Modeling CO_2 Sequestration in Saline Aquifer and Depleted Oil Reservoir to Evaluate Regional CO_2 Sequestration Potential of Ozark Plateau Aquifer System, South-Central Kansas Project Number (DE-FE0002056)

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Kansas Geological Survey
Lawrence, KS 66047

U.S. Department of Energy
National Energy Technology Laboratory
Carbon Storage R&D Project Review Meeting
Developing the Technologies and
Infrastructure for CCS
August 20-22, 2013

Brighton 1&2
2:40 August 20, 2013

KANSAS GEOLOGICAL SURVEY
The University of Kansas

Presentation Outline

- Benefits to the Program
- Project Overview
- Technical Status
- Accomplishments to Date
- Summary

DOE project team -- DE-FE002056

Principal Investigators

Jason Rush -- Joint PI
W. Lynn Watney - Joint PI

UNIVERSITY OF KANSAS

Kansas Geological Survey

Co-Principal Investigators

Kerry D. Newell -- stratigraphy, geochemistry
Jason Rush -- Petrel geomodeling and data integration
Richard Miller -- geophysics
John Doveton-- log petrophysics and core-log modeling
Jianghai Xia -- gravity-magnetics modeling & interpretation
Marios Sophocleous --geohydrology

Key Personnel

John Victorine -- Java web app development
David Laflen -- manage core & curation
Mike Killion -- modify ESRI map service for project
Jennifer Raney -- asst. project manager
Debra Stewart, Dan Suchy -- data management
Yevhen 'Eugene' Holubnyak, Petroleum Engineer
Fatemeh "Mina" FazelAlavi, Engineering Research Assistant

KU Department of Geology

Co-Principal Investigators

Evan Franseen --sedimentology, stratigraphy
Robert Goldstein -- diagenesis, fluid inclusion
David Fowle -- reactive pathways, microbial catalysis
Jennifer Roberts -- reactive pathways, microbial catalysis
George Tsoflias -- geophysics

Grad Research Assistants

Aimee Scheffer (graduated) -- biogeology & geochemistry
Breanna Huff -- biogeology
Christa Jackson -- biogeology and geochemistry
Ayrat Sirazhiev (graduated) -- geophysics
Yousuf Fadolalkarem -- geophysics
Brad King -- diagenesis

SUBCONTRACTS

Berexco, Beredco Drilling -- *Wichita, KS*

Wellington Field access; drilling, coring, completion and testing; modeling and simulation

Key Personnel

Dana Wreath - manager, reservoir and production engineer
Randy Koudele - reservoir engineer
Bill Lamb - reservoir engineer

Bittersweet Energy, Inc., *Wichita, KS*

Tom Hansen, Principal, Wichita, Geological Supervision - regional data, Arbuckle hydrogeology
Paul Gerlach -- regional data acquisition, 2 yrs.
Larry Nicholson -- regional data acquisition, 2 yrs.
Anna Smith -- regional data acquisition, 2 yrs.
Ken Cooper, Petrotek Engineering, Littleton, CO- engineer, well injection, hydrogeology
John Lorenz, Scott Cooper, FractureStudies, Edgewood, NM -- core fracture study

Kansas State University

Seismic and Geochemical Services

Co-Principal Investigators

Saugata Datta -- reactive pathways and reaction constants
Abdelmoneam Raef -- seismic analysis and modeling

Grad Research Assistants

Robin Barker (graduated)
Derek Ohl - seismic analysis and modeling
Randi Isham -- seismic
Brent Campbell - aqueous geochemistry

Services

LOGDIGI, LLC, *Katy, TX* - wireline log digitizing
David G. KOGER, *Dallas, TX* - remote sensing data and analysis
Weatherford Laboratories, *Houston, TX* -- core analyses
CMG - Simulation Services, *Calgary, Alberta* --greenhouse gas simulation and software
Halliburton, *Liberal, KS* -- wireline logging services
Hedke-Saenger Geoscience, LTD., *Wichita, KS* - geophysical acquistion, interpret & design
Susan E. Nissen, *McLouth, KS* -- Geophysical Consultant, volumetic curvature
Lockhart Geophysical, *Denver, CO* -- acquis & interpret 2D shear wave, gravity & mag
Fairfield Industries, Inc., *Denver, CO* -- 2D, 3D multicomponent seismic processing
Paragon Geophysical Services, *Wichita, KS* -- 3D seismic acquisition
Echo Geophysical, *Denver, CO* -- 3D seismic processing
Converging Point - QC seismic acquisition
Noble Energy, *Houston, TX; Denver, CO* -- collaborating co., fields adjoining Wellington

Southwest Kansas CO2 EOR Initiative - Chester Morrow

Martin Dubois, IHR, LLC -- team lead, geomodeling
John Youle, Sunflower Energy -- core and depositional models
Ray Sorenson, consultant -- data acquisition and advising
Eugene Williams, Williams Engineering -- reservoir modeling

Benefit to the Program

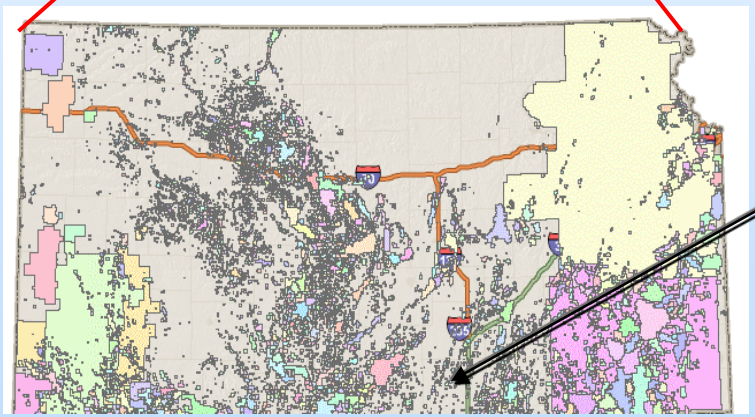
- **Goal–**
  - **Predict geologic CO_2 storage capacity within ±30%**
- **Project benefits --**
  - Refine CO_2 storage capacity of the Arbuckle saline aquifer (currently 9-75 billion tonnes, 200 yrs. KS emissions)
  - Regional characterization integrated with *Interactive Project Mapper* and *NATCARB*
  - Efficacy of CO_2 storage at Wellington and Cutter fields
  - Validate structural, stratigraphic, and well based analysis using regional 3D seismic, gravity-magnetics, and remote sensing
  - CCUS feasibility and risk at five oil fields and eight regional sites
  - Resolve heterogeneity in ~500-1000 ft thick Lower Ordovician Arbuckle saline aquifer
  - Evidence for geologic conditions best suited for CO_2 management

Project Overview: Goals and Objectives

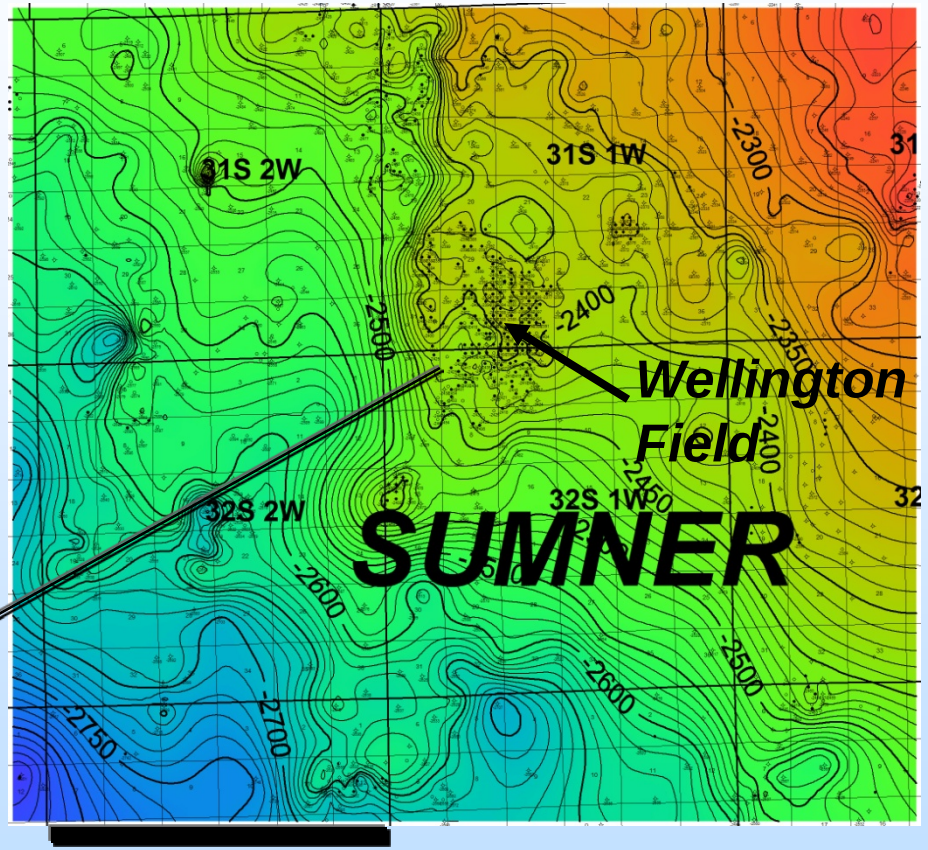
- Characterize the Lower Ordovician Arbuckle Group in 25,000 mi^2 area (*Predict CO_2 storage within ±30 percent*)
  - ***Success*** *-- Scan, digitize, and correlate key wells; New correlations for key parameters; Storage and risk evaluation maps*
- Model carbon dioxide injection within the Arbuckle Group saline aquifer and the overlying Mississippian siliceous dolomite oil reservoir at Wellington Field (Sumner County, KS) (*Calibration site for CO_2 injection and storage*)
  - ***Success*** *– Drill, core (1528 ft), and test in two 5200' basement tests; acquire, process, interpret 12 mi^2 of multicomponent 3D seismic; model for CCUS*
- Evaluate CO_2 sequestration potential in saline aquifer and CO_2-EOR in four southwestern Kansas fields (*Calibration site for CO_2 injection and storage*)
  - ***Success*** *– Drill, core (1024 ft), test 7700' basement test at Cutter Field, Stevens County, KS; acquire 10 mi^2 of multicomponent 3D seismic , LiDAR/remote sensing*
  - *Simulate CO_2-EOR @ four fields -- Cutter, South Pleasant Prairie, Eubanks North, and Shuck fields*

Wellington Field

Site of proposed Small Scale Field Test



Top Mississippian Structure, 10 ft C.I.



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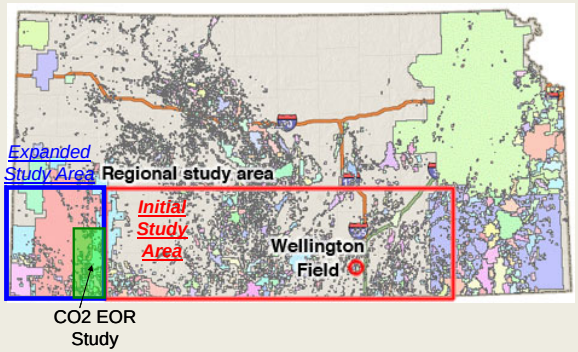
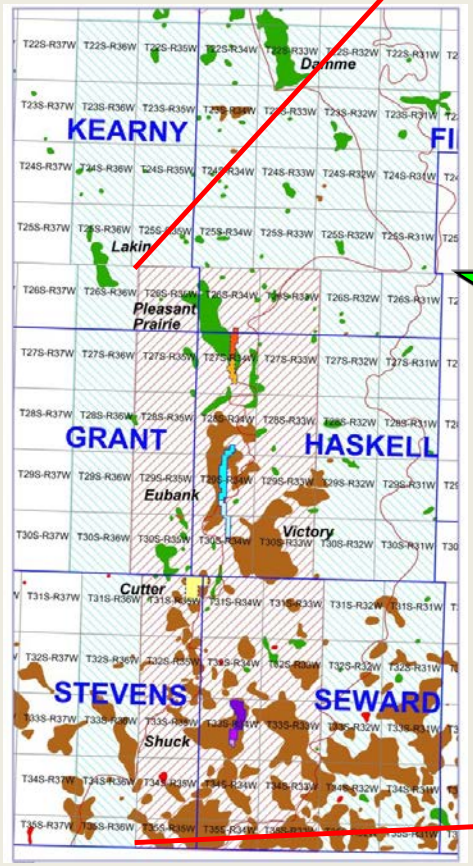
Technical Status

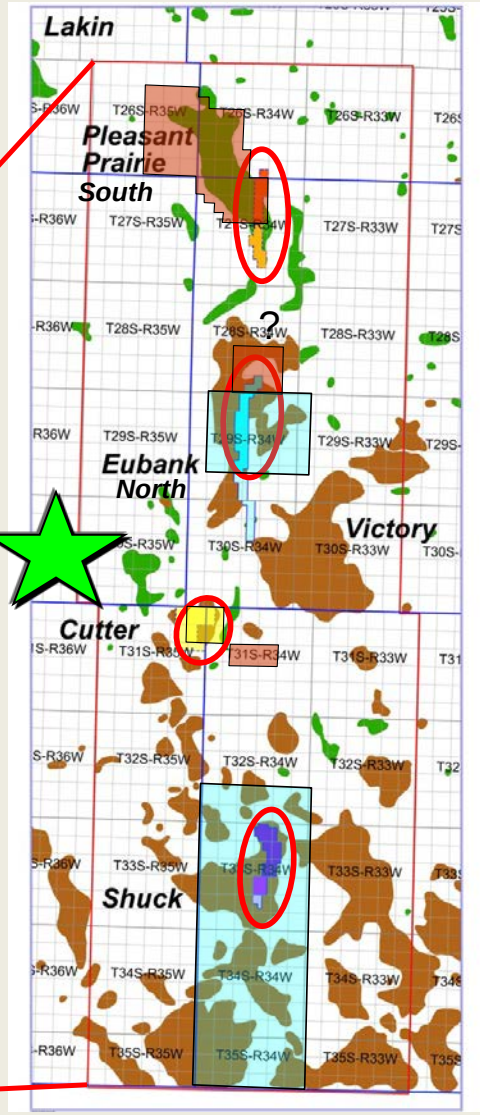
Evaluate CO_2 sequestration potential in Arbuckle Group saline aquifer and CO_2-EOR in four fields in southwestern Kansas

Southwest Kansas CO2 Consortium (*Western Annex*)

Seismic blocks are color coded by operator (~120 mi^2 of 3D seismic)







Chester/Morrow Sandstone (IVF) &

Deep saline Arbuckle aquifer

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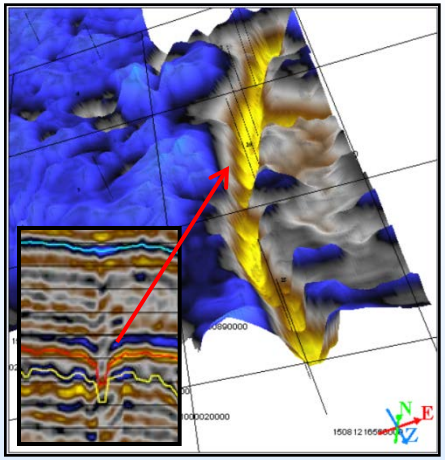
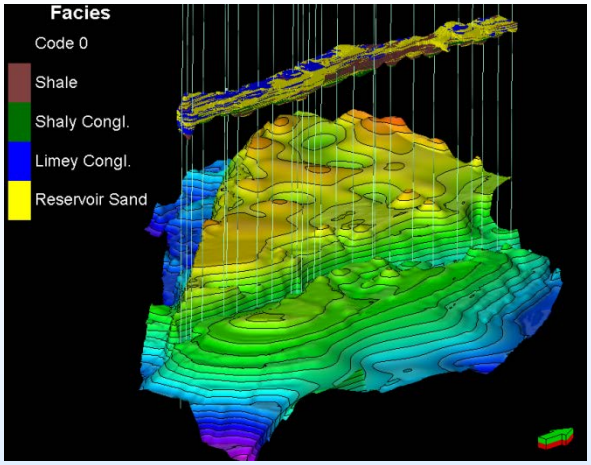
Southwest Kansas CO_2-EOR Initiative

