Strategy for Groundwater Investigations and Modelling

Anglian Region

ENVIRONMENT AGENCY

Strategy for Groundwater Investigations and Modelling

The Environment Agency Anglian Region is undertaking a ten year programme of work to provide the tools and information required to improve its management of groundwater resources. The programme of work is set out in the document "Strategy for Groundwater Investigations and Modelling: A Framework for Managing Groundwater Resources", which was published in 1998. Delivery of the Strategy will enhance the Agency's ability to make groundwater resource decisions based on sound science and good technical practice. The Strategy projects will have an important role in technically underpinning Catchment Abstraction Management Strategies (CAMS) and in assessing the impact of abstraction on wetlands and other sites designated under the Habitats Directive Review of Consents process. The Strategy projects will also contribute to the implementation of the Water Framework Directive.

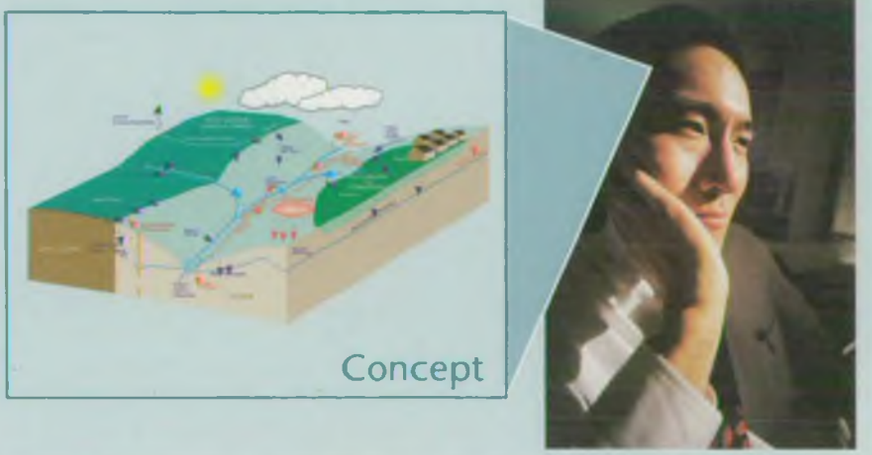
Work on the Strategy is being taken forward by the Groundwater Team within the Environment Agency Anglian Region, with help from a Term Consultant (currently Entec UK Ltd).

Role of Strategy Projects in underpinning the Environment Agency's Groundwater Management Function

Environment Agency Groundwater Management Function	Role of the Strategy
Strategic Water Resources Planning	Technically underpins CAMS and licensing policy Allows hydrological impacts of abstraction on conservation sites included within by the Habitats Directive Review of Consents process to be assessed
Operational Management of Water Resources	Technical input to abstraction licensing Water availability forecasts
Monitoring	Assessment of hydrological monitoring network
Groundwater Quality	Input to network design Framework for groundwater quality investigations

Stage 1 Data Collation

Stage 1 Conceptualisation



Resource Assessment Process

Each Strategy project comprises a five stage work programme.

Stage 1 of each project involves the collection and processing of available data for the investigation area. These data are then integrated and interpreted to produce a conceptual model of the hydrological system within the investigation area. A computer database and Geographic Information System (GIS) containing data collated as part of Stage 1 is prepared. These data, together with a report detailing the conceptual model, is available to Agency staff for immediate use in their resource management function. A key element of Stage 1 is the identification of uncertainties and shortfalls in data availability.

Stage 2 involves the collection of key data required to reduce uncertainty in the conceptual understanding of the area. This typically involves the extension of streamflow and water level monitoring for the duration of the study.

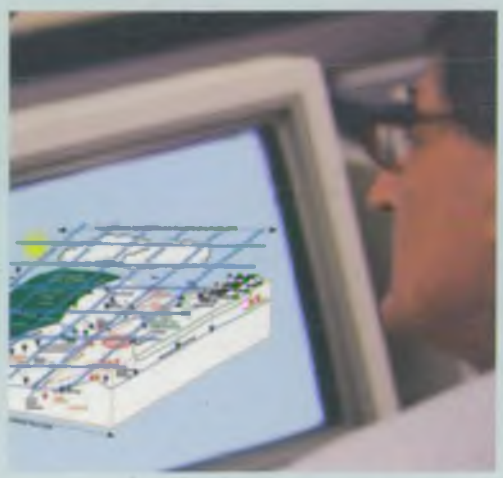
The Strategy Project Areas

The Strategy has identified nine areas which will be the subject of groundwater resource investigation projects. Investigations are currently underway in four of these areas Ely Ouse, Yare and North Norfolk, Essex, and Cam and Bedford Ouse.

