Newsletter
July – Sept 2008
Issue No. 19

Geological Storage of Carbon Dioxide for all-island Ireland

CSA Group, with partners Byrne Ó'Cléirigh, British Geological Survey (BGS) and Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC, Australia), recently completed an assessment of the potential for geological storage of carbon dioxide (CO_2) for the island of Ireland. The study was commissioned by Sustainable Energy Ireland and the Environmental Protection Agency, with technical direction provided by the Geological Survey of Northern Ireland, the Geological Survey of Ireland and Petroleum Affairs Division of the Department of Natural Resources, Energy and Communications.

The study acquired all available geological data, which were compiled to GIS to provide a preliminary assessment of likely storage basins and structures, both onshore and offshore the island of Ireland. This was followed by in-depth geological assessment of each identified structure/ basin, to quantify potential for storage of CO_2. However, the paucity of deep geological data for many basins, particularly the offshore western basins, is the over-riding constraint to a fully completed geological assessment of storage potential.

To quantify the geological CO_2 storage capacity, the study employed the techno-economic resource pyramid recommended by the international Carbon Sequestration Leadership Forum (2007), which categorises succeeding levels of confidence in safe storage structures. Due to the geological data limitations, only theoretical, effective and limited practical capacities can be calculated. To move these estimates to a higher degree of containment certainty would require further geological and engineering studies for each individual structure. Following completion of a basin-by-basin assessment, the team estimated that the island has a total storage capacity of **93,115 Mt**, which storage volume may be subdivided as follows:

- **Theoretical Capacity: 88,115 Mt**
- **Effective/ Practical Capacity 3,500 Mt**
- **Practical Capacity 1,500 Mt**

If the higher confidence Effective/ Practical capacities can be proven up, then the island of Ireland could significantly reduce its contribution to atmospheric carbon emissions and become a small but significant contributor to mitigation of climate change.

Early opportunities for CO_2 storage include the Kinsale Head field which is approaching the end of its productive life. Saline aquifers offer a huge long term potential, subject to detailed future geological assessment. A number of sites are proposed for geological storage of CO_2, each of which was risk assessed, indicating that:

- The **Kinsale deplet(ing) gas field,** with **330 Mt** of effective storage capacity, could provide a sink for Moneypoint and Cork power stations theoretically for 50 years.
- The **Portpatrick saline aquifer** (closed structures) with **37 Mt** of effective storage capacity and a further **2200 Mt** of theoretical storage capacity, could service Kilroot power station theoretically for 10 years in the closed structures or for 58 years if 10% of the theoretical storage capacity were proven up.
- The study found that the Carboniferous sandstones of the **Clare Basin** are too shallow to be a viable storage reservoir for CO_2, although potential may exist in the deeper parts of the basin.
- Saline aquifer storage in e.g. the **Peel Basin** (68,000 Mt theoretical) and other offshore basins could offer enormous storage capacity, but will require significant and costly proving up and to do so.
- The **East Irish Sea Basin** may offer a very significant sink (**1060 Mt** effective/practical capacity in depleted gas reservoirs), but would require a collaborative approach with the UK Government.

Characterisation of point source emissions allowed scenarios to be developed between the major CO_2 point sources and the most promising geological storage sites. This allowed transport, engineering specifications and costs to be addressed as well as consideration of safety and environmental issues. Nine capture, transport and storage scenarios were modelled and subjected to rigorous economic assessment. Additionally, an assessment of the all-island energy policy environment, energy security and the power generation mix underpinned the economic analysis of the most suitable technologies to capture, transport and sequester CO_2, taking cognisance of the likely price of carbon to 2020 and beyond.

