Forget Fracture Networks - How Groundwater Really Flows Through Fractured Hard Rocks

Meeting at British Geological Survey, Keyworth on 18 January 2011

Report by Geoffrey Jago

Our first meeting in 2011 saw East Midland Group hit the BGS floor running when an audience of over fifty listened to newly-elected Group Chairman John Black's clear exposition of the complexities involved in analysing the flow of groundwater through fractured rocks.

Currently Director of the consulting and testing company In Situ Solutions Ltd. of Nottingham, John's many years experience includes that of Senior Scientist with the Institute of Geological Sciences, Principal Scientist with BGS and a Director of Golder Associates. We thank John for supplying the following precis of his presentation.

"Hydrogeology began with porous media. Increased hydrogeological activity associated with nuclear waste disposal has forced the development of understanding groundwater flow in crystalline rocks where porous media are inapplicable. The last couple of decades has seen the evolution of the structurally based 'discrete fracture network' (dfn) model as the accepted approach to understanding such rocks. However, I have come to believe that dfn models fail in many ways to match underground experiments and experience. It seems they are too well connected. I illustrate these failures and inconsistencies with reference to underground experiments in an abandoned iron mine at Stripa in Sweden in the 1980s and 90s.

I have therefore ignored the emphasis on structure and, instead, decided to concentrate on explaining phenomena that are measured hydrogeologically, namely 'skin' and 'compartmentalisation'. In conjunction with John Barker and Nick Woodman of Southampton University, I have developed a concept termed 'sparse channel networks'. Using mathematical analysis to show how ellipses are better than equi-dimensional objects (discs) at intersecting each other at low area-per-volume densities, we go on to show how a lattice network model succeeds in reproducing many of the phenomena measured underground at Stripa. Appropriate model realisations are characterised by very long thin channels that bifurcate only rarely, traversing many fracture intersections without branching.

Thus we conclude that flow in fractured crystalline rocks is by virtue of sparse channel networks. They are characterised in the field by the presence of 'skin', caused by the inability of the flow system to adhere sufficiently closely to imposed boundary conditions during hydraulic and tracer experiments. Their other characteristics are the formation of compartments of head and groundwater chemistry, unstable flowpaths (such that they can swap under measurement) and multiple available but inactive channel pathways.

In general, dfn models produce large scale values of permeability close to the geometric mean of small-scale measurements. Sparse channel networks have large-scale values close to the harmonic mean which in the author's experience of real field tests is usually about an order of magnitude less. It is suggested that this agrees very well with experience in tunnelling. Finally, it is pointed out that one of the Sellafield boreholes drilled and tested by Nirex in the 90s showing compartmentalised behaviour, unmatched by the dfn modelling of the time, but which indicates that the environment is probably 10 times less permeable than believed hitherto.

The talk concluded with the suggestion that most of the deeper geosphere is probably characterised by the presence of sparse channel networks."

John has also supplied fuller details which may be found on pdf files (of 7.5 MB and 3.3MB size respectively) at the following addresses:
www.skb.se/upload/publications/pdf/R-07-35webb.pdf
and www.skb.se/upload/publications/pdf/R-06-30NYwebb.pdf

A speech of thanks for this very interesting presentation was given by Helen Reeves.

East Midland Group Annual General Meeting

This evening's meeting was preceded by our Group's AGM when tribute was paid to Vanessa Banks for her years of energetic and very successful work as leader of our Group. Welcoming John Black as the new chairman, we are pleased that Vanessa remains as a committee member.

The Origin of the Continental Crust - old controversies, new ideas

Meeting at Derby University, 29 March 2011

Report by Geoffrey Jago

Since the inception of the Plume theory in 1971, controversy continues on the subject of how the Earth's continental rocks were formed. Professor Hugh Rollinson, speaking on his home ground at Derby University to a large audience which included many students, identified the two main theories.

Do small quantities of molten rocks from the deep mantle, called plumes, migrate upwards from sites randomly located within a continent? Or are the subduction zones at continental plate boundaries the only areas of formation?

