House Bill 1: Eastern Kentucky Deep Carbon Storage

Stephen Greb and Warren Anderson

Kentucky Geological Survey

University of Kentucky

HB1: Eastern Kentucky Deep Carbon Storage

House Bill 1

$5 million appropriated to research use and storage of CO_2 in Kentucky

"…the research shall include the drilling of deep wells in both coal fields (Illinois and Appalachian) in Kentucky, and performing the analysis necessary to estimate the potential for enhanced oil and gas recovery, enhanced coalbed methane recovery, or permanent storage of sequestration of carbon dioxide."

HB1: Eastern Kentucky Deep Carbon Storage

A series of meetings were held in Spring 2008 to announce the project, set up an advisory panel, and solicit potential projects in eastern KY

- Chesapeake Energy
- Crossrock, Inc.
- East Kentucky Power Coop.
- Equitable Resources
- Interstate Natural Gas Co.
- Pike County Government Office of Energy and Technology
- Pine Mountain Regional Industrial Development Authority
- Schlumberger Carbon Services
- TECO Coal Corp.
- Triana Energy

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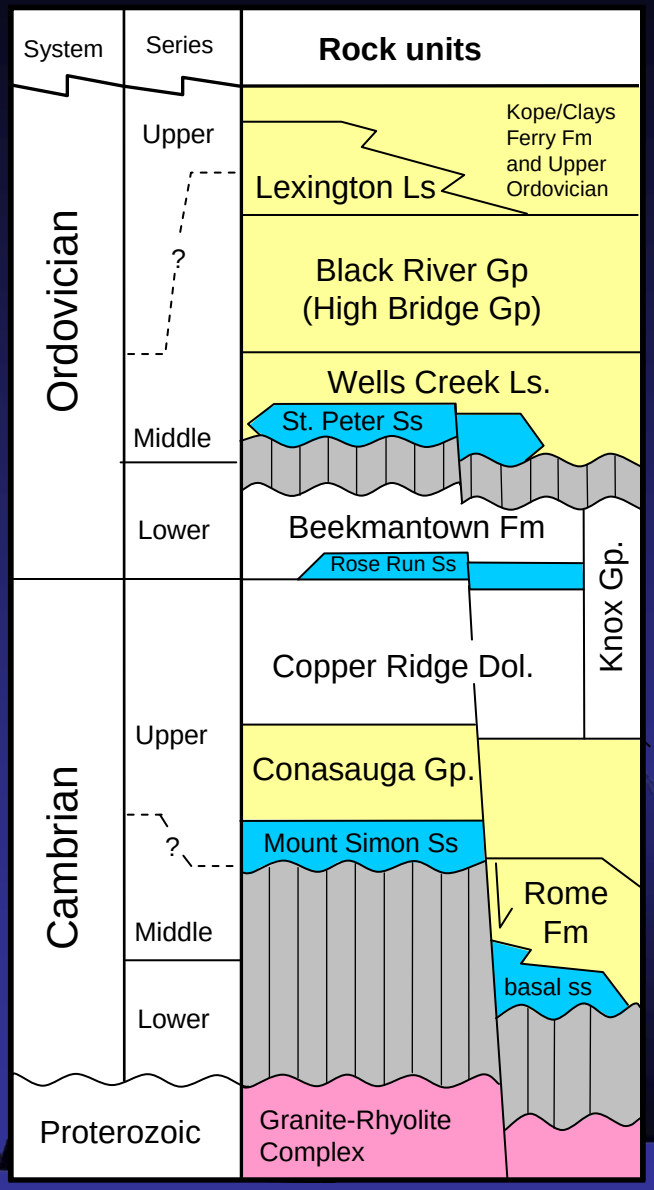

Previous research has established which rock units in the deep subsurface are possible saline reservoirs for large-scale CO_2 storage and which are possible sealing or containment intervals

- **Potential CO_2 sinks/ reservoirs**
- **Caprock-containment interval**
- **Unconformity**
- **Sink or seal (*depends on location*)**
- **Metamorphic and igneous rocks (*mostly seal*)**

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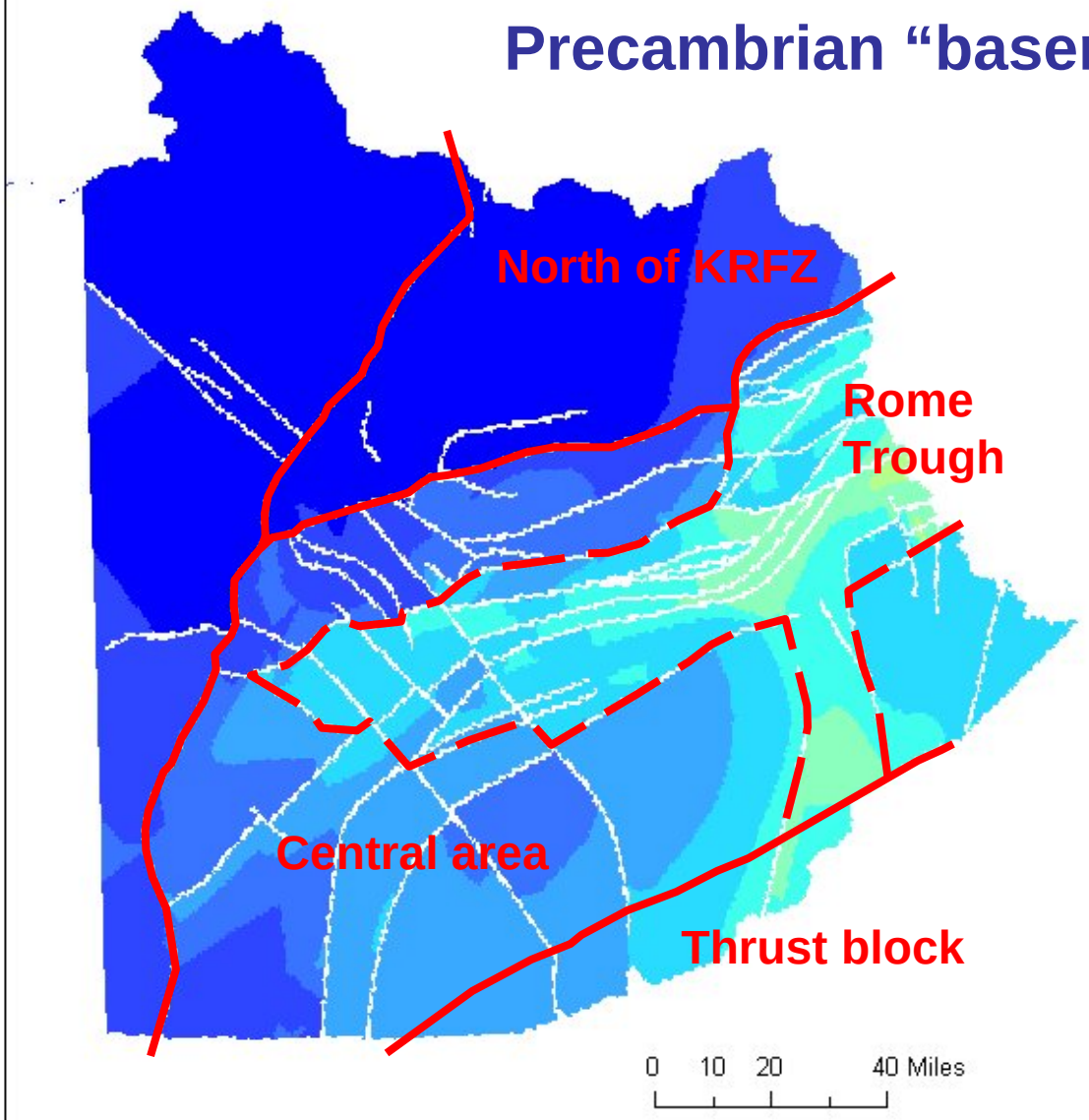
Precambrian "basement" structure



Subsea elev (ft)

- -18,000 - -16,000
- -16,000 - -14,000
- -14,000 - -12,000
- -12,000 - -10,000
- -10,000 - -8,000
- -8,000- -6,000
- -6,000 - -4,000
- -4,000 - -2,000

