorophyll a	mg/l	0.012	0.015	0.009	0.011	0.012	0.011	0.011	0.015	0.008
Salinity ‰		29.0	33.5	26.2	27.5	27.1	31.7	33.3	33.7	20.8
Total Coliforms	CFU/100 mls	15	26	23	33	400	18	2	400	1
Faecal Coliforms	CFU/100 mls	5	10	6	20	74	7	0	84	0
TN:TP ratio		37	16	44	40	35	30	24	44	16

Sites 3 and 5 were for sediment samples.

(2 samples were collected at Sites 1, 4, 6 & 7; one sample was collected at each of the other sites).

Hydrography

- 4.56 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.
- 4.57 Details of this survey are given in Appendix D of the EIS (Atkins, 2001). Dispersion and dilution characteristics 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. Recorded currents were south-south-east for the ebb tide and north-north-east for the flood tide.
- 4.58 However, there appears to be an east to west flowing current at high and low water slack periods, causing the dye to migrate towards the west shore at this time. At the high water - spring dye release strong dye concentrations were observed within the harbour where a clockwise circulation pattern appeared to have prevented this dye from re-entering the channel.
- 4.59 The drogoue tracking study indicated a current favouring the Youghal side of the channel flowing south. The directions moved towards the centre of the channel by mid-tide. On the flood tide, drogues travelled north-north-west.

Nutrient Loading

- 4.60 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.
- 4.61 Nutrient inputs to the estuary are dominated by riverine flows. Industrial loads in Youghal are low and are considered unlikely to contribute to the nutrient budget of the estuary (Marine Institute, 1999). In 1997, the River Blackwater was reported to have exported the highest load of ortho-phosphorus of all Irish rivers (Lucey *et al.*, 1999). The export load of oxidised nitrogen was found to be the fifth highest in the country in 1997 (Lucey *et al.*, 1999). Phosphorus loading from the River Blackwater is equal to 603 tonnes per annum while total oxidised nitrogen loading from the river is 8,979 tonnes per annum (Lucey *et al.*, 1999).
- 4.62 Based on typical concentrations of total phosphorus and total nitrogen in domestic wastewater of 10 and 40 mg/l respectively and 225 litres per person per day, with a population equivalent of 20,000 the proposed WWTW would produce the equivalent of 16 and 66 tonnes of TP and TN respectively per annum. This represents less than 3% of total phosphorus loading and less than 0.7% of total nitrogen loading to the estuary in comparison with loading from the river.
- 4.63 The EPA found other water quality parameters to be satisfactory (Lucey *et al.*, 1999) although autumn chlorophyll levels were slightly elevated in the upper part of the estuary in the November 1994 survey (range 1.3 to 11.3 mg/m³). Ortho-phosphate levels in recent (April 2001) surveys were also low (<0.007 mg/l). According to a classification scheme devised by the Environmental Protection Agency and the Marine Institute normal ortho-phosphate levels in estuaries range between 0.05 – 0.15 mg P/l with ‘hypersaturated’ levels greater than 0.15 mg P/l (Marine Institute, 1999). Orthophosphate levels measured by the EPA in 1994 and 1997 were < 0.128 and <0.09 mg/l respectively, while levels measured in the June 2001 survey are considered low. However, annual median values are usually used to assess eutrophication potential as ortho-Phosphate can vary greatly over time. Therefore, ortho-Phosphate values obtained in the current sampling should be observed with caution. During the EPA survey in 1994 (where a large number of samples were taken throughout the year), median concentrations of orthophosphate were as high as 0.07 mg/l in the upper estuary while median levels in the upper estuary were 0.04 mg/l in the summer sampling of 1997 (Lucey *et al.*, 1999).
- 4.64 Eutrophication can also occur if summer chlorophyll levels are consistently above 0.01 mg/l. In the EPA survey in May 1994, levels were generally below this in the estuary and lower river (EPA, unpublished data) while in 1997 median chlorophyll levels were 0.02 mg/l in the upper estuary and 0.006 in the lower estuary (Lucey *et al.*, 1999). In this survey, median chlorophyll levels in the estuary were 0.011 mg/l with little variation between low and high tide. Conversion of ortho-phosphate into chlorophyll by algae may account for the low ortho-phosphate and high chlorophyll concentrations.
- 4.65 Observed algal production solely due to high riverine nutrient levels resulting from human activity is questionable. In areas that are naturally productive it is difficult to determine the incremental contribution from these sources without detailed research. Nonetheless, it is clear that estuaries subject to increasing loads from point sources and agricultural run-off in particular, may be prone to high productivity and sensitive to increasing nutrient input.
- 4.66 However other parameters are also required for the production of algae including light and water column integrity.

Limiting Nutrient

- 4.67 Nitrogen is normally the limiting nutrient in saline coastal waters while Phosphorus is normally the limiting nutrient in freshwaters. The so-called Redfield Ratio of Total Nitrogen (TN): Total Phosphorus (TP) is often used to assess what the limiting nutrient is, and concentrations of this limiting nutrient control growth of algae and therefore potential eutrophication. (Lucey *et al.*, 1999). Normal ratios of TN: TP for algal growth are 16:1 (Redfield Ratio). At ratios above this Phosphorus is the limiting nutrient. In samples collected for this study, TN:TP ratios were greater than 16:1 for the whole estuary and reached as high as 44:1. TN:TP ratios as measured by the EPA in 1997 were even higher than this (between 31.9 - 241, n=28). This analysis would suggest phosphorus to be the limiting nutrient in the Blackwater Estuary. However the level of aggregation of the data is not apparent from the results between the upper and lower estuaries and this analysis needs to be treated with caution.
- 4.68 Based on the above it is proposed to provide for the removal of nitrogen to meet the 2001 Regulations standard (ref Table 2.2). Provision will be made for the removal of phosphorus if deemed necessary by further studies, changes in regulations etc.

