Site chosen for western Kentucky carbon storage project

A site in southeastern Hancock County has been chosen for the western Kentucky deep carbon storage test, which is overseen by Rick Bowersox of the Energy and Minerals Section and Dave Williams, who manages the KGS office in Henderson. The project is one of several research efforts mandated and funded by House Bill 1, which was enacted by the special session of the Kentucky General Assembly in August 2007. The carbon storage exploratory project will involve drilling an 8,000-foot well to test deeply buried formations for their potential to hold CO₂.

KGS and some of its partners in the project made a presentation to the Hancock County Fiscal Court at a public meeting April 28 in Hawesville. County officials and private citizens were at the meeting to learn about the project and ask questions.

KGS has allocated $1.35 million of the State funds allocated by HB-1 to this project. Peabody Energy, ConocoPhillips, and E.ON U.S. have formed the Western Kentucky Carbon Storage Foundation Inc. as a nonprofit partnership to work with KGS on the project. The foundation is providing technical assistance along with the majority of project funding.

The tentative timeline for the project calls for detailed site characterization, including seismic profiles and environmental surveys this summer; completion of well design, drilling plans, permit applications, and contract awards by autumn; drill rig setup and start of drilling by winter; and testing and injection of brine and CO₂ by spring of 2009, followed by post-injection monitoring and interpretation of the results.

Wabash Zone earthquakes capture public, media attention

A series of earthquakes in southeastern Illinois shook parts of the Midwest for several days in April, beginning with a 5.2-magnitude tremor near Belmont, Ill., on the morning of April 18. These Wabash Valley Seismic Zone events caused minor nonstructural damage in downtown Louisville and other locations, awakened people around the region, and caused a surge of interest in the earthquake hazard in the Midwest. Many instruments in the Kentucky Seismic and Strong-Motion Network recorded the events, and by the first week in June, more than 30 additional tremors had been recorded in the same vicinity.

The first shock also triggered a flurry of calls to KGS from live morning radio programs and newspaper, radio, and TV newsrooms. With the help of the University of Kentucky Public Relations office, KGS scheduled a news briefing to allow Director Jim Cobb to answer reporters’ questions about the event and the earthquake hazard.

At the request of the Kentucky Division of Emergency Management, Geologic Mapping Section Head William Andrews went to the State Emergency Operations Center in Frankfort to answer questions from state agencies and help put the event in its seismic context. The center was activated to coordinate State response to the event.
Director’s Desk

I recently participated in a celebration of the 100th anniversary of the Association of American State Geologists, which took place the first week of July in Shepherdstown, W.Va. The AASG was founded to assist all state geological surveys in the performance of their missions and to cooperate in federal programs for resources, water, hazards, and mapping. It has done an outstanding job for these 100 years. My role as the AASG historian over the past 6 years was to compile a history of the association. That book is now, thankfully, done. The founders of AASG met in 1908 at a time when President Theodore Roosevelt called a meeting of all state governors, the Cabinet, leaders of Congress, the Supreme Court, and leaders of industry to find solutions to growing concerns over the nation’s natural resources. Much of what is in President Roosevelt’s speech could be used in a speech today. The current concerns over the availability of energy and fuel have been confronted by our country in the past and solutions have been found. I do not know why this time should be any different from the past.

These days, we are looking for solutions to problems related to our use of fossil fuels. In a recent press release, Gov. Steve Beshear and E.ON U.S., ConocoPhillips, and Peabody Energy, our industry partners, officially announced the formation of the Western Kentucky Carbon Storage Foundation, a nonprofit foundation to conduct research with the Kentucky Geological Survey on deep geologic storage of CO₂. This foundation will work with KGS to drill a deep well in Hancock County in western Kentucky to test the feasibility of injecting carbon dioxide into deep formations. A test of this kind is costly, but the results will be samples of formations identified as potential reservoirs and seals. Engineering tests will be run on these samples to investigate their suitability for such a purpose. Before commercial application of this technology, feasibility tests such as this must be done. New journals are now being published on carbon storage and sequestration technology, signaling how important this technology is. Testing similar to what is being planned in Kentucky is also being done in other places in the United States and around the world.