Subsurface geology in eastern KY is quite variable

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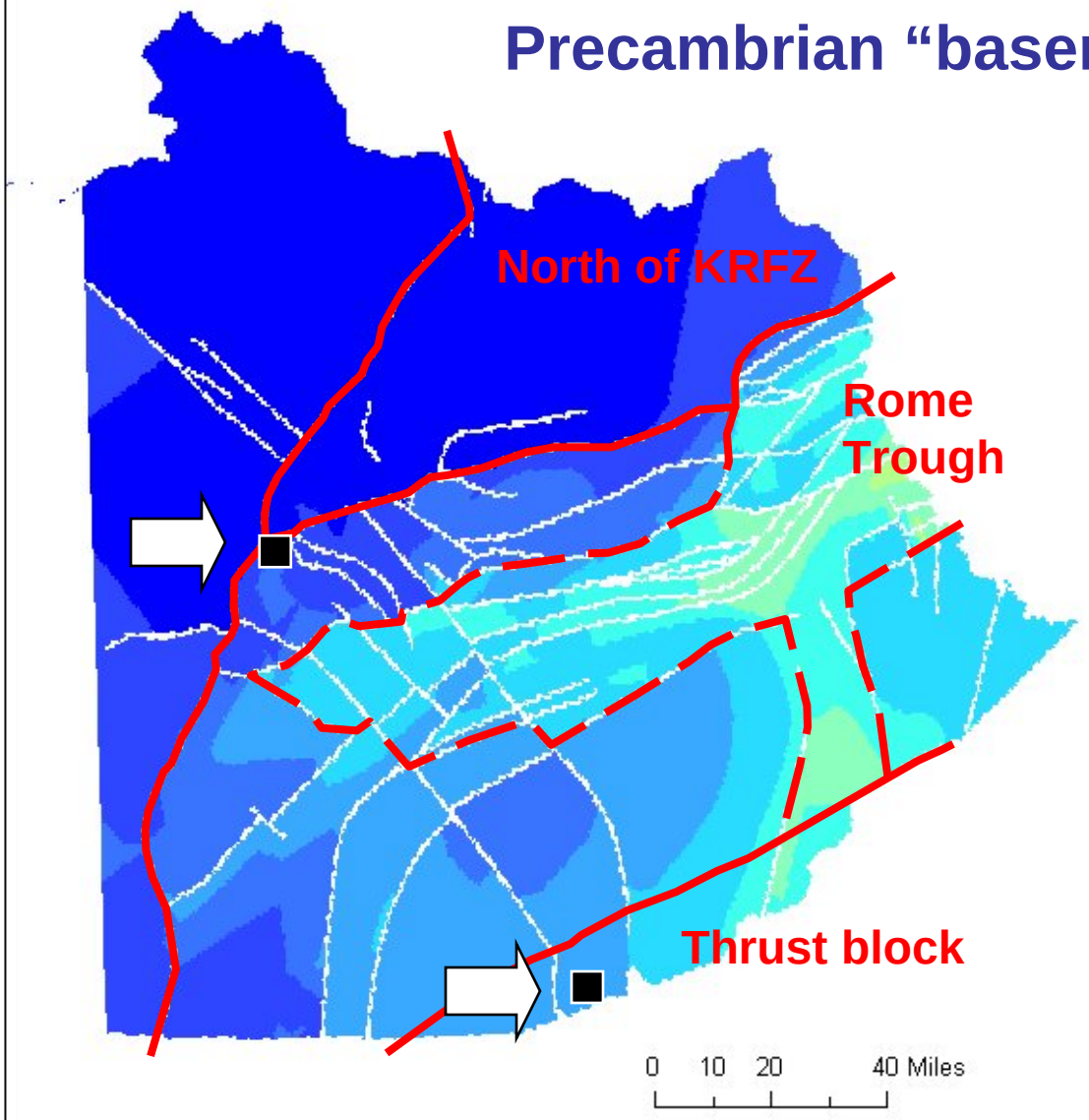
Precambrian "basement" structure



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Two sites chosen for study in eastern KY

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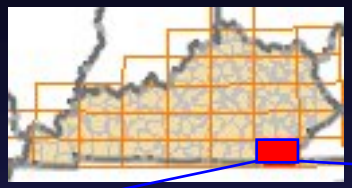
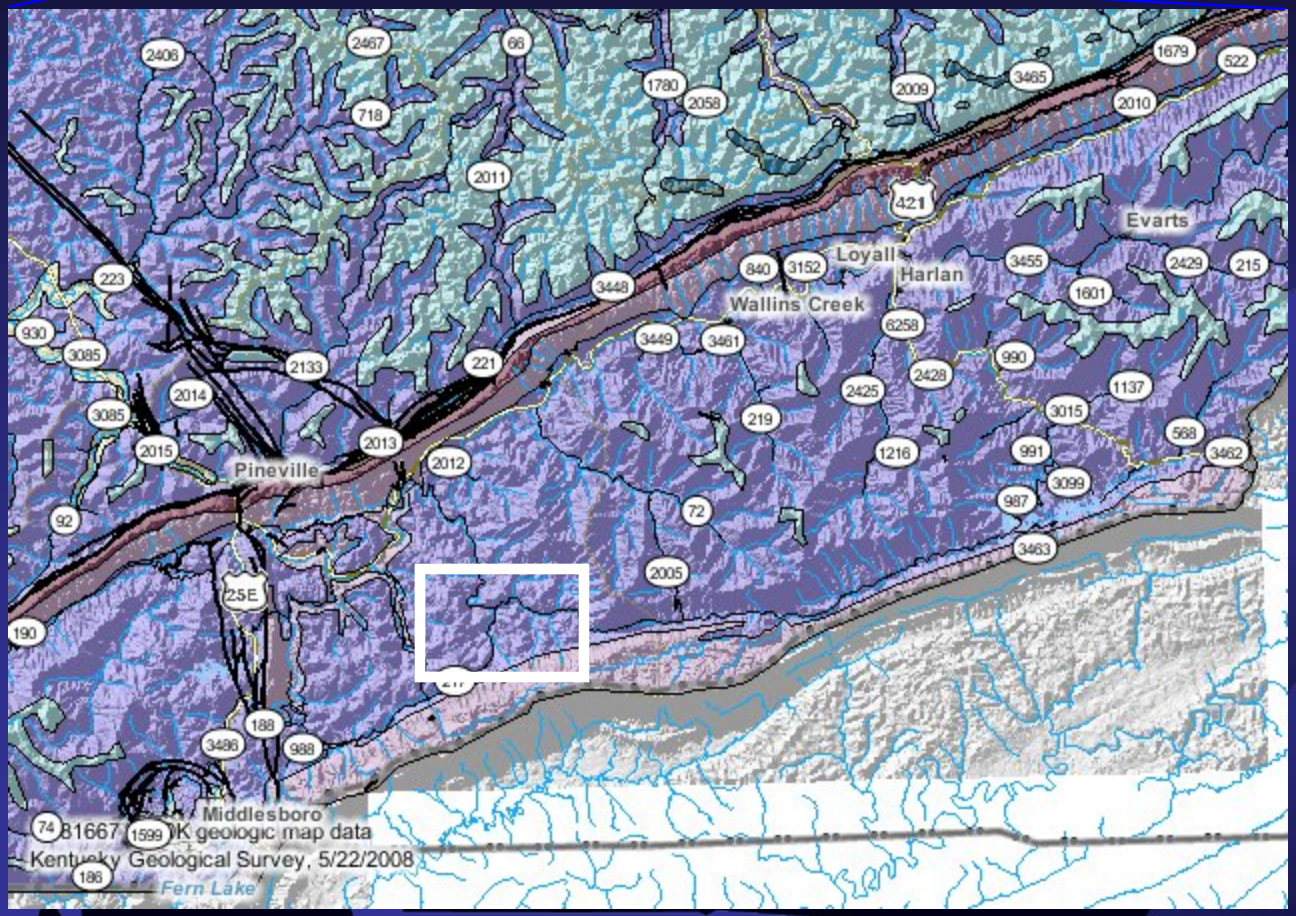


Pine Mountain site



Bell County

- **Proposed by Pine Mountain Regional Industrial Development Authority (PMRID)**

From the KGS Geologic Map Service (http://kgsmap.uky.edu/)

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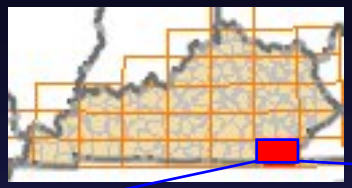