Integrated Multi-Discipline Project for CO_2-EOR Evaluation

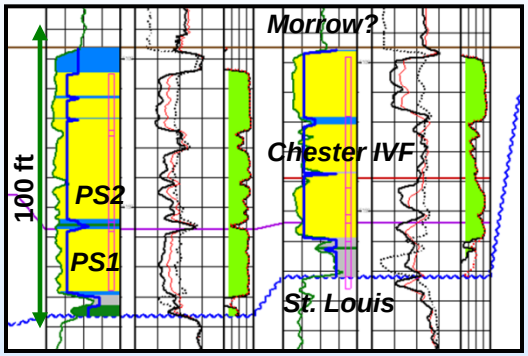
Static Model

Geophysics:
structure, attributes, faults

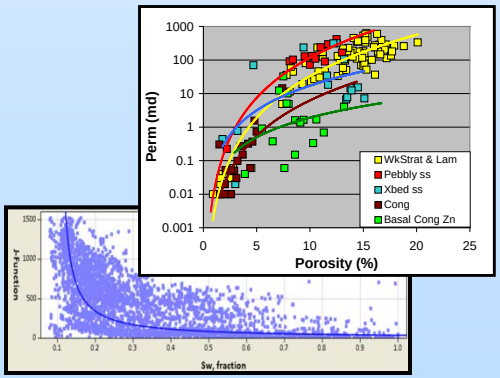




Geology:
Formation tops, sequence stratigraphy, core lithofacies, lithofacies prediction (NNet)

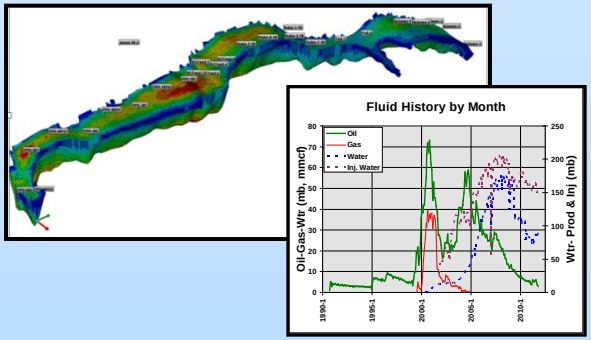


Petrophysics:
Core K-Phi, corrected porosity, free water level, J-function



Engineering:
PVT and fluid analysis, recurrent histories, dynamic modeling

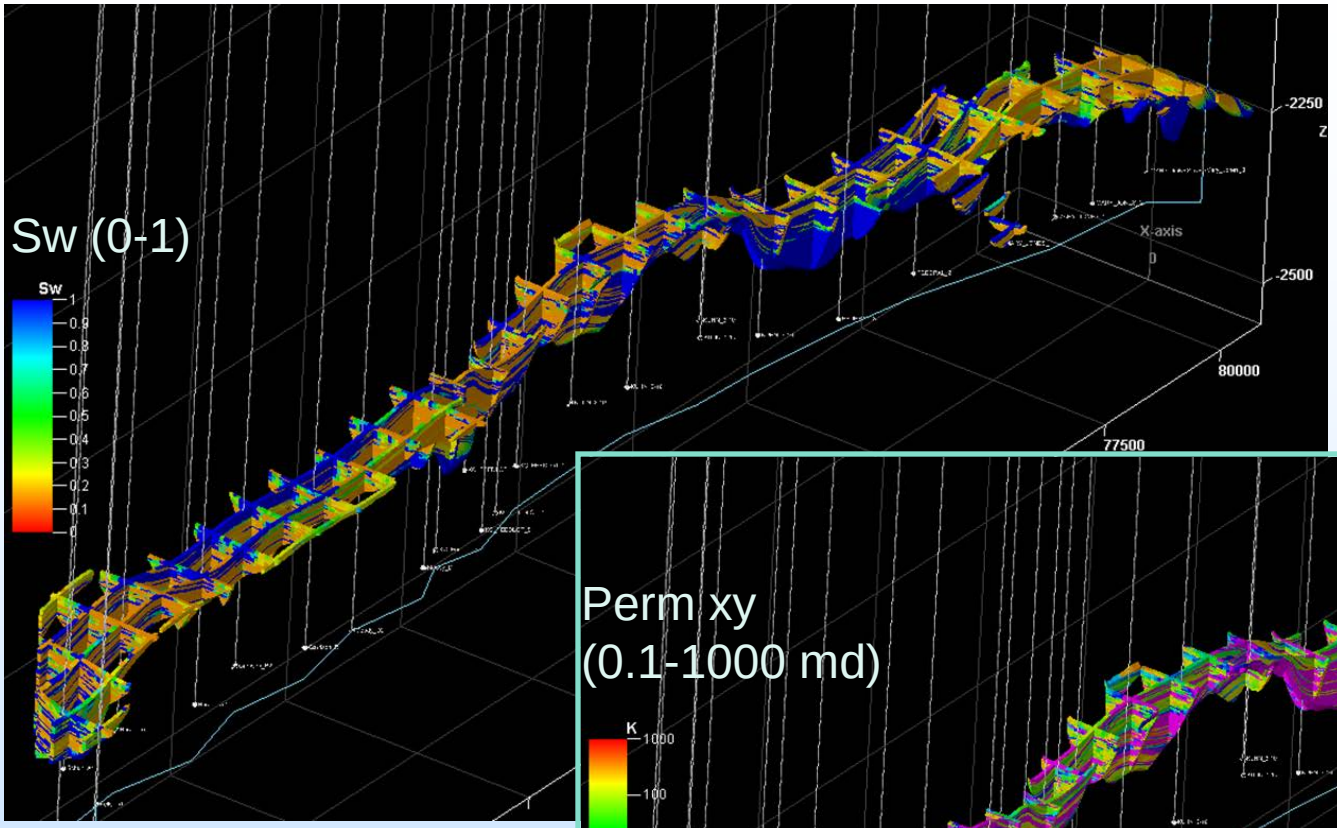
Dynamic Model

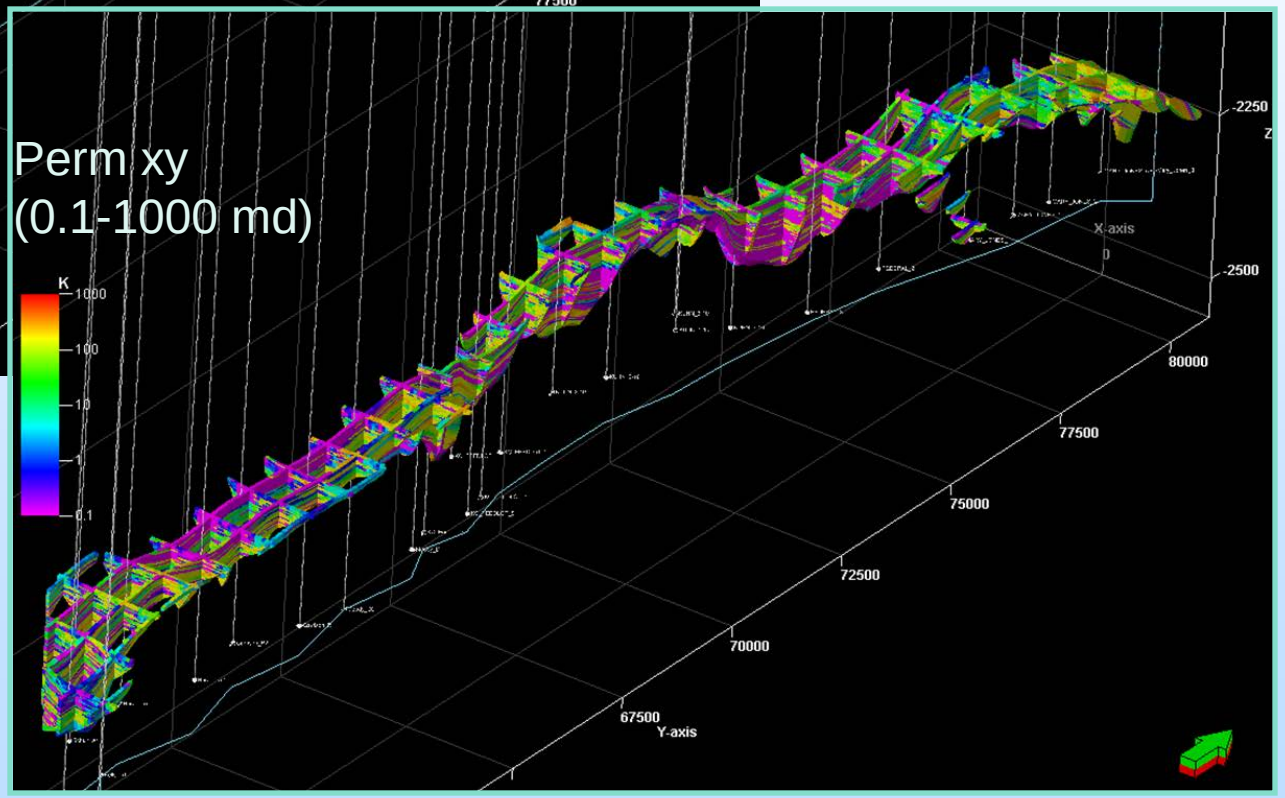


Dubois, 2012

Example from modeling of Pleasant Prairie South

Water Saturation and Permeability

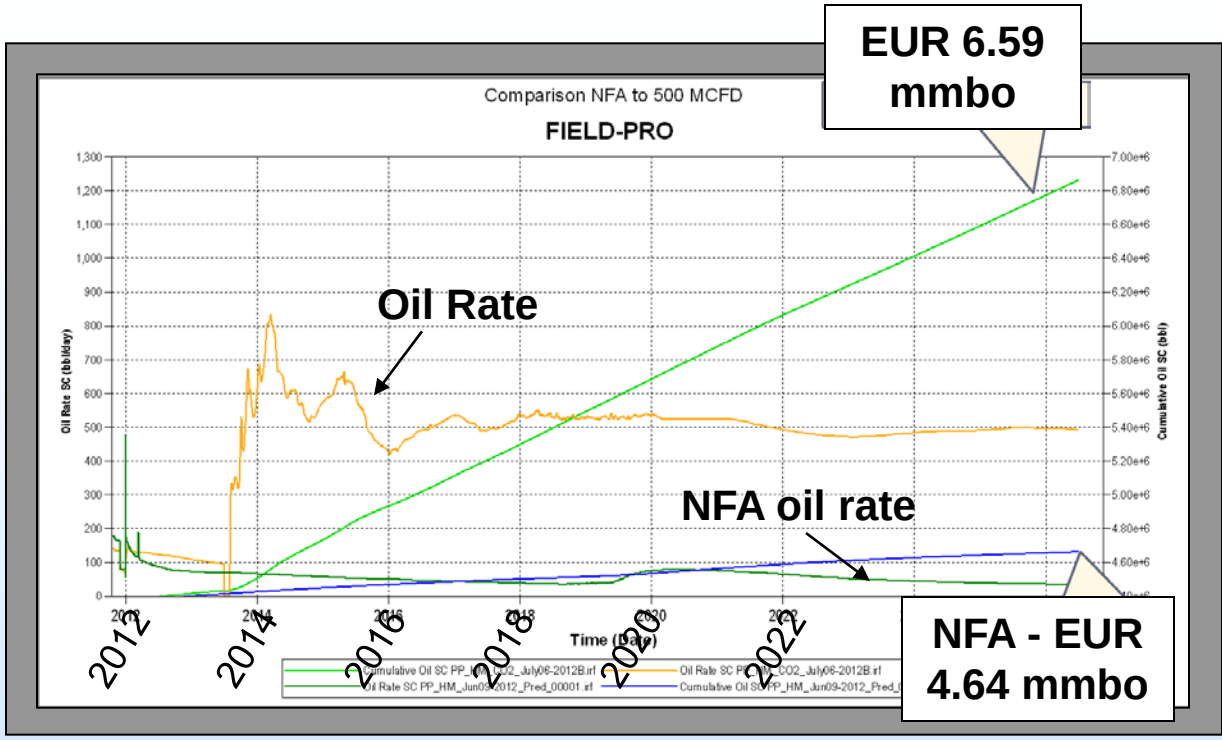




CO_2 EOR Projections – Pleasant Prairie South Field

Assumptions:

1. Convert WIW to CO_2 IW
2. Oil wells as is
3. Inject 5 mmcfd CO_2, not exceeding bhp 2600 psi
4. Continuous CO_2, no WAG
5. Injection = production
6. No optimization



13 years injection

Projections:

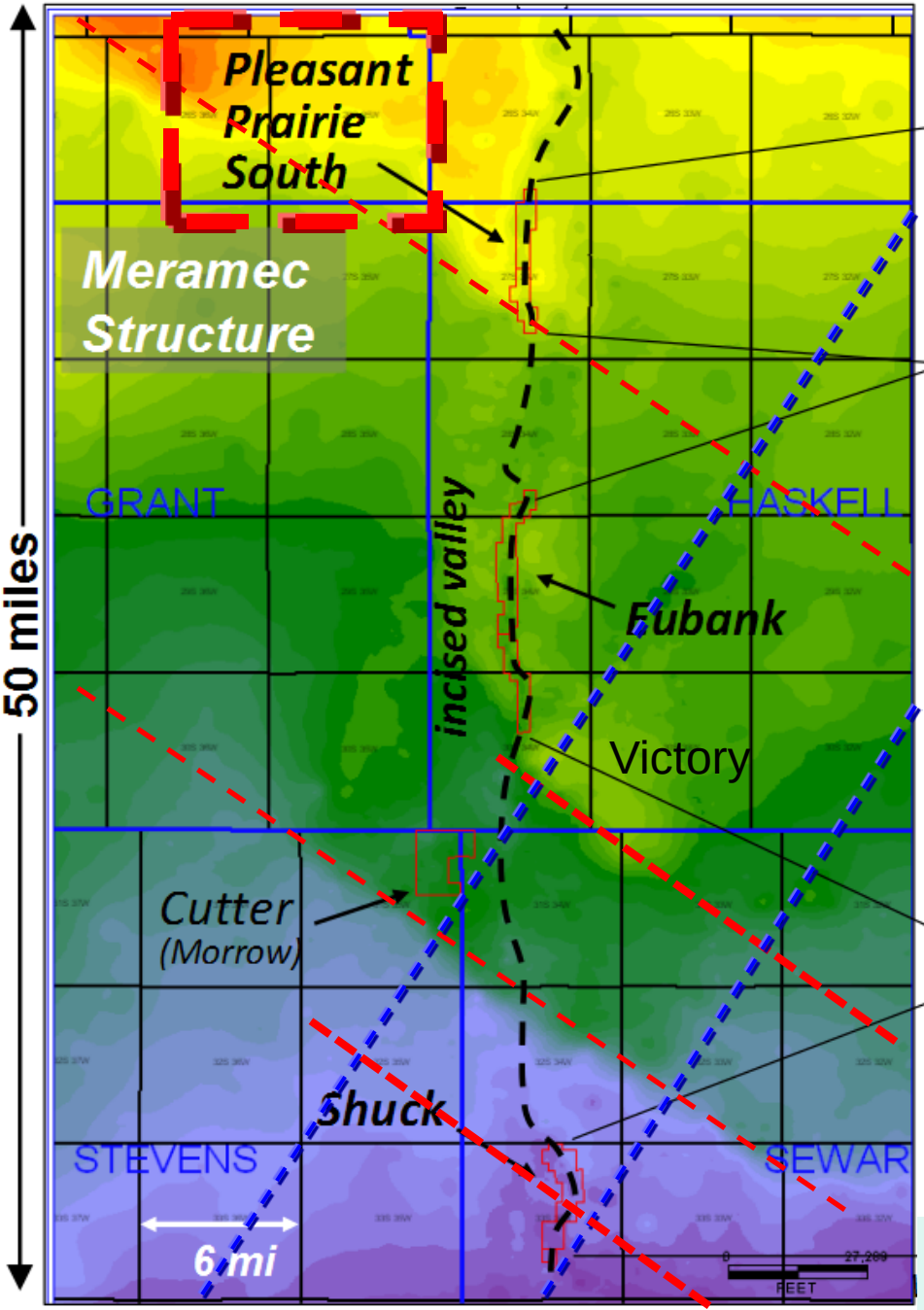
OIL (mmbo)		
Cumulative 2011	4.48	
NFA cum. 2026	4.64	
CO2 case cum.	6.59	
Increment. CO2	1.95	
Cum. 2012-2026	2.11	
CO2		*mm tons*
CO2 injected (mmcf)	23.7	1.38
CO2 produced (mmcf)	13.2	0.77
CO2 sequestered (mmcf)	10.5	0.61
Gross utilization (mcf/bo)	11.2	
Net utilization (mcf/bo)	5.0	

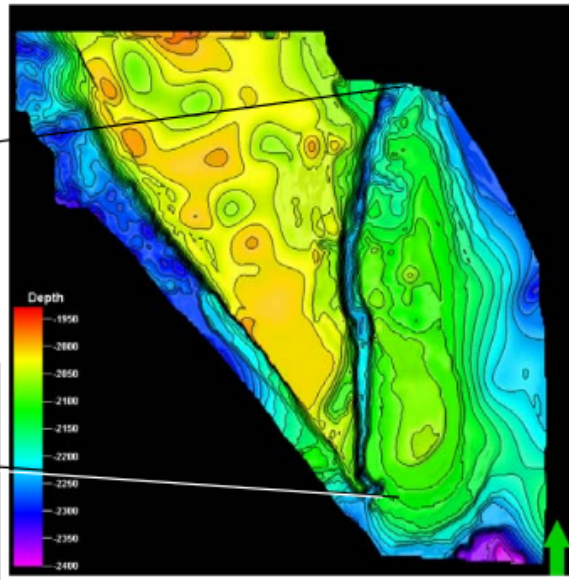
Assume 56% CO_2 is recycled

RF as *f* (OOIP)

Primary	15.8%
Secondary	15.8%
CO2	13.3%
	45.0%

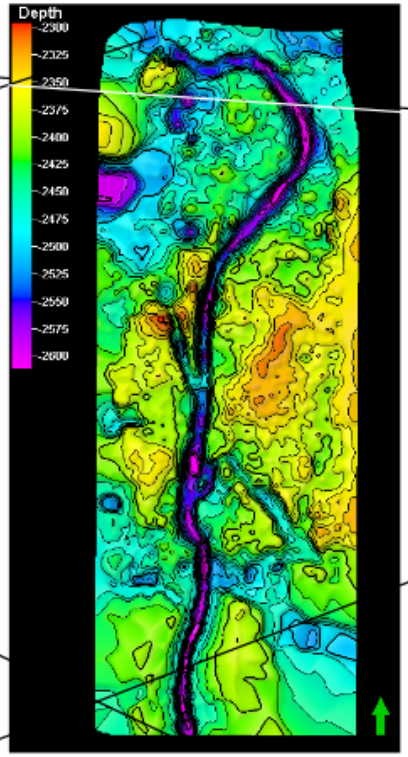
Chester Incised Valley in Kansas



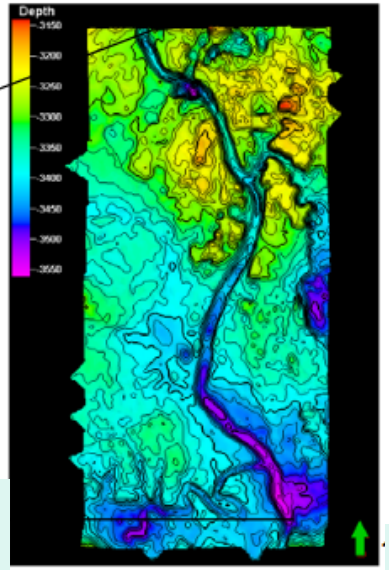


Pleasant Prairie South

Eubank



Shuck



5 mi

all views at same scale

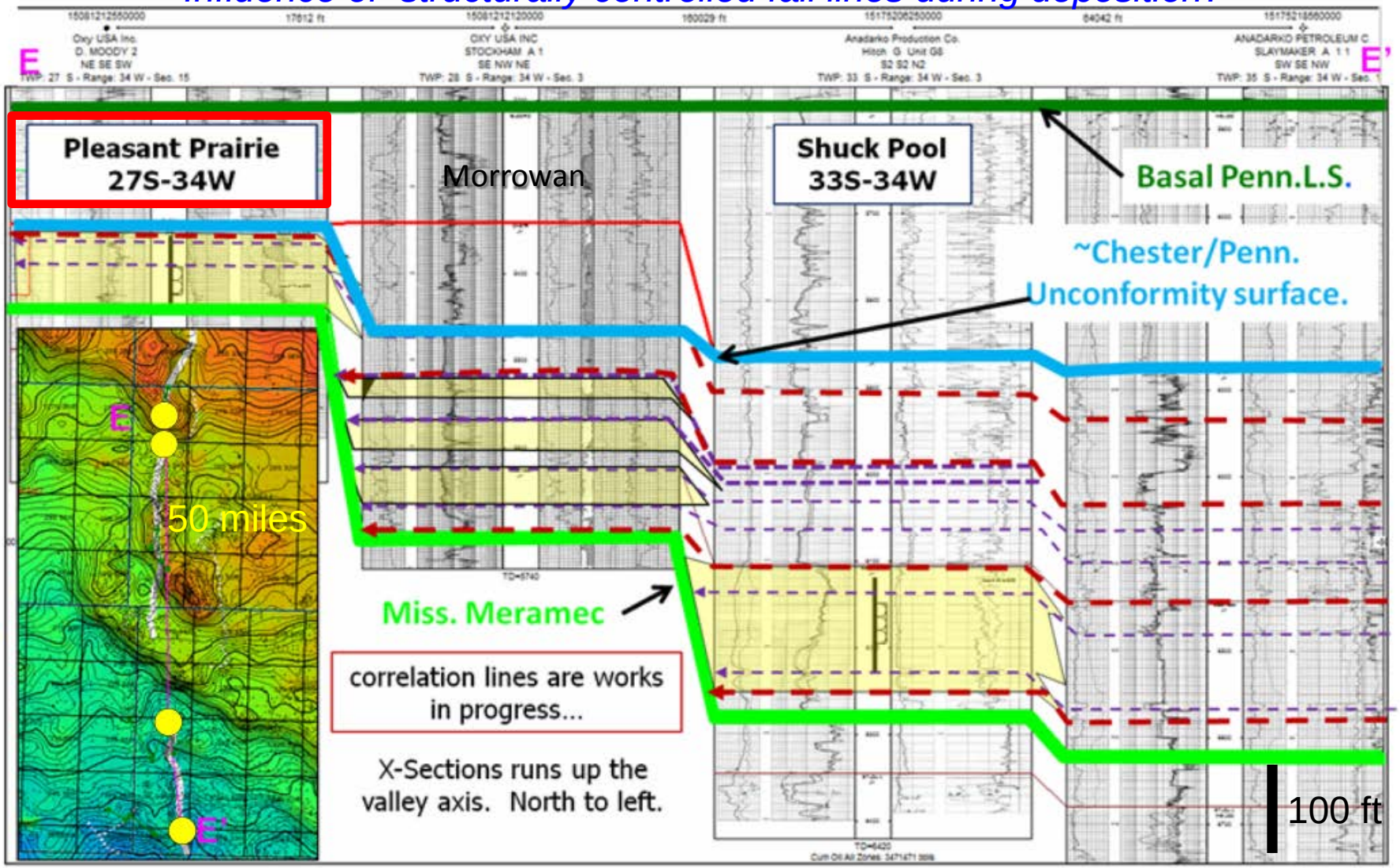
Seismic depth-converted Meramec surfaces *(by Hedke)*

Modified from Dubois (DOE/KGS-CO2)

Chester Sequence Stratigraphy

North

-Influence of structurally controlled fall lines during deposition?

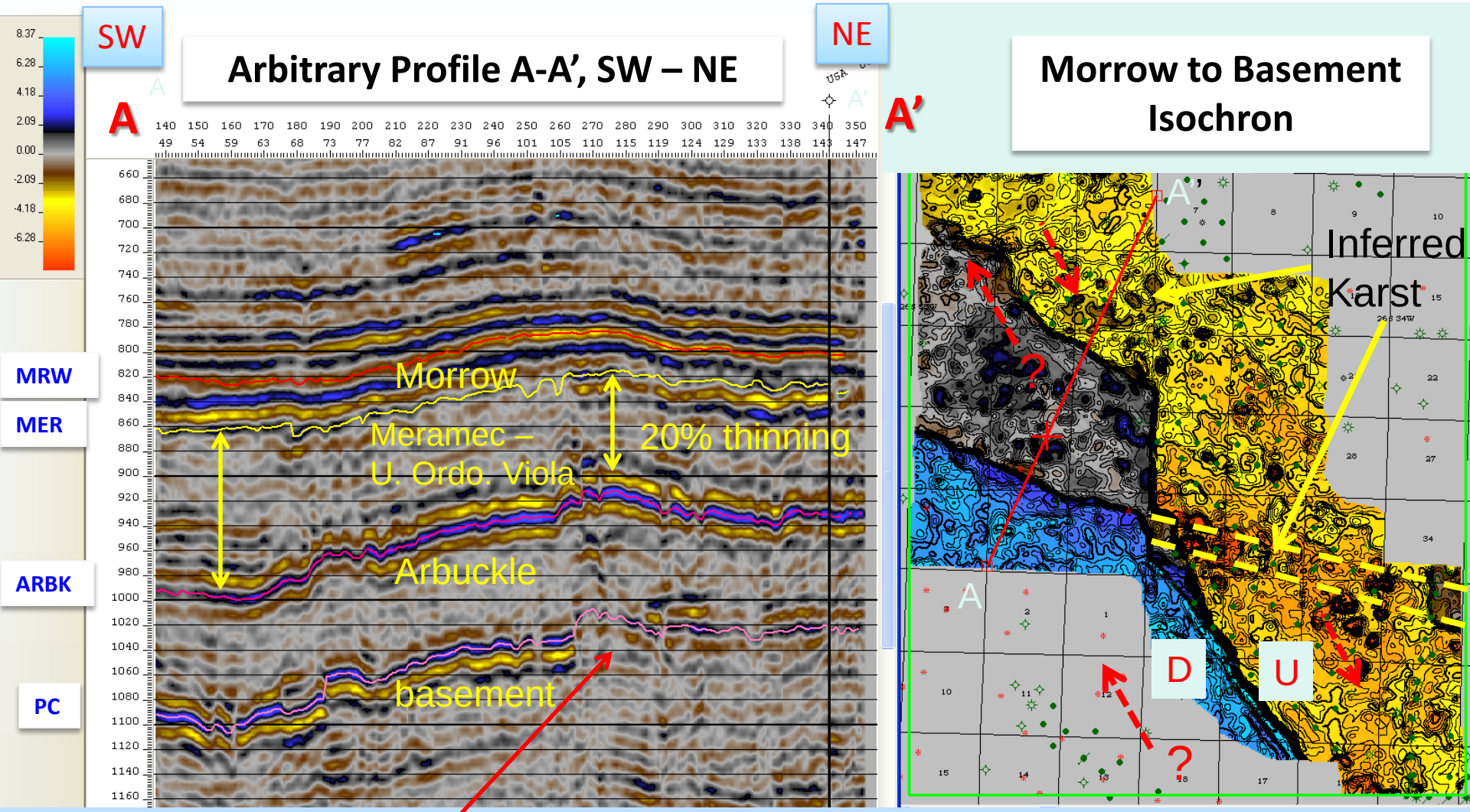


work by John Youle

The cyclic retrogradational nature of Chester shoreline advances into Kansas are interpreted to have filled incised valleys with a series of 'back-stepping' stacked estuarine sandstone reservoirs. Red dashed lines are postulated sequence boundaries, and purple lines are possible parasequences. *(Youle)*

Pleasant Prairie structural block

Fault orientation - *right lateral component along restraining bend*



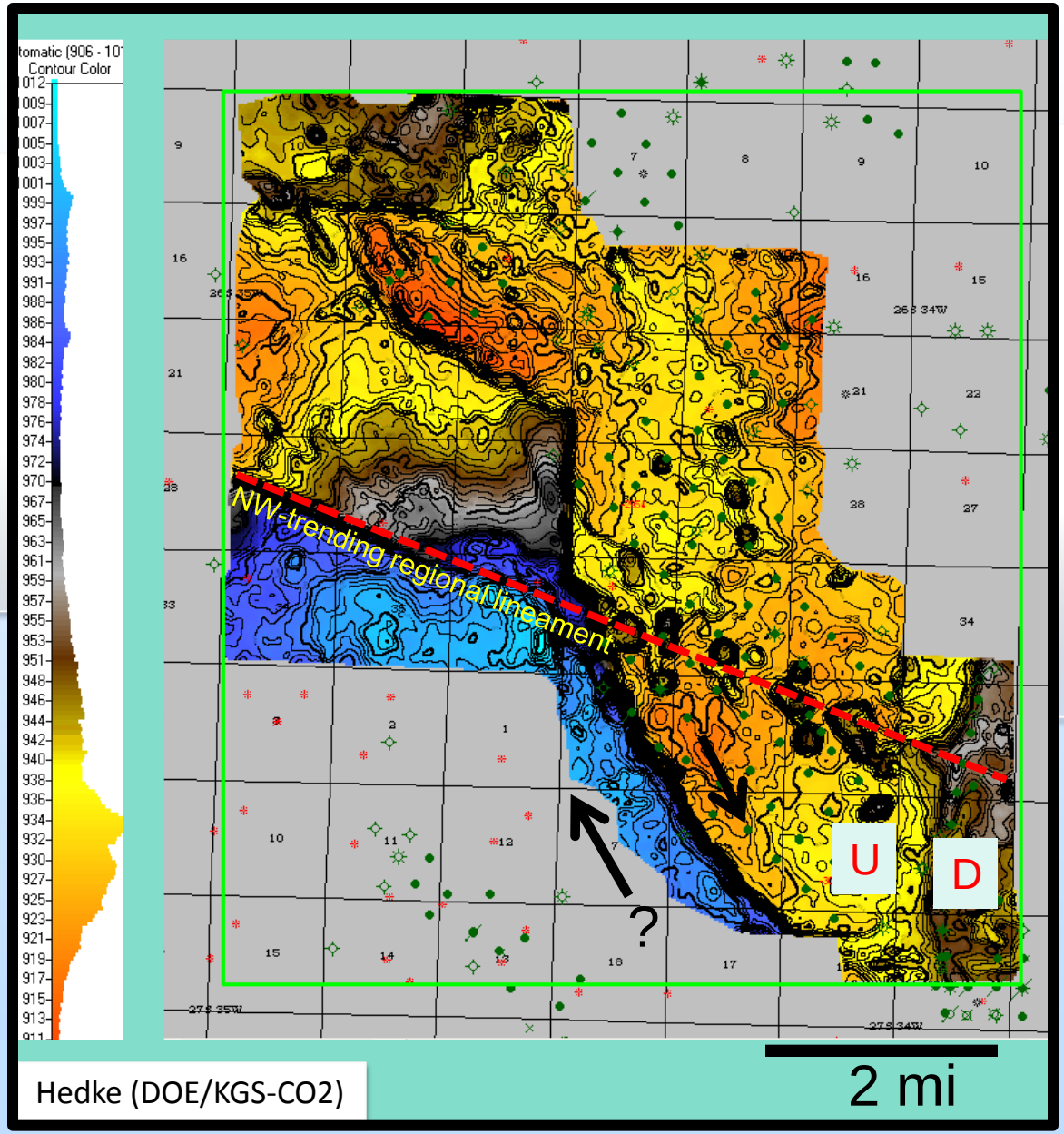
Hedke (DOE-CO2)

