

# KGS Progress Toward Improved Statewide Groundwater Monitoring and Research

KASMC Executive Meeting, Louisville, Kentucky  
December 9, 2015



# Groundwater Monitoring Needs Presented in the 2014 Draft KASMC Work Plan:

Kentucky Agriculture Science and Monitoring Committee (KASMC) –  
3-year cooperative scope of work and  
work plan (2015-2017)



- Re-establish a statewide groundwater-level observation network.
- Increase groundwater monitoring in areas where withdrawals are, or are expected to be, increasing.
- Collect hydrogeologic data needed to better assess groundwater availability and quality:
  - Aquifer mapping data.
  - Aquifer test (hydraulic) data.
  - Water table or potentiometric surface maps.
- More acquisition of groundwater-quality data.
- Improved public and Internet access to groundwater-related data.



# Re-Establishing a Groundwater-Level Observation Network

## Status of KGS Observation Well Sites As Of November 15, 2015



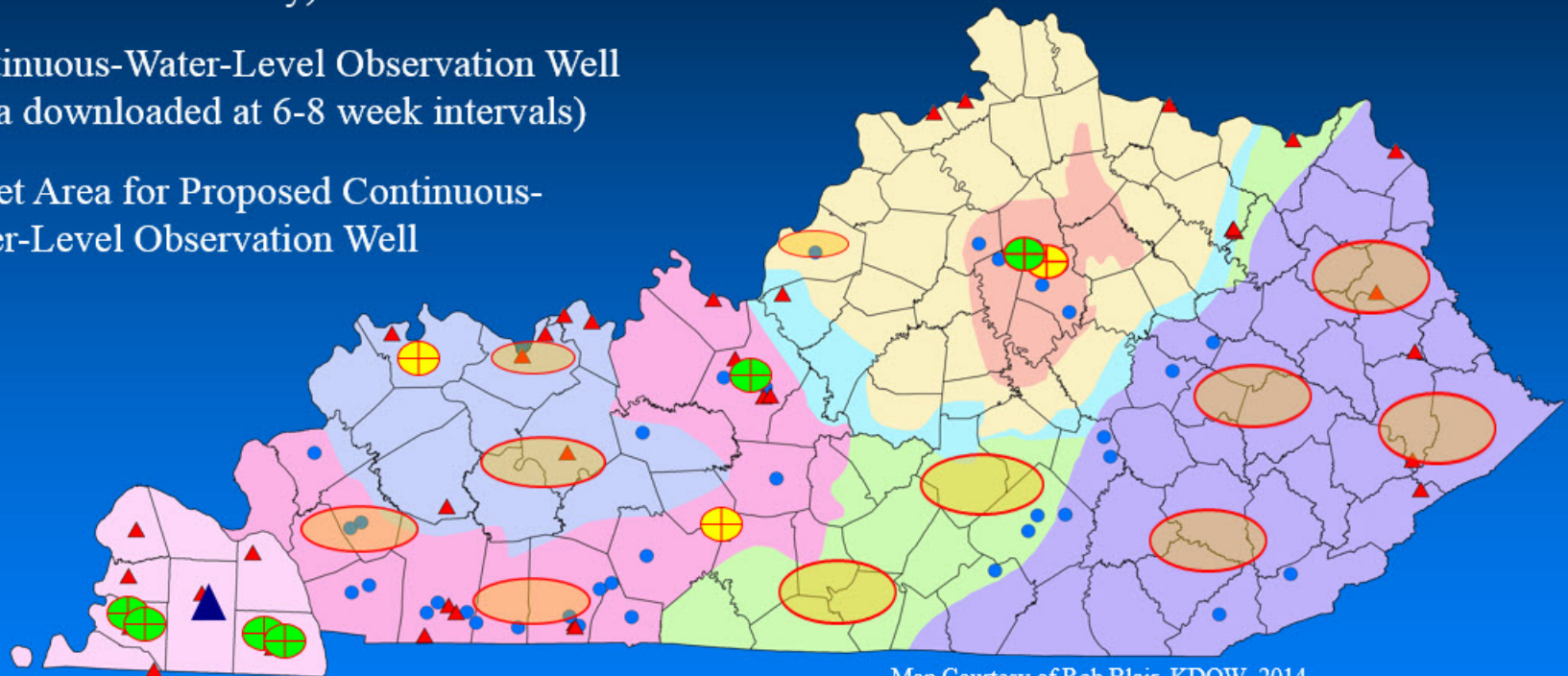
Continuous-Water-Level Observation Well  
(Data downloaded daily)



Continuous-Water-Level Observation Well  
(Data downloaded at 6-8 week intervals)



Target Area for Proposed Continuous-Water-Level Observation Well



Map Courtesy of Rob Blair, KDOW, 2014

Groundwater Monitoring Sites  
Maintained By Other Agencies:



