Geological Survey of Ireland

Annual Report

2005

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PREFACE

The Government places considerable importance on the development of the knowledge economy as part of its long-term enterprise strategy. The knowledge economy must be underpinned by research and development (R&D) in all areas of science and technology, including a number of sectors for which I have responsibility. I am aware that the Geological Survey of Ireland (GSI) is increasingly trying to position itself as a champion of R&D for the geoscience sector and I welcome this.

GSI, the national geological agency, provides services which support a range of important national objectives including environmental protection, natural resource management, development of offshore marine resources, sustainable energy supply and educational services. GSI undertakes these in collaboration with other national players and local authorities, as well as with the Geological Survey of Northern Ireland, thus ensuring that cost-effective and relevant products result.

The Government recently approved a successor programme to the Irish National Seabed Survey (INSS) and this new programme, INFOMAR, will be jointly managed by GSI and the Marine Institute, reflecting their acknowledged success in managing this nationally important task. The emerging information is used by increasingly wider sections of the community for issues as diverse as energy resources, maritime safety and fisheries.

This report outlines the main achievements of GSI in the past year and illustrates their relevance to our daily lives. It results from the support of its stakeholders and customers, as well as the contribution of its staff, which I am pleased to acknowledge.

Noel Dempsey TD
Minister for Communications, Marine and Natural Resources
February 2006

- GSI is actively supporting the knowledge economy through the development of R&D for the geoscience sector, as well as supporting research through use of its databases. Planning has started to position the sector to participate in the new National Development Plan (2007- 2013).

- During 2005, the final year of the Irish National Seabed Survey, Marine Institute vessels completed surveys off the Donegal coast while an airborne Lidar survey of Mulroy Bay, County Donegal, was undertaken. These surveys increased the GSI data holdings considerably and underpinned a range of research and value added projects.

- Ireland joined the Integrated Ocean Drilling Program (IOPD), providing excellent opportunities for scientists in Ireland to engage in cutting edge marine research, and drilling was carried out on coral mounds in the Porcupine Seabight off the West Coast.

- Groundwater protection remains a key priority for GSI and in 2005 significant support was provided on groundwater aspects of the EU Water Framework Directive through the River Basin District projects. A Groundwater Protection Scheme for County Cavan was started andsource protection reports were completed for two public water supplies in County Donegal.

- A deep strength of GSI lies in its range of growing databases, which are constantly being improved through new acquisitions and validation of its contents. A significant development was the donation of Rio Tinto's archive from 35 years of exploration throughout Ireland.

- Environmental monitoring is a priority activity for GSI and it is set to assume increased importance in the future when its results will form the basis for modelling key environmental processes, particularly those with a potential to cause natural hazards. The initial phase of work on the National Landslides Database was completed and a report will be published in 2006.

- 2005 was an important year for bedrock mapping. By year-end full coverage of maps and booklets (except for a single booklet) had been published for the nationwide 1:100,000 scale series. Work on the island-wide 1:500,000 scale map, in co-operation with the Geological Survey of Northern Ireland, was close to completion. A new 1:50,000 scale map series, responding to specific customer needs in priority areas, started and a pilot version for part of County Wexford was produced for evaluation.

- Quaternary mapping of 1:50,000 sheet number 48 (Tullamore) and of eastern Westmeath-Louth was completed.These both illustrate the importance of sand and gravel deposits as sources of aggregates while at the same time the landscape features they define are important elements of natural heritage. The information from this mapping is an important contribution to the resolution of issues surrounding conflicting land uses.

- GSI delivered a minerals potential map to Wicklow County Council. This highlighted areas with potential for gold mineralization as well as base metals.

- Landscape tourism and geological heritage projects, in which GSI participated with other partners, continued to bring geology to the attenion of rural communities in a way that is amenable to nurturing local enterprises. By year-end Phase 1 of the Breifne Project in the northwest was drawing to a close while another year remained on the Copper Coast projects in County Waterford.

- Educational and training services continued to be important for GSI. GSI participated on a pilot basis in the development and delivery of training for teachers of the Leaving Certificate geography syllabus. New training services in seabed classification and medical geology were developed, while additional offerings of the FÁS on-site wastewater management course were delivered.

- Value-added projects are a key way of extracting maximum value from the GSI databases,both onshore and offshore. GSI participated in a new departure with Irish and Canadian partners in trying to stimulate commercial consortia to exploit the considerable market in third countries for seabed mapping.

- The GSI Customer Centre provides single-portal access for customers to all GSI services. Product sales in GSI were down 10% in 2005, at 2977 items, compared to 2004 (3310) and the level of public queries, at 4240, was steady from 2004 (4133).

- As GSI moves towards greater web-enablement, the number of website visitors has increased by 64% over 2004 levels. It is expected that there will be a corresponding drop in queries by mail, phone or personal callers, but this has yet to happen.

- Among GSI publications in 2005 were *Geosolutions* (a strategic vision of GSI to the year 2015) and *Cherishing our Earth* (an account of the value of geological services).

- There is a continued focus on staff development and training, particularly at a time when there is a significant decrease in staff numbers, to underpin the efficient delivery of high quality services to customers.

- GSI seeks to raise awareness of its services and the value they deliver to society. In this regard media coverage of GSI activities is important and in 2005, largely due to publicity for the Irish National Seabed Survey, there was an increase of 80% over 2003 levels.

As a vibrant, expanding economy, Ireland has many and evolving demands on geology. It is critical that these needs are fully met in a timely and cost-effective way. It is the role of GSI to foresee and determine those needs and ensure that the national capability exists to meet them. The strategic direction of geological surveys across Europe has seen a dramatic and consistent change over the past decade. A major shift has taken place from serving a single customer segment, the natural resources sector, to providing services to a range of sectors of national life concerned with environmental protection, infrastructure development, heritage and outreach.

A recent survey of European geological surveys indicates a sharply increased focus on information delivery (preferably in digital format and web-enabled), natural hazards and international activities, as well as increases in groundwater, seabed, geotechnical, aggregates, geophysical and geochemical work. These same trends have been evident in the recent activities of GSI and will be familiar to our customers and stakeholders alike. GSI continues to function because of the importance of providing nation-wide and impartial services to support decision and policy-making at European, national and local level. This is reflected in the continued demand for GSI services and the high level of satisfaction of customers with its services.

"GSI services...reduce the risks....of poor decision making"

In 2005 GSI commissioned MORI to carry out a marketing survey of its customers and stakeholders. The aim of the survey, which used an online methodology, was to gauge satisfaction with GSI products and services, and to identify areas for improvement. GSI's customers and stakeholders expressed a high level of satisfaction. 90% were satisfied with the overall GSI service, 80% considering it had improved over the previous four years. Almost 80% were satisfied with the data and mapping products supplied by GSI, while 95% were happy with its facilities and advisory services. GSI was considered relevant and professional, providing a quality service. The survey pointed to the need for GSI to provide data in digital format, preferably web-enabled, and to improve aspects of its communications.

During 2005 GSI completed a new Strategic Vision to 2015 designed to set out its strategic imperatives over the coming decade and taking account of the upcoming decentralisation of GSI to Cavan. Based on feedback from both staff and stakeholders, *Geosolutions* sets the agenda for the next decade. Its vision is that GSI will be the recognised national provider of quality geological services, information and advice to support policy and decision-making at EU, national and local levels, as well as to inform all relevant sectors. Reconfirming the GSI strategic goals (see box), it emphasizes the need to address the information delivery issues related to digital format and web enablement, as identified in the customer survey.