Arbuckle Time Structure
(Pleasant Prairie Field)

Fault bounded orthogonal structural block:

-Regional NW-trending lineament

-Paleo Arbuckle karst (Ordovician)



- **Meramec age karst partly defines Chester incised valley location**
- **Intersecting with NW-trending Arbuckle karst trend with north-trending fault corresponding with location of Chester IVF**

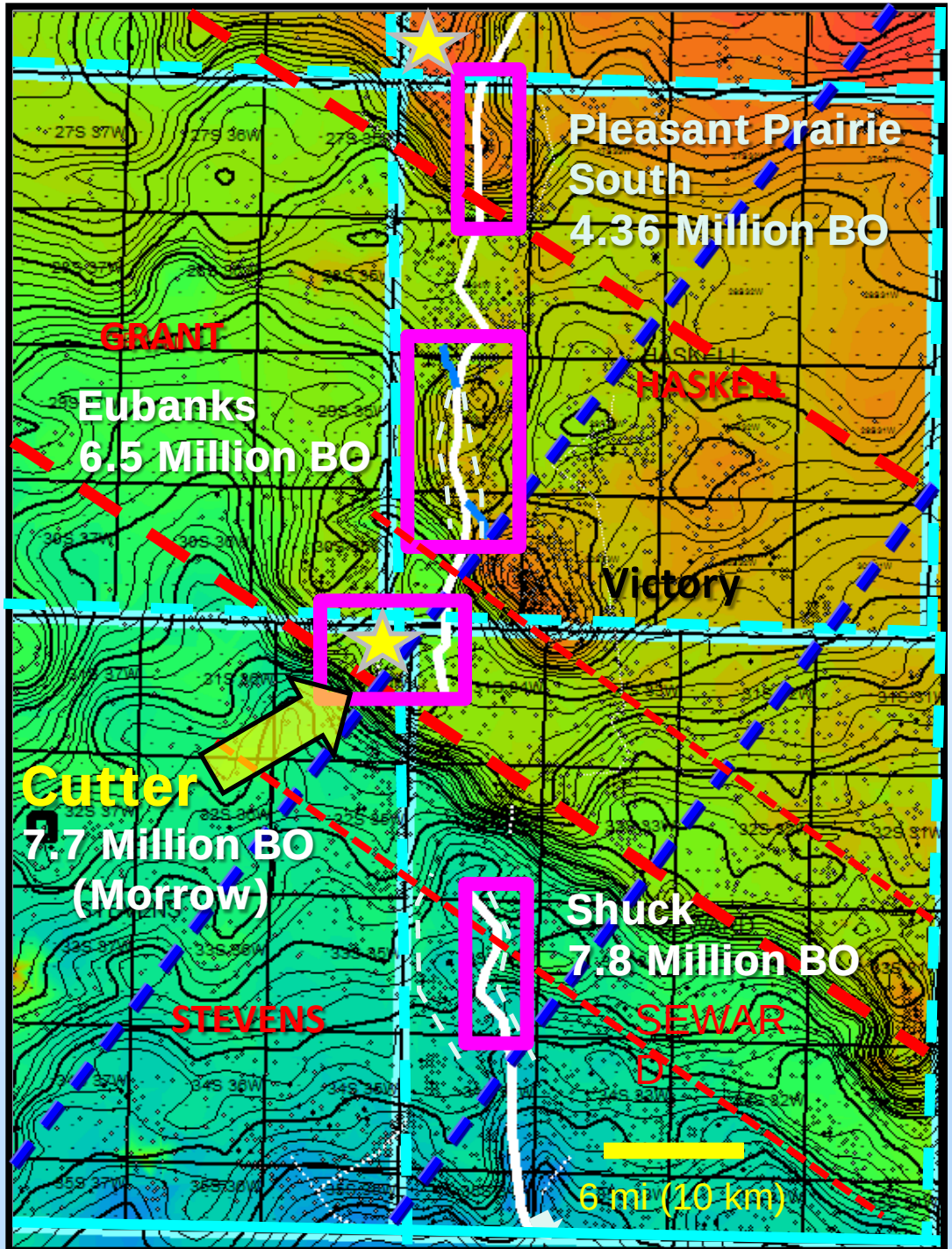
Subsea structure on top of Mississippian Meramec

(mostly Ste. Gen.)

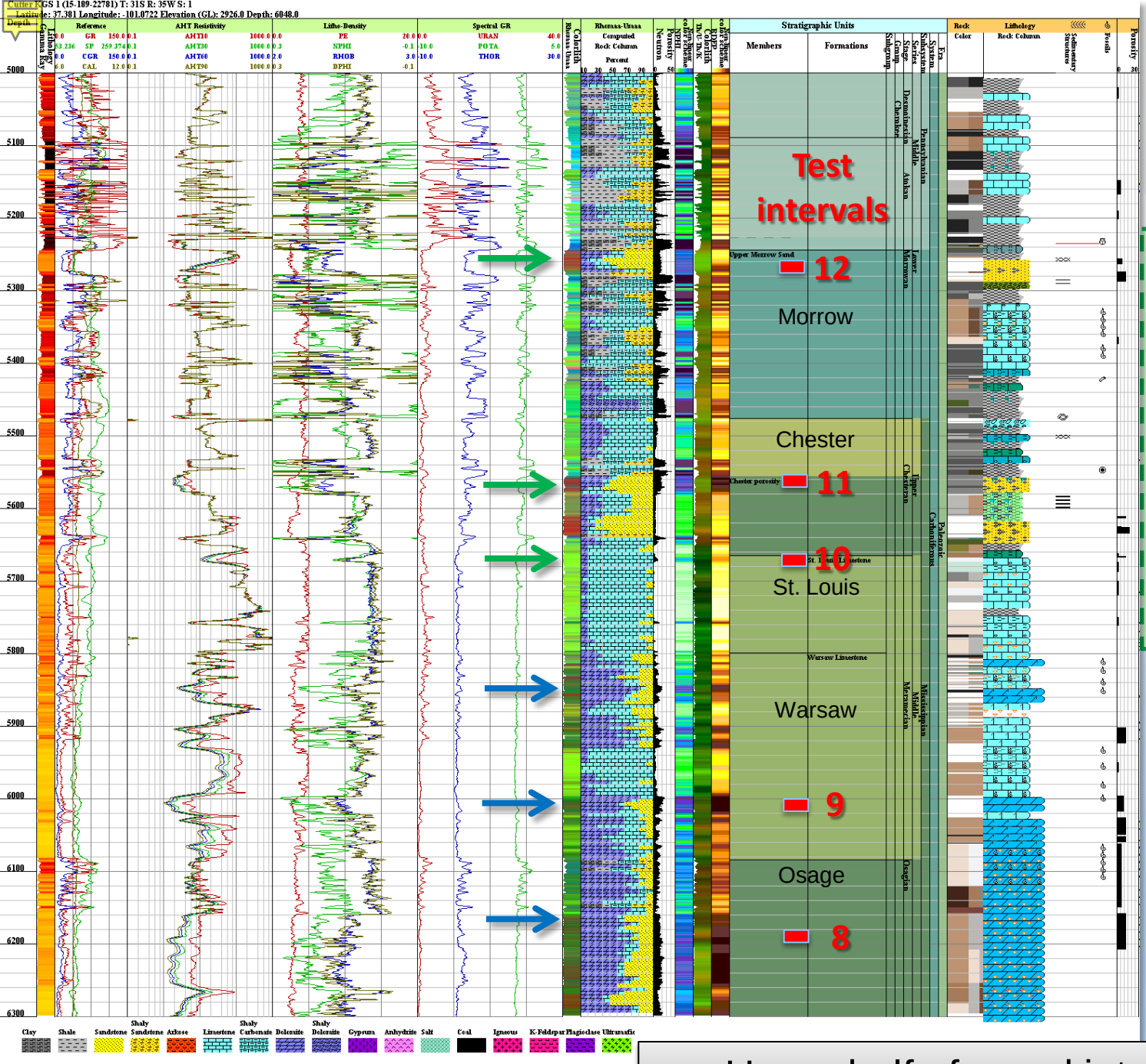
Chester incision and fill predated post-Mississippian – pre-Middle Pennsylvanian Ouachita structural events

- However, traps in valley fill sand pools sprung by Ouachita events.
- No channel deflection
- Ubiquitous fractures in Chester IVF cores.
- Antecendent paleogeomorphology – stepwise subsidence and slope to south controlled regional drainage

- ***Horst blocks*** : Cutter, Victory-Eubank and Pleasant Prairie (faulted on south and west flanks)
- ***Horst blocks :*** north sides of regional NW-trending lineaments
- *Contour Interval:* 25' (smoothed)
- *White line:* Chester incised valley axis
- *Pink Rectangles:* Chester valley fill fields (DOE investigated)



Youle (DOE/KGS-CO2)



Berexco *Cutter*
KGS #1
Cutter Field
Multiple pay & shows

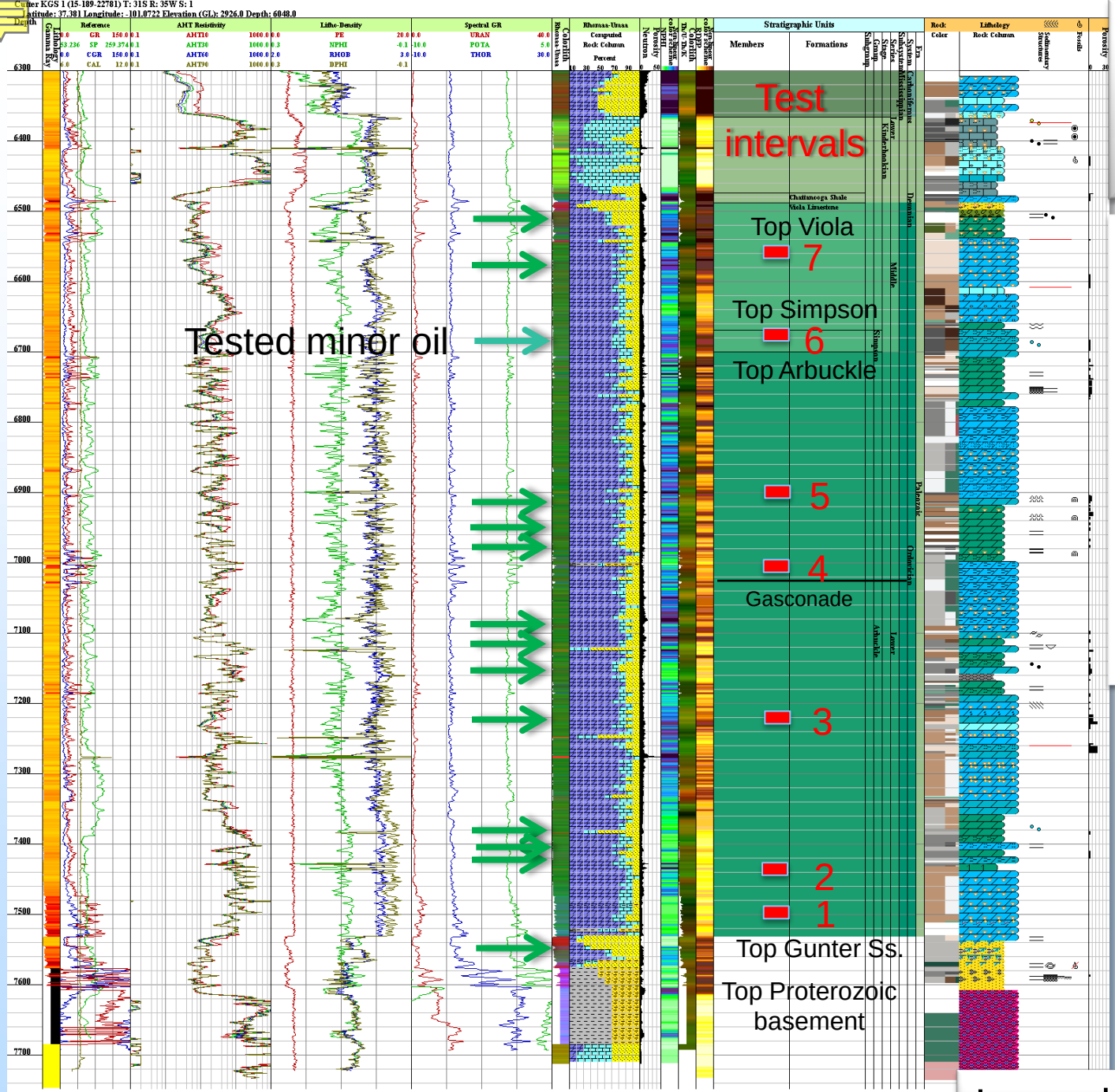
Oil Pay Zones

oil show →
no show →

200 ft

Upper half of cored interval

Berexco *Cutter* KGS #1 Cutter Field



- Extended oil shows (fluorescence) in lower Paleozoic
- Upthrown structural block near regional fault
- Prior work: Chester oil in Hitch Field has Ordovician source (Kim et al., 2010)

