DOE F 4600.2
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U.S. Department of Energy
FEDERAL ASSISTANCE REPORTING CHECKLIST
AND INSTRUCTIONS FOR RD&D PROJECTS

1. Identification Number: **DE-FE0006821**	2. Program/Project Title: **Small Scale Field Test Demonstration CO2 Sequestration**

3. Recipient:
University of Kansas Center for Research, Inc.

4. Reporting Requirements:	Frequency	Addressees
A. MANAGEMENT REPORTING		
☒ Research Performance Progress Report (RPPR)	Q	FITS@NETL.DOE.GOV
☒ Special Status Report	A	FITS@NETL.DOE.GOV
B. SCIENTIFIC/TECHNICAL REPORTING		
(Reports/Products must be submitted with appropriate DOE F 241. The 241 forms are available at www.osti.gov/elink)		
Report/Product — Form		
☒ Final Scientific/Technical Report — DOE F 241.3	FG	http://www.osti.gov/elink-2413
☒ Conference papers/proceedings* — DOE F 241.3	A	http://www.osti.gov/elink-2413
☐ Software/Manual — DOE F 241.4		
☐ Other (see special instructions) — DOE F 241.3		
** Scientific and technical conferences only*		
C. FINANCIAL REPORTING		FITS@NETL.DOE.GOV
☒ SF-425 Federal Financial Report	Q, FG	
D. CLOSEOUT REPORTING		
☒ Patent Certification	FC	FITS@NETL.DOE.GOV
☒ SF-428 & 428B Final Property Report	FC	FITS@NETL.DOE.GOV
☐ Other		
E. OTHER REPORTING		See block 5 below for instructions.
☒ Annual Indirect Cost Proposal	O	
☐ Audit of For-Profit Recipients		FITS@NETL.DOE.GOV
☒ SF-428 Tangible Personal Property Report Forms Family	A	FITS@NETL.DOE.GOV
☒ Other – see block 5 below	A	

FREQUENCY CODES AND DUE DATES:

A - Within 5 calendar days after events or as specified.
FG- Final; 90 calendar days after the project period ends.
FC- Final; End of Effort.
Y - Yearly; 90 calendar days after the end of the reporting period.
S - Semiannually; within 30 calendar days after end of project year and project half-year.
Q - Quarterly; within 30 days after end of the reporting period.
Y180 – Yearly; 180 days after the end of the recipient's fiscal year
O - Other; See instructions for further details.

5. Special Instructions:

Annual Indirect Cost Proposal – If DOE is the Cognizant Federal Agency, then the proposal should be sent to FITS@NETL.DOE.GOV . Otherwise, it should be sent to the Cognizant Federal Agency.

Other – The Recipient shall provide all deliverables as contained in Section D of Attachment 2 Statement of Project Objectives.

QUARTERLY PROGRESS REPORT
To
DOE-NETL
Brian Dressel, Program Manager
Award Number: DE-FE0006821

SMALL SCALE FIELD TEST DEMONSTRATING CO_2 SEQUESTRATION IN ARBUCKLE SALINE AQUIFER AND BY CO_2-EOR AT WELLINGTON FIELD, SUMNER COUNTY, KANSAS

Project Director/Principal Investigator:
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Joint Principal Investigator:
Jason Rush

Prepared by Lynn Watney
Date of Report: February 15, 2015
DUNS Number: 076248616

Recipient: University of Kansas Center for Research &
Kansas Geological Survey
1930 Constant Avenue
Lawrence, KS 66047

Project/Grant Period: 10/1/2011 through 9/30/2016

Thirteenth Quarterly Report

Period Covered by the Report: October 1, 2014 through December 31, 2014

Signature of Submitting Official:

W. Lynn Watney
Digitally signed by W. Lynn Watney
DN: cn=W. Lynn Watney, o=The University of Kansas, ou=Kansas Geological Survey, email=lwatney@kgs.ku.edu, c=US
Date: 2015.02.15 21:47:56 -06'00'

EXECUTIVE SUMMARY

Project Objectives

The objectives of this project are to understand the processes that occur when a maximum of 70,000 metric tonnes of CO_2 are injected into two different formations to evaluate the response in different lithofacies and depositional environments. The evaluation will be accomplished through the use of both *in situ* and indirect MVA (monitoring, verification, and accounting) technologies. The project will optimize for carbon storage accounting for 99% of the CO_2 using lab and field testing and comprehensive characterization and modeling techniques.

CO_2 will be injected under supercritical conditions to demonstrate state-of-the-art MVA tools and techniques to monitor and visualize the injected CO_2 plume and to refine geomodels developed using nearly continuous core, exhaustive wireline logs, and well tests and a multi-component 3D seismic survey. Reservoir simulation studies will map the injected CO_2 plume and estimate tonnage of CO_2 stored in solution, as residual gas, and by mineralization and integrate MVA results and reservoir models shall be used to evaluate CO_2 leakage. A rapid-response mitigation plan will be developed to minimize CO_2 leakage and provide comprehensive risk management strategy. A documentation of best practice methodologies for MVA and application for closure of the carbon storage test will complete the project. The CO_2 shall be supplied from a reliable facility and have an adequate delivery and quality of CO_2.

Scope of Work

Budget Period 1 includes updating reservoirs models at Wellington Field and filing Class II and Class VI injection permit application. Static 3D geocellular models of the Mississippian and Arbuckle shall integrate petrophysical information from core, wireline logs, and well tests with spatial and attribute information from their respective 3D seismic volumes. Dynamic models (composition simulations) of these reservoirs shall incorporate this information with laboratory data obtained from rock and fluid analyses to predict the properties of the CO_2 plume through time. The results will be used as the basis to establish the MVA and as a basis to compare with actual CO_2 injection. The small scale field test shall evaluate the accuracy of the models as a means to refine them in order to improve the predictions of the behavior and fate of CO_2 and optimizing carbon storage.

Budget Period 2 includes completing a Class II underground injection control permit; drilling and equipping a new borehole into the Mississippian reservoir for use in the first phase of CO_2 injection; establishing MVA infrastructure and acquiring baseline data; establishing source of CO_2 and transportation to the injection site; building injection facilities in the oil field; and injecting CO_2 into the Mississippian-age spiculitic cherty dolomitic open marine carbonate reservoir as part of the small scale carbon storage project.

In Budget Period 3, contingent on securing a Class VI injection permit, the drilling and completion of an observation well will be done to monitor injection of CO_2 under supercritical conditions into the Lower Ordovician Arbuckle shallow (peritidal) marine dolomitic reservoir. Monitoring during

pre-injection, during injection, and post injection will be accomplished with MVA tools and techniques to visualize CO_2 plume movement and will be used to reconcile simulation results. Necessary documentation will be submitted for closure of the small scale carbon storage project.

Project Goals

The proposed small scale injection will advance the science and practice of carbon sequestration in the Midcontinent by refining characterization and modeling, evaluating best practices for MVA tailored to the geologic setting, optimize methods for remediation and risk management, and provide technical information and training to enable additional projects and facilitate discussions on issues of liability and risk management for operators, regulators, and policy makers.

The data gathered as part of this research effort and pilot study will be shared with the Southwest Sequestration Partnership (SWP) and integrated into the National Carbon Sequestration Database and Geographic Information System (NATCARB) and the 6th Edition of the Carbon Sequestration Atlas of the United States and Canada.

Project Deliverables by Task

1.5	Well Drilling and Installation Plan (Can be Appendix to PMP or Quarterly Report)
1.6	MVA Plan (Can be Appendix to PMP or Quarterly Report)
1.7	Public Outreach Plan (Can be Appendix to PMP)
1.8	Arbuckle Injection Permit Application Review go/no go Memo
1.9	Mississippian Injection Permit Application Review go/no go Memo
1.10	Site Development, Operations, and Closure Plan (Can be Appendix to PMP)
2.0	Suitable geology for Injection Arbuckle go/no go Memo
3.0	Suitable geology for Injection Mississippian go/no go Memo
11.2	Capture and Compression Design and Cost Evaluation go/no go Memo
19	Updated Site Characterization/Conceptual Models (Can be Appendix to Quarterly Report)
21	Commercialization Plan (Can be Appendix to Quarterly Report).
30	Best Practices Plan (Can be Appendix to Quarterly or Final Report)

ACCOMPLISHMENTS

1. **Kickoff meeting with team on October 15, 2014 to implement plans for BP2.**
2. **Teleconferenced with Region 7 EPA in Lenexa, KS Washington office during the quarter to respond to questions Wellington Class VI application.**
3. **Obtained completion plans, drilled, and began testing of two of the shallow water wells to evaluate presence of USDW.**
4. **Started processing of data obtained from cGPS data to provide baseline for InSAR.**
5. **Instituted cost-center based billing through discussions with KGS, KUCR, and DOE to expedite invoicing and justification for DOE.**
6. **15 seismometers seismic array from IRIS-PASSCAL were placed on a cellular network.**

Milestone Status Report

Task	Budget Period	Number	Milestone Description
Task 2.	1	1	Site Characterization of Arbuckle Saline Aquifer System - Wellington Field
Task 3.	1	2	Site characterization of Mississippian Reservoir for CO2 EOR - Wellington Field
Task 10.	2	3	Pre-injection MVA - establish background (baseline) readings
Task 13.	2	4	Retrofit Arbuckle Injection Well (#1-28) for MVA Tool Installation
Task 18.	3-yr1	5	Compare Simulation Results with MVA Data and Analysis and Submit Update of Site Characterization, Modeling, and Monitoring Plan
Task 22.	3-yr1	6	Recondition Mississippian Boreholes Around Mississippian CO2-EOR injector
Task 27.	3-yr2	7	Evaluate CO2 Sequestration Potential of CO2-EOR Pilot
Task 28.	3-yr2	8	Evaluate Potential of Incremental Oil Recovery and CO2 Sequestration by CO2-EOR - Wellington field

Task 2 – Received written questions from EPA's on initial review of the projects Class VI application on December 23, 2014 including the Arbuckle simulation.

