KGS Update On Efforts to Improve Kentucky Groundwater Data Availability and Access

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Outline for this Presentation:

- What Are the Needs and Issues KSG Is Working to Address?
- Making More Groundwater Data Available:
  - Aquifer Designation Project
  - Groundwater Monitoring—KGS Kentucky Groundwater Observation Network (KGON)
- Ongoing and Future Activities

Needs and Issues KGS Is Addressing:

State, Federal, Private Sector Stakeholders Are Requesting Access to More Quantitative Groundwater Monitoring Data and Better Characterization and Mapping of Kentucky's Aquifers Because Of:

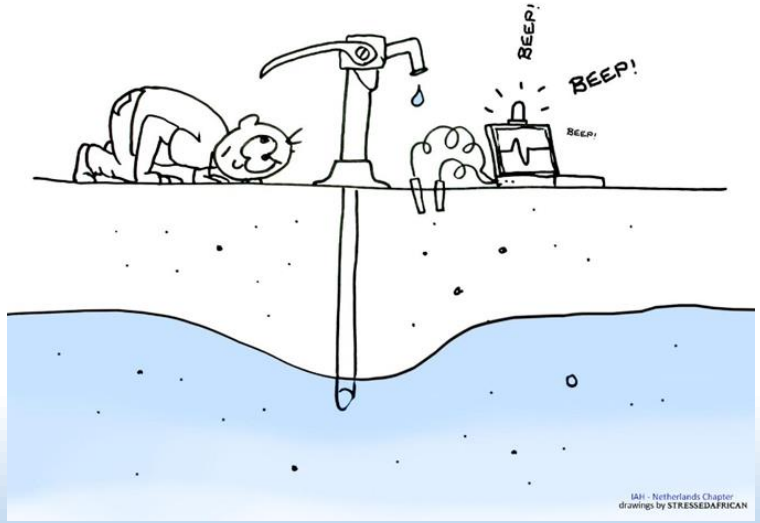
- Greater interest in groundwater as a under-utilized resource for:
  - Economic development, especially in agricultural and industrial sectors.
  - Geothermal, biofuels, and other energy related issues.

- Concern over increasing stresses on public water supplies, especially in times of drought, and long-term sustainability of state's groundwater resources.

- Need to develop robust (forecast) modeling and decision-support tools, especially for water withdrawals (budgets), watershed processes, drought.

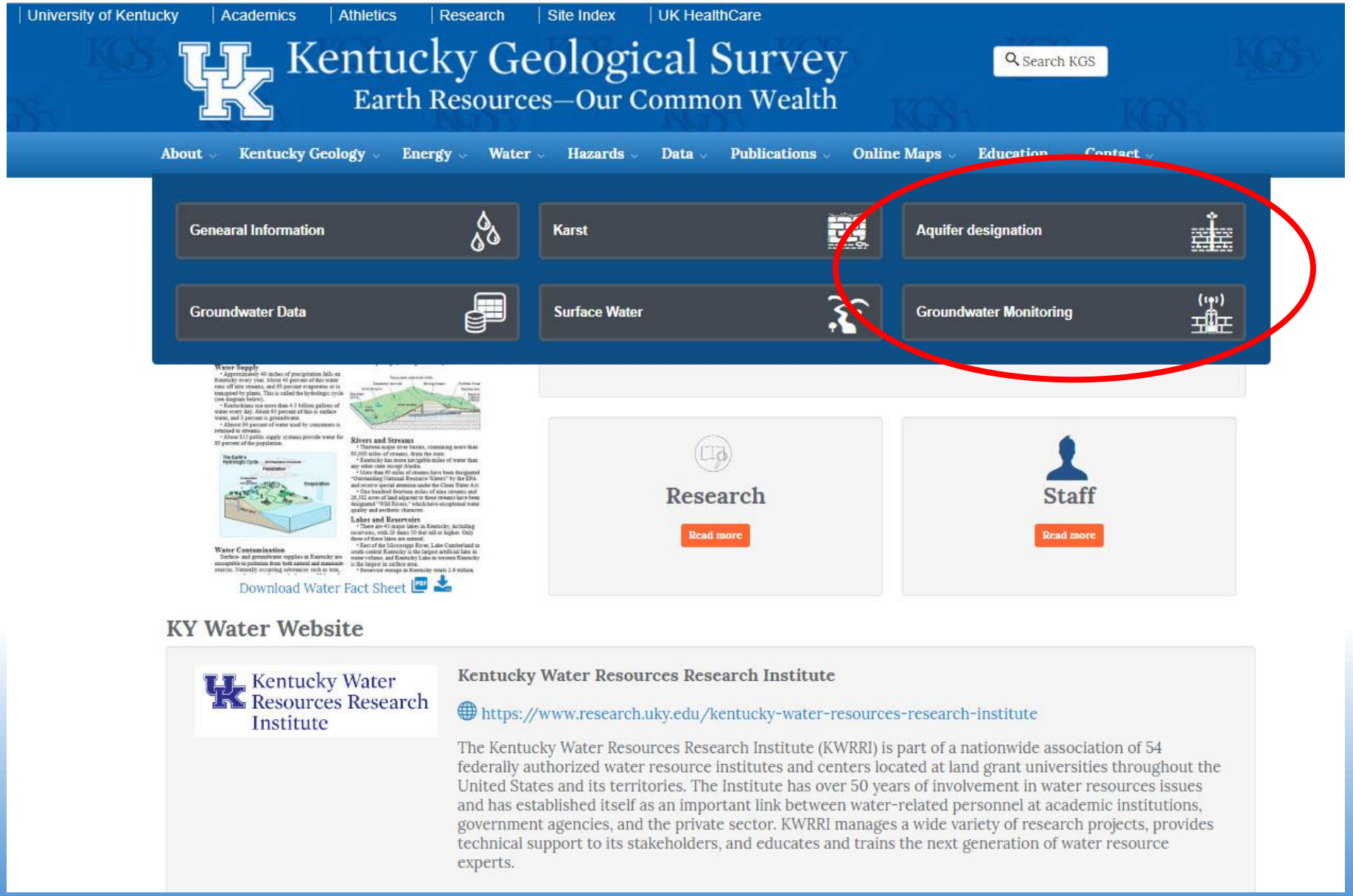
- National data compilations and assessments regarding water use and source water protection (federal and state programs related to 42 USC Ch. 109B SECURE WATER Act, and S. 3021 America's Water Infrastructure Act).

- To better address KGS mission and legislative mandates regarding water resources.



