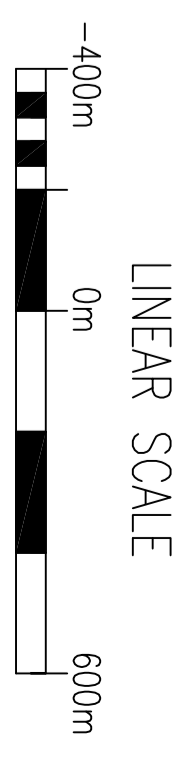
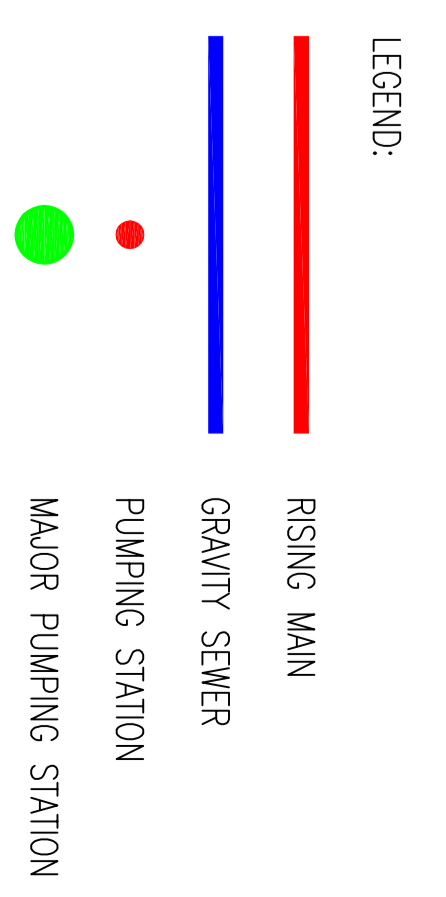


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Client: **CORK COUNTY COUNCIL**
 Title: **APPENDIX 1.C
CORK HARBOUR
MAIN DRAINAGE SCHEME
HARBOUR OVERVIEW -
PROPOSED SYSTEM**

Designed	Eng. Chk.	Of Engrg.
Drawn	S. T. H. / J. M.	Approved
Scale 1:1000	Project: 234541	Status: FIG
Drawn by: N.T.S.	CD Ref: 5670693	For: A

Appendix 2A

Terrestrial and Marine Ecology Report

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**Cork Harbour Main Drainage Scheme
Environmental Impact Assessment
Flora and Fauna**



January 7th 2008 (Final)

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EXECUTIVE SUMMARY

Cork County Council is proposing to upgrade the existing drainage network of the Cork Harbour Main Drainage Scheme to modern standards and to expand the network in order to cater for the future needs of the area. This section of the EIS outlines the potential impacts of this development on ecology. Both positive and negative impacts on ecology could occur as a result of the construction and operation of this scheme. For example, the scheme is designed to bring about positive impacts on water quality in Cork harbour and this would have indirect benefits for marine flora and fauna. Active raw sewage outfalls in the proposed development area currently release an estimated 7,515 m³ raw sewage into Cork Harbour daily. This results in reduced water quality, algal blooms that can cause shellfish poisoning, reduced marine diversity and public safety concerns. Negative impacts could occur in areas where construction works are required. However, these impacts can generally be mitigated and would be short-term in nature.

The proposed development would collect raw sewage and intercept numerous storm water outfalls, before treating collected sewage to a secondary level at a proposed new wastewater treatment facility near Carrigaline. The treated wastewater would be discharged inside the mouth of Cork harbour through the existing IDA outfall. Most of the proposed pipe network follows existing roads and disruption of terrestrial habitats would be minimal. One part of the pipeline would cross the River Lee west channel but this area is not biologically diverse and is frequently disturbed by ferry crossings. Use of a hydrodynamic dispersion model found that significant reductions in polluting substances would be realised throughout Cork Harbour following completion and operation of the proposed development. Subsequently, the ecological status of the marine environment would be raised, with beneficial impacts for the affected National Heritage Areas (NHA's) and Special Protection Area (SPA).