Bacteriological Water Quality

- 4.69 Faecal and total coliform levels in water were assessed for this EIS. The levels were found to be low throughout the harbour with a maximum faecal coliform count of 84 CFU/100 ml at Site 7 in the upper harbour (site locations are shown in Figure 7.1 - p.81 - of the EIS, Atkins, 2001).
- 4.70 Shellfish have not been harvested from Youghal Harbour in recent years. However, as recently as 2000 Youghal Bay outside the estuary from Knockadoon to Knockavery was designated as a Class B Shellfish Production Area (S.I. No. 147 of 1996). Under the new Live Bivalve Molluscs (Production Areas) Designation, 2007 (No.1) Youghal Bay has not been designated as a shellfish production area.
- 4.71 Youghal Beach and Claycastle Beach are designated bathing waters under the EU Bathing Water Directive (76/160/EEC). It has also been awarded Blue Flag Beach status for the past number of years by An Taisce. Faecal coliform levels in the water at this beach were well below mandatory levels under the Bathing Water Directive (76/160/EEC) and Bathing Water Regulations (S.I. 155 of 1992) and also the National Limit Values (S.I. 155 of 1992).

Outfall Modelling

- 4.72 Modelling of the discharge of the treated effluent scenarios has been undertaken for the discharge to the estuary by Dr. Jimmy Murphy, HMRC (Ref Chapter 7 and Appendix D (Volume 3)). The model is a CORMIX plume model based on near field dilutions. The model demonstrates that the estuary is well mixed and that the coliform concentrations diminish significantly at the harbour entrance at East Point. The model demonstrates that the predicted coliform levels with secondary treatment and without disinfection meet with the bathing water regulation guide values and that the blue flag status of the beaches would not be threatened. This is no more than expected given that the existing untreated sewage discharges to the harbour do not impact on the beaches which have enjoyed blue flag status for a number of years.
- 4.73 Survey work was carried out in May 2009. This included drogue studies of the Estuary, tidal and current flow gauging and bathymetric surveys. A 2D model of the Estuary was developed. Atkins supplied available data on water flows and quality in the Estuary and upstream, based on information received from the Environmental Protection Agency and from the recent flow and load survey of the town. The model was then calibrated to ensure that it matched as closely as possible the actual tidal action in the Estuary.

- 4.74 Initial modelling was carried out to determine the worst case scenario in terms of effluent impact on the Estuary. Various combinations of wind speed and direction, river flow rates, effluent flow rates were modelled. Effluent flow rates were modelled for both the initial load on the plant of 16,000 PE (125 l/s outflow) and 24,000 PE (187.5 l/s). Each model was simulated for a period of approximately one month, so that it could be modelled over an entire tidal cycle. The key indicator was taken to be concentrations of indicator bacteria such as faecal coliforms and *E. coli* on the Blue Flag beaches at Front Strand (Youghal), Claycastle and Red Barn to the south of the town.
- 4.75 On examination of the results, a number of scenarios were seen to be very similar in terms of bacterial concentrations on the beaches. A scenario with no wind, low river flows, and maximum discharge from the WWTP was taken as the worst case. It should be noted that this situation is unlikely in reality as the combination of low estuarine flows and maximum WWTP flows would not be expected to occur, particularly for an entire month. However, this approach was taken to ensure a conservative result was obtained. Additionally, to ensure further conservatism, the outfall was modelled as an open-ended pipe, and no account was taken of natural bacterial die-off in the water.
- 4.76 Additional modelling of this worst case scenario was carried out to assess the water quality impact of disinfection of the effluent at the WWTP and to consider the effect of a diffuser at the outfall. It was assumed in the model that disinfection would reduce bacteriological concentrations by 90% compared to non-disinfected effluent.

Results & Conclusions

- 4.77 1) The model indicates that, at the initial plant loading of 16,000 PE, the effluent is not expected to have a negative impact on the water quality in the estuary, and in particular, that bacteriological concentrations at the Blue Flag beaches are in accordance with requirements. Front Strand beach is the critical location as this is closest to the proposed outfall, and consistently recorded the highest concentrations of all parameters modelled for the three beaches.
- 4.78 The Bathing Water Regulations 2008 require that, for "Excellent" quality water, 95-percentile intestinal enterococci concentrations must be below 100 cfu/100 ml, and 90-percentile *E. coli* concentrations must be below 250 cfu/100 ml.
- 4.79 Blue Flag requirements are similar with the exception that 95 percentile compliance is required for both standards. Both standards must be achieved for a Blue Flag to be awarded.
- 4.80 For a discharge of 125 l/s, the 95-percentile intestinal enterococci concentration was 3.5 cfu/100 ml and the 90-percentile *E. coli* concentration was 94.9 cfu/100 ml. No intestinal enterococci concentrations were noted above the threshold; the maximum recorded was 17.8 cfu/100 ml. However 8 *E. coli* concentrations exceeded the limit, with a maximum recorded concentration of 339.9 cfu/100 ml. Over 99% of modelled results achieved the *E. coli* requirements for excellent water quality. This would also comply with Blue Flag standards.
- 4.81 For a discharge of 187.5 l/s, the intestinal enterococci concentrations all remain below the "excellent" standard. The maximum concentration modelled was 9.4 cfu/100 ml. The 90-percentile concentration of *E. coli* is 144 cfu/100 ml, which is in compliance with the Bathing Water Regulations. The 95-percentile result is 203 cfu/100 ml which complies with Blue Flag standards. A total of 23 results (3.1%) exceeded the 100 cfu/100 ml standard, with a maximum of 510.9 cfu/100 ml.
- 4.82 To summarise therefore, without disinfection, the model indicates that compliance with intestinal enterococci concentrations will be 100% at all effluent flows. For *E. coli*, 99% compliance will be achieved at 16,000 PE, and 97% at 24,000 PE.