KGS Efforts to Improve Groundwater Data Access and Usefulness

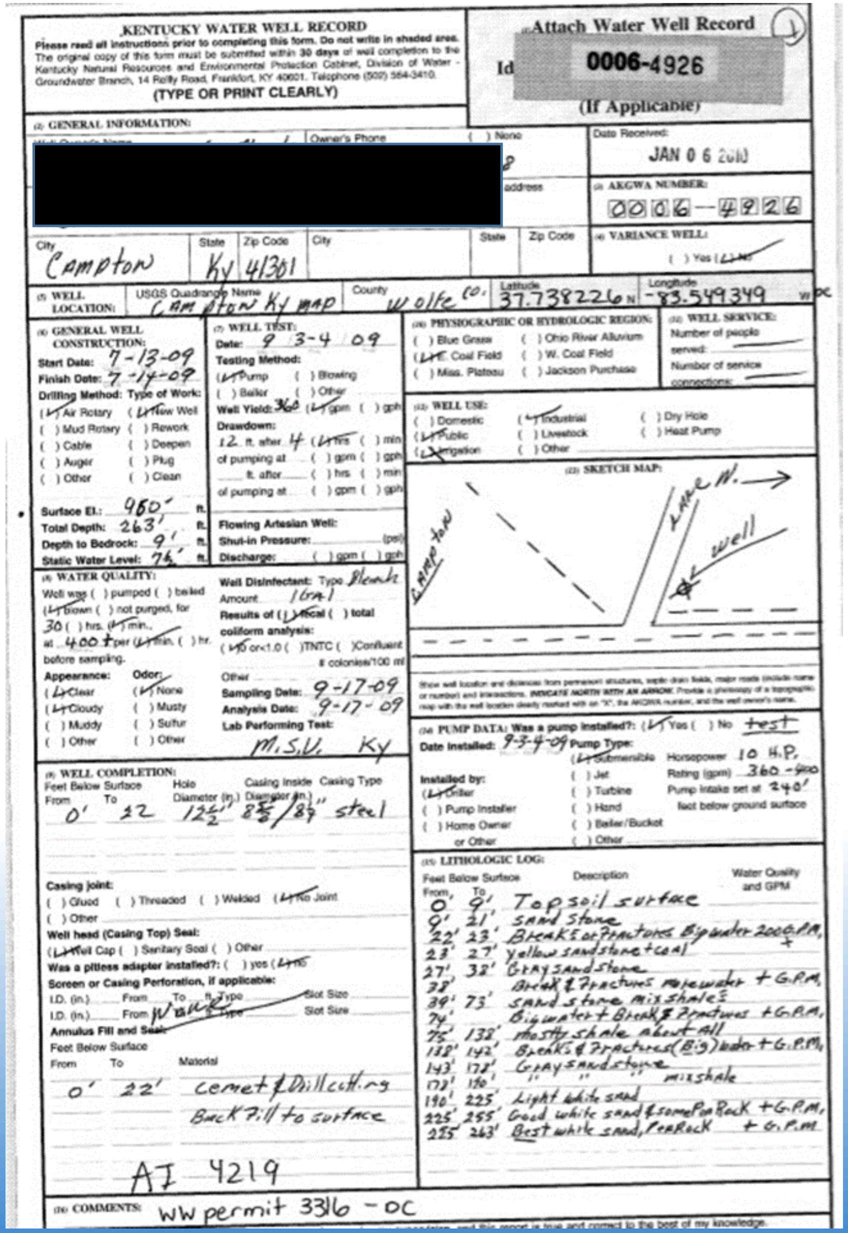
- Water Resources Webpage Is Undergoing Renovations in Organization and Contents
- New Content Being Added:
  - Aquifer Designation
  - Groundwater Monitoring



Aquifer Designation Project

Two-year project (2017-19) funded by USGS Water Use Program through KY Division of Water:

- Compile data from water-well construction records in KGDR to help identify local, primary, and principal aquifers in Kentucky by USGS-formalized stratigraphic names and codes.
- Identify aquifer zones (to the extent possible) and compile other pertinent water-use data for Permitted Water Supply (PWS—withdrawals regulated) wells and springs:
  - 179 PWS wells
  - 13 PWS springs
- As time and resources permit, do the same for agricultural irrigation wells (withdrawals not regulated).
  - 1,031 irrigation wells (~300 records reviewed to date).


KENTUCKY WATER WELL RECORD

Please read all instructions prior to completing this form. Do not write in shaded area. The original copy of this form must be submitted within 30 days of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 14 Reilly Road, Frankfort, KY 40601. Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

Attach Water Well Record

0006-4926

(If Applicable)

GENERAL INFORMATION:

[redacted]

Date Received: JAN 0 6 2010

AKGWA NUMBER: 0006-4926

City: Campton | State: Ky | Zip Code: 41301

WELL LOCATION: USGS Quadrangle Name: Campton Ky map | County: Wolfe Co. | Latitude: 37.738226 N | Longitude: -83.549349 W

GENERAL WELL CONSTRUCTION: Start Date: 7-13-09 | Finish Date: 7-14-09

WELL TEST: Date: 9-3-4-09

Surface El.: 980' ft. | Total Depth: 263' ft. | Depth to Bedrock: 9' ft. | Static Water Level: 75' ft.

Lab Performing Test: M.S.U. Ky

Sampling Date: 9-17-09 | Analysis Date: 9-17-09

WELL COMPLETION: From 0' To 22' | Hole Diameter 12¼" | Casing Inside Diameter 8⅝/8⅞" | Casing Type steel

Annulus Fill and Seal: From 0' To 22' | Material: cemet & Drillcutting Back Fill to surface

AI 4219

PUMP DATA: Horsepower 10 H.P. | Rating (gpm) 360-400 | Pump intake set at 240'