Many geoscientists postulated jets of hot rocks right down to the mantle boundary, although it was later thought that plumes are shallower. However, do mantle plumes exist at all? Are plumes an appropriate mechanism to make continents, or

perhaps they could only have contributed to continental growth in the early days of the earth? Today's Earth has churned its crust so many times that surface exposures of originally deep-seated rocks are not common; but those that exist provide evidence which appears to come down against the case for plumes.

Case studies were described including field research undertaken at the Zimbabwe Craton where an area of upper crust lies next to lower crust. To seek the likely processes whereby the very ancient rocks were formed, rock melting tests were described which have added significantly to our knowledge.

Professor Rollinson has kindly provided the following synopsis:

"Are plumes an appropriate mechanism for Archaean continent creation ?

New Secondary Ion Mass Spectrometry (SIMS) U-Pb zircon data for the Zimbabwe craton shows significant late Archaean crustal growth between 2.75 and 2.6 Ga. In particular at 2.7 Ga magmatism in the middle and lower crust is coincident with voluminous, craton wide basalt and komatiite eruption, preserved in greenstone belts and interpreted as a former large igneous province of inferred plume origin. In detail, however, this episode of crustal growth involved the reworking of, and addition to, an older (3.5Ga) continental nucleus which makes up the core of the Zimbabwe Craton. Other magmatic events during late Archaean crustal growth at 2.74, 2.67, 2.64 and 2.62 Ga cannot be closely linked with a 'plume event', but rather, are tentatively ascribed to continental margin crustal growth at the edge of the old continental nucleus. Hence in the case of the Zimbabwe Craton at 2.7 Ga, the role of plumes in continental growth is ambiguous and may be more closely linked to crustal reworking than the growth of new felsic crust.

Models for the coupling of the Archaean subcontinental lithospheric mantle (SCLM) and Archaean felsic crust have also invoked a plume process. These models are driven by the close association of Archaean felsic crust with SCLM of the same age. They require the unique, highly depleted, composition of the late Archaean SCLM to be the residue of extensive komatiite extraction from the mantle. This model is rejected here in favour of a basalt-extraction model, which better satisfies geological and geochemical constraints. An appropriate tectonic setting for a basalt extraction model for the origin of the Archaean SCLM is at a hot ridge at which thick, dense Fe-rich basaltic crust is produced, underlain by very thick buoyant SCLM, meaning that the Archaean SCLM originated as oceanic lithosphere. The coupling of thick depleted SCLM with continent-growth provides a mechanism for increasing the buoyancy and enhancing the probability of preservation and implies a process whereby the generation of felsic Theoretical Tectonics: Geodynamics (TTG) magmas is closely associated with the creation of oceanic lithosphere. One mechanism which satisfies this process is the production of felsic TTG melts by slab melting in an Archaean subduction zone. Geochemical modelling of the partial melting of thick, Fe-rich tholeiite can produce melts very similar in composition to those found in Archaean felsic crust. These data support the notion of Archaean subduction

tectonics and provide a viable model for the creation of continental crust during the Archaean.

In contrast plume models have difficulty in identifying an appropriate basaltic starting materials for the genesis of felsic crust rendering them less appropriate for explaining the coupled felsic crust – thick depleted SCLM association."

Further reading

- The Great Plumes Debate

Dr. John Black gave a speech of thanks for Professor Rollinson's interesting and fundamentally informative lecture.

Making Sense of Chalk: Engineering Properties and Hydrogeology

Meeting at British Geological Survey, Keyworth, 19 April 2011

Report by Geoffrey Jago

To a casual and distant observer viewing the white cliffs of Albion they appear consistent in character, but those who face the task of constructing a road or digging a tunnel in this rock have proved otherwise to their cost.

