

# National Groundwater & Contaminated Land Centre

Annual Report  
2000/2001

...tools of  
the trade...

...informing  
& educating...



ENVIRONMENT  
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## PROTECTING GROUNDWATER

An international conference on:  
Applying policies and  
decision-making tools to  
land-use planning

## POLICY AND PRACTICE FOR THE PROTECTION OF GROUNDWATER

Guidance for the Safe  
Development of Housing  
on Land Affected by  
Contamination



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~~EA National Centre~~  
EA NGWCLC (Box 5)

## FOREWORD

The year 2000/ 2001 saw the National Groundwater & Contaminated Land Centre mature into an effective technical group fulfilling the aims and objectives embodied in its Mission Statement that it drew up 3 years ago, shortly after its formation. With a full complement of highly motivated staff working across the Agency's functional boundaries, the focus we are able to provide and the outputs produced have been well received both within and outside the Agency. The latter have taken many forms besides the more usual paper report format; for example, web-pages with downloadable electronic files, training seminars and workshops, conference papers and journal publications.

Significant efforts have been made in training both Agency and external staff (especially Local Authority staff) in groundwater and land regulatory issues, including new methods and tools.

The key work areas continued to be:

- Advice and support to Groundwater Regulations
- Guidance for Part IIA of the Environmental Protection Act 1990 (contaminated land regime)
- Redesignation of groundwater Nitrate Vulnerable Zones (NVZs) for the EU Nitrate Directive
- Influencing and preparing for the Water Framework Directive
- Waste Management Licensing for contaminated site remediation

Towards the end of the year Centre staff played a vital part in the Agency response to the outbreak of Foot and Mouth disease, by helping to develop policy on livestock disposal and by providing technical advice to Head Office and Government Departments and other Agencies (e.g. SEAC).

Befitting a national technical group in the largest Environment Agency in Europe, we have also started to increase our influence outside the UK. Our publications on MTBE and Natural Attenuation have been particularly well received by European colleagues. It is pleasing to see the increased number of requests now being received to participate in national and international fora and the concept of a technical business area within the Environment Agency relating to the sub-surface environment is slowly becoming acknowledged by a wider internal audience.

Success brings its own problems, and as the Centre is increasingly seen as a place to undertake work effectively and efficiently, demands often exceed resources. Our agreed work programme is becoming more difficult to adhere to as new issues arise. However, the intellectual and technical lead provided by Centre staff has been greatly aided by many Regional and Area colleagues who play an important part in Centre projects. Centre staff have also brought a professional approach to managing work programmes to time, quality and cost, and the report which follows provides a small taste of all the work undertaken and the benefits which this brings to the wider Agency.

**BOB HARRIS**

**HEAD OF NATIONAL GROUNDWATER & CONTAMINATED LAND CENTRE**

ENVIRONMENT AGENCY



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## 1. INTRODUCTION

THE NATIONAL CENTRE MISSION IS TO:

**'Develop the scientific and technical understanding of the subsurface environment ensuring its translation into clear policy, helpful operational guidance and sound technical support that will contribute to open, effective and consistent regulation.'**

Throughout the year 2000-2001 Centre staff have been active at all levels in the business:

- advising Head Office and DETR on technical and related policy issues
- contributing to national projects (Part IIA, Groundwater Regulations, Water Framework Directive, Landfill Directive, Science Plan)
- providing advice, support and training to operational staff at Region and Area
- managing R&D Topics and projects
- providing a technical interface between the Agency and industry and academia and land/groundwater users in general
- advising DETR on technical management of land remediation sites

In these few pages we can only hint at the breadth and depth of work undertaken. Much of it has been in close collaboration with colleagues in Region and Area who together form a technical community focussed on the land and sub-surface environment.

## 2. SUMMARY OF THE YEAR

This section provides brief highlights of some of the key work items undertaken this year. Most of our work is cross-cutting and does not lie within a single traditional Agency Function or Directorate. However, to help Agency readers relate to the current Functional structure, items have been broadly grouped within groundwater resource, groundwater quality and land quality issues.

### 2.1 GROUNDWATER RESOURCE ISSUES

Both National Centre projects and R & D projects carried out by our staff rely heavily on the participation of Regional and Area colleagues either, as part of the project boards and teams, or in critically reviewing projects. The Centre continues to play a leading part in the Groundwater Resources Group which has developed its own business plan. This in turn feeds into the Centre business plan and the Groundwater Resources Topic of the R & D programme.

#### GROUNDWATER NITRATE VULNERABLE ZONES

Though originally assumed to be complete in 1999/2000, this project was driven to continue due to extensive DETR needs for support and advice. Significant amounts of staff time were needed, for although the original project met its target, the work was then complicated by errors found in the Agency databases. These errors were only discovered during the final stages of the work necessitating complete reworking twice in order to produce the required maps. The methodology was written up and circulated to Regions.

#### CATCHMENT ABSTRACTION MANAGEMENT STRATEGIES (CAMS)

Centre staff have advised Head Office on the Catchment Abstraction Management Strategies (CAMS) project through being part of the CAMS development group, and are also part of the Resource Assessment & Management (RAM) group that is developing a method for use in CAMS. In November this involvement increased significantly, as two staff joined the CAMS Technical Group, which was tasked with producing a new ground and surface water licensing and resource assessment methodology for implementation by May 2001.

Additionally, the external R & D contract for this work was written, let and managed by the Centre involving one staff member being taken 'offline', and one other being substantially offline. This has placed considerable stress on the Centre programme and on the remaining staff.





### GROUNDWATER MODELLING

The year saw the retirement of our external modelling advisor, Professor Ken Rushton. In order to maintain the service level an additional member of staff, Dr Dave Johnson, joined the Centre as a Senior Groundwater Modeller. Centre staff organised two seminars in the year 'Modelling Chalk' and Modelling Recharge'.

Staff at the Centre led the development of a new modelling framework for the Agency. This sets out a strategic approach that should inform any future model applications. The strategy builds on the successful Strategic Review of Groundwater Modelling produced in 1999. It enshrines the idea that numerical modelling is simply one way to test conceptual models and that the important thing is to get this conceptual basis right. Moreover it provides a first step to bringing the two branches of contaminant and resource modelling closer together. This latter point remains an objective for the National Centre that a lack of resource currently precludes.

