

National Rivers Authority

and

University of Hull

Report of

Joint Foresight Seminar

University of Hull

Dennison Centre, 5th January 1995



**NATIONAL RIVERS AUTHORITY
UNIVERSITY OF HULL**

**FORESIGHT MEETING
Thursday 5th January 1995**

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Participants in the Seminar

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Environment Agency
Information Centre
Head Office

Class No

Accession No *BDZB*

PARTICIPANTS IN THE SEMINAR

National Rivers Authority

Tony Edwards	Southern Yorkshire Area, Northumbria & Yorkshire Region
Richard Freestone	"
John Housham	"
John Pygott	"
Graham Wilson	"
Mike Briers	Regional Office
Aileen Kirmond	"
Bill Forbes	North Area, Anglian Region
Martyn Stark	Lower Trent Area, Severn Trent Region
Fiona Crouch	NRA Humber Estuary Officer (based at the University)

University of Hull

Nev Jones	Dean of the School of Life Sciences
Alan Townshend	School of Chemistry
Steve Haswell	School of Chemistry
David Freestone	School of Law
Andrew Lawrence	Department of Applied Biology
Ray Goulder	Department of Applied Biology
Ian Cowx	University of Hull International Fisheries Institute
Ben Vivian	School of Geography & Earth Resources
Jack Hardisty	School of Geography & Earth Resources
Jeremy Lowe	Institute of Estuarine & Coastal Studies
Steve Trotter	Department of Economics
David Cheswold	Department of Electrical Engineering
Tim Scott	Department of Mathematics

Additional University Contacts (unable to attend Seminar)

Dr M Elliott	Department of Applied Biology
Dr R Uglow	Department of Applied Biology
Prof W Armstrong	Department of Applied Biology
Prof J Pethick	Institute of Estuarine and Coastal Studies
Dr T Burton	School of Law
Dr N Clifford	School of Geography and Earth Resources
Dr R Arnett	School of Geography and Earth Resources

INTRODUCTION

The object of the seminar was to examine the interests of the NRA and University in relation to the water environment, the relationships between the two organisations and opportunities to develop them for the mutual benefit of both institutions. The University presentations comprised of a general overview of the range and type of expertise and facilities available followed by specific examples from the fisheries field and on education and training initiatives specifically aimed at the water industry and business. This note summarises the key issues raised at the seminar and provides an action plan for taking initiatives forward.

The seminar was run as an informal discussion around a programme of presentations:

Introduction	Tony Edwards Nev Jones
NRA activities and key issues	Tony Edwards
University of Hull and its interests in the water environment	Nev Jones
NRA's catchment management planing	John Housham
Fisheries and river rehabilitation	Ian Cowx
Water quality modelling	Richard Freestone
University education and training initiatives	Ben Vivian
NRA R&D programme	Mike Briers
General discussion and identification of future opportunities for joint work	

The presentations are summarised in the appendices.

The NRA's most important asset is its people and the knowledge that they have. It needs to be continually innovative in order to improve its effectiveness as a practical environmental regulator. It wishes to influence and keep abreast of financial, social, legal, scientific and technical developments. NRA can be looked upon as being hungry for knowledge and the University as a provider of knowledge. The NRA has, however, considerable knowledge and expertise which may be of value to the University and its students.

A series of relationships between the University and NRA can be identified:

1. Research Funding

Most of NRA R&D contracts are let by competitive tender. It also co-funds or otherwise contributes to projects and funds CASE studentships.

2. Consultancy

Examples are fishery studies for the Vale of York Groundwater investigations and work for the Humber Tidal Defences Strategy. The NRA has also funded a number of project staff based at the University, for example the Humber Estuary Officer.

3. Exchange of Ideas

A prime example is Nev Jones' membership of the Humber Estuary Committee.

4. Data and Information

The NRA provides data from its registers and other information for teaching, student projects and research purposes.

5. Contributions to Teaching

NRA staff have contributed to seminars and courses. It is important to get NRA views over to those who in the future may be employed by the Authority, work for companies regulated by it or in some other way be involved in environmental policy, research and management. It is also useful for staff development and getting feedback.

6. Environmental Impact of the University

Universities are major users of mains water. Hull is to participate in the Humber Waste Minimisation Project.

7. Academic Opinions

Many academics are influential in national and local affairs and are sought after by the media for their views. The NRA wishes that they are well informed, were relevant, on its activities and views.

8. Membership of the Community

University staff, like the NRA's employees, are "customers" of the Authority as the whole community are directly or indirectly users of its services. Some academics are members of conservation groups, water sports clubs or have other direct interests in water outside of university work.

ACTIONS

1. Information Dissemination

- (i) A list of NRA publications is provided in Appendix 1 and reports are to be supplied to the Brynmor Jones Library.

Action: AE

- (ii) Copies of University's Resource Directory and other appropriate publications will be made available to the NRA.

Action: NJ

2. Seminars

There is to be a series of either intra or inter university meetings with the NRA as appropriate. These will be on specific themes/topics to be identified as being timely by either the NRA or UoH. The '95 programme will have a minimum of two meetings, one in early summer and a second in the autumn. The following themes are suggested as a starting point:-

- environmental/policy/environmental economics
- waste management/minimisation
- aquatic biology
- fish science/fisheries
- geomorphology
- environmental rehabilitation
- resource management
- analytical chemistry
- water quality
- modelling
- land use planning
- legislation
- environmental education short courses/business seminars/training
 mainstreaming environmental education contribution
 to University courses
 public education
 influence on school curricula
- specific river systems (could include field visits)
- ecotoxicology
- coastal areas
- North Sea

Action to develop initial programme : AE, NJ

3. Community Relations

Methods of improving the links between the NRA/University of Hull and the general

public, small enterprises, etc, should be sought. The national Science Fortnight which is to be held in March will include relevant inputs from both organisations. The Humber Waste Minimisation Project, sponsored by NRA, the University, Humber Forum Ltd and the Environmental Technology Best Practice Programme, was launched on 7th February 1995. The Humber Catchment Management Plan (CMP) is in its second phase of consultation and the River Hull and Coast CMP is in its first phase of consultation which will be completed at the end of February. The NRA is holding a Community Leaders' Day at Willerby on 28th February.

Action: Further ideas All

4. Student Projects

The University postgraduate and undergraduate students undertake projects which can be of interest to the NRA. A list of these will be provided by N Jones. The NRA will provide ideas, information and a contact person for future projects (John Pygott for Southern Yorkshire).

Action: NJ and NRA staff

5. Competitive Tendering for Research Proposals

Concern was expressed about the present competitive tendering procedure of the NRA. This is a national issue and it was suggested that a formal letter addressed to AE might be useful.

Action: NJ

6. Humber Observatory

NRA to provide a point of contact (RF) for the exchange of data and information, and to discuss the further development of the monitoring network.

Action: RF, JH

7. Contact Points

Nev Jones will be the contact for the Hull University and Tony Edwards for the NRA. Staff of the two organisations are, however, encouraged to liaise directly. A list of NRA names and addresses is given in Appendix 1.

8. Review

A review of progress will be held in September/October 1995.

Action: AE, NJ

- 1 Mission, Vision, Function
 - 2 Organisation
 - 3 The Environment Agency
 - 4 Case Study - Southern Yorkshire Area
 - 5 Catchment Management Planning
 - 6 Water Quality Modelling
 - 7 Research and Development
 - 8 NRA Contacts
- NRA Publications available from HMSO

1. MISSION

We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters. We will be businesslike, efficient and caring towards our employees.

VISION

Our vision is of a healthy and diverse water environment, managed in a sustainable manner, balancing the needs of all users.