Task 3 – Mississippian geomodel and simulations slightly modified and three alternative locations of the Class II Mississippian injection well were obtained including original location. Original location confirmed for Class II well for filing Class II injection permit with the Kansas Corporation Commission in January 2015.

Task 10 – Two shallow water wells were drilled to evaluate for the presence of USDW in the project AOR. Initial fundings indicate low yield and saltwater, but further drilling and testing is being requested by EPA.

Project Schedule

BP2 activities are underway or planned as summarized below:

a) MVA implementation – seismometer array (installed Sept 2014), cGPS (installed Sept 2014), shallow USDW wells (Oct-Nov. 2014), soil gas (late 2014), re-pressuring Mississippian and sampling producing wells (~March 2015)
b) Class II application (to be filed Nov. 2014) and Public Outreach (Dec 2014)
c) Drill Mississippian injection well, #2-32 (~March 2015)
d) Inject CO2 (~April 2015) 120 metric tons per day, up to 26,000 metric tons, 8 months max.
e) EPA permit (March, now possibly April 2015)
f) Order fabrication of CASSM and U-Tube 8-9 months lead time (March 2015)
g) Drill #2-28 Arbuckle monitoring well (summer 2015)
h) Equip #2-28 with CAASM and U-Tube, and #1-28 for injection (Oct-Nov 2015)
i) Possibly deploy fiber optics in #2-28 in same timeframe -- DE-FEOO12700 -- Distributed Fiber Optic Arrays: Integrated Temperature and Seismic Sensing for Detection of CO2 Flow, Leakage and Subsurface Distribution - Rob Trautz, EPRI, PI

j) Inject CO2 in #1-28 (Nov 2015) -- 120 metric tons per day; up to 26,000 tonnes, 7.5 months max.
k) Post injection monitoring begin (July 2016) DOE project currently ends Sept 2016; extension for post injection site care defined by EPA using remaining funds

Activities of Lawrence Berkeley National Lab

Discussions on CAASM and U-Tube install began again at the Kickoff meeting and subsequent meetings were held with Tom Daley and Barry Freifeld at LBNL. LBNL continues to update the installation details and will soon supply diagrams tailored to equipping the Arbuckle injection and monitoring wells.

ONGOING ACTIVITIES

TASK 1. PROJECT MANAGEMENT AND REPORTING

Completed activities include –

- **Held kickoff meeting on October 15**

A.M. Session --
Discussed main activities in the morning session that are and will be performed in Budget Period 2 (ending August 31, 2015):

- MVA implementation – seismometer array (Sept 2015), InSAR and cgps (Sept 2015), shallow USDW wells (Oct 2015), soil gas (November 2015), re-pressuring Mississippian and sampling producing wells (Nov 2015)
- Class II application (Nov 2015) and Public Outreach (Dec 2015)
- Drill Mississippian injection well, #2-32 (by Feb. 2015)
- Inject CO2 (April 2015) 120 metric tons per day, up to 26,000 metric tons, approximately 8 months max.
- EPA permit (March 2015)
- Drill #2-28 Arbuckle monitoring well (March 2015)
- Equip #2-28 with CAASM and U-Tube, and #1-28 for injection (by Oct 2015)
- Inject CO2 in #1-28 (Nov 2015) -- 120 metric tons per day; up to 26,000 tonnes, 7.5 months max.
- Post injection monitoring begin (July 2016)
- DOE project currently ends Sept 30, 2016; extension for post injection site care to be defined by EPA using remaining funds.

Afternoon schedule of kickoff meeting:

12:00-12:15 -- Current status of the project -- Lynn Watney (KGS), Jennifer Raney (KGS), Tiraz Birdie (Birdie Consulting)
Main activities that are and will be performed in Budget Period 2 (ending August 31, 2015)
MVA implementation – seismometer array (Sept 2015), InSAR and cgps (Sept 2015), shallow USDW wells (Oct 2015), soil gas (November 2015), re-pressuring Mississippian and sampling producing wells (Nov 2015)
Class II application (Nov 2015) and Public Outreach (Dec 2015)
Drill Mississippian injection well, #2-32 (by Feb 2015)
Inject CO2 (April 2015) 120 metric tons per day, up to 26,000 metric tons, 8 months max.

EPA permit (March 2015)
Drill #2-28 Arbuckle monitoring well (March 2015)
Equip #2-28 with CAASM and U-Tube, and #1-28 for injection (Oct-Nov 2015)
Inject CO2 in #1-28 (Nov 2015) -- 120 metric tons per day; up to 26,000 tonnes, 7.5 months max.
Post injection monitoring begin (July 2016)
DOE project currently ends Sept 2016; extension for post injection site care defined by EPA using remaining funds
Brief summaries by Key Personnel
12:15-12:25 – Dana Wreath (Berexco, LLC), V.P. and Wellington Field operator
12:25-12:35 – Chris White (Linde LLC), Business Development Engineer, Oil and Gas Services
12:35-12:45 – Pete Wilt (Praxair Services, Inc.) Commercial Business Director - Oil and Gas Services with Justin Anderson and Mark Weise
12:45-12:55 -- Jason Rush (KGS, Joint P.I.) and Dave Newell, Wellington geomodel and performance
12:55-1:05 -- Eugene Holubnyak (KGS), Wellington simulation and field performance with Mina Fazelalavi
1:05-1:15 -- John Doveton (KGS), Petrophysical modeling & mechanical stratigraphy with Mina Fazelalavi and John Victorine
1:15-1:25 -- Rick Miller (KGS), water well drilling, seismometer install and operation, 2D high resolution seismic with Shelby Peterie
1:25-1:35 -- Mike Taylor (KU), InSAR, fault mapping with Drew Schwab, M.S. student; with support by Tandis Bidgoli
1:35-1:45 -- Saugata Datta (KSU), fluid and tracer sampling, water wells, Mississippian and Arbuckle monitoring wells with Austin Krehel, M.S. student
1:45-1:55 – Tom Daley (LBNL), continuous active seismic monitoring of Arbuckle injection, crosshole seismic, soil gas
1:55-2:05 – Barry Freifeld (LBNL), U-Tube insitu sampling of Arbuckle, soil gas

- Established invoicing protocol – cost center billing for Berexco accepted by Berexco, KGS, DOE, KUCR
- Holding scheduled conference calls with team (bimonthly)
- Prepared to file Class II injection permit for CO2-EOR well, Wellington KGS #2-32
- Press release prepared for Class II injection, but holding off until Class II permit is granted
- Install cellular network for remote communication with seismometers
- Install 3 accelerometer/broadband seismometers.
- PMP was revised on December 17th remove soil gas sampling grid and comment on go/no go decisions with respect to Class VI requirements and PISC

Subtask 1.7. Public Outreach Plan

Completed drafts of Public Information Circular, Fact Sheet, and KGS Press Release for upcoming work at Wellington. Press release (reviewed by key parties, project fact sheet,

website-visibility, and meet with public at Wellington to discuss the project and answer questions.)

Subtask 1.8. Arbuckle Injection Permit Application Review go/no go Memo

General Permit Application: EPA continues to review our permit application. Two wells were drilled to evaluate the presence of the USDW (**Figures 1 and 2**). Wells were completed in November 2014. Sample descriptions of 200 ft test well shows fine grained aquiclude that has yielded salty water. **Figure 3** provides a cross section of shallow interval above the Hutchinson Salt layer between KGS #1-32, KGS #-28, and USDW #2. **Figure 4** illustrates the very fine unconsolidated sand present in the top 14 ft of USDW #2. The bedrock strata beneath the sandy material is dominated by dark gray gypsiferous shale (**Figure 5**). The yield of both wells is very low as indicated by low recovery of the fluid levels after bailing (**Figure 6 and 7**).

