

## RINGSEND WASTEWATER TREATMENT WORKS Preliminary Assessment of Long Sea Outfall Locations



Jan 2010

For inspection purposes only.  
Consent of copyright owner required for any other use.

## Document Control Sheet

Client	Dublin City Council			
Project	Ringsend Wastewater Treatment Works Extension			
Report	Preliminary Assessment of Long Sea Outfall Locations			
Date	November 2009			
Project No: 67 511		Document Reference: DG19		
Version	Author	Reviewed	Checked	Date
Draft 01	Dawn Keating/ Kieran O'Dwyer	Bob Gaudes	Ken McIntyre	December 2009
Issue 01	Dawn Keating/ Kieran O'Dwyer	Bob Gaudes	Ken McIntyre	January 2010

For inspection purposes only.  
Consent of copyright owner required for any other use.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# Table of Contents

Non Technical Summary .....	iii
1 Introduction.....	1
2 Study Area .....	2
2.1 Proposed Outfall Locations.....	2
2.2 Study Area .....	3
2.3 Preliminary Modelling.....	5
2.4 Environmental Objectives (Surface Waters) Regulations 2009 .....	7
2.5 Bathing Water Quality Regulations .....	13
3 Ecological Assessment .....	16
4 Dublin Bay Water Quality Management Plan Priority Objectives .....	18
4.1 Introduction.....	18
4.2 Priority Objective a) Zone 3 Bathing and b) Zone 6 Bathing.....	20
4.3 Priority Objective c) Ectocarpus .....	20
4.4 Priority Objective d) Sewage Solids .....	21
4.5 Priority Objective e) Tolka Sediments .....	21
4.6 Priority Objective f) South Lagoon Ecosystem .....	21
4.7 Priority Objective g) North Lagoon Ecosystem.....	21
4.8 Priority Objective h) Green Micro-Algae .....	21
4.9 Priority Objective i) Fisheries / BOD / DO .....	22
4.10 Priority Objectives j, k, l and m.....	23
j) Zone 6 Watersports, .....	23
k) Zone 4 Recreation.....	23
l) Zone 5 Recreation.....	23
m) Zone 2 Recreation.....	23
4.11 Other Ecosystems / Wildlife; Protection of Wildlife and their Habitats, not encompassed by the Foregoing.....	24
4.12 Other Fisheries .....	24
4.13 External Areas .....	24
5 Conclusions .....	25
Appendices.....	27

For inspection purposes only.  
Consent of copyright owner required for any other use.

# Non Technical Summary

The purpose of this preliminary assessment was:

- to consider the long sea outfall option with respect to the Environmental Objectives (Surface Water) Regulations 2009
- to consider the long sea outfall option with respect to the Bathing Water Regulations 1992 and 2008
- to consider the long sea outfall option with respect to the Dublin Bay Water Quality Management Plan priority objectives; and
- to carry out a preliminary ecological assessment of the potential impact from long sea outfall sites on the Natura 2000 sites (Special Areas of Conservation, Special Protected Areas and Bathing Waters) around Dublin Bay.

The proposal is to relocate the treated effluent outfall from the Ringsend WWTP, currently discharging to the Liffey Estuary (a designated nutrient sensitive water) with a discharge from a long sea outfall located in the Irish Sea. This will result in the outfall being located a considerably greater distance from sensitive receptors. The open sea will have a greater assimilative capacity and will dilute and disperse the effluent over a shorter range than would be the case with the existing outfall.

Two outfall options were considered (Option 3 and Option 4). The results of a preliminary modelling/screening exercise on the dispersal of the effluent was used to indicate the change in receiving water quality in the vicinity of the two sea outfalls. It should be noted that more detailed modelling will be undertaken as part of the EIS process and will examine a variety of scenarios in order to assess the optimum location for the long sea outfall.

It is proposed to continue treating the effluent to fully comply with the secondary standard prescribed in the Urban Wastewater Treatment Regulations. The discharge of 13.8 m<sup>3</sup>/sec (the full capacity of the proposed outfall pipe) for a period of 15 days was examined in the preliminary model. For the purposes of the model the average existing effluent concentration was used.

An examination of the preliminary modelling results has shown that apart from a mixing zone in the vicinity of the outfall points the receiving waters will meet the Environmental Quality Objectives for coastal water nutrients (DIN).

There will be no deterioration in the bathing water quality in the Dublin area. The quality is expected to improve as a result of the ceasing of discharge to the Liffey Estuary.

Appropriate Ecological Assessments in accordance Article 6 of the Habitats Directive were undertaken for both outfall options. No significant effect on Natura 2000 sites are predicted. The possibility of impacts on the Kish Bank (a designated sandbank habitat that is understood will be put forward as a candidate SAC) were also assessed. No significant impact is predicted on this habitat which is located over 5 km from the nearest sea outfall option.

Neither of the proposed options were found to conflict with any of the 16 priority objectives set out in the Dublin Bay Water Quality Management Plan.

*For inspection purposes only.  
Consent of copyright owner required for any other use.*



# 1 Introduction

Dublin City Council (DCC) has retained CDM (Ireland) Ltd with J.B. Barry & Partners Ltd as Client's Consultant for the Ringsend Wastewater Treatment Works Extension Project. The project involves the planning of further works to maximise treatment capacity in order to meet future needs and to comply with the Urban Waste Water Treatment Regulations.

One option being considered is the construction of a long sea outfall, which would bring the treated discharge from Ringsend over 10 kilometres out into the Irish Sea. This document comprises the preliminary assessment of this option, and has been carried out in conjunction with Natura Environmental Consultants.

The purpose of this preliminary assessment is:

- to consider the long sea outfall option with respect to the Environmental Objectives (Surface Water) Regulations 2009;
- to consider the long sea outfall option with respect to the Bathing Water Regulations 1992 and 2008;
- to consider the long sea outfall option with respect to the Dublin Bay Water Quality Management Plan priority objectives; and
- to carry out a preliminary ecological assessment of the potential impact from long sea outfall sites on the Natura 2000 sites (Special areas of conservation, Special Protected Areas and Bathing Waters) around Dublin Bay.

This preliminary assessment is issued without prejudice to any future surveys and assessments that may be required as part of any planning application or any other information that may be made available by the National Parks and Wildlife Service (NPWS) or others.

## 2 Study Area

### 2.1 Proposed Outfall Locations

Two proposed locations for the outfall are assessed in this document (as shown in Figure 2-1) below.

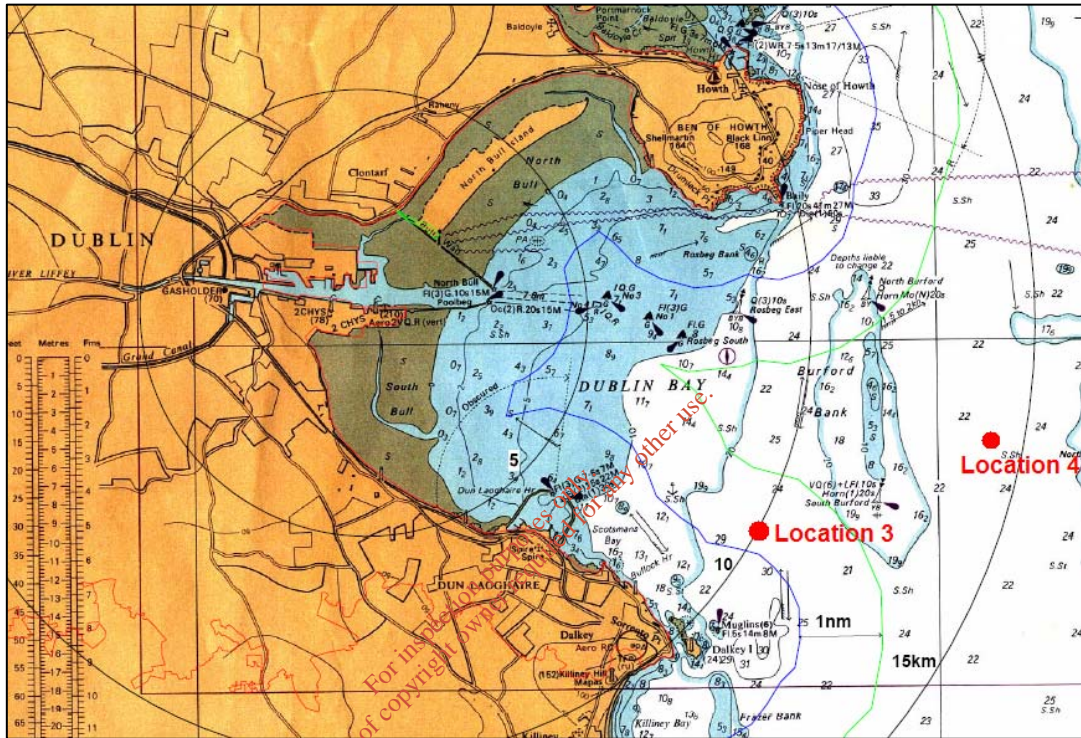


Figure 2-1 Potential long sea outfall locations.

The proposed outfall would be through a tunnel under the sea bed and will discharge wastewater treated to secondary standards (as specified in the UWWT regulations) of 25 mg/l for BOD, 35 mg/l for TSS, and 125 mg/l for COD. It is assumed that the effluent will not require disinfection due to its distance from Bathing Waters. Discharged flows shall not exceed 13.8 m<sup>3</sup>/s, which will become the maximum flow through treatment once the Works is extended. The average daily flow for the design year of 2025 is expected to be 7 m<sup>3</sup>/s.

## 2.2 Study Area

The area of interest comprises the Liffey Estuary (Figure 2-2), Dublin Bay and the Irish Sea.



Figure 2-2 Liffey Estuary

Dublin Bay contains a number of designated conservation sites including Special Areas of Conservation (SAC) and Special Protection Areas (SPA) as shown in Figure 2-3 and Figure 2-4.

A number of defined priority areas are also set out in the Dublin Bay Water Quality Management Plan<sup>1</sup> as discussed in Section 4 and shown in Figure 4-1.

---

<sup>1</sup> ERU (1992) *Dublin Bay Water Quality Management Plan*. 7 Vols. Environmental Research Unit, Department of the Environment, Dublin.

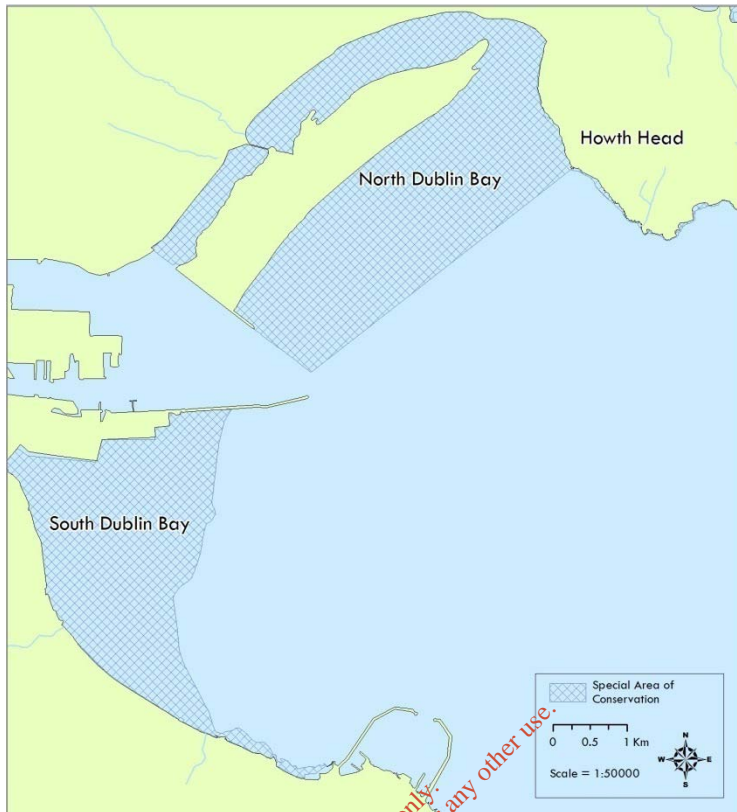


Figure 2-3 Special Areas of Conservation in Dublin Bay



Figure 2-4 Special Protected Areas in Dublin Bay

## 2.3 Preliminary Modelling

Dublin City Council (DCC) engaged CDM (Ireland) Ltd and JB Barry to undertake a study into the impact of the discharge from the Ringsend Wastewater Treatment Works (WwTW) on the receiving waters. CDM subcontracted DHI (Danish Hydraulic Institute) to provide mathematical hydraulic and water quality modelling of the effect of five outfall locations on receiving waters (Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay, CDM, Oct 2009).

The modelling exercise was to provide preliminary indications on the response of the receiving waters to the introduction of the future discharges for five outfall options in order to assess the future impacts on water quality and ecology within the bay. Based on the results of this exercise the preferred options of 3 and 4 are considered in this preliminary assessment report. It is proposed to undertake more detailed modelling once the exact location is decided (on the basis of a detailed option assessment which will include design and economic considerations as well as the environmental impacts)

### *Preliminary Modelling - Input parameters*

The two outfall options (Options 3 and 4) considered in this report were modelled for an extreme case scenario in order to provide details on the resulting water quality in terms of dissolved inorganic nitrogen (DIN) and molybdate reactive phosphate (MRP). The scenario which was modelled was a 15-day period which covered a full neap spring tidal cycle.

It is assumed that 13.8 m<sup>3</sup>/sec is continuously being discharged through the sea outfall.

### *Effluent Concentrations*

The effluent treatment under the sea outfall scenario will conform to the Urban Wastewater Treatment (UWWT) Regulations limits set for non-sensitive waters (due to the discharge location). The concentrations in the effluent that are used in the model are listed below. These are based on the average concentrations of the effluent for the existing plant. These are not intended to be the emission standards. The emission standards will be those required under the UWWT regulations 2001 and under any other water quality legislative requirements.

DIN	22 mg/l
MRP	3.6 mg/l as P
NH <sub>3</sub>	5 mg/l
Faecal Coliforms	140000 MPN/100 ml

It should be noted that there will be occasions when these concentrations will be exceeded. The faecal coliform counts are estimated on the basis that no UV will be employed.

### Baseline Water Quality

Baseline water quality concentrations for the Bay and Estuary were assigned as follows:

Estuary	
DIN	0.8242 mg/l
MRP	0.0736 mg/l as P
NH <sub>3</sub>	0.0992 mg/l
Bay	
DIN	0.0938 mg/l
MRP	0.0208 mg/l as P
NH <sub>3</sub>	0.0280 mg/l

### Preliminary Modelling Results

The model was run to simulate a 15-day period. Plots were developed to define the maximum concentration simulated in each triangular element of the mesh during the 15-day simulation. This means that the concentration plotted in adjacent triangular elements might be from different time-steps within the simulation.

Exceedance plots were also produced to define the percentage of time during the simulation for which the concentrations of parameters are higher than a particular value.

This simulation was regarded as an extreme case scenario in the fact that the outfall was discharging at the maximum capacity (13.8 m<sup>3</sup>/sec) for the entire 15 day modelling period and that the DIN concentration was 22 mg/l.

Consequently the average daily load measured over the modelling period was 26.23 tonnes per day of DIN. This is regarded to be an extreme case scenario for a number of reasons.

- The hydraulic capacity of the outfall is designed on the basis of an instantaneous peak hydraulic load and the average daily hydraulic flow will be less than this capacity.
- Extended extreme discharge flow volumes would be accompanied by a lowering in the constituent concentrations due to dilution by stormwater.

## 2.4 Environmental Objectives (Surface Waters) Regulations 2009

These regulations came into effect in July 2009 in order to implement aspects of the Water Framework Directive. Wastewater Discharge Authorisations must set standards (emission limits) that will ensure that the receiving waters will comply with the standards laid out in the regulations.

The proposed long sea outfall options being considered have discharges that are located some distance out into the Irish Sea. It should be noted that the locations of the discharge points are outside the areas delineated for consideration under the Water Framework Directive. Under the River Basin Management Plans that are being undertaken as part of the Water Framework Directive "Coastal Waters" are defined as waters out to a distance of one nautical mile beyond the baseline from which territorial waters are measured. However, for the purposes of this assessment it is proposed to assess the change in water quality in the context of the standards contained in the Environmental Objectives (Surface Waters) Regulations.

It should be noted that this assessment of the long sea outfall option considered the following:

- Capacity will be provided to discharge up to 13.8 m<sup>3</sup>/sec to the Irish Sea.
- The discharge of treated effluent to the Liffey Estuary will discontinue. This will result in an improvement in the water quality within the Inner Bay area and Estuary.
- There will be a change in water quality in the vicinity of the long sea outfall discharge point. However, one of the considerations in the long sea outfall option was to increase the distance of the discharge from sensitive receptors which are located on the coastline within the Bay area.

It is emphasised that this preliminary modelling exercise was undertaken as an initial screening of the upgrading options for the wastewater treatment works (WwTW). Further detailed modelling studies will be required to address a variety of loading scenarios for the selection of the optimum sea outfall location.

### Coastal Environmental Quality Standards

The principal quality standard of concern in relation to Wastewater Discharges to Coastal Waters are nutrients in the form of Dissolved Inorganic Nitrogen (DIN). DIN (rather than MRP) is considered to be the limiting nutrient in coastal waters and a breach of the environmental quality standard may lead to eutrophic conditions (algal blooms, etc) and consequently the only nutrient standards in place for coastal waters are for DIN. The DIN criteria for calculating the status of a coastal water body is as follows.

Good status -  $\leq 0.25$  mg/l as N (Median Value) where the salinity is 34.5 practical salinity units (psu).

It should be stressed that in order for a water to meet the "good status" category it is the median value that applies. The Statutory Instrument SI 272 of 2009 has inadvertently omitted the reference to median concentration (informed by EPA).

The MRP standard only applies to transitional waters but has also been examined in the preliminary modelling exercise.

The MRP criteria for assessing a transitional water body with full salinity is as follows.

MRP  $\leq 0.04$  mg/l as P (Median Value) where the salinity is 35 psu indicating saline water.

It must be stressed that while the model plotted the maximum concentrations the environmental quality objective for DIN is a median value of concentrations taken over the course of a winter or summer period.

An inspection of the predicted maximum concentration plots for DIN for Locations 3 and 4 (Figure 2-5 to Figure 2-8) show that the contour for 0.25 mg/l is limited to a finite mixing area around the discharge location. It should be noted that waters compliant with the environmental objectives for DIN (which is a median concentration of 0.25 mg/l for coastal waters.) will have almost 50% of the samples with a concentration greater than 0.25 mg/l.

An inspection of the plots showing the percentage of time that the concentrations exceed the concentration of 0.25 mg/l indicates that apart from a very small area in the vicinity of the outfall the DIN concentration objective is met for over 50% of the time. This can be taken to reflect the median value over the modelling periods. (Figure 2-9 to Figure 2-12)

These boundaries of the 50% exceedance enclose a small area in the vicinity of the outfall (the mixing zone). Beyond this point the modelled discharge estimate will comply with the environmental quality standard for DIN.

The results for the modelling of MRP can be interpreted in the same way and for the modelling period a small area in the vicinity of the outfall will exceed the median environmental objective.



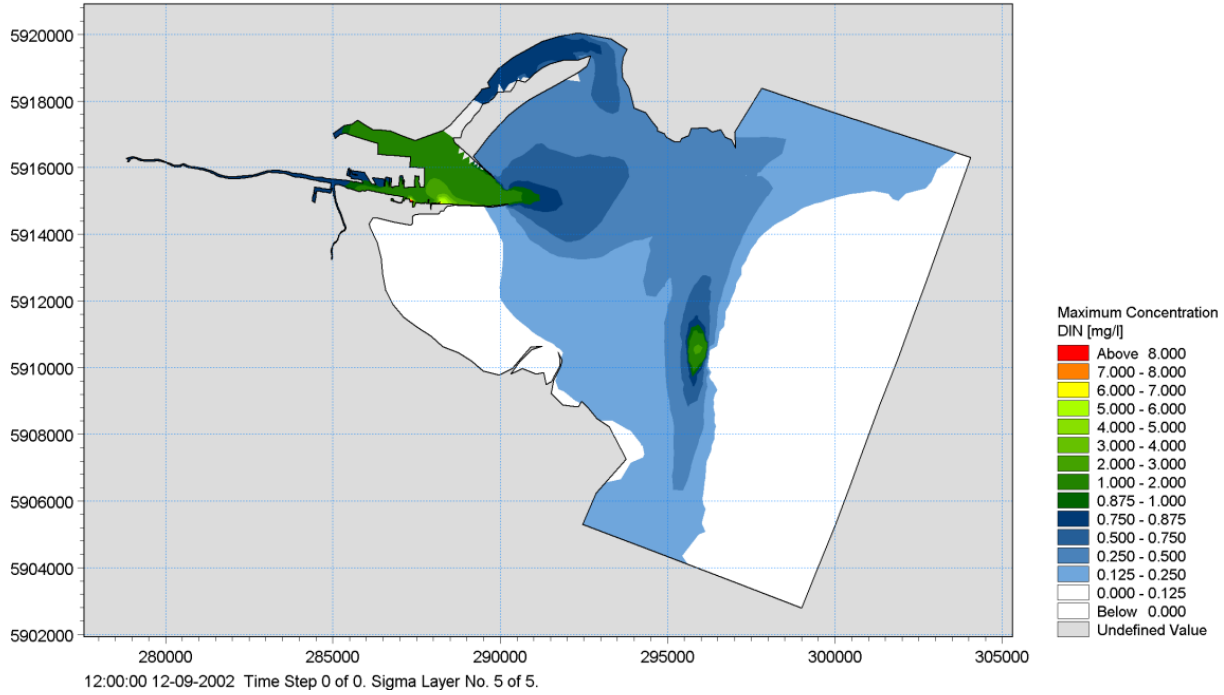


Figure 2-5: Maximum concentrations of DIN for neap tide for outfall Location 3

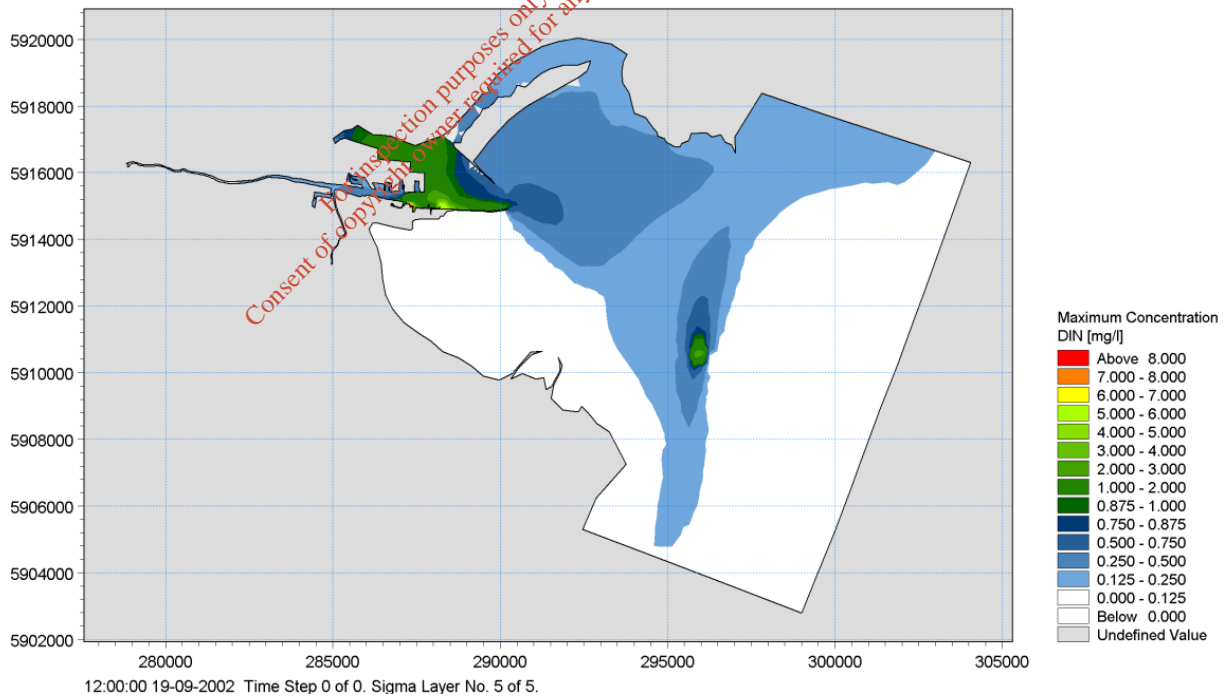


Figure 2-6 Maximum concentrations of DIN for spring tide for outfall Location 3

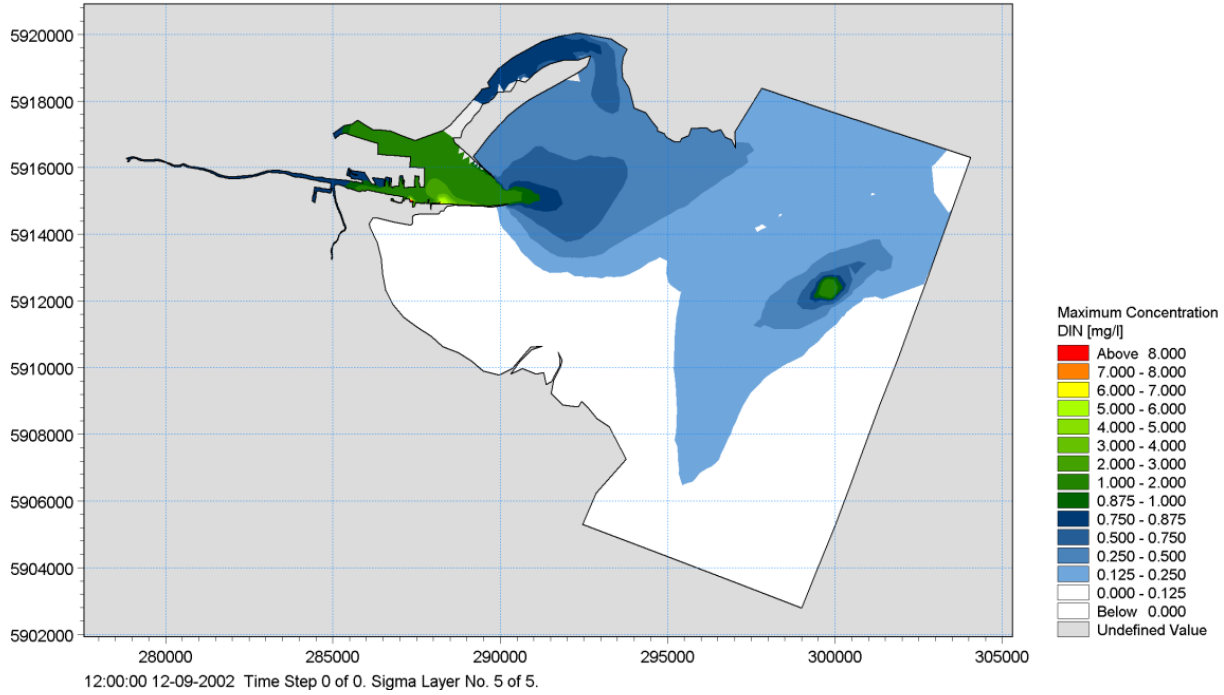


Figure 2-7 Maximum concentrations of DIN for near tide for outfall Location 4

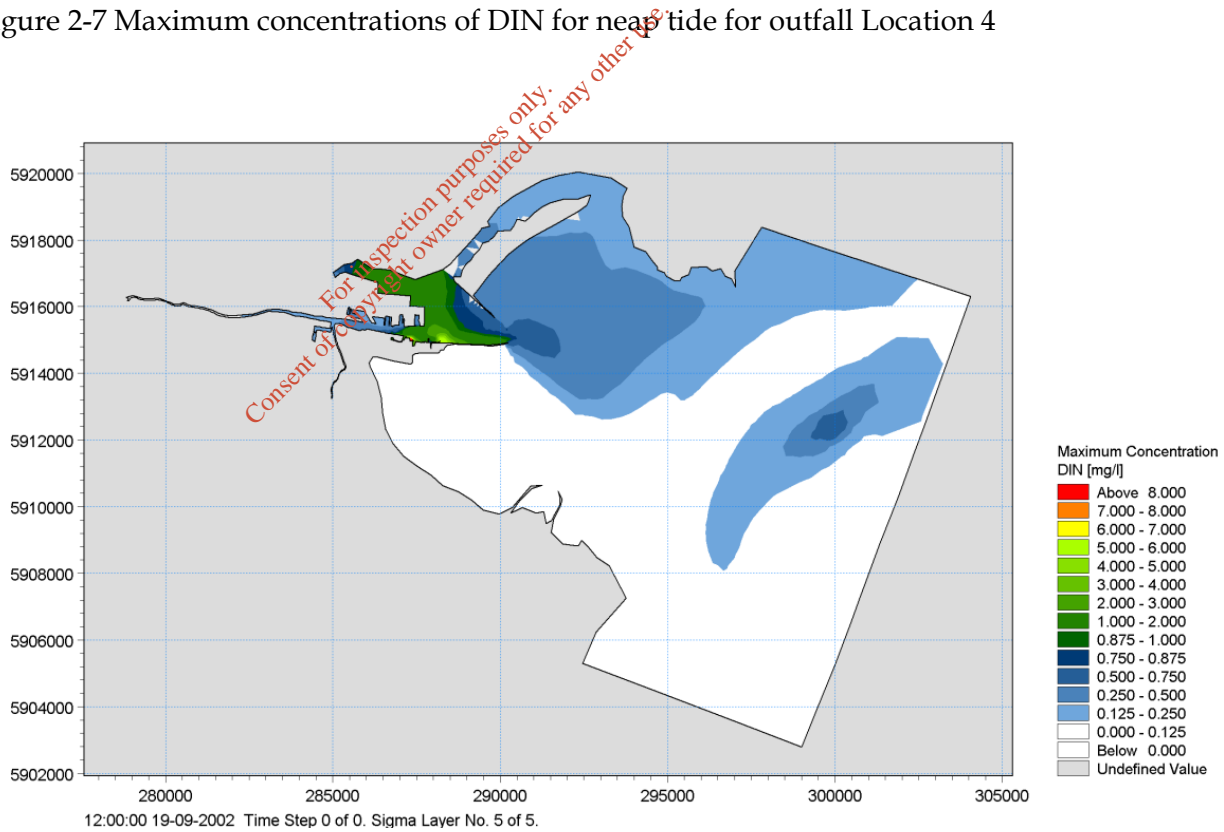


Figure 2-8 Maximum concentrations of DIN for spring tide for outfall Location 4

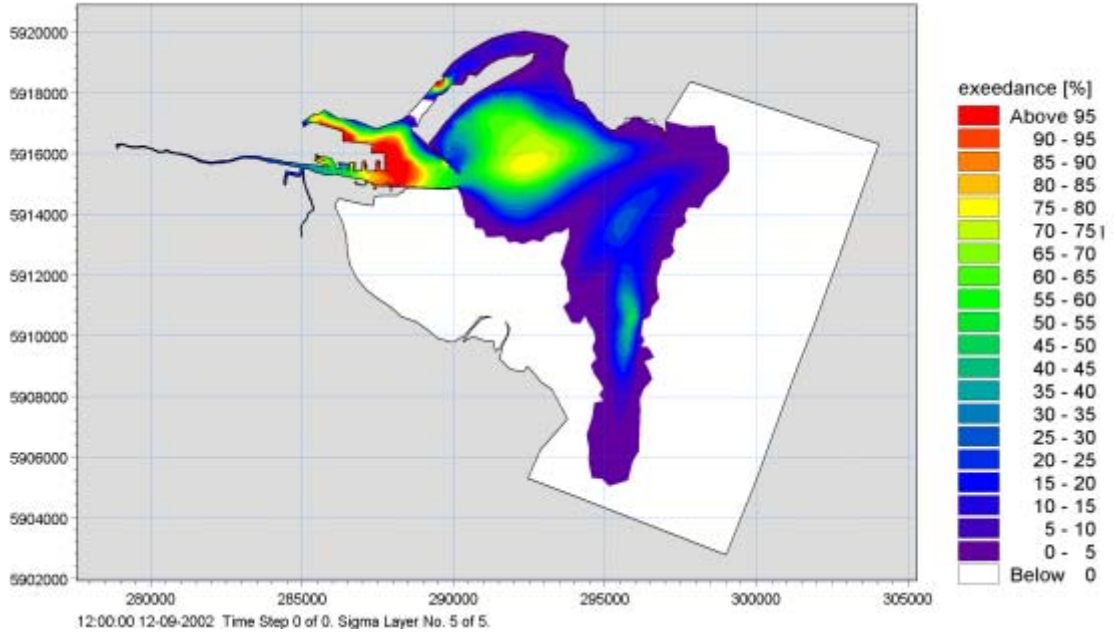


Figure 2-9: Percentage of time with MRP concentrations exceeding 0.04 mg/l for neap tide for outfall Location 3

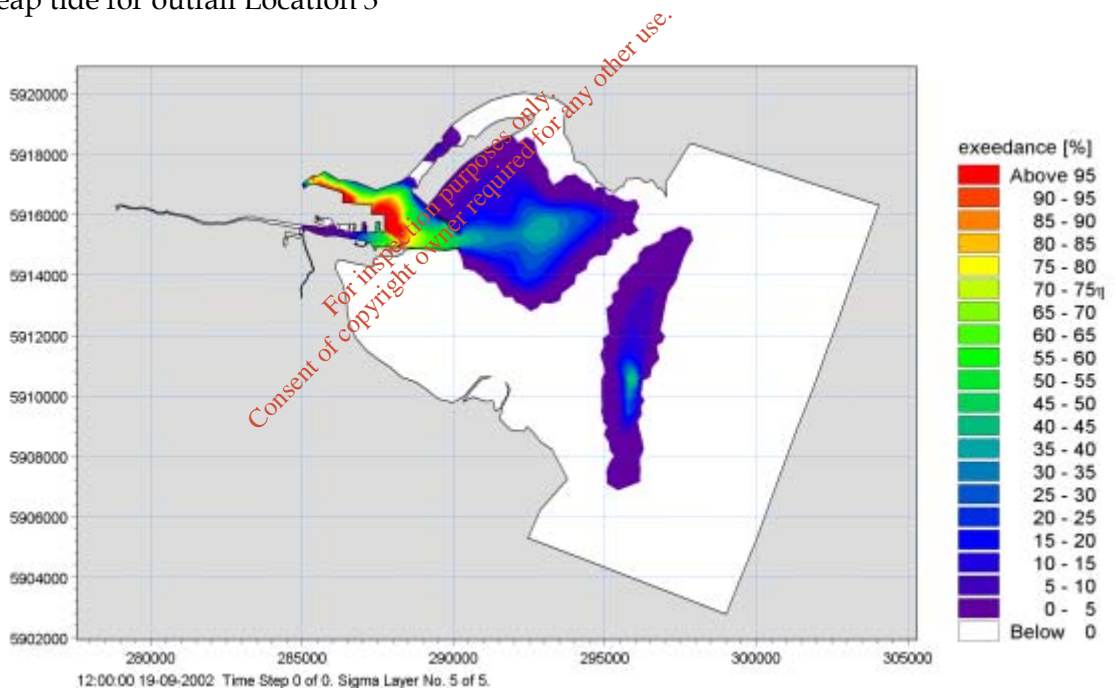


Figure 2-10 Percentage of time with MRP concentrations exceeding 0.04 mg/l for spring tide for outfall Location 3

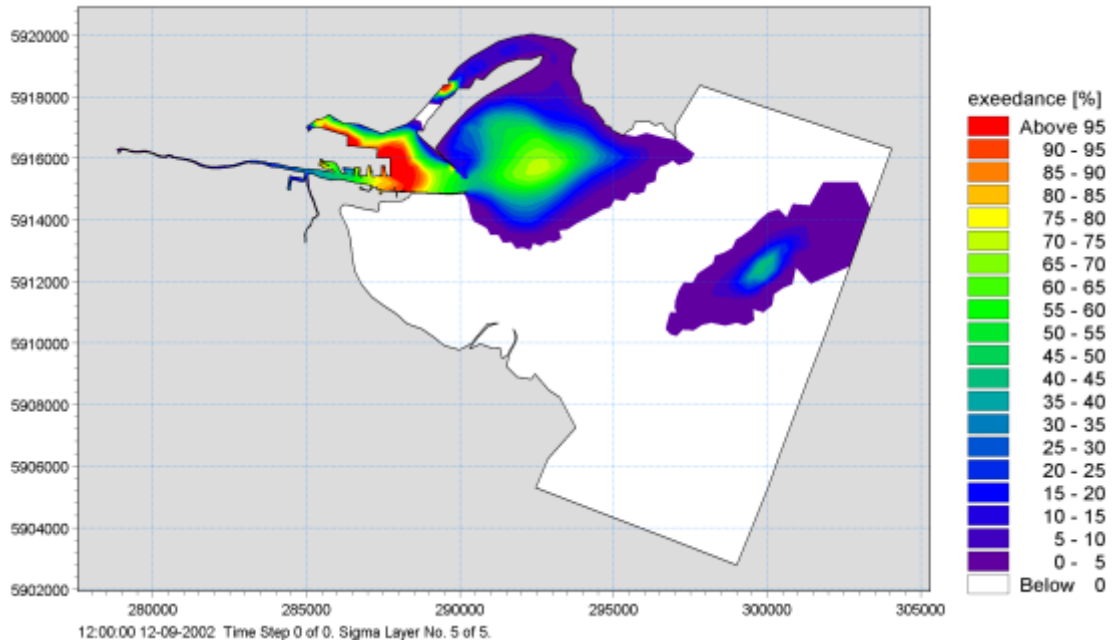


Figure 2-11 Percentage of time with MRP concentrations exceeding 0.04 mg/l for neap tide for outfall Location 4

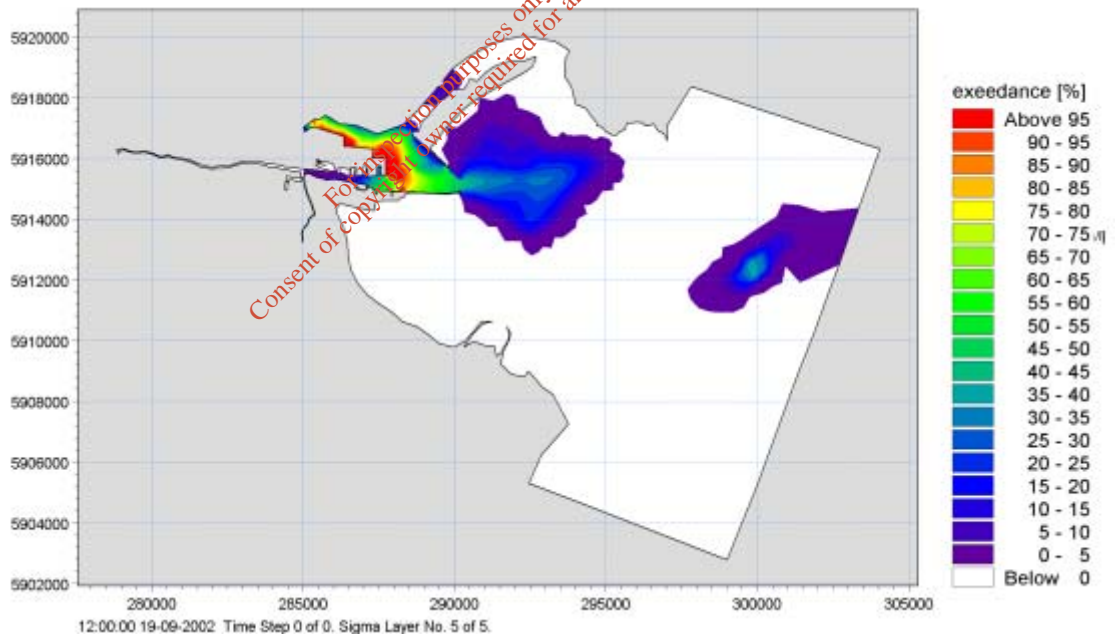


Figure 2-12 Percentage of time with MRP concentrations exceeding 0.04 mg/l for neap tide for outfall Location 4

## Conclusions

The preliminary modelling of the impact on DIN and MRP concentrations in the receiving water from a long sea outfall has shown that even for extreme conditions where over 2.4 times the DWF loadings are discharged for a period of 15 days that the receiving water (apart from a small area in the vicinity of the outfall) will remain at good status and meet the environmental quality objectives for coastal water nutrients. The fact that the two outfalls are located a considerable distance from water bodies defined as part of the Water Framework Directive will ensure that the discharge from the proposed outfalls will not be a contributory factor to any failure to comply with the regulations at any point within those specified water bodies (coastal and transitional.). Any failures to comply in such areas will result from other factors such as the existing background nutrient loads entering the bay from the Liffey and Tolka. The transfer of the discharge from the Liffey estuary to a long sea outfall can only result in a considerable improvement in the water quality in the bay and at various sensitive receptors located along the coastline.