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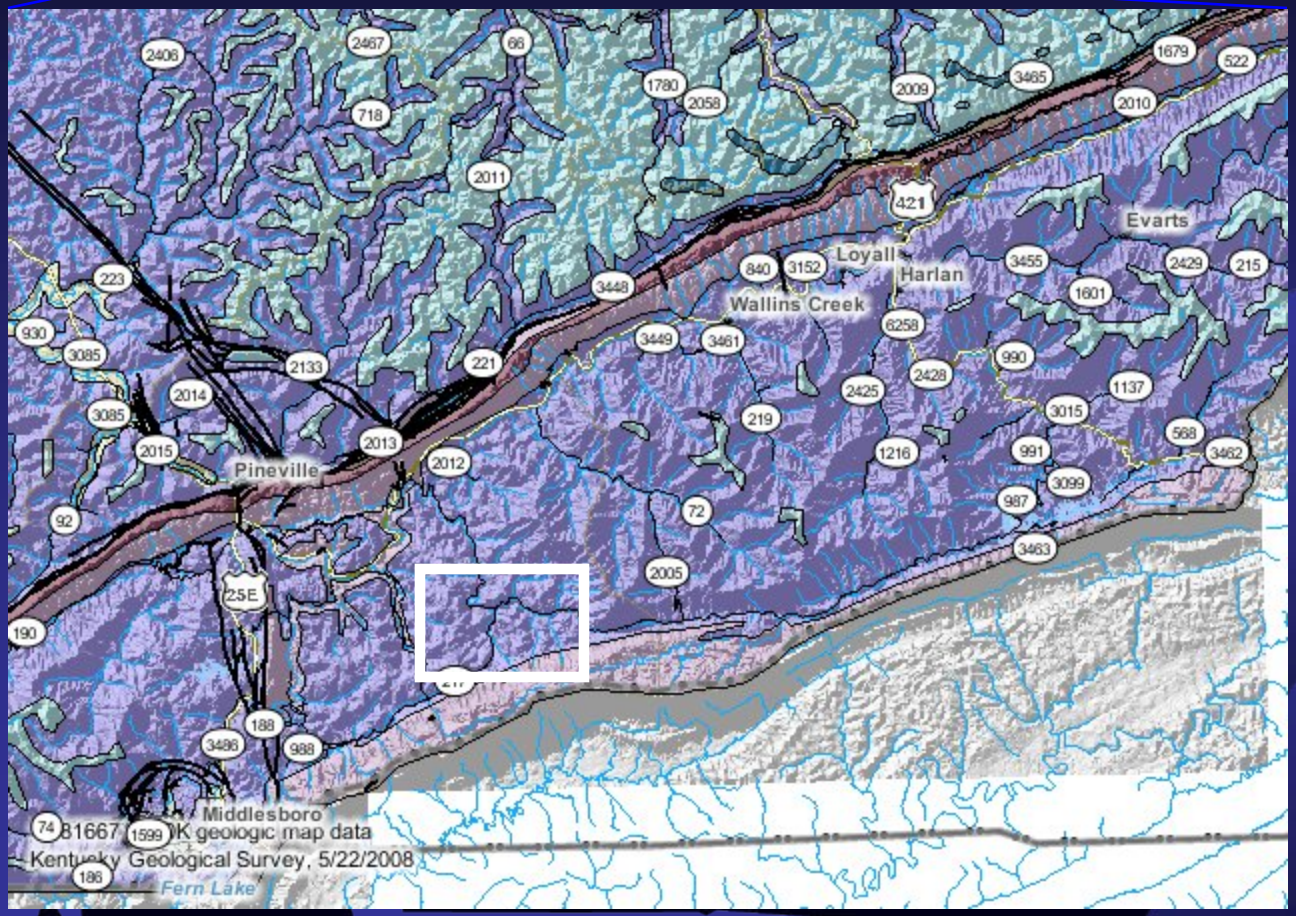

PMRID has additional funding from coal severance taxes from five member counties

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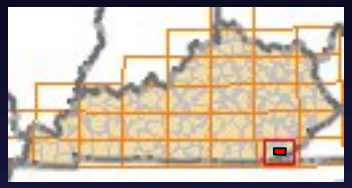
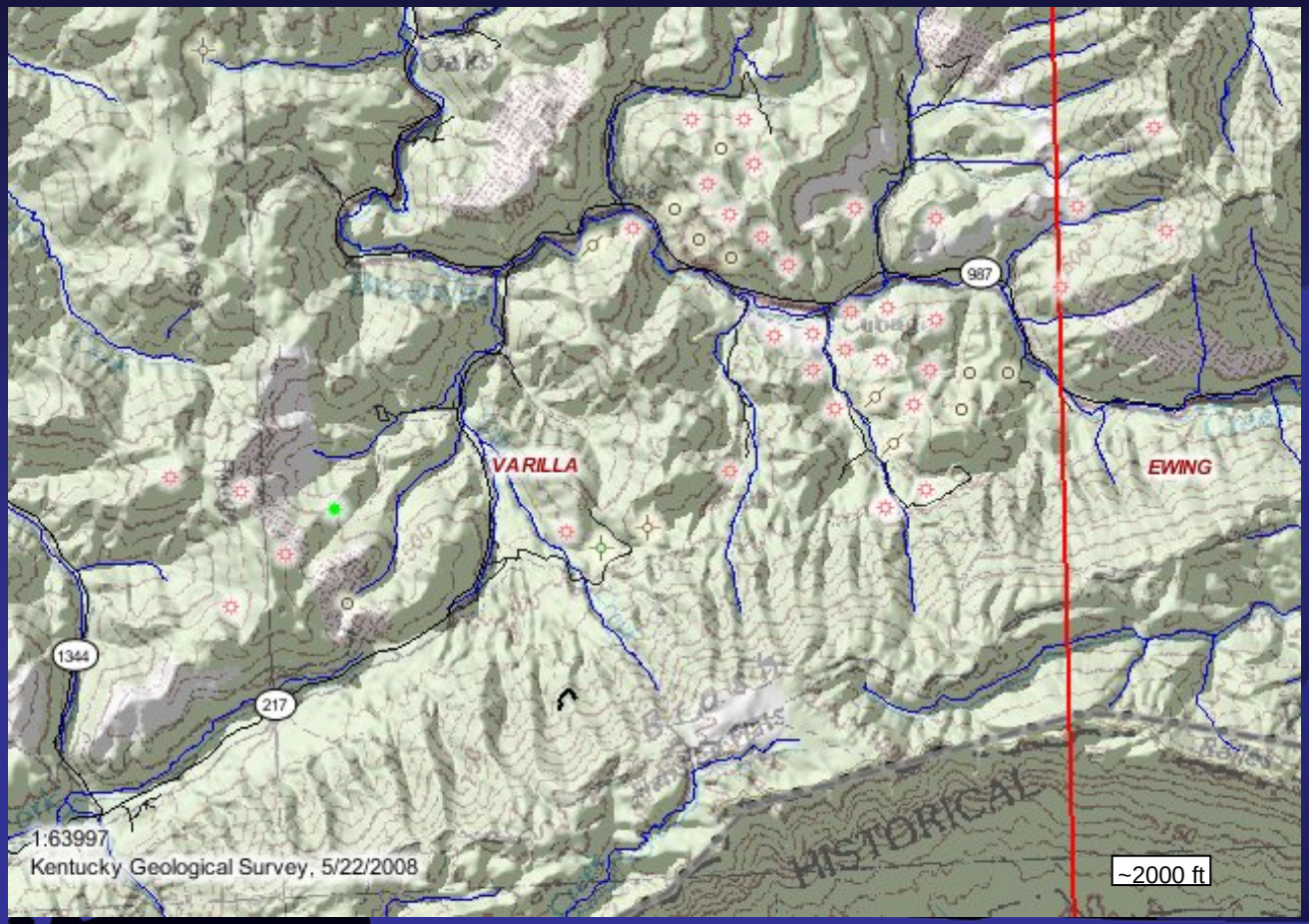


