YOUGHAL URBAN DISTRICT COUNCIL

YOUGHAL MAIN DRAINAGE SCHEME

ENVIRONMENTAL IMPACT STATEMENT

Volume 2.

Main Report

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Volume 2. Main Report

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		ATKINS McCARTHY				

Atkins McCarthy,
Consulting Engineers,
Villa Franca,
Douglas Road,
Cork.
Tel: 021-4290300
Fax: 021-4293527
E-mail: cork@atkinsmccarthy.ie

Youghal Urban District Council,
Town Hall,
Youghal,
Co. Cork.

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1 INTRODUCTION

1.1 Environmental Impact Statement

This Environmental Impact Statement was commissioned by Youghal Urban District Council in June 1999 for the Youghal Main Drainage Scheme, in accordance the EU Directive on Environmental Impact Assessment (85/337/EEC) and with the requirements of the Environmental Impact Assessment Regulations 1989 to 1998 and the Local Government (Planning and Development) Regulations 1994 to 2000.

The EIS structure is based on "Advice notes on current practice in the preparation of Environmental Impact Statements" published by the Environmental Protection Agency (1995). The Report is presented in three Volumes. Volume 1 consists of a Non-Technical Summary, Volume 2 the Main Report, while Technical Appendices are presented in Volume 3.

Youghal Main Drainage scheme concerns the upgrade of the existing drainage system and provision of a WWTW for Youghal Town and environs in County Cork. The EIS concerns itself with the WWTW and receiving water options only. Impacts of the associated drainage network have not been assessed and will be included in a separate public consultation process at a later stage.

In this Main Report Chapter 2 describes the scheme, the alternatives considered and project characteristics. Chapters 3-14 consist of an 'Appraisal of Environmental Effects'. These chapters will describe the existing environment, impacts of the proposed development and recommend mitigation measures where necessary. A list of chapters is outlined below:

Chapter 1 – Introduction;
Chapter 2 – Description of Proposed Scheme and Alternatives;
Chapter 3 – Human Beings;
Chapter 4 – Flora and Fauna;
Chapter 5 – Marine Ecology;
Chapter 6 – Soils, Sediments and Geology;
Chapter 7 – Water;
Chapter 8 – Air (emissions, noise and odour);

Chapter 9 – Climate;
Chapter 10 – Landscape;
Chapter 11 – Material Assets;
Chapter 12 – Cultural Heritage;
Chapter 13 – Traffic;
Chapter 14 – Impacts During Construction;
Chapter 15 – Interaction of Environmental Impacts;
Chapter 16 – Conclusion;
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1.2 EIS Publication

Following completion of the E.I.S., a notice will be published in the public press advising that it has been prepared and forwarded to An Bord Pleanala for certification. This has been changed recently in the new Planning Act 2000, where the responsibility for certification of Environmental Impact Assessment on Public Sewerage Schemes has been transferred to An Bord Pleanala from the Department of Environment and Local Government.

Copies of the E.I.S. will be available for inspection during normal office hours by the public, for the period specified in the notice, at Youghal Urban District Council, Town Hall in Youghal and in the Cork County Council Offices in Cork.

Copies of the E.I.S document and of the Non-Technical Summary will be available on application to Youghal Urban District Council, Town Hall, Youghal, Co. Cork or at Cork County Council at County Hall, Cork. The Non-Technical Summary is available at a cost of £1. The main E.I.S. Report is available for purchase at a cost of IR£50. Technical Appendices accompany this E.I.S. and may be purchased at an additional IR£50.

1.3 Scope of Environmental Impact Statement

Following an environmental appraisal of a number of sites in the vicinity of Youghal, the Mudlands area to the north of the town has been selected as the most suitable for the location of the proposed wastewater treatment works for the town with a discharge of the final treated effluent to the estuary.

The scope of this environmental impact statement is to make an assessment under the specialist environmental areas outlined above to determine if such a proposal would have a significant adverse impact on the area or the receiving waters. The studies will essentially undertake an assessment of the existing environment for the specialist study area, determine any potential impacts due to the proposed works and make recommendations for mitigation of the impacts if required. They will further recommend the most suitable environmental option for the location of the works based on a selection of three sites proposed within the mudlands area or indeed recommend any other site if considered more suitable.

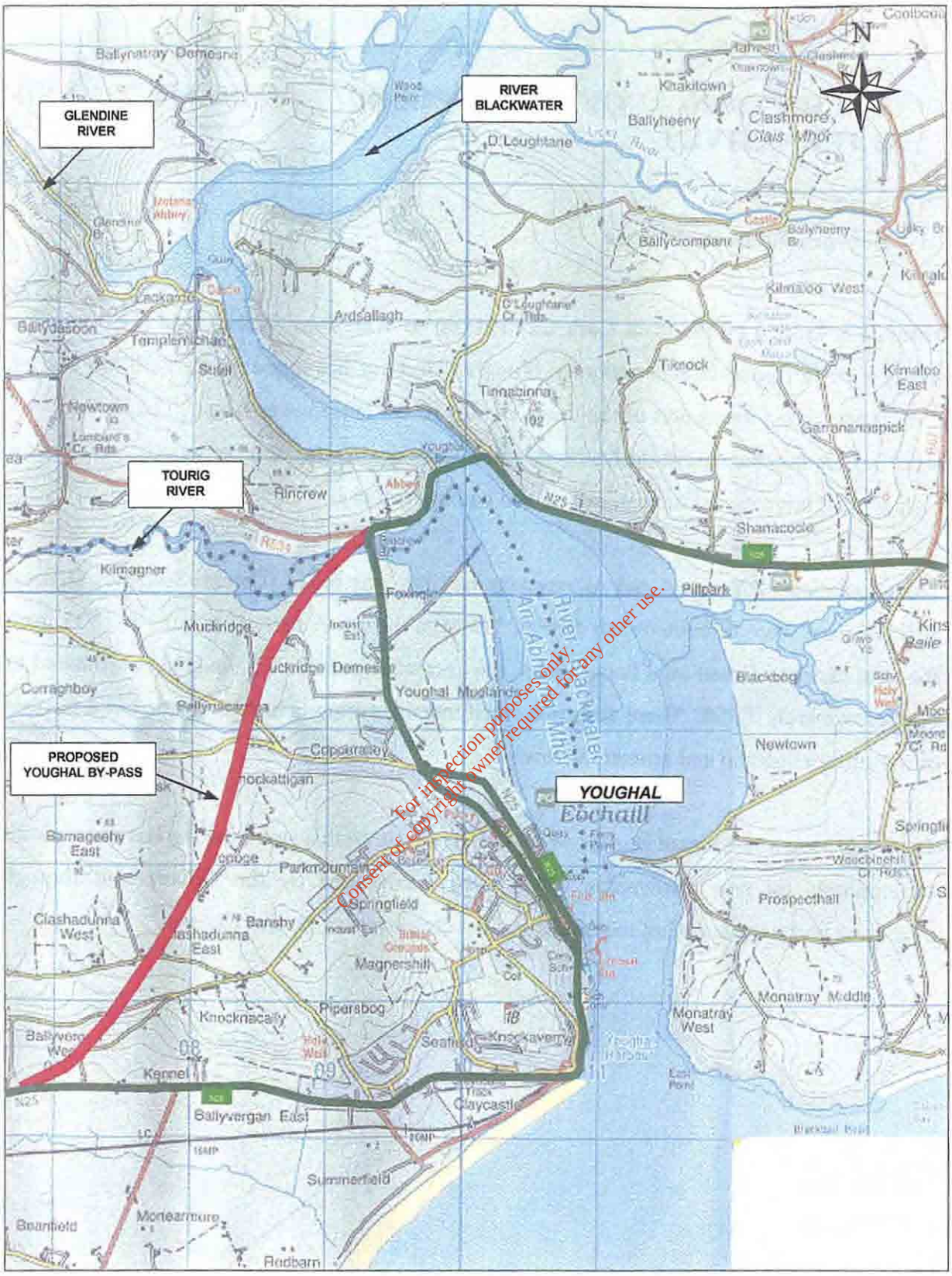
2 DESCRIPTION OF PROPOSED SCHEME AND ALTERNATIVES

2.1 Background to the Scheme

Youghal is located on the main Cork City (51km) to Waterford (72km) road (i.e. the N25) and is a port of considerable antiquity. Youghal Harbour lies approximately 30 km east of Cork Harbour and forms part of the lower estuary of the Blackwater River. The harbour and outer bay are popular tourist destinations, particularly during the summer months, and have a high level of recreational fishing, sailing and bathing activity.

The population of Youghal and its environs in 1996 was 6,674 (Central Statistics Office); 5,630 of these were from the urban district, 313 from the urban district environs and 731 from the rural district. Based on a house count, the current population of Youghal is estimated to be approximately 7,556. There are some small manufacturing industries located in a number of industrial estates in and around the town.

There has been a significant amount of development within this area over the last decade with an emphasis on new apartments which were encouraged by the Government through incentives under the tax relief mechanism of the development for Sea Resorts.



YOUGHAL TOWN AND ENVIRONS
FIGURE 2.1

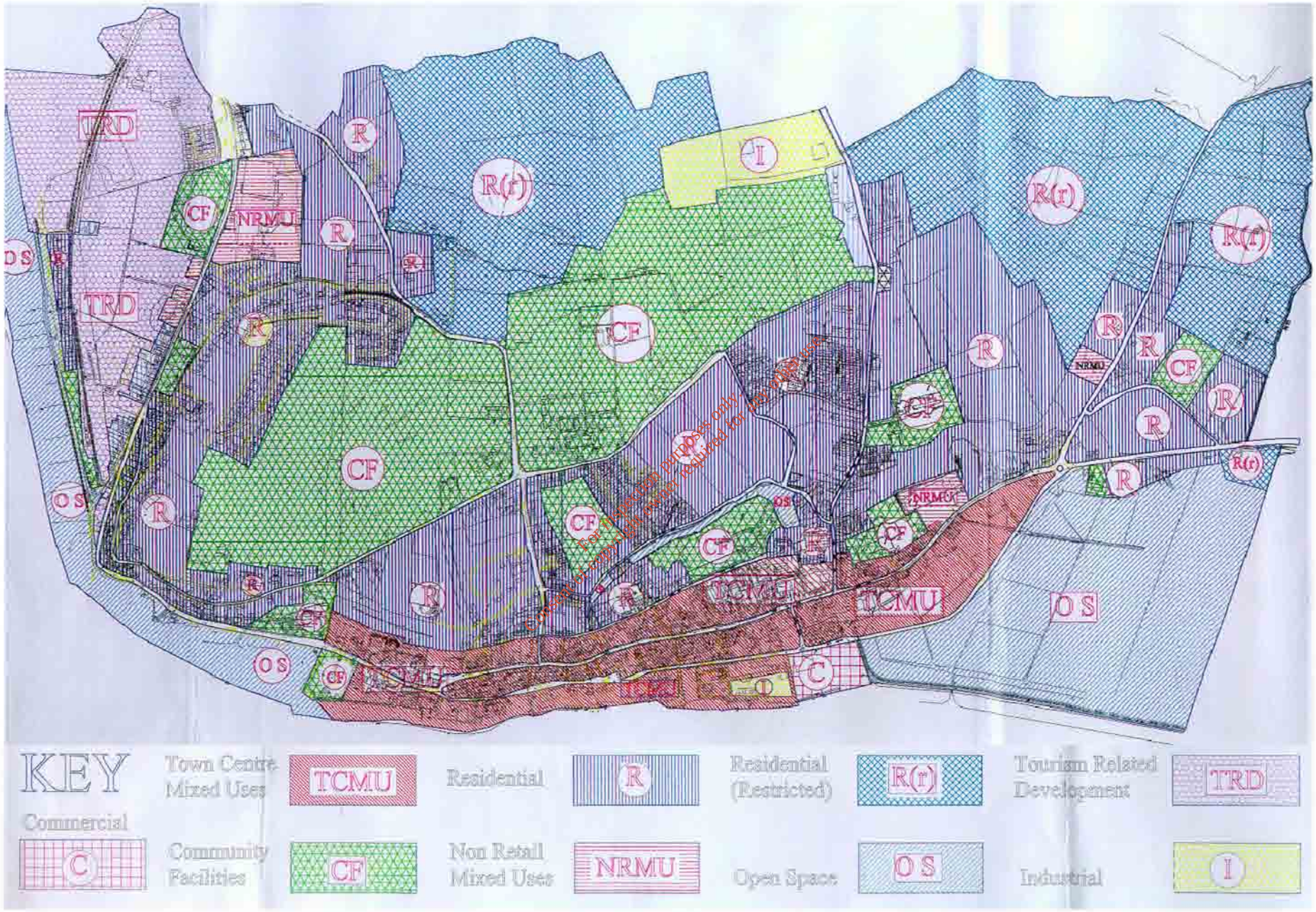
Lands within the Urban District Boundary have been zoned in the Development Plan (Youghal UDC, 1997). The majority of the lands are zoned for various forms of development including commercial, industrial and residential development. The land use zoning map for Youghal is shown in Figure 2.2.

Outside the built up areas of the town the land use is agricultural, mainly tillage and grazing. Other land uses and features in the area are:

- Special Protection Area (SPA) and Special Area of Conservation (SAC) in the Blackwater Estuary;
- SAC in the Ballyvergan Marshes road at the rear of the Claycastle Beach;
- The Mudlands to the north of the town where the landfill is located.

The mudlands are zoned as 'Open Space'. The 1999 Variation to the Development Plan states that this Open Space "may accommodate the proposed sewage treatment plant if technical studies show this to be the most suitable location".

Estimates for the preliminary design of wastewater treatment facilities for the area indicate the baseline population to be in the region of 7,600 at present. This represent approximately 72% of the total population equivalent of Youghal, with commercial, industrial, institutional and tourist sources comprising the remaining 28% giving a current population equivalent loading of 10,600 p.e. The summer to winter population fluctuates due to the seasonality of the tourist season by approximately 15 - 20%. Future growth was estimated based on population growth predicted in the Cork Area Strategic Plan 2001 - 2020 (Draft) which forms a good basis for the projections. These growth rates were used for all different sectors to reach the predicted population equivalent of approximately **20,000** p.e. for the year 2025.



YOUGHAL DEVELOPMENT PLAN, ZONING MAP

2.2 Existing Environment

2.2.1 Topography

Youghal is located on the west bank of the mouth of the River Blackwater Estuary, with the town itself steeply sloping from the high point at the west at 80.0mOD to 0.0mOD at the River. Further north of the town the lands flatten out in the vicinity of the Youghal Mudlands and the Tourig River before rising sharply again at the Blackwater / Tourig confluence with Rincrew at 80.0+mOD and confluence to the east of the Blackwater at 100.0mOD. Lands to the west of the town in the area of the Cork Road also flatten out and lead to the Ballyvergan Marshes which are a significant feature along with the long beaches from Redbarn to Moll Goggin's Corner. The lands to the north of the Cork Road are initially relatively flat and then rise sharply from 10.0m to 60.0mOD at Knocknacally.

Lands to the east of the Estuary in Co. Waterford are also steeply sloping to the River with only one or two areas (e.g. Newtown / Blackbog, Kinsalebeg) being relatively flat and at a low level (20.0-10.0mOD). The areas at the harbour mouth at East Point are also steeply sloping and very visible from the town of Youghal rising to a level of 80.0mOD.

2.2.2 Water Quality

The estuary of the Munster Blackwater extends from the limits of tidal influence at Lismore to the mouth at Youghal Harbour (at East Point), a distance of approximately 38 km. The River Blackwater is a relatively large river with a long-term mean flow rate of 80 m^3/s. There are also a number of significant tributaries, which discharge into the estuary e.g. the rivers Bride, Finisk and Likky. The estuary has a distinctive narrowing due to a shingle spit extending from the east side of the estuary known as Ferry Point. The predicted tidal range is approximately 3.5m and currents in the estuary can be strong with tidal currents at the Ferry Point varying from 0.02 – 0.89m s^{-1} (Appendix D). Data from an EPA cruise in October 1992 (Marine Institute, 1999) indicate that the estuary is well mixed.

Nutrient inputs to the estuary are dominated by riverine flows. Industrial loads in Youghal are low and are considered unlikely to contribute to the nutrient budget of the estuary (Marine Institute, 1999). In 1997, the Munster Blackwater was reported to have exported the highest load of ortho-phosphorus of all Irish rivers (Lucey *et al.,* 1999). The export load of oxidised nitrogen was found to be the fifth highest in the country in 1997 (Lucey *et al*., 1999). The EPA found other water quality parameters to be satisfactory (Lucey *et al.*, 1999) although autumn chlorophyll levels were slightly elevated in the upper part of the estuary in the November 1994 survey (range 1.3 to 11.3 mg/m^3).

Water quality in the river Blackwater and its tributaries, is generally very good. In 1997 over 82% of river water in the area was designated as Class A (unpolluted) with a further 13% designated as Class B (slightly polluted/eutrophic) (Doris *et al*, 1999). Biotic Quality Indices (which use macroinvertebrates as indicators of water quality) classified most of the River Blackwater and its Tributaries to have a Q-value of 4 or 5 (Doris *et al*, 1999; Clabby *et al*, 2001) which indicate unpolluted water. Some tributaries were slightly polluted (Q3-4) e.g. Likky River.

Just outside the harbour along the western shoreline there is a large beach, known as Youghal Main Beach and Claycastle Beach, which are designated bathing areas under the Bathing Water Regulations (76/160/EEC). The beach has been awarded Blue Flag Beach status by An Taisce, the relevant awarding authority in Ireland for a scheme organised at European level by the Foundation for Environmental Education in Europe. The beach was also awarded Blue Flag status for the past number of years. Water quality parameters were well within the mandatory values given in the Bathing Water Regulations between 1996 and 2001. Water quality parameters were also predominantly below Guide values provided in the Bathing Water Directive (76/160/EEC) and National Regulations (S.I. 155 of1992) with only 10% of samples exceeding guide values for faecal and total coliforms between 1996 and 2001. Further details are given in Chapter 7.

2.2.3 Ecology

The River Blackwater and surrounding area contain a number of important environmental designations. There are a number of "EU Habitats Directive" Annex 1 habitats (92/43/EEC) including estuaries, mudflats and sandflats, perennial vegetation of stony banks, Atlantic and Mediterranean salt meadows, floating river vegetation and old Oak woodlands (Duchas, unpublished data). There are two Special Protection Areas, designated under the EU "Birds Directive" (79/409/EEC); these are the (1) Blackwater Callows and (2) Blackwater Estuary (S.I. No. 349/1994). There are internationally important numbers of Black-tailed Godwits in the estuary and large numbers and varieties of other birds also use it. The River Blackwater also supports several "Red Data Book" plant species and "Habitats Directive" Annex II animal species such as the different Lamprey species, freshwater pearl-mussel, otter and salmon. The freshwater stretches of the Blackwater and Bride Rivers are designated salmonid rivers (78/659/EEC). Irish Red Data Book fauna found in the Blackwater River area include Pine Martin, Badger, various bat species, common frog and rare bush cricket.

There are a number of mussel-beds present in Youghal Harbour. The Harbour has not been designated under the Shellfish Waters Directive (79/923/EEC). The bay area outside the estuary from Knockadoon Head to Knockavery was designated as a Class B production area under the EU Directive "laying down the health conditions for the production and the placing on the market of live bivalve molluscs" (91/492/EEC) up until 2000, but the area was not designated in the 2001 Regulations. Under these Regulations, purification is required in an approved plant for 48 hours prior to sale for human consumption.. Shellfish within the designated waters complied with standards in recent years (Marine Institute, 1999). It is possible that the area may be re-designated in future years.

2.3 Need for Scheme

2.3.1 Existing Youghal Sewerage System

There is currently no wastewater treatment other than a holding tank and comminutors on the Green's Quay and Paxe's Lane outfalls. Table 2.1 shows existing outfall conditions.

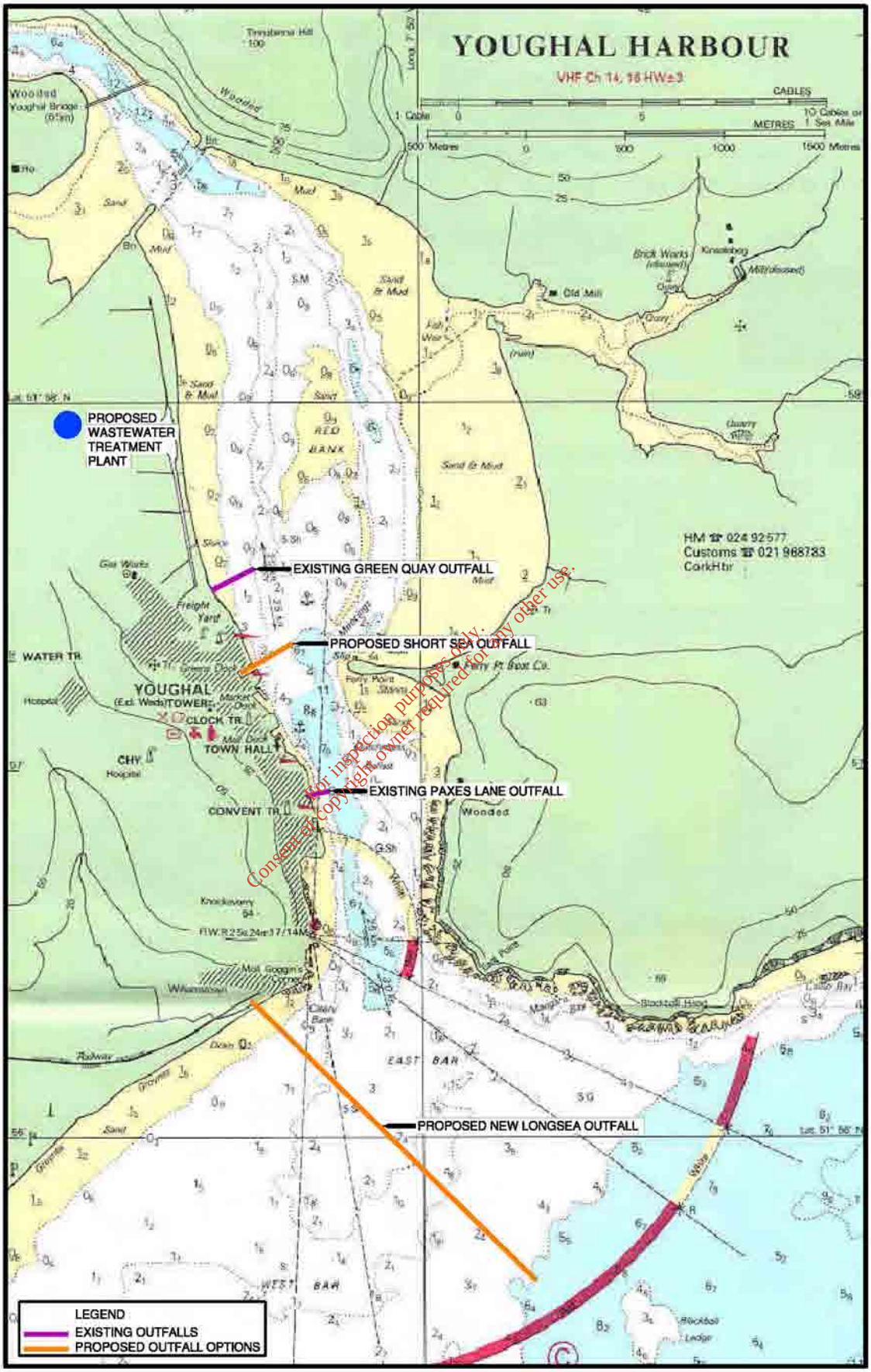
Table 2.1 – Existing and Proposed Outfall Parameters

Outfall	Distance from shoreline to discharge point (m)	Depth below MSL at discharge point (m)	Pipe Diameter (mm)	Rate of Discharge * (m^3/s)	Treatment Level
Green's Quay	50	2.2	750	0.0117	comminuted
Paxe's Lane	150	10.4	450	0.0078	comminuted

The municipal untreated raw sewage currently discharges via 2 outfalls; the Green's Quay and Paxe's Lane outfalls, while a third smaller outfall discharges effluent from the Foxhole industrial estate further upstream near the site of the old bridge. The amount of effluent discharged at the old bridge site is relatively small when compared with the town effluent.

The Green's Quay outfall discharges the northern catchment effluent, which accounts for approximately 60% of the town population while Paxe's Lane outfall discharges the southern catchment effluent, accounting for the remaining 40%. The Green's Quay outfall discharges approximately 50m offshore into water of average depth 2.2m while the Paxe's Lane outfall discharges approximately 150m offshore into the deep trench with an average depth of 10.4m. The locations of these outfalls are shown in Figure 2.3.

Water quality in the estuary is satisfactory (Lucey *et al*., 1999) (as discussed in Section 2.2.2) and discharge of raw sewage does not appear to have impaired water quality.



LOCATION OF PROPOSED W.W.T.P., EXISTING & PROPOSED OUTFALLS *FIGURE 2.3*

2.3.2 Water Quality Legislation

There is a significant amount of legislation relating to the protection and improvement of water quality. The legislation as it impacts on wastewater treatment is as follows:

1. **Framework Directive (2000/60/EC)** is recent legislation on water quality and come into effect in December 2000 and regulations giving effect to the directive will require to come into force by December 2003.
2. **Urban Waste Water Treatment Directive** (91/271/EEC) as implemented by S.I. No. 254 (2001) **Urban Waste Water Treatment Regulations, 2001**. (Note that Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 1994 (S.I. 419 of 1994) and Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) (Amendment) Regulations, 1999 (S.I. 208 of 1999) have been revoked under the 2001 regulations.)
3. **Bathing Water Directive (76/160/EEC)** as implemented by S.I. 155 of 1992, S.I. No. 145, 1994, S.I. 230 of 1996 and SI No. 84, 1998.
4. **Shellfish Directive (79/923/EEC)** as implemented by S.I. 200 of 1994 (Quality of Shellfish Waters Regulations, 1994)
5. **Shellfish Production Area Directive (91/92/EEC)** as implemented by the European Communities (Live Bivalve Molluscs) (Health Conditions for Production and Placing on the Market) Regulations, 1996 to 2000.
6. **Freshwater Fish Directive (78/659/EEC)** as implemented by S.I. 293 of 1988 (European Communities [Quality of Salmonid Waters] Regulations, 1988).
7. **Surface Water Directive (75/440/EEC)** as implemented by S.I. 294 of 1989 (Quality of Surface Water Intended for the Abstraction of Drinking Water, 1989)
8. S.I. 12 of 1933 and S.I. 17 of 1992 (Foreshore Acts 1933, 1992).
9. S.I. 10 of 1996 (Waste Management Act, 1996).
10. EC Directive (86/278/EEC) as implemented by S.I. 183 of 1991 (European Communities [Use of Sewage Sludge in Agriculture] Regulations, 1991).

Not all of the above are relevant to the current Youghal scheme and the relevant legislation is discussed overleaf.

2.3.3 Framework Directive

This directive will require a more comprehensive and integrated approach to water management than heretofore. The key aims of the directive are:

- Expanding the scope of water protection to all waters including surface water, groundwater, transitional and coastal waters;
- Achieving a "Good Status" for all waters within a specified timeframe;
- Water Management based on River Basin Districts;
- "combined approach" of emission limit values and quality standards;
- More Public consultation and participation.

2.3.4 Urban Wastewater Treatment Directive

The E.U. Directive 91/271/EEC concerning urban wastewater treatment is given effect in Ireland by **Urban Wastewater Treatment Regulations, 2001 (S.I. No. 254)**.

The main requirements of the Regulations are summarised below:

- a scheduled provision of collecting systems – depending on the size of the agglomeration and on the type of water body to which waste water is discharged;
- a scheduled provision of waste water treatment plants - depending on the size of the agglomeration and on the type of water body to which waste water is discharged;
- the provision for industrial waste water which enters collecting systems and urban waste water treatment plants to receive any pre-treatment that is required to protect the health of staff, the environment and fabric of the plant; and
- the monitoring by sanitary authorities of discharges from waste water treatment plants and the transmission of results to the EPA.

With regard to industrial waste waters entering collection systems, sanitary authorities should ensure that these are licensed and that appropriate conditions have been attached to licences issued in accordance with the Water Pollution Acts such that:

- The performance of the waste water and sludge treatment plants and their operation is not adversely affected;
- The resultant sludge can be beneficially reused, if required, and
- The receiving waters are not adversely affected.

The UWWT Regulation (2001) requires that **secondary treatment** be provided by the Sanitary Authority (Clause 4 (1))for:

1. all discharges for agglomerations 15,000 p.e. or more by December 2005 *(Clauses 4 (1) (a))*
2. all discharges from agglomerations from 10,000 – 15,000 pe by December 2005. *(Clauses 4 (1) (b))*
3. All discharges to *freshwaters and estuaries* for agglomerations from 2,000-10,000pe by December 2005 *(Clauses 4 (1) (c))*
4. Secondary treatment means a biological or other process in which the requirements of Part 1 of the second schedule are respected *(definition)* (Table 2.2)

The UWWT Regulation (2001) further requires that **more stringent treatment than secondary treatment** as defined above be provided by the Sanitary Authority for all discharges into **Sensitive areas (Clause 4 (2)):**

1. from agglomerations with a population equivalent of more than 10,000 .*(Clauses 4 (2) (a))*
2. on commencement of the regulations for sensitive areas in Part 1 of the third schedule.(*Clauses 4 (2) (b) (i))*
3. by 31 May 2008 for sensitive areas in part 2 of the third schedule .*(Clauses 4 (2) (b)(ii))*

Clauses 4 (3) and 4 (4) state the following with respect to sensitive waters:

4. treatment plant discharges shall comply with the requirements of Parts 1 and 2 of the Second Schedule (see Table 2.2) *(Clause 4 (3))*
5. Clauses 4 (2) and (3) shall not apply where the sanitary authority is satisfied that minimum % reduction of the overall load to the plant in sensitive areas is at least 75% for total P and N *(Clause 4 (4)(a))*
6. Reduction of nutrients in discharges to estuaries, bays or coastal waters shall not operate where the sanitary authority is satisfied that such a reduction will have no effect on the level of eutrophication in the receiving waters. *(Clause 4 (4)(b))*

Table 2.2 – Effluent quality requirements under Second Schedule (Parts 1 & 2) of UWWT Regulations 2001

	Normal waters Part 1	Sensitive waters Part 2
BOD (mg/l)	25 (70-90)	25
COD (mg/l)	125 (75)	125
TSS (mg/l)	35 (90)	35
Total N (mg/l) (10,000-100,000 p.e.)	None	15(70-80)
(>100,000 p.e.)		10 (70-80)
Total P (mg/l) (10,000-100,000 p.e.)	None	2 (80)
(>100,000 p.e.)		1 (80)

1. **Minimum percentage reduction shown in parentheses**
2. **One or both parameters may be applied depending on the local situation**
3. **Concentration *or* % reduction values shall apply**

Secondary treatment, at a minimum, will therefore be required under clause 4(1)(b) and effluent concentrations in the discharge shall comply with Part 1 of the second schedule irrespective of discharge location or agglomeration size.

2.3.5 Bathing Water Directive

The purpose of the Directive (76/160/EEC) as implemented by S.I. 155 of 1992, S.I. 145 of 1994 and S.I. 230 of 1996 (Quality of Bathing Water Regulations, 1992, amended 1994 and 1996) is to ensure that bathing water quality is maintained and if necessary improved so that it complies with specific standards designed to protect public health and the environment. The Regulations apply only to designated waters as set out in Second schedule (Clause 3.1). The main beach and Claycastle beach at Youghal are both designated bathing waters under the regulations.

There are also some popular bathing water areas within the estuary in some of the coves and harbours but these have not been designated and therefore bathing water standards at these locations are not mandatory. However consideration may be given to applying the standards at some future point in time.

Table 2.3 shows a list of water quality parameters, Mandatory Values and Guide Values under the regulations and also the National Limit Values (NLV)(S.I. 155 of 1992). It should be noted that the NLV limits are the statutory requirements and the Blue Flag standards are a voluntary standard to achieve this status. The Mandatory EU and Blue Flag standards are lower (higher values) than the NLV limits with the Guide EU/Blue flag standard being the highest standard.

Table 2.3 – Quality Requirements for Designated Bathing Waters.

Parameters	Directive 76/160/EEC		National Limit Values (S.I. 155 of 1992)
	Guide (G)	Mandatory (I)	
Microbiological			
1. Total coliforms (no/100ml)	**≤500 for≥80% of samples**	**≤10,000 for≥95% of samples**	**≤5000 for ≥80% of samples ≤10,000 for ≥ 95% of samples**
2. Faecal coliforms (no/100ml)	**≤100 for≥80% of samples**	**≤2,000 for≥95% of samples**	**≤1000 for ≥80% of samples ≤2,000 for ≥ 95% of samples**
3. Faecal streptococci (no/100ml)	≤100	-	≤300
4. *Salmonella* (no/1 litre)	-	0	0
5. Entero viruses (PFU/10 litres)	-	0	0
Physicochemical			
6. pH*	-	6 to 9	≥6 and ≤9
7. Colour	-	No abnormal change in colour	No abnormal change in colour
8. Mineral oils (mg/litre)	≤0.3	No film visible on the water surface and no odour	No film visible on the water surface and no odour
9. Surface active substances (mg/litre)	≤0.3	No lasting foam	No lasting foam
10. Phenol (mg/litre C_4H_3OH)	≤0.005	≤0.05 and no specific odour	≤0.05 and no specific odour
11. Transparency (m)	≥2	≥1	≥1
12. Dissolved Oxygen* (% saturation O_2)	80 to 120	-	≥70 and ≤120
13. Tarry residues and floating materials	Absence	-	No offensive presence
14. Ammonia† (mg/litre NH_4)	-	-	-
15. Nitrogen Kjeldahl† (mg/litre N)	-	-	-
2.3.5.1.1 Other Substances*			
16. Pesticides* (mg/litre)	-	-	-
17. Heavy metals* (mg/litre Cd, Cr VI, Pb, Hg)	-	-	-
18. Cyanides* (mg/litre Cn)	-	-	-
19. Nitrates and phosphates* (mg/litre NO_3, PO_4)	-	-	-

** to be sampled where an investigation shows or where there are other grounds for believing that water quality has deteriorated in respect of this parameter.*

† to be sampled where there is a tendency towards eutrophication in the bathing water.

Notes:
In addition, the following levels of compliance must be achieved with the values for individual parameters:

Guide Values (G)

Parameters Nos. 1 and 2	≥80% of samples
Parameters Nos. 3 and 12	≥90% of samples
Parameters Nos. 8, 9, 10, 11 and 13	≥90 % of samples

Mandatory Values (I)

Parameters Nos. 1, 2, 4, 5 and 6	≥95% of samples
Parameters Nos. 7, 8, 9, 10, 11 and 13	≥95% of samples

National Limit Values (NLV)

Parameter No. 1	≥80% of samples must be ≤5,000/100ml; and ≥95% of samples must be ≤10,000/100ml
Parameter No. 2	≥80% of samples must be ≤1,000/100ml; and ≥95% of samples must be ≤20,000/100ml
Parameters Nos. 3, 4, 5, 6 and 12	≥95% of samples
Parameters Nos. 7, 8, 9, 10, 11 and 13	≥95% of samples

(In addition there is a requirement that results in respect of individual samples for these six parameters which breach the National Limit Value do not exceed that value by more than 50%.)