- 4.83 Note that this concentration refers to concentrations of bacteriological compounds in the effluent, combined with normal background concentrations in the water. Additional discharges to the water body, from both natural and man-made sources, have the potential to cause contamination in excess of the standards.
- 4.84 2). Modelling of disinfected effluent indicates that disinfection would ensure Blue Flag water quality standard should be achieved for all river flow and effluent discharge rates, at all stages of the tide at all three beaches. The maximum *E. coli* and intestinal enterococci concentrations noted at Front Strand were 0.1 cfu/100ml and 0.2 cfu/100ml respectively at a discharge rate of 187.5 l/s from the outfall. Compliance is therefore expected to be 100%.
- 4.85 3). The proposed outfall was modelled both as an open ended pipe and as a diffuser with three discharge points fitted with duckbill check valves. No appreciable improvement in modelled water quality was noted as a result of the fitting of a diffuser. It is suggested by the HMRC, due to the distance between the outfall and Front Strand beach, that any initial increase in dilution close to the outfall is not noticeable by the time the effluent plume reaches the strand.
- 4.86 However, it should be noted that it is still intended to provide a diffuser fitted with duckbill check valves on the outfall as this is considered to be preferable from an operational and maintenance viewpoint.
- 4.87 4). It had also been intended, as part of the modelling exercise, to assess whether fitting diffusers to the existing outfalls in the town at Dunn's Park and Paxe's Lane should be carried out as a short term measure to improve water quality. In light of the results observed at 3 above following modelling of a diffuser at the new outfall, it was decided that that there was unlikely to be a significant benefit to be gained from this and the modelling was concentrated on the new outfall. Again, however, a duckbill check valve will be fitted to each of these discharges as part of the main drainage scheme to reduce sediment build-up within each outfall and to mitigate the risk of blockage.

Details of the nature of the proposed discharge

- 4.88 The treated effluent quality shall comply with the standards set out in Waste Water Discharge Authorisation DO139-01 for the plant included in Book 8 – Site Information (of the Waste Licence submission documents) in compliance with the requirements of the Urban Waste Water Treatment Regulations 2001 (SI No. 254 of 2001) as amended. The effluent standard applies 24 hours/day, 365/366 days per year. Table 4.2 shows the effluent standards to be achieved.

Table 4.2 - Effluent Quality Standards.

Parameter	95 th percentile Concentration	Upper tier Minimum Percentage Reduction
BOD	25 mg/l O ₂	70-90
COD	125 mg/l O ₂	25-75
TSS	35 mg/l	90
Total Nitrogen	15 mg/l	70-80
Total Phosphorous	n/a	n/a

- 4.89 A provision has been made in the design for both phosphorous removal and disinfection should these be required in the future.

- 4.90 The Contractor shall be required to install a fat, oil and grease removal system at the inlet of the proposed treatment plant.

Conservation Objectives

- 4.91 Conservation objectives for the Blackwater River SAC and Blackwater Estuary SPA are presented in sections 3.18 and 3.19, respectively.

Impacts on conservation objectives

- 4.92 Chapter 3 deals with the impacts associated with the physical structure that is the waste water treatment plant; thus direct losses such as habitat loss, fragmentation etc. have all been addressed above. Chapter 4, however, deals with the emissions; i.e. the stream of treated waste water effluent that it is proposed to discharge to the Blackwater Estuary / Youghal Bay.

- 4.93 As noted above this project is being run as a *Design Build* project; as a consequence the final design solution for the treatment plant must await the appointment of a chosen contractor / operator. Sections 4.1-4.49 summarises the treatment process and the solutions that are likely to be adopted to treat effluent at Youghal. Included above is a summary of the review of existing water quality; nutrient loading (esp. nitrogen and phosphorous); pathogen loading and dispersal (e.g. *E. coli*) etc. which has informed the preliminary design. However, ultimately the proposed character of the effluent is dictated by the Effluent Quality Standards to be imposed on the operator (see Table 4.2 above). Furthermore, allowance has been included for the addition of phosphorous removal should this, in time, be required. A conservative approach to the analysis of impacts was taken to the design throughout; e.g. maintenance of the bathing water quality standards at Blue Flag beaches; together with environmental water quality standards and shellfish standards informed the modelling of the design, treatment quality and review of dispersal / dilution undertaken during the design phase. A more complete discussion of all of the above can also be found in the EIS (Atkins, 2001) and the Discharge Licence Application submitted to the EPA.

- 4.94 In line with the requirements of the EPA, cumulative impacts from disparate point and diffuse source of discharge have been considered in the assessment of effluent discharges. As noted a conservative approach to design analyses was taken at all times with worst-case scenarios adopted to assess likely impacts.
- 4.95 Ryan Hanley Consulting Engineers were commissioned by Cork County Council to carry an assessment of the potential ecological impacts of effluent discharging to the River Blackwater from a series of waste water treatment plants along the River Blackwater. Furthermore, they were commissioned to prepare a Natura Impact Statement on the impacts of these discharges on the Conservation Objectives of the River Blackwater (Cork/Waterford) SAC. This included a review of waste water discharge licence application from a total of 23 agglomerations (>500 p.e.); namely Ballyclogh, Ballyhooley, Banteer, Boherbue, Buttevant, Bweeng, Castlelyons, Churchtoen, Castletownroche, Churchtown, Clondulane, Conna, Doneraile, Dromahane, Fermoy, Glanworth, Kanturk, Kildorrery, Kilavullen, Kilworth, Mallow, Millstreet, Newmarket and Rathcormack; there are further discharges from a range of towns at <500 p.e. to the Blackwater (Ryan Hanley, June 2011). Furthermore, within the catchment of the River Blackwater there are a significant number of IPPC licences (<http://maps.epa.ie>); those of relevance in this instance include e.g. intensive pig and poultry rearing units which can add organic matter to the river.
- 4.96 It is the combined and assimilated discharges from these point sources, together with diffuse source such as agricultural runoff, septic tank discharges and runoff from forestry etc., that reaches the Blackwater Estuary – it is this which we've taken as the basis for considering the impacts of adding discharges from the proposed Youghal Waste Water Treatment Plant and thus in this way we have considered cumulative impacts.
- 4.97 Both in previous work by the EPA and analyses undertaken for this application, the River Blackwater has been identified as the most significant contributor of nutrients to the Blackwater Estuary; it is assumed, however, that there will be a progressive increase in water quality entering the estuary as both point and diffuse discharges are addressed under the auspices of the Water Framework Directive.
- 4.98 Based upon the above assessments and adherence to the Effluent Quality Standards to be imposed on the operator (see Table 4.2 above) it is not anticipated that the proposed development would negatively impact on the conservation objectives of the Blackwater River SAC.
- 4.99 A number of Conservation Objectives of Blackwater River SAC (see section 3.18) are freshwater and will not be impacted by the proposed development; namely Freshwater Pearl mussel, White-clawed crayfish and River Lamprey. Improvements in water quality in the estuary through improvements in quality of discharged effluents should have a positive impact for species such as Sea lamprey, River lamprey, Twaite shad, Atlantic salmon and Otter, which either migrate through or use the estuary.
- 4.100 Terrestrial habitats or plant species will not be impacted by the proposal; namely Killarney fern, water courses of plain to montane levels with *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation, old oak woods, alluvial forests and *Taxus* woods.
- 4.101 The remaining conservation objectives listed in section 3.18 are habitats found in and around the estuary. The waste water treatment proposals put forward in this project should result (in combination with other measures to improve water quality on watercourses entering the estuary) in progressive improvement in water quality within the estuary. As such there should be no negative impacts on estuarine semi-natural habitats around the Blackwater Estuary / Youghal Bay.