KDOW-ITAC Groundwater-Quality Sampling Sites



USGS National Climate-Response Network Well

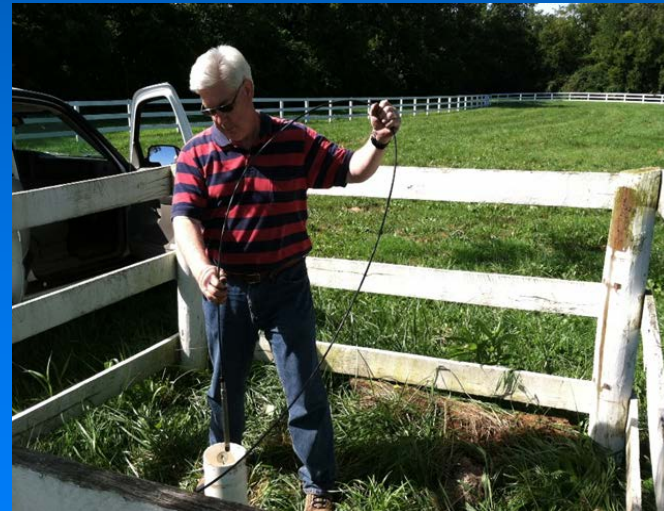


# Equipment Installation At the Network's 1<sup>st</sup> Observation Well

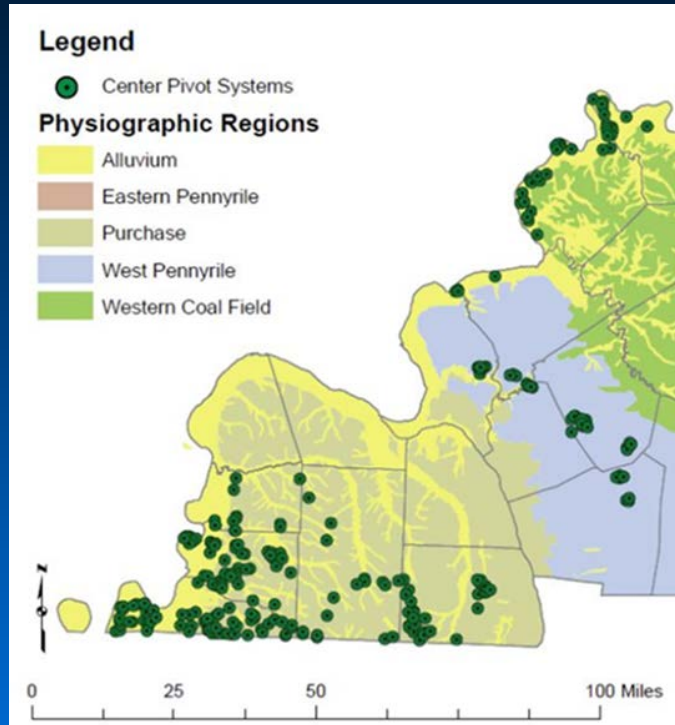
Monitoring a fractured-karstic limestone aquifer at Kentucky Horse Park, Scott Co.

Clockwise from upper left:

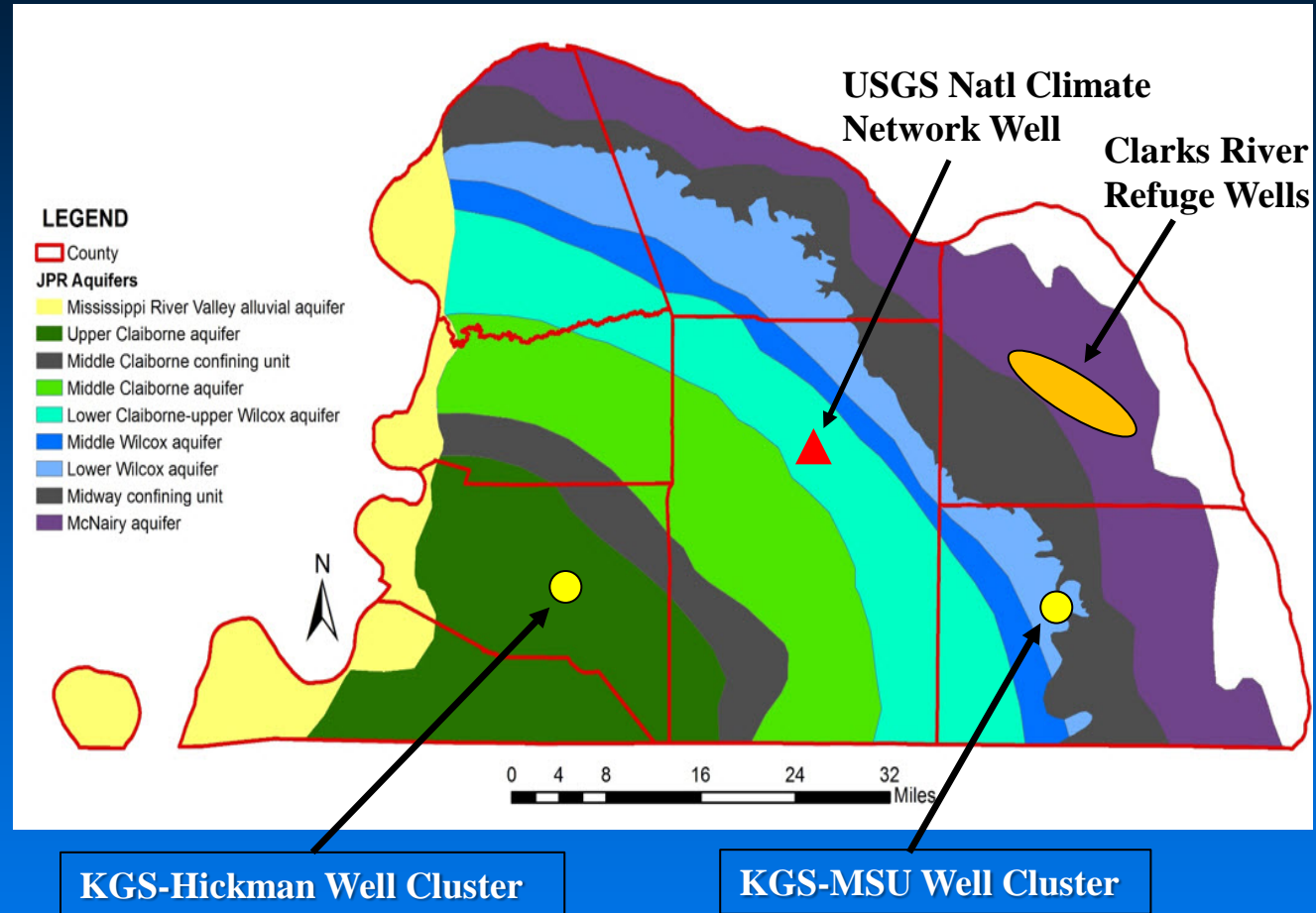
1. Preparation of anchor point (datum) for pressure transducer.
2. Measuring out transducer data cable length.
3. Inserting transducer and cable into well.
4. Final field check of transducer and telemetry equipment.



# KGS Research & Monitoring Activity in the Purchase Area



Center Pivot Wells Inventoried by KDOW & KGS in 2014

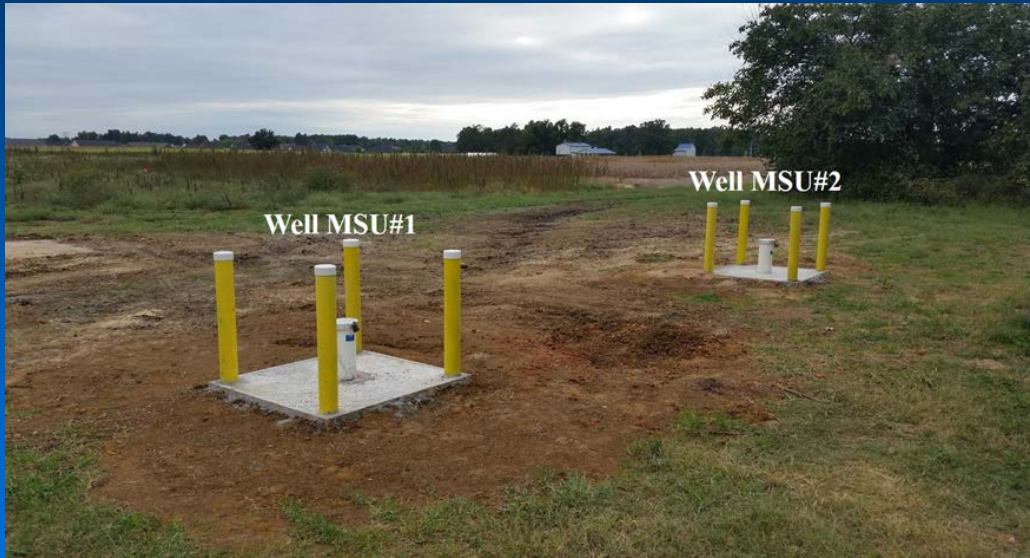


- ✓ KGS Drilled and Instrumented Two New Observation Well Clusters.
- ✓ Collecting Natural Gamma Logs, and other Geophysical Data, to Improve Identification of Subsurface Aquifer Boundaries and Confining Units.
- ✓ Collected Additional GWL Measurements and Water Well Data, and Conducted Specific Capacity Tests of Irrigation Wells at Clarks River Wildlife Refuge.