2.3.6 Shellfish Directive

The EU 'Shellfish' Directive (79/923/EEC) requires that Member states designate and monitor shellfish waters to ensure that the quality of the edible species is maintained or enhanced. Regulations transposing the Directives into Irish law and setting national standards were introduced in 1994 (Quality of Shellfish Waters Regulations, S.I. 200 of 1994). Youghal Harbour / Blackwater estuary has not been designated.

2.3.7 Shellfish Production Area Directive

This Directive concerns the laying down of health conditions for the production and the placing on the market of live bivalve molluscs (91/492/EEC). This was transposed into Irish law in 1996 Regulations (S.I. 147 of 1996) while areas were designated under subsequent Regulations. The requirements of this legislation are given in Table 2.4 overleaf. The Department of the Marine and Natural Resources is the competent authority for classifying shellfish production areas.

The following table summarises the standards under the Regulations:

Table 2.4 – Summary of scheme classification of shellfish production areas operated by the Department of the Marine and Natural Resources under 91/492/EEC

Classification	Faecal Coliforms/*E.coli* per gram of shellfish flesh[1]	Requirements
A	Less than 3/2.3[2]	None – sale for direct human consumption permitted
B	3/2.3 or greater with not more than 10% of samples exceeding 60/46	Purification at an approved plant for 48 hours prior to sale for human consumption[3]
C	Greater than 60/46 and not more than 600/460	Relaying for a period of at least 2 months in clean sea water prior to sale for human consumption[3]

[1]the first figure in the column must relates to faecal coliforms, the second to *E.coli*
[2]must not contain *Salmonella* in 25 grams of flesh
[3]scientifically proven cooking methods, approved by the Standing Veterinary Committee, may obviate the necessity for purification or relaying

The standard for shellfish production areas relates to coliforms in the flesh of the shellfish. It is difficult to translate this standard into water quality standards. However the DoMNR have adopted the Shellsan Classification System which relates directly to the faecal coliforms in the water in which the shellfish grow. The system classifies the shellfish into three categories:

1. Approved: No further purification necessary
2. Conditional: Purification necessary by relaying in uncontaminated seawater
3. Restricted: Pressure Cooking essential

The DoMNR's Shellsan classification system is set out in Table 2.5 below:

Table 2.5 – Summary of scheme classification of shellfish production areas operated by the Department of the Marine and Natural Resources under 91/492/EEC

Classification	Geometric Mean of FC /100ml	Compliance FC per 100ml
Approved	<14	90% <46
Conditional:	>14<140	90%<460
Restricted:	>140	>460

The Blackwater Estuary / Youghal Harbour is not a designated water under the Directive. However, the area outside the harbour in Youghal Bay from Knockavery Head to Knockadoon was designated as a Class B production area under the 2000 Regulations. However, it is no longer designated in the more recent (Live Bivalve Molluscs) (Production Areas) Designation, 2001 (S.I. 254 of 2001).

2.3.8 Summary

The above legislation identifies the need for the provision of a secondary wastewater treatment plant and the specific standards that require to be met with respect to the specified parameters in the relevant receiving waters.

2.4 Proposed Scheme Description

2.4.1 Recommended Scheme option

It is recommended that the wastewater treatment works be located in the Mudlands to the north of the town. Secondary treatment is proposed with nutrient reduction for nitrogen only as nitrogen is assumed to be the limiting nutrient with a discharge to the estuary at Ferry Point. Provision will be made for phosphorus removal should it be required at a future date if studies indicate that it would be beneficial. This option is considered to be the most environmentally and economically suitable location for the proposed works and outfall discharge location. Figure 2.3 indicates the WWTW site location and outfall discharge location.

2.4.2 Estuarine discharge standards

The estuarine discharge would be located in the vicinity of Ferry Point. There is a large trench in the area of Ferry Point and extends for some distance down stream. This is likely to be as a result of the narrowing of the estuary due to the spit at Ferry Point. Discharging to this location would provide significant volumes of water to dilute the effluent, even at low tide, and due to increased currents at this location would provide good mixing and dispersion in the receiving waters. The recommended launching point and discharge locations are selected to minimise disruption to activities along the quays and are sufficiently remote from public areas.

UWWT Regulations

The minimum treatment standard required is secondary treatment under Clause 4(1)(b) of the UWWT Regulations 2001 for all discharges to estuarine waters and effluent concentrations in the discharge shall comply with Part 1 of the second schedule in the regulations and as summarised in Table 2.2.

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

An assessment of Blackwater estuary was undertaken (Ref Chapter 7) based on historical data collected by the EPA and a survey undertaken by the consultant in June of this year to try and assess the causes of eutrophication in the estuary. It is quite apparent that the causes of elevated concentrations of phosphorus and nitrogen in the estuary are due to the transport of these nutrients from the River Blackwater catchment. The estimated contribution of nutrients from the proposed WWTW if it was to discharge to the estuary at Ferry Point would be less than 3% of that contributed by the river.

However, taking all point loads from all the towns on the River Blackwater together, the proportion of the loading of the total to the estuary from these urban point sources would be significantly increased. Considering all the point sources together rather than as individual point loads it would a benefit to the river that all point sources be reduced with each town making its own contribution to the reduction of nutrients to the Blackwater. It is also anticipated that other measures will be employed over time by the local authorities for the reduction of nutrients from diffuse sources, mainly due to farm practices particularly in the over use of fertilisers, so that reductions will be made in all areas to reduce the likelihood of eutrophication in both the freshwater and estuarine reaches of the Blackwater.

If the nutrient reduction is to be undertaken then the limiting nutrient is the only nutrient to be reduced unless both can be shown to be limiting. In the cases of coastal waters and estuaries the limiting nutrient is normally nitrogen with phosphorus being the limiting nutrient in freshwaters. However, this not necessarily the case particularly for estuarine (mixed saline and fresh waters). However an assessment by the EPA on the trophic status of the Lower Estuary indicates that nitrogen is the limiting nutrient.

Based on the above assessment and the recent designation of the estuary as a sensitive area it is proposed that nutrient reduction be provided for the discharge to the estuary. The nutrient reduction will initially only require the nitrogen standard to be met only on the assumption that it is the limiting nutrient. However provision will be made for the addition of phosphorus removal if required at a later stage should further ongoing studies by the EPA indicate that this would have a beneficial impact. It is proposed to meet the standards as set out in Table 2.2 Part 1 and Part 2 (with respect to nitrogen only).

To achieve this standard a secondary treatment process with aerobic and anoxic zones is considered to be sufficient to achieve these emission limit values.

Bathing Regulations

There are no bathing areas designated under the regulations in the estuary. However there are a number of popular bathing areas in the small inlets and harbours along the town. While it is not mandatory, consideration could be given to achieving the NLVs for the popular bathing waters in the estuary.

The beaches at Youghal and Claycastle are designated beaches under the Bathing Water Regulations and the bathing waters will require to meet with the National Limit Values on Coliform concentrations as set out in Table 2.3. The beaches currently enjoy the status of Blue Flag and this is a voluntary standard and to achieve this status the Guide value from the regulations should be achieved. It is important to note that the bacterial concentration limits apply to the bathing water locations and not the effluent and that the assimilative capacity in terms of the dispersive nature of the receiving waters can be used for natural treatment of the discharge.

Shellfish Regulations

Shellfish have been harvested in the estuary historically although the practise has stopped over ten years or so. This is believed to be due to over fishing of the beds with little or no control through licensing or co-operatives. The estuary and harbour is not a designated shellfish area under either of the regulations. It is therefore not mandatory to meet the Shellfish Regulation standards in the estuary.

The area between Knockadoon and Knockaverry outside the estuary had been designated until as recently as 2000 as a Class B shellfish production area by the DOMNR under the Regulations. However the most recent 2001 regulations have excluded Youghal Bay from the schedule of designated areas. Given that the area in Youghal Bay outside the estuary was previously designated it would be prudent to ensure that the standards can be met should the area be redesignated.

Summary Effluent Quality Standards

A summary of quality standards for Youghal Harbour / Blackwater Estuary is as follows

Table 2.6 – Summary Quality Standards for Estuarine discharge

Key Parameter	Limiting Concentration	Remarks
UWWT Regulations 2001 Secondary Treatment	**mg/l**	
BOD, COD, Suspended Solids, Total Nitrogen	Parts 1 and 2 Schedule 3 Ref Table 2.2 Part 2	Emission limit values Provision for Phosphorus standard
Designated Bathing Waters		**Youghal Main Beach & Claycastle Beach only**
Faecal Coliforms Total Coliforms (other parameters)	Ref Table 2.3	NLVs Blue Flag (not mandatory) Consideration of popular bathing areas in estuary
Designated Shellfish waters		**None**
Faecal Coliforms	Ref Table 2.5	Youghal Bay not currently designated to be considered (Shellsan)

Outfall Modelling

Modelling of the discharge of the treated effluent scenarios has been undertaken for the discharge to the estuary (Ref Chapter 7 and Appendix D (Volume 3)). The model is a CORMIX plume model based on near field dilutions. The model demonstrates that the estuary is well mixed and that the coliform concentrations diminish significantly as the harbour entrance at East Point is reached. The model demonstrates that the predicted coliform levels with secondary treatment and without disinfection meet with the bathing water regulation guide values and that the blue flag status of the beaches would not be threatened. This is no more than expected given that the existing untreated sewage discharges to the harbour do not impact on the beaches which have enjoyed blue flag status for a number of years.

The previously designated shellfish production area outside the harbour in Youghal Bay is also not impacted on and should the area be redesignated would meet with the Shellsan standards as set out previously.

2.4.3 Treatment Processes

There are a number of potential processes which can be utilised to achieve the standards. The following sections set out the various unit treatment processes and the options for the processes with indicative layouts of the various options which may be utilised at procurement stage.

2.4.4 Preliminary Treatment

Preliminary treatment of raw sewage is necessary before secondary treatment to achieve the removal of gross material such as gross solids and rags to avoid damage or blockage to the downstream equipment. It is normally located at the inlet to the proposed works in advance of the other processes. Generally this involves a combination of the following processes:

(a) Screenings removal – coarse and fine screens;
(b) Grit removal;
(c) Grease removal;

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

2.4.5 Storm water Treatment.

The purpose of this treatment is to balance the flow to full treatment which is restricted to a multiple of Dry weather flow (DWF), normally 3 times DWF. During periods of wet weather flows in excess of this value are diverted to the storm tank where they are stored temporarily until the storm has receded. The wastewater is then returned at a low rate usually 1 times DWF into the main treatment process for full treatment with flushing of the tanks with wash-water to ensure settled solids are returned.

2.4.6 Primary Treatment

Primary sedimentation follows preliminary treatment. This is a process by which the velocity of the waste water is reduced below the point at which it can transport suspended material, so that much of it settles and can be removed as sludge. The aim of primary sedimentation is to remove as much as possible of the polluting matter, in the form of readily settleable solids, from the waste water as quickly and as economically as possible. Once screenings and grit have been removed from the waste water, sedimentation is considered to be the cheapest way of removing pollution load present as suspended matter. Typical BOD removal rates are 30-40% and Settled solids of the order of 70%.

Primary settlement may be assisted through chemical addition to enhance settling characteristics. It can also be enhanced through the provision of lamellae plates in the tank which results in the reduction of the footprint of the process.

This process may be included in the proposed treatment plant.

2.4.7 Secondary Treatment

Secondary treatment is defined in the Regulations as "generally involving biological treatment with secondary settlement or other process" Biological processes include suspended growth and attached growth systems.

Suspended growth Systems

Three treatment process options have been considered under the suspended growth systems all of which are based on the activated sludge system and can achieve the required effluent quality standards.

The Activated Sludge process involves the production of an activated mass of micro-organisms capable of aerobically stabilising the organic content of a wastewater. Waste water is introduced into an aerated tank of masses or 'flocs' of micro-organisms, coagulants, particles etc. which are collectively referred to as activated sludge or mixed liquor. These 'flocs' capture pollutants through adsorption, absorption or entrapment. The mixed liquor requires oxygen to convert the dissolved pollutant matter (measured as Biological Oxygen Demand (BOD)) through bacterial processes to additional biomass or excess sludge. Aeration of the biomass is achieved by the use of submerged diffused or surface mechanical aeration or combinations thereof, which also maintain the activated sludge in suspension. Following a period of contact between the waste water and the activated sludge, the outflow is separated from the sludge in a secondary settlement (secondary clarifier) tank. Important factors influencing the efficiency of the process include:

- The concentration at which the mixed liquor is maintained in the aeration tank;
- Characteristics of the inflow – e.g. hydraulic and organic loading rates;
- Amount of oxygen required for respiration of micro-organisms present and maintenance of a suitable environment for these micro-organisms;
- Control and disposal of scum and supernatants;
- The amount of solids in the aeration tank.
- Sludge Age (Sludge Loading Rate)

The following processes are types of activated sludge:

1. High Rate Activated Sludge
2. Conventional Activated Sludge
3. Extended Aeration

Variants of the activated sludge process are the following:

4. Sequencing Batch Reactor (SBR);
5. Submerged Membrane Bioreactor (SMBR).

High Rate Activated Sludge

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

Conventional Activated Sludge

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

Extended aeration

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

Sequencing Batch Reactors (SBR)

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

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

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

Submerged Membrane Bioreactors (SMBR)

Membrane bioreactors are based upon submerging membrane micro-filtration units within an activated sludge wastewater treatment tank to achieve solids separation. This is a physical separation process and eliminates problems associated with poor sludge settlement characteristics and enables Mixed Liquor Suspended Solids (MLSS) levels to be increased to between 15,000 –30,000 mg/l. This enables a low tank volume and a long sludge age to be utilised, which gives reduced sludge production.

The membrane pore size is in the order of 0.1 - 0.4 µm. In operation the membranes become covered by a dynamic layer of protein and cellular material which further enhances the filtration performance by providing an effective pore size of less than 0.01 microns, which is in the ultrafiltration range. This achieves disinfection by filtering out pathogenic organisms from the effluent.

Due to the increased MLSS levels and the elimination of the need for primary and secondary settlement, membrane bioreactors have a much smaller footprint requirement than conventional activated sludge processes. The process also provides excess sludge of > 2% thickness.

Attached Growth Systems

Attached growth systems are also called biofilm and fixed film systems. These processes are where bacterial growth attaches itself to a surface and the resulting film or slime contains the micro-organisms to treat the applied waste.

These are a number of these types of processes including the following common types:

- Percolating or Trickling Filters
- Rotating Biological Contactors (RBC)
- Submerged Aerated Filters

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

Percolating / trickling Filter

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

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

Rotating Biological Contactor

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

Submerged Aerated Filters (SAF)

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

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

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

2.4.8 Disinfection

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

Ozone gas (O_3) is a highly reactive oxidising agent and rapidly forms free radicals on reaction with water. It is generated on-site in ozone generators by passing dry air or oxygen through a high voltage electric field. The gas, which is bubbled up through the water to be disinfected, reacts with organic matter in the waste water achieving disinfection.

Ultra-violet (UV) light is produced by a special mercury discharge lamp. The effectiveness of UV radiation depends on the dose received by the micro-organisms and this depends on:

- The intensity of the radiation (the most effective wavelength is 254nm);
- The path length from the source to the micro-organisms;
- The contact time at the required dose;
- The quality of the waste water (particularly with regard to turbidity).

Lamps are prone to interference from chemical constituents of the waste water such as ferric and hardness salts. Periodic cleaning of the lamps is therefore required.

The proposed discharge at Ferry Point without disinfection has been demonstrated by modelling (ref Chapter 7) to not impact on the designated beaches outside the estuary and therefore disinfection is not a mandatory requirement. However, if consideration is given to protecting the popular bathing waters in the estuary, disinfection would be required and therefore provision is made in the scheme to allow it to be fitted at a later stage if required.

2.4.9 Nutrient Reduction

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

Nitrification/De-nitrification.

The most widespread method of achieving nitrogen removal is through biological nitrification and de-nitrification.

This is a two stage process in which ammonia if firstly oxidised to nitrite and nitrate in an aerobic environment. Nitrates/nitrites are subsequently converted to nitrogen gas during the de-nitrification process which occurs in an anoxic zone.

Nitrification

This describes the process whereby ammonia is converted to nitrate and nitrite by nitrifying bacteria. Nitrifiers are slower growing bacteria than the carbonaceous bacteria and thus the hydraulic retention time and sludge age must be greater in a nitrifying plant to allow the nitrifiers time to grow and avoid washing them out of the system.

To achieve nitrification will require additional aeration capacity over that required to achieve carbonaceous removal requirement alone as this process is aerobic.

De-nitrification

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

Phosphorus removal

The principal methods of achieving Phosphorus removal are through biological removal and chemical precipitation.

Chemical precipitation is typically achieved through the addition of chemicals such as ferric sulphate or aluminium sulphate. This forms an insoluble precipitate with the phosphorous present which is removed as a sludge.

These chemicals can be added at a number of different stages of the treatment process: before the aeration basins, in the aeration basins or after the aeration basins to achieve pre-precipitation, co-precipitation or post-precipitation respectively.

Alternatively phosphorous removal can be achieved using biological removal. This is achieved through various configurations of aerobic and anaerobic stages of the treatment process to promote uptake and storage of phosphorous present in the wastewater by bacteria. The phosphorous is then removed from the system with the waste activated sludge.

Nutrient reduction processes include the Bardenpho process, A/O and UCT processes.

It is proposed to provide for meeting the nitrogen (limiting nutrient) standard for the estuary which will require the provision of nitrification and denitrification. Provision will be made for the inclusion of Phosphorus removal if deemed necessary at a future point in time.

2.4.10 Tertiary Treatment

Tertiary treatment can be used to further reduce the BOD and suspended solids normally discharged after conventional waste water treatment. Final effluent quality from a conventional activated sludge system is generally in the region of 20 to 25 mg/l BOD, 30 to 35 mg/l SS. There are four main types of tertiary treatment for BOD and Suspended Solids. They are as follows:

- Lagoons;
- Land irrigation – grass plots, reed beds;
- Straining via fabric or metal filters;
- Sand filters.

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

2.4.11 Sludge Treatment

Sludge is generated as part of primary and secondary wastewater treatment processes and the quantity and quality of the sludge can vary significantly, not only between primary and secondary, but depending on the secondary process selected and operational conditions can vary significantly within secondary processes. It is necessary for the generated sludge to be reduced in volume and further treated and stabilised before disposal in accordance with best practise and current legislation.

Sludge Management Plan

Cork County Council have undertaken a Sludge Management Plan for the county. The plan sets out the proposed strategy for the collection, treatment and disposal of all non-hazardous sludges (agricultural, industrial and municipal) in the county.

The county has been divided into 5 regions for the purposes of determining hub centres (for centralised treatment) and satellites (for collection and transportation) for the most economic and environmentally suitable treatment and disposal of sludges. Youghal is located in region 21 of the plan where Midleton is the nominated hub centre. However due to the proximity of Dungarvan in County Waterford this disposal route has also been suggested. Sludges generated at Youghal will be transported off site to one or other of these hub centres for further treatment to stabilise and pasteurise the sludge to produce a *biosolid*. The biosolid will then be disposed to agriculture as a fertiliser in accordance with best practise and the relevant sludge disposal legislation.

Processes

Stabilisation or pasteurisation of the sludge generated on site will not take place on site and the only treatment the sludge will receive is volume reduction. This is achieved using a number of possible processes usually thickening initially followed by dewatering. The indicative technologies for undertaking thickening are as follows:

- Picket Fence Thickeners
- Drum (gravity)thickeners
- Belt (gravity) thickeners

Through one or a combination of the above processes primary and secondary waste activated sludge (WAS) is thickened before blending in a storage tank prior to transferring forward for dewatering.

Typical dewatering technologies include:

- Belt Press
- Plate Press
- Centrifuge

The above processes are normally assisted through the use of polyelectrolytes which are dosed upstream of the processes to increase the level of dry solid produced and maximise volume reduction.

Sludge Volumes

The volumes can vary depending on a number of factors but particularly whether a high or low rate process is adopted or if phosphorus removal is employed. While the tonnage of the sludge remains the same as no stabilisation processes are undertaken the dry solids content and hence volume reduces through the thickening and dewatering processes. The waste activated sludge volumes (WAS) from the secondary process are based on the activated sludge rate of approximately 0.1-0.0.5KgBOD/kg MLSS which is expected to nitrify the process. This would expect to generate approximately 1kg of sludge for every kg of BOD removed (90%). This rate produces lesser sludge than the high rate processes. Primary sludge is based on the removal of 70% of the suspended solids in the influent which would be typical for the process. It is expected that the influent solids will be approximately 75g per p.e. This is based on 16,000 p.e.

The reduction in volume in the thickening and dewatering processes are typical for the technologies employed.

Table 2.7 – Estimated Sludge Volumes

	Solids generated	Settling Tank		Thickened		Dewatered(final)	
	kg	%DS	Volume (m3/day)	%DS	Volume (m3/day	%DS	Volume (m3/day
Primary	800	2%	40	4%	20	-	-
Secondary WAS	608	0.35%	173	3%	20	-	-
Total	**2,108**		**213**	**3.5%**	**40**	**22%**	**6-7**

It is proposed to provide for sludge handling and thickening and dewatering facilities at the works to reduce the volumes for disposal off site for further treatment.

2.4.12 Odour Abatement

All wastewater treatment works generate odours due mainly to anaerobic decomposition of biodegradable matter. The potential primary sources of odour are preliminary treatment processes and the raw sewage influent at the inlet works, primary tanks, activated sludge process and sludge handling and treatment processes. The emission of foul odours from wastewater treatment facilities may be controlled by a number of methods including covering/housing the primary odour sources and by providing forced ventilation of the enclosed air spaces.

Treatment technologies for odorous air streams, such as generated at wastewater treatment plants, include:

- Biofiltration and bioscrubbing;
- Activated carbon;
- Wet chemical scrubbing;
- Thermal oxidation.

It is proposed to provide odour abatement measures to reduce odour impact in the Works (Ref Chapter 8)

2.4.13 Indicative processes and works layouts

The alternative processes discussed in the above sections have been developed into layouts to provide treatment to sewage from Youghal and the sludge generated on site. The alternative layouts have been undertaken to indicate typical potential solutions to meet the required standards for the recommended location for the works at the Mudlands north of the town.

The mudlands are generally low lying and are below the level of the High Tides. However the lands are protected by the sea wall constructed in the Famine era when the lands were reclaimed from the estuary. Inflow of sea water to the Mudlands are controlled by a sluice in the sea wall which protects the lands from inundation by the tidal waters.

The mudlands are also fed with a freshwater stream from the west which discharges to a saline lake located immediately adjacent to the seawall and which ultimately flows to the estuary via the sluice. The lands can flood to a small degree if high tide conditions coincide with a significant rain storm which occurs on a very infrequent basis.

The processes have been sized to accommodate a proposed population equivalent of 16,000 p.e. in the first phase of the development of the works in two streams of 8,000 p.e. with provision for a third stream to provide capacity of up to 24,000 p.e. to deal with the potential full development of Youghal.

The proposed works are located to the north of the town in the Mudlands (Figure 2.4) and access is from the new N25 main road east of the roundabout on the southbound entrance to the town. This access location was selected as good sight lines are available at the access and the access is remote from development thereby minimising intrusion on residences from both construction traffic and operational traffic. The access road is approximately 400m long and runs parallel to the east of the existing laneway before reaching the proposed site. The existing lane was considered to be too narrow and widening of the laneway would result in removal of one or both of the important hedgerows bounding the laneway.

Conventional activated Sludge

Figure 2.5 shows a typical footprint for a WWTW using conventional activated sludge treatment processes with primary settlement. The dimensions of the system are suitable for a design capacity of 16,000 p.e. The site includes provision for sludge thickening and dewatering facilities as well as for . The works described above requires 2.5 ha of land with provision for expansion if required in the future.

The layout is indicative in nature and the works essentially comprise the following:

- Inlet works area for preliminary treatment processes and storm treatment tankage;
- low level tanks to contain the primary and secondary treatment processes;
- tanks for the thickening and storage of sludge;
- buildings to house the control and administration functions, treatment machinery and equipment and storage and also the sludge dewatering and ancillary equipment;
- Circulating roads to facilitate access for maintenance and inspection.

The buildings which will be the tallest features on the site will not be limited to any significant degree in height (5-8m) as the impacts are assessed to be not significant with the mitigation proposed by screening with the existing hedgerows and proposed screen bunding and landscaping on the perimeter of the site. The buildings will be capable of being up to two storey with elevations of up to 8.0m above existing ground level. The buildings will be constructed of non reflective material and colours of finishes will be limited to minimise visual impact. (ref Chapter 10)

Due to the potential for flooding and to reduce the extent of excavation it is proposed to raise the site by approximately 1.0-1.5m. It is also proposed to provide extensive landscaping around the periphery of the site to provide screening for the proposed works from the adjacent developments and the popular walking route along the sea wall.

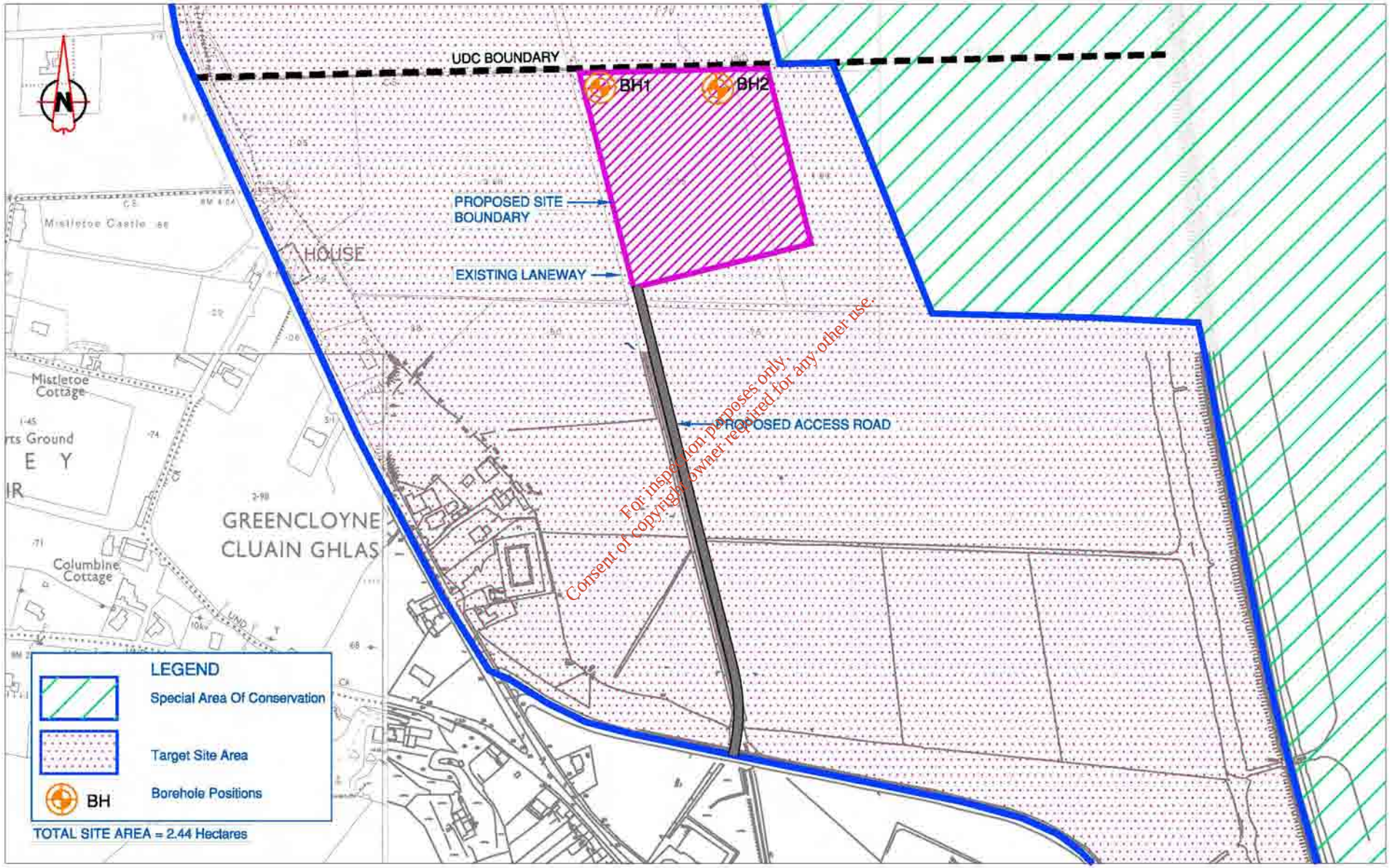
Sequenced Batch reactor

Preliminary design calculations were carried out for an SBR based on a design p.e. of 16,000. Figure 2.6 shows a footprint for a typical SBR for this p.e. The footprint required is approximately 1.4 ha is smaller than that required for conventional activated sludge due to the achievement of aeration, settlement and decanting in the one tank.

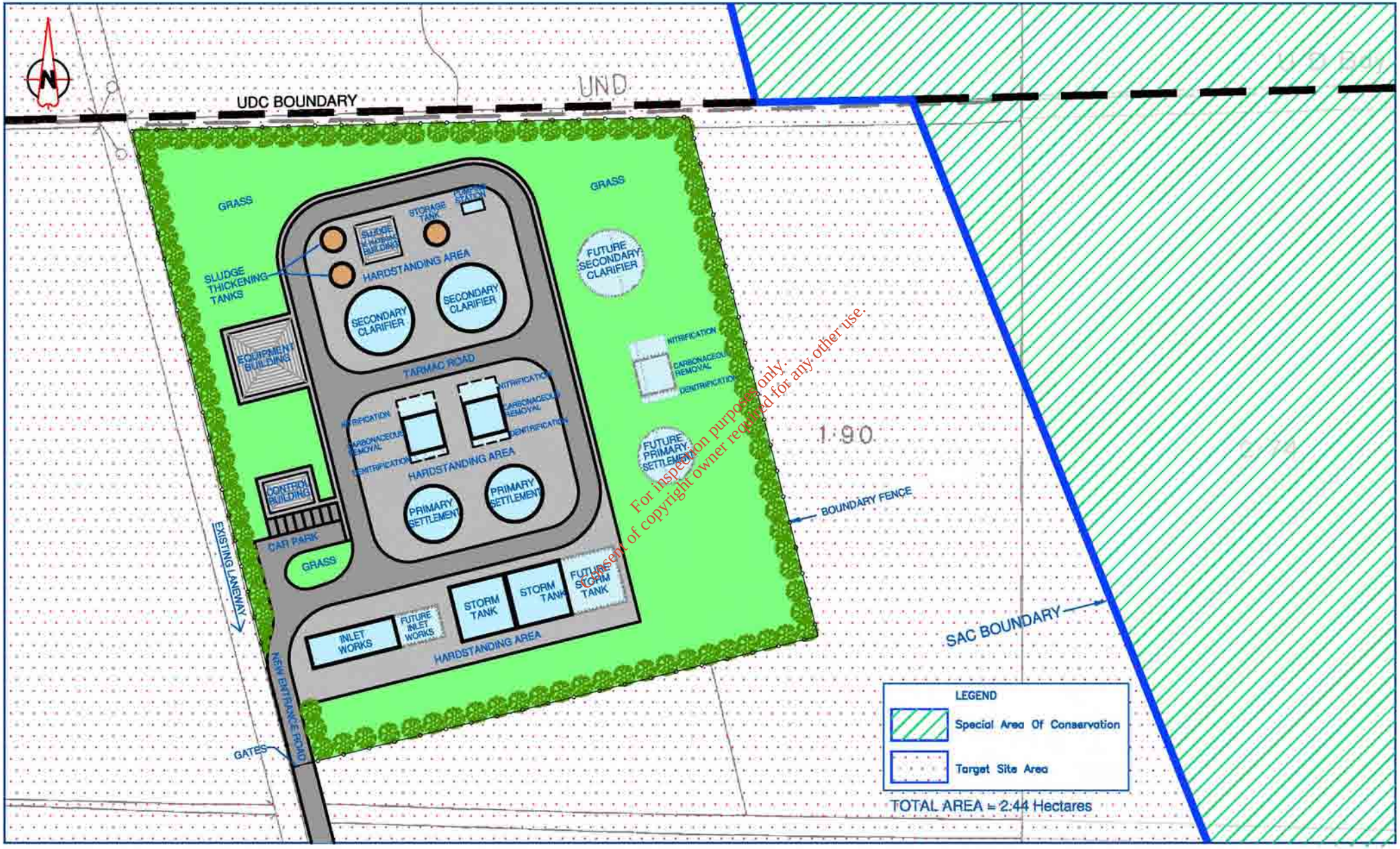
The general arrangement is quite similar to that for conventional activated sludge with the control and equipment buildings and sludge handling facilities being very similar with the significant differences in the wastewater process area.

Submerged Membrane Bioreactor

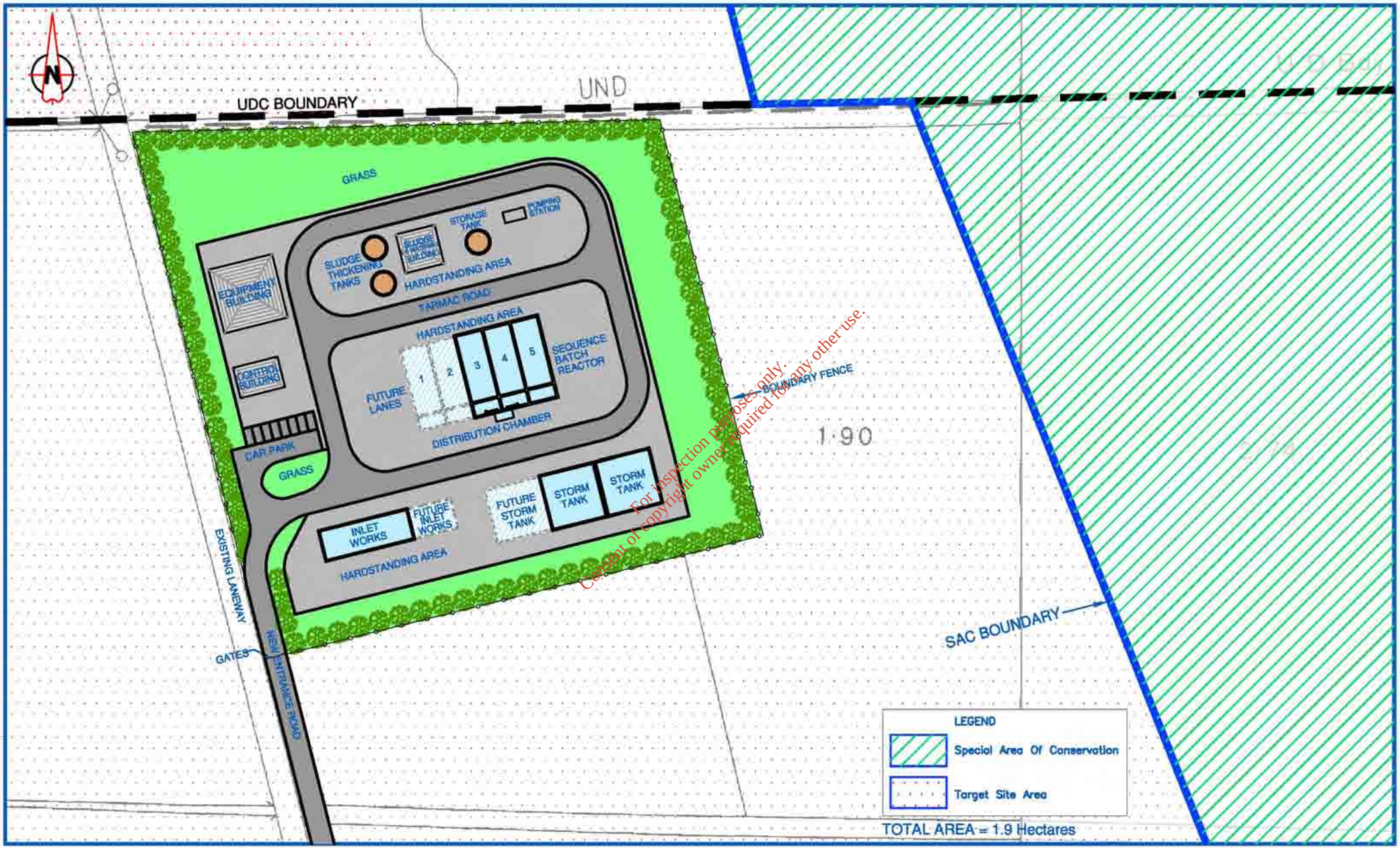
Footprints for SMBRs for a p.e. of 16,000 are approximately 1.4 ha in size (Figure 2.7). Again it is quite similar in size and general arrangement as the SBR process.