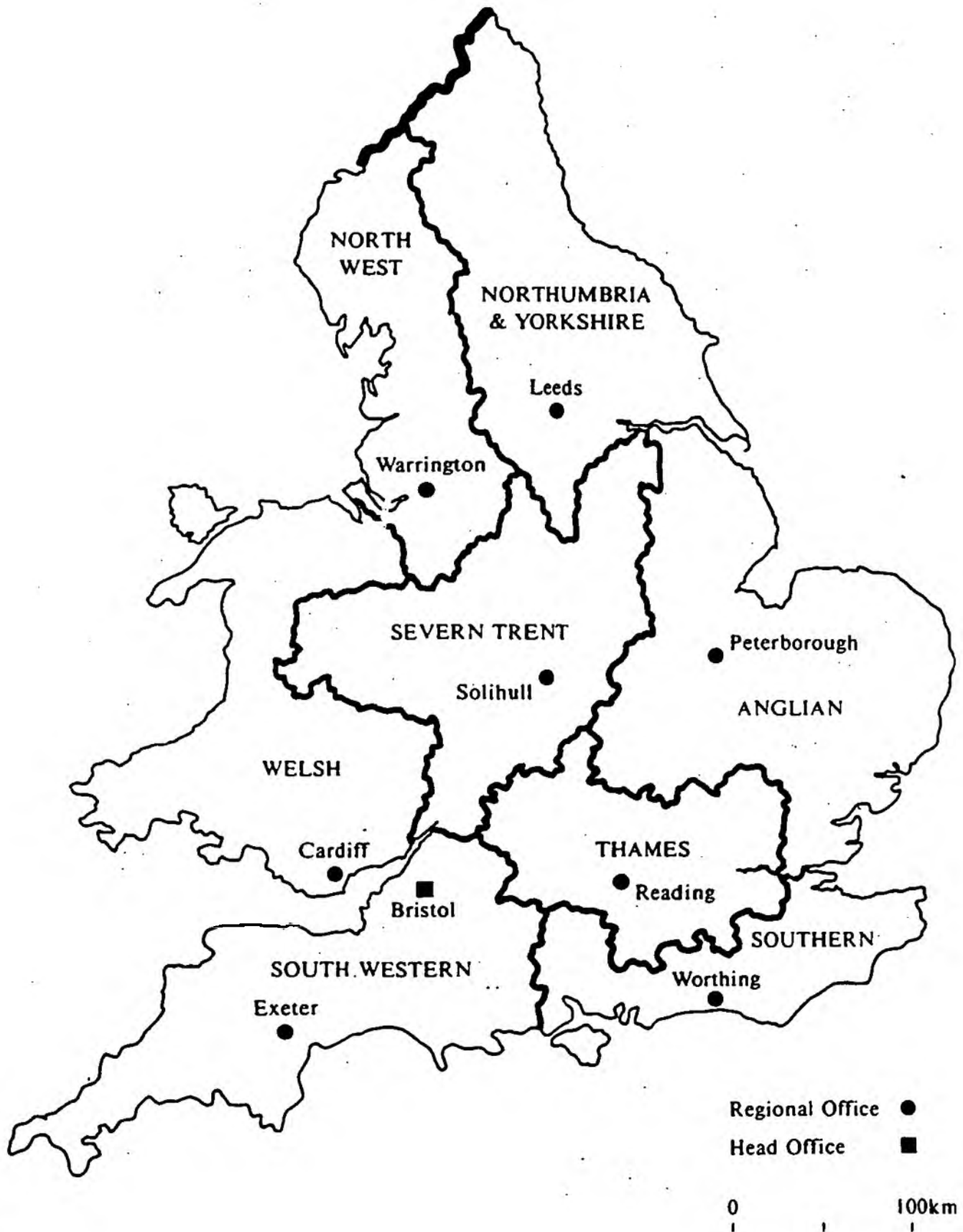
FUNCTIONS

Flood Defence
Water Quality
Water Resources
Fisheries
Conservation
Recreation
Navigation

2. ORGANISATION

The NRA was established in 1989 as a Non Departmental Public Body reporting to the Secretary of State for the Environment. The Ministry of Agriculture, Fisheries and Food and the Welsh Office have a statutory relationship with the NRA for Flood Defence and Wales respectively. The NRA's responsibilities are now set out in the Water Resources Act 1991. The Authority has no remit in Scotland or Northern Ireland.

NATIONAL RIVERS AUTHORITY



The Secretary of State appoints the Chairman and Board of the Authority. The NRA has a relatively small Head Office located in Bristol with an outstation in London. The country is covered by eight regions although most operational works is devolved to operational areas, three to four per region (26 in total). Integrated catchment management plans are being developed to direct its provision of services for the water environment.

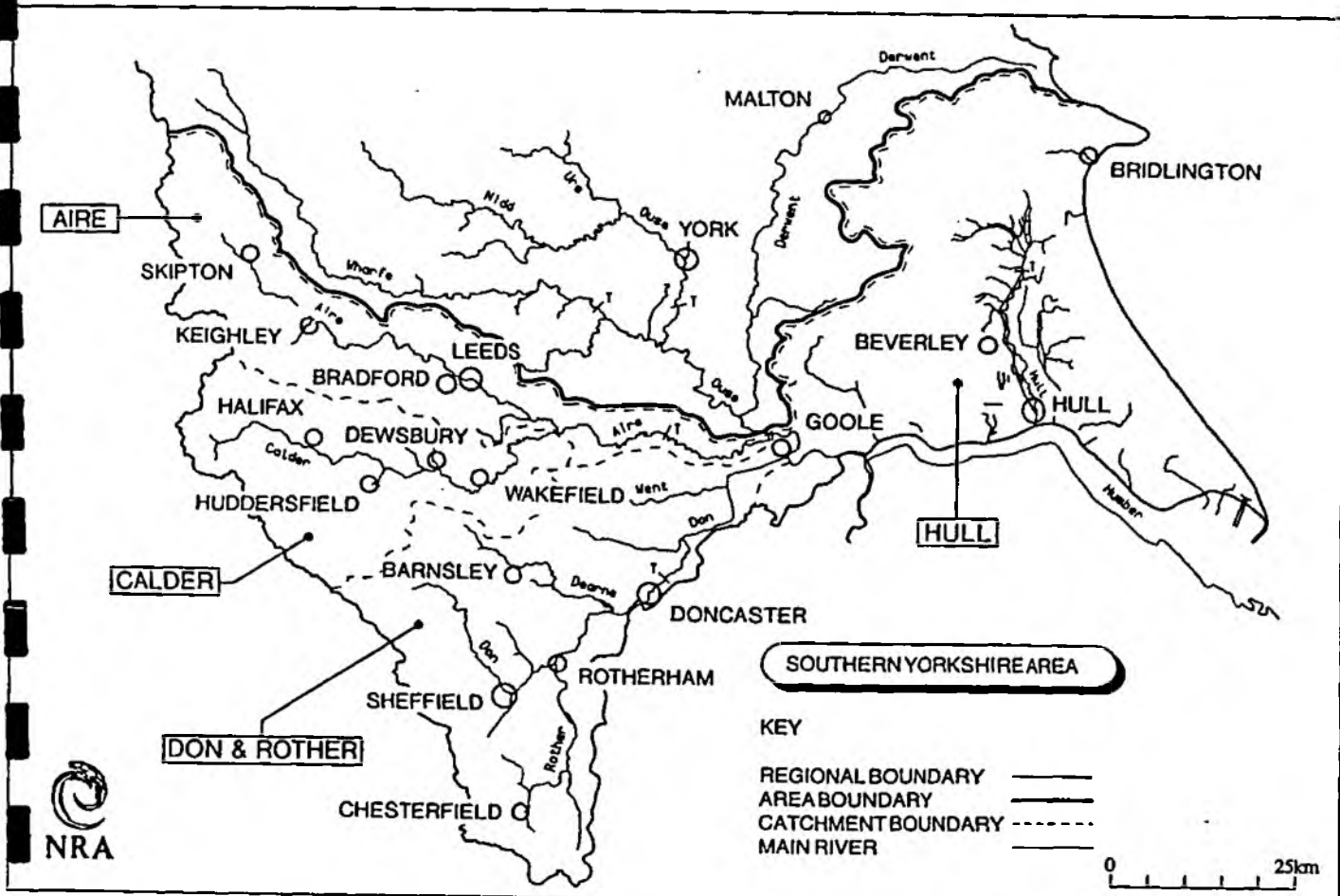
In 1994/95 the NRA has a budget of £455m and an establishment of 7,520 employees.

3. THE ENVIRONMENT AGENCY

The bill to establish an Environmental Agency for England and Wales (and the Scottish Environmental Protection Agency) is currently before Parliament. This bill will abolish NRA, Her Majesty's Inspectorate of Pollution (HMIP) and the 83 Waste Regulatory Authorities, which are at present part of local government. The work of these organisations, plus some tasks of DoE and MAFF, will pass to the Agency. Assuming that the Bill receives Royal Assent in the Summer of 1995, the Agency is due to become operational on 1st April 1996.

4. CASE STUDY - SOUTHERN YORKSHIRE AREA

The Area covers the Aire, Calder, Don and Hull catchments and shares the Humber with the Anglian Region's North Area and Severn Trent's Lower Severn Area. The Area has a budget of £15.3m in 1994/95 and 230 employees, including an in-house workforce which also has important tasks in flood emergencies. The population of the Area is 3.8m, and it has an area of 6195km covering most of West and South Yorkshire, North Humberside and North Derbyshire.