- 4.102 With respect to the Blackwater Estuary SPA conservation objectives are listed in section 3.19. It has been found the inputs of untreated wastes to coastal estuaries have increased their carrying capacity for supporting intertidal / subtidal wintering waders and wildfowl. By improving the quality of effluent streams one is also reducing the nutrient loading within the estuary. While in compliance with the requirements of the Water Framework Directive (and other relevant Directives) the combined improvements in water quality in the estuary and in watercourses discharging to the estuary may also inadvertently reduce the number of birds within the estuary over time. However, the most important areas for intertidal / subtidal wintering waders and wildfowl in Youghal are upstream of the estuary in and around the River Tourig estuary; thereby reducing the potential for negative impacts on the site...

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5. Conclusions

- 5.1 It is not envisaged that there would be any significant negative impacts on Natura 2000 sites arising from the proposed works. While the full effects of the reduction in nutrient loading in Youghal Harbour are difficult to quantify, it is considered that this will have a positive impact on water quality within the estuary in the long term. The lands proposed for development do not host significant number of birds for which the SPA has been designated and adoption of best practice on site will help to minimise disturbance of birds using surrounding areas.
- 5.2 It is not envisaged that there would be any significant negative impacts on Natura 2000 sites arising from the proposed works, when the above mitigation measures are implemented. These include the requirement for the successful Contractor to prepare a Method Statement, with the assistance of an appropriately qualified ecologist and following consultation with Cork County Council, National Parks & Wildlife Service and Inland Fisheries Ireland to outline the nature of proposed works and appropriate mitigation measures to avoid impacts on Natura 2000 sites, such as impacts on water quality or disturbance of protected birds and other animals.

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Appendix A

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A.1 Blackwater Estuary SPA Site Synopsis (004028)

- A.1.1 The Blackwater Estuary SPA is a moderately-sized, sheltered south-facing estuary, which extends from Youghal New Bridge to the Ferry Point peninsula, close to where the river enters the sea. It comprises a section of the main channel of the River Blackwater. At low tide, intertidal flats are exposed on both sides of the channel. On the eastern side the intertidal channel extending as far as Kinsalebeg and Moord Cross Roads is included, while on the west side the site includes the estuary of the Tourig River.
- A.1.2 The intertidal sediments are mostly muds or sandy muds reflecting the sheltered conditions of the estuary. Green algae (*Enteromorpha* spp. and *Ulva lactuca*) are frequent on the mudflats during summer, and Bladder Wrack (*Fucus vesiculosus*) occurs on the upper more stony shorelines. The sediments have a macrofauna typical of muddy sands, with polychaete worms such as Lugworm (*Arenicola marina*), Ragworm (*Hediste diversicolor*) and the marine bristle worm *Nephtys hombergii* being common. Bivalves are also well represented, especially Peppery Furrow-shell (*Scrobicularia plana*), but also Sand Gaper (*Mya arenaria*), Baltic Tellin (*Macoma balthica*) and Common Cockle (*Cerastoderma edule*). Among the brown seaweed on the shoreline, the Shore Crab (*Carcinus maenas*) and the Rough Periwinkle (*Littorina saxatilis*) are found. Salt marshes fringe the estuarine channels, especially in the sheltered creeks.
- A.1.3 The Blackwater Estuary is of high ornithological importance for wintering waterfowl, providing good quality feeding areas for an excellent diversity of waterfowl species. At high tide, the birds roost along the shoreline and salt marsh fringe, especially in the Kinsalebeg area. A low-lying field at Blackbog is a favoured roost. Some birds may leave the site to roost in fields above the shoreline. The site supports an internationally important population of Black-tailed Godwit (934), and has a further eight species with nationally important populations (all figures are average peaks for the five winters 1995/96 to 1999/2000): Shelduck (151), Wigeon (1,232), Golden Plover (2,947), Lapwing (3,988), Dunlin (2,016), Curlew (1,194), Redshank (634) and Greenshank (30). A population of Bar-tailed Godwit (172) is very close to the threshold for national importance.
- A.1.4 Other species which occur in significant numbers include Grey Heron (27), Teal (527), Mallard (148), Oystercatcher (508), Grey Plover (2,947), Knot (50) and Turnstone (56). The site is also notable for supporting large concentrations of gulls in autumn and winter. Principal species are Black-headed Gull (549), Common Gull (253), Lesser Black-backed Gull (602) and Great Black-backed Gull (227).
- A.1.5 Little Egrets are a feature of the site throughout the year as there is a breeding colony upstream. The estuary provides an important feeding area for these birds (often more than 10).
- A.1.6 The Blackwater Estuary SPA is an internationally important wetland site on account of the population of Black-tailed Godwit it supports. It is also of high importance in a national context, with eight species having populations which exceed the thresholds for national importance. The occurrence of Little Egret, Golden Plover and Bar-tailed Godwit is of particular note as these species are listed on Annex I of the E.U. Birds Directive. The site has been well-studied, with detailed monthly counts extending back to 1974.