A parallel publication considered the value of geological services. *Cherishing our Earth* identifies the spectrum of GSI services and indicates that these reduce

the risks of sterilising important water resources, of transport and infrastructure projects incurring unforeseen costs and delays, of damage to our natural environment and resulting damage to our national image, of losses resulting from damage to shipping, of Ireland becoming too heavily dependent on imported energy sources, and of poor decision-making due to lack of accessible information. The publication states that the principal beneficiaries from GSI services are EU and national government departments and agencies, local authorities, the education sector, sectors dealing with construction, mineral extraction, energy, agriculture, heritage, fisheries, environment and tourism, and the general public.

Mission and Goals of GSI

GSI is the national geological agency charged with the provision of geological information and advice in support of national and regional objectives.The strategic goals of GSI are as follows:

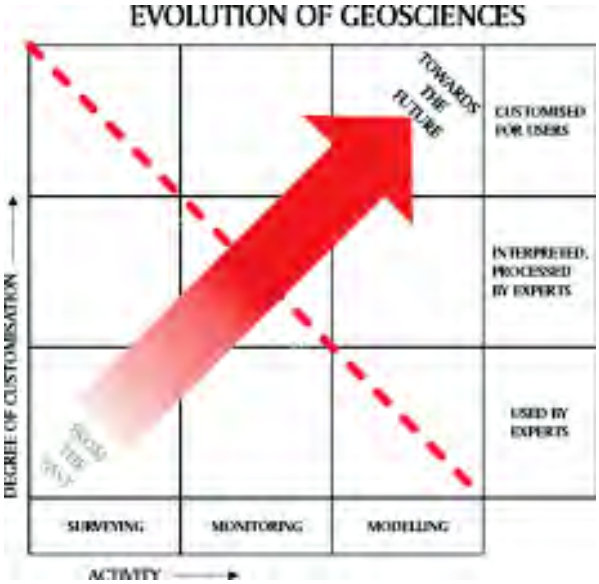
- To provide easily accessible and accurate geological information.
- To support sustainable development, environmental protection and national development plans.
- To map Ireland's earth resources.
- To promote public understanding of the role of GSI and geology in Irish society.
- To provide a stimulating, motivating and rewarding work environment for GSI staff.

Progress on achieving each of these goals during 2005 is described in this Annual Report.

Future and Past

Traditionally geology has been focused on the past. The nature and sequence of earlier events are of great interest, as well as placing a time frame on them. But society's expectations of geology have changed and there is now a greater focus not simply on mapping the past but on monitoring the present and modelling the future. Earth forecasts are required: in the next major storm which flood plains will be inundated or which hill slopes will fail?

Of course we still need geological maps and equally we need new editions that take account of recent geological insights and emerging customer requirements. Customers require geological information in accessible formats and integrated with their own databases. So, for example, planners require information in a digital format and viewed against the County Development Plan. More than that, they require customized products that deal with their key issues. GSI groundwater maps were formerly based on geological characteristics and now they focus on specific planning responses.

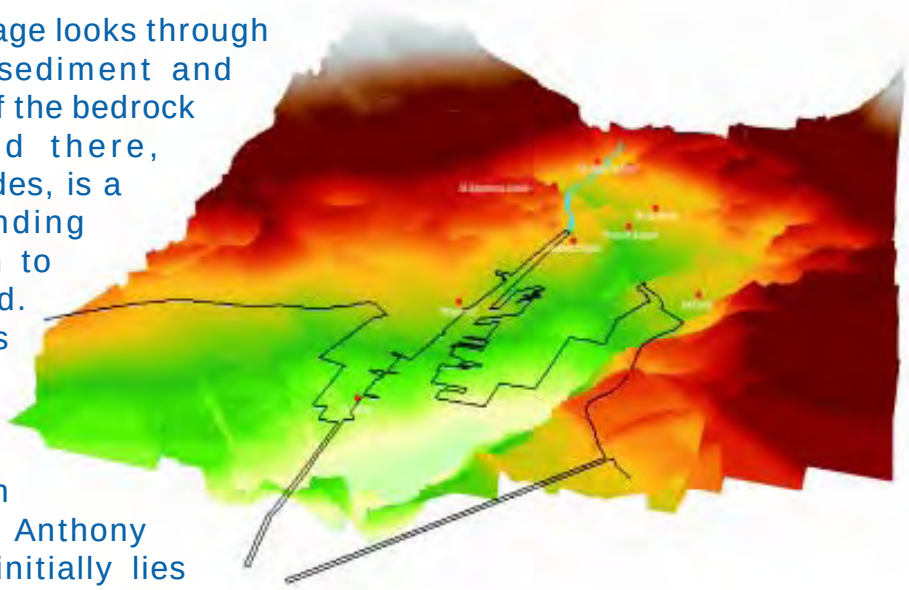


But in the future there will be increasing demands for monitoring and modelling information. Monitoring landslide activity will feed into a model of future ground behaviour. Monitoring groundwater levels can help build a model of the future capacity of aquifers to meet our needs. This will bring its own demands: geology needs to evolve to providing realistic models that will provide society with practical benefits and not just alarming its citizens. Certainly the recent news that Ireland will join the Earth Observation Programme of the European Space Agency in 2008 is welcome in that it will enable increased participation by Irish researchers in earth observation.

Dublin's Subsurface

The Government's Transport 21 initiative will include a major expansion of Dublin's transportation system, both above and below ground. With extensive tunnelling envisaged, the nature of the subsurface geology is crucial to the success and design of the engineering works. We are set to become familiar with Dublin's subsurface.

In central Dublin the bedrock is obscured by widespread glacial till, or boulder clay. For engineering purposes this material is divided into an upper Brown Boulder Clay and a lower Black Boulder Clay, the former being a weathered version of the latter. These sediments vary greatly in thickness, from a few to about 20 metres. East of Butt Bridge along the Liffey they are overlain by up to 40 metres of intertidal and estuarine sediments. These unconsolidated sediments are all floored by calp limestone bedrock which is not exposed anywhere in central Dublin. Yes, those limestone slabs in St. Stephen's Green are simply carefully landscaped slabs.



The accompanying image looks through the unconsolidated sediment and gives us a 3D picture of the bedrock surface itself. And there, outlined in green shades, is a valley feature extending from Heuston Station to Dublin Port and beyond. But remarkably it does not follow the course of the modern River Liffey. This buried river channel, which was first identified by Anthony Farrington in 1929, initially lies south of the River Liffey but then turns northwards under the Guinness Brewery towards Broadstone, the North Circular Road and the East Wall. The channel then turns southeast towards the sea, running diagonally across Alexandra Basin towards Poolbeg.

This buried channel does represent the ancient river course of the River Liffey and at a time when sea level was lower than it currently is. During the Ice Age, ice sheets extended across Dublin city and, when they melted in due course, left behind the thick cover of boulder clay. As river drainage re-established itself, the original channel was re-excavated to almost its original depth. As the sea level rose gradually after the Ice Age, this channel was effectively filled up with sediment and the modern River Liffey followed an independent course.

This fascinating history has been built up from borehole information gathered over many decades. This information also provides essential support for urban construction (and especially for transport tunnels) because the cost and nature of engineering works in this area will be strongly dependent on the depth to bedrock. The GSI National Geotechnical Database is a major resource for modelling the subsurface geology in Dublin and elsewhere in Ireland. For example the 3D model shown here was based on 1528 boreholes which reached bedrock beneath Dublin city.

That same geotechnical database which provided us with the information to image Dublin's subsurface was being upgraded in 2005 to create a relational database in Oracle, with individual boreholes linked to digital maps of urban areas and linear infrastructure nationwide. At the end of 2005 the database contained 55,103 boreholes, trial pits and probes, of which 33,130 had been input.