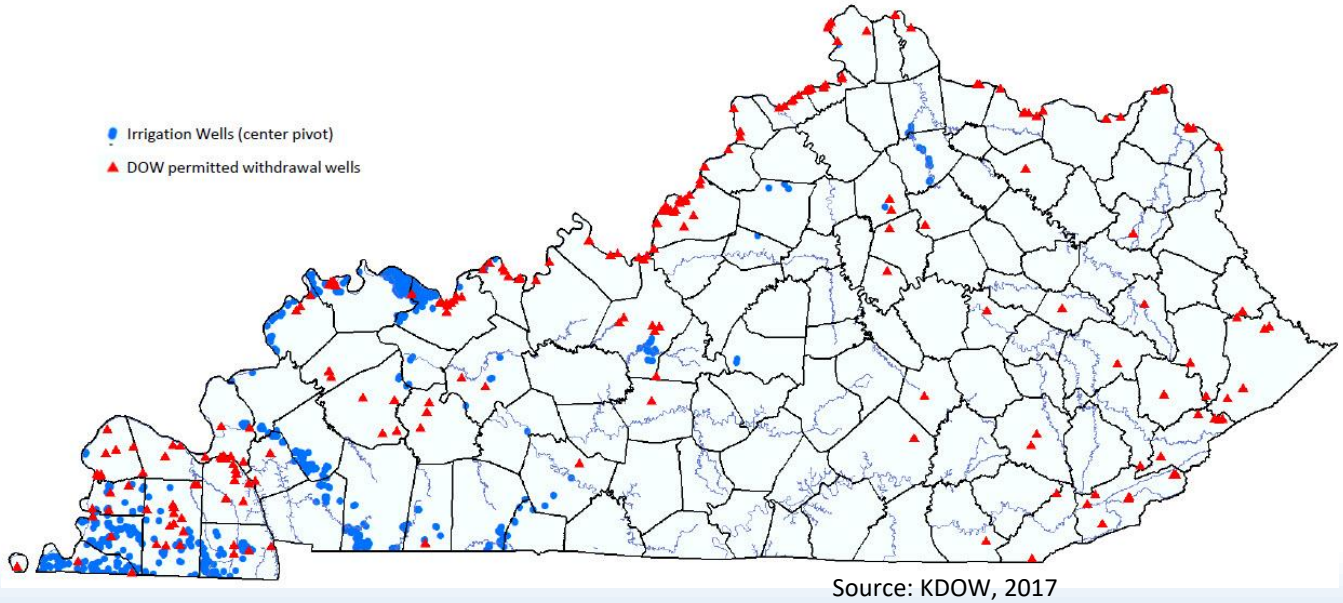
LITHOLOGIC LOG:

From	To	Description
0'	9'	Top soil surface
9'	21'	sand stone
22'	23'	Break or fracture
23'	27'	yellow sandstone
27'	32'	Gray sand stone
39'	73'	sand stone mix shale
75'	138'	mostly shale
143'	172'	Gray sand stone
190'	225'	Light white sand
225'	255'	Good white sand
255'	263'	Best white sand

COMMENTS: WW permit 3316 - OC

Aquifer Designation Project—Priority Areas

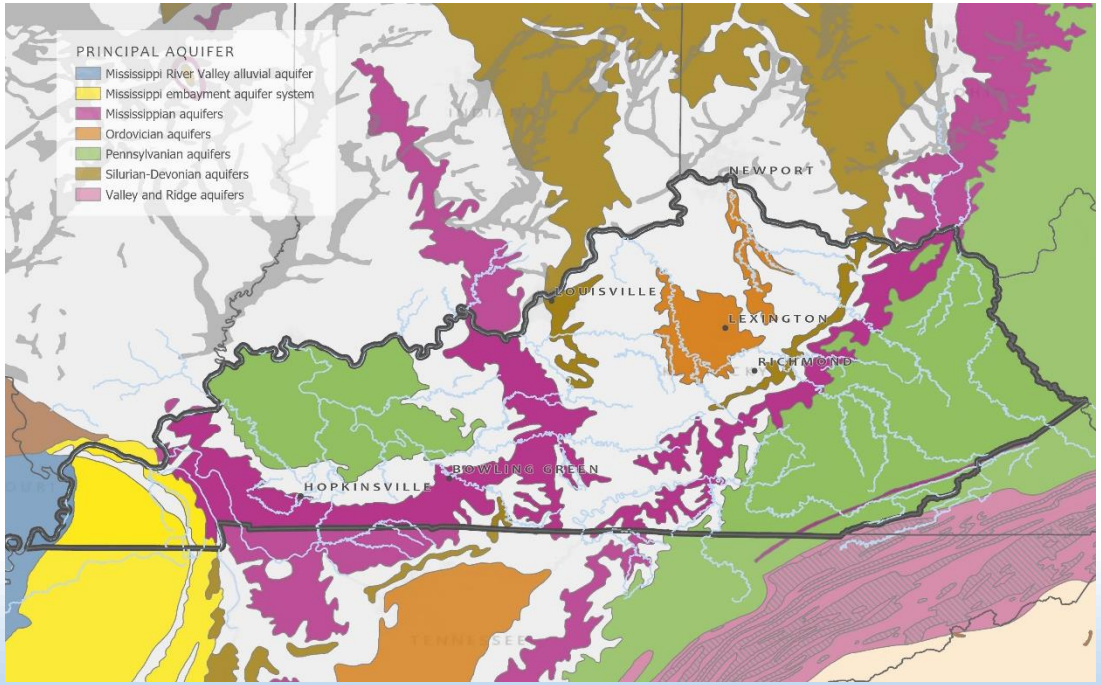
From the State's (KDOW) Perspective:



Source: KDOW, 2017

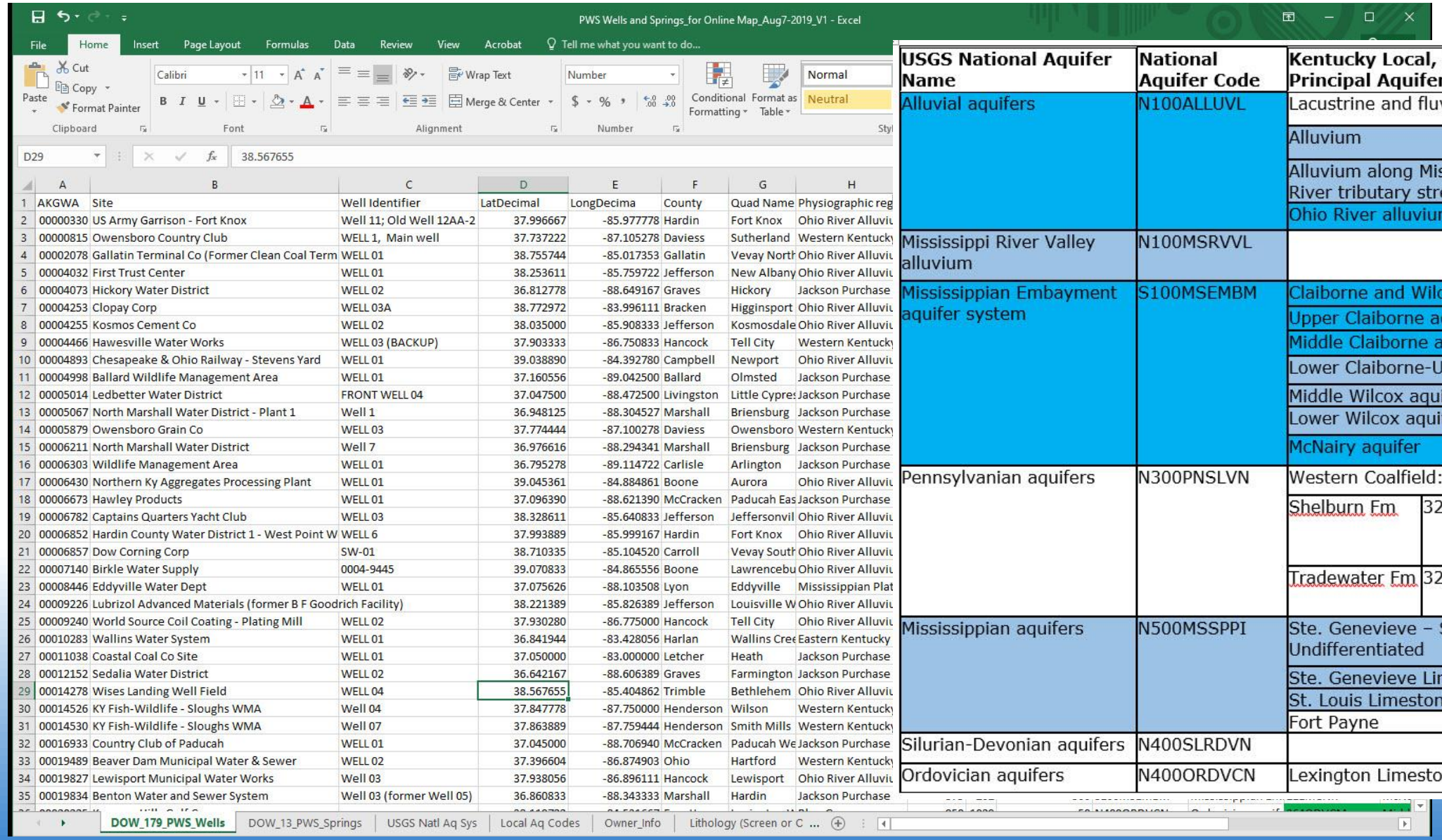
Locations where groundwater withdrawals are presently regulated (withdraw >10,000 gpd), or are likely to see increasing withdrawals for public water supplies or agricultural production.

From the National (USGS) Perspective:



Geographically extensive (regional) aquifer systems with greatest water well densities and groundwater withdrawals.