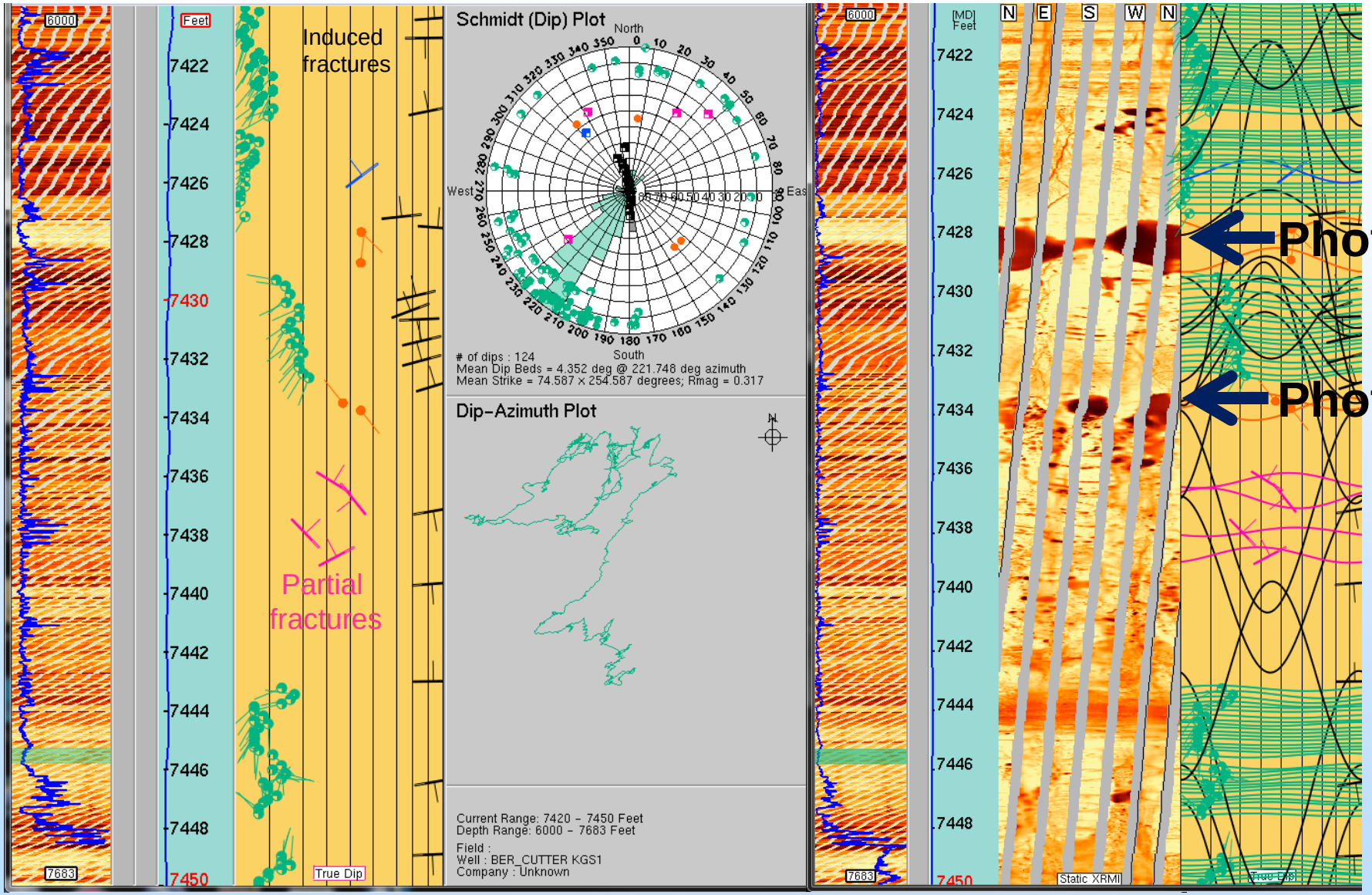
oil show →
No oil on perf and swab

200 ft

Lower half of cored interval

Lower Gasconade Dolomite, 7420-50 ft

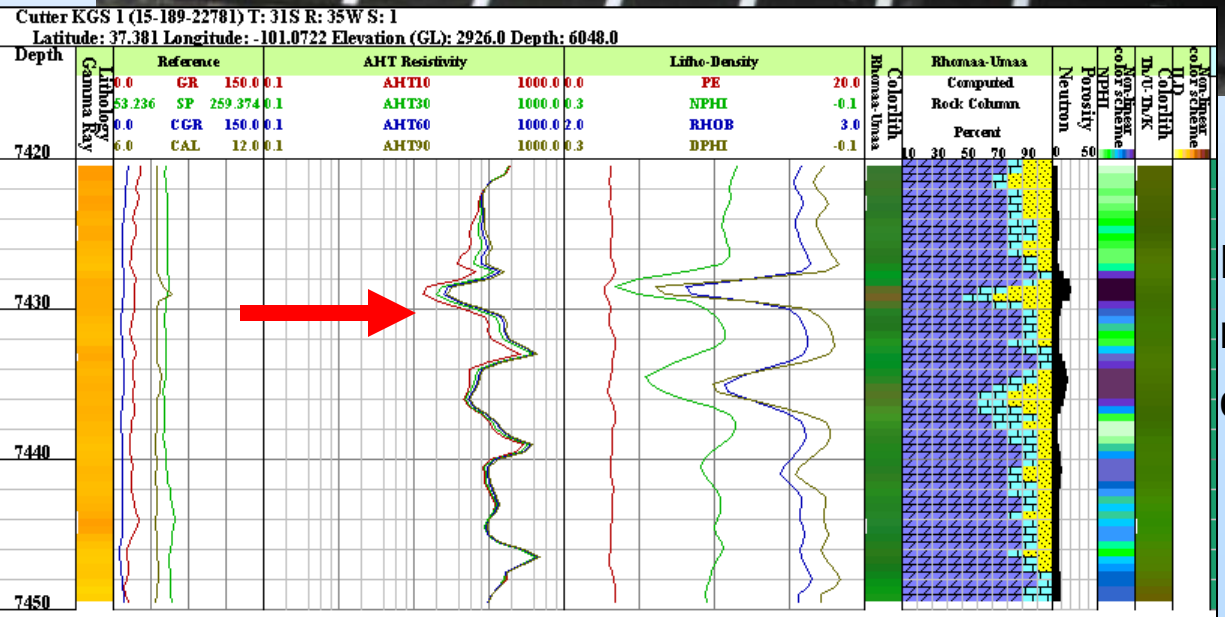
-Equivalent to injection interval at Wellington Field (225 miles east)



formation microimaging log

Lower Gasconade, 7427 ft

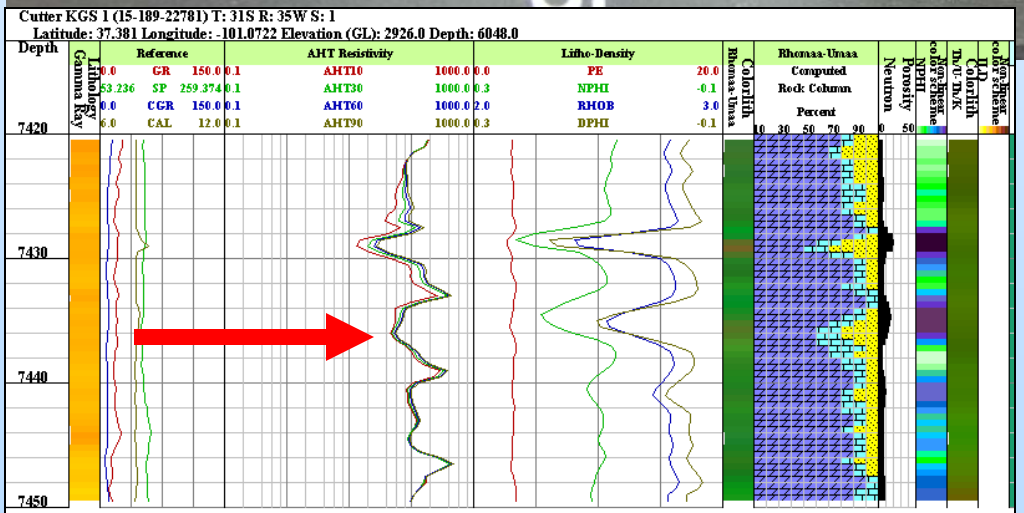
(core depth 3 ft high to log)



Dolomitic packstone-grainstone, medium to coarse grained vugs, occ. diagonal fractures

Lower Gasconade, 7433 ft

(core depth 3 ft high to log)



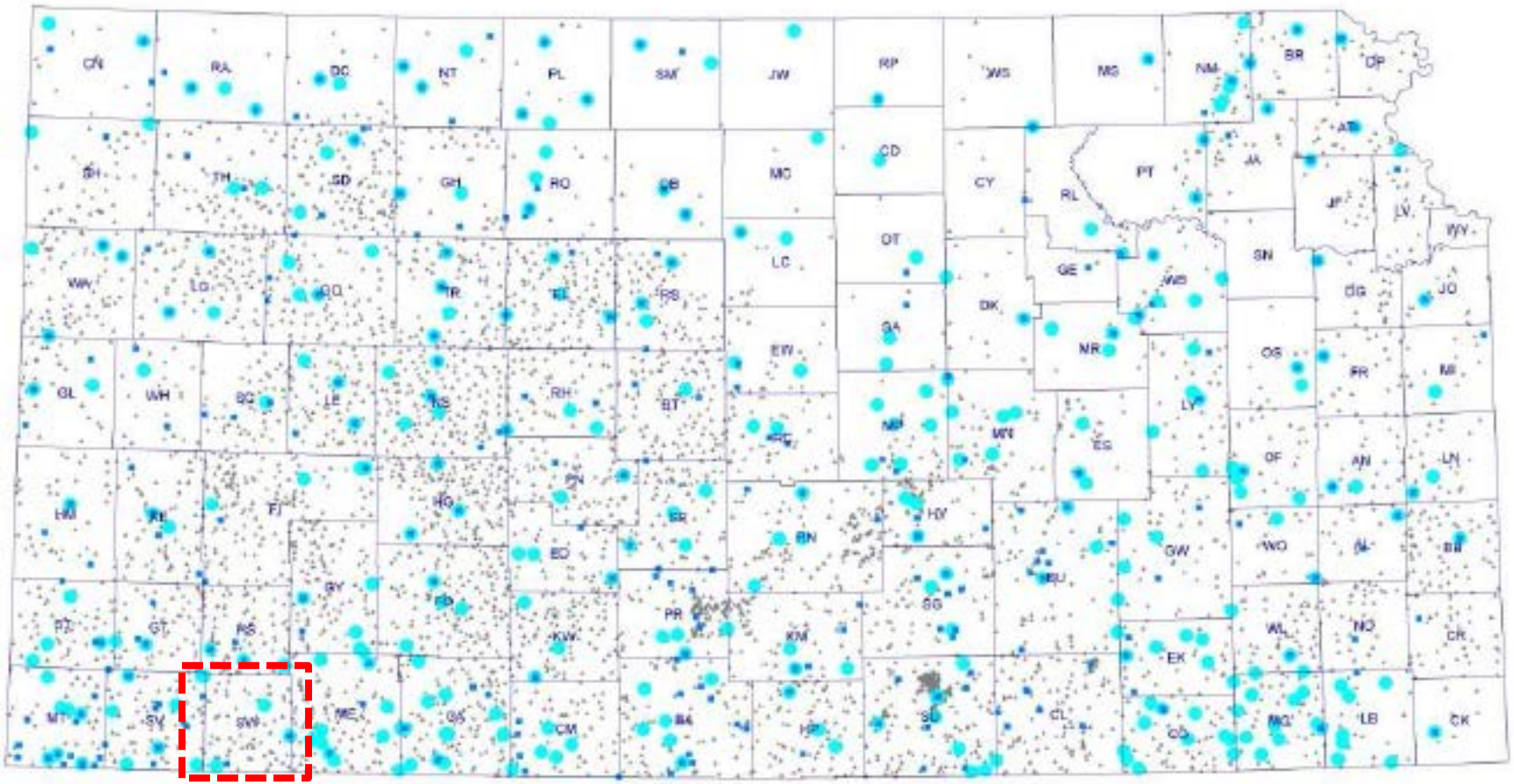
Gray-brown, packstone with quartz sandstone, cm sized vugs interconnected cut across core, saddle dolomite, very porous breccia

Type Log Project Well Inventory

Strat Type Well
modern log suite
inventory: 205

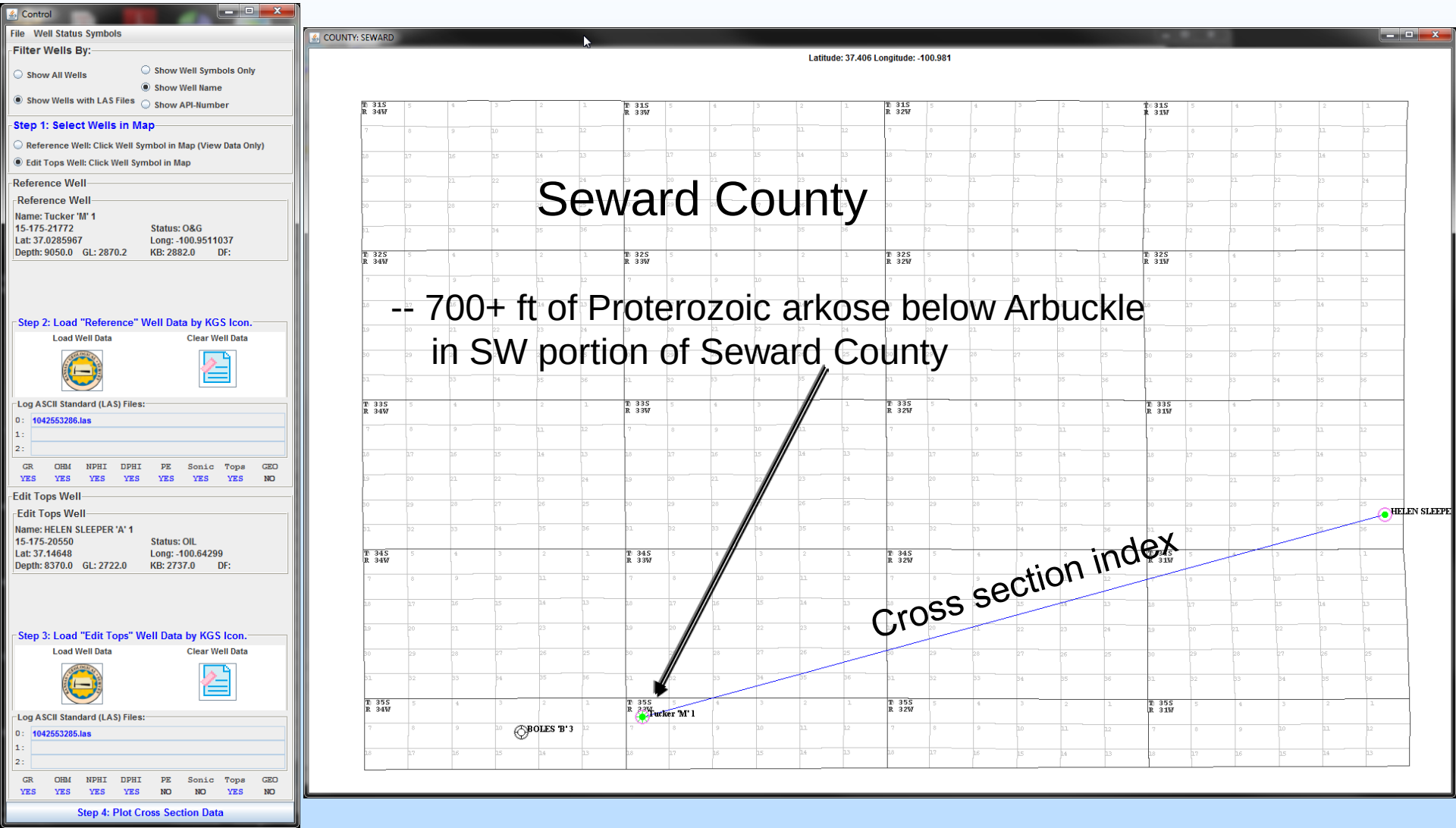
Super Type Well
penetrates >400 feet
modern log suite
inventory: 268

