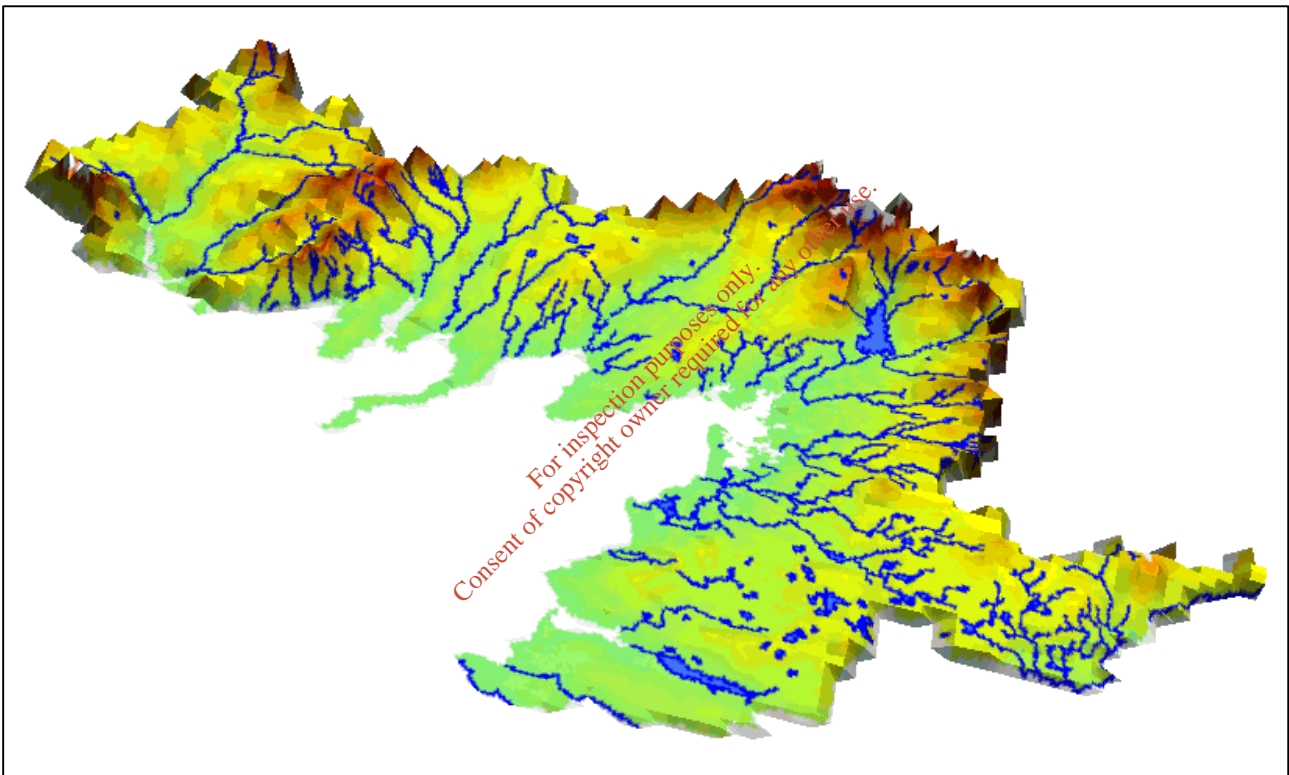


# Donegal Bay Water Quality Management Plan

Main Report  
Final Draft



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# Donegal Bay Water Quality Management Plan

## Section A

### Introduction

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## **A1 Concept of Catchment Management**

### **A1.1 Catchment Planning**

Catchment management plans represent a vision of the water environment. A catchment plan sets environmental objectives and guides all uses, and, indirectly, the water environment as a whole, to comply with these objectives. The existing status of the water environment is compared with the objectives and from this comparison, management options are developed.

The catchment is seen as the natural management unit for integration of the work programmes of all government agencies relating to water quality, water resources and ecosystem management. Catchment plans summarise relevant data and include an agreed action programme to optimise environmental protection. The catchment planning process is seen as a medium for promoting discussion, resolving conflict, assigning priorities, and setting targets by which progress on key issues can be monitored.

Ireland made statutory provision for catchment planning in the Water Pollution Act of 1977. The term used is water quality management plan. In County Donegal plans have already been conducted on two catchments; The Foyle and the Swilly. These more recent plans considerably widened the approach of the earlier plans to encompass all uses of the watercourses including amenities and habitat protection.

### **A1.2 Objectives of Catchment Management**

The objectives of the management plan for the Donegal Bay Catchment have been determined as follows:

1. To prevent and abate pollution of waters.
2. To safeguard public health.
3. To protect and, where necessary, improve the ecology of the waters.
4. To protect water quality such that many diverse uses may be possible. These may include:
  - abstraction for domestic, industrial and general uses,
  - fishery,
  - recreation and tourism,
  - wildlife conservation and habitat protection.

5. To identify and protect the major aquifers from pollution.
6. To provide a framework for water quality management on the basis of which the development of the catchment can proceed in a balanced and sustainable manner.
7. To identify monitoring and information requirements such that the resultant information is adequate and sufficient to support water quality management decisions.
8. To confirm the financing of pollution control programmes is based on efficient and effective strategies.
9. To identify the needs for investment in public and private waste water treatment facilities.
10. To facilitate the implementation of relevant EU legislation.

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## A1.3 Proposals

This report presents the initial stage in the development of a water quality management plan for the catchment.

It has been produced on the basis of existing information and information obtained from monitoring or other investigations undertaken by public authorities in recent years. A twelve month comprehensive water sampling and analysis programme was undertaken for the purpose of this report, examining the key rivers, lakes and coastal waters of the catchment.

The report may be used to inform users of the catchment and interested organisations or individuals on the state of the catchment and on management options. Based on this information, users and interested parties should be able to form a view, reach a consensus and adopt a common policy on different catchment uses and on corresponding environmental objectives.

The proposals include the following main elements in so far as they apply to the waters of the catchment, having regard to the finances available for the project and the priority attached to the elements listed:-

1. A description of the administrative and legislative framework relating to water quality management and of water quality protection policies and legislation, particularly as they relate to quality objectives, standards, guidelines and codes of practice.
2. A general description of the catchment, including its geomorphology, landuse, urban settlements, industry, agriculture and fisheries.
3. An inventory of existing and proposed water abstractions.
4. A description of the fishery resource.
5. A description of recreation and amenity resources.
6. A general description of nature conservation and cultural heritage resources.
7. An analysis of the hydrological and hydrometric characteristics of the catchment.
8. An assessment of management options for the protection and enhancement of water quality.
9. An assessment of water quality.

10. Recommendations in respect of water quality objectives.
11. Recommendations in respect of needs for investment in public and private wastewater treatment facilities.
12. An assessment of management options for the protection and enhancement of water quality.

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## **A2 The Legislative Framework**

### **A2.1 Introduction**

The purpose of a water quality monitoring and management system is to provide a framework for the co-ordination of future environmental protection in the Donegal Bay catchment area, including the licensing of discharges and effluents, and to ensure that water quality standards are attained and maintained. Management systems contain objectives for the prevention and abatement of water pollution as well as any other provisions which are considered necessary by the local authorities. The objectives are formulated with reference to relevant environmental policy and legislation issued by relevant national and international institutions.

This section provides a general overview of the environmental policies and national objectives for maintaining and protecting water quality. All major legislation which may relate to water quality and pollution control, including European Directives and national legislation, is identified. In addition, specific legislation which may be relevant to this particular catchment is included along with areas which will become the subject of legislation in the near future.

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## A2.2 Current Legislation

Water quality standards in Ireland originate from the EU legislative framework as described in Appendix A1. Through a variety of directives a quality of water required for the differential beneficial use of waters has been established. The Framework Directive – which will be dealt with later in this section – will co-ordinate all the legal aspects of EU water quality. The Donegal Bay and previous management plans will be subsumed under the River Basin District management plans.

The standards presently in operation are being implemented through National Regulations issued by the Minister for the Environment which give legal effect to the directives. The Minister is free to issue regulations which contain higher, but not lower, standards than the directives. Areas where quality standards exist already enshrined in law, are in bathing waters, fresh waters for supporting fish life and in drinking waters.

Table A2.1. gives an overview of the European directives, how they translate to Irish law and their purposes.

The most frequently applied standard for inland waters in relation to quality is the Fresh Water Supporting Fish Life Regulations and it especially refers to salmonid waters.

The next set of pieces of legislation is those which set out to control the emission of specific substances to the environment, due to their toxicity, their persistence or their bioaccumulation. Table A2.2 describes a list of the regulations governing emission of specific substances to varying receiving waters.

**Table A2.1: Use related European and Irish Legislation**

Use	European Union Directive	Irish Legislation	Purpose
Bathing Water	Directive 76/160/EEC concerning the quality of bathing waters.	European Communities (Quality of Bathing Waters) Regulations	Sets minimum water quality, establishes limit values for certain parameters, contains provisions for sampling.
To Support Fish Life	Directive 78/659/EEC on the quality of freshwater needing protection or improvement in order to support fish life.	European Communities (Quality of Salmonid Waters) Regulations 1988	Salmonid and cyprinid waters designated by Member States. Limit values for certain parameters established, minimum sampling required, timescale to conform provided.
Drinking Water	<p>Directive 80/778/EEC relating to the quality of water intended for human consumption.</p> <p>Directive 79/869/EEC concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water.</p> <p>Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water.</p>	<p><i>European Communities (Quality of Water Intended for Human Consumption) Regulations, 1988</i></p> <p>European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Waters) Regulations 1989</p> <p>Same as above</p>	Provides values for certain parameters, requires regular monitoring.

**Table A2.2 description of the regulations governing emission of specific substances to varying receiving waters.**

Discharge	European Directive	Irish Legislation	Provisions
Animal and Fish Wastes		European Communities (Disposal, Processing, and Placing on the Market of Animal By-products) Regulations, 1994.	Wastes must be disposed at a proper facility which is licensed under the regulations in order to prevent disease transmission.
Asbestos	87/217/EEC on the prevention and reduction of environmental pollution by asbestos.	European Communities (Control of Water Pollution by Asbestos) Regulations, 1990.	
Cadmium	83/513/EEC on limit values and quality objectives for cadmium discharges.	Local Government (Water Pollution)(Control of Cadmium Discharges) Regulation, 1985.	Contains limit values and quality objectives; Establishes deadlines, measurement methods, control procedures.
Dangerous Substances	76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment.	Local Government (Water Pollution) Act, 1977.	A framework Directive that establishes a control regime for two categories of substances identified as dangerous. List I substances must be eliminated and subject to prior authorisation. List II substances must be controlled and reduced as part of quality objectives and programmes.
List I substances	86/280/EEC on limit values and quality objectives for discharges of certain dangerous substances included on List 1 of the Annex to Directive 76/464.	Local Government (Water Pollution) Acts 1977-90; the Local Government (Water Pollution Acts 1977-90)(Control of Aldrin, Dieldrin, Endrin, Isodrin, HCB, HCBd and CHC13 Discharges) Regulations 1993; Local Government (Water Pollution Acts 1977-90)(Control of Carbon Tetrachloride, DDT and Pentachlorophenol Discharges) Regulations 1994.	

Discharge	European Directive	Irish Legislation	Provisions
List I and II Substances	80/68/EEC on the protection of groundwater caused by certain dangerous substances.	European Communities (Waste) Regulations, 1979; European Communities (Toxic and Dangerous Waste) Regulations, 1982; Local Government (Water Pollution) Regulations, 1978-92.	To protect against pollution to groundwater by substances identified in Lists I and II, provided by Directive 76/464/EEC. Prohibits the discharge of List I substances and the need to obtain prior authorisation to discharge List II substances. Monitoring is required of all authorisations. No license may issue without prior investigations including an assessment of the receiving environment and alternative methods of disposal.
EDI, TRI, PER and TCD	90/415/EEC	Local Government (Water Pollution) Acts 1977 and 1990 ( Control of EDC, TRI, PER and PCB Discharges) regulations 1994	Proscribes quality standards in relation to trade effluents arising from the handling of these substances in Industrial processes. Standards laid out based on grams of substance per ton of production capacity and concentration in effluent stream
Detergents	73/404/EC on the approximation of the laws of the Member States relating to detergents, as amended by directive 82/242/EEC and directive 86/94/EEC; 73/405/EEC on testing the biodegradability of anionic surfactants, as amended by 82/243/EEC.	European Communities (Detergents) Regulations 1984-88.	
Hexachlorocyclohexane	84/419/EEC on limit values and quality objectives for discharges of hexachlorocyclohexane.	Local Government (Control of Hexachlorocyclohexane and Mercury Discharges) Regulations, 1986.	Contains limit values and quality objectives, establishes deadlines, measurement methods and control procedures.

Discharge	European Directive	Irish Legislation	Provisions
Mercury	84/156/EEC on limit values and quality objectives for mercury discharges by sectors other than the chloralkali electrolysis industry.	Local Government (Control of Hexachlorocyclohexane and Mercury Discharges) Regulations, 1986.	Same as above.
Nitrates (including slurries, fertilisers, farmyard manures, silage effluent, mushroom compost, dungstead and fertilisers containing nitrogen)	91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.	Code of Good Agricultural Practice to Protect Waters from Pollution from Nitrates; Water Pollution Act, Fisheries Act.	Requires the preparation of Codes of Good Agricultural Practice; provides limits on the application of chemical fertilisers, training and information to farmers. Waters must be monitored to determine nitrates concentrations.
Trade and Sewage effluents	91/271/EEC on urban waste water treatment.	The Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 1994. Urban Waste Water Treatment regulations 2001. These 2001 regulations revoke and re-enact the 1994 regulations and give effect to provisions of Directive 91/271/EEC and Directive 2000/60/EC -the Water Framework Directive.	Establishes standards for the treatment of municipal waste water and the disposal of sludge. Standards vary in relation to the size of the discharge and nature of receiving water. Phosphate reduction facilities must be provided in sensitive areas and in towns with a population of greater than 10,000 or where discharges contribute to the eutrophication of the area. The disposal of waste water from treatment plants must be authorised and regulated. The 2001 regulations define further 'Sensitive Areas'
		The Public Health (Ireland) Act 1878.	Sanitary authorities must provide working sewers in their functional areas and ensure sewage is purified and does not constitute a nuisance or health concern on discharge.
		The Environmental Protection Agency Act, 1992.	The EPA possesses enforcement authority over sanitary authorities discharging effluents to water if the effluent arises from the operation of a scheduled activity.

Discharge	European Directive	Irish Legislation	Provisions
		Water Pollution Act.	All point source discharges of any trade or sewage effluent must be licensed except for (1) domestic sewage not exceeding five cubic metres in any 24 hour period which is discharged from a septic tank or any other disposal unit by means of, e.g., a percolation area; (2) trade effluent discharged by a sanitary authority, other than from a sewer; and (3) discharges which are subject to licensing requirements of section 82 of the Environmental Protection Agency Act, 1992.
		Local Government (Planning and Development) Acts 1963-93; IIRS Recommendations for Septic Tank Drainage Systems Suitable for Single Homes (S.R.o.1991).	Planning authorities regulate domestic sewage from single houses which may be exempt from the provisions of the Local Government (Water Pollution) Act 1977 by means of this legislation. Conditions to planning permission may be attached for proper septic tank drainage for a development.
	85/337/EEC on Environmental Impact Assessment (EIA)	Local Government (Planning and Development ) Regulations 1990 (S.I. No. 25 of 1990	Planning Authorities regulate certain Industrial, Commercial, and Agricultural developments which are scheduled under these regulations in order to control their impact on the environment.
		Environmental Protection Agency Act, 1992; the Environmental Protection Agency (Licensing) Regulations 1994.	All effluent generated as a result of activities listed in the First Schedule to the Act or as extended by the Minister in accordance with section 82(2) of the Act.

Discharge	European Directive	Irish Legislation	Provisions
Sewage sludge	86/278/EEC on the use of sewage sludge in agriculture.	Waste Management Act 1996 ( use of sewage sludge in Agriculture Regulations 1998) Formerly European Communities (Use of Sewage Sludge in Agriculture) Regulations 1991.	Regulates the use of sewage sludge in agriculture to prevent harm to soil, vegetation, animals and humans. Sets limits for concentrations of heavy metals in sludge and maximum annual quantities of such metals, which may be introduced into the soil. Local authorities must be notified by sludge suppliers of its use, including the quantities and composition, and are responsible for supervising its use in the respective functional areas.
Phosphorous	Dangerous Substances directive 74/464/EEC	Water Pollution Act 1977 Water Quality Standards for Phosphorous Regulations 1998 Nutrient Management Planning Consultation Regulations 1998	Sets out clearly formulated targets for reduction in Phosphorous levels in rivers and lakes. Sets of time frames to achieve targets. Includes also standards for the Biological standards for rivers and lakes as defined by the EPA Biological Classification system

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### **A2.2.1 Pollution Controls**

The basis for the control of water pollution and the enforcement and monitoring of water quality is contained in several Acts:

- (1) The Local Government (Water Pollution) Acts 1977-1990 (“Water Pollution Acts”);
- (2) The Fisheries (Consolidation) Acts 1959-1997 (“Fisheries Act”);
- (3) The Environmental Protection Agency Act, 1992;
- (4) The Waste Management Act, 1996;
- (5) The Local Government (Planning and Development) Acts 1963-1993; and
- (6) Others including Public Health (Ireland) Act 1878, the Litter Act (1997) and the Arterial Drainage (Amendment) Act 1995.

The main provisions of these instruments are described in Table A2.3.

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**Table A2.3 Provisions Stipulated by Irish Legislation.**

Legislation	Subject Pollutant	Applicable Waters	Penalty	Other Provisions
Water Pollution Acts	Polluting matter Being any poisonous and noxious matter and any substance (including any explosive, liquid or gas) the entry or discharge of which into any waters is liable to render those or any other waters poisonous or injurious to fish, spawning grounds or the food of any fish, to injure fish in their value as human food, or to impair the usefulness of the bed and soil of any waters as spawning grounds or their capacity to produce the food of fish, or to render such waters harmful or detrimental to public health or to domestic, commercial, industrial, agricultural or recreational uses.	Any (or any part of any) river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial; any tidal waters, and any breach, river bank, and salt marsh or other area which is contiguous to the above which is for the time being dry, but does not include a sewer.	Maximum penalty: conviction on indictment - £25,000 and/or 5 years imprisonment.	Licensing scheme for discharges to water and sewers from point sources.  Water Quality Management Plans to be produced.  Monitoring of waters and licensees required.  Bye laws may be issued by local authorities to prohibit or regulate activity.  Phosphate Limits in Rivers and Lakes.  Production of Nutrient Management Plans can be required from Farming Community
Fisheries Acts	Deleterious matter Being any substance (including any explosive, liquid or gas) the entry or discharge of which into any waters is liable to render those or any other waters poisonous or injurious to fish, spawning grounds or the food of any fish or to injure in their value as human food, or to impair the usefulness of the bed and soil of any waters as spawning grounds or their capacity to produce the food of fish.	Any river, lake, watercourse, estuary or any part of the sea.	Maximum penalty for summary conviction- £1,000 and/or 6 months, Imprisonment on conviction on indictment- £25,000 and or 6 years.	Licensing and certification scheme provided
•				

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Legislation	Subject Pollutant	Applicable Waters	Penalty	Other Provisions
Waste Management Act	Environmental Pollution caused by waste, including the holding, transport, recovery or disposal of waste in a manner which would endanger human health or harm the environment including among other things, create a risk to waters. Waste is defined as any object belonging to a category of waste specified in the first schedule to the Act which the holder discards or intends or is required to discard, and anything which is discarded or otherwise dealt with as if it were waste. Includes hazardous waste as defined in the Act but not sewage and sewage effluent.	The same waters as defined in the Water Pollution Acts.	£1,500 and/or imprisonment for 12 months for summary offence. 10,000,000 and/or imprisonment for conviction on indictment and costs of prosecution and investigation. Cost of measures to prevent or limit pollution.	Permit system for waste collectors. Licensing scheme for holding, recovery, and disposal of waste.  Monitoring of emissions from waste recovery and disposal facilities mandated.  Waste management plans to be compiled.  Measures to minimise prevent and recover waste to be issued by regulation including waste audit.  EPA to compile a national hazardous waste management plan and inventory.
The Planning Act	Seeks to ensure development within a County is maintained in an orderly manner and is in accord with good environmental practice and legislation.	The same waters as defined in the Water Pollution Acts.	On summary conviction £1000 and costs with continuing penalties thereafter for so long as the offence continues	Formulation of County/Urban Development Plan Production of environmental impact statements
The Litter Act	Litter	Public places or places visible from a public place.	On summary conviction-£800	Measures to prevent and dispose of litter.  Promotion of Litter Warden
The Waterworks Clauses Act 1847	Contamination of drinking water	Any stream or reservoir used as a public water supply.	£1,000	
Public Health (Ireland) Act 1878	Pollution of waterwork, improper sewage disposal	Waters which supply drinking water.		

## **A2.2.2 The Local Government (Water Pollution) Act 1977-90 ("Water Pollution Act")**

This Act is the primary source of pollution control. The Act provides that a person shall not cause or permit any polluting matter to enter waters. The definition of “polluting matter” is very broad, focusing on any impairment of a use of the water, e.g. fishing, bathing, drinking, etc., rather than on particular pollutants. It is a defence to any action initiated under the Act that the defendant took all reasonable care to prevent the prohibited entry.

The Act prohibits the discharge of trade effluent or sewage effluent to any water except under and in accordance with a license. A licensing regime is provided for all discharges to water which is administered by the local authorities, except in circumstances where an activity would be required to obtain a license under Part IV of the Environmental Protection Agency Act 1992. Applications for licenses are reviewed in light of the water quality standards for the receiving waters, the management plan for the area, Ministerial and Government policies, the potential effect of a discharge on downstream users or fisheries, and compliance with conservation Directives and regulations, among other things.

The Act provides authority for monitoring and enforcing water quality standards for waters and the preparation of water quality management plans. The Act provides authority for the issuing of Notices under Section 12 of the Act which proscribe certain pollution prevention and/or amelioration action to be carried out by individuals or other legal entities such as industrial companies within specified time limits.

Water quality management plans for a particular functional area contain objectives for the prevention and abatement of water pollution and other measures which the Local Authority deems necessary, including quality objectives established by the EPA.

In order to fulfil their role in monitoring and enforcing the Act, Local Authorities have the power to require dischargers to submit information, to enter and inspect premises or a vessel and take samples, and to require extensive monitoring and record-keeping of water quality and discharges. The EPA has a supervisory power to ensure proper monitoring by the local and sanitary authorities.

The most recent addition to this Act concerns the control of Phosphorous regulations whose objective is to reduce if possible, and at a minimum contain, the level of this nutrient in rivers and in particular lakes. Details of these regulation are given at the end of this section. In a related piece of legislation regulations have also been put in place relating to Nutrient Management. This provision has been inserted into the Water Pollution Act through a section (Section 66 /3) of the Waste Management Act. Guidelines for Local Authorities have been published on the implementation of the NMP provisions. These regulations proscribe the EPA for consultation purposes.

### **A2.2.3 Fisheries (Consolidation) Act 1959-97**

In addition to the water pollution prohibition contained in the Water Pollution Acts, important measures relating to water quality control are also contained in the Fisheries (Consolidation) Acts 1959-97. This Act provides that it is an offence to deposit "deleterious matter" in "waters". The definition of "deleterious matter" is narrower than the subject of the Water Pollution Acts; it is limited to substances which adversely affect fish life in affected waters. However, unlike the Water Pollution Acts, this Act is a "strict liability" offence. Consequently, a polluter may not rely on the defence that the pollution occurred notwithstanding the fact that he or she exercised reasonable care to prevent the pollution. Also, the provisions of the Act may be applied to local authorities offenders as well as the public.

## **A2.2.4 The Waste Management Act, 1996**

This Act provides a framework for the prevention, management and control of waste. It prohibits the holding, transport, recovery or disposal of waste in a manner that causes or is likely to cause environmental pollution. The term "environmental pollution" encompasses pollution to waters. The definition of "waste" is very broad and specifically includes, most importantly in terms of water quality control, sludge and agricultural waste.

As with air and water pollution legislation, the Act is centred on the production of management plans, and the licensing, monitoring and enforcement of waste licenses for holders, transporters, and disposers of waste. Waste management plans must contain objectives and specify measures which are considered necessary and reasonable to accomplish the following:

- to prevent or minimise production or harmful nature of waste;
- to encourage and support the recovery of waste;
- to ensure that such waste as cannot be prevented or recovered is disposed of without causing environmental pollution; and
- to ensure in the context of waste disposal that regard is had to the need to give effect to the polluter pays principle.

The Act also provides wide ranging authority to the Minister to establish programmes or issue regulations to stimulate the prevention and recycling of waste.

The Act distinguishes between hazardous and non-hazardous waste, the former to be managed by the EPA. Toxic waste inventories will be established and administered by the EPA. The EPA must assemble a national hazardous waste management plan. A list of hazardous substances is provided in the Second Schedule. Included in the Schedule are many of the substances which are the subject of several EU Directives relating to water quality standards, including cadmium, mercury and asbestos. The appropriate authorities must implement any relevant recommendations contained in the national plan.

The Waste Management Act is important in terms of water quality control because it contains a framework for regulating the recovery of non-hazardous agricultural waste, including manure and slurry spreading. The recovery of sewage and water treatment sludge and specified agricultural waste, waste disposal or recovery activities are not required to be licensed, however, they are subject to alternative controls to be issued. The Act does not apply to sewage and sewage effluent or the treatment or disposal of effluent to water.

The Waste Management Act provides for the imposition of substantial penalties for an offence of a fine not to exceed ten million pounds and/or imprisonment not to exceed ten years on conviction of indictment. The size of the penalty will depend on the risk or extent of environmental pollution arising from the act or omission that caused the offence.

In contrast, the Water Pollution Act provides maximum penalties of twenty five thousand pounds and/or up to five years imprisonment on conviction of indictment.

## **A2.2.5 The Environmental Protection Agency Act, 1992**

This Act provides additional measures for the protection of the environment, including water resources, and established the Environmental Protection Agency (EPA) to, among other things, provide a reservoir of expertise in environmental matters and consistency in enforcing national standards. The Agency will be responsible for licensing all activities with a major polluting potential on the basis of integrated pollution control (IPC) as well as providing advisory and support services for local and public authorities, and co-ordinating monitoring and research. In addition, the EPA will monitor certain activities of local authorities, including discharges of sewage and other effluents by sanitary authorities.

Under the Act, the EPA may prepare and publish Environmental Quality Objectives (EQOs) with respect to any medium. The Objectives must be taken into account in formulating policy, establishing standards, or exercising any of their responsibilities.

Finally, the Act provides that any process which is subject to the IPC licensing scheme will no longer require a license issued by a local authority pursuant to the Water Pollution Acts. With respect to an application for an IPC license, the EPA is prohibited from granting a license if, among other things, any emissions from the activity may not comply with, or result in a contravention of, relevant quality standards for water quality and effluents prescribed in the Water Pollution Acts.

Under the EPA the waste water act 2001 was introduced which established the standards for the treatment of municipal waste water and the disposal of sludge. Standards vary in relation to the size of the discharge and nature of receiving water. Phosphate reduction facilities must be provided in sensitive areas and in towns with a population of greater than 10,000 or where discharges contribute to the eutrophication of the area. The disposal of waste water from treatment plants must be authorised and regulated. These 2001 regulations also define further 'Sensitive Areas'.

### **A2.2.6 Local Government (Planning and Development) Act 1963-93**

Provisions contained in this Act are utilised to control the location of potential sources of water pollution, including the discharge of domestic and industrial effluent. Planning authorities may refuse, or permit subject to conditions, the location of developments likely to cause water pollution. Conditions likely to be imposed on all developments by planning authorities are those providing for the treatment and/or disposal of domestic effluent. Recent evidence suggests that in some areas septic tanks may cause localised contamination of groundwater and nearby lakes from faecal bacteria and nitrates.

The relevance of these conditions is particularly important in unserviced areas where discharges of domestic effluent from single homes are generally not required to be licensed. Discharges from septic tanks or other disposal systems of a certain maximum value which are made into an aquifer are exempt from the provisions of the Water Pollution Acts. The standard recommendations for septic tank drainage arrangements were contained in the IIRS Recommendations for Septic Tank Drainage Systems Suitable for Single Homes (S.R. 6:1991) which has now been replaced by the EPA handbook on waste water treatment systems for single houses (October, 2001).

### **A2.2.7 Other Legislation**

Other legislation may be relevant to water quality control, namely, the Public Health (Ireland) Act 1878, the Litter Act 1997, and the Arterial Drainage (Amendment) Act, 1995, which relates to flooding.

## New Drinking Water Directive

A revised EU Drinking Water Directive (98/83/PC) was adopted by the European Environment Council on 3 November, 1998. It entered into force on 25 December 1998. The new Directive must be transposed into law within 2 years of its entry into force (by 24 December, 2000) while the quality standards set out in the Directive must be met within 5 years (by 24 December, 2003). Longer timeframes are allowed, for achievement of the new standards for lead, bromate and THM'S.

Adoption of the new Directive followed a comprehensive review of experience gained in implementing existing Directive 80/778/EEC on the quality of water intended for human consumption. The new Directive provides for a greater focus on human health, a streamlining of parametric standards in the light of scientific and technical developments and a more flexible compliance regime.

The most significant change in terms of cost implications for Member States is the reduction in the parametric value for lead from 50 µg/l in the present Directive to 10 µg/l. This has been reduced in line with WHO recommendations. A 15 year timeframe is provided for, to allow for achievement of this value with an interim value of 25 µg/l to apply after 5 years. Compliance with the interim standard will generally be achieved through the provision of appropriate treatment at water treatment plants while compliance with the 10µg/l standard could involve replacement of lead services as appropriate.

Fuller assessment of the cost implications of meeting the new lead standard must await determination of a recommended sampling method for lead. Proposals in this regard are awaited from the EU Commission.

The following is a summary of the main provisions of the new Directive:

- the number of parametric categories has been reduced from 6 to 3 i.e. **microbiological, chemical and indicator**,
- the number of parameters has been reduced from 67 to 51, 14 of which are new,

- parameters have been included on the basis that (i) they are health- related or a good indicator of likely health implications, (ii) they are of Community-wide importance and (iii) in the case of microbiological and chemical parameters, a maximum value could be defined for them,
- because of the health implications involved, exceedances of the microbiological parameters i.e. escherichia coli and enterococci, are not tolerated under the Directive,
- some flexibility has been introduced in relation to the compliance regime in respect of chemical and indicator parameters. This flexibility is based on the need to (i) investigate any exceedances of parametric values and (ii) take remedial action to restore water quality as quickly as possible. Time-limited derogations are provided for in respect of exceedances of chemical parameters so long as there is no potential danger to human health. In the case of indicator parameters, remedial action is only necessary where there are health implications associated with an exceedance. Where there is a potential danger to public health, the supply must be suspended or its use restricted,
- the Directive provides for clearer identification of the point of compliance for parametric values e.g. at the consumer's tap in the case of water supplied from a distribution system,
- the monitoring regime has been rationalised into two categories, check and audit monitoring, and increased monitoring frequencies provided for,
- a three yearly reporting requirement is provided for (Ireland will continue to publish an annual report).

## Phosphorus Regulations

The new Regulations prescribe water quality standards for phosphorus. For the first time, national standards have been set in respect of the nutrient, phosphorus, which plays a vital role in terms of water quality in Ireland. There are now clearly formulated targets for reducing phosphorus levels in rivers and lakes. While water quality cannot be allowed to deteriorate any further, in general, a 10 year timeframe will apply to the achievement of the new targets.

The Regulations address the problem of eutrophication in rivers and lakes caused by excessive inputs of phosphorus from a range of sources - agriculture, industry, forestry and sewage. They will provide the focus for concerted action by all sectors, under the overall supervision and control of local authorities and the EPA, to redress the deterioration in water quality which has occurred over the last few decades.

Compliance with the water quality standards will require the adoption of comprehensive measures by local authorities addressing all sources of phosphorus inputs to rivers and lakes. The primary means of implementing the standards will be through the catchment based initiatives which have been/are being developed as part of the Department's overall strategy to tackle the increasing levels of eutrophication in rivers and lakes. The making of these Regulations will provide an important impetus to the development of these initiatives.

The EPA's most recent national overview of water quality covering the period 1991-1994 found that the level of slight to moderate pollution had increased from 21.5% (in the period 1987/1990) to 28.2% while serious pollution had reduced from 1.0% to 0.6% of river length monitored. Of 135 lakes monitored over the period 1991-1994, 18% indicated polluted conditions. A further 5% displayed a moderate level of artificial enrichment ( involving no significant adverse effects on beneficial uses). The results of monitoring for the period 1995/1997 which will be published by the EPA later this year will provide the benchmark against which compliance with the new phosphorus standards will be measured.

## Summary of the Main Provisions of the Regulations

- no further deterioration in the quality of rivers and lakes is allowed. Conditions as recorded by the EPA during its monitoring in the period 1995-1997 will be used as a general benchmark..
- as a minimum specified levels of improvement in the condition of rivers and takes found to be polluted during the 1995-1997 period must be achieved within a 10 year timeframe;
- a maximum 6 year extension may apply in certain circumstances i.e. if the local authority or EPA is satisfied that one or more of the following conditions apply:-
  - I. the effects of human activity are such as would make compliance with the standards within the 10 year timeframe impractical or too costly,
  - II. at least BATNEEC (best available technology not entailing excessive cost) is being used to treat any direct discharge or emission or
  - III. appropriate steps are being pursued by the local authority or EPA in respect of other sources of pollution for the purpose of seeking to comply with the quality standards;

local authorities (under the Water Pollution Acts, 1977 and 1990) and the EPA (insofar as activities subject to integrated pollution control licensing under the EPA Act, 1992 are concerned) are required to take all such steps as may be appropriate to secure compliance with the quality standards. These measures will include:-

- I licensing of effluent discharges,
- 2 Control on agriculture and forestry, ( section 12 notices and nutrient management planning),
- 3 continuing high investment in improving sewage treatment facilities.

- local authorities are required to submit an initial report to the EPA by 31 July, 1999 setting out the measures to be taken in the discharge of their statutory pollution control functions and to submit two yearly reports on progress in implementing the Regulations,
- the EPA are required to prepare and publish two-yearly progress reports on overall implementation of the Regulations, and
- the situation will be reviewed towards the end of the 10 year timeframe and new standards introduced involving further improvements in the condition of rivers and lakes.

Tables A2.4 to A2.6 outline the Trophic classification system for lakes and the Phosphate Quality standards for rivers and lakes respectively.

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**Table A2.4. Trophic classification system for lakes.**

Lake Trophic Category	Annual Maximum Chlorophyll mg/m <sup>3</sup>	Probability of Pollution
Ultra-Oligotrophic	<2.5	None
Oligotrophic	≥2.5<8	None
Mesotrophic	≥8<25	Low
Eutrophic*	≥25<75	Moderate-Substantial
Hypertrophic	≥75	High

*\*Sub-categories may be assigned in respect of moderately, strongly and highly eutrophic lakes.*

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Table A2.5. Phosphate Quality standards for rivers.

Existing Biological Quality (Q) Rating/Q Index	Minimum Target Biological Quality (Q) Rating/Q Index	Molybdate-Reactive Phosphate Median Concentration* ( $\mu\text{gP/L}$ )
Unpolluted		
5	5	15
4-5	4-5	20
4	4	30
Slightly Polluted		
3-4	4	30
Moderately Polluted		
3	3-4	50
2-3	3	70
Seriously Polluted		
$\leq 2$	3	70

*\*Median concentration to be determined using as a minimum ten samples taken at intervals of four weeks or longer in any twelve consecutive month period. Where the requisite number of samples has not been taken within such period, the median concentration shall be determined from sampling conducted over such period not exceeding twenty four months, as required to obtain a minimum of fifteen samples taken at intervals of four weeks or longer.*

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Table A2.6. Phosphate Quality standards for Lakes.

Existing Trophic Status	Minimum Target Trophic Status	Total Phosphorus Average Concentration* ( $\mu\text{g P/L}$ )
<u>Satisfactory</u>		
Ultra-Oligotrophic	Ultra-Oligotrophic	$\leq 5$
Oligotrophic	Oligotrophic	$>5 \leq 10$
Mesotrophic	Mesotrophic	$>10 \leq 20$
<u>Unsatisfactory</u>		
Eutrophic	Mesotrophic	$>10 \leq 20$
Hypertrophic	eutrophic	$>20 \leq 50$

\* Average concentration to be determined using as a minimum ten samples taken at intervals of four weeks or longer in any twelve consecutive month period. Where the requisite number of samples has not been taken within such period, the average concentration shall be determined from sampling conducted over such period being a period not exceeding twenty four months, as required to obtain a minimum of fifteen samples taken at intervals of four weeks or longer.

### **A2.3 The Water Framework Directive**

The Water Framework Directive (2000/60/EEC) entered into force on December 22<sup>nd</sup>, 2000. The Directive establishes a strategic framework for managing the water environment and sets out a common approach to protecting and setting environmental objectives for all groundwaters and surface waters within the European Community.

The Directive is probably the most comprehensive piece of EC water legislation to date.

At the heart of the Directive is the requirement to produce a strategic management plan for each river basin setting out how the objectives are to be achieved. The plan must be based on a detailed analysis of the pressures on the water bodies within the river basin, and an assessment of their impact. This allows a comprehensive programme of measures to be drawn up, tailored to the specific circumstances in each river basin district, and in particular to target improvements and monitoring effort on those water bodies most at risk of failing to meet their environmental objectives.

The implementation of the Water Framework Directive (WFD) raises challenges, which are widely shared by all Member States. The timetable for its implementation is outlined in Table A2.7.

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<b>Year</b>	<b>Summary Timetable</b>
2000	<ul style="list-style-type: none"> <li>• Directive enters into force</li> </ul>
2003	<ul style="list-style-type: none"> <li>• Transpose into national law</li> <li>• Identify location and boundaries of River Basin Districts</li> <li>• Identify competent authorities</li> </ul>
2004	<ul style="list-style-type: none"> <li>• Characterise river basins</li> <li>• Identify pressures and impacts</li> <li>• Economic analysis of water use</li> <li>• Define reference conditions for good water status</li> <li>• Identify locations and boundaries of water bodies</li> <li>• Register of Protected Areas</li> </ul>
2006	<ul style="list-style-type: none"> <li>• Water monitoring programmes to be operational</li> <li>• Work programmes for River Basin Management Plans to be made public</li> </ul>
2007	<ul style="list-style-type: none"> <li>• Public consultation on significant water management issues</li> </ul>
2008	<ul style="list-style-type: none"> <li>• Draft River Basin Management Plans made public</li> </ul>
2009	<ul style="list-style-type: none"> <li>• River Basin Management Plans agreed and sent to EU Commission</li> </ul>
2015	<ul style="list-style-type: none"> <li>• Good water status to be achieved for all surface waters, artificial and heavily modified waters, and groundwater</li> </ul>

Table A2.7. Timetable for the implementation of the Water Framework Directive.

### **A2.3.1 River Basin Management**

The best model for a single system of water management is management by river basin - the natural geographical and hydrological unit instead of according to administrative or political boundaries. Initiatives taken forward by the States concerned for the Maas, Schelde or Rhine river basins have served as positive examples of this approach, with their cooperation and joint objective-setting across Member State borders, or in the case of the Rhine even beyond the EU territory. While several Member States already take a river basin approach, this is at present not the case everywhere.

In Ireland, practical implementation of the WFD will take place in the context of River Basin Management Projects. These will be established on the basis of a small number of areas to be known as River Basin Districts. Local authorities will have the primary role in promoting, establishing and implementing these projects which will provide much of the basic data requirements and necessary analysis for the characterisation of river basins, the identification of pressures and impacts, the mapping of locations and boundaries of water bodies, the establishment of integrated water monitoring programmes, the establishment of programmes of measures for the preparation of River Basin Management Plans.

The overall objective of river basin projects is to establish an integrated monitoring and management system for all waters within a RBD, to develop a dynamic programme of management measures and to produce a River Basin Management Plan, which will be continually updated in order to:

- Prevent further deterioration and protect/enhance water quality and quantity of aquatic ecosystems and groundwater and associated terrestrial ecosystems;
- Promote sustainable water use based upon long-term protection of available water resources;
- Provide enhanced protection of the aquatic environment through specific measures aimed at eliminating and/or mitigating the impacts of pollutants; and
- Assist in compliance with EU Directives and national legislation.

Groundwater characterisation and monitoring, for the purposes of the WFD, will be included in these projects.

### **A2.3.2 Public participation**

A key part of the timetable for implementation of the WFD is public consultation on management issues. This is necessary in that the decisions on the most appropriate measures to achieve the objectives in the river basin management plan will involve balancing the interests of various groups. It is essential that the process is open to the scrutiny of those who will be affected.

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## **A3 The Administrative Framework**

The remits of the Government Departments most significant to water quality are presented in the following sections.

### **A3.1 Department of Environment and Local Government**

The leading policy role in Ireland in relation to the environment is exercised by the Minister for the Environment and Local Government who was assigned general responsibility in 1978 to promote the protection and improvement of the physical environment and provide support and advisory services for the Government and Local Authorities. Donegal County Council is the principal implementing agency in the Donegal Bay catchment for the purposes of environmental policy and regulations. It operates under the co-ordination and supervision of the Department of Environment and Local Government.

Two other centralised agencies also operate under the auspices of the Department of the Environment and Local Government, The Planning Appeals Board and the Environmental Protection Agency.

The Planning Appeals Board is an independent tribunal which adjudicates appeals on planning permissions and on air and water pollution licences.

The Environmental Protection Agency has taken over responsibility from local authorities for licensing all activities with a major polluting potential on the basis of integrated pollution control (IPC). The Agency in addition, provides advisory and support services for local and other public authorities, and co-ordinates environmental monitoring and research.

The Government's Environment Action Programme, published in 1990, explicitly commits Irish environmental policy, for the present decade, to the following principles:

- the principle of sustainable development
- the precautionary principle,
- the integration of environmental considerations in all policy areas.

Sustainable development, the precautionary principle and the polluter pays principle are each formally incorporated in the legislative statement of functions for the Environmental Protection Agency.

### **A3.2 Department of Marine and Natural Resources**

The Minister for the Marine and Natural Resources has important functions in relation to conservation and protection of the marine environment, and is the licensing authority for foreshore activities, marine dumping and aquaculture developments within Donegal Bay. The Regional Fisheries Board administers the Fisheries Acts on behalf of the Department of Marine and Natural Resources. The Central Fisheries Board advise the Regional Fisheries Board.

### **A3.3 Department of Finance**

The Department of Arts, Heritage, Gaeltacht and the Islands, formerly the Office of Public Works, which operates under the aegis of the Minister for Finance is directly responsible for wildlife, habitat and national monument protection, for the management of national parks and waterways and for catchment drainage schemes.

Responsibility for nuclear safety is assigned to the Minister of Public Enterprise, while the Minister for Enterprise, Trade and Employment is responsible for industrial safety.

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# **Donegal Bay Water Quality Management Plan**

## **SECTION B**

### **GENERAL INFORMATION**

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## **B1 The Catchment**

### **B1.1 Physical Features**

The District Electoral Divisions (DED's) which comprise the Donegal Bay catchment area are shown in Map 1. The combined catchment of the Donegal Bay Area and its tributaries is 971.6 km<sup>2</sup>. The population density, including the urban area is low at approximately 46 persons/km<sup>2</sup>. The present population of the Donegal Bay catchment is 28,500. Donegal Town is the largest town with around 3,500 persons. The other main urban area in the catchment include Killybegs, Ballyshannon, and Bundoran. The roads network serving the catchment are shown in Map 2.

The physical environment is this region's greatest asset, boasting a variety of scenery, including mountains, hills, an extensive network of salmonid lakes and rivers, a comprehensive coastline sprinkled with a range of high quality sandy beaches, coves, cliffs, woodland, boglands and pasture.

The major rivers in the Donegal Bay Catchment are shown in Map 3. The Glen River river system flows in a southerly direction from its source at Slievetooy Mountain to its mouth Carrick Village. The Glen river system includes a large number of small tributaries which include the Crow River, and the Owenteskiny River.

The Bungosteen River rises in the Crockanpeast Mountains, northwest of Killybegs and flows into Donegal Bay at the most northerly point of Killybegs Harbour. The catchment of the Bungosteen River is greatly extended by a number of tributaries. The largest of which are the Stragar, Loughaderry, Roechrow, and Meengilcarray Rivers. Loughaderry Reservoir, which provides the water supply for Killybegs Town, is the only major lake on this river system.

The Corker river is supplied by two smaller tributaries which rise in the Cuskeraghan Bog and Tamur Lough, to the north of the catchment. It then feeds into the Oily river, along with The Tullintreane tributary, and exits into Donegal Bay at Bruckless Village.

The Eany Water is the largest sub-catchment in the Donegal Bay catchment area. It comprises of the Eany Beg River which rises in Bunnasruell Mountain, and the Eany More River which is supplied by the Sruell and Eglis River. All the tributaries rise in the Blue Stack Mountains to the north of the Donegal Bay Catchment Area.

The Eske River flows from Lough Eske to Donegal Town. Lough Eske is in turn fed by a number of tributaries, which include the Clogher, Lewerymore, Clady, and Corabber Rivers. The southern area of the catchment is Drained by the Drowes River, which flows from Lough Melvin, and the Bradoge River which exits into Donegal Bay at Bundoran Town.

The topography, aspect and slope of the catchment are presented in Maps 4-6.

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## **B2 Solid Geology**

### **B2.1 Introduction and sources of information**

The geology of County Donegal was first mapped and described in detail by the Geological Survey of Ireland in the latter part of the 19<sup>th</sup> Century as presented in Map 7. The Geological Survey of Ireland has recently published an updated version of the geology of Donegal where the Donegal Bay Catchment lies within Sheet number 3 of the new 1:100000 scale GSI geology maps.

In the last two decades Donegal has also attracted commercial interest in metal-mining possibilities. The implications are discussed in the following sections.

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### **B3 Geology of the Donegal Bay Catchment**

The varied landscape of Donegal has been sculpted from a complex bedrock geology, most recently the glaciers of the last Ice Age. Comparing the distribution of rock types with the contours reveals a general geological basis for the main landscape features of the catchment. Contrast the mountainous northern coast of the Slieve League peninsula, formed of quartzite, with the lowlands underlain by granite just across Loughros Bay. Quartzite is a hard rock, made largely from the mineral quartz and resistant to erosion, and so tends to form high ground. Other quartzite peaks include the dramatic sea cliffs of Slieve League and, inland, Aghla Mountain and Gaugin Mountain. The granites of Donegal are made chiefly of three minerals, quartz, feldspar and mica. They show contrasting landscape forms. Granite underlies the low ground in coastal areas north of Ardara and around Dunglow, yet the granites of the Bluestack Mountains and Slieve Snacht of the Derryveagh mountains form the highest peaks of the south Donegal area. The reasons for this difference are not clear, but may include the upland granites having a higher content of resistant quartz grains, strengthening ribs of other rock types or a more recent exposure to erosion.

Major fractures running through the rocks have been exploited by erosion, mainly by ice, to produce long straight valleys. Most dramatically, the deep valley of Glenveagh that separates the granite uplands of the Derryveagh and Glendowan mountains continues to the southwest as the Barra, Owenwee and the Gweebarra River valleys, all in a straight line along the trace of the Gweebarra Fault. Barnesmore Gap is another dramatic valley formed where a fault line cuts through upland granite.

The landscape around Donegal Bay is gentler than that to the north for two main reasons: the bedrock consists of relatively soft shales, sandstones and limestones; and, the area was one of Ice Age glacial deposition, so that drumlins and tills blanket the area.

Fundamental controls on the Donegal landscapes were the interactions of rock structure and glaciation. The rock structure was assembled over a long geological history. Minor present day modifications include coastal erosion and shifting sands, and the actions of humans.

The geology of southern Donegal is varied and complex, with a history spanning almost 2000 million years. Five main subdivisions can be made of the bedrock preserved, at the Donegal land surface.

- **Dalradian Rocks**

The Dalradian Supergroup is a distinctive and varied sequence of metasediments with some basic igneous volcanic and intrusions. The most common rocks are quartzite, schist and marble (i.e. the metamorphic equivalents of sandstone, mudstone/shale and limestone respectively). The metasedimentary rocks are intruded by a number of sills of dolerite, each generally consisting of a bedding-parallel layer a few meters thick and later metamorphosed to metadolerite, a hard green-black rock which is commonly exploited by small roadstone quarries. These metasedimentary rocks are deposited in intertidal to marine environments, but includes metamorphosed volcanic and intrusive rocks and glacio-marine deposits. The full sequence of Dalradian sediments was deposited during the period from about 810 to about 525 million years ago.

- **Silurian and Devonian Rocks**

Several granite plutons collectively known as the Donegal Batholith, were intruded during the late Silurian and early Devonian times, approximately between 420 and 390 million years ago. Thorr granite is one of the oldest granites in Donegal, and is found in the Donegal Bay Catchment along with Barnesmore Granite.

- **Carboniferous Sedimentary Rocks**

During the Carboniferous Period, a sea spread northwards over Ireland. Sedimentary rocks around Donegal Bay record environments across a shoreline, with Dalradian rocks to the north forming land and supplying sediment. Coarse grained onshore and nearshore deposits pass southwards into limestone and shale deposited in offshore settings. The lowest beds, of sandstone and impure limestone, mark the onset of marine conditions. Overlying purer limestone was deposited in a warm, shallow sea, with sandstone and conglomerate deposited at the same time in the north, where rivers reached the sea. These rivers then became more active, probably as a consequence of uplift to the north, and built deltas of mud and sand out into the sea. The youngest Carboniferous rocks in the Donegal Bay area are the limestone areas, which were deposited after the deltas retreated northwards.

- **Quaternary Geology**

The Quaternary Period covers the last 1.6 million years and includes the Pleistocene and Holocene Epochs. During the Pleistocene, which lasted from 1.6 million years to 10,000 years ago, alternating glacial (cold) and interglacial (warm) periods led to the growth and decay of ice sheets which covered the country on a number of occasions. The Holocene, which is the current interglacial period, dates from 10,000 years ago to the present day.

### Recent Geological Processes

During the last glacial period, South Donegal was glaciated by ice that originated as a sheet that thickened and spread from the Derryveagh and Bluestack mountains, but was also influenced by ice flowing from an ice-divide stretching from Carrick-on-Shannon to Lough Neagh. Ice flowing out from these centres met in the Donegal Bay area and deflected the flow towards the southeast and east. Bedrock topography channelled the flow of ice around the highest mountains to form well developed glaciated valleys in the area, a spectacular example of which is Barnesmore Gap, with its 300m high walls. The low ground of the Donegal Town area is a drumlin field in which the prominent northeast-southwest orientation of the drumlins indicates ice flow to the southwest as the ice from the opposing ice caps was deflected through Donegal Bay. The modern coastline began to develop when the postglacial sea-level stabilised more than 5000 years ago. The modern beaches and spits (Rossnowlagh for example) were formed when blown sand collected in the form of sand dunes. Erosion of other parts of the coastline has produced cliffs, most dramatically around the Slieve League peninsula.

## **B4 Hydrology**

### **B4.1 Introduction**

This section considers the main features of the natural water resources within the Donegal Bay catchment. The total available water resource is dependent on rain falling on the catchment, of which a proportion is lost as evaporation and transpiration. The remainder, termed the effective rainfall, is available as either surface run-off or groundwater recharge.

The allocation of effective rainfall between surface run-off and groundwater is largely dependent on the nature of the surface geology.

### **B4.2 Data Collection**

#### River Flows

The river flows within the Donegal Bay catchment are presently monitored at a much reduced rate than in previous years. The majority of the recording sites are currently inactive. Those rivers with recording stations still active include the rivers Eske, Erne, Corabber, and the Glenaddragh. Loughaderry and Cull Lough are the only lakes currently monitored. A summary of the hydrometric stations is presented in Table B4.1. The locations of these stations is presented in Map 8.

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Station Number	Location	Waterbody	Operator	Irish Grid Reference	Easting	Northing	0= active, 1=inactive	Type: AR= recorder, SG= staff gauge	Area (km <sup>2</sup> )	Start of records	Water Resource Region
37001	BALLYMACAHILL	EANYWATER	OPW	G841814	184100	381400	0	SG		MAY 1974	NORTH-WESTERN
37002	DONEGAL RLY. BR.	ESKE	OPW	G938791	193800	379100	0	SG		MAY 1974	NORTH-WESTERN
37003	ESKE D/S	ESKE	DON	G964813	196400	381300	1	AR	78.6	SEP 1951	NORTH-WESTERN
37004	ESKE U/S	CORABBER	ESB	G977877	197700	387700	1	AR	8	SEP 1951	NORTH-WESTERN
37005	SHINNAN HILL	RATH	DON	G979706	197900	370600	0	SG			NORTH-WESTERN
37006	AGHAYEEVOGE	STRAGAR	DON	G728787	172800	378700	0	SG			NORTH-WESTERN
37007	MILLTOWN	OILY	DON	G746774	174600	377400	0	SG			NORTH-WESTERN

Table B4.1. Summary of the Donegal Bay hydrometric stations.

Station Number	Location	Waterbody	Operator	Irish Grid Reference	Easting	Northing	0= active, 1=inactive	Type: AR= recorder, SG= staff gauge	Area (km <sup>2</sup> )	Start of records	Water Resource Region
37008	D/S LAGHY	LAGHY	DON	G942748	194200	374800	0	SG			NORTH-WESTERN
37009	BRIDGETOWN	BALLINTARA	DON	G927717	192700	371700	0	SG			NORTH-WESTERN
37010	DUNRAGH	DUNRAGH	DON	G715764	171500	376400	0	MS			NORTH-WESTERN
37011	CASHLING'S BRIDGE	BALLAGHDOO	DON	G616776	161600	377600	0	SG			NORTH-WESTERN
37012	U/S CARRICK	GLEN	DON	G604832	160400	383200	0	SG			NORTH-WESTERN
37013	BUNLACKY BR	BUNLACKY	DON	G779763	177900	376300	0	SG			NORTH-WESTERN
37014	U/S DOONAN FALLS	CORABBER	ESB	-----	-----	-	1	MS			NORTH-WESTERN
37020	VALLEY BR	GLENADDRAGH	DON	G642767	164200	376700	0	AR	13.5	MAY 1978	NORTH-WESTERN
37021	DRUMNAN ANGLE	GLENADDRAGH	DON	G627759	162700	375900	1	SG			NORTH-WESTERN
37060	KILLYBEGS	SEA	OPW	G715764	171500	376400	0	AR	---	MAR 1981	NORTH-WESTERN
37070	ADEERY	L.	DON	G716817	171600	381700	1	AR	8.2	NOV	NORTH-

		ADEERY								1975	WESTERN
37071	L. ESKE	L. ESKE	DON	G968821	196800	382100	0	AR	80	SEP 1977	NORTH- WESTERN
37072	MOUNTCH ARLES	ST. PETER'S L.	DON	G866782	186600	378200	0	SG			NORTH- WESTERN
37073	CUILL	CUILL L.	DON	H013782	201300	378200	1	SG			NORTH- WESTERN
	CATHLEEN FALLS	ERNE	ESB				1				

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## Rainfall

Rainfall data for thirteen sites within the Donegal Bay catchment are available from the Meteorological Office, Dublin. The location of each of the rain gauges is shown in Table B4.2 and depicted in Map 9.

