

**HB 1 Carbon Storage Research  
Kentucky Consortium for Carbon Storage**

**Contract PO2-855-0700011517**

**Progress Report for the Quarter Ending March 31, 2009  
Submitted to the Kentucky Energy and Environment Cabinet**

Kentucky Geological Survey  
James C. Cobb, Director and State Geologist  
University of Kentucky

David C. Harris, Principal Investigator  
Rick Bowersox  
Dave Williams  
Steve Greb  
Mike Lynch  
Marty Parris  
Brandon Nuttall  
Warren Anderson

May 7, 2009



**Kentucky**   
**Geological Survey**  
UNIVERSITY OF KENTUCKY

## Major Accomplishments during the Quarter

- Activity continued during the quarter on all 4 of the subprojects setup to perform the research mandated by HB 1 (2007), Western and Eastern Kentucky deep CO<sub>2</sub> storage, CO<sub>2</sub> enhanced oil recovery, and CO<sub>2</sub> enhanced gas recovery (Devonian Shale).
- Progress on all of the projects was reviewed by the Energy and Environment Cabinet on March 6 in Frankfort.
- Progress continued on the Western Kentucky deep CO<sub>2</sub> storage test project. The project advisory group for this project met once in person, and held 3 teleconferences during the quarter in Lexington.
- The Class V (experimental) underground injection control (UIC) permit for the KGS #1 Blan was issued for public comment until January 30, 2009. No technical comments were received. A 30-day appeal period started after release of the final permit, and ended on April 10, 2009
- Seismic reflection data acquisition, which began in December, was completed in January 2009. Processed seismic data were interpreted and no structural features that could impact containment of CO<sub>2</sub> were observed. Seismic data was used to estimate formation tops for the Blan well.
- EPA issued a decision that drilling could not begin until the final permit was released. This delayed drilling of the Blan well until after the permit comment and appeal periods. This delay resulted in losing priority for a local drilling rig, and bidding for a rig was re-opened. A rig was located in Texas and contract for a April drilling start was signed at the end of the quarter.
- KGS agreed to participate in a CO<sub>2</sub> enhanced oil recovery project in the Sugar Creek field in Hopkins County with the Illinois State Geological Survey. KGS began work on the project by drilling 3 groundwater monitoring wells, and collecting 3 rounds of water samples. KGS is responsible for monitoring the movement of injected CO<sub>2</sub> through water, brine and gas sampling.
- A consulting engineering firm was hired to develop a CO<sub>2</sub> injection program for the Devonian shale in Pike County. This work will use data from the nominated wells and a nearby well to model CO<sub>2</sub> injection in the shale.
- Bowersox and Harris were filmed for a University of Kentucky documentary on clean coal technology using the sequestration research program as an example.
- A new logo for the Kentucky Consortium for Carbon Storage was designed for use in all project materials. The new logo is included on the cover of this report.

Details of activity during the quarter pertaining to each of the subprojects follow. Figure 1 is a project status map indicating project activity by county.