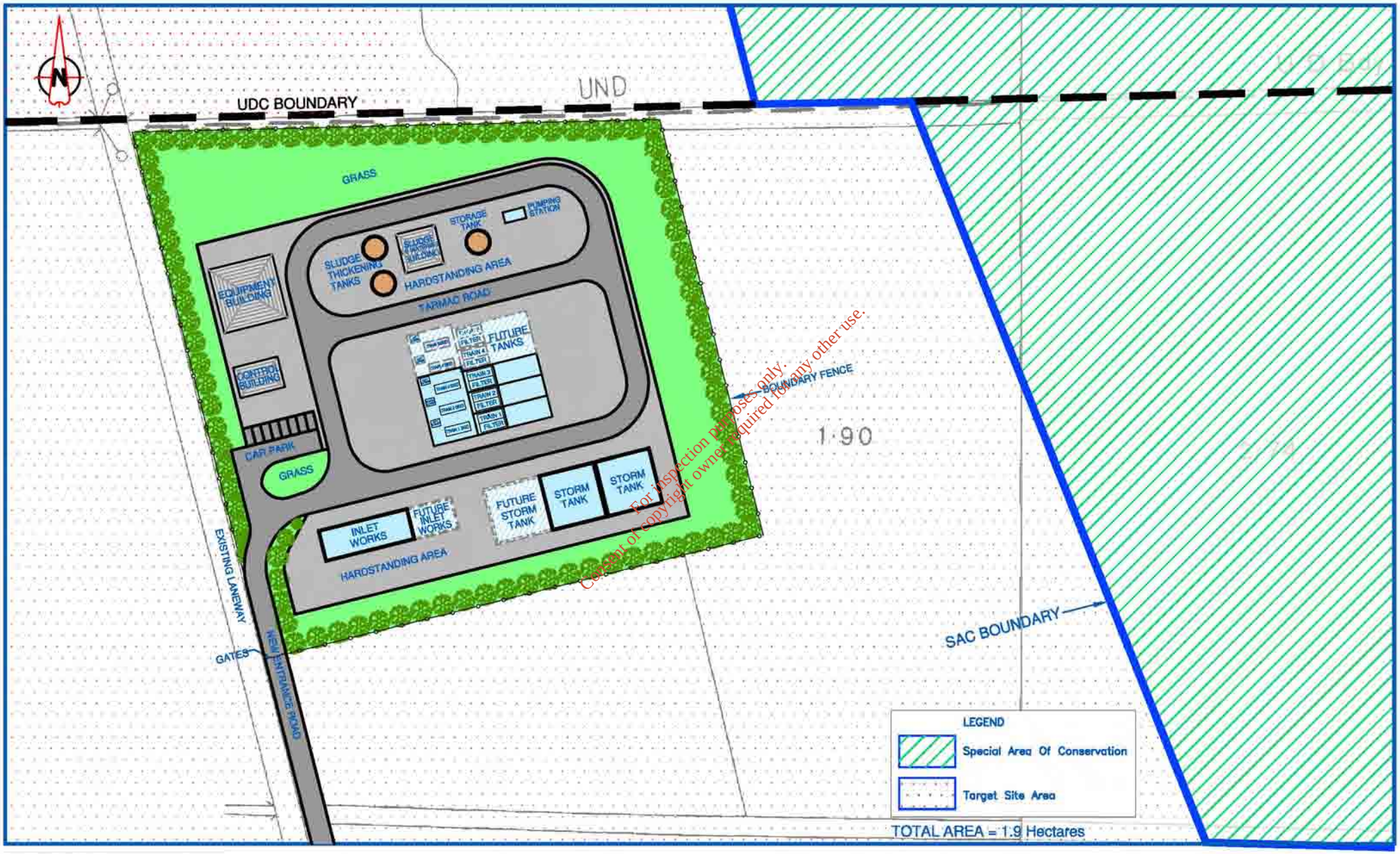
PROPOSED WASTEWATER TREATMENT PLANT SITE LOCATION



TYPICAL SITE LAYOUT - (CONVENTIONAL ACTIVATED SLUDGE) FIGURE 2.5



TYPICAL SITE LAYOUT - (SEQUENCED BATCH REACTOR) FIGURE 2.6



TYPICAL SITE LAYOUT - (SUBMERGED MEMBRANE BIOREACTOR) FIGURE 2.7

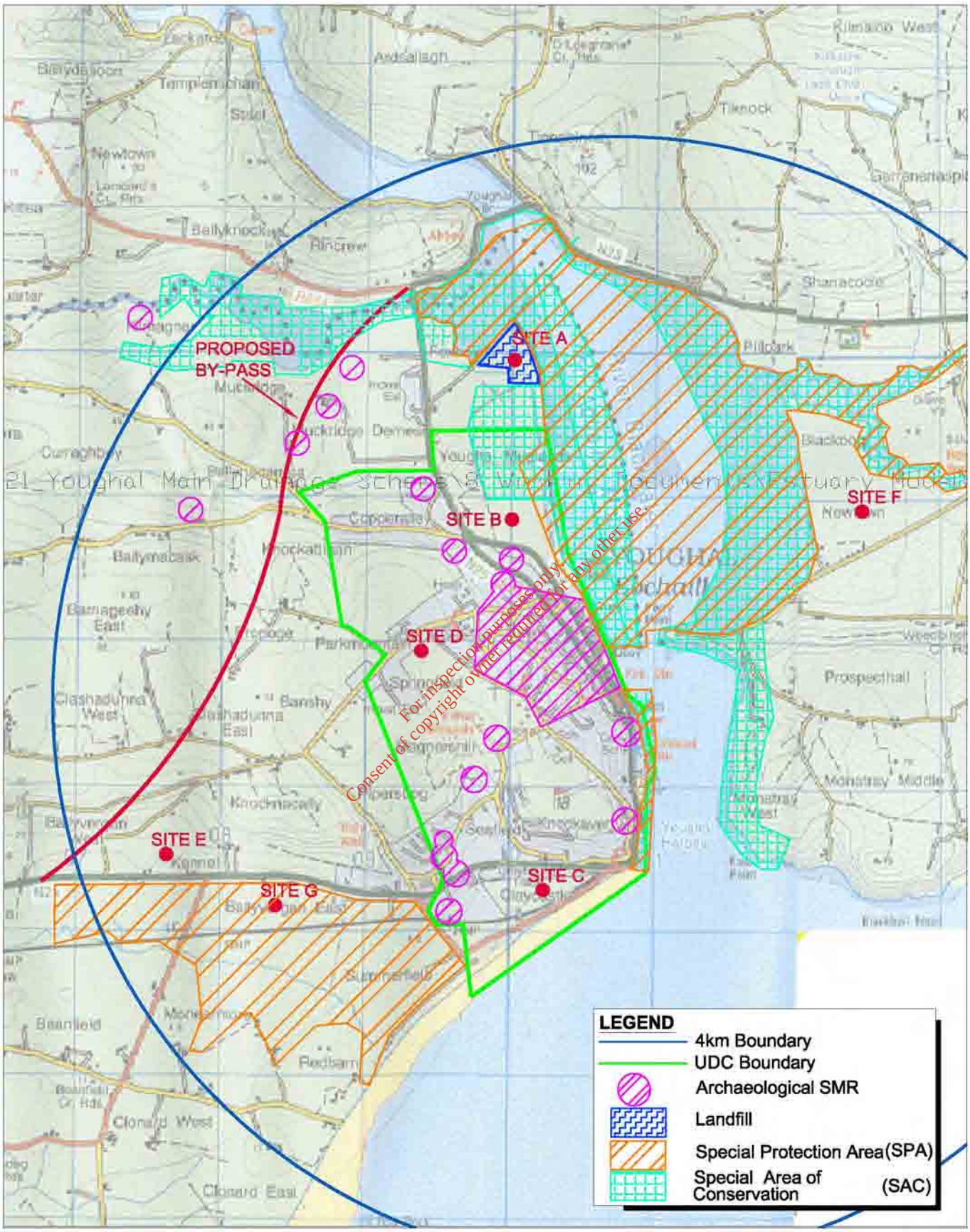
2.5 Alternatives Considered

2.5.1 Wastewater Treatment Works Site Selection

A site selection process was undertaken to determine the most environmentally suitable location for the provision of a wastewater treatment works. A constraints map was undertaken based on broad criteria including ecological and heritage designations, accessibility, proximity to development and the catchment, proximity to potential discharge locations, land ownership and land use zonings. Based on this constraints map, 7 sites were selected for consideration. The constraints map and alternative site locations are indicated in Figure 2.8 and listed in Table 2.8

Table 2.8 – Site options and locations

Site	Location
Site A	Landfill site (Mudlands)
Site B	Mudlands
Site C	Williamstown(Rear Front Strand)
Site D	Springfield (Adjacent Water Tower)
Site E	Ballyvergan West (Killeagh Road)
Site F	Newtown (Co. Waterford)
Site G	Ballyvegan Marshes (Killeagh Road)



CONSTRAINTS MAP AND SITE LOCATIONS *FIGURE 2.8*

2.5.2 Environmental Appraisal of Site Options

Each of the sites was subjected to an environmental appraisal to establish the most suitable site. The criteria for the assessments were as follows:

- *Receiving Waters and Levels of Treatment;*
- *Proximity to catchment and outfall location;*
- *Access;*
- *Land Use and Planning;*
- *Odour and Noise;*
- *Heritage and Archaeology;*
- *Habitat;*
- *Visual Impact.*

The assessment indicated that a site to the north of the town in the Mudlands was the most environmentally suitable area for the proposed WWTW to provide for secondary treatment for Youghal. A summary of the assessment is indicated in the Table 2.8. The environmental assessment of the site options is based on a scoring system. Scores vary from 0 to 4 i.e. from neutral to high impact with the highest score resulting in the least favoured environmentally. A detailed assessment of the site options in included in Appendix K.

The area in the Mudlands was then subjected to a more detailed environmental impact appraisal where three site options within the area were assessed and which is set out in detail in this statement. The mudlands are designated as “open space” in the Development Plan (Youghal UDC, 1997; 1999 Variation) but a specific clause in the 1999 Variation states that the location of the proposed wastewater treatment works will be allowed in the land use designation if technical studies indicate that it is suitable and the site selection is therefore compliant in a planning context.

The assessment indicates that the most northerly site option 3 adjacent to the UDC boundary is the most environmentally suitable option. It should be noted that this is at additional cost by comparison with the other two options which are closer to the catchment and outfall locations.

The economic assessment also indicated that locating a treatment works at the mudlands was the most economically advantageous for both estuary and long sea outfall options.

Table 2.9 – Summary Environmental appraisal.

Site	Location	Landscape and Visual	Access	Habitat	Heritage	Land Use and Planning	Odour & Noise Risk	Proximity to development	Total Score	Rank
A	Landfill	1	0	0	0	4	1	1	7	2
B	**Mudlands**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**4**	**1**
C	Williamstown	4	1	4	0	4	2	4	19	7
D	Springfield	3	2	1	0	3	3	3	15	6
E	Ballyvergan West	3	0	1	0	2	1	1	8	3
F	Newtown	2	4	1	0	3	1	1	12	4
G	Ballyvergan Marshes	4	0	4	0	4	1	0	13	5

2.5.3 Discharge Location options

Both long sea outfall to the Youghal bay area and short sea outfall to the estuary have been considered for the disposal of treated effluent from the proposed wastewater treatment works each with differing effluent quality standards and treatment processes based on the legislative requirements set out above. The following sections set down the effluent quality standards for each of the options and the treatment processes required to achieve these standards. The short outfall option is the preferred option and was described earlier. The following section describes the long sea outfall option considered.

Coastal Discharge Standards

The coastal discharge would be located some distance off the main beach in Youghal and the length of the outfall would be determined by the level of treatment provided at the WWTW and the assimilative capacity of the receiving waters.

UWWT Regulations

The minimum treatment standard required is secondary treatment under Clause 4(1)(b) of the UWWT Regulations 2001 for all discharges to coastal waters and effluent concentrations in the discharge shall comply with Part 1 of the second schedule in the regulations and as summarised in Table 2.2. To achieve this standard a high rate secondary treatment process is considered to be sufficient to achieve these emission limiting values with a sludge age of no greater than 5 days. This will give a low aeration capacity and reactor vessel volume requirement.

Bathing Regulations

Also as the beaches at Youghal and Claycastle are designated beaches under the Bathing Water Regulations the discharge will require to meet with the National Limit Values on Coliform concentrations as set out in Table 2.3. The beaches currently enjoy the status of Blue Flag and this is a voluntary standard and to achieve this status the Guide value from the regulations should be achieved. It is important to note that the bacterial concentration limits apply to the bathing waters and not the effluent and that the assimilative capacity in terms of the dispersive nature of the receiving waters can be used for treatment of the discharge.

Shellfish Regulations

The area between Knockadoon and Knockaverry outside the estuary had been designated until as recently as 2000 as a Class B shellfish production area by the DOMNR under the Regulations. However the most recent 2001 regulations have excluded Youghal Bay from the schedule of designated areas. This is mainly due to the fact that shellfish harvesting has not been practised in the area for a number of years. This however does not mean that it would not be designated at some future point in time and it would be prudent to ensure that the standards for Class B production be met in the planning of a long sea outfall discharge. The Slellsan Classification system has been adopted by the DoMNR and the water quality shall comply with Table 2.5.

Outfall length

To achieve these bacterial water quality standards for both the bathing and shellfish there are two options in terms of treatment which can be provided resulting in differing outfall lengths. These are:

1. Secondary treatment alone with a long sea outfall and
2. Secondary treatment with disinfection and a shorter sea outfall

Based on a desk study of the receiving waters in Youghal Bay, including the Bathymetry and Tidal diamonds from the Admiralty Charts (Figure 2.3), and the previous shellfish designation, a length of 2.5 km long sea outfall has been estimated as the order of length of outfall for option 1 for secondary treatment only. This will bring the discharge point to approximately 5m depth of water in the vicinity of Blackball Ledge. A shorter length outfall of 1.5 km is assumed for a WWTW which has disinfection included in the process.

A summary of effluent quality standards for discharge to Youghal Bay are as follows:

Table 2.10 – Summary Quality Standards for Coastal discharge

Parameter	Limiting Concentration	Remarks
UWWT Regulations 2001 Secondary Treatment		
BOD, COD & TSS	Part 1 Schedule 3 Ref Table 2.2 (Part 1)	
Bathing Waters		**Youghal Main Beach & Claycastle Beach only**
Total and Faecal Coliforms	Ref Table 2.3	NLVs
Total and Faecal Coliforms	Ref Table 2.3	Blue Flag
Shellfish waters		**Youghal Bay** not Currently designated
Faecal Coliforms	Ref Table 2.5	Shellsan

3 HUMAN BEINGS

3.1 Existing Environment

There has been a significant amount of development within the Youghal area over the last decade and the baseline population equivalent in the area is likely to be in the region of 7,600. There is currently no wastewater treatment other than a holding tank and comminutors on the Green's Quay and Paxe's Lane outfalls. Without development of suitable wastewater treatment facilities, the amenity value and fishing resources could be adversely impacted through declining water quality as the area becomes more developed.

3.2 Impacts

The proposed scheme will have very limited impact on human beings, other than the positive contribution which it is expected to make in terms of providing improved sewerage to existing settlements and catering for future development. The scheme will facilitate improved economic and social conditions through:

- *Catering for new residential and industrial developments;*
- *Such developments will be more environmentally sustainable;*
- *Protecting amenity through improved water quality conditions.*

Potential adverse impacts might include:

- *Amenity loss due to works;*
- *Construction impacts.*

Hazards for working personnel within the WWTW would involve hygiene and interaction with equipment.

No significant health issues are expected from the scheme. Atmospheric emissions of gas or aerosols will not impact on people in the area and will not be a health risk.

3.3 Mitigation Measures

Health & Safety impacts can be mitigated to a substantial degree through the following measures:

(i) Secure fencing and gates to the site boundary to exclude unauthorised entry by members of the public;

(ii) Complying with Building Regulations and appropriate standards in relation to the design of the works, for example, through the provision of hand-railing, covers/decking where appropriate, cleaning equipment to maintain platforms and walkways, protective covers to moving parts, etc.;

(iii) Classification of hazardous areas in buildings, appropriate zoning and specification of electrical apparatus, fixed and portable gas monitoring equipment (methane, petroleum vapours, oxygen level), with effective ventilation by forced air change;

(iv) Provision of hygiene facilities for operators including lockers and washing facilities;

(v) Training of operational personnel and development of a safe system of work for the WWTW.

Amenity impacts could arise from adverse visual or aesthetic impact. This is mitigated at the WWTW site by architectural design and boundary treatment (Chapter 10).

The only part of the outfall pipeline not buried beneath the sea-bed should be the outlet diffuser. This will be marked by a permanent buoy to define its location for fishing and other marine activities.

4 FLORA & FAUNA

4.1 Existing Environment

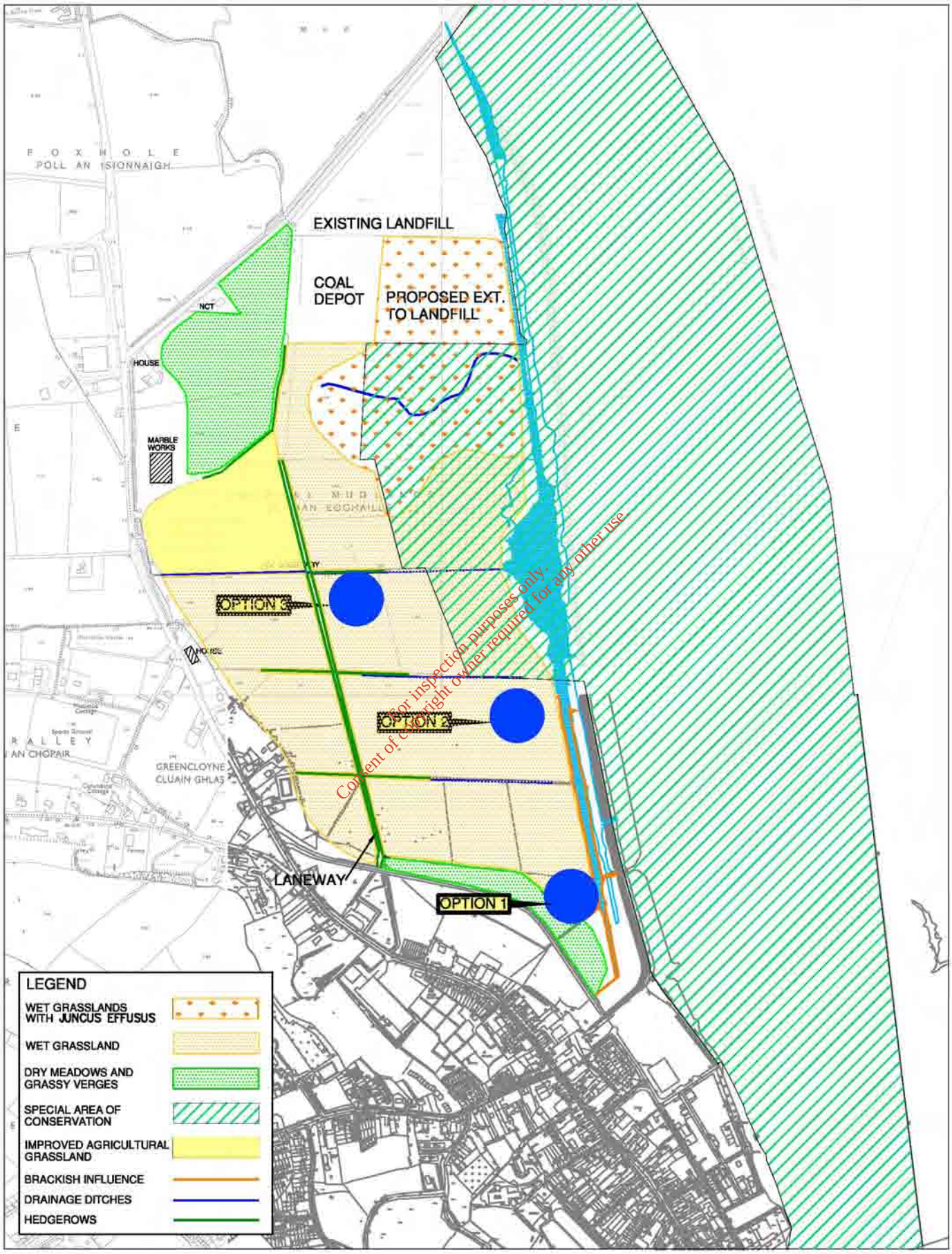
4.1.1 General information

A flora and fauna assessment of the Youghal Mudlands, where the proposed WWTW will be located, was undertaken in April 2001 by Roger Goodwillie and Associates (Ecological Consultant). Phase I habitat survey (JNCC, 1991) methods were used, but habitat classification followed that of Fossitt (2000). Additional information is acknowledged from Pat Smiddy, the Dúchas Conservation Ranger for the area, and the Dúchas files – part of the area is included in the Blackwater River candidate SAC (Code No 2170) while it adjoins the Blackwater Estuary SPA.

4.1.2 Habitats

The area is largely artificial in origin having been reclaimed from the estuary (as an intake) during Famine times, with the exception of a portion of Foxhole townland (Figure 4.1). The survey area consists of flat fields, mostly below high tide level although the northern tip has been raised by a landfill site. The access laneway enters the mudlands (intake) from the south and is lined by hedges and ditches which extend along most of the field boundaries, petering out towards the sea. Animal enclosure is ensured by wire fences although the number of grazed fields are few – mainly the western ones. Many of the others are overgrown by dense rushes, particularly so in the north-eastern corner.

The site is made up of typical habitats for land that has been reclaimed from an estuary as an intake and is little managed. Its vegetation consists for the most part of common plants though these become more specialised as the salt water is approached to the east. Again, however no rare species were observed. The hedges represent high species diversity with those present on each side of the access laneway being the richest.



TERRESTRIAL HABITATS AT YOUGHAL MUDLANDS *FIGURE 4.1*

The soil contains sediment from the estuary and has an obvious shell content when turned. It is heavy, poorly drained and waterlogged. The main habitat is wet grassland (GS4 in Fossitt, 2000) although there are also dry grassland (GA1, GS2), hedgerows (WL1) and drainage ditches (FW4) present (Figure 4.1). These habitats are described below. The detailed survey including full species lists and Latin names is provided in Appendix A.

Wet grassland (Habitat Type GS4)

The vegetation in the fields on each side of the access lane consists of grasses, rushes and species such as meadow foxtail, and Yorkshire fog and ryegrass varying in frequency depending on the intensity of management. Brown sedge and hard rush are characteristic where water accumulates seasonally. Grazed fields have a selection of broad-leaved species, such as creeping and field buttercup, daisy, creeping thistle, white and red clover.

Seaward the fields usually become wetter and grass growth less vigorous. As well as brown sedge and hard rush there is meadowsweet, silverweed, knapweed *ra*, the moss *Brachythecium* cf *rutabulum*, woodrush, ribwort plantain and at the very eastern edge, fleabane. Small relics of winter ponds contain reed grass, jointed rush, curled dock and sweet grass which become frequent towards the east, along with reed fescue, glaucous sedge etc. This eastern part borders a designated SAC under the EU Habitats Directive (92/43/EEC).

The fields that are overgrown by soft rush *Juncus effusus* – mostly north of the UDC boundary and east of the lane – have a slightly different flora, with additional species such as ragworth, meadow vetchling and meadow foxtail.

One of the fields, directly south of the coal depot, has a ditch line running W-E across it from a spring. On this ditch fool's watercress, sweet grass, willowherbs, fox sedge and lady's smock are present.

Dry grassland (Habitat Types GA1 and GS2)

A single field north of the UDC boundary and west of the lane has been reseeded recently and consists of a stand of ryegrass, white clover, rough-stalked and annual meadowgrass. It is mown for silage and is typical of improved agricultural grassland (GA1).

North of it in Foxhole the fields are abandoned but dry and consist of ragwort, docks *Rumex obtusifolius*, *R.conglomeratus* and *R.crispus*, tussocky cocksfoot and meadow foxtail. This area may be categorised as GS2 (dry meadows and grassy verges). A similar community occupies the southern end of the mudlands, where Option 1 is located. Although below sea level it is rarely exposed to salt water which is restricted to the marginal stream. Here sea clubrush, sea aster and scutch form a fringe. The latter species spreads widely into the field along with the tall grasses false oat, cocksfoot, reed fescue and red fescue. Some glaucous sedge and fleabane also occur. There is a central rushy section in which hard rush, soft rush and field buttercup are found.

Hedgerows (Habitat Type WL1)

The oldest and best developed hedges follow the access lane (Figure 4.1) and were presumably planted when the intake was created. Grey willow, wych elm, sycamore, blackthorn, privet, hawthorn, dog rose and bramble are the main woody species present, with some honeysuckle, holly and field rose. Gorse is occasional becoming more frequent on the eastern side in field hedges and at the northern end. A large number of associated herbs are found here including false broom, hogweed, cow parsley, bush vetch, meadowsweet and cinquefoil. The townland boundary around Foxhole contains a hedge on a stone-faced bank with black splenwort, bittercress and violet present here. Larger hedges on the western side of the lane consist of willows, with some ash and occasional poplar.

Drainage ditches (Habitat Type FW4)

The field ditches generally lie at the base of open hedges in which gorse and hawthorn are the main species. Rushes *Juncus inflexus*, *J.effusus*, sweet grass and wild angelica are ubiquitous with reed fescue, fleabane, reed and coltsfoot in places. Green algae are not uncommon in the seaward parts and also around the few streams that flow east to form the UDC boundary. Such waters appear to be enriched and their sides are generally overgrown by brambles, nettles and goosegrass. The stream just referred to also contains celandine *Ranunculus ficaria* which is not otherwise widespread.

Adjacent habitats

The site adjoins the wet grassland and pool of the candidate SAC on the eastern side. This is a water collection point for the mudlands (intake) - which subsequently flows south to escape at the southern end when tidal height allows it. On other sides there is rush-covered ground which is proposed as an extension to the landfill, the coal depot, a planned and existing industrial site at Foxhole and general urban land to the west and south.

4.1.3 Fauna

Vertebrates

The area has a reduced mammal fauna because of the prevailing damp conditions. Hares and foxes were found to occur at low density and there are rabbits in the north-west corner along the townland boundary. Otters may be assumed to use the pond under the seawall at times but would be unlikely to use the sites under discussion. Small mammals are likely to include bank vole, wood mouse and pygmy shrew while some burrows of brown rat were seen at the northern end. Most of the site would be of little habitat value to bats which rely on hedges and taller trees to create foraging areas and communication routes. However the south-west corner (Figure 4.1) is likely to be visited by these animals as there are tree lines in the hedges close enough to potential roosting areas (west of the main road).

The frog is likely to occur around the lane area and breed in transitory puddles and ditches. It would not be favoured because of the eutrophic condition of the more permanent streams where there would also be fish predators (e.g. stickleback).

Avifauna

The mudlands is occasionally used for feeding by waders, e.g. black-tailed godwits (up to 150), lapwing (50) but these are irregular visitors and more likely to be seen within the SAC (Pat Smiddy, Duchas, pers. comm.). The pond there provides regular feeding for little egret, heron, red-breasted merganser, teal (seen on this visit) and a few other duck, as well as curlew, redshank, dunlin and snipe. There is no regular use of the site (for feeding or roosting) by the shorebirds associated with the SAC (Pat Smiddy, Duchas, pers. comm.) as there are other more attractive habitats available.

Small birds include skylark and meadow pipit which were seen in the open fields and reed bunting, linnet, goldfinch, greenfinch, blackbird, robin, great tit and blue tit, associated with the hedges. The rush-filled fields appear to be suitable habitat for short-eared owls which would occur in winter with kestrels hunting there more regularly.

No fauna of nature conservation importance were found in the area although some parts of the area are occasionally used in winter by shorebirds from the estuary. This use of the area by shore birds was probably more intensive when it was managed intensively as farmland in the past: several species (lapwing, golden plover, black-tailed godwit and curlew) feed in pastures as well as on mudflats. The general avifauna is characteristic of open coastal lands and is of amenity rather than heritage value.

Invertebrates

The invertebrate fauna was not examined and the site of greatest habitat value for invertebrates is that of Option 1 – because of its unmanaged vegetation and proximity to brackish conditions.

4.1.4 Designations

None of the study area is included in the candidate Special Area of Conservation (designated under the EU Habitats Directive 92/42/EEC) which is based on the estuary, taking in the saline lake beside the seawall and the adjacent fields. There is comparatively little ecological connection between the study area and this area. Adjacent land, outside the seawall is part of the Blackwater Estuary SPA (designated under the EU Birds Directive 79/409/EEC).

No habitats or species listed in the Annexes of these Directives occur on the study area with the exception of the common frog (Annex V – Habitats Directive) and there are no plant species present that are included in the Flora Protection Order 1999. However the otter (Annex II – Habitats Directive) and black-tailed godwit (Annex II/2 – Birds Directive) occur on adjacent land. These three species are included in the Irish Red Data Book 2 (Whilde, 1993).

4.2 Impacts

The physical presence of the proposed WWTW will have very little effect on the ecological value of the area. On a local scale, existing habitats will be removed for construction of the WWTW. However, these are not of nature conservation importance so the impact is not considered significant.

Construction and pipe-laying has more potential to create disturbance in the natural communities though there is adequate land available to limit this to a minimum with suitable mitigation. Provided there is no impact on the SAC area it should not be a significant impact. A little extra disturbance could be caused by WWTW operation but it is considered that the bird life will easily readjust to this. The construction of a road to the WWTW will impact on habitats through direct removal of habitat and temporary disturbance of nearby habitat during the construction phase. This will have the least impact in the case of Option 1 which is the shortest route.

Based on an ecological assessment there is little to differentiate the sites. Option 1 would have the greatest impact on vegetation as this plot has not been managed in recent years. However it would have least impact on bird life. The other options are located in similar terrain to each other. Option 3 is on a slightly drier and more modified field than Option 2 and therefore is the preferred option for siting of the WWTW.

4.3 Mitigation Measures

- The construction of the WWTW and associated pipe-laying should be designed to remove as few hedges as possible. In particular the laneway from the southern end should be retained in its present form and a new access be provided. The lane could in time form an attractive walking route, parallel to the sea wall.
- During the construction phase, sedimentation of drainage ditches shall be avoided with suitable mitigation measures in place.
- All vehicular traffic shall avoid the vicinity of the SAC boundary to restrict to a minimum the potential inflow of sediment or oil.
- The land based pipeline from the WWTW should avoid the SAC.

5. MARINE ECOLOGY

5.1 Existing Environment

The focus of this study is on the proposed outfall to Ferry Point in the Estuary. Two route options are being considered for the outfall locations from the WWTW, Option 1 and Option 3. Option 1 would be a short sea outfall located at the southern end of Allin's Quay in Youghal town. Option 3 would be a short sea outfall situated north of the quays at Youghal town and at the southern end of the Youghal mudlands (Figure 2.3 & 2.1).

5.1.1 Littoral

Twenty biotopes (habitats and species assemblages) were recorded from the littoral survey. Details of these biotopes are given in Appendix B. 62% of the biotopes consisted of LMU (Littoral mud), while 21% consisted of LGS (Littoral gravel and sands) biotopes with approximately 17% consisting of rocky biotopes. However, this figure is a rough estimate and does not take into account biotopes mapped on vertical surfaces such as walls. Figures 5.1 and 5.2 illustrate the main biotopes found in the vicinity of the two proposed outfall locations.

Seaweed species in the area included *Fucus vesiculosus, Ascophyllum nodosum, Pelvitia canaliculata* and *Enteromorpha* spp. while a large number of bivalve molluscs and polychaetes were found in sedimentary biotopes. Patches of mussels (*Mytilus edulis*) were also present at various locations.

In general the biotopes recorded along the inner part of the estuary are typical of more wave sheltered locations than those recorded along the outer estuary. The biotopes recorded are commonly found along the Irish coast (EcoServe, unpublished data) and no species or habitats of conservation importance were recorded. Kinsalebeg, a small inlet off the east side of the Blackwater estuary is known to be of ornithological importance. The dominant species here (Picton and Costello, 1998) were found to be the polychaetes, *Hediste diversicolor*, *Arenicola marina* and *Nepthys* sp. and the bivalve *Scrobicularia plana*. The current survey found *Macoma balthica* to be the dominant bivalve.