Pine Mountain site



Anderson Oil

- 500-acre industrial development site with surface and subsurface leases

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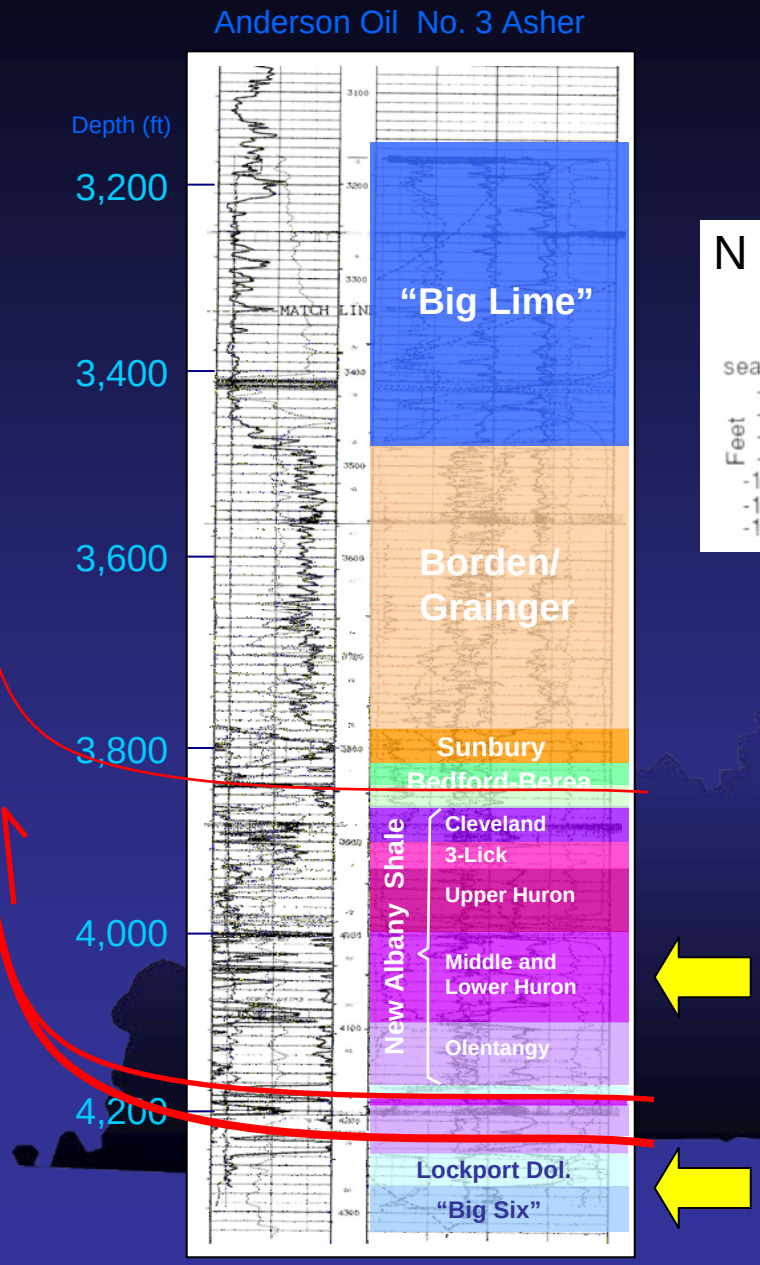
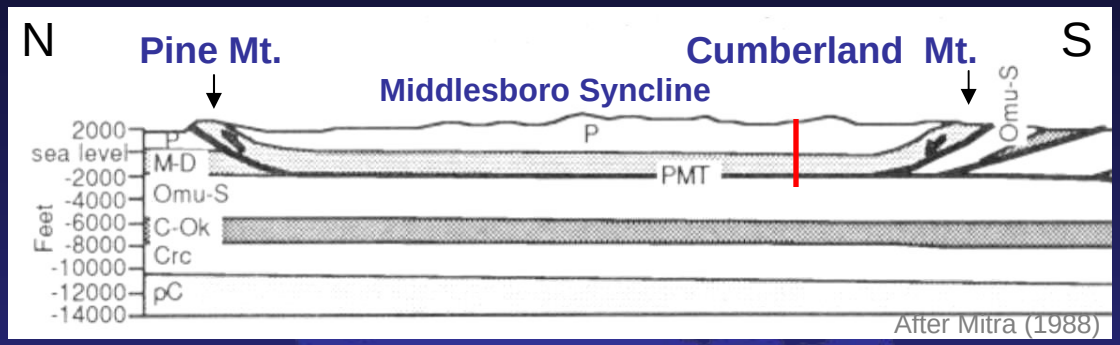


Pine Mountain site



"Big Six", sandy dolomite reservoirs are below PM thrust

- **The Lockport-"Big Six" and Devonian Shale are deep enough for miscible CO_2 injection**

  → **Shale and thrust faults would be part of the seal**

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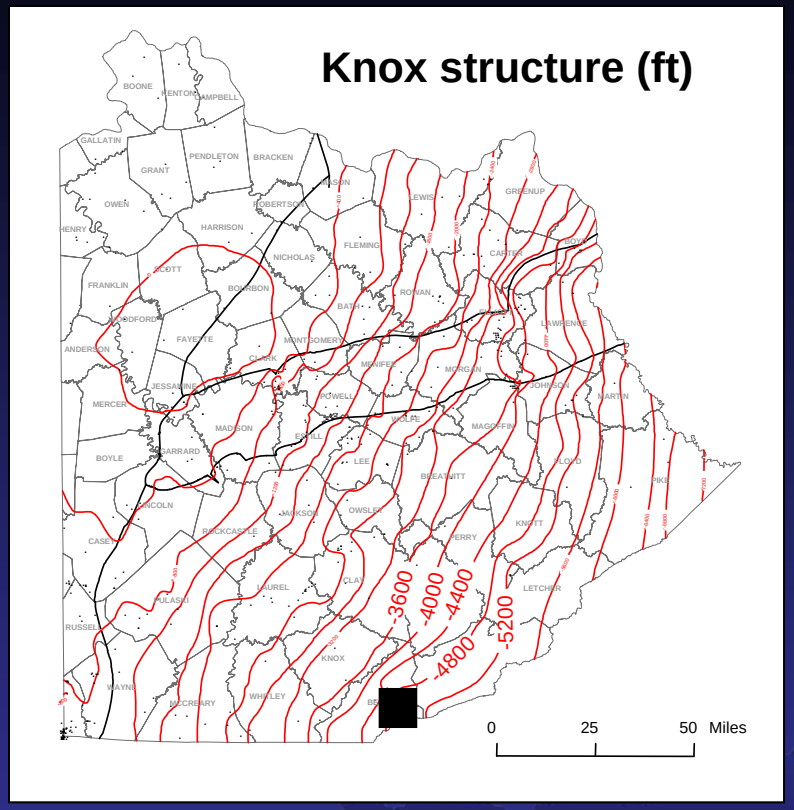

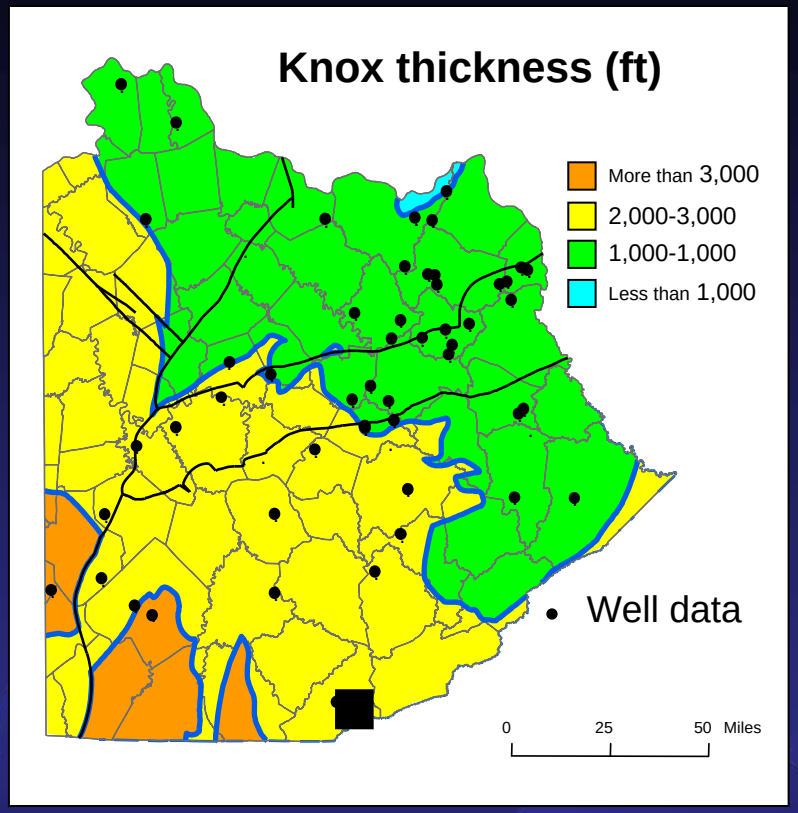

- The Knox Dolomite is ~2,600 ft below the base of the black shale at depths of ~6,500-7,000 ft.