<b>Meteorological Station Name</b>	<b>Latitude</b>	<b>Longitude</b>
Ritchies Bay	543648	82600
Lough Eske (Edergole)	544350	80230
Lough Eske (Drimnacarry)	544105	80305
Ballyshannon (Cathleen's Falls)	543000	81045
Frosses (Meenagran)	544200	81425
Kilcar (Cronasillagh)	543830	83240
Ardnawark Barnesmore	544220	75836
Bruckless	543809	82308
Killybegs Waterworks	543903	82700
Ballyshannon (Cherrymount)	542930	80910
Finner Camp	542931	81423
M. Lough Eske (Brockahy II)	544415	80235
M. Lough Eske (Burns MTN)	544220	80520

Table B4.2. Meteorological stations in the Donegal Bay catchment area.

The rainfall characteristics recorded at three gauging stations within the catchment are presented in Appendix B1 at the end of this section. The figures given are those for the period of river water sampling. These gauging stations were selected as they are representative of the entire catchment in their distribution.

The average daily rainfall within the catchment for the period examined varied from 5.99mm (Lough Eske - Edergole) to 3.3mm (Ballyshannon), to 4.89mm (Kilcar). Such spatial variations are to be expected with the highest rainfall expected in upland regions (2725.9mm at Edergole over sampling period) and the lowest within the south-eastern sector of the catchment (1500.3mm at Ballyshannon over the period from February 2000-April 2001).

## B4.3 Hydrological Characteristics

### River Flows

Hydrological data of only three rivers was available from the catchment, namely the Rivers Glenaddragh, Eske and Erne. The results of the hydrological data are summarised in Tables B4.3 to B4.5.

Table B4.3. Hydrological data from the Glenaddragh River Valley Bridge, EPA site No. 37020.

Date	Staff Gauge Reading (m)	Flow Rate (m <sup>3</sup> /s)
22/03/00	0.323	0.14
11/04/00	0.455	0.52
8/05/00	0.28	0.07
30/05/00	0.31	0.11
20/06/00	0.79	1.9
6/07/00	0.26	0.04
1/08/00	0.395	0.31
14/09/00	0.395	0.31
10/10/00	0.66	1.25
10/01/01	0.378	0.25

Table B4.4. Hydrological data from the River Eske, Lough Eske Bridge, EPA site No. 37071.

Date	Staff Gauge Reading (m)	Flow Rate (m <sup>3</sup> /s)
30/03/00	0.3	1.73
27/04/00	0.49	5.45
18/05/00	0.225	0.87
13/06/00	0.497	5.7
29/06/00	0.252	1.12
19/07/00	0.21	0.74
20/07/00	0.2	0.66
30/08/00	0.294	1.63
27/09/00	0.525	6.4
12/12/00	0.548	7.0
18/01/01	0.275	1.45
14/03/01	0.37	2.8

**Table B4.5. Flow Rates of the River Erne at Cathleens Falls as Regulated by the E.S.B.**

MONTH	Average Monthly River Flow (m <sup>3</sup> /Sec)	
	2000	2001
January	211	145
February	155	104
March	136	38
April	60	121
May	54	33
June	29	20
July	14	17
August	10	52
September	61	N/A
October	162	N/A
November	204	N/A
December	242	N/A

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## **B5 Landuse**

### **B5.1 Introduction**

This section provides an overview of existing and potential catchment land use. The predominant activities are agriculture and forestry, which require careful management to protect the water environment. Further detailed consideration of each use of the catchment and its impact on water quality is presented in Section C.

The existing land use was determined from satellite imagery of the region. Potential land use was assessed from the catchment topography and soil distribution.

### **B5.2 Existing Land Use**

The land cover within the Donegal Bay Catchment was identified using satellite imagery. Landsat Thematic Mapper (TM) imagery was selected, the spectral bands of TM being the most appropriate for vegetation classification. The analysis was based on a cloud free spring TM recorded in May 1989.

The land cover classification adopted was the same as that applied in the recent CORINE project which identified land use throughout the European Union at spatial resolution of around 10 km<sup>2</sup>.

The land cover identified within the catchment is presented in Table B5.1. The land cover is presented in Map 10.

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**Table B5.1 Land Cover in the Donegal Bay Catchment, May 1989.**

<b>Classification</b>	<b>Area %</b>	<b>Area (km<sup>2</sup>)</b>
Bare Rock	0.080	0.865
Beaches	0.406	3.954
Broad Leaved Woodland	0.336	3.269
Coniferous Woodland	4.585	44.557
Discontinuous Urban Fabric	0.296	2.877
Diversity of Agriculture & Natural Vegetation	10.254	99.636
Easturries	0.062	0.615
Inland Marshes	0.363	3.532
Inter-tidal Flats	0.441	4.292
Lake & Water Bodies	1.298	12.618
Mixed Broad Leaved & Coniferous Trees	0.281	2.735
Moors & Heathland	8.568	83.258
Natural Grassland	8.026	77.995
Pastures	28.947	281.275
Peat Bogs	35.149	341.532
Sparsely Vegetated Areas	0.260	2.533
Sport Leisure Facilities	0.184	1.793
Traditional Woodland Scrub	0.439	4.273
Water Courses	.005	0.051
<b>Total</b>	<b>100%</b>	<b>971.66</b>

### **B5.3 Land Use and Soil Distribution**

The primary parameters in the assessment of potential land use is the soil distribution and the ground slope.

The General Soil Map of Ireland 1980 shows nine distinct soils with a predominance of Brown Podzolics and Peaty Podzols both of which are peaty soils with parent material of volcanic origin. The general soils map prepared by Geological Survey of Ireland is presented in Map 11.

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## **B6 Planning Issues**

### **B6.1 Introduction**

Planning decisions can have a very direct effect on the water quality of a catchment. Issues such as the location and size of residential, commercial and industrial development are significant in terms of their implications with respect to water supply sources and possible pollution due to the resulting discharges to water. Landscape categories 1, 2 and 3 are shown for the catchment in Map 12 where category 3 is the most restricted.

This section of the Plan presents an overview of the catchment in terms of population trends and its commercial and industrial base.

### **B6.2 Population Trends**

The present population within the Donegal Bay Catchment, based on recent Census data 1996, is approximately 28,500. The catchment is predominantly rural with around 34% of its population living in Bundoran, Ballyshannon, Donegal, and Killybegs DED's as defined by the Census 1996 (see Map 13). The 2001 census was postponed due to the foot and mouth disease crisis.

The population trends within the catchment between 1991 and 1996 are presented in Table B6.1 which gives a detailed spatial breakdown of the population based on District Electoral Divisions (DEDs, see Map 1) while Table B6.2 describes the population of the towns within the Donegal Bay catchment area.

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**Table B6.1. Populations within Catchment Based on District Electoral Divisions.**

DED'S	POPULATION		CHANGE %
	1991	1996	1991-1996
Altnapaste	37	45	17.777%
Ardara	125	132	5.303%
Ballintra Ballyshannon	782	751	-4.797%
Ballintra Donegal	570	576	0.535%
Ballyshannon Rural	1586	1565	-0.083%
Ballyshannon Urban	4726	4544	-4.005%
Binbane	185	176	-5.113%
Bonnyglen	454	444	-3.980%
Bundoran Rural	4376	4706	6.870%
Carrickboy	754	697	-7.932%
Cavangarden	456	443	-2.238%
Cliff	220	195	-11.111%
Clogher	594	578	-2.768%
Corkermore	267	282	5.338%
Crowkeeragh	196	177	-10.734%
Crownarad	608	538	-13.011%
Donegal	5559	5769	1.603%
Dooish	4	6	33.333%
Dunkineely	1137	1037	-21.189%
Eanymore	469	470	0.212%

DED'S	POPULATION		CHANGE
	1991	1996	%
	1991	1996	1991-1996
Glencolumbkille	1159	1065	-6.910
Glengesh	162	138	-16.666
Goland	5	3	-66.666
Graffy	16	11	-45.454
Grousehall	115	117	-3.409
Haugh	174	167	-4.191
Inishkeel	135	127	-6.451
Inver	1078	1093	0.267
Kilcar	948	935	-2.262
Kilgoly	223	207	-6.535
Killybegs	4614	4261	-7.750
Laghy	876	833	-4.505
Largymore	934	945	1.313
Lough Eske	122	123	0.854
Malinbeg	401	247	-62.348
Mulmosog	114	135	-10.569
Pettigo	710	642	-11.811
Tanatallon	1750	1737	-0.278
Tawnawully	259	264	1.893
Templecarn	163	168	0.714
Tieveskeelta	114	119	4.201
Tullynaught	552	546	-1.782

The population for the remainder of the catchment has either been static or in slow decline. A portion of the rural population living in the southern sector of the catchment commute to work across the county border to Sligo.

TOWN	POPULATION					CHANGE %			
	1971	1981	1986	1991	1996	1971-81	1981-86	1986-91	1991-96
Ballyshannon	2497	3066	3015	2838	2775	22.787%	-1.663%	-5.870%	-2.219%
Donegal	1742	1956	2243	2193	2296	12.284%	14.672%	-2.229%	4.559%
Killybegs	1099	1570	1632	1522	1408	42.857%	3.949%	-6.740%	-7.490%
Bundoran	1337	1610	1535	1463	1704	20.418%	-4.658%	-4.690%	16.4735

**Table B6.2 Population of Towns Within the Donegal Bay Catchment Area.**

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### **B6.3 Commercial and Industrial Development**

Commercial and Industrial Development will be expected to conform to a high standard of design and construction. Where materials are being stored in the open air sufficient screening must be provided. The height of commercial and industrial buildings, particularly in built-up areas, must have regard to the overall building height in the area.

When assessing applications for extractive industries, the Council will be particularly concerned to ensure that restorative work will be carried out either on an ongoing basis as the site is opened up or when operations have ceased. Security may be required from a developer to ensure that this work is carried out.

The Council is particularly concerned with problems arising out of the disposal of industrial waste. Conditions requiring satisfactory disposal of such waste will be incorporated in relevant planning permissions.

The current distribution of commerce and industry within the catchment is given in Map 14.

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## **B6.4 Development Control Policy**

In assessing planning applications for residential, commercial or industrial expansion, the Council is primarily concerned with traffic safety, public health, fire safety and the protection of the environment, particularly in areas of high amenity.

The Council does not lightly refuse planning permission and in carrying out its day to day planning control function, the Council's working in the broad context of "providing, in the interest of the common good, for the proper planning and development of cities, towns and other areas, whether urban or rural", (quotation from the preamble to the 1963 Planning Act).

As with many towns in Ireland of comparable size, the towns within the catchment are made up of a mix of land uses existing side by side. In the main, the land use zoning objectives are designed to permit this mix of land uses to continue and most of the land has been designated for general development.

### **Residential**

Most new building development in rural Donegal is house building. Donegal is a rural county, with only around 35% of the population living in towns and villages. The population growth since 1991 has therefore been reflected in widespread house building, throughout the catchment.

Donegal does not have the population density or growth pressures which warrants stringent control of the location and scale of development, such as exists in Britain and many European Countries. There is a tradition of rural living which has survived in the area for far longer than most European Countries.

The Council accepts that this pattern of housing development will continue, but is concerned that the scale of and form of development should respect the rural environment. Informal clustered developments, based on the long established clachan form, will be given favourable consideration. Applications for development within convenient walking distance of primary schools will also be given favourable consideration.

# DONEGAL BAY MANAGEMENT PLAN

## SECTION C

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## USES

## **C. USES**

### **C.1 Water Supply**

This use relates to the provision of water supplies from both surface and groundwaters. Donegal County Council have responsibility for the public water supply system. Group water supply schemes are significant sources for more remote regions and some industrial and commercial concerns have established private water supplies.

Donegal County Council has no control over the protection of groundwaters from any threatening developments. Exclusion zones are currently required for specific threats to the groundwater resource and will be included in the next County Development Plan.

There are four types of sources for water supply in the Donegal Bay catchment: groundwater including springs and boreholes; impoundments; rivers and loughs. The predominant sources in the catchment are lough abstractions.

The water supply catchments and locations of boreholes, abstractions, loughs and impoundments within the Donegal Bay catchment are presented in Maps 15 and 16.

#### **C.1.1 Public Water Supply**

The public water supply sources in the catchment, the volume of water supplied and the area supplied are presented in Table C.1.1. Loughs are the most common sources of public supply in the Donegal Bay catchment. Seven loughs throughout the catchment are used as sources of water supply. These are Lough Unshin, Lough Melvin, Glen Lough, Lough Gorman, Lough Glencoagh, St. Peters Lough and Croagh Lough.

The major river abstractions are from the Eske, Tullinteane and Glen rivers and also the Sliabh League stream.

The main impounding reservoir in the catchment is Loughaderry.

<b>Scheme</b>	<b>Source</b>	<b>Yield m<sup>3</sup>/Hour</b>	<b>Treatment</b>
Ballyshannon/Ros snowlagh	Lough Unshin	60	chlorination/D.A.F./sl ow sand filtration
Ballintra	Glen Lough	20	Slow sand filtration/chlorination
Ballymagroarty	Lough Gorman*	20	Chlorination
Donegal Town	River Eske	150	Settlement rapid gravity filtration/chlorination/ flouridation
Cullionbuoy	Cullionbuoy Lough	22	Pressure filtration/chlorination
Mountcharles	St. Peters Lough	22 & 8	Two schemes; The 8 m <sup>3</sup> /Hr supply receives Slow sand filtration, the 22 m <sup>3</sup> /Hr receives Pressure filtration
Frosses/Inver	Lough Glencoagh	45	Settlement rapid gravity filtration/chlorination/ flouridation
Dunkineely	Croagh Lough*	15	Pressure filtration/chlorination
Tullinteane	Croagh Lough*	8	Slow sand filtration. No current treatment following boil notice
Killybegs	Loughaderry Lough Aroshin	225 70	2 x settlement rapid gravity filtration/chlorination
Largymore	Spring source*	15	Slow sand filtration. No current treatment following boil notice
Kilcar	Glen River	20	Slow sand filtration/chlorination
Carrick	Sliabh League Stream	20	Slow sand filtration/chlorination

**Table C.1.1. Public water schemes within the Donegal Bay Catchment (\* indicates a group scheme).**

There have been three health concern incidents regarding the water supply within the catchment in the recent past. These are

1. Ballyshannon. The outdated treatment works in Ballyshannon has become problematic regarding residual chemicals from the treatment process, namely aluminium. An alternative water supply scheme for Ballyshannon and environs, possibly on a regional scale, is being advanced at present, with Lough Melvin currently being favoured as the source.
2. Ballymagroarty Group Scheme. This group scheme had sporadic consumer complaints over the taste of the water. This taste anomaly is an algal problem which will be addressed by either the introduction of activating carbon at the treatment works or by total replacement of this scheme by the imminent extension of the Ballyshannon system.
3. Largymore Group Scheme. Bacteriological failures have resulted in a standing boiling notice being served on this group scheme. The members of this scheme will either introduce ultra violet or chlorine treatment of the water or replace it by availing of the nearby Killybegs network.

The significant increases in the population and industrial development within the catchment has created a need for water supply development works to be conducted. Four such developments are proposed:

1. Ballyshannon/Rossnowlagh. An alternative water supply scheme, possibly on a regional scale, is being advanced at present which will replace the existing supply from Lough Unshin.
2. River Eske. Extend this network Westwards towards Mountcharles and increase treatment capability at the River Eske head works.
3. Frosses/Inver. The Lough Glencoagh group scheme is to be developed and the Frosses/Inver treatment works is likely to be expanded so as to supply Mountcharles.
4. Dunkineely. Historically this area has been served by Croagh Lough and the Tullinteane group scheme. Under Phase II for Killybegs it is proposed to replace this arrangement by extension of the Killybegs network which would also include Frosses. . The demand of such development would be eased by a positive outcome of current studies on using sea water for the heavily water dependent fish processing industries in the town.

### **C.1.2. Group Schemes**

These schemes are where two or more households or farms get together to provide themselves with a water supply when no such supply (or a seriously deficient supply) exists. When the group has found a possible source it is subject to quantity and quality tests to ensure it will supply a satisfactory supply of potable water. The design, construction and maintenance is the responsibility of the group and subjected to continual assessment from the Department of the Environment an local Government. The Group Water Schemes within the Donegal Bay catchment are included in Table C.1.1.

Grant aid for the development of group schemes is currently available under two schemes:

1. For upgrading/maintaining existing schemes at up to 85% assistance.
2. For the treatment only of the water at source at 100% assistance.

Donegal County Council is also examining the feasibility of incorporating the group schemes with their agreement, into the mains systems networks. However, it may be proved more economically feasible for these schemes to remain independent and having their facilities upgraded by availing of the currently available grant assistance. Any such development remains the majority decision of the scheme participants.

Major studies on the quality of group scheme waters are underway both for schemes with separate sources and those connected to Council mains.

### **C1.3 Water Supply Schemes for Industry, Agriculture and Tourism**

Water supply for industry and agriculture includes, process water and stock watering.

There are a number of industrial borewells located throughout the catchment supplying farms industry and tourism. The most significant of these boreholes are given in Table C.1.2 below.

<b>Location</b>	<b>Industry</b>	<b>Yield (m<sup>3</sup>/Hour)</b>
Kilcar	Wool/tweed factory	Minor
Kilcar	Luach Bressie Teo, fish factory	Minor
Killybegs	Glenstone quarry	2-3
Murvagh	Murvagh Golf Club	Minor
Laghey	Roadstone quarry	2-3

**Table C.1.2. The most significant boreholes within the Donegal Bay catchment.**

There is very little abstraction from rivers for agricultural use. Irrigation occasionally takes place in the catchment especially in dry summers, most notably at the Murvagh Golf Club. Other agricultural uses, such as water supply to dairy sheds, are generally supplied from the mains. Stock are sometimes watered by allowing direct access to the river. In these cases, a ramp is built down to the river and an area on the river is fenced off to stop stock wandering. This system can only be used in the tributaries because in the lower reaches storm flows would obliterate the watering structure.

## C2 Freshwater Fisheries

- As part of a water quality management strategy for the Donegal Bay area Donegal County Council commissioned the Central Fisheries Board to review the freshwater fisheries resource comprising seventeen catchments nominated by the Council (Map 16A).
- The catchments are of varying size. The majority is salmonid catchments and all have brown trout (*Salmo trutta* L.) populations. Salmon (*Salmo salar* L.) are recorded in all of the medium and large catchments (Table C2.1). Sea trout (*Salmo trutta* L.), the migratory form of trout, probably frequent the lower reaches at least of all of the channels to varying degrees.
- Four of the larger catchments - the Glen, the Eany, the Eske and the Erne estuary - are the principal salmonid angling fisheries with salmon being the main quarry in the each catchment, apart from the Erne estuary, where sea trout are the main angling species. Each of these fisheries has been developed and each has good angling infrastructure.
- Coarse fish and pike are present in four catchments, (Bridgetown, Ballintra, Abbey and Erne) (Table C2.1) and the majority of these have extensive networks of lakes of varying size and angling quality where coarse and/or pike angling can be conducted. However, apart from Assaroe Lake on the Erne the level of utilization of the resource is thought to be small but these fisheries are potentially very valuable as angling fisheries.
- Several “conservation fish” species - sea lamprey (*Petromyzon marinus* L.), juvenile salmon and char (*Salvelinus alpinus* L.) - are recorded in the Donegal Bay catchments (Table C2.1). Additional data are required on lamprey and char to establish their current status.
- Commercial activity, in the form of estuarine and coastal salmon fisheries and finfish aquaculture, is a feature of several bays. Finfish aquaculture is confined to Mc Swynes Bay and Inver Bay. The presence of farmed salmon installations in such bays has been associated with the decline of sea trout stocks, due to the prevalence of sea lice, in proximal fisheries.

- Environmental pressures on these fisheries include water quality, acid sensitivity, afforestation, and overgrazing with associated bank erosion Table C2.2. Urban pressure and to a lesser extent industrial development are also cited as potential threats in some catchments. Abstraction of water for potable/industrial supplies and the advent of small hydroelectric schemes are issues which have to be monitored carefully to minimise impacts on freshwater fisheries.

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Table C2.1. Summary of selected freshwater fisheries resources discharging into Donegal Bay														
System	Type	Catchment size	Angling fisheries						Conservation fish	Commercial activity		Other		Overall Fishery Rating
			Salmonid fisheries		Coarse fisheries		Pike fisheries			Sea angling (estuarine)	Conservation fish * species present	Commercial salmon fisheries	Finfish aquaculture	
			River	Lake	River	Lake	River	Lake						
Glen	River & Lake	large										Good	V. Good	***
Ballaghdoe	River & Lake	medium										Moderate	Poor	**
Glenadragh	River only	medium										Moderate	Poor	**
Fintragh	River only	small										Moderate	Poor	*
Cunlin Lough outflow	River & Lake	small										Poor	Nil	*
Bungosteen	River & Lake	medium										Moderate	Poor	**
Oily	River & Lake	medium										Difficult	V. Poor	**
Bunlacky	River only	small										V. difficult	Nil	*
Eany	River & Lake	large										Good	V. Good	***
Eddrim	River	small										Good	Nil	*
Eske	River & Lake	large										Good	Good	***
Laghy	River & Lake	medium										Good	Poor	**
Bridgetown	River & Lake	large										Good	Poor	**

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Ballintra	River & Lake	large												Good	Poor	**
Durnesh	Lake	small												Moderate	Moderate	**
Abbey	River & Lake	medium												Moderate	Moderate	**
Erne	River & Lake	large												Good	V. Good	**
Bradogue	River	small												Poor	Nil	*
* includes either juvenile salmon, lamprey species or char																

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<b>Table C2.2. Summary of habitat/environmental issues for selected catchments discharging into Donegal Bay</b>											
(majority of data adapted from Maguire, 1997)											
<b>System</b>	<b>Type</b>	<b>Catchment size</b>	<b>Fishery habitat problems</b>	<b>Acid sensitive</b>	<b>Eutrophication</b>	<b>Agricultural Pressure</b>	<b>Urban Pressure</b>	<b>Industrial/Development Pressure</b>	<b>Afforestation</b>	<b>Overgrazing/Erosion</b>	<b>Other</b>
Glen	River & Lake	large									
Ballaghdoe	River & Lake	medium									Water abstraction instream and L. Nambraddan
Glenadragh	River only	medium									Sewage system improved and discharges directly to sea
Fintragh	River only	small									
Cunlin Lough outflow	River & Lake	small									
Bungosteen	River & Lake	medium									
Oily	River & Lake	medium									
Bunlacky	River only	small									
Eany	River & Lake	large									Hydroelectric scheme on Eany Beg upper
Eddrim	River	small									
Eske	River & Lake	large									
Laghy	River & Lake	medium									
Bridgetown	River & Lake	large									
Ballintra	River & Lake	large									

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Durnesh	Lake	small													
Abbey	River & Lake	medium													
Erne	River & Lake	large													
Bradogue	River	small				?	?								

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## C2.1 Introduction

For the purpose of the Donegal Bay management plan a desk study was carried out on each catchment to collate and assess general catchment data relating to their freshwater fisheries. Subsequently, each catchment was investigated on the ground and a series of representative photographs was taken at sites throughout. Where feasible aerial photographs were taken with the assistance of the Irish Air Corps.

Field activity in the form of electrofishing was concentrated on channels where such data were scant. Many channels had little or no electrofishing data and no information was available on fish species present or stock levels. This activity was confined to periods between July to October when juvenile salmonids could be speciated *in situ*. In 2000 sampling was conducted on the Bridgetown and Ballintra Rivers (Roche, 2000) and the remaining catchments were sampled in 2001. This reports details the data collected over this period.

## C2.2 Water Chemistry

Single water samples were taken irregularly in many of the different catchments (Map 16B) during the course of the programme to establish basic water profiles and supplement extensive regular sampling undertaken by Donegal Co. Co. over the period. Previous work included within Donegal Bay included the classification of its acid sensitive rivers (see Appendix C4).

The waters sampled are for the most part soft and coloured. Only the Stragar River (Bungosteen) at the location sampled showed elevated total and molybdate reactive phosphate (MRP) (Table C2.3). MRP results and TON concentrations for the sites sampled in September 2001 suggest that only the Bradogue at the downstream site has slightly raised phosphate. The Bradogue is the most alkaline and therefore probably the most naturally productive of the rivers sampled.

Waters samples were also analysed for trace element content using ICP-MS (Varian Ultramass 700) (Table C2.4). The high iron content reflects a peaty influence in much of the waters in the South Donegal area. Likewise the low calcium levels reflect the poor buffering capacity in most of these systems. Limestone in some catchments contributes the higher calcium

values which signify better buffering capacity and somewhat higher natural productivity. Total aluminium content is elevated in the very poorly buffered waters of the upper Drumenny River. There is potential here for toxic monomeric aluminium to occur should acidification levels increase further. Those waters with the higher calcium content also show high strontium which occurs with the former in limestone deposits. The remaining elements show concentrations within the expected range for natural surface waters.

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Table C2.3. Results of physico-chemical water analyses for selected Donegal Bay freshwater catchments											
Sample Code	Sample Location	Sample Date	Total P mg/L	MRP mg/L	Total N mg/L	TON mg/L	Conductivity mS/cm	Colour Hazen	Turbidity N.T.U.	Total Hardness mg/L CaCO3	Alkalinity meq/L
01/GN/1	Glen Catchment,Owenwee Upper.	26-Oct-01	0.035	0.013	0.228	< 0.049	85.9			13.5	
01/GN/2	Glen Catchment,Owenwee Mid.	25-Oct-01	0.019	< 0.006	0.239	0.069	72.2			11.6	
01/BO/1	Ballaghadoo R.,Upper Reaches	25-Oct-01	0.035	< 0.006	0.274	< 0.049	71.6			16.5	
01/BO/2	Ballaghadoo R.	25-Oct-01	0.031	< 0.006	0.254	0.097	102.2			26.8	
01/GH/1	Glenaddragh R.,Upstream of Kilcar	25-Oct-01	0.028	< 0.006	0.250	0.172	98.7			24	
01/FH/1	Fintragh R.	25-Oct-01	0.022	< 0.006	0.218	0.076	80.7			21.25	
01/CN/1	Cunlin L Outflow	24-Oct-01	< 0.018	< 0.006	0.240	< 0.049	76.8			19.6	
01/BN/1	Stragar Catchment, L. Derry Outflow.	25-Oct-01	< 0.018	< 0.006	0.452	0.363	68.6			16.2	
01/BN/2	Stragar Catchment, Rosacrue R., D/S Br.	24-Oct-01	< 0.018	< 0.006	0.239	< 0.049	59.9			11.7	
01/BN/3	Stragar R., Upper Bridge	24-Oct-01	0.061	0.025	0.563	0.385	92.3			23.2	
01/OY/1	Oily Catchment,Tullinteane R.	23-Oct-01	0.019	< 0.006	0.234	< 0.049	90.1			24.7	
01/OY/2	Oily Catchment,Corker R.	23-Oct-01	0.023	< 0.006	0.302	0.124	77.8			21.5	
01/OY/3	Oily Catchment, Multins Br.	24-Oct-01	< 0.018	< 0.006	0.294	0.072	82.0			23.4	
01/BY/1	Bunlacky R.	23-Oct-01	0.034	< 0.006	0.378	0.155	198.2			84.8	
01/EY/1	Eany Catchment,Eany Beg	24-Oct-01	< 0.018	< 0.006	0.231	0.064	51.3			11.3	
01/EY/2	Eany Catchment,Sruell R.	23-Oct-01	0.024	< 0.006	0.208	< 0.049	49.1			10.3	
01/EY/3	Eany Catchment,Eglish R.	23-Oct-01	< 0.018	< 0.006	0.193	< 0.049	64.1			16.8	
01/ED/1	Eddrim R. U/S Eddrim Br.	12-Sep-01		0.017		0.178	291	112.5	6.0	137	
01/EE/2	Corabber R	20-Sep-01		< 0.006		< 0.049	48.7	45	1.39	10	
01/EE/2a	Corabber R, main channel	20-Sep-01		< 0.006		< 0.049	28.2	35	1.13		
01/EE/3	Lowerymore	20-Sep-01		< 0.006		< 0.049	58.4	35	3.4	12.5	
01/EE/3a	Lowerymore R. (Tawnawully Br)	20-Sep-01		0.006		0.090	96.2	65	2.0	31.7	
01/EE/4a	Clogher R Lower, near Tawnawully Br	20-Sep-01		0.008		0.165	142.7	112.5	3.7	57.6	
01/EE/5	Drumenny R.	13-Sep-01		< 0.006		< 0.049	39.5	162.5	2.2	8.0	
01/EE/7	Drumenny R.	20-Sep-01		0.014		0.191	242	75	2.1		2.16
01/LS/1	Laghy	13-Sep-01		< 0.006		< 0.049	44.4	212.5	2.0		
01/LS/4	Laghy R, @ Picnic area	20-Sep-01		0.011		0.195	252	112.5	5.3	115.6	

01/AY/1a	Abbey R, N15 Br	20-Sep-01		< 0.006		0.363	325	75	2.9	159.4	3.2
01/BR/2	Bradoge	20-Sep-01		0.022		0.262	423	112.5	5.0		4.12
a = no electrofishing conducted at this site											

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Table C2.4. Results of waters trace metal analysis (ICPMS) for selected Donegal Bay freshwater catchments																		
Sample Code	Sample Location	Sample Date	Ca mg/L	K mg/L	Mg mg/L	Na mg/L	Al ug/L	Ba ug/L	Cd ug/L	Co ug/L	Cr ug/L	Cu ug/L	Fe ug/L	Mn ug/L	Ni ug/L	Pb ug/L	Sr ug/L	Zn ug/L
01/GN/1	Glen Catchment, Owenwee Upper.	26-Oct-01	2.82	0.70	2.05	12.66	129.80	13.66	0.02	0.32	2.71	<0.1	1173.92	49.77	<0.1	0.10	16.95	2.50
01/GN/2	Glen Catchment, Owenwee Mid.	25-Oct-01	2.73	0.60	1.69	9.83	91.11	16.45	<0.1	0.35	2.01	0.30	1084.40	23.04	0.41	0.28	14.47	2.33
01/BO/1	Ballaghadoo R., Upper Reaches	25-Oct-01	4.29	0.46	1.80	9.07	122.10	4.41	<0.1	0.66	1.95	1.39	4132.28	121.49	<0.1	0.53	15.44	5.56
01/BO/2	Ballaghadoo R.	25-Oct-01	8.44	0.74	2.38	10.73	72.98	2.58	<0.1	0.24	1.50	1.27	2190.71	45.85	0.12	0.14	24.99	3.85
01/GH/1	Glenadragh R., Upstream of Kilcar	25-Oct-01	7.02	0.74	2.16	10.81	84.22	6.69	0.25	0.30	1.92	1.26	1234.92	133.67	0.54	0.35	26.66	4.11
01/FH/1	Fintragh R.	25-Oct-01	6.13	0.40	1.81	8.39	34.33	19.68	<0.1	0.08	1.81	0.68	1626.87	32.70	<0.1	0.18	29.21	1.85
01/CN/1	Cunlin L Outflow	24-Oct-01	6.12	0.43	1.70	8.82	65.61	10.29	<0.1	0.31	0.64	0.57	1303.80	80.86	0.14	0.14	21.90	2.95
01/BN/1	Stragar Catchment, L. Derry Outflow.	25-Oct-01	4.90	0.86	1.53	7.61	55.66	10.24	0.04	0.43	1.13	0.33	813.67	57.61	<0.1	0.12	16.58	2.73
01/BN/2	Stragar Catchment, Rosacrue R., D/S Br.	24-Oct-01	2.97	0.33	1.34	7.62	90.24	4.38	<0.1	0.45	2.04	0.46	1606.31	126.90	<0.1	0.20	11.53	4.20
01/BN/3	Stragar R., Upper Bridge	24-Oct-01	6.78	1.30	2.18	9.52	91.50	8.39	<0.1	0.85	0.94	1.11	2779.89	309.38	0.26	0.29	21.88	10.10
01/OY/1	Oily Catchment, Tullinteane R.	23-Oct-01	6.81	0.76	2.76	9.69	90.21	19.63	<0.1	0.50	1.07	0.81	2274.22	101.55	2.03	0.29	25.27	3.66
01/OY/2	Oily Catchment, Corker R.	23-Oct-01	6.55	0.63	1.94	8.19	74.93	8.68	0.03	0.26	2.46	0.20	1693.59	26.33	1.27	0.17	29.63	2.55
01/OY/3	Oily Catchment, Multins Br.	24-Oct-01	6.35	0.68	1.98	8.12	71.48	12.01	<0.1	<0.1	0.49	1.44	1574.49	29.43	1.97	0.20	29.48	4.19
01/BY/1	Bunlacky R.	23-Oct-01	30.51	1.36	3.60	10.10	63.99	49.74	<0.1	0.47	0.86	0.28	2703.94	17.14	2.01	0.16	273.73	3.85
01/EY/1	Eany Catchment, Eany Beg	24-Oct-01	2.80	0.50	1.26	5.96	101.83	4.50	<0.1	<0.1	0.61	<0.1	1334.15	29.75	1.46	0.26	11.52	4.96
01/EY/2	Eany Catchment, Sruell R.	23-Oct-01	3.00	0.58	1.19	5.71	53.19	1.71	0.06	0.08	0.83	0.45	1240.44	24.42	0.06	0.32	11.59	3.03
01/EY/3	Eany Catchment, Eglis R.	23-Oct-01	4.75	0.43	1.64	6.30	98.86	7.72	<0.1	0.21	0.38	0.22	995.37	32.15	2.53	0.09	14.19	4.26
01/ED/1	Eddrim R. U/S Eddrim Br.	12-Sep-01	51.10	2.18	5.47	13.07	85.15	46.37	<0.1	0.28	10.50	4.68	1426.82	28.21	5.08	0.24	260.19	7.51
01/EE/2	Corabber R	20-Sep-01	1.69	0.22	1.22	5.58	45.34	19.45	<0.1	0.03	1.48	0.96	523.69	15.08	1.92	0.11	12.36	<0.1
01/EE/2a	Corabber R, main channel	20-Sep-01	0.87	0.16	0.56	3.54	96.49	1.53	<0.1	<0.1	1.86	0.95	138.44	6.11	3.14	0.20	6.01	2.47
01/EE/3	Lowerymore	20-Sep-01	2.37	0.32	1.35	6.40	61.24	2.24	<0.1	0.14	1.56	1.12	284.57	31.25	1.66	0.16	10.89	<0.1
01/EE/3a	Lowerymore R. (Tawnawully Br)	20-Sep-01	9.06	0.92	2.35	6.76	66.51	11.55	<0.1	0.05	3.64	1.10	713.84	29.67	2.91	0.28	29.91	0.88
01/EE/4a	Clogher R Lower, near Tawnawully Br	20-Sep-01	17.29	1.01	3.03	7.35	85.98	21.71	<0.1	0.22	3.88	1.64	1283.03	37.93	5.49	0.31	101.92	7.09

01/EE/5	Drumenny R.	13-Sep-01	1.75	0.30	0.97	4.80	214.74	3.37	<0.1	0.30	1.18	1.57	709.15	70.75	2.22	0.21	7.76	6.33
01/EE/7	Drumenny R.	20-Sep-01	40.88	1.12	3.57	8.59	47.90	21.97	<0.1	0.11	8.06	1.98	876.26	40.89	4.55	0.09	263.25	1.65
01/LS/1	Laghy	13-Sep-01	2.20	0.32	1.22	4.92	104.12	3.44	<0.1	0.17	1.46	1.65	719.57	36.30	3.20	0.22	9.30	11.52
01/LS/4	Laghy R, @ Picnic area	20-Sep-01	41.78	1.46	4.40	10.04	75.06	21.11	<0.1	0.29	8.34	1.46	1008.90	30.34	6.46	0.12	241.13	0.50
01/AY/1a	Abbey R, N15 Br	20-Sep-01	51.67	2.02	10.72	10.82	31.22	17.91	<0.1	0.18	11.45	0.98	778.29	78.56	4.25	0.15	69.69	<0.1
01/BR/2	Bradoge	20-Sep-01	78.64	2.51	6.95	16.04	45.97	61.31	<0.1	0.43	14.53	1.72	976.30	104.05	6.71	0.35	295.44	1.16
a = no electrofishing conducted at this site																		

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## C2.3 Summary Fisheries Report for Individual Catchments

A considerable amount of data exists for several of the more important and valuable fisheries in the study area, mainly from work carried out by the Northern Regional Fisheries Board since its inception in 1980. For the purposes of this report, data were distilled from these sources to be presented as concisely as possible in tabular format. Additional data was gleaned from a number of sources including authoritative angling guidebooks by O' Reilly (1998 a & b), discussions with some Regional Fisheries Board staff and other sources.

Electrofishing was conducted at sites in channels where data was scant or non-existent. Limited electrofishing was necessary where extensive studies had been carried out previously. In as far as was practicable representative sites were chosen following a preliminary inspection of each catchment when section characteristics were noted and sites were photographed. This photographic archive will be extremely useful in the event of significant changes occurring in the catchment.

Summaries for each catchment are presented below. Individual reports are compartmentalized as follows:

Catchment Name

Catchment description/general data:

General data are presented together with relevant historical data.

Representative photographs of sections/sites in the catchment will be available through the GIS.

Spawning/nursery capacity:

Donegal Bay catchments are within the Ballyshannon District of the Northern Regional Fisheries Board operational area. The Northern Regional Fisheries Board conduct salmonid redd counts annually on selected catchments within their operational area between November and January (i.e. the spawning season). Channel sections surveyed within the Donegal Bay area are shown in Map 16C. These sections are based on knowledge of previously established spawning areas and include criteria like channel size, distribution of spawning gravels, access, visibility and fish preference. Other criteria such as resources and the angling value of the fishery are also important. These regular counts over set segments of channels provide a useful barometer of spawning activity but are not a complete appraisal of spawning activity in the Donegal Bay area. Spawning also occurs in other

catchments as was evidenced by the presence of juvenile salmon. A full appraisal of the salmonid spawning/nursery resource is presented in Appendix E.1. Redd counts for spawning season 2001/2002 are presented in Table C2.5.

**Table C2.5. Salmon and sea trout redd count data for rivers in the Donegal Bay area in 2001-2002 spawning season (data source: NRFB staff)**

River	No. of Salmon redds	No. of Trout redds
Glen River	no count in 2001/2002	
Ballaghadoo/ Glenaddragh	no counts undertaken in this catchment	
Fintragh	no counts undertaken in this catchment	
Cunlin Lough outflow	no counts undertaken in this catchment	
Bungosteen	17	39
Oily	54	70
Bunlacky	no counts undertaken in this catchment	
Eany	78	14
Eddrim	no counts undertaken in this catchment	
Eske	104	89
Laghy	28	
Ballintra/Bridgetown	18	
Durnesh	no counts undertaken in this catchment	
Abbey	46	
Erne	not counted by NRFB staff	
Bradogue	no counts undertaken in this catchment	

Coarse fish and pike generally spawn on vegetation in lake margins. Fluctuating water levels which would be an issue in Assaroe Lake is the only likely impediment to coarse fish spawning in any of the waters in the Donegal Bay area.

#### Riverine fisheries:

In Donegal Bay this term refers primarily to salmonid fisheries. Ratings for this resource are presented in Appendix E.1. Available serviced angling water on managed fisheries is shown in Map 16D. Available/accessible angling water is difficult to quantify in the other riverine fisheries. The latter provide angling for local anglers, adventurous or knowledgeable tourist anglers, and the occasional angler.

#### Lake fisheries:

The majority of lakes in the Donegal Bay catchments hold trout populations (Appendix E.2). The lakes in the catchments north of, and including the Laghy and including Durnesh Lake are exclusively salmonid bearing waters. All present different qualities of angling opportunities and angling can be conducted from the shore in smaller lakes while boat angling is preferable in medium sized and larger waters.

Lakes in four catchments (Bridgetown, Ballintra, Abbey and Erne) hold populations of coarse fish. Species recorded in this part of Donegal include perch, and rudd, roach, bream and hybrids of the latter three species. Issues for coarse anglers include species availability and access. Fish size is important to some coarse fish anglers. However, match anglers are generally satisfied with quantity. Size limits do not apply and there is no close season for coarse fish.

Pike are available in these four systems also. This species is increasingly popular with anglers. As with coarse fish the majority of pike are returned alive to the water.

Issues such as species availability and size, shoreline access and angling information have a significant bearing on utilization levels in lakes.

Estuarine angling fisheries:

Sea angling surveys were carried by Dunlop (1987) to determine the quality of shore angling within the NRFB area including Donegal Bay. These data were documented in the form of a guidebook (Dunlop, 1987). Donaher (2001) also documented additional shore angling marks in his wide ranging guidebook (Map 16E). Only angling locations close to the relevant estuary are included. Locations where sea angling bait can be gathered are also shown.

Electrofishing survey data:

Sites were electrofished throughout the Donegal Bay catchments (Map 16F) to determine species present and their densities (Appendices E.3 & E.4). Trout were recorded in all catchments (apart from the Eddrim) and were widely distributed. Juvenile salmon were recorded in all of the medium and larger catchments generally in the lower reaches. Eels (*Anguilla anguilla* L.) were relatively common. Other “large” fish species recorded included occasional flounder (*Platichthys flesus* L.) and one small pike (*Esox lucius* L.).

“Conservation fish” species:

In Irish waters this term has been used to describe a grouping of fish species which includes smelt, pollan, shad, lamprey and char. Lamprey and char occur in some catchments in the Donegal Bay area (Table C2.6). The lamprey grouping is designated under the EU Habitats Directive together with the juvenile stages of the Atlantic salmon, which is widely distributed in the Donegal Bay catchment area.

Char are not designated but their status is described as “vulnerable” in the Irish Red Data Book (Whilde, 1993).

### **C2.3.1. Glen River catchment**

Catchment description/general data:

The Glen is an extensive spate catchment comprising the Owenwee, Owenteskiny, Crow tributaries and the Glen main channel, together with several lakes, and is one of the most important salmon (grilse) fisheries in

Donegal (Map 16G). The Northern Regional Fisheries Board has identified the Glen system as one of its prime salmonid fisheries resources and a considerable amount of fishery development work has been undertaken by the NRFB, in conjunction with the local angling club, in the catchment.

**Spawning/nursery capacity:**

Salmon spawn virtually throughout the catchment. Redd counts are carried out annually on the Glen main channel and the Crow by NRFB staff (Map 16G). Particularly important is the main channel of the Glen both upstream and downstream of Meenaneary. The Owenwee and the Owenteskiny are also recognised as extremely important spawning channels (Appendix C4.1). Nursery quality is good also although some degradation is evident due to localised bank erosion, which is severe in some sections of the tributaries, and to a lesser extent in the main channel. Overgrazing and rapid run-off of flood waters are the most likely causes of this erosion (Boylan & Sheridan, 1994).

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**Table C2.6. Waters in the Donegal Bay area where "conservation fish" species have been observed**

Species	Catchment	Water(s)	Conservation Status	Presence observed by	Comment
<b>Habitats Directive - Annex 11 species</b>					
Sea lamprey ( <i>Petromyzon marinus</i> )	Erne	Erne estuary	unknown	NRFB staff	Infrequently observed in this catchment; pollution & barriers have led to a substantial decline in European populations (Maitland, 1980)
Atlantic salmon ( <i>Salmo salar</i> )*	Glen	all channels		historical data; current survey	
	Ballaghdoonagh	main /Glenaddra channel		current survey	
	Bungosteen	all channels		current survey	
	Oily	all channels		current survey	
	Eany	all channels		historical data; current survey	
	Eske	all channels		historical data; current survey	
	Laghy	all channels		current survey	
	Bridgetown/Ballintra	all channels		current survey	
	Abbey	main channel		current survey	
Erne	all channels		historical data; current survey		

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**Vulnerable species**

Artic char ( <i>Salvelinus alpinus</i> )	Glen	Lough Nalughram an	substantial stock	NRFB staff	Boylan & Sheridan, 1994
	Oily Eske	Naminfin Lough Eske	unknown healthy stock	NRFB staff; local anglers (Tierney, 2000)	anecdotal information Regularly angled in November annually

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\* freshwater populations only

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### Riverine fisheries:

In addition to the excellent river angling facility which extends for much of the main channel, one of the major tributaries, the Owenwee is a productive grilse fishery (Appendix E.1). Infrastructural improvements have increased availability of angling opportunities. Between 1993 and 2001 the mean annual salmon rod catch was 352 fish (range 148 – 510) (Sliabh Liag Anglers Association, 2001). Well regarded for spring salmon catches in the early part of the 20th century this component of the Glen salmon stock has declined substantially and few spring fish are taken now.

Up to the mid-1980's the Glen and the Owenwee were excellent sea trout fisheries with fish in the 1 to 2 kg bracket being taken regularly. These larger fish characterized one of the major differences in the Glen catchment compared to other Donegal Bay sea trout fisheries. Following the decline there has been an improvement in rod catches in recent years. The mean annual sea trout catch between 1993 and 2001 was 96 fish (range 39 to 157). Brown trout tend to be small in the system and are little angled.

### Lake fisheries:

The Glen catchment is dotted with several small to medium sized lakes (Map 16G). The majority is concentrated in the Owenwee catchment. Angling quality is variable ranging from monocultures of small brown trout to mixed salmonid fisheries where occasional grilse and sea trout are taken, depending on water levels (Appendix E.2). These lakes are valuable fisheries in their own right and each has a different appeal to tourist and/or local anglers.

### Estuarine angling fisheries (from Dunlop, 1987):

The Glen discharges into the fjord-like Teelin Bay. From the pier at Teelin Point dab, coalfish, mackerel and flounder can be taken (Map 16E). Specimen conger (i.e. > 18 kg weight) have been caught from this pier at night. Small boats can be launched from Teelin slipway to fish deep water which is located nearby where species available include cod, pollack, mackerel, gurnard, coalfish and flatfish. Haddock and whiting can also be taken in these waters.

#### Electrofishing survey data:

Juvenile salmon, trout and eels were recorded in the Owenwee (Appendix C4.3). Electrofishing results showed that reasonable densities of juvenile salmon were recorded at Site 01/GN/2 in 2001 while only trout were recorded at a site in the upper reaches, Site 01/GN/1 (Appendix C4.4). These results were similar to those recorded for proximal sites as part of an extensive survey of the Glen catchment by Boylan & Sheridan in 1993. The principal environmental problems of bank erosion arising from afforestation, drainage and overgrazing identified at that time still remain and these have led to some instability in the system. This process tends to impair fish productivity. However, it is reasonable to suggest that fish stocks remain healthy as recorded by Boylan & Sheridan (1994) although targeted remedial works would undoubtedly stabilise eroding banks and enhance fish production.

#### “Conservation fish” species:

Data from 1993 and the current survey indicate that juvenile Atlantic salmon are well distributed and present in good densities in the catchment. Char, which are generally classified as “vulnerable” in Ireland, have only ever been recorded in Lough Nalughraman in this catchment and their status is deemed healthy (Tierney, 2000).

#### Finfish aquaculture:

No cages are located in Teelin Bay.

#### Commercial fisheries (salmonids):

The Teelin Bay area including the estuary is heavily commercially fished. Drift netting is carried out and six draft nets operate. Illegal netting in the catchment generally is limited and can generally be classified as sporadic and opportunist.

#### Summary:

The Glen is an extensive, prolific salmonid fishery which is located close to an important tourist area in west Donegal. Angling development works have been undertaken. The three major tributaries are large rivers in their own right. Some habitat degradation has occurred in the catchment due to overgrazing. The Glen River catchment is one of the prime salmon fisheries in Donegal.

### C2.3.2. Ballaghdoe/Glenaddragh complex

Catchment description/general data:

Draining off the slopes of Mulnanaff Mountain (475 m), these channels, which drain extensive tracts of forestry in their upper reaches, coalesce in the village of Kilcar before draining into the sea some 700 m further downstream. They enter the sea at Tawny Bay which is located at the lower end of Teelin Bay.

Both are relatively high gradient channels although some lower gradient water characterises their middle reaches. A weir in the middle reaches of the Glenaddragh, which was built to supply potable water to Kilcar, has a fish pass but its effectiveness is unknown.

Spawning/nursery capacity:

In general, boulder and heavy cobble dominate the substratum in both of these catchments although bedrock underlies much of the high gradient channel. The middle reaches of both rivers have segments characterised by riffle/pool/glide sequences where considerable quantities of gravels are deposited. Good spawning habitat is available at these locations. The substrate in the lower reaches of both is rough and heavy and is more suited to function as nursery rather than spawning habitat.

Riverine fisheries:

Neither is regarded as important salmon or sea trout angling fisheries because of the limited runs of these species currently (O'Reilly, 1998 a) (Appendix C4.1). However, grilse have been taken in the vicinity of Cashling's Bridge within the past five years and one angler is believed to have taken about 20 grilse in a season. Historically, the Glenaddragh had greater runs of salmon. Little is known about the status of sea trout in these systems. Few large holding pools are present in the individual channels particularly in the lower reaches. However, downstream of their confluence there is considerable fishery potential with good instream features for about 700 m to the sea. The middle reaches of the Glenaddragh offers several small salmon holding pools.

Brown trout tend to be small in the system and are little angled although brown trout to 25 cm were taken during electrofishing.

Lake Fisheries:

Brown trout to 500 g can be taken in this remote lake.

Estuarine angling fisheries (from Dunlop, 1987):

No specific angling marks noted for this estuary.

Electrofishing survey data:

Three sites were electrofished (Map 16H). The low densities of salmon recorded (Appendices C4.3 & C4.4) support the statements about the limited status of the salmon angling fishery. High densities of trout were recorded in the middle reaches of the Ballaghdoe (Site 01/BO/1) while the low densities of trout at both Ballaghdoe sites in the lower reaches were surprising in the absence of competition from salmon. Poor water quality from industrial sources is suspected. Eels were reasonably abundant at these sites.

“Conservation fish” species:

Low juvenile salmon densities are a concern.

Finfish aquaculture:

Nil.

Commercial fisheries (salmonid):

As per the Glen River catchment.

Summary:

These rivers are of limited angling fisheries importance currently. Salmon production appears to be limited possibly due to lack of recruitment due to limited runs of spawning adults and/ or intermittent water quality problems. Access for migrating adult salmon to spawning areas in the middle and upper Glenaddragh may be restricted by an artificial weir. However, it is extremely likely that both rivers contribute to sea trout production in the Donegal Bay area and, with sufficient resources, both could be developed for angling.

### **C2.3.3. Fintragh River**

Catchment description/general data:

This small trout-producing river discharges into the sea at Fintragh Beach. Draining off Crownarad (493 m) it has a reasonably steep gradient although it is characterised by long flat reaches and fast flowing riffles. A millrace in the lower reaches may limit movement of migratory fish upstream. The middle and lower reaches of this river has a heavy bankside cover regime, including many mature deciduous trees.

Spawning/nursery capacity:

Good gravel deposits are available in the lower gradient sections in the middle reaches and a good density of trout was recorded at the site fished.

#### Riverine fisheries:

It is likely that sea trout ascend into the lower reaches periodically and would provide some sport for occasional anglers. Spate periods are likely to be most productive.

#### Lake fisheries:

No lakes in the catchment.

#### Estuarine angling fisheries (from Dunlop, 1987):

Shore angling is good in the Fintragh Bay area. Flounder to 0.8 kg weight can be taken in the channel on the beach. Sea trout can also be taken while spinning. Night fishing on the beach can produce small turbot, dogfish, dab and occasional ray (Fig. Map 16E). On the eastern side of the channel (Nun's Cove) four species of flatfish can be taken including flounder, plaice, dab and small turbot. Bait collecting can be carried out in the inner reaches of the estuary where lugworm and sandeel are available.

#### Electrofishing survey data:

Electrofishing data for the single site fished (Site 01/FH/1) showed that it was populated by trout and eels only (Appendix C4.3). Trout densities were high (Appendix C4.4).

#### “Conservation fish” species:

None recorded for this catchment.

#### Finfish aquaculture:

None.

#### Commercial fisheries (salmonid):

None, although it is suspected that some illegal netting for salmon is carried out in the immediate vicinity of the bay.

#### Summary:

Good densities of juvenile trout were recorded in this catchment. The presence of sea trout in the estuary suggests that the Fintragh may have a role in producing sea trout for the Donegal Bay area. Overall, with the availability of better quality salmonid angling within a reasonable radius of this river, angling pressure on the Fintragh itself is probably very limited. The small size of the channel and the lack of defined pools in the lower reaches has a significant bearing on angling opportunities. Currently, sea angling within the “estuarine” area appears to be the most valuable and tangible element of this fishery.

#### **C2.3.4. Cunlin Lough outflow**

Catchment description/general data:

This is a small catchment entering the sea in the north western corner of Killybegs Harbour.

Spawning/nursery capacity:

Gravel deposits and pools to 0.5 m depth provide good trout production potential in the lower reaches.

Riverine fisheries:

Virtually nil and no potential due to the small size of the river.

Lake fisheries:

Status of Cunlin Lough is unknown.

Estuarine angling fisheries (from Dunlop, 1987):

Killybegs Pier is an excellent venue for grey mullet and the Irish record was established here (Map 16E). The Gunwell at Killybegs offer excellent quality shore angling for a variety of species. Bait collection is feasible in the inner section of the Cunlin Lough outflow/Bungosteen estuary where lugworm and crab baits can be collected.

Electrofishing survey data:

This stream was electrofished at Commons Bridge (Site 01/CN/1) where trout and eels were recorded (Appendix C4.3). Good densities of trout of all life stages were present (Appendix C4.4).

“Conservation fish” species:

None recorded.

Finfish aquaculture:

None.

Commercial fisheries (salmonid):

None.