At our April meeting we were very happy. to welcome Professor Rory Mortimore and listen to his presentation based on his Glossop Lecture, Number 11. His initial address had been arranged by Engineering Group on 8th December 2010 at the Royal Geographical Society, London, and a report of this meeting is available at www.geolsoc.org.uk/page8086.html.

The chalk in North West Europe extends from Bergen southwards to the Paris Basin. Professor Mortimore explained how problems encountered with this rock had been studied and overcome in a number of projects in the UK including the A27 Brighton Bypass, the Channel Tunnel Rail Link, the Crossrail tunnel beneath London, the A303 Stonehenge Tunnel and the Thames Tideway and Lee Tunnels.

Gathering the Knowledge

Faulting and open fracturing are problems all too commonly facing the civil engineer working with chalk . The importance of obtaining an adequate preliminary appreciation of rock nature by boring, pitting and geophysics, both surface and down-hole, was demonstrated by diagrams comparing cross sections of initial best interpretations with those made after the site investigation logs were complete. Such new information has extended beyond the confines of the job in hand to areas of

wider use and interest, including revisions both of the mapping of the English Chalk and of systems of rock classification.

Solution Hollows

Weathering subjects carbonate rocks to uneven dissolution and, in many places in this cleanest form of limestone, vertical fissures have been widened into solution hollows which become filled with soft material containing flints, presenting a hazard to civil engineers and especially to tunnellers. Road constructors have found that their calculations to balance volumes of cut and fill can be thrown awry because, whereas chalk dug from road cuttings makes a sound embankment, the stuff in solution hollows does not and must be discarded.

Flint

Flints in the chalk are common, both disseminated and in distinct bands. Such bands can be troublesome when, as often happens, they are fulsome aquifers. Small flints do not present major problems but not so the large ones, so work with tunnel boring machines (TBM) calls for a precise stratigraphy of each flint band. In one sewage tunnel scheme a modification to double the number of cutters in the cutting heads was needed to cope with large flints. At a road construction site, the consultants were able to devise a different method of excavation to tackle such inconsistencies.

Stonehenge

Site investigation into the postulated but now withdrawn road tunnel at Stonehenge surprisingly proved a large area of phosphatic chalk which is wet and weaker than the normal rock. Military operations in the surrounding land limit drilling and every category of local information was combed for clues. Bad news to tunnellers, pumping tests proved a whopping underground water source.

Issues and Strategies

Professor Mortimore concluded by giving a number of suggestions for improved future practice which included techniques in instrumentation, drilling, geophysical logging both on surface and down-hole and in the study of variable ground and water regimes. He highlighted a need for closer links with engineering geologists, with universities and industry, increased multi discipline research, greater feedback between pure and applied science and a better appreciation of the significant impact that can be made by apparently insignificant features.

Peter Hopson gave a speech of thanks for this interesting and stimulating evening.

Two lectures: Electrokinetic Geosynthetics and Bank Slope Stabilisation / Dragging Waste Classification into the 21st Century

Meeting at British Geological Survey, Keyworth, 17 May 2011

Report by Geoffrey Jago

Our meeting of May 2011 was a double feature. Firstly Dr. John Lamont-Black of ElectroKinetic Ltd. spoke on how electrical techniques can both stabilise rock slopes and de-water soils and sludges. He was followed by Dr. Ian Bishop of One Touch Data Ltd. who spoke on the importance of method in industrial waste classification.

Electrokinetic Geosynthetics

When water moves through the ground or through materials derived from broken or eroded rock such as sludges there is an electrical element in the process. This can be reversed by inserting arrays of electrodes and applying suitably contrived voltages. The advantages gained by this method are summed up in the following synopsis which Dr. Lamont-Black has supplied:

"The presentation discussed electro osmosis and its physical effects on ground materials. Electrokinetic geosynthetics (EKG) are materials which combine the benefits of electro osmosis with the established functions of geosynthetics. A full scale slope stabilisation project was described and the different components of the EKG slope treatment system examined. These included improvement of the soil strength, reinforcement with electrokinetic soil nails, permanent horizontal drainage and chemically-induced changes in the soil. There are major benefits of the treatment which include a 26% reduction in cost and a 47% reduction in Carbon footprint."