Teleconference with EPA led to comments 11-26-14 that included alternative sampling locations, a request to submit a Quality Assurance Project Plan, and a recommendation to review ADM's approved plan.

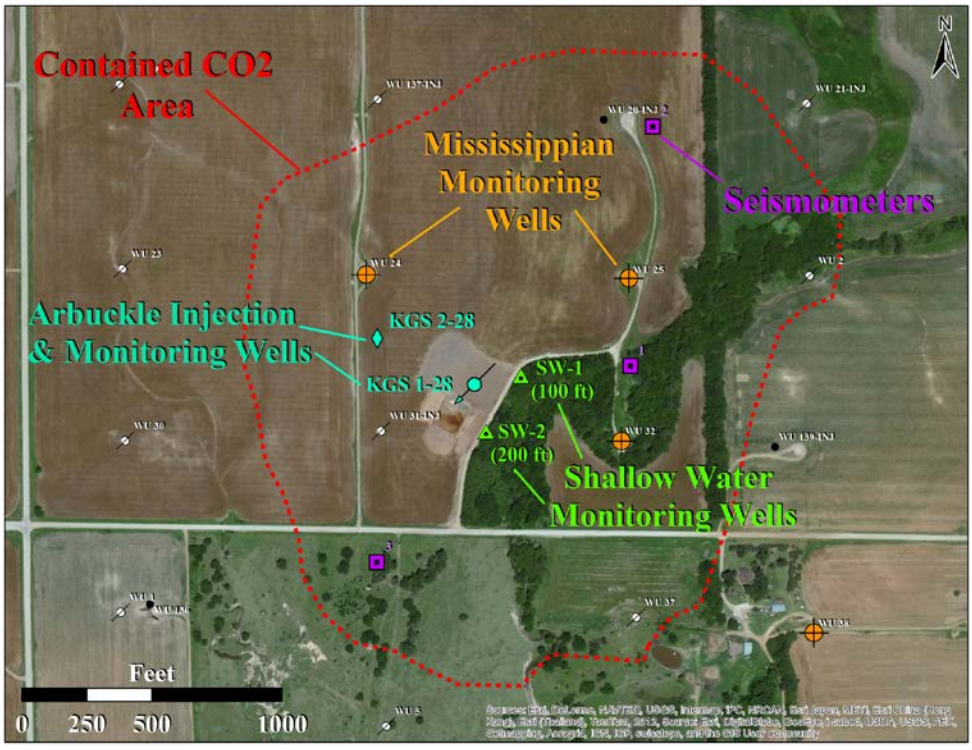


Figure 1. Base map at Wellington showing locations of USDW #1 and #2, located east of the Arbuckle injection well #1-28.

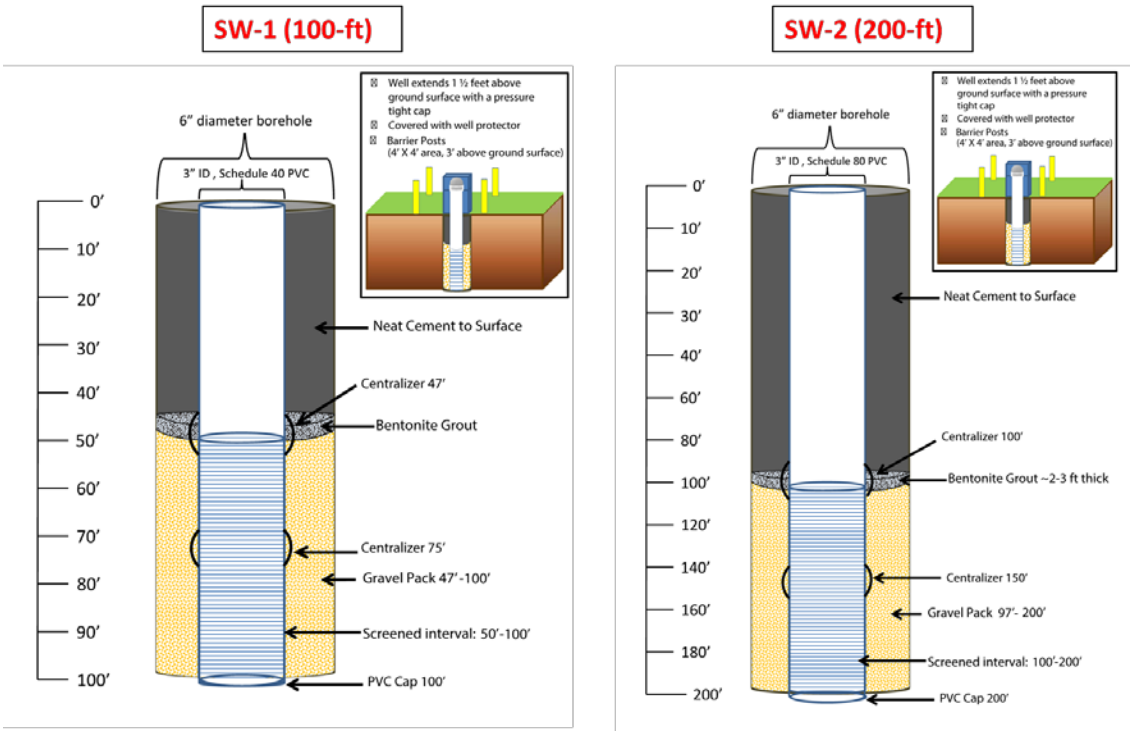


Figure 2. Completion diagrams of UDSW #1 and #2.

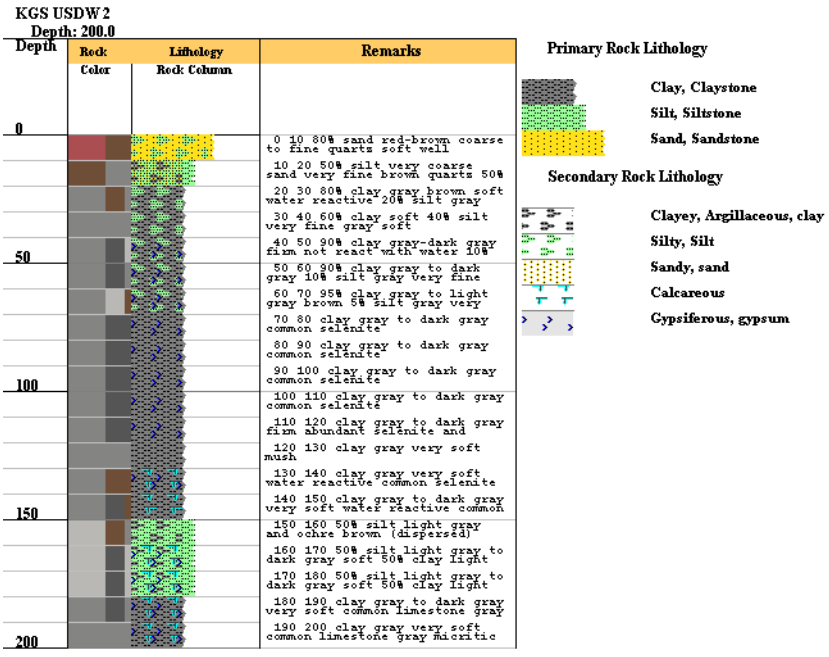


Figure 3. Sample description of deepest USDW monitoring well. Uppermost 10 ft has silt and sand and clay or silt below. Yield of this well has been low and water is briny.