The only area where a series of samples collected may not comply with the requirement to have a median concentration of less than 0.25 mg/l N is the mixing zone at the outfall. Exceedances of the environmental quality objectives within a mixing zone are permitted under the Environmental Objectives (Surface Waters) Regulations 2009. It should also be noted that the mixing zone where the exceedance may occur is not defined as a specific water body under the framework directive.

In the areas where the nutrient concentrations are predicted to meet the “good status” criteria it is reasonable to conclude that eutrophic conditions will not occur as a result of the discharge and that chlorophyll and other ecological indicators will remain unaffected.

## 2.5 Bathing Water Quality Regulations

### Bathing Water Quality Regulations 2008 (SI No. 79 of 2008)

### Quality of Bathing Water Regulations 1992 (SI 155 of 1992)

As discussed in Section 2.3, the potential impact of discharge from a number of long sea outfall locations was assessed using modelling for an extreme case scenario. (Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay, CDM, DHL, October 2009). This modelling will be further refined as the project progresses. For the preliminary modelling exercise there was no disinfection and the treated effluent was assumed to have a faecal coliform count of 140,000 /100ml. The modelling results, including faecal coliform levels, were assessed with respect to the Bathing Water Quality Regulations 1992 and 2008; in addition, the more stringent bathing water quality standards required by the Blue Flag Beaches Programme were also assessed.

The Bathing Water Quality Regulations 2008 (S.I. 79 of 2008) will repeal and replace the Quality of Bathing Waters Regulations, 1992 (S.I. No. 155 of 1992) with effect from 31<sup>st</sup> December 2014. Until the first monitoring calendar as specified in the new Bathing Water Regulations, 2008, is established for each Bathing Water on the 24<sup>th</sup> March 2011, the Bathing Water Standards as set in Schedule 2 Part I of the Quality of Bathing Waters Regulations, 1992 remain relevant and have therefore been used for comparison to model results. The standards are shown in Table 2-1.

Table 2-1 : Quality of Bathing Waters Regulations, 1992 (S.I. No. 155 of 1992)

Bathing Water Quality Standards Second Schedule Part I		
Parameters	Guide	Mandatory
Total coliforms (Number/100ml)	≤ 5000 <sup>1</sup>	≤ 10,000 <sup>2</sup>
Faecal coliforms (Number/100ml)	≤ 1000 <sup>1</sup>	≤ 2,000 <sup>2</sup>

1. 80% of the samples
2. 95% of the samples

Table 2-2 : Quality of Bathing Waters Regulations, 2008 (S.I. No. 79 of 2008)

Bathing Water Quality Standards Schedule 4			
Parameters	Excellent Quality	Good Quality	Sufficient Quality
Intestinal enterococci (cfu/100ml)	100 (95-percentile)	200 (95-percentile)	185 (90-percentile)
Escherichia coli (cfu/100ml)	250 (95-percentile)	500 (95-percentile)	500 (90-percentile)

In addition, a number of Bathing Water Beaches in Dublin have obtained Blue Flag Status (Dollymount and Sandycove). The Blue Flag Programme for beaches and marinas is run by the non-governmental, non-profit organization 'Foundation for Environmental Education' (FEE). The Programme is run in Ireland by An Taisce. The more stringent Blue Flag standards are shown in Table 2-3.

Table 2-3 Blue Flag Programme for Beaches – Water Quality Standards

Parameter	Unit	Standard		Accepted % of test results higher than standard	
		Guideline	Mandatory	Guideline	Mandatory
Total Coliforms	No./100ml	<500	<10,000	20	5
Faecal Coliforms (E.Coli) <sup>1</sup>	No./100ml	<100	<2,000	20	5
Faecal Streptococci	No./100ml	<100	-	10	-

1. Note that E.Coli is accepted as a surrogate for Faecal Coliform

The results of the simulations show that the discharge plume from the assessed outfall locations will remain offshore and that bathing water beaches in Dublin Bay will not be impacted by discharge from the long sea outfall locations assessed. There will be no discernible increase in the bacteriological quality at the beaches as a result of the discharge via the long sea outfalls. However, the beaches will still be vulnerable to bacteriological contamination from other sources such as the Tolka and Liffey. Nonetheless, the fact that the discharges of treated effluent to the estuary will be discontinued should result in an overall improvement in bathing water quality at the beaches around Dublin Bay.

For inspection purposes only. Consent of copyright owner required for any use.

### 3 Ecological Assessment

There are four existing Natura 2000 sites within Dublin Bay:

- South Dublin Bay and River Tolka Estuary - SPA;
- North Bull Island - SPA;
- North Dublin Bay - SAC; and
- South Dublin Bay - SAC

The SPAs are areas of conservation value for the protection of rare and endangered bird species designated internationally under Council Directive 79/409/EEC on the Conservation of Wild Birds.

The SACs are habitats of EU importance designated for conservation under Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

It is understood that the NPWS intend to propose the Kish Bank as an SAC under the Habitats Directive (and possibly as an SPA under the Birds Directive). Sand banks are considered special habitats under the directive.

Under Article 6(3) of the Habitats Directive, an Appropriate Assessment must be undertaken for any plan or program that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An Appropriate Assessment is an evaluation of the potential impacts of a plan on the conservation objectives of a Natura 2000 site, and the development, where necessary, of mitigation or avoidance measures to preclude negative effects.

It was decided to undertake Appropriate Assessments of the two proposed long sea outfalls in order to establish whether there were any impacts of concern associated with these options. Natura Environmental Consultants were commissioned by J.B. Barry and Partners Limited to prepare the Assessments. An assessment was undertaken for each of the two options and the Natura Environmental Consultants reports are contained in Appendix A and B.

The impact of the discharge of future treated effluent (of a standard that meets the UWWT regulations) from Ringsend WwTW at the locations of proposed long sea outfalls in the Irish Sea on the Natura 2000 sites listed above was assessed. The results of the modelling exercise were used to assist in the evaluation. It should be noted that the modelling exercise was based on an extreme case scenario.

The Appropriate Assessments concluded that although the discharge from the proposed long sea outfalls will result in a change in water quality in the vicinity of the outfall, no significant impacts were predicted for any existing or proposed Natura 2000 sites (or for the proposed SAC in the Kish Banks) providing the quality of treated effluent discharging from the WwTW will comply with the



Urban Wastewater Treatment Regulations S.I. No. 254/2001. The assessment was made on the basis that there is no evidence that the current discharge from Ringsend WWTP is resulting in a significant impact on the conservation objectives of the Natura 2000 sites. Effluent discharging from the long sea outfall will be treated to secondary standards and will meet the UWWT Regulations. It is therefore concluded that the discharge from the proposed long sea outfall will have no significant impacts due to the distance of the discharge from the designated Natura 2000 sites in Dublin Bay. Any potential indirect impacts to the Kish Bank proposed for designation are considered unlikely due to the quality of effluent discharging, the location and distribution of the modelled plume and the nature of the Annex I habitat (sandbanks).

It should be noted that the exact boundaries of the area proposed to be designated in the Kish Bank are unknown at present.

*For inspection purposes only.  
Consent of copyright owner required for any other use.*

## 4 Dublin Bay Water Quality Management Plan Priority Objectives

### 4.1 Introduction

A number of priority objectives were set out in the Dublin Bay Water Quality Management Plan (as shown in Figure 4-1) These objectives were drafted in 1991 and a considerable amount of work and improvement has been undertaken since then. The Ringsend Wastewater Treatment Works has undergone a major upgrade in 2003 which introduced secondary treatment (prior to this there was only primary treatment). The dumping of sludge at sea also ceased.

In addition, there has been a considerable amount of environmental legislation passed in the interim (Water Framework Directive, European Environmental Objectives (Surface Water ) Regulations Objectives, the Habitats Directive) which are all contributing to the protection of the waters of Dublin Bay. The Eastern River Basin District Management Plan has been completed and includes Coastal areas of the Bay.

Since the objectives were drafted it is acknowledged that there has been a considerable improvement in the water quality of the waters of Dublin Bay. Dollymount Strand and Sandycove have Blue Flag status. The EPA have reported an overall improvement in Dublin Bay Water Quality since the commissioning of the upgrade in 2003.

For inspection purposes only  
Consent of copyright owner required for all other uses

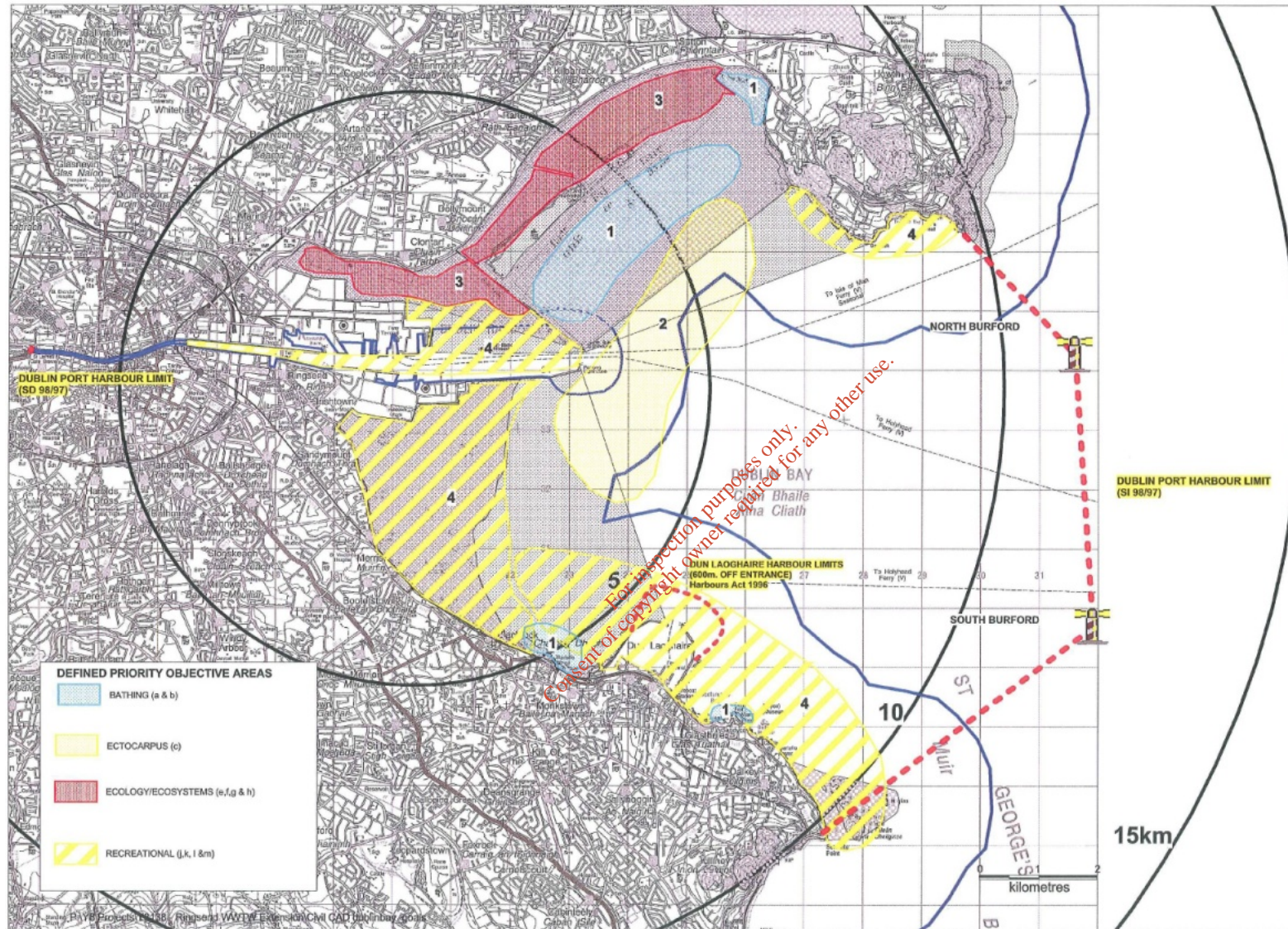


Figure 4-1 Priority Areas as set out in the Dublin Bay Water Quality Management Plan

## 4.2 Priority Objective a) Zone 3 Bathing and b) Zone 6 Bathing

*Zone 3 Bathing; Priority Objective: ensuring that the quality of bathing waters in the area between Red Rock and the Bull Wall including Dollymount Strand (recreational Zone 3) conforms to the requirements of the Bathing Water Regulations with particular emphasis on microbiological parameters.*

*Zone 6 Bathing; Priority Objective: ensuring that the quality of bathing waters in the area between Seapoint and Sorrento Point (recreational Zone 6) conforms to the requirements of the Bathing Water Regulations with particular emphasis on microbiological parameters.*

As discussed in Section 2.4, the discharges from the assessed long sea outfall locations will not result in a deterioration in Bathing Water Quality.

## 4.3 Priority Objective c) Ectocarpus

*Priority Objective: the reduction of deposits of algae, in particular Ectocarpus, on recreational beaches (Dollymount, Shellybanks), to the extent that these deposits are indirectly attributable to waste inputs to the Plan area; in particular to reduce the supply of particulate organic matter to the areas colonized by the tubeworm Lanice thereby reducing aiming at reducing the availability of anchorages and mineralized nutrients for the development of Ectocarpus.*

A study is currently being carried out into *Ectocarpus* growth in the bay. Dublin Bay displays algal blooms in the intertidal area of the North and South Bull Lagoons and in the shallow subtidal zones (where *Ectocarpus* seems to be the dominant species (Brennan et al. 1994)<sup>2</sup>). A model proposed by Jeffrey et al. (1995)<sup>3</sup> suggested that the nitrogen source facilitating this growth was in the form of particulate N, which settled out of suspension and was then rapidly remineralised by the sediments and the fauna for uptake by the algae. Prior to plant improvements, the WwTW was the predominant source of particulate N (in readily processable form).

However, both the River Liffey and the River Tolka, and the tides also bring in substantial quantities of N (Wilson 2004)<sup>4</sup>. Stable Isotope Analysis (SIA) was used to measure the isotopic signatures of C and N, specifically <sup>13</sup>C and <sup>15</sup>N, and the signature in turn linked to the contributing sources (e.g. food types) and used to discriminate among sewage particulate organic matter (POM), marine POM and river POM.

Initial results indicate that *Ectocarpus* growth is not dependent on nutrients from Ringsend WwTW but also nutrients from marine and estuarial sources. A change

---

<sup>2</sup> Brennan, M. et al. 1994 *Particulate nutrient inputs and their role in macro-algal development in Dublin Bay*. Final Report, DoE, Dublin.

<sup>3</sup> Jeffrey, D.W. et al. 1995 Nutrient sources for nuisance macroalgae: the Dublin Bay case. *Ophelia* 42, 147-161

<sup>4</sup> Wilson, J.G. 2004 *Diffuse inputs of nutrients to Dublin Bay*. *Wat. Sci. Technol.* 51 231 -237.

in the location of the discharge may, therefore, have a beneficial impact and, at worst, would not be expected to negatively impact this priority objective relating to *Ectocarpus* growth, which is a natural process in the Bay.

#### **4.4 Priority Objective d) Sewage Solids**

*Priority Objective: Improving the aesthetic quality of the beaches and shoreline waters of the Plan area by measures such as the interception of plastics and other solids of sewage origin.*

The discharge will be screened to intercept plastics and other solids of sewage origin. Any potential long sea outfall discharge will support this priority objective.

#### **4.5 Priority Objective e) Tolka Sediments**

*Priority Objective: improving the environmental quality of the Tolka Estuary, particularly in relation to the chemical and bacteriological of the intertidal elements.*

The removal of the discharge from the Liffey Estuary to the a location several kilometres out into the Irish Sea will ensure that the source of potential impact will be further from the receptor of concern. As a consequence the risk of the chemical and bacteriological quality being adversely affected due to the deposition of suspended solids discharged from the Ringsend WWTP will be significantly reduced.

#### **4.6 Priority Objective f) South Lagoon Ecosystem**

*Priority Objective: ensuring a stable biological habitat is maintained in the south lagoon of the Bull Island; and that its wildlife conservation is protected.*

The discharge from the proposed long sea outfall will have no significant impacts due to the distance of the discharge from the designated Natura 2000 sites in Dublin Bay. Further details are included in Chapter 3 Ecological Assessment and in the Appropriate Assessments in the Appendix.

#### **4.7 Priority Objective g) North Lagoon Ecosystem**

*Priority Objective: ensuring a stable biological habitat is maintained in the north lagoon of the Bull Island; and that its wildlife conservation is protected.*

The discharge from the proposed long sea outfall will have no significant impacts due to the distance of the discharge from the designated Natura 2000 sites in Dublin Bay. Further details are included in Chapter 3 Ecological Assessment and in the Appropriate Assessments in the Appendix.

#### **4.8 Priority Objective h) Green Micro-Algae**

*Priority Objective: ensuring that effluents and related inputs do not give rise to excessive growths of green micro-algae in the Bull Island Lagoons or the Tolka Estuary; the aim is to achieve a reduction in the anthropogenic contribution to these growths by reducing the*

particulate content of sewage effluent as a source of nutrient to the sediments and thence to the algae.

Dublin Bay displays several features of eutrophication including algal blooms in the intertidal area of the North and South Bull Lagoons (mostly *Enteromorpha* spp.) and in the shallow subtidal areas.

A model proposed by Jeffrey et al. (1995)<sup>5</sup> suggested that the nitrogen source facilitating algal growth was in the form of particulate N, which settled out of suspension and was then rapidly remineralised by the sediments and the fauna for uptake by the algae. Prior to plant improvements, the WwTW was the predominant source of particulate N (in readily processable form).

However, both the River Liffey and the River Tolka, and the tides also bring in substantial quantities of N (Wilson 2004)<sup>6</sup>. Stable Isotope Analysis (SIA) was used to measure the isotopic signatures of C and N, specifically <sup>13</sup>C and <sup>15</sup>N, and the signature in turn linked to the contributing sources (e.g. food types) and used to discriminate among sewage POM, marine POM and river POM.

Initial results indicate that for algae such as *Ectocarpus*, growth is not dependent on nutrients from Ringsend WwTW but also nutrients from marine and estuarial sources. A change in the location of the discharge may, therefore, have a beneficial impact and, at worst, would not be expected to negatively impact this priority objective relating to the growth of green micro-algae which is a natural process in the Bay.

It should be further noted that any discharge will be in compliance with the Urban Wastewater Treatment Regulations S.I. No. 254/2001.

## 4.9 Priority Objective i) Fisheries / BOD / DO

*Priority Objective: ensuring that excessive dissolved oxygen deficits do not occur in the waters of the Liffey Estuary, and that the dissolved oxygen standards are met; thereby protecting migratory fish.*

Natura Environmental Consultants were commissioned to produce a report that addressed the impacts of the proposed long sea outfalls on the ecology of the Bay and the receiving waters. This report is contained in Appendix C. The Natura report concludes that the transfer of the discharge over 10 km into the Irish Sea will result in an improvement in the water quality in the Liffey Estuary which will benefit migratory fish.

---

<sup>5</sup> Jeffrey, D.W. et al. 1995 Nutrient sources for nuisance macroalgae: the Dublin Bay case. *Ophelia* 42, 147-161

<sup>6</sup> Wilson, J.G. 2004 Diffuse inputs of nutrients to Dublin bay. *Wat. Sci. Technol.* 51 231 -237.

## 4.10 Priority Objectives j, k, l and m:

**j) Zone 6 Watersports,**

**k) Zone 4 Recreation**

**l) Zone 5 Recreation**

**m) Zone 2 Recreation**

*Priority Objective j: protecting the microbiological quality of the waters of zone 6 for water sports such as wind surfing.*

*Priority Objective k: protecting the the environmental quality of Zone 4 (Bull Wall to South Wall and Matt Talbot bridge) particularly for non water- contact recreation.*

*Priority Objective l: protecting the recreational uses of Zone 5 (South Wall to Blackrock)*

*Priority Objective m: protecting the recreational uses of Zone 2 (Baily to Red Rock)*

Of the 16 objectives listed in the Dublin Bay Water Quality Management Plan (1992) Objectives (j) to (m) are directed at protecting recreation and water sports areas within the Bay and the areas cover the virtually the entire coastline in the Bay area.

(j) **Zone 6 water sports;** protecting the microbiological quality of the waters of zone 6 for water sports such as wind surfing.

(k) **Zone 4 recreation;** protecting the environmental quality of Zone 4 (Bull Wall to South Wall and Matt Talbot bridge) particularly for non water- contact recreation.

(l) **Zone 5 recreation;** protecting the recreational uses of Zone 5 (South Wall to Blackrock)

(m) **Zone 2 recreation;** protecting the recreational uses of Zone 2 (Baily to Red Rock)

In the absence of any standards specifically for recreational or water sports areas it is considered appropriate to assess the consequences of the proposed long sea outfalls in terms of the contribution that they will make to the overall faecal coliform counts in the these amenity areas.

The proposal for the long sea outfall will result in a cessation of discharges of treated effluent from the Ringsend WwTW into the Liffey Estuary. The discharge of the treated effluent will be transferred into the Irish Sea. It is clear that this must result in an improvement in the bacteriological quality of the Inner Bay. However, it must be noted that there will still be considerable faecal coliform loads entering the Bay in the baseline quality of the Liffey and Tolka. The preliminary modelled plots for the maximum concentrations of faecal coliforms associated with the log sea outfalls clearly show that apart from a finite mixing

area the Coastal Waters in the vicinity of the outfalls that the receiving water will conform to the Bathing Regulations (1992 and 2008). There will be no discernible impact whatsoever on the bacteriological quality of the amenity areas defined in the Priority Objectives. If anything there will be discernible improvement due to the fact the discharge of treated effluent to the Liffey Estuary will cease.

#### **4.11 Other Ecosystems / Wildlife; Protection of Wildlife and their Habitats, not encompassed by the Foregoing**

*Priority Objective: protection of wildlife and their habitats not encompassed by the foregoing*

Natura Environmental Consultants were commissioned to produce a report that addressed the impacts of the proposed long sea outfalls on the ecology of the Bay and the receiving waters. This report is contained in Appendix C. The Natura report concludes that there will be no significant impacts.

#### **4.12 Other Fisheries**

*Priority Objective: Protection of other existing fisheries in the Plan area.*

Natura Environmental Consultants were commissioned to produce a report that addressed the impacts of the proposed long sea outfalls on the ecology of the Bay and the receiving waters. This report is contained in Appendix C. The Natura report concludes that there will be a change in nutrient levels in the immediate vicinity of the outfall, however this is not expected to have an impact on the levels of dissolved oxygen in the water or result in an increase in biological oxygen demand.

#### **4.13 External Areas**

*Priority Objective: Protection of areas outside the Plan boundaries from environmental degradation from any action taken under the provisions of this plan.*

The impacts on areas outside the plan boundaries will be an area in the vicinity of the outfall (the mixing zone) in which there will be elevated nutrient and faecal coliforms. The treated wastewater will meet the standards specified in the UWWT regulations; the receiving water is the Irish Sea.

It is proposed to tunnel the outfall from the treatment plant and consequently there will be no disturbance of the sea bed apart from the point at which the tunnel will emerge.

Apart from the area in the vicinity of the outfall discharge point no significant impacts are predicted.



## 5 Conclusions

The purpose of this preliminary assessment was:

- to consider the long sea outfall option with respect to the Environmental Objectives (Surface Water) Regulations 2009
- to consider the long sea outfall option with respect to the Bathing Water Regulations 1992 and 2008
- to consider the long sea outfall option with respect to the Dublin Bay Water Quality Management Plan priority objectives; and
- to carry out a preliminary ecological assessment of the potential impact from long sea outfall sites on the Natura 2000 sites (Special areas of conservation, Special Protected Areas and Bathing Waters) around Dublin Bay.

The proposal is to relocate the treated effluent outfall from the Ringsend WwTW, currently discharging to the Liffey Estuary (a designated nutrient sensitive water) with a discharge from a long sea outfall located in the Irish Sea. This will result in the outfall being located a considerably greater distance from sensitive receptors. The open sea will have a greater assimilative capacity and will dilute and disperse the effluent over a shorter range than would be the case with the existing outfall.

Two outfall options were considered (Option 3 and Option 4). The results of a preliminary modelling/screening exercise on the dispersal of the effluent was used to indicate the change in receiving water quality in the vicinity of the two sea outfalls. It should be noted that more detailed modelling will be undertaken as part of the EIS process and will examine a variety of scenarios in order to assess the optimum location for the long sea out fall.

It is proposed to treat the effluent to fully comply with the secondary standard prescribed in the UWWT regulations. The discharge of 13.8 m<sup>3</sup>/sec (the full capacity of the proposed outfall pipe) for a period of 15 days was examined in the preliminary model. For the purposes of the model the average existing effluent concentration was used.

An examination of the preliminary modelling results has shown that apart from a mixing zone in the vicinity of the outfall points the receiving waters will meet the Environmental Quality Objectives for coastal water nutrients (DIN).

There will be no deterioration in the bathing water quality in the Dublin area. The quality is expected to improve as a result of the ceasing of discharge to the Liffey Estuary.

Appropriate Ecological Assessments in accordance Article 6 of the Habitats Directive were undertaken for both outfall options. No significant on Natura 200 sites are predicted. The possibility of impacts on the Kish Bank (a designated sandbank habitat that is understood will be put forward as a candidate SAC) were

also assessed. No significant impact is predicted on this habitat which is located over 8 km and 2 km from outfall options 3 and 4, respectively.

Neither of the proposed options were found to conflict with any of the Dublin Bay Water Quality Management Plan Priority objectives.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# Appendices

For inspection purposes only.  
Consent of copyright owner required for any other use.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# Appendix A

## Appropriate Assessment Location 3

For inspection purposes only.  
Consent of copyright owner required for any other use.

For inspection purposes only.  
Consent of copyright owner required for any other use.

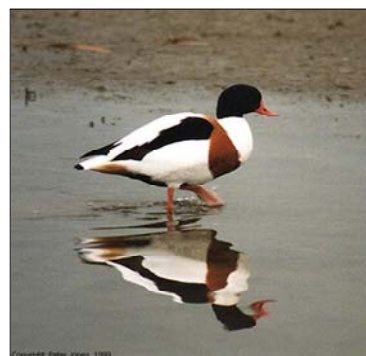
# RINGSEND WASTEWATER TREATMENT WORKS

## PROPOSED LONG SEA OUTFALL - OPTION 3

### APPROPRIATE ASSESSMENT

December 2009

For inspection purposes only.  
Consent of copyright owner required for any other use.



For further information contact:  
T: 00 353 1 4880500. E: [info@natura.ie](mailto:info@natura.ie) W: [www.natura.ie](http://www.natura.ie)



## Table of Contents

1.	INTRODUCTION .....	1
2.	REGULATORY CONTEXT .....	1
3.	METHODOLOGY AND APPROACH .....	2
3.1.	Introduction .....	2
3.2.	Approach.....	2
3.3.	Methodology .....	3
4.	SITE DESCRIPTION .....	4
4.1.	General Description of Study Area .....	4
4.2.	Current Water Quality .....	5
5.	BRIEF DESCRIPTION OF NATURA 2000 SITES .....	7
5.1.	Designated and Proposed Sites .....	7
6.	ASSESSMENT OF POTENTIAL IMPACTS .....	8
6.1.	Details of Plan/Activity (Discharge) .....	8
6.2.	Compliance with Ambient Standards Specified in European Environmental Objectives (Surface Waters) Regulations.....	8
6.3.	Coastal Environmental Standards .....	9
6.4.	Preliminary Modelling of Discharge from Long Sea Outfall.....	9
6.5.	Assessment Criteria.....	10
6.5.1.	Water Quality.....	13
6.5.2.	Status and Condition of Natura 2000 Sites .....	13
6.6.	Potential Impacts on the Integrity of Natura 2000 Sites .....	16
6.7.	Cumulative Assessment .....	16
7.	CONCLUSIONS .....	18
8.	REFERENCES .....	
9.	APPENDICES.....	

For inspection purposes only. Consent of copyright owner required for any other use.



## 1. INTRODUCTION

Natura Environmental Consultants were commissioned by J.B. Barry and Partners Limited to prepare a Habitats Directive Assessment (HDA) otherwise known as an 'Appropriate Assessment' for each of two proposed long sea outfall options (Options 3 and 4) from the existing Ringsend Wastewater Treatment Works (WwTW), as part of future plans to improve the treatment works.

An application for a Wastewater Discharge Licence for the existing treatment works was submitted to the EPA by Dublin City Council. As part of a request for additional information Dublin City Council were asked to supply supporting information for the licensing of the existing discharge in the form of water quality modelling and an appropriate assessment of potential impacts to protected areas.

To maximise the benefit of the EPA's requirements, an additional assessment of a number of potential long sea outfall sites was performed. A preliminary modelling exercise was undertaken to provide information on the dispersion associated with the proposed outfall option and to assess the potential impacts from the discharge on receiving water and Natura 2000 sites.

The purpose of this report is to determine the effects, if any, of a proposed long sea outfall (Option 3) on four existing Natura 2000 sites within Dublin Bay and one offshore site proposed for designation and to further assess if any of the predicted impacts have the potential to have significant negative impacts on the qualifying interests or on the conservation objectives of these designated areas for nature conservation.

## 2. REGULATORY CONTEXT

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) formed a basis for the designation of Special Areas of Conservation (SACs). Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds). Collectively, SACs and SPAs are referred to as Natura 2000 sites. In general terms, they are considered to be of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community. Under Article 6(3) of the Habitats Directive an Appropriate Assessment must be undertaken for any plan or program that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An Appropriate Assessment is an evaluation of the potential impacts of a plan on the conservation objectives of a Natura 2000 site, and the development, where necessary, of mitigation or avoidance measures to preclude negative effects.

Article 6, paragraphs 3 of the Habitats Directive state that:

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

The statutory agency responsible for Natura 2000 sites is the National Parks and Wildlife Service of the Department of Environment, Heritage and Local Government.

The European Court of Justice has recently (December 13 2007) issued a judgment in a legal case against Ireland that found that Ireland has failed in its statutory duty to confer adequate protection on designated areas. Following on from this the Circular Letter 1/08 & NPWS 1/08 on Appropriate Assessment of Land Use Plans (from the Department of the Environment, Heritage and Local Government) states that all plans and projects will be subject to critical assessment to ensure that they comply with all relevant legislation.

### ***The Stages in an Appropriate Assessment***

There are 4 stages in an Appropriate Assessment as outlined in the European Commission Guidance document (2001). The following is a brief summary of these steps.

Stage 1 - Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 Site and considers whether it can be objectively concluded that these effects will not be significant

Stage 2 - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function.

Stage 3 - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary.

The Screening Matrix is provided in Appendix C.