The current study was carried to provide baseline information on the ecological status of the study area and assessed both terrestrial and aquatic (marine and estuarine) ecology. This was undertaken through reviewing existing information of the harbour and consulting with numerous state agencies, NGO's and others. An extensive field sampling programme was also undertaken during June 2007. The desktop review was carried out to identify features of ecological importance within the study area and surrounding region. A hydrodynamic dispersion model formulated by the Civil and Environmental Engineering Department of the University College Cork was also consulted to assess the likely change in water quality and resulting ecological impacts of the proposed development.

Field survey work comprised a walk over study of the proposed WWTP site, pump stations and collection system, and adjacent marine / estuarine areas. All sightings and signs of fauna were recorded. A Phase 1 habitat survey of the study area was conducted using recognised standard methods, and habitats of conservation concern were classified and mapped accordingly. The results of the habitat survey were evaluated to determine the significance of identified habitats. The marine field survey comprised of standard quadrat, core and grab sampling in areas of soft sediment, mixed substrates and underwater, respectively. Survey work was undertaken from the shore at low tide and also from a hired charter boat. The organisms found were identified and used to gain an understanding of the ecosystems that could be affected by the proposed development. The means of assessing impact significance was based on the Institute of Ecological and Environmental Management draft guidelines on Ecological Impact Assessment.

The proposed development area includes a number of designated areas. Some sections of the proposed development are alongside the Cork Harbour SPA for birds, mainly adjacent to mudflats at Carrigaline and Monkstown. Proposed works associated with the development are also located within 2km of the Great Island channel Special Area of Conservation (SAC) (Site Code: 0001058), designated for the presence of the Annex I habitats; mudflats and Atlantic salt meadows. However, the proposed pipeline would mainly follow the course of existing roads that already form the border of the local protected areas. In addition, the proposed pumping stations would be on artificial surfaces and amenity grassland, areas of low ecological value. Some of the proposed pipeline routes and pump stations are adjacent to

the Annex I listed habitats estuaries/large shallow inlets and bays, which are of international importance. Again, these habitats are adjacent to existing roads and also comprise the SPA.

Terrestrial habitats affected by the proposed development would be improved agricultural grassland, hedgerows, mixed broadleaved woodland, treelines, arable crops, tilled land, stone walls, grassy verges, ornamental / non native shrubs, artificial surfaces, spoil and bare ground. Of these, hedgerows and mixed broadleaved woodland are of high local ecological importance while the remainder are either of local ecological importance or of little ecological significance. However, a large proportion of the pipeline routes would follow the paths of existing roads, or existing hard artificial surfaces. Protected terrestrial mammals that occur within the study area include badgers, bats, otters, hedgehogs, pygmy shrews, and Irish hares. A number of protected marine mammal species also use Cork Harbour. However, the proposed development is not predicted to have a significant impact on any mammal species.

The potentially affected environment of Cork Harbour is a large, sheltered bay system, with several river estuaries including those of the Lee, Douglas and Owenacurra. Due to inputs of freshwater, the mixing of different waters gives rise to complex sedimentological and biological processes and patterns. Brackish water habitats typically have impoverished fauna due to fluctuations in salinity and water levels and Cork Harbour follows this trend. A variety of shore types occur within the study area, all being influenced by a range of factors including particle sizes, anoxic layer depths, re-suspension of sediments and suspended particles, currents, waves and freshwater inputs. Different shoreline types were inhabited by organisms suited to the environmental conditions provided by those shores. For example some sites around the ferry crossing had large numbers of mussels and a reduced diversity of organisms. This area is disturbed on a daily basis by the movements of the ferry between Cobh and the mainland, and tidal currents. Towards the mouth of the harbour, the shores and related fauna were more exposed and consist mainly of snails, small mussels, anemones, keelworms, green shore crabs and barnacles. The outer part of the harbour was more diverse, and habitats were of a marine nature as opposed to estuarine. Only one macroinvertebrate species – estuary ragworm – was found near the current IDA outfall in sub littoral mixed sediment during the grab sampling. Typical of the estuarine shores deeper within the harbour the benthic community was dominated by ragworms, catworms and *Corophium*. The prevalence of the ragworm on muddy shores was indicative of pollution. All of the sites examined during the current survey had a poor benthic community diversity. Cork Harbour is important as a nursery area for marine fish, however trawling within the harbour still takes place. Cork harbour also provides passage for migratory salmon, lampreys and European eels and is important for aquaculture.