Dr Deirdre Lewis,
CSA Group
Note: CSA has recently merged with SLR Consulting
For further info: **dlewis@slrconsulting.com**

Flagstaff Declaration

The 3rd Annual International Professional Geologic Conference was held in Flagstaff, Arizona on September 20-24, 2008. The conference theme was '***Changing Waterscapes and Water Ethics for the 21st Century and Global Geoscience Practice, Standards, Ethics, and Accountability'.***

Gareth Jones, former IGI and EFG President, represented the IGI at the 3rd Professional Geological Conference in Flagstaff, Arizona and the 45th Annual Meeting of the AIPG Recognition on September 20-24, 2008 '*Changing Waterscapes and Water Ethics for the 21st Century and Global Geoscience Practice, Standards, Ethics, and Accountability'.* Gareth co-authored and presented on the Geotrainet Project, Geothermal Energy in Europe and Professional Qualifications as Passports.

Gareth was also a signatory to the 'Flagstaff declaration on International Co-operation' between the IGI, EFG, American Institute of Professional Geologists (AIPG), Canadian Council of Professional Geoscientists (CCPG), the Ilustre Colegio Oficial de Geologos (ICOG-Spain) and the Geological Society London. The declaration, shown below, is a commitment to establish a global framework of improved co-operation on professional ethics, conduct and standards.

From left to right: Gareth Jones (IGI); Bruce Boster (CCPG), Manuel Regueiro (EFG and ICOG); Luis Swarez (EFG and ICOG), Dan St Germain (AIPG). (Edmund Nickless, Geol Soc absent).

FLAGSTAFF DECLARATION

WE

The Presidents and/or representatives of the American Institute of Professional Geologists (AIPG) the European Federation of Geologists (EFG) the Canadian Council of Professional Geoscientists (CCPG) the Institute of Geologists of Ireland (IGI), the Geological Society of London (GS) and the Ilustre Colegio Oficial de Geólogos (ICOG), during the 3rd International Professional Geology Conference held in Flagstaff (Arizona),

AGREE

To nominate a group of representatives to work together to establish a global framework for improved cooperation on issues including, but not restricted to:

- Fostering high standards of professionalism among geosciences practitioners for the greater benefit to society
- Harmonizing codes of ethics and their enforcement
- Sharing professional and technical expertise among geoscientific organizations and enhancing continuing professional development of geoscientists internationally
- Representing the importance of geosciences and geoscientists in international organizations such as UN, UNESCO, ICSU, IUGS, IUGG, and promoting international policies on matters such as natural hazards, land-use planning and the sustainable use of natural resources
- Promoting, encouraging and applying geoscientific knowledge worldwide, for example in sustainable development, natural disaster mitigation and recovery, and the use of natural resources
- Raising the profile of the geosciences and geoscientists in society by disseminating geological knowledge and its application at all levels
- Promoting geoscientific awareness and education for citizens at all levels

Signed in Flagstaff on the 23th of September of 2008

Dan St. Germain, CPG
President AIPG

Manuel Regueiro, EurGeo
President EFG

Bruce Broster, PGeo
President CCPG

Gareth Jones, EurGeo
Representative IGI

Luis Suárez, EurGeo
President ICOG

Edmund Nickless, CGeo
Representative GS

Professional Recognition

The EU Directive on the Recognition of Professional Qualifications (2005/36/EC) was transposed into Irish Law on May 6th, 2008 under Irish Statutory Instrument (SI) 139 of 2008. Geology is *not* a Regulated Profession under the Statute. This arises as the profession of geology has no legal, regulatory or administrative recognition here, nor is it likely that this position will change in the near future.

The Department of Education and Science is the Irish National Contact Point and the Designated National Coordinator for the implementation of Dir. 2005/36. The IGI will make contact with the person(s) responsible for managing applications to work as geologists in Ireland so that the IGI can provide guidance and assistance to those wishing to work here as professional geologists.

IGI are currently endeavouring to ascertain how the Directive 2005/36/EC is being implemented across the EU and how the Directive applies to geologists moving from countries where geology is not a regulated profession to countries where it is.

IGI Extraordinary General Meeting

The IGI wish to notify its members of an **Extraordinary General Meeting** of the IGI to be held at the Geological Survey of Ireland on **26th November 2008 from 6 to 7 pm**. The purpose of the meeting is to set the Annual Subscription rates for 2009 and to amend Articles 13 and 17 of the Articles of Association. Notification of the EGM and the related documents will be forwarded to the membership shortly.