## **3. METHODOLOGY AND APPROACH**

### **3.1. Introduction**

The objective of the Appropriate Assessment Process is to evaluate whether there is or there will be a significant impact on the Natura 2000 sites. It is the impacts on the qualifying interests (species and habitats) together with the conservation objectives of these sites that will be assessed (these terms are described in Appendix A). This assessment was carried out with reference to the relevant guidance, in particular:

- *Assessment of Plans and Projects significantly affecting Natura 2000 Sites*: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission 2002
- *Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC*, European Commission, 2000
- Circular L8/08 Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments. 2 September 2008.
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

### **3.2. Approach**

A review of areas designated (or being considered for designation) for nature conservation was carried out by consulting the National Parks and Wildlife Service (NPWS). These included Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) for birds.

The approach adopted for this assessment is summarised as follows:

- The plan or activity being assessed is the discharge of treated effluent to the Irish Sea approximately 10km from the existing outfall location, which is currently discharging to the Liffey Estuary.
- The consequence of this activity will be a change in background water quality in the receiving water.
- The change in the receiving water quality will be variable and the effects will be attenuated with time and distance.

- The receptors that this assessment is directed at are Natura 2000 sites in the vicinity of Dublin Bay with the potential to be affected by the discharge. In particular the impacts from the discharge (change in water quality) on qualifying species and habitats and conservation objectives associated with the sites are being assessed.
- The pathway by which the receptors can be impacted is through the aquatic environment.
- The discharge from the WwTW at Ringsend can only impact directly on the aquatic elements of the qualifying interests of the Natura Sites. This would eliminate habitats such as dunes, cliffs etc. as well as flora that are based on dry land.
- It is possible that indirect impacts could occur where the change in water quality could affect the food chain and consequently impact on species that rely on the receiving water environment for their food.
- As there is currently no effluent discharging at the location point of the proposed long sea outfall. Data from the modelling report '*Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay*' (CRM, 2009) will be used to provide information on the dispersion associated with the proposed outfall option and compliance with Environmental Quality Standards.
- Effluent discharging from the long sea outfall will be treated to the same standards as the existing discharge, currently discharging to the Liffey Estuary. It is therefore possible to use existing data relating to the current discharge to assess existing trends and impacts on the basis of a number of criteria.

a) An assessment of the change in receiving water quality as a result of the existing discharge, i.e. the baseline water quality at the Natura 2000 sites. This water quality can then be compared to the various quality standards to provide an indication of the significance of the alteration in quality.

b) Identifying whether a pathway exists by which an effect can be imparted to the Natura 2000 site. If no pathway exists then it follows that there can be no impact on a particular qualifying interest.

c) An examination of whether there has been any significant deterioration in the status of the Natura 2000 site. If no deterioration has been observed and its status is satisfactory then it follows that the existing activity is not significantly impacting the site. If a deterioration has been observed it still remains to establish whether the discharge is the cause of the deterioration. Based on the results of the various assessment criteria a subjective assessment may be required if sufficient information is not available to provide definitive proof.

### **3.3. Methodology**

#### ***Desk Study***

A range of data relating to the discharges and the baselines conditions in the bay as well as data on the relevant designated habitats was reviewed. This data included:

- Ringsend Wastewater Treatment Works Appropriate Assessment (CDM, 2009a);
- Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay (CDM, 2009b).
- Various studies undertaken in relation to the flora and fauna of the designated areas in the vicinity of the discharge point; and
- EPA Water Quality Reports; and
- Eastern River Basin Management Plan Reports.

It should be noted that due to the improvements in the treatment process in 2004, that many studies carried out prior to this do not reflect current baseline receiving water conditions.

## Consultation

- Bird population data were provided by Dublin City Council (DCC) along with bird count data previously commissioned by DCC in relation to the WwTW and potential impacts on protected bird species in the study area.
- The National Parks and Wildlife Service (NPWS) was consulted in relation to designated areas (existing and proposed) and records of protected species within the study area.

## 4. SITE DESCRIPTION

### 4.1. General Description of Study Area

The area of interest comprises the Liffey Estuary, Dublin Bay and a number of offshore sandbanks.

The Liffey enters Dublin Bay between Clontarf and Ringsend in the channel formed by the North Bull Wall and the Great South Wall. The North Bull Wall is a natural bank reinforced by a stone embankment that is only inundated at half tide. It therefore holds back the water flowing out of the harbour at and after half ebb. The navigation channel runs close to the South Wall and extends from the Port area through the mouth of the harbour. This navigation channel is maintained at a depth of 7 to 8m below chart datum by dredging and natural scouring. To the north of this channel are extensive areas which dry out at low water. These mudflats extend from the mouth of the River Tolka almost to the end of the Bull Wall and north-eastwards to the Bull Island Causeway at St. Annes. Dublin Bay is a shallow bay with water depths not greater than 20m at low tide at its outer limit between Sorrento Point and Baily at Howth. The water depth decreases towards the harbour with depths of less than 5m occurring in the inner half of the Bay. North of the harbour at Bull Island and south around Sandymount extensive areas dry out at low tide. These areas provide important habitats for wading birds and wildfowl.

Situated approximately 10km offshore of Dublin Bay, are a series of coast-parallel north-south trending offshore-banks. These banks stand in 20-30m of water and rise to within a few metres of the water surface. The banks form a punctuated line along the eastern Irish coast south of Dublin with breaks maintained by strong currents and sediment movements. They offer wave protection to the coast and have a strong control on tidal flow pathways along the coast. The banks are quasi-stable features in dynamic equilibrium with tidal and wave conditions and are an integral part of the coastal system resulting from coastal erosion and the remobilisation of land-based gravel deposits in north county Wicklow (Warren and Keary, 1989).

The largest of the banks in the survey area are the Kish Bank and Bray Bank, the Bray Bank being a southerly continuation of the former. The Kish Lighthouse marks the northern end of the Kish Bank and the Codling Bank (a shallow platform of scoured seabed) marks the southern end of the Bray Bank. The Burford Bank is c.5km landward of the Kish Lighthouse and sits centrally across the mouth of Dublin Bay that forms a semi-circular embayment 8km across bordered by rocky coastline to the north (Howth) and south (Dún Laoghaire and Dalkey) (Wheeler et. al., 2001).

The tidal flow characteristics of Dublin Bay reflect the tidal regime in the Irish Sea. On the flood tide, the tidal stream enters from the south of the bay past Dalkey Island and runs north creating a clockwise flow. On the ebb, the tidal stream flows eastward past Howth Head and then southwards towards the shore at Dalkey Island. The resulting dominant feature is therefore a clockwise tidal circulation giving a strong eastwards net flow.

The currents in Dublin Port are dominated by the tidal fluctuations and are only to some extent influenced by wind and pressure fields over the east coast of Ireland and Dublin Bay, except during extreme weather conditions. The freshwater inflow influences the currents and a salt water wedge can be observed in the estuary. In the upstream part around Butt

Bridge the estuary is highly stratified. The stratification decreases downstream. From Ringsend and towards the mouth the estuary can be considered well mixed. Stratification and location of the salt water wedge depends on the tidal conditions and the river discharge. The salinity of the sea water in the outer part of Dublin Bay and along the eastern coast of Ireland shows insignificant annual variation and is around 35 PSU all year round.

#### 4.2. Current Water Quality

The rates of exchange of water between the Liffey estuary and Dublin Bay and between Dublin Bay and the open sea are very good.

Low level of phosphorus shows good water quality in the bay. Water quality of the bay is considered high in terms of nutrient and chlorophyll levels. Bacterial contamination in the bay is low.

Biochemical oxygen demand (BOD) concentrations in the Liffey Estuary, Dublin Bay and adjacent coastal waters are generally low. Oxygen saturation levels are generally within the range of normal saturation (80-120%).

##### **EPA classification**

The present assessment of the Liffey estuary would appear to confirm that water quality in the estuary continues to improve with only phosphorus levels in winter marginally exceeding the set criterion. Since the 1995-1999 period the trophic status of the estuary has improved from eutrophic to intermediate in 1999-2003 and in the current assessment period. As in the previous assessment summer chlorophyll levels in the estuary remained low with values of 3.2 (median) and 5.6 (90 percentile)  $\mu\text{g/l}$  respectively. Dissolved oxygen levels showed little evidence of disturbance ranging between 80 and 119 per cent saturation (EPA, 2008).

The observed improvement in water quality in the Liffey estuary is clearly a result of the installation of significantly upgraded treatment facilities at the Ringsend WwTW in 2004, though further investigation is still required to track the change in nutrient levels as the full effect of the works is realised. In the previous period 1999-2003, there was some evidence to suggest that while total and ammoniacal nitrogen concentrations had fallen as a consequence of nitrification, oxidized nitrogen levels had increased. It had been suggested that this situation should be kept under review in case it might lead to the reoccurrence of excessive nitrogen availability in the estuary. It would appear though from examination of data collected during the current assessment period that levels of total oxidized nitrogen in the estuary have changed little in the intervening period (EPA, 2008).

BOD concentrations were generally low, as indicated by the median value of 2.0 mg/l O<sub>2</sub> in both the estuary and Dublin Bay. Given that this value is also the limit of detection for the method used, at least half of the reported measurements were less than 2.0 mg/l O<sub>2</sub>. In Dublin Bay, 80 per cent of BOD values were reported at the limit of detection indicating that the 'true' median value for the Bay is much lower than the limit of detection. However, the Liffey estuary and Dublin Bay were both in breach of the recommended 95 percentile BOD value of 4 mg/l O<sub>2</sub>. In the estuary the exceedance was the result of a small number of high BOD values in the range 12 – 27 mg/l O<sub>2</sub> collected adjacent to the Ringsend effluent cascade. These high BOD values were mostly restricted to 2002 and data collected since then indicate a decline in BOD values both within the lower estuary and particularly in the vicinity of the existing Ringsend discharge – again indicating an improvement in the quality of the discharge at this point. The reduction in organic loading from Ringsend, as indicated by declining BOD values, is also reflected in the considerable improvement in the bacteriological quality of the Liffey estuary and bathing areas within the Dublin Bay area (EPA, 2008).

##### **Water Framework Directive Classification**

Dublin Bay comes under the terms of the recent Water Framework Directive (WFD) (2000/60/EC); however the location of the long sea outfall discharge point is outside the area delineated for consideration under the Water Framework Directive (WFD). Under the River Basin Management, plans that are being undertaken as part of the WFD "Coastal Waters" are

defined as water out to a distance of one nautical mile beyond the baseline from which territorial waters are measured. For the purpose of this assessment the proposed long sea outfall option will be assessed in accordance with the standards set out in the WFD.

The WFD sets quality standards for chemical and biological parameters, including an obligation to maintain or to restore to 'good ecological quality and sets a timetable for a series of actions, up to the final implementation of the WFD in 2015. The WFD specifies the factors, referred to as quality elements, which must be used in determining the ecological status or ecological potential and the surface water chemical status of a surface water body. The lists of quality elements for each surface water category are divided into three groups of elements:

- biological elements;
- hydromorphological elements; and
- chemical and physico-chemical elements.

The EC Environmental Objectives (Surface Waters) Regulations came into effect in July 2009 in order to implement aspects of the Water Framework Directive (WFD). The regulations establish Environmental Objectives and Environmental Quality Standards for the classification and management of Surface Waters. The draft classifications for Dublin Bay and the Liffey Estuary under the Water Framework Directive were published at the end of 2008. Dublin Bay has **MODERATE** water quality WFD Classification. Water quality is generally very good. There is only one breach in standards and that was for winter dissolved inorganic nitrogen (DIN).

### Cumulative

It should be noted that the water quality data contained in both the EPA Water quality report and the Data from the Water Framework Directive (ERBD management plan) reflects the cumulative effect of all the discharges that end up in Dublin Bay. The River Liffey is considered to be the main source of diffuse nutrients to Dublin Bay and accounts for 85% of all riverine inputs (Dublin Drainage Consultancy, 2005).

Other activities that may affect water quality and sediment quality are dredge spoil disposal, litter, chronic spillages of small amounts of oil, ores and other toxic substances and diffuse sources. Since 1999 there has been no dumping of sewage sludge at sea.

Water is abstracted from the Liffey Estuary by the ESB Power Generation Station for use as cooling waters. The ESB Cooling Waters mix with the WwTW discharge before final discharge to the estuary. There are currently two power generation plants at Poolbeg; the Thermal Plant and the Combined Cycle Gas Turbine (CCGT). The CCGT is run continuously whilst the Thermal Plant is only used during periods of peak demand. The CCGT is serviced by 2 CW Pumps at 5m<sup>3</sup>/s flow each, which gives a continuous base CW discharge of 10m<sup>3</sup>/s.

The effluents include condenser cooling water, discharge from the water treatment neutralisation tanks, boiler blowdown water and screen wash water. The IPPC Licences for these plants contain limits for the quality of the effluents in terms of physical and chemical properties.

The observed improved water quality in the Liffey Estuary in recent years is, according to the EPA, *"clearly a result of the installation of significantly upgraded treatment facilities at Ringsend WwTW"*.

## 5. BRIEF DESCRIPTION OF NATURA 2000 SITES

### 5.1. Designated and Proposed Sites

A brief synopsis of all Natura 2000 sites with potential to be affected by the proposed development is provided below.

#### South Dublin Bay and River Tolka Estuary SPA

The South Dublin Bay and River Tolka Estuary SPA comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, the estuary of the River Tolka to the north of the River Liffey, Booterstown Marsh and an area of grassland at Poolbeg, north of Irishtown Nature Park. A portion of the shallow marine waters of the bay is also included. The site is of special conservation interest for a number of bird species (Light-Bellied Brent Goose, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Bar-tailed Godwit, Redshank, Black-Headed Gull, Roseate Tern, Common Tern and Arctic Tern) and is important for wintering waterfowl and wintering gulls. An internationally important population of Light-bellied Brent Goose feed on the Eelgrass bed at Merrion and is also known to feed on the grassland at Poolbeg. The SPA is of international importance for Light-bellied Brent Goose and of national importance for nine other waterfowl species. It is also of international importance as an autumn tern roost. The EU Birds Directive pays particular attention to wetlands, and these form part of the SPA, the site and its associated waterbirds are of special conservation interests for Wetlands and Waterbirds.

#### North Bull Island SPA

North Bull Island is a sand spit that developed after the construction of the North Bull Wall. This island is covered in dune grassland. Other important ecosystems associated with the island are salt marsh and mud flats. The reserves are of international scientific importance for Brent Geese and also on botanical, ornithological, zoological and geomorphological grounds. North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. It also qualifies for international importance as the numbers of two species exceed the international threshold – Brent Goose and Bar-tailed Godwit. A further 15 species have populations of national importance – Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Curlew, Redshank and Turnstone. The North Bull Island SPA is a regular site for passage waders, especially Ruff, Curlew Sandpiper and Spotted Redshank.

#### North Dublin Bay cSAC

Annex I Habitats include fixed dunes, marram/shifting dunes, embryonic shifting dunes, dune slack, annual vegetation of drift lines, salicornia mud and sand flats, Atlantic salt meadows, Mediterranean salt meadows, mud and sand flats. Annex II species include Petalwort. The site overlaps with North Bull Island SPA.

#### South Dublin Bay cSAC

The site has extensive areas of sand and mudflats, a habitat listed on Annex I of the EU Habitats Directive. The largest stand of Eelgrass on the east coast occurs at Merrion Gates. New habitats are developing just south of Merrion Gates including embryonic dunes and a sand spit. This area is becoming increasingly important as a high tide roost site for waterfowl. The site overlaps with South Dublin Bay and River Tolka Estuary SPA

#### Kish Bank (and Bray Bank) proposed cSAC

The National Parks and Wildlife Service is currently in discussions regarding the proposed designation of an area known as Kish Bank (and possibly also Bray Bank), in the Irish Sea off the coast of Dublin, as a candidate Special Area of Conservation (cSAC). This area is being considered for designation due to the presence of the habitat 'Sandbanks which are slightly covered by sea water all the time' (code 1110), which is listed in Annex I of the EU Habitats Directive.

According to the NPWS, a boundary for the proposed cSAC has not yet been defined, however it will include the Kish Bank and possibly also the Bray Bank, which is a part of the Kish Bank. It is expected that further information in relation to the proposal will be available in

February 2010 (NPWS consultation). There are currently no conservation objectives available for the proposed site, however for the purpose of this report it is assumed that the primary objective will be to maintain the Annex I habitat for which the cSAC has been selected at favourable conservation status. Section 5.3 defines the term favourable conservation status.

The following is a description of the Annex I habitat for which the site is proposed as a cSAC. Sandbanks consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20 m below chart datum (but sometimes including channels or other areas greater than 20 m deep). The habitat comprises distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) which may arise from horizontal or sloping plains of sandy sediment. Where the areas of horizontal or sloping sandy habitat are closely associated with the banks, they are included within the Annex I type (Roche et. al., 2007).

The diversity and types of community associated with this habitat are determined particularly by sediment type together with a variety of other physical, chemical and hydrographical factors. These include geographical location (influencing water temperature), the relative exposure of the coast (from wave-exposed open coasts to tide-swept coasts or sheltered inlets and estuaries), topographical structure of the habitat, and differences in the depth, turbidity and salinity of the surrounding water.

Shallow sandy sediments are typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Mobile epifauna at the surface of the sandbank may include mysid shrimps, gastropod molluscs, crabs and fish. Sand-eels *Ammodytes* spp., an important food for birds, live in sandy sediments. Where coarse stable material, such as shells, stones or maerl, is present on the sediment surface species of foliose seaweeds, hydroids, bryozoans and ascidians may form mixed communities (Johnston et al., 2002). Shallow sandy sediments are often important nursery areas for fish, and feeding grounds for seabirds (especially puffins *Fratercula arctica*, guillemots *Uria aalge* and razorbills *Alca torda*) and sea-duck (e.g. common scoter *Melanitta nigra*) (Roche et. al., 2007)..

The Kish Bank is known to be an important foraging area for seabird species, many of which nest on the islands of Lambay, Ireland's Eye and Rockabill off Co. Dublin (Newton and Crowe 1999, 2000). The tern species, in particular, are all listed in Annex I of the EU Birds Directive and they use the Bank for foraging and roosting especially in the period August to September.

## 6. ASSESSMENT OF POTENTIAL IMPACTS

### 6.1. Details of Plan/Activity (Discharge)

This assessment is concerned with the impacts of the discharge of treated effluent from the Ringsend Wastewater Treatment Works through a proposed long sea outfall (Option 3). The current discharge of effluent to the Liffey Estuary will discontinue and will instead discharge through the proposed long sea outfall at a location approximately 10km out in the Irish Sea.

The installation of the proposed long sea outfall pipe will involve tunnelling under the seabed, therefore there will be minor loss and/or disruption of the sea bed at the entry and exit points.

### 6.2. Compliance with Ambient Standards Specified in European Environmental Objectives (Surface Waters) Regulations

There will be a change in water quality in the vicinity of the long sea outfall and for the purpose of this assessment the change in water quality will be assessed in the context of the standards contained in the EC Environmental Objectives (Surface Waters) Regulations 2009. These regulations came into effect in July 2009 in order to implement aspects of the Water Framework Directive (WFD). Wastewater Discharge Authorisations must set standards (emission limits) that will ensure that the receiving waters will comply with the standards laid out in the regulations. It should be noted that however the location of the discharge point is outside the area delineated for consideration under the Water Framework Directive (WFD). Under the River Basin Management, plans that are being undertaken as part of the WFD



“Coastal Waters” are defined as water out to a distance of one nautical mile beyond the baseline from which territorial waters are measured.

### 6.3. Coastal Environmental Standards

The principal quality standard of concern in relation to Wastewater Discharges to Coastal Waters is nutrients in the form of Dissolved Inorganic Nitrogen (DIN). DIN (rather than MRP) is considered to be the limiting nutrient in coastal waters and a breach of the environmental quality standard may lead to eutrophic conditions (algal blooms etc.) and consequently the only nutrient standards in place for coastal waters are for DIN. The DIN criteria for calculating the status of a coastal water body is as follows.

Good status -  $\leq 0.25$  mg/l as N (Median Value) where the salinity is 34.5 psu

It should be stressed that in order for a water to meet the “Good Status” category it is the median value that applies. The Statutory Instrument SI 272 of 2009 has inadvertently omitted the reference to median concentration (informed by EPA).

The MRP standard only applies to transitional waters but has been examined in the preliminary modelling exercise.

The MRP criterion for assessing a transitional water body with full salinity is as follows.

MRP  $\leq 0.04$  mg/l as P (Median Value) where the salinity is 35 psu indicating saline water.

### 6.4. Preliminary Modelling of Discharge from Long Sea Outfall

A preliminary modelling exercise was undertaken to provide information on the dispersion associated with the proposed outfall (Option 3). The following section reviews the modelling results for the proposed outfall location. It describes the effect on the receiving waters. The results of the long sea outfall modelling exercise are presented in Figures C 55 C56 C 65 C66 below.

MRP: For this substance a plume is formed around the outfall which is completely separate from the plume that is associated with the Liffey and Tolka estuaries. The outfall plume is located far from any beaches and designated areas. The 50% exceedance will be limited to an area in the vicinity of the outfall. This is taken to represent the median concentration and is the criteria for good status as set out in the Environmental Quality Objectives (Surface Waters) Regulations. This is a considerable improvement on the current situation where the 50 % contour extends to designated areas.

DIN: As for MRP a plume is formed around the outfall which is completely separate from the plume that is associated with the Liffey and Tolka estuaries. The outfall plume forms a narrow band that follows the streamlines from north to south and vice versa and is located far from any beaches and designated areas. The 50% exceedance will be limited to an area in the vicinity of the outfall. This is taken to represent the median concentration and is the criteria for good status as set out in the Environmental Quality Objectives (Surface Waters). This is a considerable improvement on the current situation where the 50 % contour extends to designated areas

The outfall option was modelled for what is regarded as an extreme case scenario in that the outfall was discharging at the maximum capacity (13.8 m<sup>3</sup>/sec) for the entire 15 day modelling period and that the DIN concentration was 22 mg/l. Consequently the average daily load measured over the modelling period was 26.23 tonnes per day of DIN. This is regarded to be a worst case scenario for a number of reasons.

- The hydraulic capacity of the outfall is designed on the basis of an instantaneous peak hydraulic load and is not predicted to flow at capacity for extended periods.

- The proposed DWF for the treatment plant is 5.83 m<sup>3</sup>/sec which is considerably less than the continuous flow discharge scenario.
- Extended extreme discharge flow volumes would be accompanied by a lowering in the constituent concentrations due to dilution by storm water.

It must be stressed that the environmental quality objective for DIN is a median value of concentrations taken over the course of a winter or summer period..

An inspection of the plots showing the percentage of time that the concentrations exceed the concentration of 0.25 mg/l indicates that apart from a very small area in the vicinity of the outfall the DIN concentration objective is met for over 50% of the time. This can be taken to reflect the median value over the modelling periods.

These boundaries of the 50% exceedance enclose a very small area in the vicinity of the outfall (the mixing zone). Beyond this point the very conservative discharge estimate will not breach the environmental quality standard for DIN.

The results for the modelling of MRP can be interpreted in the same way and for the modelling period a small area in the vicinity of the outfall will exceed the median environmental objective.

### 6.5. Assessment Criteria

The criteria adopted for this assessment are based on an assessment of the existing conditions prevailing in Dublin Bay and whether these conditions are causing a significant impact on the qualifying interests of the Natura 2000 sites.

The effect of the existing discharge is an alteration in water quality in the receiving waters. Therefore the available data on water quality has been examined and assessed in terms of whether the water quality could result in the deterioration in the status of the Natura 2000 sites. It should be noted that this is an assessment of the effect of the cumulative discharges to the Bay.

The discharge was also assessed in terms of the present conservation status of the sites and whether any deterioration has been observed. If no reduction in the conservation status of the sites has been observed, it follows that there is no significant impact as a result of the discharge (or any other activity).

As the effluent discharging from the proposed long sea outfall will be treated to the same standards as the existing discharge, it is possible to use existing data relating to the current discharge to assess existing trends and impacts. Preliminary modelling results for the proposed long sea outfall discharge have also been assessed in terms of plume dispersion and compliance with Environmental Quality Standards.

MRP – Option 3

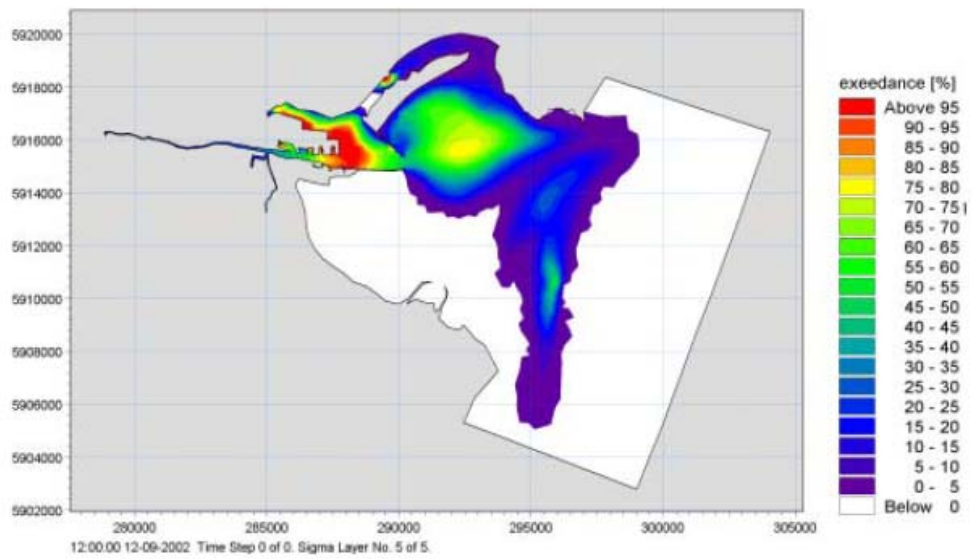


Figure C55: Percentage of time with concentrations exceeding 0.04 mg/l for neap tide for outfall Location 3

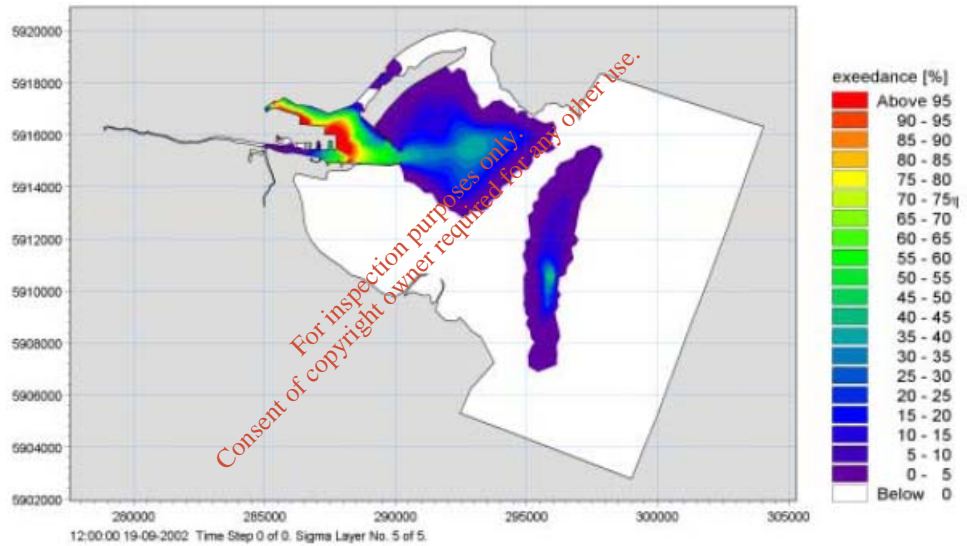


Figure C56: Percentage of time with concentrations exceeding 0.04 mg/l for spring tide for outfall Location 3

### DIN – Option 3

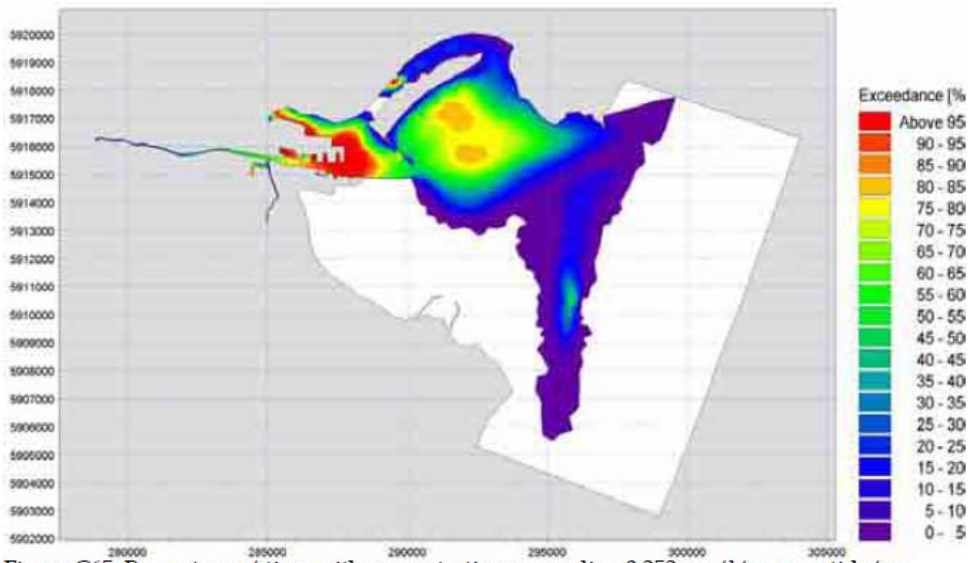


Figure C65: Percentage of time with concentrations exceeding 0.252 mg/l for neap tide for outfall Location 3

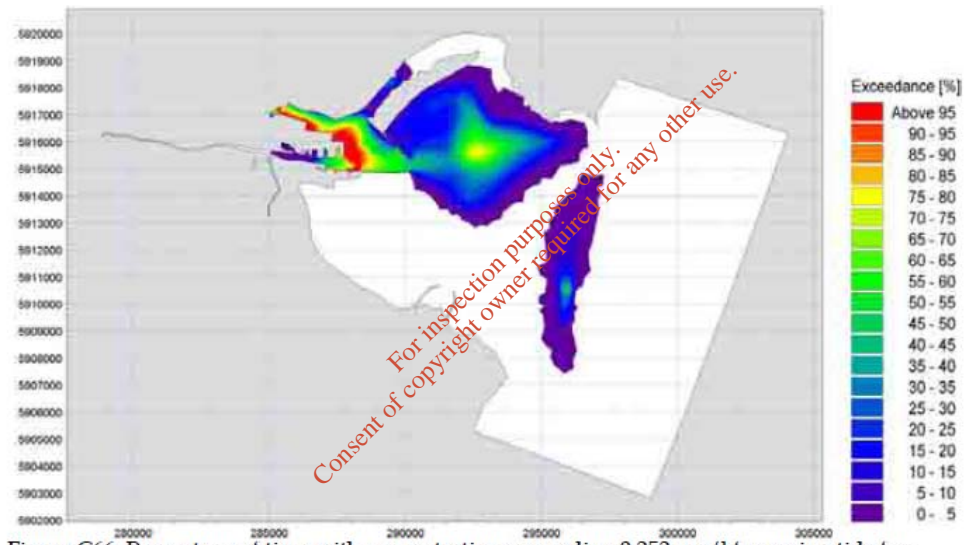


Figure C66: Percentage of time with concentrations exceeding 0.252 mg/l for spring tide for outfall Location 3

### **6.5.1. Water Quality**

Data on the water quality in the receiving waters has been provided from:

- The EPA Water Quality in Ireland Report 2008; and
- The Eastern River Basin Management Report 2008

Water Quality Modelling has also been undertaken to support the discharge licence application (CRM, 2009).

#### **EPA Water Quality Report 2008**

This report summarises the water quality in Ireland between 2002 and 2006. The improvements to the treatment works were completed in 2004 and the report notes that there was a continuing improvement in the water quality of the Liffey and Dublin Bay. The Bay was classified as being unpolluted while the estuary was classified as being intermediate due to a failure to meet the winter orthophosphate (MRP) threshold. There had been concern that the introduction of nitrification to the treatment process could result in increased oxidised nitrogen.

However, the report states that the levels of oxidised nitrogen had changed little in the period 2002 - 2006. One area of concern was the reoccurrence of opportunistic macroalgae in the Tolka estuary and along the south Dublin seashore. The occurrence of green opportunistic algal mats (mostly *Enteromorpha* spp.) in the intertidal area of the Tolka estuary, mainly behind the southern promontory of Bull Island, is of concern. The presence of these mats, which can have an adverse impact on marine benthic fauna, in terms of smothering the underlying sediment, is likely to result in the Tolka estuary being classified as less than good ecological status under the WFD.

Furthermore, the reoccurrence of substantial strands of brown macroalgae (*Ectocarpus siliculosus*) along the south Dublin seashore during the autumn months is also of concern. The abundance and distribution of opportunistic algal species within the Dublin Bay area will be assessed as part of the national WFD monitoring programme.

The exact reason for the occurrence of the ectocarpus blooms has not been established and specialist studies have been commissioned by DCC as part of the undergoing studies in connection with the further improvements in Ringsend WwTW. These studies will be directed at establishing whether the nutrients discharged at Ringsend are contributing towards the growth of the blooms.

### **6.5.2. Status and Condition of Natura 2000 Sites**

The second criterion used to assess whether the existing discharge is significantly impacting on Natura 2000 sites is the condition of the sites and whether there has been a deterioration in the qualifying interests. If there has been no discernible deterioration then there can be no significant impact.

The protected areas in Dublin Bay support large concentrations of wintering water birds which occupy the habitats that are naturally enriched by organic material carried in by rivers, by the growth and nutrient re-cycling of a variety of species of seaweeds including green algae, and by salt marsh habitats. Sheltered areas within bays and estuaries tend to accumulate organic

material and fine sediments. These muddy habitats generally support high densities of macroinvertebrates which are not of conservation interest themselves, but provide feeding for protected bird species.

### ***Bird populations in Dublin Bay***

Waterfowl distribution within Dublin Bay is determined by the distribution of the preferred feeding habitats of individual species, by tidal cycle and range, by the availability of roosting areas, and fresh water preening and loafing areas (which are important particularly for geese and ducks). The availability of food and its comparative abundance in different parts of the bay is likely to be an important determinant of waterfowl feeding distribution. Bird distribution is also influenced by disturbance. A study carried out in South Dublin Bay indicated that uncontrolled dogs were the most significant source of disturbance to water birds (Phalan and Nairn 2007).

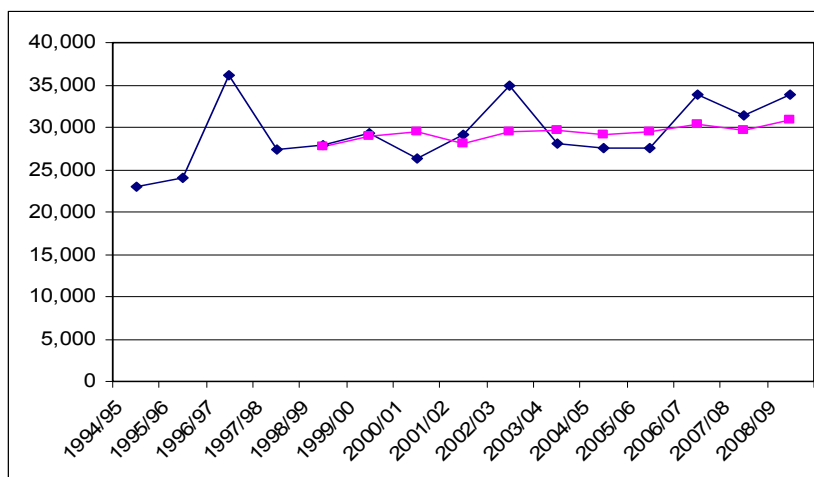
Crowe (2006) examined the wintering waterbird populations in Dublin Bay and concluded that “their numbers have remained relatively stable since the mid-1990s despite encroaching development and increased levels of disturbance from recreational activities”. From the total numbers of each species recorded in the IWeBS counts, it is possible to determine the trends in all species. Table 1 shows that there have been considerable fluctuations between the limits of approximately 23,000 and 36,000 birds (all species combined) over this 15-year period.