The Government has a long-term strategy to drive economic development and competitiveness through its investment in research and development. This has the underlying aim of reducing Ireland's dependence on foreign inward investment in our industry, an area where Ireland is facing serious challenge from emerging economies. Alternatively the Government's vision is that the future economy will be built on knowledge and innovation. Such an economy can only be built on research, the key mechanism to create new knowledge. Since 2000 the Government has invested significantly in creating the right conditions where research can prosper. Ireland requires an adequate supply of high quality researchers, supported by world class research infrastructure and the Government has indicated its intention to provide continued support in the upcoming National Development Plan (2007-2013).

Geoscience has a key role to play in this exciting research landscape. The geoscience sector, with an industry turnover of €2 billion per year and services valued at €130 million annually, has the capacity to play an increased role in support of the Government's strategy. The EU at the end of 2005 warned that Ireland's R&D spend as a proportion of GDP had slipped in recent years and that it has fallen relative to many other European countries in the area of innovation. More broadly based research, including geoscience, can redress this unwelcome trend and raise Ireland's research effort (and knowledge economy).

"Geoscience Industry turns over €2 billion annually, it's services €130 million"

In the past 18 months the geoscience sector in Ireland has developed a set of objectives designed to support key national objectives and which require significant new funding for their implementation. The objectives address important research and services issues in the energy, environment, marine and infrastructure sectors. The estimated total cost over 5 years is €170 million. See "Geoscience Priorities". Read more about this initiative on the GSI website (www.gsi.ie). The indications are that the National Development Plan (2007-2013) will specifically accommodate competitive applications for funding from the geoscience sector. In the meantime funding has been provided for INFOMAR, a successor to the Irish National Seabed Survey, and there may be opportunities to fund geoscience priorities through the Energy Research, Development and Demonstration Programme.

GSI provides services which underpin the development of economic activities in a number of sectors. The Atlantic Partners initiative (see panel) is an attempt to stimulate serious private sector activity in third countries based on the partnerships of organisations, including GSI, in both Ireland and Canada. On a national level there are tourism enterprise opportunities based on an appreciation of landscape in which GSI has also participated (see "A challenge for rural communities").

Much of our services are based on systematic databases built up over decades and many heavily rely on data provided by third parties. This is provided on a voluntary basis and GSI fervently appreciates this. The collection and validation of such data remains a key activity, as collaborated by the following trends in data holdings: (numbers of records).

Database	2005	2004	2003
Minex	75,300	75,300	72,500
Geotechnical	55,103	51,253	48,578
Wells	36,150	35,417	34,772

Geoscience Priorities (2007-2013)

Energy: Secure and diversified supplies

The EU goal is that renewables will contribute 12% of total energy needs by 2010. GSI, in partnership with Sustainable Energy Ireland and the third level and private sectors, can contribute to assessments of geothermal energy, offshore wind, tidal and wave energy sources and land-based wind energy potential. Priority actions include the development of a 3D model of the Irish underground; identification, evaluation and monitoring of zones of high potential for geothermal energy; and identification of potential hydrocarbon resources in offshore basins.

Environment and Health: Addressing emissions to air and water

Economic development, urbanisation and intensive agriculture represent significant pressures on Ireland's environment. Climate change is a key issue for geoscience; one response highlighted here is the evaluation of underground potential for carbon storage. Implementation of the EU Water Framework Directive is another issue where geoscience can contribute, in this case through groundwater surveys and monitoring, as well as targeted research of the geological environment.

Marine: Developing a unique resource

Ireland's seabed is ten times that of its land area. The Marine Institute has estimated that this marine resource was worth €3 billion in 2003. Priority geoscience actions, including INFOMAR, a successor to the Irish National Seabed Survey being managed jointly by GSI and the Marine Institute, are data acquisitions, management and interpretation; data integration and exchange, value added services; seabed monitoring; and world-class geoscience research based on participation in the Integrated Ocean Drilling Programme.

Infrastructure: Building on sound foundations with quality materials

Geoscience contributes to effective infrastructure development by providing cost-effective information on ground conditions. Priority actions include high resolution monitoring of hazards such as subsidence, landslides and abandoned mines, and assessment of key mineral and rock resources.

Atlantic Partners

When the international magazine *Newsweek* devotes significant space to seabed mapping, as it did recently, we can be fairly sure that this technology has a significant future. The context for the article was the continuing melting of Arctic ice, rendering this potentially energy-rich region accessible for the first time to governments and the energy sector, and the only route to staking a claim to a portion of this hostile environment is through seabed mapping. This itself is sufficiently significant to make international news, but imperatives are being replicated far beyond the Arctic Circle also, wherever coastal states seek seabed rights under the UN Law of the Sea.

Ireland and Canada, by playing to their complementary strengths, have a remarkable opportunity to jointly capture a significant portion of this international business. On the Irish side, GSI and its partner, The Marine Institute, are in a unique position to build on the experience of the Irish National Seabed Survey since 1999 and to provide an integrated set of skills. A Canadian-Irish consortium* involving them, called the Atlantic Partners initiative aims to stimulate marine and geoscience businesses on both sides of the Atlantic to become leaders in this international market.

The Irish National Seabed Survey represented a €33 million investment by Government in the Irish geoscience and marine sectors, the largest of its kind world-wide and an investment that is widely regarded as both courageous and successful. The established national expertise and capacity can now be exploited to deliver business success, particularly for the private sectors of both countries, in tapping into a global market estimated to be worth perhaps €2 billion up to 2009.

The first steps in this initiative will be a co-funded consultancy study to advise on the development of a business model to harness the commercial opportunities represented by this market. At the end of 2005 the process of appointing consultants was well advanced with the aim of completing the study by mid-2006. At their meeting in September 2005 this was one of the initiatives which was specifically welcomed by the Newfoundland Premier, the Hon. Danny Williams and An Taoiseach, Mr Bertie Ahern, TD.

*The Irish partners are Enterprise Ireland, Ireland Newfoundland Partnership, Geological Survey of Ireland and the Marine Institute; the Canadian partners are the Canadian Center for Marine Communications and the Ireland Business Partnerships Board.

A good year for minerals information

Mineral resources are essential for the well-being and development of society. Zinc and lead are but two essential commodities and Ireland has recently accounted for 40% and 30% respectively of Western European production of these from its three active mines (Navan, Lisheen, Galmoy).* GSI continues to support the Exploration and Mining Division (EMD) of its parent Department in providing information services and monitoring for the sector.

In July the Minister for Communications, Marine and Natural Resources welcomed the donation by Rio Tinto to the GSI of its extensive Irish Geological Archive. One of the world's major mining companies, it explored in Ireland from the early 1960s to the mid-1990s, amassing a veritable treasure trove of information that will add enormously to the GSI databanks. Important material is included on the Keel zinc-lead deposit, County Longford, and the Kilmacoo gold deposit, County Wicklow. The material, once catalogued and archived, will yield new inputs and interpretations on Irish geology for all customers.

* State Mining and Prospecting Facilities and Industry News. 1st November 2005. Exploration and Mining Discussion Ireland. Department of Communications, Marine and Natural Resources.

A major priority in 2005 was the groundwater work undertaken as part of the implementation of the EU Water Framework Directive (WFD). This Directive will have a positive impact on the lives of all Europeans in the coming decade, ensuring all residents have access to clean water supplies. GSI work on groundwater, supporting its other partners in this important task, was done in the context of River Basin District (RBD) projects. It involved analysis and characterisation studies, convening the WFD Groundwater Working Group and contributing to various WFD national committees and RBD project steering groups.

There remains a strong demand from local authorities for county-based Groundwater Protection Schemes (GWPS), which constitute an important planning tool, and GSI is striving to respond to this demand within its resource constraints. In late 2005, a GWPS for County Cavan was started. The groundwater vulnerability maps for Kilkenny, North Tipperary, Laois, Kildare, Meath and Monaghan were up-dated using the newly-released Teagasc subsoils map as a basis. Two source protection reports and maps were completed for public and group water supply wells and springs at Ballyshannon and Pettigo in County Donegal.