Modelling staff also spent approximately 40% of their time working directly with Regions and Areas on project work. This is seen as vital since it provides a unique mechanism for the spread of best practice across the Agency. However, groundwater resource modelling as a discrete area in the Agency is coming under increasing threat as staff turnover has become extreme. Since the Centre started looking at modelling, a strong group has built up in the Agency consisting of Area, Region and Centre staff. Since modelling assumes a central position in water resource management, it is essential that this be maintained and enhanced. However, this changed over the last three months of the year as over half the Agency groundwater modelling staff left for career advancement. Centre staff developed a case on the resulting business risks to the Agency.

The Centre also sponsored a student at Birmingham University to look at the opportunities offered by groundwater modelling codes based on the 'object

oriented programming' methods now prevalent in the computing world. This proved to be very successful and this advance will be pursued over the coming year.

### GROUNDWATER RESOURCES RESEARCH

The Groundwater Resource R&D Topic is led from the Centre and staff continued to manage and input to a variety of R & D projects. The previous year's work on the impact of groundwater abstraction on river flows - IGARF was continued. The new method proposed using Artificial Neural Networks (ANN) to produce a desktop tool. This side of the work was very successful and will undoubtedly figure in future Agency projects. The input to the ANN was to be the results of modelling generic groundwater situations which has proved less successful, but has served to underline the problems of producing any generic methodology which can be applied to hydrogeological situations.

A review of Agency requirements for the mapping of drift has been conducted. This should feed into subsequent R & D projects.

There was collaboration with UKWIR to look at methods of defining the critical period for groundwater yield of sources. As always, joint projects pose problems in managing them satisfactorily, particularly in meeting the aspirations of both parties. They invariably require a higher input of staff time to ensure good useable results and this has been difficult with staff being taken offline in the latter stages of the year. Notwithstanding this, large amounts of staff time have been input to this project in order to produce a rounded methodology. Notable R&D outputs this year have been reports on:

- modelling flows to borehole adits
- unified methodology for determination of deployable output from water sources
- subsidence and desiccation resulting from groundwater abstraction
- small licence exempt groundwater sources.



We continue to have a wide ranging remit on groundwater quality issues, from a formal arrangement of a part-time policy advisor role at WQ Head Office, to detailed operational support in respect of particular sites. During 2000/ 2001 we also added a new staff member (Dr Kamrul Hasan) to assist with our work on Groundwater Monitoring.

The work of developing a new Groundwater Protection Policy has begun with workshops and seminars for selected Agency staff. This work will continue into the next year, and is linked to an international conference organised by the Centre for October 2001 'Protecting Groundwater: applying policies and decision-making tools to land-use planning'.

We have continued to take a lead in training staff on groundwater quality issues, with further events on natural attenuation and remedial target methodology. These were well received as shown in the feedback responses from attendees.

#### **FOOT & MOUTH DISEASE**

The outbreak of Foot and Mouth Disease in early 2001 led to a large amount of additional work for Centre staff. This included input to national policy and expert advice to Head Office, DETR, MAFF and the Spongiform Encephalopathy Advisory Committee (SEAC). Staff were instrumental in development of the draft guidance on 'Disposal of culled stock by burial: Guidance and reference data for the protection of controlled waters' and also provided operational advice to Region and Area staff.

Moreover, many of the products from past Centre work, for example the Groundwater Vulnerability maps and Source Protection Zone maps, provided key resources for the assessment of disposal sites.

#### **GROUNDWATER REGULATIONS**

Following the implementation of the Groundwater Regulations in April 1999, a

large amount of work remained to be done in providing the supporting documentation and procedures. We have managed the scoping work for a performance-based Groundwater Protection Code for fuel storage and dispensing facilities, including petrol stations. This has now been taken up by the DETR for further development. Work has also begun on a similar document for solvents handling. In a related development, guidance on piling through contaminated land to minimise groundwater pollution was published.

#### **GROUNDWATER SOURCE PROTECTION ZONES**

During 1999/ 2000 the Agency developed the map series of Groundwater Protection Zones. These zones are designated areas around public water supply abstractions, and other sensitive receptors, that signal there are particular risks to the groundwater source to which they relate. They provide a readily understandable signal that particular land uses or activities within those Areas may be inappropriate, and are based on an estimation of the time it would take for a pollutant that enters an aquifer to reach the receptor.

The paper maps and supporting data are held in Regional offices but the entire national map set is now available over the internet. The data can be downloaded into external geographical information systems (GIS) and subsequently used in documents such as Local Authority Strategic Plans. The publication of these maps was the first such effort by the Agency, and preceded the Flood Risk Maps by some months.

#### **GROUNDWATER MONITORING**

Centre staff have continued to provide a technical lead in the development and implementation of a new Agency-wide groundwater monitoring strategy. This included identifying and balancing the respective needs and demands of each Region. We have provided the detailed strategy to support the business case for, and the use and management of, new grant-in-aid allocations for groundwater and nitrate monitoring. This strategy involved a number of supporting efforts:



- a dataset of groundwater quality monitoring sites
- a review of regional practices
- a review of existing data transfer agreements with third parties (e.g. Water Companies and Environmental Health Depts)
- identification of existing activities and infrastructure resource requirements of each Region.

#### **BASELINE QUALITY OF AQUIFERS**

This is a large collaborative project valued at £500K shared between the Agency and BGS. It is linked to a much larger pan-European project in the EU Framework IV Programme. The recommendation for a water quality baseline study of England and Wales was made in 1996 in a NRA report (WD/96/46R) which reviewed the approach to be adopted in producing a series of regional reports on the principal aquifers for England and Wales.

The key objective for this project is to establish baseline quality criteria for a wide range of substances naturally occurring in groundwater.

In doing so, the project will establish a series of reference aquifers across England and Wales that can be used to illustrate the ranges in natural groundwater quality. The work will provide some scientific foundation to underpin both UK and EU water quality guideline policy, notably the Water Framework Directive, with an emphasis on the protection of high quality groundwater and sustainable development.