According to the EPA, water quality in Cork Harbour is only moderate and is reflected by growths of *Enteromorpha* and *Ulva*. However, Lough Mahon (inner part of harbour) has recovered somewhat since the cessation of untreated sewage discharges into the Lee Estuary and Lough Mahon as part of previous phase of the Cork Main Drainage Project. The current project aims to bring similar benefits to the lower harbour area. High nutrient levels in the harbour have been linked to the occurrence of algal blooms in which certain species of phytoplankton reach very high densities, release toxins and contaminate shellfish. The most recent documented episode of contamination was in 2005 when Paralytic Shellfish Poisoning (PSP) showed up during a Marine Institute monitoring programme. Three locations in Cork Harbour are listed as Class 'B' Bivalve Mollusc Production Areas for shellfish, but were closed for a period during 2005 following an algal bloom affecting mussels. Algal mat growths, indicative of pollution, were recorded on some mudflats in the current survey adjacent to untreated sewage outfalls. Associated anoxic conditions (oxygen deprivation) were also recorded in the sediments at these locations.

Construction works associated with the proposed scheme would involve typical construction activities such as excavation, filling, lifting, pumping, pipe laying, concrete works and mechanical installation. The construction phase for the wastewater treatment plant is likely to extend over a two-year period on the site of WWTW. This site consists of portions of two agricultural fields that have already been zoned for a waste water treatment plant. The discharge standards which shall apply to the proposed wastewater treatment plant are 25

mg/l for Biochemical Oxygen Demand (BOD), 35 mg/l for total suspended solids and 125 mg/l for chemical oxygen demand (COD). The fact that treated effluent would be discharged just inside the mouth of the harbour would increase the dilution rate. Potential exists through the operation of the proposed WWTP that an accidental pollution episode may affect water quality in the receiving waters. This could affect water quality and consequently fish and other aquatic life. However, the risk of such an event happening with the proposed WWTP scheme would be much lower than is currently the case. Water quality in sections of Cork Harbour would be monitored periodically during the construction phase to confirm that no impact on water quality occurs.

As construction works will take place near and within the boundary of the Cork Harbour SPA / Owenboy River NHA / Monkstown Creek NHA, there is potential for direct negative impacts on these internationally and nationally important sites to occur during the construction and operation of the proposed scheme. Construction works mainly due to excavation of the foreshore areas are likely to deter birds from using the affected areas due to physical intrusion and indirect effects such as noise. However the extent of such areas is relatively limited and the degree of disturbance will be reduced as far as possible. Reinstatement of habitats along the pipeline footprint would ensure that such impacts were short-term in nature only. Currently, traffic on roads around these areas is constant and fauna would be expected to be accustomed to some degree of background noise levels. Regular construction impacts could occur as a result of the release of suspended solids and contaminated runoff / deleterious substances into nearby estuarine areas. However, such potential impacts can generally be avoided with careful site management and appropriate timing of the proposed works. The placement of a pipeline across the River Lee west channel would not change the ecology of the wider environment in this area, as this area is already subjected to variable conditions and daily disturbance by the ferry.

Despite the predicted increase in population in the study area, the operation of the proposed development would enhance water quality in Cork Harbour. This would happen via interception of current raw sewage outfalls at various shores, secondary treatment of same, and release of treated effluent to an existing outfall in an area where dispersion rates would ensure lower concentrations of potentially harmful substances. Improved water quality would be expected to lead to an increase in diversity of organisms as well as reducing the incidence of algal blooms and shellfish poisoning. Furthermore, the overall conservation value of Cork Harbour would be expected to improve as a result of the scheme. During the operation of the plant, the treated discharge and adjoining areas of Cork Harbour would be monitored regularly and would include parameters such as suspended solids, heavy metals, organics, coliforms and faecal coliforms. The monitoring regime would be agreed in advance with Cork County Council, EPA, NPWS, SWRFB and the other relevant agencies. The fifth schedule of the *Urban Waste Water Treatment Regulations* would stipulate the monitoring requirements for this plant.