GSI continued to provide advice to the Exploration and Mining Division of our parent Department on water related aspects of mining developments, including both current and former operations.

In 2005, the Department of the Environment, Heritage and Local Government agreed to GSI becoming a statutory consultee for planning matters relating to quarrying and extensive infrastructure projects. It is expected that a new Statutory Instrument giving legal affect to this matter will be signed by the Minister in 2006. GSI also responds to planning submissions relating to environmental impact statements and planning applications: it received 60 applications in 2005 (62 in 2004) and its comments tended to focus on geotechnical and heritage issues.

Groundwater: The impact of the EU Water Framework Directive

Progress is always pleasing to report. In the last three years, the implementation of the Water Framework Directive (WFD) and the work undertaken by the GSI, Teagasc, EPA, local authorities and RBD (river basin district) consultants has advanced considerably the understanding of groundwater in Ireland. Groundwater has been ‘characterised’ and, in the process, a new aquifer map of Ireland has been produced, all readily available groundwater data have been collected, soils and subsoils mapping has been undertaken, the hydrochemistry of our groundwater has been assessed and over 700 ‘groundwater bodies’ (the management units under the WFD) have been delineated and described.

Generally, groundwater is a 'hidden resource', and the focus in the past has been mainly concerned with its use for drinking water. Now the focus is broader, and the WFD requires that it also be seen in terms of the link with, and contribution to, ecosystems, whether in surface water or wetlands. Risk characterisation which integrates pressures and impacts with the physical characterisation, has been undertaken to evaluate whether the groundwater bodies are 'at risk' of failing to meet the environmental objectives of the WFD. This has shown that a high proportion are indeed 'probably at significant risk'; either from diffuse sources of pollution (mainly agricultural) or point sources (mainly old landfills, urban areas, or contaminated land).

Testing challenges lie ahead. The characterisation process, completed in March 2005, was a screening exercise, pointing the way forward and highlighting the main issues for the future. Now further characterisation and monitoring will be undertaken to decrease uncertainties and check the validity of the risk assessment results. In the process, our understanding of groundwater in Ireland will improve further. More controversially perhaps, a programme of measures will be required to ensure that there is no deterioration in the states of any groundwater bodies, and that the status of those classed as 'poor' is restored to 'good'. This is likely to have implications for some current land uses in Ireland.

Our Fragile Earth

A major undersea earthquake on 26th December 2004 offshore Sumatra generated a powerful tsunami, which resulted in the deaths of almost 230,000 persons around the margins of the Indian Ocean. The ensuing humanitarian effort united people across the globe in a remarkable way, not least in the geoscience community. It responded with services to ensure safe water supplies from wells, mineral and aggregate materials to underpin reconstruction, and resurveyed seabed bathymetry to support maritime safety.

"The Sumatran Earthquake...caused planet Earth to shudder"

The Sumatran earthquake was of a scale that globally caused planet Earth to shudder. Even in Ireland its physical effects were registered when abrupt water level changes were registered in GSI and GSNI boreholes. Indeed this caused us to review similar water level changes against seismic events over the past 25 years, leading to the identification of at least 110 earthquakes, mostly of magnitudes greater than 7.0. However the Sumatran record stood out as generating an almost unique water level fluctuation. Indeed variations in the degree of fluctuation from one borehole to another has led groundwater specialists to believe that such catastrophic earthquakes may help us to understand better the nature of our aquifers.

The international response to disasters has been under scrutiny during 2005, as the impact was considered of Hurricane Katrina and the Pakistani Earthquake as well as the Sumatran Tsunami. In the case of the Sumatran Tsunami there was a considerable delay before aid arrived at some communities, suggesting

casualties in these regions might have been averted. Acknowledging the need for quicker, more targeted and insightful responses, there is also the growing awareness that early warning systems would have saved a considerable number of lives and reduced property damage.

The available evidence indicates that Ireland's coastal communities are themselves at risk from tsunamis generated by earthquakes or sub marine landslides in the North Atlantic. While the risk may have a low probability, its occurrence would have high impact and cannot be ignored. At the end of 2005 GSI was coordinating a national proposal for an effective tsunami warning system, integrated with evolving international systems and based on collaboration between relevant state organisations and the third level sector.

Geology and Earth Observation

Arising from the 2001 Gothenburg summit, European leaders decided to implement and monitor comprehensive environmental and security policies in the context of sustainable development. To achieve these objectives, the European Commission together with the European Space Agency have developed the Global Monitoring for Environment and Security (GMES) initiative, comprising space-borne and in-situ techniques to provide an operational and autonomous European capability.

GMES will provide three "fast-track" operational services by 2008 embracing Land Monitoring, Marine Core Services and Emergency Response; a possible fourth service in Atmospheric Monitoring is under construction. Data acquired through GMES will contribute to the INSPIRE (Infrastructure and Spatial Information in Europe) Directive. GMES will contribute to access, use and harmonisation of geospatial information at pan-European level and to interoperability of national systems.

GMES will be the main European contribution to the 10-year project GEOSS (Global Earth Observation System of Systems) managed by the US-led intergovernmental Group on Earth Observation (GEO). GEO involves about 60 countries (including Ireland) and 40 international organisations (including Eurogeosurveys).

Geologists in general, and GSI in particular, can contribute to the in situ ground component of GMES and GEOSS over the coming years and a wealth of further information can be obtained from the websites www.gmes.info and www.earthobservation.org. The Environmental Protection Agency and GSI provide the national delegates to the GMES Advisory Council and the GEO Plenary. Furthermore, at the ESA Ministerial Council of 6th December 2005 it was agreed that Ireland would participate fully in the next ESA Earth Observation Envelope Programme (EOEP) 2008-2012.

The important task of mapping, whether onshore or offshore, is essential to support the range of services that GSI provides. It provides a baseline for monitoring and modelling activity and it confirms (or "ground-truths") the results of remotely-sensed information.

"Mapping...is essential to support...(GSI) Services...

2005 was the final year of the Irish National Seabed Survey (INSS). With Zone 3 (deep water) already fully surveyed, surveys during this year brought the coverage in shallow water Zone 2 (50-200m water depths) to 30%. The ship-based surveys, carried out in partnership with the Marine Institute, continued in the Donegal Bay area using the RV Celtic Explorer. A total of 28,263 line km of data was collected in four survey legs and in addition a number of seabed sediment samples were collected. In addition the RV Celtic Voyager spent 45 days surveying off the east and south coasts, including data acquisition for the IMAGIN project supported by INTERREG and led by the Coastal and Marine Resource Centre of University College Cork.

Mulroy Bay, County Donegal, is an inlet whose bathymetry was imperfectly known and whose potential for shipping has not been fully achieved. In order to improve the information available GSI in conjunction with Donegal County Council contracted an airborne LIDAR survey of the bay. Completed by the Tenix Lads Corporation of Australia, the resulting survey provides a high quality profile of the seabed of this complex bay. This provides additional, although still limited, coverage in Zone 1 (less than 50m water depth). Following the successful completion of INSS, the Government has announced approval of a successor programme (see "Sustainable offshore management").

Recent progress in land-based surveying is covered in the panels accompanying this chapter. They were supported by an extensive drilling programme whose results are summarised on opposite page. 156 holes were drilled to an aggregate depth of 2,225 metres.