#### **MONITORING NATURAL ATTENUATION**

A guidance document (R&D publication P95) on regulatory assessment of monitored natural attenuation was published in 2000. 'Guidance on the assessment and monitoring of natural attenuation of contaminants in groundwater' builds on US practice from a number of sources combining the best bits and putting all in the regulatory context of England and Wales. This has been well and widely received internationally, and is the first such protocol in Europe. The guidance has been promoted

within the Agency through workshops run jointly with the Agency's Research Fellow in Natural Attenuation, who is based in Sheffield University.

#### **THE FUEL ADDITIVE, MTBE**

The publication of 'A review of current MTBE usage and occurrence in groundwater in England and Wales' (R&D Publication 97) raised a large amount of external interest. This is not surprising as this is an extremely high profile pollutant in the US, and during the year, the United States Environmental Protection Agency (US EPA) and White House issued a joint statement that it would seek to remove MTBE from fuels. Some States went further with a direct ban on use. As a result many questions have been raised in Parliament and in Europe and we were well armed to advise DETR and others. This report, managed through the large 'umbrella' project P2-169 provides by far the most useful European data and provided a strong lever to argue for appropriate management of environmental risk based on land use planning and sound understanding of the vulnerability of receptors.

As a result of this work we have played an influential role in the submission of an EU Framework V proposal for a Europe-wide appraisal of MTBE pollution and risk management and remedial options.

#### **GROUNDWATER QUALITY RESEARCH**

The Groundwater Quality R&D Topic within the Water Quality Programme is led from the Centre. The first large 'umbrella' R&D project 'Fate, transport and natural attenuation of pollutants in the subsurface' is managed from the Centre. There are almost twenty sub-projects currently underway or completed. MTBE (above) has already reported. One key project 'SIREN' is providing a unique national research site facility for externally funded research. 'SIREN' has also been a good example of industry (Shell), consultancy (AEAT) and Agency collaboration. Moreover, the commitment to P2-169 has played a big part in bringing invitations to join a Faraday and



LINK Programme (see page 7).

Bob Harris completed his third and final year of service on the NERC Freshwater Sciences Peer Review Committee, and Rob Ward took over from Bob on the NERC Inductively Coupled Plasma Mass Spectroscopy Steering Committee.

## **2.3 LAND ISSUES**

### **CAPITAL FUND PROJECTS**

Management and technical review of the DETR Programme on Supplementary Credit Approval sites continued. The technical review of local authority schemes identified opportunities for saving to the public purse of £4M to £5M on remediation proposals.

A new Agency 'Process' for initiation and management of new Capital Fund works was developed and adopted.

Centre staff provided technical advice and support to approximately 20 Capital Fund sites managed by Agency Regional staff. However, the take up of Capital Funds in the Agency slowed noticeably compared to previous years. This was despite a slightly increased allocation of DETR monies to the Programme. We have identified a need for further detailed project rather than programme management which could be 'loaned' to Regions or Areas and will be seeking further resources in the coming year to deliver this.

### **PART IIA CONTAMINATED LAND REGIME**

The long awaited introduction of Part IIA of EPA 1990, the Contaminated Land Regime, continued to drive much of the Centre's work relating to land quality. Procedural guidance and technical training material was prepared for use by operational staff and for external guidance.

### **CONTAMINATED LAND EXPOSURE ASSESSMENT (CLEA)**

Our staff reviewed the risk assessment tool CLEA, and a large number of issues with the then current version were revealed. This tool is a key plank of the Part IIA regime, and as such became the priority work item for two

of our staff. The Centre was fortunate in already having 2 national experts in the application of land risk assessment models and they were assigned to redevelopment of the CLEA package. This was a major undertaking and work of international standing.

A suite of soil guideline values were completed and delivered to Head Office. Matt Whitehead from North-East Region joined us on a temporary assignment to help to backfill the two posts.

### **OPERATIONAL SUPPORT**

Centre staff have supported operations on some high profile and sensitive sites. Issues such as the disposal of incinerator ash at a site in North-East led to significant input for both this Centre and the National Centre for Risk Analysis and Options Appraisal (NCRAOA). Brian Bone assisted Midlands Region over the well publicised Cleansing Services Group site problems in Gloucester and of course there has been considerable assistance given with Capital Projects fund sites.

### **JOINT TRAINING WITH LOCAL AUTHORITIES**

This training programme initiative was completed with seminars to the Regions that missed out last year. The low costs enabled large numbers of local authority staff to attend and included some from complementary disciplines to hear about contaminated land e.g. planning, building control, architects surveyors, engineers and lawyers. In all around 350 to 400 attended these few final events, but note that this is in addition to the 2,500+ in previous years.

### **EXTERNAL INFLUENCING AND LIAISON**

The land remediation and risk team continued to work with external parties. We have been invited to contribute to several national and international collaborations. Some examples are highlighted below:

- **ExSite, CL:AIRE**, Centre staff sit on technical steering groups for these contaminated site research programmes



- **Biowise**, we have agreed to co-operate with this DTI initiative to assist with technical review and advice on their publications related to contaminated land
- **CLARINET**, Bob Harris is one of two national expert representatives to this European regulator forum
- The **Brazilian Ministry of Health** requested advice and support of the Foreign and Commonwealth Office who in turn requested Joint Environmental Markets Unit (JEMU) at DTI and Agency support regarding a pesticide contaminated site near Rio de Janeiro. This site is thought to be impacting on the health of the local population and has resulted in the closure of a childrens' home nearby. The Agency was represented by Theresa Kearney from the Centre and Phil Crowcroft of Land Quality Policy Group. The UK advice was well received as cost-effective and practical
- Tony Marsland was invited to advise **New South Wales** Land & Water Conservation Dept and discussed soil and groundwater contamination problems at a former chemical manufacturing site in Botany Bay. The visit was timed to coincide with the Contaminated Site 2000 Conference in Melbourne where a paper was presented
- **Consoil 2000**, Bob Harris led the UK team that was asked to consider the technical approach to assessing and planning the remediation strategy for a large area of industrial contamination (dioxins, pesticides and heavy metals) near Leipzig, Germany. Four separate countries presented their strategies in plenary session at this leading international biannual conference. The UK approach was considered the best in terms of our risk assessment approach and we received a plaque on behalf of the UK team. National Centre staff took a leading role at Consoil 2000 with 4 staff members (Ian Martin, Theresa Kearney, Jonathan Smith, Bob Harris) presenting papers, chairing sessions and contributing to workshops. Other staff also authored papers (Bridget Butler, Alwyn Hart, John Davys).