## Summary:

This small system which comprises a lake and a stream outlet supports a good brown trout population. It may support sea trout. However, because the juvenile stages of the non-migratory brown trout are indistinguishable from the juvenile stages of their migratory form, the sea trout, it is impossible to determine from these data. In angling terms this channel offers little and at best it contributes to sea trout populations in the larger fisheries in the immediate vicinity.

### **C2.3.5. Bungosteen River (= Stragar River)**

#### Catchment description/general data:

This river enters the sea in the north eastern corner of Killybegs Harbour. The Bungosteen has several major tributaries and is a substantial catchment (Map 16K Appendix C4.1). The upper reaches of the main stem form the Stragar. The channel becomes the Bungosteen from the confluence of the Stragar and the Loughaderry River. O'Reilly (1998 a) states that the runs of salmon and sea trout into the Bungosteen are too small to warrant any angling attention. Access to the main channel is difficult in many sections due to high banks and heavy bank cover.

#### Spawning/nursery capacity:

Historically salmon were known to spawn well up into the headwaters at Site 01/BN/3. Limited sections are surveyed annually by NRFB for salmonid redds (Map16C). Only 17 salmon redds were counted in 2001-2002 (Table C2.5).

#### Riverine fisheries:

The Bungosteen is regarded primarily as a grilse and brown trout fishery by the NRFB with only small numbers of sea trout being taken (Appendix C4.1). Up to 10 years ago the Bungosteen was a very good grilse fishery but river poaching and poor water quality has contributed to its decline. The river was formerly regarded as one of the better sea trout fisheries in the Donegal Bay area and sea trout used to run the entire system. The decline in fish stocks has led to a substantial reduction in illegal activity. However, with a recent improvement in water quality the potential of this system may be improved but considerable infrastructural investment in angling facilities would be required.

#### Lake fisheries:

There are two significant lakes on the system: Aroshin and Aderry (Appendix C4.2). The fishery status of Aroshin is unknown but Aderry, which was impounded in 1993, is productive for small trout and used to get a run of sea trout during the summer. The absence of a fish pass in the impounding dam is likely to impede any upstream migrating fish.

Estuarine angling fisheries (from Dunlop, 1987):

See Cunlin Lake outflow.

Electrofishing survey data:

No juvenile salmon were recorded on the main Bungosteen channel at Meentullynagarn Br (Site 01/BN/3) during this survey although excellent densities of trout were present. Juvenile salmon were recorded by Harvey (unpublished data) in the Bungosteen main channel (lower reaches) in 2001. In the lower reaches of two of the major tributaries, the Loughaderry outflow (Site 01/BN/1) and the Roechrow River (Site 01/BN/2) small numbers of salmon parr were present (Appendix C4.3). Only juvenile trout and eels were recorded by Harvey at three disparate sites in the Loughaderry River in 2001. These limited data suggest that trout are produced throughout the catchment while salmon production is limited to the main channel and the lower reaches of the tributaries.

“Conservation fish” species:

Data suggests that juvenile salmon may have been impacted by water quality within the past decade.

Finfish aquaculture:

None.

Commercial fisheries (salmonid):

None.

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## Summary:

The Bungosteen is an extensive salmonid system in which the distribution of migratory salmonids appears to have contracted within the past decade. Infrastructure is poor and the bankside terrain is difficult to traverse. Recent improvements in water quality are encouraging (Maguire pers comm.) and this fishery could be restored and enhanced given its previous capacity to produce salmonids.

### C2.3.6. Oily River

#### Catchment description/general data:

The Oily is an extensive system which flows parallel to the Bungosteen entering the sea at McSwyne's Bay (Map 16L). It has two major tributaries, the Tullinteane River, which is a trout producing stream, and the larger Corker River which produces salmon and trout and has reasonable angling fishery potential (Appendix C4.1). Salmon and sea trout runs are understood to have declined a little in recent years. Brown trout are present in each of the three larger lakes in the system (NRFB, unpublished data) (Appendix C4.2).

#### Spawning/nursery capacity:

Despite the suitability of many sections of the tributaries for spawning, annual redd counts are carried out in the middle reaches and the extreme lower reaches of the Oily main channel only (Map 16L). A total of 54 salmon redds and 70 trout redds were counted in 2001/2002 (Table C2.5). The system also has extensive areas of nursery water.

#### Riverine fisheries:

The Oily is well regarded in terms of grilse and sea trout angling potential but access and angling infrastructure is poor (Appendix C4.1). Few anglers use the fishery but it is productive for grilse for those that fish after a flood. Little sea trout angling is carried out.

#### Lake fisheries:

Brown trout populate the three relatively large lakes in the Oily system (Appendix C4.2). Each is regarded as a fishery for small brown trout. Sea trout and char have been reported from Lough Namanfin but their current status is unconfirmed.

#### Estuarine angling fisheries (from Dunlop, 1987):

Plaice, dabs and occasional ray can be taken from a shore angling mark at Sand Port, a rocky shelf some 1.25 km southwest of where the Oily discharges into McSwyne's Bay (Map 16E).

Electrofishing survey data:

No salmon were recorded in the Tullinteane site while salmon, trout and some adult sea trout were recorded at the remaining two sites sampled (Appendix C4.3). High salmon fry and excellent salmon parr densities were recorded on the main channel at Multin's Bridge (01/OY/3) (Appendix C4.4). This is an important spawning location in the catchment (NRFB, unpublished report). Crowley (pers. comm.) recorded good numbers of salmon parr from the Oily main channel in 2001.

“Conservation fish” species:

Char are reported for Lough Namanfin but their current status is unknown (Tierney, 2000). Data suggests that juvenile salmon stocks are good in the main channel. The absence of salmon from the Tullinteane site was surprising but may be related to access for spawning adults.

Finfish aquaculture:

Salmon cages are located in Mc Swyne's Bay into which the Oily discharges.

Commercial fisheries (salmonid):

Two salmon draft nets operate on the Oily.

Summary:

The presence of adult sea trout in the short, shallow sections of channel electrofished and the high levels of juvenile salmonid production (Appendix C4.4) is indicative of a system which has excellent potential as a rod fishery. Access to and along the river varies but is generally poor. However, the physical regime is good with pools and runs characterising long sections. Angler usage is limited but it seems that the Oily does produce adult fish to the rod to those who frequent the fishery, particularly after a flood. However, the availability of more accessible waters in the immediate vicinity results in this useful fishery being underutilised.

### **C2.3.7. The Bunlacky River**

Catchment description/general data:

The Bunlacky is a long, small, meandering river which discharges into Inver Bay some 1.5 km east of Dunkineely village. No historical data were available.

Spawning/nursery capacity:

Bedrock was the dominant feature of the substrate where the channel was investigated. Little gravel was observed at these locations.

#### Riverine fisheries:

Small brown trout and eels populated the site electrofished (01/BY/1). It is possible that sea trout enter the system but this could not be established. Physically the middle and lower reaches of the channel is unsuited to angling due to a lack of definable pools, overgrown banks and tunneling. Angling opportunities may be available (a) for small brown trout in the upper reaches where access is available, and (b) in the lower 200 m before the Bunlacky runs into the sea where sea trout may be available.

#### Lake fisheries:

None in the catchment.

#### Estuarine angling fisheries (from Dunlop, 1987):

None are described by Dunlop.

#### Electrofishing survey data:

Small brown trout and a single eel were recorded at the single site electrofished (Site 01/BY/1) (Appendix C4.3). Bedrock dominated the physical features in this site and trout densities were moderate overall (Appendix c4.4).

#### “Conservation fish” species:

None recorded.

#### Finfish aquaculture:

Inver Bay has one of the highest concentrations of salmon cages in Ireland.

#### Commercial fisheries (salmonid):

None.

#### Summary:

The Bunlacky may offer some angling possibly for sea trout or small brown trout but with difficult access in the lower reaches its overall potential is limited. It probably contributes to sea trout production in the Donegal Bay generally.

### **C2.3.8. The Eany River**

#### Catchment description/general data:

The Eany is one of the prime salmonid fisheries in Donegal. Managed by the Northern Regional Fisheries Board a considerable amount of funding has been diverted to this fishery to provide quality access for anglers.

The Eany comprises three major tributaries, the Eany Beg, the Eanymore (incorporating the Sruell and Eglis) and the substantial main channel (Map 16N). The main channel is the major component of the fishery and is a very

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important salmon fishery (Appendix C4.1 & Map 16D). It also is a good sea trout fishery. The lower reaches of the Eany Beg are also important as a salmon fishery. The tributaries are mainly trout production units.

An upstream fish counter has been installed recently as part of the Marine Institute's Tourism Angling Measure programme.

Bank erosion from overgrazing is a problem in the upper reaches of the Eany catchment.

Spawning/nursery capacity:

Redd counting is carried out by the NRFB in discrete sections of the Eanybeg and lower Eanybeg Rivers (Map 16N). The total salmon redd count for the 2001/2002 spawning season was 78 which was among the highest for the Donegal Bay area (Table C2.5). Little spawning is believed to occur in the Eany River (main channel) which is characterised mainly by holding pools and falls. In contrast, redds tend to be widely distributed up to the middle reaches of the Eanybeg which is characterised by bedrock and discrete areas of gravel. Bedrock and boulder dominate the upper reaches of the Eanybeg which limit spawning possibilities. No juvenile salmon were recorded in these reaches in a previous survey (NRFB, unpublished). Several good spawning sections are present in the upper reaches of the Eanybeg. Good quality nursery water is available in all of the tributaries.

Riverine fisheries:

The Eany Water is the collective term used to describe the three discrete Eany fisheries. This term describes the Eany River, the Eanybeg and the Eanybeg (Map 16D). Salmon (mainly grilse) and sea trout are the important angling species in these productive fisheries. Salmon runs have been relatively good in recent years. Approximately 300 salmon were taken on rod and line in 2000, the majority in the Eany River downstream of Ballymacahill Bridge. Traditionally, the Eany was one of the better sea trout angling fisheries but it is thought that runs had declined although some improvements have been observed lately. Approximately 500 sea trout were taken annually up to the mid-1990's. Since 1996 it is estimated that only about 100 sea trout were taken per annum. This figure rose to 150 in 2001 (Gargan, 2002).

Lake fisheries:

Only four sizeable lakes are located in the catchment (Appendix C4.2). Glencoagh Lake and St. Peter's Lake hold stocks of wild brown trout with some fish to 400 g (O'Reilly, 1998 b). Glencoagh is the better of the two. Brown trout are intermittently stocked into St. Peter's Lake and Glencoagh Lake by the local angling club. No data are available regarding fish stocks in Camlargo or Meenaguse Lakes, both of which are located on Eany tributaries.

Estuarine angling fisheries (from Dunlop, 1987):

None are described by Dunlop.

Electrofishing survey data:

Three sites were sampled in this catchment (Appendix 3). Juvenile salmon, trout and eels were recorded on the Eany Beg site while only trout and eels were recorded from the Sruell and Eglish sites. Salmon densities were good (Appendix C4.4) and comparable to data from a previous survey (NRFB, unpublished data). Bank erosion problems are a feature of sections of the tributaries.

“Conservation fish” species:

Juvenile salmon present.

Finfish aquaculture:

Inver Bay has one of the highest concentrations of salmon cages in Ireland. Serious sea lice infestation has been a feature of sea trout populations in the Eany since the mid-1990's and the lice infestation pattern has indicated a local source (Gargan, 2002). Declines in sea trout populations have been associated with the occurrence of marine salmon farm units particularly along the west coast of Ireland.

Commercial fisheries (salmonid):

Several draft and drift net fisheries operate within the Inver Bay area.

Summary:

The Eany is a well developed and well serviced salmon and sea trout rod angling fishery and is important to the locality and further afield. Issues for the fishery are bank erosion in some of the tributaries and the decline in the sea trout population. The Eany has been identified by the NRFB as one of the prime salmonid fisheries within the region.

### **C2.3.9. The Eddrim River**

Catchment description/general data:

This is a small catchment, which enters the sea some 2 km east of Mountcharles, which has no potential as a rod fishery (Appendix C4.1). Bedrock dominates the lower reaches.

Spawning/nursery capacity:

The Eddrim is a heavily tunneled bedrock dominated channel. It has limited spawning potential but good salmonid nursery potential. No redd counts are carried out.

Riverine fisheries:

This river is narrow and bereft of holding pools. It is unlikely to hold larger fish although sea trout could enter it in spate conditions.

Lake fisheries:

No lakes in the catchment.

Estuarine angling fisheries (from Dunlop, 1987):

None are described by Dunlop. Bait such as lugworm and crab is probably available in the extensive estuary.

Electrofishing survey data:

No salmonids were recorded in the single site electrofished (lower reaches) although no impediment to salmonids was noted. Eels and numerous flounder were the sole fish species recorded (Appendix C4.3).

“Conservation fish” species:

None recorded.

Finfish aquaculture:

None in this bay.

Commercial fisheries (salmonid):

None.

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## Summary:

The Eddrim is a small river with no potential as a fishery. Surprisingly, no trout were recorded at the site electrofished.

### **C2.3.10. The Eske**

#### Catchment description/general data:

The Eske is one of the largest and most valuable salmonid fisheries in the Donegal Bay area. Comprising the Eske River and its tributary the Drummenny River, and Lough Eske, which has several large tributaries including the Corraber, the Lowerymore and the Clogher, the catchment has an interesting assemblage of waters and salmonid forms present (Map 16P & Appendix C4.1). The fishery is managed by the NRFB and the Board has improved angler access along the river together with creation of pools and other improvements.

Habitat quality is generally good in the catchment although bank erosion is an extreme problem in sections of the upper and middle reaches of the Lowerymore. Increased macrophyte cover in the channel and spawning areas downstream of Thrushbank Br. on the main channel may be indicative of enrichment. Water quality in the lower reaches of the Drummenny is suspect with domestic sewage the most likely problem on an intermittent basis.

#### Spawning/nursery capacity:

Salmon spawn throughout the Eske main channel and in the lower reaches of the major tributaries of Lough Eske and the lower reaches of the Drummenny, Lowerymore and Clogher Rivers systems. NRFB redd counting locations are shown in Map 16P. Over 100 salmon redds and 89 trout redds were counted in this catchment in the 2001-2002 spawning season (Table C2.5). These are the highest counts in the Donegal Bay catchment area over this period.

A Borland fish lift was installed at Mullanalamphry (Map 16P) in the lower reaches of the Lowerymore River in 2001 as part of a hydroelectric generation scheme. This pass is designed to allow access for spawning salmonids to an extensive area of suitable salmonid spawning and nursery area upstream of this previously impassable barrier. It is possible that salmon and possibly sea trout may have spawned for the first time in this part of the channel in winter 2001/2002. Non-migrating trout probably spawn throughout the Eske system given their ability to utilize small gravel pockets. In contrast salmon require more extensive gravelled areas to spawn.

#### Riverine fisheries:

The main channel of the Eske to the lake is short, approximately 6 km with angling generally confined to a number of key locations (Map 16P). The lower reaches of the Lowerymore also provide some angling water.

There is a small run of spring salmon to the main channel. Grilse tend to arrive in numbers from August onwards and anglers tend to concentrate on angling the lake (O'Reilly, 1998 a). Previously the river was well regarded as a sea trout fishery but the sea trout fishery has declined in recent years. The estimated rod catch was approximately 200 sea trout per annum up to the mid-1990's. Between 1998 and 2001 the rod catch ranged from 20 to 100 fish p.a. (Gargan, 2002). However, these catch data may be somewhat unreliable.

#### Lake fisheries:

Small numbers of spring salmon, summer salmon, sea trout (both finnock and large fish) are taken in the lake fishery (O'Reilly, 1998 b). Angling is mainly carried out from boats. Trout feature regularly in anglers' catches and there is a unique traditional char rod fishery which happens over a two-week period in November. The lake is very scenic and given its proximity to Donegal town the lake and the catchment are ideally situated from a tourist angler perspective.

Brown trout occur in the other large lakes distributed throughout the catchment (Appendix C4.2).

#### Estuarine angling fisheries (from Dunlop, 1987):

Small boats can be launched from the quay in Donegal town for sea fishing in the Eske estuary. Species available include flounder near the town while dogfish and tope can be taken in deeper water further west during the summer months. Mullet can be taken in the harbour in summer and autumn.

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Electrofishing survey data:

This entire catchment was surveyed extensively, including Lough Eske, in 1993 (Boylan & Sheridan, 1994). They recorded good densities of juvenile salmon in the main channel and in the lower reaches of all of the major Lough Eske tributaries. It is likely that salmon only spawn in sections that are accessible thus concentrating on these lower reaches. Trout densities were generally high also.

Four sites on Lough Eske tributaries were sampled during the present study (Map 16P). Results were broadly comparable to the previous study although salmon fry densities were lower in the Clady than recorded previously (Appendix C4.3 & C4.4). No salmon were recorded in the middle reaches of the Clogher River which had yielded good numbers previously. Trout numbers were excellent. Trout fry and salmon parr populated the site fished in the middle reaches of the Clady River. Gravels have been inserted here in the recent past together with rock weirs. Moderate densities of trout were recorded in the Lowerymore site sampled. A tributary of the Coradder yielded moderate densities of trout and salmon.

The Drummenny River is an extensive tributary of the River Eske. Boylan & Sheridan (1994) found that the Drummenny was extremely productive for salmon in the lower reaches with good trout production throughout. A similar result was recorded for all three sites in 2001 (this survey) with exceptional densities of salmon parr at Site 01/EE/7. The presence of one sea trout (finnock) (26 cm) in the lower reaches of the Drummenny was interesting but this river should primarily be regarded as a productive salmonid spawning and nursery unit. However, some angling is carried out by locals following spate conditions.

These data show that trout are widely distributed in the Eske catchment and production levels are high. Juvenile salmon production is restricted to larger channels mainly and the lower reaches of tributaries.

“Conservation fish” species:

Juvenile salmon populations are present in the system where anticipated. Char are taken in the rod fishery in Lough Eske in November. Tierney (2000) describes the char population as healthy.

Finfish aquaculture:

None in this bay. However, infestation of sea trout by sea lice has been a feature of the population for a number of years. The level of infestation has been lower than that recorded for sea trout from the nearby Eany River but higher than that recorded for rivers nationally which are distant from salmon farms (Gargan, 2002).

Commercial fisheries (salmonid):  
Suspended.

#### Summary:

The Eske is a well-serviced and valuable river and lake salmon and sea trout fishery which is managed by the NRFB. Some diverse habitat/environmental problems are issues in the catchment but these can be addressed. The Eske is one of the most important salmonid fisheries in this part of Donegal. The presence of a traditional and currently viable char angling fishery is noteworthy.

### **C2.3.11. The Laghy River**

#### Catchment description/general data:

This relatively substantial catchment, which discharges into the sea in the estuary behind Rossnowlagh Beach, can be sub-divided into the larger Laghy North and the lesser Laghy South. Physically, the lower reaches downstream of Laghy village offer the best scope for angling with some good pools present.

#### Spawning/nursery capacity:

The Laghy is well endowed with good quality salmonid spawning and nursery water throughout. Redd counts are carried out by NRFB in the lower reaches (Map 16Q) and 28 salmon redds were recorded between November and January 2001-2002.

#### Riverine fisheries:

Historically, the Laghy was well regarded as a salmon angling fishery but it has declined. Large salmon were known to run the system (Appendix C4.1).

There is good angling potential in the lower reaches of the Laghy catchment, particularly downstream of where both coalesce, (i.e. downstream of Laghy village) where good pools and runs are present. Bank cover is heavy which would limit angling opportunities. Based on instream physical habitat there is potential for a sea trout fishery and possibly a spate salmon fishery. Some angling may be feasible in the lower reaches of the Laghy North also. Salmon run timing is not fully known but NRFB staff suggest that a late run of salmon is a significant factor in maintaining stocks. This late run would not be available to anglers. Some illegal fishing has been carried out on this channel in the recent past which indirectly reflects the potential of this catchment.

#### Lake fisheries:

Six substantial lakes are present on the system - five of these are on the Laghy South (Appendix C4.2). Brown trout are known to be present in all of these lakes from survey work undertaken by NRFB in 1982 (unpublished data) (Table C2.4). O'Reilly (1998 b) describes Lough Keeran as a good fishery with brown trout ranging from 300 to 600 g. Brown trout to 450g have also been

reported from Lough Cullion. Smaller trout are the norm from the other lakes. All of these lakes have good shorelines ranging from 50 to 100% in terms of accessibility.

Estuarine angling fisheries (from Dunlop, 1987):

Rosstown Beach offers some shore angling for flounder and occasional bass (to specimen size (> 4.54 kg)) but little shore angling is carried out at this venue. The remainder of the coastline between Donegal and Ballyshannon is little angled by sea anglers. Digging the estuary behind Rosstown Beach will produce good quantities of lugworm.

Electrofishing survey data:

Six sites were electrofished in the Laghy catchment (Map 16Q). In total five fish species were recorded in the catchment (Appendix C4.3). In the upper reaches of both only trout were recorded. Good densities of juvenile salmon were present up to middle reaches of Laghy North and downstream of Laghy village on the Laghy South (Appendix C4.4). Trout recorded at all sites in fair to good densities. The salmonid density data suggest that significant spawning occurs in this catchment.

“Conservation fish” species:

Juvenile salmon are present in good densities in the catchment.

Finfish aquaculture:

None occurs in the estuary.

Commercial fisheries (salmonid):

None known.

Summary:

This is a salmonid catchment which has several good quality brown trout lake fisheries. Salmon run the main channel and juvenile densities were satisfactory where salmon were present. However, despite its potential the Laghy is currently not regarded as a significant angling fishery. A lack of knowledge about the status of the runs of fish into the system, and the availability of larger and better serviced river fisheries nearby militate against significant utilization of this fishery currently.

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### **C2.3.12. & C2.3.13. The Bridgetown and Ballintra Rivers**

Catchment description/general data:

The Bridgetown and Ballintra Rivers are tributaries of the Murvagh River which discharges into Donegal Bay estuary some 6 km south of Donegal town. These channels, which combined drain a catchment area of 85 km<sup>2</sup>, coalesce in their lower reaches to form the Murvagh (Maps 16R and 16S).

The Bridgetown and Ballintra are extensive tributaries which drain numerous small lakes, rough grazing land (upper reaches) and productive farmland (lower reaches) along their course. Small coniferous forestry plantations are features of the upper reaches of both catchments. In contrast, the Murvagh is a short canal-like tidal channel.

An exceptionally high waterfall on the Ballintra (100 m downstream of Aghadullagh Bridge) prevents migratory salmonids (i.e. salmon and sea trout) from migrating further upstream. The falls is the site of a former hydroelectric generating unit.

The current distribution of migratory salmonids seems to be limited on the Bridgetown to the channel downstream of a lesser falls (at Rath Bridge). However, sea trout were taken on rod and line in the middle reaches of the Bridgetown (near Rath Mountain) previously.

Spawning/nursery capacity:

Both the Bridgetown and the Ballintra offer good salmon and trout spawning and nursery potential with good mixed instream habitat and adequate deposits of spawning gravels (Appendix C4.1). Tree cover is excessive in some areas, which can lead to limitations in overall productivity, but it is not a significant problem. The major limitation to production of migratory salmonids is access to available spawning areas although sea trout may be able to access to the middle reaches of the Bridgetown. Redd counts are undertaken by NRFB staff in the lower reaches of the Bridgetown, the Ballintra and in the Murvagh River (Maps 16R and 16S). A total of 18 salmon redds was counted in spawning season 2001-2002 (Table C2.5).

#### Riverine fisheries:

O'Reilly (1998a) regards the Murvagh as an excellent sea trout river (Appendix C4.1). He also states that sea trout are taken in the Bridgetown and Ballintra with fish running from the end of June and peaking in mid-July. The Bridgetown is regarded as the better of the two rivers for sea trout. Estimated rod catches for the Murvagh over the past decade range from 140 to 250 sea trout per annum (Gargan, 2002).

Salmon are also taken in the Murvagh with small numbers being caught in the two tributaries. July and August are the peak months and the main angling areas are above and below Murvagh Bridge. Small numbers of spring or summer salmon can be taken.

Brown trout are also available throughout the Murvagh complex. According to local sources the introduction of pike to the Ballintra River by "foreign anglers" has led to a significant decline in the trout fishery due to predation. Despite the availability of different salmonid species O'Reilly (1998 a) regards the Murvagh complex as "a difficult, undeveloped river system with little or no provision for anglers".

#### Lake fisheries:

Many of the lakes within the Bridgetown and Ballintra catchments formerly held good populations of trout. The trout were small but some of the more productive waters held larger fish. Often trout were recorded in association with perch and to a lesser extent rudd. Pike were introduced to the system, probably in the late 1970's and are quite widespread currently. Within the Irish jurisdiction, these lakes are probably the most northerly point of pike distribution. The view is strongly held that their introduction has led to a substantial decline in the quality of trout angling in these lakes. Available data suggests that the majority, with some notable exceptions (Appendix C4.2), can now be classified as mixed fisheries where for most species fish tend to be small.

#### Estuarine angling fisheries (from Dunlop, 1987):

See C2.3.11.

Electrofishing survey data:

Electrofishing was conducted in these catchments in 2000. Six sites on the Bridgetown and five sites in the Ballintra were electrofished using handset gear which limited surveying to depths < 1.2 m. This depth is representative of long segments of both channels during low water periods. Water levels were low for much of the survey.

Five fish species were recorded in total (Appendix C4.3). Juvenile salmon were recorded at all sites on the main Bridgetown channel downstream of Rath Bridge. On the Ballintra juvenile salmon distribution was limited to the lower reaches downstream of the impassable falls at Aghadullagh Bridge (Site 00/BA/4). 1+ year old salmon dominated the sample in both catchments and no 0+ (fry of the year) fish were recorded on the Ballintra. Few older salmon were recorded reflecting the fact that the majority of salmon in Irish fisheries migrate as two-year-old smolts.

Juvenile salmon densities (fry and parr) in the Bridgetown increased with distance downstream (Appendix C4.4). This may reflect adult salmon spawning activity which may decrease with distance from the sea. Densities of salmon parr were very satisfactory at Sites 00/BN/5 and 00/BN/6. No 0+ salmon were recorded in the Ballintra but the parr density was very high.

These data suggest that, although salmon production is limited to the middle and lower reaches of both catchments, the high levels of parr production mean that the overall production level is likely to be relatively significant to salmon smolt production in the greater Donegal Bay area. Trout were recorded at many sites in both catchments (Appendix C4.3) with 0+ and 1+ dominant and lesser numbers of older fish.

Few trout were recorded from sites in the lower reaches of the Bridgetown. As anticipated the distribution of adult trout (i.e. 2 years old and older) was limited to the main channels of both rivers where depth was adequate. The maximum density was recorded in the middle reaches of the channel (Site 00/BN/3) (Appendix C4.4).

Trout fry, parr and adult densities were low in the Ballintra. The virtual absence of trout from tributaries to Rath Lake (Sites 00/BA/2 and 00/BA/3) on the Ballintra was inexplicable given the quality of the habitat. The introduction of pike to this once prolific trout lake some decades ago may have affected the trout population but it is unlikely to have eliminated it totally. Poor water quality is not suspected as the sites held significant numbers of the pollution sensitive freshwater crayfish (*Austropotamobius pallipes*). This is probably the most northerly location for the crayfish in Ireland (viz. Lucey & Mc Garrigle, 1987) and appears to be the first record for the species in the catchment.

Flounder were recorded in the lower reaches of the Bridgetown some 1 km above the tidal influence. Their presence was not unusual. A single juvenile pike (*Esox lucius*) was recorded in the upper reaches of the Ballintra River.

“Conservation fish” species:

Juvenile salmon populations were recorded in the lower reaches of both rivers.

Finfish aquaculture:

None in this estuary.

Commercial fisheries (salmonid):

A draft net used to operate in the estuary.

Summary:

Both the Bridgetown and Ballintra Rivers are extensive convoluted channels with numerous lakes distributed throughout. Both rivers have been identified as productive sea trout fisheries in their lower reaches, particularly where they coalesce to form the Murvagh. Salmon can also be taken in good numbers in the Murvagh. However, poor access and limited facilities for anglers limit their current angling potential.

Physically, both rivers are potentially productive for salmon and trout although waterfalls limit access for migratory salmonids to their lower reaches. This is borne out by the limited distribution of juvenile salmon in both catchments. Juvenile salmon density data indicates that the contribution of both channels to salmon smolt production in the Donegal Bay catchment area is likely to be significant.

The quality of brown trout fisheries in both catchments appears to have deteriorated. Many of the lakes are populated by pike and perch and can be classified as mixed fisheries. It is a firmly held view that the presence of pike may account for decline in trout stocks.

The Bridgetown/Ballintra complex is a large important mixed fishery which is evolving due to introductions of different species notably pike. Underutilisation of this valuable resource due to poor infrastructure and a lack of information on angling opportunities is an issue in fisheries such as this.

### **C2.3.14. Durnesh Lake**

Catchment description/general data:

Durnesh Lake is a naturally productive, eutrophic, shallow lake situated on low-lying productive agricultural land near Rossnowlagh Lower beach. The lake is a cSAC (candidate Special Area of Conservation).

A floodgate regulates flows on the outlet to and from the sea. It supports brown trout populations and sea trout enter the fishery in summer.

#### Spawning/nursery capacity:

At least four streams drain into Durnesh Lake (Map 16T). Survey data shows that only the streams draining into the lake on the southern shore offer any salmonid spawning potential and the available spawning substrate is limited (CFB, unpublished data).

#### Riverine fisheries:

No substantial riverine channels are present in the catchment.

#### Lake fisheries:

Brown trout are available ranging from 200 g with some to 1 kg (Appendix C4.2). Reasonable numbers of sea trout enter the fishery in summer. Access around the shoreline is restricted due to heavy macrophyte cover and marshy nature of the ground. Angling tends to be restricted to boating which are available from an establishment on the lakeshore. Concern has been expressed about the functionality of the flood control gate on the outflow in relation to fish passage which may be impeded at times.

#### Estuarine angling fisheries:

Creevy Pier, Rossnowlagh Strand lower and Carrickfad Rock are shore angling venues mentioned by Donaher (2001). Species available include flounder, plaice, dogfish and sea trout off the beach. Pollack, wrasse and conger can be taken off Creevy pier.

#### Electrofishing survey data:

None.

#### “Conservation fish” species:

Previous survey data indicate none present.

#### Finfish aquaculture:

None in this bay.

#### Commercial fisheries (salmonid):

None.

#### Summary:

Durnesh Lake is an interesting cSAC and brown trout and sea trout fishery which is mainly angled from boats. It appears to have good angling potential and is probably underutilised. However, eutrophication problems in the lake are a concern for fish populations. Water and habitat quality in the tributaries requires to be well maintained to ensure continued production of juvenile trout.

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### **C2.3.15. The Abbey River (Two Mile Water)**

Catchment description/general data:

The Abbey is a small fast-flowing river which flows into the Erne estuary west of Ballyshannon (Map 16U). The river is well regarded locally for its sea trout. Several lakes are situated in the upper reaches of the catchment. ESB claim ownership of the Abbey system under the Erne Hydroelectric Scheme.

The main channel has recovered post-drainage but remains limited in terms of instream character. Regular river maintenance work is carried out by the Office of Public works (OPW) within whose remit the Abbey River is situated.

Currently, adult salmon enter the system in small numbers usually in Autumn because of the lack of pools and lower summer water levels (D. Doherty, 2001). Adult brown trout are present in good numbers. Some larger fish are also recorded because of the limestone influence on the riverine portion of the catchment.

Spawning/nursery capacity:

Spawning areas are well distributed in the Abbey catchment and NRFB staff count redds annually over extensive sections of the channel. (Map 16U). A total of 46 salmon redds was counted in 2001-2002 (Table C2.5).

Riverine fisheries:

Sea trout (ranging from of 220 g to 1 kg) are regularly taken during the summer months mainly by local anglers. However, access to the small pools is difficult for anglers. Some pools lost in the course of drainage operations have not been recovered and work would be required to re-establish these. Other species recorded in the main channel include pike, perch and eels (D. Doherty pers. comm.).

Lake fisheries:

There are ten identifiable lakes on the system (Appendix 2). Perch occur in the majority followed by pike (about 50% of these lakes). Roshin Lake is reputed to hold stocks of perch including fish exceeding the Irish Specimen Fish Committee qualifying specimen weight of 3 lbs (ISFC, 2001). Few perch of this size are taken in Irish waters which points to the potential value of Roshin Lake. Pike from these waters tend to be generally small although occasional large pike (to 10 kg) can be taken (Matthews, pers. comm.).

Trout have been recorded in three of the lakes. Lough Unshin has stocks of small trout, perch and rudd. Unshin is easily accessible and provides good sport for both local and tourist anglers. Boats are available locally. The

neighbouring Loughnambrackalan which holds smaller stocks of larger trout is difficult to access and the shoreline is difficult to fish.

#### Estuarine angling fisheries:

The Erne estuary is an important and valuable sea trout fishery. The Abbey River is likely to contribute substantially to the fishery in terms of sea trout smolt production. See C2.3.16. Slob trout (estuarine resident “brown trout”) are taken by anglers in the estuary also.

#### Electrofishing survey data:

Juvenile trout were recorded in the upper reaches of the Abbey catchment (Appendix C4.3). ESB have been conducting experimental stockings of juvenile salmon and trout throughout the catchment which they monitor annually by electrofishing since the 1992 (Dennis Doherty, pers comm). The ultimate aim of the project is to increase adult salmon penetration and to enhance the salmon angling potential of this catchment with a view to ultimately to produce a self-sustaining population in these reaches previously unspawned.

#### “Conservation fish” species:

Juvenile salmon are present in the Abbey system and the species is stocked in many parts of the upper reaches by ESB (Doherty, 2001).

#### Finfish aquaculture:

None in the marine environment. The ESB have a major hatchery on the Erne downstream of Cathleen Falls which is mainly used for rearing salmon to various stages up to smolt to support the Erne Salmon Enhancement Programme. The hatchery was built in 1983.

#### Commercial fisheries (salmonid):

Fourteen special salmon draft netting licenses are available for the Erne estuary.

#### Summary:

The Abbey catchment is a mixed river and lake fishery populated by several different species of fish including salmonids, coarse fish and pike. Usage of the sea trout river fishery is mainly limited to locals. The lakes offer good scope for mixed angling while Lough Unshin is popular for trout angling because of good access and infrastructure. Overall the fishery is underutilized given its angling potential.

The Abbey is likely to be very significant in terms of contributing sea trout smolts which ultimately return as adult sea trout which sustain the important Erne estuary sea trout rod fishery.

### **C2.3.16. The Erne**

Catchment description/general data:

In the context of this study the Erne has been defined as the lower Erne catchment downstream of Belleek to the sea at Tullan Strand at the mouth of the river. Essentially this incorporates the artificial Assaroe Lake and the Erne estuary.

The bulk of the once famous river Erne salmon fishery has been lost due to the impoundment at Ballyshannon on which construction began in 1946 to accommodate a hydro-electric power station. A second hydro-electric power station was constructed at Cliff near Belleek at the same time. Both dams incorporate fish passes.

Although the Erne is currently regarded as a productive estuarine sea trout fishery power generation is the principal function of the river. Assaroe Lake is a substantial and important coarse and pike fishery (Donaher, 2001). Since the mid-1990's two extensive EU-funded studies of the important commercial species in the catchment, eels (Matthews et al., 2001) and salmon (Mathers & Crowley, 2001), have been carried out to determine their status and future management options.

Spawning/nursery capacity:

It has been established that between 1960 and 1970 the Erne ceased to support a self-sustaining population of salmon (Mathers & Crowley, 2001). These authors also point to strong evidence that adult salmon derived from the hatchery programme return to the river but cannot ascend into the system upstream of Cathleen's Falls and do not contribute to spawning effort upstream. The Abbey River has an important salmonid spawning/nursery function for the Erne downstream of Ballyshannon and contributes substantially to the Erne estuary sea trout population. No redd counts are carried out by NRFB staff in the Erne catchment proper.

Riverine fisheries:

Historically, the Erne was an excellent salmon fishery but it yields only small numbers of salmon to the rod currently when power is being generated at Cliff. For safety reasons angling is not permitted between Cathleen's Falls Hydroelectric station and the Mall Quay, a tidal reach of the Erne.

Lake fisheries:

Assaroe Lake, an artificial lake created by the impoundment is controlled by the ESB and an angling permit is required. The lake is a mixed fishery with both salmonid and coarse fish and pike present. It has small stocks of large (average 800g) brown trout with occasional salmon and sea trout (O'Reilly, 1998b). Angling infrastructure, in the form of a refurbished boat jetty and several angling stands, is good.

Assaroe Lake is the principal coarse fishery in this part of Donegal (Central Fisheries Board, 1992). Roach are common in the fishery while bream, cyprinid hybrids, perch, pike and eels are also taken (Appendix C4.2). Large pike are taken regularly and Assaroe is also an ideal pike and coarse fish match-angling venue (P. Bourke pers. comm.).

Zebra mussel, *Dreissena polymorpha* L., has recently been introduced to the fishery and it will be interesting to monitor the impact of this prolific bivalve, regarded as a major nuisance species, on the system and its fisheries.

Estuarine angling fisheries:

The Erne estuary is an important and valuable sea trout fishery which extends from the Mall Quay at Ballyshannon to the river mouth at Tullan Strand. Regarded by Donaher (2001) as “one of the best sea trout fisheries in the country” angling is carried out from boats and from the shore. Donaher lists eleven different shore angling locations within the estuary. A special angling permit is required to fish the estuary. Estimated rod catches range from 600 to 2000 sea trout per annum over the past decade (Gargan, 2002). The average annual catch is approximately 1250 p.a. This is significant in a national context.

Flounder can be taken in the Erne estuary channels (Dunlop, 1987) while mullet and freshwater eels can be taken from the Mall Quay (Donaher, 2000). Lugworm and crab baits can be collected in the estuary.

Electrofishing survey data:

As part of the EU funded Erne salmon programme an extensive electrofishing survey of the Erne catchment was undertaken between 1994 and 2000 to establish the distribution of naturally spawned salmon and the survival of stocked juvenile salmon (Mathers & Crowley, 2001). This survey activity was confined to channels east of Beleek. The data showed that the majority of Erne rivers are capable of producing and supporting juvenile salmon but that the stock is not self-sustaining. It is reasonable to conclude that the small number of lesser channels discharging into Assaroe Lake that may be capable of supporting salmonids are performing similarly.

“Conservation fish” species:

Sea lamprey (*Petromyzon marinus* L.) have been observed by NRFB staff in the Erne estuary within the past decade. Juvenile salmon are present and stocks are maintained by stocking.

Finfish aquaculture:

None.

Commercial fisheries (salmonid):

See Abbey River section.

## Summary:

The lower Erne at Ballyshannon comprises two unique and valuable angling fishery components: the estuarine sea trout fishery and the regulated Assaroe lake pike and coarse fishery. The former is one of the better sea trout fisheries in the country while Assaroe Lake is rapidly gaining a deserved reputation for its fisheries.

### **C2.3.17. The Bradoge River**

#### Catchment description/general data:

The Bradoge is a small riverine catchment which discharges into the sea at Bundoran (Map 16W).

#### Spawning/nursery capacity:

Patches of salmonid spawning gravels are available throughout the catchment but the gravels tend to be compacted in the boulder clay bed.

#### Riverine fisheries:

It is likely that some limited angling occurs on the lower reaches of this narrow channel at Bundoran but it is not a valuable fishery (Appendix C4.1).

#### Lake fisheries:

No lakes in the catchment.

#### Estuarine angling fisheries:

Donaher (2001) recommends Bundoran Beach as a shore angling mark. Flounder, plaice and cod can be taken here.

#### Electrofishing survey data:

Two sites were electrofished in this small catchment (Map 16W). Trout were recorded at both sites (Appendix C4.3) although densities were low at 01/BR/1 (Appendix C4.4). Minnow and stickleback were common at this site. Trout up to 24 cm forklength were captured at the site sampled in Bundoran (01/BR/2). Flounder & eels were common at this site also. No salmon were captured in the Bradoge and it unlikely that salmon enter this channel.

#### “Conservation fish” species:

None recorded.

#### Finfish aquaculture:

None.

#### Commercial fisheries (salmonid):

Drift net fishing for salmon takes place in the general vicinity and especially at Aughrus Point.

## Summary:

The Bradoge has limited angling fishery potential but it may contribute to sea trout populations in the Donegal Bay area and has to be considered as a resource in that context.

## C2.4. Conclusions

Three substantive salmonid fisheries, the Glen, the Eany and the Eske have been identified as the key fisheries in Donegal Bay. The Northern Regional Fisheries Board has invested considerable resources in upgrading the angling facilities in each having identified each as the prime fisheries in this part of Donegal. All of the relevant data, including biological data, supports their designation as prime salmonid angling waters particularly for salmon. The Erne estuary is an extremely important sea trout fishery which is very well regarded by anglers.

Other important salmonid fisheries in the area include the Bungosteen, the Oily, the Laghy, the Bridgetown, the Ballintra, Durnesh Lake, and the Abbey River. Within this category of fishery there is a waters of different angling quality. In some cases the infrastructure is limited but each has significant potential as a fishery in the medium to longer term once the different problems (access, instream enhancement requirements etc.) affecting these fisheries have been addressed. Despite their potential many of these channels are underutilized.

A third category of fishery, which includes the remaining waters like the Ballaghdoe/Glenaddragh complex, the Fintragh, Cunlin Lough outflow, the Bunlacky, the Eddrim, and the Bradogue, have limited angling value because of their size. The lower reaches of the Ballaghdoe/Glenaddragh complex, the largest of these catchments, could be enhanced but this probably better regarded as a long-term proposal. The remaining channels may contribute to sea trout production in the Donegal Bay area but this would be difficult to ascertain. All of these channels (apart from the Eddrim) supported populations of juvenile brown trout which may, in some cases, be juvenile sea trout as the life stages are indistinguishable in the juvenile stage. Production of juvenile sea trout to the pre-migration stage (smolt) is an important and significant beneficial use to the Donegal Bay area as a whole.

Apart from valuable salmonid fisheries this part of Donegal also has pike and coarse fisheries. Coarse fish and pike are found in the Bridgetown, Ballintra, Abbey and the Lower Erne systems. Many small to medium sized lakes are situated in these subcatchments (apart from the lower Erne which is dominated by Assaroe Lake). Fish quality is variable in the small to medium sized lakes but for the most part the fish tend to be small and the fisheries under-exploited. The fisheries are generally not well developed but they can

offer good sport angling. The exception is Assaroe Lake on the Lower Erne where excellent quality coarse fish and pike are available together with good angling facilities.

Several “conservation fish” species are present in the Donegal Bay catchments. From well-sourced anecdotal and some factual data it seems that sea lamprey and char occur but have a limited distribution within the Donegal Bay catchments. In contrast, juvenile salmon, an EU Habitats Directive species, is widely distributed being recorded in twelve of the seventeen catchments investigated.

Several environmental pressures on these fisheries have been identified. Many different studies have shown the impact of poor water quality, acidification, afforestation and overgrazing with associated bank erosion on juvenile salmonids principally in rivers. Coarse fish are less susceptible to poor water quality and quality standards are substantially lower for these species.

Infestation of sea trout by sea lice has been shown to be a problem for sea trout populations in the Eany and to a lesser extent in the Eske, both of which are monitored annually. Sea trout populations in the west of Ireland close to marine salmon aquaculture sites have collapsed over the past decade (Gargan, 2002).

Commercial activity is primarily related to salmon netting which is contributing to the local economy. The Erne eel fishery requires additional management based on sound scientific principles to render it more productive and attention to after-processing and added value product. Salmon aquaculture is intensive in two bays.

Urban pressures and industrial developments appear to have a limited effect on fisheries in the Donegal Bay area presently although several problem point sources are monitored regularly. A watching brief will have to be maintained in relation to water abstraction and small hydroelectric schemes which have been proliferating in recent times.

In conclusion, it is evident that there are several excellent fisheries within the confines of Donegal Bay currently and that there is considerable scope to advance other fisheries which are, to date, largely an untapped resource. This project has provided an opportunity to collate existing data from various sources and to generate additional supporting data for seventeen different catchments in the Donegal Bay areas. This will provide a good baseline for future studies and a means of gauging any changes that may occur in these systems in the future.

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### C3. Aquaculture and Marine Fisheries

#### C3.1 Donegal Bay Aquaculture

Aquaculture/Fish Farming is defined as the culture or farming of any species of fish, shellfish or aquatic plant. This section of the water quality management plan examines the extent of aquaculture within the Donegal Bay catchment.

Open to the prevailing south-westerly winds and exposed to the full vigours of the Atlantic swell, Donegal Bay harbours some of the most exposed Fish Farms in the world. The bay is an important area for the production of high quality Salmon (*Salmo salar*), Rope grown Mussels (*Mytilus edulis*) and Pacific Oysters (*Crassostrea gigas*).

In 1999 Donegal Bay accounted for over one-fifth of the value of national aquaculture production with an output value exceeding IR £9.5 million. The bulk of this output was from Salmon Farming of which 3,449 tonnes was produced. Table C3.1 outlines aquaculture production, volume and value in Ireland, County Donegal and Donegal Bay.

Species	Irish Volume (Tonnes)	Irish Value (IR £,000)	Donegal County Volume (Tonnes)	Donegal County Value (IR£,000)	Donegal Bay Volume (Tonnes)	Donegal Bay Value (IR £,000)
Salmon/Sea Trout	19,152	45,932	5,383	15,925	3,449	9,357
Freshwater Trout	1,077	2,446	83	153	0	0
Arctic Charr	56	2,060	0	0	0	0
Eels	25	na	0	0	0	0
Turbot	0	179	0	0	0	0
<b>Total Finfish</b>	<b>20,430</b>	<b>50,673</b>	<b>5,466</b>	<b>16,080</b>	<b>3,449</b>	<b>9,357</b>
Gigas Oysters	6,555	7,270	400	433	216	235
Native Oysters	696	2,294	420	1,386	0	0
Rope Mussels*	6,467	3,385	489	243	0	0
Bottom Mussels	9,644	3,241	2,420	720	0	0
Urchins**	0	0	0	0	0	0
Clams	121	334	0	0	0	0
Scallops (Mature)	33	100	20	201	0	0
<b>Total Shellfish</b>	<b>23,516</b>	<b>17,041</b>	<b>3,749</b>	<b>2,991</b>	<b>216</b>	<b>235</b>

**Table C3.1. Aquaculture Production, Volume and Value in Ireland, County Donegal and Donegal Bay (1999). Source B.I.M. Job Production Survey.**

\*No rope grown mussels were forwarded for sale to market from Donegal Bay due to naturally occurring toxic algal blooms.

\*\*No urchins as yet produced as operation has just been established.

There are 19 aquaculture operations in Donegal Bay, as described in Table C3.2 and identified in Map 17. These operations range from the smaller scale owner operated enterprises to larger integrated companies engaged in production, handling, grading and value adding activities. Employment in aquaculture in Donegal Bay amounts to 178 of which 124 are engaged in finfish production and 54 shellfish in the shellfish sector. These figures include full time, part time and casual employees.

<b>Species Farmed</b>	<b>No. of Farms/Operations</b>
<i>Salmon</i>	<i>3</i>
<i>Sea Trout</i>	<i>1</i>
<i>Fresh Water Hatchery</i>	<i>1</i>
<i>Rope Mussels</i>	<i>3</i>
<i>Gigas Oysters</i>	<i>10</i>
<i>Urchins</i>	<i>1</i>

**Table C3.2. Species and Numbers of Fish Farms in Donegal Bay 1999.**  
**Source B.I.M. Job Production Survey.**

The most dominant aquaculture sector in Donegal Bay is the Salmon/Sea Trout Farming industry, which boasts over 20% of the country's value of Salmon. The success of this sector has been underpinned by investment towards the development of necessary primary handling and processing facilities. The companies engaged in Salmon/Sea Trout farming include Ocean Farm Ltd. (Gallagher Bros.); Eany Fish Farms and Creevin Salmon.

There are ten Pacific oyster farming operations in Donegal Bay. These range from small part-time to large-scale operations utilising primary handling operations and depuration facilities. However this sector is now poised to develop further with the recent granting of up to three new licences, which have been pending over the last number of years.

In the past, the rope mussel industry in Donegal has been restricted to sheltered bays and inlets (e.g. Mulroy Bay). However developments in offshore technology has allowed farms in some of the more exposed bays such as Bruckless Bay to develop.

A fresh water hatchery with a licensed capacity of 25 tonnes per annum is situated on the river Erne just up stream from the town of Ballyshannon. This hatchery was set up by the ESB primarily to enhance the salmon stocks on the Erne system. The hatchery's licence also allows for the production of Salmon (*Salmo salar*) Smolts, Rainbow Trout (*Oncorhynchus mykiss*) and Arctic Charr (*Salvelinus alpinus*) in the past has produced Salmon smolts for the purpose of ongrowing at sea and rainbow trout for the table market.

### **C3.2 Single Bay Management (SBM)**

Single Bay Management for finfish farms has been in operation in Donegal Bay since 1995. SBM arrangements for fin-fish farms are designed to co-ordinate husbandry practices in such a way that on individual farms best practice is followed and that stocking, fallowing and treatment regimes on individual farms are compatible with the arrangements on neighbouring farms. The goal is to ensure that practices on individual farms act synergistically to enhance the beneficial effects to the bay as a whole.

The contribution of the SBM process to the rational management of the coastal zone in aquaculture areas has been recognised by the DoM&NR, BIM and the Aquaculture industry. This management strategy has also been endorsed by the Dept. of Marine, the Sea Trout Task Force and the Irish Salmon Growers Association as fundamental to the rational management of the salmon farming industry.

### **C3.3 National Policy**

Government policy is directed at expanding the sector in a fair, equitable and environmentally conscious way to secure and enhance the livelihoods of coastal communities. The new National Development Plan 2000-2006 provides for an allocation of IR£25 million in EU and Exchequer funds for Ireland's aquaculture industry. The last operational programme saw the industry increase production by 44%, proposed targets under the current programme will see production in aquaculture increase by 108% by 2006, and this in turn will result in a direct increase in value and employment.

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Under the Border, Midland and Western (BMW) regional development scheme in October 2001, Donegal Bay aquaculture was awarded £1,315,754 as follows;

Creevin Salmon Farm Ltd., Inver,	£72,513,
Eany Fish Products Ltd.,	£42,000,
Ocean Farm Ltd., Killybegs,	£968,344,
Fanad Pettigoe Teo, Pettigo,	£182,615,
Donegal Aquaculture Services, Mountcharles,	£18,787,
Donegal Oysters Ltd., Mountcharles,	<u>£31,495</u>
<b>TOTAL</b>	<b>£1,315,754.</b>

These awards were made under the first round of the current National Development Plan which the Minister for the Marine, Mr. Fahey, described as ‘the beginning of a determined drive to help position Irish aquaculture produce as a clearly identifiable top-class product’.

### **C3.4 Supporting Infrastructure**

Commercial fishing within Donegal Bay is regulated by the Sea Fisheries Division of the Department of the Marine & Natural Resources, all Aquaculture Activities are regulated by the Coastal Zone Management Division of the Department of the Marine & Natural Resources.

The Aquaculture Initiative (AI) is a cross border development body committed to playing a leading role in the development of a sustainable aquaculture industry throughout the remit area of Northern Ireland and the six border counties of the Republic. The team advises the aquaculture industry on financial, technical, and strategic issues, in order to provide effective support for new and existing aquaculture ventures. A dedicated Resource Development Officer is based in Letterkenny who works in liaison with a Quality & Environmental Officer when necessary.

Bord Iascaigh Mhara (B.I.M., the Irish Sea Fisheries Board) is the state agency charged with the sustainable development of the seafood and aquaculture industry within the lough. It provides a range of services for the fishing sector from the production to the processing and the marketing sectors, including financial, technical, educational, marketing and resource development. BIM in conjunction with the Department of the Marine & Natural Resources have just appointed an Inshore Fishery Development Officer for the Donegal area.

Taighde Mara Teo is a wholly owned subsidiary of Udaras na Gaeltachta. Taighde Mara Teo function is to promote, assist and meet the requirements of all sectors of a rapidly growing Aquaculture industry in Gaeltacht areas. Priority is given to research and development work in which economic parameters are evaluated in tandem with research targets so that technical and commercial viability is accurately quantified.

The Marine Institute (MI) is the semi-state body charged to undertake, to co-ordinate, to promote and to assist in Marine research and development. Three out of five MI divisions input into Aquaculture.

1. The Marine Environment and Health Services Division has three sub-divisions, The Fish Health Unit, The Marine Chemistry Unit and The Marine Biotoxin Unit.
  - The Fish Health Unit carries out statutory work on finfish and shellfish sampling under EU Directive 91/67, and 96/23. Services available to the aquaculture include histology, bacteriology, virology, parasitology and immunodiagnostic techniques.
  - The Marine Chemistry unit is responsible for residue testing in wild and farmed fish under EU directive 96/23 and environmental monitoring including sampling shellfish production sites.
  - The Marine Biotoxin unit is responsible for the co-ordination of routine monitoring programmes to test products for toxicity in compliance with EU Directive 91/492.
2. The Salmon Management Services Division provides services in relation to wild salmonids, aquaculture, eels and integrated inshore fishery management. Services to the aquaculture industry include the implementation of Single Bay Management (SBM), sea lice monitoring, and benthic monitoring.
3. The Marine Technology Division runs the 'Marine Enterprise Investment Programme'. It is aimed at marine technology companies and aims to maximise the impact of funding available to marine companies.

## **C3.5 Donegal Bay Marine Fisheries**

In this section of the report an indication of the types of marine fisheries activities that have been carried out within the Donegal Bay area over the last twenty years is given. These fishing activities are divided into four main categories. These categories are:

1. Pelagic fisheries
2. Whitefish fisheries.
3. Crustacean fisheries.
4. Other fisheries.

### **C3.5.1. Pelagic Fisheries**

The pelagic fishery has expanded so greatly in the last twenty years that Donegal Fishermen are now considered to be World leaders in the operation of Pelagic Pair Trawl. Pelagic fishery nets are built in Killybegs and operated on every part of the Globe.

The Pelagic Activities within Donegal Bay, which are the most lucrative, can be subdivided into four groups or species.

- Mackerel (*Scomber scombrus*)

Mackerel are caught throughout Donegal Bay and large shoals of mackerel have been caught traditionally in the vicinity of Carrigan Head. These Mackerel are caught in late summer and early autumn. They are a good quality commercially valuable stock. There exists a huge amount of juvenile mackerel throughout the whole Bay on an annual basis. During the late summer months mackerel can be found extensively to the shoreline along the whole coast of Donegal Bay from Rathlin O Birne Island all the way to Bundoran. They come inshore in large shoals and can be found in the harbours such as Killybegs. They swim up the river estuaries and have been caught in Inver Bay and Donegal Town Harbour.