A moving 5-year mean of the summed peaks smoothes the natural fluctuations that are a feature of waterbird populations. This indicates that over the last 10 years, total bird numbers in Dublin Bay have increased from 27,718 to 30,839 (Figure 1) (Boland et al 2008, Crowe and Boland 2004; Colhoun 1998).

**Table 1:** Trends in bird populations in Dublin Bay (data from IWeBS published counts) Figures are the sum of the peak counts for each species, regardless of the month in which the peak occurred.

<b><i>Winter</i></b>	<b><i>Summed Peak for all species*</i></b>	<b><i>Moving 5-year Mean Peak*</i></b>
1994/95	23,069	n/a
1995/96	24,001	n/a
1996/97	36,191	n/a
1997/98	27,389	n/a
1998/99	27,942	27,718
1999/00	29,357	28,976
2000/01	26,254	29,427
2001/02	29,183	28,025
2002/03	34,996	29,546
2003/04	28,051	29,568
2004/05	27,472	29,191
2005/06	27,536	29,448
2006/07	33,826	30,376
2007/08	31,427	29,662
2008/09	33,933	30,839

\*A moving 5-year mean peak is the average of the previous five years peak counts which is moved forward by one year at a time, thus smoothing the natural fluctuations in populations and giving an overall trend.



**Figure 1:** Peak counts of all species of wintering waterbirds combined in Dublin Bay over the period 1994/95 to 2008/09. The squares represent a moving 5-year mean peak.

Details of most recently available counts of important bird species numbers in Dublin Bay up to 2006 are contained in Appendix B. There are four species that occur in numbers of international importance in Dublin Bay. These are Light-bellied Brent Goose, Bar-tailed Godwit, Black-tailed Godwit and Redshank. Of these species, there have been significant increases in the Dublin Bay populations of the first three species, while Redshank numbers have increased slightly over the same period (Crowe 2006).

The bird species listed in Annex I of the EU Birds Directive and which occur in Dublin Bay include: Little Egret, Golden Plover, Bar-tailed Godwit, Sandwich Tern, Common Tern, Arctic Tern, Roseate Tern. Little Egret has been increasing consistently in Ireland and in Dublin Bay since the mid 1990s. Golden Plover peak numbers increased between the 5-year periods 1994/95-1998/99 and 1999/2000-2003/04 although this species fluctuates widely and is widespread inland. Bar-tailed Godwit have increased significantly in Dublin Bay in the same period (Crowe 2006).

Both Common Tern and Arctic Tern breed in Dublin Docks, on a man-made mooring structure known as the ESB dolphin (Merne 2004). This is included within the South Dublin Bay and River Tolka Estuary SPA. Recent data highlights this site as one of the most important Common Tern sites in the country with over 400 pairs recorded here in 2007. The Dublin Port Tern project has enabled improvements to the ESB Dolphin and there are no negative impacts on the colony from the existing Ringsend WWTW discharge.

There is also a night roost of at least six species of terns, with Common Terns as the great majority, in South Dublin Bay each autumn. This reached a recorded peak of 11,700 terns at night roost in 2006. The birds were present from late July to early October in 2006 and 2007. The core area is on sand banks between Sandymount and Williamstown Martello towers. At high spring tides all terns are on the sand spit between Booterstown DART station and Merrion gates. At high neap tides terns roost between Booterstown sand spit and Sandymount Martello tower (Merne et al 2008). This tern roost has increased in numbers over the period since it was first reported in the 1950s and there is no indication of any loss of integrity of the site for these species.

Overall the bird numbers in Dublin Bay have been either increasing or in cases where there has been a decrease in numbers the decrease has followed the national or international trends. There are several cases where there has been an increase in numbers in Dublin Bay, in contrast to the national trend. The bird population data indicate that the Annex I species are increasing in Dublin Bay. There is no evidence that the aquatic and semi-aquatic habitats that provide the foods source for the qualifying species are being adversely impacted by the proposed development.

The main conservation objective is to maintain the favourable conservation status of the species listed in Annex I of the EU Birds Directive, Annex II of the EU Habitats Directive and

habitats listed on Annex I of the EU Habitats Directive as well as other important species and habitats. This conservation objective has been shown to continue to be achieved.

## 6.6. Potential Impacts on the Integrity of Natura 2000 Sites

The primary effect of the discharge will be elevated nutrients (particularly Dissolved Inorganic Nitrogen) in coastal waters. It should be noted that the quality of the discharged effluent will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001. Using the assessment criteria outlined in Section 6.5, the direct and indirect impacts (actual and potential are summarised below)

- There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the tunnel. Due to the small scale of these impacts there will be no significant impacts to Natura 2000 sites as a result of habitat loss.
- The water quality in the bay is reported to be unpolluted (EPA Water Quality in Ireland 2008 report) or MODERATE (WFD classification). The classification would be GOOD but for the fact that there have been elevated inorganic nitrogen levels recorded. The water quality is also in compliance with the bathing water quality standards.
- While the change of water quality in Dublin Bay creates the potential for impacts on biodiversity, there is no evidence of the qualifying interests or conservation objectives of the Natura 2000 sites being directly impacted by the existing discharge. The removal of the existing discharge in the Liffey Estuary and its transfer to the new proposed long sea outfall, will be of benefit to the four Natura 2000 sites within Dublin Bay, as it will reduce further the risk of negative impacts on water quality.
- The change in the water quality caused by transfer of the discharge point from the Liffey Estuary to the Option 3 location could potentially indirectly impact on the lower end of the food chain that supports the protected bird species. There has been no reported decrease in the numbers of birds in the two SPAs in Dublin Bay in the last 15 year period. It is considered unlikely that the slightly reduced nutrients in the water column in the inner parts of Dublin Bay would result in a reduction in the food sources available to the birds.
- The area known as the Kish Bank, which is proposed as a cSAC, is the closest potential Natura 2000 site (within approximately 8km) to the long sea outfall discharge location. 'Sandbanks which are slightly covered by sea water all the time' (code 1110) is the Annex I habitat for which the site qualifies for designation. Sand banks by their very nature are quasi-stable features in dynamic equilibrium with tidal and wave conditions. The data available on the biodiversity of the Kish Bank is limited but it is clear that the construction of the outfall (Option 3) will not directly impact on the area currently proposed as cSAC. Any indirect effects are likely to be insignificant as the effluent plume will flow in a north-south orientation and will not impact directly on the Kish Bank to the east. The use of this area by foraging terns in the summer-autumn period is not likely to be impacted by the long sea outfall as these species are feeding on mobile shoals of small fish, which will not be impacted by the effluent discharge.

## 6.7. Cumulative Assessment

There has been and continues to be development, regeneration and improvement of the whole of the Dublin Bay area. Mitigation policies and objectives for biodiversity and water quality must be implemented and monitored as there is potential for impact on Natura 2000 sites.

The approach to the assessment has been one of investigating whether there has been deterioration in the factors that could result in an impact i.e. the water quality. The water quality in the receiving waters is a reflection of the cumulative impact of the activities in the vicinity of Dublin Bay.



Similarly the condition of the protected areas is a reflection of all the activities that are taking place. The fact that internationally and nationally important species remains consistent with previous years findings indicate that the cumulative effect on the sites is not significant.

## **Planned and Future Developments**

### ***Waste to Energy Plant***

The Environmental Protection Agency (EPA) has issued a licence to Dublin City Council, to operate a non-hazardous waste incinerator at Pigeon House Road, Poolbeg Peninsula. The licence provides for the operation of an incinerator to burn non-hazardous waste and to recover energy in the form of steam and electricity for export to the national grid, and for the transfer of heat to a municipal district-heating scheme, once such a scheme is available. It is not predicted that there will be significant impacts on any of the sites of conservation importance in Dublin Bay as a result of the proposed discharge. The thermal plume should lose much of its energy by the time it reaches these sites. The biocides should also be diluted and deactivated to an extent that they will not directly impact the habitats. However, there would be potential absorption effects that could lead to bioaccumulation and subsequent adverse impacts in some high trophic level species including birds. The modelling analysis indicates that hypochlorite and its degradation product may also occur in a concentration that may have toxic effects on the Liffey Estuary. However, it will only occur very locally to the proposed cooling water outfall. Similarly, concentrations of trihalomethane (THM) were only above the predicted no-effect concentration (PNEC) value very close to the outfall. Therefore, it would be preferred to use hypochlorite in the Facility for the prevention of biofouling. The contribution of hypochlorite/chlorine and THMs from the other plants using hypochlorite/chlorine (Synergen and Poolbeg) is well below the PNEC values and the cumulative effect is thus on average considered negligible. There will be a very local residual impact in the vicinity of the outlet of the cooling water system. The joint discharges from Waste to Energy Facilities and the other plants in the area have been considered to ensure that there will not be significant adverse impacts on marine ecology in the extended study area (Elsam, 2006)

### ***Poolbeg Planning Scheme***

The new planning scheme area, as set out in Ministerial Order 297/2007, comprises lands principally located on the Poolbeg Peninsula to the east of Sean Moore Road and west of the South Bull Wall. New development will be dependent on the expansion of the wastewater treatment works to ensure that adequate capacity exists for treatment as otherwise water quality in the receiving waters could be affected through inadequate collection or wastewater treatment system capacity. Therefore, development will not proceed unless such capacity is provided in a timely manner. As a result, the plan is not expected to have a cumulative effect that would influence the assessment of the works discharge.

### ***Dublin Port Reclamation***

Dublin Port has recently reclaimed land on the Poolbeg Peninsula north of the overflow tanks from the Ringsend Wastewater Treatment Works. It is currently examining the issue of further land reclamation in the North Port. Any potential impacts would be centred on:

- Hydrodynamics, particularly: changes to the wave and current regime, changes to the tidal regime, changes to the erosion and deposition of sediments, changes to suspended sediments during construction and operation of the development, and changes to flooding and flood risk; and
- Water quality, particularly: the re-suspension of sediments during construction and operation (maintenance dredging), the re-mobilisation of contaminated sediment during construction and operation (maintenance dredging), planned and unplanned discharges of polluting substances during construction and operation, and the long-term hydrodynamic changes as a result of the development. Minor negative impacts are predicted to arise from the physical disturbance to benthic communities from reclamation and dredging, the smothering of benthic communities by suspended sediments during dredging, the result of piling noise on fish (particularly migratory species), the release of contaminants during dewatering (during reclamation), increased suspended sediment concentrations in surrounding waters during

dredging, an increase in deposition of sediment during dredging and an increase in contaminant levels in water during dredging. Should the project proceed, it is not anticipated that there will be any cumulative discharges influencing this assessment (Royal Haskoning, 2008).

### **Other Future Developments**

Due to the tidal regime and dilution effects within the bay, it is anticipated that other developments such as the planned Portrane, Donabate, Rush & Lusk WWTS which will discharge effluent to the Irish Sea via a 600m pipeline will not result in any cumulative impacts on the modelled water quality discussed, with respect to potential negative effects on the designated areas.

### **Climate Change**

According to an EPA report 'Climate Change – Scenarios and Impacts for Ireland' Environmental RTDI Programme 2000 – 2006, a sea level rise of 0.5 metres is expected during the period 1990 – 2100, i.e. an average rise of 0.45 cm per year. This may gradually influence many coastal habitats.

## **7. CONCLUSIONS**

The discharge from the proposed long sea outfall (Option 3) from the Ringsend Wastewater Treatment Works will result in a change in water quality in the vicinity of the outfall. The quality of treated effluent discharging from the WwTW will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001. Modelling of the outfall option for the impact on DIN and MRP concentrations in the receiving water has shown that even for extreme conditions where over 2.4 times the DWF is discharged for a period of 15 days that the receiving water will remain at good status and meet the environmental quality objectives for coastal water nutrients as set out under the Water Framework Directive.

Overall there is no evidence that the current discharge from Ringsend WwTW is resulting in a significant impact on the conservation objectives of the Natura 2000 sites. Effluent discharging from the long sea outfall will be treated to the same standards as the existing effluent discharging to the Liffey Estuary. It is therefore concluded that the discharge from the proposed long sea outfall will have no significant impacts due to the distance of the discharge from the designated Natura 2000 sites in Dublin Bay. Any potential indirect impacts to the Kish Bank proposed for designation are considered unlikely due to the quality of effluent discharging, the location and distribution of the modelled plume and the nature of the Annex I habitat, sandbanks. No significant impacts are predicted for any existing or proposed Natura 2000 sites.

## REFERENCES

- Boland, H., Crowe, O. and Walsh, A. 2008. Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2006/07. *Irish Birds* 8: 341-350.
- CDM 2009a. Ringsend Wastewater Treatment Works Appropriate Assessment.
- CDM 2009b. Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay.
- Colhoun, K. 1998. *Irish Wetland Bird Survey 1996-97: Results of the third season of the Irish Wetland Bird Survey*. BirdWatch Ireland. Monkstown.
- Crowe, O. 2005. *Ireland's Wetlands and their Waterbirds: Status and Distribution*. BirdWatch Ireland. Newcastle.
- Crowe, O. 2006. A review of the wintering waterbirds of Dublin Bay, 1994/95 to 2003/04. *Irish East Coast Bird Report 2002*: 123-129
- Crowe, O. and Boland, H. 2004. Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2001/02. *Irish Birds* 7: 313-326.
- Crowe, O., Austin, G. E., Colhoun, K., Cranswick, P., Kershaw, M., and Musgrove, A. J. 2008. Population estimates and trends for wintering waterfowl in Ireland, 1994/94 – 2003/04. *Bird Study* 55: 66-77.
- Dublin Drainage Consultancy 2005. Greater Dublin Strategic Drainage Study. Regional Policies - Volume 3. Environmental Management. Executive Report.
- EPA 2008. *Water Quality in Ireland 2004-2006*. Environmental Protection Agency. Wexford.
- Johnston, C.M., Turnbull, C.G. & Tasker, M.E. 2002. Natura 2000 in UK offshore Waters: advice to support the implementation of the EC Habitats and Birds Directives in UK offshore waters. JNCC Report, No. 325
- Mayes, E. 2007. Wintering waterfowl and conservation designations in Dublin Bay. Brief of Evidence, Dublin Waste to Energy Project, 25 April 2007.
- Merne, O.J. 2004. Common and Arctic Terns breeding in Dublin Port, Co. Dublin, 1995-2003. *Irish Birds* 7: 369-374.
- Merne, O.J., Madden, B., Archer, E. and Porter, B. 2008. Autumn roosting by terns in south Dublin Bay. *Irish Birds* 8: 335-310.
- Newton, S.F. and Crowe, O. 1999. Kish Bank: a preliminary assessment of its ornithological importance. *BirdWatch Ireland Conservation Report No. 99/8*. BirdWatch Ireland. Monkstown. Dublin.
- Newton, S.F. and Crowe, O. 2000. *Roseate Terns – The natural connection*. Maritime Ireland/Wales INTERREG Report no. 2. Marine Institute. Dublin.
- NPWS 2008. *Status of EU Protected Habitats and Species in Ireland*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.
- NPWS 2009. *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.
- Phalan, B. and Nairn, R.G.W. 2007. Disturbance to waterbirds in South Dublin Bay. *Irish Birds* 8: 223-230.

- Roche, C., Lyons, D.O., Farinas Franco, J. & O'Connor, B. 2007. Benthic surveys of sandbanks in the Irish Sea. *Irish Wildlife Manuals, No. 29*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Warren, W.P. and Keary, R. 1989. The sand and gravel resources of the Irish Sea Basin. In: Sweeney, J. (ed.) *The Irish Sea Basin: A Resource at Risk*. Geographical Society of Ireland. Special Publication No. 3. Dublin.
- Wheeler, A.J., Walshe J. and Sutton G. D. 2001. Seabed mapping and seafloor processes in the Kish, Burford, Bray and Fraser Banks area, south-western Irish Sea. *Irish Geography* 34: 194-211.

For inspection purposes only.  
Consent of copyright owner required for any other use.

## 8. APPENDICES

### APPENDIX A: Definition of concepts

#### 8.1. Integrity of the Site

The 'integrity of the site' relates to the site's conservation objectives. As regards the connotation or meaning of 'integrity', this can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation.

The 'integrity of the site' has been usefully defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'.

A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.

When looking at the 'integrity of the site', it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term.

#### 8.2. Conservation status

The conservation status is defined in Article 1 of the directive:

\_ For a natural habitat, Article 1(e) specifies that it is: *'the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species...'*

\_ For a species, Article 1(i) specifies that it is: *'the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its population ...'*

The Member State has therefore to take into account all the influences of the environment (air, water, soil, territory) which act on the habitats and species present on the site.

The favourable conservation status is also defined by Article 1(e) for natural habitats and Article 1(i) for species. For a natural **habitat**, it occurs when:

*'its natural range and areas it covers within that range are stable or increasing;*

*the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future;*

*the conservation status of its typical species is favourable'.*

For a **species**, it occurs when:

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

*the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;*

*there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis'.*

The favourable conservation status of a natural habitat or species has to be considered across its natural range, according to Articles 1(e) and 1(i), i.e. at biogeographical and, hence, Natura 2000 network level. Since, however, the ecological coherence of the network will depend on the contribution of each individual site to it and, hence, on the conservation status of the habitat types and species it hosts, the assessment of the favourable conservation status at site level will always be necessary.

### 8.3. Conservation Objectives

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, is stable or increasing, and
- the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below. The favourable conservation status of a species is achieved when: population data on the species concerned indicate that it is maintaining itself, and
- the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Conservation objectives for all of the Natura 2000 sites are described in detail in the Appropriate Assessment tables in Appendix B.

*For inspection purposes only.  
Consent of copyright owner required for any other use.*

## APPENDIX B: Summary of water bird counts from Dublin Bay (after Mayes 2007)

Table 1. Peak counts of wildfowl and waders in Dublin Bay in the years up to 2006 (Mayes, 2007)

	Mean peak 2001/02-2005/06	Mean peak 98/99-2002/03	Mean peak 1994/95-1998/99	Trend in Dublin Bay	National trend	Threshold 2005/06	
						National	International
Great-grested grebe	112	62	26	Increase	Increase	55	4,800
Cormorant	151	62	24	Increase	Increase	140	1,200
Grey heron	33	34	24	Increase	Increase	30	2,700
Little egret	7	-	-	Increase	Increase	20	1,300
Light-bellied Brent goose	3,181	2,907	1,930	Increase	Increase	220	220
Shelduck	1,140	1,287	1,261			150	3,000
Wigeon	855	785	924	Decrease*	Decrease	820	15,000
Teal	1,125	870	1,157			450	4,000
Mallard	90	135	90			380	20,000
Pintail	139	204	296	Decrease	Decrease	20	600
Shoveler	133	128	191	Decrease	Decrease	25	400
Goldeneye	17	13	34	Decrease	Decrease	95	4,000
Red-breasted merganser	40	40	35			35	1,700
Oystercatcher	4,349	4,177	2,526	Increase	Increase	680	10,200
Ringed plover	316	365	302			150	730
Golden plover	1,924	2,174	3,118	Decrease		1,700	9,300
Grey plover	573	629	705	Decrease		65	2,500
Lapwing	56	68	60		Decrease	2,100	20,000
Knot	4,475	3,503	3,575	Increase	Decrease	190	4,500
Sanderling	519	386	402	Increase	Increase	65	1,200
Dunlin	5,595	6,141	6,810	Decrease	Decrease	880	13,300
Black-tailed godwit	1,059	752	397	Increase		140	350
Bar-tailed godwit	2,026	1,901	1,669	Increase		160	1,200
Curlew	1,210	1,091	1,056	Increase	Decrease	550	3,200
Redshank	2,146	2,056	1,679	Increase	Increase	310	1,900
Greenshank	37	17	14	Increase	Increase	20	3,100
Turnstone	338	255	206	Increase	Decrease	120	1,000

Note: Internationally important numbers are shown bold-faced, nationally important numbers are in italics. Data for Brent geese and waders are combined Dublin Bay Project and I-WeBS data from 1998 on, other species and dates are I-WeBS data. National trends are indicated where these exceed 5% change between 1994/95-1998/99 and 1999/00-2003/04 (Crowe et al, 2008). Trends in Dublin Bay are indicated for changes of more than 10% between 1994/95-

For inspection purposes only  
Consent of copyright owner required for any other use

## APPENDIX C: Screening Matrix

Stage 1. Screening	
<b>1. Description of the project or plan</b>	
Location	Ringsend Dublin. Discharge direct to Liffey Estuary at Poolbeg.
Distance from designated site	The long sea outfall pipe from the Ringsend WwTW (Option 3) is located in the Irish Sea approximately 10km from the Treatment Works (Co-ordinates UTM30 X299988.6, Y5912494.4), approximately 9km from North Bull Island SPA, 11km from North Dublin Bay cSAC, 11km from South Dublin Bay and River Tolka Estuary SPA and 12km from South Dublin Bay SAC.
Brief Description of the project or plan	The proposal is to relocate the existing outfall in the Liffey Estuary to a long sea outfall in the eastern part of Dublin Bay, approximately 10km from the Treatment Works.
Is the plan directly connected with or necessary to the Natura 2000 site management for nature conservation?	No
<b>2. Brief Description of the Natura 2000 sites</b>	
<b>Name</b>	<b>North Bull Island (SPA)</b>
<b>Site designation status</b>	<b>Special Protection Area (SPA)</b>
<b>Basis</b>	<b>EU Birds Directive (79/209/EEC)</b>
Natura 2000 Site description	<p>This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5 km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses.</p> <p>A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. Marram Grass (<i>Ammophila arenaria</i>) is dominant on the outer dune ridges. A feature of the dune system is a large dune slack with a rich flora, usually referred to as the 'Alder Marsh' because of the presence of Alder (<i>Alnus glutinosa</i>) trees. The water table is very near the surface and is only slightly brackish. Sea Rush (<i>Juncus maritimus</i>) is the dominant species, with Meadowsweet (<i>Filipendula ulmaria</i>) and Devil's-bit Scabious (<i>Succisa pratensis</i>) being frequent.</p> <p>The orchid flora is notably diverse in this area. Saltmarsh extends along the length of the landward side of the island and provides the main roost site for wintering birds in Dublin Bay.</p> <p>The island shelters two intertidal lagoons which are divided by a solid causeway. These lagoons provide the main feeding grounds for the wintering waterfowl. The sediments of the lagoons are mainly sands with a</p>



	<p>small and varying mixture of silt and clay. Tasselweed (<i>Ruppia maritima</i>) and small amounts of Eelgrass (<i>Zostera</i> spp.) are found in the lagoons. Common Cord-grass (<i>Spartina anglica</i>) occurs in places. Green algal mats (<i>Enteromorpha</i> spp., <i>Ulva lactuca</i>) are a feature of the flats during summer. These sediments have a rich macro-invertebrate fauna, with high densities of Lugworm (<i>Arenicola marina</i>) and Ragworm (<i>Hediste diversicolor</i>).</p> <p>The North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. It also qualifies for international importance as the numbers of two species exceed the international threshold – Brent Goose and Bar-tailed Godwit. A further 15 species have populations of national importance – Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Curlew, Redshank and Turnstone. The island is also regular wintering site for Short-eared Owl.</p> <p>The site has five Red Data Book vascular plant species, four rare bryophyte species, and is nationally important for three insect species. The rare liverwort, <i>Petalophyllum ralfsii</i>, was first recorded from the North Bull Island in 1874 and its presence here has recently been re-confirmed. This species is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. A well-known population of Irish Hare is resident on the island.</p> <p>The main landuses of this site are amenity activities and nature conservation. The North Bull Island is the main recreational beach in Co. Dublin and is used throughout the year. Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. North Bull Island is also a Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site. Much of the SPA is also a candidate Special Area for Conservation. The site is used regularly for educational purposes and there is a manned interpretative centre on the island.</p> <p>The North Bull Island SPA is an excellent example of an estuarine complex and is one of the top sites in Ireland for wintering waterfowl. It is of international importance on account of both the total number of waterfowl and the individual populations of Brent Goose and Bar-tailed Godwit that use it. Also of significance is the regular presence of several species listed on Annex I of the E.U. Birds Directive, notably Golden Plover and Bartailed Godwit but also Ruff and Short-eared Owl.</p>
Unit size	North Bull Island SPA 1,945ha.
<b>Qualifying Interests (Species)</b>	<p>North Bull Island SPA is selected for:</p> <ul style="list-style-type: none"> <li>▪ Light-bellied Brent Goose</li> <li>▪ Shelduck</li> <li>▪ Pintail</li> <li>▪ Shoveler</li> <li>▪ Oystercatcher</li> <li>▪ Grey Plover</li> <li>▪ Knot</li> <li>▪ Dunlin</li> <li>▪ Black-tailed Godwit</li> <li>▪ Bar-tailed Godwit</li> <li>▪ Redshank</li> <li>▪ Turnstone</li> <li>▪ 20,000 wintering waterbirds</li> </ul>

Additional species of interest:	<ul style="list-style-type: none"> <li>▪ Teal</li> <li>▪ Ringed Plover</li> <li>▪ Golden Plover</li> <li>▪ Sanderling</li> <li>▪ Curlew</li> <li>▪ Black-headed Gull</li> <li>▪ Wetland &amp; Waterbirds</li> </ul>
Qualifying Interests (Habitats)	None
Conservation Objectives	To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied Brent Goose, Shelduck, Pintail, Shoveler, Oystercatcher, Grey Plover, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Redshank, Turnstone, 20,000 wintering waterbirds, Teal, Ringed Plover, Golden Plover, Sanderling, Curlew, Black-headed Gull, Wetland & Waterbirds.

Name	North Dublin Bay SAC
Site designation status	Candidate Special Area of Conservation
Basis	EU Habitats Directive (92/43/EEC)
Natura 2000 Site description	<p>This site covers the inner part of north Dublin Bay, the seaward boundary extending from the Bull Wall lighthouse across to the Martello Tower at Howth Head. The North Bull Island is the focal point of this site. The island is a sandy spit which formed after the building of the South Wall and Bull Wall in the 18<sup>th</sup> and 19<sup>th</sup> centuries. It now extends for about 5 km in length and is up to 1 km wide in places. A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. Marram Grass (<i>Ammophila arenaria</i>) is dominant on the outer dune ridges, with Lyme Grass (<i>Leymus arenarius</i>) and Sea Couchgrass (<i>Elymus farctus</i>) on the foredunes. Behind the first dune ridge, plant diversity increases with the appearance of such species as Wild Pansy (<i>Viola tricolor</i>), Kidney Vetch (<i>Anthyllis vulneraria</i>), Bird's-foot Trefoil (<i>Lotus corniculatus</i>), Rest Harrow (<i>Ononis repens</i>), Yellow Rattle (<i>Rhinanthus minor</i>) and Pyramidal Orchid (<i>Anacamptis pyramidalis</i>). In these grassy areas and slacks, the scarce Bee Orchid (<i>Ophrys apifera</i>) occurs.</p> <p>About 1 km from the tip of the island, a large dune slack with a rich flora occurs, usually referred to as the 'Alder Marsh' because of the presence of Alder trees (<i>Alnus</i> spp). The water table is very near the surface and is only slightly brackish. Saltmarsh Rush (<i>Juncus maritimus</i>) is the dominant species, with Meadow Sweet (<i>Filipendula ulmaria</i>) and Devil's-bit (<i>Succisa pratensis</i>) being frequent. The orchid flora is notable and includes Marsh Helleborine (<i>Epipactis palustris</i>), Common Twayblade (<i>Listera ovata</i>), Autumn Lady's-tresses (<i>Spiranthes spiralis</i>) and Marsh orchids (<i>Dactylorhiza</i> spp.). Saltmarsh extends along the length of the landward side of the island. The edge of the marsh is marked by an eroding edge which varies from 20 cm to 60 cm high. The marsh can be zoned into different levels according to the vegetation types present. Towards the tip of the island, the saltmarsh grades naturally into fixed dune vegetation.</p>

	<p>The island shelters two intertidal lagoons which are divided by a solid causeway. The sediments of the lagoons are mainly sands with a small and varying mixture of silt and clay. The north lagoon has an area known as the "Salicornia flat", which is dominated by <i>Salicornia dolichostachya</i>, a pioneer Glasswort species, and covers about 25 ha. Tassel Weed (<i>Ruppia maritima</i>) occurs in this area, along with some Eelgrass (<i>Zostera angustifolia</i>). Eelgrass (<i>Z. noltii</i>) also occurs in Sutton Creek. Cordgrass (<i>Spartina anglica</i>) occurs in places but its growth is controlled by management.</p> <p>Three Rare plant species legally protected under the Flora Protection Order 1987 have been recorded on the North Bull Island. These are Lesser Centaury (<i>Centaureum pulchellum</i>), Hemp Nettle (<i>Galeopsis angustifolia</i>) and Meadow Saxifrage (<i>Saxifraga granulata</i>). Two further species listed as threatened in the Red Data Book, Wild Sage (<i>Salvia verbenaca</i>) and Spring Vetch (<i>Vicia lathyroides</i>), have also been recorded. A rare liverwort, <i>Petalophyllum ralfsii</i>, was first recorded from the North Bull Island in 1874 and has recently been confirmed as being still present there. This species is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. The North Bull is the only known extant site for the species in Ireland away from the western seaboard.</p> <p>North Dublin Bay is of international importance for waterfowl, the following species occurred in internationally important numbers: Brent Geese; Knot; Bar-tailed Godwit. A further 14 species occurred in nationally important concentrations - Shelduck; Wigeon; Teal; Pintail; Shoveler; Oystercatcher; Ringed Plover; Grey Plover; Sanderling; Dunlin; Blacktailed Godwit; Curlew; Turnstone and Redshank. Some of these species frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes.</p> <p>The tip of the North Bull Island is a traditional nesting site for Little Tern. However, nesting attempts have not been successful since the early 1990s. Ringed Plover, Shelduck, Mallard, Skylark, Meadow Pipit and Stonechat also nest. A well-known population of Irish Hare is resident on the island. The invertebrates of the North Bull Island have been studied and the island has been shown to contain at least seven species of regional or national importance in Ireland (Orders Diptera, Hymenoptera, Hemiptera).</p> <p>The main landuses of this site are amenity activities and nature conservation. The North Bull Island is the main recreational beach in Co Dublin and is used throughout the year. Much of the land surface of the island is taken up by two golf courses. Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. The site is used regularly for educational purposes.</p> <p>North Bull Island has been designated a Special Protection Area under the E.U. Birds Directive and it is also a statutory Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site.</p> <p>This site is an excellent example of a coastal site with all the main habitats represented. The site holds good examples of ten habitats that are listed on Annex I of the E.U. Habitats Directive; one of these is listed with priority status. Several of the wintering bird species have populations of international importance, while some of the invertebrates are of national importance. The site contains a numbers of rare and scarce plants including some which are legally protected. Its proximity to the capital city makes North Dublin Bay an excellent site for educational studies and research.</p>
Unit size	North Dublin Bay cSAC 1,475ha;
Qualifying Interest (species)	North Dublin Bay cSAC is selected for: <ul style="list-style-type: none"> <li>▪ Petalwort (<i>Petalophyllum ralfsii</i>)</li> </ul>

<p><b>Qualifying Interests (habitats)</b></p>	<p>North Dublin Bay cSAC is selected for:</p> <ul style="list-style-type: none"> <li>▪ Mudflats and sandflats not covered by seawater at low tide</li> <li>▪ Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)</li> <li>▪ Mediterranean salt meadows (<i>Juncetalia maritimi</i>)</li> <li>▪ Salicornia and other annuals colonizing mud and sand</li> <li>▪ Annual vegetation of drift lines</li> <li>▪ Embryonic shifting dunes</li> <li>▪ Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)</li> <li>▪ Fixed coastal dunes with herbaceous vegetation (grey dunes)*</li> <li>▪ Humid dune slacks</li> <li>▪ <i>Spartina</i> swards (<i>Spartinion maritima</i>)</li> </ul> <p>* Indicates priority habitat</p>
<p><b>Conservation Objectives</b></p>	<p>Objective 1: To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; Salicornia and other annuals colonizing mud and sand; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>); Mediterranean salt meadows (<i>Juncetalia maritimi</i>); Embryonic shifting dunes; Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Humid dune slacks.</p> <p>Objective 2: To maintain the Annex II species for which the cSAC has been selected at favourable conservation status: <i>Petalophyllum ralfsii</i>.</p> <p>Objective 3: To maintain the extent, species richness and biodiversity of the entire site.</p> <p>Objective 4: To establish effective liaison and cooperation with landowners, legal users and relevant authorities.</p>

<p><b>Name</b></p>	<p><b>South Dublin Bay SAC</b></p>
<p><b>Site designation status</b></p>	<p><b>Candidate Special Area of Conservation</b></p>
<p><b>Basis</b></p>	<p><b>EU Habitats Directive (92/43/EEC)</b></p>
<p>Natura 2000 Site description</p>	<p>This site lies south of the River Liffey and extends from the South Wall to the west pier at Dun Laoghaire. It is an intertidal site with extensive areas of sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. The sediments are predominantly sands but grade to sandy muds near the shore at Merrion Gates. The main channel which drains the area is Cockle Lake. There is a bed of Eelgrass (<i>Zostera noltii</i>) below Merrion Gates which is the largest stand on the east coast. Green algae (<i>Enteromorpha</i> spp. and <i>Ulva lactuca</i>) are distributed throughout the area at a low density. Furoid algae occur on the rocky shore in the Maretimo to Dún Laoghaire area.</p> <p>Several small, sandy beaches with incipient dune formation occur in the northern and western sectors of the site, notably at Poolbeg, Irishtown and Merrion/Boosterstown. The formation at Boosterstown is very recent. Driftline vegetation occurs in association with the embryonic and incipient fore dunes.</p>

	<p>Typically drift lines occur in a band approximately 5m wide, though at Booterstown this zone is wider in places. The habitat occurs just above the High Water Mark and below the area of embryonic dune. A small area of pioneer salt marsh now occurs in the lee of an embryonic sand dune just north of Booterstown Station. This early stage of salt marsh development is here characterised by the presence of pioneer stands of Glasswort (<i>Salicornia</i> spp.) occurring below an area of drift line vegetation. As this is of very recent origin, it covers a small area but ample areas of substrate and shelter are available for the further development of this habitat.</p> <p>South Dublin Bay is an important site for waterfowl. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there. The principal species are Oystercatcher, Ringed Plover, Sanderling and Dunlin, Redshank. Up to 100 Turnstones are usual in the south bay during winter. Brent Geese regularly occur in numbers of international importance. Bar-tailed Godwit, a species listed on Annex I of the EU Birds Directive, also occurs. Large numbers of gulls roost in South Dublin Bay. It is also an important tern roost in the autumn, regularly holding 2000-3000 terns including Roseate Terns, a species listed on Annex I of the E.U. Birds Directive. South Dublin Bay is largely protected as a Special Protection Area.</p> <p>At low tide the inner parts of the south bay are used for amenity purposes. Baitdigging is a regular activity on the sandy flats. At high tide some areas have windsurfing and jet-skiing. This site is a fine example of a coastal system with extensive sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. South Dublin Bay is also an internationally important bird site.</p>
Unit size	South Dublin Bay cSAC 742ha;
Qualifying Interest (species)	None
Qualifying Interests (habitats)	<p>South Dublin Bay cSAC is selected for:</p> <ul style="list-style-type: none"> <li>■ Mudflats and sandflats not covered by seawater at low tide.</li> </ul>
Conservation Objectives	<p><b>Objective 1:</b> To maintain the Annex I habitat for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide.</p> <p><b>Objective 2:</b> To maintain the extent, species richness and biodiversity of the entire site.</p> <p><b>Objective 3:</b> To establish effective liaison and cooperation with landowners, legal users and relevant authorities.</p>

<b>Name</b>	<b>South Dublin Bay and River Tolka Estuary SPA and pSPA*</b>
<b>Site designation status</b>	<b>Special Protection Area (SPA)</b>
<b>Basis</b>	<b>EU Birds Directive (79/209/EEC)</b>
<b>Natura 2000 Site description</b>	This site comprises a substantial part of Dublin Bay. It includes virtually all of the intertidal area in the south bay, as well as much of the estuary of the River Tolka to the north of the River Liffey. A portion of the shallow marine