## CONTAMINATED LAND RESEARCH

Centre staff both lead the topic area and manage individual projects. In partnership with the NHBC, one R&D project has produced an important guidance document to promote the safe and effective development of housing on land affected by contamination. It was published by the Stationery Office in June 2000, and launched at the Conference of the Chartered Institute of Housing in Harrogate at that time. Around 2000 copies have now been sold, and it is generally accepted by the industry as a significant contribution towards the achievement of the government's 'brownfield' housing initiative targets. On a wider front we have been closely involved (through invitation) with two key national initiatives:

- **Faraday Partnership** on remediation of land and water. Alwyn Hart was actively involved in the successful bidding process and the Centre has now been invited to chair the management steering group for this proposed £4M+ research initiative funded by DTI and Research Councils
- **DTI LINK** Programme on Bioremediation. The Agency has agreed to sponsor this new programme valued at £12M and staff from the Centre will represent the Agency on the management groups
- **Queens University, Belfast - QUESTOR Centre** The Centre joined the QUESTOR Centre at the end of the year on behalf of the Agency and has an opportunity to steer significant research in partnership with some leading blue chip companies interested in contaminated water and polluted groundwater problems.



## WASTE MANAGEMENT ISSUES

### WASTE MANAGEMENT LICENSING

Centre staff continued to provide technical advice and support to the implementation of waste management licensing in respect of land contamination. Staff also gave technical support on the application of Regulation 15 of the Waste Management Licensing Regulations (WML, 1994) to landfill and on landfill site licensing decisions.



## 2.5 EDUCATION AND DISSEMINATION

The Centre continued to promote groundwater issues and land contamination issues both internally through training provision and externally through leading or collaborating on seminars and workshops and contributing to conferences etc. Centre led projects and products provide leading examples of Agency work being disseminated with web pages, internet data, electronic reports and printed documents all extremely popular.

### PRINT MEDIUM

The Centre has produced two new A4 sized booklets during the year to inform staff and customers on key issues:

- A guide to monitoring water levels and flows at wetland sites
- Water supply borehole construction and headworks

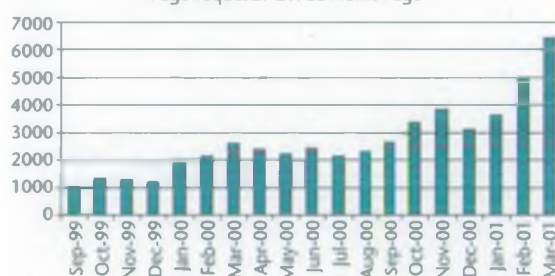
Reports from the various Centre projects have been produced and where appropriate included on the Agency website.

The Centre continued to produce the bi-monthly, circular 'Underground'. A range of Agency and external authors have contributed to make the circular a groundwater and contaminated land community document. It has matured into a very well respected publication.

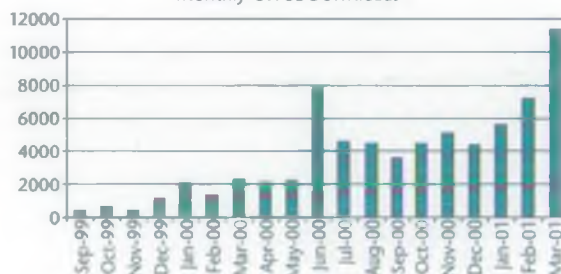
### INTERNET/INTRANET

We have continued to play a leading role in the use and development of the Agency web-site as a way to disseminate our messages and to gain feedback from the outside world. The groundwater and contaminated land pages have become the 3rd most popular area of the Agency web-site with only Floodline and the News Release pages receiving more visitors. This continued growth in external popularity of the groundwater and contaminated land pages demonstrates steady and targeted management of the pages.

Page requests: GWCL Home Page




Monthly GWCL Downloads



We have continued to make our booklets and Centre reports available for download. This approach has already led to over 20,000 copies being downloaded. In all, over 71,000 items have been downloaded from the pages since they began in September 1999. By implication there are environmental benefits through wider dissemination and/or real cost savings for the Agency in reduced printing costs.

Even more significant has been the move to online display and download of groundwater data and tools. In collaboration with the National Centre for Environmental Data and Surveillance we





have made Groundwater Source Protection Zones viewable over the 'in your backyard' portion of the Agency site. The data itself is then available for download and use in geographical information systems. This represents a first for the Agency and remains unique.

The web has also been used to host a map selector tool for anyone wishing to purchase a groundwater vulnerability map from The Stationery Office. This has been highly effective resulting in over 3,500 queries since January 2000. In the past each of these may have required a 5 or 10 minute telephone conversation to resolve. As a result of the Internet approach the number of such calls has reduced greatly, and even when they do occur, callers can be referred to the website in a matter of seconds saving literally weeks of telephone time for our staff.

The Centre was an early contributor to the Agency Intranet site (we had the first interactive staff guide on the site) and we continue to make available as much as possible through that route.

One word of caution though must be the cost of the work; it is important that all our projects and our customers understand and support the use of the new media which in turn requires an imaginative grasp of the potential for new ways of working and product delivery.

#### **PRICED PUBLICATIONS**

Some of our publications are sold through The Stationery Office (TSO) including Groundwater Vulnerability Maps, Policy and Practice for Protection of Groundwater (PPPG) and supporting documents.

However, we have not released as many new titles through this route as in the past, not least since the vulnerability map series is now complete. Notable TSO publications from Centre led work were:

- P66 - Guidance for the safe development of housing on land affected by contamination.
- P97 - A review of current MTBE usage and occurrence in groundwater in England and Wales.