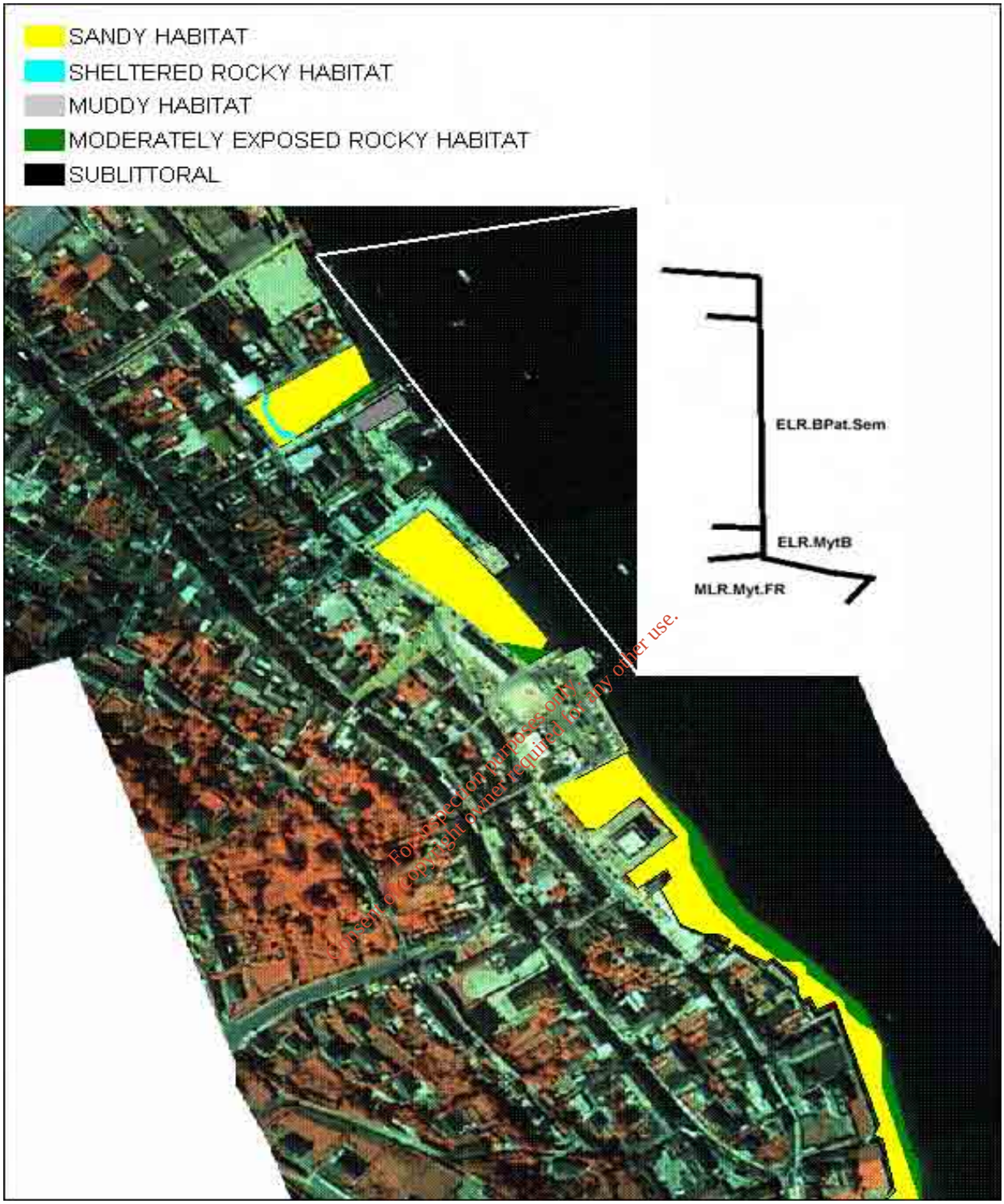


Figure 5.1 – Marine Biotopes in Youghal Harbour

showing the biotopes mapped along the harbour walls at Youghal town. This section is approximately 0.75 km in length and is where Option 1 for the short sea outfall is located. The number and width of the biotopes in the survey are too detailed to be displayed for the whole map. For this reason an insert of a blown up section of the biotopes typically found

along this stretch are shown in each case. The higher biotope codes, which represent the wave exposure of the site are however indicated.

A profile of the harbour wall is indicated showing the relative proportions of various biotopes. ELR.Bpat.Sem consists predominantly of barnacles, with the other two biotopes consisting predominantly of mussels. Detailed descriptions of the biotopes are given in Appendix B.

5.1.2 Sublittoral

The species recorded in the survey area are commonly found in estuaries on the south coast of Ireland (EcoServe unpublished data). No species or habitats of conservation importance were recorded. Typically species diversity and abundance was low (see Appendix B for details). The sites with the highest number of species were recorded from the middle and outer estuary where the substrata consisted of coarse sand, gravel and shell and cobbles (D3, D6, D7 and D9 in Figure 5.3). Sites with the least number of species mainly occurred in the inner estuary where the substrata consisted of anoxic mud and muddy sand (D1, D2 and D4 in Figure 5.3).

5.1.3 Mussel beds

Youghal Harbour used to be a shellfish production area, although harvesting has not been undertaken for a number of years and is not nor has been a designated shellfish production area under the *European Communities (Live Bivalve Molluscs) (Health Conditions for the Production and Placing on the Market) Regulations*, 1996 (S.I. No. 147 of 1996). Prior to 2001 the area between Knockadoon and Knockavery outside the harbour was designated as a Category B in the regulations. However, in the 2001 Live Bivalve Molluscs (Production Areas) Designation, 2001 (No.1) Youghal was not designated as a shellfish production area.

Bacteriological levels in mussels collected in the estuary were assessed. The Department of the Marine and Natural Resources reports shellfish beds (*Mytilus edulis*) in Youghal Harbour with locations indicated in Figure 5.3. However, dredging surveys carried out for the current study found few mussels in the estuary with abundant mussels only found at site M1 located in the harbour area(Figure 5.3). Two mussel dominated biotopes were found in the littoral

survey extending on the west side of the estuary from the landfill site in the north to the south of Youghal town. These two biotopes (ELR.MytB and SLR.MytX) represented less than ½% of the littoral area mapped, although this figure is only representative of horizontal surfaces as discussed in Section 5.1.1. Most of the mussels were present on walls and vertical surfaces, the area of which could not be calculated.

Mussels were collected from a mussel-bed north of Ferry Point (M1) and also from a pier wall in the town (M2). Faecal coliform levels were low in the sample collected in the mussel bed (130 FC/100g), well below the level required under the shellfish production regulations. Levels were relatively high in the mussels collected on the pier wall (5,400 FC/100g) but within the specified limits under the regulations (although mussels would not be harvested from here).

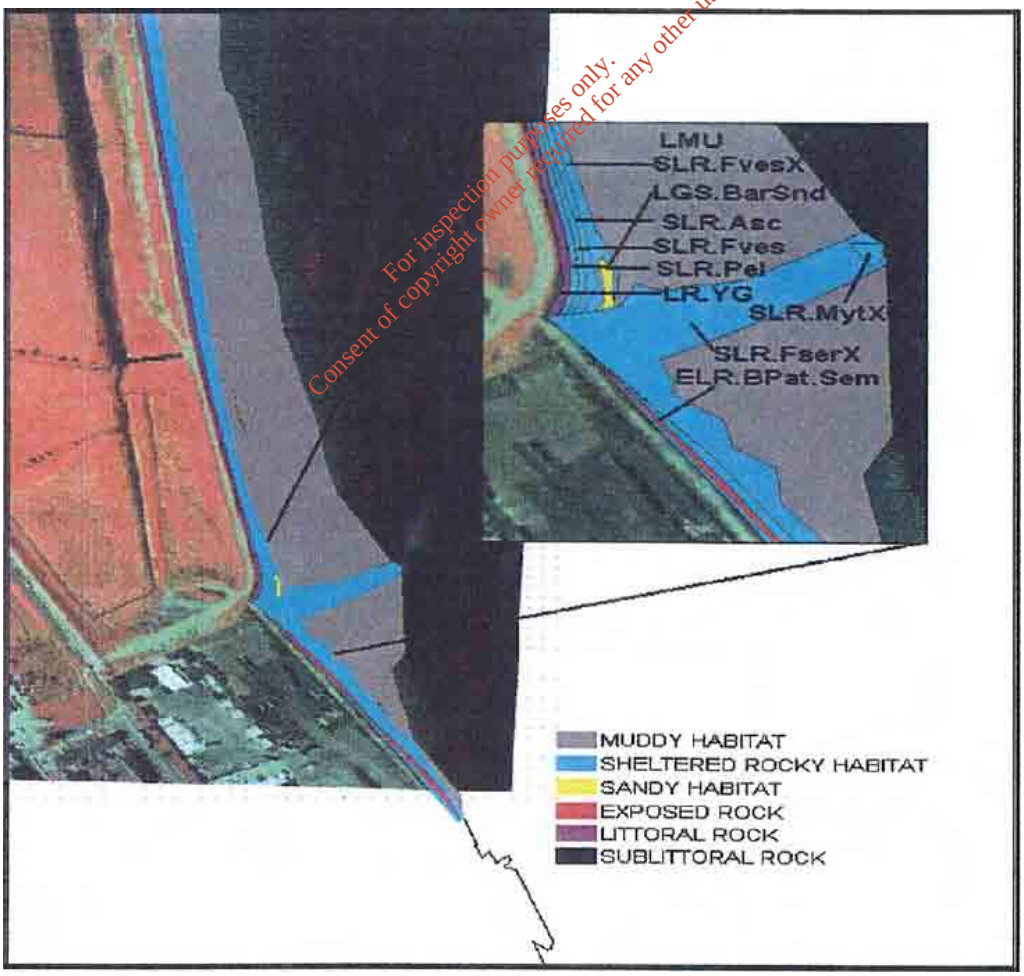


Figure 5.2 – Marine biotopes along the lower Youghal Mudlands

Figure 5.2 shows the biotopes mapped along the lower Youghal Mudlands. This map is approximately 0.75 km in length. The insert is a blown up section of the biotopes found at the site of the proposed outfall Option 3.

SLR. Asc, SLR.Fves, SLR.Pel and SLR.FserX consisting of brown seaweeds. ELR.Bpat.Sem consists predominantly of barnacles while SLR.Myt.X consists predominantly of mussels. Details descriptions of the biotopes are given in Appendix B.

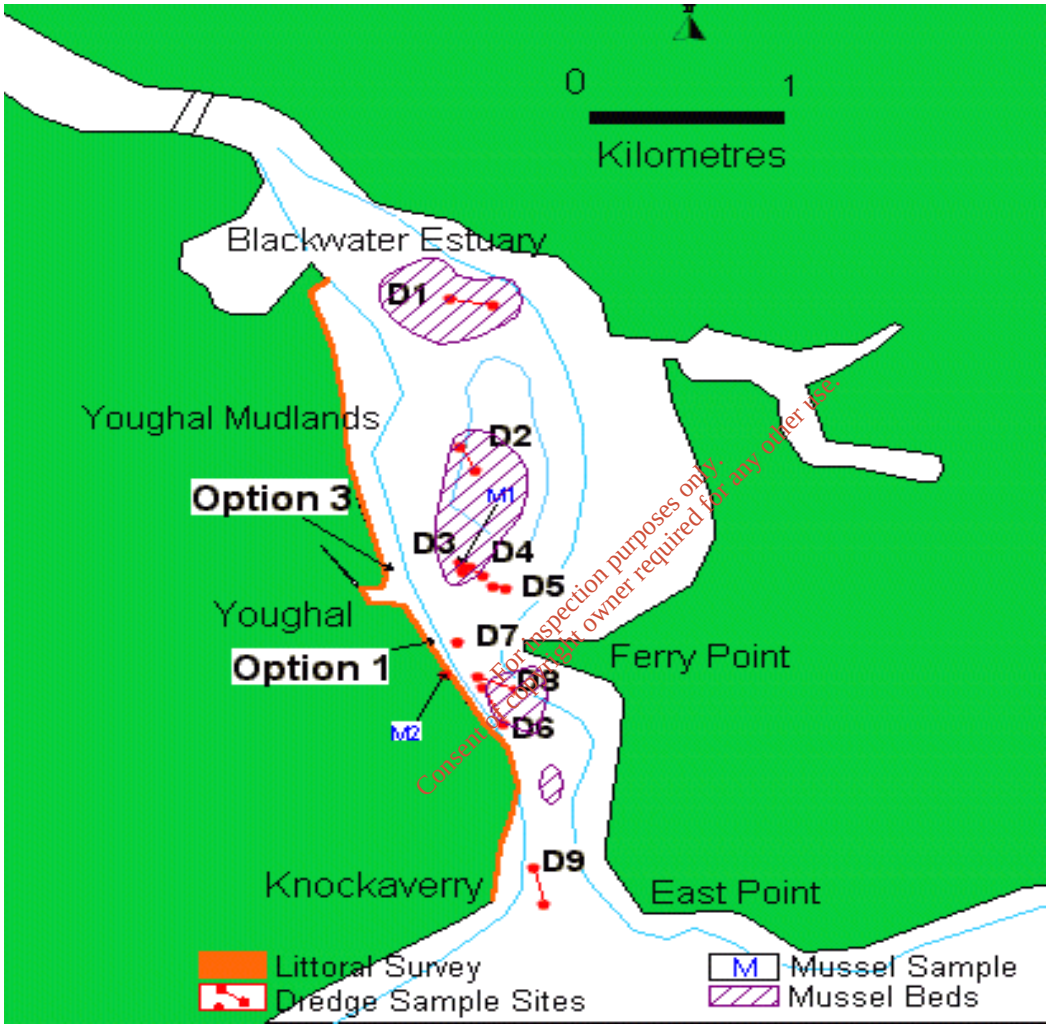


Figure 5.3 – Map showing locations of dredge sampling sites

Figure 5.3 shows locations of dredge sampling sites (in red), the extent of the littoral survey (in orange) and the two locations where the mussels samples were collected (in blue).

5.2 Impacts

5.2.1 Short term impacts

Habitat will be lost in the short term during the construction of a trench for laying the outfall pipe. The loss of habitat is likely to be temporary as the trench will be back filled. It is expected that the habitat will return to its natural state. The habitats likely to be impacted by the development at Option 1 and Option 3 are widespread in the survey area and percentage loss in area is expected to be minimal.

Species will be lost in the short term during the construction phase of the outfall pipe, directly through the removal of habitat when the outfall trench is made, and indirectly through the loss of feeding grounds. Epifaunal species will be most affected as they are attached to the substratum. Once the habitat has been reinstated it is expected that species from the sites at Option 1 and Option 3 will readily re-colonise the area from the surrounding habitat. The loss of species due to loss of feeding and spawning grounds is likely to be negligible due to the small area of seabed likely to be impacted in relation to the wide area of similar habitat available in the area.

There will be an increase in the turbidity of the water during construction of the pipeline trench. This could result in increased siltation, smothering of organisms and reducing light for phytoplankton and seaweed. Estuarine environments are typically sedimentary with a high sediment load in the water. Species living in estuaries have adapted to these conditions and therefore additional short term sedimentation from the pipeline construction is likely to have minimal impact.

Contamination of the area due to accidental spillage of pollutants or waste, e.g. oil and other chemicals, or litter, may occur during the construction phase. However, with suitable precautions and best practice for the storage, handling and disposal of such material followed, significant damage will not occur.

5.2.2 Long term impacts

Long term positive impacts from the wastewater treatment works are predicted to occur from the outfall discharge into the Blackwater estuary through an improvement in water quality in the estuary over time. At present untreated sewage is discharged into the estuary, while the new development will provide secondary treatment provision for nutrient removal.

5.2.3 Impacts on Mussel-beds

Shellfish are filter feeders that eat bacteria from sewage along with the tiny particles of food they pump through their gills into their stomachs. They can convey virtually all water-borne pathogens (disease-causing organisms) to humans. In South Australia, the government recommends no harvesting of mussels within 1000m of any existing outfall while in South Carolina in the US, shellfish beds are closed when the coliform count reaches 200 per 100 ml of water.

Faecal coliform levels were predicted for a plume emanating from the two existing outfalls and for the proposed outfall at Ferry Point (options 1 & 3)using a CORMIX dilution based discharge plume model undertaken for this EIS (Ref Chapter 7). This model predicts that the proposed secondary treated effluent without disinfection discharging at the Ferry Point outfall will improve water quality conditions even with a greatly increased loading on the works. This model predicts high variability in faecal coliforms in the outfall plume centreline depending on tidal conditions. Faecal coliform levels were predicted to occur during high water slack for Neap tides and vary from 16,430 FC/100ml at 10m from the outfall to 230 FC/100ml at a distance of 1000 m upstream from the outfall. The downstream value for the Spring low water slack varies from 13,550 FC/100ml at 10m from the outfall to 70 FC /100ml at the mouth of the estuary 1750m downstream of the proposed outfall. This latter value of 70 FC/100ml compares well with the Conditional Classification Shellsan standard which can be achieved at even closer distances to the outfall (approximately up to 500m from the outfall). These figures are also conservative as no account is taken of the Decay factor of bacteria which could lower the values by as much as 30%.

With secondary treatment and disinfection, faecal coliform levels are negligible even at a distance of 10m from the outfall (maximum 110 FC/100ml).

At present sewage receives no treatment, but despite this, faecal coliform levels were found to be low in mussel tissue in the samples taken. Secondary treatment will reduce coliform levels which will enhance the potential for shellfish harvesting should the practice resume again. However it is not proposed to meet the Shellsan Standards in the estuary. However, the proposed WWTW will lead to positive and significant long-term impacts on water quality and the quality of shellfish.

5.3 Mitigation Measures

To minimise the levels of suspended solids released into the water column during construction, efforts should be made to minimise the area of seabed disturbed. Construction should be carried out over periods of slack tide to minimise the dispersion and removal of material from the area. It is preferable to avoid undertaking work during early summer and autumn when salmon returning from the sea enter the river.

In order to reduce the area of habitat and number of species lost, it is recommended that the area impacted upon is kept to a minimum along the route of the outfall. Habitats disturbed during the construction process should be restored as close as possible to their previous status after construction by replacing sediment in dredged locations.

Potential contaminants should be stored in suitable storage facilities both on land, and at sea. The use of bunded containers would minimise the likelihood of spillages. Waste and litter generated during construction should be returned to the shore for authorised disposal at suitable facilities. Construction and on site operating procedures should be followed to the highest standard to minimise unnecessary disturbance and prevent accidental spillage of contaminants.

6 SOILS, SEDIMENTS AND GEOLOGY

6.1 Existing Environment

6.1.1 Marine Sediments

Sediment samples were collected in Youghal Harbour analysed for grain-size and organic matter content and the results are summarised in Table 6.1. (see Figure 7.1 for site locations).

Table 6.1 – Marine Sediment characteristics in Youghal Harbour

Site	1	3	4	6	7	8	9
Loss On Ignition (%)*	5.4	5.6	5.9	7.9	8.1	2.7	2.7
Median particle diameter (mm)	2.4	2.5	0.4	1.4	0.5	0.5	0.6
% sand	52	53	43	52	32	98	94
% muddy sand	46	47	40	45	30	89	90
% silt	48	47	57	48	68	2	6

*Loss on Ignition (LOI) represents organic matter present in the sample.

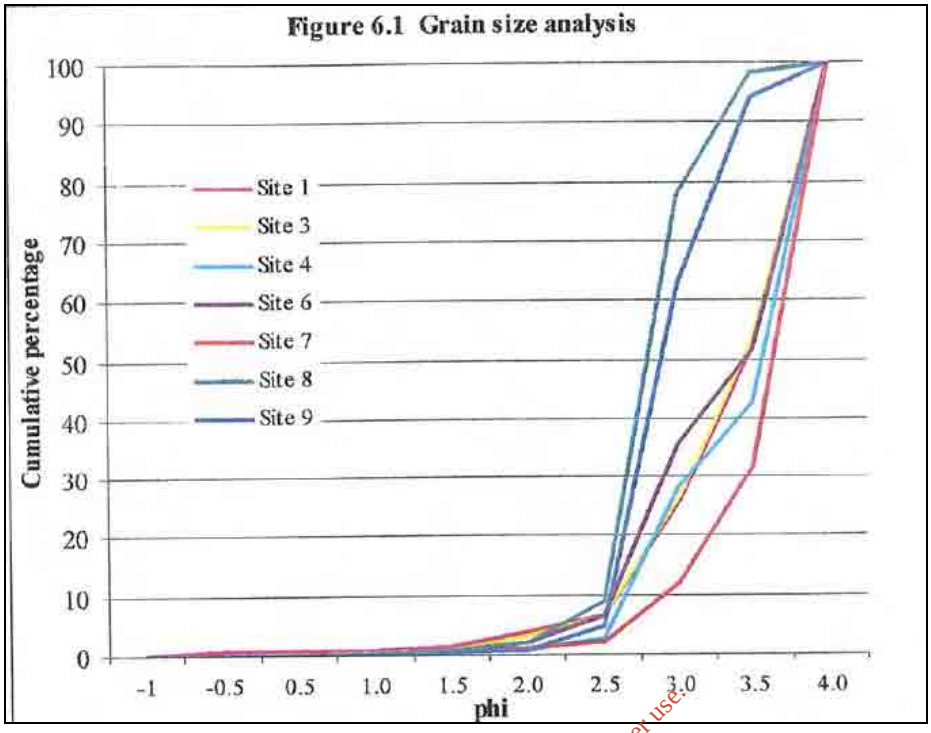
Sand = 0.062-2mm grain size diameter.

Muddy sand = 0.062 - 0.125 mm grain size diameter.

Silt = <0.062 mm grain size diameter.

Loss on ignition values in sediment were quite low (between 2.7 – 7.1%). Karakassis *et al* (1998) recorded LOI between 7 and 10% at control sites in the Mediterranean, while analysis of core sediment samples at Lough Leane, Killarney showed typical LOI of about 20% (Murray, 1998).

Sediment in Youghal harbour consists predominantly of sand (43-98%) with a large proportion of this sand being muddy sand (40-90%) (Table 6.1). Figure 6.1 shows a cumulative frequency curve illustrating particle size distribution represented in phi units (where phi = $-\log_2$ x (mm)), which is the usual way to present grain size data. This shows that sediment at all sites is predominantly distributed between 2.0 and 4.0 phi units. These represent fine sand and silt portions. This is normal for estuaries which are low energy environments and fine sediment is deposited from rivers.



Sediment was analysed for metals from three samples collected in the vicinity of the proposed outfall at Ferry Point (see Figure 7.1 for site locations). The results of the analyses are shown in Table 6.2.

Table 6.2 – Concentrations of metals in marine sediment in Youghal Harbour.

mg/kg (ppm)	Site 3	Site 4	Site 5	Sewage Sludge Directive limits*	Dumping at Sea Act** limits
Arsenic	<1	<1	4	No limit	No limite
Cadmium	<1.0	<1.0	<1.0	20-40	10
Copper	<5	6	9	1000-1750	300
Lead	10	10	19	750-1200	400
Mercury	<0.10	<0.10	<0.10	16-25	5
Nickel	12	11	25	300-400	250
Tri-butyl tin	<0.02	<0.02	<0.02	No limit	No limite
Zinc	32	49	70	2500-4000	1000

*EC limits for disposal of sewage sludge to agricultural land (98/278/EEC).

**Licenced limits set under Dumping at Sea Act, 1981 (before dumping of sewage sludge at sea ceased in 1998).

Metal concentrations were found to be low in all samples and well below concentrations permitted in sewage sludge for disposal on agricultural land (EU Directive 86/278/EEC) or limits allowable under the Dumping at Sea Act, 1981 (Table 6.2). It is known that the deposit feeding bivalve *Scrobicularia plana* (a common species in Youghal harbour) is highly sensitive to sediment-bound TBT, with population declines likely at TBT concentrations >0.3 mg TBT/kg sediment (Marine Institute, 1999). Bivalves in particular are sensitive to TBT. Levels of TBT were found to be low in Youghal sediments (<0.02 mg/kg sediment).

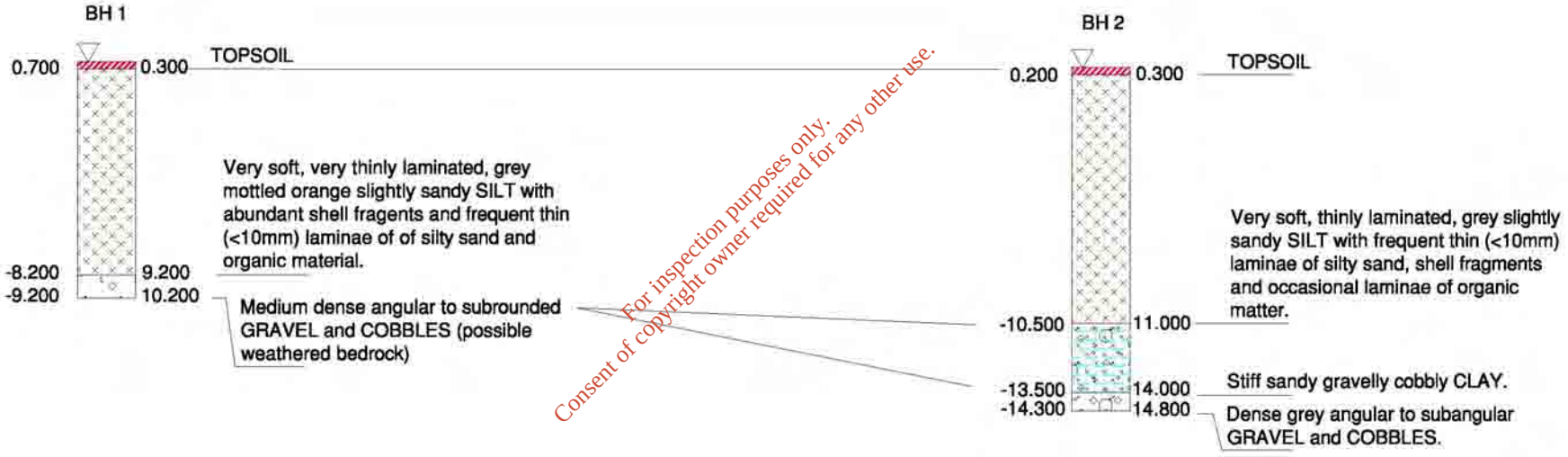
6.1.2 Geology and Hydrogeology – Mudlands

Data on ground conditions in the area of the proposed development was available from two boreholes drilled in the area of the WWTW site Option 3 (Figure 2.4). Details of the borehole data are indicated in Figure 6.2. Site investigation data was available from the new road embankment crossing the River Tourig (approximately 1km north west of the site) and the proposed landfill site extension approximately 500m north of the site. In addition data was available from aerial photography, topographic maps, Admiralty charts and geological maps.

The bedrock geology in the Youghal area consists of Carboniferous and Devonian limestones, sandstones and mudstones. The superficial soil deposits consist primarily of estuarine deposits associated with the rivers Blackwater and Tourig. These deposits consist of normally consolidated estuarine and marine sediments. These sediments consist of soft thinly laminated organic silts and very silty clays with frequent thin (<10mm) sand layers and layers of partially decomposed organic material overlying dense gravel.

In the BH2, 3m of stiff clay was encountered between the silt and gravel. The dense gravels were encountered at 9.2m in BH1 and 14m in BH2 indicating that the depth of this stratum increases towards the river.

The ground profile encountered in both boreholes is similar to that encountered during the site investigations for the landfill and road embankment. These site investigations show lateral continuity of the silt across the flood plain with the silts underlain by gravel towards the river and stiff clay towards the land.



BOREHOLE DETAILS *FIGURE 6.2*

The thickness of the estuarine deposits can be expected to vary over the mudflats with the deeper deposits being located adjacent to the river.

Groundwater was struck in the gravel deposits rising to ground level.

6.2 Impacts

6.2.1 Marine Sediments

Concentrations of metals and organic matter was found to be low in sediments analysed from Youghal harbour. Thus, there will be a significant adverse impact on water quality and marine life from release of contaminants when sediment is dredged during construction of the proposed outfall.

The proposed WWTW will not have a significant impact on marine sediments. There may be some deposition of particles from the outfall but this should be negligible due to tidal currents in the area. Deposition or erosion of sediments in the estuary as a result of the outfall is likely to be insignificant in comparison to the scale of sediment dynamics in the estuary from natural processes.

6.2.2 Geology and Hydrogeology – Mudlands

The proposed waste water treatment works will involved the construction of several reinforced concrete treatment and settling tanks with associated infrastructure. Initial estimates of foundation loading conservatively indicate maximum gross foundation loads of less than 100kPa.

The soft nature of the superficial deposits in the mudlands will necessitate piled foundations for structures on all 3 options. Combined end bearing / friction piles will be required with the extremely soft nature of the silts necessitating a large end bearing component to the pile design. Pile toes will probably be situated in the gravels encountered during site investigation drilling.

To provide an adequate lateral support to piles the pile toe will be required to be seated an adequate depth into the founding stratum. If the gravel deposits represent weathered rockhead this may necessitate the drilling of rock sockets into bedrock.

For Option 3 pile lengths are likely to be 10-15m. The pile length is dependant on depth to a suitable bearing stratum which is likely to be deeper for Options 1 and 2 than for Option 3, due to the proximity to the river to these sites.

The required construction method of the piles is dependent on economic considerations. However it is likely that bored or augered piles will be necessary if rock sockets are required. The low bearing capacity of the surface soils also has an effect on the trafficability of the ground by heavy pile driving plant. It is likely that a substantial piling mat will be required for driven piles.

The main impacts caused by piling are noise and spoil generation. The significance of these impacts is dependent on the selection of pile type. Bored or augered piles will generate spoil.

There is no significant impact on the soils due to the proposed WWTW.

6.3 Mitigation Measures

6.3.1 Marine Sediments

The area of seabed disturbed and dredged during construction of the outfall should be minimised to reduce short-term impacts from the release of contaminants and increased turbidity.

6.3.2 Geotechnics & soils

Spoil generation from construction of bored piles can be mitigated by reuse of the excavated materials on site for landscaping.

If driven piles are selected, noise can be reduced by specifying appropriate pile driving equipment to keep noise to within allowable tolerances.

7 WATER

7.1 Existing Environment

7.1.1 General Water Quality

The estuary of the Munster Blackwater extends from the limits of tidal influence at Lismore to the mouth at Youghal Harbour (at East Point), a distance of approximately 38 km. The River Blackwater is a relatively large river with a long-term mean flow rate of 80 m^3/s. There are also a number of significant tributaries, which discharge into the estuary e.g. the rivers Bride, Finisk and Likky. The estuary has a distinctive narrowing due to a shingle spit extending from the east side of the estuary known as Ferry Point. The predicted tidal range is approximately 3.5m and currents in the estuary can be strong with tidal currents at the Ferry Point varying from 0.02 – 0.89m s^{-1} (Appendix D). Data from an EPA cruise in October 1992 (Marine Institute, 1999) indicate that the estuary is well mixed.

The EPA have reported (Water Quality in Ireland 1995-1997) on estuarine and coastal water quality on a number of estuaries including the Blackwater at Youghal. This assessment indicated that slight deoxygenation was observed in the upper estuary but oxygen saturation was close to 100% in both the river and tributaries and in the coastal waters outside the estuary. Oxidised Nitrogen and Phosphorus were quite high in the upper estuary but ammonia levels were generally low. Slightly elevated levels of algal growth were detected in both the '91-'94 and '95-'97 surveys but without serious effect on water quality. Generally satisfactory water conditions have persisted over the period.

Water quality in the river Blackwater and its tributaries, is generally very good. In 1997 over 82% of river water in the area was designated as Class A (unpolluted) with a further 13% designated as Class B (slightly polluted/eutrophic) (Doris *et al*, 1999). Biotic Quality Indices (which use macroinvertebrates as indicators of water quality) classified most of the River Blackwater and its Tributaries to have a Q-value of 4 or 5 (Doris *et al*, 1999; Clabby *et al*, 2001) which indicate unpolluted water. Some tributaries were slightly polluted (Q3-4) e.g. Likky River.

Just outside the harbour along the western shoreline there is a large beach, known as Youghal Main Beach and Claycastle Beach, which are designated bathing areas under the Bathing Water Regulations (76/160/EEC). The beach has been awarded Blue Flag Beach status by An Taisce, the relevant awarding authority in Ireland for a scheme organised at European level by the Foundation for Environmental Education in Europe. The beach was also awarded Blue Flag status for the past number of years. Water quality parameters were well within the mandatory values given in the Bathing Water Regulations between 1996 and 2001. Water quality parameters were also predominantly below Guide values provided in the Bathing Water Directive (76/160/EEC) and National Regulations (S.I. 155 of1992) with only 10% of samples exceeding guide values for faecal and total coliforms between 1996 and 2001.

7.1.2 Hydrography

A dye trace and drogue tracking study was conducted in the Blackwater estuary, which provided more detailed and up to date information on water current directions and velocity. Details of this survey are given in Appendix D. Dispersion and dilution characteristics appeared to be good, with low concentrations of dye recorded before the dye reached the estuary mouth on the ebb releases and Youghal Bridge on the flood releases. Recorded currents were south-south-east for the ebb tide and north-north-east for the flood tide. However, there appears to be an east to west flowing current at high and low water slack periods, causing the dye to migrate towards the west shore at this time. At the high water, spring dye release, strong dye concentrations were observed within the harbour where a clockwise circulation pattern appeared to have prevented this dye from re-entering the channel.

The drogue study indicated a current favouring the Youghal side of the channel flowing south. The directions moved towards the centre of the channel by mid-tide. On the flood tide, drogues travelled north-north-west.

7.1.3 Field Sampling And Analysis

In April of 2001, 11 water samples were collected at 7 harbour sites during high and low water for this study. These were analysed for a range of water quality parameters. A summary of the results is presented in Table 7.1, and site locations are shown in Figure 7.1.

The freshwater section of the River Blackwater is a designated salmonid water (78/659/EEC). Although the estuary does not come under the remit, recommended limits given in this legislation are useful in assessing water quality in the harbour. This Directive requires total ammonia levels below 0.8 mg/l N. Values in the estuary ranged between 0.046 – 0.064 mg/l and thus were well within the recommended limits. Under this Directive BOD levels should be below 3 mg/l. The highest BOD level recorded in this survey was only 2.0 mg/l. Nitrate levels were also low (<1.6 mg/l). Levels for these parameters were also low in the EPA survey in 1994 and 1997 (EPA, unpublished data; Lucey *et al.,* 1999).