A full account may be read at www.electrokinetic.co.uk/ground_engineering.

Waste Classification

Dr. Bishop explained his company's modern spreadsheet method (see www.hazwasteonline.com) which can furnish an invaluable guide to all those addressing the problems of waste classification. He has kindly supplied the following account:

The waste regulations put the responsibility for classifying waste as either hazardous or non hazardous on the shoulders of the waste producer. However, approximately 80% of waste classifications are actually done by the waste receivers themselves as most waste producers do not have the resources or time to (learn, keep up and) do it themselves in what is really a specialist subject.

For mirror entry type waste streams, receivers accept the chemistry results tabulated on faxes, emails and in pdf documents along with copies of site plans and other supporting material. Sometimes, receivers are sent Waste Acceptance Criteria

(WAC) data with the expectation that these data are suitable for classification. Similar issues are also found for Absolute wastes with low quality or incomplete data being the normal deliverable.

The resource required by a receiver to manually enter all these chemistry results is prohibitive so most assessments are made by scanning the chemistry results and looking for obvious outliers. This "experience" based approach has to be conservative and also explains why producers can get two different classifications for the same analysis.

Where calculations are carried out (by producers, receivers, agents, consultants, hauliers and the EA), most are done through either thousands of custom made spreadsheets, via a spreadsheet-to-web based service (waste soils/EWC chapter 17 only) or manually on paper. There is little or no audit trial, poor transparency, and for spreadsheet based approaches, organisations have to worry about which versions of a spreadsheet their staff may be using or has someone inadvertently deleted a calculation field. On top of all that, someone in each organisation has to keep up with new amendments to the WM2 guidance and the Classification, Regulation and Packaging (CLP) regulation (ATPs) issued by the authorities and expend the resources necessary to update, test and deploy their revised classification tool. (WM2 v2.3 and ATP 2 were published in April which impart significant updates to both the hazard properties, risk phrases and Notes in Table 3.2, Annex VI of the CLP).

The presentation discussed the issues introduced above and from there introduced HazWasteOnline (tm) – a web-based solution that :

- means one organisation keeps up with all the changes, rather than thousands
- means one consistent approach for all classifiers; producers and receivers
- allows users to concentrate on what is in the waste rather than working out how to classify the waste
- records why choices were made, by whom and when
- improves quality, auditability and transparency
- means that all producers can join the game more easily and get immediate results
- creates economic benefits as accurate classification should mean fewer hazardous outcomes and thus a reduction in expensive transportation costs
- is creating an environment for electronic data delivery between users – i.e. data is entered once and then passed to the next party in the supply chain
- creates the outcome of an increasingly greater per centage of correctly classified waste
- provides better risk management for producers and receivers

Dr. Tony Cooper spoke to thank both speakers for an interesting and informative evening.

Tales from the 2011 New Zealand Christchurch Earthquake

Meeting at British Geological Survey, Keyworth on 19 July 2011

Report by Geoffrey Jago

On 19 July, 2011 at British Geological Survey, Keyworth, to an audience of over fifty, David Boon, engineering geologist at BGS and committee member of our Group, recounted his experience of studying the after effects and seismicity of the earthquake which devastated so much of Christchurch last February.

He was one of the EEFIT (Earthquake Engineering Field Investigation) Team, a multidisciplinary group of engineers, scientists and academics, which visited Christchurch soon after the quake.

His vivid report, which leaves little to add here, is available on these pages at: www.geolsoc.org.uk/page9837.html You can also view a video of the earthquake actually happening at: tvnz.co.nz/national-news/cctv-footage-shows-liverpool-st-quake-hits-chch-4-38-video-4097563

David's presentation included many illustrations of the damage. These included an especially graphic video, taken by a security camera, showing the initial violent shaking of cars followed by the collapse in the background of part of a substantial building, thus demonstrating that unreinforced bricks and mortar are no match against a severe shaking and gravity.