The first of these was easily the top selling Agency/ TSO report in 2000 despite only being published half way through the year.

An updated set of digital vulnerability maps is due for release in early 2001 and a completely revised PPPG in late 2001. Nevertheless, total TSO face value sales of groundwater and contaminated land related items amounted to 1,866 items valued at £45,987 in 2000 (data is only available for the calendar year 2000). This is out of total Agency/ TSO sales of 4,178 items and £153,424 (i.e. 45% and 30% respectively).

Groundwater vulnerability data is now supplied to a number of value-added-resellers (e.g. Landmark Information Group). This is managed by the Scientific and Technical Information Service (SATIS) and income and benefit to the Agency are managed through SATIS. Quantitative data is not available.

The sophisticated contaminated site risk tool ConSim produced at the end of 1999 has sold 95 full price copies with a value of £58,600 shared between the Agency and our partners Golders Associates. Similarly the new version of LANDSIM has now sold 108 copies with a value of £49,750 again shared between the Agency and Golders Assoc. The income has been used in further software development and training for staff.

Much of our work is distributed through the R&D route and, as a result, made available externally through the WRc publication contract. As with TSO, groundwater and land contamination titles show strong demand. Indeed over the year WRc sold a total of 4,182 copies of 667 individual Agency documents. On average each document sold 6 copies. Groundwater related titles however, proved an exception; P20 'Methodology for the derivation of remedial targets for soil and groundwater to protect water resources' alone sold 514 copies. This made P20 by far the most popular title in the entire catalogue, alone accounting for over 12% of total sales. P95 'Guidance on the assessment and monitoring of natural attenuation of contaminants in groundwater' was the third most popular with 94 copies sold.



### SUPPORT TO UNIVERSITY COURSES

Centre staff have continued to support relevant MSc courses by giving guest lectures. We have also participated in several short courses which have provided benefit to the Agency either as income to the Centre (see financial reporting on page 9) or more commonly through the allocation of free places or reduced attendance fees to Agency staff by the course organisers (e.g. Sheffield Univ. - Natural Attenuation; Risk Assessment and; Solvents in Groundwater courses, Birmingham Univ. - Groundwater Modelling course). Conservative estimates of the benefit of these is c.£10K per annum.

### JOURNAL AND CONFERENCE PAPERS

Centre staff authored 5 papers published in recognised journals during the year plus 4 in international conference proceedings. More than 20 oral conference papers were presented.

## 2.6 BUSINESS SYSTEMS

We have continued to work in a flexible, project based way with the use of computer based timesheet and project databases. We have also prepared a National Centre Handbook of working practices to inform ourselves and store Centre and Agency procedures and methods. This is intended to provide an easy reference for our staff and a mechanism for explaining our working methods to new recruits.

The Centre continues to use a number of management computer systems to promote efficient delivery of work:

- 'Enquiries' database (developed in-house) tracks all requests for assistance and helps ensure that responses are delivered in line with the Agency's Customer Charter.
- 'Project database' (developed in-house) holds details of all Centre projects.
- 'Timesheet Professional' provides detailed cost breakdowns to inform future planning and to report to customers.

The Centre has reported against its Operational Performance Measures both to

the Client Board bi-annually and to the Regional Director, Midlands on a quarterly basis.

## 2.7 FURTHERING THE SCIENCE BASE

We have continued to build links with external science organisations, where these links can strengthen Agency knowledge and reputation and allow us to foster collaborative research and development. Although the Centre has only been established for 3 years, the outputs from the programme are already highly regarded both internally and externally. In a recent DETR sponsored audit of contaminated land research within the UK the Environment Agency came top for relevance and accessibility of outputs. The Centre has developed close technical contacts with industrial stakeholders in contaminated land and groundwater including research federations and national and multinational companies. We are beginning to explore international links with key research groups in Europe and North America. The National Centre provides a necessary technical focus for external parties and, having gained the respect of big industry through our output and approach to problems, has achieved good dialogue. Our profile is such that we have been invited, inter alia, to:

- participate in a Faraday Centre and several EU Framework 5 research programme bids.
- take a leading role (UK technical expert) in a European contaminated land network.
- present keynote papers at international conferences.
- participate on external national steering groups (e.g. NERC Peer Review Committee, DTI LINK programme).

Participating in these is only possible because of the technical competence of staff and the resources available to undertake the work. Key R&D outputs led from the Centre have been:

- assessment of risks from land and waste to water resources.



- procedural and technical guidance for Agency staff to support implementation of Part IIA of the Environmental Protection Act 1990.
- understanding the regulatory implications of natural attenuation.
- guidance for house builders in redevelopment of contaminated sites.

A number of joint projects have also been developed with industry groups such as the Institute of Petroleum, the Groundwater Forum and the Chartered Institute of Environmental Health.

We also joined (in conjunction with Head Office R&D) the QUESTOR Centre at the Queen's University, Belfast. This multidisciplinary Centre is an internationally leading group for the assessment and remediation of (ground)water and land contamination.

### 3. CENTRE MANAGEMENT

The Centre is managed by the Head of Centre and its internal senior management team. Strategic direction, review and overview is provided by the Client Board. The Regional Director, Midlands and the Regional Environmental Protection Manager provide a quarterly management review.

During the year the Internal Audit report on National Centres was completed. In general the report gave few recommendations on operational management of the Centre. The main recommendation was the development of a Science Plan to include a strategy for National Centres. Centre staff have become actively involved in the development of this Plan, which is scheduled for completion in October 2001.

#### 3.1 CLIENT BOARD REPORT

The Client Board met in May to receive the annual report for the previous year and in October to steer the development of the workplan for 2001/02. The board welcomed the previous annual report and commended the Centre output.

The May meeting in particular also looked at longer term issues in groundwater

protection and contaminated land. A number of issues were identified where additional support for Head Office would be needed (Landfill Directive, Groundwater Monitoring, IPPC) and these were to be included in future workplans.