Map showing extent of Strategy Project Areas within the Anglian Region

Stage 2 Field Investigations

Stage 3 Groundwater Modelling



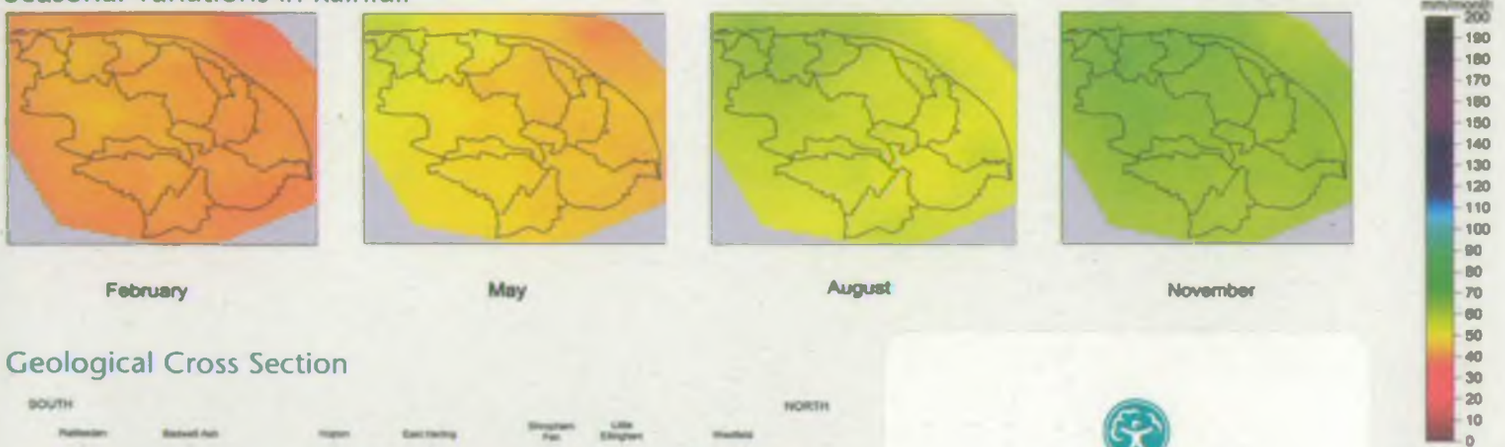
Stage 3 is to develop a grid-based computer model (termed a Distributed Groundwater Model) capable of representing flows within the project area. The model allows the interaction between rainfall, groundwater, surface water (rivers, lakes etc) abstractions and discharges to be quantified. The impact of changes to the existing regime e.g. from the licensing of a new groundwater abstraction borehole, can therefore be quantified.

Stage 4 involves using the model to examine the impact of a range of recharge and abstraction scenarios on water resource availability. The aim of these predictive simulations is to identify the optimum strategy for managing abstraction across the area. The predictive simulations will also allow the hydrological impacts of abstraction on conservation sites included within the Habitats Directive Review of Consents process to be assessed.

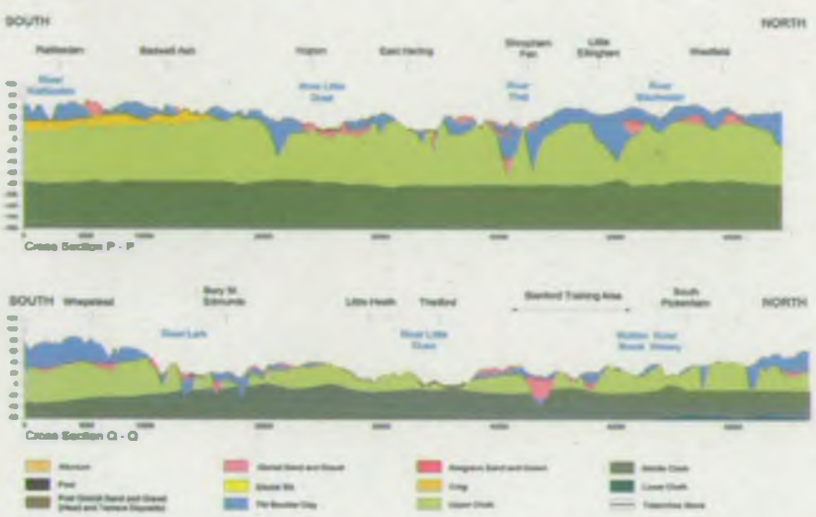
Stage 5 involves setting up the distributed groundwater models so that they can be used to support the operational management of groundwater resources.

