

**OHIO COAL DEVELOPMENT OFFICE
PROJECT ABSTRACT
as of October 1, 2010**

1. PROJECT SPONSOR:

ODNR, Division of Geological Survey
2045 Morse Rd, Bldg. C-1
Columbus, Ohio 43229

2. PROJECT MANAGER:

Chris Perry

3. OCDO GRANT NO.

CDO D-10-7b

4. PHONE: (614) 424-4901

EMAIL: Chris.perry@dnr.state.oh.us

5. PROJECT TITLE: "Conducting Research to Better Define the Sequestration Options in Eastern Ohio and the Appalachian Basin"

6. PROJECT TERM FROM: May 11, 2010 **TO:** December 31, 2011

7. PROJECT UPDATE **--OR-- FINAL REPORT** _____

8. BUDGET:

CO-SPONSOR'S NAME

COST-SHARE

OCDO	\$790,591
ODNR	\$0
Grand Total	\$790,591

Abstract: During the TAC meeting of 9/20/07 the TAC recommended OCDO contribute \$3,000,000 to funding of Phase III of the MRCSP. At that time it was hoped that a test well would be developed at Greenville Ohio and injection of 1 million tons or more of CO2 into the Mount Simon Sandstone would be demonstrated. As is discussed in detail in the attached proposal for redirection, the Greenville site was abandoned and there was no other site in Ohio with sufficient CO2 available for the proposed demonstration. The grant agreement for this project was never finalized as per a request from Battelle to allow some overlapping of the end date of funding of the OCDO grant and the DOE funding. Also, there was a paragraph in the OCDO recommendation to the TAC and the OAQDA that allowed for renegotiation of the OCDO award, if the demonstration at Greenville was not possible. This proposal is to maintain funding of project D-07-04 at \$3,000,000 but to redirect the work to focus on characterization of the potential for geologic sequestration of CO2 in Eastern Ohio. The work will be divided between Battelle and ODNR-DG by two contracts numbered as D-10-7a for the Battelle contract and D-10-07b for ODNR-DGS. There is one statement of work for these two subcontracts. Both parties assist in all tasks of the statement of work. The lead responsibilities of the parties vary among the tasks as presented in Table 1 of the proposal.

In the new project D-07-0b it is proposed that \$790,591 of the original grant be awarded to ODNR-DGS to support staff as they prepare data bases and maps of the area bringing together all available information regarding possible geologic CO2 sequestration in Eastern Ohio. This should be recognized as a first step in the characterization of Eastern Ohio's sequestration potential. ODNR-DGS would also play an active role in bringing together a consortium of stake holders who would prepare a long term, multiyear plan for a more detailed evaluation of the region's sequestration potential. Battelle would assist ODNR-DGS in these activities. ODNR would also assist Battelle in planning and evaluation of piggyback drilling opportunities.

Status: **Work Performed and Results Obtained During This Reporting Period**

Work performed during the first quarter was on Tasks 1 thru 4 as they are defined in the statement of work.

Task 1: Preparing Current State of Geologic Knowledge

- Task development and planning: ODGS Chief Wickstrom, project manager Chris Perry, and other ODGS Supervisors met to identify and develop detailed tasks and to assign ODGS staff to those tasks. Project hours for each team member for work to be performed were allotted. A preliminary area of review (AOR) was also identified. The AOR has been defined to extend from the eastern and southeastern state boundary westward to a line defined by the western pinch-out or cropline of the Devonian shales. This AOR therefore covers an area slightly larger than the eastern half of the state. While tasks have been identified and work is underway, further task evaluation and development is needed so this effort is considered 65% complete.
- Data identification: The project manager and ODGS Chief met with ODGS team to discuss tasks and objectives and to identify all known available data that can be accessed to compile, review, interpret and apply to a geologic model building effort. As staff explore each data type and provide feedback the list of data is updated. The objective of data identification is considered 65% complete.
- Data mining: Data mining efforts are now underway for this project. Several members of ODGS have met with key staff at ODNR's Division of Mineral Resource Management (MRM) to discuss the availability and contents of Class II (oil field brine injection) well data. There are over 165 Class II wells permitted by MRM to operate in the state. Since the majority of in-state oil and gas production is located within the AOR, the majority of these permitted Class II wells are also located within the AOR. Examples of available Class II well data include wireline geophysical logs, drill stem tests, and hydraulic injection step rate tests and also some brine chemistry data. MRM's files and databases will be evaluated by ODGS to collect any and all useful data of these types. Data mining efforts are underway but are only estimated to be 10% complete.
- Stratigraphic characterization: A regional evaluation of Knox stratigraphy over eastern Ohio has been initiated. A digital database of Knox wells data and completion cards has been compiled. Preliminary regional cross sections have been constructed that span across areas of eastern Ohio. Hardcopy log data is