In October the Board broadly agreed the plan and a final version was approved by correspondence in January 2001. Also in October the Board were joined by the new Chief Scientist, John Murlis and the meeting was extended to include a discussion of the role and shape of National Centres into the future. There was general agreement that the amount of effort spent on building and developing international links was too low at present. Board members suggested that at least 5% of our effort should go on this.



#### 2000/2001 CUSTOMER SURVEY

The Centre again carried out a survey of its internal customer base. Fifty-five staff at Head Office, Region and Area were targeted with questionnaires and an electronic copy was placed on the Agency's Intranet with a call to all Agency staff to respond. The results were generally favourable, most categories of Centre work or service scoring "good" and responses were generally internally consistent (only one intranet response claimed not to have seen the intranet pages). Once again, although every survey recipient was asked to copy to colleagues, there was little evidence of 'cascading' of surveys in this way.

Some comments sent to us or about us from both internal and external customers during the year are included in Section 5.



### 3.3 FINANCE

The Centre budget and end of financial year out-turn is presented below. The final out-turn for the year shows an overspend of £14,335. However, this is within our performance target of plus or minus 2.5 % of budget.

Item	Cost
Staff costs	862034
Project direct costs	712022
GRAND TOTAL	1574056
Overspend	14335

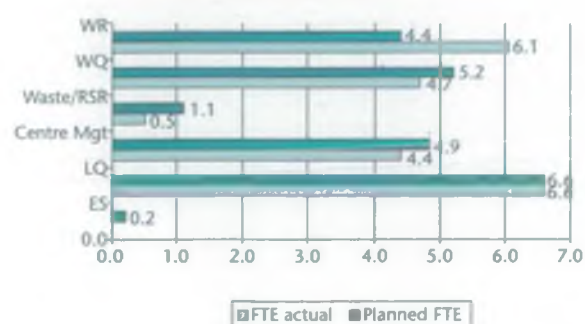
### 3.4 STAFFING

The Centre complement grew to 22 full time equivalent (FTE) posts compared with 19 in the previous year. Two of these extra posts were funded through grant-in-aid for the "new duties" of Groundwater Regulations and Groundwater Monitoring. The third post was created by redirecting budget originally allocated to hiring external consultants.

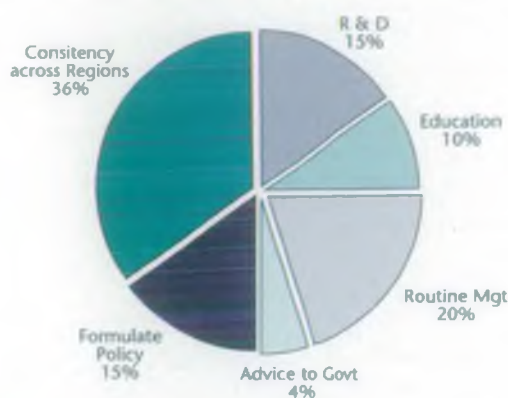
### 3.5 EFFORT

Delivery of the Centre work programme is focussed through a system of projects and a computer-based time recording system, which allows us to both review the effort expended on each project and then to use this information in future planning. A breakdown of the workload by Agency Directorate or Function is shown in the attached chart. However, it is important to recognise that this is only a partial reflection of the beneficiaries of Centre projects since much of our work is cross-Directorate and cross-Functional.

Effort (staff time) expended by Function (or Directorate) is shown in the figure below:



Breakdown of activities shown below.



### 3.6 BUDGET FOR 2001/ 02

The budget for the financial year 2001/ 02 is below. This is a further increase over previous years and reflects the addition of new grant-in-aid associated IPPC. Further additions for new Agency duties are anticipated during the year in respect of Groundwater Regulations, Groundwater Monitoring, Landfill Directive and Agricultural Waste Directive. This will be used to grow our business with the addition of extra staff to cover these important areas.

SUPPORTING DIRECTORATE/FUNCTION (£K)						
TOTAL	WR	LQ	WQ	WM	IPPC	RSR
(£k)						
1607	422	509	565	35	40	36

## 4. UNSOLICITED COMMENTS

"Thank-you very much for your help and advice....As an Area Manager, this is just the sort of support that we need."

Howard Davidson, Area Manager

"an enviable group of staff who, despite all the odds, are hard working, motivated and above all professional in the way they conduct themselves and in the way they look after the Agency's business."

David Hall, Director of Golders Associates

"Excellent. Probably the most useful technical training I have attended within the Agency."

Anon response to MNA training

"I would like to express my thanks to you and the staff



at the National Groundwater and Contaminated Land Centre and the National Centre for Risk Analysis and Options Appraisal for the hard work and co-operation provided during our investigation."

Godfrey Williams, Acting Area Manager.

"It was evident from your excellent presentations how much hard work had gone into them and I am sure that all present....were highly impressed by your knowledge, expertise and professionalism."

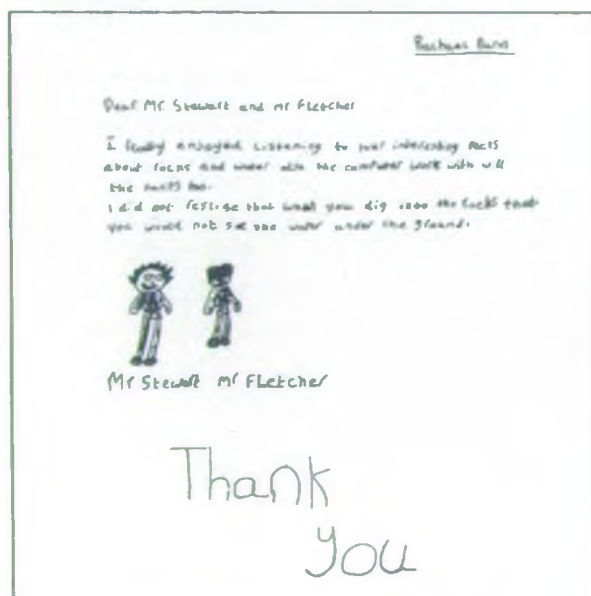
Gale Jenkinson, Foreign and Commonwealth Office.