Borehole No:	County	Location	Drilling Method	Total Depth (m)	Mapping Sections
GSI/05/1	Monaghan	Gortmore Sth	Coring	39.0	Bedrock
GSI/05/2	Monaghan	Barratitoppy	Coring	161.0	Bedrock
GSI/05/3-69	Louth	Various	Flight Augering	676.0	Quaternary
GSI/05/70-83	Westmeath	South	Flight Augering	80.0	Quaternary
GSI/05/84	Offaly	North	Flight Augering	9.0	Quaternary
GSI/05/85-87	Westmeath	South	Flight Augering	19.0	Quaternary
GSI/05/88-114	Offaly	North	Flight Augering	288.0	Quaternary
GSI/05/115-117	Kildare	North	Flight Augering	23.0	Quaternary
GSI/05/118	Laois	North East	Flight Augering	7.0	Quaternary
GSI/05/119-125	Kildare	North	Flight Augering	62.0	Quaternary
GSI/05/126	Carlow	South	Flight Augering	10.0	Quaternary
GSI/05/127-128	Kildare	North	Flight Augering	22.0	Quaternary
GSI/05/129-136	Carlow	South	Flight Augering	47.0	Quaternary
GSI/05/137	Laois	North Central	Flight Augering	5.0	Quaternary
GSI/05/138-140	Carlow	South	Flight Augering	28.0	Quaternary
GSI/05/141	Wicklow	West	Flight Augering	8.0	Quaternary
GSI/05/142-147	Kildare	North	Flight Augering	43.0	Quaternary
GSI/05/148-149	Dublin	Loughlinstown	Flight Augering	26.0	Quaternary
GSI/05/148A	Dublin	Loughlinstown	Coring	33.0	Quaternary
GSI/05/149A	Dublin	Bray	Coring	31.0	Quaternary
GSI/05/150	Monaghan	Scotstown	Coring	60.5	Bedrock
GSI/05/151	Monaghan	Shanroe	Coring	150.5	Bedrock
GSI/05/152	Galway	Cappan Raheen	Coring	251.0	Bedrock
GSI/05/153	Galway	Kilcreest	Coring	106.0	Bedrock
GSI/05/154	Galway	Carrowmuna	Coring	100.0	Bedrock

Sustainable Offshore Management

Ireland since 1999 has developed a world-class reputation for seabed mapping through the success of the Irish National Seabed Survey, which has already mapped 87% of the Irish seabed area. GSI with its strategic partner, the Marine Institute, and others has led the development of methodologies, human capability and physical infrastructure.

Building on this success, the Government has approved a follow-on strategy, Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR). The focus of this new programme, which will be a joint

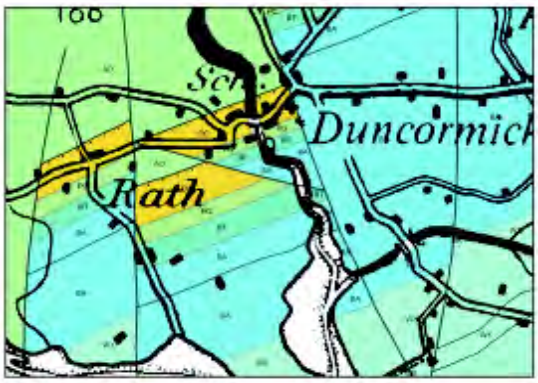
venture between GSI and the Marine Institute, will be on the near-shore environment - an area subject to significant development and environmental regulation. An extensive stakeholder process has identified priority areas for mapping: the resulting 26 priority bays and three coastal areas are outlined on the accompanying map.

The programme has three major components:

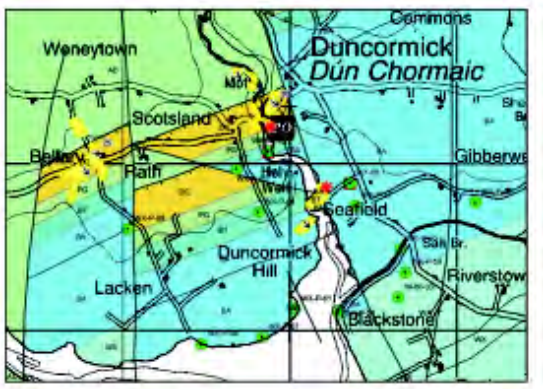
- Data acquisition, management and interpretation;
- Data exchange and interpetation - to establish inter-agency data exchange;
- Value added exploitation - to deliver demand-driven opportunities to create added value.

INFOMAR is set to deliver significant national benefits. In addition to the value added to specific stakeholders, additional benefits arise from marine data integration and interpretation, increased national research profile and commercial services and contracts.

New Maps for Old!



The first edition of the Geological Map of Ireland was completed in the 1890s based on almost 50 years of intensive mapping on the scale of 1:10,560 and subsequent publication at 1:63,360. This set provided remarkable value for money, being the main source of geological mapping for a full century. During the 1990s a major initiative was undertaken to rapidly update these maps, based on compiling information from all available sources, in order to make the insights of the intervening decades available to map users. Based on the scale of 1:100,000, all the maps have now been published and only one accompanying booklet (for Sheet 11) remains to be printed.



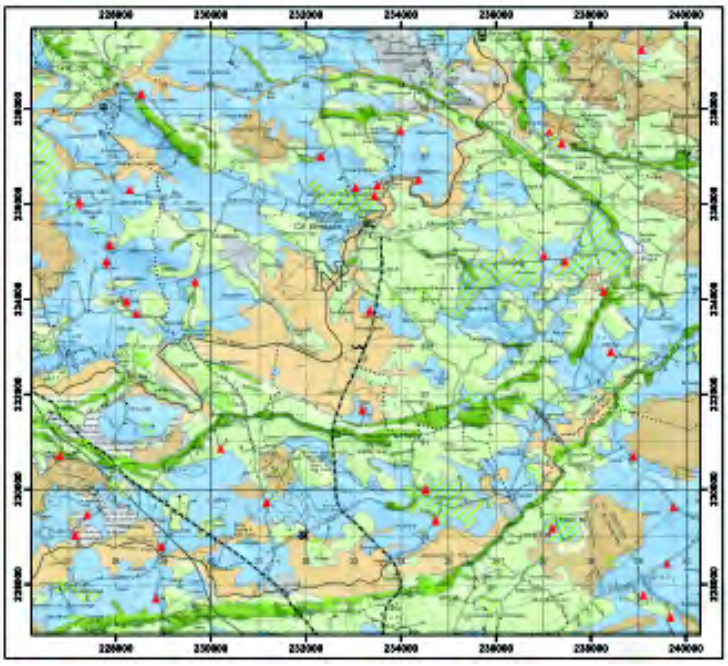
Already GSI has completed a draft pilot for a new series of bedrock maps. What was the need to commence the job once more? The new maps will be on a scale of 1:50,000 and will include specific point information, such as boreholes, outcrops and quarries. This will allow the map user to form a judgment on the reliability of the map, or a particular part of it. The user will also, because the map will be digital, be able to interrogate more detailed information based on

associated databases. A whole new spectrum of information will be available to users. The new map series also recognizes the uncertainties in many of the 1:100,000 map series, especially where the geology was either unusually complex or poorly exposed. Such areas will be marked out for special attention in this mapping programme wherever a specific priority has been established.

Ice sheets leave a heritage

Mapping over adjoining areas of Counties Westmeath and Offaly, published in 2005*, depicts patterns of sediments that were formed during glacial (Ice Age) and post-glacial times. They make up a landscape that typifies almost the entire Shannon River basin. Pride of place must go to those deep green coloured linear ridges on the map, which have both southeasterly and east northeasterly trends that converge about 5km east of Kilbeggan. These are esker ridges formed by meltwater rivers under or immediately proximal to ice sheets. Their pattern reflects the fact that the ice sheet comprised two ice domes which merged at the latitude of Kilbeggan, with the meltwaters from both domes meeting here. Indeed some of the eskers shown, part of Eiscir Riada, marked an ancient boundary between two halves of Ireland, Leath Choinn to the north and Leath Mhogha to the south. These ridges are dominant features of the midland landscape, they formed a critical part of its communications network over thousands of years and remain an important component of our natural heritage. Of course their sands and gravels are also important sources of aggregate which support construction and road building.