# Status of HB 1 Carbon Sequestration Projects, April 2009

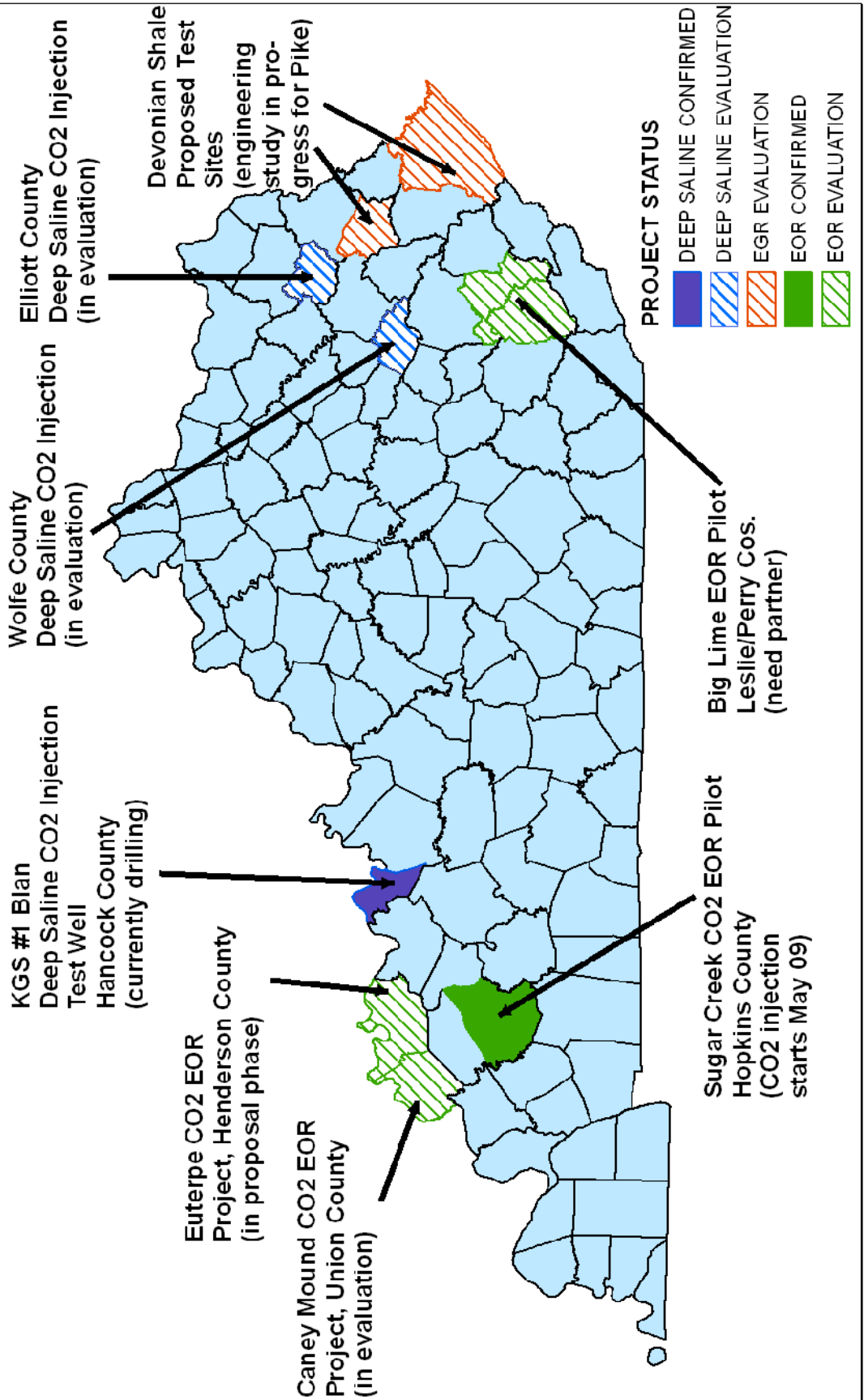


Figure 1. Map of Kentucky showing status of carbon sequestration demonstration projects in active or evaluation stages.

## **Western Kentucky Deep Saline CO<sub>2</sub> Storage**

Lead Geologists:

Rick Bowersox and Dave Williams

### **KYCCS-WKY – Summary of 1<sup>st</sup> Quarter 2009 Activities**

#### **Advisory Committee Meetings Highlights:**

- One project advisory group meeting and three teleconferences were held during the quarter in Lexington. Agendas and summaries of the meetings are included in Appendix A.
- Seismic data acquisition was completed and processing of the data continued during the quarter. Final seismic data set was received in April.
- A draft of the EPA Class V injection permit was issued for public comment until January 30. The final permit was issued March 10, starting a 30-day appeal period that ended April 10. No serious technical comments, and no appeals were submitted.
- The EPA comment and appeal period prevented spudding of the Blan well, and the rig we originally intended to use was contracted for drilling a CO<sub>2</sub> well in Illinois. Bidding for drilling the Blan well was reopened to obtain a new rig. A suitable rig was located at the end of March and a contract was signed for an April spud date.
- Final contracts for drilling-related services and logging were awarded.
- Final well design and drilling plans were completed.
- Work continued on the CO<sub>2</sub> injection testing program, with design work and bid review.
- Public relations efforts continued with writing and approval of a new release when drilling begins, and a wellsite tour for media and VIP's. Harris and Bowersox were filmed for a short UK-produced documentary on clean coal technology. The film crew will also visit the well site when drilling begins.
- 
- The EPA-required monitoring program was implemented:
  - Domestic water wells available for sampling were identified; only 2 wells and 2 springs are suitable for sampling
  - A monitoring well was designed, and bids were received to drill an approximately 400 foot well near the location for the Blan deep well. The well was drilled in early April, encountered no water, and could not be sampled. The well was plugged and EPA has removed that requirement from the permit.