[01.06.2004]

A.2 Blackwater River (Cork/Waterford) SAC Site Synopsis (002170)

- A.2.1 The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and five ranges of mountains. In times of heavy rainfall the levels can fluctuate widely by more than 12 feet on the gauge at Careysville. The peaty nature of the terrain in the upper reaches and of some of the tributaries gives the water a pronounced dark colour. The site consists of the freshwater stretches of the River Blackwater as far upstream as Ballydesmond, the tidal stretches as far as Youghal Harbour and many tributaries, the larger of which includes the Licky, Bride, Flesk, Chimneyfield, Finisk, Araglin, Awbeg (Buttevant), Clyda, Glen, Allow, Dalua, Brogeen, Rathcool, Finnow, Owentaraglin and Awnaskirtaun. The extent of the Blackwater and its tributaries in this site, flows through the counties of Kerry, Cork, Limerick, Tipperary and Waterford. Towns along, but not in the site, include Rathmore, Millstreet, Kanturk, Banteer, Mallow, Buttevant, Doneraile, Castletownroche, Fermoy, Ballyduff, Rathcormac, Tallow, Lismore, Cappoquin and Youghal.
- A.2.2 The Blackwater rises in boggy land of east Kerry, where Namurian grits and shales build the low heather-covered plateaux. Near Kanturk the plateaux enclose a basin of productive Coal Measures. On leaving the Namurian rocks the Blackwater turns eastwards along the northern slopes of the Boggeraghs before entering the narrow limestone strike vale at Mallow. The valley deepens as first the Nagles Mountains and then the Knockmealdowns impinge upon it. Interesting geological features along this stretch of the Blackwater Valley include limestone cliffs and caves near the villages and small towns of Killavullen and Ballyhooly; the Killavullen caves contain fossil material from the end of the glacial period. The associated basic soils in this area support the growth of plant communities which are rare in Cork because in general the county's rocks are acidic. At Cappoquin the river suddenly turns south and cuts through high ridges of Old Red Sandstone. The Araglin valley is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy.
- A.2.3 The site is a candidate SAC selected for alluvial wet woodlands and Yew wood, both priority habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for floating river vegetation, estuaries, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, perennial vegetation of stony banks and old Oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter and the Killarney Fern.
- A.2.4 Wet woodlands are found where river embankments, particularly on the River Bride, have broken down and where the channel edges in the steep-sided valley between Cappoquin and Youghal are subject to daily inundation. The river side of the embankments was often used for willow growing in the past (most recently at Cappoquin) so that the channel is lined by narrow woods of White and Almond-leaved Willow (*Salix alba* and *S. triandra*) with isolated Crack Willow (*S. fragilis*) and Osier (*S. viminalis*). Grey Willow (*S. cinerea*) spreads naturally into the sites and occasionally, as at Villierstown on the Blackwater and Sapperton on the Bride, forms woods with a distinctive mix of woodland and marsh plants, including Gypsywort (*Lycopus europaeus*), Gueider Rose (*Viburnum opulus*), Bittersweet (*Solanum dulcamara*) and various mosses and algae. These wet woodlands form one of the most extensive tracts of the wet woodland habitat in the country.
- A.2.5 A small stand of Yew (*Taxus baccata*) woodland, a rare habitat in Ireland and the EU, occurs within the site. This is on a limestone ridge at Dromana, near Villierstown. While there are some patches of the wood with a canopy of Yew and some very old trees, the quality is generally poor due to the dominance of non-native and invasive species such as Sycamore, Beech and Douglas Fir (*Pseudotsuga menziesii*). However, the future prospect for this Yew wood is good as the site is proposed for restoration under a Coillte EU Life Programme. Owing to its rarity, Yew woodland is listed with priority status on Annex I of the EU Habitats Directive.