The length of freshwater rivers and canals in the Quality Classification scheme is 2,080 km and 906 km of watercourse are classified as "Main River" for Flood Defence purposes. There are 12 beaches designated under the EC Bathing Water Directive along the coast from Flamborough to Spurn Point.

The principal issues facing the Area in applying the NRA's vision can be summarised as:

- Protection of water resources and high amenity areas in the Pennines.
- Restoration of the quality and ecology of the industrial rivers and the enhancement of the resource for water supply, fisheries, wildlife, amenity and recreation.
- Restoration of the flood carrying capacity of the industrial rivers and the protection of flood plains for flood storage.
- Management of the Chalk aquifer and protection of water quality in an area of intensive agriculture in East Yorkshire.
- Achievement and maintenance of flood defence/land drainage standards of service in East Yorkshire and the enhancement of the fishery and conservation value of the watercourses.
- Ensure compliance with the EC Bathing Water Directive and the protection of coastal water quality.
- Collaboration with other Areas and Regions in the management of the migratory fishery along the North East coast.
- Maintain fully integrated management of the Humber system with Anglian and Severn Trent Regions.
- Achievement of water quality standards for the estuary and the measures required to protect the North Sea.
- Implementation of flood defence projects to guard against rising water levels, along with the protection and enhancement of the conservation value of the Humber.
- Rationalise the management of the Humber's fisheries.
- Determine rules for abstractions from the Ouse and Trent systems so that freshwater flows to the Humber are not excessively depleted.
- Assess developing trends and needs so that the water environment is protected and enhanced, competing interests balanced and the needs of the community are met as far as is practical.

5. CATCHMENT MANAGEMENT PLANS

Catchment planning is an evolving process within the National Rivers Authority which is achieving objectives and real improvements to the water environment in an integrated manner.

Objectives

- (i) To integrate NRA activities, developing teamwork and deriving yearly business plans.
- (ii) To achieve true ownership of catchment action plans by the community at large and NRA staff through wide consultation.
- (iii) To merge catchment action plans with local authority structure plans and the plans of other organisations.
- (iv) To bring the NRA closer to its customers and learn by the experience.

The process involves considering all aspects of the water environment for a defined catchment and all relevant interests within the community. The aim is to produce an action plan of costed and prioritised improvements which can be implemented either by the NRA or other organisations. The process is illustrated in the following diagrams.

Discussion Points

- (1) CONSULTING WIDELY - Who and how to reach. How to achieve understanding of committee members.
- (2) MAKING IT HAPPEN - how to achieve ownership in the community. Novel solutions.
- (3) ENVIRONMENTAL BENEFITS AND COSTS - Experiences from abroad and other organisations.
- (4) Relevance to the ENVIRONMENT AGENCY - vital for the successful integration of NRA/HMIP/WRAs.

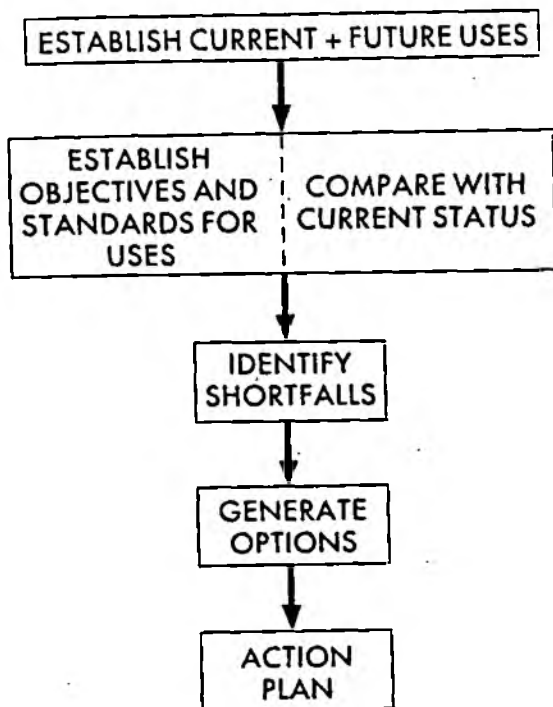
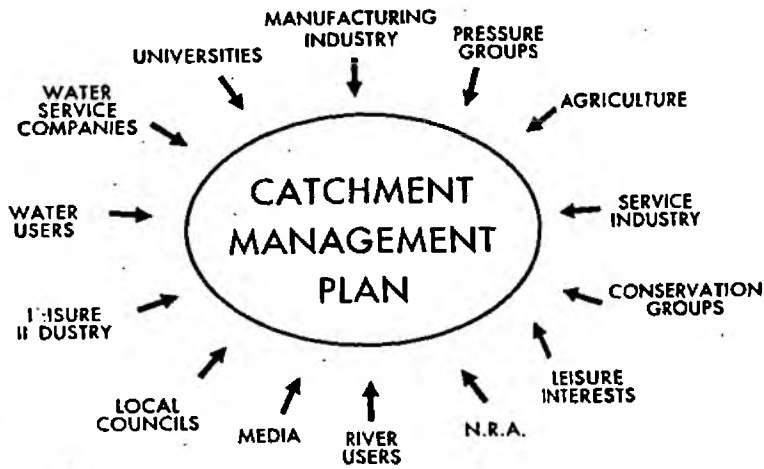
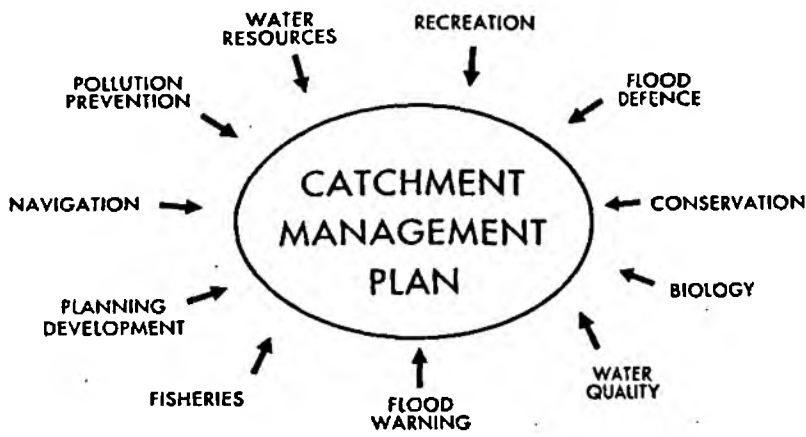
6. ENVIRONMENTAL MATHEMATICAL MODELLING

Mathematical modelling is a specialist task within the NRA but underpins a wide variety of activities including development of water quality, water resource and flood defence strategies, groundwater investigations, pollution incident prediction and flood forecasting.

Some of the tasks using models for managing surface water quality are:

- (i) Determination of discharge consent and abstraction licence conditions - predictions are made of the variation in concentration along rivers of quality parameter such as Biochemical Oxygen Demand (BOD) and ammonia using a simple mass balance model with stochastic simulation. Various combinations of consent conditions can be examined in order to decide upon the best manner in which to achieve the River Quality Objective (RQO).
- (ii) Evaluation of water quality problems - an example is the large diurnal variations in dissolved oxygen in the River Foss near York. Modelling is being used to assess the effectiveness of nutrient removal, diversion of effluents to sewage treatment works discharging to other catchments and flow regulation.

THE CATCHMENT MANAGEMENT PLANNING PROCESS



- (iii) Modelling has been used extensively for the Humber Estuary, particularly for the longitudinal variations in dissolved oxygen with low levels in the Goole area at times of low freshwater flow. This results from pollution from inland rivers and industrial discharges at Selby, coupled with the effect of high sediment loads. A two dimensional model is also used to examine variations in quality across the Humber.
- (iv) Modelling is being used to assess the risk of pollution from spillages and other actions so that precautionary measures can be taken.
- (v) Modelling estimates are used once a pollution incident has occurred to predict its time of travel and dispersion along a river so that, for example, measures can be taken to shut down abstractions to protect public water supply quality. The Aggregated Dead Zones (ADZ) model is utilised and has been calibrated by fluorescent dye tracing for the river with public water supply intakes.

7. RESEARCH & DEVELOPMENT IN THE NRA

The NRA carries out research and development as a Statutory Duty in support of all its core functions. The aim is to improve its efficiency and effectiveness in carrying out its own business. To ensure its R&D programme is integrated into its functional activities, staff from the functions are responsible for identifying R&D needs, for the supervision of projects and for the subsequent implementation of R&D results and outputs.