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3.2.1 INTRODUCTION

Cork County Council are proposing to construct a new urban wastewater treatment plant (WWTP) for Cork Harbour Lower. This plant would form an integral part of the Cork Harbour Main Drainage Scheme. Currently, the wastewater from the population centres in the drainage scheme is not treated and is discharged directly to the Lower Harbour. This is having a negative effect on water quality in the harbour. It is expected that the new plant would bring significant benefits to the ecology and water quality of the harbour.

The Cork Harbour Main Drainage Scheme involves upgrading the existing sewerage system of Cork Lower Harbour and environs together with the provision of a secondary wastewater treatment plant. Under the proposed scheme it is expected that wastewater and stormwater collection will be separated as far as possible. The population centres within the Cork Lower Harbour Drainage Scheme include Carrigaline, Ringaskiddy, Shanbally, Coolmore, Cobh, Monkstown/Passage West and Crosshaven.

A single WWTP at a site located to the east of Carrigaline near the townland of Shanbally is proposed. Sewage from Cobh would be pumped across the Harbour to Monkstown, from where the combined Passage West, Cobh and Monkstown flows would be pumped to the WWTP. Wastewater from Crosshaven and Carrigaline would be pumped via the existing rising mains to the WWTP. The treated effluent would be pumped to the existing Ringaskiddy outfall. The only marine work required would be a Cobh to Monkstown marine crossing. The proposed WWTP for the Cork Lower Harbour area is to be located at a site east of Carrigaline near the townland of Shanbally. This green field site has an area of approximately 7.36 hectares.

Although the scheme has the potential to have positive impacts, significant negative impacts could occur in the absence of suitable mitigation. The proposed storm water outfalls and the treated effluent outfall pipe all lay within the boundary of the Cork Harbour Special Protection Area (SPA). Pipelines associated with the proposal would also have the potential to impact on Monkstown creek NHA and the Owenboy River NHA. Potential impacts associated with the construction phase of the scheme would include habitat loss and the types of pollution and disturbance impacts associated with construction sites. Potential impacts during the operational phase of the scheme would be related to effects on water quality and general impacts due to maintenance requirements. However, with the mitigation measures proposed many of the potential impacts of the scheme can be avoided and the scheme will ensure that the water quality and conservation status of the affected designated areas is maintained while facilitating sustainable development in the lower Cork Harbour area. The proposed development would allow existing untreated effluent outfalls to be replaced with treated outfalls therefore the development should facilitate an improvement in water quality once operational.

This study was carried out with reference as applicable to the Environmental Protection Agency's (EPA) 'Guidelines on the Information to be Contained in Environmental Impact Statements' (March, 2002) and Advice Notes on Current Practice (EPA, 2003), the Institute of Environmental Assessment's 'Guidelines for Baseline Ecological Assessment' (1995), along with experience of 'best practice' in the ecological assessment. Preparation of this section included consultation with:

- National Parks and Wildlife Service (NPWS);
- Environmental Protection Agency (EPA);
- Cork County Council (Cork Co. Co.);
- Botanical Society of the British Isles (BSBI);
- South Western Regional Fisheries Board (SWRFB);
- Department of Communications, Marine and Natural Resources (DCMNR);
- Marine Institute (MI);
- Bat Conservation Ireland (BCI);
- BirdWatch Ireland (BWI);
- Irish Whale and Dolphin Group (IWDG);

- National Roads Authority (NRA);

This report was prepared by Ecofact Environmental Consultants Ltd. on behalf of Mott McDonald Pettit Consulting Engineers.

3.2.1.1 Cork Harbour

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Owenboy, Douglas and Owenacurra. It is connected to the Atlantic Ocean by a narrow inlet between Roche's Point and Crosshaven, at the south of the harbour. The River Lee which flows through Cork City enters the harbour at the north-west, via the West-Passage. The Owenboy River flows through Carrigaline, to the south-east of Cork city, and enters the harbour at Crosshaven, to the south-west of the harbour.