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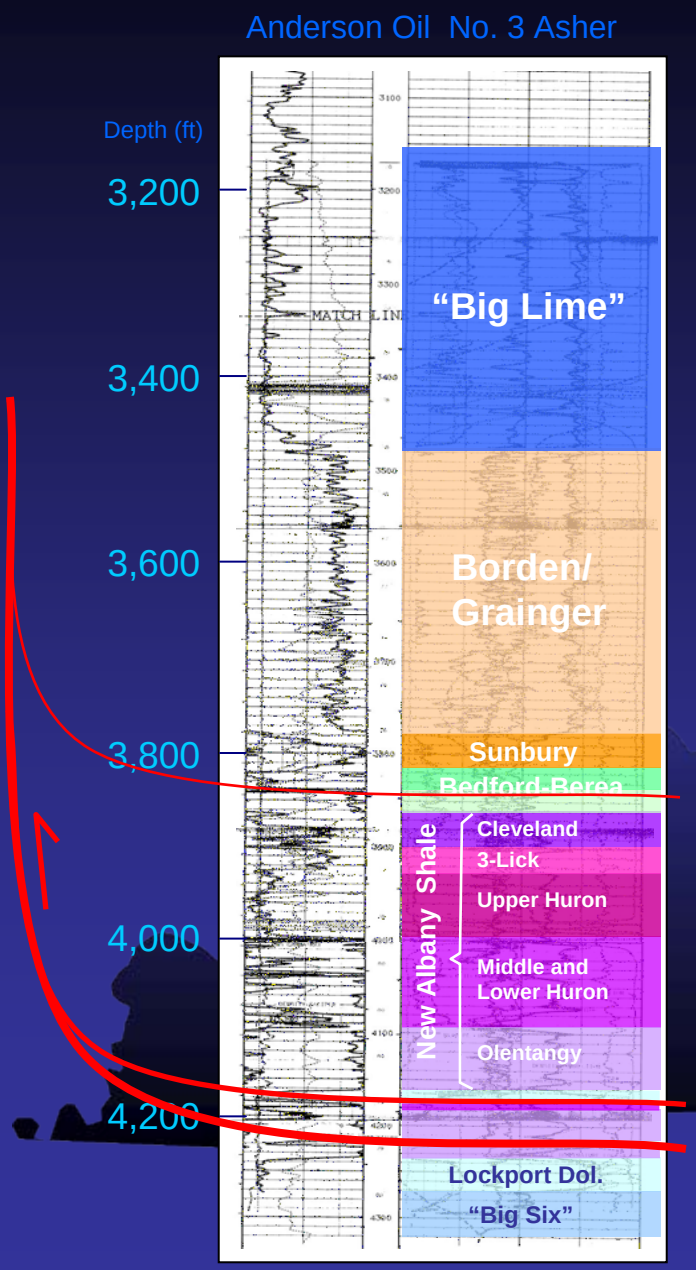

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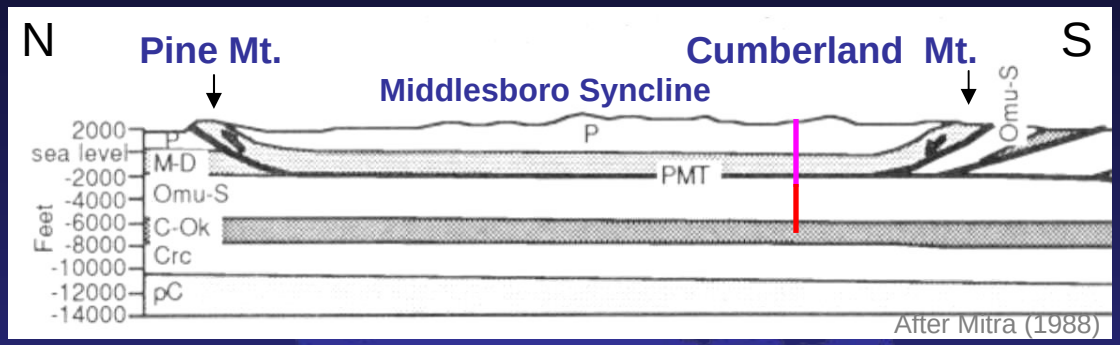

Draft proposal

Deepen an existing hole to the Knox, run a suite of logs, and collect sidewall core samples to determine if the Knox is suitable for injection

- **Potential at this site for stacked reservoir testing**

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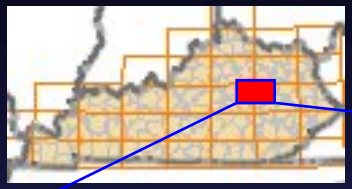
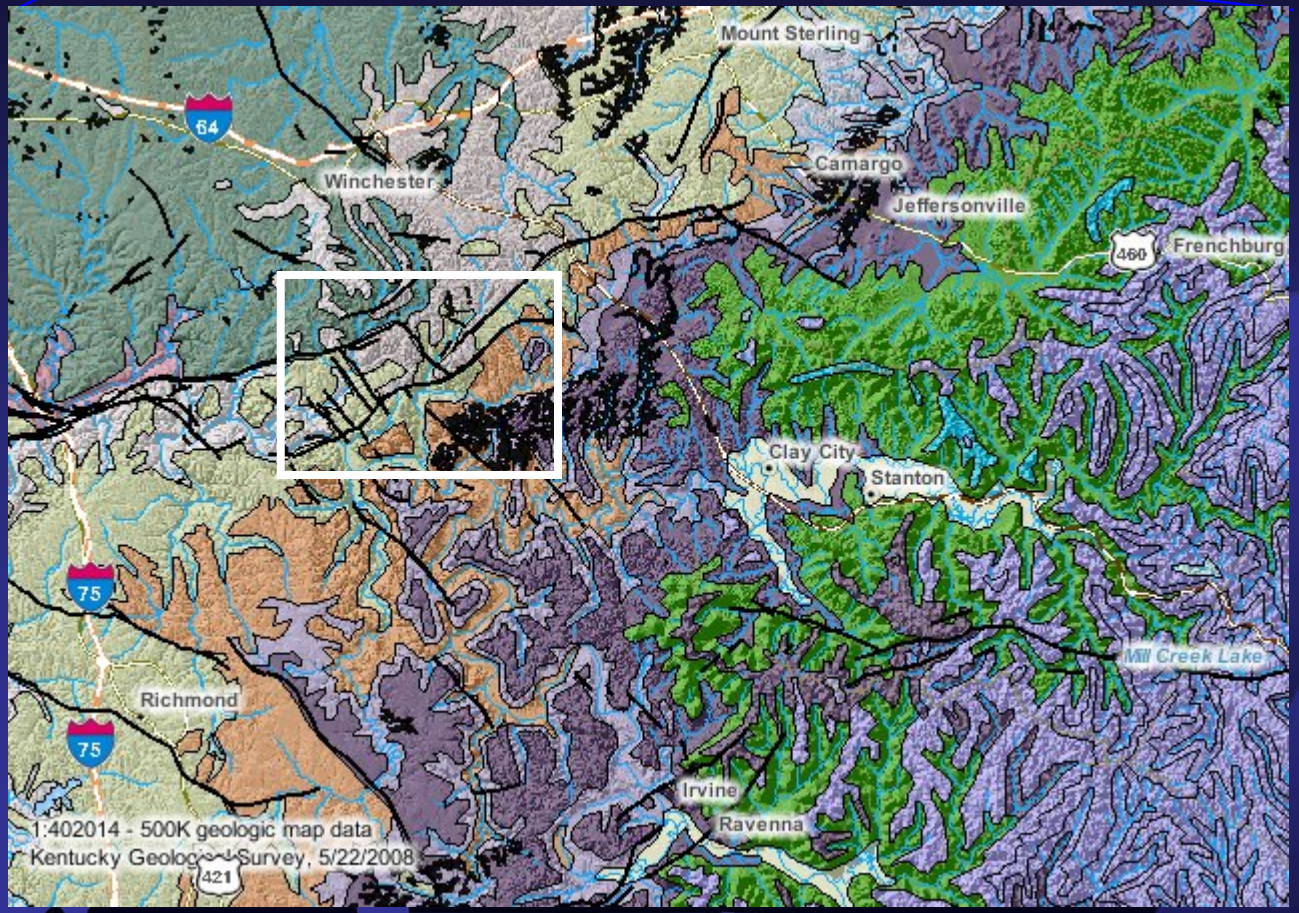