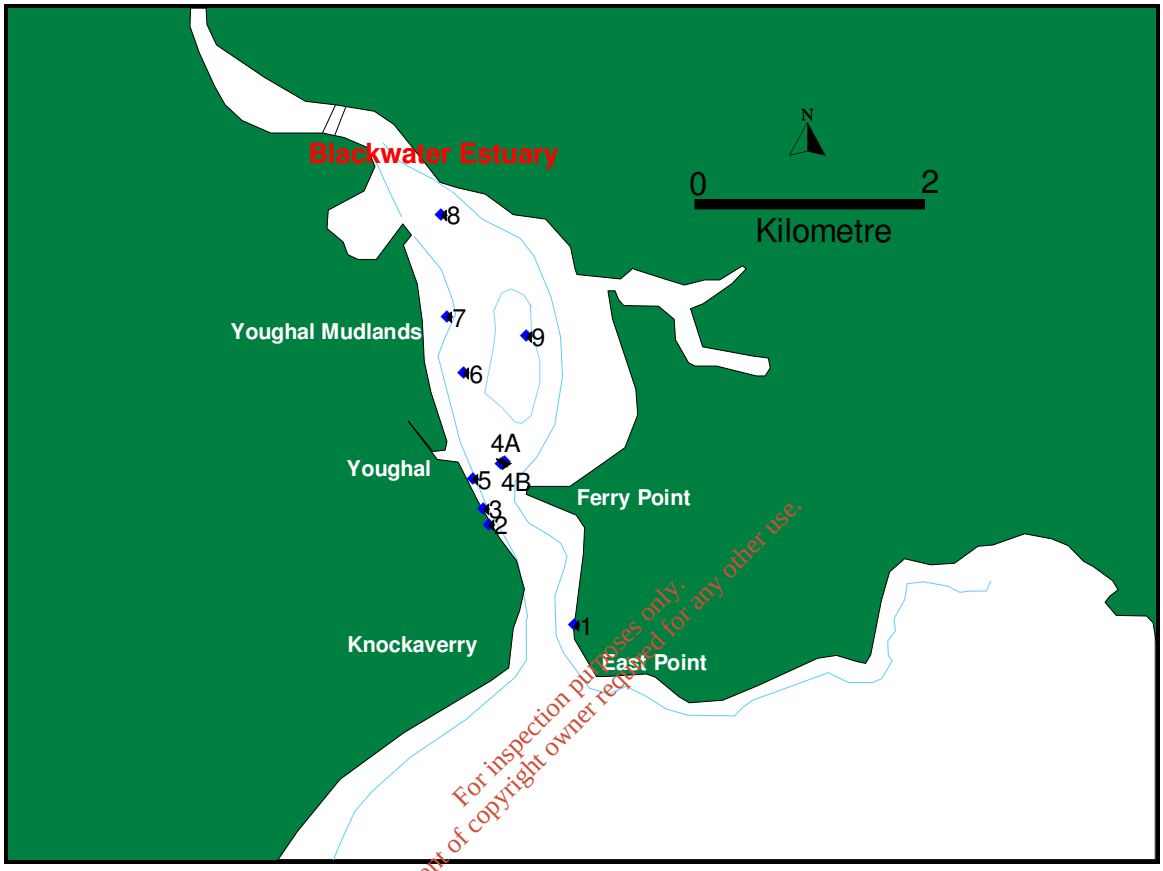
Table 7.1 – Median concentrations for water quality parameters at Youghal Harbour.

Parameters	Units	SITES								
		Site 1	*Site 2*	*Site 4*	*Site 6*	*Site 7*	*Site 8*	*Site 9*	*Max*	*Min*
B.O.D.	mgO_2/l	1.1	2.0	0.9	0.9	1.1	0.7	0.9	2.0	0.7
Ammonia	mgN/l	0.064	0.060	0.059	0.068	0.055	0.046	0.064	0.072	0.046
Nitrite	mg N/l	0.003	0.002	0.004	0.004	0.003	0.002	0.001	0.005	0.001
Nitrate	mgN/l	0.54	0.03	0.93	0.77	0.82	0.31	0.09	1.55	0.03
Total Nitrogen	mgN/l	0.72	0.24	1.18	1.01	1.04	0.45	0.31	1.75	0.24
Orthophosphate	mgP/l	0.002	0.000	0.006	0.006	0.007	0.001	0.000	0.013	0.000
Total P	mgP/l	0.020	0.015	0.027	0.026	0.030	0.015	0.013	0.042	0.013
Suspended Solids	mg/l	6.3	8.8	3.0	8.3	14.7	3.6	2.2	23.2	1.0
Chlorophyll a	mg/l	0.012	0.015	0.009	0.011	0.012	0.011	0.011	0.015	0.008
Salinity	‰	29.0	33.5	26.2	27.5	27.1	31.7	33.3	33.7	20.8
Total Coliforms	CFU/100 mls	15	26	23	33	400	18	2	400	1
Faecal Coliforms	CFU/100 mls	5	10	6	20	74	7	0	84	0
TN:TP ratio		*37*	*16*	*44*	*40*	*35*	*30*	*24*	*44*	*16*

Sites 3 and 5 were for sediment samples.

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

Figure 7.1 – Sampling locations for water quality



7.1.4 Nutrient Levels

Nutrient inputs to the estuary are dominated by riverine flows. Industrial loads in Youghal are low and are considered unlikely to contribute to the nutrient budget of the estuary (Marine Institute, 1999). In 1997, the Munster Blackwater was reported to have exported the highest load of ortho-phosphorus of all Irish rivers (ref Appendix L) (Lucey *et al.,* 1999). The export load of oxidised nitrogen was found to be the fifth highest in the country in 1997 (Lucey *et al*., 1999). Phosphorus loading from the River Blackwater is equal to 603 tonnes per annum while total oxidised nitrogen loading from the river is 8,979 tonnes per annum (ref Appendix L) (Lucey *et al*., 1999).

Based on typical concentrations of total phosphorus and total nitrogen in domestic wastewater of 10 and 40 mg/l respectively and 225 litres per person per day, with a population equivalent of 20,000 the proposed WWTW would produce the equivalent of 16 and 66 tonnes of TP and TN respectively per annum. This represents less than 3% of total phosphorus loading and less than 0.7% of total nitrogen loading to the estuary in comparison with loading from the river**.**

The EPA found other water quality parameters to be satisfactory (Lucey *et al.*, 1999) although autumn chlorophyll levels were slightly elevated in the upper part of the estuary in the November 1994 survey (range 1.3 to 11.3 mg/m^3)

Ortho-phosphate levels in recent (April 2001) survey were also low (<0.007 mg/l). According to a classification scheme devised by the Environmental Protection Agency and the Marine Institute, normal ortho-phosphate levels in estuaries range between 0.05 – 0.15 mg P/l with 'hypersaturated' levels greater than 0.15 mg P/l (Marine Institute, 1999). Ortho-phosphate levels measured by the EPA in 1994 and 1997 were < 0.128 and <0.09 mg/l respectively, while levels measured in the June 2001 survey are considered low. However, annual median values are usually used to assess eutrophication potential as ortho-Phosphate can vary greatly over time. Therefore ortho-Phosphate values obtained in the current sampling should be observed with caution. During the EPA survey in 1994 (where a large number of samples were taken throughout the year), median concentrations of ortho-phosphate were as high as 0.07 mg/l in the upper estuary while median levels in the upper estuary were 0.04 mg/l in the summer sampling of 1997 (Lucey *et al*., 1999).

Eutrophication can also occur if summer chlorophyll levels are consistently above 0.01 mg/l. In the EPA survey in May 1994, levels were generally below this in the estuary and lower river (EPA, unpublished data) while in 1997 median chlorophyll levels were 0.02 mg/l in the upper estuary and 0.006 in the lower estuary (Lucey *et al.,* 1999). In this survey, median chlorophyll levels in the estuary were 0.011 mg/l with little variation between low and high tide. Conversion of ortho-phosphate into chlorophyll by algae may account for the low ortho-phosphate and high chlorophyll concentrations.

Observed algal production solely due to high riverine nutrient levels resulting from human activity is questionable. In areas that are naturally productive it is difficult to determine the incremental contribution from these sources without detailed research. Nonetheless, it is clear that estuaries subject to increasing loads from point sources and agricultural run-off in particular, may be prone to high productivity and sensitive to increasing nutrient input. However other parameters are also required for the production of algae including light and water column integrity.

7.1.5 Trophic Status of Blackwater Estuary

An assessment was undertaken by the EPA on behalf of the DoELG of the trophic status of a number of estuaries and bays around Irish coastal waters including the Blackwater estuary which was required for the full implementation of the UWWT Directive (91/271/EEC). The assessment was based mainly on data collected between 1995 and 1999.

To undertake the assessment it was necessary to set down quantitative criteria for the occurrence of eutrophication. Three classifications of waters were made for the assessment and the quantitative criteria for Nitrogen and Phosphorus are as follows:

Table 7.2 – Water classification and Eutrophication Criteria

Water Classification	Dissolved Inorganic Nitrogen (DIN)	Ortophosphate (MRP)
	mg/l	ug/l
Tidal Fresh waters	>2.6	>60
Intermediate salinity Waters (17 psu)	>1.4	>60
Full salinity Waters (35 psu)	>0.25	>40

All levels are medians and apply to winter and summer

Other key water quality parameters were measured including chlorophyll-a and dissolved oxygen.

For the purposes of assessment, the Blackwater was split into the different classifications as follows;

Table 7.3 – Blackwater classifications

Zone	Type	Reach
River	Fresh	River at Lismore Bridge
Estuary Upper	Tidal Fresh	Bullsod Is. to Dromana Ferry
Estuary Lower	Estuary	Dromana Ferry toNear East Point
Youghal Harbour	Outer	Bay seawards of East Point

The assessment concluded that the Upper estuary was marginal in respect of eutrophic criteria and could be considered potentially eutrophic.

As the proposed discharge point for the works and tidal influence remains within the estuary the area of our concern is Lower Estuary and the results for the area are reported in Table 7.4.

Table 7.4 - Survey Results for Lower Estuary

Salinity	DIN	MRP
psu	mg/l N	ug/l P
16.2	1.529	28

Based on the criteria set out in Table 7.2 the criterion for DIN (>1.4 mg/l) is exceeded but the phosphorus criterion is not (>60 ug/l). The criteria for chlorophyll a is also exceeded and the Dissolved Oxygen are reaching the criteria. The area is therefore considered to be potentially eutrophic.

The Blackwater Estuary has recently been designated as a “sensitive area” under the 2001 Urban Wastewater Treatment Regulations (S.I. No. 254). Under these regulations nutrient reduction is required under Clause 4 (3).

7.1.6 Limiting Nutrient

Nitrogen is normally the limiting nutrient in saline coastal waters while Phosphorus is normally the limiting nutrient in freshwaters. This is borne out by the analysis in the trophic assessment where the Nitrogen criterion has been exceeded while the phosphorus criterion has not. Nitrogen is therefore considered to be the limiting nutrient.

The so-called Redfield Ratio of Total Nitrogen: Total Phosphorus is often used to assess what the limiting nutrient is, and concentrations of this limiting nutrient control growth of algae and therefore potential eutrophication. (Lucey *et al*., 1999). Normal ratios of TN: TP for algal growth are 16:1 (Redfield Ratio). At ratios above this Phosphorus is the limiting nutrient. In samples collected for this study, TN:TP ratios were greater than 16:1 for the whole estuary and reached as high as 44:1. TN:TP ratios as measured by the EPA in 1997 were even higher than this (between 31.9 - 241, n=28). This analysis would suggest phosphorus to be the limiting nutrient in the Blackwater Estuary. However the level of aggregation of the data is not apparent from the results between the upper and lower estuaries and this analysis needs to be treated with caution.

Based on the above it is proposed to provide for the removal of nitrogen to meet the 2001 Regulations standard (ref Table 2.2). Provision will be made for the removal of phosphorus if deemed necessary by further studies.

7.1.7 Bacteriological Water Quality

Faecal and total coliform levels in water were assessed for this EIS. The levels were found to be low throughout the harbour with a maximum faecal coliform count of 84 CFU/100 ml at Site 7 in the upper harbour.

Shellfish have not been harvested from Youghal Harbour in recent years. However, as recently as 2000 Youghal Bay outside the estuary from Knockadoon to Knockavery was designated as a Class B Shellfish Production Area (S.I. No. 147 of1996). Under the new Live Bivalve Molluscs (Production Areas) Designation, 2001 (No.1) Youghal Bay has not been designated as a shellfish production area.

Youghal Beach and Claycastle Beach are designated bathing waters under the EU Bathing Water Directive (76/160/EEC). It has also been awarded Blue Flag Beach status for the past number of years by An Taisce. Faecal coliform levels in the water at this beach were well below mandatory levels under the Bathing Water Directive (76/160/EEC) and Bathing Water Regulations (S.I. 155 of 1992) and also the National Limit Values (S.I. 155 of 1992). Summary of results obtained from Cork County Council are given in Table 7.5. This illustrates the high water quality. Less than 10% of samples taken between 1996 and 2001 had total and faecal coliform levels above Guide Levels as given in the Bathing Water Directive.

Table 7.5 – Water Quality at Youghal Main Beach between 1996-2001 (Cork County Council, unpublished data).

Year		Total Coliforms /100ml:	Faecal Coliforms /100ml:	Faecal Streptococci /100ml:	Dissolved Oxygen % sat	pH
1996	*Average*	329	57	5		
	Max	1,100	320	13		
	N	10	10	10		
1997	*Average*	444	121	7	113	8
	Max	2,700	770	61	113	8
	N	16	16	16	1	1
1998	*Average*	156	30	13	108	8
	Max	440	80	75	117	8
	N	12	12	11	11	11
1999	*Average*	343	90	21	92	8
	Max	1,500	610	80	114	8
	N	11	11	11	11	11
2000	*Average*	324	61	12	97	8
	Max	2,125	430	30	103	8
	N	12	12	12	11	9
2001	*Average*	161	37	14	101	8
	Max	355	73	58	103	8
	N	*10*	*10*	*10*	*8*	*5*
1996-2001	***Average***	***303***	***70***	***12***	***100***	***8***
	Max	***2,700***	***770***	***80***	***117***	***8***
	N	***71***	***71***	***70***	***42***	***37***
Directive 76/160/EEC	***Mandatory***	***<10,000***	***<2,000***	***none***	***80-120***	***6-9***
	Guide	***<500***	***<100***	***<100***	***none***	***<300***
S.I. 155 of 1992		***<10,000***	***<2,000***	***<300***	***70-100***	***none***

7.2 Impacts

7.2.1 Biological and Nutrient Water quality

There is currently no effluent treatment other than a holding tank and comminutors at the Green's Quay and Paxe's Lane outfalls and therefore the proposed WWTW will lead to an improvement in harbour water quality. The estuary has a tendency toward eutrophication and has recently been designated as a sensitive area. The discharge from the works could lead to enhanced nutrient levels in the harbour with possible adverse impacts.

The proposed WWTW will involve secondary treatment and due to the potential for eutrophication will also include nutrient removal. This will lead to significant reductions in BOD, COD, suspended solids and nutrients achieving the emission limit values set down in the legislation which are set out in Section 2.3.

It is proposed that the WWTW would reduce nitrogen, the assumed limiting nutrient, with the provision for phosphorus removal if deemed to be required by further monitoring of the estuary.

Therefore, the proposed wastewater treatment works will help to ensure good water quality in the future thus protecting designated waters (e.g. sensitive area, bathing waters, shellfish waters).

7.2.2 Bacteriological Water Quality Modelling

A CORMIX model was undertaken for bacteriological water quality assessment. This model predicted dispersion and dilution of faecal coliform bacteria concentrations discharged in an effluent plume from the two existing outfalls. The following Table 7.6 and 7.7 below indicates output data for Paxes Lane and Greens Quay existing outfalls for neap tide:

Table 7.6 - Results of Neap Tide Simulations for Paxe's Lane Outfall

Point on Tide	FAECAL COLIFORM CONCENTRATIONS AT PLUME CENTRELINE ON NEAP TIDE (per 100ml)											
	UPSTREAM						DOWNSTREAM					
	1000m	500m	200m	100m	50m	10m	10m	50m	100m	200m	500m	1000m
Max Flood	380	580	4,500	16,460	38,710	158,000	-	-	-	-	-	-
High Water Slack	860	1,670	11,760	34,120	58,570	100,180	-	-	-	-	-	-
Max Ebb	-	-	-	-	-	-	138,000	42,310	18,480	4,110	710	460
Low Water Slack	-	-	-	-	-	-	136,990	75,170	38,400	11,600	1,550	1,190

Table 7.7 - Results of Neap Tide Simulations for Green's Quay Outfall

Point on Tide	FAECAL COLIFORM CONCENTRATIONS AT PLUME CENTRELINE ON NEAP TIDE (per 100ml)											
	UPSTREAM						DOWNSTREAM					
	1000m	500m	200m	100m	50m	10m	10m	50m	100m	200m	500m	1000 m
Max Flood	900	1,300	2,270	7,520	35,670	90,100	-	-	-	-	-	-
High Water Slack	2,970	3,120	21,920	90,130	253,280	577,600	-	-	-	-	-	-
Max Ebb	-	-	-	-	-	-	78,800	42,250	15,000	2,670	1,500	1,030
Low Water Slack	-	-	-	-	-	-	809,580	297,950	94,710	21,850	3,680	3,650

This data is based on a faecal concentration of 1E7 FC/100ml. Following secondary treatment only (without disinfection) a 2 log kill is predicted with concentrations of 1E5 FC/100ml based on performance data from the nearby Midleton WWTW which demonstrates that these concentrations are regularly achieved.

This model predicts a significant reduction in faecal coliform levels in the harbour from the proposed outfall at Ferry Point even with an increase in loading to 20,000 population equivalent. The following are the key parameters for the modelling.

- Flow = 1.5 DWF =0.078m3/s
- Influent FC = 1E7 FC/100ml
- Effluent concentration = 1E5 FC/100ml

The following Table 7.8 indicates these results:

Table 7.8 - –Neap Tide Simulations for Secondary Treated Discharge from Proposed Ferry Point Outfall

Point on Tide	FAECAL COLIFORM CONCENTRATIONS AT PLUME CENTRELINE ON NEAP TIDE (per 100ml)												
	UPSTREAM						DOWNSTREAM						
	1000m	500m	200m	100m	50m	10m	10m	50m	100m	200m	500m	1000m	1750m
Max Flood	70	110	750	1,230	1,470	12,010	-	-	-	-	-	-	-
High Water Slack	230	1,045	4,950	9,300	12,440	16,430	-	-	-	-	-	-	-
Max Ebb	-	-	-	-	-	-	12,085	1,260	890	205	125	85	65
Low Water Slack	-	-	-	-	-	-	8,265	4,790	2,790	965	135	80	75

These results are considered to be conservative as no decay factor for bacteria has been accounted for and further reductions of the order of 50% for these tidal conditions can be expected based on a T_{90} of 12 hours.

If disinfection is undertaken, concentrations of faecal coliforms are virtually zero within a very short distance of the outfall. Details of the CORMIX model are given in Appendix D Volume 3.

From the model results it is concluded that the proposed discharge from the WWTW will improve bacteriological water quality in the harbour although not meeting bathing or shellfish (shellsan) standards. The large reduction in the effluent concentration of faecal coliforms afforded by secondary treatment without disinfection (approximately 2 log) will lower significantly the concentrations occurring in the harbour at the design population equivalent of 20,000.

The computed concentrations for the proposed new outfall at Ferry Point fall below the Bathing Waters Directive guide value of 100 per 100ml at a distance of 1750m downstream at the estuary mouth. Since the designated beach is located outside the estuary, the new discharge situation will not adversely affect the Blue Flag status of the beach.

The Shellsan Conditional water quality standard for the previously designated area in Youghal Bay outside the estuary (Knockadoon to Knockaverry) of >14 <146 FC /100ml (90% compliance) is also being met.

For a secondary treated effluent with disinfection the coliform concentrations are greatly reduced and do not exceed 100 per 100ml within 10 metres of the outfall.

7.3 Mitigation Measures

The WWTW will be designed to provide secondary treatment of the wastewater to comply with the standards set down in the UWWT Regulations 2001 and for designated Bathing Waters and Shellfish areas as set out in section 2.3.

8. AIR

8.1 Odour

8.1.1 Existing Environment

The concentration of odorants in air is expressed in odour units per cubic metre (OU/m^3).

At a concentration of 1 OU/m^3 the odour is just perceptible, at 2 OU/m^3 an odour is faintly perceivable, at 3 OU/m^3 it is clearly perceivable while at 5 OU/m^3 is strongly perceivable and likely to give rise to environmental nuisance. The duration of an odour is also significant. Dispersion calculations are normally based on meteorological data using mean 1-hour wind speeds, producing hourly means of odour concentration. A concentration of 5 OU/m^3 lasting 15 to 30 minutes is commonly used as the nuisance threshold. If the mean hourly odour concentration is less than 1 OU/m^3, it is unlikely that shorter duration odour concentrations will exceed 5 OU/m^3. Further details on odour modelling and impacts are given in Appendix E, Volume 3.

The baseline odour levels were recorded during a survey to the site on three separate days. The ranges of odour detected for each of the days is indicated below

Table 8.1 – Baseline Odour levels in Mudlands area.

	14 July 2001	15Aug 2001	22 Aug 2001
Odour Range OU/m3	**45-118**	**9-62**	**44 - 108**

The baseline levels recorded during the surveys of 14 July and 22 August were significantly higher than typical rural open-air background levels and in general that as one travels further downwind (south) of the landfill the odour concentration decreased. Climatic conditions with slack air movement and elevated temperatures can lead to these high values. The landfill site, agriculture and the tidal mudflats are the main sources of odour in the area. However, the area generally is not the subject of complaint due to odours in this area. This would suggest that the odours measured are likely to be agricultural or due to the mudflats which are not of a nuisance type. Surveys taken on 15 August indicate much lower and more typical of the odour levels in the area. Details of the survey are given in Appendix J.

8.1.2 Impacts

Causes of Odour

Wastewater odours arise either through the discharge of odorous substances of industrial origin to the sewer system or from the anaerobic decomposition of biodegradable matter in the wastewater. Biodegradation rates are also strongly influenced by temperature, hence odour problems are likely to be accentuated during warm weather or where industrial discharges raise the wastewater temperature.

Standards

The European Community has not as yet developed environmental directives relating to the control of odour nuisance nor are there any mandatory national standards in force in Ireland. However, it is well established that odour nuisance in the vicinity of wastewater treatment facilities can be avoided by the application of the EPA BATNEEC (Best available technology not entailing excessive cost) to the design of new wastewater treatment facilities.

The Netherlands has adopted a policy aimed at the reduction of environmental odour to an as low as reasonably achievable level. For wastewater treatment plants this translates into the following maximum environmental concentration levels:

At locations surrounded by residential areas, ribbon-development or other odour-sensitive receptors:

- 1 ou/m^3 at 98% non-exceedance level for new WWTWs;
- 3 ou/m^3 at 98% non-exceedance level for existing situations.
-

At locations with scattered houses or industrial estates:

- 2 ou/m^3 at 98% non-exceedance level for new WWTWs;
- 7ou/m^3 at 98% non-exceedance level for existing plants.

Odour Emission Rates

The rate of release of odorous compounds into the atmosphere at wastewater treatment works (WWTW's) is influenced by:

(a) concentration of odorous substances in liquid phase exposed to air;

(b) total air/wastewater interface area;

(c) conditions at air/wastewater interface.

The specific odour emission rate from surfaces is measured experimentally in a standardised way using a floating collector hood into which is discharged a measured flow of odour-free air. The odour concentration is then measured in the emergent air stream. The specific odour emission rate (OU/m^2.h) is quantified as the product of the emitted odour concentration (OU/m^3) and the specific air flow rate (m^3/m^2.h). Sample odour concentrations and emission rates for different processes in a WWTW are given in Table 8.1. The major odour sources at WWTW's are:

- The inlet works
- primary treatment processes
- biofiltration processes
- sludge handling processes.

For example the highest odour concentration emanates from the grit container, i.e. 10,520 OU/m^3 (Table 8.1). With the exception of aerobically stabilised sludges, sludge residues are the primary sources of very high odour concentration at WWTW's. This is because of their potentially high concentrations of reduced volatile substances including hydrogen sulphide (H_2S).

Table 8.2 – WWTW Processes Sample odour emission measurement results (Frechen, 1992).

Odour source	Odour Concentration (OU/m^3)	Specific air flow rate ($m^3/m^2.h$)	Specific emission rate ($OU/m^2.s$)
Aerated grit chamber	1,021	7.00	1.99
Grit container	10,520	7.00	20.46
Storm tank, dirty	71	6.30	0.12
Influent water	995	8.4	2.32
Primary sedimentation surface	100	8.00	0.22
Primary sedimentation overflow	193	8.00	0.43
Aeration tank	63	7.10	0.12
Secondary sedimentation tank	37	5.30	0.05
Secondary sedimentation overflow	52	5.50	0.08
Final sludge thickener	1,045	5.40	1.57
Fresh dewatered sludge	102	6.00	0.17

8.1.3 Odour Dispersion Modelling

A computer model was used to model dispersion of odour from three potential sites for the proposed development. An indicative proposal using a conventional activated sludge system was modelled, providing a worst case scenario with regard to process free surfaces (see Appendix E for details of the model).

For dispersion modelling purposes, the overall odour emission from the Youghal WWTW was allocated to the 11 discrete sources listed in Table 8.1. The odour emission rates from the odour treatment units (located at the inlet works and the sludge handling area) were based on an assumed 90% odour removal from the treated air.

8.1.4 Initial Modelling Scenarios

For each of the three proposed sites, two odour emission scenarios were examined:

(a) without odour abatement measures

(b) with specific odour abatement measures at primary sources (90% reduction)

These are further detailed in Tables 3 & 4 in Appendix E.

These scenarios were analysed to establish an envelope with the most stringent conditions, an odour level of 1 OU/m^3 at a 99.5% non-exceedance level with and without treatment. The output data defined the 99.5% odour threshold isoline for the plant i.e. the boundary line within which the threshold odour concentration of 1 OU/m^3 was exceeded during 0.5% of the time or 44 hours of the one year test period. This would establish the most suitable site option.

The plotted isolines are presented in Figure 8.1 (Site option 1) Figure 8.2 (Site option 2) and Figure 8.3 (Site option 3).

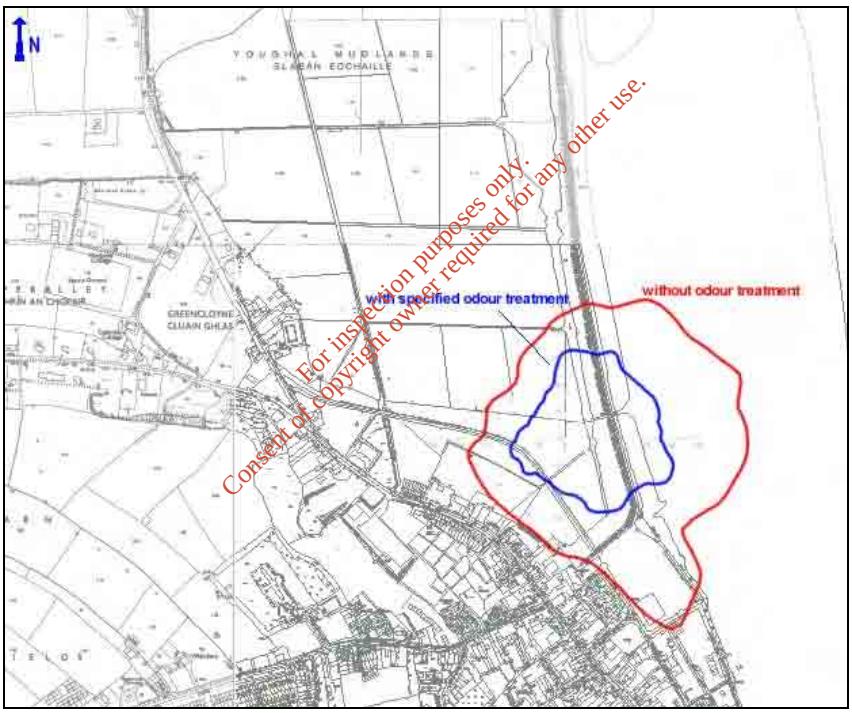


Figure 8.1 – 99.5% Odour contour lines for 1 OU/m^3 for Site Option 1

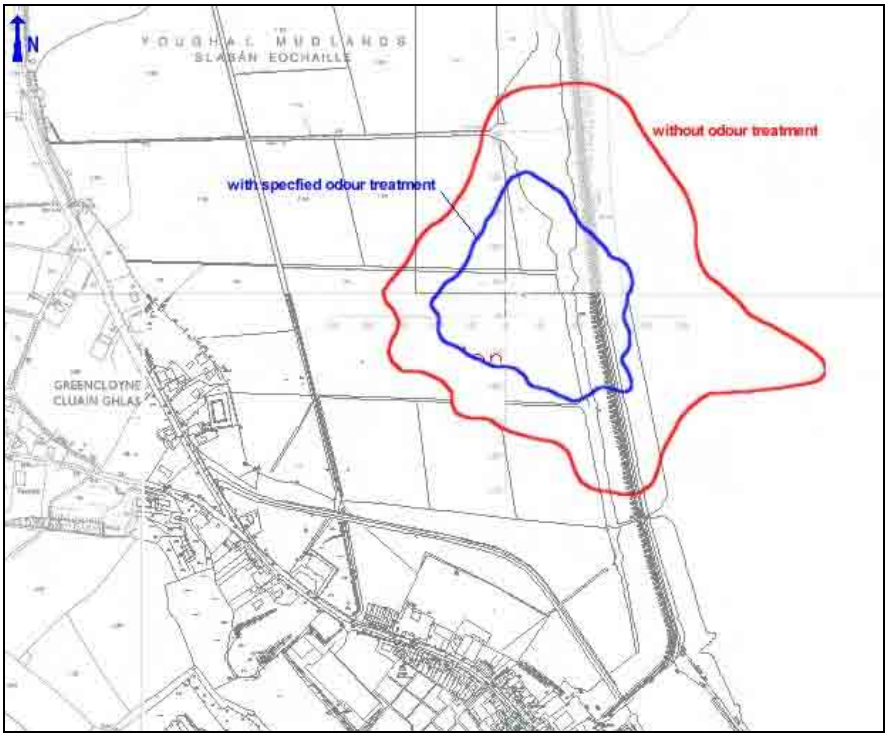


Figure 8.2 – 99.5% Odour contour lines for 1 OU/m^3 for Site option 2

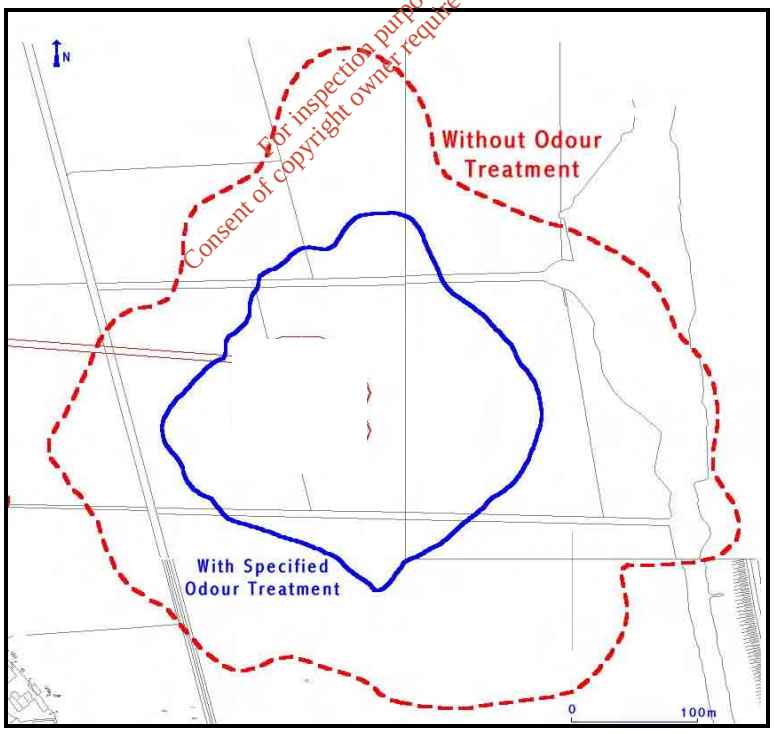


Figure 8.3 – 99.5% Odour contour lines for 1 OU/m^3 for Site option 3

8.1.5 Analysis of Initial Model Results -

The results of the model indicate:

- that all three sites with 90% removal of odours do not impact on any residential or other developments
- Site Option 1 is the highest risk location with the 1OU/m3 isoline with treatment impacting on the seawall walk and potentially impacts on local residences without treatment
- Site options 2 and 3 are predicted not to have an adverse odour impact on any residences (1OU/m3 isoline does not reach residences) even **without** any odour abatement measures.
- Option 2 would impact on the seawall walk while option 3 impacts on no location other than the open space lands.

Site option 3 is the most suitable location and is the preferred and recommended site for the proposed works.

8.1.6 Supplementary Modelling

Due to the remoteness of Site option 3 the predicted odour isoline of the 1OU/m3 at the 99.5% non-exceedance **without** treatment does not impact on local residences. This indicates that the site is sufficiently remote from local residences. It would also suggest that odour abatement measures are not required at this proposed WWTW. However, despite this model prediction, it is proposed that odour treatment be provided.

Supplementary modelling was undertaken on the Site 3 option to establish an acceptable standard of odour treatment and compliance. The following scenarios were modelled:

1. without odour abatement measures
2. With partial odour abatement measures (sludge areas only)
3. with full odour abatement measures at primary sources(90% reduction)

These were modelled for 2 OU/m3 at the 98%, 99% and 99.5% non exceedances which is following the Dutch Standard. The results are indicated in Figures 8.4, 8.5 and 8.6.

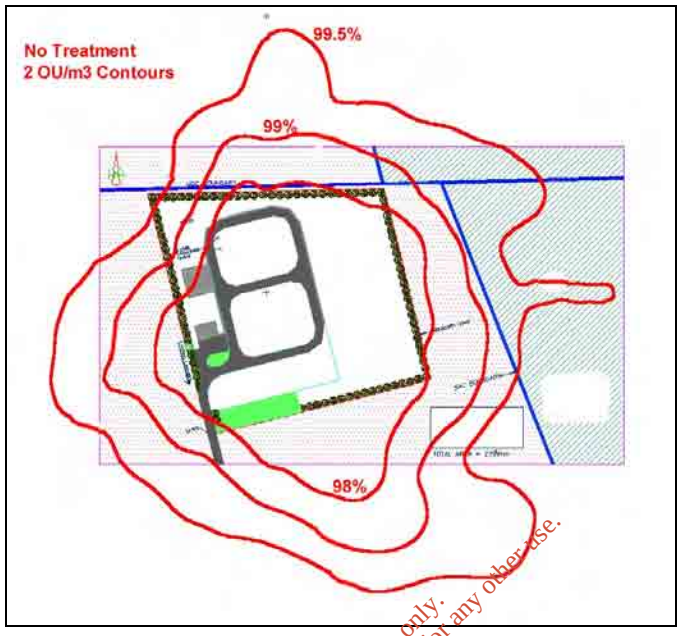


Figure 8.4 - No treatment option Isolines for 2ou/m3 (site option 3)

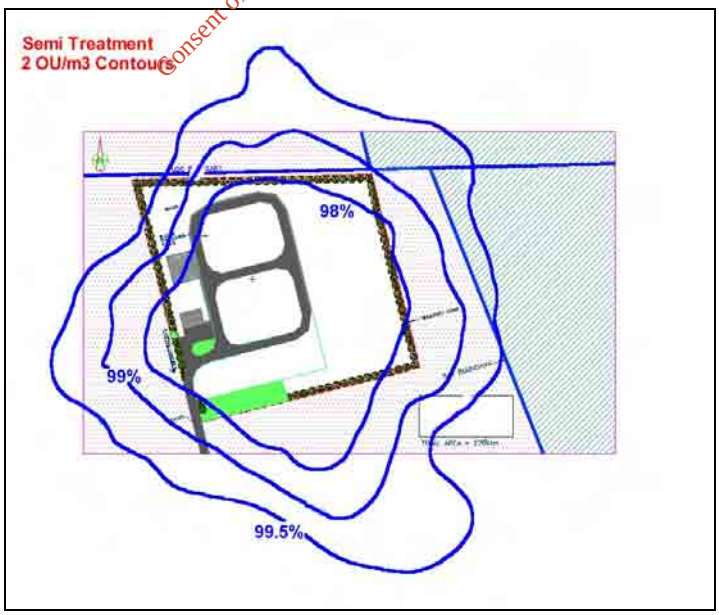
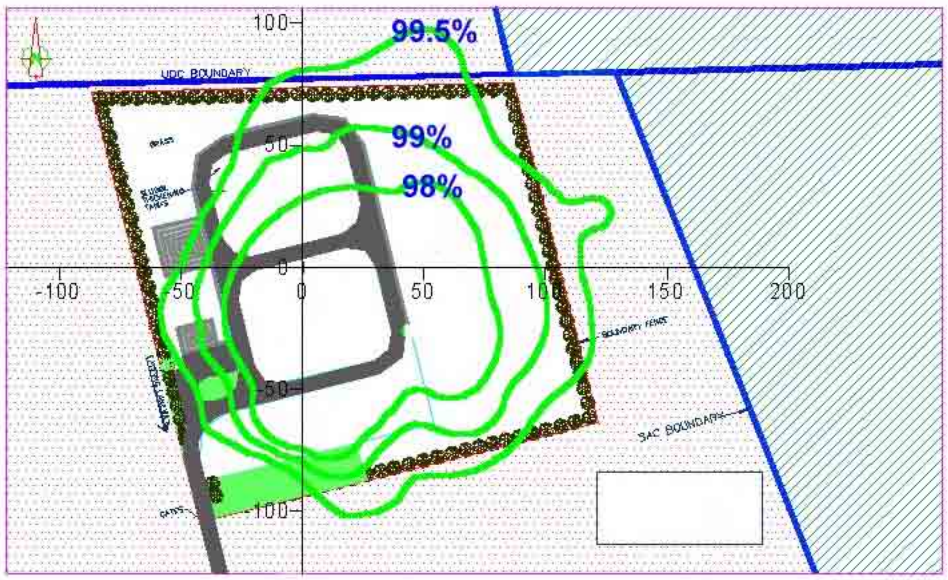


Figure 8.5 - Partial treatment option Isolines for 2ou/m3(site option 3)



2 OU/m3 Odour Contours for site 3 with specfied odour treatment measures

Figure 8.6 - Full treatment option Isolines for 2ou/m3(site option 3)

8.1.7 Analysis of Supplementary Model Results

The modelling demonstrates the following:

- The full treatment(90% reduction) demonstrates that the 2ou/m3 isoline for the 98% and 99% non-exceedance are contained within the site boundary. The 99.5% non - exceedance partially goes outside the site boundary
- The no treatment option demonstrates that the three non exceedances all are outside the boundary of the site.
- The partial treatment option, which excluded treatment of the inlet works, demonstrated a similar pattern for that of the no treatment option indicating that the inlet works can be a significant contributor to the odour and that there is little benefit to be gained from not including it for treatment.