With the aid of diagrams David expanded on the reasons why damage had been aggravated by liquefaction of soft deposits and explained the trampoline effect which occurred when the tremors hit alluvial beds.

Dr. Helen Reeves, Head of Science at BGS, made the introduction and gave the speech of thanks.

Shale Gas Exploration in the UK

Meeting at British Geological Survey, Keyworth, on 27 September 2011

Report by Geoffrey Jago

"There's a famous seaside place called Blackpool". The words of Marriott Edgar on the lips of Stanley Holloway once provided enhanced publicity for Blackpool world-wide with the tale of how a local lion made a meal of Albert. Blackpool again hit all the front pages, only a few days prior to our September meeting, as the hitherto largely unsuspected source of husky amounts of potential energy.

So, ever with its ear to the ground (boom boom) for topical subjects, our Group welcomed the very man to give us the low-down on the new Blackpool gas field: Dr. Peter Turner, Director of Exploration of Cuadrilla Resources. Our burgeoning audiences swelled to an even more satisfactory figure of eighty.

Nowadays the public reaction to a new source of indigenous energy (hooray) raises the question of methane and the environment (er, well). On the latter, Dr. Turner explained that his company were at pains to comply with all UK and European development regulations to ensure that facilities, both on surface and subsurface, will be acceptable and that public and political accord would be sought before production begins. Environmental concerns regarding unburned methane leakage are answered by the knowledge that modern engineering techniques ensure that minimal gas escapes during set-up procedures and that the Blackpool gas is too deep to be likely to leak during the production phase. A statement by Cuadrilla Resources is available at:

www.cuadrillaresources.com/cms/wp-content/uploads/2011/02/Cuadrilla-Resources-Reponse-to-Huw-Irranca-Davies-MP-26-01-11.pdf

The company was set up in 2007 by a group of students and later the firms of A.J. Lucas and Riverstone Europe became investors. The area of Lancashire around Blackpool, the Bowland Basin, was chosen because the team were familiar with the geology. Triassic Mercia Mudstone and Sherwood Sandstone is underlain by middle Carboniferous, but it is the older Carboniferous Namurian shales that are expected to be the producers. The methane sought derives from these shales and not, as might be surmised, from the younger coal measures. A video showed that a core of this gas shale under water will exude methane bubbles for over three weeks but in a producing well some help must be provided by opening up artificial fractures "fracking" by pumping down sand and water at high pressure. After the fracking operation the hole is expected to become a producing well, carefully sealed against leakage near the surface by double casing, cemented in.

Lithological study identified three shale beds in the UK and another in Europe that may, from the way they were laid down, be expected to produce methane. The Bowland Shale appeared the best prospect at a depth of around 3000 metres. A DrillMec HH220 drill was purchased and the first well, Preese Hall-1 began. At the end of May 2011 a few small earthquakes occurred locally and operations were curtailed pending investigation into whether the quakes could be related to drilling.

Dr. Turner showed drill logs of Preese Hall-1 and explained how many kinds of information could be interpreted from the cores and down-hole geophysical logging. This was supplemented by thorough laboratory study of the cores.

Dr. Turner concluded his interesting and very topical presentation by saying that potential gas shales of both Namurian and Dinantian age existed with a total

thickness of over 1000 metres and that the Bowland Shale was especially naturally fractured. He felt that in the future an important feature of power stations using new methane sources would be to enable carbon capture and storage.

A speech of thanks was given by Professor John Ludden, Executive Director of BGS.

Arabian Adventures: Geological Mapping in the United Arab Emirates (UAE)

Meeting at the University of Derby on 18 October 2011

"*Happiness does not come from doing easy work but from the afterglow of satisfaction that comes after the achievement of a difficult task that demanded our best*" - T.I. Rubin

At our October meeting at Derby University an audience which included a good proportion of students was stimulated by a picture of interesting and fulfilling geological achievement despite harsh working conditions.