Rome Trough site



Clark County

- Proposed by Triana Energy

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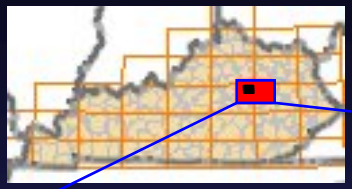
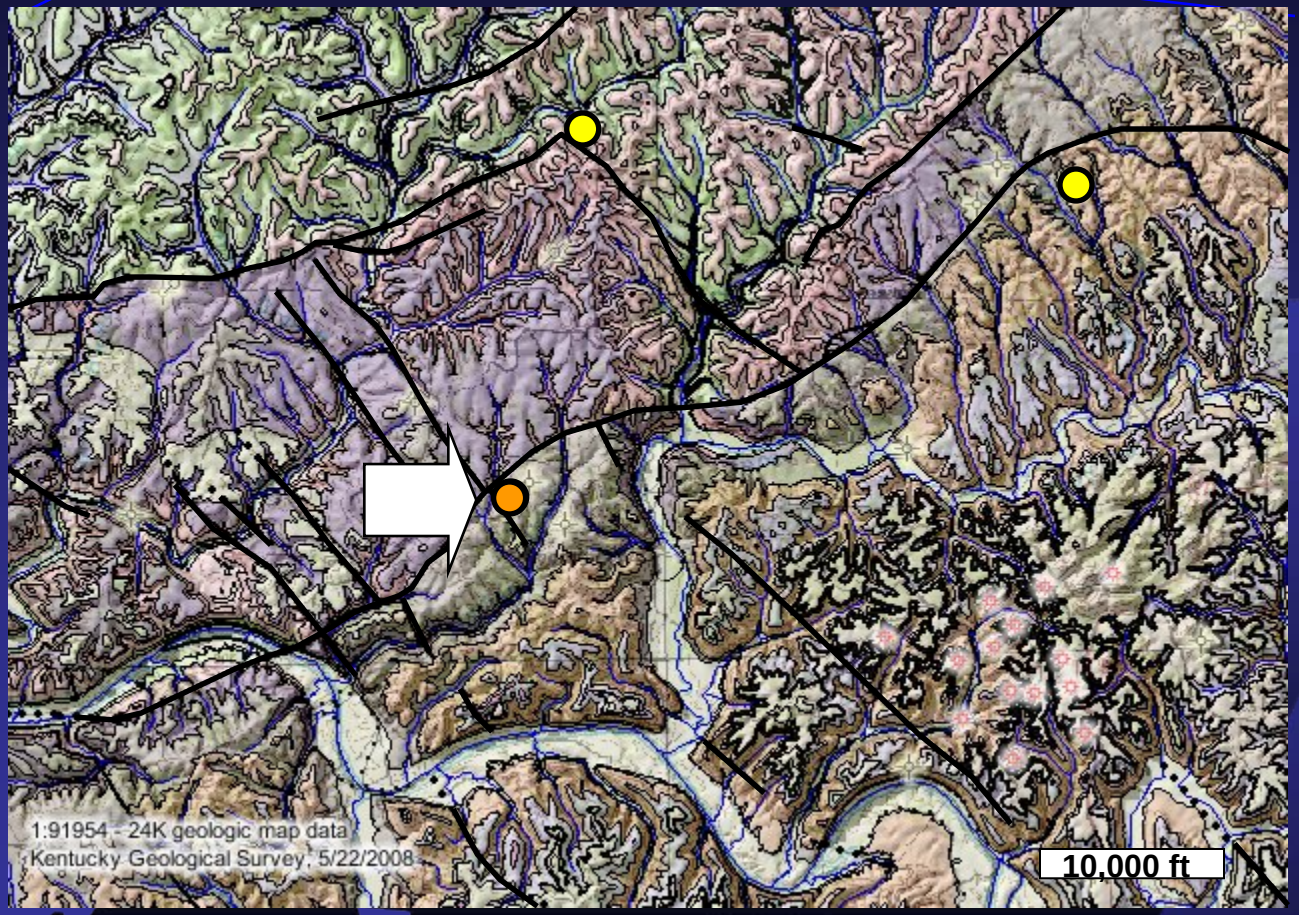


Rome Trough site



Triana Energy

- **Have 3 wells drilled through Cambrian Rome Sand, which are available for testing**

From the KGS Geologic Map Service (http://kgsmap.uky.edu/)

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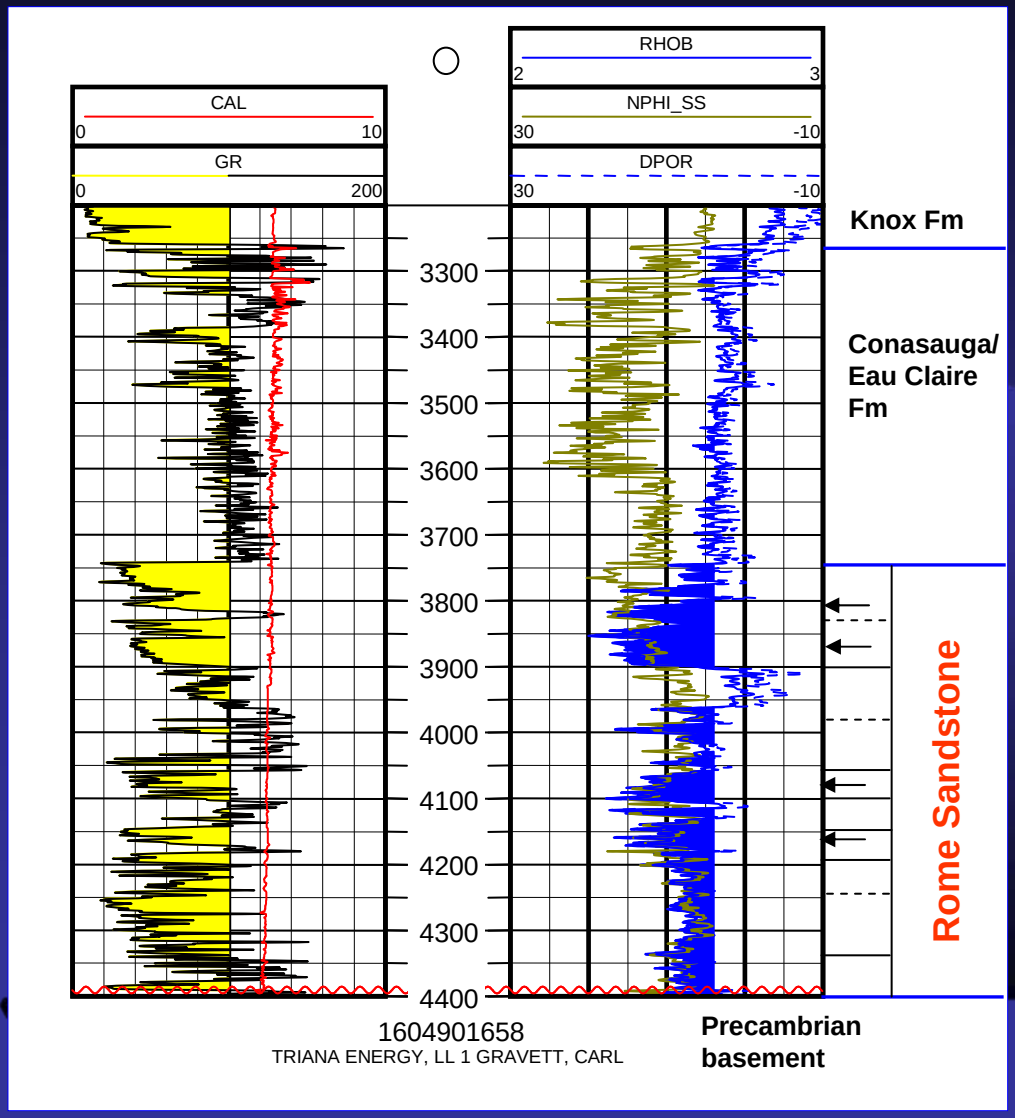
Triana Energy No. 1 Gravett



Rome Trough site

Rome Sandstone

- 3,500-4,200 ft depth
- More than 575 ft of 5% porosity or more
- More than 100 ft of 15% porosity or more
- 480 ft of overlying Eau Claire-Conasauga shales (good seal)