	<p>waters of the bay is also included.</p> <p>In the south bay, the intertidal flats extend for almost 3 km at their widest. The sediments are predominantly well-aerated sands. Several permanent channels exist, the largest being Cockle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs near Dun Laoghaire. The landward boundary is now almost entirely artificially embanked. There is a bed of Dwarf Eelgrass (<i>Zostera noltii</i>) below Merrion Gates which is the largest stand on the east coast. Green algae (<i>Enteromorpha</i> spp. and <i>Ulva lactuca</i>) are distributed throughout the area at a low density. The macroinvertebrate fauna is well-developed, and is characterised by annelids such as Lugworm (<i>Arenicola marina</i>), <i>Nephtys</i> spp. and Sand Mason (<i>Lanice conchilega</i>), and bivalves, especially Cockle (<i>Cerastoderma edule</i>) and Baltic Tellin (<i>Macoma balthica</i>). The small gastropod Spire Shell (<i>Hydrobia ulvae</i>) occurs on the muddy sands off Merrion Gates, along with the crustacean <i>Corophium volutator</i>.</p> <p>The site is an important site for wintering waterfowl, being an integral part of the internationally important Dublin Bay complex. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there. An internationally important population of Brent Goose occurs regularly and newly arrived birds in the autumn feed on the eelgrass bed at Merrion. The site supports nationally important numbers of a further six species: Oystercatcher Ringed Plover, Knot, Sanderling, Dunlin and Bar-tailed Godwit. Other species which occur in smaller numbers include Great Crested Grebe, Grey Plover, Curlew, Redshank and Turnstone.</p> <p>South Dublin Bay is an important site for wintering gulls, especially Black-headed Gull, Common Gull and Herring Gull. It is also the premier site in Ireland for Mediterranean Gull, with up to 20 birds present at times. These occur through much of the year, but especially in late-winter/spring and again in late summer into winter. The south bay is an important tern roost in the autumn (mostly late July to September). The wintering birds within this site are now well-monitored.</p> <p>The main threat to this site is further reclamation for industrial and/or infra-structural purposes. The intertidal areas receive water that is somewhat polluted though there are no apparent impacts on the associated flora and fauna. Owing to its location in Dublin Bay, pollution such as oil spillages from Dublin Port and shipping is a threat. Commercial bait digging may be a problem - this causes disturbance to wintering birds. Disturbance to birds is also caused by walkers and dogs.</p> <p>Sandymount Strand/Tolka Estuary SPA is of high ornithological importance, being of international importance for Brent Goose and of national importance for six waterfowl species. As an autumn tern roost, it is also classified as of international importance. All of the tern species using the site are listed on Annex I of the E.U. Birds Directive, as are Bar-tailed Godwit and Mediterranean Gull.</p>
<b>Unit size</b>	South Dublin Bay and River Tolka Estuary SPA 597ha;
<b>Qualifying Interest (species)</b>	<p>South Dublin Bay and River Tolka Estuary is selected for:</p> <ul style="list-style-type: none"> <li>▪ Light-bellied Brent Goose</li> <li>▪ Knot</li> <li>▪ Sanderling</li> <li>▪ Bar-tailed Godwit</li> <li>▪ Redshank</li> <li>▪ Roseate Tern</li> <li>▪ Common Tern</li> <li>▪ Arctic Tern</li> </ul>

	<p>Additional Special Conservation Interests</p> <ul style="list-style-type: none"> <li>▪ Oystercatcher</li> <li>▪ Ringed Plover</li> <li>▪ Golden Plover</li> <li>▪ Grey Plover</li> <li>▪ Dunlin</li> <li>▪ Black-headed Gull</li> <li>▪ Wetland &amp; Waterbirds</li> </ul>
<b>Qualifying Interests (habitats)</b>	None
<b>Conservation Objectives</b>	To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied Brent Goose, Knot, Sanderling, Bar-tailed Godwit, Redshank, Roseate Tern, Common Tern, Arctic Tern, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Dunlin, Blackheaded Gull and Wetland & Waterbirds.
<b>3. Describe the individual elements of the plan (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 sites.</b>	<p>The proposed development involves the discharge of treated effluent from the existing Ringsend Wastewater Treatment Works (WwTW) through a proposed long sea outfall (Option 3), at a location approximately 10km from the Treatment Works. The current discharge of effluent from the treatment works to the Liffey Estuary will discontinue and will instead discharge through the proposed long sea outfall.</p> <p>The installation of the proposed long sea outfall pipe will involve tunnelling under the seabed, therefore there will be minor loss and/or disruption of the sea bed at the entry and exit points to the tunnel.</p>
<b>4. Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of:</b>	<p>The tunnel proposed for the long sea outfall will be located under the sea bed and therefore disruption to habitats will be minimal. There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the tunnel.</p> <p>Discharge of treated effluent from the WwTW will result in a change in water quality in the vicinity of the long sea outfall discharge point. The primary effect of this discharge will be an increase in the nutrient concentration in the receiving water.</p> <p>Without strict adherence to the discharge standards as set out in the discharge licence, there is potential for impacts on Natura 2000 sites. A breach of Environmental Quality Standards (EQS) may lead to eutrophication of waters, which could cause alterations to aquatic habitats and water dependent ecosystems.</p> <p>The nearest designated Natura 2000 site (North Bull Island SPA) is located 9km from the proposed discharge point. The boundary of the Kish Bank area proposed for designation is unknown at present but is within approximately 8km of the discharge point.</p>
<ul style="list-style-type: none"> <li>▪ Size and scale;</li> <li>▪ Land-take;</li> <li>▪ Distance from Natura 2000 site or key features of the site;</li> <li>▪ Resource requirements;</li> <li>▪ Emissions;</li> <li>▪ Excavation requirements;</li> <li>▪ Transportation requirements;</li> <li>▪ Duration of construction,</li> </ul>	

<p>operation etc.;</p> <ul style="list-style-type: none"> <li>▪ Others.</li> </ul>	
<p><b>5. Describe any likely changes to the site arising as a result of:</b></p> <ul style="list-style-type: none"> <li>▪ Reduction of habitat area;</li> <li>▪ Disturbance of key species;</li> <li>▪ Habitat or species fragmentation;</li> <li>▪ Reduction in species density;</li> <li>▪ Changes in key indicators of conservation value;</li> <li>▪ Climate change.</li> </ul>	<ul style="list-style-type: none"> <li>▪ There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the underground tunnel. Due to the small scales of these impacts there will be no significant impacts to Natura 2000 sites as a result of habitat loss.</li> <li>▪ The presence of extensive areas of sand and mudflat and a diverse macro-invertebrate community provides valuable source of food for herbivorous wild birds and wintering water birds. Shallow sandy sediments on sandbanks are often important nursery areas for fish, and feeding grounds for seabirds.  Eutrophication of water in these feeding areas could result in a change in invertebrate communities and plant growth (algal blooms), reduced levels of dissolved oxygen, increased biological oxygen demand and increased water temperature. However, the degree of water deterioration will depend on the level of treatment and the quality of the effluents.  The risk of a major event occurring that would negatively affect the structure and function of the site, or impact on the long-term distribution of species for which the site is designated, is not considered significant.</li> <li>▪ According to an EPA report 'Climate Change – Scenarios and Impacts for Ireland' Environmental RTDI Programme 2000 – 2006, a sea level rise of 0.5 metres is expected during the period 1990 – 2100, i.e. an average rise of 0.45 cm per year. This may gradually influence many coastal habitats.</li> </ul>
<p><b>6. Describe any likely impacts on the Natura 2000 site as a whole in terms of:</b></p> <ul style="list-style-type: none"> <li>▪ Interference with the key relationships that define the structure of the site;</li> <li>▪ Interference with key relationships that define the function of the site.</li> </ul>	<p>The Natura 2000 sites form part of the extensive coastal habitat within Dublin Bay. Water quality, tidal regime and salinity are the key environmental conditions that support the integrity of these sites. Interference or deterioration of any of these factors could alter the structure and function of the site, which could potentially negatively impact on the habitats and species for which the sites are designated.</p>
<p><b>7. Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale of magnitude of impacts is not known.</b></p>	<p><b>Water quality standards</b></p> <p>Treated effluent from the Ringsend WwTW is in compliance with concentration limits set for non sensitive waters as given by:</p> <p>S.I. No. 254/2001 - Urban Waste Water Treatment Regulations</p> <p>Although the location of the discharge point is outside of the areas delineated for consideration under the Water Framework Directive (WFD) the changes in water quality have been assessed in accordance with the stringent standards contained in:</p> <p>S.I. No. 272/2009 - Environmental Objectives (Surface Water) Regulation</p> <p>Primary modelling for outfall Option 3 show that even for extreme conditions the receiving water will remain at good status and meet the</p>



	<p>environmental quality objectives for coastal waters as stated in the 2009 regulations above.</p> <p><b>Impacts on designated Natura 2000 sites</b></p> <p>Effluent discharging from the long sea outfall will be treated to the same standards as the existing effluent discharging to the Liffey Estuary.</p> <p>An assessment of impacts from the existing discharge to the Liffey Estuary has shown that there is no evidence of the qualifying interests or conservation objectives of the Natura 2000 sites in Dublin Bay being significantly impacted by the existing discharge.</p> <p>The transfer of the discharge from the Liffey Estuary to a location at least 9km from the nearest designated Natura 2000 site can only result in a considerable improvement in the water quality in the bay and at various sensitive receptors located along the coastline.</p> <p>Due to the quality of effluent being discharged (Compliant with UWWT Regulations), the dilution and dispersion modelling results (Receiving water quality will comply with the requirements of the WFD) and the distance from the nearest Natura 2000 sites in Dublin Bay there will be no significant impacts to designated Natura 2000 sites.</p> <p><b>Impacts on sites proposed for designation</b></p> <p>The area known as the Kish Bank, which is currently proposed as a cSAC, is the closest site (within 8km) to the long sea outfall discharge location. Sandbanks are the Annex I habitat for which the site is proposed for designated. Sand banks by their very nature are quasi-stable features in dynamic equilibrium with tidal and wave conditions. It is therefore extremely unlikely that there would be an accumulation of excess nutrients within this habitat type at the levels being discharged.</p> <p>The increase in nutrient levels in water surrounding the long sea outfall is not expected to have a significant impact on the distribution or abundance of fish or other aquatic life associated with the sandbanks due to the concentration of nutrients outside of the mixing zone and the mixing of waters as a result of tidal currents.</p>
--	---

---

\* pSPA - On 28 May 2008 the Department of Environment, Heritage and Local Government published a notice of intention to designate the South Dublin Bay and River Tolka Estuary as a Special Protection Area (SPA). This proposed SPA includes additional areas to those contained within the original SPA. On 15<sup>th</sup> December 2009, this pSPA has not been formally confirmed.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# Appendix B

## Appropriate Assessment Location 4

For inspection purposes only.  
Consent of copyright owner required for any other use.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# RINGSEND WASTEWATER TREATMENT WORKS

## PROPOSED LONG SEA OUTFALL - OPTION 4

### APPROPRIATE ASSESSMENT

December 2009



*For inspection purposes only.  
Consent of copyright owner required for any other use.*

For further information contact:  
T: 00 353 1 4880500. E: [info@natura.ie](mailto:info@natura.ie) W: [www.natura.ie](http://www.natura.ie)



# Table of Contents

1.	INTRODUCTION .....	1
2.	REGULATORY CONTEXT .....	1
3.	METHODOLOGY AND APPROACH .....	2
3.1.	Introduction .....	2
3.2.	Approach.....	2
3.3.	Methodology .....	3
4.	SITE DESCRIPTION .....	4
4.1.	General Description of Study Area .....	4
4.2.	Current Water Quality .....	5
5.	BRIEF DESCRIPTION OF NATURA 2000 SITES .....	7
5.1.	Designated and Proposed Sites .....	7
6.	ASSESSMENT OF POTENTIAL IMPACTS .....	8
6.1.	Details of Plan/Activity (Discharge) .....	8
6.2.	Compliance with Ambient Standards Specified in European Environmental Objectives (Surface Waters) Regulations .....	8
6.3.	Coastal Environmental Standards .....	9
6.4.	Preliminary Modelling of Discharge from Long Sea Outfall.....	9
6.5.	Assessment Criteria.....	10
6.5.1.	Water Quality.....	13
6.5.2.	Status and Condition of Natura 2000 Sites .....	13
6.6.	Potential Impacts on the Integrity of Natura 2000 Sites .....	16
6.7.	Cumulative Assessment .....	16
7.	CONCLUSIONS .....	18
8.	REFERENCES .....	19
9.	APPENDICES.....	21

For inspection purposes only.  
Consent of copyright owner required for any other use.

## 1. INTRODUCTION

Natura Environmental Consultants were commissioned by J.B. Barry and Partners Limited to prepare a Habitats Directive Assessment (HDA) otherwise known as an 'Appropriate Assessment' for each of two proposed long sea outfall options (Options 3 and 4) from the existing Ringsend Wastewater Treatment Works (WwTW), as part of future plans to improve the treatment works.

An application for a Wastewater Discharge Licence for the existing treatment works was submitted to the EPA by Dublin City Council. As part of a request for additional information Dublin City Council were asked to supply supporting information for the licensing of the existing discharge in the form of water quality modelling and an appropriate assessment of potential impacts to protected areas.

To maximise the benefit of the EPA's requirements, an additional assessment of a number of potential long sea outfall sites was performed. A preliminary modelling exercise was undertaken to provide information on the dispersion associated with the proposed outfall option and to assess the potential impacts from the discharge on receiving water and Natura 2000 sites.

The purpose of this report is to determine the effects, if any, of a proposed long sea outfall (Option 4) on four existing Natura 2000 sites within Dublin Bay and one offshore site proposed for designation and to further assess if any of the predicted impacts have the potential to have significant negative impacts on the qualifying interests or on the conservation objectives of these designated areas for nature conservation.

## 2. REGULATORY CONTEXT

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) formed a basis for the designation of Special Areas of Conservation (SACs). Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds). Collectively, SACs and SPAs are referred to as Natura 2000 sites. In general terms, they are considered to be of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community. Under Article 6(3) of the Habitats Directive an Appropriate Assessment must be undertaken for any plan or program that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An Appropriate Assessment is an evaluation of the potential impacts of a plan on the conservation objectives of a Natura 2000 site, and the development, where necessary, of mitigation or avoidance measures to preclude negative effects.

Article 6, paragraphs 3 of the Habitats Directive state that:

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

The statutory agency responsible for Natura 2000 sites is the National Parks and Wildlife Service of the Department of Environment, Heritage and Local Government.

The European Court of Justice has recently (December 13 2007) issued a judgment in a legal case against Ireland that found that Ireland has failed in its statutory duty to confer adequate protection on designated areas. Following on from this the Circular Letter 1/08 & NPWS 1/08 on Appropriate Assessment of Land Use Plans (from the Department of the Environment, Heritage and Local Government) states that all plans and projects will be subject to critical assessment to ensure that they comply with all relevant legislation.

### ***The Stages in an Appropriate Assessment***

There are 4 stages in an Appropriate Assessment as outlined in the European Commission Guidance document (2001). The following is a brief summary of these steps.

Stage 1 - Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 Site and considers whether it can be objectively concluded that these effects will not be significant

Stage 2 - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function.

Stage 3 - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary.

The Screening Matrix is provided in Appendix C.

## **3. METHODOLOGY AND APPROACH**

### **3.1. Introduction**

The objective of the Appropriate Assessment Process is to evaluate whether there is or there will be a significant impact on the Natura 2000 sites. It is the impacts on the qualifying interests (species and habitats) together with the conservation objectives of these sites that will be assessed (these terms are described in Appendix A). This assessment was carried out with reference to the relevant guidance, in particular:

- *Assessment of Plans and Projects significantly affecting Natura 2000 Sites*: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission 2002
- *Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC*, European Commission, 2000
- Circular L8/08 Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments. 2 September 2008.
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

### **3.2. Approach**

A review of areas designated (or being considered for designation) for nature conservation was carried out by consulting the National Parks and Wildlife Service (NPWS). These included Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) for birds.

The approach adopted for this assessment is summarised as follows:

- The plan or activity being assessed is the discharge of treated effluent to the Irish Sea approximately 15km from the existing outfall location, which is currently discharging to the Liffey Estuary.
- The consequence of this activity will be a change in background water quality in the receiving water.
- The change in the receiving water quality will be variable and the effects will be attenuated with time and distance.



- The receptors that this assessment is directed at are Natura 2000 sites in the vicinity of Dublin Bay with the potential to be affected by the discharge. In particular the impacts from the discharge (change in water quality) on qualifying species and habitats and conservation objectives associated with the sites are being assessed.
- The pathway by which the receptors can be impacted is through the aquatic environment.
- The discharge from the WwTW at Ringsend can only impact directly on the aquatic elements of the qualifying interests of the Natura Sites. This would eliminate habitats such as dunes, cliffs etc. as well as flora that are based on dry land.
- It is possible that indirect impacts could occur where the change in water quality could affect the food chain and consequently impact on species that rely on the receiving water environment for their food.
- As there is currently no effluent discharging at the location point of the proposed long sea outfall. Data from the modelling report '*Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay*' (CRM, 2009) will be used to provide information on the dispersion associated with the proposed outfall option and compliance with Environmental Quality Standards.
- Effluent discharging from the long sea outfall will be treated to the same standards as the existing discharge, currently discharging to the Liffey Estuary. It is therefore possible to use existing data relating to the current discharge to assess existing trends and impacts on the basis of a number of criteria.

a) An assessment of the change in receiving water quality as a result of the existing discharge, i.e. the baseline water quality at the Natura 2000 sites. This water quality can then be compared to the various quality standards to provide an indication of the significance of the alteration in quality.

b) Identifying whether a pathway exists by which an effect can be imparted to the Natura 2000 site. If no pathway exists then it follows that there can be no impact on a particular qualifying interest.

c) An examination of whether there has been any significant deterioration in the status of the Natura 2000 site. If no deterioration has been observed and its status is satisfactory then it follows that the existing activity is not significantly impacting the site. If a deterioration has been observed it still remains to establish whether the discharge is the cause of the deterioration. Based on the results of the various assessment criteria a subjective assessment may be required if sufficient information is not available to provide definitive proof.

### **3.3. Methodology**

#### ***Desk Study***

A range of data relating to the discharges and the baselines conditions in the bay as well as data on the relevant designated habitats was reviewed. This data included:

- Ringsend Wastewater Treatment Works Appropriate Assessment (CDM, 2009a);
- Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay (CDM, 2009b).
- Various studies undertaken in relation to the flora and fauna of the designated areas in the vicinity of the discharge point; and
- EPA Water Quality Reports; and
- Eastern River Basin Management Plan Reports.

It should be noted that due to the improvements in the treatment process in 2004, that many studies carried out prior to this do not reflect current baseline receiving water conditions.

## Consultation

- Bird population data were provided by Dublin City Council (DCC) along with bird count data previously commissioned by DCC in relation to the WwTW and potential impacts on protected bird species in the study area.
- The National Parks and Wildlife Service (NPWS) was consulted in relation to designated areas (existing and proposed) and records of protected species within the study area.

## 4. SITE DESCRIPTION

### 4.1. General Description of Study Area

The area of interest comprises the Liffey Estuary, Dublin Bay and a number of offshore sandbanks.

The Liffey enters Dublin Bay between Clontarf and Ringsend in the channel formed by the North Bull Wall and the Great South Wall. The North Bull Wall is a natural bank reinforced by a stone embankment that is only inundated at half tide. It therefore holds back the water flowing out of the harbour at and after half ebb. The navigation channel runs close to the South Wall and extends from the Port area through the mouth of the harbour. This navigation channel is maintained at a depth of 7 to 8m below chart datum by dredging and natural scouring. To the north of this channel are extensive areas which dry out at low water. These mudflats extend from the mouth of the River Tolka almost to the end of the Bull Wall and north-eastwards to the Bull Island Causeway at St. Annes. Dublin Bay is a shallow bay with water depths not greater than 20m at low tide at its outer limit between Sorrento Point and Baily at Howth. The water depth decreases towards the harbour with depths of less than 5m occurring in the inner half of the Bay. North of the harbour at Bull Island and south around Sandymount extensive areas dry out at low tide. These areas provide important habitats for wading birds and wildfowl.

Situated approximately 10km offshore of Dublin Bay, are a series of coast-parallel north-south trending offshore-banks. These banks stand in 20-30m of water and rise to within a few metres of the water surface. The banks form a punctuated line along the eastern Irish coast south of Dublin with breaks maintained by strong currents and sediment movements. They offer wave protection to the coast and have a strong control on tidal flow pathways along the coast. The banks are quasi-stable features in dynamic equilibrium with tidal and wave conditions and are an integral part of the coastal system resulting from coastal erosion and the remobilisation of land-based gravel deposits in north county Wicklow (Warren and Keary, 1989).

The largest of the banks in the survey area are the Kish Bank and Bray Bank, the Bray Bank being a southerly continuation of the former. The Kish Lighthouse marks the northern end of the Kish Bank and the Codling Bank (a shallow platform of scoured seabed) marks the southern end of the Bray Bank. The Burford Bank is c.5km landward of the Kish Lighthouse and sits centrally across the mouth of Dublin Bay that forms a semi-circular embayment 8km across bordered by rocky coastline to the north (Howth) and south (Dún Laoghaire and Dalkey) (Wheeler et. al., 2001).

The tidal flow characteristics of Dublin Bay reflect the tidal regime in the Irish Sea. On the flood tide, the tidal stream enters from the south of the bay past Dalkey Island and runs north creating a clockwise flow. On the ebb, the tidal stream flows eastward past Howth Head and then southwards towards the shore at Dalkey Island. The resulting dominant feature is therefore a clockwise tidal circulation giving a strong eastwards net flow.

The currents in Dublin Port are dominated by the tidal fluctuations and are only to some extent influenced by wind and pressure fields over the east coast of Ireland and Dublin Bay, except during extreme weather conditions. The freshwater inflow influences the currents and a salt water wedge can be observed in the estuary. In the upstream part around Butt

Bridge the estuary is highly stratified. The stratification decreases downstream. From Ringsend and towards the mouth the estuary can be considered well mixed. Stratification and location of the salt water wedge depends on the tidal conditions and the river discharge. The salinity of the sea water in the outer part of Dublin Bay and along the eastern coast of Ireland shows insignificant annual variation and is around 35 PSU all year round.

#### 4.2. Current Water Quality

The rates of exchange of water between the Liffey estuary and Dublin Bay and between Dublin Bay and the open sea are very good.

Low level of phosphorus shows good water quality in the bay. Water quality of the bay is considered high in terms of nutrient and chlorophyll levels. Bacterial contamination in the bay is low.

Biochemical oxygen demand (BOD) concentrations in the Liffey Estuary, Dublin Bay and adjacent coastal waters are generally low. Oxygen saturation levels are generally within the range of normal saturation (80-120%).

##### **EPA classification**

The present assessment of the Liffey estuary would appear to confirm that water quality in the estuary continues to improve with only phosphorus levels in winter marginally exceeding the set criterion. Since the 1995-1999 period the trophic status of the estuary has improved from eutrophic to intermediate in 1999-2003 and in the current assessment period. As in the previous assessment summer chlorophyll levels in the estuary remained low with values of 3.2 (median) and 5.6 (90 percentile)  $\mu\text{g/l}$  respectively. Dissolved oxygen levels showed little evidence of disturbance ranging between 80 and 119 per cent saturation (EPA, 2008).

The observed improvement in water quality in the Liffey estuary is clearly a result of the installation of significantly upgraded treatment facilities at the Ringsend WwTW in 2004, though further investigation is still required to track the change in nutrient levels as the full effect of the works is realised. In the previous period 1999-2003, there was some evidence to suggest that while total and ammoniacal nitrogen concentrations had fallen as a consequence of nitrification, oxidized nitrogen levels had increased. It had been suggested that this situation should be kept under review in case it might lead to the reoccurrence of excessive nitrogen availability in the estuary. It would appear though from examination of data collected during the current assessment period that levels of total oxidized nitrogen in the estuary have changed little in the intervening period (EPA, 2008).

BOD concentrations were generally low, as indicated by the median value of 2.0 mg/l O<sub>2</sub> in both the estuary and Dublin Bay. Given that this value is also the limit of detection for the method used, at least half of the reported measurements were less than 2.0 mg/l O<sub>2</sub>. In Dublin Bay, 80 per cent of BOD values were reported at the limit of detection indicating that the 'true' median value for the Bay is much lower than the limit of detection. However, the Liffey estuary and Dublin Bay were both in breach of the recommended 95 percentile BOD value of 4 mg/l O<sub>2</sub>. In the estuary the exceedance was the result of a small number of high BOD values in the range 12 – 27 mg/l O<sub>2</sub> collected adjacent to the Ringsend effluent cascade. These high BOD values were mostly restricted to 2002 and data collected since then indicate a decline in BOD values both within the lower estuary and particularly in the vicinity of the existing Ringsend discharge – again indicating an improvement in the quality of the discharge at this point. The reduction in organic loading from Ringsend, as indicated by declining BOD values, is also reflected in the considerable improvement in the bacteriological quality of the Liffey estuary and bathing areas within the Dublin Bay area (EPA, 2008).

##### **Water Framework Directive Classification**

Dublin Bay comes under the terms of the recent Water Framework Directive (WFD) (2000/60/EC); however the location of the long sea outfall discharge point is outside the area delineated for consideration under the Water Framework Directive (WFD). Under the River Basin Management, plans that are being undertaken as part of the WFD "Coastal Waters" are

defined as water out to a distance of one nautical mile beyond the baseline from which territorial waters are measured. For the purpose of this assessment the proposed long sea outfall option will be assessed in accordance with the standards set out in the WFD.

The WFD sets quality standards for chemical and biological parameters, including an obligation to maintain or to restore to 'good ecological quality and sets a timetable for a series of actions, up to the final implementation of the WFD in 2015. The WFD specifies the factors, referred to as quality elements, which must be used in determining the ecological status or ecological potential and the surface water chemical status of a surface water body. The lists of quality elements for each surface water category are divided into three groups of elements:

- biological elements;
- hydromorphological elements; and
- chemical and physico-chemical elements.

The EC Environmental Objectives (Surface Waters) Regulations came into effect in July 2009 in order to implement aspects of the Water Framework Directive (WFD). The regulations establish Environmental Objectives and Environmental Quality Standards for the classification and management of Surface Waters. The draft classifications for Dublin Bay and the Liffey Estuary under the Water Framework Directive were published at the end of 2008. Dublin Bay has **MODERATE** water quality WFD Classification. Water quality is generally very good. There is only one breach in standards and that was for winter dissolved inorganic nitrogen (DIN).

### Cumulative

It should be noted that the water quality data contained in both the EPA Water quality report and the Data from the Water Framework Directive (ERBD management plan) reflects the cumulative effect of all the discharges that end up in Dublin Bay. The River Liffey is considered to be the main source of diffuse nutrients to Dublin Bay and accounts for 85% of all riverine inputs (Dublin Drainage Consultancy, 2005).

Other activities that may affect water quality and sediment quality are dredge spoil disposal, litter, chronic spillages of small amounts of oil, ores and other toxic substances and diffuse sources. Since 1999 there has been no dumping of sewage sludge at sea.

Water is abstracted from the Liffey Estuary by the ESB Power Generation Station for use as cooling waters. The ESB Cooling Waters mix with the WwTW discharge before final discharge to the estuary. There are currently two power generation plants at Poolbeg; the Thermal Plant and the Combined Cycle Gas Turbine (CCGT). The CCGT is run continuously whilst the Thermal Plant is only used during periods of peak demand. The CCGT is serviced by 2 CW Pumps at 5m<sup>3</sup>/s flow each, which gives a continuous base CW discharge of 10m<sup>3</sup>/s.

The effluents include condenser cooling water, discharge from the water treatment neutralisation tanks, boiler blowdown water and screen wash water. The IPPC Licences for these plants contain limits for the quality of the effluents in terms of physical and chemical properties.

The observed improved water quality in the Liffey Estuary in recent years is, according to the EPA, *"clearly a result of the installation of significantly upgraded treatment facilities at Ringsend WwTW"*.

## 5. BRIEF DESCRIPTION OF NATURA 2000 SITES

### 5.1. Designated and Proposed Sites

A brief synopsis of all Natura 2000 sites with potential to be affected by the proposed development is provided below.

#### South Dublin Bay and River Tolka Estuary SPA

The South Dublin Bay and River Tolka Estuary SPA comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, the estuary of the River Tolka to the north of the River Liffey, Booterstown Marsh and an area of grassland at Poolbeg, north of Irishtown Nature Park. A portion of the shallow marine waters of the bay is also included. The site is of special conservation interest for a number of bird species (Light-Bellied Brent Goose, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Bar-tailed Godwit, Redshank, Black-Headed Gull, Roseate Tern, Common Tern and Arctic Tern) and is important for wintering waterfowl and wintering gulls. An internationally important population of Light-bellied Brent Goose feed on the Eelgrass bed at Merrion and is also known to feed on the grassland at Poolbeg. The SPA is of international importance for Light-bellied Brent Goose and of national importance for nine other waterfowl species. It is also of international importance as an autumn tern roost. The EU Birds Directive pays particular attention to wetlands, and these form part of the SPA, the site and its associated waterbirds are of special conservation interests for Wetlands and Waterbirds.

#### North Bull Island SPA

North Bull Island is a sand spit that developed after the construction of the North Bull Wall. This island is covered in dune grassland. Other important ecosystems associated with the island are salt marsh and mud flats. The reserves are of international scientific importance for Brent Geese and also on botanical, ornithological, zoological and geomorphological grounds. North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. It also qualifies for international importance as the numbers of two species exceed the international threshold – Brent Goose and Bar-tailed Godwit. A further 15 species have populations of national importance – Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Curlew, Redshank and Turnstone. The North Bull Island SPA is a regular site for passage waders, especially Ruff, Curlew Sandpiper and Spotted Redshank.

#### North Dublin Bay cSAC

Annex I Habitats include fixed dunes, marram/shifting dunes, embryonic shifting dunes, dune slack, annual vegetation of drift lines, salicornia mud and sand flats, Atlantic salt meadows, Mediterranean salt meadows, mud and sand flats. Annex II species include Petalwort. The site overlaps with North Bull Island SPA.

#### South Dublin Bay cSAC

The site has extensive areas of sand and mudflats, a habitat listed on Annex I of the EU Habitats Directive. The largest stand of Eelgrass on the east coast occurs at Merrion Gates. New habitats are developing just south of Merrion Gates including embryonic dunes and a sand spit. This area is becoming increasingly important as a high tide roost site for waterfowl. The site overlaps with South Dublin Bay and River Tolka Estuary SPA

#### Kish Bank (and Bray Bank) proposed cSAC

The National Parks and Wildlife Service is currently in discussions regarding the proposed designation of an area known as Kish Bank (and possibly also Bray Bank), in the Irish Sea off the coast of Dublin, as a candidate Special Area of Conservation (cSAC). This area is being considered for designation due to the presence of the habitat 'Sandbanks which are slightly covered by sea water all the time' (code 1110), which is listed in Annex I of the EU Habitats Directive.

According to the NPWS, a boundary for the proposed cSAC has not yet been defined, however it will include the Kish Bank and possibly also the Bray Bank, which is a part of the Kish Bank. It is expected that further information in relation to the proposal will be available in

February 2010 (NPWS consultation). There are currently no conservation objectives available for the proposed site, however for the purpose of this report it is assumed that the primary objective will be to maintain the Annex I habitat for which the cSAC has been selected at favourable conservation status. Section 5.3 defines the term favourable conservation status.

The following is a description of the Annex I habitat for which the site is proposed as a cSAC. Sandbanks consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20 m below chart datum (but sometimes including channels or other areas greater than 20 m deep). The habitat comprises distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) which may arise from horizontal or sloping plains of sandy sediment. Where the areas of horizontal or sloping sandy habitat are closely associated with the banks, they are included within the Annex I type (Roche et. al., 2007).

The diversity and types of community associated with this habitat are determined particularly by sediment type together with a variety of other physical, chemical and hydrographical factors. These include geographical location (influencing water temperature), the relative exposure of the coast (from wave-exposed open coasts to tide-swept coasts or sheltered inlets and estuaries), topographical structure of the habitat, and differences in the depth, turbidity and salinity of the surrounding water.

Shallow sandy sediments are typically colonised by a burrowing fauna of worms, crustaceans, bivalve molluscs and echinoderms. Mobile epifauna at the surface of the sandbank may include mysid shrimps, gastropod molluscs, crabs and fish. Sand-eels *Ammodytes* spp., an important food for birds, live in sandy sediments. Where coarse stable material, such as shells, stones or maerl, is present on the sediment surface species of foliose seaweeds, hydroids, bryozoans and ascidians may form mixed communities (Johnston et al., 2002). Shallow sandy sediments are often important nursery areas for fish, and feeding grounds for seabirds (especially puffins *Fratercula arctica*, guillemots *Uria aalge* and razorbills *Alca torda*) and sea-duck (e.g. common scoter *Melanitta nigra*) (Roche et. al., 2007)..

The Kish Bank is known to be an important foraging area for seabird species, many of which nest on the islands of Lambay, Ireland's Eye and Rockabill off Co. Dublin (Newton and Crowe 1999, 2000). The tern species, in particular, are all listed in Annex I of the EU Birds Directive and they use the Bank for foraging and roosting especially in the period August to September.

## 6. ASSESSMENT OF POTENTIAL IMPACTS

### 6.1. Details of Plan/Activity (Discharge)

This assessment is concerned with the impacts of the discharge of treated effluent from the Ringsend Wastewater Treatment Works through a proposed long sea outfall (Option 4). The current discharge of effluent to the Liffey Estuary will discontinue and will instead discharge through the proposed long sea outfall at a location approximately 15km out in the Irish Sea.

The installation of the proposed long sea outfall pipe will involve tunnelling under the seabed, therefore there will be minor loss and/or disruption of the sea bed at the entry and exit points.

### 6.2. Compliance with Ambient Standards Specified in European Environmental Objectives (Surface Waters) Regulations

There will be a change in water quality in the vicinity of the long sea outfall and for the purpose of this assessment the change in water quality will be assessed in the context of the standards contained in the EC Environmental Objectives (Surface Waters) Regulations 2009. These regulations came into effect in July 2009 in order to implement aspects of the Water Framework Directive (WFD). Wastewater Discharge Authorisations must set standards (emission limits) that will ensure that the receiving waters will comply with the standards laid out in the regulations. It should be noted that however the location of the discharge point is outside the area delineated for consideration under the Water Framework Directive (WFD). Under the River Basin Management, plans that are being undertaken as part of the WFD

“Coastal Waters” are defined as water out to a distance of one nautical mile beyond the baseline from which territorial waters are measured.

### 6.3. Coastal Environmental Standards

The principal quality standard of concern in relation to Wastewater Discharges to Coastal Waters is nutrients in the form of Dissolved Inorganic Nitrogen (DIN). DIN (rather than MRP) is considered to be the limiting nutrient in coastal waters and a breach of the environmental quality standard may lead to eutrophic conditions (algal blooms etc.) and consequently the only nutrient standards in place for coastal waters are for DIN. The DIN criteria for calculating the status of a coastal water body is as follows.

Good status -  $\leq 0.25$  mg/l as N (Median Value) where the salinity is 34.5 psu

It should be stressed that in order for a water to meet the “Good Status” category it is the median value that applies. The Statutory instrument SI 272 of 2009 has inadvertently omitted the reference to median concentration (informed by EPA).

The MRP standard only applies to transitional waters but has been examined in the preliminary modelling exercise.

The MRP criterion for assessing a transitional water body with full salinity is as follows.

MRP  $\leq 0.04$  mg/l as P (Median Value) where the salinity is 35 psu indicating saline water.