During 2005 Quaternary mapping on a 1:50,000 scale was completed in eastern County Westmeath and County Louth in a project jointly funded by Kilsaran Concrete Products Ltd and GSI. In addition the digitizing of archival Quaternary geological data, albeit of poor quality, for 50% of County Tipperary was completed at the year end. A number of successful mapping projects were completed in recent times in East Leinster (Counties Carlow, Kildare, Offaly, Westmeath and Wicklow) and a programme of 80 boreholes was undertaken to facilitate production of a seamless regional map (through filling small gaps and reconciling boundaries)



*Sheet 48, 1:50,000 scale GSI Quaternary Geology Map.

GSI seeks to raise awareness with the general public concerning its mission and the value of its services to society. Increasing contact is being made with GSI over the Internet, as illustrated by these figures for visits (not hits) to the GSI websites:

	2005	2004	% Increase
gsi.ie	225,004	137,182	64%
webmapping	32,868	18,879	74%
gsiseabed.ie	28,811	18,988	52%
Total	**286,683**	**175,049**	**64%**

Overall figures for 2005 show a 64% increase over 2004. A deeper level of interaction is represented by the Webmapping domain where systematic map sets for many counties are becoming available. This domain has visitors to groundwater, general and seabed themes in the ratio 6:3:1. The number of digital licences issued in 2005 was 89 (73 in 2004). In addition new data agreements were concluded with six third level institutes in UK and Ireland.

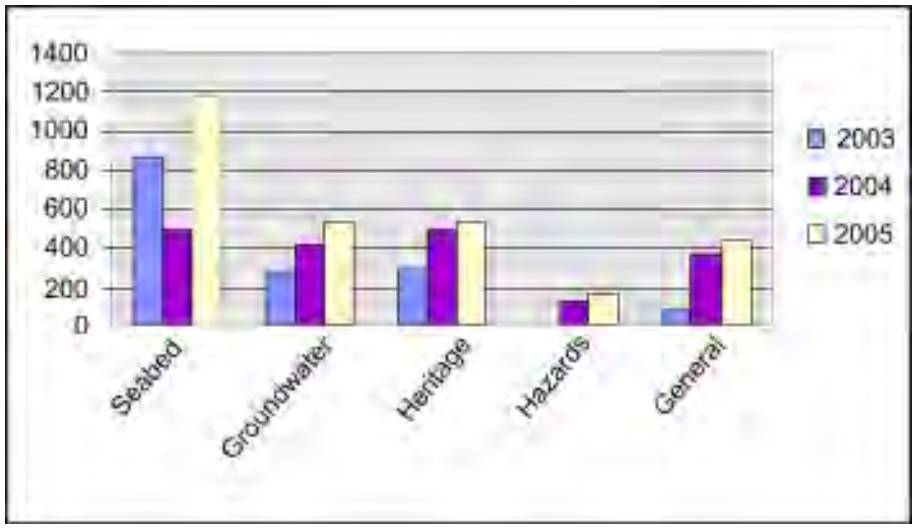
Queries from the public via phone, fax, mail or personal callers has remained steady in recent years, although there are differences in detail. Heritage, Seabed and Quaternary experienced increases, while Bedrock decreased slightly: Groundwater enquiries remained an order of magnitude above other areas.

	2005	2004
Customer Centre	1524	1492
Groundwater	1543	1629
Minerals	158	154
Heritage	251	150
Seabed	253	224
Quaternary	175	159
Geotechnical	143	136
Information Management	122	112
Bedrock	53	77
Total:	**4240**	**4133**

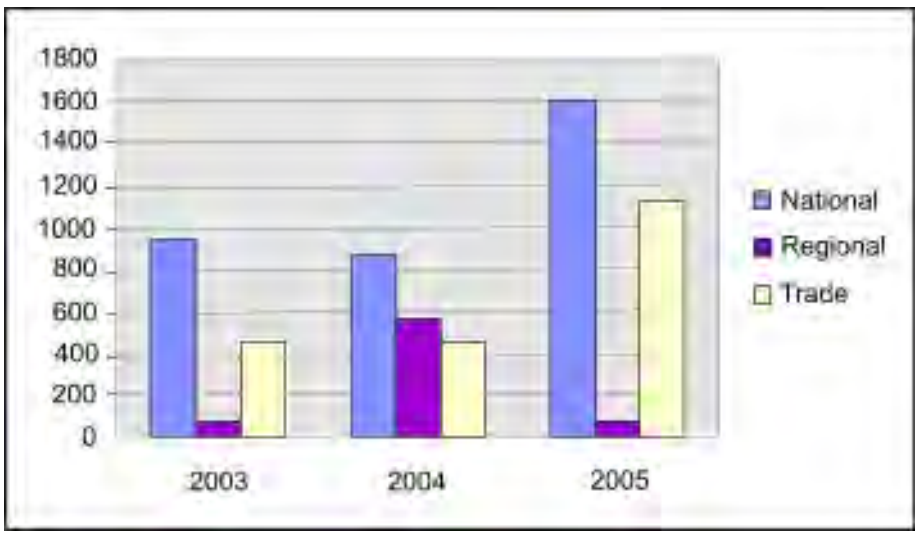
Progress on the work of GSI is included in the regular issues of its newsletter, *Geology Matters*. In order to receive regular copies please contact gsisales@gsi.ie or the GSI Customer Centre.

"GSI activities featured in the news media regularly in 2005"

The breakdown of print media coverage of GSI activities for 2005 can be summarized as follows (measured in column centimetres)



There has been a considerable increase in print media coverage in recent years, with an 80% increase in 2005 over 2003. This is reflected in increases for each of the programmes or categories measured. The national media have tended to be dominant and the typical 2:1 ratio of national:trade in earlier years dropped to 1.5:1 in 2005. Regional media have not been significant, except in 2004 when anomalously they represented 30% of total coverage.



GSI activities featured in the news media regularly in 2005. Some highlights can be mentioned. In May, the occasion of the Dublin portcall by the drill ship JOIDES Resolution (see "Ireland's Coral Treasures") was covered by TV, radio and newspapers. In July-August the geotourism project on Waterford's Copper Coast and mining heritage projects at Allihies, County Cork, featured on TV and in newspapers. In November the Irish Times issued a special supplement entitled Ireland Offshore with an accompanying poster and the Irish National Seabed Survey featured prominently in both. They were heralded by a front page masthead and by regular advertising beforehand.

Training Services

Ireland requires access to the necessary skills capacity to ensure that its pace of development can be sustained and appropriate support provided to its knowledge economy. As far as geoscience is concerned it would not be practical for GSI itself to seek to discharge this function. Therefore it seeks to provide selected training services for targeted groups. For example, two further offerings were presented on the FAS on-site wastewater treatment course, attended by 120 participants. This rigorous course also involves the EPA and runs over several days, including field modules, followed by submission of project work which is examined at interviews. Almost 500 have now completed this valuable course and local authorities in assessing relevant planning applications look increasingly for this qualification in applicants' representatives.

GSI and Quester Tangent Corporation of Canada ran a successful training workshop on seabed classification for 25 Irish and overseas participants. Seabed classification enables the production of a group of added-value products from multibeam bathymetry data. Later in the year an international course on medical geology was hosted by GSI, the first of its kind held in Ireland. Medical geology is the science of dealing with the relation between natural geological factors and health in humans and animals. It considers many major controlling factors on health, such as the nature and quality of our diet, water and air. This brought together a range of environmental, public health and geoscience professionals to discuss the impact of physical environment on our health. Further developments are foreseen in this key area.