Kentucky was also the subject of recent media interest when a 5.2-magnitude earthquake at Bellmont, Ill., on April 18 shook up residents of Lexington over 200 miles away. It got me out of bed at 5:37 a.m., and by 5:50 a.m. reporters were calling my house for up-to-the minute analysis of the event. With the phone ringing, I was trying to log on to the KGS and USGS Web sites for a glimpse of the seismic recordings before speaking to the media. Luckily, UK’s public relations office offered to coordinate the media, including a press conference and at least five radio shows throughout the day. As luck would have it, Dr. Zhenming Wang, KGS seismologist, was at a conference in Santa Fe with most of the other U.S. seismologists. The earthquake sparked some interest from government and the public into geology, and it was nice to have a spotlight on us if only for awhile. My take-away message though was “get prepared in advance,” because this was as gentle a trial run as ever could be expected, as our friends and colleagues in China discovered on May 12 when they were hit with a 8.0-magnitude earthquake.

As always, do not hesitate to contact us about what we are doing and with any questions you might have. Feedback from the public is important to us.

Staff news

The manager of the KGS office in Henderson, Dave Williams, has been awarded the 2008 Lifetime Achievement Award by the Kentucky Section of the American Institute of Professional Geologists. A 33-year veteran of KGS, Williams is co-principal investigator of the Western Kentucky Carbon Storage Project, one of the largest research projects in KGS history.

A native of North Carolina, he earned a bachelor’s degree in geology from Western Carolina University and a master’s in geology from Eastern Kentucky University. He has expertise in coal, oil and gas, groundwater, geologic mapping, and surficial geologic processes.

The Kentucky Section of AIPG has awarded its Lifetime Achievement recognition since 1996 to a member whose career has played a substantial role in benefiting the geologic community and the state.

The organization also named Doug Curl of the KGS Geospatial Analysis Section the recipient of its 2008 Geologist of the Year Award. Curl has been instrumental in the development of online geologic databases for disseminating information through the KGS Web site. He began by developing and maintaining an online list of geologic publications, adding services for a variety of commodity databases and creating Internet map tools for exploring the data. These tools and services have...

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Wang visits China for post-earthquake investigations

KGS Geologic Hazards Section Head Zhenming Wang traveled to China June 9 to do post-earthquake investigations of the huge May 12 magnitude-8.0 earthquake in Sichuan. Wang says the invitation to travel to the stricken area is the result of a 3-year research relationship between UK and the Research Institutes of China’s Earthquake Administration.

Wang spent 10 days in the field during his visit and found some stark contrasts even in areas close to the epicenter of the earthquake. In Chengdu, about 50 km from the epicenter, he saw essentially no damage because it is situated in a special location where ground shaking was much lower. But about 40 km to the west of Chengdu, in Dujiangyan, which is located on one of two active faults in the area, the story was very different.

“If you drive around the city, you will see massive damage,” Wang says. “Ninety percent of the buildings were damaged. About a hundred buildings collapsed; most of those were built in the 1980’s with fewer or no seismic considerations.”

Wang says he wanted to see how buildings, bridges, and other structures performed in the earthquake and examine the relationship between seismic provisions in Chinese building codes and the damage that was done. Unfortunately, he says, the Chinese national earthquake hazards map doesn’t take local conditions into consideration enough to ensure the building codes match the earthquake threat in geologically active areas. For instance, the map shows expected peak ground motion for the area of the earthquake to be about 10 to 15 percent of the acceleration of gravity, but the maximum actual ground motion recorded for the May 12 event was about 65 percent.

“What you try to prepare for should reflect the realities of the scientific conditions of the area in question,” he says, “so that you neither under-prepare nor overstate the risk.”

Earthquakes in the region of the May 12 event are not uncommon. In 1920, an earthquake of 8.5 magnitude on the Richter scale in northeastern Gansu Province killed more than 230,000 people.

KGS and the UK Department of Earth and Environmental Sciences began a formal exchange of information and seismic investigators with the Lanzhou Institute in 2005. Scientists and exchange students from Lanzhou have traveled to Kentucky on several occasions, and KGS/UK earthquake researchers have gone to China to give seminars and help train their Chinese counterparts on how to interpret data gathered by networks of seismic instruments in China. “The scientific exchange between UK and the Lanzhou Institute of Seismology has been very beneficial for both parties. UK researchers were in the area of the recent earthquake as recently as November 2007, so we have special empathy for the people affected by this recent disaster,” says KGS Director Jim Cobb.

Wang, who is originally from Fuzhou in Fujian Province in southeastern China, says there are lessons to be learned in both China and Kentucky from the recent earthquake. “This earthquake demonstrated the clear need for stronger codes and building design in the area where so much damage occurred,” says Wang. “But we, too, can learn an important lesson from this. We need to understand the science behind hazard estimates and use what we know about regional hazards to develop appropriate building codes and design practices.”