The NRA's R&D programme is a National programme with individual projects being devolved to Regions to manage.

The 1994/95 R&D programme involves about 150 projects at various stages of completion. Nearly all of the projects are undertaken by external contractors. The annual R&D budget is about £7m with approximately half of this spent on R&D related to water quality.

The R&D programme is very much focused on applied research and it does not undertake "blue skies" project, although it does liaise with Research Councils and other funders of less "market oriented" research. An analysis of the present programme shows that R&D is undertaken for the following purposes.

- to improve its ability to carry out statutory duties (18%);
- to improve its efficiency and effectiveness in carrying out its business (57%);
- to support policy development (20%);
- to increase its general knowledge and understanding (5%).

To date the NRA has produced over 400 documents on its R&D projects, the majority of which are in the public domain. It is important to appreciate that it is not just reports that are being produced through the R&D programme. Some examples of other types of output include water quality instrumentation, mathematical models, software for data analysis, electric fishing sampling equipment and manuals of best practice.

The following documents provide further information on the NRA's R&D programme:-

R&D Strategy (published in 1994)

List of Outputs

Each year (around February) the **Annual R&D Review** is published together with a **Schedule of Projects** for the forthcoming financial year.

APPENDIX 8 NRA CONTACTS

HEAD OFFICE

Rivers House
Waterside Drive
Aztec Centre
Almondsbury
Bristol BS12 4UD
Tel: 01454 624400

LONDON OFFICE

Eastbury House
30-34 Albert Embankment
London SE1 7TL
Tel: 0171 820 0101

NORTHUMBRIA & YORKSHIRE REGION

Rivers House
21 Park Square South
Leeds
LS1 2QG

Tel: 0113 244 0191

SOUTHERN REGION

Guildbourne House
Chatsworth Road
Worthing
West Sussex
BN11 1LD
Tel: 01903 820692

AREA OFFICES

SOUTHERN YORKSHIRE

Olympia House
Gelder Road
Gelder Lane
Leeds
LS12 6DD
Tel: 0113 244 0191
Fax: 0113 231 2116

NORTH WEST REGION

Richard Fairclough House
Knutsford Road
Warrington
WA4 1HG

Tel: 01925 653999

THAMES REGION

Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 01734 535000

WELSH REGION

Rivers House
Plas-yr-Afron
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770088

ANGLIAN REGION

Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough
PE2 0ZR
Tel: 01733 371811

SOUTH WESTERN REGION

Manley House
Kestrel Way
Exeter EX4 7LQ
Tel: 01392 444000

SEVERN TRENT REGION

Sapphire East
Streetsbrook Road
Solihull
West Midlands
B91 1QT
Tel: 0121 711 2324

NORTHUMBRIA

Eldon Office
Regent Centre
Gosforth
Newcastle-upon-Tyne
NE3 3UD
Tel: 0191 213 0266
Fax: 0191 284 5069
(office to move in mid 1995)

SOUTHERN YORKSHIRE LOCAL OFFICE

1 Viking Close
Great Gutter Lane (East)
Willerby
HULL
HU10 6DE
Tel: 01482 651446
Fax: 01482 654052

LOWER TRENT AREA (SEVERN TRENT REGION)

Trentside
Scarrington Road
Off Laydbay Bridge
West Bridgeford
Nottingham NG2 5FA
Tel: 0115 945 5722
Fax 0115 981 7743

NORTH AREA (ANGLIAN REGION)

Aqua House
Harvey Street
Lincoln LN1 1TF
Tel: 01522 513100
Fax: 01522 512927

Head Office, Bristol	Director of Technical Services	Clive Swinnerton
	Head of R&D	Mervyn Bramley
Northumbria & Yorkshire Region (Regional Office: Rivers House, Leeds)	Regional General Manager	Roger Hyde
	Technical Manager	Sue Slack
	Business Services Manager	Garry Greenlay
	Solicitor	Adrian Nuttall
	R&D Co-ordinator	Mike Briers
Northumbria Area	Area Manager	Richard Cresswell
Dales Area	Area Manager	Paul Tullett
Southern Yorkshire Area	Area Manager	Tony Edwards
	Planning & Services Manager	John Housham
	Resources & Quality Manager	Gerard Morris
	Flood Defence Manager	David Pelleymounter
	Ecology & Recreation Manager	John Pygott
	Operations Manager	Bob Wood (based at Rivers House, Leeds)
North Area	Area Manager	Ron Linfield
	Water Quality Manager	Bill Forbes
Lower Trent Area	Area Manager	Brian Waters
	FRCN Manager	Martyn Stark
	Water Quality Manager	Keith Selby

NRA PUBLICATIONS AVAILABLE FROM HMSO

ISBN	TITLE	PRICE
11 885804 1	Toxic Blue Green Algae: The report of the NRA (WQS 2)	£15.00
11 885805 X	Bathing Water Quality in England and Wales 1990 (WQS 3)	£10.00
11 885806 8	The Quality of Rivers, Canals and Estuaries in England & Wales (WQS 4)	£5.00
11 885807 6	Influence of Agriculture on the Quality of Natural Waters in England & Wales (WQS6)	£10.00
11 885808 4	Bathing Water Quality in England and Wales 1991 (WQS 8)	£3.00
11 885809 2	Water Pollution Incidents in England and Wales 1991 (WQS 9)	£4.00
11 885810 6	Discharges of Waste Under the EC Titanium Dioxide Directives (WQS 10)	£5.00
11 885811 4	Bathing Water Quality in England & Wales 1992 (WQS 11)	£3.00
11 885812 2	Quality of the Humber Estuary 1980 - 1990 (WQS 12)	£5.00
11 885813 0	Water Pollution Incidents in England & Wales 1992 (WQS 13)	£4.50
11 886520 X	Abandoned Mines and The Water Environment (WQS 14)	£7.95
11 886521 8	Contaminated Land and The Water Environment (WQS 15)	£7.95
11 886522 6	Implementation of the EC Shellfish Waters Directive (WQS 16)	£7.95
11 886513 7	Discharge Consents and Compliance (WQS 17)	£7.95
11 886524 2	Bathing Water Quality in England and Wales - 1993 (WQS 18)	£7.95
11 886519 6	The Quality of Rivers and Canals in England and Wales (1990 to 1992)	£11.95
11 885814 9	Fisheries Technical Report 1 - Sea Trout in England and Wales	£6.00
11 885815 7	Fisheries Technical Report 2 - Sea Trout Catch Statistics	£6.00
11 885816 5	Fisheries Technical Report 3 - Sea Trout Literature Review	£6.00
11 885817 3	Fisheries Technical Report 4 - Sea Trout Gene Banks	£6.00
11 885818 1	Fisheries Statistics 1990	£6.00
	Fisheries Statistics 1991	£6.00
11 886525 0	Fisheries Statistics 1992	£8.95
11 885819 X	River Corridor Surveys - Conservation technical handbook 1.	£10.00
11 885820 3	River Landscape Assessment - Conservation technical handbook 2	£6.00
11 885821 1	Otters and River Habitat Management - Conservation technical handbook 3	£5.00
11 885822 X	Groundwater Protection Policy Document (including vulnerability map)	£15.00
	Groundwater Vulnerability Map	£5.00
11 885823 8	Low Flows and Water Resources (Facts on the top 40 low flow rivers in England & Wales)	£5.00
11 886523 4	Water Nature's Precious Resource (March 1994)	£22.50
11 885824 6	R&D Annual Review - 1991	£12.00
11 885825 4	R&D Annual Review - 1992	£17.00
11 886516 1	R&D Annual Review - 1993	£19.95
11 885826 2	Diversion and Entrapment of Fish at Water Intakes and Outfalls - R&D Report 1	£17.00
11 885827 0	Airborne Remote Sensing of Coastal Waters - R&D Report 4	£40.00
11 885828 9	Development of Environmental Economics for the NRA - R&D Report 6	£15.00
11 886518 8	The Disposal of Sheep Dip Waste Effects on Water Quality	£15.00
11 886517 X	The Implications of Climate Change for the National Rivers Authority - R&D Report 12	£15.00

**APPENDIX 2 THE UNIVERSITY OF HULL'S INTERESTS IN THE
WATER ENVIRONMENT**

1. Schools and Institutes concerned with Estuarine and Coastal Science and Management.
2. Department of Applied Biology : Marine Studies; inter and multi-disciplinary, and integrative studies; freshwater studies.
3. School of Chemistry.
4. School of Law.
5. Activities of interest to the NRA in the Electrical Engineering Department.
6. Economics.
7. Applied Mathematics.
8. Hull International Fisheries Institute.
9. Education and Training

1

**Schools and Institutes
Concerned with Estuarine and Coastal
Science and Management**

Life Sciences
(including Applied Biology)

Geography and Earth Resources
(including Inst. Est. Coast. Stud.)