Products We Produced for the Project…

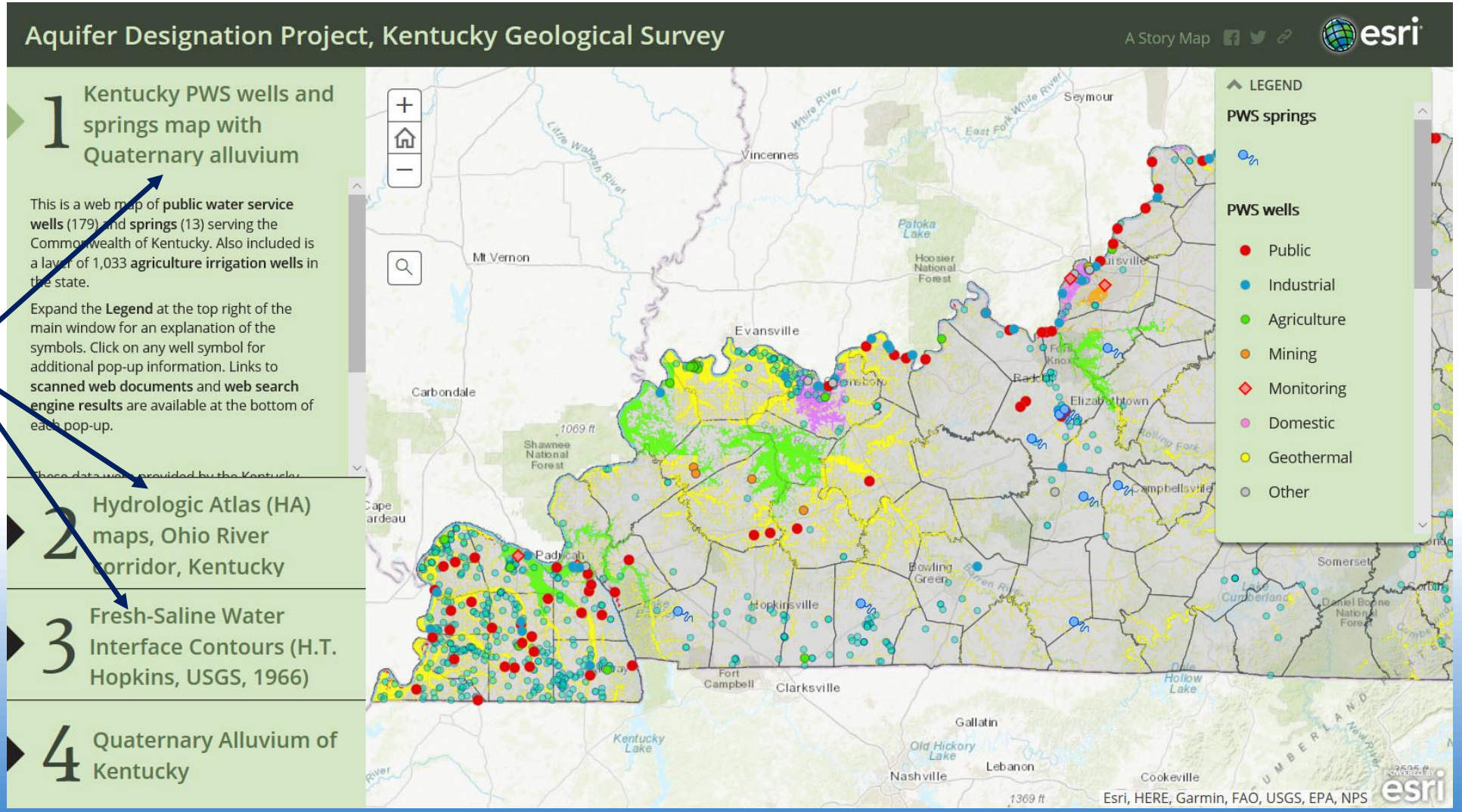


A	B	C	D	E	F	G	H
AKGWA	Site	Well Identifier	LatDecimal	LongDecima	County	Quad Name	Physiographic reg
00000330	US Army Garrison - Fort Knox	Well 11; Old Well 12AA-2	37.996667	-85.977778	Hardin	Fort Knox	Ohio River Alluvi
00000815	Owensboro Country Club	WELL 1, Main well	37.737222	-87.105278	Daviess	Sutherland	Western Kentucky
00002078	Gallatin Terminal Co (Former Clean Coal Term	WELL 01	38.755744	-85.017353	Gallatin	Vevay North	Ohio River Alluvi
00004032	First Trust Center	WELL 01	38.253611	-85.759722	Jefferson	New Albany	Ohio River Alluvi
00004073	Hickory Water District	WELL 02	36.812778	-88.649167	Graves	Hickory	Jackson Purchase
00004253	Clopay Corp	WELL 03A	38.772972	-83.996111	Bracken	Higginsport	Ohio River Alluvi
00004255	Kosmos Cement Co	WELL 02	38.035000	-85.908333	Jefferson	Kosmosdale	Ohio River Alluvi
00004466	Hawesville Water Works	WELL 03 (BACKUP)	37.903333	-86.750833	Hancock	Tell City	Western Kentucky
00004893	Chesapeake & Ohio Railway - Stevens Yard	WELL 01	39.038890	-84.392780	Campbell	Newport	Ohio River Alluvi
00004998	Ballard Wildlife Management Area	WELL 01	37.160556	-89.042500	Ballard	Olmsted	Jackson Purchase
00005014	Ledbetter Water District	FRONT WELL 04	37.047500	-88.472500	Livingston	Little Cypres	Jackson Purchase
00005067	North Marshall Water District - Plant 1	Well 1	36.948125	-88.304527	Marshall	Briensburg	Jackson Purchase
00005879	Owensboro Grain Co	WELL 03	37.774444	-87.100278	Daviess	Owensboro	Western Kentucky
00006211	North Marshall Water District	Well 7	36.976616	-88.294341	Marshall	Briensburg	Jackson Purchase
00006303	Wildlife Management Area	WELL 01	36.795278	-89.114722	Carlisle	Arlington	Jackson Purchase
00006430	Northern Ky Aggregates Processing Plant	WELL 01	39.045361	-84.884861	Boone	Aurora	Ohio River Alluvi
00006673	Hawley Products	WELL 01	37.096390	-88.621390	McCracken	Paducah Eas	Jackson Purchase
00006782	Captains Quarters Yacht Club	WELL 03	38.328611	-85.640833	Jefferson	Jeffersonvil	Ohio River Alluvi
00006852	Hardin County Water District 1 - West Point W	WELL 6	37.993889	-85.999167	Hardin	Fort Knox	Ohio River Alluvi
00006857	Dow Corning Corp	SW-01	38.710335	-85.104520	Carroll	Vevay South	Ohio River Alluvi
00007140	Birkle Water Supply	0004-9445	39.070833	-84.865556	Boone	Lawrencebu	Ohio River Alluvi
00008446	Eddyville Water Dept	WELL 01	37.075626	-88.103508	Lyon	Eddyville	Mississippian Plat
00009226	Lubrizol Advanced Materials (former B F Goodrich Facility)		38.221389	-85.826389	Jefferson	Louisville W	Ohio River Alluvi
00009240	World Source Coil Coating - Plating Mill	WELL 02	37.930280	-86.775000	Hancock	Tell City	Ohio River Alluvi
00010283	Wallins Water System	WELL 01	36.841944	-83.428056	Harlan	Wallins Cree	Eastern Kentucky
00011038	Coastal Coal Co Site	WELL 01	37.050000	-83.000000	Letcher	Heath	Jackson Purchase
00012152	Sedalia Water District	WELL 02	36.642167	-88.606389	Graves	Farmington	Jackson Purchase
00014278	Wises Landing Well Field	WELL 04	38.567655	-85.404862	Trimble	Bethlehem	Ohio River Alluvi
00014526	KY Fish-Wildlife - Sloughs WMA	Well 04	37.847778	-87.750000	Henderson	Wilson	Western Kentucky
00014530	KY Fish-Wildlife - Sloughs WMA	Well 07	37.863889	-87.759444	Henderson	Smith Mills	Western Kentucky
00016933	Country Club of Paducah	WELL 01	37.045000	-88.706940	McCracken	Paducah We	Jackson Purchase
00019489	Beaver Dam Municipal Water & Sewer	WELL 02	37.396604	-86.874903	Ohio	Hartford	Western Kentucky
00019827	Lewisport Municipal Water Works	Well 03	37.938056	-86.896111	Hancock	Lewisport	Ohio River Alluvi
00019834	Benton Water and Sewer System	Well 03 (former Well 05)	36.860833	-88.343333	Marshall	Hardin	Jackson Purchase