## **Project Administration:**

1. A funding request for project phase 4B was submitted to the Western Kentucky Carbon Storage Foundation on January 19, 2009. This request provides funds for well drilling, coring, logging, and well site supervision fees. This request was approved.

Agendas, meeting summaries, and other details of the western project's activity can be found in Appendix A and on the project web site ([www.kyccs.org](http://www.kyccs.org)).

## **Kentucky Consortium for Carbon Storage Western Kentucky Deep Saline Project Industry Partners**

### **Funding Partners**

ConocoPhillips  
E.ON U.S. LLC  
Kentucky Syngas, LLC  
Kentucky Geological Survey, University of Kentucky  
Kentucky Governor's Office of Energy Policy  
Smith Management Group  
State of Illinois Office of Coal Development (pending)  
Schlumberger Carbon Services  
Tennessee Valley Authority

### **Associate Partners**

Big Rivers Electric Corp.  
GEO Consultants, LLC  
Henderson County Riverport Authority  
ICON Construction, Inc.  
Praxair Inc.  
Sunshine Oil and Gas  
University of Kentucky Center for Applied Energy Research  
URS Corp.

## **Eastern Kentucky Deep Saline CO<sub>2</sub> Storage**

Lead Geologists:

Steve Greb and Warren Anderson

### **Boyd County Drill Site**

We have had no further discussions with Chesapeake Energy on participation in the sequestration program. Chesapeake Energy announced that they are closing their Charleston, WV office on June 30, 2009. Staff are being transferred to Oklahoma City, but they will still operate and drill in the Appalachian Basin. This change may reduce or eliminate their interest in the project. They offered a drill site in Boyd County, but the site was a gas prospect, which creates problems for our testing program if a gas discovery is made.

### **Elliott County Depleted Gas Wells**

We continue to investigate the possibility of using one of several depleted wells in a deep gas field in Elliott County for CO<sub>2</sub> injection tests. The owner of these wells has expressed interest in working with us. We scheduled a meeting with him to discuss the project in March, but he cancelled at the last minute. We have had no further communication with the operator, so we are unsure of his interest. We are working with the state representative for that district to determine his interest in participating in the project.

### **Deep well in Wolfe County**

Warren Anderson and Steve Greb have been evaluating the potential for CO<sub>2</sub> injection tests in a deep well in Wolfe County. Steve, Dave Harris, and Marty Parris met with Bernie Miller (Basin Petroleum) on Feb. 26 to discuss this well. The exploration well was drilled into the deep Knox (Copper Ridge Dolomite) at 4750 feet and had shows of gas with high CO<sub>2</sub> levels. Porosity is not very well-developed on the logs, and much of the gas may be coming from fractures. The operator is willing to let us do some testing in the well. The reservoir quality is questionable, and would involve some risk. We are waiting for the release of logs from a nearby deep salt-water disposal well (currently confidential) to compare with this well. We have also requested all records for the Underground Injection Control (UIC) permit on the salt-water disposal well from US EPA, region 4. These should be received by May 21. Once this additional data is received, we can better evaluate the well that has been offered to the project.

## **CO<sub>2</sub> Enhanced Oil and Gas Recovery**

Lead Geologists:

Brandon Nuttall and Marty Parris

### **Devonian Shale CO<sub>2</sub> Enhanced Natural Gas Recovery and Storage Project**

Brandon Nuttall, lead geologist

Summit Engineering, Pikeville, compiled an initial tract and property ownership map of the vicinity of the Interstate #3 Panther Land (nominated injection well). A contract was negotiated and data submitted to Advanced Resources International to build a Devonian shale reservoir model. This work will include matching historical production data to the model, and simulate CO<sub>2</sub> injection into the shale for designing a test well program for investigating CO<sub>2</sub> storage and enhanced natural gas production. Results are expected mid-summer 2009 and will be used to make a decision to proceed at the Burke Branch (Pike Co.) site.