# KGS MSU Observation Well Cluster

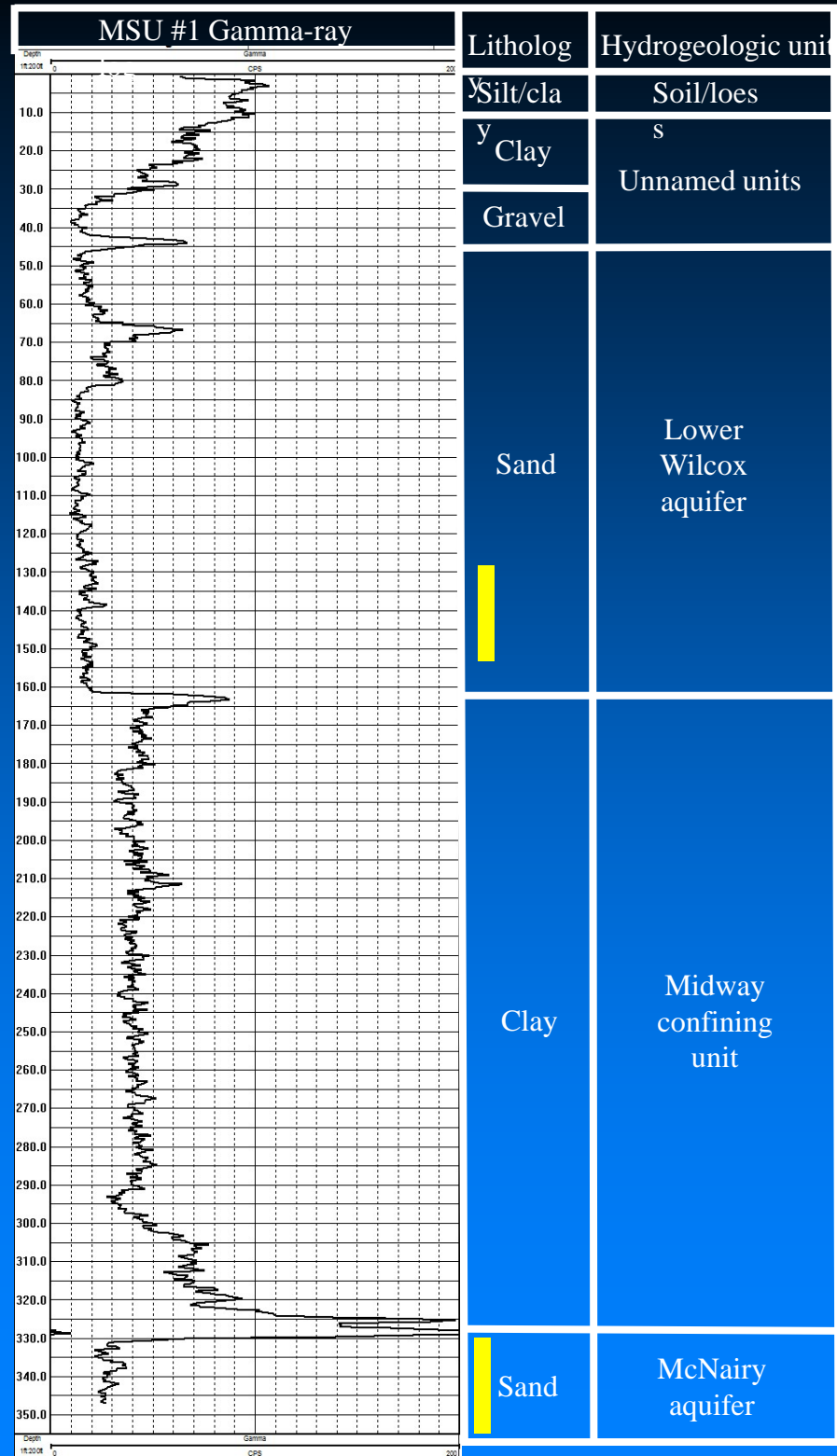
at Murray, Calloway Co., KY



SWL/TD:

MSU #2      45/150 FBLS

MSU #1      150/350 FBLS



# First Transmitted Hydrograph Data for Observation Wells MSU#1 and MSU#2

(Raw data, water levels reported in feet above transducer)