People pick through the rubble of buildings destroyed by the May 12 earthquake in Dujiangyan, China, where most of the buildings were damaged. The epicenter of the earthquake was just a few kilometers away. Photo by Zhenming Wang.
gained worldwide usage from a variety of audiences. The Geologist of the Year Award has been given since 1997 for outstanding work during the previous year. Both awards were presented during the Kentucky Section’s spring field trip and awards banquet at the Lake Cumberland State Resort Park in May.

Gooding Recognized by AAPG
KGS Well Sample and Core Library Manager Patrick Gooding was awarded the 2008 Distinguished Member of the House Award from the American Association of Petroleum Geologists House of Delegates at the AAPG annual convention April 20–23 in San Antonio, Tex. An active member of AAPG for over two decades, he is in his fourth term as chair of the Credentials Committee of the House of Delegates. Gooding also serves as chair of the AAPG Preservation of Geoscience Data Committee. He is also a past president of the Kentucky Society of Professional Geologists.

The award is presented by AAPG to recognize unique or exemplary service to the House of Delegates through committee work. Patrick has a bachelor of science degree in petroleum geology from Eastern Kentucky University, and he has been with KGS since 1977.

Francis Receives ASTM International Award
KGS Laboratory Manager Henry Francis has been honored with an Award of Merit from the Committee on Coal and Coke of ASTM International (originally known as the American Society for Testing and Materials). The Award of Merit and accompanying title of fellow is the highest organizational honor for individual contributions to standards activities.

Francis was cited for “meritorious service and outstanding leadership of the committee, for service to the ASTM Society, and service to the development and promulgation of standards of the Committee on Coal and Coke.” A member of ASTM International since 1977, Francis works on several subcommittees, including 15 years as chair of the Subcommittee on Statistics. His contributions have been recognized by ASTM International twice before, with the R.A. Glenn Award in 1994 and a Service Award in 1998. He holds a bachelor’s degree in chemistry from Western Kentucky University.

Donna Webb joins KGS
Donna Webb joined the Energy and Minerals Section in mid-June. Originally from Huntsville, Ala., she now lives in Lexington with her husband, Gerry. She earned a topical studies degree in environmental geosciences in 2005 from the UK Department of Earth and Environmental Sciences. She worked for 2 years with former Earth and Environmental Sciences faculty member Harry Rowe on projects to find isotopic evidence of climate change. At KGS, she will work with Energy and Minerals staff on carbon storage projects funded in part by State money from House Bill 1.

Dinger travels to Ecuador
In May, Water Resources Section Head Jim Dinger traveled with three dozen other volunteers to Ecuador on a mission sponsored by the University Kentucky Timmy Foundation Chapter to provide health care to indigent communities in Santo Domingo, Ecuador. The Timmy Foundation works to create collaborative partnerships that provide healthcare, medical, and educational resources to the Americas, Africa, and Asia. With no laboratory capabilities in the region he visited, Dinger and a volunteer from the UK Department of Civil Engineering used a field kit to test for contamination of water used for drinking and bathing.

Thousands of people living in shanty communities on the outskirts of Santo Domingo rely on wells, rainwater collected from rooftops, and river water. One community Jim visited, the Tsachila native community, used river water as a supply. Although visually clear, the water proved to be contaminated. When not dealing with water supplies, Jim spent a large part of his time taking height and weight measurements of the approximately 1,000 clients served during the 4-day mission.

KGS Web pages updated, searches revamped
KGS has just completed revamping the popular database search services on its Web site (kgsweb.uky.edu). Many of the changes are technical enhancements that won’t be obvious. New features include the ability to search multiple quadrangles or counties, more complex search parameters, a quick map link that shows a site on the Google map base, and additional information on some search result pages. The coal production search function was completely redesigned for more flexible searches.

Coming soon!
Visitors to the Web site should watch for two new search services in the near future. The first will be a database of geologic descriptions from the collars of all 1:24,000-scale geologic quadrangle maps. Users will be able to search map unit descriptions for key words and concepts, then find map areas that match the criteria. Second is a database of annual oil and gas activity information by county, including wells completed and oil and gas production data.
Land-use maps popular in Kentucky classrooms

Hundreds of teachers across the state have responded enthusiastically to the offer of free county land-use planning maps from KGS. Over 500 of these maps are now in classrooms and school libraries in nearly all Kentucky counties as a result of the “maps-to-teachers” service initiated in November 2007. An additional 150 maps have been sent to educators in UK extension offices and Kentucky conservation districts.