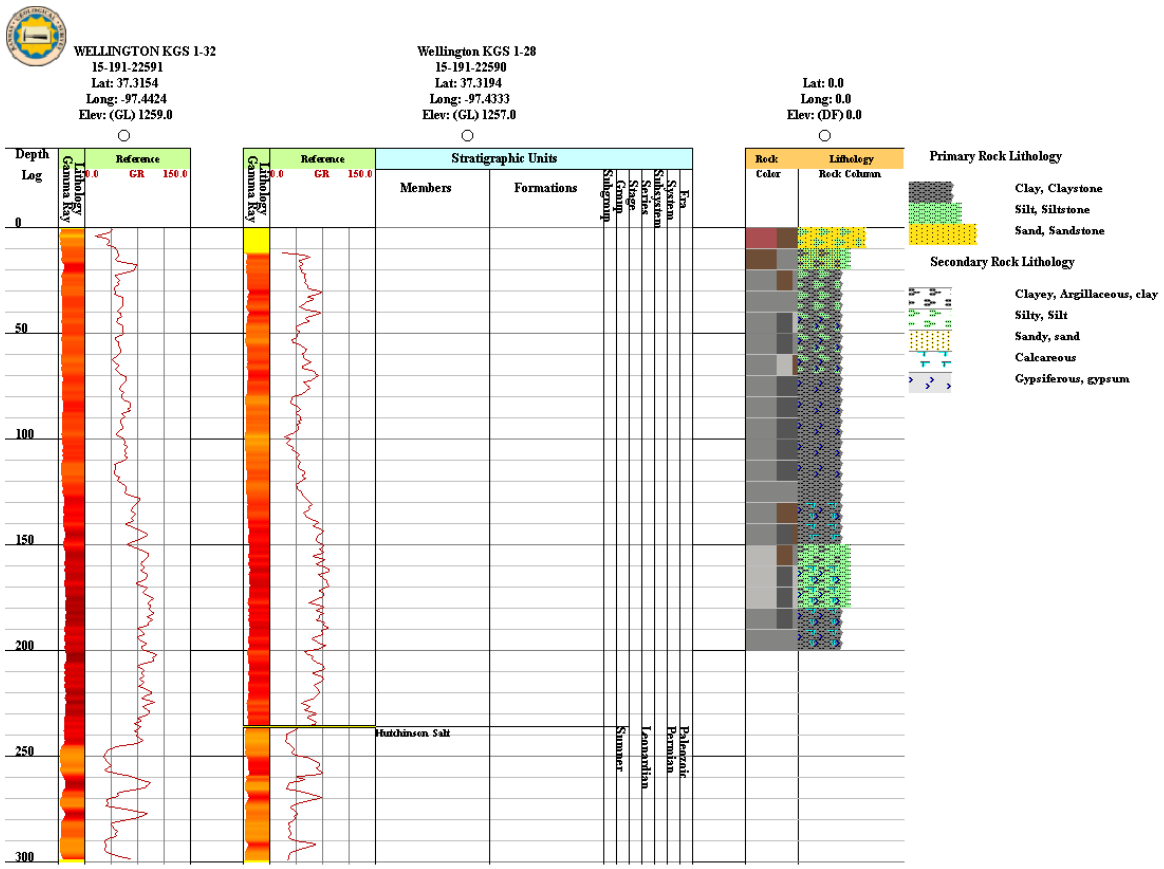


Figure 3. Cross section showing the extent of the Wellington Shale that is sampled in the deeper USDW monitoring well.

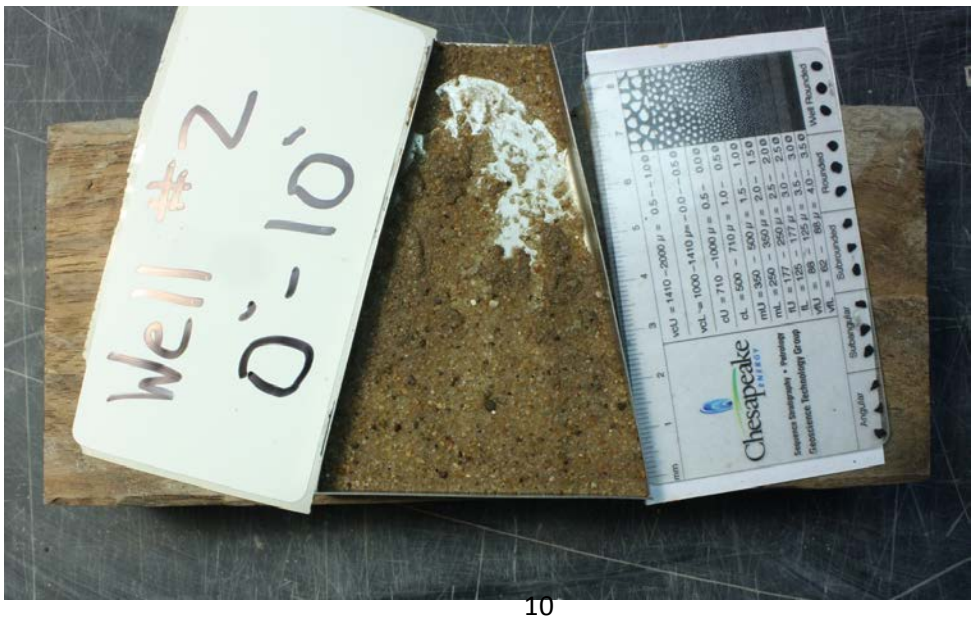
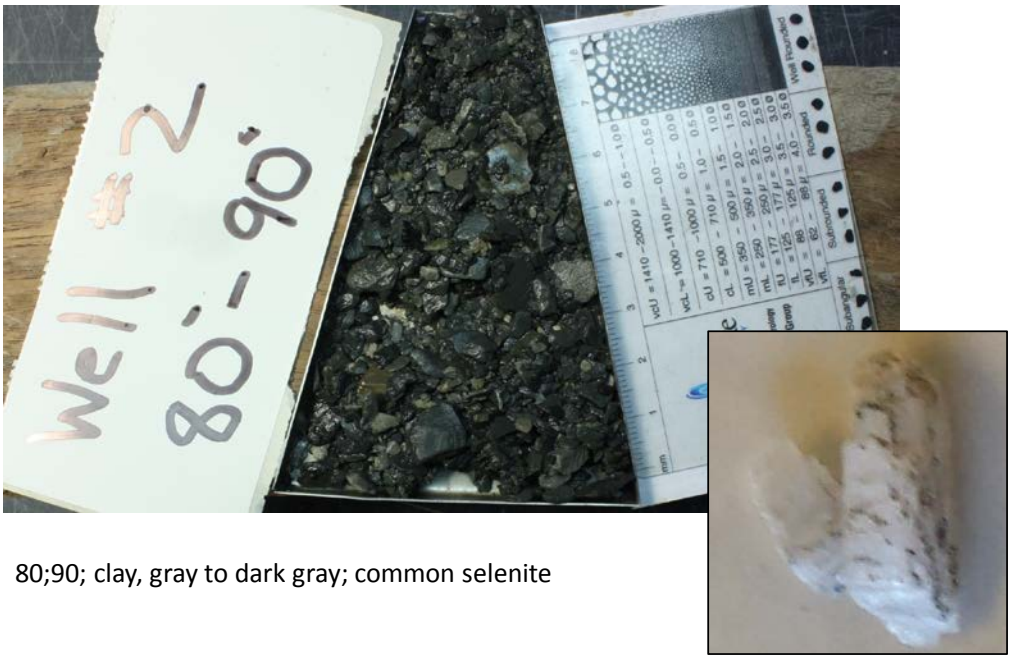


Figure 4. Sand, fine to coarse grained mixed with silt and clay, ochre to dark yellow. Loose, friable, separate grains.



80;90; clay, gray to dark gray; common selenite

Figure 5. Representative sample below 14 ft. consisting of dark gray silty clay to claystone containing scattered gypsum as noted in the inset photo.

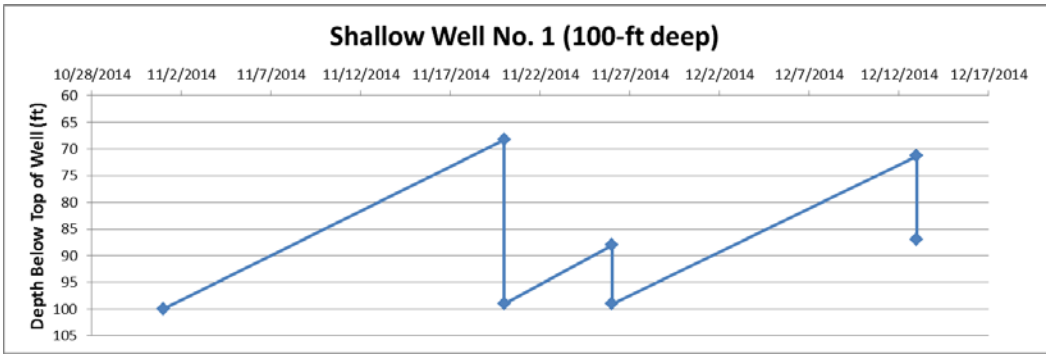


Figure 6. Changes change in fluid level fill up in shallow 100 ft deep USDW Well #1.

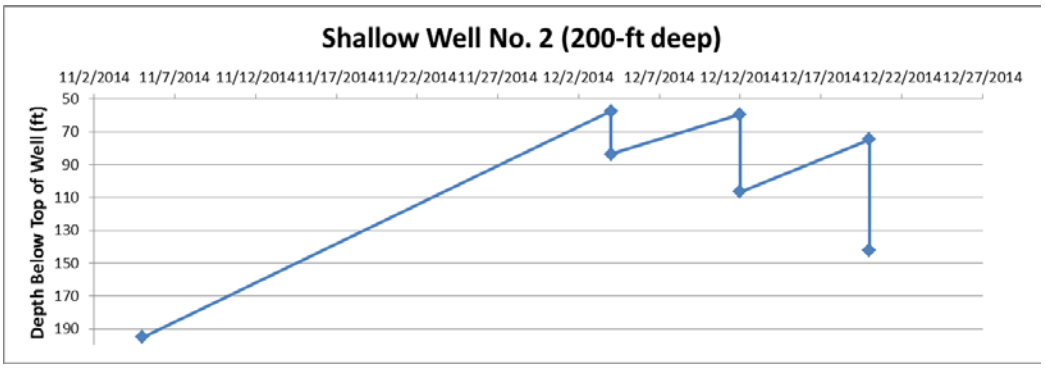


Figure 7. Slow buildup of water level in well #2 indicating low yield.