Dual speakers Dr. Andy Farrant and Helen Burke, colleagues at British Geological Survey, explained the science and practicalities of comprehensively mapping the 84,000 square kilometres of the UAE.

Part 1 by Dr. Farrant

The territory extends across most of the southern shore of the Arabian Gulf and includes, in the east, apart from Oman's enclave at the tip, the Musandam peninsula that guards the Gulf's entrance. This peninsula was formed by a thrust front of ophiolites and includes the Hajar mountains. To the west over large areas of desert lie Permian to Cretaceous shelf carbonates and Quaternary rocks.

In the desert, Sadkhas - Arabic for salt flats - proliferate above tidal levels, some extending as wide as 15 km. Of layered evaporites with carbonates and some siliciclastics, they formed when the sea, then at a higher level, flooded in between dunes to form algal swamps which were then overlain by evaporites. Many sequences comprise a bacterial mat overlain by gypsum with anhydrite at the surface.

The UAE Ministry of Energy sought the best scientific information on their country's resources and BGS took on the task, signing two contracts in 2002 and 2008. As well as geology the study included the need for minerals, geohazards, flooding, sinkholes, dune migration and advice on infrastructure projects. Full airborne magnetic and gravity geophysical surveys were completed for the whole country. The bedrock was determined and mineral assessments were completed for aggregates, limestones and platinum. Identification of geohazards included dune migration, flash flooding and groundwater pollution. The coastal Sabhaks have

variable bearing strengths and can suffer liquefaction and sinkholes (gypsum solution) often worsened by local dewatering and irrigation.

Now almost complete, the field work has generated geological maps at 1:50,000 scale, for publication at 1:100,000 scale and BGS is now considered as the father of the UAE Geological Survey.

Part 2 by Helen Burke

The UAE is almost wholly desert, the main population living in towns along the coast where urban expansion is rapid.

Field work was done in six 6-week seasons in the spring and autumn and geoscientists worked across the country from east to west, in pairs for safety. Rugged laptop computers and cameras recorded the information using a Geographic Information System (GIS). Field observation points (FOP) were spaced at 2km centres in the north and every 4 to 6km elsewhere, up to twenty a day being completed. The more remote points were logged in three-day guided traverses.

Powerful all-wheel-drive vehicles were used, complete with extra fuel tanks, plenty of drinking water and satellite navigation. Driving long distances on soft dunes takes much practice, illustrated by a roller coaster video sequence through a windscreen with Helen at the wheel. Helen advised to travel in the wind direction where possible, always park facing downhill and return the way you came. Tyres must be partially deflated for extra traction on sand and reinflated when back on hard surfaced roads. Cobras and scorpions are to be avoided.

The harsh environment in UAE commands the greatest respect but those working there felt they were lucky by being able to benefit from the experience and by gaining an enhanced confidence. Helen paid tribute to the friendliness and generosity of the UAE people and said she would happily pay a return visit.

A speech of thanks to both our speakers was given by Russell Corbyn.

1. Continuous Ground Gas Data
2. The Specialist in Land Condition (SiLC) Register

Meeting at the University of Nottingham on 8 November 2011

Report by Geoffrey Jago

Our November event, held at Nottingham University, was a double feature on subjects related to the ever important matter of assessing the condition of land destined for development.

Our first speaker spoke on a specific problem faced by architects, building contractors and planners in that the land for which they have responsibility may suffer an unsuspected problem from gas seeping from the soil.

The subject of our second speaker described the highest professional qualification for those working in land condition.

1. Simon Talbot: Continuous Ground Gas Data

Where gas presents a problem fortunately experts are available at Ground Gas Solutions Ltd. (GGS) who are able to save developers money, worry and valuable time. Simon Talbot, their Managing Director, spoke on the work of his consultancy in monitoring areas where hazardous gases, primarily methane and carbon dioxide, seep out of the ground to present dangers to local dwellings, public buildings and industrial areas. Clients of GGS include property developers, local authorities and environmental consultants.