### **CO<sub>2</sub> Enhanced Oil Recovery (EOR) Project**

Lead Geologist: Marty Parris

Project Geologists: Kathryn Takacs, Glenn Beck

Sugar Creek field in Hopkins County has been the primary focus of enhanced oil recovery work during the first quarter of 2009. In this project KGS has partnered with the Illinois State Geological Survey and Gallagher Drilling, the owner and operator of the field. The field is located approximately 5 miles southwest of Madisonville, and it produces oil from the Mississippian Jackson Sandstone at a depth of approximately 1865 ft. Preparations are being made to conduct a pattern flood in which CO<sub>2</sub> will be injected into a central well and produced from 8 surrounding wells. Injection of CO<sub>2</sub> is scheduled to start May 11 or 12. Depending on well response, continuous injection of 8,000 tons of CO<sub>2</sub> is scheduled for 6 to 8 months.

Work at Sugar Creek is divided into three broad areas: (1) operations and equipment that include getting the wells ready for production and injection, getting the tank in place for CO<sub>2</sub> storage, and completing the skid for the injection pump; (2) developing the framework for monitoring-verification-accounting (MVA) of the fate of CO<sub>2</sub>; and (3) public outreach and safety that includes developing a health and safety plan and notifying the appropriate emergency and county officials. The MVA work includes the drilling and completing of 3 groundwater monitoring wells near the injection well, and 3 rounds of sampling of the groundwater wells and the production and injection wells. In addition, domestic groundwater wells in and near the Sugar Creek field have been sampled. The goal of the MVA work is to document the fate of CO<sub>2</sub> in the reservoir and to ensure safety and protection of potable water supplies. In addition to contributing \$300k to the project, KGS will be taking the lead role for MVA investigations with investigators Beck and Takacs conducting most of the measurements.

Marty Parris and Dave Harris met with Bernie and Steve Miller of Basin Operating on April 15 about a second EOR project at Euterpe field in Henderson County. Euterpe produces oil from the Cypress sandstone at a depth of approximately 1850 ft. EOR at Euterpe would be conducted in what is termed a Huff-n-Puff project in which CO<sub>2</sub> is injected into and oil, CO<sub>2</sub>,

and other fluids produced from the same well. Typically the well is shut-in—that is, not produced—after injection in what is called the “soak” period before being produced. The soak period provides time for some of the CO<sub>2</sub> to dissolve into the oil, thereby decreasing viscosity, and cause expansion of the oil. Collectively, the processes allow oil to flow more readily thereby facilitating its recovery. Basin Petroleum is proposing an approximate 2 month soak period. Depending on reservoir response, the project could have up to 3 separate injection and soak cycles over a 6 to 8 month period. As with Sugar Creek, KGS responsibilities will focus on MVA work with sampling and monitoring of the injection/production well and 3 to 5 surrounding wells.



# Appendix A

## Western Deep CO<sub>2</sub> Storage Project

### Meeting Proceedings January–March, 2009

#### WESTERN KENTUCKY SEQUESTRATION SUB-PROJECT MEETING

January 8, 2009

KGS Well Sample and Core Library, Lexington, KY

These people were present for the meeting:

#### **KGS Staff**

Jim Cobb  
Dave Williams  
Dave Harris  
Rick Bowersox  
Jim Drahovzal  
Jerry Weisenfluh  
Brandon Nuttall  
Glynn Beck  
Jackie Silvers  
Mike Lynch

#### **Smith Management**

Karen Thompson

#### **CAER**

Jim Hower

#### **GEO Oil / Gas**

Ross Miller

#### **Sandia Technologies**

Phil Papadeas

**TVA** (via telephone)

Ed Stephens

**Schlumberger Carbon Services** (via  
telephone)

Dwight Peters

#### **Sandia Technologies**

Phil Papadeas

#### **ConocoPhillips**

Scott Rennie

Paul Heard

Sarah Edman (via telephone)

#### **E.ON US**

Roger Medina

Doug Schetzel

Glenn Sundheimer

## **Project administration:**

Drilling rig schedule: Paul Heard gave an update on the availability of drill rigs capable of doing this project, noting that this project could be competing with the ADM / Illinois project for a rig. There was a general discussion of the EPA comment and appeals periods, EPA's expectations, and how these will affect the drilling schedule.