State regulators at Kansas Corporation Commission and Kansas Department of Health and Environment have been asked to review the Class VI application. Request has been made to again have a face-to-face meeting with Region 7 EPA.

On December 19, 2014 EPA provided a review of the entire Class VI application and with "*Request for Additional Information #1*" covering the major topics in a set of tables. Team is addressing questions. This is not a note of deficiencies, but is treated as an informal communication. The questions are part of four tables. The team is currently working on the responses to the questions.

- Table 1. AoR and Corrective Action – 28 questions
- Table 2. Testing and Monitoring (Ground Water/Plume/Pressure-Front Monitoring) – 18 questions
- Table 3. Testing and Monitoring (Other Monitoring) – 20 questions.
- Table 4. Testing and Monitoring (PISC and Site Closure) – 15 questions.

We have also approached EPA about reducing financial assurance and it was agreed to discuss topic in January 2015.

Seismicity -- EPA has asked us as part of the questions to comment on the increase in seismicity in the area to the west and south of Wellington. In addition to answering the question, the KGS has taken an active role including 1) deploying new seismometers in the region, 2) contributing to developing a response plan with the state regulators that affect brine disposal wells in the vicinity of the earthquakes as part of the *Induced Seismicity Task Force* appointed by the state, 3) obtaining information from petroleum industry on well activities to help evaluate the science behind seismicity. A presentation on earthquakes was made on December 2nd to the Kansas Geological Society -- http://www.kgs.ku.edu/PRS/Seismicity/KS_Geo_Society_Talk_12022014.pdf

The presentation was followed up by an endorsement of the KGS efforts by the Kansas Geological Society and the Kansas Independent Oil and Gas Association to seek a better scientific understanding of earthquakes. In addition a seminar at KU was developed for the

Spring 2015 semester to discuss induced seismicity. In addition, numerous inquiries of the press have been made concerning the earthquake, e.g.,

http://cjonline.com/news/2015-01-04/earthquake-monitors-being-installed-south-central-kansas -- Interviews with KGS geophysics team who set up the Wellington seismometers. http://www.wibwnewsnow.com/four-seismic-monitoring-stations-installed-south-central-kansas/ - interview with KGS Tandis Bidgoli.

Our response to EPA on earthquakes is that 1) the volume and rate of CO2 injected is orders of magnitude less than the brine disposal in south-central Kansas and central Oklahoma; 2) the monitoring of the injection including pressure, 3) seismicity monitoring with the 15-seismometer array, and 4) tracking plume movement in this highly characterized and tested location should avail them of any concerns of the project's injecion creating earthquakes. Geomechanical modeling of stress-strain during injection is being conveyed to EPA in writing, but will also be explained in a teleconference.

TASK 2. SITE CHARACTERIZATION OF ARBUCKLE SALINE AQUIFER SYSTEM - WELLINGTON FIELD (GO/NO-GO DECISION #3)

Additional analysis of the geomodel are being made as theses from DE-FE0002056 are completed.

TASK 3. SITE CHARACTERIZATION OF MISSISSIPPIAN RESERVOIR - WELLINGTON FIELD (CLASS II APPLICATION & GO/NO-GO DECISION #4)

The following figures (Figure 8-illustrate the refinement in the Mississippian geomodel that was recently done for verifying the location of the Class II injector.

Wellington Field

- **Contours are top Mississippian**
- **NE-SW fault**
  - **<u>20+ ft of reflector offset</u>** is best imaged at this depth (2810-ft TVDSS)
  - Fault tips out at top Mississippian
  - **Within the Mississippian, the fault may record strike/slip movement** as opposed to vertical offset in older strata
  - **Fault is discontinuous**
  - **Fault underwent episode of later movement** just prior to deposition of upper Pennsylvanian Oread Limestone

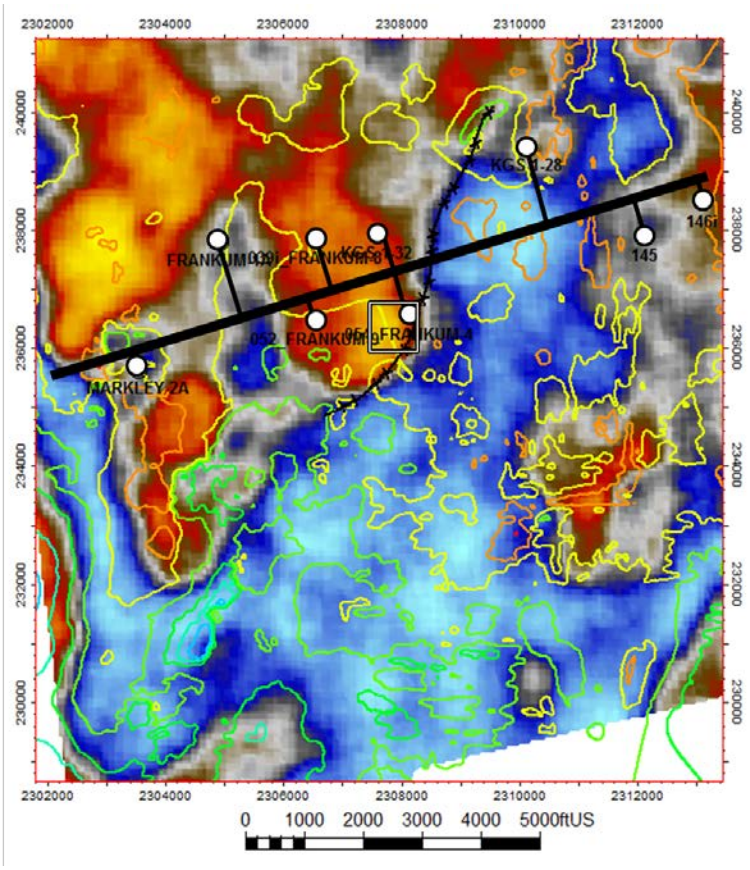


Figure 8. Geomodel of the top of the Mississippian resevoir at Wellington field.