The map series, Generalized Geologic Maps for Land-Use Planning, was developed by Dan Carey of the Geospatial Analysis Section to help local officials, developers, and property owners understand the geology of the places where they live, work, and play.

“The current maps are based on Kentucky’s 1:24,000-scale topographic and geologic maps, representing nearly 60 years of work by hundreds of geologists. The topographic map program, championed by Phil Miles of the Kentucky Agricultural and Industrial Development Board, was completed from 1949-56. The topographic maps provided the foundation for the subsequent detailed geologic field mapping. That cooperative USGS-KGS effort was carried out by over 260 geologists across Kentucky in the 1960’s and ’70’s under the leadership of State Geologist Wallace W. Hagan. Both mapping programs were milestones for the state and nation,” says Carey. "The 707 1:24,000-scale geologic maps were digitized in recent years by KGS staff. Twenty geologists from KGS, state agencies, federal agencies, and the private sector then volunteered their time and expertise to create the new county maps based on the digital data. “As we continued to develop the maps, we expanded their message to also help students and the public better understand how the rocks beneath their feet shape the land and the ways that they live on it.”

Teachers at the 2007 conference of the Kentucky Science Teachers Association were offered a free classroom copy of their county’s map at the KGS display booth. The response was overwhelmingly positive, and inspired the subsequent maps-to-teachers service that offers free copies for classrooms and libraries in all Kentucky schools.

“Maps seem to attract people of all ages—from my 3-year-old grandson to senior citizens—who want to see and learn more about the place where they live,” says Carey. “Providing these maps to classrooms across the state seemed to be a great way to realize both the KGS and UK missions of service and dedication to applying, sharing, and disseminating knowledge across Kentucky, as we work to make the commonwealth a better place to live and learn.”

Teachers apparently like the maps as classroom aids. A Lexington teacher wrote in a message to Carey, “I have the map prominently displayed in the classroom and my students started using it as soon as I hung it up to find sinkholes near their homes. The resource that you have provided will greatly enhance my instruction by clearly illustrating to my students the importance of earth science in their daily lives.”

Another teacher in Wolfe County wrote, “The maps that you sent arrived and are wonderful! Is there a chance that we could get a few more? Our social studies teachers and ag science teachers would love a copy and our principal would like one to display at the entrance of the school.”

Similar responses have come from teachers around the state who ordered the maps. Teachers who have not yet received a county map for their classroom are encouraged to contact Carey at carey@uky.edu.

Any of the maps in this series can be viewed at the KGS Web site by going to kgsweb.uky.edu/download/geology/landuse/lumaps.htm.

Parris recognizes property owners for assistance

Marty Parris of the Energy and Minerals Section has received cooperation from a number of property owners during his soil-gas monitoring project. He recently presented several of them with plaques of appreciation, including Don Lutes, right in photo, who allowed Parris to drill a monitoring well on his rural Lee County property. Plaques were also presented to several coal and natural gas companies as well as individual homeowners who have allowed Parris access to their property or provided other assistance.
Brandon Nuttall helps in NEED energy tour for teachers
A couple of dozen teachers from across Kentucky took an “energy tour” of the state April 9–13, visiting various sites involved in the production and development of energy. Brandon Nuttall of the Energy and Minerals Section joined the bus tour on June 11 in the Big Andy oil-producing area of Lee County. He and Bernie Miller of Miller Energy Technologies showed the teachers oil-production sites in the area. Above, Nuttall uses a jar of marbles to illustrate the geology of oil and gas fields. The tour was sponsored by the National Energy Education Development Project, which promotes energy education of students, educators, business, government, and community leaders.

AIPG-KY holds annual spring field trip
Members of the Kentucky chapter of the American Institute of Professional Geologists, including a number of KGS staff, went to Lake Cumberland May 16–17 for their spring field trip and awards banquet. Steve Greb of the Energy and Minerals Section put together the field trip guidebook, as the members first visited Wolf Creek Dam, where the U.S. Army Corps of Engineers is rehabilitating the structure to reduce seepage and prevent possible dam failure. The second day, participants took boats down the lake, which is created by Wolf Creek Dam, to view geologic structures made visible by the lowering of the lake level during dam repairs. Above, the group makes a stop on the lake to examine the Fort Payne Formation (photo by Doug Curl).