### 6.4. Preliminary Modelling of Discharge from Long Sea Outfall

A preliminary modelling exercise was undertaken to provide information on the dispersion associated with the proposed outfall (Option 4). The following section reviews the modelling results for the proposed outfall location. It describes the affect on the receiving waters. The results of the long sea outfall modelling exercise are presented in Figures C 57 C58 C 67 C 68 below.

MRP: For this substance a plume is formed around the outfall which is completely separate from the plume that is associated with the Liffey and Tolka estuaries. The outfall plume is located far from any beaches and preservation areas. The 50% exceedance will be limited to an area in the vicinity of the outfall. This is taken to represent the median concentration and is the criteria for good status as set out in the Environmental Quality Objectives (Surface Waters) Regulations. This is a considerable improvement on the current situation where the 50 % contour extends to designated areas.

DIN: As for MRP a plume is formed around the outfall which is completely separate from the plume that is associated with the Liffey and Tolka estuaries. The outfall plume forms a narrow band that following the streamlines from north to south and vice versa and is located far from any beaches and preservation areas. The 50% exceedance will be limited to an area in the vicinity of the outfall. This is taken to represent the median concentration and is the criteria for good status as set out in the Environmental Quality Objectives (Surface Waters). This is a considerable improvement on the current situation where the 50 % contour extends to designated areas

The outfall option was modelled for what is regarded as an extreme case scenario in that the outfall was discharging at the maximum capacity (13.8 m<sup>3</sup>/sec) for the entire 15 day modelling period and that the DIN concentration was 22 mg/l. Consequently the average daily load measured over the modelling period was 26.23 tonnes per day of DIN. This is regarded to be a worst case scenario for a number of reasons.

- The hydraulic capacity of the outfall is designed on the basis of an instantaneous peak hydraulic load and is not predicted to flow at capacity for extended periods.
- The proposed DWF for the treatment plant is 5.83 m<sup>3</sup>/sec which is considerably less than the continuous flow discharge scenario.

- Extended extreme discharge flow volumes would be accompanied by a lowering in the constituent concentrations due to dilution by storm water.

It must be stressed that while the model plotted the maximum concentrations the environmental quality objective for DIN is a median value of concentrations taken over the course of a winter or summer period.

It should be noted that waters compliant with the environmental objectives for DIN (which is a median concentration of 0.25 mg/l for coastal waters.) will have almost 50% of the samples with a concentration greater than 0.25 mg/l.

An inspection of the plots showing the percentage of time that the concentrations exceed the concentration of 0.25 mg/l indicates that apart from a very small area in the vicinity of the outfall the DIN concentration objective is met for over 50% of the time. This can be taken to reflect the median value over the modelling periods.

These boundaries of the 50% exceedance enclose a very small area in the vicinity of the outfall (the mixing zone). Beyond this point the very conservative discharge estimate will not breach the environmental quality standard for DIN.

The results for the modelling of MRP can be interpreted in the same way and for the modelling period a small area in the vicinity of the outfall will exceed the median environmental objective.

## 6.5. Assessment Criteria

The criteria adopted for this assessment are based on an assessment of the existing conditions prevailing in Dublin Bay and whether these conditions are causing a significant impact on the qualifying interests of the Natura 2000 sites.

The effect of the existing discharge is an alteration in water quality in the receiving waters. Therefore the available data on water quality has been examined and assessed in terms of whether the water quality could result in the deterioration in the status of the Natura 2000 sites. It should be noted that this is an assessment of the effect of the cumulative discharges to the Bay.

The discharge was also assessed in terms of the present conservation status of the sites and whether any deterioration has been observed. If no reduction in the conservation status of the sites has been observed, it follows that there is no significant impact as a result of the discharge (or any other activity).

As the effluent discharging from the proposed long sea outfall will be treated to the same standards as the existing discharge, it is possible to use existing data relating to the current discharge to assess existing trends and impacts. Preliminary modelling results for the proposed long sea outfall discharge have also been assessed in terms of plume dispersion and compliance with Environmental Quality Standards.



MRP- OUTFALL 4

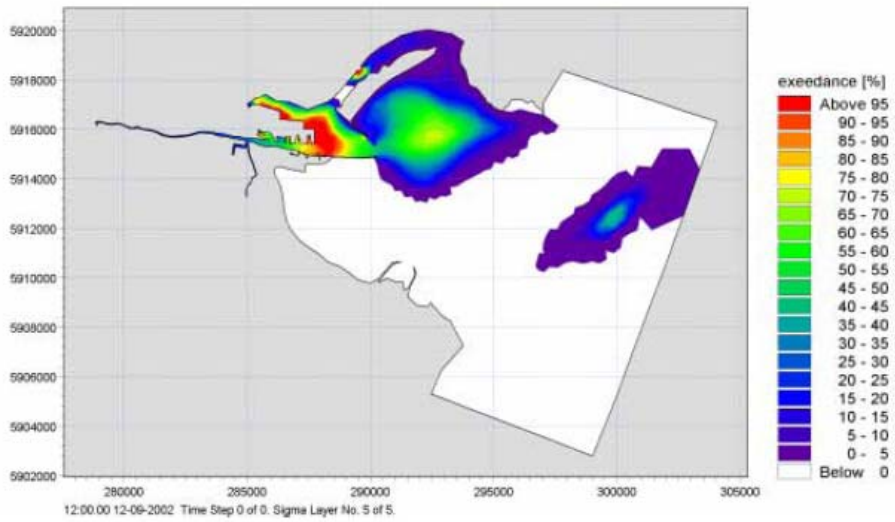


Figure C57: Percentage of time with concentrations exceeding 0.04 mg/l for neap tide for outfall Location 4

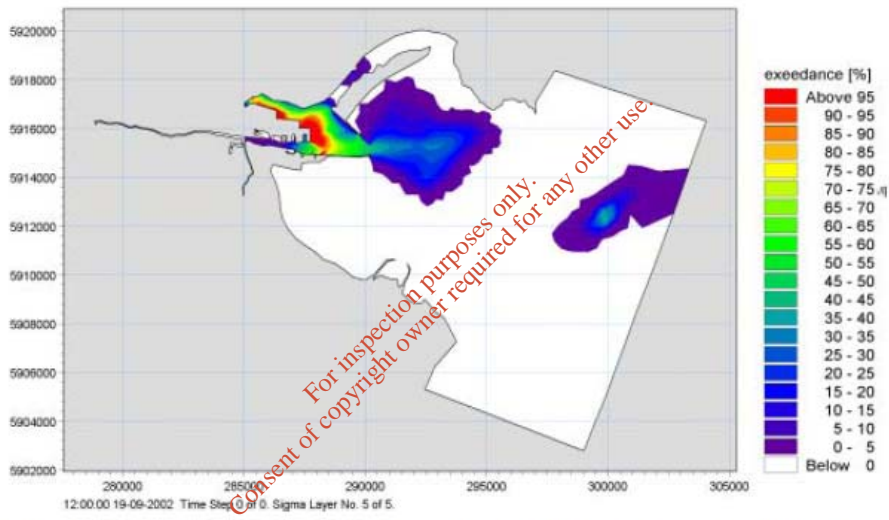


Figure C58: Percentage of time with concentrations exceeding 0.04 mg/l for neap tide for outfall Location 4

### DIN- OUTFALL 4

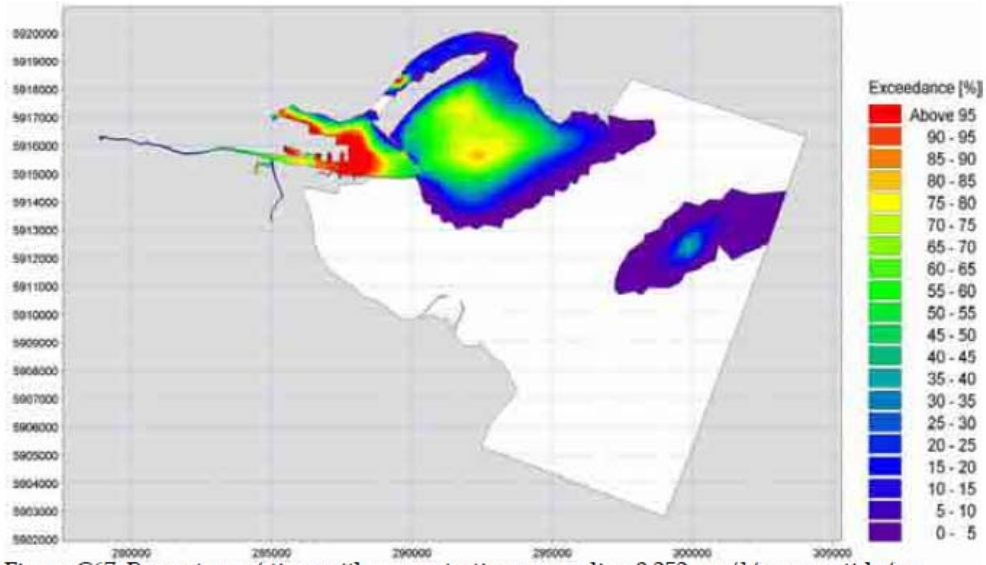


Figure C67: Percentage of time with concentrations exceeding 0.252 mg/l for neap tide for outfall Location 4

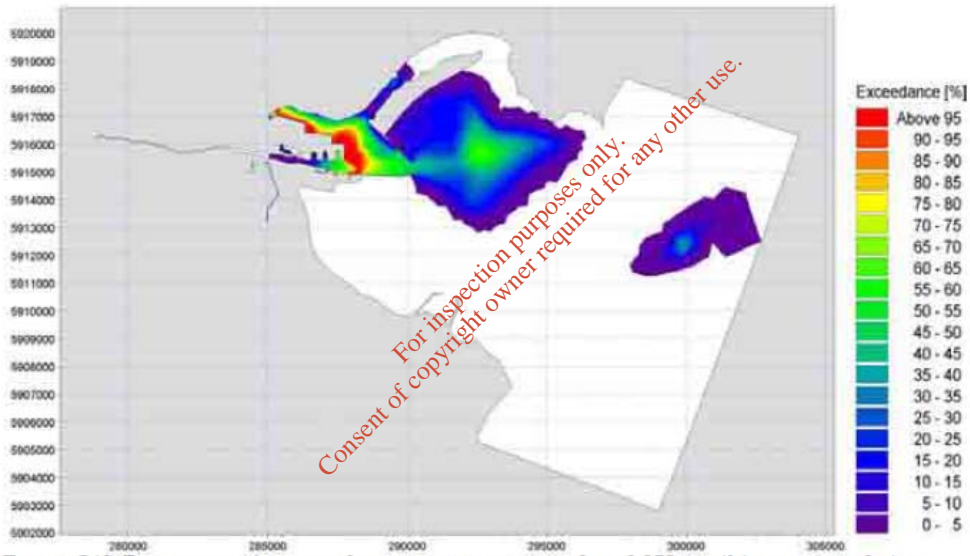


Figure C68: Percentage of time with concentrations exceeding 0.252 mg/l for spring tide for outfall Location 4

### **6.5.1. Water Quality**

Data on the water quality in the receiving waters has been provided from:

- The EPA Water Quality in Ireland Report 2008; and
- The Eastern River Basin Management Report 2008

Water Quality Modelling has also been undertaken to support the discharge licence application (CRM, 2009).

### **EPA Water Quality Report 2008**

This report summarises the water quality in Ireland between 2002 and 2006. The improvements to the treatment works were completed in 2004 and the report notes that there was a continuing improvement in the water quality of the Liffey and Dublin Bay. The Bay was classified as being unpolluted while the estuary was classified as being intermediate due to a failure to meet the winter orthophosphate (MRP) threshold. There had been concern that the introduction of nitrification to the treatment process could result in increased oxidised nitrogen.

However, the report states that the levels of oxidised nitrogen had changed little in the period 2002 - 2006. One area of concern was the reoccurrence of opportunistic macroalgae in the Tolka estuary and along the south Dublin seashore. The occurrence of green opportunistic algal mats (mostly *Enteromorpha* spp.) in the intertidal area of the Tolka estuary, mainly behind the southern promontory of Bull Island, is of concern. The presence of these mats, which can have an adverse impact on marine benthic fauna, in terms of smothering the underlying sediment, is likely to result in the Tolka estuary being classified as less than good ecological status under the WFD.

Furthermore, the reoccurrence of substantial strands of brown macroalgae (*Ectocarpus siliculosus*) along the south Dublin seashore during the autumn months is also of concern. The abundance and distribution of opportunistic algal species within the Dublin Bay area will be assessed as part of the national WFD monitoring programme.

The exact reason for the occurrence of the ectocarpus blooms has not been established and specialist studies have been commissioned by DCC as part of the undergoing studies in connection with the further improvements in Ringsend WwTW. These studies will be directed at establishing whether the nutrients discharged at Ringsend are contributing towards the growth of the blooms.

### **6.5.2. Status and Condition of Natura 2000 Sites**

The second criterion used to assess whether the existing discharge is significantly impacting on Natura 2000 sites is the condition of the sites and whether there has been a deterioration in the qualifying interests. If there has been no discernible deterioration then there can be no significant impact.

The protected areas in Dublin Bay support large concentrations of wintering water birds which occupy the habitats that are naturally enriched by organic material carried in by rivers, by the

growth and nutrient re-cycling of a variety of species of seaweeds including green algae, and by salt marsh habitats. Sheltered areas within bays and estuaries tend to accumulate organic material and fine sediments. These muddy habitats generally support high densities of macroinvertebrates which are not of conservation interest themselves, but provide feeding for protected bird species.

### ***Bird populations in Dublin Bay***

Waterfowl distribution within Dublin Bay is determined by the distribution of the preferred feeding habitats of individual species, by tidal cycle and range, by the availability of roosting areas, and fresh water preening and loafing areas (which are important particularly for geese and ducks). The availability of food and its comparative abundance in different parts of the bay is likely to be an important determinant of waterfowl feeding distribution. Bird distribution is also influenced by disturbance. A study carried out in South Dublin Bay indicated that uncontrolled dogs were the most significant source of disturbance to water birds (Phalan and Nairn 2007).

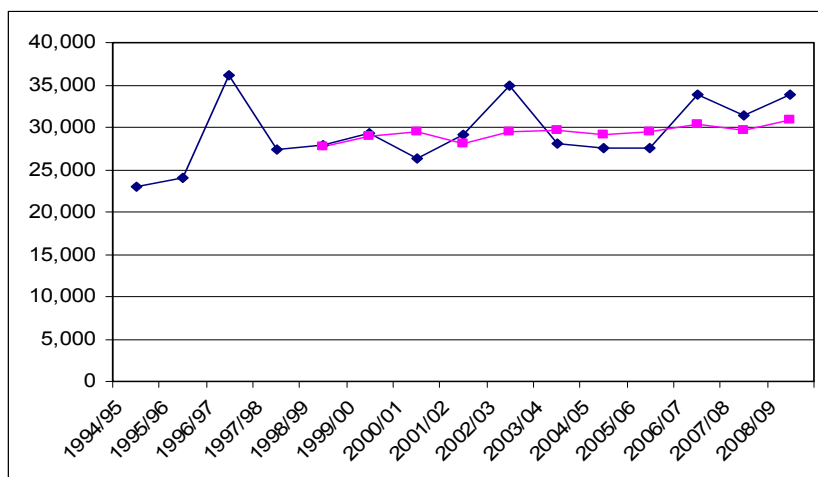
Crowe (2006) examined the wintering waterbird populations in Dublin Bay and concluded that “their numbers have remained relatively stable since the mid-1990s despite encroaching development and increased levels of disturbance from recreational activities”. From the total numbers of each species recorded in the IWeBS counts, it is possible to determine the trends in all species. Table 1 shows that there have been considerable fluctuations between the limits of approximately 23,000 and 36,000 birds (all species combined) over this 15-year period.

A moving 5-year mean of the summed peaks smoothes the natural fluctuations that are a feature of waterbird populations. This indicates that over the last 10 years, total bird numbers in Dublin Bay have increased from 27,718 to 30,839 (Figure 1) (Boland et al 2008, Crowe and Boland 2004; Colhoun 1998).

**Table 1:** Trends in bird populations in Dublin Bay (data from IWeBS published counts) Figures are the sum of the peak counts for each species, regardless of the month in which the peak occurred.

<b><i>Winter</i></b>	<b><i>Summed Peak for all species*</i></b>	<b><i>Moving 5-year Mean Peak*</i></b>
1994/95	23,069	n/a
1995/96	24,001	n/a
1996/97	36,191	n/a
1997/98	27,389	n/a
1998/99	27,942	27,718
1999/00	29,357	28,976
2000/01	26,254	29,427
2001/02	29,183	28,025
2002/03	34,996	29,546
2003/04	28,051	29,568
2004/05	27,472	29,191
2005/06	27,536	29,448
2006/07	33,826	30,376
2007/08	31,427	29,662
2008/09	33,933	30,839

\*A moving 5-year mean peak is the average of the previous five years peak counts which is moved forward by one year at a time, thus smoothing the natural fluctuations in populations and giving an overall trend.



**Figure 1:** Peak counts of all species of wintering waterbirds combined in Dublin Bay over the period 1994/95 to 2008/09. The squares represent a moving 5-year mean peak.

Details of most recently available counts of important bird species numbers in Dublin Bay up to 2006 are contained in Appendix B. There are four species that occur in numbers of international importance in Dublin Bay. These are Light-bellied Brent Goose, Bar-tailed Godwit, Black-tailed Godwit and Redshank. Of these species, there have been significant increases in the Dublin Bay populations of the first three species, while Redshank numbers have increased slightly over the same period (Crowe 2006).

The bird species listed in Annex I of the EU Birds Directive and which occur in Dublin Bay include: Little Egret, Golden Plover, Bar-tailed Godwit, Sandwich Tern, Common Tern, Arctic Tern, Roseate Tern. Little Egret has been increasing consistently in Ireland and in Dublin Bay since the mid 1990s. Golden Plover peak numbers increased between the 5-year periods 1994/95-1998/99 and 1999/2000-2003/04 although this species fluctuates widely and is widespread inland. Bar-tailed Godwit have increased significantly in Dublin Bay in the same period (Crowe 2006).

Both Common Tern and Arctic Tern breed in Dublin Docks, on a man-made mooring structure known as the ESB dolphin (Merne 2004). This is included within the South Dublin Bay and River Tolka Estuary SPA. Recent data highlights this site as one of the most important Common Tern sites in the country with over 400 pairs recorded here in 2007. The Dublin Port Tern project has enabled improvements to the ESB Dolphin and there are no negative impacts on the colony from the existing Ringsend WWTW discharge.

There is also a night roost of at least six species of terns, with Common Terns as the great majority, in South Dublin Bay each autumn. This reached a recorded peak of 11,700 terns at night roost in 2006. The birds were present from late July to early October in 2006 and 2007. The core area is on sand banks between Sandymount and Williamstown Martello towers. At high spring tides all terns are on the sand spit between Booterstown DART station and Merrion gates. At high neap tides terns roost between Booterstown sand spit and Sandymount Martello tower (Merne et al 2008). This tern roost has increased in numbers over the period since it was first reported in the 1950s and there is no indication of any loss of integrity of the site for these species.

Overall the bird numbers in Dublin Bay have been either increasing or in cases where there has been a decrease in numbers the decrease has followed the national or international trends. There are several cases where there has been an increase in numbers in Dublin Bay, in contrast to the national trend. The bird population data indicate that the Annex I species are increasing in Dublin Bay. There is no evidence that the aquatic and semi-aquatic habitats that provide the foods source for the qualifying species are being adversely impacted by the proposed development.

The main conservation objective is to maintain the favourable conservation status of the species listed in Annex I of the EU Birds Directive, Annex II of the EU Habitats Directive and

habitats listed on Annex I of the EU Habitats Directive as well as other important species and habitats. This conservation objective has been shown to continue to be achieved.

## 6.6. Potential Impacts on the Integrity of Natura 2000 Sites

The primary effect of the discharge will be elevated nutrients (particularly Dissolved Inorganic Nitrogen) in coastal waters. It should be noted that the quality of the discharged effluent will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001. Using the assessment criteria outlined in Section 6.5, the direct and indirect impacts (actual and potential are summarised below)

- There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the tunnel. Due to the small scale of these impacts there will be no significant impacts to Natura 2000 sites as a result of habitat loss.
- The water quality in the bay is reported to be unpolluted (EPA Water Quality in Ireland 2008 report) or MODERATE (WFD classification). The classification would be GOOD but for the fact that there have been elevated inorganic nitrogen levels recorded. The water quality is also in compliance with the bathing water quality standards.
- While the change of water quality in Dublin Bay creates the potential for impacts on biodiversity, there is no evidence of the qualifying interests or conservation objectives of the Natura 2000 sites being directly impacted by the existing discharge. The removal of the existing discharge in the Liffey Estuary and its transfer to the new proposed long sea outfall, will be of benefit to the four Natura 2000 sites within Dublin Bay, as it will reduce further the risk of negative impacts on water quality.
- The change in the water quality caused by transfer of the discharge point from the Liffey Estuary to the Option 4 location could potentially indirectly impact on the lower end of the food chain that supports the protected bird species. There has been no reported decrease in the numbers of birds in the two SPAs in Dublin Bay in the last 15 year period. It is considered unlikely that the slightly reduced nutrients in the water column in the inner parts of Dublin Bay would result in a reduction in the foods sources available to the birds.
- The area known as the Kish Bank, which is proposed as a cSAC, is the closest potential Natura 2000 site (within approximately 2km) to the long sea outfall discharge location. 'Sandbanks which are slightly covered by sea water all the time' (code 1110) is the Annex I habitat for which the site qualifies for designation. Sand banks by their very nature are quasi-stable features in dynamic equilibrium with tidal and wave conditions. The data available on the biodiversity of the Kish Bank is limited but it is clear that the construction of the outfall (Option 4) will not directly impact on the area currently proposed as cSAC. Any indirect effects are likely to be insignificant as the effluent plume will flow in a north-south orientation and will not impact directly on the Kish Bank to the east. The use of this area by foraging terns in the summer-autumn period is not likely to be impacted by the long sea outfall as these species are feeding on mobile shoals of small fish, which will not be impacted by the effluent discharge.

## 6.7. Cumulative Assessment

There has been and continues to be development, regeneration and improvement of the whole of the Dublin Bay area. Mitigation policies and objectives for biodiversity and water quality must be implemented and monitored as there is potential for impact on Natura 2000 sites.

The approach to the assessment has been one of investigating whether there has been deterioration in the factors that could result in an impact i.e. the water quality. The water quality in the receiving waters is a reflection of the cumulative impact of the activities in the vicinity of Dublin Bay.

Similarly the condition of the protected areas is a reflection of all the activities that are taking place. The fact that internationally and nationally important species remains consistent with previous years findings indicate that the cumulative effect on the sites is not significant.

## **Planned and Future Developments**

### ***Waste to Energy Plant***

The Environmental Protection Agency (EPA) has issued a licence to Dublin City Council, to operate a non-hazardous waste incinerator at Pigeon House Road, Poolbeg Peninsula. The licence provides for the operation of an incinerator to burn non-hazardous waste and to recover energy in the form of steam and electricity for export to the national grid, and for the transfer of heat to a municipal district-heating scheme, once such a scheme is available. It is not predicted that there will be significant impacts on any of the sites of conservation importance in Dublin Bay as a result of the proposed discharge. The thermal plume should lose much of its energy by the time it reaches these sites. The biocides should also be diluted and deactivated to an extent that they will not directly impact the habitats. However, there would be potential absorption effects that could lead to bioaccumulation and subsequent adverse impacts in some high trophic level species including birds. The modelling analysis indicates that hypochlorite and its degradation product may also occur in a concentration that may have toxic effects on the Liffey Estuary. However, it will only occur very locally to the proposed cooling water outfall. Similarly, concentrations of trihalomethane (THM) were only above the predicted no-effect concentration (PNEC) value very close to the outfall. Therefore, it would be preferred to use hypochlorite in the Facility for the prevention of biofouling. The contribution of hypochlorite/chlorine and THMs from the other plants using hypochlorite/chlorine (Synergen and Poolbeg) is well below the PNEC values and the cumulative effect is thus on average considered negligible. There will be a very local residual impact in the vicinity of the outlet of the cooling water system. The joint discharges from Waste to Energy Facilities and the other plants in the area have been considered to ensure that there will not be significant adverse impacts on marine ecology in the extended study area (Elsam, 2006)

### ***Poolbeg Planning Scheme***

The new planning scheme area, as set out in Ministerial Order 297/2007, comprises lands principally located on the Poolbeg Peninsula to the east of Sean Moore Road and west of the South Bull Wall. New development will be dependent on the expansion of the wastewater treatment works to ensure that adequate capacity exists for treatment as otherwise water quality in the receiving waters could be affected through inadequate collection or wastewater treatment system capacity. Therefore, development will not proceed unless such capacity is provided in a timely manner. As a result, the plan is not expected to have a cumulative effect that would influence the assessment of the works discharge.

### ***Dublin Port Reclamation***

Dublin Port has recently reclaimed land on the Poolbeg Peninsula north of the overflow tanks from the Ringsend Wastewater Treatment Works. It is currently examining the issue of further land reclamation in the North Port. Any potential impacts would be centred on:

- Hydrodynamics, particularly: changes to the wave and current regime, changes to the tidal regime, changes to the erosion and deposition of sediments, changes to suspended sediments during construction and operation of the development, and changes to flooding and flood risk; and
- Water quality, particularly: the re-suspension of sediments during construction and operation (maintenance dredging), the re-mobilisation of contaminated sediment during construction and operation (maintenance dredging), planned and unplanned discharges of polluting substances during construction and operation, and the long-term hydrodynamic changes as a result of the development. Minor negative impacts are predicted to arise from the physical disturbance to benthic communities from reclamation and dredging, the smothering of benthic communities by suspended sediments during dredging, the result of piling noise on fish (particularly migratory species), the release of contaminants during dewatering (during reclamation), increased suspended sediment concentrations in surrounding waters during

dredging, an increase in deposition of sediment during dredging and an increase in contaminant levels in water during dredging. Should the project proceed, it is not anticipated that there will be any cumulative discharges influencing this assessment (Royal Haskoning, 2008).

### **Other Future Developments**

Due to the tidal regime and dilution effects within the bay, it is anticipated that other developments such as the planned Portrane, Donabate, Rush & Lusk WWTS which will discharge effluent to the Irish Sea via a 600m pipeline will not result in any cumulative impacts on the modelled water quality discussed, with respect to potential negative effects on the designated areas.

### **Climate Change**

According to an EPA report 'Climate Change – Scenarios and Impacts for Ireland' Environmental RTDI Programme 2000 – 2006, a sea level rise of 0.5 metres is expected during the period 1990 – 2100, i.e. an average rise of 0.45 cm per year. This may gradually influence many coastal habitats.

## **7. CONCLUSIONS**

The discharge from the proposed long sea outfall (Option 4) from the Ringsend Wastewater Treatment Works will result in a change in water quality in the vicinity of the outfall. The quality of treated effluent discharging from the WwTW will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001. Modelling of the outfall option for the impact on DIN and MRP concentrations in the receiving water has shown that even for extreme conditions where over 2.4 times the DWF is discharged for a period of 15 days that the receiving water will remain at good status and meet the environmental quality objectives for coastal water nutrients as set out under the Water Framework Directive.

Overall there is no evidence that the current discharge from Ringsend WwTW is resulting in a significant impact on the conservation objectives of the Natura 2000 sites. Effluent discharging from the long sea outfall will be treated to the same standards as the existing effluent discharging to the Liffey Estuary. It is therefore concluded that the discharge from the proposed long sea outfall will have no significant impacts due to the distance of the discharge from the designated Natura 2000 sites in Dublin Bay. Any potential indirect impacts to the Kish Bank proposed for designation are considered unlikely due to the quality of effluent discharging, the location and distribution of the modelled plume and the nature of the Annex I habitat, sandbanks. No significant impacts are predicted for any existing or proposed Natura 2000 sites.



## REFERENCES

- Boland, H., Crowe, O. and Walsh, A. 2008. Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2006/07. *Irish Birds* 8: 341-350.
- CDM 2009a. Ringsend Wastewater Treatment Works Appropriate Assessment.
- CDM 2009b. Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay.
- Colhoun, K. 1998. *Irish Wetland Bird Survey 1996-97: Results of the third season of the Irish Wetland Bird Survey*. BirdWatch Ireland. Monkstown.
- Crowe, O. 2005. *Ireland's Wetlands and their Waterbirds: Status and Distribution*. BirdWatch Ireland. Newcastle.
- Crowe, O. 2006. A review of the wintering waterbirds of Dublin Bay, 1994/95 to 2003/04. *Irish East Coast Bird Report 2002*: 123-129
- Crowe, O. and Boland, H. 2004. Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2001/02. *Irish Birds* 7: 313-326.
- Crowe, O., Austin, G. E., Colhoun, K., Cranswick, P., Kershaw, M., and Musgrove, A. J. 2008. Population estimates and trends for wintering waterfowl in Ireland, 1994/94 – 2003/04. *Bird Study* 55: 66-77.
- Dublin Drainage Consultancy 2005. Greater Dublin Strategic Drainage Study. Regional Policies - Volume 3. Environmental Management. Executive Report.
- EPA 2008. *Water Quality in Ireland 2004-2006*. Environmental Protection Agency. Wexford.
- Johnston, C.M., Turnbull, C.G. & Tasker, M.E. 2002. Natura 2000 in UK offshore Waters: advice to support the implementation of the EC Habitats and Birds Directives in UK offshore waters. JNCC Report, No. 325
- Mayes, E. 2007. Wintering waterfowl and conservation designations in Dublin Bay. Brief of Evidence, Dublin Waste to Energy Project, 25 April 2007.
- Merne, O.J. 2004. Common and Arctic Terns breeding in Dublin Port, Co. Dublin, 1995-2003. *Irish Birds* 7: 369-374.
- Merne, O.J., Madden, B., Archer, E. and Porter, B. 2008. Autumn roosting by terns in south Dublin Bay. *Irish Birds* 8: 335-310.
- Newton, S.F. and Crowe, O. 1999. Kish Bank: a preliminary assessment of its ornithological importance. *BirdWatch Ireland Conservation Report No. 99/8*. BirdWatch Ireland. Monkstown. Dublin.
- Newton, S.F. and Crowe, O. 2000. *Roseate Terns – The natural connection*. Maritime Ireland/Wales INTERREG Report no. 2. Marine Institute. Dublin.
- NPWS 2008. *Status of EU Protected Habitats and Species in Ireland*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.
- NPWS 2009. *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.
- Phalan, B. and Nairn, R.G.W. 2007. Disturbance to waterbirds in South Dublin Bay. *Irish Birds* 8: 223-230.

- Roche, C., Lyons, D.O., Farinas Franco, J. & O'Connor, B. 2007. Benthic surveys of sandbanks in the Irish Sea. *Irish Wildlife Manuals, No. 29*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Warren, W.P. and Keary, R. 1989. The sand and gravel resources of the Irish Sea Basin. In: Sweeney, J. (ed.) *The Irish Sea Basin: A Resource at Risk*. Geographical Society of Ireland. Special Publication No. 3. Dublin.
- Wheeler, A.J., Walshe J. and Sutton G. D. 2001. Seabed mapping and seafloor processes in the Kish, Burford, Bray and Fraser Banks area, south-western Irish Sea. *Irish Geography* 34: 194-211.

For inspection purposes only.  
Consent of copyright owner required for any other use.

## 8. APPENDICES

### APPENDIX A: Definition of concepts

#### 8.1. Integrity of the Site

The 'integrity of the site' relates to the site's conservation objectives. As regards the connotation or meaning of 'integrity', this can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation.

The 'integrity of the site' has been usefully defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'.

A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required.

When looking at the 'integrity of the site', it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term.

#### 8.2. Conservation status

The conservation status is defined in Article 1 of the directive:

\_ For a natural habitat, Article 1(e) specifies that it is: *'the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species...'*

\_ For a species, Article 1(i) specifies that it is: *'the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its population ...'*

The Member State has therefore to take into account all the influences of the environment (air, water, soil, territory) which act on the habitats and species present on the site.

The favourable conservation status is also defined by Article 1(e) for natural habitats and Article 1(i) for species. For a natural **habitat**, it occurs when:

*'its natural range and areas it covers within that range are stable or increasing;*

*the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future;*

*the conservation status of its typical species is favourable'.*

For a **species**, it occurs when:

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

*the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;*

*there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis'.*

The favourable conservation status of a natural habitat or species has to be considered across its natural range, according to Articles 1(e) and 1(i), i.e. at biogeographical and, hence, Natura 2000 network level. Since, however, the ecological coherence of the network will depend on the contribution of each individual site to it and, hence, on the conservation status of the habitat types and species it hosts, the assessment of the favourable conservation status at site level will always be necessary.

### 8.3. Conservation Objectives

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as candidate Special Areas of Conservation. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

According to the EU Habitats Directive, favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, is stable or increasing, and
- the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below. The favourable conservation status of a species is achieved when: population data on the species concerned indicate that it is maintaining itself, and
- the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Conservation objectives for all of the Natura 2000 sites are described in detail in the Appropriate Assessment tables in Appendix B.