- Scad (*Trachurus trachurus*)

Scad or Horse Mackerel, which is a name by which it is more commonly known, is another late summer or autumn visitor to Donegal Bay. They arrive within the Bay in large shoals but remain in relatively deep water in the outer areas of the Bay. Juveniles exist throughout the Bay and are often found to be in mixed shoals along with small Mackerel.

- Herring (*Clupea harengus*)

The abundance of the shoals of herring within the Bay has made Donegal Bay and the town of Killybegs famous. Killybegs became a world-renowned fishing port on the strength of the lucrative shoals of herring that exist within the Bay and the fact that Killybegs itself is a natural deep-water harbour providing boats safe and practical berthage.

There are specific herring stocks that need to be identified, most importantly a spawning stock that comes into Rosbeg annually. This stock of herring comes inshore in late November and December to reproduce. It is believed that this may be the reproductive center for the whole of the Bay, as throughout the year Donegal Bay is full of juvenile herring of different year classes. There are also large amounts of herring all around Rathlin O Birne Island. Herring can be found in large shoals all along the coastline of the Bay and are often found in winter right under the falls of freshwater from Slieve League. Carrigan Head to Muckros Head, Drumanoo Head to Fintra Beach, are well known places for large shoals of herring, as is St John's Point to Doorin Point. These stocks of herring can be found throughout the whole of Donegal Bay and at various times of the year. During the winter months, shoals of herring come right to the shore especially where fresh water enters the sea.

- Sprat (*Sprattus sprattus*)

Sprat is another species which come inshore during the winter period. They come so far inshore that they have been traditionally fished in Inver Bay in depths of a meter and less. Although Sprat have been caught in recent years in the vicinity of Carrigan Head they are mostly found right up into the river estuaries of the Eany Water which flows into Inver Bay, and from the back of Doorin Point and into Mountcharles, where the River Eske Estuary flows out from Donegal town. There have been shoals of sprat caught off Tullan Strand at the mouth of the Erne as well as close to the shore at Bundoran.

### **C3.5.2. Whitefish Fisheries**

There has been a decline in whitefish stocks throughout Donegal Bay over the past number of years, which is similar to experiences within other bays along the Western Seaboard. Stock Management Plans together with Technical Conservation Measures are being implemented nationally in an effort to reverse this situation. Within the Bay fishermen are adopting these new regimes so as to enhance the whitefish stocks.

The varying types of whitefish that have been traditionally caught in the Bay are Cod (*Gadus morhua*), Haddock (*Melanogrammus aeglefinus*), Whiting (*Merlangius merlangius*), Pollack (*Pollachius pollachius*), Plaice (*Pleuronectus platessa*), Monkfish (*Lophius piscatorius*), Black Sole (*Solea solea*), Lemon Sole (*Microstomus kitt*), Turbot (*Scophthalmus maximus*), and many other less abundant species. Within the past two years large Blue Fin Tuna have been caught by the Pelagic Vessels working within the Bay. Recently a Blue Fin Tuna weighing almost 1000lbs was caught by a Killybegs Fisherman on rod and line.

Most Whitefish species have been either trawled or seine netted on the vast areas of sandy ground that exist within the Bay. Although there are parts of the sea bed of Donegal Bay that are hard and rocky, for the most part it is flat coarse sand that makes up the sea bed.

There are a number of small trawlers, and seine netters, who operate within the Bay mostly on a daily basis. These operations are carried out throughout the year, with most of the produce of the Bay being landed in Killybegs for the fresh market.

### **C3.5.3. Crustacean Fisheries.**

The two main crustacean species that have been commercially fished within the bay are Lobster (*Homarus gammarus*) and Brown Crab (*Cancer pagarus*). Both Lobster and Crab are fished by numerous small vessels from a variety of ports from Bundoran right around to Carrick. This is a trap fishery. Lobster are mostly fished with individual pots in rocky outcrops along the shore line, while Brown Crab are fished along the edges of the hard ground with tows or strings of pots.

The introduction of V-notching under the PESCA scheme has led to an increase in stock levels of Lobster within the Bay, as it has done in other areas where the program has been adhered to. The principle of the V-notching scheme is to cut a V shaped mark into the tail of an egg bearing female lobster and return it to the sea to encourage recruitment to the stock. The scheme subsidised the fishermen for the commercial loss incurred due to the female-berried lobster being put back into the Bay. Other regulatory practices were introduced, such as a minimum size for lobsters sold to market have led to the recovery of this stock. Other regions are presently considering a maximum allowable size for marketable lobster. Under this scheme both male and female lobsters above a recommended size could be V-notched and returned to the sea with the intent of building up a brood stock. This would compliment the already emerging juvenile stock due to the V-notching scheme. It is hoped that such an initiative can be adopted by the users of this resource within Donegal Bay

Stocks of brown crab within the bay are continually being assessed by the Fishermen in conjunction with Scientists and the State Agencies. Brown Crab has become a very important fishery within the whole of County Donegal, and its managed sustainability is paramount to this emerging fishery.

Prawns also exist in the upper part of the Bay and have been fished from St Johns Point up to Bundoran on a commercial basis.

#### **C3.5.4. Other Fisheries**

Other fishing activities have emerged within Donegal Bay recently such as jigging for Squid (*Loligo vulgaris*), which has taken place within the vicinity of St Johns Point. This is a high value low volume fishery which has been carried out by small vessels from Killybegs and the surrounding area.

There is potential that pink shrimp (*Crangon crangon*) which exist in inshore areas of other bays along the western seaboard could become a viable fishery. Experience in other areas has shown that this stock can be quickly overexploited and would need stringent management plans prior to its development.

The emergence of blue fin tuna (*Thunnus thynnus*) within Donegal Bay may be developed both commercially and has the potential to become a huge attraction as a big game fishery.

#### **C3.5.5 Overview**

Donegal Bay's history shows that it is prolific in the production of all kinds of marine life. The economy of the county is highly dependent on the continuance of managed fisheries stocks that can be taken from Donegal Bay. Within the pelagic species alone which can be valued in millions of euro's, there is a high dependence on the quality of the seawater and the aquatic systems that feed into the Bay. Herring and sprat, which seem to seek those parts of the Bay where fresh water enters the sea must be most vulnerable to any deterioration with the quality of water entering the sea.

The pristine waters of the Bay have the potential for whitefish management regimes to be put in place, so as to encourage the rejuvenation of its whitefish stocks.

Lobster are starting to show an increase in their stock levels due to the management regimes that have been in place over the past few years, along with the fact that their environment is of the highest quality.

## **C4. Donegal Bay Tourism and Recreation**

### **C4.1 Introduction to Donegal Tourism**

The end of the last century saw a concerted boost to tourism in Donegal with active promotion and development. A three-year brand marketing campaign by Donegal Tourism Ltd. investing in excess of £1,000,000 to promote the many tourism products of County Donegal formally came to an end in December 2000. The main drivers behind Donegal Tourism Ltd. are Donegal County Council, North West Tourism, Donegal County Tourism Committee, & Gael Saoire (Údaras na Gaeltacht). These organisations are working together within the context of the new County Development Board, which is supported by the Community & Enterprise Unit of Donegal County Council. The varied members of this committee are named over.

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## Donegal Tourism Members 2001

Clr. Noel Mc Ginley	McGinley Motors, Pearse Road, Letterkenny.
Clr. Sean McEniff	Derlua, Church Road, Bundoran.
Mr. Michael McLoone	County Manager, Donegal County Council.
Mr. Denis Doyle	Tourism Officer, North West Tourism.
Clr. Ciaran Brogan	43 Manor View, Letterkenny.
Clr. Brianie McEniff	The Ross, Bundoran.
Clr. Peter McLaughlin	Main Street, Buncrana.
Ms. Mai Kelly	West Rock, Ballyshannon.
Mr. Patsy Doherty	Lake of Shadows, Buncrana.
Mrs. Margaret Maguire	Hillcrest House, Lurgybrack, Letterkenny.
Mrs. Rosemary Crawford	Gleann Oir, Ards, Ramelton.
Mr. Colm Doherty	Magheradrummond, Milford.
Mr. Sean O'Connell	Atlantic Apartotel, Bundoran.
Mr. James Lafferty	Faugher, Port Na Blagh, Letterkenny.
Mr. John Sweeny	Sweeny's White Horse Bar, Ballyshannon.
Clr. Terry McEniff	Mount Errigal Hotel, Ballyraine, Letterkenny
Mr. Barney McLaughlin	Erne Enterprise Development, Belleek Road, Ballyshannon.
Ms. Siobháin NicGrianana	Udarás Na Gaeltachta, Na Doire Beaga, Leitir Ceanainn.
Mr. Conor Daly	Tourism Development Unit, Donegal County Council.

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A recently formed Tourism Development Unit is part of the new Community & Enterprise Section of Donegal County Council, which provides executive support to the County Development Board. The purpose of the Tourism Development Unit is to develop and implement an agreed Tourism Strategy for Donegal, which will integrate product development with market demands, while also matching the needs of the tourism industry with the interests of the local communities within Donegal as a whole (REF 1).

General economic indications show that the tourist industry is now a significant contributor to the country's GNP and that by the middle of the first decade of this new millennium, jobs in this sector will surpass the number of jobs in agriculture in Ireland. Tourism to the northwest region and to County Donegal has increased significantly since 1990. Between 1995 and 1999, the total tourism revenue created in the region increased by 33%. Figures from 1999 of the origin of the tourists to the region are described in Table C4.1 while Table C4.2 highlights the seasonality of the tourism market in the northwest. County Donegal is the principal destination for visitors to the northwest and the increase at regional level are reflected in the tourist flows in the County.

	Number Of Tourists (000's)	Tourism Revenue (IR£m)
Britain	326	72.4
Mainland Europe	125	18.9
North America	131	18.9
Other Areas	31	2.7
Domestic Tourism	638	85.8
Northern Ireland	200	27.9
<b>Total</b>	<b>1,451</b>	<b>226.6</b>

**Table C4.1. Tourism figures and generated revenues for the year 1999 (Ref.3).**

Month	Total (%)	Britain (%)	M Europe (%)	N America (%)	Other (%)
Jan – March	11	13	7	13	6
April	8	9	9	6	4
May	13	12	11	14	31
June	12	11	15	10	7
July	15	11	21	13	20
August	16	14	20	15	12
September	11	11	6	14	9
Oct - Dec	15	19	9	13	12

**Table C4.2. Seasonality of tourists arriving in the northwestern region in 1999 (Ref.3).**

## **C4.2 Marine Tourism**

The long coastline, the sheltered coves, lakes and excellent blue flag beaches of Donegal Bay are ideal for enthusiasts of all types of water sports. There are four Blue Flag beaches within Donegal Bay at Bundoran, Rosstown, Murvagh and Fintragh, all of which are tested on a regular basis during the summer and faecal coliform counts for all are regularly well below the EU limits. The water quality testing of the Blue Flag beaches in the bay has been taken over by the County Council and they report on water quality during the summer season. None of these beaches has had any significant breaches of water quality levels. Water quality is a paramount consideration for tourism and the status of beaches in the Donegal Bay catchment is likely to have an impact on the numbers of tourists visiting the Town.

**County Donegal has the potential to greatly expand the economic importance of water-based tourism and the Marine Institute has prepared a framework report for the development of the sector in the county. This was published in December 1999 and set eight development objectives as follows:**

1. Appoint a co-ordinator and advisory forum.
2. Develop leisure products and improve access to the resource for locals and visitors.
3. Promote water leisure/tourism and codes of best practice, e.g. dissemination of information to visitors and tourism service providers on activities/accepted practice/rules/prices etc.
4. Conserve the natural resource through coastal zone management initiatives and preservation programmes for fish stocks.
5. Develop overseas-marketing and promotion of the Donegal product.
6. Develop new infrastructure and encourage best practice in co-ordinated management of quays, piers and slip ways to avoid conflict among user groups.
7. Develop training packages for marine/water leisure providers to improve the quality of services to the customer.
8. Develop a county database on number, origin, behaviour and attitude of participants (to inform management priorities in the future).

These objectives were identified at meetings and seminars hosted by the Marine Institute to seek the views of a wide cross-section of people in the marine/water leisure sector. A co-ordinator was appointed in January 2001 (Kevin O'Connor) and is based in the County Development Board offices at Lifford. The appointment is sponsored by Donegal County Council, Udaras na Gaeltachta, the Regional Fisheries Board, North West Tourism and the Marine Institute.

#### **C4.2.1 Diving**

The northwest area as a whole is considered by sub-aqua enthusiasts to be one of the most interesting in Ireland. There are a wide range of popular dive sites along the Donegal Bay coastline including:

St John's Point  
Rathlin O'Beirne  
Glencolumbcille  
Fintragh Bay  
Teelin

The only known commercial diving operation catering for the Donegal Bay region is the Glencolumbcille Adventure Centre which attracts substantial numbers of diving visitors per year including both Irish divers and visitors from England, Wales and Germany. The key to the success of the centre is its location close to a good diving area, drying facilities and appropriate parking, qualified instruction and compressor facilities (REF 5).

There are plans to incorporate diving facilities, including a compressor, in the proposed boat house and yard complex which is currently being designed by Creevy Co operative Society. There will also be a Dive Training Centre in the Lakeside, Ballyshannon (REF 3).

#### **C4.2.2 Sailing**

There are three main categories of sailor in the Donegal Bay area: those who keep their keel boats on moorings or on the few pontoons; those who stop off at moorings or anchorage's as part of a cruising holiday on the Irish west coast; and those who use dinghies in the more sheltered waters of the various inlets.

To date there have been few infrastructural developments to facilitate sailing within the catchment, though some are in the planning stages including a large marina proposal for Bundoran and a proposal to develop marina facilities at Ballyshannon on the Erne Estuary. Pontoons have also been proposed for Killybegs and Donegal Town. Facilities fall considerably behind those now available on the south and south west coast of Ireland where there are larger numbers of both local and visiting yachts. Apart from round-Ireland and long distance sailors, the market for keel boat sailing in Donegal Bay is the boats on the Clyde and other parts of the west coast of Scotland. The area is not, currently, actively promoted to this market (REF 3).

Information about sailing the coast of Donegal is contained in various almanacs and most effectively in the Irish Cruising Club Sailing Directory. Whilst there are many small harbours in Donegal few are suitable for yachts, either because of the priority placed on commercial fishing, or because the harbours dry or are shallow at low tide, necessitating anchoring or mooring nearby.

The national moorings scheme promoted by Bord Fáilte and the Marine Institute has led to the placing of moorings at a number of sheltered locations around the Donegal coastline to facilitate visiting yachts. Within the catchment, only Teelin Bay was included in this scheme.

With no dedicated club, sailing dinghies tend to be launched and sailed sporadically wherever there is sheltered water and a suitable slipway.

### **C4.2.3 Sea and River Kayaking and Canoeing**

The Donegal coastline as a whole is suitable for sea kayaking. To date it has been relatively lightly used and only by a few enthusiasts. This picture is set to change as the attractions of sea kayaking on the West Coast and in Donegal appears in British canoeing magazines. A number of businesses further South of Donegal are attracting North American tourists on sea kayaking trips (REF 3).

River kayaking in Donegal is primarily a winter activity taking place from October to April because it is normally dependent on heavier flows of water to make rivers passable and interesting. River kayaking within Donegal Bay is less popular due to the rivers not being suitable.

### **C4.2.4 Surfing**

Surfing is possible at many Donegal beaches due to the regular relatively large surf and it is a widely practiced casual and organised activity. The key locations in the county for surfing are considered to be Rossnowlagh and Bundoran where there are competition Surf clubs and particularly reliable Surf. The Irish Surfing Association is participating in the development of a water safety centre at Ballyshannon, which is intended to become an important coaching, and development base for the sport.

The organisations, which provide surfing or surfing services within Donegal Bay, are:

- Bundoran Surf School - a commercial surf school, of a national standard;
- Bundoran Surf Club;
- Rossnowlagh Surf Club- the biggest in the country with 200+ members;
- Bundoran - Fitzgeralds Surf World - Donegal Surf. Co.;
- Rossnowlagh Surf School and Fitzgerald's Surf World.

### **C4.3 Marine Eco-Tourism**

Whilst Donegal has no specific advertised wildlife watching trips it does have boat trips which seek to ensure that their visitors see interesting wildlife, such as dolphins and seals. Most angling boats take occasional wildlife trips, according to demand, and there is interest in the development of a number of dedicated boats and wildlife itineraries. Dolphins occasionally appear in Donegal Bay and may stay for up to a month. Seals are quite common and there is a colony in Donegal Bay, which is reported by Dúchas to be dwindling in numbers as a result of the disturbance caused by the boat trips (Ref. 6).

A waterbus operates from Donegal town pier providing a cruise within the bay, often visiting a seal colony as part of the trip. The waterbus operates from the beginning of June to the end of September but may cease operation earlier if there is little or no demand, poor weather, or because of the tides.

The Tourist Information Office in Donegal Town has a list of 16 deep sea angling boats/boat operators who may charter boats for general trips, deep sea angling, diving or wildlife watching. Dolphins are present in Donegal Bay on a regular basis all year round (see Section C5) but are most easily spotted in Summer. However, there are few boats, which are licensed by the Department of the Marine and Natural Resources. Since licensed boats are the only boats, which can be promoted to tourists and visitors by North West Tourism and Bord Fáilte, the potential to promote Donegal for boat trips is currently limited.

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## C4.4 Donegal Bay Sport Fisheries

### C4.4.1 Game Angling

Due to a variety of dedicated development schemes by the Northern Regional Fisheries Board, the salmon and sea trout river fishing has gradually improved over the last few years within Donegal Bay. The most current and far reaching development proposal is included in Appendix C1.

In addition to the natural brown trout fishing, a considerable number of lakes in Donegal can hold a good stock of salmon and sea trout making for some exciting and varied fishing for the visitor angler.

A state licence is necessary for salmon angling and tagging of all rod landed salmon has now been introduced. In addition to the licence, you will normally need a permit, which can usually be had from the Northern Regional Fisheries Board, local clubs and tackle dealers (Ref. 6).

Game angling in the Donegal Bay area is mainly focused on inland salmon and sea trout fisheries. Local awareness and appreciation of the fisheries has increased in recent years, and a promotional brochure has been produced by local enterprises. The key locations for game fishing, or those of greatest acclaim, can be subdivided into four categories:

#### (1.) Salmon rivers

River Drowes, Lareen Private Fishery (Donegal/Leitrim)

***River Eske, Donegal Town, Regional Fisheries Board***

River Eany, Frosses, Regional Fisheries Board;

River Glen, Carrick, permit from Slieve League Angling Association;

#### (2.) Salmon Lakes

***Lough Melvin, Kinlough, discharges to Donegal Bay***

Lough Eske, Donegal Town, Regional Fisheries Board

#### (3.) Sea Trout Rivers and Lakes

Erne Estuary, Ballyshannon, Regional Fisheries Board

River and Lough Eske, Donegal Town, Regional Fisheries Board

River Eany, Frosses, Regional Fisheries Board;

River Glen, Carrick, permit from Slieve League Angling Association;

#### (4.) Major Brown Trout Lakes

Lough Melvin, (also ferox and gillaroo trout), Lareen Fishery, Kinlough, - discharges to sea at Donegal Bay

Lough Derg, local permit Pettigo Angling Association

Also a large number of isolated hill loughs – very good wild trout but requires a guide, enquire with Regional Fisheries Board.

For the above named rivers, some open as early as January 1st to avail of the early run of 'spring salmon'. Grilse run from June to September. The main run of sea trout is from June to August. These are but a few of the better known game angling destinations within the Donegal Bay catchment. There are literally hundreds of rarely fished mountain lakes and quiet river stretches in the region which obviously could not be included (Ref. 5).

Day to day management of the Donegal angling waters, and issue of permits and licences, is carried out by a wide variety of clubs, fishery owners and government agencies as indicated above. Increased access for visitors to fisheries is being encouraged through making more permits available to visitors, and through a process of identification of fishing rights on some stretches. The NRFB has discovered ownership of a number of rivers and is making visitor permits available (Ref. 3).

A marine and countryside guides programme (for training game, coarse and sea angling guides) has been developed with CERT and the Marine Institute and has been delivered in Killybegs and Fermanagh. The programme was well received and there is demand from some Clubs for another Donegal-based programme to be run. This can only be of benefit to the game angling within the Donegal Bay catchment. North West Tourism is prepared to support the development of improved promotion of fishing packages to Donegal following improvement of the product. This will depend on the accessibility of permits, appropriate accommodation and ghillies/guides, and on quality catchment management to ensure the reliability of fishing (Ref. 3).

## C4.4.2 Sea Angling

The remote, rugged coastline of Donegal Bay is simply teeming with opportunities for the dedicated sea angler. The area holds phenomenal stocks of varied cold water species and during the summer warmer water species such as blue shark, tope and bass visit the shores. The Bay also holds the European record for blue fin tuna caught on rod & line (980lbs in October 2001). Fishing is possible from purpose-built sea angling boats, from small boats and from the shoreline. Fishing can be carried out almost anywhere from the Donegal shores, though Atlantic swells restrict the number of suitable boat days in the less sheltered areas.

Good shore fishing is available around much of the coastline from both the bays and rocky shoreline, with a variety of species at each site. Whilst access to most bays is easily gained from nearby roads and paths, this is not always the case at headlands, and can necessitate a difficult shoreline walk or farmland crossing. Wreck angling is popular and there are numerous wreck sites, which offer good fishing. However, more specialist licensed boats fitted out for this activity and for tuna fishing are needed.

The current Bord Failte Anglers Guide lists four licensed sea angling boat operators in Donegal Bay, three are based in Killybegs and one in Teelin Harbour. These boats are operated by experienced skippers and each can cater for up to 12 anglers. Angling equipment can usually be hired on board. These boats are 10 to 15 metres long and come well equipped with modern fish-finding equipment. An additional two boats operate from Donegal Town. All boats offer shark, bottom and wreck fishing. In value terms, this is estimated to be worth in excess of £130,000 per annum (Ref. 5).

Sea angling is available all year round with the exception of bass, which is subject to a closed season from 15th May to 15th June. The NRFB has responsibility for the conservation and development of sea angling.

Clubs based around the coast organise various events, which cater for their own members and for visitors. Examples include: -

Killybegs Festival, on the second weekend in August, organised by Killybegs Sea Angling Club;

Ballyshannon Sea Angling Festival, in the first weekend in September, hosted by Ballyshannon Sea Angling Club.

North West Tourism will, understandably, only promote licensed boats in its publications; hence sea angling in Donegal seems to have a lower profile than in other regional brochures. North West Tourism staff have met with sea angling boat operators and the Dept of the Marine and Natural Resources to try

to ensure that local boats are assisted, where possible, in achieving licensing requirements (Ref. 6).

#### **C4.5 Maritime Heritage**

The marine and inland waters natural heritage aspect of Donegal is less well interpreted than any other aspect, even though some 80% of the coastline is subject to nature conservation designations. In 1996 the Marine Institute and CERT developed a professional training course for businesses wishing to provide activity holidays for potential clients. The first six-month programme commenced in October 1997 and focused on the training of game angling guides and pike course angling guides. A number of Donegal participants have completed this professional training course (REF 3). There is now a range of Interpretative Centres and Maritime Museums throughout the Donegal Bay area. These include:

Folk Village Museum, Glencolumbkille;  
Donegal Historical Society Museum, at the Franciscan Friary near  
Rossnowlagh;  
Ballyshannon Interpretative Centre and Waterwheels,

These centres add significantly to the coastal visitor attractions and often provide necessary opportunities to purchase gifts, buy refreshments, and to find in depth information about the area.

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## **C4.6 Hiking**

The main hiking route within the Donegal Bay catchment is the Bluestack Way. This is a fully waymarked long-distance walk through the Bluestack mountains reaching to the shores of the Atlantic Ocean. The route is 142 Kilometres long and has local link routes from towns and villages where accommodation and entertainment are available. The Bluestack Mountains are a rugged mountain range with peaks in excess of 600m and in parts is quite remote. The Waymarked Way has been designed to traverse these mountains using existing roadways, paths and tracks to lead the walker through the mountains in a safe and sustainable way. Most of the route is below 300m and the upland sections are on existing tracks with alternative routes in the event of inclement weather (Ref. 5).

## **C4.7 Waterside and Coastal Walking**

County Donegal, with the second longest coastline of the counties in Ireland, offers visitors ample opportunities for coastal walking. However, within the Donegal Bay catchment there are few river walks, though there is rich potential for this activity.

Walking is currently a popular local development-group activity and is being actively developed and promoted at present by Údarás na Gaeltachta and Donegal County Council. Coastal walking and climbing are often possible when weather is poor in the hills. This option can make an area attractive as an activity destination for visitors. There is a strategic approach to routes and a Donegal 'house-style' for route way-marking and promotion has been developed. Advertised coastal routes include:

- Glencolmbkille area;
- Cliff walks at Bundoran;
- 6 mile coastal and cliff walk from near Rossnowlagh to the abbey near Ballyshannon;
- Carrick and Kilcar walks Lip Slieve League.
- Beach walks at Rossnowlagh.

The following walks lead along inland waters:

Town trails, some of which provide waterside walks, are developed and signed in Ballyshannon and Donegal Town.

## **C4.8 Equestrian Centres**

Riding instruction within the Donegal Bay catchment area is available at three Association of Irish Riding Establishments e approved equestrian centres. These recognised centres offer the visitor the opportunity to safely develop their horse riding skills in a relaxed holiday atmosphere (Ref. 6). These centres are located in;

Castleview, Loughros Point, Ardara,  
Deanes Open Farm, Darney, Bruckless,  
Homefield Equestrian Centre, Bundoran.

## **C4.9 Golf**

Donegal Bay has two of the county's finest golf courses in Murvagh and Bundoran. Murvagh has a spectacular 18 hole links course of 6,867 yards (one of the longest in Europe) winding its way through splendid sandhills testing even the most skilled player (Ref. 6). Bundoran's 18-hole championship course is a fine coastal course, which annually hosts two International Competitions and a Summer Open. This 5,599 metre par-69 course winds along the coastline and returns inland to give a mix of holes that provides a test to golfers of all abilities (Ref. 5).

## **C4.10 Creative Arts and Crafts**

While home based arts and crafts are to be found scattered throughout the remotest corners of the Donegal Bay catchment area, the main centre is the Donegal Craft Village in Donegal Town. The ongoing attraction with this centre is the opportunity to meet directly with the various artists at work and to view the individual displays of their finished pieces, exclusively for sale in the Village (Ref. 5). Traditional music instruments, paintings, stone sculptures and iron works are all hand produced in this unique centre.

## **C4.11 Donegal Town**

The main heritage town in the County is Donegal Town which lies at the centre of the Donegal Bay catchment and is discussed in this section. A synopsis of tourism in the other key towns and villages within the catchment area is included in Appendix C2.

The Office of Public Works (OPW) closed Donegal Castle in 1991 to carry out extensive refurbishment work. During the tourist season of 1991, there were 16,512 visitors to the Castle. The restoration and refurbishment works were completed and the Castle was re-opened in June of 1996. In the short period from June 1996 to September of that year the Castle received a total of 30,569 visitors. This dramatic increase in the number of visitors to the Castle represents a substantial increase in the number of visitors to the Castle and is indicative of the overall increase in the number of tourists to the town and surrounding Donegal Bay catchment.

In the Donegal Town Development Plan for the period 1993-1998 one of the implicit objectives was the further development of the town as a tourist destination. A number of specific objectives, including the development of a tourist trail or walkway along an axis running between the town's historic landmarks, the castle and the Franciscan Friary via the Quay Street area, and the upgrading of the Bank Walk have been included in the development strategy. These objectives have been met during the period of the Plan. Other objectives such as the provision of extra car spaces, street widening and the maintenance of original shop facades all combine to add an aesthetic value to the town thereby encouraging tourism.

A project, which was recently granted planning permission, will be the most significant private development in the tourism sector in County Donegal for many years. The planned development on Lough Eske (3 miles outside Donegal town) involves the development of a 60-bed hotel with conference and leisure facilities, self-catering units, and apartment block and tourist amenities

## **C4.12 References**

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## **C5 Nature Conservation**

### **C5.1 General**

The natural heritage is an integral part of our national inheritance. It forms part of our sense of identity and provides us with resources of social, educational, recreational and aesthetic value.

Nature conservation in the Donegal Bay catchment is an essential element in the protection of the natural environment. In particular the aim is to conserve remaining natural habitats, native plant and animal species and communities and to maintain biodiversity.

The traditional wetlands, particularly peat bogs and naturally poorly drained land are under threat. Some are used as tip sites for rubbish, others are exploited for peat or drained to provide productive farmland.

Nature conservation is the responsibility of central government in the Department of Art, Heritage, the Gaeltacht and the Islands. The Environmental Protection Agency also has an important role in environmental protection.

### **C5.2 Duchas**

Duchas, the Heritage Service of the Department of Art, Heritage, Gaeltacht and the Islands manages the Department's responsibilities under National and European law for the protection, conservation, management and presentation of Ireland's natural and built heritage. The National Parks and Wildlife Division of Duchas is the section specifically responsible for our natural heritage.

#### **C5.2.1 National Parks and Wildlife Division**

The National Parks and Wildlife Division is charged with the conservation of a range of ecosystems and populations of flora and fauna in Ireland. The Division is responsible for the implementation of a large body of legislation both domestic (Wildlife Acts) and international (EU Habitats and Birds Directives) and for the management and development of National Parks and Nature Reserves. The Division also oversees the issuing of licences under the Convention on International Trade in Endangered Species and the Wildlife Acts.

The Development Applications Section of Duchas provides an important service in relation to the assessment of the impact of proposed developments on the built and natural heritage. A particular responsibility of this Division is the designation and protection of Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs). Consultation with interested parties is an integral element of the performance of these activities.

Duchas defines the role of their National Parks and Wildlife Division as:

- ◆ To secure the conservation of a representative range of ecosystems and maintain and enhance populations of flora and fauna in Ireland,
- ◆ To implement the Wildlife Act, 1976, the Wildlife (Amendment) Act, 2000, and to implement the provisions of the EU Habitats Directive and Birds Directive,
- ◆ To designate and protect Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs), having particular regard to the need to consult with interested parties,
- ◆ To make the necessary arrangements for the implementation of EU legislation and policies and for the ratification and implementation of the range of international Conventions and Agreements relating to the natural heritage, and
- ◆ To manage, maintain and develop National Parks and Reserves.

### **C5.3 Natural Heritage Management**

A number of regional managers have responsibility for a particular section of the country. The Northern regional manager, based in Glenveagh National Park, is responsible for:

- ◆ Implementation and enforcement of the Wildlife Act (1976) and the Wildlife Amendment Act (2,000), the Whale Fisheries Acts and the Regulations which bring the Habitats and Birds Directives into force.
- ◆ Management the state owned nature reserves and national parks.
- ◆ Protection of Special Protection Areas for birds, Special Areas of Conservation and Natural Heritage Areas.
- ◆ Advice to planning authorities on the impacts of development applications.
- ◆ Participation in research and survey projects by collecting data within their areas.
- ◆ Provision of an education and advisory service to the public.

National Parks and Wildlife have a nation-wide network of field staff. In the Northern region there are currently 10 Conservation rangers spread over County Donegal, including those who are based in the National Park at Glenveagh. These Conservation Rangers are organised into ten Districts, run by the District Conservation Officer. The entire regional staff works to a Director in the Dublin headquarters.

### **C5.3.1 Parks and Reserves Section**

The Parks and Reserves Section is responsible for administration of lands acquired by the State for nature conservation purposes, i.e. National Parks, Nature Reserves and other, as yet undesignated, properties acquired for nature conservation purposes, This involves :

- ◆ The designation of Nature Reserves under the Wildlife (Amendment) Act, 2000, by preparing Statutory Instruments and supporting documentation.
- ◆ Developing proposals for the provision of visitor facilities in co-operation with Education and Visitor Services division.
- ◆ Managing and monitoring expenditure of approved ERDF/ Structural Fund and NDP funded projects.
- ◆ Arranging contracts for works, supplies and services in NPW properties.
- ◆ Administration, control and regulation of concessions/licenses including restaurants, boating, pony trekking, filming etc. in NPW properties.
- ◆ Handling of personal injury and other claims made by the public. Investigating enquiries from the Office of the Ombudsman, Freedom of Information Act requests pertaining to National Parks & Nature Reserves, etc.
- ◆ Establishment of National Park Liaison Committees
- ◆ Co-ordinating Dúchas response to development applications affecting NPW property, e.g. Glen of the Downs Dual Carriageway, the Kildare Bypass Road, etc.
- ◆ Dealing with NPW property issues relating to boundary disputes, trespass on State property, etc.

## C5.4 National Parks

There are six National Parks in Ireland. These are:

Park Present Area (Approx.)

Killarney National Park, Co. Kerry (10,289 ha)

Glenveagh National Park, Co. Donegal (16,548ha)

Connemara National Park, Co. Galway (2,957 ha)

Wicklow Mountains National Park, Co. Wicklow (15,917 ha)

The Burren National Park, Co. Clare (1,673 ha)

The National Park in North-West Mayo, Co. Mayo (11,837 ha)

\*An official title will be given shortly to the National Park in North-West Mayo, Co. Mayo.

In 1969, the International Union for the Conservation of Nature (IUCN) recommended that all governments agree to reserve the term 'National Park' to areas sharing the following characteristics:

1. Where one or several ecosystems are not materially altered by human exploitation and occupation; where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contain a natural landscape of great beauty;
2. Where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment;
3. Where visitors are allowed to enter, under special conditions, for inspirational, educational, cultural and recreational purposes.

It is the policy of the Department of Arts, Heritage, Gaeltacht and the Islands, endorsed by successive governments, to abide by the criteria and standards for the National Parks laid down by the IUCN.

## C5.5 Natural Heritage Areas (NHAs)

Natural Heritage Areas (NHAs) are the national framework to provide for protected areas in Ireland. All other nature conservation designations overlap with NHAs. Until recently, there were no formal legal means for designation of NHAs. The process of designation will take place over several years. Existing protective measures include the use of planning legislation to prevent certain damaging activities, refusal of State/EU grants for damaging activities, and financial incentives for environmentally sound farming. Details of proposed NHAs are supplied to all planning authorities, who normally take them into account in considering developments (although there is currently obligation on them to do so). However, developments which are exempt from planning cannot be controlled, except, in some cases, indirectly through the refusal of grants or provision of incentives.

The NHA network is the result of ecological surveys extending from the late 1960's through to the 1990's. The NHA system evolved from the previous Areas of Scientific Interest (ASI) system. ASIs were first surveyed and mapped in the 1970's and by 1989 almost 1,500 ASIs were mapped and listed. The changeover to NHAs included a major re-survey from 1992 to 1994 of over 80% of listed sites. Currently there are over 1,100 individual proposed NHAs. However, many are proposed SAC's or SPA's. 802 sites, covering approximately 113,000ha, are proposed for NHA status only. Table C5.1 describes the NHA's within the Donegal Bay catchment. These are described in full in Appendix C3 and identified in Map 18.

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Site Name	Site code	Area (m2)	Perimeter (m)
NO CLASS	181	156.2192	56.06
ERNE ESTUARY/FINNER DUNES	139	9493978	20046.15
CARRICKNAHORNA LOUGH & LOUGH GORMAN	2068	417781.5	3686.07
NO CLASS		68959.95	1206.03
NO CLASS		136275.4	1924.72
LOUGH FAD BOG	1159	2705252	8142.02
NO CLASS		107520.3	2323.56
DONEGAL BAY (MURVAGH)	133	18100996	55651.08
COGUSH BOG	1938	11610678	23097.14
MEENYBRADDAN BOG	1177	433801.2	2766.74
NO CLASS		149889.9	1877.65
CARRICKNAHORNA LOUGH & LOUGH GORMAN	2068	338046.8	4190.79
CARRICKNAHORNA LOUGH & LOUGH GORMAN	2068	86881.58	1168.72
NO CLASS		198014.4	2845.96
NO CLASS		9813.404	527
NO CLASS		244973.6	1933.59
NO CLASS		542860.1	4724.74
CROWDOO BOG	1878	7364264	23116.4
NO CLASS		38194.6	1045.65
LOUGH FAD BOG	1159	515394.1	3306.8

**Table C5.1. NHA's within the Donegal Bay Catchment. 'No Class' denotes where an area falls within a previously designated region.**

The Wildlife Amendment Act (2000) contains provisions for designation of NHAs, including requirements for notification of landowners and means for objection to proposed designations.

A large but unquantified proportion of Ireland's biodiversity is estimated to lie within the NHA network. NHAs cover sites of national or higher importance for wildlife, and also geological interest. NHAs include peatlands, native woodlands, grasslands, wetlands, rivers, lakes, machair, limestone pavement, islands, cliffs and estuaries.

The Geological Survey is preparing a list of geological/geomorphological NHAs. The first proposals for karst areas and very early fossil sites, will be published

## **C5.6 SACs AND SPAs**

In 1992 the Council of the European Communities adopted the Habitats Directive, on the conservation of natural and semi-natural habitats and species of flora and fauna. The Directive seeks to establish "Natura 2000", a network of protected areas throughout the European Community. It is the responsibility of each member state to designate Special Areas of Conservation (SACs) to protect habitats and species, which, together with the Special Protection Areas (SPAs) designated under the 1979 Birds Directive, form Natura 2000.

In the Habitats Directive, there is a list of habitats requiring conservation measures. The list, which is called Annex I, includes priority habitats, which require particular attention. Priority Irish habitats include raised bogs, active blanket bogs, turloughs and machair. Other Annex I habitats include heaths, lakes and woodlands among others. There is also a list of species which must be afforded protection and for Ireland this includes the Bottle-Nosed Dolphin, Otter, Freshwater Pearl Mussel and Killarney Fern. The list of species is called Annex II list.

The Habitats Directive was transposed into national legislation by the European Union (Natural Habitats) Regulations, 1997, which include the following points:

- ◆ The Minister for AHGI must propose a list of SACs for designation.
- ◆ Landowners should be notified of designation, and the Minister must make all reasonable efforts to do so.
- ◆ Landowners may appeal the designation of lands on scientific grounds.
- ◆ Landowners will be compensated for actual loss of income arising from designation.
- ◆ The Minister must prepare lists of "Notifiable Actions" for different habitats, which should be sent to known landowners and users. Any actions in the lists can be carried out only with prior agreement of the Minister.
- ◆ A person who illegally damages a site may be prosecuted or required to repair damage.
- ◆ The Minister must transmit information on SACs to the European Commission for consideration.
- ◆ Following agreement by the Commission, the Minister will formally designate the sites as SACs.
- ◆ Sites are legally protected once they are publicly advertised.

The Birds Directive came into force in 1979 and it requires each member state to designate "Special Protection Areas" for birds. The Directive contains annexes which are lists of birds which require particular conservation measures (Annex I), and also species which may be hunted, and species which may be sold. Annex I species include Whooper Swan, Greenland White-fronted Goose, Peregrine Falcon, Corncrake and Terns. Member states are also required to protect sites which are important for migratory species such as ducks, geese and waders.

The EU Natural Habitats Regulations, 1997, also cover the Birds Directive.

There are 19 SAC's and 3 SPA's within the Donegal Bay Catchment as described in Tables C5.2 and C5.3 respectively. These are identified in Map 19.

<b>Site Name</b>	<b>Site code</b>	<b>Area (m2)</b>	<b>Perimeter (m)</b>
SLIEVE TOOEY/TORMORE ISLAND/LOUGHROS BAY	190	93599238	137585.4
OWENDOO & CLOGHERVADDY BOGS	2046	11917393	22679.1
LOUGH EASKE & ARDNAMONA WOOD	163	5358947	18537.06
LOUGH UNNA/LOUGH UNSHAGH BOGS	167	9903522	19593.55
ST. JOHN'S POINT	191	2284578	30466.22
DURNESH LOUGH	138	3121179	22307.88
BALLINTRA	115	689410.3	4457.71
LOUGH GOLAGH & BREEZY HILL	2164	1231152	8954.55
TAMUR BOG	1992	431912.9	4507.88
TAMUR BOG	1992	1404253	7334.2
LOUGH MELVIN	428	38905.17	879.26
LOUGH NAGEAGE	2135	0	0
LOUGH MELVIN	428	417514.7	9760.05
TAMUR BOG	1992	13629572	45183.64
ST. JOHN'S POINT	191	49422.09	1036.43
SLIEVE LEAGUE	189	41731156	62198.88
MEENAGUSE/ARDBAN E BOG	172	8479309	22698.52
MEENAGUSE SCRAGH	1880	6256295	10807.15
DUNRAGH LOUGHS/PETTIGO PLATEAU	1125	20979721	33981.72

**Table C5.2. SAC's within the Donegal Bay Catchment.**

Site Name	Site code	Area (m2)	Perimeter (m)
PETTIGOE BOG	99	0	0
LOUGH NILLIAN BOG	165	18982723	32216.17
LOUGH NILLIAN BOG	165	11479494	25628.18

**Table C5.3. SPA's within the Donegal Bay catchment.**

## C5.7 Natural Heritage Policy

The protection of the natural, architectural and archeological heritage is an integral part of the Department's responsibilities, requiring coordinated effort in many areas. Through developing appropriate policies and legislation, Heritage Policy Division contributes to this task.

As well as working on policy documents and legislation, the Division also ensures heritage is taken into consideration by other Departments or bodies whose work may impact on the national heritage and provides advice on such matters.

The Heritage Council, an independent statutory body, is principally funded by the Department and this Division is responsible for the administration of those funds.

### General

- ◆ Finalising Heads of Bills for legislation before submission to parliamentary counsel for drafting on the natural, architectural and archaeological heritage.
- ◆ Advice on policy and legislative implications of certain cases and issues.
- ◆ Ensuring heritage input to legislation, programmes and policies of other Departments.

### Key Responsibilities

- ◆ To secure an appropriate legislative framework in respect of the conservation of a representative range of ecosystems and the maintenance of populations of flora and fauna in Ireland, having particular regard to the need to consult with interested parties;
- ◆ To make the necessary arrangements for the implementation of EU legislation and policies and for the ratification and implementation of the range of international Conventions and Agreements relating to the natural heritage;
- ◆ To assist policy formulation in relation to conservation of natural heritage including biodiversity and to co-ordinate the initiation of a programme of actions to conserve biodiversity;

## **Legislation/Regulations**

### *Existing*

Wildlife (Amendment) Act, 2000 was passed into law on 18th December 2000.

European Communities (Natural Habitats) Regulations, 1997

Heritage Act, 1995

### *In preparation*

Minister for Arts, Heritage, Gaeltacht and the Islands (Powers and Functions)

Bill (supplemental to the Minister for Arts, Heritage, Gaeltacht and the Islands (Powers and Functions) Act, 1998)

Ratification and/or implementation of other International Conventions and Agreements relating to the natural heritage are given in Table C5.4 below.

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<b>Title</b>	<b>Signed</b>	<b>Ratified</b>
Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention)	1979	1982
Convention on the Conservation of migratory Species of Wild Animals. (Bonn Convention)	1979	1983
Agreement on the Conservation of Bats in Europe (Bonn Convention)	1993	1995
Convention on Wetlands of International Importance (Ramsar Convention)	1971	1984
International Convention for the Regulation of Whaling	1946	1985
Convention on International Trade in Endangered Species (CITES) <a href="http://www.cites.org">www.cites.org</a>	1974	Following commencement of Wildlife (Amendment) Act, 2000
Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (Bonn Convention)	1996	Following commencement of Wildlife (Amendment) Act, 2000
International Tropical Timber Agreement	1996	Following commencement of Wildlife (Amendment) Act, 2000
Pan-European Biological and Landscape Diversity Strategy	-	Endorsed 1995

**Table C5.4. Ratification and/or implementation of other International Conventions and Agreements relating to the natural heritage.**

## **C5.8 Donegal Bay Birdlife**

In accordance with EC Bird Directive 79/409/EC Ireland is obliged to protect all wildbirds and their habitats. Those areas that warrant protection are categorised as SPA's within which steps must be taken to avoid any pollution, deterioration or excessive disturbance affecting the wildbirds.

The Donegal Bay catchment includes some of Ireland's key ornithological wetlands. In addition to its value as a wintering and breeding ground, its location in the north of Ireland renders it of value during migration. The number and significance of these species, and those of importance in an all Ireland context, are given in Table C5.5, while Table C5.6 details the key waterfowl observation stations. At present there is minimal adverse land use or disturbance to the bird populations, but the major threat of pollution from land or water-based activities is ever-present.

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Site	94-95	95-96	96-97	97-98	98-99	Mean	Intl. Threshold	Irish Threshold
Great Northern Diver	79	390	47	(9)	67	146	50	20
Mute Swan	109	98	136	(0)	61	101	2,400	100
Red-breasted Merganser	50	50	47	(0)	47	49	1,250	25
Light-bellied Brent Goose	184	197	96	(87)	309	197	200	
Common Scoter	0	662	1,073	1,063	1,496	859	16,000	120
Sanderling	28	100	70	(0)	49	62	1,000	40

**Table C5.5. Total number of waterfowl in Donegal Bay monitored through I WeBs.**

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Site	Grid Ref.
Inner Bay/Section 1: Revlin Pt.	G918775
Inner Bay/Section 10: Eddrim Estuary	G893770
Inner Bay/Section 2: MuckrosStrand	G920770
Inner Bay/Section 3: St. Ernans Isl.	G905759
Inner Bay/Section 4: Dungally Strand	G915758
Inner Bay/Section 5: Legacurry	G920745
Inner Bay/Section 6: Roughan	G925745
Inner Bay/Section 7: Mullanasole	G915738
Inner Bay/Section 8: Murvagh E	G905741
Inner Bay/Section 9: Murvagh NE	G905745
Outer Bay/Section 1: Doorin Pt. – Salthill Pier	G850740
Outer Bay/Section 2: Mountcharles	G885760
Outer Bay/Section 3: Murvagh	G892735
Outer Bay/Section 4: Rossnowlagh - Inishfad	G870700
Outer Bay/Section 5: Rossnowlagh	G850660

**Table C5.6. Key waterfowl observation stations within the Donegal Bay catchment.**

Birdwatch Ireland monitor the seabird colonies within Donegal Bay annually. Tables C5.7 and C5.8 give the 1999 and 2000 counts for a variety of species with the abbreviations as follows;

FUL = Fulmar

SH = Shag

HG = Herring Gull

GB = Great Black-backed Gull

KIT = Kittiwake

GUI = Guillemot

All counts, except Guillemots and Black Guillemots, refer to ‘apparently occupies sites or nests’, roughly analagous to the number of pairs. The guillemots are counted as number of individuals.

Black Guillemots								Counts		
site	site code	grid start	grid end	visit	date	time start	time end	individual adults	immatures	feeding offshore
Killybegs Harbour outer-W	KHOW	G704737	G717757	A	22/04/00	0815	0900	4		
Killybegs Harbour inner	KHI	G717757	G722758	A	22/04/00	0730	0815	3	2	1
Killybegs Harbour outer-E	KHOE	G722758	G717742	A	22/04/00	0815	0900	10	1	
Richies Bay	RBAY	G717742	G724744	A	22/04/00	0900	0930	1		
Scar Point - Kiln Port	SPKP	G779758	G754742	A	05/05/00	0730	0815			
McSwyne's Bay	MSB	G754742	G724744	A	05/05/00	0815	0900	1		
Drumanoo Head	DHD	G704737	G687744	A	05/05/00	0900	0945			
Fintragh Bay	FB	G687744	G639746	A	05/05/00	0945	1030			
Muckros Head	MHD	G639746	G596755	A	02/05/00	0630	1000			
Teelin - Cunniltragh	TC	G587765	G557758	A	03/05/00	0630	0930			
Malinbeg 4	MG4	G531782	G501790	A	04/05/00	0620	0900	17		
Malinbeg 1	MG1	G501790	G496827	A	01/05/99	0615	0930	5		
Malinbeg 2	MG2	G496827	G520846	A	02/05/99	0615	1230	5		
Malinbeg 3	MG3	G493841	G522846	A	28/04/00	0720	0900			
Malinbeg 5	MG5	G501790	G503798	A	04/05/00	0900	0905			

Table C5.7. Birdwatch Ireland Black Guillemot counts in the Donegal Bay catchment.

subsite	code	grid start	grid end	visit	date	time start	time end	FUL	HG	KIT	GUI	SH	GB
Malin More	MAL	G504845	G487826	A	20/06/99	1700	1810	112	28			6	
Malin Beg	MLB	G485801	G418794	A	18/06/99	1000	1050	9	5				
Carrigan Head	CAR	G558759	G574748	A	20/06/99	850	950	40	13				3
Dundawoona Point	DWA	G607746	G602748	A	18/06/99	1310	1430	92	83	424	27		
Muckros Head 3	MH3	G622744	G614745	A	18/06/99	1140	1150	66	4				
Muckros Head 1	MH1	G619734	G624734	A	18/06/99	1240	1250	3		106			
Muckros Head 2	MH2	G631741	G645748	A	18/06/99	1200	1200	12	4				
St John's Point	SJP	G718705	G713705	A	17/06/99	1800	1900	23	20				
Coolmore	COOL	G863667	G848658	A	17/06/99	1430	1530	67	1	372			
Kilbarron Castle	KIL	G843653	G838651	A	17/06/99	1540	1600	26					

Table C5.8. Birdwatch Ireland counts of other seabirds and cliff colonies in the Donegal Bay catchment.

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## **Nocturnal seabirds**

Donegal Bay supports two Storm Petrel colonies on the following islands:

- Rathlin O’Birne 160 apparently occupied sites, 2001
- Inishduff 200-250 ‘pairs’, 1985

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## C5.9 Bottlenose Dolphins

Bottlenose dolphins are listed in Annex II of the EU Habitats Directive as a species requiring special measures of protection. Accordingly, the importance of the Donegal Bay dolphins has been recognised and were included in a recent comprehensive study of bottlenose dolphin populations in European, Atlantic coastal waters (Ingram, S., Englund, A. & Rogan, E., 2001).

The bottlenose dolphin belongs to the dolphin family Delphinidae within the order Cetacea. They are dark grey in colour with pale countershading on their underside. They are robust animals with a blunt beak and a large, moderately falcate dorsal fin. Bottlenose dolphins around Irish coasts are not easily confused with other delphinid species due to their large size and lack of patterned colouration.

Bottlenose dolphins live for approximately 25 and 35 years for males and females, respectively. Calves are approximately 1m long at birth and suckle for 1.5 to 2 years, and remaining with their mother for a further 3 to 4 years.

In this recent survey coastal locations with frequent reports of bottlenose dolphin sightings were considered as suitable survey sites. Sightings reports were provided by new and established contacts around the coast and by the Irish Whale and Dolphin Group (IWDG). In total, 12 surveys were conducted during the project four of which resulted in encounters with dolphin schools (see Table C5.7). McSwynes Bay and surrounding waters was the site selected in Donegal Bay for study. Each site was surveyed at least twice and dolphins were encountered in each site with the exception of Broadhaven Bay (see Table C5.8).

<b>Date</b>	<b>Location</b>	<b>Estimated dolphin schools encountered</b>
15 July	Killary	2
16 July	Killary	0
22 July	Brandon Bay	0
<b>03 August</b>	<b>McSwynes Bay</b>	<b>0</b>
<b>04 August</b>	<b>McSwynes Bay</b>	<b>0</b>
05 August	Broadhaven Bay	0
07 August	Broadhaven Bay	0
09 August	Killary	0
<b>10 August</b>	<b>McSwynes Bay</b>	<b>1</b>
10 September	Brandon Bay	2
20 September	Killary	1
21 September	Broadhaven Bay	0

**Table C5.7. Summary of Bottlenose survey effort**

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<b>Date</b>	<b>Location</b>	<b>Encounter code</b>	<b>Estimated school size</b>	<b>Number of identifications</b>	<b>Number of calves</b>	<b>Depth (m)</b>
15/07/01	Ballynakill Bay	1	5	5	0	8
15/07/01	Killary Fjord	2	3	0	0	18
<b>10/08/01</b>	<b>McSwyne's Bay</b>	<b>3</b>	<b>30</b>	<b>35</b>	<b>4</b>	<b>20</b>
10/09/01	Magharees	4	12	15	3	15
10/09/01	Magharees	5	20	21	0	12
20/09/01	Cleggan Point	6	8	8	0	10

**Table C5.8. Summary of survey encounters with bottlenose dolphins**

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The sighting of calves in an area indicates the possible importance for nursing young animals and breeding adults. Calves were included in two of the encountered schools with the highest recordings of calves occurring in McSwyne's Bay.

### **C5.9.1 Tourism implications**

In the future, viable dolphin watching operations may be established in Donegal Bay as dolphin watching tourism grows in popularity. Presently boat tours on the west coast are aware of local dolphins and feature them during tours, rather than specifically targeting cetaceans. In order to maintain sustainability of such tourism operations and to minimize potential disturbance to dolphins precautionary measures would have to be adopted. For example, careful regulation in the form of codes of conduct and issuing of licences would serve as appropriate measures.

### **C5.9.2 References**

An Extensive Survey of Bottlenose Dolphins (*Tursiops truncatus*) on the West Coast of Ireland. Ingram, S., Englund, A. & Rogan, E. (2001). Department of Zoology & Animal Ecology, UCC.

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## **C5.10 Donegal Bay Pearl and Zebra Mussels**

### **Pearl Mussels**

The Pearl Mussel (*Margaritifera Margaritifera*) is recorded within the Donegal Bay catchment in the Bungosteen, Stragar, Tullinteane, and Eske Rivers. This mussel, listed in the red data book, is highly sensitive to all forms of pollution. It can live for over 140 years however any recent juvenile mussel recordings are uncertain.

Pearl mussel larvae, glochidia, are released into the free-flowing river current. Mature salmon and trout, migrating towards their spawning grounds, inhale a tiny number of these free floating glochidia. As the fish move upstream, the glochidia grow as parasites on the gills of their host, eventually falling off during late winter or early spring. Here, the juvenile mussels 'dig in' to the gravel or sand to begin a long life of filtering. Adult pearl mussels live by filtering up to 50 litres of water per day for minute organic particles, from which they receive sustenance.

The Tullinteane River pearl mussel population showed signs of recent influence by gravel extraction with the remains of several mature shells found with the extracted gravel.

### **Zebra Mussels**

Zebra mussels expanded their range from rivers entering the Black Sea and Caspian Sea to much of Europe, attached to ships and boats, following the building of canals. The zebra mussel was established in Britain by 1830. In 1986 they were introduced to North America in ships' ballast water and now cause serious fouling problems there. Zebra mussels have originally appeared in very large numbers in the River Shannon in Limerick, but have now extended their coverage northwards and are well established in Lough Assaroe. They probably arrived in Ireland on the hulls of private boats and barges imported on trailers.