8.1.8 Mitigation Measures

It is proposed to adopt the Dutch standard for the mitigation of odour from the proposed wastewater treatment works. The standard is for **2ou/m3** with a non-exceedance of **98%** at the **boundary of the site**. This will mean that potential for a perceptible odour is predicted to occur outside the boundary of the site on 2% of the year (175 hours) but without impacting on local residences. The isoline for these conditions will be inside the 1OU/m3 / 99.5% isoline.

These standards will be sufficient to ensure that local residences will not be significantly adversely impacted on by odour from the proposed WWTW.

These standards are reasonably achieved on the BATNEEC principle while providing mitigation against odour nuisance in the local area.

The emission of foul odours from wastewater treatment facilities may be controlled by a number of methods including covering/housing the primary odour sources including the inlet works channels and processes, the sludge handling and storage facilities and by providing forced ventilation of the enclosed air spaces.

Treatment technologies for odorous air streams, such as generated at wastewater treatment plants, include:

- Biofiltration and biosscrubbing;
- Activated carbon;
- Wet chemical scrubbing;
- Thermal oxidation.

8.2 Noise

8.2.1 Existing Environment

Noise measurements were made during the daytime and night-time periods, from 9:30am on the 25th April 2001 to 8am on the 26th of April at six locations, along the east side of the site and along the west and south of the site, at the nearest noise sensitive locations (Appendix F, Figure F.1). In general the dominant noise source at the measured locations is road traffic noise from the N25.

The average daytime noise level at the residential locations depends very much on the location. The most northern end of the site is the noisiest, being dominated by road noise (Average Day-time $\mathbf{L_{Aeq}}$. 75, Average Night-time $\mathbf{L_{Aeq}}$. 67). Further south, once the properties become more distant from the N25 the measured levels are much lower (Average Day-time L_{Aeq} 48-66) Further details are given in Table 8.3 below. Locations are given in Figure 8.7 with further detail in Appendix F.

Table 8.3 – Summary of Noise Measurements

Measurement Location	*L_{Aeq}*	*Average L_{Aeq}*
1		
Daytime (0800-2200)	*47-53*	*66*
Night-time (2200-0800)	*37-51*	*44*
2		
Daytime	*46-52*	*49*
Night-time	*33-52*	*43*
3		
Daytime	*44-51*	*48*
Night-time	*33-52*	*43*
4		
Daytime	*70-77*	*75*
Night-time	*63-72*	*67*
5		
Daytime	*63-67*	*65*
Night-time	*48-58*	*54*
6		
Daytime	*55*	*55*
Night-time	*42-52*	*47*

8.2.2 Impacts

Impacts of the WWTW

Predicted noise levels for the proposed WWTW were based on indicative proposals based on the conventional activated sludge system. Noise levels were measured at an existing secondary WWTW in Greystones, Co. Dublin (with an operational p.e. of 15,000) which can be regarded as a typical modern secondary wastewater treatment plant. Generally the most dominant noise sources on site were from the plant rooms. The maximum measured L_{Aeq} at the site was 61dB(A). Given that the nearest noise sensitive location is 150m (Site Option 1) (location 5), the maximum noise level here of 58 L_{eq} would be below the ambient background noise level of 63-67 L_{Aeq}.(Ref Table 8.3).

The Standard BS 4142 has been used to determine the emitted noise level which would be likely to lead to complaints. This standard recommends that a level of noise from a new industry of 10dB lower than the background noise level would be unlikely to lead to complaints. It has been assumed that the noise from the site will be tonal in nature. Using the typical noise emission measured at Greystones site, options 2 and 3 would be unlikely to cause complaints and site option 1 would be of marginal significance.

The increase in noise level as a result of traffic flow from the proposed WWTW would be insignificant compared with the noise resulting from existing road traffic noise.

Impacts during construction

Generally a level of 65dB(A) incident outside a house would be audible indoors, and generally could be tolerated for limited duration. A level exceeding 70dB(A) would be likely to be intrusive, if it maintained this level for prolonged periods.

There is likely to be some increase in noise levels during the construction phase. The impact would be most significant with option 1, as the properties are closest to the construction site, and this is also the largest group of properties. The impact of the construction works would be less significant for Options 2 and 3. Piling operations would be likely to cause the greatest impact (LAeq 63 at a distance of 150m). Further details are given in Appendix F and Chapter 14.

It is anticipated that 100 construction vehicles will visit and leave the site per day during construction. The predicted noise level at 150m from the site entrance is 55dB. There would therefore be a slight impact as a result of construction noise traffic. This level of traffic will only occur at peak for a period of three to four months at which stage the traffic levels will ease back by the order of 50%.

8.2.3 Mitigation Measures

Noise from operational activities on the proposed waste water treatment plant will be minimised during the design phase, by careful selection of plant and equipment. Noise can also be minimised through site design layout such that noisier sources are distant from noise sensitive locations and are screened by buildings, or earthworks on site. It is proposed that the operational noise levels LAeq will not exceed 55 dB(A) for daytime and 45 dB(A) for night-time outside the boundary of the site.

Noise generated during the construction phase is likely to be more significant than that generated by the permanent works. Noise can be limited through application of the recommendations in BS5228, which include the following measures:

1. Limiting the hours during which noisy site activities are permitted;
2. Establishing channels of communication between the contractor/developer, Local Authority and residents;
3. Monitoring typical levels of noise during critical periods and at sensitive locations.
4. Selection of suitable construction techniques to limit noise outputs.

9. CLIMATE

9.1 Existing Environment

Met Eireann collects climatology data at 13 synoptic stations in Ireland. The nearest synoptic station to the proposed development is located at Cork Airport, approximately 50 km east of Youghal. However, rainfall data is available for Youghal and this is presented in Table 9.2. Summary data for temperature, relative humidity, sunshine hours, rainfall, wind speed and other parameters measured at Cork Airport are presented in Table 9.1.

Table 9.1 – Monthly and annual mean and extreme meteorological values for Cork Airport (1962-1991)*.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature													
Mean	5.1	5.0	6.2	7.7	10.2	12.9	14.8	14.5	12.7	10.3	7.2	6.1	9.4
Max	12.6	13.5	15.5	20.5	23.6	25.7	28.7	27.5	24.7	19.0	15.9	13.6	28.7
Min	-8.5	-8.6	-6.1	-2.4	-0.9	2.4	4.8	4.9	2.3	-0.4	-3.3	-5.9	-8.6
Sunshine (hours)													
Mean daily duration	7.3	9.3	11.8	13.8	15.4	15.9	15.4	14.2	12.8	9.9	8.5	6.7	15.9
Rainfall (mm)													
Mean monthly total	138.3	115.6	98.7	67.7	83.4	68.8	66.4	88.7	96.4	125.4	111.1	133.8	1194.4
Greatest daily total	55.1	48.2	39.3	44.9	49.3	43.3	83.8	64.8	51.8	86.7	69.9	52.2	86.7
Mean no. days with ≥ 5 mm	9	8	6	4	6	5	4	5	6	8	7	8	75
Wind (knots)													
Mean monthly speed	12.9	12.6	12.3	11.0	10.6	9.5	9.1	9.2	10.3	11.2	11.6	12.4	11.1
Max. gust	94	83	70	63	60	51	57	54	64	75	66	68	94
Weather (mean no. of days with…..)													
Snow or sleet	4.5	4.7	3.0	1.1	0.2	0.0	0.0	0.0	0.0	0.0	0.6	2.3	16.4
hail	1.0	1.1	1.9	1.9	1.1	0.3	0.1	0.1	0.1	0.4	0.3	0.6	8.8
thunder	0.4	0.1	0.1	0.2	0.4	0.5	0.6	0.5	0.2	0.4	0.1	0.1	3.7
fog	7.4	7.3	7.9	5.9	7.7	8.6	8.5	9.8	10.7	10.4	7.3	8.0	99.5

* data was collected at a height of 154 m above MSL.

Met Eireann data collected between 1962 – 1984 indicate that the dominant wind direction for all wind speeds for Cork Airport is from the north-west, west and south-west direction. Mean monthly wind speeds varied between 9.1 – 12.9 knots with highest wind speeds recorded during the month of January and lowest wind speeds in July (Table 9.1). Wind patterns for Youghal are likely to be similar.

Table 9.2 – Rainfall at Youghal (mm)*.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	87	17	54	65	39	64	35	77	179	154	-
1961-90	109	85	79	64	65	59	57	81	86	101	89	104
Annual	**Mean**	**Max**	**Min**									
771	77	179	17									
979	82	109	57									

*Data was recorded in mm at a height of 70 m at St. Raphael's Hospital, Youghal.

The annual average air temperature for the Youghal area is 9.4 ºC with the monthly average ranging from 5.0 ºC in February to 14.8 ºC in July.

9.2 Impacts

The proposed WWTW will not have an impact on climate. However, odour levels will be partially dependent on local climate. The main factors that affect the concentration of malodorous organic compounds experienced at ground level in the vicinity of an emission source are the dispersive properties of the lower atmosphere and also the air temperature and relative humidity that may accelerate or inhibit the formation of certain organic compounds. Generally odours from an emission source at ground level such as a WWTW will be greatest in the summer months especially during periods of warm, dry conditions when the winds will also tend to be light. Chapter 8 deals with odour emissions.

9.3 Mitigation Measures

No mitigation measures are required other than those outlined in Chapter 8 with respect to odour treatment.

10. LANDSCAPE & VISUAL

10.1 Existing Environment

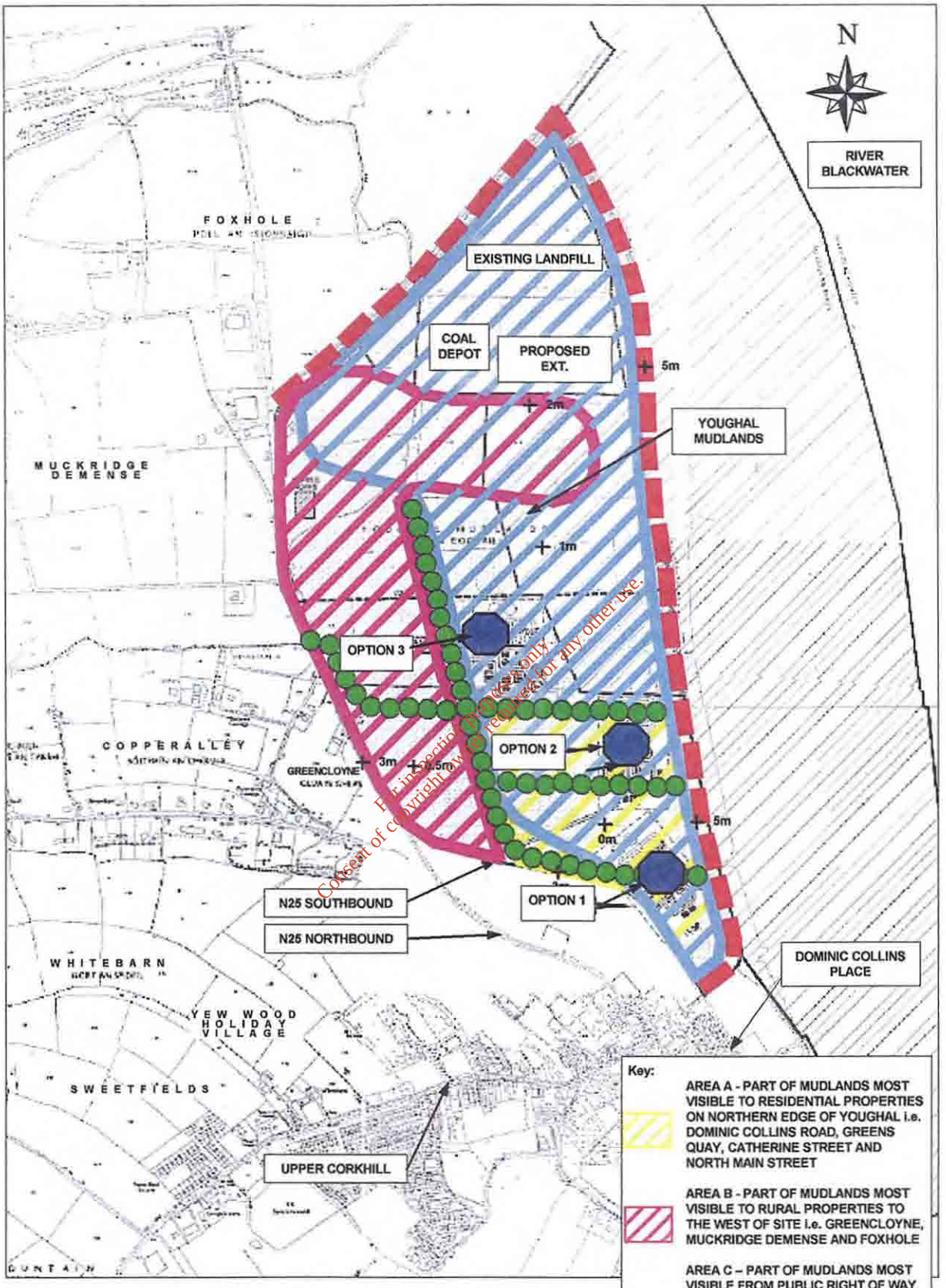
10.1.1 Landscape Character

The Mudlands comprises a series of fields and wetland areas with saltwater lake surrounded by trees, hedgerows and ditches. In spite of the presence of an operational landfill in the north-eastern corner of the site the Mudlands are rural and tranquil in character and form part of a wider highly scenic estuary. The existing farm track and hedges which cross the Mudlands provide partial screening across the site, from the Public Right of Way on the seawall and for residential properties along the N25.

10.1.2 Visual Envelope

The 'Visual Envelope' marks the approximate boundary of the zone of visual influence of the proposed development i.e. where the site would be visible during either construction or operation phase without visual mitigation measures in place. The Visual Envelope may be solid as in building edges or diffuse as in vegetation screens where filtered views are possible. Visually Sensitive Receivers are those people within the Visual Envelope who would experience adverse visual impact from the development.

Due to the relatively open and flat nature of the Mudlands and the undulating landscape enclosing the site on the north, west and eastern sides, the Visual Envelope of the Mudlands is extensive. However, roadside vegetation and mature hedgerows within the site limit views from certain locations. The Visual Envelope extends from properties in Dominic Collins Place to the south, Upper Cork Hill to the south west and Greencloyne, Copperalley, Muckridge Demesne and Foxhole to the west.



EXISTING CONDITIONS AND SITE VISIBILITY *FIGURE 10.1*

The general visibility of the Mudlands is summarised in Figure 10.1. The area falls into three categories of visibility (A,B and C). The part of the mudlands which is visible to the least numbers of Visually Sensitive Receivers is the centre of Area C (Figure 10.1). Views into this part of the site are screened from residential properties to the south and west by the mature hedgerows either side of the farm access and field boundary hedgerows to the south. This area is visible to properties in elevated locations on adjoining hillsides but does not intrude significantly upon their wider view of the estuary. A more detailed analysis is given in Appendix G.

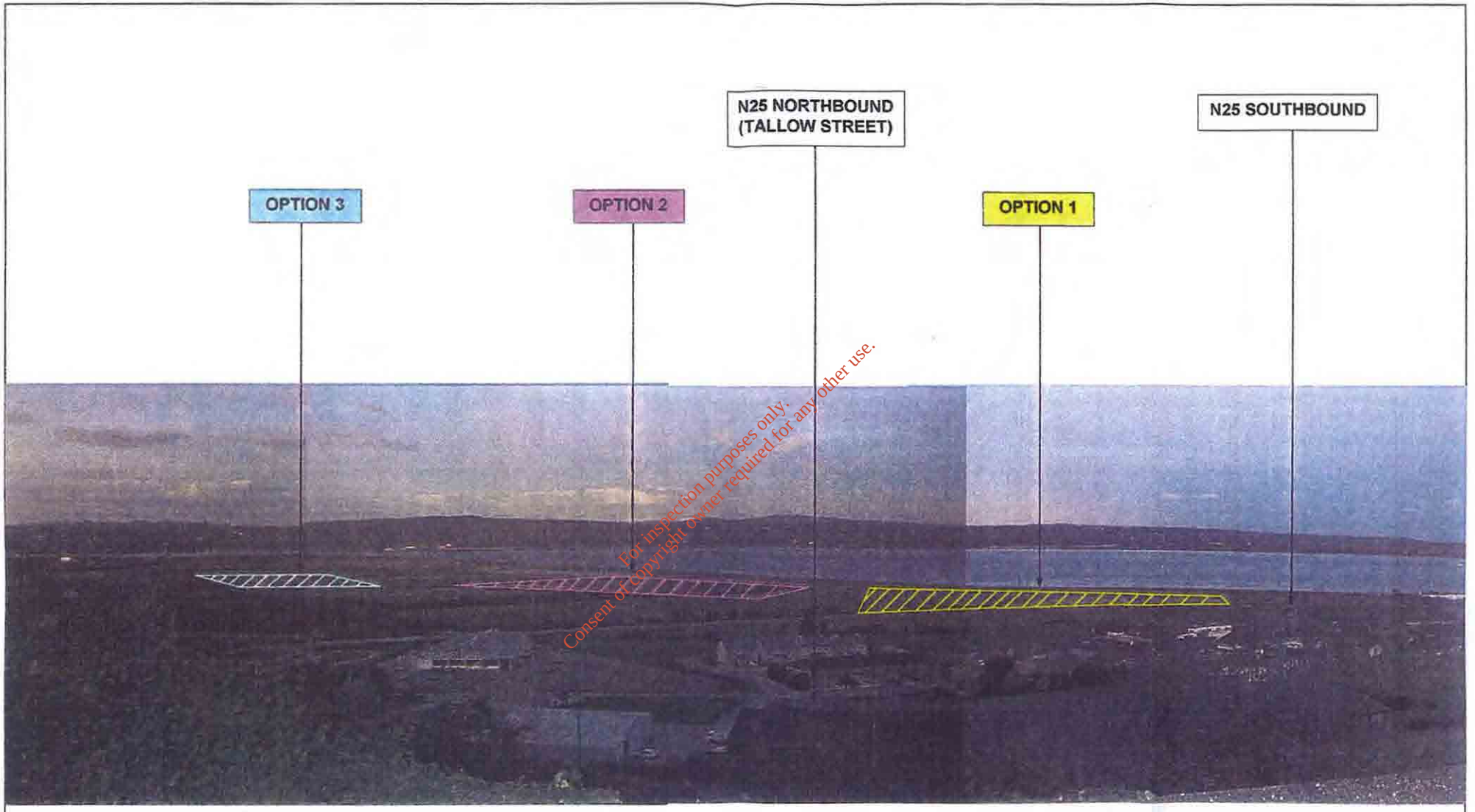
10.2 Site Options Assessment

The proposed development on Youghal Mudlands will have an extensive Visual Envelope. This is because the Mudlands is an open flat area adjacent to an estuary and is overlooked by residential properties on north east and north-west facing slopes.

A number of sites have been selected in the Mudlands for consideration to assess the most suitable site from a visual perspective. A detailed analysis of the impacts of developing each of the three Site Options is given in Appendix G. Site option 1 and 2 will have a high visual impact on Visually Sensitive Receivers in the adjacent housing area and properties on the north-east facing slopes off Upper Cork Hill. Option 1 and 2 will also have a high impact on the landscape character of the Mudlands.

Site option 3 is in the centre of the Mudlands. This area benefits from existing hedgerows to the western and southern side which offer partial screening.

Site option 3 is the preferred location for the WWTW. Visibility of this area from surrounding properties is low and the area benefits from natural screening from mature hedgerows to the west and south. With additional screen planting on earth banks around the north and eastern side of this site the landscape and visual impacts on surrounding properties and the seawall will be low and generally acceptable.



NORTH EAST FACING VIEW OF MUDLANDS FROM PROPERTY OFF UPPER CORK HILL

ELEVATED VIEW OF MUDLANDS SHOWING SITE OPTIONS FIGURE 10.2

10.3 Proposed Development

The proposed development will be a Waste Water Treatment Plant of approximately 2-3 hectares in size. It is proposed to raise the ground level within the boundary of the site by 1-1.5m in order to sink certain components of the plant into the ground to reduce their visibility from the surrounding visually sensitive receivers.

The typical elements of the Treatment Plant and their indicative height above the proposed ground level are as follows:

- Aeration Tanks, 1.5m above ground level;
- Primary Settlement Tanks, 2m above ground level;
- Inlet Works, 3m above ground level;
- Control and Administration Building, 5m above ground level;
- Sludge dewatering Building 5m above ground level:
- Equipment Building between 5-8m above ground level dependant on single or two storey building to be decided at detailed design stage;
- Site Boundary Fence, 2.5m above ground level

10.4 Potential Landscape and Visual Impacts

Potential sources of landscape and visual impact during the construction and operational phases are identified below.

10.4.1 Construction Phase

- Traffic movements;
- Cut and fill;
- Materials stockpiling, construction equipment and plant;
- Utilities, including water, drainage, power and lighting; and
- Temporary parking and on site accommodation and working areas.

10.4.2 Operational Phase

- Individual components of the WWTP;
- Equipment Building and Control/ Administration Building and associated parking; and
- Security fencing.

10.4.3 Visual Envelope and Visually Sensitive Receivers

The 'Visual Envelope' marks the approximate boundary of the zone of visual influence of the proposed development i.e. where the site would be visible during either construction or operation phase without visual mitigation measures in place. The Visual Envelope may be solid as in building edges or diffuse as in vegetation screens where filtered views are possible. Visually Sensitive Receivers are those people within the Visual Envelope who would experience adverse visual impact from the development.

Due to the relatively open and flat nature of the Midlands and the undulating landscape enclosing the site on the north, west and eastern sides, the Visual Envelope of the Mudlands itself is extensive. However, the site for the WWTW is adjacent to an existing mature hedgerow either side of a farm access lane. The hedgerow provides a high degree of ground level screening for the properties to the west of the site.

The Visual Envelope extends from properties and vehicular traffic along the N25 between Muckridge Demesne and the Youghal Shipping Yard i.e. Visually Sensitive Receivers No.T2 R1, R2, R3, R4, R7, R10 I1, I4, I5, and I6. Also industrial, residential and community properties off Upper Cork Hill i.e. VSR No.'s R5, R6, R8, R9, C1, C2, I1, I2, I3 and I7 to the south-west. Additionally users of the Public Right of Way VSR No. OS1 to the east would have views into the site.

The site is located in the base of the Blackwater River valley bordered to the west and east by hills. Short views into the site are possible from the properties along the N25 with east and northeast facing windows. The properties nearest to the site i.e. VSR No.'s R1 and R2 and users of the field to the west of the site (VSR No. I5) currently have their views into the site screened by the double hedgerow either side of the farm access lane. It is not intended to remove this hedgerow as part of this project. However users of the Public Right of Way some 200m from the eastern boundary of the site and agricultural workers and grazing animals in the fields to the north south and east of the site (VSR No. I6), will have short distant open views of the development.

Similarly properties shown as VSR No.'s R3, R4, R7, R10, I1, I3 and I4 will have middle distant views of the site, however again their views will be part screened by the existing significant hedgerows of the site.

Long distance glimpse views are available from some properties and community facilities on the east facing hillsides overlooking the site off Upper Cork Hill i.e. VSR No.'s R5, R6, R8, R9, C1, C2, I1, I2, I3 and I7. The site is not visible to properties outside the visual envelope i.e. properties in Foxhole, Muckridge Demesne, Whitebarn, Sweetfields and VSR No. R11-town centre.

The location of visually sensitive receivers and the extent of the visual envelope are shown on Figure 10.3. Photographs of some views towards the site from key locations are also indicated in Appendix G.

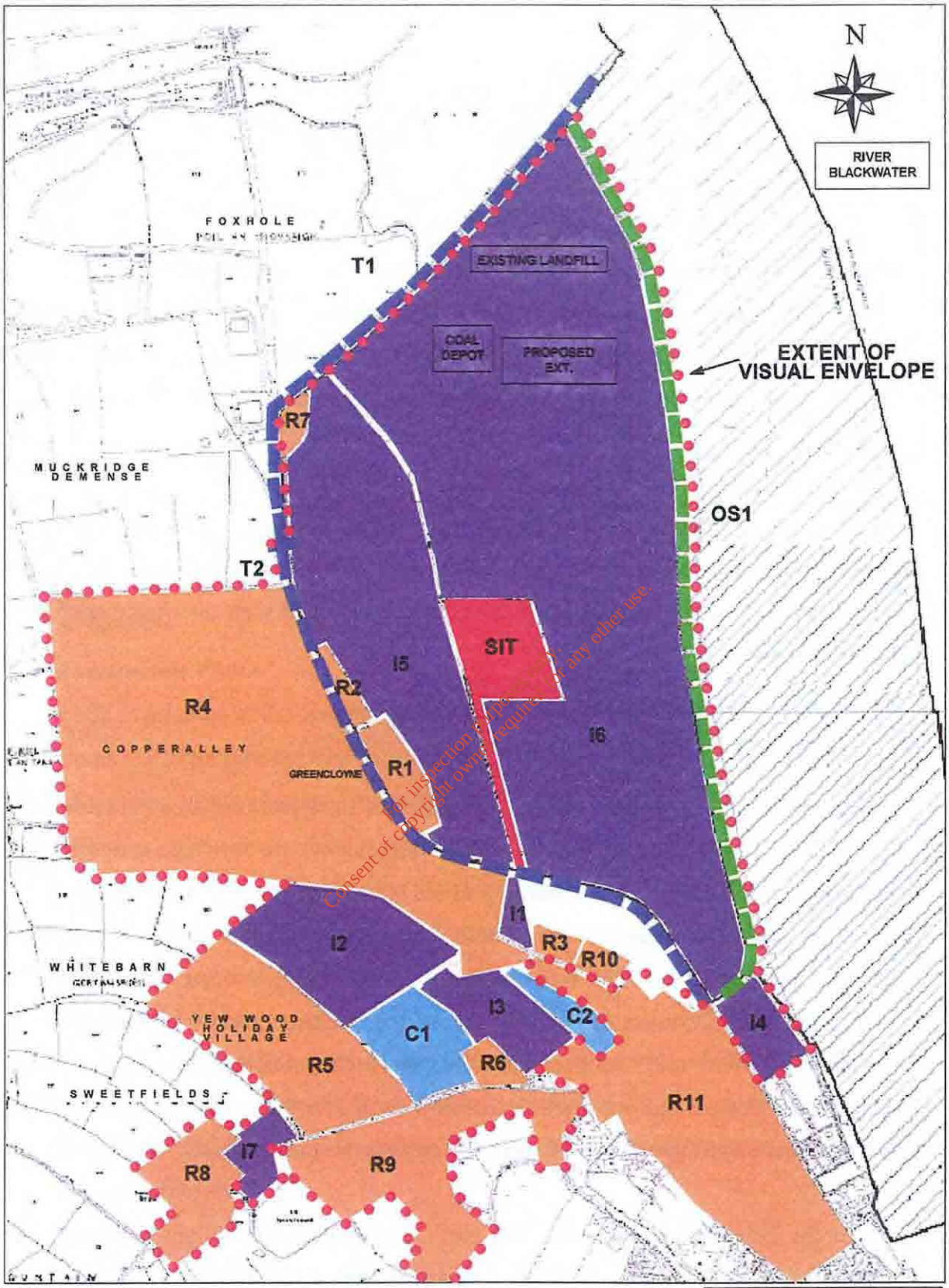
10.5 Identification of Impacts

10.5.1 Construction Phase

It is proposed that construction of the Plant will take place within the site and all storage of materials will be contained within the site boundary. The construction will require the creation of a new access road along the western boundary of two fields and removal of grass covering the site. No field boundary hedges will be removed and there will be no disruption to the Special Area of Conservation to the east.

During the construction process it is likely that temporary flood lighting will be required to improve visibility. The lighting columns and lamps will be visible and when in use will be a source of visual intrusion. There will also be activity associated with utilities to serve the new Plant and Buildings.

The increased traffic movement entering and leaving the site will be visible from all properties in and around the site and from those overlooking the site to the southwest. The activity and disruption resulting from the construction process will be confined to a small area of the site and much of the works will be screened by the early formation of perimeter earth mounds up to 2m in height.



VISUAL ENVELOPE & LOCATION OF VISUALLY SENSITIVE RECEIVERS (VSR)

FIGURE 10.3

People living in properties near to the site are the most sensitive receivers i.e. VSR No.R1 and R2. They will experience visual intrusion from the positioning of temporary buildings, flood lighting at night and by the traffic movement associated with the construction. However they are between 250-300m from the site and the existing hedgerow will provide a degree of temporary screening until long term planting on perimeter mounds reaches maturity. The short-term impact will be moderate negative. Users of the Public right of way are also sensitive to changes effecting the landscape character of the Mudlands. The construction period will change the tranquil and still atmosphere of the site and reduce the quality of the landscape.

A moderate negative impact will be also be experienced during the construction period by residents in properties off Upper Cork Road. These views although long distant will not be screened by the existing hedgerow and the activity associated with the construction of the Plant will be visible.

10.5.2 Operational Phase

The proposed components of the Plant, in particular the Equipment building between 5-8m in height, will be visible over the existing mature hedgerow to the west and will cause some visual intrusion against the scenic backdrop of the hills on the eastern side of the estuary. At this early stage of the design it has not been determined whether a single or a two-storey building is required for the WWTP equipment. If a single storey building will suffice i.e. 5m in height, the visual intrusion will be minimal and the resulting overall visual impact will be low. If however a two-storey building is required the building will be visible over the existing hedgerow and cause a moderate visual intrusion for the visually sensitive receivers living near to the site. The resulting visual impact will be negative and medium.

Users of the Public Right of Way (VSR No. OS1) located some 200m from the eastern boundary of the site and agricultural workers and grazing animals in the fields to the north south and east of the site (VSR No. I6), will have short distant open views of the development. The impact upon these users will also be negative and medium as the views from the site will not be screened by significant existing hedging.

Properties shown as VSR No.'s R3, R4, R7, R10, I1, I3 and I4 will have middle distant views of the site. However views from these properties will be part screened by the N25 which is on a raised embankment approx. 3m above the existing site and approx. 1.5 m above the proposed ground level of the development. Due to the distance separating the site from these properties only the tallest elements i.e. the buildings of the site will be visible. The resulting impact will be negative and low.

Properties and community facilities on the east facing hillsides overlooking the site off Upper Cork Hill i.e. VSR No.'s R5, R6, R8, R9, C1, C2, I1, I2, I3 and I7 will not benefit from the screening properties of the existing hedgerows or the N25. All elements within the Plant including the hard standing areas will be visible, although from a distance and the visual impact will also be negative and low.

10.6 Mitigation

10.6.1 Construction Phase

- Early positioning of the permanent earth bunds with advance planting
- Control of night time lighting using lighting baffles;
- Minimising height of temporary buildings;
- Minimise disruption to existing vegetation;
- Careful positioning of construction plant; and
- Control of dust using waters spray techniques.