Aurora Borealis European Polar Research

A recent seminar held at the Geological Survey of Ireland introduced the Aurora Borealis Polar Research Project. Research in polar regions can only be undertaken by sophisticated research vessels capable of penetrating into the central Arctic. To that end, €4.5 million has been allocated to the European Research Icebreaker Consortium to construct the most advanced polar research vessel in the world. To be named *Aurora Borealis*, and with a construction phase announced for 2012-13, the circa 630 million Euro vessel will allow the deployment of long, international and interdisciplinary expeditions into the central Arctic Ocean, and eventually also the Southern Ocean, during all seasons of the year. The *Aurora Borealis* will be the first and only deep-sea drilling platform able to operate autonomously in frozen oceans, and thus to retrieve sedimentary palaeoclimatic records from regions of the sea-floor that were previously inaccessible. With the ability to manoeuvre and break sea ice both forward, backward and laterally in order to stay in position during drilling operation, the vessel will be equipped with a deep drilling rig able to sample the ocean floor in up to 5000 metres of water and 1000 metre penetration.

This drilling capacity will enable European and other international researchers to map the geological and palaeoenvirnomental histories of the Arctic Ocean, and thus to evaluate and help resolve the scientific debate about which profound changes in the Arctic are due to natural fluctuations and which ones are due to human activity. In addition, *Aurora Borealis* will also serve the general polar research community by providing a year-round field and marine platform to facilitate a wide spectrum of scientific investigations relating to marine ecosystems, currents and sea-ice/atmosphere interaction.

The consortium of 16 national institutions, funding agencies and companies from ten European countries will be coordinated by the European Science Foundation. The engagement of the European Science community is to be further promoted through workshops organized in different countries in order to discuss science plans and technical requirements.

Recent IGI Courses – feedback

Report Writing and Expert Witness Course

The IGI ***Report Writing and Expert Witness*** course was held on September 3rd in Bewley's Hotel in Leopardstown, Dublin and attracted 25 attendees. Bruce Misstear of Trinity College lectured on Best Practice in the preparation and writing of technical reports. Kevin Cullen, IGI, lectured on his experience of giving expert witness evidence in different official forums such as planning and licensing Oral Hearings and in Courts of Law.

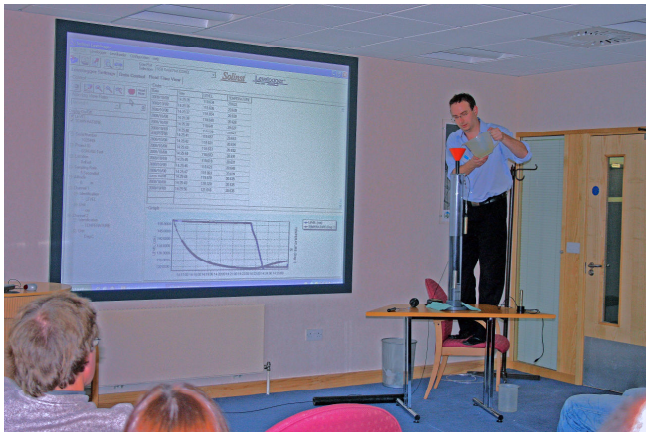
In addition to the hand-outs accompanying the lectures each participant was given a Certificate of Attendance and asked to complete a Course

Evaluation Record. An analysis of the Evaluation Records showed that 91% of those attending the course scored the course content and delivery as Very Good to Excellent, which was a great return on the organisation of the day by Susan Pyne from the IGI Office and the delivery of the course by the two lecturers

Collection, Interpretation and Use of Groundwater Level Data for Assessing Hydrogeological Settings

An IGI Course on the ***Collection, Interpretation and Use of Groundwater Level Data for Assessing Hydrogeological Settings*** was held at the offices of the Geological Survey of Northern Ireland on October 8th. The course was attended by 14 representatives of the wider geoscience community across Northern Ireland and included a series of lectures in the morning followed by a practical logger demonstration and workshop in the afternoon. The IGI wishes to thank the Director of the GSNI, Garth Earls, for the invitation to hold the course in Belfast and Peter McConvey also of the GSNI for lecturing and making the arrangements for the day.