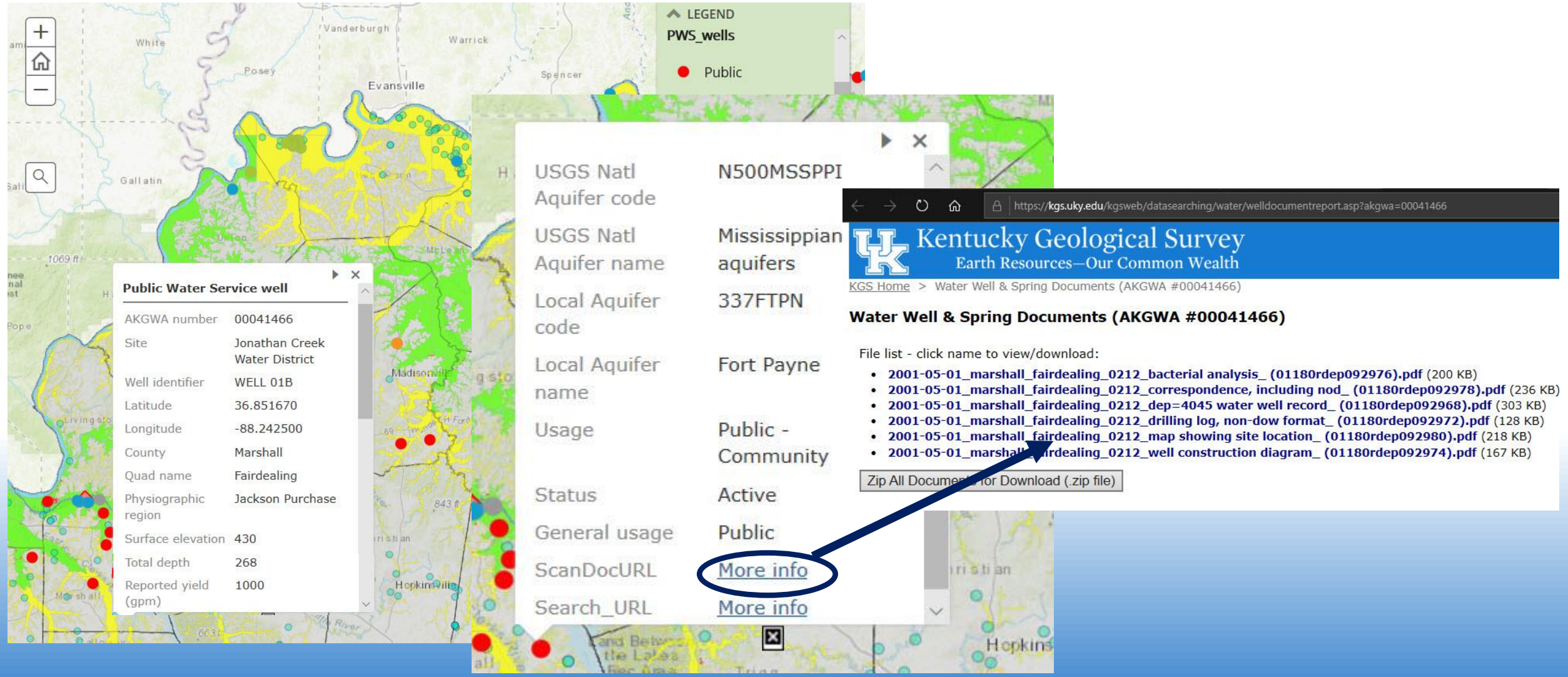
USGS National Aquifer Name	National Aquifer Code	Kentucky Local, Primary, or Principal Aquifer Name	Local Aquifer Code
Alluvial aquifers	N100ALLUVL	Lacustrine and fluvial deposits	112LAFL
		Alluvium	111ALVM
		Alluvium along Mississippi and Ohio River tributary streams	111AMOT
		Ohio River alluvium aquifer	111OHOA
Mississippi River Valley alluvium	N100MSRVVL		
Mississippian Embayment aquifer system	S100MSEMBM	Claiborne and Wilcox Undifferentiated	124CBWX
		Upper Claiborne aquifer	124CLBR
		Middle Claiborne aquifer	124CLBR
		Lower Claiborne-Upper Wilcox aquifer	124CBWX
		Middle Wilcox aquifer	124WLCX
		Lower Wilcox aquifer	124WLCX
		McNairy aquifer	211MCNR
Pennsylvanian aquifers	N300PNSLVN	Western Coalfield:	Eastern Coalfield:
		Shelburn Fm 321SLBR	Four Corners Fm 324FRCR
			Pikeville Fm 324PKVL
		Tradewater Fm 321TRDT	Corbin Sandstone 327CRBN
Mississippian aquifers	N500MSSPPI	Ste. Genevieve – St. Louis Limestone Undifferentiated	333SGSL
		Ste. Genevieve Limestone	333SGVV
		St. Louis Limestone	333STLS
		Fort Payne	337FTPN
Silurian-Devonian aquifers	N400SLRDVN		
Ordovician aquifers	N400ORDVCN	Lexington Limestone	364LXNG

To Make Aquifer Designation Data More Useful We Have Developed a New Interactive Webpage

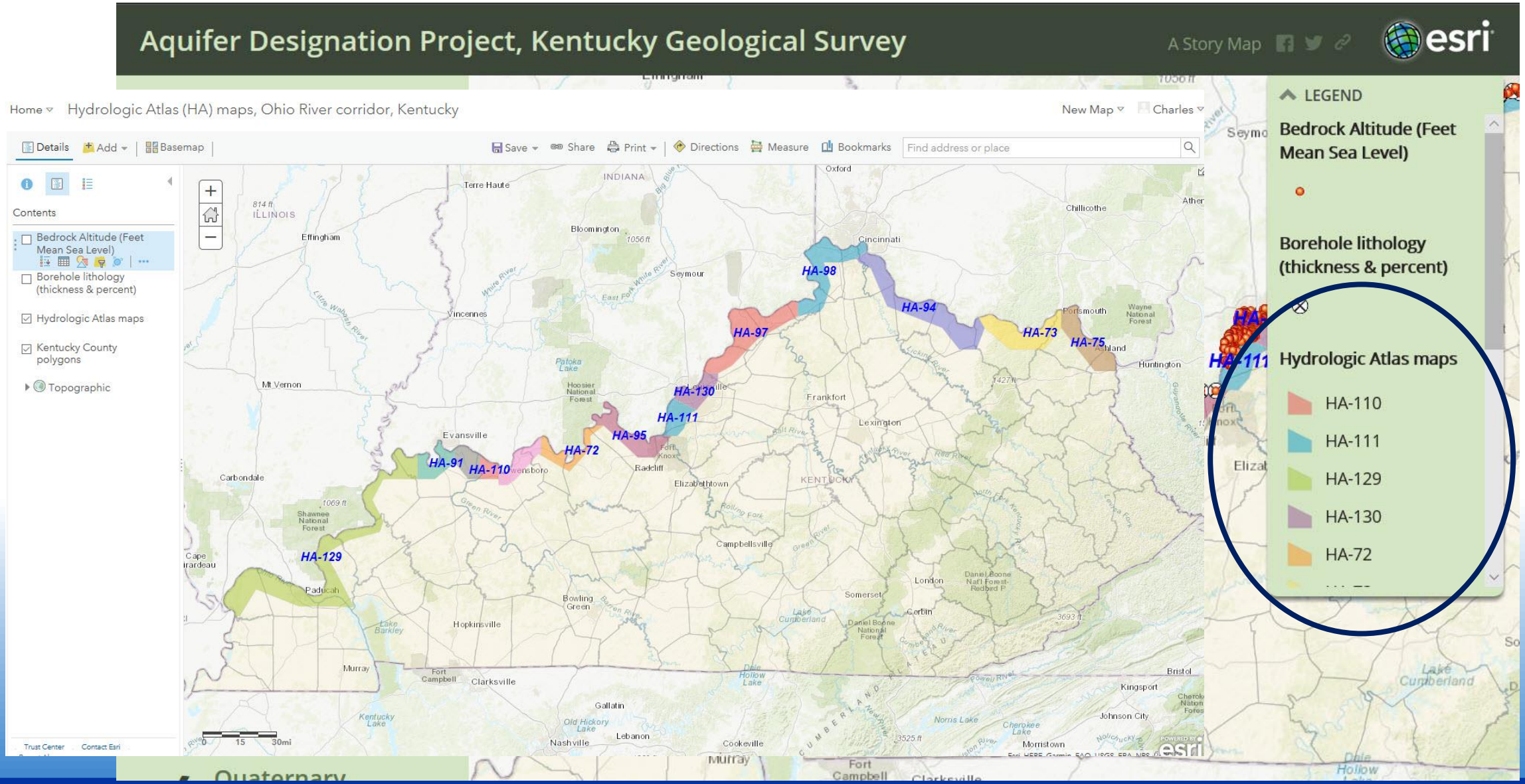
Content for the Aquifer Designation Webpage Will Consist of a Series of On-Line ArcGIS Web Maps.