being digitized to be imported into the OCDO project database so that additional cross sections can be built. Once a sufficient number of cross sections have been built, regional structure and gross thickness maps will be constructed, and then key potential injectivity zones will be identified and also mapped to delineate thickness and structure. The Knox is thought to contain some of the key CO₂ storage targets in eastern Ohio. This task is estimated to be 20% complete.

- Data acquisition from operators: ODGS staff met with geologists and geophysicists from Artex Oil Company, who came to ODGS to get our available data and information and our outlook on Beekmantown and the potential of other Cambrian reservoirs. Artex complemented ODGS' efforts to advance their database and knowledge by providing ODGS with figures from a proprietary 3D seismic survey that Artex ran in within our AOR. This particular interaction with industry 100% complete but new opportunities to exchange data and information with oil exploration and development companies will continue to arise, so this effort is on-going.
- AEP Mountaineer: ODGS Chief and staff participated in a two day meeting at the HR Collins Core Facility for the AEP Mountaineer Geologic Expert Committee. Chief Wickstrom is a member of that committee. While the Mountaineer Expert Committee project is funded by AEP as a separate effort from this OCDO contract, work on the AEP Mountaineer site is very relevant because the site lies within to our AOR, although is it located across the Ohio River in West Virginia. During this meeting, Cambrian-aged core acquired by Battelle and AEP from the Mountaineer site was displayed and inspected. Also, regional cross sections were reviewed. Battelle's site specific geologic model was presented as were plans and an approach for drilling two additional test CO₂ injection wells. The AEP Mountaineer CO₂ sequestration program is on-going. The newly-funded scale-up project for CO₂ capture and injection is just underway. Data and knowledge gained from this project will benefit our evaluation of eastern Ohio so progress, activities, and data generated at and around the Mountaineer plant will be monitored continually as work on this project continues.
- OSU-CWRU Proposal to OCDO. Ohio State University and Case Western Reserve University have expressed interest in collaborating with the ODGS on characterizing Ohio deep geology for CO₂ sequestration. ODGS met with Drs. Jeff Daniels and Beverly Saylor on May 4, 2010 to provide input to the proposal they were preparing to the OCDO. In July the ODGS provided a review of this proposal to Bob Brown of OCDO. We are currently scheduling a meeting with the researchers to assist them in their well selection and analytical approach.

Task 2: Preliminary Planning and Program Structuring

- ODGS Chief Wickstrom has had several discussions with Battelle towards planning the consortium-building portion of the project. Battelle and the chief are now scheduling a meeting with Ohio Air Quality Development Authority (OAQDA) Director Shanahan to review the plan prior to implementation. Preliminary discussions have also been held with AEP and the Ohio Environmental Council concerning formation of this consortium and the expert advisory group. Both organizations expressed favorable input.

- ODGS Chief Wickstrom and Energy Group supervisor Perry attended the August 25-26 meeting of the Midwest Governor's Association CCS task force in Columbus. The views and priorities of this group will be important to the consortium planning and building of this project.