Zebra mussels are small shellfish shaped like marine mussels. They are striped with varying patterns of dark and pale bands, hence the zebra name. They attach themselves to hard surfaces using special anchoring threads such as wood, plastic, stones etc. They live in fresh-water and the upper reaches of tidal estuaries, but cannot live in seawater. They usually grow to 15-25mm but can attain 50mm.

Zebra mussels feed by filtering the surrounding water and removing the plankton from it. Each individual sieves as much as one litre per day. They can reproduce within a year when temperatures exceed 12°C, releasing many microscopic young which swim weakly in the water and so are moved downstream by currents. They settle after about three weeks and soon grow into the shape of a miniature adult. Zebra mussels can live 3 to 5 years, and rapidly increase their population numbers.

Zebra mussels are considered a pest and a threat to the freshwaters of the Donegal Bay catchment. They congregate in very large numbers, as many as 100,000 per square metre. They clog intake pipes, drains and screens, causing reduced water delivery to boat engines, power plants, industries, fish hatcheries and municipal waterworks resulting in engine overheating, fish mortalities, increased maintenance costs and sometimes short-term closures in production. In addition mussels occur in such numbers that they can change the ecology of some aquatic systems.

Zebra mussels can live out of water for several days in moist shaded areas. When kept wet, adults can survive for more than a week. This means that they can be transported easily from one region to another. Should a boat or fishing gear have been in an infested area for even a few days it could carry zebra mussels upstream or, by being moved by road, introduce them to another lake or river.

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### **C5.11 Donegal Bay Biomar Sites**

In 1997 the Biomar group at Trinity College, Dublin and the Ulster Museum Zoology Department in Belfast created a map-linked database of information on marine sites, habitats, and species recorded during field surveys of the seashore and seabed in the Republic of Ireland.

Descriptions and photographs of the Biomar classification of marine biotopes in Ireland were developed by the Marine Nature Conservation Review of the Joint Nature Conservation Committee (UK) as part of the Biomar Project.

This baseline information is of importance to environmental management, consultants and researchers. The biotope and species photographs and descriptions that illustrate the data provide a state-of-the-art educational tool for studying marine species and biotopes.

In all, there are forty-one Biomar sites within the Donegal Bay catchment. These are depicted in Map 20 and described in full in Appendix C3.2.

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## **C6 BUILT HERITAGE**

### **C6.1 Introduction**

The Cultural Heritage aspect of the Water Quality Management Plan involves the preservation and protection of historic and archaeological sites within the Donegal Bay catchment area.

There are a range of sites and features which occur in, or beside, or across watercourses, and whose existence needs to be acknowledged in devising watercourse management strategies and individual schemes.

Ireland's built heritage consists of architectural and archaeological elements, both movable and immovable, including gardens and instances of vernacular architecture. The National Monument Acts, 1930 to 1994 provide a statutory basis for the protection of the Built Heritage. This heritage is an integral part of our national inheritance. It forms part of our sense of identity and provides us with resources of social, educational, recreational and aesthetic value. A range of integrated measures is being implemented to strengthen the protection of our built heritage.

The carries out its remit in relation to the preservation and presentation of the built heritage

### **C6.2 Duchas**

Duchas, under the Department of Arts, Heritage, Gaeltacht and Islands, manages the Department's responsibilities under National and European law. This duty includes the protection, conservation, management and presentation of Ireland's built heritage in co-operation with local authorities and voluntary groups at national and local level. In order to carry out its wide ranging brief which encompasses the maintenance and management of national monuments and historic properties Duchas is divided into main operational areas.

### **C6.2.1 Architectural Heritage Advisory Section**

This section of Duchas is responsible for providing architectural conservation advice to the Minister and planning authorities, including the publication of architectural conservation guidelines.

Architectural Conservation Advisors examine planning cases affecting the built heritage and advise planning authorities and individual owners on steps needed to safeguard the heritage and, in some cases, recommend that permission be refused where unacceptable damage to the built heritage arises.

Under the provisions of the Local Government (Planning and Development) Act 1999, the Minister is required to provide planning authorities with guidelines relating to the Act. During 2000, these guidelines were issued in draft form. Officials from the advisory section have met with planning officials from every planning authority as well as organisations such as An Taisce and the Heritage Council. A revised version of the draft is now in preparation.

### **C6.2.2 National Monuments and Architectural Protection Division (NMAPD)**

NMAPD helps protect the built heritage of Ireland by:  
Influencing and implementing statutory responsibilities to protect the architectural and archaeological heritage which is not in the care of the Department and Caring for over 700 heritage properties in the ownership of the Department.

As the name suggests it is divided between two sections, dealing with  
**1) Architectural Protection and 2) National Monuments.**

### **C6.2.3 Architectural Protection**

The NMAPD has over 700 National Monuments in its care. The work involves the protection, conservation and presentation of such monuments. The care of these monuments is on a geographical basis. The country is divided into six regions. Each region is supported centrally by administrators, architects, architectural technicians and archaeologists in the Dublin Headquarters. In addition, each region has a depot which is managed by a works manager who reports to the relevant senior architect. The works manager, in turn, is in charge of a team of industrial staff (craft/trade workers and general operatives). The Donegal Bay catchment falls within the Northern region.

#### **C6.3.1 Archaeological Survey of Ireland (ASI)**

The ASI has been in operation since the early 1960s. Its aim has been to identify and record all archaeological sites and monuments in the State to assist in the protection and management of the immovable archaeological heritage. The ASI has tended to concentrate on sites dating up to 1700 AD approximately but in some cases post-1700 sites and structures have been surveyed. The ASI is undertaken in three stages - initial paper survey based on documentary evidence (this first stage forms the basis of the Sites and Monuments Records - SMR), followed by field inspection of the sites initially identified and subsequently by detailed survey and mapping of the sites.

The SMR was completed in 1992 after 10 years and marked a significant development in Irish archaeology in that, for the first time, all known or suspected archaeological sites and monuments were documented. The SMR is available to all the agencies involved in land development and management and has proved an invaluable tool in protecting our archaeological heritage. The SMR is updated by reference to fieldwork, the results of which are subsequently incorporated in the Record of Monuments and Places (RMP).

### **C6.3.2 National Inventory of Architectural Heritage (NIAH)**

The work of the NIAH was first founded on Article 2 of the Council of Europe Convention for the Protection of the Architectural Heritage of Europe (Granada Convention). It states that for the purpose of precise identification of monuments, groups of structures and sites to be protected, each member state will undertake to maintain inventories of that architectural heritage. Ireland's undertaking under article 2 of the Granada Convention is now enshrined in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999.

The NIAH identifies and records the architectural heritage of Ireland in a systematic and consistent manner so that:

- a source of guidance is provided for the selection of structures for protection
- data is supplied to Local Authorities which allows them to make informed judgements on the significance of building stock in their functional area
- greater knowledge and appreciation of Ireland's architectural heritage is fostered.

Essentially, surveys of the architectural heritage are carried out by conservation experts who assess the importance of structures in the survey area. As surveys are published, the Minister, under the provisions of Section 4 of the Local Government (Planning and Development) Act 1999, formally recommends that structures rated as being of "Regional" "National" or "International" importance in a survey be placed on the local authorities Record of Protected Structures. In the year 2000 there were 1243 buildings recommended for inclusion in the RPS relating to 10 planning authorities.

Survey work of structures throughout the country involves paper research and field studies. Results and assessments are recorded in the NIAH which is a computerised record. As surveys are completed for designated areas (a town or county) the results are sent in draft form to the relevant local authority for comment. Final adjustments are then made before the survey is published. The service is delivered through the office at Dún Scéine, with the assistance of external personnel contracted to carry out surveys.

To date 11 town surveys and 1 interim county survey (Clare) have been published. Interim county surveys of the remaining 25 counties should be finished by 2003. It is envisaged that a full countrywide survey will be completed within 12 years.

### **C6.4 National Monuments**

Under the National Monuments Acts 1930-1994 a monument is defined as including "any artificial or partly artificial building, structure, or erection whether above or below the surface of the ground and whether affixed or not affixed to the ground and any cave, stone, or other natural product whether forming part of or attached to or not attached to the ground which has been artificially carved, sculptured or worked upon or which (where it does not form part of the ground) appears to have been purposely put or arranged in position, and any prehistoric or ancient tomb, grave or burial deposit, but does not include any building which is for the time being habitually used for ecclesiastical purposes".

The National Monuments Acts define a National Monument as "a monument or the remains of a monument the preservation of which is a matter of National importance by reason of the historical, architectural, traditional, artistic, or archaeological interest attaching thereto and also includes (but not so as to limit, extend or otherwise influence the construction of the foregoing general definition) every monument in Saorstát Éireann to which the Ancient Monuments Protection Act, 1882, applied immediately before the passing of this Act, and the said expression shall be construed as including, in addition to the monument itself, the site of the monument and the means of access thereto and also such portion of land adjoining such site as may be required to fence, cover in, or otherwise preserve from injury the monument or to preserve the amenities thereof".

### **C6.5 Donegal Bay Catchment Heritage Sites**

Throughout the catchment area there are sites and structures of archaeological, historical, architectural and industrial interest. Some heritage sites are visually impressive, others are not visible at all, even to the trained eye, but all of them can contribute to our understanding of the past, and may provide resources for use in education, tourism and recreation.

There may be traces of encampments, settlements and industrial remains of any period on the banks of a watercourse, and stray finds of objects and artefacts can be made. The remains of fords and bridges, quays and moorings, fish weirs and traps, mills and machinery, or boats and cargoes, may survive the watercourse itself, as well as objects from dumped rubbish, casual losses and votive or religious offerings.

Dredging, channel-widening and other activities associated with watercourse management can have a significant impact on such features, and can also lead to the discovery of new objects, sites or features and thus increase our knowledge of the past, and enhance the man-made heritage.

The majority of the sites within the Donegal Bay catchment comprise ringforts, enclosures, cashels, holy wells and standing stones. A summary of these sites is given in Table C6.1 while they are listed in full in Appendix C5. The locations of these monuments are identified in Map 21.

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<b>Class Description</b>	<b>Number of Sites</b>
RINGFORT (RATH \ CASHEL)	131
ENCLOSURE	59
CASHEL	37
HOLY WELL	33
STANDING STONE	32
ECCLESIASTICAL REMAINS	24
CHURCH AND GRAVEYARD	21
SOUTERRAIN	19
COURT-TOMB	18
RING-BARROW	17
CASTLE	13
GRAVEYARD	13
HUT SITE	13
MEGALITHIC TOMB	11
BULLAUN STONE	10
WEDGE-TOMB	8
MISCELLANEOUS	8
PROMONTORY FORT	8
CAIRN	7
CROSS-SLAB	6
GRAVE-SLAB	6
MIDDEN	6
MOUND	6
STONE SCULPTURE	6
CHURCH	5
PENITENTIAL STATION/CAIRN	4
CHILDREN'S BURIAL GROUND	3
ABBAY	3
FRIARY	3
TOWN	3
ARCHITECTURAL FRAGMENT	3
CHURCH SITE AND GRAVEYARD	3
BURIAL	2
SHORT CIST	2
BUILDING	2
CLOCHAN	2

Table C6.1. Summary of the recorded archaeological sites within the Donegal Bay catchment.

<b>Class Description</b>	<b>Number of Sites</b>
CIST	1
CROSS	1
DWELLING	1
ECCLESIASTICAL ENCLOSURE	1
CROSS-INScribed STONE	1
FIELD SYSTEM	1
FULACHT FIADH	1
HILLFORT	1
STONE CIRCLE	1
SETTLEMENT DESERTED	1
BAWN	1
HOLY STONE	1
BURIAL GROUND	1
RING-BARROW GROUP	1
FIELD WALL	2
CRANNOG	2
PASSAGE-TOMB	2
PORTAL-TOMB	2
ROAD	2
STANDING STONE - PAIR	2
ARCHAEOLOGICAL COMPLEX	2
CAVE	2

Table C6.1 continued. Summary of the recorded archaeological sites within the Donegal Bay catchment.

The specified period for the Archaeological Survey of County Donegal by Brian Lacy published in 1983 is from the Mesolithic period to the end of the 17th Century. No post 17th Century surveys have been executed although a limited number of industrial archaeological sites exist. The most significant are the Mill in Ballyshannon, and a flax mill in Bridgetown.

## **C7 EFFLUENT DISPOSAL**

### **C7.1 Introduction**

In accordance with the policy of the Department of Environment and Local Government Donegal County Council has decided to advance the procurement of main pumping stations, rising mains, waste water treatment plants and outfalls in key locations throughout the Donegal Bay catchment area. These locations (shown in Map 22) are; Donegal Town, Rossnowlagh and Ballyshannon under one contract (Group A) and at Killybegs and Bundoran under another contract (Group B). The Group A contract also includes for a Sludge Treatment Centre for South West Donegal to be located at Donegal Town waste water treatment plant. Both contracts will be implemented using the design, build and operate arrangements. The initial operating phase will be for a period of twenty years.

### **C7.2 Group A Waste Water Treatment Plants**

The Group A Waste Water Treatment Plants shall cater for an overall Population Equivalent of as described in Table C7.1

<b>Plant</b>	<b>Donegal Town</b>	<b>Rossnowlagh</b>	<b>Ballyshannon</b>
Design PE	12,000	4,000	6,000

Table C7.1. Population Equivalents for which the Group A Waste Water Treatment Plants shall cater for.

### **C7.3 Donegal Town**

Donegal Town has been identified as a hub-centre in the County Sludge Management Plan and will therefore include a sludge acceptance facility and Sludge Treatment Centre for South West Donegal. The treated sludge shall be a dried bio-solid product suitable for application to agriculture and horticulture.

#### **C7.4 Rossnowlagh**

The treatment process at Rossnowlagh shall have to be able to handle large variations in influent loading, which occurs in this small sea-side town during the summer months. Transport of sludge from Rossnowlagh to the Sludge Treatment Centre at Donegal Town WWTP is included in the contract.

#### **C7.5 Ballyshannon**

The treatment process at Ballyshannon shall have to comply with the requirements of the relevant legislation. Transport of sludge from Ballyshannon to the Sludge Treatment Centre at Donegal Town WWTP is included in the contract.

#### **C7.6 Bundoran**

Bundoran is a popular seaside tourist destination. While the resident population is of the order of 2000 persons, the population during the summer months and during peak holiday weekends can rise to 15,000. Long term demographic projections estimate that the peak holiday population could rise to 40,000.

The existing sewerage system for Bundoran discharges untreated waste water directly into Donegal Bay at a sea outfall at Pollbreen, to the west of the town. Under the Environmental Protection Agency Act 1992 (Urban Waste Water Treatment) Regulations 1994 (SI 149 of 1994), a wastewater treatment works is required for the town by 31<sup>st</sup> December 2005. A new Main Pumping Station is also required and the existing outfall is to be extended.

While an E.I.S. for Bundoran has been prepared to support the development of a waste water treatment works for a population equivalent of 30,000, the development will be considered in two phases. The initial stage of the treatment works will be for a population equivalent which does not exceed 20,000. The treatment process shall cope with the large seasonal variations in loading.

## C7.7 Killybegs

Killybegs is located on the shores of a deep sheltered harbour and is Ireland's largest Fishing Port. It has nine fish processing factories and a fishmeal factory together with net making industries, marine electronics and businesses which service visiting foreign trawlers. From this service industry has stemmed a relatively new industry to service the Corrib gas field. New harbour facilities will be developed over the next 1 to 2 years.

The sewer network at Killybegs will be separated into a Domestic Network and an Industrial Network. The Industrial Network will be dedicated to the collection of fish processing waste waters.

In line with the Polluter Pay's Principle, a strategy has been agreed between Donegal County Council and the Fish Processing Industry. The essence of the agreement was that the Fish Industry installs its own treatment plants within its premises and treat the fish processing waste water before discharge to the Industrial Network for pumping (via a separate sump at the proposed Main Pumping Station) to an outfall.

The treated domestic effluent pipe will join this pipeline so that there is a combined, single outfall.

Thus, the Group B Contract is concerned with pumping of the industrial waste water between the Main Pumping Station and the Outfall, pumping the domestic waste water between the Main Pumping Station and the treatment works, providing secondary treatment facilities for domestic/commercial waste water only and discharge to the combined outfall.

The proposed domestic/commercial waste water treatment works for Killybegs has a design p.e. of 4,200 at Stage 1 rising to 6,500 at Stage 2.

## **C7.8 Other Donegal Bay Sewage Schemes**

### **Kilcar and Carrick Sewerage Schemes**

Between mid 1984 and early 1986 Kilcar had extensive upgrading works conducted. Similarly, between 1983 and 1984 Carrick had its sewage scheme upgraded to its current standard.

### **Glencolumbkille Sewerage Scheme**

Contract Documents are currently being updated for a 1,000 p.e. scheme which is expected to go to construction in late 2002. The scheme comprises a new sewer network and a treatment works. The main component of the proposed works are expected to comprise:

- Preliminary treatment included screening and grit removal
- Primary and Secondary treatment in Rotating Biological Contractors
- Tertiary treatment in reed beds

In addition, reed beds will accommodate stormwater overflows.

### **Mountcharles Sewerage Scheme**

A Preliminary Report is currently being revised in relation to Mountcharles Sewerage Scheme. Due to the proximity of the proposed sewage treatment works for Donegal Town at Drumkeegan and the upgrading of an access road to the plant from the Mountcharles side, it will be more cost effective to pump sewage collected at Mountcharles to Drumkeegan than to provide local treatment. This will also benefit water quality in streams currently subject to sewage overflows at Mountcharles.

### **C7.9 Sludge Disposal**

The role of the successful Group B Contractor/Operator includes the transportation of dewatered sludge from both Bundoran and Killybegs to the proposed Sludge Hub Centre at Drumkeegan, Donegal Town.

### **C7.10 Regulatory Conditions**

Each Project will be procured using FIDIC Conditions of Contract as a Design, Build, and Operate scheme. The Operate period will be for twenty years. It is expected that the construction stage will commence early in 2003. In implementing the scheme, regard must be had to the following: -

- 1. compliance with the relevant E.U. Directives and Irish National Standards.**
- 2. maintenance of the beneficial uses of the receiving waters.**
- 3. compatibility with the County Sludge Management Plan**

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## **C8 Solid Waste Disposal**

### **C8.1 Introduction**

Solid waste management is currently the most rapidly developing field in the environmental and public health sectors as a range of policy and legislative measures are enacted at European, National and Regional levels. All societies produce waste and the amount of waste being produced in industrialized economies throughout the world has been increasing steadily for the past 30-40 years. This trend of increasing waste production has been identified as an area of concern within the European Union and has led to the adoption of a range of policy and legislative measures which are set to transform waste management practices in the coming years.

Local authorities have been under a legal obligation to introduce waste management plans since the commencement of the Waste Management Act in July, 1996. From the outset local authorities were encouraged to adopt a regional approach to this planning process, with a view to the more efficient and cost-effective provision of services and infrastructure.

Donegal County Council compiled a new Waste management Plan in October 2000. The new Waste Management Plan commits Donegal County Council to a number of actions over the next 5 years. These include the following:

- Protecting existing landfill space including compliance with Environmental Protection Agency licensing requirements. Providing new Landfill Capacity to replace existing facilities. This will require a Site Selection Study to identify the most suitable locations for between 2 and 4 landfill facilities.
- Employing an Environmental Awareness Officer.
- Employing a Recycling and Waste Reduction Officer.
- Employing a Waste Regulation Officer to enforce relevant legislation, particularly the Waste Packaging Regulations.
- Providing 50% of households in the County with gardens with home composters by 2005. There is a provision of £50,000 to supply 5,000 composters in 2001.
- Expanding the range of materials collected through recycling centres.
- Expanding the number of Civic Amenity Sites and Recycling Centres in the County.

- Carrying out a Feasibility Study on the establishment of Materials Recovery Facility (MRF).
- Developing a 3-bin kerbside recycling system based on the source separation of materials by householders.
- Providing facilities for the collection of household hazardous wastes at all Civic Amenity Sites.
- Developing a Waste Transfer Station network where landfill sites are closed or not replaced by new facilities.
- Supporting and facilitating the recycling of Construction and Demolition Waste.
- Developing, within a 7-year period, an Integrated Waste Management system capable of reducing reliance on landfill and complying with legislative and policy targets.
- Promoting sustainable waste management policies in respect of reduction, reuse, recycling and composting.

## **C8.2 European Policy and Legislation**

Adopted in September 1989, the strategy outlines the EU policies on Waste Management in the context of the principles laid down in the Single European Act and the Fifth Action Programme on the Environment. The Strategy sets out five strategic guidelines; prevention by technologies and products, recycling and reuse, optimization of final disposal, regulation of transport and remedial action.

The Waste Management Act (1996) sets out the responsibilities and functions of various persons in relation to waste. Specifically, the Act provides a comprehensive statutory framework for the management of waste as follows;

1. prohibits any person from holding, transporting, recovering or disposing of waste in a manner which causes or is likely to cause environmental pollution;
2. requires any person who carries on activities of an agricultural, commercial or industrial nature to take all reasonable steps as are necessary to prevent or minimize the production of waste;
3. prohibits the transfer of waste to any person other than an authorised person;
4. requires the Environmental Protection Agency (EPA) to make a national plan in relation to hazardous waste;

5. requires local authorities to make waste management plans in relation to non-hazardous waste;
6. imposes certain obligations on local authorities to collect household waste and to provide facilities for the recovery and disposal of such waste;
7. enables the Minister for the Environment and Local Government to make Regulations for various purposes to promote better waste management;
8. provides for substantial penalties for offences including fines of up to £10 million and/or ten years imprisonment and/or liability for clean-up measures.

### **C8.2.1 The Environmental Protection Agency Act**

The main functions of the Environmental Protection Agency include:

1. licensing and regulation of activities with significant pollution potential, including hazardous waste management and landfill waste disposal;
2. monitoring of the quality of the environment and the establishment of environmental databases;
3. promotion of environmentally sound practices;
4. preparation of National Monitoring Programmes;
5. preparation of National Reports on drinking water, wastewater and landfills.

The Agency considers that sustainable development requires the effective integration of economic and environmental considerations into the decision making process, which can be achieved in the context of waste management and disposal through the following approaches:

- Polluter Pays Principle - The costs of monitoring a clean environment should be borne by those who directly or indirectly cause pollution.

- Precautionary Principle - If there are threats of serious or irreversible environmental damage lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- Intergenerational Equity - The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- Economic Mechanisms - Appropriate integration and use of economic mechanisms within decision-making processes to achieve environmental protection at least cost to society.

Under the Environmental Protection Agency Act, the EPA is required, as soon as possible, to specify and publish criteria and procedures for the selection, management, operation and termination of use of landfill sites for the disposal of domestic and other wastes. These criteria and procedures are to be published in a number of modules, under the general heading of Landfill Manuals. The following manuals have been published to date:

Investigations for Landfills (1995)  
Landfill Monitoring (1995)  
Landfill Operational Procedures (1997)  
Landfill Restoration and Aftercare (1999)

The Agency has also published a Landfill Design manual.

## C8.2.2 Waste Management - Changing Our Ways - A Policy Statement

Launched by the Minister for Environment and Local Government in September 1998, this radical document sets out the Government's policy objectives with respect to waste management. The policy statement identifies an urgent need to modernise waste management practise in Ireland and describes the current state of the waste management industry as follows:

- Waste services are generally the least developed of the environmental services traditionally delivered by local authorities;
- With very few exceptions, authorities have not so far developed or applied integrated management techniques or innovative technology solutions;
- Public perception of local authority performance on waste is poor because of the environmental impact and visibility of waste and the nuisance which poorly managed and overfull landfills can cause;
- Private sector interest in the provision of waste management facilities is now very apparent.

It also reinforces the need to move away from the landfilling of waste and more towards the prevention, reduction and recycling of waste. The document states:- *“Reducing this reliance on landfill is the most fundamental issue to be addressed in the waste management area, and should be the core objective of the current local planning process ...It is evident that undue reliance on landfill cannot continue to be the basis of modern waste infrastructure. Change is necessary for a number of reasons.”*

Changing Our Ways sets out a range of targets that reflect this need to move away from disposal over the 15 year policy period. However, at present, it is unclear how the Government intends to ensure that these targets will be achieved.

The targets set out in Changing Our Ways are as follows:-

1. A diversion of 50% of overall household waste away from landfill;
2. A minimum 65% reduction in biodegradable wastes consigned to landfill
3. Recycling of 35% of municipal waste;
4. Recycling at least 50% of Construction and Demolition (C&D) waste by 2003, with a progressive increase to at least 85% by 2013;
5. An 80% reduction in methane emissions from landfill.

In the context of waste plans, “Changing Our Ways” emphasises the need for dynamic change at all levels, stating “*waste management plans should be subject to ongoing review and refinement*” and advocates a “*triple-track*” approach to the production of waste plans consisting of:

- a comprehensive waste recovery programme, aimed in particular at substantially increasing recycling rates for municipal waste and C&D waste;
- planning for and the provision of requisite infrastructure, which should substantially come on stream within a period not exceeding 7 years;
- access to adequate, environmentally sound, residual waste disposal capacity.

It is clear that “Changing Our Ways” will have far-reaching and radical implications for all aspects of waste management in Ireland. It sets out many challenging targets with respect to the alternatives to landfill while recognising that state-of-the-art landfill technology remains an essential component of any sustainable waste management strategy.

### C8.2.3. European Union Legislation

European legislation is now the key driver of change in waste management procedures and practices throughout the European Community. This section describes the key relevant adopted and proposed directives in the field of waste management.

The Framework Directive on Waste (75/442/EEC) - This directive is the basic EU legislative instrument on waste requiring Member States to take appropriate measures to encourage the prevention or reduction of waste generation, the recovery by recycling and the use of waste as an energy source.

The Directive requires Member States to:

- take appropriate measures to establish an integrated and adequate network of disposal installations which should enable both individual member states (as far as practicable) and the EU as a whole to become self sufficient in waste disposal (the principle of self sufficiency);
- limit the risks inherent in waste transport by encouraging waste disposal in the nearest appropriate installation (the proximity principle).

The Directive introduced the requirement for licensing of waste disposal operations (defined in the Directive) and the “*polluter pays principle*”, where the cost of disposing of the waste must be borne by the holder of the waste.

The Landfill Directive (99/31/EC) - A final draft of this much awaited Directive was agreed in March 1998. The most important targets set out in the Directive are for the pre-treatment of biodegradable wastes prior to landfilling, and a ban on co-disposal of hazardous wastes.

Quantities of biodegradable municipal waste (BMW) to be accepted to landfill are to be reduced. Biodegradable waste means any waste that is municipal in character and capable of undergoing anaerobic or aerobic decomposition. The Directive will also ban the practice of co-disposal i.e. the joint disposal of hazardous and non-hazardous wastes and disposal of certain other wastes, including used tyres and infectious hospital or clinical waste.

The implementation of the landfill directive will have enormous implications for countries with a heavy dependence on landfill such as Ireland.

### **C8.3.1 Sustainable Development. A Strategy for Ireland (1997)**

The issue of sustainable development rose to international prominence with the Rio declaration in 1992. This aimed to reach global agreement on a number of key issues including climate change, biodiversity, tropical forests and sustainability. The Rio declaration also set out the principles to guide environment and development policy on a national level through the introduction of Agenda 21.

Sustainability involves the management of all assets and natural and human resources to increase long-term wealth and well being for all. By definition sustainable development is “development which meets the needs of present generations without compromising the ability of future generations to meet their own needs”.<sup>1</sup>

The Rio declaration was followed by the adoption of sustainable development policies at both European and National levels.

### **C8.3.2 Recycling for Ireland**

Recycling for Ireland, published in 1994, sets out the national strategy for recycling domestic and commercial waste streams. The strategy set recycling targets to be achieved and established a number of mechanisms for implementation and review.

Packaging waste, the compostable fraction of household and commercial waste and waste newsprint were the key areas targeted in the strategy. Specifically this strategy recognised the need for an integrated approach to waste management and stated that new and upgraded landfill sites should be developed as “Central Waste Management Facilities”.

### **C8.3.3 The National Development Plan**

The National Development Plan (2000-2006) commits itself to the promotion of more balanced regional development. The Plan recognises that the better management of solid waste is one of the main environmental challenges, stating: *“Appropriate waste management infrastructure is vital not only for environmental protection reasons, but also for industrial development reasons, for lack of appropriate facilities may hamper development.”*

The Plan also estimates that a total of £650m is needed to provide the necessary infrastructure identified by local authority waste plans and promotes a Public-Private Partnership approach to fund most of this infrastructure.

### **C8.3.4 Proposed National Hazardous Waste Management Plan**

Published by the EPA in September 1999, the National Hazardous Waste Management Plan recommends the adoption of an ambitious Prevention Programme with the following key elements:

- no increase in the quantity of hazardous waste subject to disposal operations;
- the establishment of a core of expertise or “prevention team” to prioritise and co-ordinate the implementation of the Prevention Programme;
- the development and implementation of a Prevention Programme inclusive of demonstration projects, information dissemination, assistance to industry,
- educational initiatives, research and support staff.

The Plan sets out a range of priorities for the period 1999-2004:

1. The establishment of an Implementation Committee. This committee would be responsible for guiding the overall implementation of the Plan;
2. The establishment of a Prevention Team to implement the Prevention Programme. This ‘Team’ would be responsible for the development of the Programme, for the setting of priorities within the Programme itself and for their initiation;
3. The identification and improved management of unreported hazardous waste to prevent its uncontrolled disposal and resultant emissions to the environment;

4. The identification, preliminary evaluation and prioritisation of sites at which hazardous waste disposal has taken place and the implementation of remedial works at priority sites;
5. Establishment of an improved collection infrastructure for hazardous household wastes, agricultural wastes and wastes arising from small and medium enterprises (SME's);
6. The allocation of financial and technical assistance for the development of facilities for the recovery and disposal of hazardous waste where existing capacity is unsatisfactory;
7. The development of hazardous waste landfill capacity and thermal treatment to achieve self sufficiency and reduce our reliance on export;
8. Improved public awareness of the impacts of hazardous wastes;
9. Build on on-going prevention, research and demonstration initiatives – for example, the Cleaner Production Pilot Demonstration Programme.

#### **C8.4.1 Waste Arisings**

The Waste Management (Planning) Regulations 1997 state that a waste plan must specify the quantities of waste arising within the local authority area, classified as follows:

##### **Household waste collected by or on behalf of the local authority**

- Household waste delivered to civic amenity or other bring facilities
- Other household waste
- Litter and street sweepings

### Commercial waste

- Industrial waste not specified elsewhere
- Construction and demolition waste (C & D)
- Contaminated soils
- Ash and other incineration residues
- Mining and quarry waste
- Healthcare wastes (clinical, dental, veterinary)
- Sewage sludges

### Water treatment sludges

- Industrial sludges
- Agricultural waste

In addition, the Regulations require that the Plan provide a breakdown of the hazardous component, if any, of such wastes.

## **C8.4.2 Quantities of Waste Arising Within Donegal County Council**

The amendments of the Waste Framework Directive adopted by the European Commission in 1991 established a programme of Priority Waste Streams. The following waste streams were identified as having priority under the resolution:

- End-of-Life Vehicles;
- Tyres;
- Batteries;
- Electrical and Electronic Waste;
- Construction/Demolition Waste;
- Healthcare Waste;
- PCB's (Polychlorinated Biphenols);
- Packaging and Packaging Waste;
- Waste Oils.

## **C8.5 Donegal County Council Waste Management Systems, Techniques and Technologies**

This section reviews the current systems, techniques and technologies available within the County and catchment area to implement the Waste Management Plan by the Donegal County Council. This will be discussed with reference to the Waste Management hierarchy:

1. Prevention;
2. Minimisation;
3. Reuse;
4. Recycling;
5. Recovery of Energy;
6. Environmentally sustainable landfill of waste which cannot be prevented or recovered.

### **C8.5.1 Waste Collection**

Section 33 of the Waste Management Act requires Local Authorities to collect or arrange for the collection of household waste within its area. It also provides the local authority with the power to require all householders to present their wastes for collection once a collection service has been provided. The forthcoming Waste Collection Regulations will provide additional powers which may allow local authorities to direct wastes to specific facilities and will require collectors to supply data on waste quantities.

The current waste collectors operating within the Donegal Bay catchment area are described in Table C8.1.

<b>Refuse Collector</b>	<b>Collection Area</b>	<b>Landfill Site Used</b>
P.J. Rooney, Laghey Waste	South Donegal, Bundoran through to Killybegs- mainly commercial	Ballynacarrick, Ballintra & Balbane Killybegs
Shaun Molloy Donegal Waste	Donegal Town, Ballyshannon, Bundoran, Killybegs, Mountcharles, Carrick-Kilcar	Ballynacarrick, Ballintra & Balbane Killybegs

Table C8.1 Private collectors currently operating within Donegal Bay catchment area.

Householders are charged directly by collectors, who in turn dispose of the wastes at local Council operated landfill sites. At present domestic refuse collection is financed either under a “Tag” system, or by annual payment. Typically tags may be purchased for £1.00 each, with a small bin or bag requiring one tag and a 240 litre Wheeled-Bin requiring either two tags or an annual payment of approximately £100.00 to £120.00.

### **C8.5.2 Recycling**

Recycling can be defined as the collection and sorting of materials to produce a useable raw material or product.

Section 35 of the Act enables Local Authorities to make byelaws specifying how the producers of household or commercial waste should present their waste for collection, such as the type of container to be used or what wastes are to be placed in it. The application of the powers set out in Section 35 could allow Donegal County Council to require householders to source-separate their wastes into different containers for refuse collection and recycling.

When comparing different waste management options against recycling and waste management targets, assumptions need to be made on the amount of material that can be retrieved and the component of the retrieved waste that can then be segregated for recycling or other uses. Collection systems are therefore a central issue, which needs to be considered before any recycling scheme, can be established.

The provision of bottle/can banks has increased significantly throughout the County, since the adoption of the Waste Management Plan by the Council. The distribution (number and location) of Civic Amenity Sites and Bring Centres is recognised as the most significant factor in their use and hence their ability to contribute to the sustainable management of wastes. The locations of the recycling centres within the Donegal Bay catchment area are shown in Map 23 and given in Table C8.2.

<b>Recycling Centre</b>	<b>Location</b>	<b>Bottle Bank ?</b>	<b>Can Bank ?</b>
Ballyshannon	Car Park, Market Yard	Yes	Yes
Bundoran	The Bridge	Yes	Yes
Carrick	Lay By, Line Road	Yes	Yes
Donegal Town	Pauls Car Park, Main Street	Yes	Yes
Killybegs	Town Centre	Yes	Yes

Table C8.2. Locations of the recycling centres within the Donegal Bay catchment.

### C8.5.3 Composting

Composting is the conversion of organic (green) wastes into a reusable compost by an aerobic degradation process. According to the Waste Management Plan, adopted by the elected members November 2000 Donegal County Council committed itself to distributing 5000 compost bins to households and businesses in the county by the end of 2001. Approximately 100 compost bins were distributed to schools in October 2000, compost bins were also made available to staff and members at this time, at a subsidised rate of £10 per unit.

Composting units and Wormeries were distributed throughout Donegal through the various area offices.

Table C8.3 describes the current prices of the various composting bins presently available.

<b>Type of Bin</b>	<b>Price</b>
Standard Compost Bin	£10 (12.70 euro)
Wormery	£45 (57.14 euro)
Compost Kit	£20 (25.40 euro)
-Bin +kitchen caddy+aerator	

Table C8.3. The current prices of the various composting bins presently available.

In broad terms there are two main composting systems that can be considered; home composting, and centralised composting. At present there is no centralised composting centre within the Donegal Bay catchment.

Home composting refers to composting undertaken at home by individuals or householders by either using a traditional compost heap or a purpose made compost bin or wormery. It forms an important element of reducing waste at source with both garden and kitchen waste able to be composted. Modern purpose-made composting bins and wormeries are capable of dealing with most garden and kitchen food wastes without giving rise to nuisance. Experience has shown that where members of the public are prepared to co-operate with such schemes, significant reductions in the waste stream, particularly during the spring to early autumn, can be achieved. To be successful however there needs to be an ongoing awareness and reinforcement programme to maintain the commitment.

#### **C8.5.4 Landfill**

The Waste Plan established that landfill represented the most appropriate, secure long-term method of waste disposal to ensure that the needs of the County continued to be serviced. It also identified the approach by which this policy objective could be met, recognising the high environmental standards that would be demanded in the future, and the significantly increased costs.

In recognition of the importance of providing cost-effective collection services the Waste Plan also proposed that a supporting network of transfer stations would be developed in association with the phased closure of the existing landfill sites.

Landfill has been the traditional approach in Ireland to the management of wastes. The old generation of landfill sites were based on a “dilute and disperse” approach. These are being phased out and are superseded by fully engineered sites with multi-layer containment systems, leachate collection and treatment and landfill gas collection and flaring, for new developments.

There have also been significant changes in landfill operational practices which require a greater level of resources. These factors have resulted in increases in the costs of landfill in recent years, although it still remains the lowest cost waste management option.

Within the waste management hierarchy there is increasing pressure to reduce the amount of waste being disposed of at landfills. The standards now required for new landfill development and operation, and the recognition of the costs for aftercare, will result in higher disposal costs at landfills reducing the differential cost between it and higher technology options. However irrespective of any alternative waste management systems being introduced there will always be a need for landfill in which to dispose of residual wastes.

The waste from the Donegal Bay area currently goes to two landfills Ballinacarrick in Ballintra and Balbane in Killybegs (Table C8.4) as shown in Map 24.

A new cell is currently being developed at the Ballinacarrick site to handle waste from the Donegal Bay area.

<b>Site</b>	<b>Waste Input (Tonnes)</b>	<b>Date of Licence Application</b>	<b>Cost of Licence Application</b>	<b>Anticipated Closure</b>
Ballinacarrick	24,000	1/3/98	£13,000	2003
Balbane	4,000	1/3/99	£5,000	2003/04

Table C8.4. Donegal Bay landfill sites.

Secure disposal capacity is a key component of any Waste Management Plan. As such, two fundamental objectives with respect to future landfill disposal capacity must be achieved:

1. accurately assess the existing disposal capacity and predict when it will be consumed;
2. identify secure long-term replacement disposal capacity.

## **C8.6 Waste Growth Projections and Management options**

In order to develop a waste management strategy it is important to consider the future waste arisings (i.e. the volume of waste that is expected to be collected and disposed of in the future). In this case the assessment has been undertaken over a twenty-year period. The data produced by the Environmental Protection Agency in the National Waste Database suggests that a growth rate of 4.5% per annum is realistic which increases the amount of waste produced as shown in Table C8.5.

<b>Category</b>	<b>1999</b>	<b>2005</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
Paper/card	7,467	9,724	12,118	15,101	18,819
Putrescible	11,058	14,400	17,946	22,363	27,869
Textiles	684	891	1,110	1,383	1,724
Fines	6,517	8,487	10,576	13,180	16,424
Misc.Comb.	3,097	4,033	5,026	6,263	7,805
Misc. Non-Comb	1,615	2,103	2,621	3,266	4,070
Other (metal & glass)	7,562	9,848	12,272	15,293	19,058
<b>Total</b>	<b>38,000</b>	<b>49,486</b>	<b>61,668</b>	<b>76,850</b>	<b>95,769</b>

Table C8.5. Projected waste figures for the County with 4.5% per annum increases per annum as predicted by the EPA.

Based on a growth in waste arising of 4.5% per annum over the next twenty years the total amount of municipal solid waste (MSW) managed by Donegal County Council will rise from 38,000 tpa to 95,000 tpa by 2020.

The policy targets that apply to waste in Ireland means that by 2013, 50% of household waste will have to be diverted from landfill, 35% of municipal waste will have to be recycled or composted, and the quantity of biodegradable waste being landfilled will have to reduce to 35% of 1995 levels. To meet all waste obligations the best options currently available to Donegal County Council are detailed in Table C8.6.

Technology	2000		2005		2010		2013		2020	
	Tonnes (000's)	%	Tonnes (000's)	%	Tonnes (000's)	%	Tonnes (000's)	%	Tonnes (000's)	%
Recycling	0.2	1%	1	2%	7	11%	14	20%	26	27%
Composting	0	0%	2	4%	7	11%	10	15%	20	21%
WTE	0	0%	0	0%	38	63%	37	52%	42	44%
Landfill	40	99%	43	94%	9	15%	9	13%	8	8%
Total (Tonnes)	40		46		61		70		96	

Table C8.6 . Best options currently available to Donegal County Council to meet all present waste obligations. Figures are generally reported to the nearest '000 tonnes and to the nearest percent.

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It must be noted that this input data includes several specific characteristics where considerable uncertainty remains and which could have significant impact on the model outputs. These are:-

1. Projected waste growth rates
2. Composition of the waste stream
3. The accuracy of current estimates of waste quantities.

However, the results from this 'snapshot' analysis indicate, that based on current data on waste quantities, composition and growth rate, a form of thermal treatment will be required to meet all of the policy and legislation targets. However, the targets which require the implementation of a thermal treatment option are a considerable number of years into the future, namely, 2013 for the targets in 'Changing our Ways' and either 2016 or 2020 for the landfill Directive targets for diversion of Biodegradable Municipal Waste from landfill.

In short, there are no targets for either recycling or recovery which require a decision to be made on the development of thermal treatment before the statutory plan review point in 2005.

However under all scenarios recycling and composting are critical elements in complying with the targets. Therefore it is considered pragmatic at this stage, given the range of uncertainties on waste quantities, composition and growth rates, that the Council progress with recycling and composting as a priority in order to put in place the fundamental building blocks for a sustainable waste management system.

## C9 Sludge Disposal

### C9.1 Introduction

The 1996 Waste Management Act obliges Local Authorities to produce a sludge management plan dealing with non-hazardous sludge generated within its functional area. Donegal County Council produced its Sludge Management Plan in 2000. Specifically relevant to the Donegal Bay Catchment is the recommendation that a thermal sludge drying facility be located in the Donegal Town locality.

An inventory of all non-hazardous sludges produced in Ireland was commissioned and published by the Department of the Environment & Local Government with the aim of assisting the planning of non-hazardous sludges nationally. This inventory identifies and quantifies sludge generated by the agricultural sector, local authorities, agri-industries and other sludge-producing sectors. Future trends in potential sludge production from the local authority sector are discussed. Current disposal practices are documented for each sludge.

When designing a system of sustainable sludge management for Donegal, the first tasks undertaken were to:

- correlate volumes of sludge document by the *Inventory of Non-Hazardous Sludges in Ireland* with current sludge production in Donegal.
- investigate the potential production of sludges not identified by the *Inventory of Non-Hazardous Sludges in Ireland*.

Figures obtained from the Department of the Environment, the Central Statistics Office and Teagasc identifies 98.87% of all sludges generated in County Donegal to be produced by the agricultural sector on a dry tonnage basis. Sludge levels produced by industries were obtained from their IPC licenses, or by contacting the industry itself and the volume estimated is approximately 0.23%. Staff at Sanitary Services estimated that only 0.9% of all sludges are a result of Donegal County Council's water and wastewater treatment services.

## **C9.2 Wastewater Treatment Plant Sludges**

All wastewater treatment plants were assessed in relation to their current and future sludge generation capacity. Treatment process type at each wastewater treatment facility was identified. Different plant operation, availability of sludge storage and other plant facilities were noted.

Donegal County Council has recently carried out a detailed assessment of current and future wastewater treatment requirements. This resulted in the production of an Assessment of Needs report. This report sets out a programme of wastewater infrastructural investment required in County Donegal in order to achieve compliance with the E.U. Urban Wastewater Directive. The budgetary requirement to meet this investment is detailed in this report also. Priorities have been assigned to the schemes in each electoral area together with the relevant implementation time scale as defined by the Urban Wastewater Directive.

The report addresses Donegal's wastewater needs under the headings of:

1. The improvement of existing treatment works that are currently not operating correctly.
2. The up-grading of existing treatment works that are of inadequate capacity.
3. The replacement of existing treatment works at population centres where a higher standard of treatment is required under the Urban Wastewater Treatment Directive.

In line with the Water Services Capital Works programme the sludge plan evaluates sludge production in the years 1999, 2006 and 2020. The Urban Wastewater Regulations require a number of treatment works to be provided by the year 2006, these were identified in the Assessment of Needs Report. The type of treatment in all cases was assumed to be the activated sludge process, with primary settlement included in works with a population equivalent greater than 5000. Any further locations where wastewater treatment is required are included in the period from 2006 to 2020. To allow for any increase in required standards by 2020, primary settlement has been included in the treatment process at all works. From the treatment process and population equivalent for each works the quantity and characteristics of sludge is determined.

### C9.2.1 Calculation of Sludge Production for each Wastewater Treatment Works

Population figures for towns and villages were taken from census reports from 1966 to 1996 and then projected forward at the average percentage increase over those years. The figures for industry, commercial, tourism and institutional population equivalents were calculated in a similar manner.

The quantity of sludge to be produced from wastewater treatment was calculated from the population equivalent and a figure for the production per person per day. These figures were taken from two sources, (*CIWEM Handbooks of UK Wastewater Practice: Sewage Sludge, Introducing Treatment and Management and from the estimation of sludge generation*. Table 1, Sludge Management Plans, Guidance Document, Appendix 5).

Primary Settlement + Activated sludge :	90g/p.e./day	3% DS
Primary Settlement :	55g/p.e./day	4% DS
Septic tank :	35g/p.e./day	2.5%DS
Imhoff tank :	40g/p.e./day	4% DS
Septic tank + Percolating filter :	64g/p.e./day	2% DS
Activated Sludge :	35g/p.e./day	1% DS
Oxidation Ditch :	50g/p.e./day	1.5%DS
Primary settlement, biofiltration, activate sludge	105g/p.e./day	3% DS

The annual volume of wastewater sludge currently produced in Donegal is approximately 49,590 m<sup>3</sup> or 919 tDS.

The quantities of sludge currently produced and to be produced in 2020 from wastewater treatment in County Donegal are shown in Table C8.7.

Future volumes of sewage sludge to be generated in Donegal as a result of the phased implementation of the above programme of works over a 20-year period are estimated to be, almost six times that currently produced.

Wastewater treatment plant	1999				2020			
	p.e.	Volume		DS	p.e.	Volume		DS
		(tDS)	(m <sup>3</sup> )			(%)	(tDS)	
<b>Donegal Town</b>	5800	0.0	-	-	18000	561.7	18725	3.0
<b>Ardara</b>	1000	12.8	511	2.5	1500	39.4	1314	3.0
<b>Ballintra</b>	246	3.6	90	4.0	280	9.2	307	3.0
<b>Ballyshannon</b>	3912	50.0	1999	2.5	6000	197.1	6570	3.0
<b>Bundoran</b>	3735	0.0	-	-	30000	344.9	11498	3.0
<b>Carrick</b>	659	8.4	337	2.5	1000	26.3	876	3.0
Clyghore/Belleek					100	3.3	110	3.0
<b>Dunkineely</b>	1491	19.0	762	2.5	2000	52.6	1752	3.0
Glencolmcille	-	-	-	-	800	15.8	526	3.0
<b>Glenties</b>	990	12.6	506	2.5	1600	47.3	1577	3.0
Inver					250	8.2	274	3.0
Kilcar	805	0.0	-	-	1100	36.1	1205	3.0
<b>Killybegs</b>	177155	0.0	-	-	3600	112.3	3745	3.0
Laghey	-	-	-	-	400	13.1	438	3.0
Malinbeg	-	-	-	-	130	4.3	142	3.0
Malinmore	-	-	-	-	500	8.0	321	2.5
Meenaneary	-	-	-	-	130	4.3	142	3.0
<b>Mountcharles</b>	561	14.3	478	3.0	800	26.3	876	3.0
Naran/Portnoo	-	-	-	-	1290	21.2	706	3.0
<b>Pettigo</b>	329	6.6	264	2.5	350	11.5	383	3.0
Rosbeg	-	-	-	-	160	5.3	175	3.0
Rossnowlagh	-	-	-	-	6000	118.3	3942	3.0
Ardara HS	220	2.8	112	2.5	-	-	-	-
Clyghore HS	40	0.5	20	2.5	-	-	-	-
Donegal Town NBA	100	1.3	170	0.8	-	-	-	-
Donegal Town, HS	130	1.7	66	2.5	-	-	-	-
Drimarone HS	35	0.4	18	2.5	35	0.4	18	2.5
Frosses HS	45	1.1	53	2.0	45	1.2	41	3.0
Glencolmcille HS	60	1.4	70	2.0	-	-	-	-
Laghey HS	25	0.3	13	2.5	-	-	-	-
<b>Region Totals</b>	<b>197338</b>	<b>136.9</b>	<b>5469</b>		<b>76070</b>	<b>1668.1</b>	<b>55661</b>	
<b>Overall Totals</b>	<b>253384</b>	<b>919.2</b>	<b>49590</b>		<b>192416</b>	<b>5455</b>	<b>181897</b>	

Table C8.7. Current and future volumes of sludge arising from wastewater treatment in the Donegal Bay catchment area and immediate neighbouring parishes.

### **C9.3 Water Treatment Plant Sludges**

In order to make them suitable for human consumption, both surface waters and ground waters undergo various types of treatment, this usually results in the production of sludges. These sludges will vary in type and quantity according to the treatment method employed and the quality of the raw water abstracted. Traditional methods of treatment have involved sand filtration and/or clarification with chemical coagulants and flocculants. Treatment of surface waters with chemical coagulants and flocculants can generate sludge at a rate of 2% of throughput. Groundwaters often contain very high levels of iron and manganese and the treatment of these produces sludges with a very high insoluble, inorganic content.

Sludge draw off from clarifiers generally has a dry solids content of around 0.2% and the current method of disposal is usually to lagoons or shallow drying beds. Dry solids content can be increased to 4-6% by thickening in continuous flow thickeners with the addition of a poly-electrolyte conditioner and a filter press will dewater thickened sludge to 20-25% dry solids. Alternative dewatering equipment available includes, the inflatable membrane plate press, centrifuge or filter belt press.

The ideal solution for water treatment sludges is to eliminate their production, particularly that of chemical sludges by changing to chemical free treatment processes. In many instances this will not be economic or possible.

#### **C9.3.1 Disposal Options**

- Water treatment sludges can be piped into the sewer network, however the intermittent nature of this can cause problems. According to the Foundation for Water Research, the addition of aluminium hydroxide to activated sludge improved the removal of phosphate, however to prevent deterioration in sludge biomass, concentrations of aluminium should be less than 0.3g/l.
- Aluminium recovery has been investigated in the past although it was found that problems can occur with accumulation of impurities and the removal of these impurities renders it a costly process.

- Waterworks sludge can also be dried and incinerated, however this is uneconomical.
- Other disposal options include, land application, landfill and manufacture of building materials.

### **C9.3.2 Water Treatment Sludges in County Donegal**

The total volume of sludge produced annually from the treatment of water in the County, is approximately 47430m<sup>3</sup>.

Most water treatment sludges produced currently in Donegal are transferred to sludge lagoons. Sludge at Bundoran water treatment works is thickened and transferred to sewers.

### **C9.3.3 Current Strategies for Management of Local Authority Sludges**

Where appropriate sludge from outlying works are transported to the major plants for treatment and disposal.

At many wastewater facilities, the tanks are not accessible for desludging. Within the Donegal Bay catchment these include; Ballyshannon and Dunkineely.

### **C9.4 Agricultural Sludges**

As the agricultural industry in County Donegal is variable throughout the region, it is necessary to estimate the volumes of sludges on a rural district basis, as well as the county as a whole. The results achieved give a more in-depth look at the levels of sludge produced within Donegal.

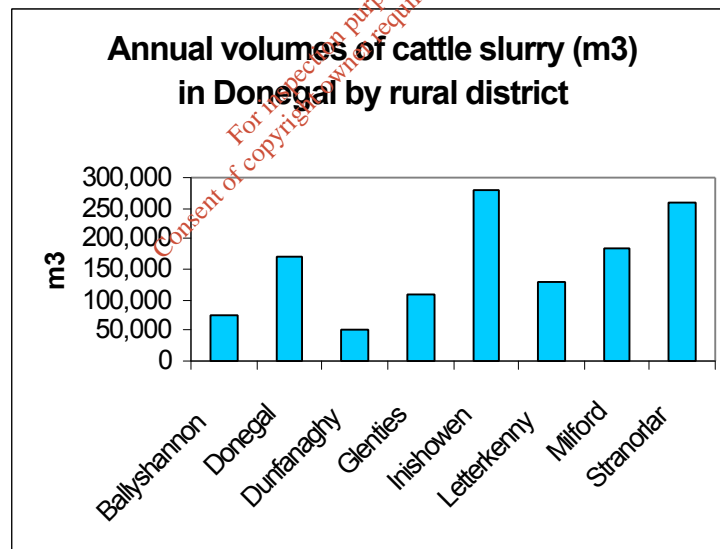
### C9.4.1 Cattle Slurry

The figures from the Department of Agriculture's 1998 Schemes were used to determine the cattle numbers in the county as these were the most recent records available due to the Foot and Mouth Disease outbreak and associated restrictions.

An estimation of the slurry produced by each animal during an annual 20-week over-wintering period was determined using figures provided by the Department of Agriculture, Food and Forestry.

Calculations indicate that 1.26 million m<sup>3</sup> of slurry is generated every year in Donegal by cattle housed over the winter months. Cattle slurry is generally of a relatively high dry solid (DS) content. Therefore, at 10% DS, the total volume of cattle slurry arising annually in Donegal on a dry tonnage basis is 126,311 tDS.

Figure C9.1 Annual volumes of cattle slurry produced in Donegal rural districts



### **C9.4.2 Pig slurry**

The pig population of Donegal although, generally increased over the last decade has been decreasing at a rapid rate over the past few years. Figures used for calculating the amount of slurry produced by the pig population were obtained from Teagasc and were dated 1997. The following figures for slurry volume must therefore be taken as an estimate only.

There are no pig production units large enough within the County that require an IPC licence. Given the problems associated with disposal of pig slurry it is likely that this sector will find the County a favourable place to develop. In the past a proposed development of this type did not succeed in starting up due at least in part to slurry disposal problems.

Teagasc has made accurate estimations of phosphorus generation by each of the three pigmeat production units types found in Ireland:

- integrated breeding and finishing unit: 22 kg phosphorus per sow and progeny to finish
- specialised breeding unit: 9 kg phosphorus per sow and progeny to 32 kg weight
- specialised finishing unit: 3 kg phosphorus per pig place.