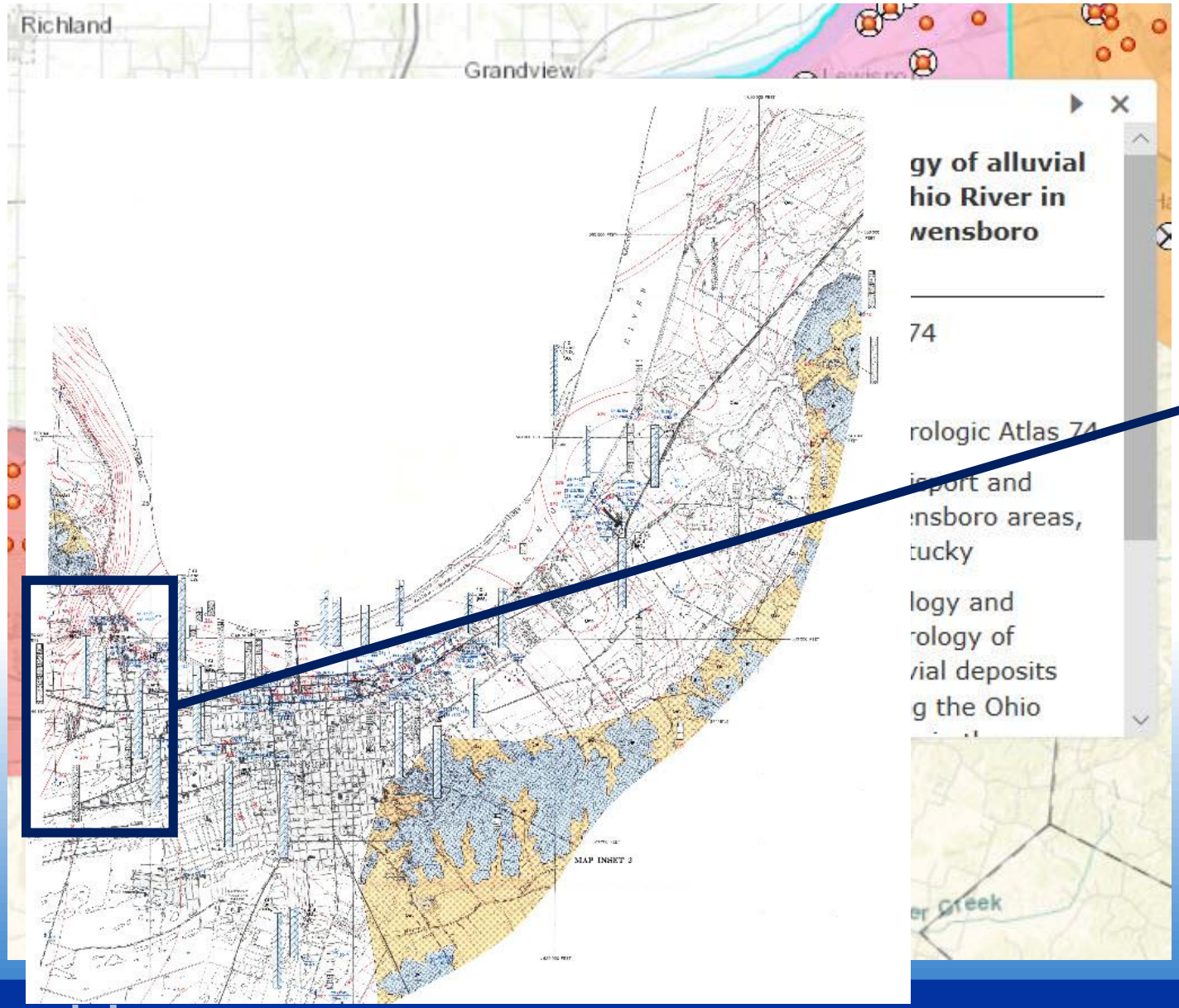
Features of Interactive Web Map for PWS Wells and Springs