There was some interest in proceeding cautiously in case permit comments or an appeal require changes the design. Phil Papadeas responded, though, that the design is robust enough that it should survive any comments. Participants discussed when to sign a rig contract and its dependence on the issuance of the permit.

There was discussion of the contingencies related to the permit comments and any added items and cost they could create for the project design.

Members also discussed the EPA requirement for separate water-monitoring well with the project. Phil Papadeas said it looks very likely that such a well will have to be drilled, because it's in the conditions of the permit, which are never removed.

There was a general discussion about the need to proceed with the project in a timely and successful manner because of the disappointments which followed some other such projects elsewhere. This project has included the selection of the geologically best available site, promising a probability of success.

There was agreement that no major project actions should take place until the end of the comment period and issuance of the EPA permit.

## **Update on possible new participants:**

Dave Harris said he had contacted USGS in Reston, VA, and suggested their participation in this project as an avenue of increased involvement, since USGS is now assessing what it needs to do in this area. They are considering it. They may possibly provide in-kind services.

Rick Bowersox said he had received no response after sending an e-mail to the Texas Bureau of Economic Geology. Phil Papadeas will follow up on this.

Jim Cobb volunteered to contact Scott Tinker on coring and logging services. He will also contact Alliance Coal next week about helping, possibly with the monitoring well and NETL within a week as well.

## **Vendor Presentation:**

Ross Miller of GeoConsltants talked about working up a quote for the monitoring well services. He said the specifications would be to Kentucky monitoring well standards. He discussed his company's experience elsewhere with such wells.

There was a discussion about where to do the water testing, using the KGS Laboratory or an outside lab. It was suggested that the initial tests could be done by an outside lab and the later ones at KGS.

## **Project Operations:**

Dave Williams reported letters were sent on Jan. 6 to land owners around the project site asking about water wells and whether they could be sampled, as required by the EPA draft permit. Five wells have been identified so far. Because there is public water available throughout the area, he doubted anyone is using wells for drinking water, though perhaps for agriculture purposes. There was a discussion about using the responses in the KGS / Foundation comments on the EPA permit.

There was a discussion on handling the 3-year water monitoring requirements after the project timelines have been completed.

Karen Thompson reported on the December meeting of the group examining the legal and regulatory issues related to carbon storage. They plan to meet later in January.

Brandon Nuttall made a PowerPoint presentation on the state energy strategy, and there was a discussion of the strategy, its effects on the coal industry and projects like this one.

The next meeting was set for February 5 or 12, depending on the status of the EPA permit after public comments have been evaluated.

#### **ACTION ITEMS:**

#### **KGS:**

**Jim Cobb** will contact Scott Tinker, Alliance Coal, and NETL about possible participation in the project.

**Dave Williams** will gather replies from land owners who have water wells near the project site about monitoring the wells.

**Dave Harris** will prepare a budget for Phase 4b next week.

**KGS** will consider the possibility of reducing the number of cores taken.

**Jim Drahovzal** and Michelle Pittenger will work on the seismic data when it comes in.

**Glynn Beck** will work on the monitoring well design

**Mike Lynch** will coordinate with state government, Foundation and others to develop a news release and organize a media and VIP visit to the well site.

#### **Sandia Technologies:**

**Phil Papadeas** will follow up on efforts to contact Texas Bureau of Economic Geology for participation.

COP and **Sandia** will prepare comments on the draft EPA permit to send out to the partners.

**Phil Papadeas** will gather additional information on some of the potential vendors on drilling phase.

**ConocoPhillips:**

**Scott Rennie** will also make some contacts to recruit new participants.

**COP** and Sandia will prepare comments on the draft EPA permit to send out to the partners.

**Paul Heard** will work to streamline the well testing program to reduce costs.

Jim Drahovzal and **Michelle Pittenger** will work on the seismic data when it comes in.

**GeoConsultants:**

**Ross Miller** will develop cost figures for a monitoring well.

**WesternGeco:**

Will finish remaining seismic program lines, probably in less than ten days.

**Foundation partners:**

**The Foundation** will continue to look into its tax exempt status for purposes of sales tax on bills paid to contractors & suppliers.