Chemistry
(including Inst. Chem. in Industry)

Engineering and Computing
(including Electronic Engineering)

Law

[For:
biological, chemical and physical studies,
environmental management and policy,
environmental law and its administration,
environmental chemistry and instrumentation,
environmental education, research and consultancy]

Physical Studies
(School of Geography and Earth Studies
& Institute of Estuarine and Coastal Studies)

Mechanisms of physical change;
Coastal geomorphology;
Natural erosion patterns and changes to them
through engineering;
Close-shore hydrodynamics;
Water movements, sediment transport;
Humber-marine fluxes;
Beach nourishment;
Saltmarsh dynamics and characteristics.

SCHOOL OF GEOGRAPHY & EARTH RESOURCES

Contact: Dr J Hardisty

The Humber Observatory (funded by Univ. Hull, NERC, NRA, ABP)

Operationalised from 1.1.95 to measure, archive and report at hourly intervals:

- a) Meteorology (on campus),
pressure precipitation, wind temperature, humidity, radiation
- b) Estuary (at Bull Float)
tidal elevation, currents, waves, water temperature, salinity,
suspended sediment, dissolved oxygen
- c) Air Quality (with Hull City Council)
ozone, sulphur dioxide and nitrogen dioxide.
Developments '95 - extend to middle estuary with NRA funding.

Environmental Modelling - 2D and 1D estuary models

Humber Flux Curtain (funded by NERC, LOIS)

Humber Plume and Sediment Jets (NERC)

INSTITUTE OF ESTUARINE AND COASTAL STUDIES

IECS

The Institute of Estuarine and Coastal Studies (IECS) in the University of Hull is an interdisciplinary research and consultancy department that has built up a national and international reputation for its coastal work over the past decade.

Areas of Expertise

IECS has a detailed knowledge of many coastal and estuarine issues in the British Isles. Examples of some of the work are given below:

Research has been applied to coastal protection and flood defence problems throughout Britain. This has enabled IECS to advise on the integration of coastal defence works with the environment. By these means it is possible to ensure both efficient defence and protection, even enhancement, of natural habitat and aesthetic qualities of the coastal zone. IECS has been instrumental in the development of managed retreat, soft engineering and geomorphological modelling approaches to coastal management in the UK.

One of the most important projects undertaken by IECS has been the preparation of two documents for MAFF on Coastal Defence and the Environment; a practical guide for coastal managers and a strategic guide for senior decision-makers. These are now used as the basis for many of the current coastal management schemes.

IECS has been commissioned to study the coastal processes of many of the east coast estuaries. This has involved consideration of coastal processes and landforms and human impacts on these; the information being used to detail the historical evolution of the estuaries. This knowledge has been used to propose and evaluate management options to protect the geomorphological resource of the estuaries.

Biological community monitoring is an important component of IECS work, with particular reference to the analysis of anthropogenic impacts on the community structure. Aspects of water quality research undertaken by the Institute, include comparative toxicity research carried out on biocides together with direct toxicity testing on industrial effluents; the characterisation of bacteriological and industrial effluent dispersion; assessments of proposed discharges on current WQOs and effluent dispersion model validation.

Within IECS there is extensive experience in utilising GIS for the purpose of storing and analysing information on the coastal environment. The GIS is entirely compatible with the NRA Anglian Shoreline Management System, and has in fact been used to transfer data compiled by IECS to the NRA (and *vice versa*) in the past.

Organisation

IECS has 12 full time staff and 30 members of University staff, from a wide range of disciplines, who act as specialised consultants. IECS is housed in its own offices and has a wide range of equipment and facilities including computer laboratory with GIS, biological and sedimentological laboratories and a wide range of field equipment. IECS is primarily funded through its commercial research and consultancy although an increasing amount of academic and post-graduate teaching is undertaken.

MARINE BIOLOGICAL STUDIES:

at several levels of biological
organisation including:

- (A) response at the individual level;
- (B) dynamics and health at the population level;
- (C) community and ecosystem
structure and functioning;

(A) Response at the Individual Level

including genetics, physiology, toxicology, morphology and behaviour at the individual level;

(i) Toxicology

of sewage (from Scalby, etc.) and industrial waste (production water from British Gas):

response of polychaetes (*Nereis*), crustaceans (*Crangon*, *Corophium*), molluscs (*Mytilus*);

toxicity of effluent as produced and modified during discharge;

toxicity modified by weathering (aeration, photo-oxidation);

toxicity alteration and synergistic/antagonistic effects through temperature and salinity (leading to 3-D response surface for LC_{50} and LD_{50}).

(ii) Morphology and Reproductive Deviation

(a) Imposex in populations of dog-whelk (*Nucella*) as an indication of TBT contamination:

covering coast from Wear-mouth (Pincushion Rocks) to Bridlington:

links between RPSI, %Imposex, sex ratio, shell sculpture, population structure and tissue tin concentration, *etc.*

(b) Reproductive (endocrine control) changes through natural (temperature, day-length) and anthropogenic (waste-waters) influences:

use of errant polychaetes (*Nephtys*, *Harmothoe*, *Ophryotrocha*), sedentary polychaetes (*Pomatoceros*), bivalves (*Mytilus*).

(iii) Neurobiology of Coelenterates

behavioural and response changes in relation to natural micro-organic materials.

(iv) Settlement patterns

of sessile invertebrates in relation to plant chlorination practices:

toxicity of chlorine to mussel spat.

(v) Behaviour, physiology

Natural patterns and functioning:

alteration through effluent exposure (power plant effects)
field and laboratory;

filtration, respiration, excretion, assimilation in *Mytilus*;

SFG, SIA in relation to organohalogen and TRO exposure
and thermal pollution;

relative excretion products in relation to overall metabolism
in *Mytilus*, *Carcinus*, *Nephrops*, etc.

(vi) Genetics

response to metal contamination:

acquired tolerance, selection and response through toxicity
(*Nereis*, *Corophium*); relevance to Humber and elsewhere.

(B) Response as Dynamics and Health of Populations

(i) Rocky shore populations - natural changes
(natural and anthropogenic: Cornelian Bay, Scalby, *etc.*);

(ii) Estuarine invertebrate population - growth,
somatic and reproductive production;

(iii) Pathological anomalies in estuarine fish;

(iv) Micro-organism contamination
(especially faecal streptococci and coliforms)
in seawater, uptake and culture by shellfish,
die-off rates through exposure.

(C) Assessment of Assemblage/Community and Ecosystem Structure and Functioning

(i) Inshore and Estuarine Fish

including response to water quality and human activities,
trophic structures, ecotrophic guilds and usage of areas:

(a) Intertidal (rocky shore and beach) fish community
structure and trophic relationships;

(b) Estuarine fish assemblage - functioning on local scale
(Humber) and Europe wide (Oslofjord to Tagus);

(c) Fish impingement on cooling water intakes;

(ii) Soft sedimentary assemblages

- structure, temporal and spatial changes, production and export of material;
- functioning and links with higher trophic levels and detritus pathways;
- large and small scale patterns - degree of heterogeneity;

(a) Intertidal sandy beach fauna
(Scarborough to Skegness)

in relation to natural features
(shore and sediment characteristics,
erosion patterns, freshwater run-off),

and anthropogenic features
(waste water discharge, hard engineering).

(b) Subtidal benthos
(Forth to Suffolk, especially Yorkshire coast)

- in relation to major environmental features;
- environment - biota interactions and biota- biota interactions;
- in relation to present and proposed anthropogenic influences (cooling water discharges, effluent pipes and their discharges, dredge-spoil and sewage dumping, *etc.*);
- the impact of natural biological disturbance due to cliff erosion;
- information leading to improved predictive capability for community structure (taxa present) and primary and derived community variables (S A B H', *etc.*).

(iii) Water column

trophic state
(nutrients, primary production response),

in relation to inputs
(in Suffolk estuaries, Strangford Lough).

**Inter- and multi-disciplinary
and integrative Studies**

EIS, EIA for developments
(oil/gas exploration, pipeline construction
and discharge, power plant construction,
hard and soft engineering, etc.)