"Thank-you for the booklet, please pass on my congratulations to the authors for a clear and informative document."

John Marshall, Area Manager

"My overall message is that the Centres are a valuable part of the Agency. They provide a single focus for specific issues, building up a critical mass of experience and expertise. This makes the collation of best practice and delivery good advice much easier, and raises the standards of the Agency's activities.....These comments are of course based on my own experience in dealing with the NGWCLC. They have a clear vision of the national issues in the field, and are normally ahead of thinking in academic and government circles. They provide a good service to regions, for example digesting policy into usable forms, issuing guidance, arranging training to meet new needs. Their R&D function is exceedingly well performed, often to my disappointment as my pet projects often don't fit their hard nosed priorities!"

Professor David Lerner, University of Sheffield. (submission to FMPR)



## APPENDIX A

### PUBLISHED AND CONFERENCE PAPERS BY NATIONAL CENTRE STAFF

#### ISO PUBLICATION

Water quality sampling Pt 18; Guidance on sampling of groundwater at contaminated sites

ISO 5667-18:2001(E). Rob Ward

#### PUBLISHED PAPERS

'Water resource protection issues in relation to Contaminated Land' Dominique Darmendrail and Bob Harris (2001); Land Contamination and Reclamation; 9, p.89-94

'MTBE in groundwater of England and Wales'. Alwyn Hart. (2001) Journal of the Association for Petroleum and Explosives Administration, 39(1) p.23-27.

'Establishing a baseline for sustainable land remediation targets' Ian Martin (2000) ENDS Report 306 p.20-22

'Environment Agency and remediation of mines & quarries'. Brian Bone (2000). Mines & Quarries Yearbook 2000.

'Groundwater pollution and fuel storage'. Smith, J. W. N., 2000. Insite, 7, April 2000.

'Adopting monitored natural attenuation as an option for the remediation of polluted groundwater in the UK'. Harris, R. C., Smith, J. W. N., Finnimore, J., Carey, M. A., Morrey, M. & Marsland, P. A., 2000. Proceedings of the 7th international FZK/TNO conference on contaminated soil (Consoil 2000), Leipzig, Germany.

'Bitterfeld problem - UK solution'. Harris, R. C., Earl, N., Harris, M., Swannell, R. & Smith, J. W. N., 2000. Special supplement to the Proceedings of the 7th international FZK/TNO conference on contaminated soil (Consoil 2000), Leipzig, Germany.

'DNAPL and groundwater vulnerability'. Tait, N., Lerner, D. N., Smith, J. W. N., & Leharne, S., 2001. Quarterly Journal of Engineering Geology and Hydrogeology, X, pp-pps. In press.

'An anniversary of Part IIA through the eyes of a regulator'. Brian Bone. 2001; The Catalyst, 15. March 2001.

#### Major International Conferences

'Targets and Toolkits: the development and use of an integrated suite of guidance and protocols for groundwater protection in England & Wales'. Marsland, P.A. (2000); Contaminated Site Remediation Conference, Melbourne, Australia, December 2000.

'Tracer Testing as an aid to groundwater protection'. Rob Ward, Steve Fletcher, Sarah Evers and Daminder Chadha (2000). Tram 2000, IAH Conf. on Tracers



and Modelling in Hydrogeology, Copenhagen, Denmark.

'MTBE in groundwater in UK and Europe'. Jane Dottridge, Paul Hardisty, Alwyn Hart and Lamorna Zambellas (2000). US National Groundwater Association Annual Conference on Groundwater Pollution Anaheim, Ca.

'Occurrence of fuel oxygenates in groundwater of England and Wales' Jane Dottridge, Mark Hall,, Lamorna Zambellas, Alwyn Hart, Gordon Lethbridge and Martin Maeso. European Geophysical Society Annual Meeting 2000. Nice. France

'Defining land zones for minimising nitrate leaching to groundwater using a combined spatial data and risk based approach'; Steve Fletcher, Sarah Evers, Rob Ward and Bob Harris (2000). International Conference on Agricultural Effects on Ground and Surface Waters at Wageningen, The Netherlands

'Taking account of costs and benefits in groundwater remediation'. Hardisty, P. E., Dottridge, J., Wallace, S. & Smith J.W.N., 2001. Batelle, San Diego, CA.

'Contaminated land and groundwater - linking regulatory drivers to research needs'; Alwyn Hart (2000). Geoscience 2000. Manchester. UK

'Incorporation of groundwater modelling in groundwater resource estimation'; Paul Hulme (2000). GeoScience 2000. Manchester. UK.

'Monitoring groundwater quality' Rob Ward (2000). GeoScience 2000. Manchester. UK.

'Issues for the selection of remedial strategies'. Ian Martin (2001). International Clean-Up Exhibition and Conference. Manchester, UK.-

'Regulation of land contamination - looking ahead'. Bob Harris (2001). International Clean-Up Exhibition and Conference. Manchester, UK.

'A framework for assessing, water resources and abstraction sustainability' Stuart Kirk and Rob Soley International Association of Hydrogeologists - 30th Congress 2000 Groundwater: Past Achievements and Future Challenges. Capetown S. Africa.

#### Other conferences

'Parameters that influence leaching of organic and inorganic contaminants from soils' Brian Bone Contest 2000 Annual Meeting.

'Bioremediation problems and solutions: A regulatory perspective'; Theresa Kearney. (2001). Biotechnology Forum 2000, University of Birmingham.

'The future role of stabilisation and solidification' Brian Bone (2000). Site remediation. University of Greenwich, UK.

'Piling on land affected by contamination: Potential environmental impacts, regulatory concerns and effective solutions'. Westcott, F. J., Smith, J. W. N. & Lean, C. M. B., 2001 British Geotechnical Association annual conference, Edinburgh, 2001.

'Monitored natural attenuation guidance'.

Jonathan Smith (2001) Research Development and Technology Forum (RTDF). Runcorn, UK.

'Contaminated land meets groundwater'. Bob Harris. (2000) Keynote paper Geological Society Conference 2000 Manchester. UK.