Type Well
Arbuckle test
modern log suite
inventory: 1625

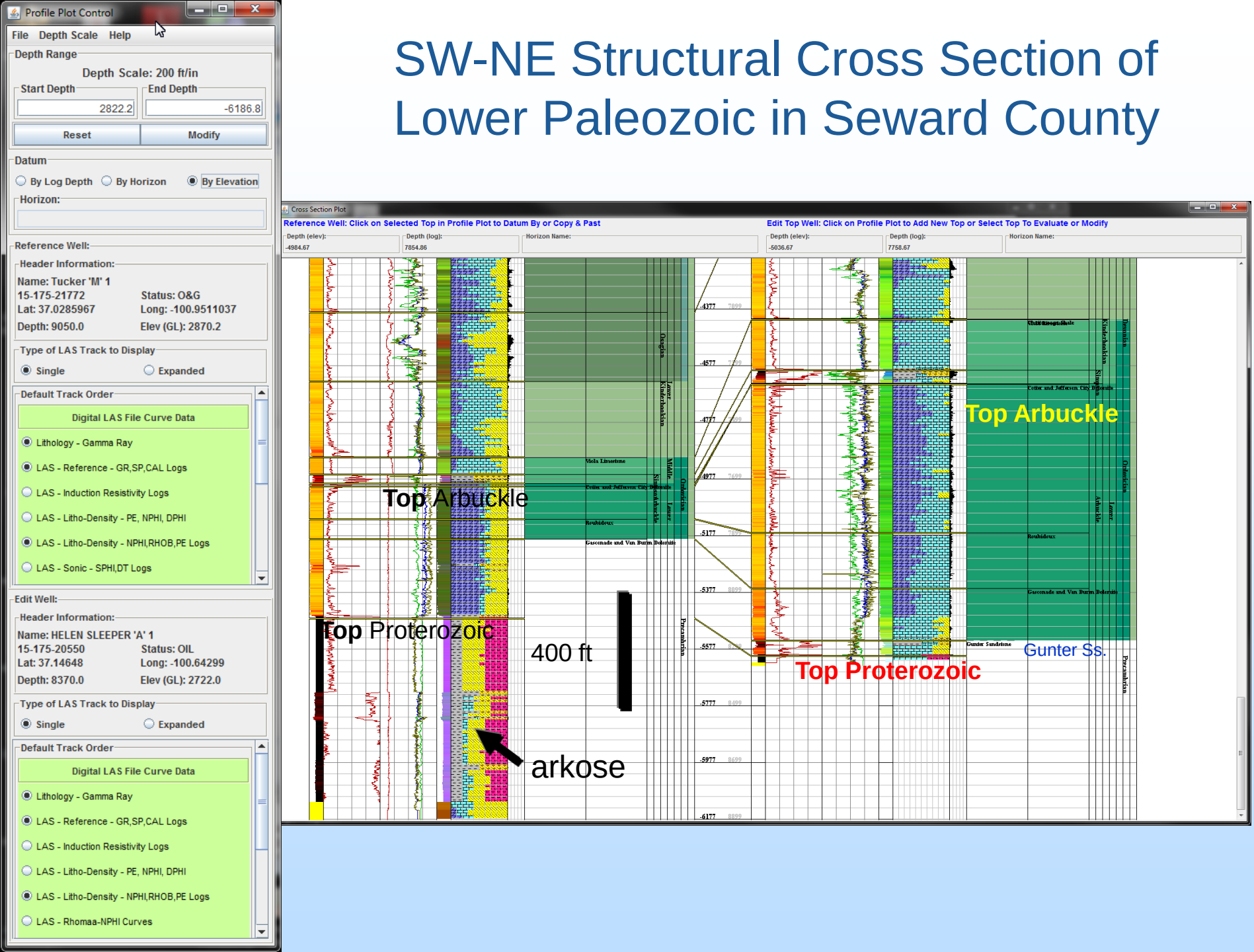


Interactive map

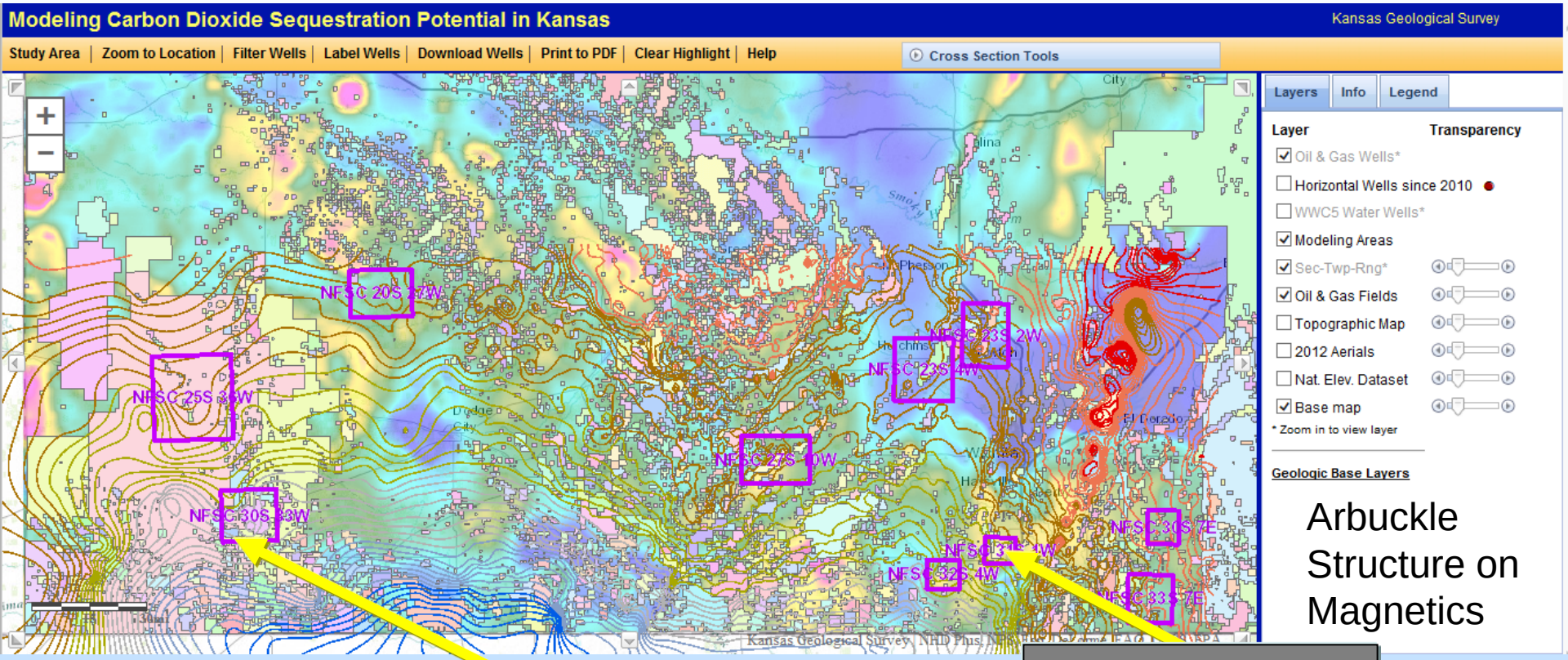
-Compare control well with well to be classified



SW-NE Structural Cross Section of Lower Paleozoic in Seward County

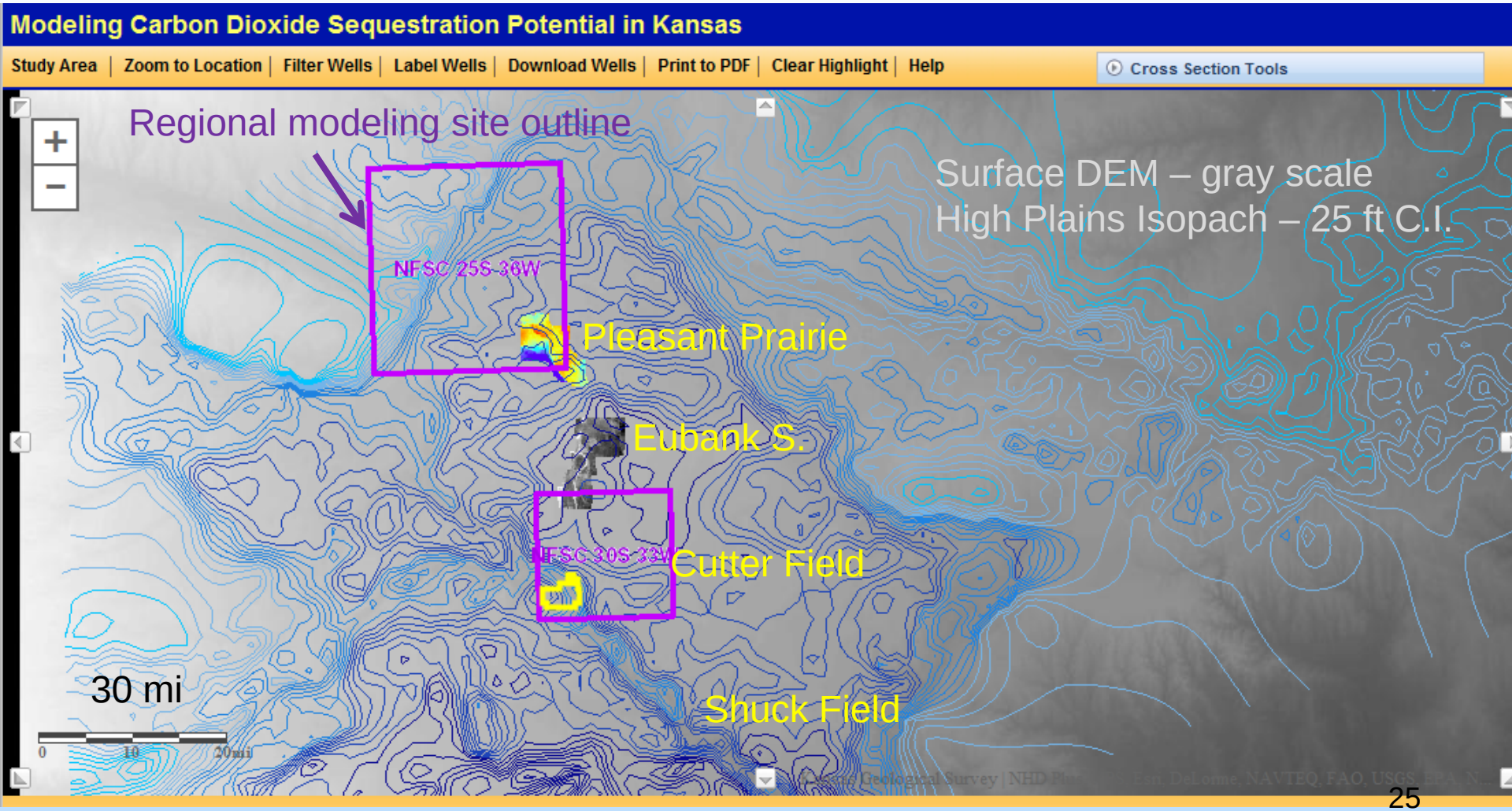


Drilling, Coring, and Seismic Data at Cutter and Wellington
Western Calibration for Regional CO_2 Storage Assessment

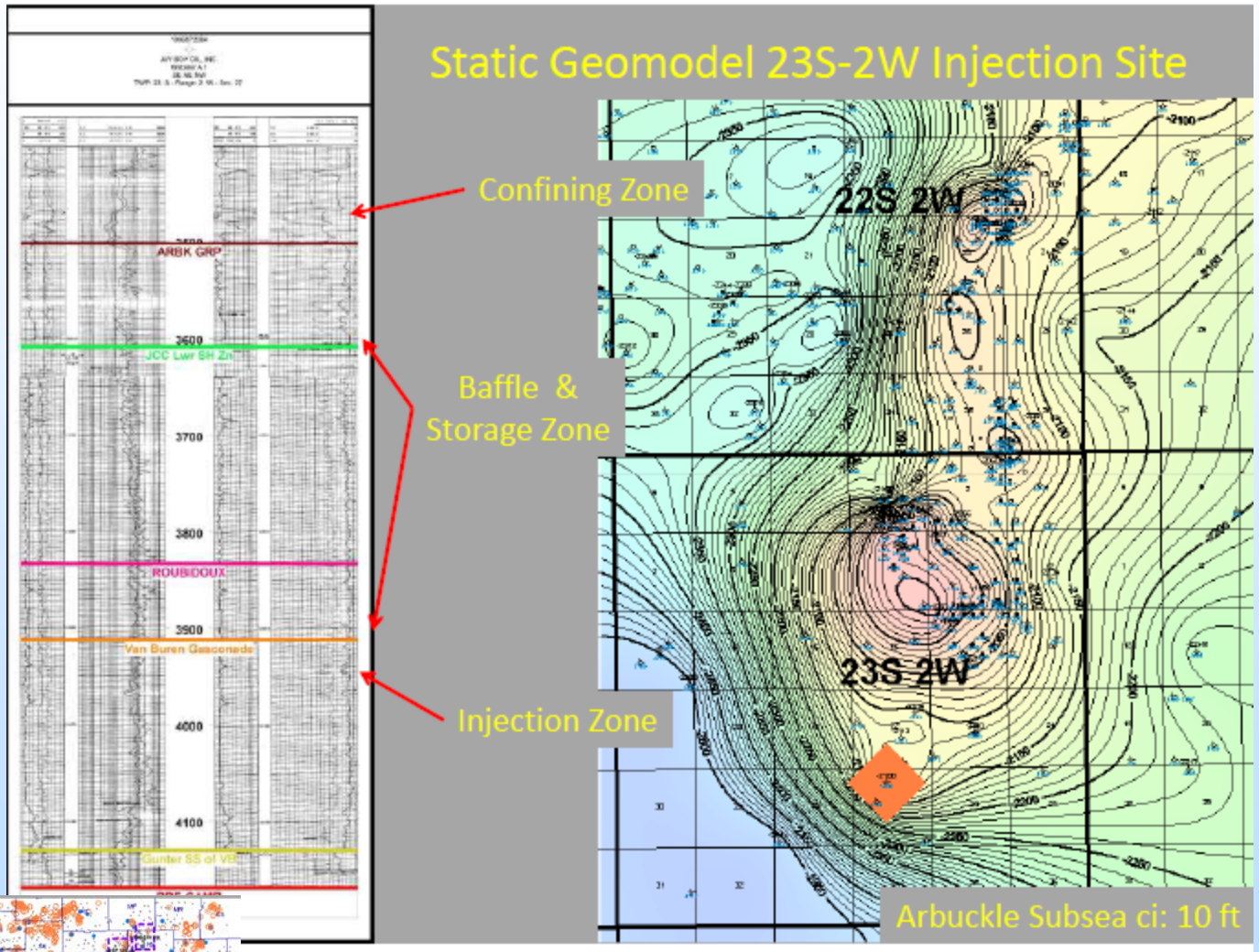


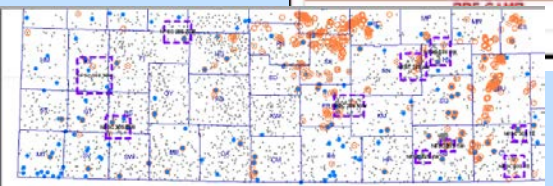
Risk Assessment –

Correlation between high Plains Aquifer Isopach and Surface Low in Southwest Kansas