Management plans and proposals
(input to NRA, HCC and EN Management plans)
(Humber Estuary Officer)

FRESHWATER STUDIES

Applied Biology

Dr Ray Goulder

Fish farm management and effluent quality

Extracellular-enzyme production in fish farms

Microbial N and P cycling in rivers

Analytical Science (Professor Alan Townshend, Dr Steve J Haswell)

Chemometrics

Trace analysis

ICP-mass spectrometry for inorganics

Flow injection analysis; automated systems

On-line preconcentration for organics and inorganics

On-line microwave sample pretreatment

GC-mass spectrometry

Enzyme inhibition for pesticide etc detection

Chemiluminescence ultrasensitive detection

Electrochemiluminescence detection

On-line headspace/mass spectrometry for process analysis

Micromachined devices

Institute for Chemistry in Industry (Professor A Townshend)

Short Courses (Dr M C Pitt)

Waste utilisation

Quality

Contract analysis (Dr I Flynn)

Physical Chemistry

Surfactant science (Dr R Aveyard)

Inorganic Chemistry

Metal complexes in solution (Professor E Sinn)

Professor D A C Freestone

EU Environmental Law

Regional environmental protection - particularly North Sea

Regional and global agendas (UN Land-based sources of marine pollution. Agenda 21.)

Editor-in-Chief of International Journal of Marine Coastal Law

Editorial Board of European Environmental Law Review

Dr T P Burton

UK Water Resource Management

Assistant Editor of Water Law

Convenor of UKELA Water Group

IPC. Access to information.

Mr D Ong Law of the Sea

Dr K Gjerde Biodiversity

Mr Z Makuch Environment and Trade

5 ACTIVITIES OF INTEREST TO THE NRA IN THE ELECTRICAL ENGINEERING DEPARTMENT

Contact: Dr David Chesmore

1. Background

The Department of Electronic Engineering at the University of Hull offers a full-time four year degree in Electronic Engineering (BEng) together with taught Masters Degrees in Advanced Radio Systems and Mechatronics. The Department pioneered the introduction of environmental teaching in an electronic engineering degree five years ago.

Research activities within the Department are strongest in radio communications, robotics and modelling with developing interests in applying new technology to environmental problems.

2. Research Activities and Interests

The main research areas of relevance to the NRA are:

- Radio telemetry. Systems developed at Hull are aimed at long distance (100's of km to world-wide) and intermediate distance (10's of km to 100's of km) low power reliable communications. The propagation mechanisms employed are mainly HF (2-30MHz, ionospheric) and VHF (30-300MHz, line of sight, meteor scatter and tropo-reflection). Research involves propagation analysis as well as complete system design.
- Datalogger design. A long standing interest is the design of ultra low power dataloggers with large memories for use in remotely sited or difficult to access environments. Such systems can be coupled with the radio telemetry systems mentioned above.
- Sensor design. Collaborative research with the School of Chemistry is examining a variety of sensing techniques for water pollutants.
- Signal processing for sensors, eg sensor fusion, calibration drift, failure detection, etc using digital signal processing, knowledge-based techniques and artificial neural networks.
- Acoustic signal monitoring and analysis. Previous work funded by SERC involved acoustic condition monitoring of gearboxes but could be applied to many condition monitoring applications (eg pumps, motors, etc). The approach uses time encoded signals and artificial neural networks.

- **Modelling.** Modelling activities involve the application of Transmission Line Modelling (TLM) to various problems such as heat diffusion in kiln firing. TLM is well suited to modelling transient diffusion problems and may be applied to pollutant dispersal.

In addition to the electronics aspects of environmental research, Dr Chesmore has recently set up a Special Interest Group for Technology in Entomology in conjunction with the Royal Entomological Society of London. Its purpose is to increase the awareness of entomologists (and biologists, ecologists, etc) of the applications of electronics and computing technology. Examples include: geographical information systems, expert systems, entomological radar, image and signal processing. Part of Dr Chesmore's interests in this area lie in the use of insects as bio-indicators of pollution.

3. Teaching

As mentioned in Section 1, the Department was the first in the UK (possibly anywhere) to introduce environmental topics in electronic engineering. Several other universities have recently followed Hull's lead. Some of the courses are also taken by students on the Environmental Analysis and Dynamics MSc and the Estuarine and Coastal Science and Management MSc. Full details of the educational aspects of this teaching can be found in the references listed in Section 4.

4. References

A list of references is given below. Copies of any papers can be provided if required.

Chesmore, E.D., "System designs for very large scale acquisition of environmental parameters", International Conference on Instrumentation, Measurement and Control, Singapore, January 1991, pp 66-82.

Chesmore, E.D., "Advanced systems for environmental pollution monitoring on a large scale basis", COMADEM'91 International Conference, published by Adam Hilger, July 1991, pp 321-325.

Chesmore, E.D., "System design approaches for the acquisition and transmission of environmental parameters", 8th International Conference on Systems Engineering, September 1991, Coventry Polytechnic, pp 574-579.

Chesmore, E.D., "Ecological and environmental electronics - a new teaching initiative", Conference on "The Teaching of Electronic Engineering Degree Courses", University of Hull, April 1992, pp. 46:1-46:7.

Khalil, A.H. & Chesmore, E.D., "A blackboard system for adaptive data compression in telemetry systems", 4th Communications Symposium, University College of North Wales, Bangor, May 1992.

Pulko, S.H., Gaskell, S., Witwit, A.R.M., Chesmore, E.D., "TLM modelling of the dynamics of populations of simple species", International Conference on "Control: Modelling, computation, Information", Institute of Mathematics & its Applications, UMIST, September 1992.

Chesmore, E.D., "The teaching of environmental subjects in electronic engineering degree courses", First IEEE International Symposium on Electronics and the Environment, Arlington, Virginia, USA, 10-12 May 1993.

Chesmore, E.D., "Ecological and Environmental Electronics BEng(Hons) Electronic Engineering Final Year Specialisation", University of Hertfordshire, 14 July 1993.

Chesmore, E.D., Gilbert, J.M. & McLachlan, D.S., "Teaching environmental electronics in university degree courses", First International Conference on Environmental Engineering, Leicester, 21-23 September 1993.

Chesmore, E.D., "Water quality monitoring", Scottish Hydraulics Study Group Annual Seminar on "Hydro-scientific Data Collection", Glasgow, 18 March 1994

Pulko, S.H., Chesmore, E.D. & Waldes, A., "Simulation of butterfly wing pattern development using transmission line modelling", 12th IASTED International Conference on Applied Informatics, Annecy, France, May 17-20 1994.

Lucking, W.G., Darnell, M. & Chesmore, E.D., "Acoustical condition monitoring of a mechanical gearbox using artificial neural networks", IEEE Conference on Neural Networks, 28 June-2 July 1994, part of the IEEE World Congress on Computational Intelligence, Orlando, Florida.

Chesmore, E.D., Pulko, S.H. & Waldes, A., "Computer simulation of butterfly wing pattern development using transmission line modelling", Fifth European Congress of Entomology, University of York, 29 August - 2 September 1994.

Chesmore, E.D., "Technology in Entomology - an overview", Fifth European Congress of Entomology, University of York, 29 August - 2 September 1994.

Chesmore, E.D., Elliott, M.E. & Taylor, D., "Multidisciplinary teaching in environmental science and engineering", First Conference of the Forum for Environmental Engineering Education, Dundee Institute of Technology, 8-10 September 1994.

Lucking, W.G. & Chesmore, E.D., "Acoustical condition monitoring of a mechanical gearbox using artificial neural networks", 10th International Conference on Systems Engineering, September 1994, Coventry University.

Chesmore, E.D., "Electronic and Computing Technology in Entomology", Newsletter of the European Society of Entomologists, Issue 0 (launch issue), September 1994.

Chesmore, E.D. & Monkman, G., "Automated analysis of variation in Lepidoptera", *The Entomologist*, 113 (3&4), 1994, pp 171-182.

Dr S D Trotter

Dr J Atkins

Mr C Hammond

Economics of regulation and privatisation

Agricultural and environmental economics

Cooperated with Professor J A Rees on NRA project on value of water to different user groups.

7 APPLIED MATHEMATICS

TIM SCOTT

Senior Lecturer in Industrial Applied Mathematics

Director Designate of the University's Centre for Industrial Applied Mathematics

Interests:

Groundwater flow and gas migration through porous media.