- A.2.6 Marshes and reedbeds cover most of the flat areas beside the rivers and often occur in mosaic with the wet woodland. Common Reed (*Phragmites australis*) is ubiquitous and is harvested for thatching. There is also much Marsh Marigold (*Caltha palustris*) and, at the edges of the reeds, the Greater and Lesser Pond-sedge (*Carex riparia* and *C. acutiformis*). Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Reed Canary-grass (*Phalaris arundinacea*), Meadowsweet (*Filipendula ulmaria*), Nettle (*Urtica dioica*), Purple Loosestrife (*Lythrum salicaria*), Marsh Valerian (*Valeriana officinalis*), Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*).
- A.2.7 At Banteer there are a number of hollows in the sediments of the floodplain where subsidence and subterranean drainage have created isolated wetlands, sunk below the level of the surrounding fields. The water rises and falls in these holes depending on the watertable and several different communities have developed on the acidic or neutral sediments. Many of the ponds are ringed about with Grey Willows, rooted in the mineral soils but sometimes collapsed into the water. Beneath the densest stands are woodland herbs like Yellow Pimpernel (*Lysimachia nemorum*) with locally abundant Starwort (*Callitriche stagnalis*) and Marsh Ragwort (*Senecio palustris*). One of the depressions has Silver Birch (*Betula pendula*), Ash (*Fraxinus excelsior*), Crab Apple (*Malus sylvestris*) and a little Oak (*Quercus robur*) in addition to the willows.
- A.2.8 Floating river vegetation is found along much of the freshwater stretches within the site. The species list is quite extensive and includes Pond Water-crowfoot (*Ranunculus peltatus*), Water-crowfoot (*Ranunculus* spp.), Canadian Pondweed (*Elodea canadensis*), Broad-leaved Pondweed (*Potamogeton natans*), Pondweed (*Potamogeton* spp.), Water Milfoil (*Myriophyllum* spp.), Common Club-rush (*Scirpus lacustris*), Water-starwort (*Callitriche* spp.), Lesser Water-parshnip (*Berula erecta*), particularly on the Awbeg, Water-cress (*Nasturtium officinale*), Hemlock Water-dropwort, Fine-leaved Water-dropwort (*O. aquatica*), Common Duckweed (*Lemna minor*), Yellow Water-lily (*Nuphar lutea*), Unbranched Bur-reed (*Sparganium emersum*) and the moss *Fontinalis antipyretica*.
- A.2.9 The grassland adjacent to the rivers of the site is generally heavily improved, although liable to flooding in many places. However, fields of more species-rich wet grassland with species such as Yellow-flag (*Iris pseudacorus*), Meadow-sweet, Meadow Buttercup (*Ranunculus acris*) and rushes (*Juncus* spp.) occur occasionally. Extensive fields of wet grassland also occur at Annagh Bog on the Awbeg. These fields are dominated by Tufted Hair-grass (*Deschampsia cespitosa*) and rushes.
- A.2.10 The Blackwater Valley has a number of dry woodlands; these have mostly been managed by the estates in which they occur, frequently with the introduction of Beech (*Fagus sylvatica*) and a few conifers, and sometimes of Rhododendron (*Rhododendron ponticum*) and Laurel. Oak woodland is well developed on sandstone about Ballinatrav, with the acid Oak woodland community of Holly (*Ilex aquifolium*), Bilberry (*Vaccinium myrtillus*), Greater Woodrush (*Luzula sylvatica*) and Buckler Ferns (*Dryopteris affinis*, *D. aemula*) occurring in one place. Irish Spurge (*Euphorbia hyberna*) continues eastwards on acid rocks from its headquarters to the west but there are many plants of richer soils, for example Wood Violet (*Viola reichenbachiana*), Goldlocks (*Ranunculus auricomus*), Broad-leaved Helleborine (*Epipactis helleborine*) and Red Campion (*Silene dioica*). Oak woodland is also found in Rincrew, Carrigane, Glendine, Newport and Dromana. The spread of Rhododendron is locally a problem, as is over-grazing. A few limestone rocks stand over the river in places showing traces of a less acidic woodland type with Ash, False Brome (*Brachypodium sylvaticum*) and Early-purple Orchid (*Orchis mascula*).
- A.2.11 In the vicinity of Lismore, two deep valleys cut in Old Red Sandstone join to form the Owenashad River before flowing into the Blackwater at Lismore. These valleys retain something close to their original cover of Oak with Downy Birch (*Betula pubescens*), Holly and Hazel (*Corylus avellana*) also occurring. There has been much planting of Beech (as well as some of coniferous species) among the Oak on the shallower slopes and here both Rhododendron and Cherry Laurel (*Prunus laurocerasus*) have invaded the woodland.

- A.2.12 The Oak wood community in the Lismore and Glenmore valleys is of the classical upland type, in which some Rowan (*Sorbus aucuparia*) and Downy Birch occur. Honeysuckle (*Lonicera periclymenum*) and Ivy (*Hedera helix*) cover many of the trees while Greater Woodrush, Bluebell (*Hyacinthoides non-scripta*), Wood Sorrel (*Oxalis acetosella*) and, locally, Bilberry dominates the ground flora. Ferns present on the site include Hard Fern (*Blechnum spicant*), Male Fern (*Dryopteris filix-mas*), Buckler Ferns (*D. dilatata*, *D. aemula*) and Lady Fern (*Athyrium filix-femina*). There are many mosses present and large species such as *Rhytidiadelphus* spp., *Polytrichum formosum*, *Mnium hornum* and *Dicranum* spp. are noticeable. The lichen flora is important and includes 'old forest' species which imply a continuity of woodland here since ancient times. Tree Lungwort (*Lobaría* spp.) is the most conspicuous and is widespread.
- A.2.13 The Araglin valley consists predominantly of broadleaved woodland. Oak and Beech are joined by Hazel, Wild Cherry (*Prunus avium*) and Goat Willow (*Salix caprea*). The ground flora is relatively rich with Pignut (*Conopodium majus*), Wild Garlic (*Allium ursinum*), Garlic Mustard (*Alliaria petiolata*) and Wild Strawberry (*Fragaria vesca*). The presence of Ivy Broomrape (*Orobanche hederae*), a local species within Ireland, suggests that the woodland, along with its attendant Ivy is long established.
- A.2.14 Along the lower reaches of the Awbeg River, the valley sides are generally cloaked with mixed deciduous woodland of estate origin. The dominant species is Beech, although a range of other species are also present, e.g. Sycamore (*Acer pseudoplatanus*), Ash and Horse-chestnut (*Aesculus hippocastanum*). In places the alien invasive species, Cherry Laurel, dominates the understorey. Parts of the woodlands are more semi-natural in composition, being dominated by Ash with Hawthorn (*Crataegus monogyna*) and Spindle (*Euonymus europaea*) also present. However, the most natural areas of woodland appear to be the wet areas dominated by Alder and willows (*Salix* spp.). The ground flora of the dry woodland areas features species such as Pignut, Wood Avens (*Geum urbanum*), Ivy and Soft Shield-fern (*Polystichum setiferum*), while the ground flora of the wet woodland areas contains characteristic species such as Remote Sedge (*Carex remota*) and Opposite-leaved Golden-saxifrage (*Chrysosplenium oppositifolium*).
- A.2.15 In places along the upper Bride, scrubby, semi-natural deciduous woodland of Willow, Oak and Rowan occurs with abundant Great Woodrush in the ground flora.
- A.2.16 The Bunaglanna River passes down a very steep valley, flowing in a north-south direction to meet the Bride River. It flows through blanket bog to heath and then scattered woodland. The higher levels of moisture here enable a vigorous moss and fern community to flourish, along with a well-developed epiphyte community on the tree trunks and branches.
- A.2.17 At Banteer a type of wetland occurs near the railway line which offers a complete contrast to the others. Old turf banks are colonised by Royal Fern (*Osmunda regalis*) and Eared Willow (*Salix aurita*) and between them there is a sheet of Bottle Sedge (*Carex rostrata*), Marsh Cinquefoil (*Potentilla palustris*), Bogbean (*Menyanthes trifoliata*), Marsh St. John's-wort (*Hypericum elodes*) and the mosses *Sphagnum auriculatum* and *Aulacomnium palustre*. The cover is a scraw with characteristic species like Marsh Willowherb (*Epilobium palustre*) and Marsh Orchid (*Dactylorhiza incarnata*).
- A.2.18 The soil high up the Lismore valleys and in rocky places is poor in nutrients but it becomes richer where streams enter and also along the valley bottoms. In such sites Wood Speedwell (*Veronica montana*), Wood Anemone (*Anemone nemorosa*), Enchanter's Nightshade (*Circaea lutetiana*), Barren Strawberry (*Potentilla sterilis*) and Shield Fern occur. There is some Wild Garlic, Three-nerved Sandwort (*Moehringia trinervia*) and Early-purple Orchid (*Orchis mascula*) locally, with Opposite-leaved Golden-saxifrage, Meadowsweet and Bugle in wet places. A Hazel stand at the base of the Glenakeeffe valley shows this community well.
- A.2.19 The area has been subject to much tree felling in the recent past and re-sprouting stumps have given rise to areas of bushy Hazel, Holly, Rusty Willow (*Salix cinerea* subsp. *oleifolia*) and Downy Birch. The ground in the clearings is heathy with Heather (*Calluna vulgaris*), Slender St John's-wort (*Hypericum pulchrum*) and the occasional Broom (*Cytisus scoparius*) occurring.