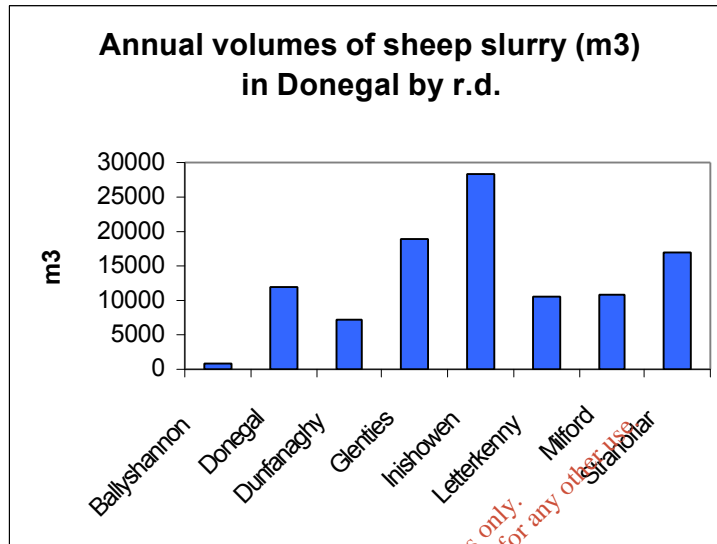
The above figures were used to calculate phosphorus production per unit type for each pigmeat production unit in County Donegal. The Department of Agriculture, Food and Forestry estimates 1.4 kg phosphorus to be present in every tonne of pig slurry at 6% DS. Therefore total volume of pig slurry produced annually in Donegal was calculated to be 62,904m<sup>3</sup> or 3,774 tDS.

### **C9.4.3 Sheep slurry**

As in the case of cattle slurry, the volume of slurry generated by the sheep population in County Donegal was calculated on the basis of sheep numbers provided by the Department of Agriculture 1998. It was assumed that slurry produced by sheep would not require storage and management, with the exception of that produced by ewes housed indoors for a six-week period during the lambing season.

On this basis, it was calculated that 105,596m<sup>3</sup> slurry can be attributed to the sheep population of Donegal. At a dry solid content of 25%, this is equivalent to 26,399 tDS. As with the cattle, the slurries produced by the sheep-farming industry will vary greatly throughout the county.

Figure C9.2 Annual volumes of sheep slurry in Donegal by rural district



#### C9.4.4 Spent mushroom compost

According to Teagasc figures there are 32 mushroom producers operating in Co. Donegal in 1999, the majority of which are in the Inishowen and Stranorlar rural districts. These have between them approximately 175 house units. It is estimated that the total amount of spent mushroom compost produced annually in the county is 17,160 tonnes. Currently most of this compost is spread on-land or delivered to golf courses where it is used for landscaping purposes.

#### C9.4.5 Poultry litter/slurry

Poultry breeding is not very intensified in Donegal, it is again mostly concentrated in the Inishowen and Stranorlar rural districts. Estimates received from Teagasc put the total amount of poultry sludge at approximately 59,126m<sup>3</sup> or 5,616 tDS annually.

#### **C9.4.6 Current strategies for management of livestock slurries**

The traditional method of managing agricultural slurries is to return them to agricultural land as a fertiliser. Generally, livestock and sheep slurries are spread on the farm where they are produced. By contrast, pigmeat producers are frequently required, by either planning permissions or Integrated Pollution Control licences, to transport pig slurry over long distances before landspreading. In the case of poultry production, because poultry rearing is not a widespread activity in Donegal, landspreading of poultry litter and slurry does not pose a significant management problem.

Various technologies exist for treatment of slurries. Additives are marketed to reduce the odour impact of landspreading. Aeration may be used to reduce odours and noxious gases associated with slurry storage. Manure composting is an age-old form of waste treatment but, because slurry requires separation prior to composting, has become relatively unfashionable. Anaerobic digestion may be used on an on-farm basis for odour reduction, pathogen and weed seed destruction and improving ease of slurry handling.

In general, despite the availability of suitable technologies, few farmers opt for treatment of slurry prior to landspreading. Most slurries are stored in underfloor or underground tanks, agitated intermittently and siphoned into vacuum tankers for spreading. Farmers are requested to apply slurry to land in accordance with a number of Codes of Practice, including:

- the Teagasc Code of Good Practice for Slurry Spreading
- BATNEEC Guidance Note for the Pig Production Sector (Environmental Protection Agency, 1996)
- the Code of Practice for the Protection of Groundwater from the Landspreading of Organic Wastes (Environmental Protection Agency, Geological Survey of Ireland, 1996)
- the Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates (Department of the Environment, Department of Agriculture, Food and Forestry, 1996).

#### **C9.4.7 Future trends in production of livestock slurries**

To date, long-term increases in livestock numbers reflect favourable policies at a European level. However, it is difficult to use historical trends as an indicator of future livestock numbers as, at the present time, proposed amendments to the Common Agricultural Policy are under review. These include the lowering of grain prices and the elimination of milk quotas, both of which will impact directly on pig and cattle production. The headage payments which accounted for the steep rise in ewe numbers at the beginning of the 1990's are not as encouraging of a high sheep population as they were initially and developing European policies are expected to support the already evident decline in ewe numbers. The negative impact on upland areas by over-grazing sheep will be reduced by this trend.

Generally, the tendency towards more spatially concentrated, intensive production in the agricultural sector will have as great or greater an impact on the production and management of agricultural slurries than will either an increase or decrease in livestock numbers. The development of “organically based” agricultural practices to meet consumer demand has yet to have a significant impact in Donegal.

#### **C9.5 Industrial Sludges**

County Donegal's industrial sector is mainly involved in agri-industry. The fish processing and aqua-culture industry is well-developed in many regions. The largest sludge producer in agri-industry in Donegal is an animal slaughtering plant in the Letterkenny rural district. The Integrated Pollution Control licenses were examined with a view to identifying industries which produce a sludge for disposal. Industrial sludge types were categorised as a function of the activity by which they were produced:

- fish farming
- fish processing
- food processing
- industrial biological.
- animal slaughtering

The estimated total volume of sludge produced by industries in Co. Donegal in 1999 was of the order of 4,392 m<sup>3</sup>.

### **C9.5.1 Current strategies for management of industrial sludges in Donegal**

With the exception of meat rendering and Fish Processing, from which a re-saleable product is derived, the main disposal outlet currently used for industrial sludges of all types in Donegal are offsite removal for landfill. A small quantity derived from aquaculture has been spread on or ploughed into agricultural land. The animal slaughtering industry has its own on-site treatment facility, the effluent from which, along with paunch is spread on-land. Five farms in the surrounding areas take this sludge and it is spread in accordance with a nutrient management plan drawn up by the Environmental Protection Agency.

Many of the industries produce a sludge which is mainly domestic in origin.

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### C9.5.2 Current management routes for industrial sludges in Donegal

<b>Industry</b>	<b>Sludge type</b>	<b>Current management route</b>
<u>Animal slaughtering</u>	Offal Effluent treatment Paunch	Rendering Agriculture Agriculture
<u>Food processing</u> - drinks manufacture	Municipal treatment	Disposal as fraction of municipal sludge
- dairy processing	Effluent treatment	Agriculture
<u>Fish Processing</u>	Offal Effluent treatment	Fish meal production offsite disposal
<u>Industrial biological</u>	Effluent treatment	Disposal as fraction of municipal sludge

Dewatering and digestion are the methods used to treat sludges produced in Donegal prior to disposal.

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## **C10. Donegal Bay Quarrying**

Within the Donegal Bay catchment area there are a number of varying quarry types from crushed rock to sand and gravel. Table C10.1 describes the main quarries while Map 25 identifies their locations within the catchment.

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QUARYNAME	CRUSHED ROCK	SAND GRAVEL	QUARRY ADDRESS	QUARRYTOWN	OPERATOR	EASTING	NORTHING
Altclough Quarry (1)	0	0	Meenaneary, Carrick	Meenaneary	Dan Mc Monagle & Sons Ltd.	159050	384500
Altclough Quarry (2)	0	0	Largybrack, Glencolumbkille	Largybrack	Dan Mc Monagle & Sons Ltd.	159000	385000
Laghy Quarry	-1	0	Laghy	Laghy	Readymix (Maye Concrete) Ltd.	194216	373999
Roadstone Ballintra Quarry	-1	0	Roadstone Ltd., Ballinacarrick, Ballintra	Ballinacarrick	Roadstone Provinces Ltd.	191950	368550
Ballymagroarty Quarry	-1	0	Ballymagroarty, Ballintra	Ballymagroarty	P. Mc Caffrey & Sons Ltd.	190972	367313
Stone Developments Ltd.	0	-1	Altclough		Stone Developments Ltd.	158650	384300
Mountcharles Quarry	0	0	Mountcharles	Drumkeelan	Dan Mc Monagle & Sons Ltd.	186000	378000
The Glen Stone Co. Ltd.	-1	0	Drimaghey, Bruckless	Drimaghey	The Glen Stone Co. Ltd.	174300	379150

**Table C10.1. Main Quarries within the Donegal Bay catchment area.**

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## **C11. Donegal Bay Agriculture**

### **C11.1 Introduction**

Agriculture makes a significant contribution to life in Ireland. Agricultural productivity has been greatly increased by mechanisation, the availability of artificial fertilisers and the intensive rearing of livestock. Associated with these changes has been the expanded use of silage for fodder and the off-farm purchase of feed. These developments have changed the nature of farming and modified the natural environment.

Agricultural activity can be a source of pollution and destruction for watercourses, habitats and wildlife. Large farming enterprise by the very size have greater potential to cause environmental damage. For example, there is the need to dispose of, as waste, livestock excretion and vegetable residues which, in the much smaller amounts accumulating under traditional farming systems, were formerly recycled as fertiliser for fodder and other crops. The accumulation of large quantities of high-strength organic waste, usually in slurry form, is a particular risk for surface waters and groundwaters. Environment policy must be adapted to minimise these risks.

The main source of agricultural data from within the Donegal Bay catchment area is currently from the 1991 Census of Agriculture. While some ten years old now it was not updated as intended due to the recent outbreak of foot and mouth disease. Since the collation of this data, it is estimated that an 8-10% decrease in cattle numbers and an increase of sheep numbers of 40% has occurred within the catchment (Mr. Pat Molloy, Teagasc, Pers. Comm.).

### **C11.2 Agricultural Practices**

Over the past decade the Donegal Bay catchment area, as elsewhere in County Donegal, has seen a noticeable decline in the area of tillage land. This trend has been much influenced by EEC policies, particularly those relating to pork, dairy and land production. Virtually no tillage now occurs north of Donegal Town

### **C11.3 Agricultural Surveys**

The most recent agricultural land use statistics have been abstracted from the Census of Agriculture 1991 rural districts, as compiled by the Central Statistics Office and are described in the Agriculture Appendix. The tables included give details on the size of the farms, livestock numbers and area under tillage for District Electoral Divisions (DED's) in the Donegal Bay Catchment. These DED's within the catchment are also described in Appendix C6.

Seven maps describe the Donegal Bay farms per DED as from the Census of Agriculture 1991 as follows;

- Maps 26-30. Varying farm sizes per DED.
- Map 31. Total farms per DED.
- Map 32. Areas per DED farmed.

The 1991 Census methodology was completely new and differed radically from that employed in the 1980 and earlier census. Consequently, comparisons between the 1980 and 1991 Census may not be valid. However, the change in methodology has had only a negligible effect on the recording of the level of agricultural activity in the site i.e. in terms of the numbers of livestock and the areas under cash crops. Practically all the difference in the area used for agriculture is reflected therefore in the coverage of land use for grass, pasture and rough grazing.

#### **C11.3.1 Main Crop and Livestock Changes**

Table C11.1 summarises the main changes at State level between 1980 and 1991 for the principal crop and livestock activities. The large expansion in sheep numbers is the most notable feature of the period 1980-1991. There were also significant increases in the numbers of pigs and poultry. With the exception of sugar beet, which showed a marginal increase, the areas under the principal crops fell significantly over the period. A similar decrease is to be expected up to the present.

Eleven maps describe the Donegal Bay livestock on farms as from the Census of Agriculture 1991 as follows;

- Map 33. Total sheep per DED.
- Map 34. Other sheep per DED.
- Map 35. Total cattle per DED.
- Map 36. Total ewes per DED.
- Map 37. Total rams per DED.
- Map 38. Total bulls per DED.
- Map 39. Total cows per DED.
- Map 40. Total heifers per DED.
- Map 41. Total cattle 2 years+ per DED.
- Map 42. Total cattle 1-2 years per DED.
- Map 43. Total cattle <1 year per DED.

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Item	Unit	1980	1991	Change
Cereals	000 ha	446.5	301.5	-32.5%
Potatoes	000 ha	41.6	20.5	-50.7%
Sugar beet	000 ha	33.0	33.3	+0.9%
Total crops*	ha	553.9	391.7	-29.3%
Cattle	nr	6,908.9	6,912.0	+0.0%
Dairy cows	nr	1,583.3	1,330.8	-15.9%
Other cows	nr	459.9	817.3	+77.7%
Sheep	nr	3,291.5	8,888.2	+170.0%
Ewes	nr	1,547.4	4,626.0	+199.0%
Pigs	nr	1,030.5	1,303.7	+26.5%
Poultry	nr	9,903.3	12,052.8	+21.7%

\* Including fruit and horticulture.

**Table C11.1. Summary of the main changes at State level between 1980 and 1991 for the principal crop and livestock activities.**

### C11.3.2 Clogher and Corabber Catchment Farm Surveys

Within the Donegal Bay catchment two river sub-catchments were examined in relation to pollution threats from agriculture. These sub-catchments were the rivers Corabber and Clogher (Maps 44 and 45). These rivers were selected owing to their offering a range of varying terrain. This terrain includes hill ground, lower lying pasture, and an S.A.C. Both rivers also ultimately drain to Lough Eske which is an important game fishery and a source of a public water supply.

The risk of pollution assessment covered a number of areas:

- The species and number of animals was noted.
- The ground slope, drainage and soil type was assessed.
- The amount of silage produced was recorded.
- The type of slurry storage facility and condition was examined and its distance to the nearest watercourse determined.
- The collection system for soiled water was assessed.

The Corabber river catchment was the largest of the two examined covering 21.25km<sup>2</sup>. The highest point of this catchment is approximately 630ft above sea level in the Blue Stack Mountains. The catchment drops to 30ft above sea level where the Corabber river drains into Lough Eske. The landuse within the catchment is described in Table C11.2.

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The Lough Eske and Ardnamona Wood S.A.C. partially falls within the Corabber river catchment around the point where the river enters the lake, covering an area of approximately 0.5545km<sup>2</sup>. The Owendoo and Cloghervaddy Bogs S.A.C. is located to the north of the Corabber River Catchment also extends, to an area of 2.312km<sup>2</sup>, into this catchment area.

The Clogher river catchment covers an area of 9.799km<sup>2</sup>. The highest point of this catchment is approximately 400ft above sea level in the upland area of Clogher Hill and Croaghmeen. The catchment drops to 30ft above sea level where the Clogher river drains into Lough Eske.

Part of the Lough Eske and Ardnamona Wood S.A.C. also falls within the Clogher river catchment. It covers approximately 0.5307km<sup>2</sup> of the catchment at the point where the river enters Lough Eske. The landuse within the catchment is described in Table C11.2.

Landuse	Corabber River Catchment (km <sup>2</sup> )	Clogher River Catchment (km <sup>2</sup> )
Moors and Heathland	8.4770	3.4760
Sparsely vegetated areas	1.6559	0.0000
Pastures	2.2324	1.6712
Lakes and water bodies	0.7198	0.3006
Coniferous woodland	0.8095	0.0007
Natural Grasslands	5.9321	0.2465
Diversity of Agriculture and natural vegetation	0.1292	3.4690
Peat Bogs	1.1540	0.6351
Bare Rocks	0.6468	0.0000
Transitional Woodland Scrub	0.0037	0.0000
Broad Leaved woodland	0.0491	0.0000

**Table C11.2. Description of landuse in the Corabber and Clogher river catchments.**

A total of 25 individual farms within the Clogher catchment were identified and examined (1 high risk, 1 medium risk, 22 low risk) and 6 farms within the Corabber catchment (0 high risk, 1 medium risk, 5 low risk).

The majority of land use is grazing for the farm animals which are generally dry cattle and sheep. Only one pig farm was present. Some 17.05% of the land within the Clogher catchment is pasture compared to 10.5% of the Corabber.

The slurry is contained in slatted tanks or lagoons and spread on the land in the summer months. The majority of these storage facilities is in excess of ten years old.

The majority of farms safely contained their silage baled within plastic.

The one high risk and one moderate risk farm detected had threats of spillage of slurry into nearby watercourses. However, overall these farms were in the minority. The results of this survey are indicative of the state of agricultural practices within the Donegal Bay catchment as a whole.

#### **C11.4 Soil Survey**

A soil sampling survey of County Donegal was undertaken by Teagasc during the period 1986-1996 and the findings reported in "The Concentrations of Major and Trace Elements in Irish Soils" in December 1996.

The report presents data on major and selected trace element concentrations obtained from field trials and soil analysis. Some 5722 samples from Donegal County were analysed. Results are presented on a county by county basis and mapped on a 10 km grid system.

Most soils were concluded to have higher phosphorus and potassium status compared with early survey results available in 1950, however, recorded levels of elements are generally low in County Donegal compared to national averages.

## **C11.5 Farm Development Schemes**

A number of schemes have been devised to control farm pollution and protect the environment.

The increasing concern with environmental pollution has seen a change in emphasis in CAP policy from production to environmentally driven incentives, including the Control of Farmyard Pollution Scheme (CFP), the Farm Improvement Programme (FIP) the Dairy Hygiene Scheme and the Agri-Tourism Scheme, the Rural Environment Protection Scheme (REPSII) and a Farm and Countryside Enhancement Scheme operated under the Peace Initiative.

### **C11.5.1 Rural Environment Protection Scheme**

Under the agricultural environment programme, aid may be paid to farmers under a scheme known as the Rural Environment Protection Scheme (REPS). This successful scheme was initiated in June 1994 with final applications received in January 1999 and finally closed in January 1999. This scheme was relaunched as REPS II in November 2000. The scheme was drawn up by the Department of Agriculture, Food and Forestry in consultation with agricultural, environmental and community interests. The aim is to establish farming activities which take account of environmental protection and conservation measures.

While no figures are available for the Donegal Bay catchment area specifically, County Donegal has been one of the busier participating counties in the country both in the original and REPS II (J. Ryan, pers. comm.). Table C11.3 describes the payments under both REPS I and II for the County. Those figures given for REPS I are the final totals while those given for REPS II are those correct up until November 2001. The current fee per hectare for those participating in REPS II starts at 151euros and increases to 242euros depending on classification of land such as that within an N.H.A., an S.A.C., an S.P.A. or on commonage.

	Number of Payments	Total of Payments	Total Area Covered
REPS I	3171	£31.6m	134,000 (Ha.)
REPS II	940	£4.4m	37,374 (Ha.)

**Table C11.3. Description of payments under both REPS I and II for County Donegal to date.**

Farmers in the scheme will be asked to follow a wide range of measures which are aimed at resolving a number of problems, including:

- water quality
- maintenance of the landscape and appearance of the countryside
- loss of wildlife habitats and endangered species of flora and fauna

The objectives of the REPS are to:

- Establish farming practices and controlled production methods which reflect the increasing concern with conservation, landscape protection and wider environmental problems.
- Protect wildlife habitats and endangered species of flora and fauna.
- Produce quality food in an extensive and environmentally friendly manner.

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The following is a summary of what is required for each measure.

1. Follow a waste management, liming and fertilisation plan prepared for the total area of the farm.
2. Adopt a grassland management plan.
3. Protect and maintain watercourses and wells.
4. Retain wildlife habitats.
5. Maintenance of farm and field boundaries.
6. Cease using herbicides, pesticides and fertilisers in and around hedgerows, lakes, rivers and streams etc., except with the consent of the Minister.
7. Protect features of historical or archaeological interest.
8. Maintain and improve the visual appearance of the farm.
9. Produce tillage crops.
10. Become familiar with environmentally friendly farming practices.
11. Keep such farm and environmental records as may be prescribed by the Minister.
12. Comply with any other environmentally friendly activity which the Minister may prescribe.

Point source pollution such as those presented by industry and sewage works are relatively simple to tackle given the current legislation and adequate finance, whereas agricultural pollution from both point (farmyards) and diffuse (leachates) sources is more challenging. The REPS scheme has gone some way to improve land management practices, however this is a voluntary scheme. The more intensive farmers in the catchment are unlikely to consider REPS incentives adequate. The implementation of the REPS scheme along riparian zones of the Donegal Bay catchment which requires the fencing off of rivers and the provision of alternative water sources, would assist the rural landscape through enhanced riparian management and a reduction in nutrient loading.

A nutrient management scheme has recently been carried out for the Lough Erne area to create enhanced environmental management. Under this scheme aspects such as farm buildings, nutrient management planning, achieving quality standards during land spreading of waste and countryside are covered. In return for adopting these measures farmers receive economic and environmental benefits.

As part of this scheme, farmers are educated in the efficient and correct use of inorganic fertilisers, creating an awareness of the long-term implications of agriculture on water quality and aquatic life.

### **C11.5.2 Scheme of Investment Aid for the Control of Farm Pollution**

Under the National Development Plan 2000-2006 the Department of Agriculture has initiated a scheme of investment aid for the control of farm pollution.

- The Scheme aims to control farm pollution by providing grant aid to farmers for farm buildings, farm yards, storage facilities for fodder and agricultural wastes (incl. silage effluent, slurry, waste water, roof run off, dairy washings etc.), and disposal equipment.
- Participants in the Scheme may also qualify for grant aid to provide farm roads, water supplies to fields and shelter/screening belts.
- Participants in the Scheme, however, must not spread farm waste between 1 November and 31 January and must undertake to empty their storage tanks by 31 October each year.

## **C11.6 Farm Waste**

The 'Guidelines on control of farm waste and pollution' give strict standards for farmers to obey. Table C11.4 lists the quantities of neat slurry produced by different classes of livestock. Tables C11.5 and C11.6 list the amount of nutrients N and P contained in slurry. In addition the guidelines list the amount of soiled water produced in milking premises, the storage requirements for slurry, FYM production in cattle, sheep and pig housing and guideline on the storage and disposal of soiled water.

Agricultural activity can adversely affect water quality in a number of ways. In particular, water quality can be impaired by the direct entry of polluting farmyard wastes to waters and by nutrient inputs. The main concern arising from farm wastes is their direct ingress to waters, due to badly designed or maintained storage facilities or the lack of such facilities. This concern arises particularly in relation to silage effluent. State grants have been made available to assist in the provision of necessary facilities. Assistance is made available for the provision of slurry and silage effluent storage tanks, animal housing and fodder storage.

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Description of animal		Volume Litres/Week	
Dairy cow - 560 kg live weight		315	
Suckler cow - 500 kg live weight		280	
Beef cattle - 450 kg live weight		250	
Young cattle - 250 kg live weight		140	
Calf - 140 kg live weight		80	
* <u>Finishing Pig</u> - average live weight 58 kg	2.0 to 1	20	These figures are based on a dairy intake of 1.95 kgs of meal/pig
	2.5 to 1	27	
water/solids	3.0 to 1	34	
ratio in feed	3.5 to 1	41	
	4.0 to 1	48	
* <u>Lactating sow and Litter</u>	3.0 to 1	97	These figures are based on a daily intake of 5.5 kgs of meal/sow
water/solids	3.5 to 1	115	
ratio in feed	4.0 to 1	135	
* <u>Dry Sow/Boar</u>	3.5 to 1	53	These figures are based on a daily intake of 2.5 kgs of meal/animal
water/solids	4.0 to 1	62	
ratio in feed	4.5 to 1	70	
* <u>Gilt</u>	3.0 to 1	44	This figure is based on a daily intake of 2.5 kg of meal/gilt
water/solids			
ratio in feed			
<u>Weaner</u>	3.0 to 1	15	This figure is based on a daily intake of 0.85kgs of meal/pig
water/solids			
ratio in feed			
Lambs - finishing 25-40 kg live weight		13	
Mountain ewes 40-50 kg live weight		17	
Lowland ewes 60-80 kg live weight		28	

Table C11.4. The estimated quantities of neat slurry produced by the different classes of livestock (average weight animals).

Description of animal	Volume Litres/Week	
<u>Laying hens</u> (100 places)	80	
Broilers (100 places)	30	
<u>Turkeys</u>		
Poults up to 14 weeks (100 places)	91	
Hens up to 22 weeks (100 places)	126	
<u>Ducks</u>		
Up to 4 weeks (100 places)	84	
4-7 weeks (100 places)	161	
Layers and breeding stock	133	
<u>Horse</u> (450 kg)	193	
<u>Red Deer</u>		
Mature Hind (96-120 kg)	42.0	
Calf houses for feeding (40-60 kg)	16.0	
<u>Fallow Deer</u>		
Doe (50 kg)	16.0	
Calf houses for feeding (20-30 kg)	8.0	
<u>Japanese Sika</u>		
Mature Hind (55-60 kg)	17.0	
Goat	20.0	
Rabbit (commercial)	1.6	
Rabbit (Angora)	2.1	
Greyhounds	15.0	

\* The water source can be either drinking water, whey, skim milk, silage effluent etc, or a combination of these.

**Table C11.4 continued. The estimated quantities of neat slurry produced by the different classes of livestock (average weight animals).**

Type of storage tank	Cattle Slurry		Pig Slurry		Sheep Slurry	
	N(kg)	P(kg)	N(kg)	P(kg)	N(kg)	P(kg)
Uncovered 1.7 to 2.75 m deep	3.9	0.60	5.2	1.0	-	-
Uncovered <1.7 m deep	3.6	0.56	4.8	0.9	-	-
Uncovered > 2.7 m deep	4.3	0.66	5.3	1.1	-	-
Separate covered	5.0	0.77	6.6	1.25	-	-
Roofed slatted	4.6	0.72	5.8	1.2	10	10

**Table C11.5. The amount of N & P contained in 1 m<sup>3</sup> (1000 litres) of slurry stored in a range of tanks on farm.**

	N(kg)	P(kg)
Poultry slurry/litter	26	9.0
Dungstead manure	3.5	0.9
Farmyard manure	4.5	1.0
Mushroom compost	8.8	4.2
Blood	18.0	0.2
Sewage Sludge	N & P content shall be as declared by the supplier in accordance with SI No 183 of 1991	

**Table C11.6. N & P contained in 1 m<sup>3</sup> (1000 litres) of other farm wastes.**

### **C11.6.1 Landspreading of Slurry**

Slurry is applied by farmers in the spring and summer. The slurry consists of animal waste that has been collected over the winter (when the animals are housed indoors), silage leachate and farmyard runoff. The usual policy is to apply slurry to a field immediately after the grass has been cut and harvested for silage production. However many farmers leave large quantities of slurry in storage for subsequent spreading. The slurry is an effective fertilizer that strongly enhances grass growth.

There is no explicit legislation governing the timing of landspreading animal manure slurries. In Ireland, Local Authorities may in accordance with Section 21 of the Water Pollution Act 1990, (by making bye-laws) avail themselves of statutory powers regarding landspreading of slurry over the autumn and winter periods and promote the adoption of waste management plans on an individual basis. Guidelines are being prepared in order to assist local authorities in the preparation of such by-laws. Intensive animal rearing and processing above certain thresholds are subject to a new system of integrated pollution control (IPC) licences operated by the Environmental Protection Agency. Specifically, licensing is required for the rearing of poultry where the capacity exceeds 100,000 units and for the rearing of pigs where the capacity exceeds 1000 units on gley soils or 3000 units on other soils.

The application of slurry can have a significant impact on water quality. Slurry can enter waterways as runoff following application on poorly drained soils or as a consequence of spillage from storage facilities. The decision to spread is judged on an individual basis as it is a function of soil type, land slope, weather conditions and the quantity of slurry being stored.

Farming organisations in Ireland have issued Codes of Practice to farmers giving advice as to how to control pollution resulting from land application of slurry.

The EU Directive Concerning the Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources (91/676/EEC) will influence slurry spreading practices on lands draining to waters affected by or vulnerable to nitrate pollution. Member States are required to have identified such vulnerable zones. Needs in this respect are being assessed at present. Specific Codes of Practice for landspreading of slurries are to be prepared and implemented in these zones.

Present indications are that nitrate pollution is not a significant problem in the Donegal Bay catchment.

### **C11.7 Agricultural Chemicals**

The amount of inorganic chemicals used on agricultural land should be based on crop and animal production requirements. In Ireland Teagasc have developed recommendations for the application of inorganic fertilisers based on soil analysis results. Table C11.7 presents the correlation between the soil phosphorus level and necessity for application of phosphorus.

<b>P Index</b>	<b>P ppm</b>	<b>Correlation with Crop Response</b>
1	0-3	Nutrient Response Definite
2	3-6	Nutrient Response Likely
3	6-10	Nutrient Response Unlikely, except for root crops, but a maintenance dressing should be used
4	>10	Nutrient Levels adequate, maintenance dressings not necessary at present except for potatoes. For silage P should be applied until the soil test exceeds 15 ppm.

Table C11.7. Soil correlation between the soil phosphorous level and necessity for application of phosphorous (November 1997 "Managing Phosphorus in Farming - Teagasc Phosphorus Campaign").

The Teagasc publication "Guidelines for Phosphorus Use on Soils" (1991), recommends that, even in a disposal situation, the maximum soil P level for mineral soils should not exceed 30ppm.

From soil samples taken in the catchment it can be seen that soil phosphorus levels where available, are everywhere below 10ppm. This indicates that additional spreading of phosphorus from time to time is recommended in these areas. However, there are cases of continued use of fertiliser at high application rates even when the soil no longer requires it. Concern has been expressed at the marked increase in nutrient enrichment of watercourses in recent years arising directly from fertiliser application.

A number of maps describing the uses of various fertilisers within the Donegal Bay catchment are described as follows;

- Map 46. Phosphorous from organic manure.
- Map 47. Phosphorous from artificial fertilisers.
- Map 46. Phosphorous from both agricultural and artificial fertilisers.
- Maps 49-51. Mean phosphorous levels in soils.
- Map 52. Levels of lime required in soils, 1989-1995.
- Map 53. Potassium required in soils, 1989-1995.

In Ireland clearance to market pesticides is given on the basis of detailed evaluation of information and studies which must be submitted by the person wishing to market the product. The information is evaluated by the Pesticide Control Unit, Department of Agriculture, Food and Forestry. There is at present no specific Code of Practice governing the safe use of pesticides or sheep dips except that users follow all instructions on the packaging with respect to application rates and safe usage. The main problem with respect to sheep dips occurs when the resulting polluting wash down waters are discharged into adjacent streams. There is no control on sheep dips within County Donegal. Ireland are signatories to the Convention of the Marine Environment of the North-East Atlantic which will replace both the Oslo and Paris Conventions (PARCOM). PARCOM Recommendation 94/7 deals with the elaboration of National Action Plans and Best Environmental Practice for the reduction of inputs to the environment of pesticides from agricultural use.

## **C.12 Forestry in the Donegal Bay Catchment Area**

### **C12.1 Introduction**

Ireland's forest area now comprises approximately 626,000 Ha. or 9% of the total land area (D.O.M.N.R., 2000). Most of this forest has been established since 1950, with significant increases in the rate of planting in the private sector since 1989 (Coillte, 2000). At present the forest cover of the Donegal Bay catchment amounts to just under 11% of the total area with the species distribution dominated by sitka spruce and lodgepole pine. Table C12.1 summarises the area covered by the varying species within the catchment, while Table C12.2 outlines the ownership of these forests. Table C12.3 details the current status of the maturity of the Donegal Bay catchment tree cover.

<b>Species</b>	<b>Area Covered (Ha.)</b>	<b>% Cover of Catchment</b>
Oak	0.64	0.00065
Beech	1.26	0.00128
Larch	21.5	0.0219
Other Conifers	292.5	0.2978
Other Broadleaves	728.64	0.7423
Pine/Spruce Mix	855.82	0.87187
Pine	1096	1.11655
Unknown	323.72	3.29791
Spruce	441.98	4.4947

Table C12.1. The Areas covered by the varying tree species grown within the Donegal Bay catchment area.

<b>Owner</b>	<b>Area Covered (Ha.)</b>
Private	6285.76
Coillte Teoranta	5683.44
Private	775.12

Table C12.2. The ownership of the forests within the Donegal Bay catchment.

<b>Maturity</b>	<b>Area Covered (Ha.)</b>
Cleared	1509.30
Mature	4878.44
Young	5516.44

Table C12.3. The current status of the maturity of the Donegal Bay catchment tree cover.

Maps 54 and 55 outline the various forestry types within the catchment area and their positions relative to the various fresh water systems respectively.

With increased environmental awareness the Forest Service's Code of Best Practice was produced in 2000 (Anon, 2000). These guidelines relate to the entire forest cycle, including ground preparation, fertiliser and chemical application, thinning and harvesting for sensitive and non-sensitive areas. In these guidelines, sensitive areas are identified based on several criteria, e.g. base-poor geology, low water pH, location in salmon fishing and spawning areas. The Donegal Bay Management Plan was an ideal means to assess the impacts of these guidelines on the Bay's forestry practices in relation to any influences on the aquatic zone.

Final harvesting and fertilisation are two elements of any forestry development with potential detrimental influence on the aquatic zone. Forest harvesting and extraction have the potential to adversely impact on water quality through sedimentation, pH influence and increased erosion rates. Any such impact of harvesting the Fintragh Forest on the Glenaddragh River was assessed over a twelve month period. Similarly, without proper management, fertiliser application always carries a threat to water quality and aquatic life by water eutrophication. The Stragar and Roechrow Rivers were assessed for any influence following the application of differing fertilisers to two upstream forestry developments. Both studies are included in Appendix C7.1.

The Forest service is currently drawing up new Forest Pesticide Guidelines which will be completed by April 2002. The purpose of these guidelines is

- To ensure that pesticides are handled, stored and applied in such a way that public health, soil and lands, wild life, aquatic habitat and water quality will not be put at risk
- That pesticide usage forms part of an integrated forest establishment and management system which ensures that pesticides are used only when necessary at the correct time and at the minimum quantities and rates required for effective treatment.

### **C12.2 Forest Inventory and Planning System (FIPS)**

Under the guise of the Forest Service a Forest Inventory and Planning System (FIPS) has been initiated to create an up to date database of all forestry developments in the country. FIPS 98 is a combination of two main datasets. The primary dataset, FIPS 95, constituted a national forest inventory, which was derived from a combination of an automatic classification of satellite imagery and the on-screen interpretation of Landsat TM imagery (1993 - 1997), panchromatic orthophotos (1995), and Ordnance Survey 25" map series. Forest boundaries were digitised to within 2m accuracy of the orthophotos, and where appropriate the Ordnance Survey 25" map series. The secondary dataset was captured from Ordnance Survey hard copy maps (1:2500) which delineated private grant applications from landowners. This data source comprised grant applications up until the end of 1998. The FIPS data is given in full for the Donegal Bay catchment area in Appendix C7.2, describing the forestry developments in each DED.

### **C12.3 References**

Anon, (1992). Forest and Fisheries Guidelines. Forest and Fisheries Guidelines. Forest Service, Dept. of Energy, Dublin 2.

Anon, (2000). Code of Best Forest Practice - Ireland. Forest Service, Dept. of Energy, Dublin 2.

Coillte, (2000). Pettigo Forest Management Unit. A Coillte publication.

D.O.M.N.R., (2000). Code of Best Practice – Ireland. Leeson Lane, Dublin 2.

E.P.A., (1995). Managing Ireland's Rivers and Lakes. A department of the Environment publication.

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### **C.13 Bathing Beaches**

Donegal Bay has four Blue Flag beaches as listed in Table C13.1 and depicted in Map 56. These beaches are extremely popular and are a central part of the Donegal Bay tourism industry.

<b>Location</b>	<b>Blue Flag Beaches</b>
<b>Bundoran</b>	*
<b>Rossnowlagh</b>	*
<b>Murvagh</b>	*
<b>Fintra</b>	*

Table C13.1 Donegal Bay's Blue Flag Beaches.

### **C14 Donegal Bay Hydroelectric Installations**

#### **C14.1 Introduction**

In Ireland today there are in excess of 100 working water turbines and some 6,500 abandoned mills and water power sites. Hydroelectric installations are actively promoted as a source of 'green' energy.

In 1994 the Department of Public Enterprise promoted the first Alternative Energy Requirement awards for wind, hydro and combined heat and power (chp). These promotional awards have continued with the 5<sup>th</sup> tranche of funding to be awarded in 2001. With such active promotion, hydroelectric installations will become more commonplace in the Donegal countryside.

Map 57 depicts the positions of the Donegal Bay hydroelectric installations which are described in the following sections.

### **C14.2 The River Erne:**

The River Erne is home to two of the largest and longest established hydroelectric installations in County Donegal and the country as a whole. In 1950 the Cliff hydroelectric station commenced generating, followed by the larger Cathleens Falls station, further downstream, in 1952. The Cliff station has two turbines each capable of producing 10 megawatts of power. The Cathleens Falls station has two turbines each capable of producing 22.5 megawatts of power. Therefore when combined these two stations have a capacity of producing 65 megawatts at any given time. The difference in output capacity between the two installations is due to the difference in head of water behind each installation. The Cathleens Falls station has a head of water of 30m behind it owing to the damming of the Erne, compared to a head of only 10m behind the Cliff station. Both stations are on constant full production during the winter months through to Easter. However, during the summer months when the river water is too low, full production is reserved for midday and early evening to facilitate peak demand on the national grid system.

### **C14.3 The Lowerymore River:**

The most recent hydroelectric installations within the Donegal Bay catchment opened on October 26<sup>th</sup> 2001 as part of the Alternative Energy Requirement scheme. In association with the ESB, Hibernian Hydro opened two plants on the Lowerymore River in Barnesmore at Mullenphyly and Barnes Bridge with a production capacity of 550 kw and 485 kw respectively. Selling to the national grid, these installations operate on a 2000l/s race.

### **C14.4 The Corabber River**

The hydroelectric turbine on the Corabber river was established in 1990 by the Fingleton-White Organisation prior to the AER awards and any governmental promotion. The 700kw turbine requires a 500l/s race and the power generated is sold directly to the national grid.

### **C14.5 The Eanybeg Water:**

In 1996 the Dublin based Saporito company established its hydroelectric installation on the Eanybeg Water in Annarget, near Letterbarra. This development was devised under the Alternative Energy Requirement in partnership with the ESB. Monitored from Dublin, the electricity produced by the twin 402 kw generators is sold directly to the national grid. Requiring a flow of 1000l/s for optimal output, this facility is rarely in production during the summer months.

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# **Donegal Bay Water Quality Management Plan**

## **SECTION D**

### **CLASSIFICATION SYSTEMS**

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## **D Classification Systems**

### **D1 Introduction**

In previous water quality management plans (WQMP) for the County, a single system combining chemical and biological parameters was used to classify the state of the particular catchment. This allowed water managers to assess the state of the rivers throughout the county by using the same set of rules. Since the drawing up of those previous WQMP's the Phosphorous Regulations National Implementation Report (2001) has introduced a new approach to water classification, with a strong focus on freshwater phosphate concentrations. Q values relative to water phosphate concentrations is the new approach to water classification.

For convenience the Donegal Bay catchments rivers and key tributaries have been divided into a number of reaches which can then be classified. The reaches have been chosen such that they are representative of an existing sampling site within that reach, and it is assumed that the site is typical of conditions throughout the reach. It is recognised that this may not be the case in some circumstances but the assumption is considered to be appropriate for the purposes of this management plan. It should be noted that in general we consider the sampling locations to be well chosen and representative of conditions over a reach.

In this section a classification system for running freshwaters is firstly developed followed by a brief description of a system for defining eutrophic lakes. Thirdly a classification system for estuaries is presented together with a system for assessing the trophic status of estuaries. Classification systems for water contact activities and shellfisheries are then considered.

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## **D2 An Integrated Framework for Running Freshwaters**

### **D2.1 Existing Water Quality Management Frameworks**

The existing framework for water quality management is as follows:

A biological assessment system which monitors the health of the river ecosystem by reference to its macro-invertebrate populations presently exists. Regard is also given to eutrophication as observed by the level of macrophyte, particularly attached algae, growth. Rivers in Ireland have been classified using this system, (the "Q" quality system), since the early 1970's. Phosphate concentrations relative to Q values are now also considered in any management framework.

Ireland does not have a distinct chemical classification system and chemical aspects are considered in Ireland in terms of the relevant EU Directives.

Water quality classification is based mainly on biological assessments. However where chemical data exists, regard is given to it, to confirm biological quality findings. Previously, where conflict arises the biological quality is given greatest credence.

### **D2.2 Macro-Invertebrate Classification System - Freshwater**

Biological communities, reflect the overall quality of the freshwater environment in which they exist. The natural environment can suffer stress in a number of ways which may not be detected by assessment through chemical monitoring alone. Such sources of stress include:

- intermittent pollution due to short lived events such as storm overflows or silage spills
- presence of toxic elements, such as heavy metals or pesticides
- nutrient enrichment, from agricultural run-off and point discharges
- changes to the flow regime, such as a reduction in flows due to over-abstraction
- river management, including excessive aquatic plant control, canalization and draining of adjacent wetlands

The effect of environmental stress is normally to change the balance of biological communities, with an increase in tolerant species and a reduction or disappearance of sensitive species. The use of macro-invertebrates is now a well established technique for assessing the effects of pollution and river management. In this context, the term macro-invertebrates covers all the insect and small animal life living on the river bed, for example worms, snails, caddis flies and beetles. In clean, healthy rivers there will be both a large number of macro-invertebrates and also a wide variety of taxa (groups of species). In rivers suffering stress, either of these factors can be affected, but there is normally a change of balance between families, with an increase in pollution tolerant species such as worms and an absence of pollution sensitive species, for example mayflies and stoneflies.

A number of biological based systems are available such as the BMWP, RIVPACS and 'Q' quality system. The existing 'Q' quality biological assessment system in conjunction with Q values relative to phosphate concentrations is currently the most suitable for the Donegal Bay Water Quality Management Plan.

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### D2.3 "Q" Quality Biological Classification

The pollution status of a stream is determined by comparing the relative proportions of the organisms collected from a stream or river with the expected ratios in similar, but unpolluted habitats. This system takes into account the physical characteristics of the sample site that influence the macro-invertebrate community, such as water depth, bed material and current speed. The results of the biological assessment are then converted into a five point biotic index, Q5-Q1, where the status of each class is as shown in Table D2.3.

**Table D2.3 Biotic Index for Expressing Quality of a Freshwater System**

Biotic Index or 'Q' Value	Community Diversity	Water Quality
Q5	High	Good
Q4	Slightly reduced	Fair
Q3	Significantly reduced	Moderate
Q2	Low	Poor
Q1	Very Low	Bad

In Ireland the invertebrates are sampled every few years, with the period between sampling varying between sampling sites. The most recently EPA published Q values for the Donegal Bay catchment was 1999. Unpolluted sites are sampled less frequently than polluted sites.

### D2.4 Eutrophication and Other Biological Considerations

The use of river macrophytes (plants and weeds, normally growing in the river bed) is starting to become recognised as a valuable tool in the assessment of the overall health of the river environment. Unfortunately, a rigorous framework for assessing water quality using macrophytes does not currently exist. However, it should be noted that research is proceeding in a number of European Countries on a rigorous classification system based on macrophytes. The restricted flora of brisk rivers may have implications in the mobility of any classification system developed.

It is important to include macrophytes as a measure of river water quality as macrophytes are a useful indicator of eutrophication. In this section a classification system for eutrophication in running freshwaters which includes consideration of macrophytes is developed. Eutrophication is defined as:

*'the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned' (UWWT Directive (91/271/EEC).*

However, the assessment of whether a stretch of water actually or potentially is eutrophic is not possible simply by reference to numeric chemical criteria. It is recommended (*Ref DR/8/1(A): Criteria and Procedures for Identifying Sensitive Areas and Less Sensitive Areas (Urban Waste Water Treatment Directive) and 'Polluted Waters' (Nitrates Directive) in England and Wales*) that the symptoms summarised below are considered when identifying waters as eutrophic or potentially eutrophic.

The following symptoms all need to be considered when identifying running freshwaters as eutrophic or potentially eutrophic, but the presence of any of them, either singly or in combination, will not necessarily indicate eutrophication and a final judgement will depend on local conditions and knowledge.

- a. **Phosphorus Concentration**  
An annual average orthophosphate concentration over 30ug/l P.
- b. **Algal Biomass**  
Excessive growth of attached algae, especially Cladophora, which may reach biomass levels of several hundred g/m<sup>2</sup>. Planktonic algae producing annual mean concentrations of more than 25 ug/l chlorophyll-a or a maximum of 100ug/l.
- c. **Water Retention Time**  
In rivers affected by planktonic algae, sufficient retention time for algal multiplication (normally over 5 days).
- d. **Dissolved Oxygen**  
A strong diurnal cycle of dissolved oxygen saturation, daytime supersaturation levels (over 150%) and reduced night time saturation levels.
- e. **Effects on Fauna**  
Reductions in diversity and increased abundance of pollution tolerant taxa which can be attributed to the effect of nutrient enrichment.
- f. **Effects on Macroflora**  
Substantial adverse changes in macrophyte abundance and/or diversity.

g. **Effects on Microflora**

Exceptional increases in planktonic, floating, or attached algal biomass leading to blooms, scums or discoloration.

An important element of the criteria for running freshwaters is whether substantial adverse changes in macrophyte abundance and/or diversity have occurred. Macrophytes, like macro-invertebrates, are sensitive to the environmental conditions in which they exist. They can play a vital role in the water quality of the river itself, increasing dissolved oxygen due to photosynthesis during the day and decreasing it due to respiration at night. In extreme cases, where there is a very large plant biomass, this diurnal variation in dissolved oxygen can be a significant source of stress for invertebrates and also fish life.

A wide variation in the numbers and types of aquatic plants is normally found within rivers. Three distinct macrophyte zones are generally apparent, depending on the physical nature of the river reach under consideration. In the upper reaches, the river is often characterized by fast flowing water over a rocky substrate with mosses and liverworts being the dominant species. The middle reaches are generally still reasonably fast flowing over a gravel substrate, where rooted plants adapted to withstand the flows, such as Water Crowsfoot, tend to dominate. The lower reaches are deeper and slower moving with silty or sandy substrates and macrophytes are typically submerged and emergent species similar to those occurring in a shallow lake or pond. Within each of these zones the distribution and abundance of different macrophytes are often very different, reflecting sources of environmental stress such as organic pollution or nutrient enrichment.

Obvious signs that a river is suffering from organic pollution include the appearance of 'sewage fungus' which is normally only found near to the source of the pollution.

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## D2.5 National Environmental Quality Objectives

In view of the critical role which phosphorus plays in the eutrophication process environmental quality objectives/standards for phosphorous have been prescribed. Local authorities are obliged to take all necessary steps to ensure that phosphorus concentrations in freshwaters do not exceed stated levels.

In the case of rivers the overall objective is to eliminate seriously, moderately and slightly polluted stretches i.e. to achieve a 'Q' 4 rating or higher. Targets have been set to avoid any future deterioration in river water quality with a timeframe of 10 years (up to 2007) set for the achievement of the following:

- elimination of seriously polluted river stretches;
- incremental improvements in river channels currently slightly polluted or moderately polluted.

The quality standards which represent minimum targets are set out in Table D2.5.

**Table D2.5 Phosphorous regulations target values for Irish rivers - EQO's**

Orthophosphate Median Concentration* (mgP/L)	Corresponding Q Rating	EPA Classification
≤0.015	5	Satisfactory
0.016-0.020	4-5	Satisfactory
0.021-0.030	4	Satisfactory
0.031-0.050	3-4	Satisfactory/Unsatisfactory
0.051-0.070	3	Unsatisfactory
>0.070	2-3	Unsatisfactory
>0.070	≤2	Unsatisfactory

\*Median concentration to be determined using as a minimum ten samples taken at intervals of four weeks or longer in any twelve consecutive month period. Where the requisite number of samples has not been taken within such period, the median concentration shall be determined from sampling conducted over such period not exceeding twenty four months, as required to obtain a minimum of fifteen samples taken at intervals of four weeks or longer.

## **D2.6 An Integrated Water Quality Classification System**

It would be useful for a water quality management framework in the Donegal Bay catchment to incorporate a combination of chemical and biological aspects.

Whilst in previous WQMPs chemical monitoring was only useful for determining the extent to which a river is suffering from significant pollution stress, from routine sources macro-invertebrates provided a more sensitive means of classification. Thus, we considered the macro-invertebrate part of the classification system to provide a more important means of classification than purely chemical data. However in this Donegal Bay WQMP through the phosphorous regulations the chemical influence of phosphates on a watercourse's Environmental Quality has been incorporated to produce an integrated water quality classification system.

The target environmental quality objectives for phosphorus as set out in Phosphorous Regulations National Implementation Report (2001) are Q4 or higher. This, coupled with the target Q values set for the majority of river reaches within the catchment area in the County Councils Measures Report (1999) gives a common classification system by which to judge the status of the catchment's rivers.

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### D3 Freshwater Lakes

Environmental quality objectives have been set in Ireland with an objective to eliminate hypertrophic and eutrophic conditions. Where lakes were previously oligotrophic the aim will be to restore them to that condition. These objectives are intended to ensure lake conditions suitable for water quality sensitive species such as salmon and trout. They cater for conservation and protection of high ecological quality conditions as well as providing for waters of the quality required to meet all potential beneficial uses. These interim objectives are to be met by the year 2007.

A small number of lakes may be naturally eutrophic and thus their condition may be irreversible, consequently exemptions may have to be provided with respect to generally applicable target status for lakes.

Table D3.1 sets out the interim statutory standards which apply (by 2007 at the latest) to phosphorus levels in clear rivers and other lakes.

**Table D3.1 Phosphorus Standards - EQO's**

Existing Trophic Status	Target Trophic Status 2007	Total P annual average (ugP/l) 2007
Clearwater Lakes		
Ultra-Oligotrophic	Ultra-Oligotrophic	<5
Oligotrophic	Oligotrophic	5-10
satisfactory	Mesotrophic (or	10-20
Mesotrophic	Oligotrophic*)	(5-10)
	Mesotrophic	10-20
Eutrophic	Eutrophic	20-50
unsatisfactory		
Hypertrophic		
Other Lakes		
Oligotrophic	Oligotrophic	≤10
Mesotrophic	Mesotrophic (or	10-20
satisfactory	Oligotrophic*)	(≤10)
	Mesotrophic	10-35
Eutrophic	Eutrophic	35-100
unsatisfactory		
Hypertrophic		

\* in the case of lakes which were originally of that quality

## **D4 Donegal Bay Estuarine and Coastal Waters**

Estuarine conditions are extremely difficult to quantify in any detailed classification system. The interaction of salt and fresh water produces variable salinity environments, both in the short term due to tidal movements and seasonally with river flow fluctuations. The change in chemical composition of the water causes flocculation of sediment particles and adsorption of pollutants such as metals (if present) onto them. The flocculated sediment particles tend to settle out of the water column, typically producing the muddy substrates associated with estuaries.

The organisms inhabiting these difficult conditions are often specialised; some have evolved to tolerate small variations of salinity, others are capable of surviving in a wide range. This makes it almost impossible to classify estuaries using a system comparable to that applied to rivers.

The classification systems proposed for the Donegal Bay estuarine regions are therefore not based entirely on rigorous numerical standards but are partially subjective.

The proposed classification systems are consistent with those currently adopted for the Foyle and Swilly estuaries, which have been developed by the Association of Directors of River Inspectors in Scotland (ADRIS).

For the purposes of the study the estuary is defined as covering the area from the open sea to the tidal inlets of the rivers in the catchment.

### **D4.1 Integrated Classification System**

The ADRIS estuarine classification scheme is based on the six criteria show in Table D4.1. The coastal waters classification is shown in Table D4.2. Both of the schemes are default based, that is, an area of estuary or a stretch of coastal water is classified by allocating it to the highest class to which all of its condition criteria conform.

Table D4.1 Adris Estuarine Classification Scheme

Class	Description	Aesthetic Condition	Fish Migration	Resident Biota and/or Bioassay	Resident Fish	Persistent Substances (Biota)	Water Chemistry	
							Dissolved Oxygen (DO)	UK Red List and EC Dangerous Substances
A	Excellent	Unpolluted	Water quality allows free passage	Normal	Resident fish community normal	<twice national background	Minimum DO >6 mg/l	100% compliance of samples with EQS
B	Good	May show signs of contamination	Water quality allows free passage	Normal	Resident fish community normal	>or = twice national background but <substantially elevated	Minimum DO < or = 6 mg/l but > 4 mg/l	Annual compliance of samples with EQS
C	Unsatisfactory	Occasional observations or substantiated complaints of pollution	Water quality restricts passage	Modified	Resident fish community modified	>or = substantially elevated but <grossly elevated	Minimum DO < or = 4 mg/l but > 2 mg/l	One or more List II substances fail to comply with EQS, List I and Red List all comply
D	Seriously polluted	Frequent observations or substantiated complaints	Water quality allows NO passage	Impoverished or severely modified	Resident fish community impoverished	> or = grossly elevated level	DO <2 mg/l	One or more List I or Red List substances fail to comply with EQS

Table D4.2 Adris Coastal Waters Classification Scheme

Class/Description	Aesthetic Condition	Biological Condition	Bacteriological Condition	Chemical Condition
A Excellent	Near pristine	Flora and fauna normal	Likely to meet quality standards no less stringent than the guideline standards for EC designated bathing waters.	
B Good	Unpolluted, but may show traces of contamination	Flora and fauna normal	Likely to meet quality standards no less stringent than the mandatory standards for EC designated bathing waters.	
C Unsatisfactory	Occasional observations or substantiated complaints of sewage solids, smell, nuisance or oil	Flora and/or fauna modified by effluent discharges	Likely to occasionally fail to meet quality standards no less stringent than the mandatory standards for EC designated bathing waters	Likely to meet all quality standards applied as a consequence of the EC Dangerous Substances Directive.
D Seriously Polluted	Frequent observations or substantiated complaints of sewage solids, smell, nuisance or oil	Flora and/or fauna impoverished or absent	Likely to frequently fail to meet quality standards no less stringent than the mandatory standards for EC designated bathing waters.	Likely to fail any one or more of quality standards applied as a consequence of the EC Dangerous Substances Directive.