Hydrodynamic flow in estuaries and coastal regions.

Development and application of simulation models to predict fluid and tracer movement through porous media (eg aquifers) and estuarine systems (eg tidal flows, contaminant transport and dispersal).

Previous Customers:

- * Nirex - gas migration studies, groundwater flow, software review and quality audit
- * D.En/DTI - software development and simulation of oil recovery from petroleum reservoirs
- * Statoil (Norway) - development of mathematical models for petroleum reservoir simulation

CENTRE FOR INDUSTRIAL APPLIED MATHEMATICS

Additional areas of expertise include:

- * Fundamental mathematical analysis of turbulent flow
- * Heat transfer in fluid systems
- * Application of stochastic methods for the design of experiments
- * Statistical analysis of data

INTERNATIONAL FISHERIES INSTITUTE

The University of Hull, International Fisheries Institute is a specialist unit which undertakes a wide range of educational, training, consultancy and research work both within the UK and internationally. The staff's wide experience embraces planning and management, marketing, economics, post harvest operations, fishing systems technology, ecology, environmental; impact assessments and aquaculture. The location in the University of Hull and the high level of international experience and consultancy work enable staff to offer services of an excellent academic standard with a direct application to contemporary fisheries, environmental and management problems.

The Institute has long standing relationships with key organisations that promote development, research and training, notably Overseas Development Administration (ODA), Food and Agricultural Organisation of the United Nations (FAO), Asian Development Bank (ADB), World Bank, European Community (EC), Ministry of Agriculture, Food and Fisheries (MAFF) and the National Rivers Authority (NRA). In addition the Institute has business links with many national organisations and individual companies.

A list of current and recent training consultancy and research activities is given below. It is important to stress that HIFI does not deal exclusively with Fisheries issues. It has considerable experience in the field of project planning and management, environmental impact assessment and aquatic resource management planning. These activities are reflected in the diverse range of activities that HIFI have been involved in recent years.

RECENT CONSULTANCIES CARRIED OUT BY HIFI IN FRESHWATER FISHERIES

Kenya Power Company: Fisheries Ecology in Relation to Proposals for Ewaso Ngiro River Developments, Kenya.

Assessment of the current status of the fisheries resources in the Ewaso Ngiro River, Kenya, and evaluation of the impact of potential hydropower developments on the fisheries. Assessment of the socio-economic impact of such proposals on the fishing communities and potential mechanisms of rehabilitation. (Knight Piesold & Partners, December 1991/ January 1992)

Post-impoundment changes in the fish fauna of Lake Itzhi-tezhi, Zambia.

Evaluation of the changes in the fish fauna of the Lake Itzhi-tezhi following impoundment of the Kafue River, Zambia and the socio-economic effects of the changes. (Department of Fisheries, Zambia 1987.)

FAO Fisheries Consultant: Development of a Fisheries Department and a BSc in Fisheries at Moi University, Kenya

Identify training needs of fisheries staff in Kenya and the rest of East Africa, advise on the organizational structure of a new fisheries department at Moi University and design a course

curriculum to meet the demands of the local fisheries personnel. (FAO, August/Sept 1990, January 1991)

Assessment of the impact of land drainage engineering works and river regulation on instream ecology.

Assessment of the impact of river channelization and/or flow regulation on the fish fauna of the rivers Severn, Vyrnwy, Clywedog, Soar, Trent, Wye, Exe, Tame and Derwent (all in UK). Severn-Trent Water, National Rivers Authority (1985 to present).

Assessment of the effect of water quality problems on freshwater fisheries with particular reference to large rivers.

Impact of sewage effluent and thermal effluent on fish stocks in the rivers Severn, Trent, Tame, Soar and Wye. Development of management strategies to ameliorate the problems encountered. (NRA-Severn Trent Region, Welsh Region Yorkshire and Northumberland Region and Nottingham Federation of Anglers - ongoing.)

Fishing with electricity and its application to population ecology. Evaluation of the applicability of electric fishing for stock assessment in large rivers. Development of new multi-electrode equipment to improve efficiency of the gear in large deep waters. (National Rivers Authority, Humberside County Council and Water Research Centre - 1985 to present.)

Application of capture data census techniques for monitoring fish stocks in large water bodies.

Joint research programme to evaluate the use anglers for the assessment of the status of fish stocks in large water bodies and how they can be used in freshwater fisheries management to identify and assess water quality problems. The main work has been carried out on the rivers Trent and Severn in the UK and Pilica in Poland. National River Authorities, University of Lodz, Polish Anglers Board - 1985 to present).

Ecotones in channelized and regulated rivers.

A multinational research programme to evaluate the factors which characterise habitats for different species of fish. Assessment of the impact of river regulation and channelization on the fish stocks using criteria identified (UNESCO 1989 -1994).

Re-introduction of salmon into the river Derwent.

Assessment of the feasibility of re-introducing Atlantic salmon into the River Derwent by evaluating the cost of bypassing weirs and restocking against the indirect benefits in terms of improving the status of the fishery (Derbyshire County Council Anglers Assoc 1987)

Use of electrophoretic techniques to identify hybridization in salmonid fisheries. Protein assays of various salmonid stocks in the Yorkshire region of NRA to assess the degree of hybridization between salmon and sea trout (NRA Yorkshire Region 1988).

The development of an environmental strategy to improve coastal and estuarine fisheries around Humberside.

Assessment of the current status of the fish stocks in and around the Humber Estuary and impact of pollution and exploitation on development of the fisheries for commercial and recreational purposes (Humberside County Council, 1990-1991)

FAO Fisheries Consultant: Development of Cold Water Fisheries in Northern Areas, Pakistan.

Formulation of a FAO/UNDP project on the development of the cold water fish resources in Northern Areas of Pakistan through stock assessment and rational management of the indigenous stocks and culture of rainbow trout for restocking and the table market (FAO August 1991).

FAO Fisheries Consultant: Cold Water Fish Culture Project, Azad Kashmir, Pakistan.

Identify the training needs of private and governmental fisheries personnel in the Azad Kashmir area of Pakistan and develop an Extension service which will meet the development needs of the fisheries sector in terms of resource management and fish culture (FAO August/September 1991).

Anglers Cooperative Association; Impact of River Ouse Flow Augmentation Scheme on the Recreational Fisheries.

Impact of augmenting flows in the River Ouse for abstraction purposes with borehole water discharged into tributaries and drains on the endemic fish stocks.

National Rivers Authority: Coarse Fish in Lowland Rivers: Evaluation of the current status of the coarse fish populations in the lowland rivers of England and Wales and assessment of the factors constraining the development of the fisheries. Formulation of rational management policies to rehabilitate and improve the fisheries for recreation and conservation purposes. (NRA Jan 1992 - March 1994).

National Rivers Authority/Halcrow and Partners: River Ouse Augmentation Scheme

To assess the impact of pumping groundwater into tributaries of the Yorkshire Ouse on the fisheries of the main Ouse and associated rivers. (NRA June 1992-Dec 1992)

Watson Hawkesly/South West Water: Wimbleball Pumped Storage Scheme

To assess the impact of pump recharging Wimbleball Reservoir, Devon from the main River Exe on the fish and fisheries of the river and its tributaries. The EIA focussed on the salmon fisheries and the impact the altered discharge regime would have thereon. (July 1992-December 1992).

Government of Sarawak: In-country training course on research techniques in inland fisheries and aquaculture.

Two-week training course for middle level fisheries staff on advanced research techniques used in inland fisheries and aquaculture with a view to improving the status of scientific knowledge about endemic species. Department of Agriculture, Sarawak, East Malaysia (April 1993)

Irish Salmon Growers Association: Decline of sea trout in the west coast of Ireland

Independent assessment of causes for the collapse of the sea trout population in the west coast of Ireland and evaluate whether increased incidence of salmon lice and the development of marine salmon farming are responsible (May 1993).

Overseas Development Administration: Fisheries Planning and Management Course for Romania

Member of project team implementing training course on Fisheries Planning and Management for developing the inland fisheries and aquaculture sectors in Romania. Particular expertise was offered in the areas of Environmental Impact Assessment, Fisheries Stock Assessment and Research towards improving the status of the fisheries. (November 1993).

FAO/EIFAC expert on stocking strategies for inland waters:

Prepare draft guidelines for stocking strategies for freshwater fish into rivers, lakes and reservoirs. (FAO, November, 1993)

Cobham Resource Consultants: Impact of water resource schemes on the Yorkshire Ouse.