Underground gas sources typically derive from old landfill, peat or historical industrial activity. In addition radon gas is generated by deep-seated rocks.

Gas Measurement

Monitoring of ground gas has customarily taken the form of sampling gas from set points at regular intervals, often monthly, the results being presented in tabular form. However this gives too simple a picture because variable factors radically affect the flow of gas between the instants of sampling. The major consideration is the constant change of atmospheric pressure, when gas outflow increases and decreases in company with the barometer needle. In 1986 a bungalow, situated not far from a landfilled quarry in Derbyshire, was destroyed by a methane explosion following a few days of low barometric pressure.

A clear confirmation of how gas emissions follow atmospheric pressure was demonstrated when the two variables, gleaned from some of GGS's sites, were displayed alongside. A rise in the water table following rainy periods is another factor and In certain coastal areas it can be shown that gas flow changes regularly with the tides.

The Merit of Continuity

Monthly or weekly spot sampling is therefore of limited use. The answer must lie in continuous monitoring which can be done by placing sensors in boreholes connected to data recorders. GASCLAM monitors installed in 50 mm boreholes can record the amounts of several gases and can monitor the water level in each borehole as well.

Case studies

Several case studies demonstrated the value of GGS's advice. At one site work was halted owing to a breach of Planning conditions by a ground gas problem, but installation of monitors allowed an early restart of activities.
The fifty-year-old Forth Road Bridge has anchors at each end positioned in underground chambers where inflammable gas accumulated, emanating from oil shales. Costs were reduced when weekly gas measurement was replaced by continuous monitoring.

CL:AIRE

Simon drew our attention to Contaminated Land: Applications in Real Environments (CL:AIRE) which is a respected independent not-for-profit organisation established in 1999 to stimulate the regeneration of contaminated land in the UK. CL:AIRE has a library and Research Bulletin, downloadable from the internet.

In Summary

Simon Talbot ended by listing the ways that GGS can help, adding that the quality of their advice normally resulted in a shorter working period compared to conventional techniques and was thus able to deliver real savings for clients.

2. Kevin Eaton: the SiLC Accreditation

In companion with its fellow sciences, geoscience evolves as knowledge expands, never standing still. Likewise the qualification of its upholders must keep pace as disciplines expand.

The role of our second speaker was to champion SiLC (Specialist in Land Condition) which is the premier accreditation scheme for experienced individuals who have gained a high degree of experience, competence and skill in land assessment in their career. A SiLC is competent to verify the accuracy of a completed Land Condition Record (LCR).

Our speaker also described the work of the parent body, The Specialist in Land Condition Register. SiLC was established after the Land Condition Report was launched in 1999 and uniquely recognises the multitude of disciplines that contribute to successful and sustainable management of land.

As legislation necessarily increases more administration work is generated for regulators and hence arises a need for greater specialist knowledge in guidance statements requested by key financial and legal organisations.

The list of SiLCs currently includes a variety of professionals with geologists predominating and chemists well represented. Each can be relied upon to bring to a

team a high standard in his or her specific field giving confidence to those seeking expert advice on land condition.

Meeting convenor Professor Paul Nathanail concluded the meeting by thanking the speakers.

Deep Geothermal Energy

Meeting at the University of Derby on 6 December 2011

Report by Geoffrey Jago

The Annual Christmas Lecture of our Group was held on Tuesday 6 December, 2011 at the University of Derby in collaboration with them and with the British Geological Survey when Professor Peter Styles (University of Keele) spoke on "Deep Geothermal Energy".

North Staffordshire mines reached depths in excess of 1100 metres, with temperatures giving a geothermal gradient of 40oC /km. This suggests that a borehole to 1500 metres would reach temperatures in excess of 55oC, far exceeding that which might generally be expected in the UK away from the Granite targets. This deep geothermal energy has excellent potential as a source for running district and Keele campus heating schemes in new and old developments.