# KGS Hickman Co. Observation Well Cluster

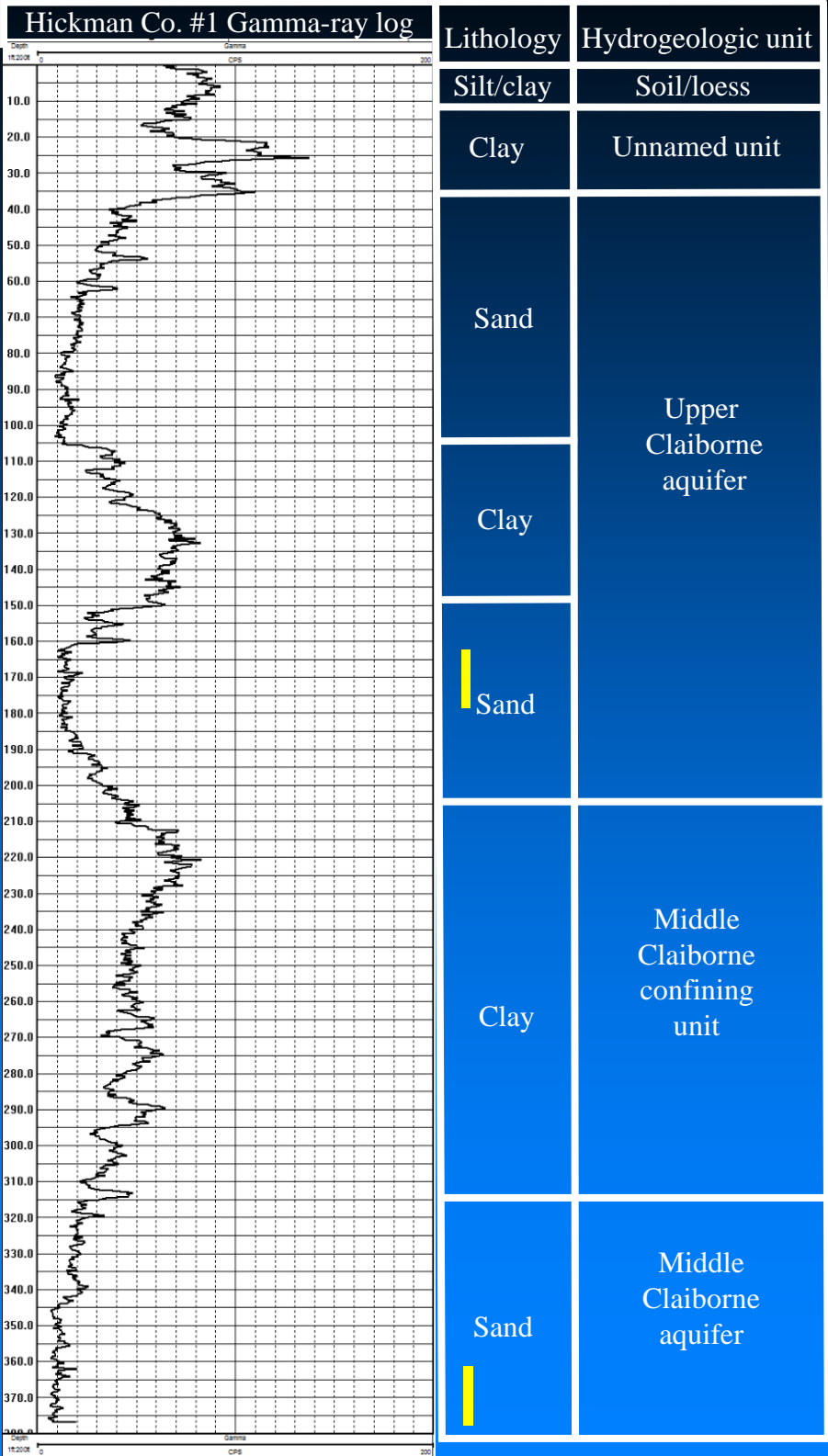
near Clinton, KY



SWL/TD:

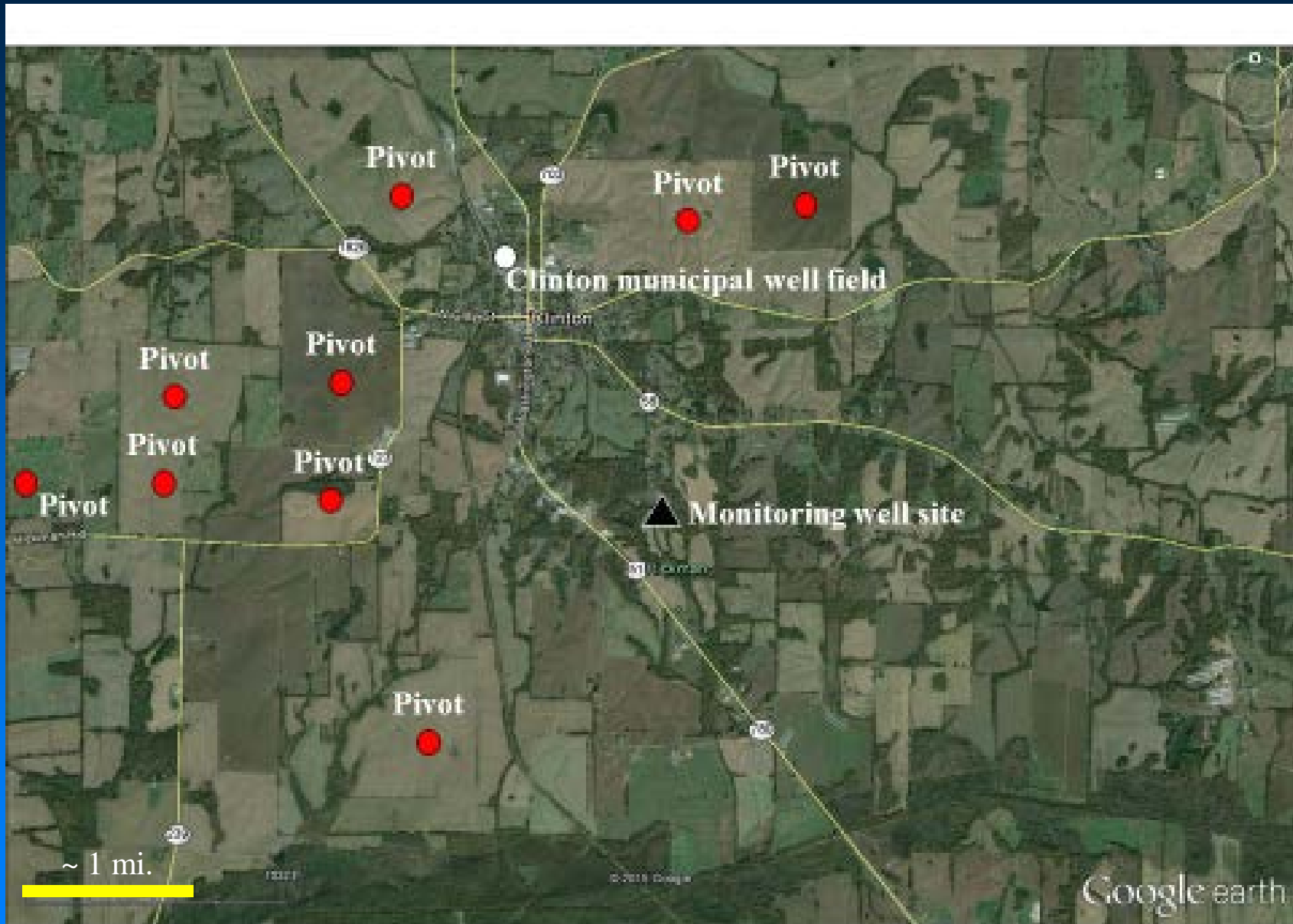
HICKMAN #2      81/180 FBLS

HICKMAN #1      84/380 FBLS



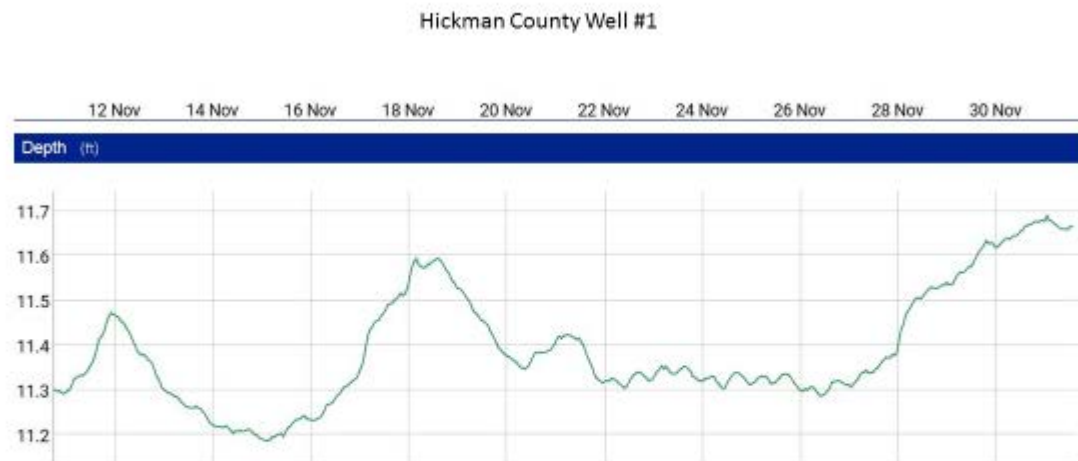
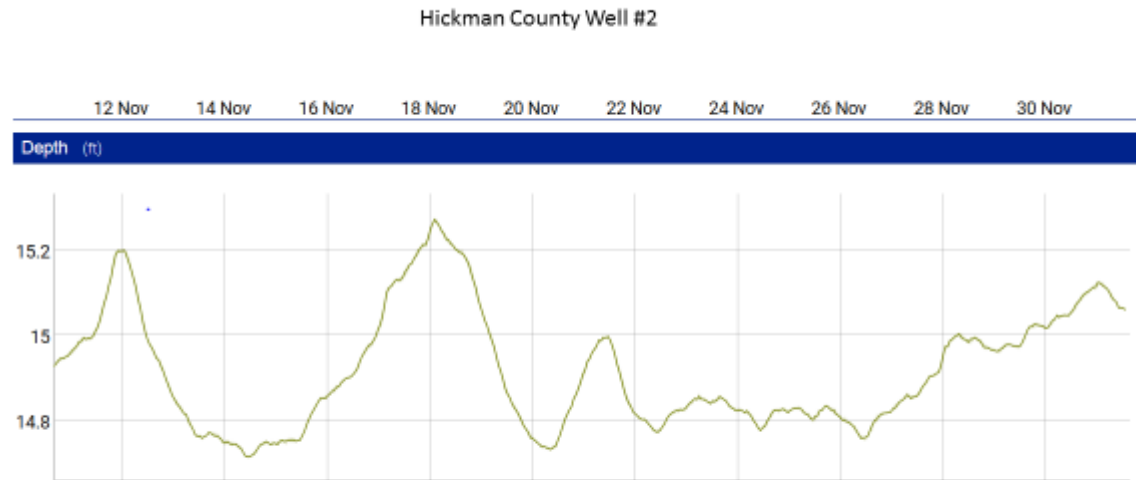


## Location of the Hickman Observation Cluster Relative to Some High-Yield Water Wells



# First Hydrographs for Hickman Co. Observation Wells #1 and #2

(Raw data, feet above  
transducer)