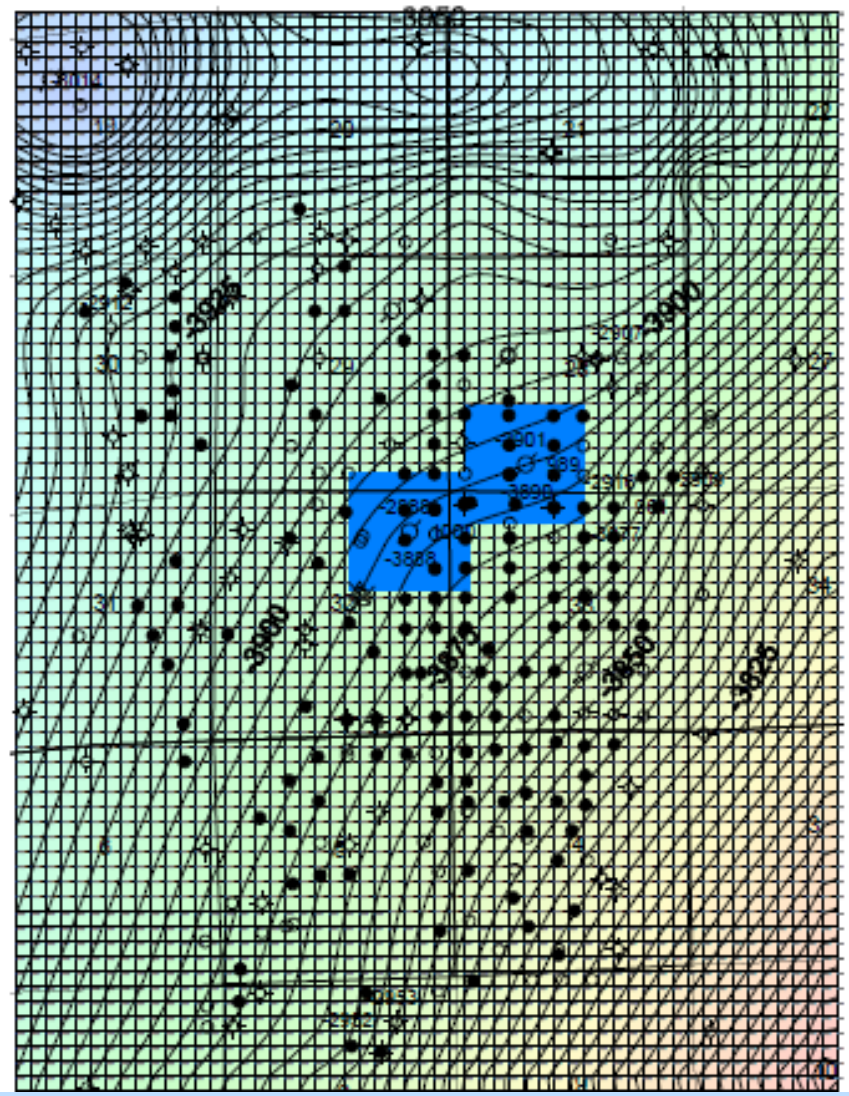
10 Static-Dynamic Modeling Sites in Assessment Area





Coarse Grid Simulations - Arbuckle Saline Aquifer

Improve Assessment of CO_2 Sequestration Capacity



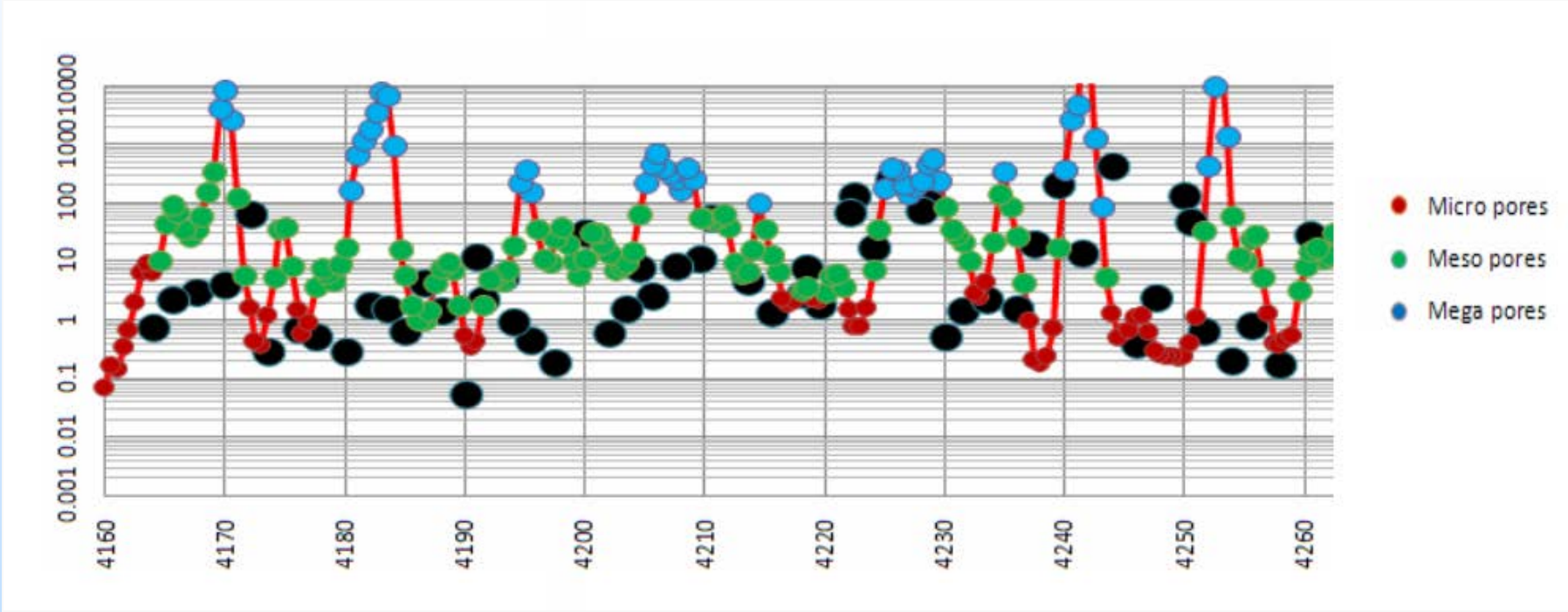
Geomodel input format for coarse grid simulation prior to final regional assessment

Grid Cell Size: 330 ft, Col: 56, Row: 73, total cells: 4088

- Info on Grids in Zmap based on stratigraphic divisions, lithofacies, and pore types
- Parameters assigned by fuzzy logic correlations from core and log data from Cutter and Wellington fields --
  - Phi
  - K and relative permeability
  - Capillary pressure for supercritical CO_2

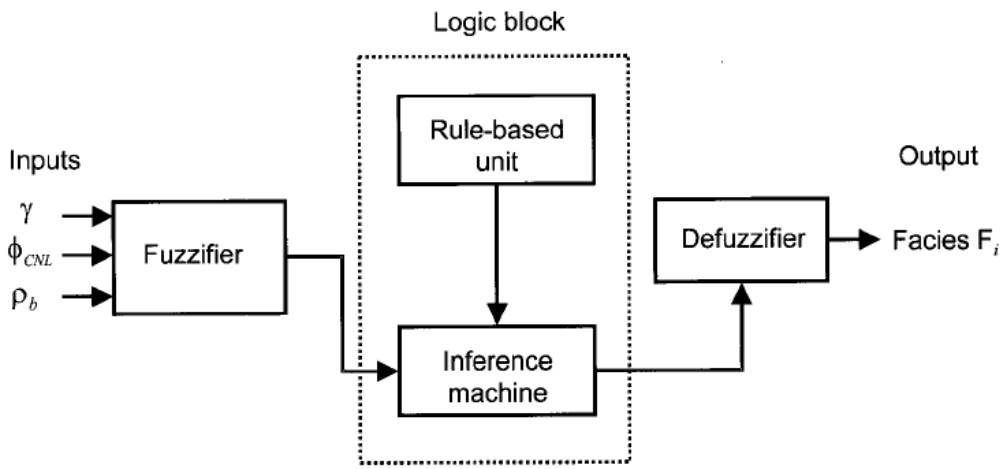
Improved permeability estimation in Wellington #1-32:

- -micro, meso, and mega groups defined
- -core FZI and irreducible water saturation (from MRI log)
- -permeability computed from FZI value

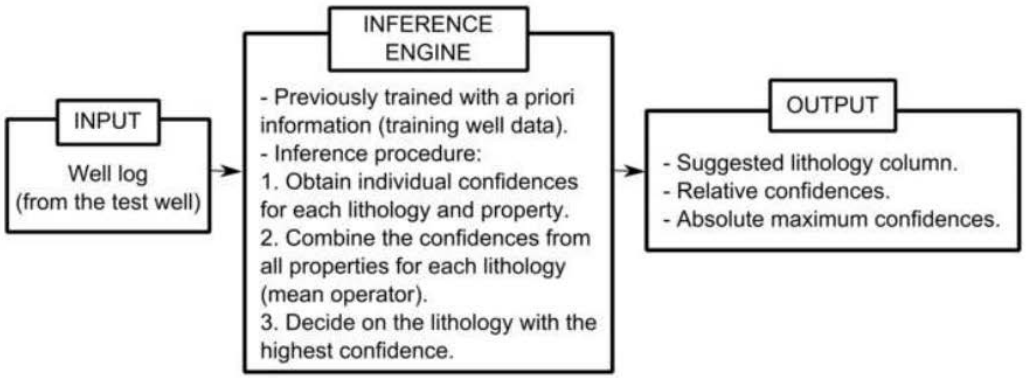


Black points = core measured permeability

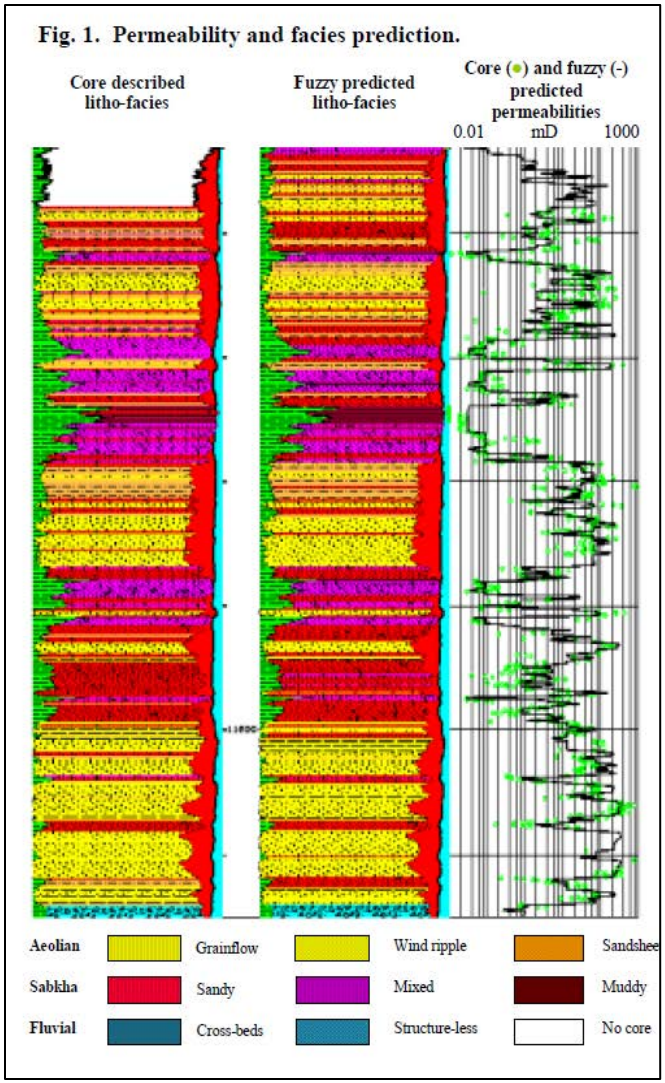
Fuzzy Partitioning Systems for Electrofacies Classification



Finol et al. (2001)



Bosch et al., in press



Cuddy and Glover (2002)

Accomplishments to Date

- KGS Milestone 1.2: Acquire/analyze seismic, geologic and engineering data - Wellington field -- COMPLETED
- KGS Milestone 1.3: Develop initial geomodel for Wellington field -- COMPLETED
- KGS Milestone 1.4: Locate and initiate drilling of Well #1 at Wellington field -- COMPLETED
- KGS Milestone 2.1: Complete Well#1 at Wellington - DST, core, log, case, perforate, test zones -- COMPLETED
- KGS Milestone 2.2: Complete Well#2 at Wellington - Drill, DST, log, case, perforate, test zones -- COMPLETED
- KGS Milestone 2.3: Update Wellington geomodels - Arbuckle & Mississippian – 90%
- KGS Milestone 2.4: Evaluate CO_2 Sequestration Potential of Arbuckle Group Saline Aquifer - Wellington field – 85%
- KGS Milestone 3.1: CO_2 sequestration & EOR potential - Wellington field – 85%
- KGS Milestone 3.2: Characterize leakage pathways - Risk assessment area – 85%
- KGS Milestone 3.3: Risk assessment related to CO_2-EOR and CO_2-sequestration – 70%
- KGS Milestone 3.4: Regional CO_2 Sequestration Potential - 33 Counties – 50%

Summary

- **Key findings**
  1. Initial estimates of CO_2 P10 & P90 Arbuckle aquifer storage are 8.8 and 75.5 billion metric tons.
  2. Core, logs, seismic, DST, geochemical and microbial analysis, and step-rate test at Wellington Field indicate that lower Arbuckle is *a primary injection interval* (~150 ft thick) overlain by widespread thick (400 ft) *baffle/barrier in mid Arbuckle*.
  3. Geochemical and microbial analyses indicate that upper and lower portions of the Arbuckle saline aquifer are not in hydraulic communication.
  4. Thick (~120 ft) primary caprock in lower Mississippian (“Pierson Fm.”) augments the Chattanooga Shale and Simpson Group in south-central Kansas.
- **Future Plans**
  - Complete geomodels and simulations in SW Kansas fields and Wellington
  - Refine regional CO_2 storage estimates from quantitative analysis of LAS log files and static and dynamic modeling at 10 sites
  - Complete project by Febuary 2014

Appendix

ORGANIZATIONAL STRUCTURE

Modeling CO_2 Sequestration in Saline Aquifer and Depleted Oil Reservoir to Evaluate Regional CO_2 Sequestration Potential of Ozark Plateau Aquifer System, South-Central Kansas

DOE project -- DE-FE002056

Principal Investigators

Jason Rush -- Joint PI
W. Lynn Watney - Joint PI

UNIVERSITY OF KANSAS

Kansas Geological Survey

Co-Principal Investigators

Kerry D. Newell -- stratigraphy, geochemistry
Jason Rush -- Petrel geomodeling and data integration
Richard Miller -- geophysics
John Doveton-- log petrophysics and core-log modeling
Jianghai Xia -- gravity-magnetics modeling & interpretation
Marios Sophocleous --geohydrology