**WESTERN KENTUCKY SEQUESTRATION SUB-PROJECT  
MEETING**

**February 16, 2009**

**Conference call**

These people were telephone-conferenced in for the meeting:

**KGS Staff**

Dave Williams  
Dave Harris  
Rick Bowersox  
Glynn Beck  
Jim Dinger  
Mike Lynch

**Sandia Technologies**

Phil Papadeas  
Bill Armstrong  
Mike Grant

**ConocoPhillips**

Scott Rennie  
Paul Heard  
Sarah Edman  
Michelle Pittenger

**Peabody Energy**

Brian Brown

**E.ON US**

Doug Schetzel  
Glenn Sundheimer

**TVA**

Ed Stephens

## **Budget Status**

There was discussion of the savings from Phase 4a, including the seismic program. While the budget is currently “over” by \$149,392, Scott Rennie noted that the overall budget is not exceeding the available funding, pending finalization of the drilling and testing budget.

Rig availability: A comparison sheet was handed out showing the proposals from a variety of companies with drill rigs. One more proposal is coming, but it is expected to be higher than others due to mobilization and demobilization costs. The Les Wilson rig is on contract in Illinois through April. The Pioneer rig should be available for several weeks, and there are good reports on its performance. Some problems drilling the Duke well with this rig were apparently not related to the rig itself. These two rigs (Pioneer and Les Wilson) will apparently provide the best choices.

## **Permit Status**

Expectation is that the permit could be sent by the reviewer to the EPA Region IV legal office and management by Feb. 17 and be completed and signed by Feb. 27. There was a discussion of whether to wait to drill until the end of the 30-day appeal period. Phil Papadeas said it was very rare for any appeal to cause drilling to be stopped. It was agreed that a contract for a drill rig would be started after review of permit comments and any changes EPA makes to the permit based on the comments. Another conference call will be arranged after the comments are received.

## **Monitoring Wells**

Phil Papadeas suggested sending the design for the water well and sampling program to EPA for review.

Jim Dinger discussed the plans for the on-site monitoring well required by EPA; he added an open hole or a hole with a liner may be drilled, depending on where the sampling zone is found. Cox Drilling is likely to do the work. KGS will consider renting equipment separately to keep the cost of drilling under the threshold which requires competitive bidding.

On the monitoring of existing domestic wells and springs: Glynn Beck said seven were originally submitted as possibly available, but all are plugged or no longer available. There are now two springs, one well within two miles and a well on the site property itself to be monitored.

## **Seismic Program**

Rick Bowersox reported that he convinced WesternGeco to reduce the seismic-work invoice by the cost of the one day the field crew had equipment problems. Data processing should be completed by Feb. 20. The data seen so far is very good, and there was discussion about some re-processing work. Michelle Pittenger asked about the possibility of getting the “gatherers” to extract additional data to better estimate porosity and stratigraphy.

## **Testing bids and estimates**

Paul Heard reported that he should be able to finalize the bids on the workover rig, estimating 850 hours of work, or 35.5 days. Two vendors should qualify to do to work. The rest of the major items should be finished this week with bids back in two weeks.

Dave Harris is working on finding an alternate supplier of carbon dioxide. There was discussion of buying or renting the equipment needed and contracting for the carbon dioxide and services, because the equipment can be used in other projects.

## **Mudlogging award**

The proposal from Geosearch Logging appears to be the one which will be used. Sandia will work on this.

## **Core Handling**

Phil Papadeas said he had spoken to Ross Miller about core handling and site restoration, though his company may only be able to provide oversight and management. It was agreed that the mudloggers could handle the core.

## **Mud program and disposal**

M-I will provide the mud program and hydraulics, and Sandia will look into disposal sites. While Pioneer also owns Franklin Well Services, it was agreed that the original plan to contract with the lowest bidder (Schwartz) would continue.

## **New agreement with property owner**

The property owner has approved the new agreement regarding a water line and hydrants going to the site, and that agreement has gone to the UK legal office.

## **New business**

Scott Rennie said several people at ConocoPhillips had discussed the possibilities that funding from the recently approved national economic stimulus bill could be available to the project if DOE receives funding from the bill. He said he will send out some ideas on this later, but noted the timing of the actual availability of the fund might be too late for this project.