- A.2.20 The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Very extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. The main expanses occur at the southern end of the site with the best examples at Kinsalebeg in Co. Waterford and between Youghal and the main bridge north of it across the river in Co. Cork. Other areas occur along the tributaries of the Licky in east Co. Waterford and Glendine, Newport, Bride and Killahaly Rivers in Waterford west of the Blackwater and large tracts along the Tourig River in Co. Cork. There are narrow bands of intertidal flats along the main river as far north as Camphire Island. Patches of green algae (filamentous, *Ulva* species and *Enteromorpha* sp.) occur in places, while fucoid algae are common on the more stony flats even as high upstream as Glenassy or Coneen.
- A.2.21 The area of saltmarsh within the site is small. The best examples occur at the mouths of the tributaries and in the townlands of Foxhole and Blackbog. Those found are generally characteristic of Atlantic salt meadows. The species list at Foxhole consists of Common Saltmarsh-grass (*Puccinellia maritima*), small amounts of Greater Sea-spurrey (*Spergularia media*), Glasswort (*Salicornia* sp.), Sea Arrowgrass (*Triglochin maritima*), Annual Sea-blite (*Suaeda maritima*) and Sea Purslane (*Halimione portulacoides*) - the latter a very recent coloniser - at the edges. Some Sea Aster (*Aster tripolium*) occurs, generally with Creeping Bent (*Agrostis stolonifera*). Sea Couch-grass (*Elymus pycnanthus*) and small isolated clumps of Sea Club-rush (*Scirpus maritimus*) are also seen. On the Tourig River additional saltmarsh species found include Lavender (*Limonium* spp.), Sea Thrift (*Armeria maritima*), Red Fescue (*Festuca rubra*), Common Scurvy-grass (*Cochlearia officinalis*) and Sea Plantain (*Plantago maritima*). Oraches (*Atriplex* spp.) are found on channel edges.
- A.2.22 The shingle spit at Ferrypoint supports a good example of perennial vegetation of stony banks. The spit is composed of small stones and cobbles and has a well developed and diverse flora. At the lowest part, Sea Beet (*Beta vulgaris*), Curled Dock (*Rumex crispus*) and Yellow-horned Poppy (*Glaucium flavum*) occur with at a slightly higher level Sea Mayweed (*Tripleurospermum maritimum*), Cleavers (*Galium aparine*), Rock Samphire (*Crithmum maritimum*), Sandwort (*Honkenya peploides*), Spear-leaved Orache (*Atriplex prostrata*) and Babington's Orache (*A. glabriuscula*). Other species present include Sea Rocket (*Cakile maritima*), Herb Robert (*Geranium robertianum*), Red Fescue (*Festuca rubra*) and Kidney Vetch (*Anthyllis vulneraria*). The top of the spit is more vegetated and includes lichens and bryophytes (including *Tortula ruraliformis* and *Rhytidiadelphus squarrosus*).
- A.2.23 The site supports several Red Data Book plant species, i.e. Starved Wood Sedge (*Carex depauperata*), Killarney Fern (*Trichomanes speciosum*), Pennyroyal (*Mentha pulegium*), Bird's-nest Orchid (*Neottia nidus-avis*), Golden Dock (*Rumex maritimus*) and Bird Cherry (*Prunus padus*). The first three of these are also protected under the Flora (Protection) Order 1999. The following plants, relatively rare nationally, are also found within the site: Toothwort (*Lathraea squamaria*) associated with woodlands on the Awbeg and Blackwater; Summer Snowflake (*Leucojum aestivum*) and Flowering Rush (*Butomus umbellatus*) on the Blackwater; Common Calamint (*Calamintha ascendens*), Red Campion (*Silene dioica*), Sand Leek (*Allium scorodoprasum*) and Wood Club-rush (*Scirpus sylvaticus*) on the Awbeg.
- A.2.24 The site is also important for the presence of several Habitats Directive Annex II animal species, including Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*L. fluviatilis*), Twaite Shad (*Alosa fallax fallax*), Freshwater Pearl-mussel (*Margaritifera margaritifera*), Otter (*Lutra lutra*) and Salmon (*Salmo salar*). The Awbeg supports a population of White-clawed Crayfish (*Austropotamobius pallipes*). This threatened species has been recorded from a number of locations and its remains are also frequently found in Otter spraints, particularly in the lower reaches of the river. The freshwater stretches of the Blackwater and Bride Rivers are designated salmonid rivers.
- A.2.25 The Blackwater is noted for its enormous run of salmon over the years. The river is characterised by mighty pools, lovely streams, glides and generally, a good push of water coming through except in very low water. Spring salmon fishing can be carried out as far upstream as Fermoy and is very highly regarded especially at Careysville. The Bride, main Blackwater upstream of Fermoy and some of the tributaries are more associated with grilse fishing.