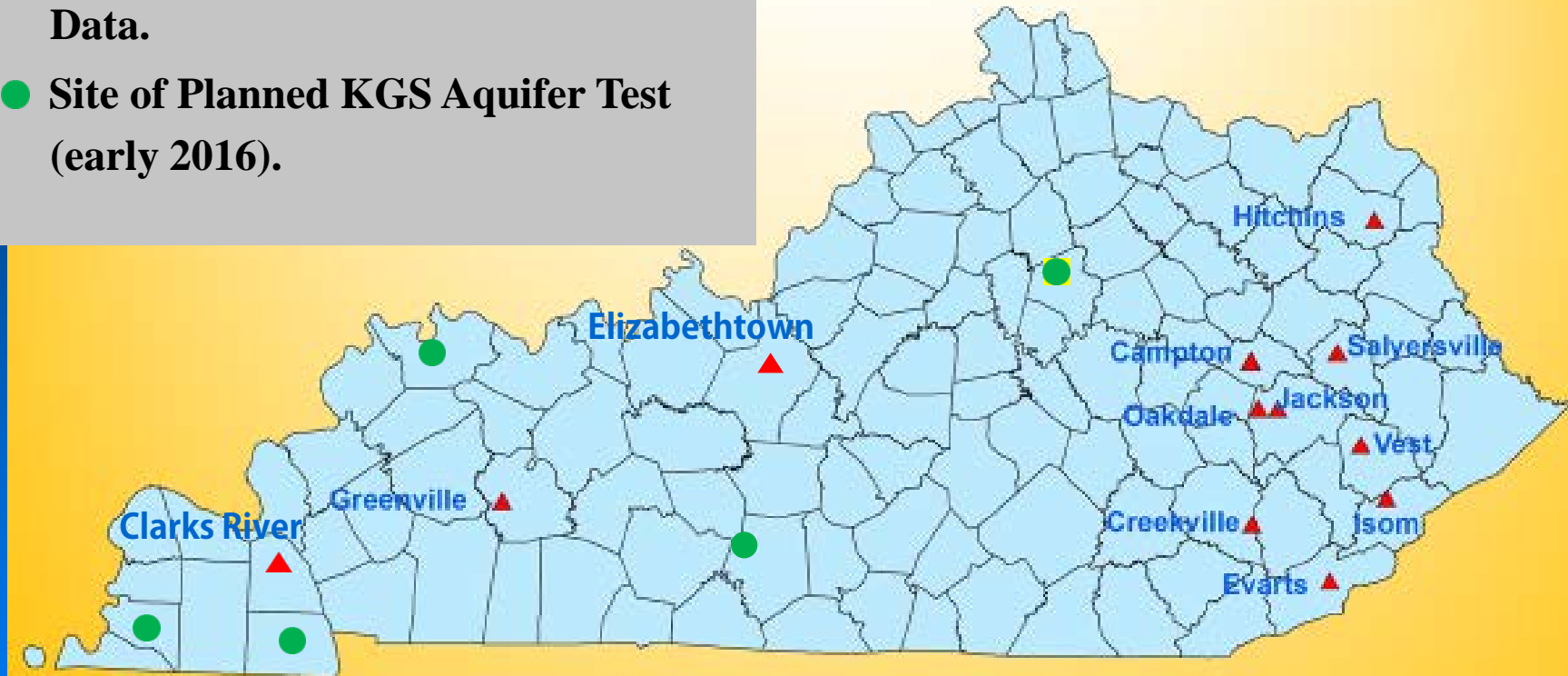




# Creating an Public Aquifer Test Archive and Webpage

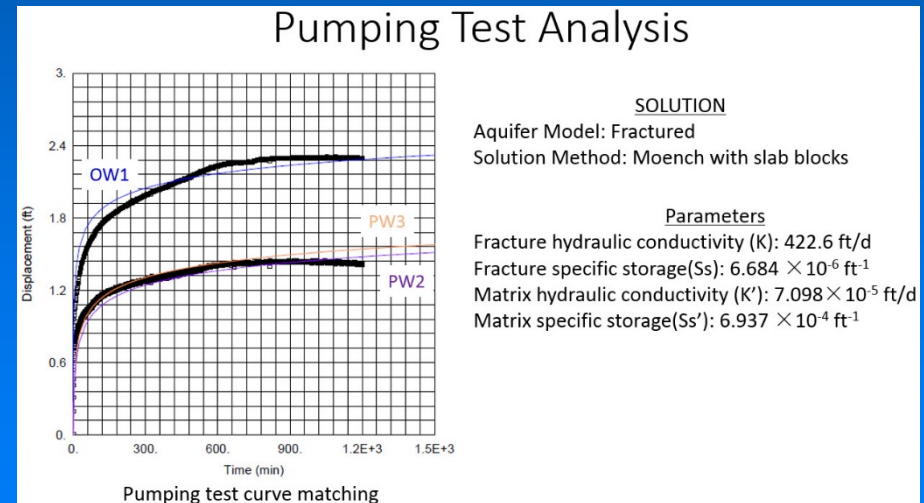
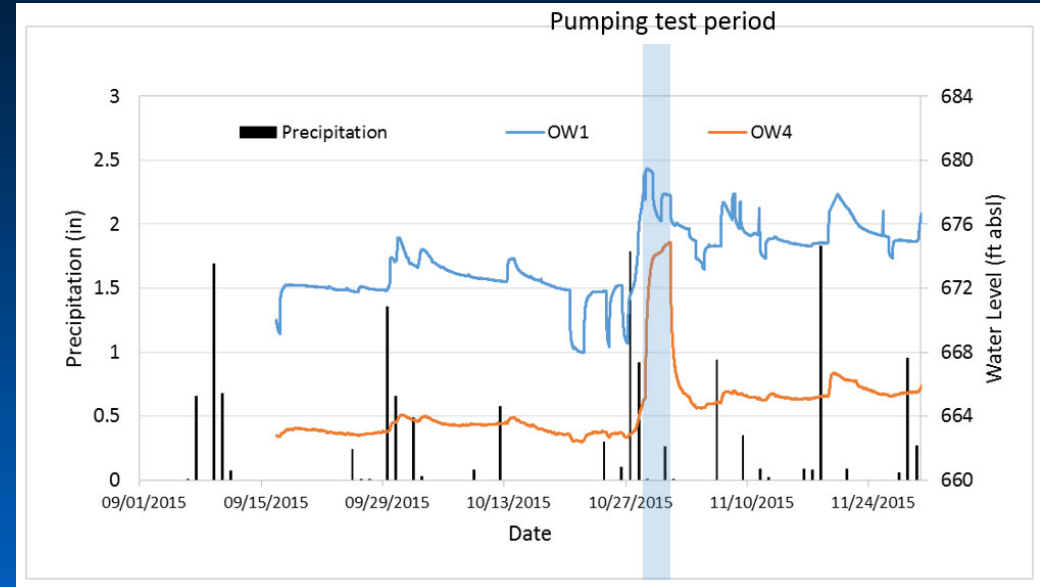
## Aquifer Test Data Compiled by KGS

- ▲ Site of Existing KGS Aquifer Test Data.
- Site of Planned KGS Aquifer Test (early 2016).



KGS intends to collaborate with USGS, among others, to obtain and compile additional existing aquifer test data.

# Recent KGS Aquifer Test—Elizabethtown well field



Municipal supply wells completed in a karstic limestone aquifer



# Exploring Use of “Story Map” Web Design for Presenting Aquifer-Test Data:

<https://storymaps.arcgis.com/en/>



Site of well near location of proposed Campton Water Plant.



Well sites on a 7.5-minute topograph base of the Campton quadrangle.

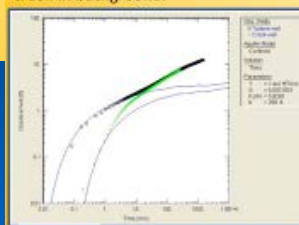
## Campton, Wolfe Co. New Plant Well (Brewer Trail Road) December 19, 2009

### BACKGROUND

The City of Campton had been looking for an additional groundwater supply well to supplement water production drawn from nearby Campton Lake. KGS was asked in 2006 to



City of Campton's Swift Road well, adjacent to a city lift station. Generator powers pump in well in foreground, overflow is pumped to creek in background.



Theiss equation solution on drawdown data comparing Turbine well and nearby city pumping well near the creek.



## Campton, Wolfe Co. Swift Road Well December, 2008



Plot of Campton wells on the KGS online geologic map. Wells are situated on the Pikeville Formation, the Corbin Sandstone, or Quaternary alluvium.



Water volume is measured



Geologist checks groundwater for iron content.

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## Greenville, Muhlenberg Co. 03/2009

### BACKGROUND

The City of Greenville had drilled a water well to supplement their water supply from a reservoir. They asked KGS in 2009 to assist with an aquifer test on the well to determine the zone of influence as the well was pumped. The production zone was white sand at 800 feet depth.

It was determined that the well was suitable as a supplemental well.



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Groundwater discharge from a well.



Greenville well during preparation for aquifer test.

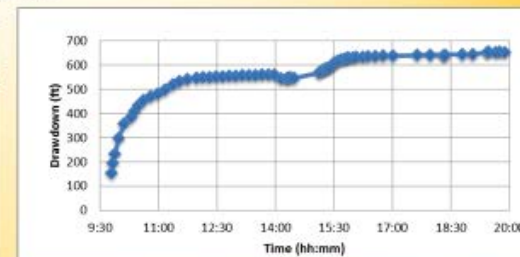


Groundwater upwelling from a white sandstone aquifer at 800 feet.

## Greenville, Muhlenberg Co. 03/2009



Geology map showing location of the Greenville well situated on the Carbondale Formation, but the production zone was at 800 feet, likely the Caseyville Sandstone.