**Note:** Tables D4.1 and D4.2 are complimented by comprehensive notes defining each of the classes specifically.

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It is also proposed to adopt additional water quality standards recommended by the Central Fisheries Board which are presented in Table D4.3. These standards have been developed to ensure that the coastal and estuarine waters within the Donegal Bay catchment achieve compliance with relevant EU Directives.

**Table D4.3 Proposed Coastal and Estuarine Water Quality Standards**

Parameter	Units	Standards	Comments
Temperature	°C	<21.5	Except for natural occurrences
Dissolved Oxygen	mg/l O <sub>2</sub>	>7 for 50% of time	General Standard
Dissolved Oxygen		>5 for 95% of time	General Standard
Dissolved Oxygen		>4 for 100% of time	General Standard
Dissolved Oxygen	% Saturation	>80%	Guideline for shellfish areas
Dissolved Oxygen		>70%	Mandatory for shellfish areas
Dissolved Oxygen		70 - 120%	Bathing Areas
BOD	mg/l O <sub>2</sub>	<4 for 95% of time	
PH		6.5 - 8.5	
Total Ammonia	mg/l N	<0.3 for 95% of time	Guideline
		<0.8 for 95% of time	Mandatory
Nitrate	mg/l N	<1.0 for 95% of time	Guideline for outer Estuary
Total Coliforms	counts/100 ml	<5,000 for 80% of time	Bathing Areas
Faecal Coliforms	counts/100 ml	<1,000 for 80% of time	Bathing Areas
Faecal Coliforms	counts/100 ml	<300 for 75% of time	Shellfish Waters
Chromium	mg/l Cr	<0.05	Mariculture Areas
		<0.10	Elsewhere
Lead	mg/l Pb	<0.10	
Copper	mg/l Cu	<0.05	
Zinc	mg/l Zn	<0.10	
Cadmium	mg/l Cd	<0.005	
Mercury	mg/l Hg	<0.0001	

## D4.2 Eutrophication - Tidal Waters

The following criteria are useful for determining whether an estuary is eutrophic:

a. **Nitrate Concentrations**

Winter (February) nitrate-nitrogen concentrations significantly enhanced relative to a background concentration for a defined geographical area based on salinity.

b. **Occurrence of Exceptional Algal Blooms**

Attention should be given to the occurrence of unusual blooms of phytoplanktonic species or blooms of unusual scale or blooms with unusual toxicity characteristics.

In considering abundance it can be taken that blooms of algae in coastal waters normally reach densities of at least  $5 \times 10^5$  cells per litre and chlorophyll-a concentrations of around  $10 \text{ mg/m}^3$ .

c. **Duration of Algal Blooms**

It could be considered exceptional if the normal spring bloom algal densities persisted through the summer until the autumn bloom without the typical nutrient-limited decline in the summer.

This applies to relatively calm waters where thermal stratification occurs during the summer, and therefore nutrients can be consumed from the upper warm waters. In well mixed waters such as is the case in much of the Irish Sea and North Atlantic, stratification is not as strong and nutrients are readily available from the whole of the water column and a single summer bloom may occur, rather than two separate blooms in spring and autumn.

d. **Oxygen Deficiency**

Attention should be given to decreased oxygen concentration at the surface, as well as in deeper water layers, including in areas where sedimentation and/or stratification may occur.

Care must be taken under this heading to ensure that consideration is given to oxygen deficiency which is due to the decay of plant material and not caused by organic discharges to the local areas.

e. **Reductions in Fauna**

Substantial increases or decreases in benthic biomass, shifts in species composition and mortality of benthos and fish.

f. **Changes in Macrophyte Growth**

These can be relatively minor, such as the disappearance of red algal species, or a reduction in depth of the photic zone, or more significant, for example dense and widespread growth of *Enteromorpha* spp.

g. **Occurrence and Magnitude of Paralytic Shellfish Poisoning (PSP)**

The occurrence of PSP-causing species (eg *Alexandrium* sp) is endemic in areas around the British Isles coast even where there is no nutrient enrichment and blooms of varying significance occur each year. However, their scale may be enhanced by nutrient enrichment, extending the duration and geographic area of effect of the present chronic phenomenon. Such an extension could indicate eutrophication but could also be due to a variety of natural causes.

h. **Formation of Algal Scums on Beaches and Offshore**

Dense blooms of colonial or chain-forming species (e.g *Gyrodinium aureolum*, *Phaetoceros*, *Chaetoceros*) can result in drifts of cells on the sea surface or on the strand-line, or slimy deposits on fish nets or drogues. The significance of these phenomena should be placed in a historical perspective as such phenomena have been regularly recorded in some UK coastal waters for over 100 years. Blooms may be occurring more recently with increased frequency and it is possible that the Swilly estuary may be subject to a bloom in the future.

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## D5 Water Contact Activities

The presence of bacteria and viruses in water may pose a health risk to users who may come into contact with the water, such as bathers, sailors and canoeists. Harmful microorganisms are normally only present in very small numbers, if at all, and are therefore difficult to use as the basis for setting targets and for regular monitoring. It is therefore normal practice to use common, but not harmful, bacteria for this purpose on the basis that if large numbers of these bacteria are present then there is a risk that some harmful microorganisms will also be present. The most often used indicator species are *Total Coliforms*, *Escherichia coliforms*, (*E. coli*) and *Faecal Streptococci*. *E. coli* are a commonly used indicator of faecal contamination (although they are also naturally present in soil, for example) and are often referred to as *Faecal Coliforms*.

However, the problem of using indicator species in the river environment is that the bacteria can be derived from a number of sources other than sewage works discharges, including run-off from urban or agricultural areas. Faecal coliforms and streptococci are more reliable indicators in this situation since they are generally derived from faecal material from mammals, although they are also found in bird faeces. Problems may thus be encountered in livestock farming areas and near bird colonies where the contribution of faecal coliforms from animal faeces may be significant. In these instances numbers of faecal indicators cannot be directly related to STW discharge. There is not a reliable correlation between numbers of faecal indicator organisms and the possible presence of microorganisms which could be harmful to humans.

In terms of standards for water contact activities consideration should be given to standards in the Bathing Waters Directive and the Dangerous Substances Directive, the Urban Waste Water Treatment Directive may also apply in certain circumstances.

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## **D6 Shellfisheries**

Shellfisheries in the Donegal Bay catchment are designated under 79/923/EEC on the quality required of shellfish waters.

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# **Donegal Bay Water Quality Management Plan**

## **SECTION E**

### **TARGETS**

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## **E Targets**

### **E1 Introduction**

The targets for water quality within the Donegal Bay catchment are set out in the following sub-sections. Targets are set for each freshwater reach in the catchment in terms of the classification framework developed in Section D. For the catchment as a whole targets are set in terms of other water quality management aspects, such as litter on stream banks. In addition the targets set out in the relevant EU Directives are discussed.

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## E2 Freshwater Targets

The water quality targets currently in place are those devised under the 1998 Local Government Measures Report, which relates to Q values. Coupled with these targets are phosphate standards corresponding to the target Q values (see Section D).

Account must be taken of effluent disposal and other valid uses of waterways. The catchment generally receives small amounts of effluent in relation to river flows, so effluent disposal should not cause a downgrading in class. Given the importance of the natural salmon fisheries within the Donegal Bay catchment, it is suggested that effluent disposal should not in any case be allowed to downgrade the class of such rivers below Q4.

A balanced approach is required for any classification system to be credible, and it would not be productive to set unachievable targets. A balanced approach has been adopted for the Donegal Bay Water Quality Management Plan in proposing water quality targets and use related targets for activities which may impact on water quality, to enable sustainable development within the catchment whilst safeguarding the ecology of the rivers.

The classification system should take account of special ecological features. Under this criteria it is suggested that particular attention is paid to the freshwater mussel *Margaritifera margaritifera*. Targets for *Margaritifera margaritifera* are not known, it is believed that the strictest water quality standards should apply because recent research indicates that the freshwater mussels may be very sensitive to eutrophication and/or pollution. Therefore, it is proposed that reaches where mussels are present are given the target of Q5. This approach is, compatible with the concept of "precautionary principal". It should be noted that most of the current *Margaritifera* reaches meet the Q5 standard.

Freshwater loughs should comply with the environmental quality objectives as set out in Managing Ireland's Rivers and Lakes.

## **E3 Estuarine Targets**

Target Class A status of both Donegal Bay coastal and estuarine waters is recommended in order to protect the area's significant value in terms of commercial fishery, recreation and amenity uses.

These targets also reflect the importance of the use of the catchment by migrating salmonids.

### **E3.1 Specific Requirements for Uses**

#### **E3.1.1 Fisheries**

Manage and monitor both finfish and shellfish farm facilities.

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## E4 EU Directives

In addition to the Donegal Bay classification systems various European Union (EU) Directives apply.

The most relevant Directives to this Donegal Bay Water Quality Management Plan are:-

- a. **78/659/EEC on the quality of fresh water needing protection or improvement in order to support fish life.** Under this directive reaches are designated as Salmonid (eg. trout or salmon) or cyprinid (i.e. coarse fish) waters. The directive sets both guideline and imperative water quality standards for these reaches, which are detailed in Appendix A1.
- b. **75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water.** The standard is designed to set guidelines for the minimum amount of treatment for a certain quality of water. It is normal practice to match the level of water treatment to the quality of the abstracted water rather than attempt to improve water quality to meet existing levels of treatment. The water classification is divided into three categories as follows, based on the type of treatment:

A1: Simple physical treatment and disinfection.

A2: Normal physical treatment and disinfection. Examples of treatment processes include pre-chlorination, coagulation, filtration.

A3: Intensive treatment. This includes all the above examples and other treatment processes such as carbon filtration.

Details of the water quality standards that apply are presented in Appendix A1.

c. **79/923/EEC on the quality required of shellfish waters.** Under the "Shellfish Waters Directive", Member states are required to designate coastal and brackish waters which need protection or improvement to support shellfish and comply with a number of water quality parameters. In the absence of any other relevant legislation, the water quality targets for shellfisheries are based on the guidelines quoted in the Shellfish Waters Directive.

d. **917/492/EEC laying down the health conditions for the production and the placing on the market of live bivalve molluscs.** The "Shellfish Hygiene Directive" requires Member States to designate bivalve mollusc production areas and classify them according to the treatment required by the harvested shellfish before they can be sold for human consumption. The requirements for harvesting, transportation and processing of shellfish, as well as the end product standards are laid down in this Directive.

e. **76/160/EEC concerning the quality of bathing water.** Bacterial and viral concentrations are specified for the bathing waters identified within Lough Swilly.

f. **86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.** The directive sets down requirements for the sludge treatment, monitoring of sludge and soil quality, monitoring of potentially toxic elements in the sludge, planting, grazing and harvesting constraints following the application of sludge, keeping of records and measures for environmental protection including water pollution.

g. **76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community.** This directive identifies a list of families and groups of dangerous substances, selected mainly on the basis of their toxicity, persistence and bioaccumulation (List I), and a separate list (List II) of substances that can also have deleterious effects on the aquatic environment. The directive requires that Member States take steps to eliminate pollution by List I substances and to reduce pollution by List II substances. Directive 86/280/EEC is a 'master' directive for List I substances and is supported by a number of 'daughter' directives for individual substances. The List I and II substances are detailed in Appendix A1 of this Water Quality Management Strategy along with the Environmental Quality Standards to be applied for the receiving waters.

h. **80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances.** This Directive prohibits the direct or indirect discharge into groundwater of List I substances and limits discharge of List II substances, unless prior investigation can establish that pollution of groundwater will not occur, or unless the groundwater is permanently unsuitable for other uses.

i. **91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.** It requires Member States to identify waters affected by pollution from nitrates if protective action is not taken. For these designated vulnerable zones Member States are required to establish action programmes in order to reduce water pollution from nitrogen-containing fertilisers and in particular to set specific limits for the application of livestock manure. Member States are also required to establish and promote codes of good agricultural practice implemented by farmers on a voluntary basis with the aim of providing for all waters a general level of protection against pollution.

The criteria for designation cover waters which contain or may contain nitrate concentrations in excess of 50 mg/l, particularly where they are intended for the abstraction of drinking water, and any surface waters (freshwater, estuaries and coastal) which are eutrophic or which in the near future may become eutrophic if protective action is not taken. In the case of this directive, eutrophication is restricted to where it is caused by compounds of nitrogen of agricultural origin, and therefore applies primarily to coastal and estuarine waters where eutrophication is normally nitrogen limited.

j. **91/271/EEC concerning urban waste water treatment (UWWT).** The UWWT Directive lays down minimum standards for the provision of sewerage systems and sewage treatment. The sewage treatment standards vary according to the nature and sensitivity of the area receiving the sewage discharge and the size of the discharge. The Directive specifies secondary treatment as the norm but provides for higher standards of treatment (involving nutrient removal) for discharges to sensitive areas, and at least primary treatment for discharges to less sensitive areas. The criteria for designation of sensitive waters are similar to those for the Nitrates Directive (91/676/EEC) except that eutrophication is defined as .....*'the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorous,.....'* Members States are required to identify sensitive and less sensitive areas for the purpose of this directive.

## **E5 Health Related Targets**

### **E5.1 Bathing Water Quality**

There are four blue flag beaches within the catchment. Other areas of the estuary are also used for primary water contact recreation. It is recommended that consideration is given to the application of the terms of the EC Bathing Waters Directive to those areas of the catchment traditionally used for swimming. The guideline and imperative water quality standards are detailed in Appendix A1.

The growth of coastal communities and seasonal increases in population due to tourism continue to present difficulties for the management of sewage in coastal areas. Demand for water-based recreational activities ensures substantial public interest in the quality of beaches and bathing waters as well as health risks associated with contamination of these amenities by pathogens and sewage solids (Marine Institute, 1999).

The microbiological quality of bathing water throughout the European Community has been monitored for almost 20 years. The Directive (7611-60/EEC) concerning the quality of bathing water was adopted in December 1975 - one of the first environmentally orientated directives of the European Economic Community. In accordance with the directive, national limit values (NLV's) were set in 1979 by the Irish Minister of the Environment and have been used since then as a basis for assessing the sanitary acceptability of bathing waters in Ireland. Prior to 1987, only 6 bathing areas were monitored in Ireland. Following further regulations and amendments the number of marine bathing areas sampled is now 121. Samples are collected fortnightly (in some cases weekly) from mid-May until the end of August. EU member states are obliged to submit annual reports on the monitoring of their bathing waters to the European Commission. In Ireland, this is the responsibility of the Environmental Protection Agency.

A review of standards for bathing waters is currently underway which may well result in a tightening of standards for bathing waters. Should this occur, it is not expected that it will prove problematic for County Donegal in general and the Donegal Bay catchment in particular.

The Directive prescribes limits for a range of physico-chemical and microbiological parameters. Compliance with the directive requires that 95% of the samples taken during the season meet the mandatory limits for total and faecal coliforms (indicator organisms; Table E5.1) as well as certain physical parameters (i.e. mineral oils, surface active substances, phenols, transparency, colour and tarry residues). Compliance rates with the guideline limits of the Directive and Irish National Limit values are shown in Table E5.1. Monitoring for pathogens, enterovirus and salmonellae is at the discretion of the national authorities and is assessed when there are particular grounds for concern about the presence of these pathogens or a deterioration in bathing water quality. In Ireland due to the perceived high quality of bathing water around the coast, monitoring for pathogens is only conducted at a few sites primarily on the east coast near urban areas which are most at risk from sewage contamination. In contrast, faecal streptococci (which only has a guideline standard and is not a mandatory requirement) has been used more recently as an additional indicator organism in sampling programmes at most beaches in the UK and Ireland as it has a longer survival time in seawater than other indicator organisms and because it is a requirement of applications for the European Blue Flag Award for beaches. Recent epidemiological evidence indicates that the risk of illnesses is best predicted by the faecal streptococci level because adverse health effects have been correlated with very low concentrations of faecal streptococci in water (Marine Institute, 1999).

Table E5.1. Microbiological quality requirements for bathing water.

	EU Mandatory Limits <sup>1</sup> C(G)	EU Guideline Limits <sup>2</sup> C(G)	National Limits NLV's
<b>Compulsory Parameters</b>			
Total coliforms /100 ml	10,000***	500*	5,000*
Faecal coliforms /100 ml	2,000***	100*	1,000*
<b>Discretionary Parameters</b>			
Faecal streptococci /100 ml	-	100**	300***
Salmonella /l	0	-	0
Enteroviruses PFU /10 l	0	-	0

1. EU Mandatory limits: limits which must be achieved.

2. EU Guideline limits: limits which member states should endeavour to achieve.

\*=80% compliance required.

\*\*=90% compliance required.

\*\*\*=95% compliance required.

## E5.2 Shellfish Water Quality

Although the term shellfish includes both molluscs (e.g. cockles and mussels) and crustaceans (e.g. crabs, lobsters and prawns), it is mainly molluscs which tend to cause health problems. This is due to their ability to accumulate pathogenic organisms as well as toxic algae from the waters in which they live. In addition, molluscs are often eaten raw or only lightly cooked. The European directive 91/492/EEC lays down conditions for the production and placing on the market of live bivalves molluscs and other shellfish (such as gastropods) intended for immediate human consumption or for further processing before consumption. Regulation S.I. No. 147 of 1996 gave legal status to the directive in Ireland and superseded previous national regulations. The Department of Marine and Natural Resources is the responsible authority for the implementation of this directive which provides for strict controls including the monitoring of shellfish from production areas for bacterial contamination (sewage indicator organisms) algal biotoxins and chemical contaminants.

The requirements under Directive 91/492/EEC for direct human consumption of shellfish are as follows:

- The possession of visual characteristics associated with freshness and viability.
- Must contain no more than 300 faecal coliforms or 230 *E. coli*/100g of flesh
- No salmonella/25g of flesh.
- Absence of harmful contaminants as per directive 79/923/EEC (Quality of Shellfish Waters).
- Must not exceed the standards for radionuclide content in food.
- Total Paralytic Shellfish Poison (PSP) content in the shellfish must not exceed 80 ug/100g of mollusc flesh in accordance with the biological testing method - in association if necessary with the chemical method for the detection of Saxitoxin.
- Biological testing methods must not indicate the presence of Diarrhetic Shellfish Poison (DSP) in mollusc flesh.

The results of such monitoring dictate requirements, where necessary, of controls on harvesting or the use of processes (i.e. heat treatment, depuration or relaying) needed to reduce the level of bacterial contamination to acceptable levels. Under this directive the location and boundaries of shellfish production areas and their classification must be clearly defined as follows:

- **Category A** Areas contain shellfish having either <230 *E. coli* or <300 faecal coliforms/100g of flesh.  
Shellfish can be collected for direct human consumption.
- **Category B** areas contain shellfish which have a 90% compliance rate with standards in the range 230-4,600 *E. coli* or 300-6,000 faecal coliforms/100g of flesh.  
Shellfish from these areas must undergo purification in an approved plant for 48 hours prior to sale for human consumption.
- **Category C** areas contain shellfish with 6,000-60,000 faecal coliforms/100g of flesh.  
Relaying required over a long period, (at least two months) in clean seawater prior to sale for human consumption.
- All shellfish after purification and relaying must comply with the standards for Category A waters.
- **Prohibited** areas contain shellfish with >60,000 faecal coliforms/100g of flesh.

All designated bivalve mollusc production within the Donegal Bay catchment area are currently Category B (D. Gallagher, pers. Comm.). Shellfish from these areas must undergo purification in an approved plant for 48 hours prior to sale for human consumption.

Since 1984, and prior to the adoption of Directive 91/492, the Department of Marine and Natural Resources have operated a shellfish sanitation programme, 'Shellsan'. This programme classifies shellfish growing waters according to microbiological limits specified in an earlier directive (79/923) on the quality of shellfish waters. Data from the Shellsan programme is being used by the Department as a basis for reviewing the classification in accordance with the requirements of the new directive.

The number of sites monitored and designated under the Shellsan programme increased by over 400% between 1986-1995. In 1995, 55% of production areas were classified as A, 29% as B and 3.5% as C; the remaining areas have several classifications as they encompass more than one production site. There were no areas in which harvesting was prohibited during 1995

At the present time the detection of enteric virus contamination of shellfish is limited by the current methodology which is time consuming, tedious and lacking in sensitivity (Marine Institute, 1999). Thus, there is no requirement for the direct measurement of human pathogenic viruses and their presence or absence is inferred from the level of bacterial contamination (faecal coliforms or *E. coli*). However, the development of gene probes and the increasing use of molecular based techniques, particularly polymerase chain reaction (PCR), may help in the further development of public health controls applicable to the consumption of molluscan shellfish.

The accumulation of algal toxins in shellfish can cause serious illnesses in humans e.g. Diarrhetic Shellfish Poisoning (DSP), Paralytic Shellfish Poisoning (PSP) and Amnesic Shellfish Poisoning (ASP). The Fisheries Research Centre of the Marine Institute is designated by the EU as the National Reference Laboratory on Marine Biotoxins. The laboratory operates a monitoring programme involving both the testing of shellfish for the presence of toxins and the examination of water samples for the presence of toxin producing algae. The programme has been in place since 1984. The detection of DSP and PSP toxins in shellfish results in a ban on harvesting and sale of shellfish products from affected areas. Algal toxins, although most common in the summer, can occur in all seasons and the duration of closures can vary considerably from year to year. The toxins which present the greatest problems for bivalve shellfish in Irish waters, and the ones most frequently monitored, are those which can cause DSP. The most affected areas within Donegal Bay is Bruckless.

A conservative estimate for the closures affecting Donegal Bay and Bruckless, in particular during 2000 and 2001, would be in excess of £635,000. This would account for direct losses of stocks due to storm damage to stocks which would otherwise normally have been harvested before the bad autumn weather but were held due to harvest bans for biotoxins. It would also include the devaluation of remaining stock due to fouling by barnacles, etc. as they are left for extensive periods on the ropes waiting for the all-clear to harvest. The loss to the producers of their customers, any potential added value through processing, increased productivity through re-investment, etc., is incalculable but also an added loss (R. Flynn, I.S.A., Pers. comm.).

## E6 Aesthetic Quality

The aesthetic quality of the Donegal Bay catchment relates to its scenic beauty. This may be detracted from by a variety of factors, including the following:-

- Litter on banks and in the water
- Odour
- Noise
- Oils and other chemicals
- Foam on the water
- Discoloured water
- Dead animals
- Unsightly buildings

Pollution of water bodies is extensively covered by the Local Government (Water Pollution) Acts 1977 and 1990 together with the Local Government Water Pollution Regulation 1978 and 1992).

The contamination of river banks by litter is dealt with by the Litter Pollution Act 1997 which strengthened the powers and obligations of local authorities in regard to the production and control of litter.

While there is no legislation directly prohibiting unsightly buildings, any potential affront to the aesthetic nature of the catchment's architecture should be dealt with during the Planning process by the planning authority. There remains, however, the potential for unsightly farm or industrial buildings which may not require planning permission.

Other forms of pollution are covered by international directives. Odour, discoloured water, foam, oils and other chemicals are dealt with by EU legislation such as the Bathing Water Directive, the Freshwater Fish Directive and the Shellfish Water Directive.

It is difficult to define exact targets for aesthetic quality, which is itself largely subjective as a category. The need to do so is self-evident and options will largely appear as a matter of course in the section on the state of the catchment.

## **E7 Control of Intermittent Pollution**

The ability of the water environment to support uses, including basic ecology, can be affected significantly by intermittent pollution, i.e. events of relatively short duration (typically of a few hours) but which can have a marked impact on the river and, in extreme cases, result in fish kills.

These events are normally the result of poor management of potentially polluting substances, for example leakage from slurry or oil storage tanks, although they can also result from accidents, such as oil or petrol pollution following a road traffic accident. The target is to reduce the impact of intermittent pollution events in the catchment to a level where they do not cause lasting environmental stress. In particular they should not prevent the river from meeting its chemical or biological targets.

Combined sewer overflows (CSOs) are a particular form of intermittent pollution. No data are available on the impact of sewer overflows in the catchment and no targets are set. In Ireland this intermittent pollution as a threat to marine food safety was recently highlighted by the Marine Institute (2001). In the UK CSOs have been the subject of a great deal of study as part of the UK Urban Pollution Management Research Programme. This programme has produced a number of reports and its recommendations are now included in the proposals for implementation of the Urban Waste Water Treatment Directive in England and Wales. Of particular interest are the recommendations made for the assessment of the impact of CSO discharges. These are summarised in Table E7.1.

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**Table E7.1 Indicative Impact Assessment Criteria for Setting Consents for CSO Discharges to Freshwaters**

<p><u>LOW SIGNIFICANCE</u>                  Discharge control methods, e.g. Formula A, QUALSOC</p> <p>Dilution &gt; 8:1 (foul DWF @ 5%ile low river flows (Q95) )                  No interaction with other discharges</p> <p>This approach is likely to be adequate in most cases. However, for very high dilutions less demanding requirements than Formula A may be acceptable</p>
<p><u>MEDIUM SIGNIFICANCE</u>                  Simple Impact Assessment Models (e.g. QUALSOC, QUALSIM, CARP, plus sewer hydraulic model Hydroworks)</p> <p>Dilution &lt; 8:1                  No interaction or limited interaction with other discharges                  &gt; 2000 population equivalent                  Cyprinid fishery</p> <p>This approach is only likely to be required if all of these criteria apply</p>
<p><u>HIGH SIGNIFICANCE</u>                  Complex Models (river and sewer hydraulic models, e.g. MOSQUITO, river quality models e.g. MIKE11) to be overtaken by UPM procedure when finalised</p> <p>Dilution &lt; 2:1                  Interaction with other discharges                  &gt; 10,000 population equivalent                  Cyprinid or Salmonid fishery</p>

Source: Guidelines prepared by the Urban Pollution Management Group.

## **E8 Control of Diffuse Pollution**

Diffuse pollution can be a major cause for failures to achieve water quality targets. In the context of this report, diffuse pollution mainly concerns increased pollutant load contained in run-off from non-urban areas. The pollutant load could be organic in nature, resulting from the application of slurry or sewage sludge, or it could be increased nutrients, again from sludge and slurry but also from mineral fertilisers. Pesticides may also be associated with rural run-off. Acidification is a further type of diffuse pollution and of great concern in those rivers within the catchment classed as Acid Sensitive.

The basic target for the control of diffuse pollution is that it should not lead to the failure of the river to meet any of its other targets. However this is somewhat vague and a more direct target is to ensure that codes of good practice are available and implemented.

A Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates has been jointly issued by the Department of Environment and Local Government and the Department of Agriculture. The code applies whenever agricultural practices involving the spreading of organic or mineral fertilisers occur. It should be noted that the code of practice is a general code and may not necessarily be relevant to a particular reach or sub-catchment. The key provisions relate to:

- Storage and management of farm wastes
- Spreading rates and dates for organic and mineral fertilisers
- Management practices on the farm to reduce nitrate losses having regard to such matters as crop requirements, weather, soil type, soil nutrient status etc.

In relation to the application of sludge the same specific requirements that apply to slurry application are required to be met (Teagasc Code of Good Practice for Slurry Spreading). These are largely based on the EC Directive concerning sludge application which is discussed in Section C11:

- The heavy metal content of the soil is measured before and after sludge application.
- The heavy metal content of the sludge is measured, and if it is too high then appropriate action is taken.
- Levels of pathogens are reduced to below an acceptable level prior to the application of sludge to land.

Nutrient Management Planning is being promoted as a key management tool for the farmer to reduce diffuse pollution. The objective is to integrate the nutrients contained in organic fertilisers such as slurries and manures, with chemical fertiliser usage, account must also be taken of nutrients already in the soil so as to achieve the right balance between crop requirements, nutrient application rates and the prevention of water pollution.

Nutrient Management Planning is already a central feature of the Rural Environment Protection Scheme (REPS). Soil sampling is required to determine soil P levels and local authorities will have to identify problem farms within catchments. The local authorities are required to ensure that effective measures are taken to eliminate the pollution risks either by requiring farmers to participate in REPS or to use statutory powers to require the farmer to prepare a Nutrient Management Plan (Waste Management Act 1996). Investment aid for the control of farm pollution is now available under the National Development Plan, 2000-2006.

Teagasc have reviewed the recommended levels of Phosphorus fertilizer. If soil P levels are too high there is a greater risk of pollution. The objective is to define minimum soil P levels at which intensive agriculture can be conducted without obviously affecting production or the environment.

Teagasc announced revised lower rates for phosphorus levels in grassland in December 1996. New recommendations have been promoted and incorporated in Nutrient Management Plans under REPS. Teagasc have also issued advise in "Managing Phosphorus in Farming" (Teagasc Phosphorus Campaign) regarding phosphorus levels, slurry spreading, leakage control and phosphorus loss prevention.

The Rural Environment Protection Scheme (REPS) has as its main objective the establishment of farming practices and controlled production methods which will prevent water pollution and promote habitat conservation and land protection. Participating farmers are revised inter alia to:

- prepare waste storage, liming and fertilization management plans;
- familiarise themselves with environmentally friendly farming practices;
- maintain prescribed farm records.

## **E8.1 Proposed New Regulation**

There is a proposed introduction of new restrictions on Nitrate and Phosphate levels in soils involving the registration of all farms where slurry spreading takes place. There are also proposals to consider the entire Republic of Ireland as a single unit under the Nitrate directive. There are ongoing negotiations on the final scope and detail of these regulations.

## **E9 River Flows**

There are no specific objective targets for river flows within the Donegal Bay catchment. However we suggest as a general target there should be no significant diminution of natural flow regime and in particular the passage of fish should not be impeded as a result of insufficient flow related to abstractions or construction developments. This applies to the river as a whole or to any individual reach within it.

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## **E10 River Topography**

This section considers the general requirements for the topography of the river and its corridor as well as the provision and maintenance of permanent facilities and access. The overall River Topography Targets for the catchment are collated from the individual uses and summarised in this Section. The nature of the features that are included under the term River Topography means that the targets involved can vary widely in scale. The intention here is not to identify, for example, points of access to the river wherever they are required, but rather to indicate the major topographical requirements of various reaches in relation to the uses concerned.

It is suggested that the following general and specific requirements are considered to be targets for the catchment:

### **E10.1 General Requirements for Uses**

- The river should be of a width and depth appropriate to the flow regime.
- Encourage the presence of uncultivated bank-side vegetation alongside the river to provide habitats, shade and cover for fish, a buffer against diffuse pollution; and to enhance the quality of the landscape.
  - Preserve the natural river features such as emergent vegetation, meanders and pool-riffle sequences for conservation of the river corridor and to enhance the quality of the landscape.
  - Limit access to the river for livestock to minimise damage caused by trampling.
  - Ensure new development does not reduce the conservation value of the river corridor.

## **E10.2 Specific Requirements for Uses**

### **E10.2.1 Flood Defence and Land Drainage**

- Undertake an Environmental Impact Assessment of new developments to ensure that full consideration is given to drainage aspects of the development.

### **E10.2.2 Mineral Extraction**

- Ensure the restoration of all mineral extraction sites to an acceptable environmental standard.
- Maintain the integrity of the river banks and channel adjacent to mineral extraction sites.
- Enforce strict control of discharges from extraction sites.

### **E10.2.3 Fisheries**

- Ensure barriers are passable by migratory fish at low river flows (95 percentile).
- Clean and suitable gravel beds for salmonid spawning.

### **E10.2.4 Recreation and Amenity**

- Maintain existing footpaths and access points.
- Promote new facilities where they are consistent with the Foyle and Swilly catchment objectives.

### **E10.2.5 Nature Conservation**

- Retain and augment wetland areas within the catchment.

### **E10.2.6 Cultural Heritage**

- Maintain valuable features.

## **E11 River Management**

This section considers the regular activities for the management of the river and its bank-side features which are necessary to enhance and maintain the various uses of the river.

The intention here is not to provide a maintenance schedule (for example the location, methods and frequency of weed cutting required for land drainage or fisheries management) but rather to indicate the major river management requirements in relation to the uses concerned.

It is suggested that the following general and specific requirements are considered to be targets for the catchment.

### **E11.1 General Requirements for Uses**

- Co-operate with local authorities and riparian landowners to ensure banks and surrounding areas are free from litter.
- Carry out river corridor surveys to determine the conservation value and management requirements of river reaches.

### **E11.2 Specific Requirements for Uses**

#### **E11.2.1 Flood Defence and Land Drainage**

- Carry out weed control in a way that provides adequate flood protection but that ensures the continued survival of healthy aquatic vegetation.
- Maintenance and clearance of ditches in a way which encourages rather than diminishes ecological diversity.

#### **E11.2.2 Fisheries**

- Where necessary, carry out appropriate fish stocking to augment natural stocks, especially where these stocks have been reduced by pollution. Due regard should be given to maintaining the genetic integrity of the natural stocks.
- Identify, maintain and improve spawning gravels.
- Carry out weed control at appropriate intervals to provide open water for angling.
- Monitor reaches which are designated as sensitive in respect of forestry development.

#### **E11.2.3 Conservation**

- Maintain valuable conservation features.

## **E12 References**

Marine Institute, (1999). Ireland's Marine and Coastal Areas and Adjacent Seas. An Environmental Assessment. A Marine Institute publication. 80 Harcourt Street, Dublin 2.

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Mc Inerney, J.F., (1999). Measures Report. Local Government (Water Pollution Act), 1977/90 (Water Quality Standards for Phosphorous) Regulations, 1998. A Donegal County Council publication.

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# **Donegal Bay Quality Management Plan**

## **SECTION F**

### **STATE OF THE CATCHMENT**

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## **F State of the Catchment**

### **F1 Introduction**

In this section the state of the Donegal Bay river water quality is assessed in relation to chemical and biological parameters in relation to targets set in Section E. 44 river sample points were selected and assessed over 17 river catchments around the Bay (Map 58). Table F1.1 outlines these river catchments and the rivers included within them along with the sample point co-ordinates.

Biological assessments of the majority of the river sample points has been conducted by the EPA under their Quality or Q rating system as described in Section E. The most recent 1999 Q ratings for each sample point is included in Table F1.1 where a value was given. Several rivers were examined for the first time for this management plan and therefore not all rivers have a previous Q rating. Also in Table F1.1 are the target Q values as set in the County Council's Measures Report for 2007 (see Map 59). Where no individual reach targets were set in the measures report they have been introduced consistent with knowledge of the catchment and the policy as indicated in E2. Such target values are designated by the \* symbol.

For the purposes of this document each river sample point was examined monthly for twelve month period for the following parameters;

- temperature,
- pH,
- conductivity,
- ammonium,
- nitrates,
- nitrites,
- orthophosphate,
- total phosphate,
- suspended solids,
- biological oxygen demand,
- copper,
- zinc,
- dissolved oxygen.

The results of this analysis are included in Appendix F.

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
1. Abbey River	Abbey River	Pound Bridge	187350	362320	n/a	4-5*
		Main Road	190220	363980	n/a	4-5*
2. Ballaghdoe River	Ballaghdoe River	Br. in Kilcar	161578	376055	3/0	4-5
		Cashling's Bridge	161600	377700	4-5	4-5*
	Glenaddragh River	500m d/s Ballaghdoe River	161378	375810	3/0	4-5
		Br. 1.5 km E. of Kilcar	162760	375980	n/a	4-5*
		Br. SW of Meenboy	164778	377019	4-5	4-5
		Fintragh Forest	667600	379650	n/a	4-5*
3. Ballintra River	Ballintra River	Aghnadullagh Br.	192440	369620	n/a	4-5
		Ballintra Br.	191780	369770	n/a	4-5*
		Br. NW L. Garlagh More	198437	369647	4-5	4-5
		Connor's Br.	190616	258418	4	4-5
4. Bradoge River	Bradoge River	Bundoran Br.	181870	358830	n/a	4-5*
		Bradoge Br.	183270	358660	n/a	4-5*

**Table F1.1. River sample point co-ordinates with current and target 2007 Q values.**

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
5. Bridgetown River	Bridgetown River	Br. @ Old Flax Mill	191884	371571	4	4-5
		Br. W L. Nadarragh	199749	370791	4	4-5
6. Bungosteen River	Bungosteen River	Br. W of Ardara Station	172900	379000	n/a	4-5
		Br. W of Tullagha	172920	378580	4-5	4-5*
	Loughaderry River	d/s Island Seafoods	173110	380450	n/a	4-5*
		u/s Island seafoods	173010	380580	n/a	4-5*
	Roechrow River	u/s Stragar River confl.	173673	383081	4-5	4-5
	Stragar River	d/s Fish Sales	173860	381590	n/a	4-5*
		u/s Fish Sales	173890	381650	n/a	4-5*
		Meentullynagarn Br.	174200	382795	4-5	4-5
		Br. Sw Tullaghacullion	172930	378570	4-5	4-5*
7. Bunlacky River	Bunlacky River	Br. near Lisavaddy	177468	379133	4	4-5
		Bunlacky Br.	177956	376317	4-5	4-5*

**Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.**

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
8. Durnesh Lake	Birra Stream	u/s Durnesh lake	188420	368490	n/a	4-5*
9. Cunlin Lough Stream	Cunlin Lough Stream	Common's Br.	172409	378481	4-5	4-5
10. Eany Water	Eany Water	Inver Br.	182190	378450	n/a	4-5
		d/s Eanybeg/More Confl.	184000	381500	5	5
	Eanybeg Water	Eanybeg Br.	184667	382350	4-5	4-5
		Br. E Cloghvin	188136	386947	4-5	5
	Eanymore Water	Br. SW Letterbarra	188339	382308	5	4-5
		Eanymore Br.	184467	381361	5	4-5
		Ford 2km NE Drumboarty	191068	385177	4-5	4-5
	Eglis	Br. @ Meenataggart	192554	386009	4	5
	Sruell	Br. S of Meenawilderg	191020	385130	n/a	4-5*
11. Eddrim River	Eddrim River	Eddrim Br.	189440	377930	n/a	4-5*
		Drumkeegan	189990	380000	n/a	4-5*

Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
12. Erne River	Erne River	d/s ESB Fish	188060	361340	n/a	4-5*
		u/s ESB Fish and d/s Cathleen's Falls	188520	361340	n/a	4-5*
		u/s Cathleen's Falls	188750	361260	n/a	4-5*
		u/s Cliff	193434	359894	n/a	4-5*
13. Lough Eske and tributaries	Clady River	Clady Br.	195830	384310	n/a	4-5*
	Clogher River	Clogher Br.	197814	381706	4	4-5
	Corraber River	Br. u/s Lough Eske	197459	386252	4-5	5
	Drumenny River	Drumenny Br.	196881	378924	4-5	4-5
	Edergole river	Edergole br.	197020	386740	n/a	4-5*
	Eske River	Br. E of Donegal Town	193044	378557	3-4	4-5
		d/s Drumenny/Eske confl.	193510	378640	n/a	4-5*
		Thrushbank br.	195592	380904	4-5	4-5
		Lough Eske Br.	196910	382040	n/a	4-5*
	Greenan River	Greenan Br.	196940	386390	n/a	4-5*

Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
	Lowerymore River	d/s Lowerymore/Clogher confl.	197970	382000	n/a	4-5*
		Barnes Br.	203973	387026	4	4-5
14. Fintragh River	Fintragh River	Br. W Corrin Lodge	169243	376955	4-5	5
15. Glen River	Crow River	S of Crove	166016	384183	3-4	4-5
		u/s Glen/Crow confl.	161303	383819	4	
	Glen River	500m d/s Glen/Owenwee confl	158510	377990	n/a	4-5*
		500m d/s Carrick Br.	158911	378738	4	4-5
		E of Croaghstraleel	160324	382406	3	4-5
		u/s Errigal Eisc	160530	383250	n/a	4-5*
		d/s Errigal Eisc	160490	382950	n/a	4-5*
		Br. u/s Crow River confl.	161270	384340	n/a	4-5*
		u/s Glen Owentskinny confl.	161100	385151	4-5	4-5

Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
	Owenteskiny River	Ford u/s Glen River confl.	162588	385509	4-5	4-5
		Just E of Largynasearagh	164119	386579	4	4-5
		S of Durlough	166518	386715	4	4-5
	Owenwee river	S of Lough Unna	156846	380272	5	5
		Carrick Lower Br.	158423	378278	4-5	4-5
16. Laghey River	Laghey River	Main rd. Br., d/s Lough Boyle	198655	374780	4-5	4-5*
		Laghey Bridge	194490	374470	n/a	4-5
		d/s of Laghey Village	193740	374990	n/a	4-5*
17. Oily River	Oily River	Br. SW of Tamur Lough	180022	385059	4-5	4-5
		Ford W of Corkebeg	176035	382697	4-5	5
		Multin's Br.	175160	380440	n/a	4-5
		Miltown Br.	174804	377199	3/0	4-5

**Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.**

River Catchment	River Name	Sample Site	X co-ordinate	Y co-ordinate	Q1999	Q Target 2007
	Tullinteane River	Br. Near Crockfada	176114	384149	4	4-5*
		u/s Tullinteane/Oily confl.	176018	382727	2/0	4-5

**Table F1.1 continued. River sample point co-ordinates with current and target 2007 Q values.**

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## **F2 River Water Quality Assessment**

### **F2.1. The Abbey River**

The Abbey River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history. While this river was not set a 2007 target under the Measures Report, from a chemical aspect, the results of this sampling regime indicated the water to be of satisfactory condition.

### **F2.2. The Ballaghdoe River**

In 1992 the Ballaghdoe River was designated as an acid sensitive river. From a chemical aspect, the results of this sampling regime indicated the water to be of satisfactory condition. The upper reaches of the Ballaghdoe River are in a satisfactory Q rating but deteriorated in the town. Discharges of a toxic nature have been suspected as the cause of this deterioration and a successful court prosecution by D.C.C. of a local factory is hoped to see an improvement of water quality. With this improvement the Q target will be more readily achieved.

### **The Glenaddragh River**

From a chemical aspect, the results of this sampling regime showed the water to be of satisfactory condition. The upper reaches of the Glenaddragh River are in a satisfactory Q rating. Downstream of the Ballaghdoe confluence however the quality becomes unsatisfactory. As mentioned above the lower reaches of the Ballaghdoe River a successful court prosecution by D.C.C. of a local factory is hoped to see an improvement of water quality. Those Q targets set for each sample point on the Glenaddragh river should be met with the end of the illegal discharges to the lower reaches of the river.

The uppermost Fintragh Forest region of the river was exposed over the course of the sampling programme to intensive forestry harvesting (see section C12). From this study, this forestry development had no adverse impact on the rivers water chemistry in the short term.

In 1992 this river was designated as an acid sensitive river.

### **F2.3. The Ballintra River**

The results of this sampling regime indicated the water to be of satisfactory condition. All stretches of the Ballintra River have a satisfactory Q value.

### **F2.4. The Bradoge River**

The Bradoge River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history. From this current sampling regime the water was found to be generally satisfactory. However, the lower Bundoran Bridge area of the river suffered a prolonged seepage of domestic heating oil and sporadic releases of sewage via the storm overflow during periods of adverse weather conditions.

### **F2.5. The Bridgetown River**

The results of this sampling regime indicated the Bridgetown River to be of satisfactory condition. All stretches of the Bridgetown River have a satisfactory Q value.

The upper reaches of the river suffered from a temporary elevation in pH and suspended solids in September due to a spill of cement during repairs to the Bridgetown Bridge (see Section C2). A fish kill immediately with the loss of a number of trout and eels resulted. This was the only incident on the river and was immediately pursued, resulting in a successful prosecution.

### **F2.6. Bungosteen River**

This river has previously been named and classified by the EPA as the Stragar River. The higher reaches of this river are indeed called the Stragar. However, to avoid confusion, these lower stretches are referred to as the Bungosteen River. These stretches of the Bungosteen River have a satisfactory Q value. A target Q value has been set. From this current sampling regime the water was found to have an orthophosphate annual median of 0.013mg/l and 0.235mg/l at the upper and lower sample stations respectively (see section F3). These widely varying results correspond to the upper reaches of the river being satisfactory while the lower reaches are unsatisfactory. Irregularly high phosphate levels

recorded on the 15/02/01 have greatly influenced the annual median, however further regular sampling of this river is required to determine if such orthophosphate levels are consistently elevated.

### **The Loughaderry River**

The Loughaderry River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history or targets. From this current sampling regime the water was found to be generally satisfactory.

### **The Roechrow River**

All stretches of the Roechrow River have a satisfactory Q rating. The results of this sampling regime also found the Roechrow River to be of satisfactory condition.

### **The Stragar River**

This section of the Stragar River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history.

The site downstream of the previously unlicensed Killybegs Fish Sales factory repeatedly had marked ammonia concentration elevations. The discharge by this company to the Stragar River is currently under negotiation following their recent installation of a waste water treatment system. Nitrate concentrations further upstream at the Meentullynagarn Bridge site were also markedly elevated and may have been sporadically influenced by local agriculture or a nearby forestry development.

In 1992 this river was designated as an acid sensitive river.

### **F2.7. The Bunlacky River**

The results of this sampling regime showed the water to be of satisfactory condition. All stretches of the Bunlacky River have a satisfactory Q value.

## **F2.8. Durnesh Lake – Birra Stream**

The Birra stream feeding Durnesh Lake had not previously been assessed for either chemical or biological parameters and therefore has no Q value history or target. From this survey ammonia concentrations were found to be elevated on a number of occasions, most notably on the 08/11/00 at 0.73 mg/l NH<sub>3</sub> as N. Nitrate concentrations were also of concern with NO<sub>3</sub> as N concentrations of up to 4.06 mg/l recorded on the 24/05/00. The NRFB has previously investigated this stream for repeated contamination by slurry but despite extensive examinations failed to source the pollution due to the underground nature of the stream. It is probable that this sporadic pollution of the stream may continue. With the imminent employment by D.C.C. of a hydrogeologist, it is hoped that the cause of this pollution will be sourced and halted.

## **F2.9. Cunlin Lough Stream**

The Cunlin Lough Stream is in good condition, with a satisfactory Q value.

## **F2.10. The Eany Water**

The results of this sampling regime showed the water to be of satisfactory condition. Where previously given a Q rating, the Eany Water was found to be of the highest quality.

## **The Eanybeg Water**

The results of this sampling regime showed the water to be of satisfactory condition. All stretches of the Eanybeg Water have a satisfactory Q value.

## **The Eanymore Water**

The results of this sampling regime showed the water to be of satisfactory condition. All stretches of the Eanymore Water have a satisfactory Q value.

## **The Eglish River**

The Eglish River has a satisfactory Q rating while concern had been expressed over the siting of a sheep dipping unit close by. However, the results of this sampling programme found the water to be of good quality.

## **The Sruell River**

The Sruell River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history or target. Over the course of this sampling programme the water quality was consistently satisfactory.

## **F2.11. The Eddrim River**

The Eddrim River had not previously been assessed for either chemical or biological parameters and therefore has no Q value history or target. The new sewage treatment plant for the Donegal Town region is to be sited along this river. The two points on the river sampled in this examination are directly upstream and downstream of the selected site. Nitrate concentrations at the Eddrim Bridge site were occasionally high, reaching a maximum concentration of 0.4 mg/l NO<sub>3</sub> as N on 23/05/00. However, this site is influenced by tidal mixing and therefore not truly representative of the river.

## **F2.12. The River Erne**

The River Erne falls under the Erne Catchment Management Plan.

## **F2.13. Lough Eske**

The three small tributaries to Lough Eske, rivers Clady, Greenan and Edergole have not previously been assessed for either chemical or biological parameters and therefore have no Q value histories or targets. Over the course of this sampling programme the water quality was consistently satisfactory at all three rivers.

### **The Clogher River**

The Clogher River has a satisfactory Q rating. The results of this sampling regime indicated the river to be of satisfactory condition.

### **The Corrabber River**

This Lough Eske tributary, the Corrabber River, has a satisfactory Q rating.

### **The Drumenny River**

The Drumenny River has a satisfactory Q rating. A high suspended solid loading of 77.60 mg/l was recorded on the 27/09/00 but otherwise the river is of satisfactory quality.

### **The River Eske**

The Q rating of the upper reaches of the River Eske is satisfactory but deteriorates in Donegal Town. Slurry entering the river via a nearby stream from the Donegal mart is suspected as being the cause of this deterioration. The elevated  $\text{NH}_3$  as N concentration of 4.48 mg/l and  $\text{NO}_3$  as N concentration of 8.26 mg/l recorded at the east bridge on 29/06/00 were attributed to this slurry. Similarly, a recent fish kill on the river where several brown trout died was also connected to the mart. The mart no longer discharges to the local stream and is currently in negotiation with Donegal County Council regarding connection to the new sewage system.

## **The Lowerymore River**

The Lowerymore River has a satisfactory Q rating. Over the twelve month sampling programme the river suffered from siltation due to the Barnesmore-Clar road development scheme and subsequent landscaping. Suspended solid loading of the river reached up to 91.80 mg/l downstream of the roadworks on 03/03/00. This work has now been completed.

Both the sample site downstream of the Lowerymore/Clogher River had an annual median orthophosphate result bordering the satisfactory/unsatisfactory classification when the corresponding Q value is considered.

## **F2.14. Fintragh River**

The Fintragh River has a satisfactory Q rating and the results of this sampling regime showed the water to be of satisfactory condition.

## **F2.15. The Glen River**

Where previously classified the upper reaches of the Glen River had a satisfactory Q designation which deteriorated downstream of the fish factory at Meenanearry (Errigal Eisc) and improved again below Carrick village. On almost each date the Glen river was sampled the site d/s Errigal Eisc showed grossly elevated readings for almost every parameter examined when compared to the sample station u/s Errigal Eisc. To highlight the threat this factory poses to this river system we can use several examples: On the 10/05/00 the pH upstream of the factory was 7.86 and a caustic 9.93 downstream, while the suspended solids were measured as 0.60 mg/l and 27.20 mg/l respectively. On the 24/08/00 the ammonia concentration of the river u/s Errigal Eisc was below detection and 1.29 mg/l NH<sub>3</sub> as N d/s Errigal Eisc. While at all sample stations upstream of the Errigal Eisc factory the orthophosphate annual median varies from 0.02-0.03 mg/l corresponding to a satisfactory Q value, the median d/s of the factory stands at the grossly unsatisfactory 0.18 mg/l (see section F3). Donegal County Council, Udaras na Gaeltacht and Errigal Eisc representatives have met to discuss the unacceptable level of deterioration in water quality of the Glen River downstream of the fish processing factory. Steps are currently being taken to rectify the current problems under the threat of legal action by Donegal County Council.

In 1992 the Glen river was designated as an acid sensitive river.

### **The Crow River**

The Crow River had previously suffered from siltation by new forestry plantations resulting in borderline water quality classification. Following heavy rainfalls on the 21/09/00 the suspended solid loading of the river reached 16.80 mg/l and 20.00 mg/l at the S. of Crove and u/s Glen River Confl. sampling stations respectively. Otherwise, the results from this sampling programme would suggest that the forestry siltation problem on this river has stabilised. The annual median orthophosphate concentration of 0.05 mg/l at the site u/s Glen River Confl. corresponds to a borderline satisfactory/unsatisfactory Q value of 3-4 (see section F3) otherwise the site S. of Crove is of a satisfactory standard.

### **The Owentskiny River**

All stretches of the Owentskiny River have a satisfactory Q rating. Concerns have previously been expressed over the level of surrounding afforestation. Following heavy rainfalls on the 21/09/00 the suspended solid loading of the river increased greatly at all sites examined, reaching 79.60 mg/l at the S. of Durlough site. An orthophosphate annual median of 0.04 mg/l corresponding to a borderline satisfactory/unsatisfactory Q value was recorded at the uppermost S. of Durlough site (see section F3). This site is the closest of all examined to the forestry development.

### **The Owenwee River**

All sections of the Owenwee River have a satisfactory Q rating and the results of this sampling regime showed the water to be of satisfactory condition. In 1992 this river was designated as an acid sensitive river (see Section C4).

## **F2.16. The Laghey River**

All sections of the Laghey River has a satisfactory Q rating. On the 04/07/00 the d/s of Laghey village site saw elevated B.O.D., suspended solids and total P levels of 2.27 mg/l, 23.20 mg/l and 0.11 mg/l respectively. None of the sites further upstream experienced this unusual increase.

## **F2.17. The Oily River**

The Oily River generally has a very high Q value. However, when last classified in 1999, the lower river quality deteriorated at the Bridge at Milltown. This deterioration was explained by a toxic effect however no such effect was evident from this sampling programme.

In 1992 this river was designated as an acid sensitive river.

## **The Tullinteane River**

In 1999, when last classified the upper reaches of the Tullinteane River were of a satisfactory Q value which deteriorated just upstream of its confluence with the Oily River due to a serious toxic pollution incident. However, no such effect was evident from this sampling programme with all stretches being of satisfactory quality.

### **F3 Donegal Bay River Phosphorous Quality**

In their 2001 Phosphorous Regulations National Implementation Report the EPA noted a widespread decline in river water quality compared to baseline reports. This decline was most apparent at high quality Q5 stations where water quality was found to have decreased. In County Donegal this deterioration in quality was affected by the increase in forestry developments which have had no large scale detrimental impact within the Donegal Bay catchment area (Mc Garrigle, pers. Comm.).

Over the twelve month river sampling programme a comprehensive analysis of each sample point for phosphorous was possible. The results of this phosphorous analysis along with the corresponding EPA Q rating is given in Table 2. Where possible Table F3.1.2 also gives an indication of those rivers achieving their Q target set under the measures report (1999) for 2007.

Of the 79 river sample points examined over the 17 river catchments, 69 (87.2%) were found to have satisfactory orthophosphate annual medians corresponding to their target Q ratings. 87.2% of stations sampled reaching satisfactory orthophosphate levels is above the County average of 75% based on Q values (EPA, 2001). These results are depicted in Map 60.

Seven sample points on five different rivers were found to have orthophosphate annual medians corresponding to Q ratings of 3-4 and thus bordering on the unsatisfactory/satisfactory status. Three sampling points were found to have unsatisfactory orthophosphate annual medians corresponding to Q ratings of 3 or less.

Figures F3.1.1 and F3.1.2 describes the number breakdown and percentage breakdown respectively of the river sample points meeting their target Q rating.

**Note:** Where no targets were set previously targets have been arrived at based on current knowledge and are designated by the \* symbol.