Again the attendees evaluated the content of the course very highly with over 90% rating it as very good to excellent.



Chris Ball, Waterra UK Ltd. carrying out the logger practical.

IGI 10 Year Celebrations

The IGI 10th Anniversary celebrations are being planned for 15th May 2009 in Dublin Castle. The celebrations will coincide with the hosting by the IGI of the EFG Summer Council Meeting on the 16th and 17th May.

The proposed programme starts with a jointly supported IGI/EFG/CRIRSCO/IAEG and Geol Soc Mineral Resource and Reserve Reporting Workshop to be held in Dublin Castle. The workshop, which will be opened by Mr. Eamonn Ryan, Minister for Communications, Energy and Natural Resources, will consider the consistency among the different resource reporting standards that are used in the mineral sector throughout the world. The workshop will also hear how the petroleum industry addresses the issue of reserve reporting and how resource reporting might be applied in the aggregate industry.

The initial flyer will issue shortly. Following the workshop, a reception will be held in Dublin Castle to welcome the EFG delegates, celebrate the IGI 10th Anniversary and to present an IGI Medal of Honour.

IAH News

Cuilcagh Mountain hydrogeology and Marble Arch Geopark.

On the weekend of the 27th/28th September the IAH (Irish Group) headed in the direction of Enniskillen for their annual fieldtrip. Just over 30 people made it for some or all of the trip and the group struck it lucky with some very reasonable weather.

First stop was in County Cavan at Annagh Wood where **Paul Johnston** from Trinity College gave an overview of the hydrogeological setting of this Bog Woodland site adjacent to Annagh Lough. A new road upgrade scheme for the N3 is proposed to run through part of the designated (Special Area of Conservation) area. Deep, narrow, peat-filled valleys between drumlins form arms of the wetland. The new road scheme will bridge one of these valleys but the likely impact of the scheme on the hydrogeological functioning of the wetland, both during and after construction, is of abiding concern.

The group headed north to the Oona Water catchment in Co Tyrone where **Dr Phil Jordan** from University of Ulster gave a summary of the research undertaken to date on hydrological processes and surface water quality in a small scale Catchment Hydrology and Sustainable Management (CHASM) project. Phil demonstrated the use of a bankside continuous water sampler installed on one of the rivers, where water samples are collected and analysed for a number of parameters including phosphorus at 10 minute intervals. This very detailed dataset has allowed some local catchment processes to be identified for the first

time which are not normally observable with a traditional (much less frequent) manual water sampling programme.

The final stop on Saturday took us to a quarry on the north shore of Lower Lough Erne. The quarry is extracting dolerite from a relatively wide dyke running through the Carboniferous Mudstone country rock. An extension is proposed and an investigation on the implications for local groundwater levels and restoration options is underway. **David McLorinan** from Mclorinan Consulting Ltd, who are undertaking the assessment, presented details of pump testing carried out at the site and there was a discussion on some of the unusual water level responses seen in this relatively uncommon hydrogeological setting.

David McLorinan presenting an overview of the quarry situated within a large dolerite dyke

Following refreshments in Enniskillen on the Saturday night, the group were greeted with a fine sunny and crisp autumnal morning. First visit was to the only turloughs (groundwater-fed seasonal lakes) in Northern Ireland at Fardrum and Roosky just to north-west of Enniskillen. Here **Dr Les Brown** from SLR Ireland gave an excellent overview of the detailed monitoring and interpretation of water level data he has been involved with, as part of an assessment of the impact of an adjacent quarry on the turloughs. From there the group made the short trip to the last stop at Marble Arch Caves where Les lead the group into the cave system and described the origin of the karst drainage and discharge features and local geological controls on karst development.