Examples of data mapping

Seasonal Variations in Rainfall



Geological Cross Section



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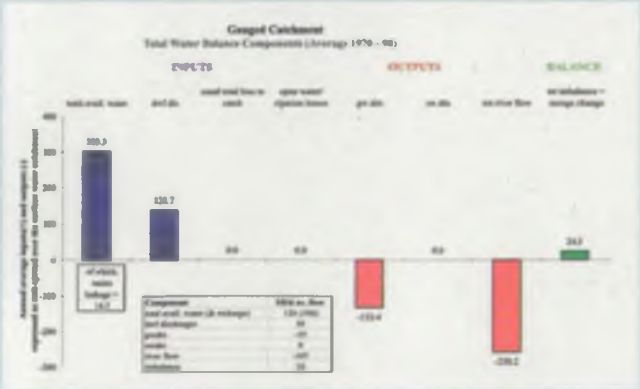
Indicative Timetable for the Strategy Projects

(Actual start and finish dates will be subject to availability of resources)

Environment Agency Area	Groundwater Resource Investigation Area	Start Date	Finish Date
Northern Area	Lincolnshire Chalk and Spilsby Sandstone Lincolnshire Limestone	October 2002 April 2004	October 2007 April 2009
Central Area	Woburn Sands North West Norfolk Ely Ouse Cam and Bedford Ouse	April 2004 April 2003 January 1999 April 2002	April 2009 April 2008 January 2004 April 2007
Eastern Area	Yare and North Norfolk Waveney and East Suffolk Essex	January 1999 April 2003 January 2000	January 2004 April 2008 January 2005

Stage 4 Predictive Simulations



Stage 5 Operational Use

- Abstraction Licensing
- Water Availability Forecasts
- Further Monitoring
- Environmental Protection
- Water Quality

Delivery dates for outputs from current Strategy Projects.

	Ely Ouse	Yare & North Norfolk	Essex
Project Database and GIS built	March 2000	April 2000	April 2001
Data Processed	June 2001	June 2001	December 2002
Initial Conceptual Model	March 2002	June 2002	March 2003
Regional Models for predictive use	July 2003	July 2003	June 2004

Consultation and Review

Each project is the subject of both stakeholder involvement and extensive technical review. Non-Agency stakeholders who have been identified for inclusion in the consultation process include:

- Abstraction licence holders, especially public water supply and agricultural irrigation abstractors.
- Central Government Agencies (especially English Nature);
- National Farmers Union;
- Country Landowners Association;
- Internal Drainage Boards (where appropriate);

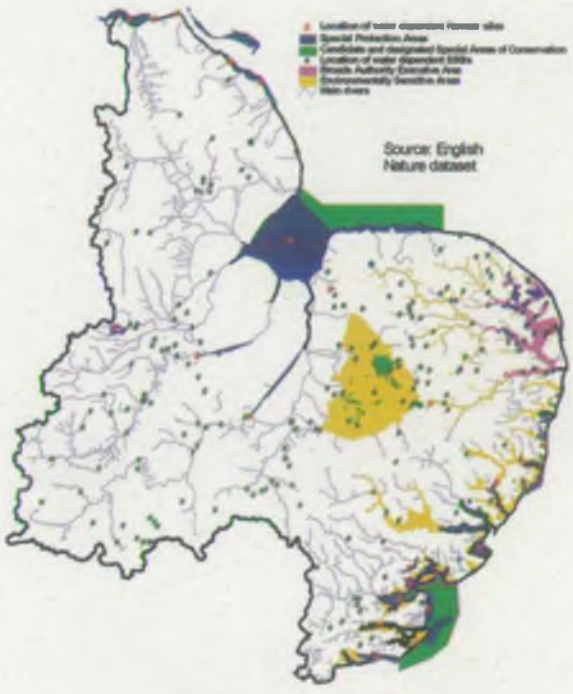
It is anticipated that stakeholders will be involved in the process at key milestones, allowing them the opportunity to influence the work and leading to subsequent confidence in the project outputs and the setting up of a shared framework for supporting water resources decision making.

Links to other Programmes

Since the "Strategy" was published in 1998 the work of the Strategy has become increasingly focused on providing the technical input to Catchment Abstraction Management Strategies, and on providing support to the Habitats Directive Review of Consents.

CAMS aim to provide a consistent catchment scale context for abstraction licensing or resource recovery. The process is described in more detail in "Managing Water Abstraction: The Catchment Abstraction Management Strategy process" which was published by the Agency in 2001. Outputs from the Strategy projects will provide both processed data and groundwater models which will help to assess the effect of groundwater resource management options on water levels and river flows.

The Habitats Directive requires the Agency to review the impact of existing consents, including abstractions, on SSSIs which have been identified as containing habitats and species which are considered particularly rare, endangered or vulnerable in a European context. The work of the Strategy is providing a significant level of support to the Review of Consents (RoC) programme. Scoping reports setting out the work required for the RoC Appropriate Assessment for 85 sites are to be completed by Spring 2002.



Water dependant conservation sites