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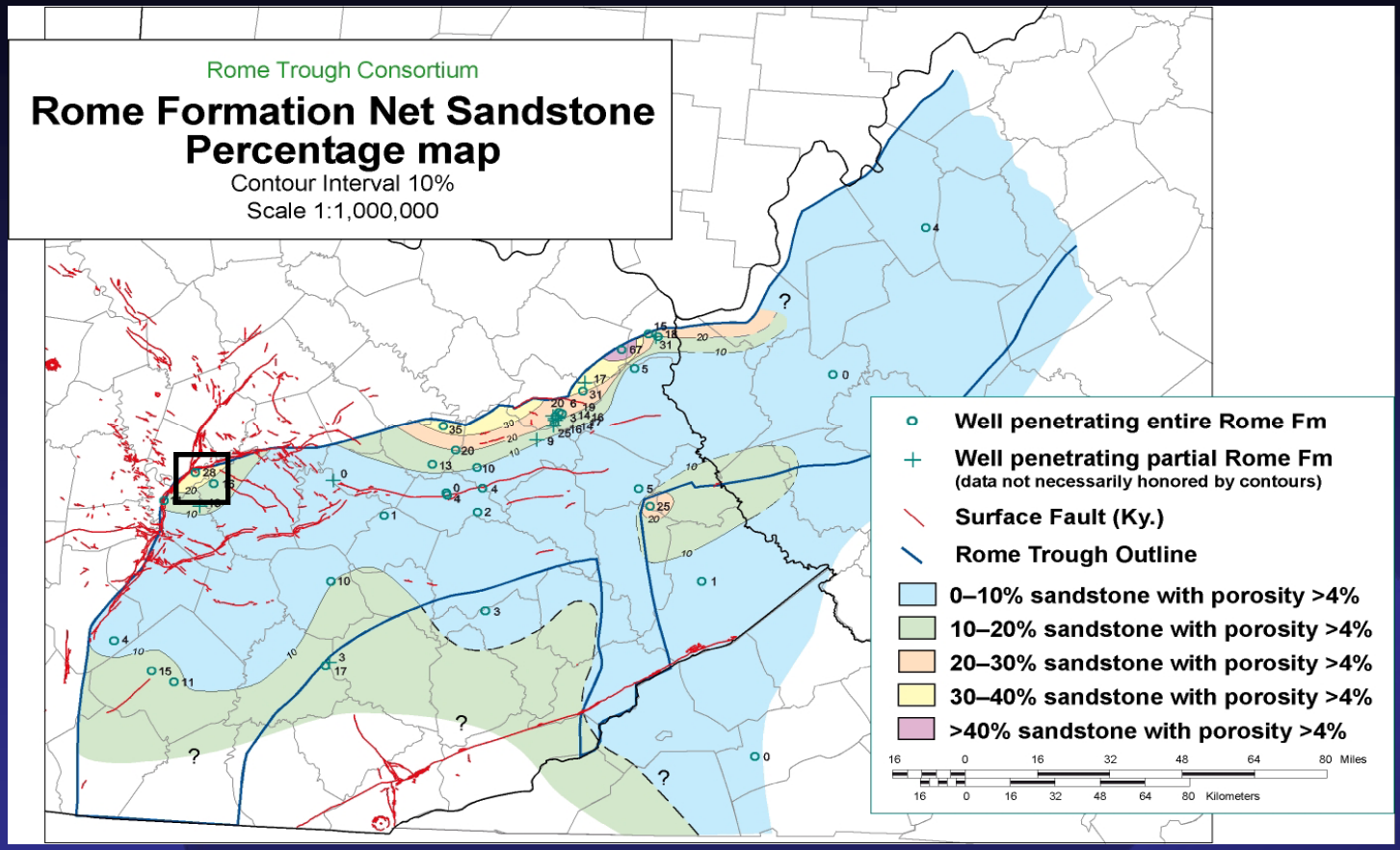

- Thick, porous Rome sands are developed across several counties in eastern KY
- This site provides shallow access to the Rome (without the expense of drilling a new hole)

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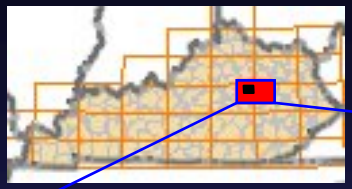
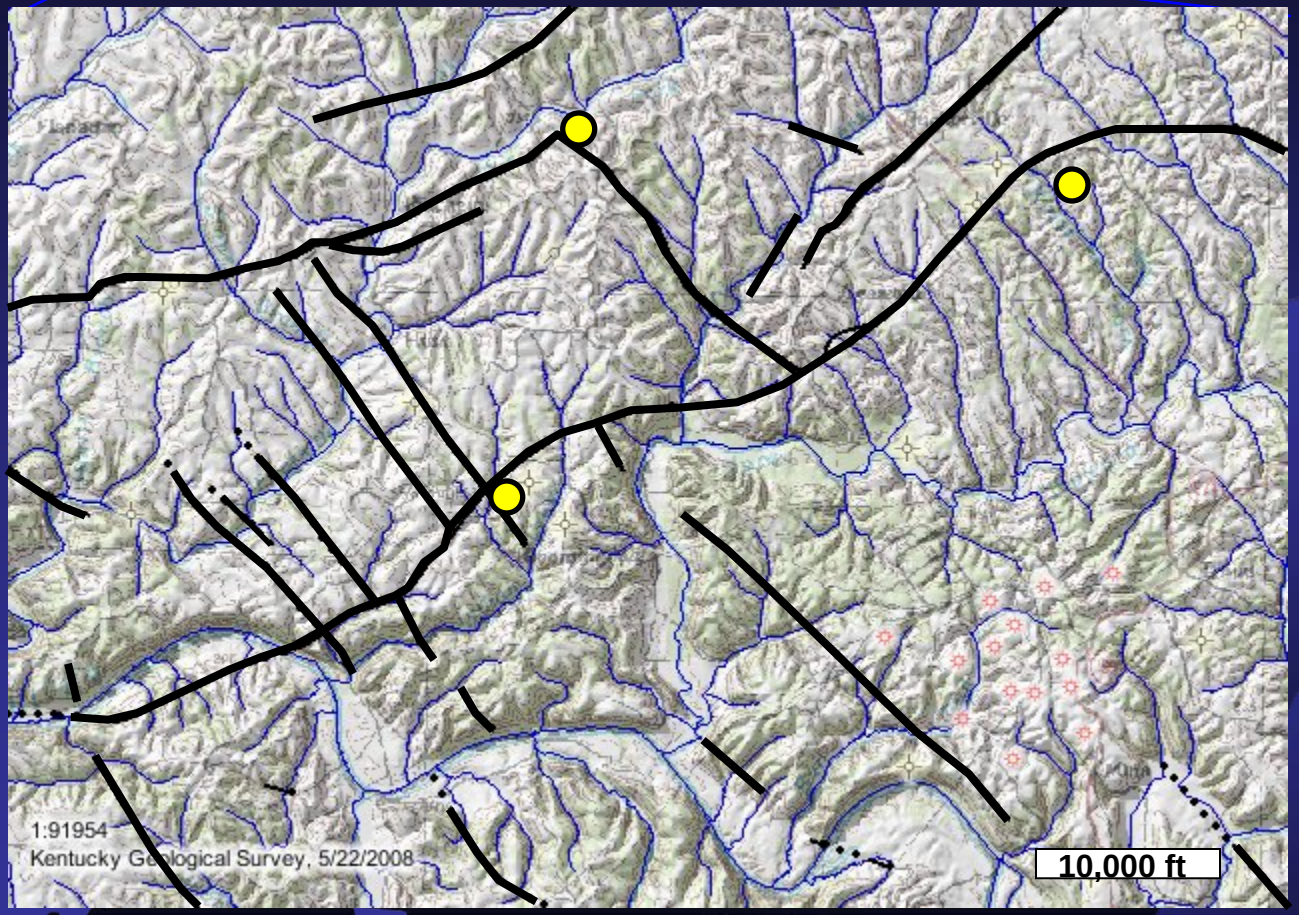


Rome Trough site



From the KGS Geologic Map Service (http://kgsmap.uky.edu/)

However, wells are drilled adjacent to faults

- **Potential fault leakage is an important issue for large-scale geologic carbon storage**