Peter McConvey, GSNI
IAH Fieldtrip Secretary

IAH Technical Discussion Meeting: Quarries and Groundwater

The IAH Technical Discussion Meetings resumed for the autumn on 8th October 2008 on the topic of Quarries and Groundwater. Fionnuala Collins, Vice-President of the IGI gave an overview of the Template for the recommended geological and hydrogeological information to accompany planning applications for quarries. Sean Moran, O' Callaghan Moran, continued with Quarry Risk Assessment in the context of the Water Framework Directive. The results of studies to date indicate that impacts are more likely on a surface water and groundwater dependent ecosystem scale rather than groundwater body scale. David Ball spoke about the appropriate scale of investigations required to ensure a full understanding of heterogeneity in aquifers. Shane O Neill spoke about the potential impacts of quarries on groundwater.

The meeting was attended by 60 people including representatives from the quarry managers, consultants, the legal profession, academia and government.

IAH AGM.

The IAH AGM will held on 4th November 2008 and will directly follow the TDM (details below) being held at the GSI. A series of short reports will be presented following which the main item of discussion is the hosting of the 2011 International Association of Hydrogeologists Conference.

OneGeology Initiative Launched

'OneGeology' (www.onegeology.org), a global initiative by national geological surveys to make a dynamic geological map data of the world available via the web, was launched at the **33rd International Geological Congress in Oslo** in August this year. The Geological Survey of Ireland was one of the organisations to have served up both onshore and offshore maps for the launch event. OneGeology is supported by UNESCO and six other international umbrella bodies and is a flagship project of the 'International Year of Planet Earth'. Ninety-Four nations are already involved. The project recognises that different nations have different abilities to participate, and one of the objectives is to transfer know-how to those who need it. Each contributor decides which maps to contribute, and it is anticipated that the majority of contributed maps will be bedrock and/or superficial maps, lithological and/or lithostratigraphical and/or chronostratigraphical where possible. These maps are important in natural resource

development, natural hazard management, the protection of groundwater and landscapes, and for educational purposes.

OneGeology Europe was launched in Rome in September 2008. This is a two year project funded under the *e*Content*plus* progamme. Its goals include delivering interoperable data, making a significant contribution to the progress of INSPIRE and demonstrating best practice examples of the delivery and application of geological spatial data in the public and private sectors.'

Enter the OneGeology Portal: http://portal.onegeology.org.

INFOMAR

Ireland's seabed mapping programme INFOMAR was also highlighted at the Oslo International Geological conference. The mapping programme is one of the most comprehensive of its type and is currently surveying coastal areas which are important for a number of reasons including: establishing renewable energy projects, ensuring shipping lanes are safely charted and supporting aquaculture and WFD initiatives as well as marine spatial planning. INFOMAR is funded from the National Development Plan and managed jointly by the Geological Survey of Ireland (GSI) and the Marine Institute. Surveys are carried out using a range of platforms including the Marine Institute research vessels , the Celtic Explorer and Celtic Voyager, airborne Lidar and contract vessels .

International Year of Planet Earth Events

IYPE Geological Exhibition
Venue: Geological Survey of Irelamd
Date: Permanent Display
Opening Hours: Monday to Friday, 9 to 5pm
Admission: Free

This is a dedicated IYPE exhibition for continuous display in GSI from Heritage Week 2008 onwards. It is primarily panel-based but it also holds a display of Ireland's rocks and other materials such as economic minerals and old maps. A replica exhibition is available for loan for short stint display in libraries, public buildings, museums, heritage centres as requested and available.

For further details please contact Enda Gallagher at enda.gallagher@gsi.ie, 01-678 2834.

Public Lecture
Dr. Pádhraig Kennan will give public lectures in early December in Dublin and Kerry. For details refer Forthcoming Public Lectures below.

For full details of forthcoming IYPE events visit www.planetearth.ie/events

Launch of Geological Heritage Guidelines for the Extractive Industry

Geological Heritage Guidelines for the Extractive Industry will be launched by the Minister of State Mr. Seán Power TD, Dept. of Communication, Energy & Natural Resources, at the Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4, on Thursday, 23rd October 2008.