Task 3: Detailed Planning and Preparation for Field Work

- Piggy-back drilling and sampling: The Ohio Division of Geological Survey is in constant contact with the Ohio Division of Mineral Resources Management concerning wells being permitted in the state. Any deep test wells permitted are examined for potential piggy back opportunities. The most important aspects of this analysis includes: 1) well location – is it to be drilled in an area where we have little of no deep data, 2) depth and formations to be penetrated, 3) the well operator – is it a reliable operator that the state can work with safely and productively. If these criteria are satisfied, The ODGS will go further towards exploring the piggyback opportunity and then involve Battelle in the discussions. If an opportunity fits within our predefined criteria, Battelle will enter into negotiations with the operator towards an agreement/contract.
- The first such opportunity this year was D&L Energy's North Star #1 well drilled in Youngstown, Mahoning County. This well was drilled as a prospective Class II (brine) injection well to a depth of 9,135 feet, into the Precambrian basement. The operator left most of the Cambrian sandstones and carbonates at and near the bottom of the well uncased or "open hole" to be used as the injection zone(s). Even though this well was planned before the contract for this OCDO project was finalized, it was still deemed a high priority opportunity. The well was drilled in May, 2010. Battelle and ODGS negotiated an agreement with the operator and were able to secure a very good suite of logs and well cuttings from this well which are now being interpreted with all other data being gathered for this project. ODGS is continuing to negotiate with the operator in the hopes of installing a pressure monitoring device in the well during injection operations to better characterize and quantify injectivity.
- Planning for important piggy-back activities is underway, as is subcontracting, and data gathering for Hill Georgetown Marine #1 brine injection well. This well will set a new depth record for the state and will be an important test of Cambrian geology in southeastern Ohio. ODGS has met twice with Battelle and the well operators to identify tasks, negotiate terms, and plan rig access and activities. ODGS has also met with Battelle and the operator to review a 1.5 mile long seismic survey the operator ran across the area of the well site to better determine details of subsurface geology and structure. Battelle deemed this seismic data useful enough to acquire it from the operator through cost-sharing. Planning efforts for the Hill Georgetown Marine well are thought to be 75% complete. The actual effort to drill the well and collect data for this OCDO project has not yet begun.

Task 4: Field Work

- From late April until mid May 2010, ODGS and Battelle identified and acted to conduct piggy-back data gathering operations on the D&L Energy North Star #1 well (API #34099231270000) drilled during this time interval in Youngstown Township, Mahoning County. This well was a 9,000 ft deep test of the Cambrian Conasauga Formation drilled as an oil & gas exploration well but completed as a Class II brine injection well. An extensive wireline log suite and well cuttings were obtained as part of the piggyback operation.

II. Problems and/or Circumstances Which Have or Will Likely Impede Timely Project Progress

- The Division of Geological Survey has lost two key geologists on staff in the last two months. Both resigned their position to work elsewhere. The Division is currently interviewing for replacements, but the amount of hours that could be devoted to this project this quarter will be somewhat less than projected. ODGS will endeavor to make up these hours once the new staff is in place.

III. Anticipated Work to be Performed Over the Next Quarterly Reporting Period (9/1/10 - 12/31/10)

Task 1: Preparing Current State of Geologic Knowledge

- Additional task delineation: ODGS is still in the process of formalizing internal work plans as our staffing levels change and identifying and verifying all possible sources of useful existing data that will be used to build our geologic model for eastern Ohio.

Task 2: Preliminary Planning and Program Structuring

- It is anticipated that the first formal meetings with prospective consortium members will take place within the next quarter.

Task 3: Detailed Planning and Preparation for Field Work

- Piggy-back activities: Completion of the Hill Georgetown Marine #1 well should be accomplished by the end of the calendar year. Data evaluation and analysis will likely extend into CY11.

A detailed planning meeting is schedule to be held at Battelle on Wednesday 9/15/10 to discuss key issues regarding the Georgetown Marine well. Issued to be discussed include: 1) the drilling timeline, borehole design, and drilling and drilling fluids program; 2) the drilling and geologic prognosis, including estimated depths and thicknesses of anticipated key formations, formation lithologies and zones of interest; 3) the wireline geophysical logging program; 4) a prioritization of the sidewall coring program; 5) site access and logistical requirements; 6) general and specific roles and responsibilities; 7) data handling, management, and distribution; and 8) consulting with and discussing

project objectives with the logging contractor, Baker Hughes, to maximize information and value from the logging effort.

Task 4: Field Work

- The David R. Hill, Inc - Georgetown Marine #1 well field work will take place within the next quarter. Other opportunities may also occur.