- A.2.26 The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. The bat species Natterer's Bat, Daubenton's Bat, Whiskered Bat, Brown Long-eared Bat and Pipistrelle, are to be seen feeding along the river, roosting under the old bridges and in old buildings.
- A.2.27 Common Frog, a Red Data Book species that is also legally protected (Wildlife Act, 1976), occurs throughout the site. The rare bush cricket, *Metrioptera roselii* (Orthoptera: Tettigoniidae), has been recorded in the reed/willow vegetation of the river embankment on the Lower Blackwater River. The Swan Mussel (*Anodonta cygnea*), a scarce species nationally, occurs at a few sites along the freshwater stretches of the Blackwater.
- A.2.28 Several bird species listed on Annex I of the E.U. Birds Directive are found on the site. Some use it as a staging area, others are vagrants, while others use it more regularly. Internationally important numbers of Whooper Swan (average peak 174, 1994/95-95/96) and nationally important numbers Bewick's Swan (average peak 5, 1996/97-2000/01) use the Blackwater Callows. Golden Plover occur in regionally important numbers on the Blackwater Estuary (average peak 885, 1984/85-86/87) and on the River Bride (absolute max. 2141, 1994/95). Staging Terns visit the site annually (Sandwich Tern (>300) and Arctic/Common Tern (>200), average peak 1974-1994). The site also supports populations of the following: Red Throated Diver, Great Northern Diver, Barnacle Goose, Ruff, Wood Sandpiper and Greenland White-fronted Goose. Three breeding territories for Peregrine Falcon are known along the Blackwater Valley. This, the Awbeg and the Bride River are also thought to support at least 30 pairs of Kingfisher. Little Egret now breed at the site (12 pairs in 1997, 19 pairs in 1998) and this represents about 90% of the breeding population in Ireland.
- A.2.29 The site holds important numbers of wintering waterfowl. Both the Blackwater Callows and the Blackwater Estuary Special Protection Areas (SPAs) hold internationally important numbers of Black-tailed Godwit (average peak 847, 1994/95-95/96 on the callows, average peak 845, 1974/75-93/94 in the estuary). The Blackwater Callows also hold Wigeon (average peak 2752), Teal (average peak 1316), Mallard (average peak 427), Shoveler (average peak 28), Lapwing (average peak 880), Curlew (average peak 416) and Black-headed Gull (average peak 396) (counts from 1994/95-95/96). Numbers of birds using the Blackwater Estuary, given as the mean of the highest monthly maxima over 20 years (1974-94), are Shelduck (137 + 10 breeding pairs), Wigeon (780), Teal (280), Mallard (320 + 10 breeding pairs), Goldeneye (11-97), Oystercatcher (340), Ringed Plover (50 + 4 breeding pairs), Grey Plover (36), Lapwing (1680), Knot (150), Dunlin (2293), Snipe (272), Black-tailed Godwit (845), Bar-tailed Godwit (130), Curlew (920), Redshank (340), Turnstone (130), Black-headed Gull (4000) and Lesser Black-backed Gull (172). The greatest numbers (75%) of the wintering waterfowl of the estuary are located in the Kinsalebeg area on the east of the estuary in Co. Waterford. The remainder are concentrated along the Tourig Estuary on the Co. Cork side.
- A.2.30 The river and river margins also support many Heron, non-breeding Cormorant and Mute Swan (average peak 53, 1994/95-95/96 in the Blackwater Callows). Heron occurs all along the Bride and Blackwater Rivers - 2 or 3 pairs at Dromana Rock; c. 25 pairs in the woodland opposite; 8 pairs at Ardsallagh Wood and c. 20 pairs at Rincrew Wood have been recorded. Some of these are quite large and significant heronries. Significant numbers of Cormorant are found north of the bridge at Youghal and there are some important roosts present at Ardsallagh Wood, downstream of Strancally Castle and at the mouth of the Newport River. Of note are the high numbers of wintering Pochard (e.g. 275 individuals in 1997) found at Ballyhay quarry on the Awbeg, the best site for Pochard in County Cork.
- A.2.31 Other important species found within the site include Long-eared Owl, which occurs all along the Blackwater River, and Barn Owl, a Red Data Book species, which is found in some old buildings and in Castlehyde west of Fermoy. Reed Warbler, a scarce breeding species in Ireland, was found for the first time in the site in 1998 at two locations. It is not known whether or not this species breeds on the site, although it is known to nearby to the south of Youghal. Dipper occurs on the rivers.

- A.2.32 Landuse at the site is mainly centred on agricultural activities. The banks of much of the site and the callows, which extend almost from Fermoy to Cappoquin, are dominated by improved grasslands which are drained and heavily fertilised. These areas are grazed and used for silage production. Slurry is spread over much of this area. Arable crops are grown. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the populations of Habitats Directive Annex II animal species within it. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the Blackwater and its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. Other recreational activities such as boating, golfing and walking are also popular. Water skiing is carried out at Villierstown. Parts of Doneraile Park and Anne's Grove are included in the site: both areas are primarily managed for amenity purposes. There is some hunting of game birds and Mink within the site. Ballyhay quarry is still actively quarried for sand and gravel. Several industrial developments, which discharge into the river, border the site.
- A.2.33 The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, dredging of the upper reaches of the Awbeg, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel.
- A.2.34 Overall, the River Blackwater is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively; furthermore it is of high conservation value for the populations of bird species that use it. Two Special Protection Areas, designated under the E.U. Birds Directive, are also located within the site - Blackwater Callows and Blackwater Estuary. Additionally, the importance of the site is enhanced by the presence of a suite of uncommon plant species.

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