10.6.2 Operational Phase

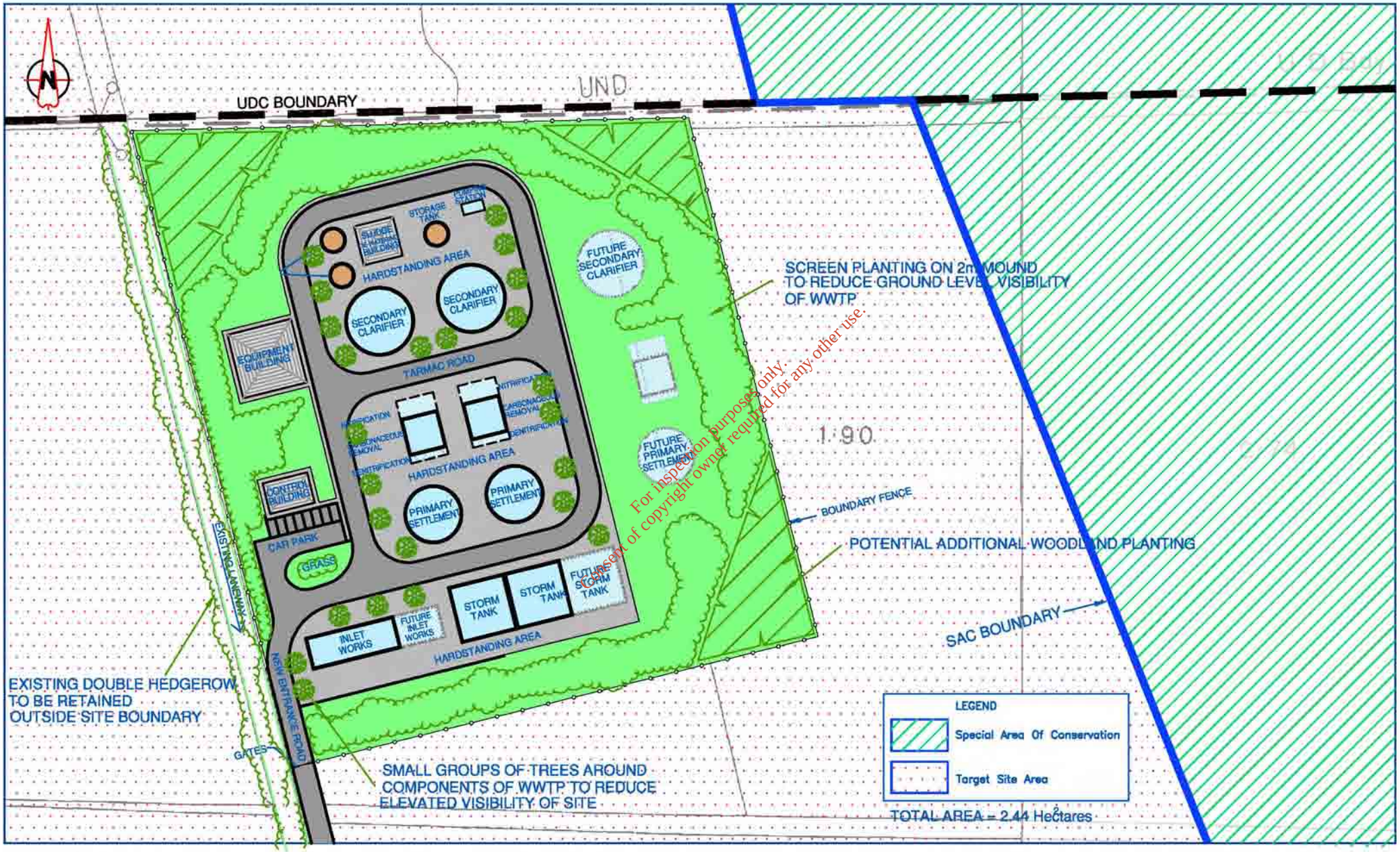
To some degree the visual impact of the individual components of the Plant has been mitigated by their sinking into the ground thereby reducing the portion visible at ground level. However further mitigation by architectural and landscape treatment is recommended and includes the following:

Careful use of materials (matt finish and non-reflective) for the Equipment and the Control/Administration buildings and individual components of the Plant. The choice of colour for materials for the building should match the earth tones of the surrounding wetland and deciduous vegetation. Similarly the perimeter fence should be finished in a dark colour to reduce its visibility when seen against the dark green of the perimeter planting.

Indigenous wetland type planting with a high screening content on 2m high earth mounds surrounding the plant will reduce visibility from properties on surrounding flat land. Indigenous wetland type planting is recommended to match the colour and texture of existing planting and to survive the wet soil conditions. Soft landscape proposals to mitigate visual impacts are shown on Figure 10.4.

Due to the large number of properties overlooking the site (VSR No.'s R5, R6, R8, R9, C1, C2, I1, I2, I3 and I7) is it also proposed to include wide spreading tree planting within the grounds of the WWTP to reduce the visibility of the individual built elements of the Plant and of the hard standing areas from elevated view points.

In both the construction and operational phases, the most significant impacts will be experienced by the residential properties located near to and overlooking the site, although the severity will be reduced after mitigation measures are applied. This will be achieved by applying the appropriate sensitive design with careful attention to materials and colour, screen planting on the earth bunds and wide spreading tree planting within the hard standing areas of the Plant.



LANDSCAPE PROPOSALS FIGURE 10.4

11. MATERIAL ASSETS

11.1 Land Use

There will some loss of amenity at the proposed location of the wastewater treatment works in the Mudlands. The area has been designated as Open Space in the Development Plan. However the Development plan has made special provision for the location of the works in the area "if studies indicate it to be the most suitable site". However the area only represents less than 5% of the open space designation and therefore the loss can be considered to be minimal.

11.2 Fisheries

The area of Youghal harbour is a popular area for fishing including drift net salmon fishing and shell-fishing has declined over the last number of years but may well be taken up again. The impacts of the scheme will be to improve water quality generally from the current situation in the harbour and hence be beneficial to this sector. However as the estuary is not a designated shellfish production area in the legislation the water quality and shellfish quality standards will not be met.

Impacts during construction of the outfall will include disruption to fishing activities in the area but which will not be significant due to relatively short length of pipe and the estimated 1 month period to install. It will also increase levels of suspended silt in the water column which will not have a significant impact on the fishing sector. The discharge point of the outfall will have to be marked with a buoy, to avoid damage to the diffuser by anchors. The pipeline will not be on or near any existing anchor points so as to prevent damage by boats and anchors.

11.3 Agriculture

Impacts on agriculture will be minimal although the current land use which is for grazing, will be lost. The works itself will not impact on agriculture.

11.4 Industry

The proposed works will provide essential infrastructure for the sustainable development of industry in the town.

11.5 Residential

The proposed works will provide for the growth of sustainable residential development in the town. The impacts of the works on residential areas will be mitigated to ensure no significant negative impact in the areas of odour, noise and visual impacts as set out in the relevant sections of this report.

11.6 Recreation / Leisure

There will be a small adverse impact due to loss of amenity land to the site of the works. The impacts on the popular bathing areas will also be marginally improved although bathing water standards as set out in the legislation are not proposed to be met in the estuary as the areas are not designated. However there would be positive impacts on water based leisure in the area including boating and fishing.

11.7 Electricity & Water

The proposed works will require a significant power input and will need to be drawn from the local electricity power grid. Provision will need to be made in the grid for the provision of power to the site and carried to site in overground or underground cable system.

There will be no significant impact on the water supply other than to provide domestic and washwater requirements on the site.

11.8 Transport

There will be no impact on the public transport sector. Private transport will be required to draw the dewatered sludge from site to a treatment centre within a reasonable distance of Youghal, either to Midleton or Dungarvan in County Waterford. Transport will also be required for the delivery of chemicals to the site.

There will also be some impact on the shipping in the area during the construction of the outfall although this will be limited. Mitigation measures will include limiting times of construction to facilitate shipping deliveries to Green's Quay.

12. CULTURAL HERITAGE

12.1 Existing Environment

A survey of the archaeological environment was undertaken within *c*.1km of the Target Site Area, which refers to the land in which the three site options for the WWTW are located. Methodology for the study is detailed in Appendix H.

The earliest archaeological site within the study area is probably the standing stone in Muckridge townland (CO067-071---) located 600m north-west of the Target Site Area. Standing stones were first erected in the Bronze Age but they may date to any period between the Bronze Age and the present. Over a kilometre south-west of the medieval walled town (Figure 12.1) Saint Coran's Well survives in Seafield townland (CO067-049---). This may date back to the Early Christian Period. A short distance south-east of the holy well there was a milestone on the roadside in Summerfield (CO067-040---).

The name Youghal means 'a wooded place' suggesting when the area of the town was initially settled it was dense forest (Lewis, 1837, 434). Historical evidence indicates the town was first settled by the Vikings in the 9th century, however the earliest known archaeological evidence for the town is from the Anglo-Norman period, the 13th century. The town was walled by the 13th century and substantial evidence of the wall survives. At the south-western side a small base town adjoined the town wall, this was named 'Parkapika' on the 1933 6" OS map (CO067-058---) (Zajac *et al*, 1995, 103).

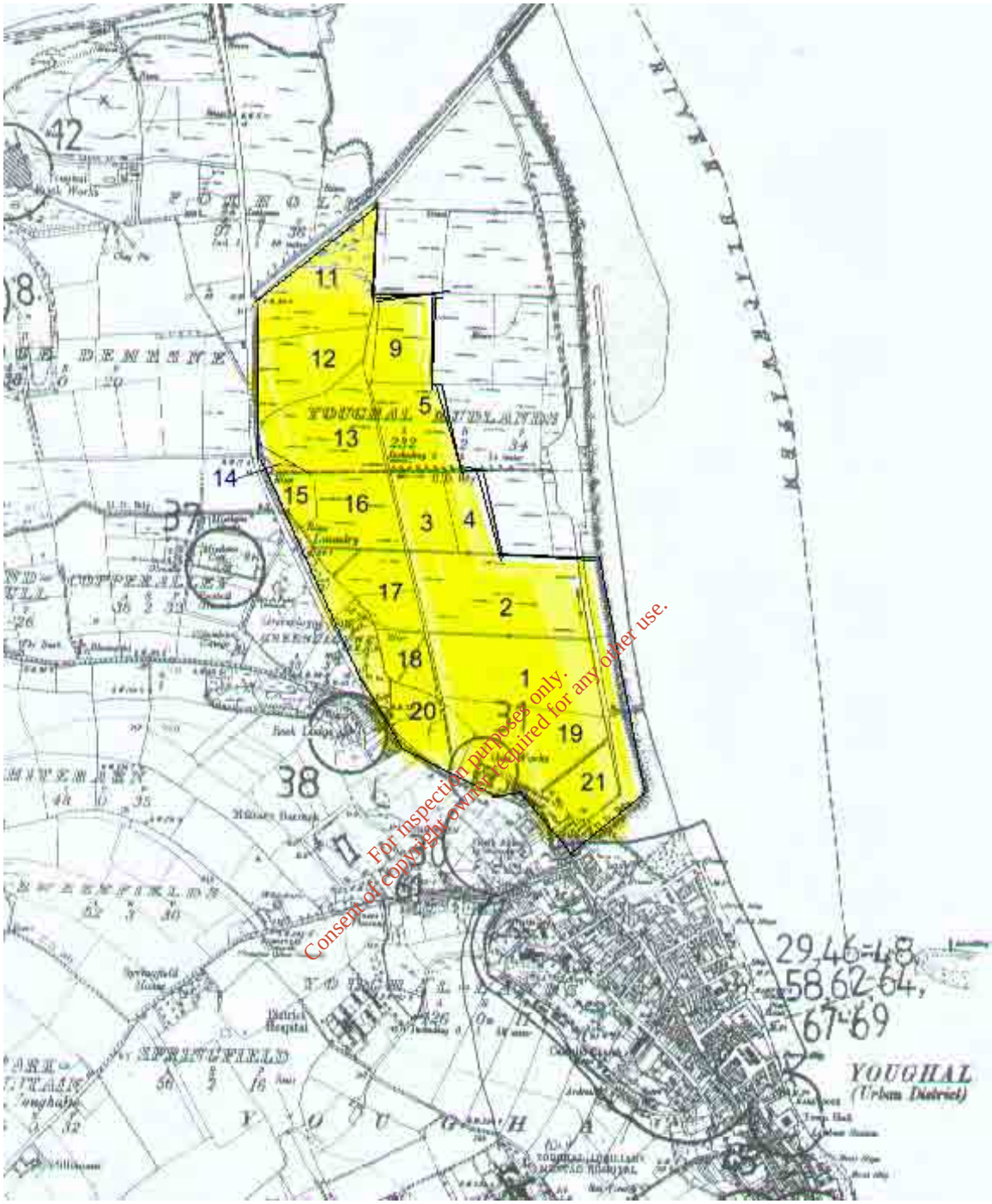


Figure 12.1 RMP map extract (CO067); showing site location and field numbers

The RMP (Record of Monuments and Places) for County Cork lists a large number of archaeological sites within the historic walled town of Youghal (CO067-02901-) (Figure 12.1). These include the town wall (CO067-02902-), church and graveyard (CO067-02903- and 02904-), graveyard and friary (CO067-03001- and 03002-), a church (CO067-061---), three town houses (CO067-02905-, CO067-02909- and CO067-048---), college (CO067-02906-), almshouse (CO067-02907-), three urban tower houses (CO067-02908-, CO067-02915- and CO067-064---), abbey (CO067-02910-), town gate (CO067-02911), water gate (CO067-02912-), mansion house (CO067-02913-), two court houses (CO067-02914- and CO067-045---), meeting house (CO067-046---), two market houses (CO067-062--- and CO067-067---), market cross (CO067-063---), school (CO067-068---) and a burial ground (CO067-069---). These sites are located within the Zone of Archaeological Potential for Youghal in Youghal-Lands townland between 50m and 800m south of the Target Site Area.

Approximately 150m south of the walled medieval town there is the site of a friary (CO067-02801-). The friary was founded in 1224 by Maurice Fitzgerald (Figure 12.1). No visible remains of this site now survive; only traces of it remained by 1681 (Power, 1994, 282). An architectural fragment was recovered from this area also (CO067-02802-). There was a mill (CO067-065---) directly west of the friary and 150m south of the medieval walled town. Both the friary and the mill are located in Youghal-Lands townland.

Approximately 800m south of the medieval walled town in Knockaverry townland (Figure 12.2) there is a nunnery (CO067-027---) and a lighthouse (CO067-066---). The nunnery was founded on the site *c.* 1190. By 1644 the convent was no longer standing but a circular tower, known as St. Anne's Tower' survived. The remains of the tower were demolished in 1848 to build the lighthouse (Power, 1994, 282).

There are a number of country houses within 1km of the Target Site Area (Figure 12.2). In Muckridge Demesne a country house (CO067-008---) is located 800m west of the development site. A country house (CO067-01102-) is located 1km west of the development site in Muckridge townland. The house, known as 'Heathfield Towers', is a late eighteenth /early nineteenth century building. The house was elaborately extended in the mid nineteenth century. It was burnt in 1935 and is now only partially occupied (Power, 1994, 328).

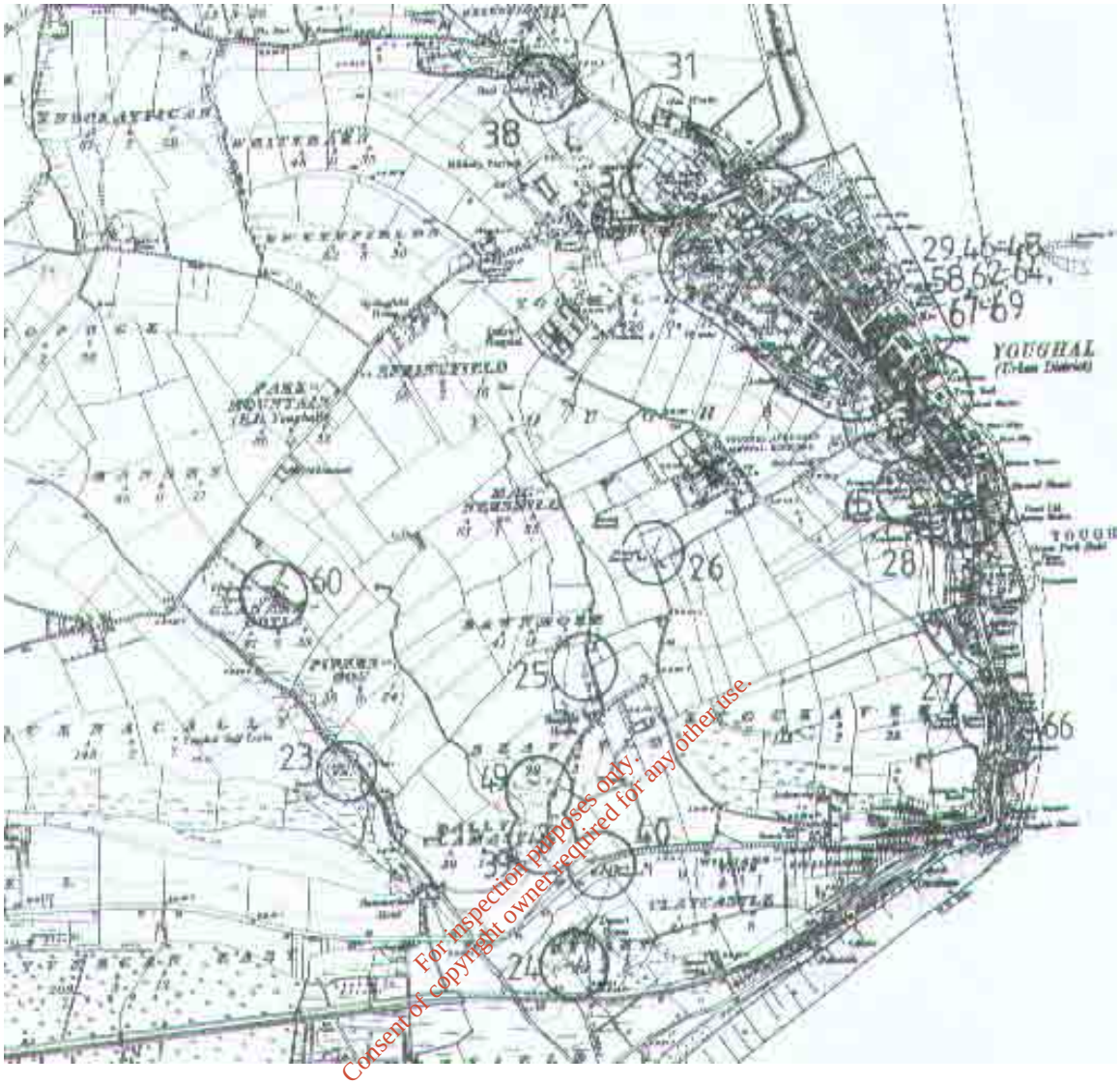


Figure 12.2 RMP map extract (CO067); showing archeological sites in and around Youghal

About 300m north of the walled town and 100m west of the Target Site Area the remains of a country house called 'Rock Lodge' (CO067-038---) are located in Youghal-Lands (Figure 12.1). The house was visited by the Cork Archaeological Survey in 1983 at which time it was roofless. The house is late eighteenth /early nineteenth century date and overlooks Youghal Harbour (Power, 1994,329).

The Zone of Archaeological Potential for the gasworks located at the northern end of Youghal town (CO067-031---) extends into the southern portion of the Target Site Area. The surrounding wall of the gasworks has a date of 1830 carved on its western elevation. On the 1842 6-inch map, prior to land reclamation, it is depicted on the seafront at the north end of Youghal town. The building was demolished in the late 1980s (Power, 1994, 361). The site was inspected as part of this assessment; most of the remains of the gasworks have been removed although some of the buildings are still standing in a dilapidated state. The gasworks was defined by a substantial stone wall which remains and now encloses a works yard for Cork County Council.

In Greencloyne, 200m west of the development site, there is a one-story vernacular house (CO067-037---) which is known as 'Mistletoe Cottage' (Figure 12.1). This is a five-bay, L-shaped house and was occupied when visited by the Cork Archaeological Survey in 1983 (Power, 1994, 346).

A 'pottery clay mill' or pottery works stood close to the country house 'Heathfield Towers' in Muckridge, 1km west of the Target Site Area (CO067-01101-) (Figure 12.2). Much of the site is now in ruins and heavily overgrown (Power, 1994, 359).

'Youghal Brick Works' (CO067-012---) were located 600m north-west of the Target Site Area in Muckridge. A portion of the late nineteenth /early twentieth century kiln to the brick-works survives on the site (Power, 1994, 360).

The 1842 1st edition OS map (Figure 12.3) records a number of fish weirs along the banks of the Blackwater, although none are shown in the Target Site Area. These were in use into the first half of this century and may have been in these positions for many hundreds of years previously. The Cork Archaeological Survey files contain a written record of the use of these weirs during the First World War. Intertidal archaeological surveys of river estuaries in other parts of the country have shown that this type of fish weir was used in medieval times and earlier.

Youghal Mudlands townland was reclaimed from the Blackwater Estuary, the reclamation of this land can be traced by studying the three editions of the OS 6 inch maps. The 1842 1st edition OS map (Figure 12.3) shows tidal mudflats on the western side of the River Blackwater, while Foxhole further to the west is agricultural land with field boundaries represented. The 1902 2nd edition OS map shows the tidal mudflats to be reclaimed encompassing an area of c. 1200 square meters which is divided into fields (Figure 12.4). It is given a townland designation and named Youghal Mudlands.

12.2 Impacts

12.2.1 Impacts of proposed WWTW

There are no known archaeological sites within the Target Site Area; given how recently the area was reclaimed this is not surprising. Therefore, the archaeological implications for the development of a treatment plant within the Target Site Area are minimal. The archaeological implications of developing Options 1, 2 and 3 are broadly similar – none of the three options will impact on any known archaeological site.

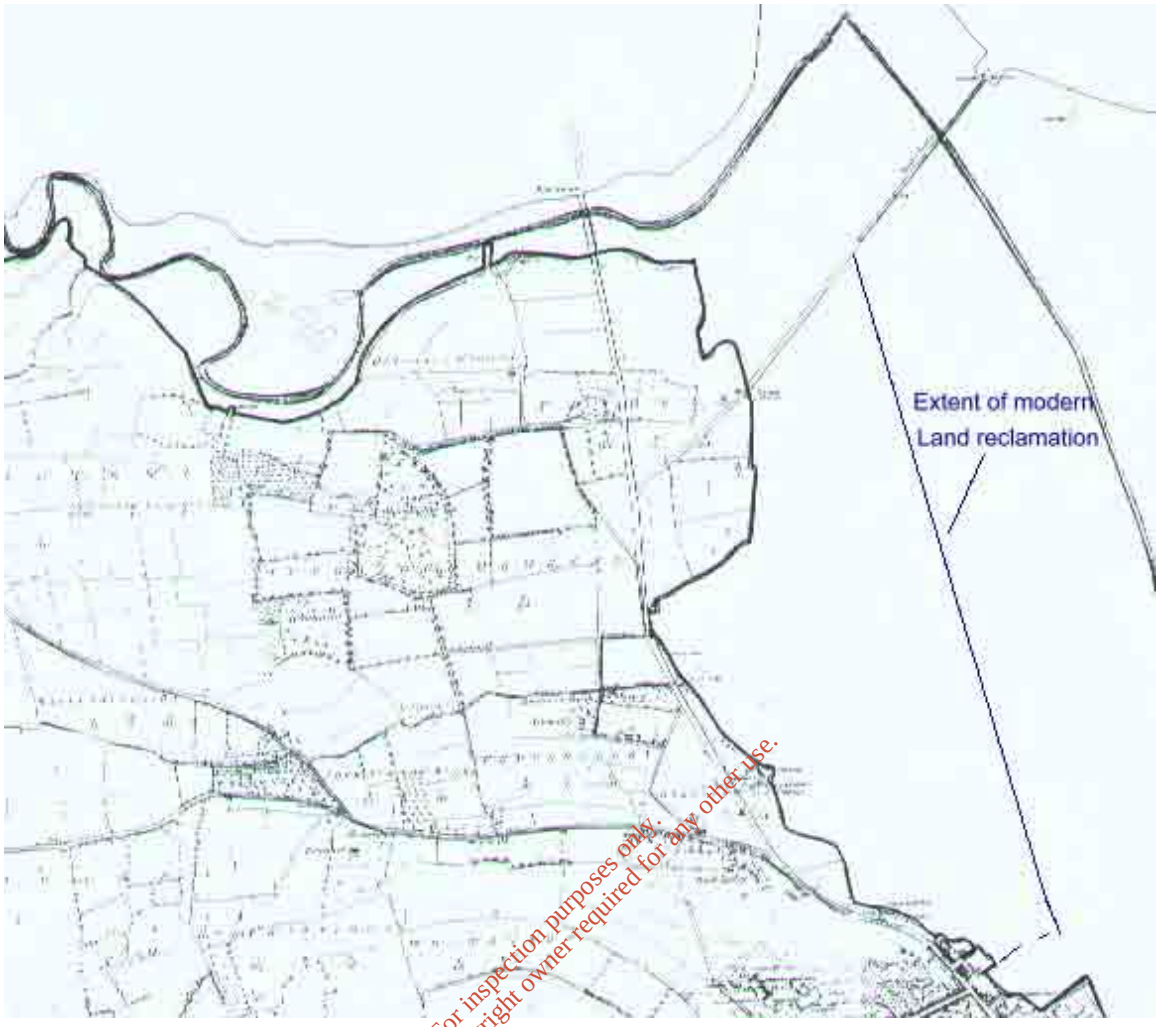


Figure 12.3. 6" OS 1842 map, reduced. Area north of Youghal prior to reclamation

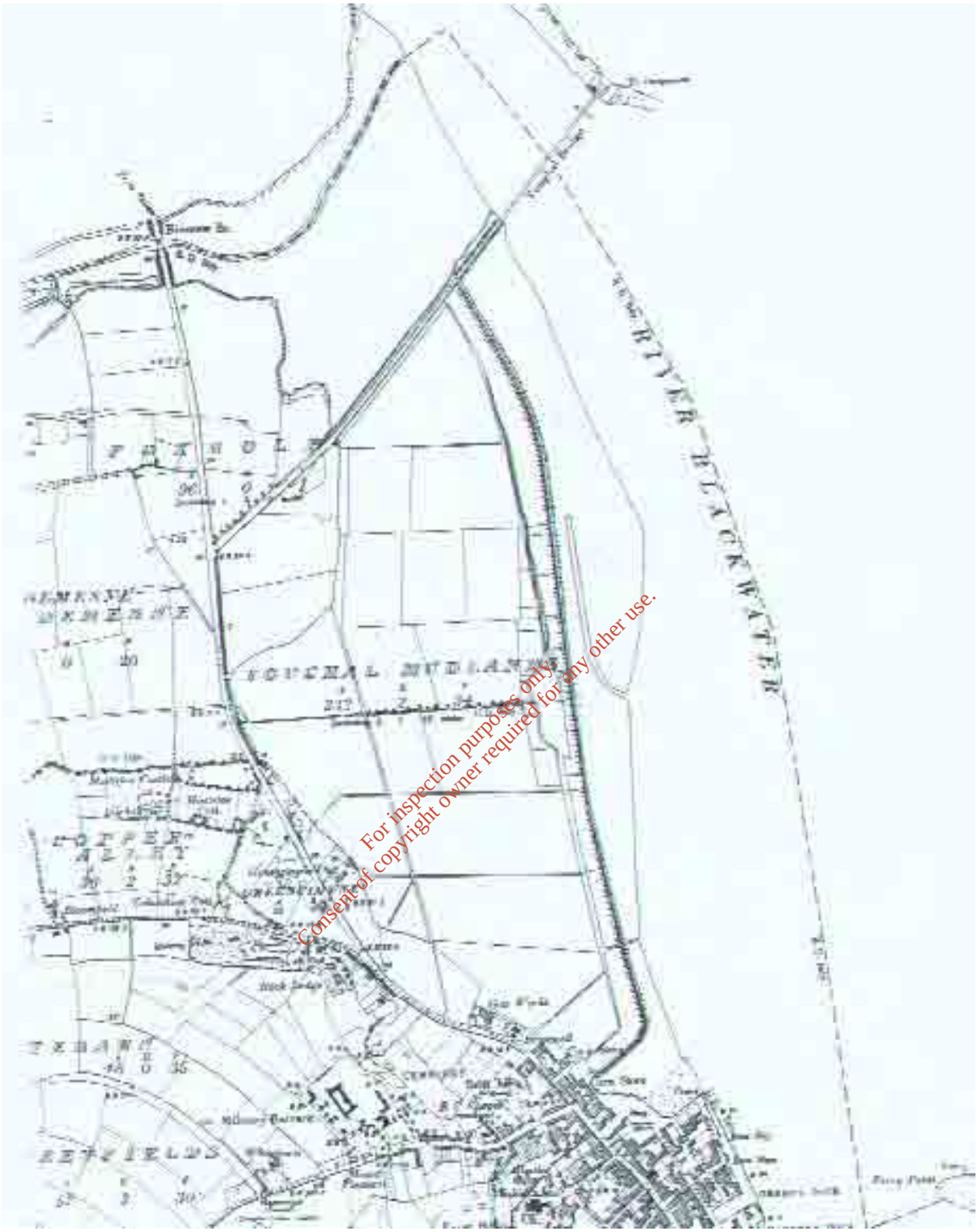


Fig. 12.4. 6" map 1903, reduced. Youghal Mudlands following reclamation

12.3 Mitigation Measures

The development of Options 1, 2 or 3 do not appear to impact on any known archaeological sites. However given the nature of their proposed siting archaeological monitoring of ground works is recommended as coastal or estuarine archaeological features may be revealed during development. An intertidal survey of the area will be undertaken to ascertain if the outfall pipes will interfere with any previously unrecorded features.

13. TRAFFIC

13.1 Existing Environment

The study area for consideration of the location of the wastewater treatment works is in the Mudlands to the north of the town. The N25 forms a border to the area to the west and south over approximately 2 km of National Primary Road (Figure 13.1).

The N25 is the National Primary Route that links Cork to Waterford and Rosslare. This route takes traffic through the old narrow streets of Youghal which operates on a one way system to improve traffic flow. As part of this one way system a new road was constructed to the northern perimeter of the town bordering the mudlands which links the N25 at the Greencloyne Roundabout immediately north of the town and the eastern streets at Youghal Shipping Yard adjacent to the estuary.

From the roundabout at Greencloyne immediately north of the town, the N25 continues one-way southwards towards the town . The route continues one-way southwards as far as the intersection of Strand Street, Friar Street and South Abbey. From this location, two-way flow returns. The one-way system described above enables southbound traffic to avoid Youghal Main Street to the west where northbound traffic is directed.

Traffic Flow data for the relevant sections of the N25 adjacent to Youghal was obtained from the NRA publication RT580 – National Roads and Traffic Flow 1999. The 1999 Annual Average Daily Traffic (A.A.D.T.) volumes on the 30 m.p.h. speed limit zone on the N25 north of Youghal were of the order of 9,500 vehicles. The proportion of heavy commercial vehicles (h.c.v.'s) was 13%, which equates to approximately 1,250 h.c.v's. On the road south from Greencloyne Roundabout on the N25, the 1999 A.A.D.T. volumes were of the order of 7,500 vehicles and the proportion of h.c.v.'s was 8% which equates to approximately 600 h.c.v's. On the two-way section through Youghal Town, the 1999 A.A.D.T. volumes were of the order of 11,000 vehicles and the proportion of h.c.v.'s was 9% resulting in approximately 990 h.c.v.'s.

The National Roads Authority (N.R.A.) in their National Road Needs Study, proposed that light vehicle traffic on national roads would increase by 4% per annum from 2000 to 2005 and by 2% per annum thereafter. Heavy commercial traffic was expected to increase at an annual average rate of 3%. In accordance with these forecasts, the 1999 traffic volumes on the N25 were factored to 2001 levels using these assumed future traffic growth forecast rates. Accordingly, the derived 2001 A.A.D.T. volumes on the N25 are shown in Table 13.1. Further details of the traffic study are provided in Appendix I.

Table 13.1 – Derived 2001 Traffic Volumes (A.A.D.T veh's & h.c.v.'s)

Location on N25	veh's	h.c.v.'s
30 m.p.h. SL north of Youghal (2-way)	10,250	1,325
One-way section southbound	8,105	640
2-way section Youghal	11,875	1,050

13.2 Access Proposals

As shown in Figure 13.2, the access road to the WWTW in each of Options 1 – 3 would link directly with the N25 on the southbound route between Greencloyne Roundabout and Youghal Shipping Yard. In each of the options, the T-junction formed at the WWTW entrance would achieve acceptable sight distances in accordance with the DMRB standard, TD42/95. The new entrance arrangement will have to incorporate road markings and signage as required by Cork County Council.

Consideration was given to providing an access to site option 3 from the N25 to the west of the site which is a shorter route. However, suitable site distances were not available at this location by comparison with the other locations. This access was also less favourable in terms of its impacts on local residences both during construction and operational phases.

There is no difference between the site options in terms of access and road impacts as they are all located on the same section of road.

13.3 Impacts

13.3.1 Operational Traffic Impact

It is expected that the WWTW will generate a maximum two-way daily volume of 10 vehicles. This figure represents less than 1% of the predicted 2005 (proposed opening year) A.A.D.T. volumes on the N25 adjacent to the site. The predicted 2005 2-way traffic volumes take into account the expected 65% reduction in traffic on this section of the N25 due to the proposed opening of the Youghal by-pass in 2003. This is detailed further in Appendix I. The proposed Wastewater Treatment Works will not have any significant adverse traffic impact on the surrounding road network.

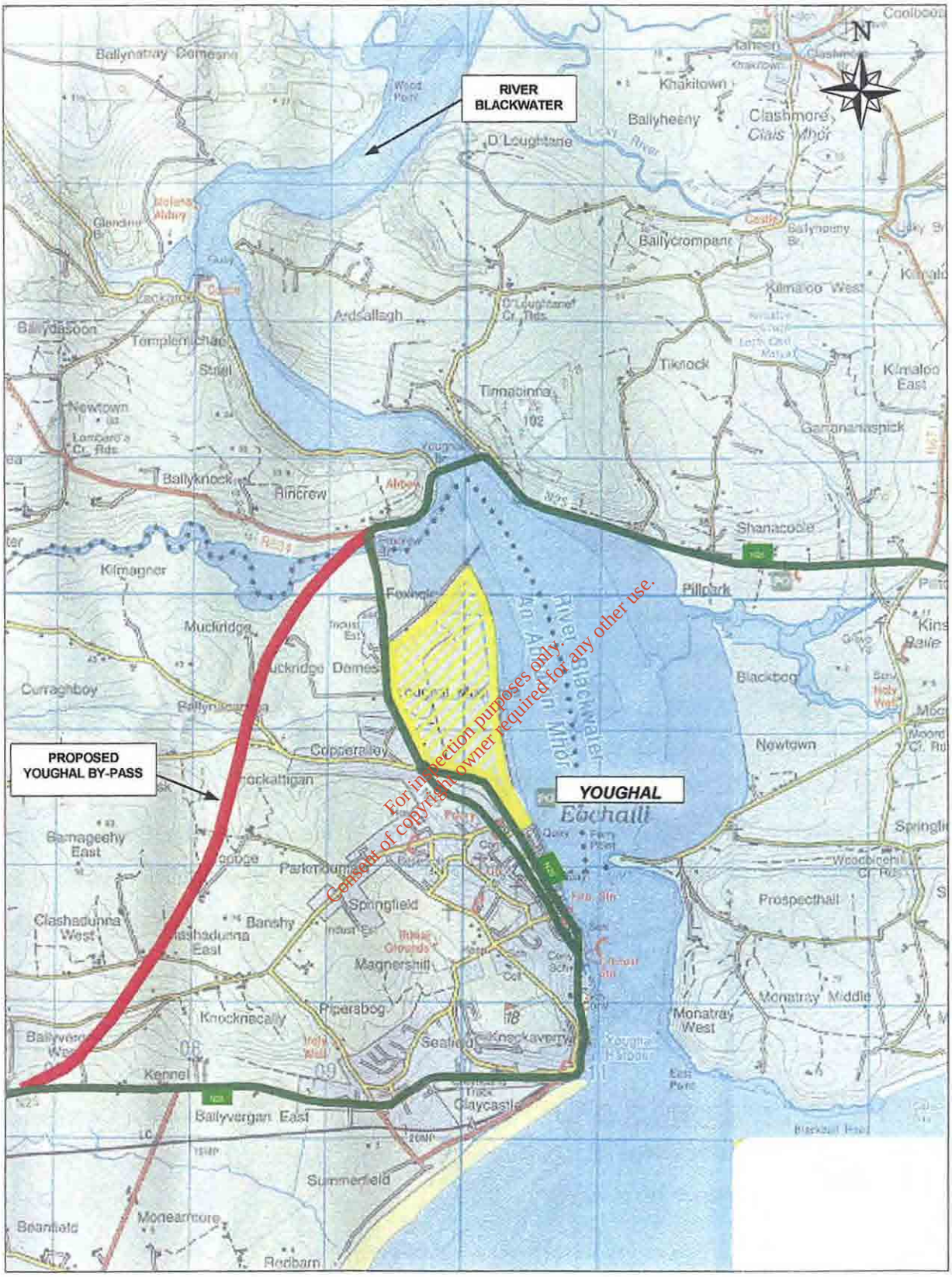
13.3.2 Impacts during construction

The expected construction period is 12 to 18 months. Construction is expected to commence in 2003. It is expected that during the peak construction period, a two-way construction traffic daily volume of 150 vehicles will be generated. This figure represents approximately 5% of the predicted 2004 A.A.D.T. volumes on the one-way section of the N25 adjacent to the site. It is assumed that the peak construction period will occur in 2004 and background traffic volumes take into account the expected 65% reduction in traffic due to the proposed opening of the Youghal by-pass in 2003.