*For inspection purposes only.  
Consent of copyright owner required for any other use.*

## APPENDIX B: Summary of water bird counts from Dublin Bay (after Mayes 2007)

Table 1. Peak counts of wildfowl and waders in Dublin Bay in the years up to 2006 (Mayes, 2007)

	Mean peak 2001/02-2005/06	Mean peak 98/99-2002/03	Mean peak 1994/95-1998/99	Trend in Dublin Bay	National trend	Threshold 2005/06	
						National	International
Great-grested grebe	112	62	26	Increase	Increase	55	4,800
Cormorant	151	62	24	Increase	Increase	140	1,200
Grey heron	33	34	24	Increase	Increase	30	2,700
Little egret	7	-	-	Increase	Increase	20	1,300
Light-bellied Brent goose	3,181	2,907	1,930	Increase	Increase	220	220
Shelduck	1,140	1,287	1,261			150	3,000
Wigeon	855	785	924	Decrease*	Decrease	820	15,000
Teal	1,125	870	1,157			450	4,000
Mallard	90	135	90			380	20,000
Pintail	139	204	296	Decrease	Decrease	20	600
Shoveler	133	128	191	Decrease	Decrease	25	400
Goldeneye	17	13	34	Decrease	Decrease	95	4,000
Red-breasted merganser	40	40	35			35	1,700
Oystercatcher	4,349	4,177	2,526	Increase	Increase	680	10,200
Ringed plover	316	365	302			150	730
Golden plover	1,924	2,174	3,118	Decrease		1,700	9,300
Grey plover	573	629	705	Decrease		65	2,500
Lapwing	56	68	60		Decrease	2,100	20,000
Knot	4,475	3,503	3,575	Increase	Decrease	190	4,500
Sanderling	519	386	402	Increase	Increase	65	1,200
Dunlin	5,595	6,141	6,810	Decrease	Decrease	880	13,300
Black-tailed godwit	1,059	752	397	Increase		140	350
Bar-tailed godwit	2,026	1,901	1,669	Increase		160	1,200
Curlew	1,210	1,091	1,056	Increase	Decrease	550	3,200
Redshank	2,146	2,056	1,679	Increase	Increase	310	1,900
Greenshank	37	17	14	Increase	Increase	20	3,100
Turnstone	338	255	206	Increase	Decrease	120	1,000

Note: Internationally important numbers are shown bold-faced, nationally important numbers are in italics. Data for Brent geese and waders are combined Dublin Bay Project and I-WeBS data from 1998 on, other species and dates are I-WeBS data. National trends are indicated where these exceed 5% change between 1994/95-1998/99 and 1999/00-2003/04 (Crowe et al, 2008). Trends in Dublin Bay are indicated for changes of more than 10% between 1994/95-

For inspection purposes only  
Consent of copyright owner required for any other use

## APPENDIX C: Screening Matrix

Stage 1. Screening	
<b>1. Description of the project or plan</b>	
Location	Ringsend Dublin. Discharge direct to Liffey Estuary at Poolbeg.
Distance from designated site	The long sea outfall pipe from the Ringsend WwTW (Option 4) is located in the Irish Sea approximately 15km from the Treatment Works (Co-ordinates UTM30 X299988.6, Y5912494.4), approximately 9km from North Bull Island SPA, 11km from North Dublin Bay cSAC, 11km from South Dublin Bay and River Tolka Estuary SPA and 12km from South Dublin Bay SAC.
Brief Description of the project or plan	The proposal is to relocate the existing outfall in the Liffey Estuary to a long sea outfall in the eastern part of Dublin Bay, approximately 15km from the Treatment Works.
Is the plan directly connected with or necessary to the Natura 2000 site management for nature conservation?	No
<b>2. Brief Description of the Natura 2000 sites</b>	
<b>Name</b>	<b>North Bull Island (SPA)</b>
<b>Site designation status</b>	<b>Special Protection Area (SPA)</b>
<b>Basis</b>	<b>EU Birds Directive (79/209/EEC)</b>
Natura 2000 Site description	<p>This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5 km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses.</p> <p>A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. Marram Grass (<i>Ammophila arenaria</i>) is dominant on the outer dune ridges. A feature of the dune system is a large dune slack with a rich flora, usually referred to as the 'Alder Marsh' because of the presence of Alder (<i>Alnus glutinosa</i>) trees. The water table is very near the surface and is only slightly brackish. Sea Rush (<i>Juncus maritimus</i>) is the dominant species, with Meadowsweet (<i>Filipendula ulmaria</i>) and Devil's-bit Scabious (<i>Succisa pratensis</i>) being frequent.</p> <p>The orchid flora is notably diverse in this area. Saltmarsh extends along the length of the landward side of the island and provides the main roost site for wintering birds in Dublin Bay.</p> <p>The island shelters two intertidal lagoons which are divided by a solid causeway. These lagoons provide the main feeding grounds for the wintering waterfowl. The sediments of the lagoons are mainly sands with a</p>

	<p>small and varying mixture of silt and clay. Tasselweed (<i>Ruppia maritima</i>) and small amounts of Eelgrass (<i>Zostera</i> spp.) are found in the lagoons. Common Cord-grass (<i>Spartina anglica</i>) occurs in places. Green algal mats (<i>Enteromorpha</i> spp., <i>Ulva lactuca</i>) are a feature of the flats during summer. These sediments have a rich macro-invertebrate fauna, with high densities of Lugworm (<i>Arenicola marina</i>) and Ragworm (<i>Hediste diversicolor</i>).</p> <p>The North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. It also qualifies for international importance as the numbers of two species exceed the international threshold – Brent Goose and Bar-tailed Godwit. A further 15 species have populations of national importance – Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Curlew, Redshank and Turnstone. The island is also regular wintering site for Short-eared Owl.</p> <p>The site has five Red Data Book vascular plant species, four rare bryophyte species, and is nationally important for three insect species. The rare liverwort, <i>Petalophyllum ralfsii</i>, was first recorded from the North Bull Island in 1874 and its presence here has recently been re-confirmed. This species is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. A well-known population of Irish Hare is resident on the island.</p> <p>The main landuses of this site are amenity activities and nature conservation. The North Bull Island is the main recreational beach in Co. Dublin and is used throughout the year. Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. North Bull Island is also a Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site. Much of the SPA is also a candidate Special Area for Conservation. The site is used regularly for educational purposes and there is a manned interpretative centre on the island.</p> <p>The North Bull Island SPA is an excellent example of an estuarine complex and is one of the top sites in Ireland for wintering waterfowl. It is of international importance on account of both the total number of waterfowl and the individual populations of Brent Goose and Bar-tailed Godwit that use it. Also of significance is the regular presence of several species listed on Annex I of the E.U. Birds Directive, notably Golden Plover and Bartailed Godwit but also Ruff and Short-eared Owl.</p>
Unit size	North Bull Island SPA 1,945ha.
<b>Qualifying Interests (Species)</b>	<p>North Bull Island SPA is selected for:</p> <ul style="list-style-type: none"> <li>▪ Light-bellied Brent Goose</li> <li>▪ Shelduck</li> <li>▪ Pintail</li> <li>▪ Shoveler</li> <li>▪ Oystercatcher</li> <li>▪ Grey Plover</li> <li>▪ Knot</li> <li>▪ Dunlin</li> <li>▪ Black-tailed Godwit</li> <li>▪ Bar-tailed Godwit</li> <li>▪ Redshank</li> <li>▪ Turnstone</li> <li>▪ 20,000 wintering waterbirds</li> </ul>

Additional species of interest:	<ul style="list-style-type: none"> <li>▪ Teal</li> <li>▪ Ringed Plover</li> <li>▪ Golden Plover</li> <li>▪ Sanderling</li> <li>▪ Curlew</li> <li>▪ Black-headed Gull</li> <li>▪ Wetland &amp; Waterbirds</li> </ul>
Qualifying Interests (Habitats)	None
Conservation Objectives	To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied Brent Goose, Shelduck, Pintail, Shoveler, Oystercatcher, Grey Plover, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Redshank, Turnstone, 20,000 wintering waterbirds, Teal, Ringed Plover, Golden Plover, Sanderling, Curlew, Black-headed Gull, Wetland & Waterbirds.

Name	North Dublin Bay SAC
Site designation status	Candidate Special Area of Conservation
Basis	EU Habitats Directive (92/43/EEC)
Natura 2000 Site description	<p>This site covers the inner part of north Dublin Bay, the seaward boundary extending from the Bull Wall lighthouse across to the Martello Tower at Howth Head. The North Bull Island is the focal point of this site. The island is a sandy spit which formed after the building of the South Wall and Bull Wall in the 18<sup>th</sup> and 19<sup>th</sup> centuries. It now extends for about 5 km in length and is up to 1 km wide in places. A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. Marram Grass (<i>Ammophila arenaria</i>) is dominant on the outer dune ridges, with Lyme Grass (<i>Leymus arenarius</i>) and Sea Couchgrass (<i>Elymus farctus</i>) on the foredunes. Behind the first dune ridge, plant diversity increases with the appearance of such species as Wild Pansy (<i>Viola tricolor</i>), Kidney Vetch (<i>Anthyllis vulneraria</i>), Bird's-foot Trefoil (<i>Lotus corniculatus</i>), Rest Harrow (<i>Ononis repens</i>), Yellow Rattle (<i>Rhinanthus minor</i>) and Pyramidal Orchid (<i>Anacamptis pyramidalis</i>). In these grassy areas and slacks, the scarce Bee Orchid (<i>Ophrys apifera</i>) occurs.</p> <p>About 1 km from the tip of the island, a large dune slack with a rich flora occurs, usually referred to as the 'Alder Marsh' because of the presence of Alder trees (<i>Alnus</i> spp). The water table is very near the surface and is only slightly brackish. Saltmarsh Rush (<i>Juncus maritimus</i>) is the dominant species, with Meadow Sweet (<i>Filipendula ulmaria</i>) and Devil's-bit (<i>Succisa pratensis</i>) being frequent. The orchid flora is notable and includes Marsh Helleborine (<i>Epipactis palustris</i>), Common Twayblade (<i>Listera ovata</i>), Autumn Lady's-tresses (<i>Spiranthes spiralis</i>) and Marsh orchids (<i>Dactylorhiza</i> spp.). Saltmarsh extends along the length of the landward side of the island. The edge of the marsh is marked by an eroding edge which varies from 20 cm to 60 cm high. The marsh can be zoned into different levels according to the vegetation types present. Towards the tip of the island, the saltmarsh grades naturally into fixed dune vegetation.</p>



	<p>The island shelters two intertidal lagoons which are divided by a solid causeway. The sediments of the lagoons are mainly sands with a small and varying mixture of silt and clay. The north lagoon has an area known as the "Salicornia flat", which is dominated by <i>Salicornia dolichostachya</i>, a pioneer Glasswort species, and covers about 25 ha. Tassel Weed (<i>Ruppia maritima</i>) occurs in this area, along with some Eelgrass (<i>Zostera angustifolia</i>). Eelgrass (<i>Z. noltii</i>) also occurs in Sutton Creek. Cordgrass (<i>Spartina anglica</i>) occurs in places but its growth is controlled by management.</p> <p>Three Rare plant species legally protected under the Flora Protection Order 1987 have been recorded on the North Bull Island. These are Lesser Centaury (<i>Centaureum pulchellum</i>), Hemp Nettle (<i>Galeopsis angustifolia</i>) and Meadow Saxifrage (<i>Saxifraga granulata</i>). Two further species listed as threatened in the Red Data Book, Wild Sage (<i>Salvia verbenaca</i>) and Spring Vetch (<i>Vicia lathyroides</i>), have also been recorded. A rare liverwort, <i>Petalophyllum ralfsii</i>, was first recorded from the North Bull Island in 1874 and has recently been confirmed as being still present there. This species is of high conservation value as it is listed on Annex II of the E.U. Habitats Directive. The North Bull is the only known extant site for the species in Ireland away from the western seaboard.</p> <p>North Dublin Bay is of international importance for waterfowl, the following species occurred in internationally important numbers: Brent Geese; Knot; Bar-tailed Godwit. A further 14 species occurred in nationally important concentrations - Shelduck; Wigeon; Teal; Pintail; Shoveler; Oystercatcher; Ringed Plover; Grey Plover; Sanderling; Dunlin; Blacktailed Godwit; Curlew; Turnstone and Redshank. Some of these species frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes.</p> <p>The tip of the North Bull Island is a traditional nesting site for Little Tern. However, nesting attempts have not been successful since the early 1990s. Ringed Plover, Shelduck, Mallard, Skylark, Meadow Pipit and Stonechat also nest. A well-known population of Irish Hare is resident on the island. The invertebrates of the North Bull Island have been studied and the island has been shown to contain at least seven species of regional or national importance in Ireland (Orders Diptera, Hymenoptera, Hemiptera).</p> <p>The main landuses of this site are amenity activities and nature conservation. The North Bull Island is the main recreational beach in Co Dublin and is used throughout the year. Much of the land surface of the island is taken up by two golf courses. Two separate Statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. The site is used regularly for educational purposes.</p> <p>North Bull Island has been designated a Special Protection Area under the E.U. Birds Directive and it is also a statutory Wildfowl Sanctuary, a Ramsar Convention site, a Biogenetic Reserve, a Biosphere Reserve and a Special Area Amenity Order site.</p> <p>This site is an excellent example of a coastal site with all the main habitats represented. The site holds good examples of ten habitats that are listed on Annex I of the E.U. Habitats Directive; one of these is listed with priority status. Several of the wintering bird species have populations of international importance, while some of the invertebrates are of national importance. The site contains a numbers of rare and scarce plants including some which are legally protected. Its proximity to the capital city makes North Dublin Bay an excellent site for educational studies and research.</p>
Unit size	North Dublin Bay cSAC 1,475ha;
Qualifying Interest (species)	North Dublin Bay cSAC is selected for: <ul style="list-style-type: none"> <li>▪ Petalwort (<i>Petalophyllum ralfsii</i>)</li> </ul>

<b>Qualifying Interests (habitats)</b>	<p>North Dublin Bay cSAC is selected for:</p> <ul style="list-style-type: none"> <li>▪ Mudflats and sandflats not covered by seawater at low tide</li> <li>▪ Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)</li> <li>▪ Mediterranean salt meadows (<i>Juncetalia maritimi</i>)</li> <li>▪ <i>Salicornia</i> and other annuals colonizing mud and sand</li> <li>▪ Annual vegetation of drift lines</li> <li>▪ Embryonic shifting dunes</li> <li>▪ Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)</li> <li>▪ Fixed coastal dunes with herbaceous vegetation (grey dunes)*</li> <li>▪ Humid dune slacks</li> <li>▪ <i>Spartina</i> swards (<i>Spartinion maritima</i>)</li> </ul> <p>* Indicates priority habitat</p>
<b>Conservation Objectives</b>	<p>Objective 1: To maintain the Annex I habitats for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; <i>Salicornia</i> and other annuals colonizing mud and sand; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>); Mediterranean salt meadows (<i>Juncetalia maritimi</i>); Embryonic shifting dunes; Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Humid dune slacks.</p> <p>Objective 2: To maintain the Annex II species for which the cSAC has been selected at favourable conservation status: <i>Petalophyllum ralfsii</i>.</p> <p>Objective 3: To maintain the extent, species richness and biodiversity of the entire site.</p> <p>Objective 4: To establish effective liaison and cooperation with landowners, legal users and relevant authorities.</p>

<b>Name</b>	<b>South Dublin Bay SAC</b>
<b>Site designation status</b>	<b>Candidate Special Area of Conservation</b>
<b>Basis</b>	<b>EU Habitats Directive (92/43/EEC)</b>
Natura 2000 Site description	<p>This site lies south of the River Liffey and extends from the South Wall to the west pier at Dun Laoghaire. It is an intertidal site with extensive areas of sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. The sediments are predominantly sands but grade to sandy muds near the shore at Merrion Gates. The main channel which drains the area is Cockle Lake. There is a bed of Eelgrass (<i>Zostera noltii</i>) below Merrion Gates which is the largest stand on the east coast. Green algae (<i>Enteromorpha</i> spp. and <i>Ulva lactuca</i>) are distributed throughout the area at a low density. Fucoid algae occur on the rocky shore in the Maretimo to Dún Laoghaire area.</p> <p>Several small, sandy beaches with incipient dune formation occur in the</p>

	<p>northern and western sectors of the site, notably at Poolbeg, Irishtown and Merrion/Boosterstown. The formation at Boosterstown is very recent. Driftline vegetation occurs in association with the embryonic and incipient fore dunes. Typically drift lines occur in a band approximately 5m wide, though at Boosterstown this zone is wider in places. The habitat occurs just above the High Water Mark and below the area of embryonic dune. A small area of pioneer salt marsh now occurs in the lee of an embryonic sand dune just north of Boosterstown Station. This early stage of salt marsh development is here characterised by the presence of pioneer stands of Glasswort (<i>Salicornia</i> spp.) occurring below an area of drift line vegetation. As this is of very recent origin, it covers a small area but ample areas of substrate and shelter are available for the further development of this habitat.</p> <p>South Dublin Bay is an important site for waterfowl. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there. The principal species are Oystercatcher, Ringed Plover, Sanderling and Dunlin, Redshank. Up to 100 Turnstones are usual in the south bay during winter. Brent Geese regularly occur in numbers of international importance. Bar-tailed Godwit, a species listed on Annex I of the EU Birds Directive, also occurs. Large numbers of gulls roost in South Dublin Bay. It is also an important tern roost in the autumn, regularly holding 2000-3000 terns including Roseate Terns, a species listed on Annex I of the E.U. Birds Directive. South Dublin Bay is largely protected as a Special Protection Area.</p> <p>At low tide the inner parts of the south bay are used for amenity purposes. Baitdigging is a regular activity on the sandy flats. At high tide some areas have windsurfing and jet-skiing. This site is a fine example of a coastal system with extensive sand and mudflats, a habitat listed on Annex I of the E.U. Habitats Directive. South Dublin Bay is also an internationally important bird site.</p>
Unit size	South Dublin Bay cSAC 742ha;
Qualifying Interest (species)	None
Qualifying Interests (habitats)	<p>South Dublin Bay cSAC is selected for:</p> <ul style="list-style-type: none"> <li>▪ Mudflats and sandflats not covered by seawater at low tide.</li> </ul>
Conservation Objectives	<p><b>Objective 1:</b> To maintain the Annex I habitat for which the cSAC has been selected at favourable conservation status: Mudflats and sandflats not covered by seawater at low tide.</p> <p><b>Objective 2:</b> To maintain the extent, species richness and biodiversity of the entire site.</p> <p><b>Objective 3:</b> To establish effective liaison and cooperation with landowners, legal users and relevant authorities.</p>

<b>Name</b>	<b>South Dublin Bay and River Tolka Estuary SPA and pSPA*</b>
<b>Site designation status</b>	<b>Special Protection Area (SPA)</b>
<b>Basis</b>	<b>EU Birds Directive (79/209/EEC)</b>
<b>Natura 2000 Site description</b>	<p>This site comprises a substantial part of Dublin Bay. It includes virtually all of the intertidal area in the south bay, as well as much of the estuary of the River Tolka to the north of the River Liffey. A portion of the shallow marine waters of the bay is also included.</p> <p>In the south bay, the intertidal flats extend for almost 3 km at their widest. The sediments are predominantly well-aerated sands. Several permanent channels exist, the largest being Cockle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs near Dun Laoghaire. The landward boundary is now almost entirely artificially embanked. There is a bed of Dwarf Eelgrass (<i>Zostera noltii</i>) below Merrion Gates which is the largest stand on the east coast. Green algae (<i>Enteromorpha</i> spp. and <i>Ulva lactuca</i>) are distributed throughout the area at a low density. The macroinvertebrate fauna is well-developed, and is characterised by annelids such as Lugworm (<i>Arenicola marina</i>), <i>Nephtys</i> spp. and Sand Mason (<i>Lanice conchilega</i>), and bivalves, especially Cockle (<i>Cerastoderma edule</i>) and Baltic Tellin (<i>Macoma balthica</i>). The small gastropod Spire Shell (<i>Hydrobia ulvae</i>) occurs on the muddy sands off Merrion Gates, along with the crustacean <i>Corophium volutator</i>.</p> <p>The site is an important site for wintering waterfowl, being an integral part of the internationally important Dublin Bay complex. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there. An internationally important population of Brent Goose occurs regularly and newly arrived birds in the autumn feed on the eelgrass bed at Merrion. The site supports nationally important numbers of a further six species: Oystercatcher Ringed Plover, Knot, Sanderling, Dunlin and Bar-tailed Godwit. Other species which occur in smaller numbers include Great Crested Grebe, Grey Plover, Curlew, Redshank and Turnstone.</p> <p>South Dublin Bay is an important site for wintering gulls, especially Black-headed Gull, Common Gull and Herring Gull. It is also the premier site in Ireland for Mediterranean Gull, with up to 20 birds present at times. These occur through much of the year, but especially in late-winter/spring and again in late summer into winter. The south bay is an important tern roost in the autumn (mostly late July to September). The wintering birds within this site are now well-monitored.</p> <p>The main threat to this site is further reclamation for industrial and/or infra-structural purposes. The intertidal areas receive water that is somewhat polluted though there are no apparent impacts on the associated flora and fauna. Owing to its location in Dublin Bay, pollution such as oil spillages from Dublin Port and shipping is a threat. Commercial bait digging may be a problem - this causes disturbance to wintering birds. Disturbance to birds is also caused by walkers and dogs.</p> <p>Sandymount Strand/Tolka Estuary SPA is of high ornithological importance, being of international importance for Brent Goose and of national importance for six waterfowl species. As an autumn tern roost, it is also classified as of international importance. All of the tern species using the site are listed on Annex I of the E.U. Birds Directive, as are Bar-tailed Godwit and Mediterranean Gull.</p>
<b>Unit size</b>	South Dublin Bay and River Tolka Estuary SPA 597ha;

<b>Qualifying Interest (species)</b>	South Dublin Bay and River Tolka Estuary is selected for: <ul style="list-style-type: none"> <li>▪ Light-bellied Brent Goose</li> <li>▪ Knot</li> <li>▪ Sanderling</li> <li>▪ Bar-tailed Godwit</li> <li>▪ Redshank</li> <li>▪ Roseate Tern</li> <li>▪ Common Tern</li> <li>▪ Arctic Tern</li> </ul>
	Additional Special Conservation Interests <ul style="list-style-type: none"> <li>▪ Oystercatcher</li> <li>▪ Ringed Plover</li> <li>▪ Golden Plover</li> <li>▪ Grey Plover</li> <li>▪ Dunlin</li> <li>▪ Black-headed Gull</li> <li>▪ Wetland &amp; Waterbirds</li> </ul>
<b>Qualifying Interests (habitats)</b>	None
<b>Conservation Objectives</b>	To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied Brent Goose, Knot, Sanderling, Bar-tailed Godwit, Redshank, Roseate Tern, Common Tern, Arctic Tern, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Dunlin, Blackheaded Gull and Wetland & Waterbirds.
<b>3. Describe the individual elements of the plan (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 sites.</b>	<p>The proposed development involves the discharge of treated effluent from the existing Ringsend Wastewater Treatment Works (WwTW) through a proposed long sea outfall (Option 4), at a location approximately 15km from the Treatment Works. The current discharge of effluent from the treatment works to the Liffey Estuary will discontinue and will instead discharge through the proposed long sea outfall.</p> <p>The installation of the proposed long sea outfall pipe will involve tunnelling under the seabed, therefore there will be minor loss and/or disruption of the sea bed at the entry and exit points to the tunnel.</p>
<b>4. Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of:</b> <ul style="list-style-type: none"> <li>▪ <b>Size and scale;</b></li> </ul>	<p>The tunnel proposed for the long sea outfall will be located under the sea bed and therefore disruption to habitats will be minimal. There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the tunnel.</p> <p>Discharge of treated effluent from the WwTW will result in a change in water quality in the vicinity of the long sea outfall discharge point. The primary effect of this discharge will be an increase in the nutrient concentration in the receiving water.</p> <p>Without strict adherence to the discharge standards as set out in the discharge licence, there is potential for impacts on Natura 2000 sites. A</p>

<ul style="list-style-type: none"> <li>▪ <b>Land-take;</b></li> <li>▪ <b>Distance from Natura 2000 site or key features of the site;</b></li> <li>▪ <b>Resource requirements;</b></li> <li>▪ <b>Emissions;</b></li> <li>▪ <b>Excavation requirements;</b></li> <li>▪ <b>Transportation requirements;</b></li> <li>▪ <b>Duration of construction, operation etc.;</b></li> <li>▪ <b>Others.</b></li> </ul>	<p>breach of Environmental Quality Standards (EQS) may lead to eutrophication of waters, which could cause alterations to aquatic habitats and water dependent ecosystems.</p> <p>The nearest designated Natura 2000 site (North Bull Island SPA) is located 9km from the proposed discharge point. The boundary of the Kish Bank area proposed for designation is unknown at present but is within approximately 2km of the discharge point.</p>
<p><b>5. Describe any likely changes to the site arising as a result of:</b></p> <ul style="list-style-type: none"> <li>▪ <b>Reduction of habitat area;</b></li> <li>▪ <b>Disturbance of key species;</b></li> <li>▪ <b>Habitat or species fragmentation;</b></li> <li>▪ <b>Reduction in species density;</b></li> <li>▪ <b>Changes in key indicators of conservation value;</b></li> <li>▪ <b>Climate change.</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ There is potential for a minor loss and/or disturbance to habitats within Natura 2000 sites due to construction activities at the entry and exit points of the underground tunnel. Due to the small scales of these impacts there will be no significant impacts to Natura 2000 sites as a result of habitat loss.</li> <li>▪ The presence of extensive areas of sand and mudflat and a diverse macro-invertebrate community provides valuable source of food for herbivorous wild birds and wintering water birds. Shallow sandy sediments on sandbanks are often important nursery areas for fish, and feeding grounds for seabirds.</li> </ul> <p>Eutrophication of water in these feeding areas could result in a change in invertebrate communities and plant growth (algal blooms), reduced levels of dissolved oxygen, increased biological oxygen demand and increased water temperature. However, the degree of water deterioration will depend on the level of treatment and the quality of the effluents.</p> <p>The risk of a major event occurring that would negatively affect the structure and function of the site, or impact on the long-term distribution of species for which the site is designated, is not considered significant.</p> <ul style="list-style-type: none"> <li>▪ According to an EPA report 'Climate Change – Scenarios and Impacts for Ireland' Environmental RTDI Programme 2000 – 2006, a sea level rise of 0.5 metres is expected during the period 1990 – 2100, i.e. an average rise of 0.45 cm per year. This may gradually influence many coastal habitats.</li> </ul>
<p><b>6. Describe any likely impacts on the Natura 2000 site as a whole in terms of:</b></p> <ul style="list-style-type: none"> <li>▪ <b>Interference with the key relationships that define the structure of the site;</b></li> <li>▪ <b>Interference with key relationships</b></li> </ul>	<p>The Natura 2000 sites form part of the extensive coastal habitat within Dublin Bay. Water quality, tidal regime and salinity are the key environmental conditions that support the integrity of these sites. Interference or deterioration of any of these factors could alter the structure and function of the site, which could potentially negatively impact on the habitats and species for which the sites are designated.</p>

<p>that define the function of the site.</p>	
<p>7. Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale of magnitude of impacts is not known.</p>	<p><b>Water quality standards</b></p> <p>Treated effluent from the Ringsend WwTW is in compliance with concentration limits set for non sensitive waters as given by:</p> <p>S.I. No. 254/2001 - Urban Waste Water Treatment Regulations</p> <p>Although the location of the discharge point is outside of the areas delineated for consideration under the Water Framework Directive (WFD) the changes in water quality have been assessed in accordance with the stringent standards contained in:</p> <p>S.I. No. 272/2009 - Environmental Objectives (Surface Water) Regulation</p> <p>Primary modelling for outfall Option 4 show that even for extreme conditions the receiving water will remain at good status and meet the environmental quality objectives for coastal waters as stated in the 2009 regulations above.</p> <p><b>Impacts on designated Natura 2000 sites</b></p> <p>Effluent discharging from the long sea outfall will be treated to the same standards as the existing effluent discharging to the Liffey Estuary.</p> <p>An assessment of impacts from the existing discharge to the Liffey Estuary has shown that there is no evidence of the qualifying interests or conservation objectives of the Natura 2000 sites in Dublin Bay being significantly impacted by the existing discharge.</p> <p>The transfer of the discharge from the Liffey Estuary to a location at least 9km from the nearest designated Natura 2000 site can only result in a considerable improvement in the water quality in the bay and at various sensitive receptors located along the coastline.</p> <p>Due to the quality of effluent being discharged (Compliant with UWWT Regulations), the dilution and dispersion modelling results (Receiving water quality will comply with the requirements of the WFD) and the distance from the nearest Natura 2000 sites in Dublin Bay there will be no significant impacts to designated Natura 2000 sites.</p> <p><b>Impacts on sites proposed for designation</b></p> <p>The area known as the Kish Bank, which is currently proposed as a cSAC, is the closest site (within 2km) to the long sea outfall discharge location. Sandbanks are the Annex I habitat for which the site is proposed for designated. Sand banks by their very nature are quasi-stable features in dynamic equilibrium with tidal and wave conditions. It is therefore extremely unlikely that there would be an accumulation of excess nutrients within this habitat type at the levels being discharged.</p> <p>The increase in nutrient levels in water surrounding the long sea outfall is not expected to have a significant impact on the distribution or abundance of fish or other aquatic life associated with the sandbanks due to the concentration of nutrients outside of the mixing zone and the mixing of waters as a result of tidal currents.</p>

\* pSPA - On 28 May 2008 the Department of Environment, Heritage and Local Government published a notice of intention to designate the South Dublin Bay and River Tolka Estuary as a Special Protection Area (SPA). This proposed SPA includes additional areas to those contained within the original SPA. On 15<sup>th</sup> December 2009, this pSPA has not been formally confirmed.

For inspection purposes only.  
Consent of copyright owner required for any other use.



# Appendix C

## Ecological Assessment of Priority Objectives

For inspection purposes only.  
Consent of copyright owner required for any other use.

For inspection purposes only.  
Consent of copyright owner required for any other use.

# RINGSEND WASTEWATER TREATMENT WORKS PROPOSED LONG SEA OUTFALL

## ECOLOGICAL IMPACT ASSESSMENT ON DUBLIN BAY WATER QUALITY MANAGEMENT PLAN PRIORITY OBJECTIVES

DECEMBER 2009

*For inspection purposes only.  
Consent of copyright owner required for any other use.*



Broomhall Business Park  
Rathnew, Wicklow, Ireland

T: +353 (1) 4880500

E: [info@natura.ie](mailto:info@natura.ie)

W: [www.naturaconsultants.com](http://www.naturaconsultants.com)

# Table of Contents

1.	INTRODUCTION .....	1
1.1.	Background.....	1
1.2.	Dublin Bay Water Quality Management Plan .....	1
2.	METHODOLOGY .....	1
3.	DETAILS OF PLAN/ACTIVITY (DISCHARGE) .....	2
4.	SITE DESCRIPTION .....	2
4.1.	General Study Area .....	2
4.2.	Designated Areas for Nature Conservation.....	2
4.3.	Aquatic Environment and Fisheries.....	3
4.3.1.	Liffey and Tolka Estuaries .....	3
4.3.2.	Inner Dublin Bay Fisheries .....	5
4.3.3.	Outer Dublin Bay Fisheries and Sandbanks .....	6
4.4.	Other ecosystems/wildlife .....	8
4.4.1.	Birds .....	8
4.4.2.	Seals.....	9
4.4.3.	Cetaceans (whales, dolphins and porpoise) .....	9
5.	ASSESSMENT OF IMPACTS IN RELATION TO PRIORITY OBJECTIVES.....	10
5.1.	Priority Objective: i) Fisheries/BOD/DO; Liffey Estuary protecting migratory fish. ...	10
5.2.	Priority Objective: n) Other ecosystems/wildlife; .....	10
5.2.1.	Birds .....	10
5.2.2.	Seals.....	10
5.2.3.	Cetaceans .....	11
5.3.	Priority Objective: o) Other existing fisheries in the Plan area. ....	11
6.	CONCLUSIONS .....	11
7.	REFERENCES .....	12

For inspection purposes only  
Consent of copyright owner required for any other use.

## 1. INTRODUCTION

### 1.1. Background

Natura Environmental Consultants were commissioned by J.B. Barry and Partners Limited to prepare an Ecological Impact Assessment report for two proposed long sea outfall options (Options 3 and 4) from the existing Ringsend Wastewater Treatment Works (WwTW), as part of future plans to improve the treatment works.

An application for a Wastewater Discharge Licence for the existing treatment works was submitted to the EPA by Dublin City Council. As part of a request for additional information Dublin City Council were asked to supply supporting information for the licensing of the existing discharge in the form of water quality modelling and an impact assessment of the discharge.

A Habitats Directive Assessment (HDA) otherwise known as an "Appropriate Assessment" of the two proposed long sea outfalls has been undertaken to assess potential impacts on Natura 2000 sites within Dublin Bay (Natura 2009a, 2009b). This report deals with fauna and fisheries not covered by Natura 2000 designations. The objective of this report is to determine the implications of the proposed outfalls for the achievement of four of the sixteen objectives set out in the Dublin Bay Water Quality Management Plan (DBWQMP, 1991).

### 1.2. Dublin Bay Water Quality Management Plan

The Dublin Bay Water Quality Management Plan was drafted in 1991 and sets out sixteen Priority Objectives for the management of water quality within Dublin Bay. The Plan covers all of Dublin Bay from Sorrento Point to Baily at Howth (see Figure 4.1 (b)). Since the production of this plan a considerable amount of change has taken place in Dublin Bay relating to the improvement of water quality and the protection of areas important for nature conservation. There are currently four Natura 2000 sites within Dublin Bay, designated for the protection of habitats and species considered to be important at a European as well as an Irish level. Of the sixteen Priority Objectives three relate to the ecological environment:

**i) Fisheries/BOD /DO;** ensuring that excessive dissolved oxygen deficits do not occur in the waters of the Liffey Estuary, and that the dissolved oxygen standards are met; thereby protecting migratory fish.

**n) Other ecosystems/wildlife;** protection of wildlife and their habitats not encompassed by the foregoing

**o) Other fisheries;** protection of other existing fisheries in the Plan area.

## 2. METHODOLOGY

A desk study was carried out to collate available information on the ecology and sensitivities of Dublin Bay not covered by a Natura 2000 site designation. The NPWS database of designated areas and records of rare and protected flora and faunal species ([www.npws.ie](http://www.npws.ie)) was accessed to review recent and historic data relating to the study area. The Development Application Unit (DAU) of the NPWS was also consulted in relation to the proposed project and asked to comment on the proposal in relation to flora and fauna.

A range of data relating to the discharges and the baselines conditions in the bay as well as data on the relevant designated habitats and modelling for the proposed outfalls was reviewed. This data included:

- Ringsend Wastewater Treatment Works Appropriate Assessment (CDM, 2009a);
- Modelling the Impact of Ringsend Discharges in the Liffey and Tolka Estuaries and Possible Long Sea Outfall Discharges in Dublin Bay (CDM, 2009b).
- Various studies undertaken in relation to the flora and fauna in Dublin Bay; and

### 3. DETAILS OF PLAN/ACTIVITY (DISCHARGE)

This assessment is concerned with the impacts of the discharge of treated effluent from the Ringsend Wastewater Treatment Works through a proposed long sea outfall. The current discharge of effluent to the Liffey Estuary will discontinue and will instead discharge through the proposed long sea outfall at one of two proposed locations, (Option 3) located approximately 10km from the Treatment Works or Option 4 located approximately 15km from the Treatment Works.

The installation of the proposed long sea outfall pipe will involve tunnelling under the seabed, therefore there will be minor loss and/or disruption of the sea bed at the entry and exit points.

Treated effluent from the Ringsend WwTW is in compliance with concentration limits set for non sensitive waters as given by:

S.I. No. 254/2001 - Urban Waste Water Treatment Regulations

Although the location of the discharge point is outside of the areas delineated for consideration under the Water Framework Directive (WFD) the changes in water quality have been assessed and are in compliance with stringent water quality standards contained in:

S.I. No. 272/2009 - Environmental Objectives (Surface Water) Regulation

Primary modelling for the two outfalls show that even for extreme conditions the receiving water will remain at good status and meet the environmental quality objectives for coastal waters as stated in the 2009 regulations above.

### 4. SITE DESCRIPTION

#### 4.1. General Study Area

The study area covers Dublin Bay within the DBWQMP Plan Area Boundary (see Figure 4.1 (b)). The bay is approximately 10 km in width at its north-south base, stretching from Howth Head in the north to Dalkey Point (at Dún Laoghaire) in the south. The artificially created Bull Island (North Bull Island) is situated in the northwest corner of the bay and features a 5 km long sandy beach, Dollymount Strand, fronting an internationally recognised wildfowl reserve. It is the expanse of the Irish Sea into which the River Liffey and the River Dodder flow after their conjunction at Dublin, as well as the River Tolka and various smaller rivers.

Situated approximately 10km offshore of Dublin Bay, are a series of coast-parallel north-south trending offshore-banks. These banks stand in 20-30m of water and rise to within a few metres of the water surface. The Burford Bank is the only bank within the study area and lies centrally across the mouth of Dublin Bay on the border of the Plan Area Boundary. The Kish and Bray Banks, the Bray Bank being a southerly continuation of the former are situated approximately 5km east and south east of the Burford bank outside of the Plan Area.

#### 4.2. Designated Areas for Nature Conservation

Designated sites comprise Special Protection Areas (SPA), candidate Special Areas of Conservation (cSAC) and proposed Natural Heritage Areas (pNHA). SAC and SPA are also known as Natura 2000 sites. There are six designated areas for nature conservation within the study area, as shown in Table 1. The pNHA designation indicates that the site is of national importance. The designation is proposed until the formal designation process is complete. From the date they are formally proposed, NHA are legally protected under the Wildlife (Amendment) Act, 2000.

**Table 1. Designated conservation areas within the study area**

Site Name	Code	Status	Distance from Outfall 3	Distance from Outfall 4
North Bull Island	004006	SPA	8km north west	9km north west
North Dublin Bay	000206	SAC	8km north west	11km north west
South Dublin Bay	000210	SAC	6km west	11km west
South Dublin Bay and River Tolka Estuary	004024	SPA and pSPA*	4.9km west	12km west
Dalkey Coastal Zone and Killiney Hill	001206	pNHA	9km south west	9km south west
Dolphins, Dublin Docks	000201	pNHA	10.5km north west	15.5km north west

\*Proposed Special Protection Area

### 4.3. Aquatic Environment and Fisheries

#### 4.3.1. Liffey and Tolka Estuaries

Undisturbed estuary systems tend to be characterised by habitats that provide rich feeding grounds for fish populations and perform particularly important functions both as refuge and nursery habitats for juveniles of many species. Additionally, estuaries serve as the natural linkage for species migrating between freshwater and ocean environments, providing the necessary habitat for their transition. Although somewhat modified, the lower Liffey and Tolka estuaries retain some natural habitats and thus support a diverse community of fish species. However, the inner Liffey estuary is characterised by habitats of poor ecological quality, low species richness and low abundance of benthic invertebrates that may provide food for fish (Wilson 1990, EcoServe 2008a, 2009).