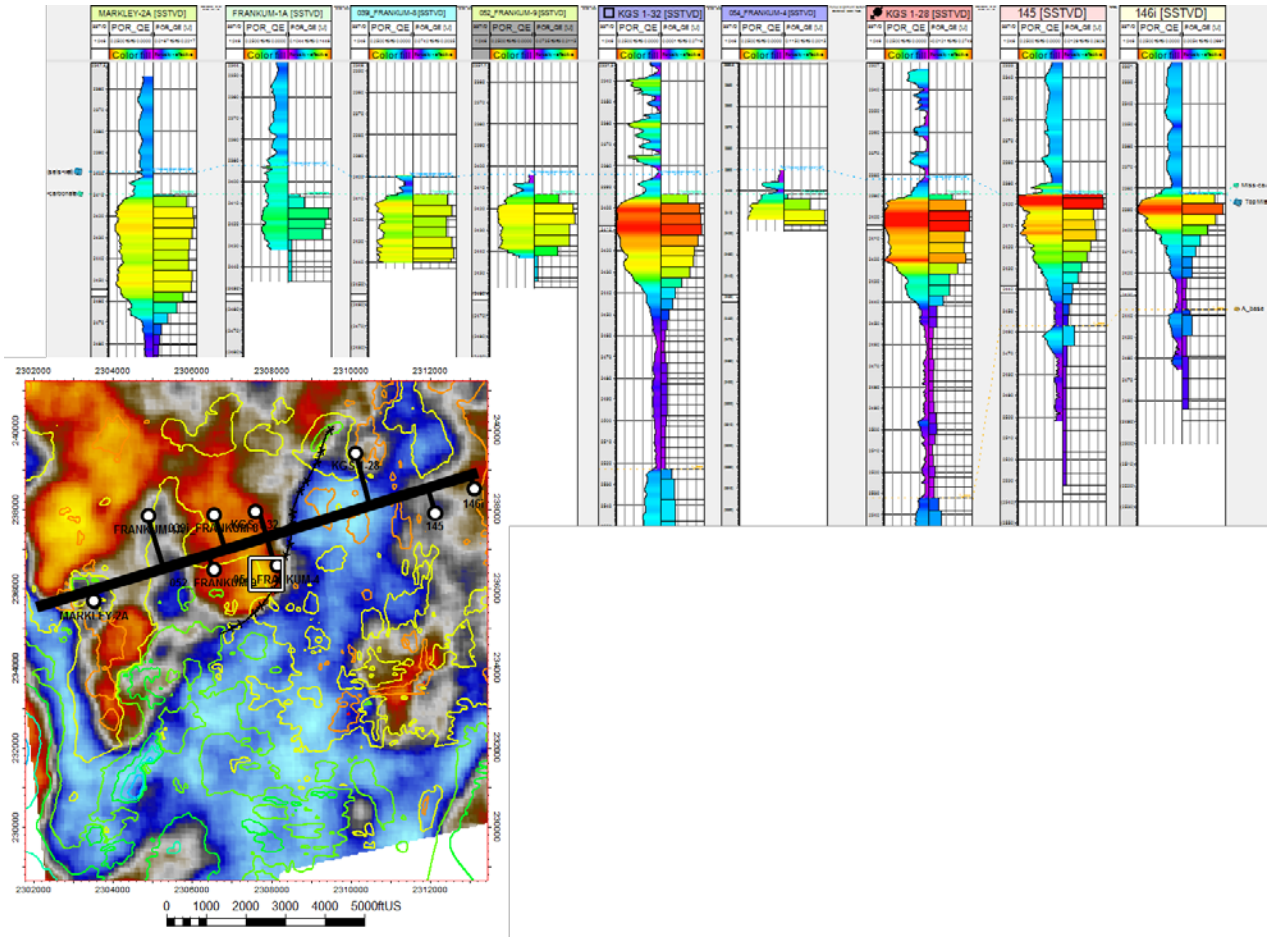


Figure 9. SW-NE cross section in upper most Mississippian at Wellngton Field showing variation in porosity of the pay zone. Hotter colors are higher values of porosity. The index map is the structure at the top of the Mississippian. Note the small yellow box in the central portion of the map. This is the location of the CO2 pilot.

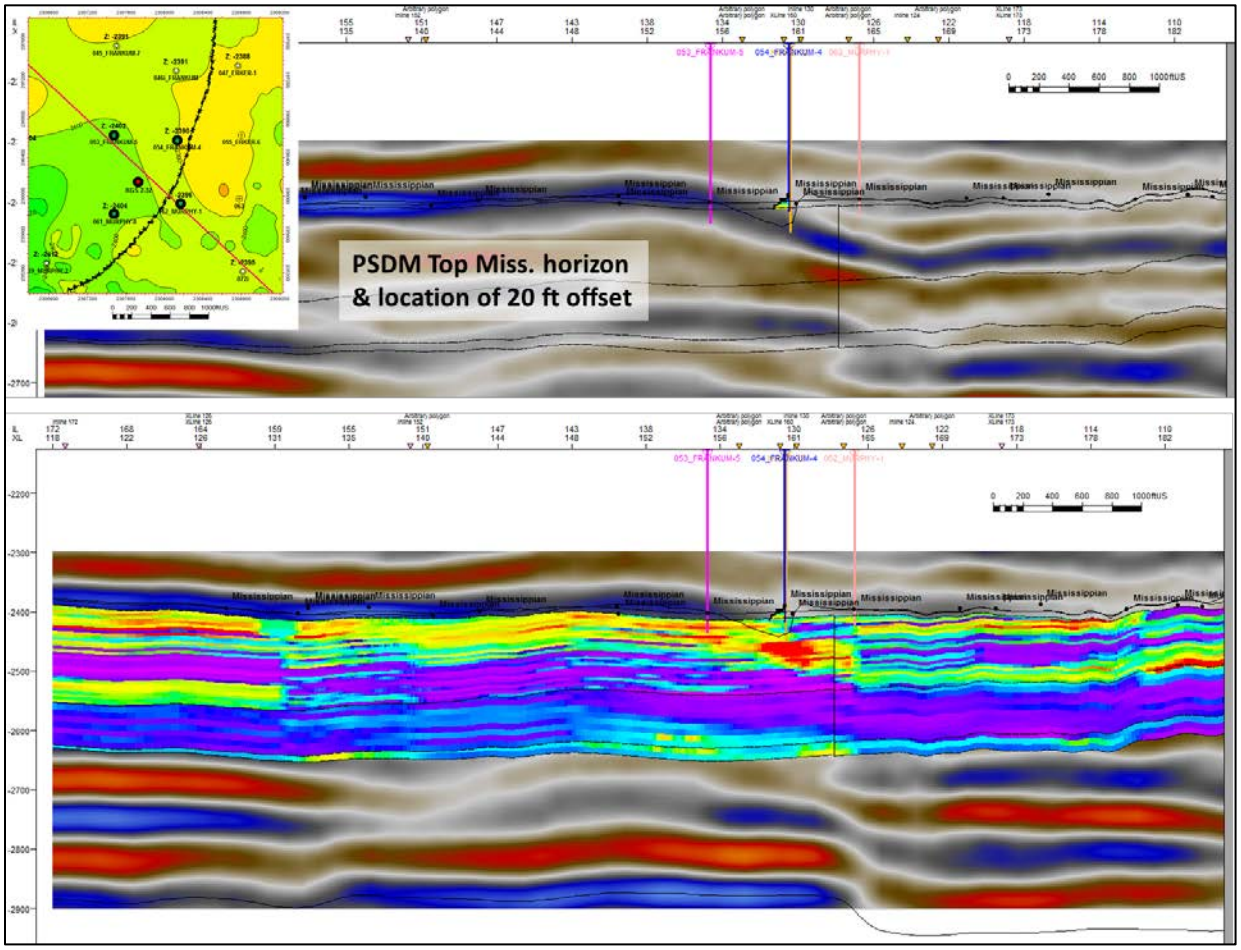


Figure 10. PSDM seismic line projected through 5-spot CO2 EOR, amplitude top and porosity section on bottom. Top Mississippian is constrained by well control. Note offlapping, progradational layering consistent with Mississippian depositional model. Doublet amplitude developed in the upper section on the right (east of the CO2-EOR site) complicates the interpretation. PSDM seismic Mississippian correlation and attribute work. Logging program for KGS 2-32 includes a sonic, which will aid future interpretation and depth-migration. Currently, sonic logs are absent where doublet is present.

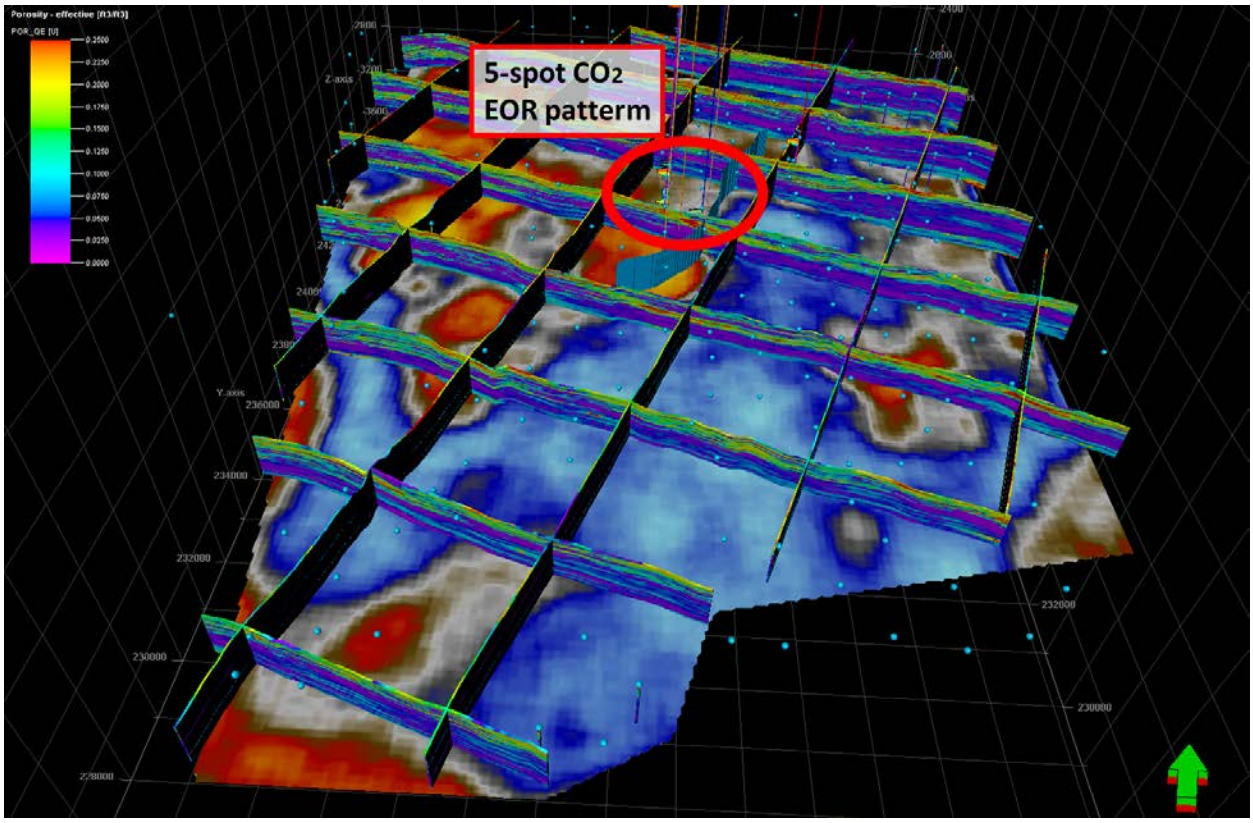


Figure 11. -2810 seismic horizon. Porosity model is conditioned to seismic porosity attribute. Layering style generates offlapping, westward-progradational geometries from a persistently (?) positive block along westward side of fault. Location of the CO2-EOR pilot area is shown.