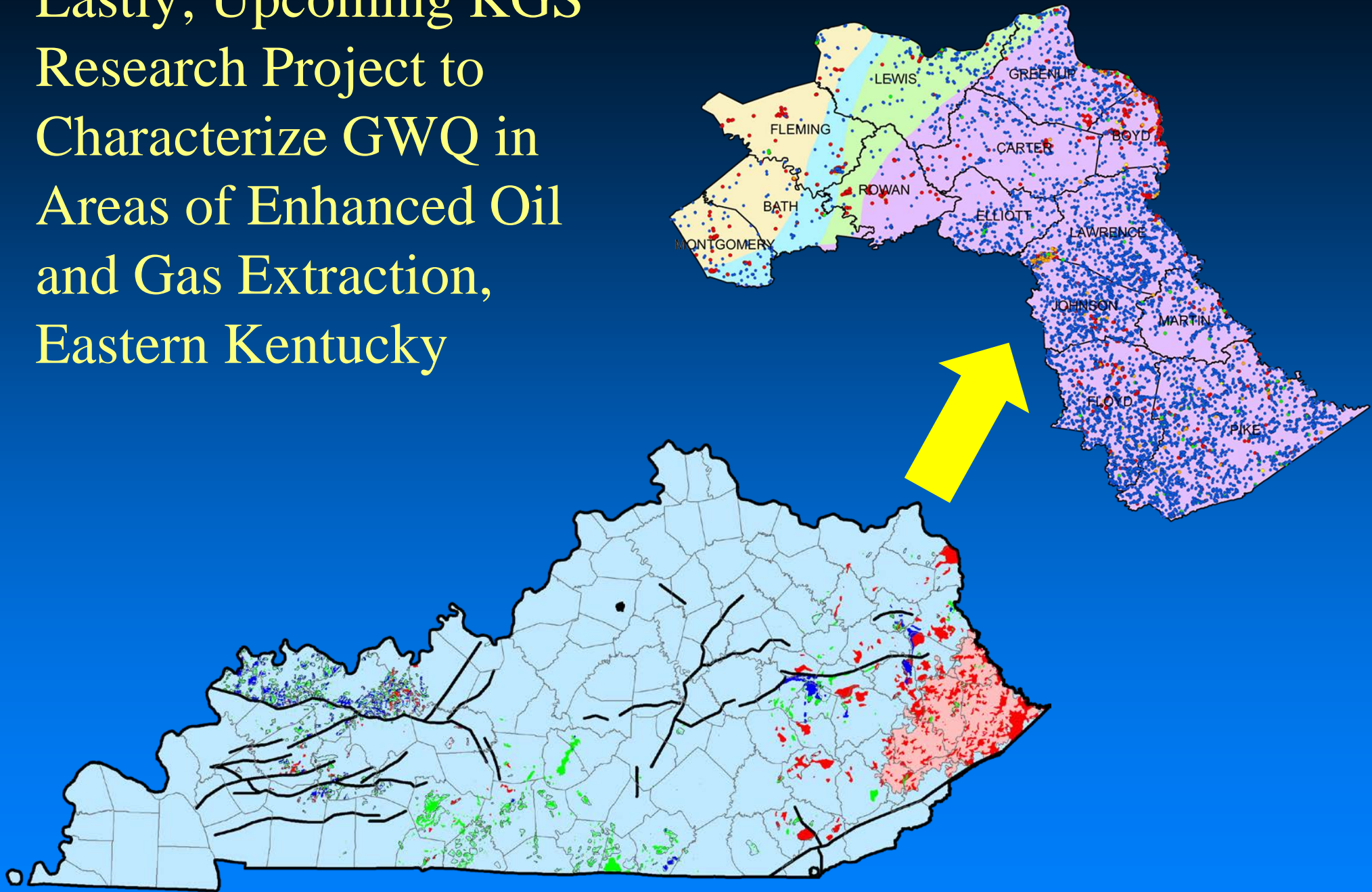


Graph showing drawdown versus time in the Greenville well.

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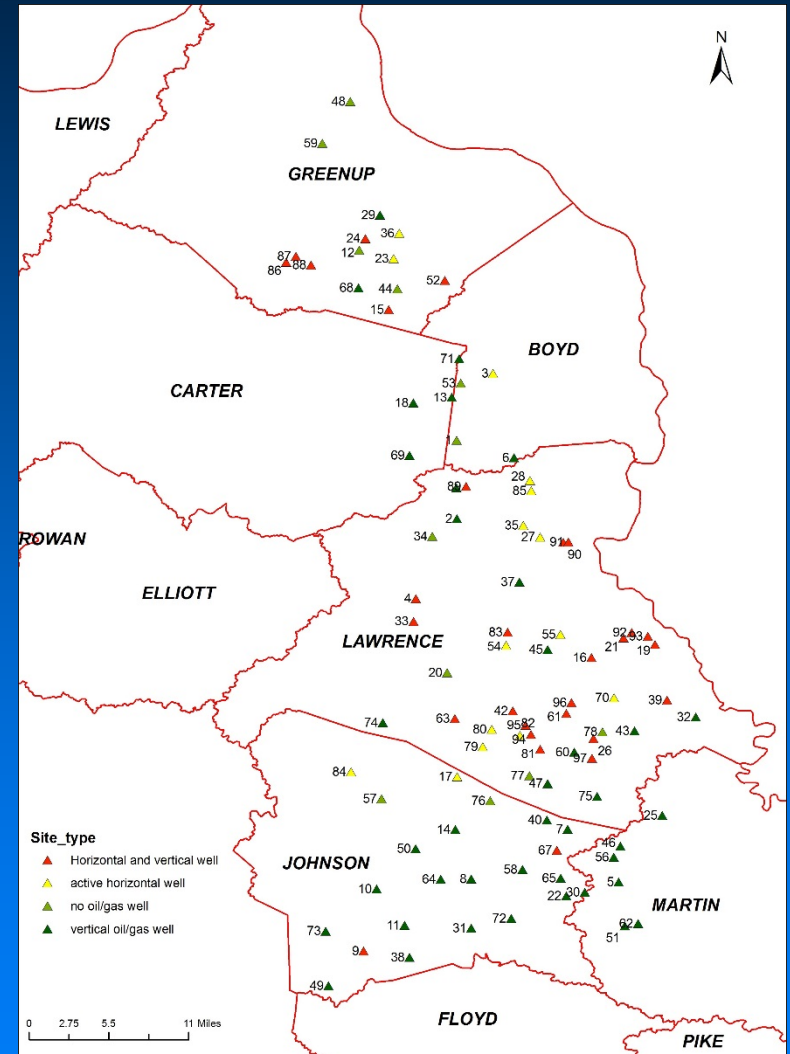
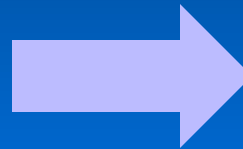
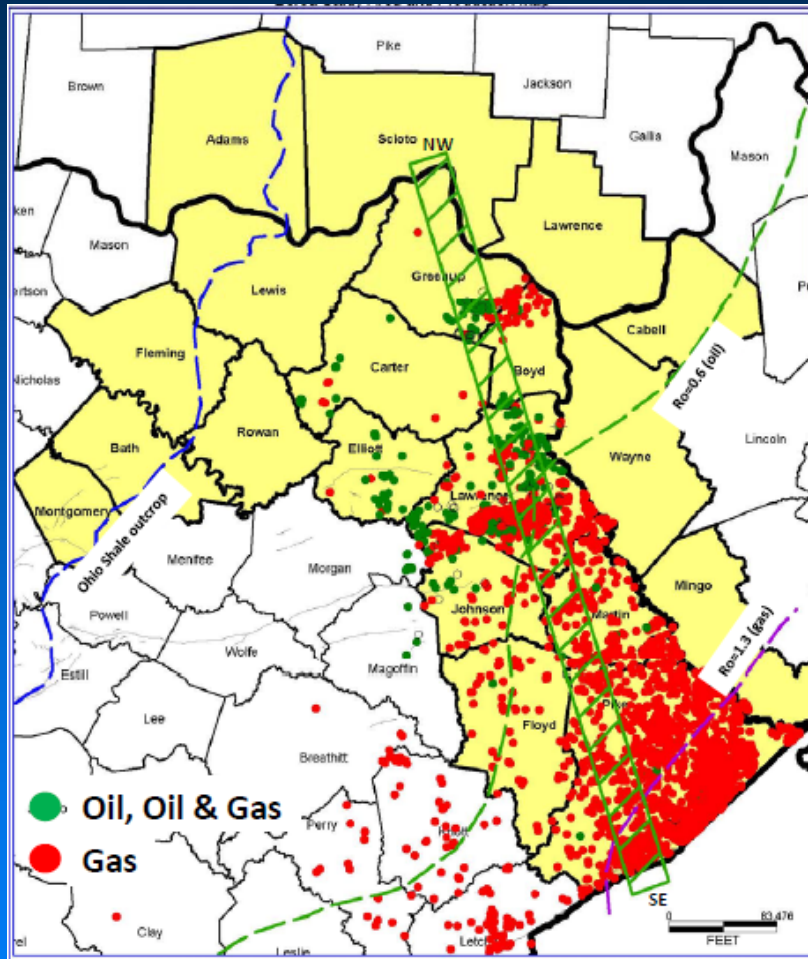