River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Abbey River	Pound Bridge	0.01	5	5*	Satisfactory
	Main Road	0.01	5	5*	Satisfactory
Ballaghdoe River	Br. in Kilcar	0.01	5	4-5	Satisfactory
	Cashling's Bridge	0.01	5	5*	Satisfactory
Glenaddragh River	500m d/s Ballaghdoe River	0.01	5	4-5	Satisfactory
	Br. 1.5 km E. of Kilcar	0.03	4	4-5*	Satisfactory
	Br. SW of Meenboy	0.01	5	5	Satisfactory
	Fintragh Forest	0.01	5	5*	Satisfactory
Ballintra River	Aghnadullagh Br.	0.01	5	4-5	Satisfactory
	Ballintra Br.	0.01	5	5*	Satisfactory

**Table F3.1.2 Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Ballintra River	Br. NW L. Garlagh More	0.01	5	5	Satisfactory
	Connor's Br.	0.02	4-5	4-5	Satisfactory
Bradoge River	Bundoran Br.	0.02	4-5	4-5*	Satisfactory
	Bradoge Br.	0.01	5	5*	Satisfactory
Bridgetown River	Br. @ Old Flax Mill	0.02	4-5	4-5	Satisfactory
	Br. W L. Nadarragh	0.02	4-5	4-5	Satisfactory
<b>Bungosteen River</b>	Br. W of Ardara Station	0.013	5	3-4*	Satisfactory
	<b>Br. W of Tullaghacullion</b>	<b>0.235</b>	<b>1</b>	3-4*	<b>Unsatisfactory</b>

Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.

River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Loughaderry River	d/s Island Seafoods	0.01	5	5*	Satisfactory
	u/s Island seafoods	0.03	4	4-5*	Satisfactory
Roechrow River	u/s Stragar River confl.	0.015	5	4-5	Satisfactory
Stragar River	d/s Fish Sales	0.02	4-5	4-5*	Satisfactory
	u/s Fish Sales	0.01	5	5*	Satisfactory
	Meentullynagar n Br.	0.01	5	4-5	Satisfactory
Bunlacky River	Br. near Lisavaddy	0.01	5	4-5	Satisfactory
	Bunlacky Br.	0.01	5	5*	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Birra Stream	u/s Durnesh lake	0.01	5	5*	Satisfactory
Cunlin Lough Stream	Common's Br.	<0.01	5	4-5	Satisfactory
Eany Water	Inver Br.	0.02	4-5	4-5	Satisfactory
	d/s Eanybeg/More Confl.	0.02	4-5	5	Satisfactory
Eanybeg Water	Eanybeg Br.	0.01	5	4-5	Satisfactory
	Br. E Cloghvin	0.01	5	5	Satisfactory
Eanymore Water	Br. SW Letterbarra	0.01	5	4-5	Satisfactory
	Eanymore Br.	0.01	5	4-5	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Eanymore Water	Ford 2km NE Drumboarty	N/A*	5	4-5	Satisfactory
Eglish	Br. @ Meenataggart	0.01	5	5	Satisfactory
Sruell	Br. S of Meenawilderg	0.01	5	5*	Satisfactory
Eddrim River	Eddrim Br.	0.02	4-5	4-5*	Satisfactory
	Drumkeegan	0.01	5	5*	Satisfactory
Erne River	d/s ESB Fish	0.02	4-5	4-5*	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Erne River	u/s ESB Fish and d/s Cathleen's Falls	0.04	3-4	4-5*	Unsatisfactory/Satisfactory
	u/s Cathleen's Falls	0.02	4-5	4-5*	Satisfactory
	u/s Cliff	0.05	3-4	4-5*	Unsatisfactory/Satisfactory
Clady River	Clady Br.	0.02	4-5	4-5*	Satisfactory
Clogher River	Clogher Br.	0.01	5	4-5	Satisfactory
Corraber River	Br. u/s Lough Eske	N/A*	5	5	Satisfactory
Drumenny River	Drumenny Br.	0.01	5	4-5	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Edergole river	Edergole br.	0.006	5	5*	Satisfactory
Eske River	Br. E of Donegal Town	0.01	5	4-5	Satisfactory
	d/s Drumenny/Eske confl.	0.01	5	5*	Satisfactory
	Thrushbank br.	0.01	5	4-5	Satisfactory
	Lough Eske Br.	0.01	5	5*	Satisfactory
Greenan River	Greenan Br.	0.01	5	5*	Satisfactory
Lowerymore River	d/s Lowerymore/Clogher confl.	0.04	3-4	4-5*	Unsatisfactory/Satisfactory
	Barnes Br.	0.03	4	4-5	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target	Satisfactory/unsatisfactory
Fintragh River	Br. W Corrin Lodge	0.02	4-5	5	Satisfactory
Crow River	S of Crove	0.02	4-5	4-5	Satisfactory
	u/s Glen/Crow confl.	0.05	3-4	4-5	Unsatisfactory/Satisfactory
Glen River	500m d/s Glen/Owenwee confl	0.03	4	4-5*	Satisfactory
	500m d/s Carrick Br.	0.04	3-4	4-5	Unsatisfactory/Satisfactory
	E of Croaghstraleel	0.04	3-4	4-5	Unsatisfactory/Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Glen River	u/s Errigal Eisc	0.03	4	4-5*	Satisfactory
	<b>d/s Errigal Eisc</b>	<b>0.18</b>	<b>1</b>	4*	<b>Unsatisfactory</b>
	Br. u/s Crow River confl.	0.02	4-5	4-5*	Satisfactory
	u/s Glen Owentskinny confl.	0.03	4	4-5	Satisfactory
Owenteskiny River	Ford u/s Glen River confl.	0.03	4	4-5	Satisfactory
	Just E of Largynasearagh	0.03	4	4-5	Satisfactory
	S of Durlough	0.04	3-4	4-5	Unsatisfactory/Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

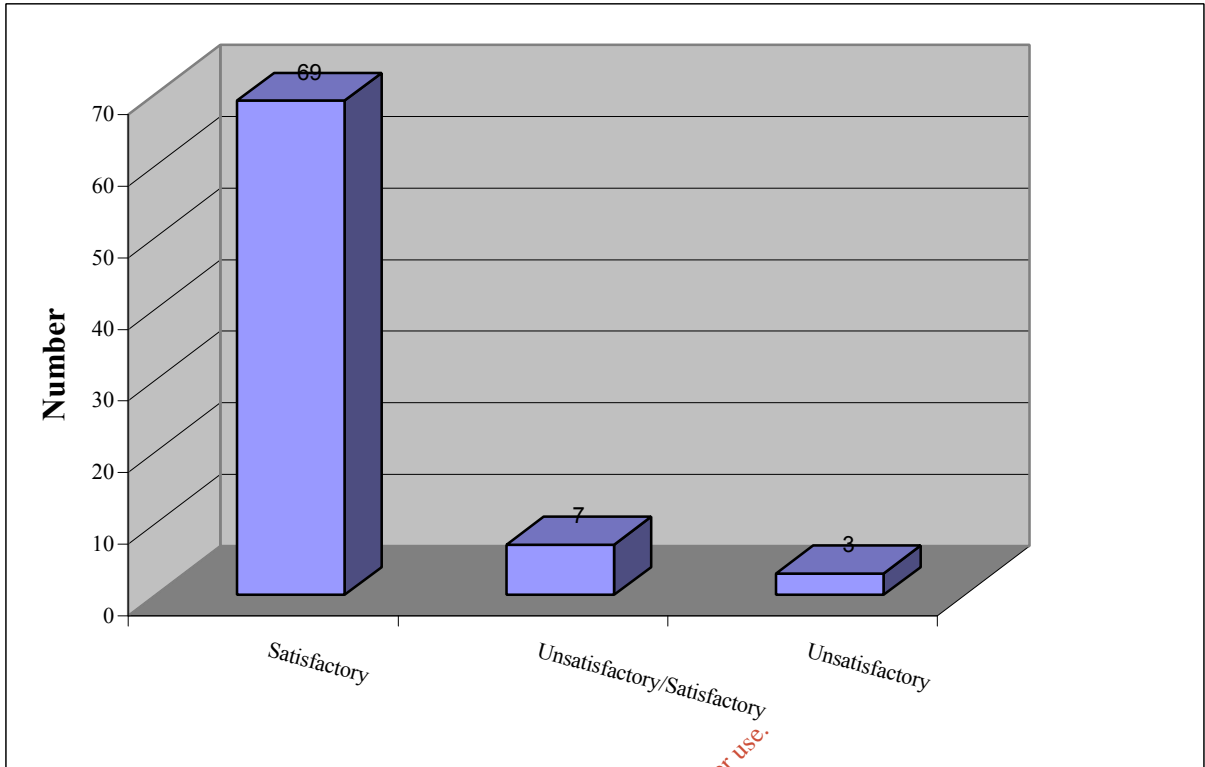
River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Owenwee River	S of Lough Unna	0.015	5	5	Satisfactory
	Carrick Lower Br.	0.03	4	4-5	Satisfactory
Laghey River	Main rd. Br., d/s Lough Boyle	0.02	4-5	4-5*	Satisfactory
	Laghey Bridge	0.02	4-5	4-5	Satisfactory
	d/s of Laghey Village	0.03	4	4-5*	Satisfactory
Oily River	Br. SW of Tamur Lough	0.03	4	4-5	Satisfactory
	Ford W of Corker beg	0.01	5	5	Satisfactory
	Multin's Br.	0.02	4-5	4-5	Satisfactory
	Miltown Br.	0.01	5	4-5	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

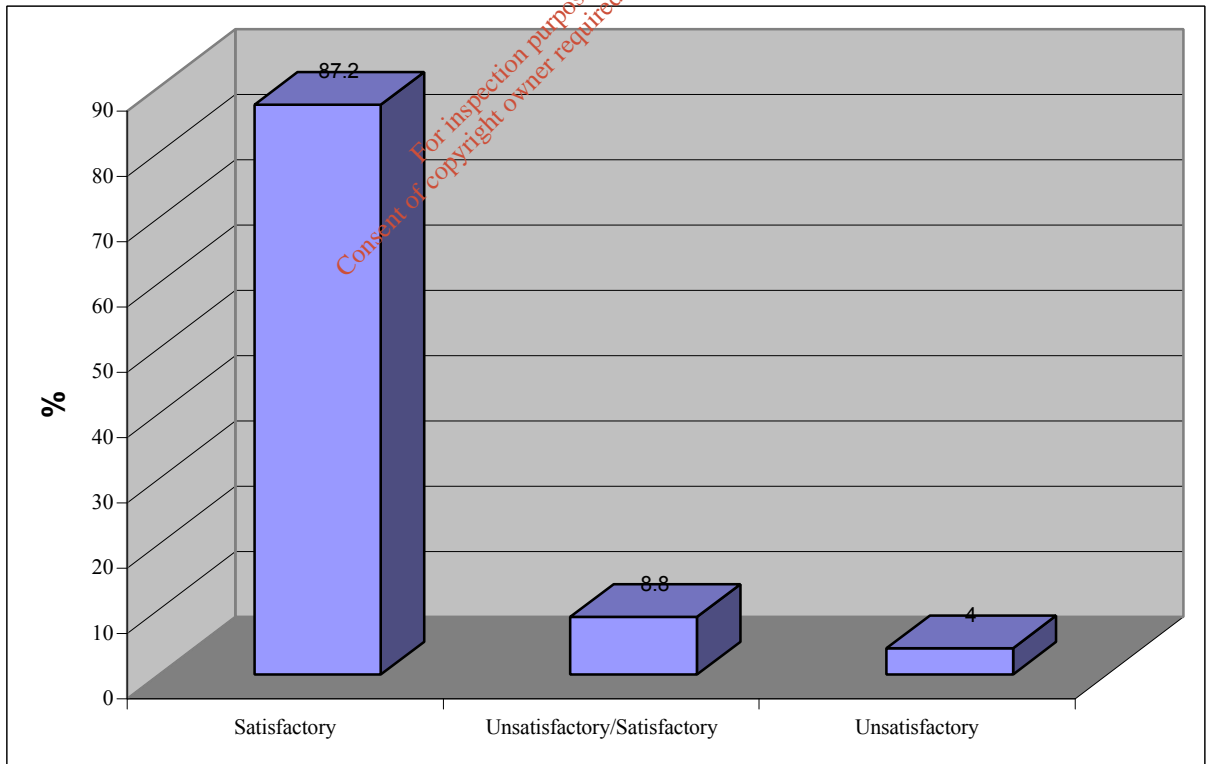
River Name	Sample Site	Orthophosphate Annual Median (mg P/l)	Corresponding EPA Q Rating	Q Target 2007	Satisfactory/unsatisfactory
Tullinteane River	Br. Near Crockfada	0.03	4	4-5*	Satisfactory
	u/s Tullinteane/Oily confl.	0.03	4	4-5	Satisfactory

**Table F3.1.2 continued. Phosphate results with an indication of those rivers achieving their Q target set under the measures report for 2007 where available.**

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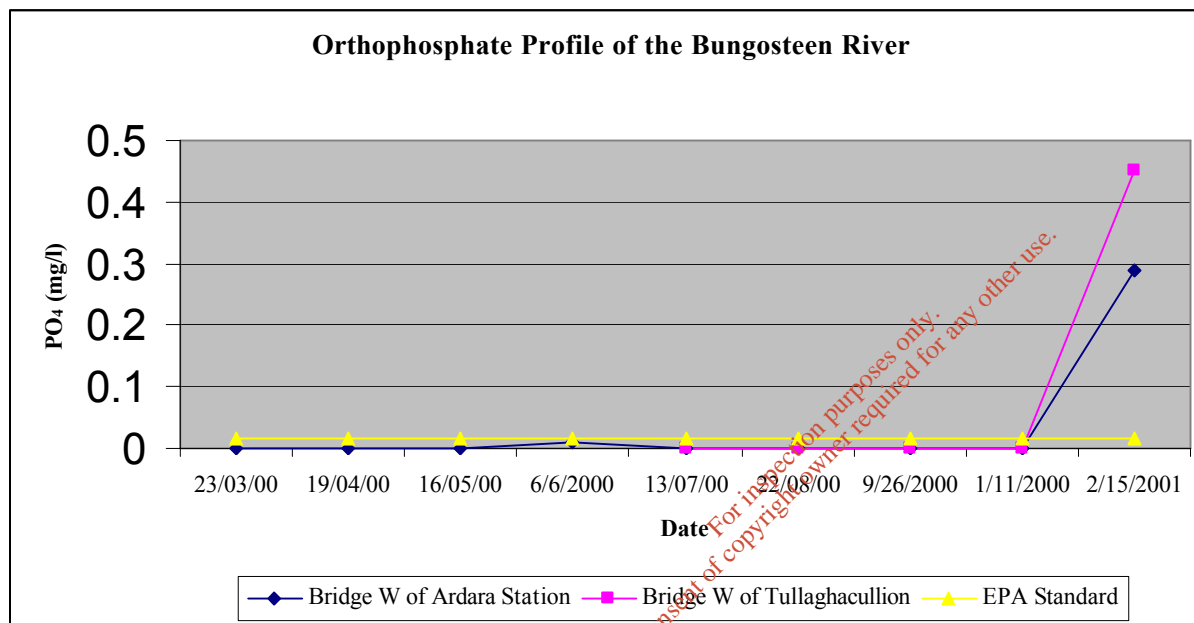
**Table F3.1.3. Comparison of numbers of the river sample points meeting their target Satisfactory Q Rating.**



**Table F3.1.4. Percentage breakdown of the river sample points meeting the desired Q rating.**

The three sample points which had annual orthophosphate median values corresponding to unsatisfactory Q ratings were situated on two rivers, namely the Bungosteen River (Br. W of Tullaghacullion) and the Glen River (u/s Errigal Eisc). Figures F3.1.3 and F3.1.4 and Tables F3.1.5 and F3.1.6 illustrate how the phosphorous levels at these sample stations deviated from their targets over the course of the twelve month sampling programme.

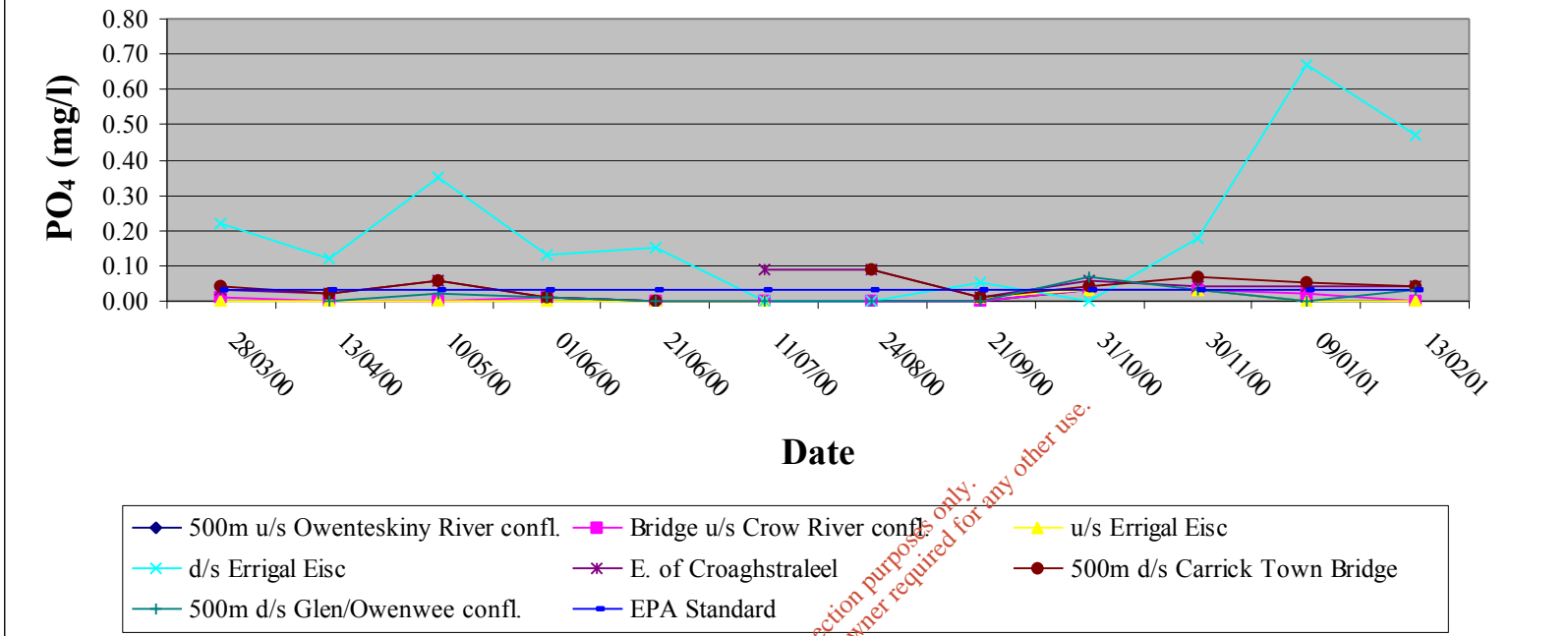
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	Date									Median
Br. W. of Ardara Station	23/03/00	19/04/00	16/05/00	06/06/00	13/07/00	22/08/00	26/09/00	11/01/01	15/02/01	0.15
Br. W. of Tullaghacullion					<0.01	<0.01	<0.01	<0.01	0.45	0.45
EPA Standard	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	
Po <sub>4</sub> (mg/l)										

**Table F3.1.5 and Figure F3.1.3. Phosphate recordings for the Bungosteen River compared to an EPA Q rating of 5.**

### Orthophosphate Profile of the Glen River



	Date												Median
	28/03/00	13/04/00	10/05/00	01/06/00	21/06/00	11/07/00	24/08/00	21/09/00	31/10/00	30/11/00	09/01/01	13/02/01	
<b>500m u/s Owenteskiny River confl.</b>				0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03	<0.01	<0.01	0.03
<b>Bridge u/s Crow River confl.</b>	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.02	<0.01	0.02
<b>u/s Errigal Eisc</b>	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.01	0.03	0.03	<0.01	<0.01	0.03
<b>d/s Errigal Eisc</b>	0.22	0.12	0.35	0.13	0.15	<0.01	<0.01	0.05	<0.01	0.18	0.67	0.47	0.18
<b>E. of Croaghstraleel</b>	0.03	0.02	0.06	0.01		0.09	0.09	0.01	0.06	0.04	0.04	0.04	0.04
<b>500m d/s Carrick Town Bridge</b>	0.04	0.02	0.06	0.01	<0.01		0.09	0.01	0.04	0.07	0.05	0.04	0.04
<b>500m d/s Glen/Owenwee confl.</b>		<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.03	<0.01	0.03	0.03
<b>EPA Standard</b>	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	

**Table F3.1.6 and Figure F3.1.4. Phosphate recordings for the Glen River compared to an EPA Q rating of 4.**

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### **F3.2 The Bungosteen River**

Over the course of the sampling period for this current management plan the Bungosteen had unsatisfactory phosphate annual medians, essentially due to irregularly high phosphate recordings on the 15/02/01. Subsequent samples taken on the 04/04/02 gave orthophosphate levels of 0.013 mg/l and 0.235mg/l for the Bridge west of Ardara station and the Bridge west of Tullaghacullion respectively. These results would correspond to the target Q value of 4-5. Further water sampling is required to ascertain the cause and source of the previous phosphate anomaly.

### **F3.3 The Glen River**

From this sampling programme the water d/s Errigal Eisc was found to have an orthophosphate annual median of 0.18mg/l corresponding to a Q rating of 1 which is unsatisfactory. The site u/s Errigal Eisc orthophosphate corresponded to a Q value of 4 therefore it is evident the industrial discharge of this factory is the cause for such elevated phosphate concentrations in this stretch of river.

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## **F4 Donegal Bay Estuarine and Coastal Water Quality**

In Section E a set of criteria were defined that could be used to assess the estuarine water quality in the Donegal Bay catchment.

### **F4.1.1 Eske Estuary**

The river Eske discharges to inner Donegal Bay (inside Murvagh pt.) through a shallow estuary that is sheltered from the Atlantic. Mixing in the bay is dominated by the tide (spring tidal range: 3.4m), with much of the inner bay being exposed at low water. Donegal Town is situated at the head of the estuary, while the remainder of the bay is largely undeveloped. The two main freshwater influences are the Eske and Ballintra rivers. There is only one municipal outfall in the bay and that is located at the freshwater limits of the estuary in Donegal Town. The current population equivalent of the outfall is estimated to be 6,100. At present the area is not routinely monitored under the EPA's estuarine and coastal water monitoring programme. However, a series of surveys have been carried out for Donegal County Council as part of a study into the imminent new urban wastewater disposal system for Donegal Town, most recently by Jennings O'Donovan & Partners (1999).

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Water quality studies of inner Donegal Bay in November 1999 found that BOD levels were satisfactory throughout much of the bay, being generally in the range 1-2mg/l (Marine Institute, 1999). An exception to this was in the upper estuary where a number of samples exceeded 4mg/l in the vicinity of the outfall. Dissolved oxygen concentrations during the winter survey were satisfactory but conditions in summer have yet to be determined. The benthic environment of the bay has also been studied and the faunal composition in the area north east of Ballyboyle Island was indicative of slight to moderate organic enrichment. Coliform measurements also showed that sewage contamination was prevalent throughout much of the inner estuary. Initial modeling of BOD dispersion in the bay, using a loading of 6,000 p.e. from an untreated outfall site opposite Revlin Point, found that BOD concentrations would be maintained below 2.5 mg/l near the outfall with lower values being achieved further afield. Further modeling based on the proposed introduction of secondary treatment for Donegal sewage indicates that further reductions will occur (Jennings O'Donovan & Partners, 1999). Thus, water and sediment quality will improve when the plant comes on stream. Data on nutrient concentrations within the bay are sparse and there is a complete absence of summer chlorophyll data. Consequently, it is not presently possible to comment on the trophic status of the bay.

#### **F4.1. 2 Killybegs Harbour**

Killybegs Harbour is a small sheltered inlet approximately 4 km in length with an area of 10 km<sup>2</sup>, located at the head of Mc Swyne's Bay. The Stragar River is the main freshwater influence in the bay. However the flow is small (95 percentile flow = 0.05m<sup>3</sup>/s) and consequently salinity rarely falls below 25 psu throughout most of the harbour. The tidal range varies between 1.5 and 3.5 m over the spring/neap tidal cycle. However, salinity and dissolved oxygen measurements indicate that the harbour may become stratified both vertically and laterally in the summer (Marine Institute, 1999). This stratification is a consequence of poor mixing, which may be attributed to slack currents in the bay. The port is the primary base for the Irish pelagic fishing fleet and is also the most important fish processing centre in the country. There are a number of fish processing factories in Killybegs. The combined licensed organic load from these industries plus domestic waste from the town is considerable, amounting to over 175,000 population equivalents or 10 tonnes of BOD per day. However, these inputs are likely to vary considerably over the year in response to seasonality in the fisheries.

Since the introduction of improved treatment at the local fish processing plants, the bay has been monitored on a number of occasions, with seven surveys being conducted between 1994 and 1997 (Marine Institute, 1999). Six of these surveys were conducted during the summer months and there was just one winter survey (November 1994). Conditions were mostly found to be satisfactory during the summer surveys with oxygen saturation levels generally approaching 100%. Similarly, BOD levels were generally <3mg/l with low levels of oxidised nitrogen, orthophosphorus and ammonia. Chlorophyll a levels were generally low to moderate i.e. 2-20 mg/m<sup>3</sup>, with few samples exceeding 30 mg/m<sup>3</sup>. The exception to this was in August 1994 when oxygen supersaturation was evident throughout the harbour coupled to moderate chlorophyll a levels i.e. 10-30 mg/m<sup>3</sup>. In the winter survey, relatively high BOD levels were recorded (mean = 3.8 mg/l) and there was some depletion in surface oxygen concentrations in the inner harbour. Benthic data are restricted to sediment organic content, which showed that the sediments in the inner harbour are organically enriched. The extent of enrichment and the consequences for the benthos are presently unknown.

As the harbour has been found to have poor flushing characteristics, it can be concluded that although organic input to the bay may have been reduced, some deterioration in water quality around the discharge points may still occur during periods of slack water. The bay is also likely to be nitrogen limited due to lack of a local riverine source. Consequently, strongly elevated chlorophyll a levels are unlikely to be a persistent problem. Nevertheless, given the poor flushing characteristics of the bay, some phytoplankton accumulation may occur during productive periods.

The Inner harbour has been designated as sensitive under the 2001 Urban Waste Water Regulations. The proposed sewage scheme for the area will include for a new combined outfall for treated industrial and municipal discharges to the outer harbour near Drumbannon. This will greatly reduce discharges to the sensitive inner harbour allowing for an increase in water quality.

## **F4.2 Donegal Bay Blue Flag Award Scheme**

Areas applying for a Blue Flag are first assessed by an independent national jury and then a European Jury. In 1998 European Blue Flags were awarded to 74 Irish beaches and 4 Irish marinas out of a total of 78 applications for beaches and 4 for marinas - a significant increase from the 22 flags awarded in 1987, the first year of the scheme (Marine Institute, 1999). Although the number of beaches awarded the Blue Flag has increased since the start of the scheme, the number of applications has decreased in recent years (90 applications in 1997, 78 in 1998) with some local authorities not applying for the award if they know that a beach does not qualify under the water quality criteria for example.

Interest in the European Blue Flag Award Scheme has led to an increase in the number of Irish beaches monitored under the Directive as well as improvements in beach management.

Donegal Bay has four Blue Flag beaches as listed in Table F4.1.1. The results of water samples for the 2001 season are included in Table F4.2.2.

<b>Beach Location</b>	<b>Status</b>
Bundoran	Blue Flag
Rossnowlagh	Blue Flag
Murvagh	Blue Flag
Fintra	Blue Flag

Table F4.2.1. Blue Flag Beaches within the Donegal Bay Catchment.

Location	Blue flag beaches	No. of Samples	No. of passes	% Compliance required for Blue Flag status		
				Total coliform % pass : 80%	Faecal coliform % pass : 80%	Streps % pass : 90%
				% pass Total Coliform	% pass Faecal Coliform	% pass Streps
Bundoran	*	15	15	100	100	100
Rossnowlagh	*	15	15	100	100	100
Murvagh	*	15	15	100	100	100
Fintra	*	15	13	100	86.6	100

Table F4.2.2. Blue Flag Beach analysis results for the 2001 season.

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The quality of bathing water in Ireland is generally very good, with 96.5% of the seawater bathing areas in 1997 complying with the minimum mandatory standards laid down in the Directive. In addition, 83.5% of the seawater bathing areas complied with the guideline limits of the Directive (Marine Institute, 1999). The EU Bathing Water Directive has substantially increased public awareness of coastal pollution and has focussed attention on the problems involved in monitoring bathing water quality. This should lead to improved methodologies and a sounder epidemiological basis for the measurements made.

The results from the Donegal Bay Blue Flag beaches are extremely encouraging. 100% pass rates on all counts were achieved at the beaches except Fintra which had an 86.6% pass rate for the Faecal coliform counts. This dip in standards was due to heavy rainfalls prior to sampling and therefore was not truly reflective of the coastal water's status.

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## **F5 Donegal Bay Marine Survey**

The European blue flag award has been awarded to twelve County Donegal beaches. Four beaches within Donegal Bay have a blue flag classification. These beaches have been discussed in Section F4.

The bacterial standards for blue flag classification are described in Table F5.1.

<b>Parameter</b>	<b>Blue Flag Target</b>
Faecal Coliforms per 100ml	<100
Faecal Streptococci per 100ml	<100
Total Coliforms per 100ml	<500

**Table F5.1. Blue flag water bacterial targets.**

Seawater bathing areas are governed by Council Directive 76/160/EEC and S.I. 203 of 1996. These bacterial standards are less stringent than the blue flag classification and are included in Table F5.2.

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<b>Parameter</b>	<b>E.C. Directive 76/160/EEC</b>	<b>National Limit Values (1988)</b>
Faecal Coliforms per 100ml	2,000 (I) 100(G)	1,000
Faecal Streptococci per 100ml	100(G)	300
Total Coliforms per 100ml	2,000 (I) 500 (G)	5,000
Salmonella/litre	0(I)	0
Enterovirus PFU/10L	0 (I)	0
pH Range	6-9 (I)	6-9
Colour	No abnormal change	No abnormal change
Mineral Oil	No visible film	No visible film
Odour	No odour (I)	No odour
Surface Active	No lasting foam (I)	No lasting foam
Phenols	No specific odour	No specific odour
Transparency (M Secchi)	1 (I)	1
Tars and Floating Materials	Absent (G)	No offensive presence

(I) Mandatory Values

(G) Guidelines values

**Table F5.2. Bathing water classification targets.**

Standards laid down in Council Directive 91/492/EEC and S.I. 147 of 1996 apply to marine shellfish production areas. These standards specify the health requirements to be observed for shellfish products during harvesting, handling, storage, transport and distribution and specifies the bacterial quality of the shellfish flesh. However, no guidance is given in this legislation on the quality of water required in shellfish production areas. The Department of Marine and Natural Resources have adopted the US National Shellfish Sanitation Programme which classifies the bacterial quality of water in which shellfish are harvested or produced. The bacterial requirements of this programme are outlined in Table F5.3 below.

Approved Category	Geometric mean value of faecal coliforms is <14/100ml and not more than 10% of observations are >46/100ml.
Conditional Category	Geometric mean value of faecal coliforms is between 14 and 140/100ml. Not more than 10% >460/100ml. Department Recommendation: Shellfish must undergo depuration before sale.
Restricted Category	Geometric mean value of faecal coliforms >140/100ml. Department Recommendation: Shellfish must be pressure cooked before consumption. Depuration is insufficient to safe guard health of consumer.

**Table F5.3. US National Shellfish Sanitation Programme classification of the bacterial quality of water in which shellfish are harvested or produced.**

As part of the Donegal Bay catchment management plan eleven marine sites were examined. These sites were situated from Fintragh Bay to Bundoran (see Map 61) and are described by the dGPS co-ordinates given in Table F5.4.

Site Name	Co-Ordinates
Fintragh Bay	5437.857N 0829.448W
Drumanoo Head	5436.147N 0829.209W
Rough Point	5437.708N 0826.263W
Rotten Island	5436.892N 0826.542W
Mc Swynes Bay A	5436.767N 0823.882W
Mc Swynes Bay B	5437.483N 0824.426W
Inver Bay A	5438.055N 0817.940W
Inver Bay B	5437.723N 0818.287W
Inver Bay C	5437.563N 0817.545W
Tullan Strand	5430.980N 0816.315W
Bundoran	5429.030N 0817.261W

**Table F5.4. Donegal Bay marine sample sites and dGPS co-ordinates.**

Water samples were collected at each site during the ebb tide on August 1<sup>st</sup> 2000 and December 13<sup>th</sup> 2001 and analysed under a range of parameters. The results for each site are described in Table F5.5.

On both sample dates the bacterial analysis at each site gave results corresponding to waters of blue flag standard except at Rough point and Tullan Strand. The elevated counts at Rough Point are not unexpected as this is the current location of the Killybegs sewage discharge. The Tullan Strand site, while meeting the 1988 national limit values for bathing water, was just over the blue flag target for faecal coliforms of <100/100ml at 146. Similarly, this site is where the River Erne - carrying the sewage discharge of Ballyshannon - mixes with the Atlantic. Sampling of the water at the Tullan strand was not possible on the second date.

With only two samples taken over a 16 month period, bacterial result categorisation in relation to the US National Shellfish Sanitation Programme was not possible. It must also be noted that these results are merely from a solitary surface spot check. A comprehensive sampling programme would be required to truly categorise any site in relation to bacteriological criteria with depth profiling.

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Site Name	Temp. (°C)	D.O. (mg/l)	Cond. (cms)	pH	B.O.D. (mg/l)	Faecal Coliform (No./100 ml)	KF Streptococcal (mg/l)	Total Coliform (mg/l)
August 1 <sup>st</sup> 2000								
Fintragh Bay	16.20	11.42	19880	8.19	0.86	4	1	5
Drumanoo Head	16.20	11.50	19860	8.21	0.71	0	0	0
Rough Point	17.00	10.25	19830	8.18	4.73	30,000	7,500	40,000
Rotten Island	16.60	11.38	19860	8.20	1.27	9	2	33
Mc Swynes Bay A	16.90	11.50	19890	8.19	1.05	0	0	1
Mc Swynes Bay B	16.90	10.89	19880	8.20	0.92	75	12	85
Inver Bay A	16.60	11.59	19850	8.22	1.05	2	0	1
Inver Bay B	16.40	11.69	19840	8.23	1.13	25	6	24
Inver Bay C	16.30	11.75	19860	8.23	0.89	13	1	8
Tullan Strand	16.70	10.39	16600	8.18	0.58	146	23	230
Bundoran	16.60	11.68	19880	8.18	0.75	11	6	22
December 13 <sup>th</sup> 2001								
Fintragh Bay	8.80	9.90	42200	8.07		0	0	0
Drumanoo Head	9.00	9.47	41200	8.05		4	2	6
Rough Point	9.00	9.81	42400	7.96		200	600	400
Rotten Island	9.00	9.48	42600	7.94		5	2	0
Mc Swynes Bay A	10.00	9.56	42600	7.91		2	2	1
Mc Swynes Bay B	10.00	9.60	42400	7.12		1	1	1
Inver Bay A	9.00	9.91	41000	7.51		2	3	5
Inver Bay B	9.00	8.80	41800	7.68		1	0	1
Inver Bay C	9.00	11.50	41900	7.83		1	1	2

**Table F5.5. Results of water sample analysis at eleven marine sites in Donegal Bay.**

## **F5 Donegal Bay Lake Water Quality**

Freshwater lakes in Donegal are major resources in terms of their use for water abstraction. Many of the lakes are also used extensively for recreational purposes such as water contact sports, angling and general pleasure boating activities. A number of the lakes within the Donegal Bay catchment are noted salmonid fisheries.

Good water quality is essential to ensure the continuation of these uses. The higher the water quality requirement the greater the need for frequent monitoring and only by regular monitoring of these resources can potential risks be identified and pollution avoided by timely implementation of remedial resources.

Since August 1999 all local authorities are obliged to examine their lake water quality as part of the EPA national lake monitoring programme. Donegal County Council has been involved in this monitoring scheme since its inception.

There are two EPA branded lakes within the Donegal Bay catchment of significant importance. These are Lough Eske and Lough Golagh. These lakes must be sampled to monitor any fluctuations in water quality. In addition to the branded lakes, those used for water abstraction and lakes supporting trout stocks must also be maintained.

Table F5.6. summarises the results of the lake water sampling conducted within the Donegal Bay catchment in 2001, indicating the high standard of the water quality of these important lakes.

Map 62 indicates the location of the branded, trout and abstraction lakes within the catchment.

Date	Lake	pH	Cond.	Temp.	True Colour	NH3-N	NO2-N	NO3-N	PO4	Total P	Alkalinity	Hardness	Turbidity	Silica	Chlorophyll
			(cms)	(oC)	(Hazen)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	CaCO3	CaCO3	(JTU)	(mg/l)	(mg/m3)
07-Aug-01	Lough GolaghB	7.33	82.00	17.60	99	0.03	0.02	<0.01	0.01	0.012	7.00	15.120	1.11	5.80	4.00
07-Aug-01	Lough EskeB	7.63	72.00	17.20	55	0.02	0.01	0.03	0.14		14.50	21.315	2.14	12.00	4.00
28-Aug-01	Glen Lough (Ballintra)A	7.73	211.00	18.80	96	<0.01	0.01	0.01	0.26	0.1	89.50	105.210	2.35	7.20	3.60
28-Aug-01	Lough UnshinT	7.45	64.00	18.00	136	<0.01	0.01	<0.01	0.01	0.019	2.50	13.020	1.08	8.40	4.60
28-Aug-01	Columbkille Lough (B'shannon)AT	7.26	78.00	18.50	81	<0.01	<0.01	<0.01	0.04	0.018	2.50	14.070	0.86	5.10	4.10
10-Sep-01	Lough UnnaT	6.22	50.00	14.50	273	0.01	0.017	0.03	<0.01	0.002	2.00	0.840	1.32	14.60	1.10
10-Oct-01	Lough EskeB	7.23	74.30	13.50	57	0.021	0.03	0.07	<0.01	0.009	12.00	19.530	2.10	2.20	4.80
10-Oct-01	Lough GolaghB	6.27	70.00	14.00	122	<0.01	0.01	0.02	<0.01	0.008	4.50	12.700	2.60	9.40	11.00

**Table F5.6. Results of lake water sampling conducted within the Donegal Bay catchment. A = Abstraction Lake, B = Branded Lake, T = Trout lake**

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## **F6 References**

E.P.A. (2001) Phosphorous Regulations National Implementation Report.

Marine Institute, (1999). Ireland's Marine and Coastal Areas and Adjacent Seas. An Environmental Assessment. A Marine Institute publication. 80 Harcourt Street, Dublin 2.

Mc Inerney, J.F. (1999). Local Government (Water pollution Act), 1977/90 (Water Quality Standards for Phosphorous) Regulations, 1998. Measures Report.

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# **Donegal Bay Water Quality Management Plan**

## **Section G**

### **MANAGEMENT OPTIONS**

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## **G1 General Management Options**

In this section the overall, or "integrated" targets for the catchment are considered in comparison to the actual water quality for the rivers. The physical causes of failure to meet target water quality class, such as the impact of a point source discharge, are then discussed.

The previous sections have also identified a wide range of issues with regard to uses of the catchment and the management of potentially conflicting activities.

The purpose of this section is, firstly, to consolidate issues regarding water quality and uses into a number of well defined key issues and, secondly, to develop management options for dealing with these issues. It should be emphasised that the management options do not represent government policy, but are a list of ideas put forward to stimulate discussion.

The following tables list the appropriate management options, the bodies who will probably be responsible for carrying them out, and the "pros and cons" of each option. The reference number does not represent any form of ranking the importance of the issues identified.

The options are intended to form the basis for a plan for the improvement of the rivers to meet the requirements of all its users. Inevitably this will involve many bodies and individuals working together to fulfil the common strategy represented by the Donegal Bay Water Quality Management Plan.

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## **G2 Key Issues**

A brief description of each key issue is given below, commencing with chemical and biological water quality issues and concluding with catchment wide usage issues.

### **Key Issue 1: Water Quality in The Ballaghdoe and Glenaddragh Rivers**

The Ballaghdoe and Glenaddragh rivers fail to meet the targets set in reaches around Kilcar village (Br. in Kilcar and 500m d/s Ballaghdoe, respectively). The problem is likely to be related to a localised industrial discharge.

### **Key Issue 2: Water Quality in The Bradoge River**

While without any previously set targets, the lower reaches of the Bradoge River (Bundoran Bridge) suffers from sporadic releases of sewage seepage via the storm overflow during periods of adverse weather conditions.

### **Key Issue 3: Water Quality in The Bungosteen River**

While without any previously set targets, the Bungosteen River (Br. W. of Tullaghacullion site) was found to suffer from unsatisfactory elevated phosphate concentrations. The cause is uncertain and may be exaggerated due to one irregularly high recording.

### **Key Issue 4: Water Quality in The Stragar River**

While without any previously set targets, the Stragar River was found to suffer from unsatisfactory elevated concentrations in ammonia at the site d/s Fish Sales. This stretch of the river received the discharge of a previously unlicensed fish processing factory.

### **Key Issue 5: Water Quality in The Birra Stream**

While without any previously set targets, the Birra Stream which flows to Durnesh lake was found to suffer from sporadic elevated concentrations in ammonia. Agriculture is suspected of contaminating the stream and causing these elevations.

### **Key Issue 6: Water Quality in the River Eske**

The lower reaches of the River Eske fail to reach the set targets (Br. E Donegal Town). The present sewage system in the Town coupled with the discharges of the agriculture mart are the main reasons for this failure.

### **Key Issue 7: Water Quality in The Glen River**

The upper reaches of the Glen River are of a satisfactory chemical and biological quality and meet their set targets. However, water quality deteriorates in the middle reaches of the river (d/s Errigal Eisc and E. of Croaghstraleel) and targets are not met. The lower reaches of the river improve as the water quality subsequently recovers. The cause of the deterioration in water quality is the discharge to the river of the Errigal Eisc fish processing factory.

### **Key Issue 8: Effluent Disposal in the Donegal Bay catchment**

Effluents from sewage works, industry, principally at Donegal Town, Killybegs, Ballyshannon and Bundoran are discharged directly to Donegal Bay. Aquaculture cages are also present in Donegal Bay. Ongoing monitoring is required to assess the impact, if any, of these uses in particular with regard to designated Bathing Beaches.

### **Key Issue 9: Impact of Forestry**

Acidification due to forestry may be a possible factor in causing stress to the headwaters of rivers within the catchment. The Oily Stragar, Glenaddragh, Glen and Ballaghdoon rivers have been designated as acid sensitive by the NRFB in 1992.

### **Key Issue 10: Data on Point Source Discharges**

There is a need to ensure point discharges are monitored at a frequency adequate to ensure targets set within the water quality management plan are complied with.

### **Key Issue 11: Water Supply**

Water supply improvements are required in the Ballyshannon/Rosnowlagh region. Further extension of the Frosses/Inver network is required to include Mountcharles. The Killybegs network must also be extended to include Fintragh.

### **Key Issue 12: Accidental Discharge**

Accidental discharge such as oil spills and farmyard runoff potentially contribute to deterioration of biological water quality.

### **Key Issue 13: Groundwater Quality**

There is a growing dependence of the catchment water resource upon abstraction from boreholes. Control of diffuse/agricultural practices in the immediate vicinity of these sources is required to maintain the water quality of abstracted supply.

### **Key Issue 14: Road Developments**

The impact of road development works on any bordering waterways must be monitored and kept to a minimum.

### **Key Issue 15: Industrial Licenses**

Sampling of industrial discharges must be of a frequency which will indicate repeated breaches of licence conditions.

### **Key Issue 16: Agriculture**

Certain sections of the catchment appear to be impacted by agriculture. Practices could be improved in various areas by measures to reduce direct impact of livestock waste to watercourses. Implementation of strategies such as Nutrient Management Plans, REPS and better information dissemination should also be considered.

### **Key Issue 17: *Magaritifera margaritifera***

The freshwater pearl mussel appears to be limited within the Donegal Bay catchment. This protected species appeared to have been disturbed in the Tullinteane River due to gravel extraction.

### **Key Issue 18: Waste Management**

Improved maintenance at landfill sites has been implemented to halt the spread of wind blown debris into watercourses at both the Ballintra and Killybegs landfill sites. The proposed leachate collection system for the Ballintra facility must be implemented to prevent the migration of leachate to adjacent watercourses. The development of extra capacity at the Ballintra site is a priority.

### **Key Issue 19: Aquaculture**

Careful control of aquaculture practices is needed to control usage of chemical pesticides, reduce escapees and prevent impact on general water quality. Further applications for fish farming developments will be supported by Environmental Impact Assessment. Disposal of fish wastes needs to be strictly monitored.

### **Key Issue 20: Bathing Beaches**

Preservation of blue flag status of bathing beaches including control of bacterial pollution from effluent discharges and aesthetic standards such as beach buggies and jet skis use is important in the context of the tourism potential of the catchment.

### **Key Issue 21: Fisheries**

The maintenance of good water quality and satisfactory habitat are essential components in protecting and promoting fisheries. The Donegal Bay catchment is faced with water quality and habitat problems previously identified. The problems identified e.g. poor quality discharges from STWs and industry, and acid sensitive waters, are by no means insurmountable and can be addressed in the context of the management plan. These problems must be challenged on an individual basis using combined effort and measures to ensure that the future catchment ecology will be the fundamental concern for sustainable development.

### **Key Issue 22: Chemical and Biological Monitoring Data**

It is essential to ensure that monitoring and information systems are adequate to support water quality management decisions. Monitoring should be increased from its present level particularly in rivers where there are problems identified. The results of the monitoring programme, through the use of GIS, should also be regularly updated and the information disseminated to water managers.

### **Key Issue 23: Coastal Zone Management**

The DCC Community and Enterprise Unit has recently proposed the development of a pilot coastal zone management model in County Donegal. The Unit concluded that Donegal Bay is a suitable location in which to base a pilot project because of its commercial importance to the catching, processing, aquaculture and tourism sectors and because the stakeholders there are influential at both county and national level. It is suggested that if these stakeholders buy into the project, the lessons learned will be acted upon and replicated elsewhere.

## **Key Issue 24: Implementation**

It is recommended that a management committee be established to implement the Donegal Bay Water Quality Management Plan at a catchment level. The management committee should address all issues which may impact on water quality including proposed industrial, sewage treatment and drainage works, with a view to enabling sustainable development within the catchment whilst safeguarding the ecology of the rivers.

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### G3 MANAGEMENT OPTIONS

**Table G3.1 Table of Management Options**

Key Issue No. 1	Water Quality in the Ballaghdoe and Glenaddragh Rivers		
Management Options	Responsible Bodies	Pros	Cons
Increase monitoring of licensed industrial discharges and outfalls to waters	DCC/EPA	Identifies polluters	Cost /laboratory resources
Identify any illegal discharges to rivers	DCC	Identify and control polluters	

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<b>Key Issue No. 2</b>	<b>Water Quality in The Bradoge River</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Infrastructure improvement to Bundoran STW and storm overflows	DCC	Eliminate sewage discharge	Cost
	DCC	Significant improvement to water quality	Cost
Increase sampling of river and establish water quality targets	DCC/EPA	Establishes records	Cost /laboratory resources

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<b>Key Issue No. 3</b>	<b>Water Quality in The Bungosteen River</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Implementation of joint agricultural schemes, ie REPS, Codes of Practice, Nutrient management Plans etc	DCC/Teagasc/IFA/Dept. of Agriculture	Reduces agricultural pollution	
Improved education of agricultural industry	DCC/Teagasc/IFA/Dept. of Agriculture		
Increase sampling of river to ascertain phosphate status of water	DCC/EPA	Establishes water quality records	Cost /laboratory resources

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<b>Key Issue No. 5</b>	<b>Water Quality in The Birra Stream</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Implementation of joint agricultural schemes, ie REPS, Codes of Practice, Nutrient management Plans etc	DCC/Teagasc/IFA/Dept. of Agriculture	Reduces agricultural pollution	
Increase sampling of river and establish water quality targets	DCC/EPA	Establishes water quality records	Cost /laboratory resources

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<b>Key Issue No. 6</b>	<b>Water Quality in The River Eske</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Infrastructure improvements to Donegal STW.	DCC	Reduces pollution	Cost
Complete improvements at Donegal Mart	Donegal Livestock Co-Operative Society	Reduces pollution	Cost

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Key Issue No. 7	Water Quality in The Glen River		
Management Options	Responsible Bodies	Pros	Cons
Improve waste water treatment plant at Errigal Eisc factory	Errigal Eisc	Returns discharge to within licence requirements	Cost
Increase sampling of river and industrial discharge to it	DCC/EPA	Monitors water quality	Cost /laboratory resources
Prosecute breaches of discharge licence	DCC		

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<b>Key Issue No. 8</b>	<b>Effluent Disposal in the Donegal Bay Catchment Area</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Improvements of STW	DCC	Estuarine water quality improvements at shellfish waters, bathing beaches and amenity areas	Cost
Ongoing monitoring of licensed industrial discharges and outfalls to waters	DCC / EPA		Cost/lab resources

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Key Issue No. 9	Impact of Forestry		
Management Options	Responsible Bodies	Pros	Cons
Implement forestry monitoring	DCC / NRFB	Fishery Improvements	
Restrict development in Acid Sensitive Areas and ensure strict compliance with Forestry and Fishery guidelines	Coillte / Department of Energy, Forestry Service	Pollution Prevention	

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<b>Key Issue No. 11</b>	<b>Water Supply</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Reduce wastage by resource management	DCC		
Improve network to the Ballyshannon/Rosnowlagh areas	DCC	Improved supply. Attracts industry. Complies with DCC policy of improved rural schemes. Comply with EU legislation. Sustain rural communities.	Time period required for works
Extend Lough Eske network to include Mountcharles	DCC	Improved supply. Attracts industry. Complies with DCC policy of improved rural schemes. Comply with EU legislation. Sustain rural communities.	
Develop Lough Glencoagh and investigate the need for supply augmentation by borehole	DCC	Improved supply. Attracts industry. Complies with DCC policy of improved rural schemes. Comply with EU legislation. Sustain rural communities.	
Extend Killybegs network to include Fintragh	DCC	Improved supply. Attracts industry. Complies with DCC policy of improved rural schemes. Comply with EU legislation. Sustain rural communities.	

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Key Issue No. 12	Accidental Discharge		
Management Options	Responsible Bodies	Pros	Cons
Implementation of joint agricultural schemes, ie. REPS, Codes of Practice etc	Department of Agriculture/ DCC	Reduces agricultural pollution	
Improved education of agricultural industry	Department of Agriculture/ DCC		

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Key Issue No. 14	Road Developments		
Management Options	Responsible Bodies	Pros	Cons
Promote a Code of Practice for all roads contractors	DCC	Prevent pollution	
Increase monitoring of major road developments	DCC/NRFB	Prevent Pollution	Cost

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<b>Key Issue No. 16</b>	<b>Agriculture</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Implement good practice strategies REPS, NMPs, etc	Department of Agriculture	Pollution Prevention	
Improved education of agricultural industry	DCC	Pollution Prevention	
Better dissemination of information	DCC	Pollution Prevention	
Improve risk farms identified in farm survey	DCC/Teagasc	Pollution Prevention	

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<b>Key Issue No. 17</b>	<b><i>Magaritifera magaritifera</i></b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Designate special protection areas to conserve existing sites	NRFB	Protect current population of species	
Further investigate disturbance of site at the Tullinteane River	Duchas	Prevent further damage to species	Cost

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Key Issue No. 18	Waste Management		
	Management Options	Responsible Bodies	Pros
Implementation of Waste Management Plan including better operation of existing sites i.e. Ballintra and Killybegs	DCC	Reduces pollution	
Provide new facility to modern engineering standards including proper disposal of leachate	DCC	Reduces pollution	
State-of-the-art monitoring for contamination	DCC	Reduces pollution	

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<b>Key Issue No. 19</b>	<b>Aquaculture</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Ensure adequate monitoring	Department of the Marine and Natural Resources, DCC, Duchas	Protect marine environment	Cost
Implement new regulations in relation to licensing i.e. EIS preparation	Department of the Marine and Natural Resources, DCC, Duchas	Pollution Prevention	Cost
Dispersal of fish waste to be strictly monitored	DCC	Prevent pollution of surface and ground waters	

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Key Issue No. 20	Bathing Beaches		
Management Options	Responsible Bodies	Pros	Cons
Improve STW where appropriate	DCC	Protect environment	Cost
Ensure adequate monitoring	DCC		Laboratory resources
Coastal resource protection by hinterland planning control i.e. provision of septic tanks at caravan parks etc	DCC		-

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Key Issue No. 21	Fisheries		
Management Options	Responsible Bodies	Pros	Cons
Ensure adequate monitoring of landfills, STW, water abstractions and industrial discharges	DCC		
Implement fishery improvement schemes	NRFB / DCC		
Protection of sensitive reaches	Forestry Service/Coillte/NRFB		

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<b>Key Issue No. 22</b>	<b>Chemical and Biological Monitoring Data</b>		
<b>Management Options</b>	<b>Responsible Bodies</b>	<b>Pros</b>	<b>Cons</b>
Undertake regular and adequate monitoring regimes	DCC / EPA		
Provide data to the public	DCC		
Ensure quality of data by accreditation	DCC		

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Key Issue No. 23	Coastal Zone Management		
Management Options	Responsible Bodies	Pros	Cons
<p>Establish pilot Coastal Zone Management project</p>	<p>DCC / NRFB/ Teagasc/ Department of the Marine and Natural Resources / Department of Agriculture/ Department of Energy, Forestry Service / Department of Arts, Heritage, the Gaeltacht and the islands</p>	<p><b>1. General</b>  a. Conservation of fish stocks  b. Secure incomes  c. Establishment of Inshore Fishery Development Committees  d. Infrastructure (harbours, piers, slips, marinas, roads etc.)  e. Global image of Donegal Bay as a quality "brand"  f. Increased value-added business  g. Business networking and clustering</p> <p><b>2. Catching Sector</b>  a. Input to planning process  b. Diversification possibilities  c. Fleet modernisation  d. Research into stocks  e. Conservation backdrop to review of Common Fisheries Policy</p> <p><b>3. Processing Sector</b>  a. Continuity of supply / quality of fish  b. Better regulation of fishing  c. Global marketing  d. New business links</p> <p><b>4. Aquaculture Sector</b>  a. Cross-sector agreement on CLAMS  b. Recognition of importance of aquaculture to economy  c. Improvement of public relations and development of positive image  d. Seen to act in concert with the natural environment  e. Greater scale and value added  f. Research and business links  g. Global brand image  h. Reduction of threats to industry, e.g. water quality, navigation, change of government policy via public/political/EU pressure</p>	

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		<b>5. Tourism / Leisure Sector-</b> a. Development of quality water-based leisure product b. Development of global brand image c. Beach management strategy d. Marina development / investment in boats e. New business links / marketing.	
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