There was a brief discussion about the progress of the non-profit status application for the Foundation and how it affects the charging of taxes by Sandia.

## **Next meeting**

There will be another conference call after the issuance of the EPA permit and comments can be examined.

**WESTERN KENTUCKY SEQUESTRATION SUB-PROJECT  
TELECONFERENCE  
March 16, 2009**

These people were present for the meeting:

**KGS Staff**

Dave Williams  
Dave Harris  
Rick Bowersox  
Jim Drahovzal  
Brandon Nuttall  
Glynn Beck  
Mike Lynch

**Peabody**

Dianna Tickner

**Sandia Technologies**

Phil Papadeas

**Smith Management**

Karen Thompson

**ConocoPhillips**

Scott Rennie  
Michelle Pittenger  
Paul Heard  
Sarah Edman

**E.ON US**

Glenn Sundheimer

**Sandia Technologies**

Phil Papadeas  
Bill Armstrong



**EPA permit / comments:** Dave Harris reported that the final EPA permit was received by FAX. Water well monitoring time was shortened to 2 years and only fresh water (not brine) requires monitoring; number of springs and wells to be monitored decreased, too. The outside comments not yet, though they may come in the mail today. (**Editor's note: The letters to the commenters DID come in the mail this date.**) Dianna Tickner noted that only commenters can appeal, and appeal bases can only be topics in the original comments. We don't know yet who the two technical commenters were yet. We'll send them out when we get them.

**Monitoring program:** Dave H summarized Jim Dinger and Glynn Beck's plans. Glynn plans to get domestic wells sampled during the week of March 30 or April 6. Two domestic wells, one on the site owner property other on Grant Blan's property will be tested. Glynn will field check two other wells. Dave noted that Grant Blan is using his for domestic purposes. Glynn also identified two springs, one outside the two-mile area of reporting; he'll sample the other spring late Mar / early April. But we may need to find a second spring in the area of interest. Phil Papadeas suggested sending a letter to EPA saying a second spring cannot be located in the area of review. The water sampling before injection will involve at least two samples. Rick Bowersox said he will send EPA a letter, because we had already noted the availability of one well only before the permit was issued. He suggested bundling all field checks, etc. relating to this topic into a single letter to EPA. There was a discussion of whether to send the well design info to EPA.

Monitoring well: Jim Dinger is meeting with driller; hopes to drill in the first week of April, before main well drilling starts. Discussion of its location on the site; the plan is for the NW corner of the site.) There was a discussion on whether water or oil will be found in the interval drilled for the monitoring well. This may possibly to change the area to be monitored to an interval above or below the EPA permit requirement. There was a discussion of how to handle this eventuality with EPA.

Discussion of the number of samples: Scott Rennie suggested that two samples aren't enough to establish a good baseline. He suggested five to ten over a couple of weeks. Glynn Beck suggested perhaps weekly for two weeks, and decreasing after that.

**Rig contracting:** Bill Armstrong reported a lot of additional interest recently from more drillers, most of them far away and whose mobilization costs would be high. So Les Wilson and Pioneer remain the most likely contractors. Pioneer rig is in Indiana; Les Wilson is on the Illinois / ADM well now. The Pioneer option has about \$80K savings. Pioneer equipment has some questions, but these issues could be offset. Pioneer has given better prices, but doesn't know about immediate availability of a crew. Noted again that there were not complaints about Pioneer, but some more confidence in Les Wilson. We need to commit to one or another soon, since additional clients will start seeking drills soon. Earliest we could start with Pioneer: early April. Les Wilson: Finishing in Illinois in late April. All participants agreed to contract with Les Wilson.

Status of other contracts: Bill Armstrong said some of them will start to be sent out this week for signature.

2D Seismic processing and data delivery: Michelle Pittenger, Rick Bowersox and Jim Drahovzal have all been examining the preliminary data sent so far; it looks good and indicates no problems for the well.