# Lastly; Upcoming KGS Research Project to Characterize GWQ in Areas of Enhanced Oil and Gas Extraction, Eastern Kentucky





# Objective is to Characterize Ambient GWQ and Collect Isotope Data from Representative Sample of Water Wells in the Berea Sandstone-Rogersville Shale Play Area

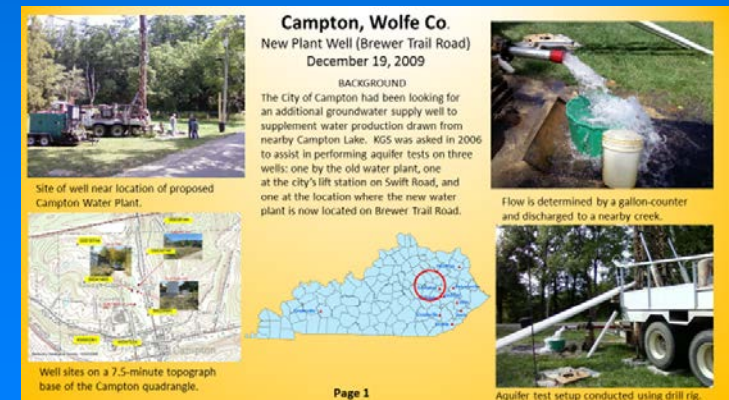


Study area (yellow counties) and geographic distribution of Berea oil and gas completions in eastern Kentucky (2,778 wells). Oil production occurs predominantly in northeastern Kentucky while gas production occurs in southeastern Kentucky. Green hatched box is approximate location of sampling transect

Up to 50 wells in this target group  
are to be sampled beginning  
January 2016

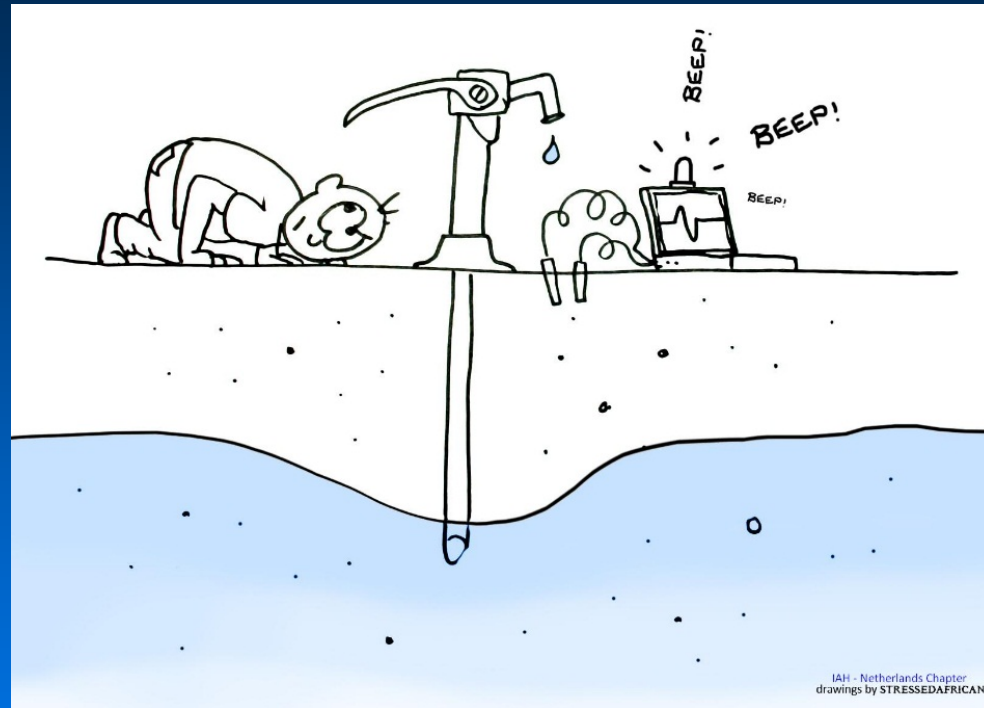
# Summary: KGS Activities to Improve GW Monitoring

- ✓ Began re-establishing statewide network of long-term water-level observation sites.
- ✓ Conducting focused groundwater research to better characterize the aquifer system in the Jackson Purchase Area.
- ✓ Conducting aquifer tests to enable better assessment of groundwater availability.
- ✓ Creating new webpages needed to enhance public access to groundwater data.
- ✓ Conducting targeted sub-regional groundwater-quality assessments.





# Questions?



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