In a new development GSI cooperated and partcipated with educational interests in the development and delivery of practical geological inputs to in-service training for teachers on the new Leaving Certificate geography curriculum. This revised curriculum has an increased emphasis on physical geography and there are many geological themes. The training was delivered by GSI staff to 20 geography teachers as a pilot scheme through the Blackrock Education Centre and plans are being made to repeat and extend its delivery in 2006.

A Challenge to Rural Communities

In a review of tourism during 2005, Failte Ireland reported the good news that visitor numbers, which have increased steadily over the past 20 years, had risen to 6.7 million with enhanced total earnings of €5.3 billion. While urban areas acknowledged this gratefully, the downside was that visitor numbers to rural areas continued to decline. As Irish tourism becomes increasingly an urban phenomenon, participation in hill walking, for example, as a percentage of total visitors has almost halved in the last decade. Rural-based activity holidays have dropped generally, thus impacting negatively on the very areas where tourism could have greater economic importance.

GSI, along with its partner, the Geological Survey of Northern Ireland (GSNI), has long had the objective of developing rural-based tourism through the development of projects featuring landscape appreciation. The beauty of our countryside always ranks highly on any list of Ireland's visitor attractions. So the challenge is how to generate real economic benefits from it in a sustainable manner for rural communities. Beauty in itself will provide little sustenance!

GSI has been involved in three recent community-based landscape geotourism projects, all designed to stimulate real economic benefits and supported by European funding programmes. The Breifne Mountains project, a Cross-Border initiative involving relevant local authorities of counties Cavan, Leitrim, Sligo, Roscommon and Fermanagh was funded by the Peace-2 Programme and achieved its objective of creating a significant tourism profile for the region based on its cultural and natural heritage resources. The project, which suffered early delays, has been extended into 2006 to ensure the successful delivery of all scheduled products.

In the southeast of the country the projects created around the Copper Coast European Geopark progressed during 2005 and are due to be completed in 2006. Here also a full range of products is envisaged including signage and onsite interpretation, conservation of the iconic Tankardstown Engine House, and educational and outreach activities.

In 2005 EUROPAMINES, the European Mine Heritage Network, was established with Culture 2000 support. This network, with 17 corporate members, created a range of informative products, including books, various pamphlets and a multilingual website (www.europamines.com). GSI is the Irish contact for this network. More generally, GSI is available to talk to communities who are contemplating the development of landscape-based projects. Why not visit our project websites (www.coppercoast.ie and www.breifne.ie) to discover what is possible?

On the global stage, geoscience has reached a critical point. It has suffered serious decline in the past 20 years in terms of level of participation and funding. The focus of its work has changed from the extractive industries to environmental issues. Nevertheless, public reaction continues to associate geoscience only with exploitation of the Earth's wealth and its image tends to be negative. A key decision at the end of 2005 is intended to have a positive and radical impact on this situation. This was the UN General Assembly resolution to designate 2008 as the International Year of Planet Earth. This event will actually span the years 2007-2009 and will constitute a concerted global effort to attract strong international attention to the value of geoscience for society and its well-being. GSI will join with the Royal Irish Academy and other partners to ensure that Ireland is fully represented in this process.

GSI does not seek work overseas. With limited resources, it is seriously challenged to meet national objectives in the sectors it serves. Nevertheless international cooperation is important for GSI to ensure it is observing best practice and therefore providing the best possible services to its customers and stakeholders, given the extent of its resources.

"...international cooperation...(ensures GSI is) ...providing the best possible services..."

GSI continues to cooperate successfully with the Geological Survey of Northern Ireland. We have jointly managed a number of projects over the past decade, mainly in the areas of landscape tourism and mineral resources. At present we are partners in the Cross-Border Breifne Mountains project, which has been extended into 2006, as well as in River Basin District projects. Staff from Groundwater Section participated in EU Working Groups on the Water Framework Directive (WFD) and Groundwater Daughter Directive. They also participated in North-South and UK fora related to WFD.

GSI is an active member of Eurogeosurveys, the association of European geological surveys. During 2005 it participated with the European institutions in the development of policies in areas such as the sustainable management of earth resources, the provision of real-time environmental monitoring (through GMES) and development cooperation. GSI was involved through regular meetings of Directors and Contact Points as well as a number of specialist events. These provided GSI with opportunities to organise joint projects and to share knowledge between staff.

The North Atlantic Minerals Symposium is a biennial meeting organised under the Memorandum of Understanding between the Government of Ireland and the Government of Newfoundland and Labrador. It is designed to stimulate mining on both sides of the Atlantic and to create learning and investment opportunities in the minerals sector. In 2005 it was held in Nova Scotia where a GSI delegation participated fully in the proceedings. GSI is also cooperating with Newfoundland on the Atlantic Partners initiative (see "Supporting a knowledge-based economy") and is represented on the Board of the Ireland Newfoundland Partnership. Another minerals sector event, the annual Prospectors and Developers Association of Canada Convention in Toronto, is key to promoting Ireland's prospectivity and GSI cooperated with the Exploration and Mining Division of our parent Department and with GSNI.

GSI hosted visitors from a wide range of countries in 2005, including Bosnia-Herzegovina, Canada, Lesotho, Netherlands, Norway, Russia, South Africa, Spain, United Kingdom and United States. These are valuable occasions for exchanges of information and experience, and in some instances memoranda of understanding have either resulted or are being contemplated in order to formalise and deepen cooperation. A wide range of themes were explored. The FEMME Conference, a user forum for customers of Kongsberg Simrad, brought 250 participants to Dublin, attracted by the success of the Irish National Seabed Survey.

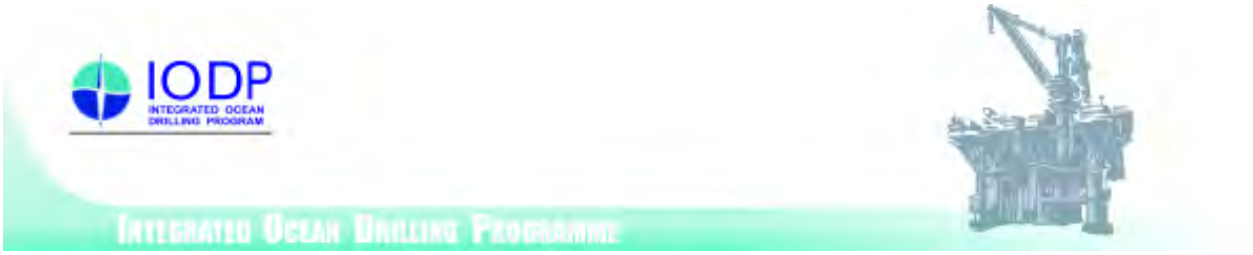
The Environmental Pulse of Europe

It was the Chernobyl accident in 1986 that finally convinced Europeans that their continent was a single environmental entity just as truly as it consisted of a set of mutually independent jurisdictions. Of course the major rivers and coastlines of Europe traversed many national boundaries, so that environmental management in any one country could have impacts in several others. But there were no reliable data, especially on toxic elements, available across Europe to evaluate the current environment or detect the impact on it of future events.

Over the past decade the geological survey organisations of 26 European countries, including Ireland, have addressed this situation by co-coordinating a widely-spaced geochemical survey across Europe, sampling multiple media in a standardised manner. Under the auspices of Eurogeosurveys (and its predecessor organisations), a sampling programme was completed in 2001 and since then the analysis of samples and processing of results have been achieved. In June 2005 the first volume of the Geochemical Atlas of Europe* was published, comprising 354 geochemical maps, background information and methodology. It contains geochemical baseline data across Europe for more than 50 chemical elements, including all bio-essential and most toxic elements. The project will be completed in 2006 with the publication of Part 2 of the Atlas which will consist of data interpretation with additional maps, diagrams and tables. The Atlas can be visited at http://www.gsf.fi/publ/foregsatlas/ and hard copies of volume 1 can be obtained from the GSI Customer Centre.