The construction traffic impacts are the more onerous in the scheme but will not be significant as good access is available from the road network particularly with the opening of the bypass subject to the mitigation measures set out below.

13.4 Mitigation Measures

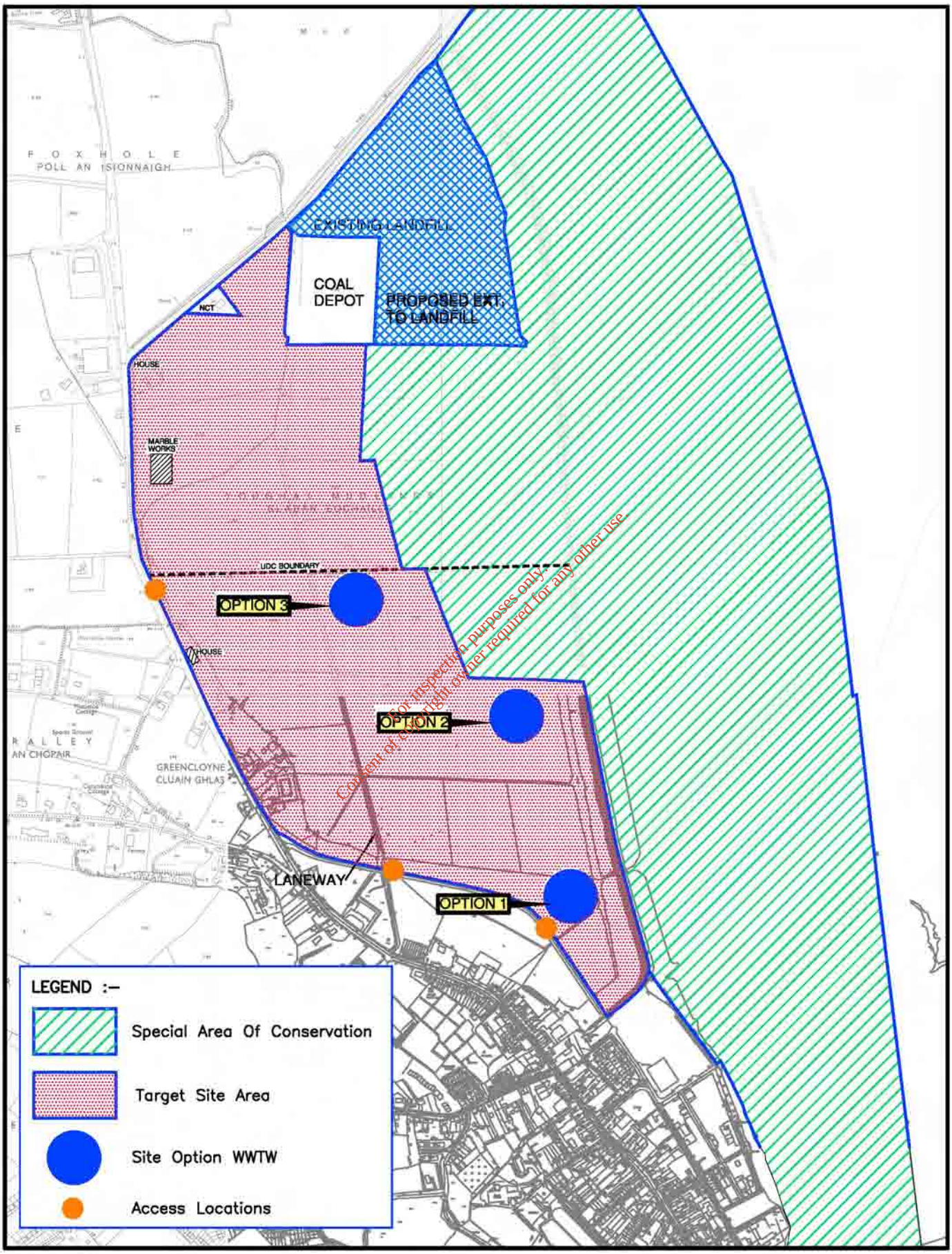
1. Hard-stand parking areas should be provided within the site for all construction parking;
2. The routing of construction vehicles will be agreed in the contract documents. This will include the restriction of construction traffic from travelling through the town with traffic directed to use the by pass which will be open in 2003.
3. Traffic control related to the construction period will be in accordance with the NRA and Cork County Council.
4. All necessary construction warning signs and permanent vehicle wheel wash facilities be provided prior to the commencement of construction.
5. The new entrance arrangement will have to incorporate road markings and signage as required by Cork County Council.



Proposed Site for Wastewater Treatment Works

SITE LOCATION IN CONTEXT OF SURROUNDING ROAD NETWORK

FIGURE 13.1



SITE OPTIONS AND ACCESS LOCATIONS FOR W.W.T.W. *FIGURE* *13.2*

14. IMPACTS DURING CONSTRUCTION

14.1 Introduction

This chapter sets out the environmental impacts which would arise during the construction of the proposed scheme. The likely significant effects direct and indirect on the environment of the proposed scheme are considered by reference to their possible impact on:-

- Human beings
- fauna and flora.
- Soil, water, air, climate and the landscape.
- Material assets.
- Cultural heritage.

14.2 Construction Period

The content of the Youghal Main Drainage Scheme is described in Chapter 2 and briefly comprises the Wastewater Treatment Plant and Outfall pipeline. The construction period for the scheme is estimated at 24 months. The contract would be subject to an additional 12 months maintenance period.

14.3 Advance Work for Utilities

There may be work required to be carried out by the utilities in rescheduling and relocating their services. Advance works, moving and re-siting E.S.B. power cables would be carried out before the main Civil Contractor can carry out any works in the vicinity of these cables.

Close liaison with all the Statutory Bodies will be required throughout the Contract.

14.4 Traffic Management

Traffic management is a very important aspect in the planning of the construction of the scheme.

The construction of the proposed scheme will require the Contractor to maintain traffic flows at all times except for short periods when flow in one of the directions only may be restricted alternately by reducing to a single lane during off peak periods or by approved road closures where this is unavoidable and all subject to the approval of Youghal Urban District Council Traffic Department and by consultation with the Garda Siochana.

All traffic management measures will be required to be in compliance with the "Guidelines for Traffic Control at Rural Roadworks" - Draft June, 1986, as published jointly by the County and City Engineer's Association and An Foras Forbartha Teo to ensure the safe operation of traffic management measures.

Some delays to road users will inevitably arise due to construction but these will be minimised by the adoption of procedures ensuring safe and proper traffic management practices.

14.5 Programme of Works

The impact of the construction of the scheme is directly related to the programme for the overall project, the programming of specific elements of the project, the method of construction adopted, the daily timing of undertaking specific activities and their overall duration. Although the construction period is stated at about 12 to 18 months, many specific construction activities are of a much shorter duration and confined to specific locations.

Prior to commencing construction work, the contractor will propose an overall programme detailing the timing and proposed duration of the various work elements and the methods to be employed to carry them out. This programme and the methods of construction set out therein must be to the satisfaction of and approved by Youghal Urban District Council. The Council in reviewing the programme and methods will take into account the possible adverse impacts on the environment and ensure mitigation measures are put in hand to reduce or eliminate these impacts.

Typical construction impacts might include a localised increase in noise, vibration, dust and dirt and a loss of amenity due to the presence of heavy construction traffic. Those affected can include people in their homes or places of work, people visiting shops or community facilities and pedestrians, cyclists or vehicle travellers.

14.6 Effects on Human Beings

14.6.1 Occupiers of Properties

Occupiers of properties in close proximity to the proposed works will be subject to some nuisance resulting from construction activity. This nuisance may consist of noise, vibration, mud or dust. Although the construction of this scheme will take about 24 months to complete, at any individual location on the pipelines construction activities will be of a much shorter duration. Noise levels and vibration will, in general, be very intermittent and the occupiers will be kept informed on programmes and progress.

It is difficult to quantify the extent of nuisance arising from noise, vibration, mud or dust. Determining factors will include meteorological conditions, type of construction plant employed and the phasing of the works. Construction nuisance is generally a localised phenomenon. The distance from the source of the nuisance however is an important factor and research conducted in the UK suggests that at least half the people living within 50m either side of the construction site boundary were seriously annoyed by construction nuisance in one form or another but that beyond 100m less than 20% of the people were seriously annoyed.

14.6.2 Noise

Noise is defined as "sound which is deemed undesirable by the recipient". The decibel scale (db) was developed for the purpose of measuring the intensity of loudness as perceived by the listener and is on a logarithmic scale.

Noise levels from construction plant such as excavators, dump trucks and compaction equipment measured at source are in the order of 85db(A). However, as much of this plant will be on the move, such high noise levels will be intermittent at any particular location and only noticeable when machines are passing that location.

14.6.3 Noise Control Measures

Contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228 (1984), "*Noise Control on Construction and Demolition Sites*" and the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988. These measures will ensure that:

(i) No plant used on site will cause a public nuisance due to fumes, noise, leakages or by causing an obstruction.

(ii) The best means practical, including proper maintenance of plant, will be employed to minimise the noise produced by on-site operations.

(iii) All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the Contract.

(iv) Compressors will be of the 'sound reduced' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.

(v) Machines which are used intermittently will be shut down or throttled back to a minimum during those periods when they are not in use.

(vi) Any plant, such as generators or pumps, which are required to work outside of 0700-1900 hours will be surrounded by an acoustic enclosure.

(vii)Throughout the Contract, the supervision of the Works will include ensuring compliance using the methods set out in BS 5228.

14.6.4 Vibration

Ground vibration from construction work would not be expected to cause undue disturbance or structural damage. The Contractor will be expected to limit vibrations, measured as peak particle velocity, at any dwelling or other building, to less than 3mm/s for vibration from mechanical plant activity and 10mm/s from use of explosives. Where vibrations of this magnitude could arise, monitoring systems will be put in place adjacent to the nearest affected property and maintained during the work.

14.6.5 Working Hours

Normal working hours will be 0700-1900 hours Monday to Friday and 0800-1630 hours on Saturday. The Safety, Health and Welfare at Work Act, 1989 will apply. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of Youghal Urban District Council. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

The same proviso applies to night and Sunday working. Night is defined as 1900-0700 hours. When overtime and shift working is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits mentioned above will apply. No work may be carried out on Sundays or Public Holidays outside of 0900 and 1600 hours, except in the case of emergencies.

14.7 Emergency Works

Emergency work will include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies or other services which have been interrupted, repair to any damaged temporary works and all repair work associated with working on public roads.

14.8 Site Compounds

One of the most important factors relating to the Environmental Impact of the various constructional activities for the proposed scheme is the location of site compounds. In general these will be located where open ground with good road access is available in close proximity to the major construction works.

The main site compound will be permanent for the duration of the contract while others will be mobile and remain at the locations for the duration of the specific construction activity.

The contract supervisory staff will also require offices. It is expected these will be adjacent to the principal compounds with the mobile offices located at the centres described heretofore. All offices and compounds will be maintained safe and secure during the contract.

14.9 Effects on Fauna and Flora

The ecosystem including individuals and populations of all plant and animal species, communities of different species, terrestrial and aquatic habitats have been assessed in depth.

Site clearance, storage of materials, disposal of materials and burning of waste materials can have an adverse effect on fauna and flora.

Disturbance of the physical environment either directly by, for example, occupation of land or indirectly by changes in water levels and flow, soil structure, landform can have the effect of removing habitats, plants and animals or of disturbing feeding, roosting, nesting, reproduction and migration requirements and habits. There will be no permanent changes in groundwater levels or quality outside the site and it is expected physical effects will only be temporary and that the sources of ecological impact including landtake and excavation, construction activity, disturbance and damage, site engineering maintenance and restoration, noise and dust will be controlled in a manner to prevent any long-term adverse effects on flora and fauna. The location of the sites has been selected to minimise impacts to sensitive species.

The Contractor will be required to control the growth and spread of weeds on the site of his works whether noxious, injurious to agriculture or otherwise for the period of the works including the maintenance period. Special precautions will be applied to those weeds which require control in their removal treatment and subsequent dumping such as the Giant Hogweed. The use of weed killer will not be allowed to contaminate water courses.

14.10 Effects on Soils

There will be no activities on the site which are a source of contamination of soils by movement through the soils under certain climatic conditions.

The physical effects of development can lead to changes in local topography, soil erosion and slope instability. The physical disturbance of soils can arise from changes in ground conditions, land-take and clearance, compaction by heavy machinery during construction and soil movement, deep digging for foundations and piling and removal of vegetation, trees and hedges. Such physical disturbance can lead to changes in the density and friability of soil, its moisture retaining ability, natural drainage and inorganic matter content.

There are no operations associated with the works on the surface which could result in soil changes at depth or lead to sub-surface subsidence.

Geological faces exposed during the course of the work will be properly contoured around the exposure to ensure no long term adverse effects and all slopes in cutting and on embankment will be engineered to ensure protection and stability. Specific mitigation measures, if any are required, will be properly designed in conjunction with the relevant statutory authority.

14.11 Watercourses

The contractor will be instructed to ensure that care be taken to prevent the silting up, the erosion of the beds, or the pollution of the water to any stream or watercourse in the vicinity of the works.

In the event of large quantities of muddy water having to be discharged from excavations into any of the streams/surface water systems, settling ponds will be constructed so as to remove the mud from the water before it joins the streams. This will be most important during the summer when the flows in the rivers will be low. The provisions of 'Local Government (Water Pollution) Act, 1977' and its subsequent amendments will be complied with throughout the course of the contract.

Waste products associated with the works and the compounds shall not be permitted to enter watercourses adjacent to the works and all precautions necessary shall be taken to prevent the spillage of diesel fuel or other solvents.

14.12 Effects on Air

Construction activities have the potential to cause the formulation/accumulation and airborne pollution of dust, particularly during the earth-moving phase.

Properly designed and recognised methods of controlling and damping down dust will be in operation during the course of the contract and strict enforcement of these regulations will be carried out.

14.13 Effects on Climate

Construction activities are unlikely to have any effects on climate.

14.14 Effect on Landscape

During the construction period there will be some visual impact as construction work proceeds. The extent of the visual intrusion will fluctuate according as the location and type of activity being undertaken varies.

14.15 Effect on Material Assets

Potential impacts of the construction phase on property in general may include:-

- *Disruption to access.*
- *General nuisance arising from encroachment on to property.*
- *Temporary disruption to services (water, electricity, telephones, etc.).*

In relation to these issues, the contractor will be obliged to maintain access to properties at all times.

Prior to the diversion of any private or publicly owned service, the owner will be consulted in relation to the planning and carrying out of the works. The contractor will be required to provide a satisfactory service prior to the cutting of any private existing service.

Temporary fencing will be erected as required to delineate the site boundary and to minimise disturbance to adjacent properties.

The contractor undertaking the works will be obliged to provide, maintain and keep available plant and equipment necessary to minimise the formation, accumulation and airborne pollution of dust arising from the works. Supervisory staff will monitor the implementation and compliance with specified Control Standards.

14.16 Effects on Cultural Heritage

The report on Archaeology deals with all matters pertaining to the impact on archaeology including those arising during the construction phase. This provides that during the construction phase an Archaeologist will be retained during soil stripping along the length of the route of the outfall and where warranted, provision will be made for full excavation of any archaeologically significant material uncovered.

14.17 Work Affecting Carriageways and Footways

Before commencing construction at any part of the works which will involve interference with the existing carriageway or footway, the Local Authority will be consulted on the proposed commencement date of these works, the area of the carriageway or footway to be occupied and duration, and the proposed methods of construction, in order to minimise inconvenience to the public.

Temporary and diverted footways will be designed for access for wheelchairs and pushchairs where reasonably practicable. The Local Authority will ensure that reasonable pedestrian routes are provided throughout the construction period and in relation thereto will meet the following requirements, where practicable:

- *Any temporary footways and carriageways should have uniform surfaces: and there should be no steps and gradients should not be greater than 1 in 12.*

- *All temporary footways and ramps must be surfaced in non-slip materials.*

- *Existing pavement widths around the work site will be maintained except where this exceeds 2 metres when the Local Authority may reduce it to not less than 2 metres following discussions with the Highway Authorities and the Gardai.*

- *Clear signing will be provided at all times for each pedestrian route with the minimum number of changes to all temporary layouts in order to reduce confusion.*

- *Headroom clearance over footways will be a minimum of 2.3m. A horizontal clearance of 0.6m will be provided from the kerb-line, where practicable, for any hoarding projection under 5.1m high, to avoid fouling by vehicles. If any projection is over the highway, the clearance will be more than 5.3m.*

- *All pedestrian routes diverted onto the carriageway will be clearly defined by continuous barriers, constructed to the reasonable requirements of the Highway Authority.*

- *Where a temporary footway is provided, the Contractor will include any reasonable requirements of the Highway Authority.*

- *So far as reasonably practicable, all footways and carriageways will be kept free from mud and other loose materials arising from the works.*

- *After completion of the works all materials arising from the works will be cleared from the highway leaving the same in a clean and tidy condition to the reasonable requirements of the Highway Authority.*

14.17.1 Damage to Existing Roads

The movement of heavy goods vehicles transporting plant and materials along the existing local roads may cause damage to the road structure. The Contractor shall take all necessary precautions to avoid damage to existing roads.

Tracked plant will not be permitted on road surfaces outside the site boundaries unless adequate protective measures have been taken to safeguard the integrity of the road surface and the approval of Youghal Urban District Council has been obtained.

Vehicles will be required to comply with the gross vehicle weights prescribed in the Road Traffic (Construction, Equipment and Use of Vehicles)(Amendment) Regulations, 1990.

14.17.2 Condition Of Road Surfaces

Every precaution will be taken to prevent soil or other material being dropped or spread on country lanes, roads, but should materials be spilt, the Contractor will be responsible for cleaning the roads to the satisfaction of the County Council. Throughout the duration of the contract, the following measures will be in force:-

(i) The implementation of a daily maintenance system to ensure that all footpaths, roads and accesses are safe.

(ii)The deployment of appropriate equipment to clean all roads upon which any material has been accidentally deposited.

(iii)The installation of equipment and the taking of all reasonable measures to ensure that a dust nuisance is not caused on the roads or that property in the locality of the works is not adversely affected by the dust.

(iv)The maintenance of open access to all landholdings and properties.

14.17.3 Maintenance and Repair of the Highway

Where works traffic has to use public highways the Contractor shall take necessary precautions to prevent damage to roads and footpaths. The Contractor will comply with relevant legislation with regard to vehicle licensing and operation.

The Contractor will be responsible for any damage caused by his activities to roads, kerbs or footpaths in the vicinity of the work site and will carry out the temporary or permanent reinstatement as may be required, of such roads, kerbs or footpaths and in a manner reasonably approved by the Local Authority and to their specification and reasonable satisfaction. Permanent reinstatement will be carried out by the Local Authority or by the Contractor in accordance with the Local Authority's specification and reasonable requirements.

14.17.4 Mud on Roads

This is regarded as one of the main environmental nuisance problems arising from construction sites with large quantities of spoil to be removed. The Contractor will take strict measures to minimise this problem.

These will include, but not necessarily be limited to:

- *The provision of easily cleaned hardstandings for vehicles entering, parking and leaving the site.*

- *The provision of wheel washing facilities including, where practicable, mechanical wheel spinners.*

- *The use of an approved mechanical road sweeper to clean the site hardstanding or any mud or debris deposited by site vehicles on roads or footpaths in the vicinity of the site. The road sweeper is to be readily available whenever the need for cleaning arises and will be properly used and maintained.*

- *The adequate sheeting of each lorry load of spoil removed to prevent spoil falling off during its journey to the tip concerned.*

The Contractor will also comply with the requirements regarding dust control.

14.18 Private and Publicly Owned Services

Private and publicly owned services such as water supply pipelines, sewage pipelines, surface water drainage pipelines, E.S.B. overhead and underground cables which pass through the lands affected by the proposed Scheme may have to be diverted or relocated in the process of executing the construction works associated with the proposed scheme.

Prior to the diversion or relocation of any service, discussions will be held with the owner of the said service to reach agreement in relation to the planning and carrying out of the diversion or relocation works. A primary objective will be to keep disruption of services to a minimum.

4.19 Impacts on Estuary

The short sea outfall pipes are proposed to be approximately 300m long. These pipes will have to be trenched into the riverbed to prevent damage from ships anchors etc. The major impact of these works is the increased turbidity caused by the disturbance of sediments by trenching. Scour may occur within the river system causing the trench backfill to be eroded.

Excavating trenches at low tide can mitigate the increase in turbidity of river water by sediment washout from excavations. This will reduce the amount of sediment washed into the river. Where the trench is to be situated in non-drying areas the trenching technique should be such as to cause as little disturbance as possible to the riverbed.

If scour is likely to occur over the alignment of the proposed outfall, consideration should be given to rock armour protection of the riverbed in the area of the outfall.

14.20 Conclusion

It is inevitable that the construction of a major sewerage project will have varying degrees of impact on the environment in the vicinity of the proposed route. However, Youghal Urban District Council intends to minimise these effects by:

- *The setting and implementation of rigid standards relating to noise levels, working hours, discharges into watercourses and the control of dust and emissions during the execution of the works*
- *The siting of compounds having due regard to the proximity of residential properties and their visual intrusion on the landscape*
- *The limiting of the number and duration of road closures*
- The proper maintenance of roads and footways during the period of construction.

15. INTERACTION OF ENVIRONMENTAL IMPACT

15.1 Human Beings

All the effects of a development impact on human beings be it directly or indirectly and therefore interactions between all the issues need to be discussed. Where there are significant impacts, mitigation has been developed.

15.2 Water Quality and Flora /Fauna

The improvement in water quality which will result from the removal of raw sewage discharges to the estuary will have a positive impact on the Flora and Fauna of the estuary.

15.3 Landscape / Flora and Fauna –Site Soil.

The development will involve the stripping of soil which will be used for cover to the site mounding and bunding which will be carried out as part of the landscaping proposals.

The proposed planting of trees and shrubs will provide new habitat for flora and fauna which will mitigate some of the loss of existing hedgerows and result in an overall minor beneficial impact.

15.4 Vibration/Noise

The carrying out of piling operations for the construction of the treatment works will result in vibration and noise. Mitigation measures for construction (chapter 14) will limit the impact and ensure no nuisance will occur.

Potential cumulative negative impacts on human beings could occur as a result of the combined effects of noise, odour and visual impacts. However, the provision of earthen embankments and screening to minimise visual impacts will also act to attenuate noise emissions.

15.5 Mitigation Measures

It is considered that the mitigation measures for each of the individual impacts will ensure that there are no significant cumulative impacts.

Table 15.1 – Youghal Main Drainage Scheme - Environmental Impacts

DESCRIPTION					EVALUATION	
Description	**Character**		**Magnitude& Duration**	**Significance**	**Consequences**	**Mitigation**
Human Beings (Ch. 3)	Health & Safety		Short-term Long-term	Permanent	• accidents during operation of plant. • Infection with pathogenic organism • Training & personal protective equipment such as gloves & clothing.	Compliance with Safety, Health & Welfare requirements, Training & Safe System of Work.
Terrestrial Flora & Fauna (Ch. 4)	Habitats	1	Permanent	Slight	Removal of habitat	Retain hedgerows where possible. Impacts will be least at Site Option 3.
	Flora& fauna	2	Permanent	Significant	Alteration of drainage and damage to habitat in SAC if pipeline built here.	Avoid routing pipeline through SAC.
		3	Short-term	Slight	Disturbance to birds during construction phase	Limit zone of disturbance
		4	Short-term	Slight	Sedimentation of drainage ditches	Avoid.
Marine Ecology (Ch. 5)	Habitats	1	Short-term	Slight	Habitat loss during construction of pipeline.	Restoration of habitat
	Flora & fauna	2	Short-term	Slight	Loss of feeding and spawning grounds and disturbance of epifauna.	Minimise area of seabed impacted.
		3	Short-term	Slight	Sedimentation causing smothering and reduction of light for flora.	Minimise area of seabed impacted.
		4	Long-term	significant	Contamination of shellfish beds in vicinity of outfall.	Locate outfall away from shellfish beds.
		5	Long-term	Significant	Improvement of overall estuary water quality thus reducing levels of bacteria in shellfish in the estuary	.
Soils & Geology (Ch. 6)	Sediment	1	Short term Long-term Short-term	Slight Moderate Slight	Construction Phase may cause release of contaminants Removal & destruction of soils in the WWTW Site foundation. Spoil generation	Reduce area of impact Excavation of trenches for outfall at low tide to reduce turbidity. Rock armour protection to prevent scour around pipeline. Use spoil generated for landscaping. No preference between site options

DESCRIPTION					EVALUATION	
Description	**Character**		**Magnitude & Duration**	**Significance**	**Consequences**	**Mitigation**
Water (Ch.7)	Water Quality	1	Long-term	Significant	Improvement in water quality	Nutrient removal (nitrogen) to reduce eutrophication and preservation of designated shellfish and bathing waters.
Air (Ch. 8)	Odour Emissions	1	Long term	Slight	Collection & treatment to 2ou/m^3 at site limit for 98 % on -exceedance	Cover & house primary odour sources & use of treatment technologies
	Noise	2	Long-term	Imperceptible	Maximum level below ambient background noise levels.	Good design layout.
		3	Short-term	Slight	▪ Piling operations during construction works. ▪ Traffic during construction phase.	▪ Limit hours of noisy activities. ▪ Monitor levels during critical receivers and at noise sensitive locations.
Climate (Ch. 9)	Atmosphere	1	None	None	None	None
Landscape/ Visual (Ch. 10)	Visual Intrusion	1	Long-term	Significant	▪ Visual Intrusion	▪ Additional screen planting. ▪ Careful selection of Building Materials
Material Assets (Ch. 11)	Land Use	1	Permanent	Slight	Loss of agricultural land and habitats	Limit area of impact
	Transport	2	Permanent	Slight	Impacts on boating activities if outfall near anchorage point.	▪ Build outfall below the surface. ▪ Avoid anchorage point.
	Fisheries	3	Permanent	Significant	Improvement in water quality	▪ none
	Agriculture	4	Permanent	Slight	Loss of land	▪ none
	Industry	5	Permanent	Significant	Provide for sustainable development	▪ none
	Residential	6	Permanent	Significant	Provide for sustainable development	▪ none
	Power and Water	7	Permanent	Slight	Provide power from grid; small water demand	▪ none
	Recreation/Leisure	8	Permanent	Significant	Improved water quality	▪ none

DESCRIPTION					EVALUATION	
Description	**Character**		**Magnitude & Duration**	**Significance**	**Consequences**	**Mitigation**
Cultural Heritage (Ch.12)	Archaeology	1 2	Long-term Long-term	Neutral Significant	No sites of archaeological significance in the vicinity of the proposed WWTW. Pipelines will go through the zone of Archaeological Potential of many sites.	None required ▪ Where possible, lay pipelines on the foreshore. ▪ Conduct Archaeological monitoring during pipe-laying
Construction (Ch. 14)			Short term			
	Health & Safety			slight	Accidents	Secure sites, S.I.138 Compliance
	Traffic			Skight	Accidents and congestion	Locally minor, Traffic Management Plans
	Waste Disposal			Slight		C/D Waste to Approved Sites
	Marine Sites			Moderate	Local Disruption/Turbidity/Amenity Loss	
	Air Emissions			Mocerate /significant	Nuisance	Limit Noise/Vibrations BS 5228
	Water Emissions			Minor	pollution	Specify Sedimentation before discharge
	Flora/Fauna			Minor	Local Impact from Construction Sites Local Disturbance of Sites/foreshore	Reinstate site Additional landscape
Traffic (Ch. 13)		1 2	Long-term Short-term	Imperceptible Slight	Traffic during operation of the WWTW. Traffic generated during construction phase	None required. ▪ Traffic control in accordance with NRA and Co. Co. guidelines. ▪ Erect necessary signage.

16 CONCLUSION

Need for the Scheme

There is currently no wastewater treatment at Youghal other than a holding tank and comminutors on the outfalls at Green's quay and Paxes Lane with raw sewage discharges to the estuary via the two outfalls. Secondary treatment is required by December 2005 under the 2001 Urban Wastewater Treatment Regulations. The proposed scheme will upgrade the existing drainage system and provide a WWTW for Youghal town and environs in County Cork which will allow the sustainable development of Youghal into the future.

Proposed scheme

The site for the proposed works is located at the Mudlands to the north of the town. The current wastewater load of Youghal is approximately 10,500 population equivalent and is predicted to increase to approximately 20,000 p.e. by the year 2025. The WWTW will be designed to accommodate 16,000 population equivalent in the first phase with provision made to allow for modular expansion of the plant. There are a number of processes and technologies available for the treatment of the wastewater and indicative proposals have been considered to establish the envelope of constraints to be considered in the EIS. Discharge of the treated effluent to the estuary is proposed.

Alternatives considered

Following a thorough site selection process of a number of locations around Youghal the Mudlands was identified as the most environmentally suitable location for the proposed works and the Environmental Impact Assessment of the area indicated that site Option 3 located in the middle of the Mudlands adjacent to the UDC boundary was the most suitable site.

Alternative receiving waters for the discharge of treated effluent were also considered with discharge to the estuary and discharge via a long sea outfall to Youghal Bay. Each option required a different level of treatment to achieve the required water quality and effluent standards. An economic assessment indicated that the estuarine discharge was the least cost solution based on the Mudlands site.

Water quality

The preferred discharge location and receiving waters is at Ferry Point in the Estuary. Existing water quality in the harbour is good with respect to biological parameters. However nutrient and chlorophyll levels have been historically high mainly due to upstream riverine inputs to the estuary leading to the susceptibility of being eutrophic.

Youghal Harbour / Blackwater Estuatry has been designated as a 'sensitive area' under the Regulations and nutrient reduction is required under this designation along with secondary treatment. This requires the treatment process to reduce nitrogen as the limiting nutrient to alleviate the potential for eutrophication of the harbour which has been identified by the EPA.

Bacteriological modelling of the discharge to the estuary indicates that the designated beaches at Youghal Main Beach and Claycastle will not be impacted on and their Blue Flag status in relation to water quality will not be threatened. Also the previously designated shellfish production areas in Youghal Bay outside the harbour will not be impacted on.

The water quality of the Estuary will improve as a result of the proposed WWTW.

Flora and Fauna

No habitats or species of nature conservation importance were found at the mudlands with the exception of the common frog (Annex V – Habitats Directive). There is comparatively little ecological connection between the area itself and the candidate Special Area of Conservation (designated under the EU Habitats Directive) which is based on the estuary, taking in the pond beside the seawall and the adjacent fields. The proposed WWTW will not have any significant impact on flora and fauna.

Marine Ecology

No marine species or habitats of nature conservation importance were found in Youghal Harbour. Few mussels were found in the sublittoral environment and no mussel beds were found near to the proposed outfall location. Faecal and total coliform levels in water and mussels were found to be low throughout the harbour, within the limits defined in both the Shellfish Waters and Shellfish Production Directives.

Traffic

The proposed Wastewater Treatment Works will not have any significant adverse traffic impact on the surrounding road network particularly due to the opening of the by pass in 2003.

Odour

Existing odour levels are elevated on occasions with these odours emanating from the landfill site and agriculture and the tidal mudflats. However these odours are not of a nuisance type and odour complaints are not a feature in the area.

A computer model was used to model dispersion of odour from three potential sites for the proposed wastewater treatment works. An indicative solution using the conventional activated sludge system was modelled, providing a worst case scenario with regard to process free surfaces. The model demonstrated that with 90% removal of odours using suitable technologies will result in the 2OU/m3 not being exceeded outside the site for 98% of the time thereby ensuring no adverse impact on local residences.

Noise

The proposed scheme will not have a significant impact on noise levels both at the operational phase and the construction phase subject to restriction on noise levels and working hours as mitigation measures.

Landscape and Visual

The proposed development on Youghal Mudlands will have an extensive Visual Envelope. This is because the Mudlands is an open flat area adjacent to an estuary and is overlooked by residential properties on north east and north-west facing slopes. Option 3 is the preferred location for the WWTW. Visibility of this area from surrounding properties is low and the area benefits from natural screening from mature hedgerows to the west and south. With additional screen planting on earth banks around the north and eastern side of this site the landscape and visual impacts on surrounding properties and the seawall will be low and generally acceptable.

Heritage

There are no known archaeological sites in the vicinity of the proposed WWTW and therefore there will be no impact on heritage. If pipe laying proceeds along the foreshore there exists the potential of finding elements of foreshore archaeology, in particular fish traps and additional fish weirs.

Summary

A summary of environmental impacts and mitigation measures are provided in Table 15.1.

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GLOSSARY

Biotope	After (Hiscock 1996) The physical 'habitat' with its biological 'community'; a term which refers to the combination of physical environment (habitat) and its distinct assemblage of conspicuous species'.
Epifaunal	fauna living on the surface
Imperceptible impact	An impact capable of measurement but without noticeable consequences.
Infauna	animals living within sediments.
Littoral	Between upper and lower tidemarks, exposed to air at the lowest tides. Also referred to as Intertidal.
Long-term impact	Impact lasting twenty to fifty years.
Medium-term impact	Impact lasting seven to twenty years.
MSL	Mean Sea Level
Neutral impact	A change which does not affect the quality of the environment.
Permanent Impact	Impact lasting over 50 years.
Profound Impact	An impact which obliterates all previous characteristics.
SAC	Special Area of Conservation as designated by the EU Habitats Directive.
Short-term impact	Impact lasting one to seven years.
Slight Impact	An impact which causes changes in the character of the environment which are not significant or profound.
Significant Impact	An impact which, by its magnitude, duration or intensity alters an important aspect of the environment.
SPA	Special Protection Area as designated under the EU Birds Directive.
Sublittoral	Below the littoral, never exposed to air.
Substrata	Surfaces (plural) to which an organism grows on or amongst.
Temporary Impact	Impact lasting for one year or less.