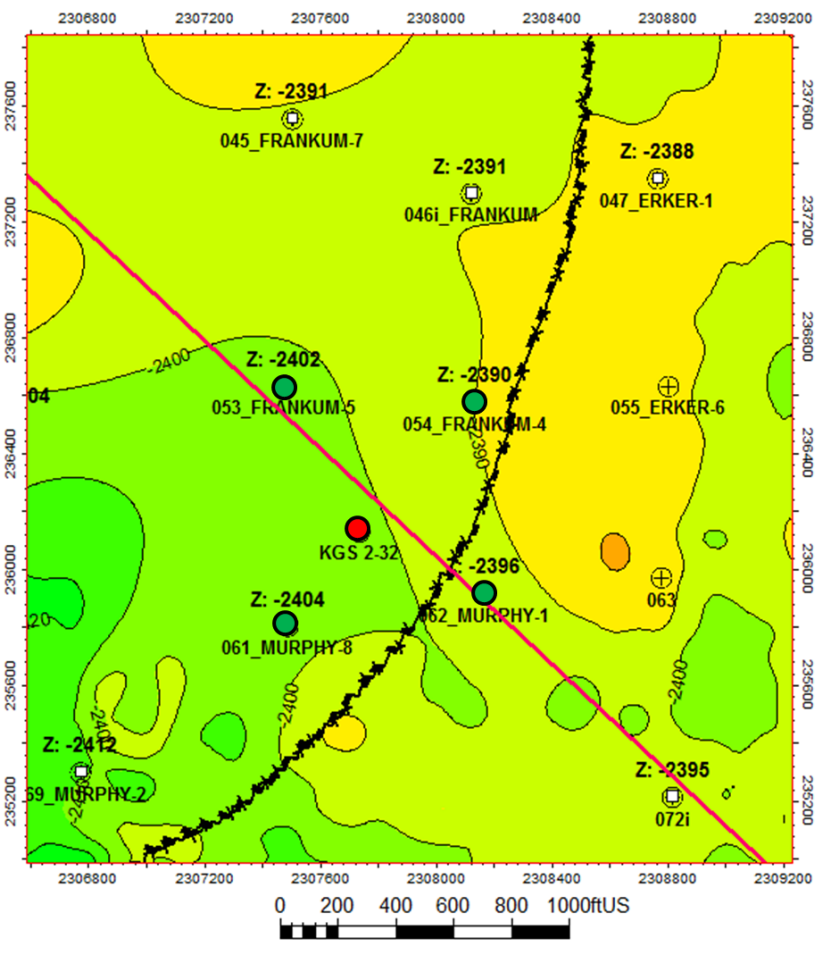


Figure 13. Structure map of CO2 EOR pilot area. Location of fault with small offset is identified by black hachured line.

TASK 5. SECURE CO2 SOURCE -- GO/NO-GO DECISION #5

Subtask 5.1 CO_2 Supply
Subtask 5.2 CO_2 Transportation

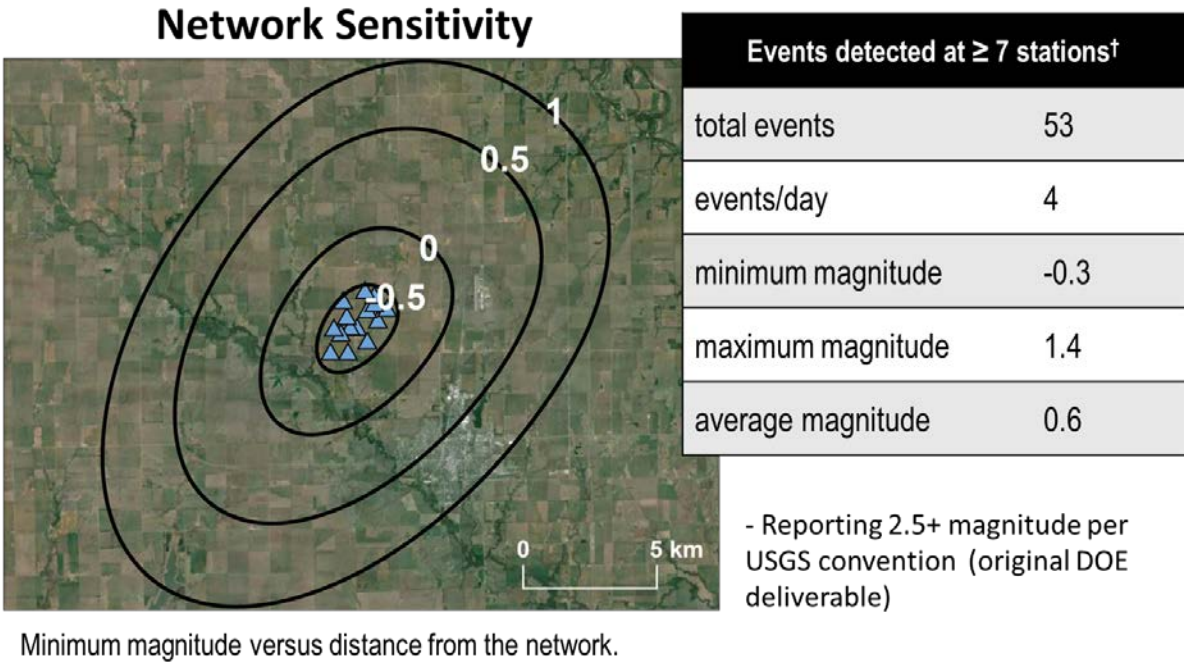
TASK 6. ESTABLISH MVA INFRASTRUCTURE - AROUND CO_2 INJECTOR FOR CARBON STORAGE

Subtask 6.1. Design MVA Components and Fabrication (Contingent on Go Decision pts 1&3)

Discussions continue on updating costs to fabricate and install CASSM and U-Tube apparatus.

Subtask 6.2. Install CGPS and Seismometers near Injection Borehole

The resolution of the seismometer array is high based in initial records (Figure 14). The objective is to refine location of events and new approaches are being tested. The reporting of felt earthquakes over 2.5 will certainly be met. What is being explored is the resolution limit and the potential use of the seismometer array to observe CO2 movement.



Events detected at ≥ 7 stations†	
total events	53
events/day	4
minimum magnitude	-0.3
maximum magnitude	1.4
average magnitude	0.6

- Reporting 2.5+ magnitude per USGS convention (original DOE deliverable)

Figure 14. Sensitivity of the seismometer array installed at Wellington.

cGPS data is being acquired and analysis has begun. The data quality looks fine, but the information needs to be reduced to define a stable base line. This data can be post-processed to establish the baseline to aid in the analysis of the SAR data to quantify the motion that occurs during a time-lapse. At this point, it is not certain what the resolution of the ground motion will be.

Subtask 6.3. Establish Protocols for InSAR data collection

See above.

Subtask 6.4. Drill Shallow Freshwater Monitoring Boreholes (Contingent on Go Decision pts 1&3)

See discussion above.

Subtask 6.6. Soil Gas Sampling around Injector

Subtask 6.7. Outfit Surrounding Mississippian Boreholes for MVA (Contingent on Go pts 1&3)

Sampling will be done at Misissippian wells before the Mississippian reservoir is pressurized before CO2 is injected.

Subtask 7.5 High Res 2D Seismic Lines Targeting Mississippian Reservoir

TASK 8. RECONDITION MISSISSIPPIAN BOREHOLES AROUND MISSISSIPPIAN INJECTOR RE-PRESSURING MISSISSIPPIAN AND SAMPLING PRODUCING WELLS

This activity is anticipated to begin when the Class II well is drilled.

Key Findings

1. Shallow water wells #1 and #2 have yielded only saltwater in small amounts.
2. EPA is requesting additional sampling and testing to confirm that a USDW is not present in the AOR.
3. EPA has submitted questions to obtain additional information on our application for Class VI permit.
4. Cellular network is active for the 15 seismometers at Wellington.
5. The geomodel of the Mississippian reservoir was modified slightly in preparation to inject CO2.