Key Personnel

John Victorine -- Java web app development
David Laflen -- manage core & curation
Mike Killion -- modify ESRI map service for project
Jennifer Raney -- asst. project manager
Debra Stewart, Dan Suchy -- data management
Yevhen 'Eugene' Holubnyak, Petroleum Engineer
Fatemeh "Mina" FazelAlavi, Engineering Research Assistant

KU Department of Geology

Co-Principal Investigators

Evan Franseen --sedimentology, stratigraphy
Robert Goldstein -- diagenesis, fluid inclusion
David Fowle -- reactive pathways, microbial catalysis
Jennifer Roberts -- reactive pathways, microbial catalysis
George Tsoflias -- geophysics

Grad Research Assistants

Aimee Scheffer (graduated) -- biogeology & geochemistry
Breanna Huff -- biogeology
Christa Jackson -- biogeology and geochemistry
Ayrat Sirazhiev (graduated) -- geophysics
Yousuf Fadolalkarem -- geophysics
Brad King -- diagenesis

SUBCONTRACTS

Berexco, Beredco Drilling -- *Wichita, KS*

Wellington Field access; drilling, coring, completion and testing; modeling and simulation

Key Personnel

Dana Wreath - manager, reservoir and production engineer
Randy Koudele - reservoir engineer
Bill Lamb - reservoir engineer

Bittersweet Energy, Inc., *Wichita, KS*

Tom Hansen, Principal, Wichita, Geological Supervision - regional data, Arbuckle hydrogeology
Paul Gerlach -- regional data acquisition, 2 yrs.
Larry Nicholson -- regional data acquisition, 2 yrs.
Anna Smith -- regional data acquisition, 2 yrs.
Ken Cooper, Petrotek Engineering, Littleton, CO- engineer, well injection, hydrogeology
John Lorenz, Scott Cooper, FractureStudies, Edgewood, NM -- core fracture study

Kansas State University

Seismic and Geochemical Services

Co-Principal Investigators

Saugata Datta -- reactive pathways and reaction constants
Abdelmoneam Raef -- seismic analysis and modeling

Grad Research Assistants

Robin Barker (graduated)
Derek Ohl - seismic analysis and modeling
Randi Isham -- seismic
Brent Campbell - aqueous geochemistry

Southwest Kansas CO2 EOR Initiative - Chester Morrow

Martin Dubois, IHR, LLC -- team lead, geomodeling
John Youle, Sunflower Energy -- core and depositional models
Ray Sorenson, consultant -- data acquisition and advising
Eugene Williams, Williams Engineering -- reservoir modeling

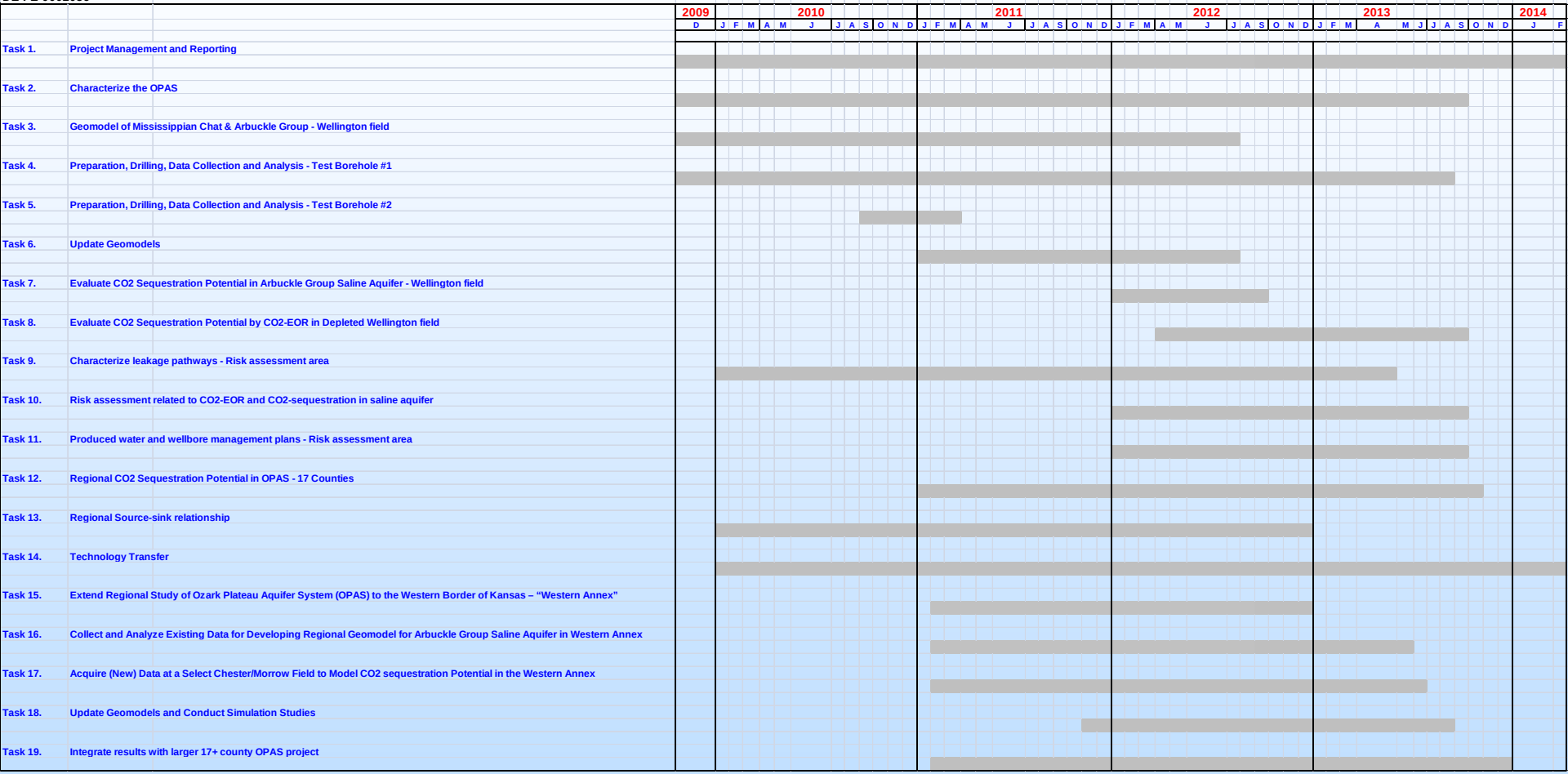
Services

LOGDIGI, LLC, *Katy, TX* - wireline log digitizing
David G. KOGER, *Dallas, TX* - remote sensing data and analysis
Weatherford Laboratories, *Houston, TX* -- core analyses
CMG - Simulation Services, *Calgary, Alberta* --greenhouse gas simulation and software
Halliburton, *Liberal, KS* -- wireline logging services
Hedke-Saenger Geoscience, LTD., *Wichita, KS* - geophysical acquistion, interpret & design
Susan E. Nissen, *McLouth, KS* -- Geophysical Consultant, volumetic curvature
Lockhart Geophysical, *Denver, CO* -- acquis & interpret 2D shear wave, gravity & mag
Fairfield Industries, Inc., *Denver, CO* -- 2D, 3D multicomponent seismic processing
Paragon Geophysical Services, *Wichita, KS* -- 3D seismic acquisition
Echo Geophysical, *Denver, CO* -- 3D seismic processing
Converging Point - QC seismic acquisition
Noble Energy, *Houston, TX; Denver, CO* -- collaborating co., fields adjoining Wellington

Gantt Chart

Abbreviated Gant Chart

DE-FE-0002056



Bibliography

Watney, W.L., Newell, K.D., Holubnyak, E., and Raney, J., 2013, “Oil and Gas in Central Kansas Potential for Enhanced Oil Recovery Using CO2”, regarding use of petroleum coke in refinery that would include CO2 generation: to McPherson Kansas Development Corporation hosted meeting, April 3.
Watney, W.L., 2013, Analysis of the Late Devonian to Early Carboniferous (Fransnian-Tornaisian) Woodford (Chattanooga) Shale, presentation to AAPG Forum Woodford, Oklahoma City, April 11. This is an important caprock in Kansas and Oklahoma.
Watney, W.L., 2013, Petrophysical Analyses and Integrated Approaches, April 16-19, AAPG Short Course, Austin, TX. Centerpiece of the course material comes from the DOE-CO2 project
Watney, W.L., 2013, Mississippian Exploration: Stratigraphy, Petrology, and Reservoir Properties with an emphasis on Wellington Field, April 23, Denver, RMAG & PTTC Symposium titled, “Making Money with Science”, April 23, Denver, Colorado.

W. Lynn Watney, John Youle, Dennis Hedke, Paul Gerlach, Raymond Sorenson, Martin Dubois, Larry Nicholson, Thomas Hansen, David Koger, and Ralph Baker, 2013, Sedimentologic and Stratigraphic Effects of Episodic Structural Activity During the Phanerozoic in the Hugoton Embayment, Kansas USA: AAPG Annual Meeting, Oral presentation, Pittsburgh, PA, May 21

W. Lynn Watney, Jason Rush, Martin Dubois, Robinson Barker, Tiraz Birdie, Ken Cooper, Saugata Datta, John Doveton, Mina Fazelalavi, David Fowle, Paul Gerlach, Thomas Hansen, Dennis Hedke, Yevhen Holubnyak, Breanna Huff, K. David Newell, Larry Nicholson, Jennifer Roberts, Aimee Scheffer, Ayrat Sirazhiev, Raymond Sorenson, Georgios Tsoflias, Eugene Williams, Dana Wreath, John Youle, 2013, Evaluating Carbon Storage in Morrowan and Mississippian oil fields and Underlying Lower Ordovician Arbuckle Saline Aquifer in Southern Kansas: AAPG Annual Meeting, Poster, Pittsburgh, PA, May 20.

DOE Site visit and project review, June 3-5, 2013, Regional CO2 Storage, Wellington and Cutter field calibration sites, SW Kansas CO2-EOR Initiative, and Small Scale CO2 Test Injection at Wellington, Wichita, KS.

Watney, L., Rush, J., Raney J., and Brian Dressel, DOE Project Manager, 2013, Presentation to the 2013 KGS Annual Kansas Field Conference. Participants included Kansas legislators and state officials, morning of Tuesday, June 4th, Meet bus at site of Wellington KGS #1-32. Brought core and posters in addition to describing DOE-CO2 project and answering questions pertaining economics, safety, and policy.

The 2013 KGS Annual Field Conference was carried out by Shane A. Lyle, Catherine S. Evans, Rex C. Buchanan, and Robert S. Sawin and was focused on “South-Central Kansas Oil Exploration, Water Allocation, and Range Management”. This project is operated by the Kansas Geological Survey and funded, in part, by the Kansas Water Office, the Kansas Department of Transportation, and the Kansas Department of Wildlife, Parks and Tourism. The Wellington Field was Stop #1 on the trip that traversed south-central Kansas (Figure 37). Members of the DOE-CO2 team met the bus at the site of Berexco Wellington KGS #1-32 in Wellington Field.

GEOCHEMICAL AND MINERALOGICAL CHARACTERIZATION OF THE ARBUCKLE AQUIFER: STUDYING MINERAL REACTIONS AND ITS IMPLICATIONS FOR CO2 SEQUESTRATION

BARKER, Robinson1, WATNEY, W. Lynn2, SCHEFFER, Aimee3, FORD, Sophia1, and DATTA, Saugata1, (1) Department of Geology, Kansas State University, 108 Thompson Hall, Manhattan, KS 66506, rbarker@ksu.edu, (2) Kansas Geological Survey, Univ of Kansas, 1930 Constant Avenue, Lawrence, KS 66047, (3) Geology, University of Kansas, 1475 Jayhawk Blv. Room 120, Lawrence, KS 66045

GEOCHEMICAL AND MICROBIOLOGICAL INFLUENCES ON SEAL INTEGRITY DURING SC-CO2 EXPOSURE, ARBUCKLE AQUIFER, SE KANSAS

JACKSON, Christa1, SCHEFFER, Aimee2, FOWLE, David3, WATNEY, W. Lynn4, STRAZISAR, Brian5, and ROBERTS, Jennifer A.3, (1) Geology, University of Kansas, 1475 Jayhawk Blvd, Room 120, Lawrence, KS 66045, christa.jackson@ku.edu, (2) Geology, University of Kansas, 1475 Jayhawk Blv. Room 120, Lawrence, KS 66045, (3) Geology, University of Kansas, Multidisciplinary Research Building, 2030 Becker Dr, Lawrence, KS 66047, (4) Kansas Geological Survey, Univ of Kansas, 1930 Constant Avenue, Lawrence, KS 66047, (5) Geomechanics and Flow Laboratory, National Energy Technology Laboratory, 626 Cochrans Mill Road, PO Box 10940, Pittsburgh, PA 15236

GEOCHEMICAL, MICROBIOLOGICAL, AND PERMEABILITY CHARACTERISTICS INDICATING VERTICAL ZONATION OF THE ARBUCKLE SALINE AQUIFER, A POTENTIAL CO2 STORAGE RESERVOIR

SCHEFFER, Aimee1, STOTLER, Randy L.2, WATNEY, W. Lynn3, FOWLE, David4, DOVETON, John H.5, RUSH, Jason6, NEWELL, K. David7, FAZELALAVI, Mina3, WHITTEMORE, Donald O.8, and ROBERTS, Jennifer A.4, (1) Geology, University of Kansas, 1475 Jayhawk Blv. Room 120, Lawrence, KS 66045, ascheffer@ku.edu, (2) Department of Geology, University of Kansas, Lawrence, KS 66045, (3) Kansas Geological Survey, Univ of Kansas, 1930 Constant Avenue, Lawrence, KS 66047, (4) Geology, University of Kansas, Multidisciplinary Research Building, 2030 Becker Dr, Lawrence, KS 66047, (5) Kansas Geological Survey, Univ of Kansas, 1930 Constant Avenue, Campus West, Lawrence, KS 66047, (6) Kansas Geological Survey, The University of Kansas, 1930 Constant Avenue, Lawrence, KS 66047, (7) Kansas Geological Survey, University of Kansas, 1930 Constant Avenue, Lawrence, KS 66047-3726, (8) Kansas Geological Survey, University of Kansas, 1930 Constant Ave, Lawrence, KS 66047

M.S. Theses

Ayrat Sirazhiev, 2012, Seismic Attribute Analysis of the Mississippian Chert at the Wellington Field, south-central Kansas: M.S. Thesis, Department of Geology, The University of Kansas.

Ohl, Derek Robert, 2012, Rock formation characterization for carbon dioxide geosequestration: 3D seismic amplitude and coherency anomalies, and seismic petrophysical facies classification, Wellington and Anson-Bates fields, Sumner County, Kansas, USA, M.S. Thesis, Department of Geology, Kansas State University, 77 p.

Randi Jo Lee, 2012, Integration of in situ and laboratory velocity measurements: analysis and calibration for rock formation characterization Isham, M.S. Thesis, Department of Geology, Kansas State University.

Presentations

Geofest 2012, October 26th 2012, held in Lawrence, KS at Kansas Geological Survey, focused on a review of the DOE funded CCUS research in a morning seminar and a core workshop in the afternoon to examine the entire 1600 ft long core from Wellington KGS #1-32. Attendees included members of the Kansas Geological Society, Kansas Geological Survey, Departments of Geology at Kansas University and Wichita State University