The Geochemical Atlas of Europe will provide decision-makers at national and regional level, environmental agencies and the general public with important baseline information on the state of Europe's environment. The experience gained in its preparation will be used for the efficient planning of global initiatives and also to promote the methodology for developing low-cost environmental baseline data in third world countries.

*Salminen, R. (Chief Editor) and others (including O'Connor, P.J) 2005. Geochemical Atlas of Europe. Part 1: Background information, methodology and maps. Geological Survey Finland. 526pp.



Ireland's Coral Treasures

In May the Minister for Communications, Marine and Natural Resources, Mr Noel Dempsey TD, announced Ireland's affiliation through GSI to the Integrated Ocean Drilling Program (IODP). This welcome development will provide access for scientists at Irish Institutions to world class geoscience. Not only are there opportunities to sail on specific drilling cruises, but access is facilitated to an enormous databank of samples and data, as well as to scientific networks with unrivalled knowledge.

The Minister's announcement coincided with a port call to Dublin by the drill ship JOIDES **Resolution,** a spectacular sight in itself and capable of drilling significant depths beneath even the deepest ocean floor. The drill ship was on its way to the Porcupine Seabight, off Ireland's west coast, to carry out a fascinating study. In the past decade a series of cold water coral mounds have been mapped at the edge of our continental margin. The task of the **Resolution,** sailing with a full complement of scientific skills (including one scientist each from University College Cork and GSI), was to drill through such mounds. It achieved its scientific objectives and the project team is now analysing the history of this wonderful heritage, and how and when it started to develop.* The results will shed new light on the course of our climate change over a period of thousands of years.

* Anon 2005. Integrated Ocean Drilling Program (IODP) scientific drilling of a modern carbonate mound in the Porcupine Seabight. Seminar Proceedings. Geological Survey of Ireland. 24pp.

As a division of the Department of Communications, Marine and Natural Resources, GSI seeks to nurture an organisational culture that emphasises core values such as integrity, impartiality and equality. Staff are developed and encouraged to perform effectively and provide a quality service for the benefit of our customers and stakeholders.

The Government's Performance Management and Development System (PMDS) is an important resource to ensure that the GSI Business Plan is effectively implemented while at the same time staff are fully empowered. All of our permanent staff participate in PMDS, while both permanent and contract staff are comprehended by the Partnership Committee which, among many agenda items, evaluated the Department's progress on key performance indicators under Sustaining Progress, the national partnership agreement. At the same time the GSI Partnership Committee focused on issues of specific relevance to GSI, with staff participation around 20%. A self-organised group of staff participated in Geosports 2005 in the Netherlands and while they brought no trophy home on this occasion, they gave a good account of themselves and enriched their network of contacts in other European geological surveys.

"Staff are developed and encouraged to perform effectively and provide a quality service"

Each year GSI hosts the Cunningham Awards which have a two-fold purpose. Two prizes are awarded for the best undergraduate geological mapping projects and in December 2005 were awarded to Eleanor Donoghue of Trinity College Dublin and Eoin MacCraith of University College Dublin. The two prizes awarded to staff members for significant contributions to the work and development of GSI went to Margaret Nolan and John Dooley.

During 2005 there was a significant turnover in both permanent and contract staff and due to changes in contractual arrangements, there was a considerable fall in the number of contract staff.

The following staff joined or returned to GSI in 2005: John Dalton, Paula Gormley, Taly Hunter Williams, Gordon Poole and Joseph Whelan. The following staff left GSI in 2005: Brian Carroll, Petra Coffey, Christine Colgan, Jane Coll, Rodger Connell, John Dalton, Laurence Dempsey, Fiona Dunne, Scott Engering, Paddy Fitzsimons, Lorraine Gallagher, Vincent Gallagher, Michael Geoghegan, Jim Graham, Kathryn Hill, Ralph Horne, David Ivers, Siobhan McLaughlin, Oisín O'Briain, Matthew Parkes, Gordon Poole, Niamh Redmond, Aaron Sheehan-Clarke and Joseph Whelan. Of these, Ralph Horne (Assistant Director) and David Ivers (Librarian) were long-standing members of staff who will be known to many customers. Following internal competition, Pat O'Connor was appointed Assisstant Director and both Eibhlin Doyle and Koen Verbruggen were appointed Principal Geologists.

Dr Ralph Horne graduated in geology in Aberdeen and subsequently gained a PhD at Birmingham based on his Antarctic research. He joined GSI in 1969 and spent several years mapping bedrock geology in southwest Ireland, followed by a period with responsibility for technical aspects of mining and

mineral exploration. He had been Assistant Director since 1981, having significant impact on the evolution of GSI through the management of its finances, operations and support services. We wish Ralph and his family a long and fulfilling retirement.

Staff training is important to ensure that GSI has the capability to meet the needs and expectations of its customers and stakeholders. With the support of the Department's staff development unit, significant investment was made in training GSI staff. IT and information management skills remained important, with a large proportion of staff either completing the European Computer Driving Licence (ECDL) or engaging in other relevant courses. Staff also attended a range of specialised technical and professional courses. All training is linked to developmental objectives agreed in PMDS. In recent years training costs have been close to 4% of salary costs, the target set by the Civil Service.

Good performance requires support

GSI provides a wide spectrum of services to a variety of national sectors and this is possible only because of the commitment to the various programmes of its support services, under the management of the Assistant Director. Many examples of this commitment appear in the pages of this report and each service is given specific recognition here.

Technical Service supervises the drilling programme (whose results are reported elsewhere in this report). It manages the core store in Sandyford Industrial Estate which acquired 960 additional trays of core and which was visited by customers on 15 occasions. GSI laboratories undertook the necessary petrographic work for a range of projects. Technical service also managed the lecture theatre (used on 179 occasions) and the vehicle fleet - with two new vehicles its average age at year-end was 5.3 years.

The Information Management and IT Section, in conjunction with the Information Systems Division of our parent department, supports a wide range of activities across GSI, including systems development. A continuing concern is the development of a new database architecture through Oracle upskilling.

Cartography Section works increasingly more closely with other services in the delivery of integrated support to all GSI programmes and indeed other parts of the Department. Typical GSI products are more likely to be digital now and Cartography Section staff participate fully in their development and delivery, while they still prepare display materials in hard copy for exhibitions, conferences and the like. For the first time staff participated in QC activity in offshore surveying associated with the Irish National Seabed Survey.

The Administration Service discharges key roles in relation to finance, staffing, accommodation and customer services. It undertakes these functions in cooperation with the Finance, Internal Audit, HR and Corporate Services Divisions of the Department. The service operates the GSI Customer Centre which markets GSI products and provides a one-stop shop for customers, ensuring enquirers receive comprehensive and timely information.

Need more Information?

If you require more information on the work of GSI or think we may be able to assist you to find solutions to problems, do not hesitate to contact us. Geology Matters, the regular GSI newsletter, is available on our website or by contacting gsisales@gsi.ie or the Customer Centre. There is also additional information on www.gsi.ie about many facets of our activities, including an appendix to this Annual Report which covers the committees and working groups which have assisted GSI over the past year. It is a pleasure to acknowledge the contributions of all participants.

The website also contains details of the national and international representation undertaken by GSI staff, their participation in societies and working groups, details of all publications, presentations and field trips led by GSI staff, as well as overseas meetings attended.

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The GSI Customer Centre answers public queries and provides access to databases and individual programmes. We recommend that you contact the Centre unless you have already established contacts in GSI. A brochure outlining services and prices is available from the GSI Customer Centre.

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Additional information on the following website:www.ecord.org

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