## APPENDIX B

### NATIONAL CENTRE STAFF IN 2000/2001

Bob Harris	Head of Centre
Mary Goldsworthy	Business Support Officer
Sue Irons	Business Support Assistant
Steve Fletcher	Manager - Groundwater Resource Management
Paul Hulme	Senior Groundwater Modeller
David Johnson	Senior Groundwater Modeller
Stuart Kirk	Senior Hydrogeologist
Sarah Evers	Hydrogeologist
Alwyn Hart	Manager - Programme Management & Information
Stephen Hall	Data and Information Scientist
Lamorna Zambellas	Senior Management Support Officer
Bill Baker	Manager National Capital Projects
Shaun Robinson	Programme Officer Capital Projects
Brian Bone	Senior Site Investigation Engineer
Ian Martin	Manager - Contaminated Land & GW Remediation
Theresa Kearney	Senior Remediation Scientist
John Davys	Senior Remediation Engineer (left to join Total/Fina in Oct 2000)
Bridget Butler	Senior Risk Assessment Scientist
Tony Marsland	Manager - Groundwater Quality & Protection
Jonathan Smith	Senior Contaminant Hydrogeologist
Rob Ward	Senior Hydrogeologist
Kamrul Hasan	Groundwater Quality Officer

## APPENDIX C - KEY OUTPUTS FOR THE YEAR

<b>Source Protection Zone (SPZ) maps</b>	<ul style="list-style-type: none"> <li>● Public launch of maps onto the Agency web-site</li> <li>● Bi-lingual guidance note to use of SPZs and Groundwater Vulnerability maps for local authority planners.</li> <li>● Land contamination technical seminars to Agency and local authority staff continued on from the previous year.</li> </ul>
<b>Joint training seminars with local authorities</b>	<ul style="list-style-type: none"> <li>● Internal briefing note.</li> </ul>
<b>Nitrate vulnerable zone methodology</b>	<ul style="list-style-type: none"> <li>● Report on benchmarking and guidance on the comparison of risk assessment models for water resources.</li> </ul>
<b>Risk assessments</b>	<ul style="list-style-type: none"> <li>● R&amp;D Publication 97: A review of current MTBE usage and occurrence in groundwater in England and Wales.</li> <li>● Report on the analysis of MTBE and other petroleum oxygenates in water in collaboration with the National Laboratory Service.</li> </ul>
<b>Groundwater quality</b>	<ul style="list-style-type: none"> <li>● Scoping study for underground storage tanks to be produced by DETR. Further reports will be produced in 2001.</li> </ul>
<b>Codes of practice</b>	<ul style="list-style-type: none"> <li>● Redevelopment of the CLEA package involved the production of a suite of soil guideline values.</li> <li>● R&amp;D P20 'Methodology for the derivation of remedial targets for soil and groundwater to protect water resources' and downloadable Spreadsheet.</li> <li>● R&amp;D report on 'Guidance on the assessment and monitoring of natural attenuation of contaminants in groundwater', Publication 95.</li> </ul>
<b>Contaminated Land Exposure Assessment (CLEA)</b>	<ul style="list-style-type: none"> <li>● R&amp;D report on the operation and protection of adit systems in UK aquifers.</li> <li>● Report on the effects of subsidence and desiccation on groundwater abstractions.</li> <li>● Joint report with BGS on small licence exempt groundwater sources.</li> <li>● R&amp;D reports with UKWIR on the methodology for deployable output from groundwater sources.</li> </ul>
<b>Remedial targets</b>	<ul style="list-style-type: none"> <li>● First 5 in a series of Remedial Treatment Action (RTA) data sheets for remediation treatments for Agency staff.</li> <li>● First in a series of reports providing guidance on the assessment and interrogation of contaminant fate and transport models.</li> </ul>
<b>Natural attenuation</b>	<ul style="list-style-type: none"> <li>● Series of technical papers, advice, development of spreadsheet tools, demonstration discs.</li> <li>● Technical report and computer application on assessments in catchment abstraction management strategy trial areas.</li> </ul>
<b>Groundwater resources</b>	<ul style="list-style-type: none"> <li>● Preparation and update of groundwater and contaminated land pages - 3rd most visited pages on the Agency site.</li> <li>● Groundwater and contaminated land circular to 550 Agency staff. 5 editions in 2000/2001</li> <li>● A guide to monitoring water levels and flows at wetland sites</li> <li>● Water supply borehole construction and headworks.</li> </ul>
<b>Part IIA guidance</b>	
<b>Contaminant transport</b>	
<b>National water resource methodologies and abstraction management strategies</b>	
<b>Internet pages</b>	
<b>Underground</b>	
<b>Publicity / guidance booklets</b>	



## MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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ENVIRONMENT AGENCY  
FLOOD LINE

**0845 988 1188**

ENVIRONMENT AGENCY  
EMERGENCY HOTLINE

**0800 80 70 60**



**ENVIRONMENT  
AGENCY**

Microbiological  
Contaminants in  
Groundwater

Policy and Practice For  
The Protection of  
Groundwaters

Guidance on the Assessment and  
Monitoring of Natural Attenuation  
of Contaminants in Groundwater

Natural attenuation

Groundwater Source  
Protection Zones

Decommissioning  
Redundant Boreholes  
and Wells

A review of current MTBE usage  
and occurrence in groundwater  
in England and Wales

National Groundwater and  
Contaminated Land Centre

Water Supply Borehole  
Construction and Headworks  
(SHEP 79-0200 PNC 312)

Searching for  
Groundwater



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## PROTECTING GROUNDWATER

An international conference on:  
Applying policies and  
decision-making tools to  
land-use planning

The Natural Quality  
of Groundwater  
in England and Wales

POLICY AND PRACTICE  
FOR THE  
PROTECTION OF GROUNDWATER

Groundwater Vulnerability  
1:100,000 Map Series

SHEET 50  
West Glamorgan

The fuel  
additive MTBE -  
a groundwater  
protection  
issue?

Guidance for the Safe  
Development of Housing  
on Land Affected by  
Contamination

A Guide to  
Monitoring Water  
Levels and Flows  
at Wetland Sites



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