The guidelines are a joint initiative by the Geological Survey of Ireland and the Irish Concrete Federation,

Forthcoming Public Lectures

Irish Geological Association
"Pioneering Mineral Exploration in Post-Soviet Mongolia: The QGX Story". Patrick Redmond,
Date: 23rd October 2008
Time: Tea/Coffee 19.30; lecture 20.00 hrs.
Venue: GSI, Beggars Bush, Haddington Road, D4
All welcome

IAH Technical Discussion Meetings
"Under down under – recent groundwater management trends in Australia" Jenny Deakin, until recently, Groundwater Section Head, Water Resources Division, Department of Primary Industries and Water, Tasmania

Date: 4th November 2008
Time: Tea/Coffee 17.30; lecture 18.00 hrs.
Venue: GSI, Beggars Bush, Haddington Road, D4

Note the lecture will be followed by the IAH AGM. Further details given above (IAH news)

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"Implementing the WFD – implications for groundwater development and protection"; Matthew Craig and Donal Daly, EPA
Date: 2nd December 2008
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Time: Tea/Coffee 17.30; lecture 18.00 hrs.
Venue: GSI, Beggars Bush, Haddington Road, D4

IYPE Lecture

"Ireland has come a long way in 750 million years". Dr. Pádhraig Kennan
Date: 3rd December 2008
Time: 18.00 hrs.
Venue: Trinity College Dublin, Burke Theatre.
and
Date: 4th December 2008
Time: 20.00 hrs.
Venue: Malton Hotel (formerly the Great Southern), Killarney

Joint Geotechnical Society of Ireland/IAH (Irish Group) Lecture

"Assessing the optimum approach for the design of a dewatering system by back analysis of a major case study"; Dr. Eric R. Farrell, Department of Civil, Structural, and Environmental Engineering, TCD

Venue: Engineers Ireland, 22 Clyde Road, Ballsbridge
Date: 13th January 2009
Time: 8pm

Forthcoming Courses

2-day course: Groundwater Source Protection
The re-run of this 2-day course held in 2007 has been postponed until February 2009. Details will be provided later to the membership and posted to the IGI web site www.igi.ie.

All course Queries to IGI office at 01-7162085 or admin@igi.ie or refer to our website at www.igi.ie.

Forthcoming Conferences

"Geothermal Resources in Ireland - Commercial Opportunities" hosted by the **Geothermal Association of Ireland**
Venue: New Park Hotel, Kilkenny
Date: 5th November 2008
Registration: Laura Steeman, GAI Events Officer
Tel: 086 3095535
Email: info@geothermalassociation.ie
www.geothermalassociation.ie/events/

"Hydrology in Spatial Planning & Development"
The conference will address a wide range of issues relating to hydrology and spatial planning including Water Framework, Floods and Groundwater Directives; CFRAM Studies; Rural Planning - septic tanks, wells, water supply, and groundwater quality; - Flood risk management and spatial planning; Planning authority perspectives on flooding; Urban flood issues.
Date: Tuesday 11 November 2008
Location: Tullamore Court Hotel
Cost: €140 per person (with a student rate of €65), including a CD-ROM of the papers and lunch.
Registration: Oliver Nicholson, OPW, 17-19 Lower Hatch Street, Dublin 2,
Tel: 01 647 6367 **Fax**: 676 6714
Email: oliver.nicholson@opw.ie
Web: www.opw.ie/hydrology

IMQS Dinner Dance

The Irish Mining and Quarrying Society (IMQS) will hold their annual dinner dance at the Crowne Plaza Hotel, Santry on Saturday 29th November 2008.

To help promote the IGI as it enters its Ten Year Anniversary, it is proposed to take a table or tables at the event (subject to availability). This event offers the chance to meet new people, renew old acquaintances and catch up on ***what's new*** in the mining and quarrying sectors, in a relaxed and convivial environment.

Interested parties are asked to contact Susan Pyne at info@igi.ie for availability at the IGI table. If your company wishes to take a table and has not already done so, please get them to contact the IMQS directly at info@imqs.ie. For further details see (www.imqs.ie).

Thanks

Many thanks to all who contributed to this issue of the newsletter. We encourage all members to forward items of news or general interest. Members are also encouraged to submit suitable geological photographs for possible inclusion on the new web pages to Susan Pyne at the IGI Offices: *admin@igi.ie*.