…and for Kentucky's carbon storage future

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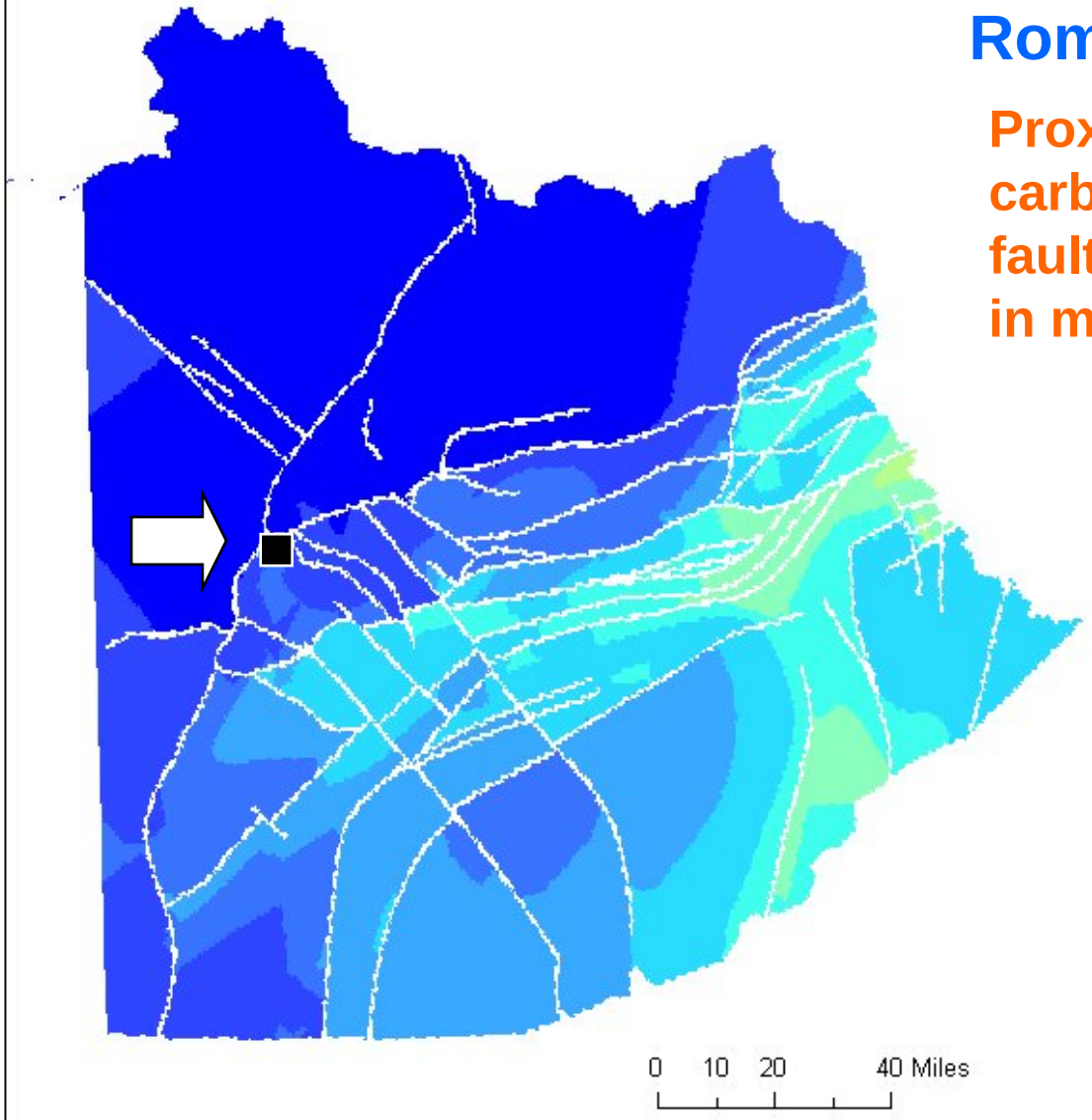

Rome Trough site

Proximity of future carbon storage fields to faults could be an issue in many parts of KY

At this site, we can collect reservoir data from Rome sands (a major potential storage reservoir in the east), and data concerning the faults

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Rome Trough site

To date:

- **Collected gas samples from two of the wells**
- **High He (1.8%) and N_2 (76%)**
- **Sent samples for isotopic analyses**

If we know the isotopic composition of the gas, and those isotopes aren't common at the surface, then we can sample for those isotopes near faults to test for any long-term leakage

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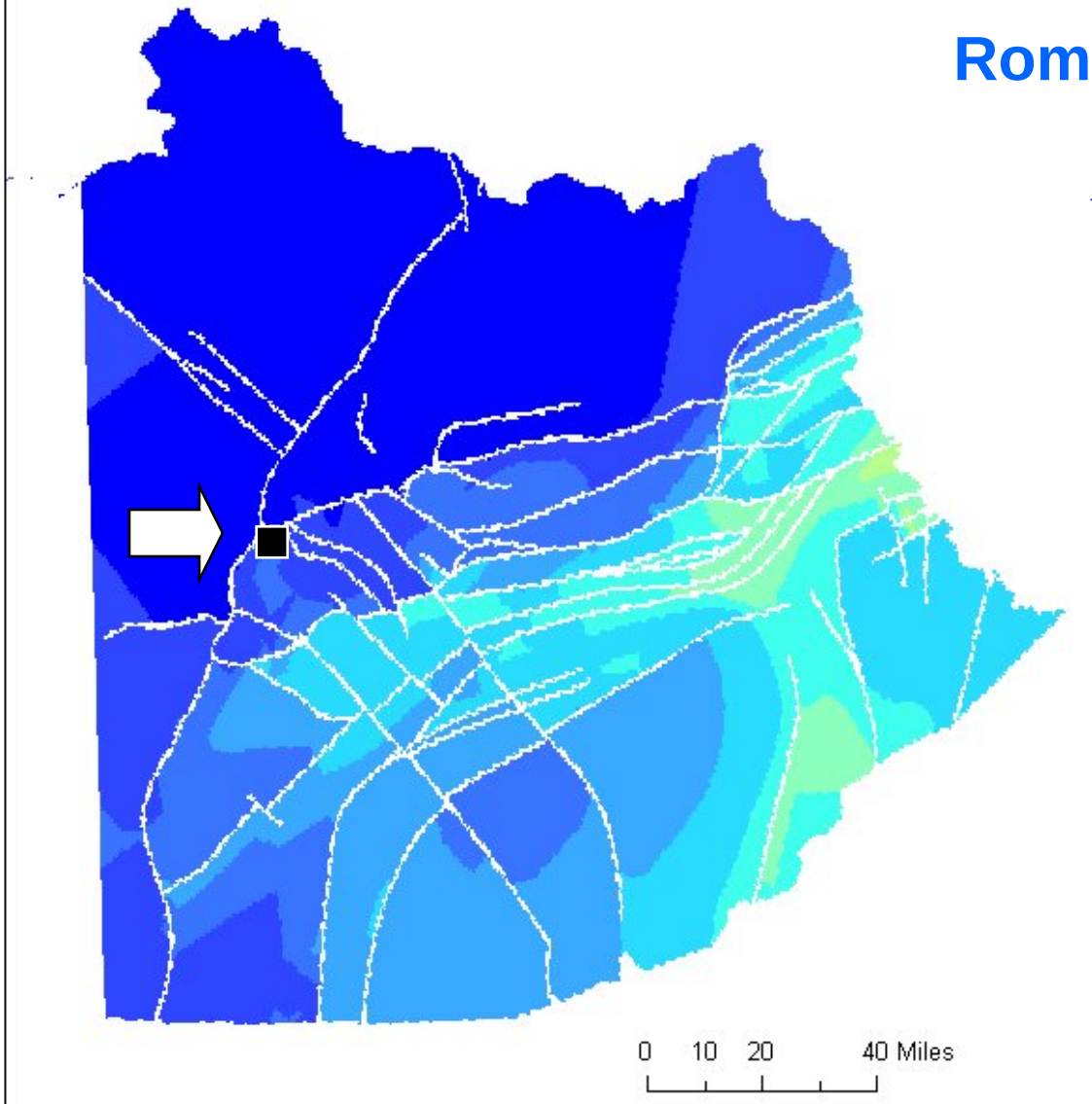

Rome Trough site

Draft Plan

- Collect samples for water chemistry
- Sidewall sampling
- Reservoir testing (with CO_2?)
- Surface monitoring along faults for deep (long-term) gas
- Inject tracer for surface monitoring of short-term leaks

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Immediate Goals

- Finalize scope of work (types of data and tests) for the two sites
- Advisory board meeting to discuss scope of work at each site
- Formalize partnerships/ responsibilities/funding for the two sites
- Budgets and Timelines

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Lastly, we need to mention that the KY HB1 projects are not being done in isolation…

KGS is actively involved in several regional carbon storage partnerships, including two in eastern Kentucky:

- **Midwest Regional Carbon Sequestration Partnership (MRCSP)**
- **Southeast Regional Carbon Sequestration Partnership (SECARB)**

As the HB1 projects proceed, we will be utilizing the experience and expertise (and possibly additional funding) from our regional partners to ensure the success of the HB1 projects

MRCSP
MIDWEST REGIONAL CARBON SEQUESTRATION PARTNERSHIP

Southeast Regional Carbon Sequestration Partnership
SECarbon.org

KGS

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Thank you

For more info on this and other CO_2 projects go to the KGS or KYCCS websites