The River Liffey represents a highly significant salmonid catchment. The river and several of its tributaries are exceptional in the area in supporting Atlantic salmon (*Salmo salar*, listed under Annex II and V of the EU Habitats Directive) and sea trout (*Salmo trutta*) in addition to resident brown trout (*Salmo trutta*) populations. The Tolka River supports salmonid populations.

The Liffey Estuary supports four migratory fish species, namely: Atlantic salmon, migratory trout, European eel (*Anguilla anguilla*) and the river lamprey (*Lampetra fluviatilis*). The Atlantic salmon, migratory trout and river lamprey are anadromous species, while the European eel is a catadromous species. The Atlantic salmon and the river lamprey are both listed under Annex II species under the EU Habitats Directive and are of international conservation importance, while the sea trout is considered 'near-threatened' in an Irish context (Poole *et al.* 2002). The Atlantic salmon, sea trout, brown trout and the European eel are of commercial importance in Ireland. The Atlantic salmon and sea trout are both subject to catch regulations, such as river angling closures aiming to improve their populations.

Recently a comprehensive fisheries survey was carried out at sites on the Tolka estuary and the Upper and Lower Liffey estuaries by the Eastern Regional Fisheries Board (ERFB), as part of a programme of surveillance monitoring for the Water Framework Directive. The upper river Liffey was found to be dominated by freshwater fish species, with only 8 species were recorded. The most common fish species recorded was roach followed by flounder and three-spined stickleback.

The lower Liffey estuary had a slightly higher diversity with thirteen fish species recorded. The most common fish species was sprat followed by sand goby, sand smelt and three-spined stickleback. In the Tolka estuary thirteen fish species were recorded. The most common fish

species was sand goby followed by sprat, thick-lipped grey mullet and sand smelt (ERFB 2008). In addition, previous CFB surveys have recorded river lamprey at Islandbridge. The river lamprey is a migratory species and thus must use the Liffey Estuary during migration.

### **Atlantic salmon**

Salmon is an important commercial species caught from Atlantic coasts and estuaries in Ireland. In 2008, the total catch was 31,118 fish, of which 72% was captured by anglers and draft nets accounted for 28% of the total catch (drift-netting is now banned). There was an increase of 10% in number of fish caught relative to 2007, although the total catch only represents 12% of the total catches in 2001 (CFB 2008). Threats to salmon and their habitats include water pollution, siltation and destruction of spawning beds, commercial fishing and obstruction of their passage upstream. Salmon are protected under Annex II and V of Council Directive 92/43/EEC (Council of the European Communities 1992). Atlantic salmon smolts (usually averaging two years of age) migrate to sea during a temperature window extending from 7-13 °C. This temperature window normally coincides with the months March through May with peak smolt migration occurring at temperatures of 10-11 °C and during conditions of high freshwater discharge. The downstream migration of salmon smolts in Irish freshwaters is largely nocturnal and tracking studies have shown that they often enter estuarine environments at dusk at the commencement of the ebb tide. Work carried out in the Liffey Estuary during 1999 showed that smolts moved rapidly through the estuary and within a matter of hours had entered Dublin Bay proper (Aztec Management Consultants 2001).

Adult salmon return to the River Liffey as one-sea-winter (1SW) fish during the summer months having spent approximately 14 months at sea. Early running multi-sea-winter (MSW) fish, which are exclusively two-sea-winter salmon, enter the Liffey during the winter and spring months (January – April). The 1SW fish are the dominant sea age group and account for approximately 90% of salmon returning to the Liffey. Some MSW salmon also enter the Liffey during the summer months (Aztec Management Consultants 2001). Adult salmon usually enter freshwater from the sea during conditions of elevated freshwater discharge and the entry to freshwater can be closely associated with the time of high tide, i.e. the fish ascend the estuary during the flood tide.

Upstream migrating salmon counts are available for the years 2002-2007 from fish counters at Islandbridge and Leixlip (Marine Institute 2008). Apart from a drop in 2003 in relation to the 2002 numbers, upstream passages of salmon at Islandbridge appear to be increasing. The opposite appears to be true for the Leixlip facility, where a gradual drop in fish counts has been observed over the same period. As may be expected, counts were higher for Islandbridge (at the tidal limit) than for Leixlip, which is located further upstream.

While the Leixlip salmon census facility is located at the water intake for the Borland-MacDonald fish-lock at the generating station, which represents the only possible upstream route for ascending salmon, the Islandbridge salmon counting facility is located at a weir fish pass. An unknown percentage of ascending salmon can cross the weir structure during suitable discharge conditions. Overall, fish count data collected since 1994 shows that salmon continue to ascend at Islandbridge and Leixlip in significant numbers. This means that juvenile salmon (smolts) continue to migrate through the estuary on their seaward migration. Due to poor stock condition, Atlantic salmon are subject to conservation measures and the Liffey River is currently closed for salmon angling (Conservation of Salmon and Sea Trout Bye-Law No. C.S., 845, 2008).

### **Trout**

It is thought that migratory trout in the Liffey Estuary system can broadly be divided into two groups: those that smoltify and migrate all the way out to sea and those that simply migrate from upstream areas to the estuary where they feed and grow. The latter fish (resident in the estuary) are normally termed 'slob trout' while the former would be regarded as sea trout. The information on slob and sea trout in the Liffey Estuary is primarily anecdotal. Also, it is likely that the estuary is a feeding ground for slob and sea trout from other east coast rivers. There is a dearth of information on trout population sizes in this area, but it is generally accepted that the sea trout population in the Liffey estuary is small. Migratory trout feed in the estuarine habitat during the late spring and summer months. Their movements and abundance will be



influenced by the availability of suitable prey. Sea trout are known to migrate upstream towards Islandbridge around July each year. Their passage has been monitored at Leixlip fish count facility and numbers remained at a similar level during 2003-2006, with an average of 128 counts.

Due to poor stock condition, sea trout are subject to conservation measures and Liffey River is closed for sea trout angling in 2009 (Conservation of Salmon and Sea Trout Bye-Law No. C.S., 846, 2008).

### ***European eel***

Unknown numbers of European eels arrive on the Irish Coast each year. Their life strategy involves either remaining in estuarine habitats (such as the Liffey Estuary) where the eels continue to grow to maturity, while others will continue the migration into freshwater much later in life (Aztec Management Consultants 2001). Glass eels arrive on the Irish Coast during the winter months. Pigmented elvers ascend into freshwater during the months April-May during a narrow temperature window of 9-12 °C. When pigmented elvers have completed their entry into freshwater, the upstream migration of older eels, sometimes termed bootlace eels, occurs and this migration can continue through August. In general, the migration of pigmented elvers and older bootlace eels into freshwater is nocturnal and is also favoured by low freshwater discharge conditions. Relatively low weirs can act as a barrier to ascending eels and the frequently of such weirs incorporate eel passes at strategic locations.

Mature silver eels migrate to sea during the autumn and winter months. Typically their migration is nocturnal and occurs during high freshwater discharge conditions during the dark of the moon (the last three days of the Lunar cycle, immediately preceding the New Moon). A catchment like the Liffey, where eels are largely confined to the lower reaches of the system (they cannot ascend upstream of Poulaphouca generating station because this station has not been equipped with a fish pass of any kind) would not be expected to produce a significant quantity of yellow (feeding stage) or silver (mature/downstream migrating stage) eel.

The majority of eels that remain in the estuarine and marine environment throughout their lives appear to be predominantly males and never reach a large size (maximum c. 43 cm long). Large females do occur in estuarine and marine environments and are taken commercially, even during the winter months when sea temperatures are high enough to enable their capture by passive fishing gear such as fyke nets. Estuarine and marine eels maintain high activity levels during winter months unlike resident freshwater eels, which enter a quiescent period during this time of the year.

Commercial eel fishing activities in the River Liffey catchment have been monitored. A licensed crew using fyke nets and fishing upstream and downstream of Leixlip generating station were examined in 1997 (Aztec Management Consultants 2001) and showed that the average size of eels caught downstream of Leixlip was smaller than that of eels taken upstream of the generating station. The total recorded catch in 1997 was 0.68 t with an average CPUE (catch per fyke net per night) of 0.38 t. By way of comparison, the total reported catch for 1996 was 3.1 t with an average CPUE of 0.82 t. Fyke net fishing for eels on the lower River Liffey occurs during the months June through September when water temperatures are relatively high.

### ***4.3.2. Inner Dublin Bay Fisheries***

Dublin Bay estuary and mudflat habitat represent a crucial biodiversity component in coastal waters and may act as vital nurseries and shelters for the juvenile stages of many commercial marine fish species. Inshore fish spend at least part of their lives at the very edge of the marine environment, exhibiting a wide range of physiological, life-history and ecological adaptations, many of which are still poorly understood. Although they may be suited to life in a turbulent, fluctuating environment, many inshore fishes are very vulnerable to the effects of pollution, sedimentation, and other impacts, and may be employed as effective bioindicators of the health of the intertidal ecosystem. The increasing loss of heterogeneous coastal habitats, as a result of a number of human activities, represents a major threat to marine biodiversity. Moreover, inshore habitats are believed to play a very important role as nursery areas for fish species with complex life cycles.

A survey carried out in North Bull Island (Dublin Bay) during summer and autumn of 2005 found a total of 17 fish species, belonging to 13 families. The community was largely dominated by the lesser sandeel (*Ammodytes tobianus*) and the common goby (*Pomatoschistus microps*). Fish communities varied significantly between time of the year and habitat characteristics, whereas the influence of tidal dynamics seem to have a lesser impact on the overall community (Jovanovic et al. 2007).

In 2008 EcoServe carried out a fisheries survey in the Liffey Estuary and Inner Dublin Bay, in relation to a proposed development of a cooling water intake and thermal discharge outlet in the area (EcoServe 2008b). During this survey six different species of fish were found, namely: three-spined stickleback (*Gasterosteus aculeatus*), flounder (*Platichthys flesus*), common goby (*Pomatoschistus microps*), thick lipped mullet (*Liza aurata*), lesser sand eel (*Ammodytes tobianus*) and sprat (*Sprattus sprattus*) (Table 2).

**Table 2. Species list found in North Bull Island during a survey in 2005 (Jovanovic et al. 2007) and 2008 (Ecoserve, 2008).**

Species	Common name	Life-history
<i>Ammodytes tobianus</i>	Lesser sand eel	Intertidal resident
<i>Atherina presbyter</i>	Sand melt	Estuarine resident
<i>Sprattus sprattus</i>	Sprat	Marine migrant
<i>Taurulus bubalis</i>	Longspinned bullhead	Intertidal resident
<i>Gasterosteus aculeatus</i>	three-spined stickleback	Freshwater migrant/estuarine resident
<i>Pomatoschistus microps</i>	Common gobi	Estuarine resident
<i>Symphodus melops</i>	Corkwing wrasse	Marine straggler
Labridae unident.		Marine stragglers
<i>Liza ramada</i>	Thin lipped mullet	Marine migrant
<i>Liza aurata</i>	Thick lipped mullet	Marine migrant
<i>Pholis gunnellus</i>	Butterfish	Intertidal resident/marine migrant
<i>Platichthys flesus</i>	Flounder	Marine migrant/estuarine resident
<i>Pleuronectes platessa</i>	Plaice	Marine migrant
<i>Psetta maxima</i>	Turbot	Marine migrant/marine straggler
<i>Solea solea</i>		Marine straggler
<i>Syngnathus rostellatus</i>		Estuarine resident
<i>Syngnathus acus</i>		Estuarine resident

#### 4.3.3. Outer Dublin Bay Fisheries and Sandbanks

Fish surveys carried out in Dublin Bay in 1996 and 1998 by the R.V. *Lough Beltra* and the R.V. *Celtic Voyager* recorded ten fish species in six 500-600 m trawls. The species recorded included plaice (*Pleuronectes platessa*), Dab (*Limanda limanda*), flounder (*Pleuronectes flesus*), whiting (*Merlangius merlangus*), common dragonet (*Callionymus lyra*), Pogge (*Agonus cataphractus*), red gurnard (*Aspitrigla cuculus*), long-spined bullhead (*Taurulus bubalis*), lesser-spotted dogfish (*Scyliorhinus canicula*) and sprat (*Sprattus sprattus*) (Wilson & Parkes 1998). The flatfish, plaice, dab and flounder, dominated most of the trawls, which is a reflection of the suitability of the sandy substratum of Dublin Bay for supporting these species (Wilson & Parkes 1998).

Within the study area, on the off-shore side of Dublin Bay, there is an important habitat for the fish communities, namely the Burford Sandbank. The EU Habitats Directive (93/43/EEC) lists sandbanks as a habitat types in Annex I that require the designation of Special Areas of Conservation (SACs). Sandbanks consist of sandy sediments that are permanently covered

by shallow seawater, typically at depths of less than 20 m. Distinct sandbanks in the Western Irish Sea create habitat for fish and macrobenthic communities characterised by low species diversity as a consequence of their unique physical regime (Mackie 1995, Kaiser et al. 2004). The community associated with sandbank is considered to be determined particularly by sediment type together with a variety of other physical, chemical and hydrographical factors, including water temperature, wave exposure, topographical structure, depth, turbidity and salinity (Johnston et al. 2002). In the Irish Sea there are several sandbanks that sustain a number of productive and profitable fisheries (e.g. whelks, seed mussels) and contain sensitive and protected habitats and species (e.g. *Sabellaria* spp. reefs).

**Table 3.** List of taxa recorded on the trawl samples from two sandbanks adjacent to the study area in the Irish Sea: Kish and Arklow Sandbanks. P denote the presence of a given taxa in the sample.

Species	Common name	Arklow	Kish
<b>CHONDRICHTHYES</b>			
<i>Raja brachyura</i>	Blonde ray	P	P
<i>Raja clavata</i>	Thornback ray	P	
<i>Raja montagui</i>	Spotted ray	P	P
<i>Scylliorhinus canicula</i>	Spotted dogfish	P	P
<b>OSTEICHTHYES</b>			
<i>Agonus cataphractus</i>	Pogge		P
<i>Ammodytes tobianus</i>	Lesser sand eel		P
<i>Arnoglossus laterna</i>	Scaldfish		P
<i>Callionymus lyra</i>	Common dragonet		P
<i>Eutrigla gurnardus</i>	Grey gurnard	P	P
<i>Gobius</i> spp.	Goby		P
<i>Limanda limanda</i>	Dab	P	P
<i>Melanogrammus aeglefinus</i>	Haddock		P
<i>Merlangius merlangus</i>	Whiting	P	P
<i>Platichthys flesus</i>	Flounder		P
<i>Pleuronectes platessa</i>	Plaice	P	P
<i>Solea solea</i>	Sole	P	
<i>Echiichthys vipera</i>	Lesser weever fish	P	P
<i>Trisopterus minutus</i>	Poor Cod	P	

A survey conducted in 2007 at three sandbanks adjacent to the Burford Bank (Kish, Arklow and Blackwater) in the Irish Sea (Atalah et al. in preparation) found a high abundance of juvenile plaice and spotted rays, which suggested the presence of possible nursery areas (Table 3). Plaice are known to have discrete spawning grounds (Dunn & Pawson 2002) and to have low fecundity and slow growth rates (Nash et al. 2000). Juvenile plaice utilise demersal habitats in sandy beach areas as nursery grounds and may spend up to two years in these grounds before joining the parent stock. These areas with high food provision and low abundance of predators form a vital habitat for the young plaice and year class strength is determined during this phase of the life cycle (Nash & Geffen 2000). Furthermore, the reproductive potential of most elasmobranchs, including the spotted ray, is known to be lower than in most teleost fish, a factor that increases their vulnerability to anthropogenic disturbances such as commercial fishing or habitat degradation. Indeed many large demersal elasmobranch species including the spurdog (*Squalus acanthias*) and thornback ray (*Raja clavata*), both of which were historically significant to the fisheries in the study area, have been seriously depleted and some including the common skate (*Dipturis batis*) have disappeared from the Irish Sea (Brander 1981, Ellis et al. 2005). Therefore the large

proportion of juvenile spotted ray, dab and plaice found at the study sites is important as it may be considered a biologically sensitive area and should receive special consideration when planning large scale and potentially disruptive developments.

#### **4.4. Other ecosystems/wildlife**

##### **4.4.1. Birds**

###### **Breeding birds**

Breeding birds occur all around the coastline of Dublin Bay although those that are dependent on the sea for food are limited by available nesting areas. Dalkey Island holds a small colony of herring gull, lesser black-backed gull and great black-backed gull. Common terns (and occasional pairs of arctic and roseate terns) also nest on Maidens Rock near Dalkey Island. Maiden's Rock is also an important roosting site for up to 2000 terns in autumn (NPWS site synopsis for Dalkey Coastal Zone and Killiney Hill pNHA). There is also a major autumn night roost of terns on Sandymount Strand within the South Dublin Bay and River Tolka Estuary SPA (Merne et al 2008). Black guillemots breed in Dun Laoghaire Harbour with three pairs estimated in 1997 (Madden 1997)

There is an important breeding colony of common and arctic terns on two mooring dolphins in the River Liffey estuary close to the Ringsend WWTW. Terns have nested in Dublin port for at least 50 years and have been closely monitored from 1995-2003. The maximum population was 238 pairs of common tern in 2002 and 10 pairs of arctic tern in 1996 (Merne 2004).

On the North Bull Island a few pairs of ringed plover breed annually near high water mark and there are occasional attempts by little tern to nest at the northern end of the island (Merne 1988).

Howth Head has a moderate-sized seabird breeding colony. In the period 1985-87 this was estimated to hold up to 1,700 kittiwake, 585 guillemot, 280 razorbill, 105 fulmar, 70 herring gull, 25 shag and a small number of other species (Merne 1988).

###### **Non-breeding birds**

The primary areas in Dublin Bay for non-breeding birds are in the intertidal mudflats and sandflats of the North Bull Island, Tolka Estuary and Sandymount-Merrion Strand. These areas are all covered by the SPA and cSAC designations. Smaller numbers of water birds also occur widely on the rocky shores between Sutton and Howth Head and between Dun Laoghaire and Dalkey Island. The species present in these rocky areas are mainly oystercatcher, curlew, redshank, turnstone and purple sandpiper and the peak numbers are found foraging in these areas between September and March. Small numbers of grey heron and little egret may also be found on the rocky shores. Most of these species are feeding on invertebrates including crustaceans, bivalves and polychaetes.

Later in the winter small numbers of brent geese also use the more sheltered parts of Scotsman's Bay between Dun Laoghaire and Sandycove where they feed on green algae. The inner parts of Scotsman's Bay near Dun Laoghaire are important for roosting gulls in winter with a number of species, including Mediterranean gull, regularly recorded here.

The open sea areas close to shore are used for winter feeding by small numbers of cormorant and shag with occasional great northern diver and great crested grebe. These species all prey on fish and so they are sensitive to any changes in fish populations.

###### **Foraging birds at sea**

There is limited data available on the feeding of seabirds in the deeper areas of Dublin Bay as these are usually out of the range of land-based observers. A boat-based survey of the Kish Bank area carried out in August-September 1999 (Newton and Crowe 1999, 2000). This survey found a total of over 3,000 birds of 26 species foraging in the area. Guillemot, kittiwake and common tern were the most commonly recorded species. Over 1,000 terns were recorded roosting on the Kish lighthouse itself.

#### **4.4.2. Seals**

Both grey and harbour (common) seal are found around the majority of the Irish coast, although most of the important breeding sites are located on the west and south-west coasts. Both seals are protected under Annex II and Annex V of the EU Habitats Directive and are listed under Appendix III of the Bern Convention.

Both grey seals and harbour seals feed in small numbers in Dublin Bay although there are no significant breeding groups here. There is a regular haul-out (resting place) for both species at the north-east end of North Bull Island, approximately 5km from the existing WWTW. Occasional harbour seal pups have been reported from here but the site is not suitable as a breeding location for either species due to the high level of human disturbance. Grey seals regularly haul-out in small numbers on the rocks between Dun Laoghaire Harbour and Dalkey Island. There are no suitable pupping beaches or caves on these islands.

The nearest large breeding assemblage of seals to Dublin Bay is on Lambay Island, and Ireland's Eye off north Co. Dublin. The all-age population here is estimated to be in the region of 203-261 animals (O'Cadhla et al 2008). There is also a significant haul-out of harbour seals on the west side of Lambay Island with approximately 30 animals recorded in 2003 (Cronin et al 2004). These animals disperse widely outside the breeding and moulting season and could be feeding anywhere in Dublin Bay. Their primary prey is fish but they also feed on squid and crustaceans such as crabs. They are not highly sensitive to water quality changes although they would be negatively affected by any significant reduction in fish populations in the inshore waters in which they feed.

#### **4.4.3. Cetaceans (whales, dolphins and porpoise)**

All cetacean species are protected under Annex IV of the EU Habitats Directive and harbour porpoise and bottlenose dolphin are also listed under Annex II of the same directive.

Irish waters are some of the most important in Europe from a wide range of cetacean species. To date 24 cetaceans have been recorded in Irish waters (Berrow, 2008). The most common near-shore species found within Dublin Bay are the harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), and minke whale (*Balaenoptera acutorostrata*).

Harbour porpoise are mainly confined to shelf waters, although sightings have occurred in deep water (Reid *et al.*, 2003). The diet of harbour porpoise comprises a wide range of small fish, such as small gadoids, whiting, poor cod, sprat, sandeel, herring, saithe, pollack, dab, flounder, and sole. Harbour porpoise have been surveyed by the Irish Whale and Dolphin Group (IWDG) in Dublin Bay in 2008. Acoustic monitoring and estimates of diversity and abundance suggest that the numbers of porpoise off Howth Head are the highest recorded in Ireland (S. Berrow, personal communication)

Bottlenose dolphin are found inshore, particularly in bays and estuaries on the west coast with the species less commonly observed in the east coast and the Irish seas. The dolphin feeds on a wide variety of bottom dwelling and mid water fish, as well as cephalopods and shellfish. Sighting listed by the IWDG between 2000 and 2008 only recorded one group of six individuals in the area around Howth in 2008 (www.IWDG.ie).

Minke whale is most commonly recorded off most headlands on the west and south west coastline of Ireland. This species is less often recorded within the Irish Sea, where it is seen in small numbers in the deeper central region with evidence of moderate density offshore from Dublin Bay. Minke whales have the most varied diet of all baleen whales, feeding on various small fish, including capelin, sandeel, herring and cod, they also feed on small squid. Sighting listed by the IWDG between 2000 and 2008, recorded one individual in the area of Howth Head in August 2006 (www.IWDG.ie).

## 5. ASSESSMENT OF IMPACTS IN RELATION TO PRIORITY OBJECTIVES

### 5.1. Priority Objective: i) Fisheries/BOD/DO; ensuring that excessive dissolved oxygen deficits do not occur in the waters of the Liffey Estuary, and that the dissolved oxygen standards are met; thereby protecting migratory fish.

Biochemical oxygen demand (BOD) is a measure of the amount of oxygen consumed by the respiration of microorganisms while feeding on decomposing organic material such as algae and other dead plants. Excessive nutrients (phosphates and nitrates) can cause algal blooms, and their eventual decomposition can cause massive fish kills if BOD drastically lowers dissolved oxygen levels. The biochemical oxygen demand should not be so great as to lower the dissolved oxygen to an unacceptable level, in general the lower the BOD the better.

Dissolved oxygen (DO) is a critical water quality parameter for characterizing the health of an aquatic system. It is a measurement of oxygen dissolved in water which is available to fish and other aquatic life. The DO content of water results from the photosynthetic and respiratory activities of the flora and fauna in the system, and the mixing of atmospheric oxygen with waters through wind and stream current action.

The quality of treated effluent discharging from the WwTW will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001 for BOD, COD and TSS. Modelling of the outfall options for the impact on DIN and MRP concentrations in the receiving water has shown that even for extreme conditions where over 2.4 times the DWF is discharged for a period of 15 days that the receiving water will remain at good status and meet the environmental quality objectives for coastal water nutrients as set out under the Water Framework Directive.

Effluent from Ringsend WwTW currently discharges to the Liffey Estuary. Salmon and trout continue to migrate through the Liffey Estuary on their seaward migration and numbers of salmon appear to be increasing according to counts taken at the Islandbridge salmon counting facility as described in Section 4.3.1. Trout passage has been monitored at Leixlip fish count facility and numbers remained at a similar level during 2003-2006, with an average of 128 counts (Ecoserve, 2009). The transfer of discharge from the current discharge point into the Liffey Estuary to a location approximately 10 to 15km out to sea will result in an increase in the quality of water within the Liffey Estuary, thereby benefiting migratory fish.

### 5.2. Priority Objective: n) Other ecosystems/wildlife; protection of wildlife and their habitats not encompassed by the foregoing

#### 5.2.1. Birds

There will be no direct impacts on birds as a result of the proposed development. The only potential impacts are indirect impacts through the reduction of food sources for foraging seabirds. However, here will be no significant impact to fish populations as any changes will be restricted to the mixing zone and receiving water will meet the criteria for "Good Status".

#### 5.2.2. Seals

There will be no direct impacts on grey or common seals as a result of the proposed development. The only potential impacts are indirect impacts through the reduction of food sources. There will be an increase in nutrients in the vicinity of the outfall point, however, modelling results show that the increase will not have a significant impact on the receiving water outside of the mixing zone and that receiving water will meet the criteria for "Good Status". There will be no significant impact to fish populations or any other aquatic species eaten by seals due to changes in water quality.

### 5.2.3. Cetaceans

There will be no direct impacts on cetaceans as a result of the proposed development. The only potential impacts are indirect impacts through the reduction of food source. As described in Section 5.1 and Section 5.3 there will be no significant changes to fish population within Dublin Bay as a result of increases in nutrients in the vicinity of the outfall discharge location. There will be no significant impacts to cetaceans in Dublin Bay as a result of the proposed development.

### 5.3. Priority Objective: o) Other fisheries; protection of other existing fisheries in the Plan area.

Construction of the long sea outfall will involve tunnelling under the sea. Disruption during construction will be minimal and the loss of habitat is considered insignificant. There will be insignificant amounts of suspended solids in the water during the construction of the seaward opening of the tunnel and as such impacts such as reduced light penetration and increased siltation of the seabed will not occur.

Organic enrichment can result in changes in the abundance, biomass and diversity of soft-bottom and plankton communities (Pearson & Rosenberg 1978). Organic and inorganic contaminants in waste water can also bioaccumulate in soft-bottom species. Furthermore, as many demersal fish feed on soft-bottom organisms the trophic interactions between these communities may be altered. These trophic interactions are also partly responsible for the bioaccumulation of contaminants in the tissues of fish (Otway *et al.* 1996). Nutrient enrichment of surrounding waters can affect the distribution and abundance of larval fish. However, the degree of water deterioration will depend on the level of treatment and the quality of the effluents.

The treated effluent will not result in a significant deterioration of water quality in the bay. There will be a change in nutrient levels in the immediate vicinity of the outfall, however this is not expected to have an impact on the levels of dissolved oxygen in the water or result in an increase in biological oxygen demand.

## 6. CONCLUSIONS

The discharge from the proposed long sea outfall (Option 3 or Option 4) from the Ringsend Wastewater Treatment Works will result in a change in water quality in the vicinity of the outfall. The quality of treated effluent discharging from the WwTW will comply with the Urban Wastewater Treatment Regulations S.I. No. 254/2001. Modelling of the outfall options for the impact on DIN and MRP concentrations in the receiving water has shown that even for extreme conditions where over 2.4 time the DWF is discharged for a period of 15 days that the receiving water will remain at good status and meet the environmental quality objectives for coastal water nutrients as set out under the Water Framework Directive.

Overall there is no evidence that the current discharge from Ringsend WwTW is resulting in a significant impact on the ecology in Dublin Bay. The removal of the discharge from the Liffey Estuary will ensure that excessive dissolved oxygen deficits do not occur in the waters of the Liffey Estuary as a result of the WwTW, and that the dissolved oxygen standards are met; thereby protecting migratory fish.

Effluent discharging from the long sea outfall will be treated to the same standards as the existing effluent discharging to the Liffey Estuary. Due to the location of the two proposed outfalls, the quality of effluent discharging and the location and distribution of the modelled plumes (treated effluent) there are no significant impacts predicted to fish populations within Dublin Bay and adjacent waters as a result of discharge from either outfall. Birds and mammals, occurring in Dublin Bay, which are dependent on fish as a food source will not be affected by the proposed development. There will be no significant impacts to the ecology of Dublin Bay as a result of the proposed long sea outfall and therefore there will be no implications for the Priority Objectives listed in the Dublin Bay Water Quality Management Plan.

## 7. REFERENCES

- Atalah J, Farrell ED, Fitch JE, Chopelet J, Coughlan J, Coscia I (in preparation) Offshore sandbanks and offshore wind farms: diversity and functioning of demersal and benthic assemblages.
- Aztec Management Consultants (2001) An ecological study of the River Liffey for the proposed bridge linking Guild Street and Macken Street. Unpublished report.
- Bender EA, Case TJ, Gilpin ME (1984) Perturbation Experiments in Community Ecology: Theory and Practice. Ecology 65:1-13
- Berrow, S. (2008). Cetaceans biodiversity in Ireland. Cetacean soup: Chowder or Concumee? <http://www.iwdg.ie>
- Brander K (1981) Disappearance of Common Skate Raia-Batis from Irish Sea. Nature 290:48-49
- CFB (2008) Wild salmon and sea trout statistics 2005. Central Fisheries Board. Internet publication: <http://www.cfb.ie/pdf/salmstat05.pdf> (Cited 27th November 2009).
- Council of the European Communities (1992) Council Directive of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (92/43/EEC). Official Journal of the European Communities L206/35
- Council of the European Communities (2006) Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life. Official Journal of the European Communities L 264/20
- Cronin, M., Duck, C., O Cadhla, O., Nairn R, Strong, D. & O'Keeffe, C. (2004). Harbour seal population assessment in the Republic of Ireland: August 2003: Irish Wildlife Manuals, No. 11. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government
- Dowley, A., Qiang, Z. (1991). Dublin Bay water quality management plan. Dublin City Council. Environmental Research Unit Dublin .
- Dunn M.R, Pawson MG (2002) The stock structure and migrations of plaice populations on the west coast of England and Wales. J Fish Biol 61:360-393
- EcoServe (2008a) Dublin Eastern Bypass – Marine Ecology Report, Prepared for Biosphere Environmental Services Ltd, Dublin
- EcoServe (2008b) Dublin Waste-to-Energy fish survey baseline study: 2nd survey, Dublin
- EcoServe (2009) A freshwater and estuarine ecological study of the Grand Canal Docks and River Liffey for the proposed extension of the stormwater outfall into the River Liffey – Routes A and B, Prepared for Barry & Partners Consulting Engineers, Dublin
- Ellis JR, Dulvy NK, Jennings S, Parker-Humphreys M, Rogers SI (2005) Assessing the status of demersal elasmobranchs in UK waters: a review. J Mar Biol Assoc U K 85:1025-1047
- ERFB (2008) Preliminary Synopsis of the WFD Surveillance Monitoring Fish Stock Survey at selected Transitional Waterbodies in the Eastern Regional Fisheries Board, September 2008



- Johnston CM, Turnbull CG, Tasker ML (2002) Natura 2000 in UK offshore Waters: advice to support the implementation of the EC Habitats and Birds Directives in UK offshore waters, JNCC Report No. 325.
- Jovanovic B, Longmore C, O'Leary Á, Mariani S (2007) Fish community structure and distribution in a macro-tidal inshore habitat in the Irish Sea. *Estuarine, Coastal and Shelf Science* 75:135-142
- Kaiser MJ, Bergmann M, Hinz H, Galanidi M, Shucksmith R, Rees EIS, Darbyshire T, Ramsay K (2004) Demersal fish and epifauna associated with sandbank habitats. *Estuarine, Coastal and Shelf Science* 60:445-456
- Langford TE (1990) Ecological effects of thermal discharges, Vol. Elsevier Applied Science Publishers, New York
- Lyons, D. O. (2004). Summary of National Parks and Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003: Irish Wildlife Manuals, No. 13. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government
- Madden, B. 1997. Black guillemots breeding at Dun Laoghaire Co. Dublin. *Irish East Coast Bird Report 1996*: 83-84.
- Mackie ASY, Oliver, P.G. & Rees, E.I.S. (1995) Benthic biodiversity in the southern Irish Sea. *Studies in Marine Biodiversity and Systematics from the National Museum of Wales BIOMOR Reports* 1:1-236
- Marine Institute (2008) The Stock Book. Report to the Minister for Agriculture, Fisheries and Food Annual Review of Fish Stocks in 2008 with Management Advice for 2009. <http://www.marine.ie/NR/rdonlyres/7B67DD30-4D1F-4F7F-9A26-D6058D1D9D98/0/TheStockBook2008.pdf> (cited 27th November 2009).
- Merne, O.J. 1988. Recent changes in breeding seabird populations in counties Dublin and Wicklow. *Irish East Coast Bird Report 1987*: 69-77.
- Merne, O.J. 2004. Common and Arctic Terns breeding in Dublin Port, Co. Dublin, 1995-2003. *Irish Birds* 7: 369-374.
- Merne, O.J., Madden, B., Archer, E. and Porter, B. 2008. Autumn roosting by terns in south Dublin Bay. *Irish Birds* 8: 335-310.
- Nash RDM, Geffen AJ (2000) The influence of nursery ground processes in the determination of year-class strength in juvenile plaice *Pleuronectes platessa* L. in Port Erin Bay, Irish Sea. *Journal of Sea Research* 44:101-110
- Nash RDM, Witthames PR, Pawson M, Alesworth E (2000) Regional variability in the dynamics of reproduction and growth of Irish Sea plaice, *Pleuronectes platessa* L. *Journal of Sea Research* 44:55-64.
- Newton, S.F. and Crowe, O. 1999. Kish Bank: a preliminary assessment of its ornithological importance. *BirdWatch Ireland Conservation Report No. 99/8*. BirdWatch Ireland. Monkstown. Dublin.
- Newton, S.F. and Crowe, O. 2000. *Roseate Terns – The natural connection*. Maritime Ireland/Wales INTERREG Report no. 2. Marine Institute. Dublin.
- Otway NM, Sullings DJ, Lenehan NW (1996) Trophically-based assessment of the impacts of deepwater sewage disposal on a demersal fish community. *Environmental Biology of Fishes* 46:167-183

- Pearson TH, Rosenberg R (1978) Macrobenthic Succession in relation to Organic Enrichment and Pollution of the Marine Environment. *Oceanogr. Mar. Biol. Ann. Rev.* 16: 229-311. *Oceanography and Marine Biology: An Annual Review* 16:229-311
- Poole WR, Byrne CJ, Dillane MG, Whelan KF (2002) The Irish sea trout enhancement programme: a review of the broodstock and ova production programmes. *Fisheries Management and Ecology* 9:315-328
- Reid, J.B., Evans, P.G.H., Northridge, S.P. (2003). *Atlas of Cetacean Distribution in North-west European waters*, JNCC, Petersborough.
- Underwood AJ, Fairweather PG (1989) Supply-side ecology and benthic marine assemblages. *Trends Ecol Evol* 4:16-20
- Wilson JG (1990) Studies of macrozoobenthos in Dublin Bay. *Coastal Benthic Ecology Activity Report 1988 - 1991 Coast* 647:269
- Wilson JG, Parkes A (1998) Network analysis of the energy flow through the Dublin Bay ecosystem. *Biology and Environment: Proceedings of the Royal Irish Academy* 98B:179-190
- 

*For inspection purposes only.  
Consent of copyright owner required for any other use.*