Cork Harbour has a surface water area of around 100km² and is a large, sheltered, naturally deepwater harbour. Strong estuarine influences dominate the upper reaches of the harbour in particular. The coastline is mixed, consisting of built infrastructure, shallow cliffs, intertidal mudflats, reedbeds, shingle and rocky foreshores, which are exposed by the tide. The mean range spring and neap tide variations throughout the Harbour are as follows (Source: Cork County Council);

Table 1 Tides in Cork Harbour.

	Mean Spring Tides	Mean Neap Tides
Cork	3.93m	2.16m
Passage East	3.72m	2.04m
Cobh	3.70m	2.00m

The bathymetry of the Harbour reflects the morphology of the coastline, with gentle slopes dropping to a depth of 28m near the mouth of the harbour (11m in the channel which is maintained at that depth for navigation). Riverine inputs originate from the Lee, the Owenacurra, the Glashboy and the Owenabue. Freshwater inputs from the Lee are controlled by the ESB dam upstream at Inniscarra. Nutrient loading is primarily from non-point agricultural sources distributed throughout the catchment, but primarily in the upper reaches of the Lee estuary (Source: Cork County Council). Point source discharges have been reduced by the recent Cork Main Drainage Scheme.

Cork Harbour is an important sea port and shipping area. It is an important site for the pharmaceutical and chemical industries, particularly the areas of Ringaskiddy and Little Island in the west and north-west of the area. Also a major oil refinery is located in the east of the harbour, while on Haulbowline Island there is a naval base. Cobh is important for fishing, tourism and recreation with many pleasure boaters and water sports enthusiasts using the harbour (Source: Cork County Council).

The north of the harbour, including the waterfront areas of Cobh is underlain by carboniferous limestone. To the south of this, encompassing Spike Island is an area of shales and sandstones while to the south of the harbour a band of old red sandstones extends across the mouth of the harbour through Crosshaven and Roche's Point. Owing to the sheltered conditions, the inter-tidal flats are often muddy in character (King, 2002).

Rapid industrialisation in the Cork Harbour area along with increased population growth has led to increased vulnerability to pollution in the harbour, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. A study by the Environmental Protection Agency from 1999 to 2003 sampled water in the Lee river, Lee estuary, Lough Mahon, Owenacurra river, Owenacurra estuary, the North Channel of Great Island and in Cork Harbour. Nutrient enrichment was measured as Dissolved Inorganic Nitrogen (DIN) and orthophosphate (MPR) while undesirable disturbance was measured as

percentage saturation of Dissolved Oxygen (DO). The results of this survey are provided in Table 2.

Table 2 Assessment of the trophic status of the main water bodies of Cork Harbour 1999 – 2003. C: Compliant, B: Breach; U: Unpolluted, I: Intermediate, E: Eutrophic (adapted from Toner *et al*, 2005).

Water Body	Chl a ($\mu\text{g/L}$)(Summer)				DO (%) (Summer)				
	Median		90%ile		5%ile		95%ile		
Lee River	6.7	C	10.4	C	84	C	114	C	U
Lee Estuary	4.6	C	15.4	C	31	B	109	C	I
Lough Mahon	5.6	C	23.8	B	62	B	114	C	E
Owenacurra River	6.7	C	10.4	C	84	C	114	C	I
Owenacurra Estuary	8.4	C	35.9	B	80	C	134	B	E
North Channel Great Island	7.3	C	29.3	B	89	C	123	B	I
Cork Harbour	4.5	C	12.9	C	89	C	112	C	I

Water Body	Salinity				DIN (mg/l N^2)				MRP ($\mu\text{g/L P}$)			
	Winter	n	Summer	n	Winter		Summer		Winter		Summer	
Lee River	0.1	44	0.1	79	2.4	C	1.8	C	30	C	18	C
Lee Estuary	0	7	8.2	165	3.1	B	1.9	C	15	C	45	C
Lough Mahon	23.6	9	30.7	135	1.4	B	0.4	C	14	C	28	C
Owenacurra River	0.1	24	0	20	6.6	B	6.2	B	32	C	59	B
Owenacurra Estuary	11.6	2	17.6	51	2.2	B	1.3	C	14	C	18	C
North Channel Great Island		0	31.6	45			0.2	C			11	C
Cork Harbour	21.6	2	34	71	2.5	B	0	C	7	C	5	C