Plans for Fourth Quarter 2014 (BP2 start date -- September 22, 2014)

1. Obtain Class II permit in March.
2. Drill Mississippian CO_2 injection well in March.
3. Complete updating costs.
4. Determine whether USDW is present in the project's AOR.
5. Obtain more details from EPA on granting the Class VI permit.

PRODUCTS

Publications, conference papers, and presentations

PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

A project organization chart follows (**Figure 19**). The work authorized in this budget period includes tasks discussed above.

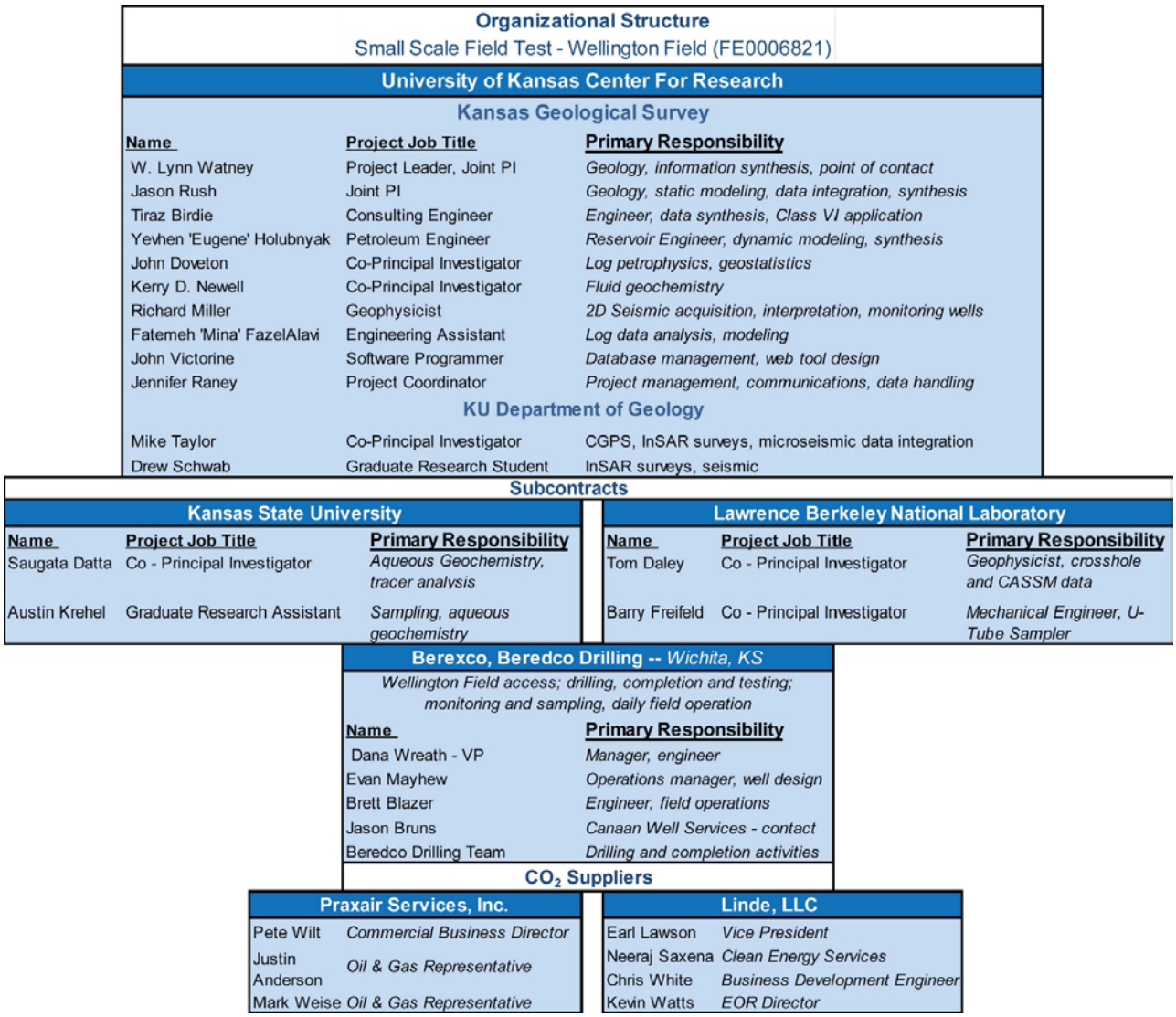


Figure 19. Organizational Chart.

IMPACT

See earlier discussion.

CHANGES/PROBLEMS

Please refer to earlier discussion.

BUDGETARY INFORMATION

Cost Status Report

See table below and on the following page for the cost status for quarters 1-13.

COST PLAN/STATUS

BP1 Starts: 10/1/11

Baseline Reporting Quarter		10/1/11-12/31/11 Q1	1/1/12-3/31/12 Q2	4/1/12-6/30/12 Q3	7/1/12-9/30/12 Q4	10/1 /12- 12/31/12 Q5	1/1/13 - 3/31/13 Q6
Baseline Cost Plan (from SF-424A)		(from 424A, Sec. D)					
Federal Share		$326.84	$17,208.52	$17,282.92	$31,693.50	$23,000.00	$23,000.00
Non-Federal Share		$365,421.00	$365,421.00	$365,421.00	$365,421.00	$0.00	$0.00
Total Planned (Federal and Non-Federal)		$365,747.84	$382,629.52	$382,703.92	$397,114.50	$23,000.00	$23,000.00
Cumulative Baseline Cost		$365,747.84	$748,377.36	$1,131,081.28	$1,528,195.78	$1,551,195.78	$1,574,195.78
Actual Incurred Costs							
Federal Share		$326.84	$17,208.52	$17,282.92	$31,693.50	$31,572.56	$25,465.07
Non-Federal Share		$0.00	$6,475.85	$43,028.94	$9,058.04	$15,226.34	$0.00
Total Incurred Costs-Quarterly (Federal and Non-Federal)		$326.84	$17,208.52	$60,311.86	$40,751.54	$46,798.90	$25,465.07
Cumulative Incurred Costs		$326.84	$17,535.36	$77,847.22	$118,598.76	$165,397.66	$190,862.73
Variance							
Federal Share		$0.00	$0.00	$0.00	$0.00	-$8,572.56	-$2,465.07
Non-Federal Share		$365,421.00	$358,945.15	$322,392.06	$356,362.96	-$15,226.34	$0.00
Total Variance-Quarterly Federal and Non-Federal)		$365,421.00	$358,945.15	$322,392.06	$356,362.96	-$23,798.90	-$2,465.07
Cumulative Variance		**$365,421.00**	**$724,366.15**	**$1,046,758.21**	**$1,403,121.17**	**$1,379,322.27**	**$1,376,857.20**

			BP1 Ends 8/31/14		BP2 Starts 9/1/14	Ends 8/31/15
4/1/13 - 6/30/13 Q7	7/1/13-9/30/13 Q8	10/1/13 - 12/31/13 Q9	1/1/14 - 3/31/14 Q10	4/1/14 - 6/30/14 Q11	7/1/14 - 9/30/14 Q12	10/1/14 - 12/31/14 Q13
$23,000.00	$23,000.00	$1,997,070.75	$1,997,070.75	$1,997,070.75	$1,997,070.75	$325,087.75
$0.00	$0.00	$258,982.75	$258,982.75	$258,982.75	$258,982.75	$184,656.00
$23,000.00	$23,000.00	$2,256,053.50	$2,256,053.50	$2,256,053.50	$2,256,053.50	$509,743.75
$1,597,195.78	$1,620,195.78	$3,876,249.28	$6,132,302.78	$8,388,356.28	$10,644,409.78	$11,154,153.53
$13,078.68	$52,993.14	$23,181.46	$12,053.49	$9,400.96	$0.00	$51,530.98
$0.00	$0.00	$0.00	$0.00	$90,624.59	$0.00	$0.00
$13,078.68	$52,993.14	$23,181.46	$12,053.49	$100,025.55	$0.00	$51,530.98
$203,941.41	$256,934.55	$280,116.01	$292,169.50	$392,195.05	$392,195.05	$443,726.03
$9,921.32	-$29,993.14	$1,973,889.29	$1,985,017.26	$1,987,669.79	$1,997,070.75	$273,556.77
$0.00	$0.00	$258,982.75	$258,982.75	$168,358.16	$258,982.75	$184,656.00
$9,921.32	-$29,993.14	$2,232,872.04	$2,244,000.01	$2,156,027.95	$2,256,053.50	$458,212.77
$1,386,778.52	**$1,356,785.38**	**$3,589,657.42**	**$5,833,657.43**	**$7,989,685.38**	**$10,245,738.88**	**$10,703,951.65**