Evaluation of the impact of proposed water resource schemes, including increased abstraction and regulation of flow regimes on the fisheries of the Yorkshire Ouse (April-July 1994).

FAO/EIFAC expert on inland fisheries development in Western Europe

Evaluation of the current status and develop future strategies for the promotion of inland fisheries and aquaculture in Western Europe. This formed part of a pan-European initiative to establish the future needs and prospects for European Inland Fisheries (FAO Jan-May 1994)

Shewater Ltd/Bristol Electricity Company: Run of river hydropower schemes in Wales

Environmental impact assessment of run-of-river hydropower schemes on the migratory salmonid fisheries in rivers in North Wales and development of strategies to mitigate against any potentially deleterious affects (August 1994).

Overseas Development Administration: Rehabilitation of the inland fisheries sector in Romania

Evaluation of the current status of the inland and coastal fisheries sectors in Romania and development of a management plan to maintain, improve and develop inland fisheries on a sustainable basis. (ODA, JAU, September/October 1994 - ongoing).

Re-introduction of salmon into the rivers Trent and Dove.

Assessment of the feasibility of re-introducing Atlantic salmon into the Rivers Trent and Dove by evaluating the cost of bypassing weirs and restocking against the indirect benefits in terms of improving the status of the fishery (National Rivers Authority, ongoing)

Manual on the Rehabilitation of floodplain fisheries

Editing and revising a manual on rehabilitation of floodplain rivers to provide a baseline text for planners, engineers and biologists (FAO Dec 1994-Jan 1995)

River Twyi Salmon tracking studies

Evaluation and appraisal of the fish tracking data for the River Twyi salmon tracking studies. Preparation of reports on the studies and formulate recommendations for the sustainable management of the fisheries (NRA-Welsh, Sept 1994-February 1995)

RESEARCH AND TRAINING ACTIVITIES

Current and recent research projects

Development of a management strategy for the tuna and shrimp fisheries of Madagascar (PhD study in conjunction with the Department of Fisheries, Madagascar) (ongoing).

Strategy for the rehabilitation of freshwater fisheries in the Rivers Rother and Don, Yorkshire (with NRA Northumbria and Yorkshire region)

Hybridization in cyprinid fishes. Joint programme with Department of Applied Biology (SERC CASE award with NRA Anglia Region).

Impact of liming to ameliorate the effect of acidification in the River Twyi (NERC CASE studentship with NRA and Atlantic Salmon Trust).

Decline in the salmon stocks of the River Coquet, Northumberland. (NRA Northumbrian Region.)

Development of electric fishing methods for sampling large rivers.

Detrimental effects of electric fishing on fish and fisheries resources (SERC Case studentship with NRA Severn-Trent Region)

Environmental factors constraining the development of coarse fish populations. Key factor analysis as a mechanism for establishing mortality schedules in juvenile cyprinids

Training

Full time MScs in:

- Inland fisheries management
- Fisheries policy and planning
- Fish marketing
- Aquaculture planning and management
- Business studies
- Post harvest technology
- Fisheries technology
- Fisheries resource management

Part-time MScs in the above subjects

Short courses in:

Natural Resources and the Environment
Fish product quality management
Project planning and management
Coastal zone management

Expertise in rehabilitation and environmental protection

- Habitat improvement measures
 - Impact on flora and fauna
 - Impact on conservation
 - Impact on hydrology
 - Impact on WQ

- Flow regulation and river engineering
 - Impact on fish, invertebrates - flora
 - Physiochemical changes

- Water quality improvements

- Stocking and introduction of aquatic organisms
 - Impact on indigenous fish stocks
 - Predator prey relationships
 - Fisheries management

- Environmental Impact statements

- Training
 - PGD/MSc in inland Fisheries Management
 - Aquatic Resources and the Environment
 - Coastal Zone Management
 - Environmental Impact Assessment
 - Fisheries Planning and Management

Introduction of salmon into the River Trent

- Assess barriers to salmon migration
 - Weirs
 - Low flows
 - Water quality problems
 - DO sag in estuary
 - pollution
 - thermal enhancement

- Recommend options to bypass weirs
 - pool and traverse passes
 - Denil passes
 - Lariner passes

- Assess suitable spawning and nursery habitat

- Recommend options to improve juvenile habitat
 - improve spawning areas
 - bankside cover
 - flow regimes

- Assess response to introductions
 - impact on indigenous fish stocks
 - PR value
 - Coarse anglers v game anglers

- Cost-benefit analysis

Rehabilitation of the Danube fisheries in Romania

- Evaluate status of the fisheries:
 - Danube
 - Danube Delta
 - Tributaries
 - Black Sea coast
 - Aquaculture

- Assess factors responsible for their decline
 - Impoundments
 - River engineering works
 - Poldering for agriculture
 - Water quality
 - Overfishing fishing
 - Illegal fishing
 - Introduction of exotic species
 - Inadequate infrastructural support
 - Inadequate legislation
 - Inadequate aquaculture management
 - Inadequate training

- Development of aquatic resource management plans for each region

- Recommendations for future research

Education and Training at the University of Hull

From October 1995 the University of Hull is moving to a CATS programme.

Undergraduate (leading to BA or BSc qualifications)

e.g.

Geography

Physical Geography

Environmental Resource Management

Environmental Biology and Geography

Postgraduate (leading to MSc qualifications)

e.g.

Environmental Policy and Management

Environmental Analysis and Dynamics

Estuarine and Coastal Management

Degrees by research (leading to MPhil and PhD qualifications)

Universities are increasingly looking for part funding from non-HEFCE sources

Continuing Education

e.g.

In-house environmental education and training for business and public sector organisations under the title of:
Corporate Awareness and Responsibility for the Environment (CARE)

Workshops - e.g. Estuary Management

Short Courses - e.g. Estuaries: form and function

Biological Techniques (Intensive 2 day course)

NRA already involved in a course on 'Field and Laboratory Methods' jointly with ECSA

Part-time degree in the Regional Environment (forthcoming)

CORPORATE

AWARENESS and

RESPONSIBILITY for the

ENVIRONMENT

One hour intensive briefing to keep all your management up to speed on developments and their implications to your activities

Specialist courses of varying length, usually including emphasis on interaction and problem solving

 THE
UNIVERSITY
OF HULL

Environmental Training

To maintain and develop the performance of key personnel with specific environmental responsibilities, workshops and courses can be produced as required.

executive team briefing

As Environmental policy, legislation and regulation are developed we will explain how they affect your organisation.

- European, National & Local Perspectives
- Regulation Compliance
- Increased Liability
- Bottom-line benefits
- Long-term investment strategies

environmental techniques

- Environmental Impact Assessment
- Environmental Auditing
- Report writing
- Life cycle analysis
- Monitoring
- Data Analysis.

environmental management

BS7750 and Eco-Management and Audit Scheme require personnel to be trained in order to achieve compliance.

- Register of Effects
- Programme of Implementation
- Review and Auditing

INNOVATIONAL EDUCATIONAL ACTIVITIES

- CROSS-GENERATIONAL ENVIRONMENTAL AWARENESS SESSION IN LOCAL SCHOOLS

There is a significant shortage of environmental education in the 16-19 age range in schools and colleges.

- IN-HOUSE TRAINING IN LOCAL BUSINESSES
- TARGETED TRAINING FOR SMALL BUSINESSES
- TRAINING FOR ECONOMIC DEVELOPMENT OFFICERS IN TEC AND LOCAL AUTHORITIES IN RECOGNITION OF ENVIRONMENTAL TECHNOLOGY POTENTIAL

One of the major problems with environmental education outside a traditional education system is the level of factual uncertainty and the level of interaction and the holistic nature of the issues is beyond:

- THE COMPREHENSION OF MOST 'STUDENTS'
- AND
- THE ABILITY OF MOST TRAINERS TO DELIVER

Specialised and tailored training provision

The development of a training policy and programme should require at least a two stage process

- Assess needs within the organisation
- Identify a training provider

For a high quality and effective training programme discussion/negotiation provides the opportunity to get what you want.

SOME COURSES OF INTEREST TO NRA

Undergraduate

Aquatic biology
Fisheries biology
Environmental biology
Molecular biology
Environmental engineering
Environmental resource management
Physical geography
Analytical chemistry
Law

Postgraduate

(Taught MSc/PG Dip.)

Estuarine and Coastal Science and Management
Fisheries
Environmental Policy and Planning
Environmental Analysis and Dynamics
International Environmental Law
Marine Environmental Law
Analytical chemistry
Global Biodiversity - Conservation and Management