**DOE proposals for post injection work:** Dave H. said he and Rick B. he are working on this. He's trying to determine some mechanisms for non-federal cost share. He is considering whether previously spent time of the partners, in-kind contributions, etc. are eligible. He explained that DOE is looking for new technology related to sequestration. We're working on new applications of not-so-new technologies. One would sidetrack and core through the reservoir after injection to see rock changes and fluid saturations as a result of the injection. This would require a vertical seismic profile to image the CO<sub>2</sub> plume. Second one would involve additional logging work in the original hole, vertical seismic profiling, logging tools, saturation tools, brine sampling, and investigating differences in the rock as a result of injection work, possible side wall cores to investigation changes in the rock after injection. Possible additional CO<sub>2</sub> injection was discussed, too, discussed, along with whether the timing of the grant itself (December 2009) would make it feasible. Dave added that another possible problem is possibly having to do a VSP BEFORE injection, at a cost of perhaps 200K, without a guarantee of receiving DOE funding.

Rick B: explained sidetracking proposal in some more detail. KGS' new staff modeler says this would be a cutting edge application. It would involve three separate sidetracked holes. Paul will work on estimated costs of this. RFT says awards will run from \$.5M to \$2M; we're estimating the higher end for our proposals. Dave Harris said he will get a rough draft out in the next couple of days.

**Testing:** Bill A. said he has most bids back in and should be able to get recommendations out this week CO<sub>2</sub> supply cost. There was a discussion of the relative merits of designing and building CO<sub>2</sub> pumps to meet the higher pumping rate needs of this project vs. paying for the entire CO<sub>2</sub> service, including pumping on a single project. The latter is overall most costly; the former may take more time to complete. With training, it's possible to work out something to have one of the other contractors operate pumps designed specifically for the project. Dave Harris asked Bill Armstrong to look into the options.

**Other topics:**

There was a discussion on a news release and media / VIP trip to the site. It was agreed that the interest from VIPs will likely be lower due to a number of financial issues the state is facing. A trip will be scheduled in about two weeks after spud. Mike Lynch will work on transportation, news release and notification issues.

**TELECONFERENCE ON NEW DRILL RIG POSSIBILITY  
WESTERN KENTUCKY DEEP TEST  
(HANCOCK COUNTY)**

**March 26, 2009**

These people were present for the teleconference:

**KGS**

Dave Williams  
Dave Harris  
Rick Bowersox  
Jim Dinger  
Mike Lynch

**Sandia Technologies**

Phil Papadeas  
Mike Grant  
Bill Armstrong

**ConocoPhillips**

Paul Heard  
Michelle Pittenger  
Scott Rennie

**Peabody Energy**

Dianna Tickner

**E. ON U.S.**

Roger Medina  
Doug Schetzel

There was discussion by participants on cost proposals from NorAM Drilling Company, which are lower than the other current proposals. (See e-mail text from Paul Heard at end of this summary.)

A mobilization date for the rig will depend on the expiration of the EPA appeal period, which is April 10. Appeals go to the Environmental Appeals Board in Washington DC.

Dianna Tickner noted that EAB has a web site which may have the information on appeals filed. Phil Papadeas suggested that Monday, April 13, someone should call EAP and determine if any appeals have been filed. Dianna volunteered to have a Peabody attorney make that call. It was noted that none of the comment letters appeared to deal with an appealable technical topic, but there is also the chance an environmental NGO may get with one of the commenters to file an appeal. But it was also noted that addresses are redacted in the comment letters.

The participants agreed that NorAm should be contracted but not be requested to mobilize before that call is made on April 13.

Phil Papadeas noted that EPA Region IV should be called to inform them once mobilization is agreed to and that they should receive regular e-mail and telephoned updates, per their permit requirements.

It was agreed that Rick Bowersox and Paul Heard would make a list of the contractual, local government, and regulatory notifications to insure none of them are missed once the site work gets underway. Dave Williams volunteered to take care of notifications to the state Division of Oil and Gas.

Jim Dinger said he expects to start drilling the water monitoring well on April 1, and it should take a maximum of 3 days.

There was discussion about a small change in the location of the monitoring well.

Vendors will be notified during next week about impending mobilization and drilling at the site. If a contract with NorAm is completed on April 13<sup>th</sup>, drilling could start within a few days of that.

No news release should be made before April 13, and should wait for actual drilling. The partners will further discuss a VIP / media tour date as we move closer to that date.

There was a clarification of how NorAm will be paid, which will be by the Foundation.