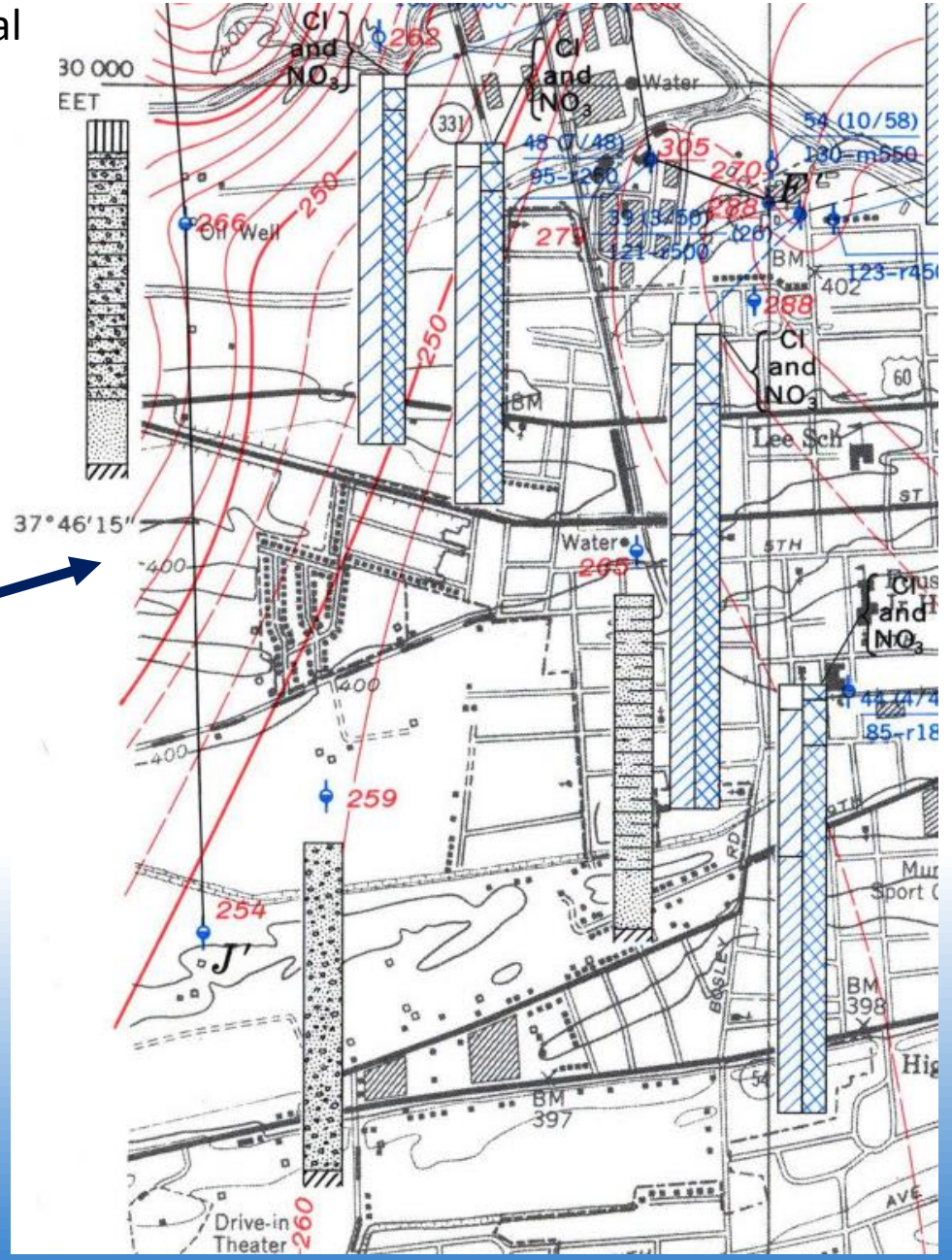


Content of Ohio River Alluvial Aquifer and Hydrologic Atlas Web Map:

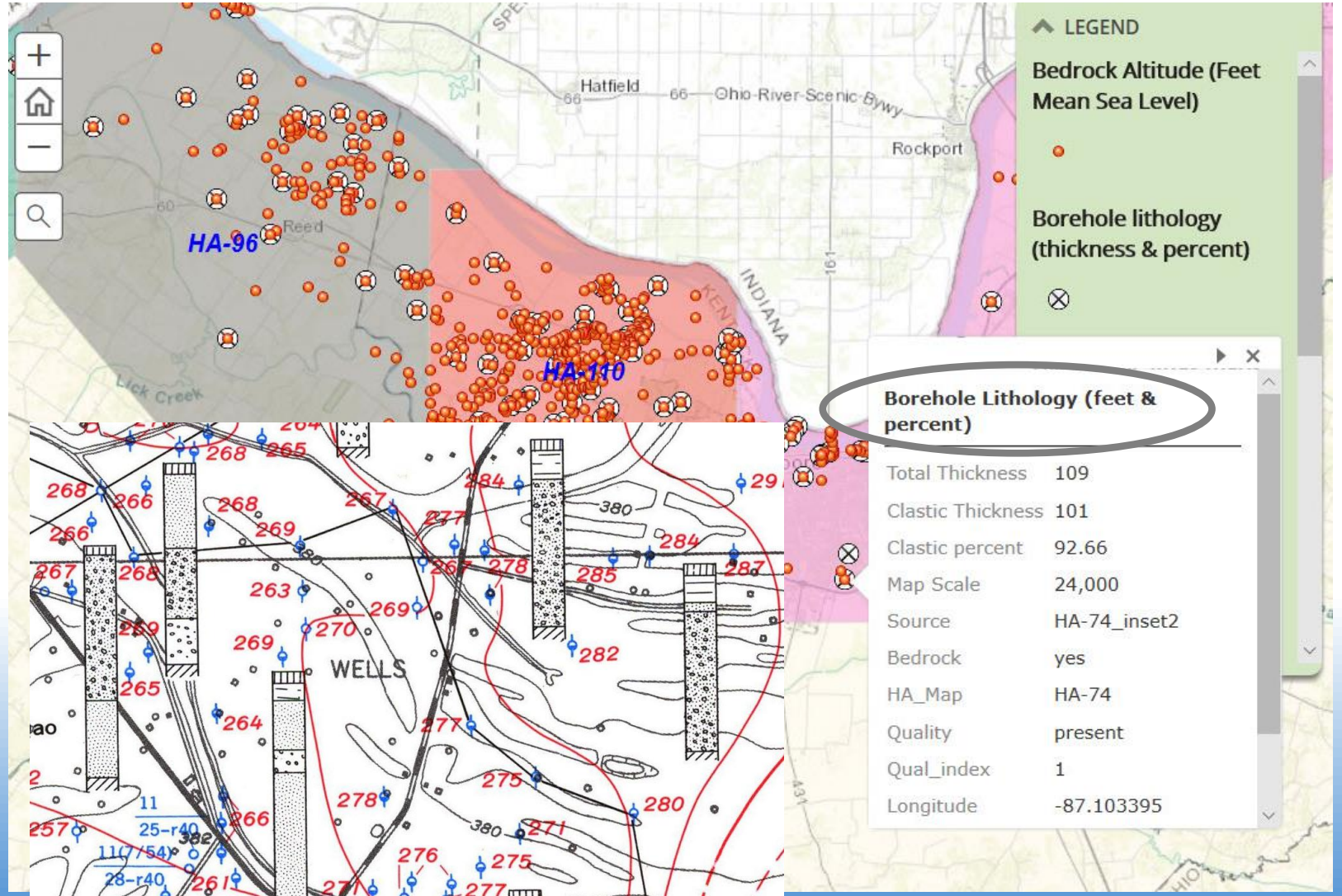


Links Provided to Hi-Resolution PDF of HA Map Plate for Ohio River Alluvial Aquifer and USGS Publication Warehouse (Source)

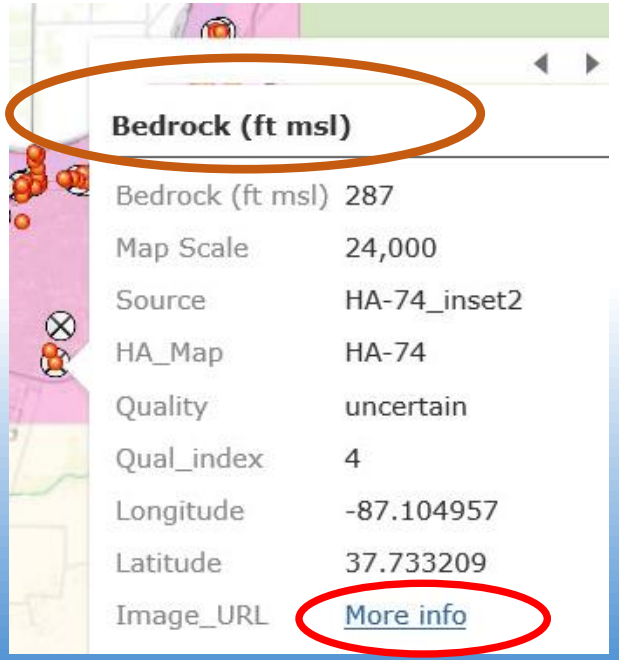




Data Extracted from HAs for Ohio River Alluvial Aquifer Web Page



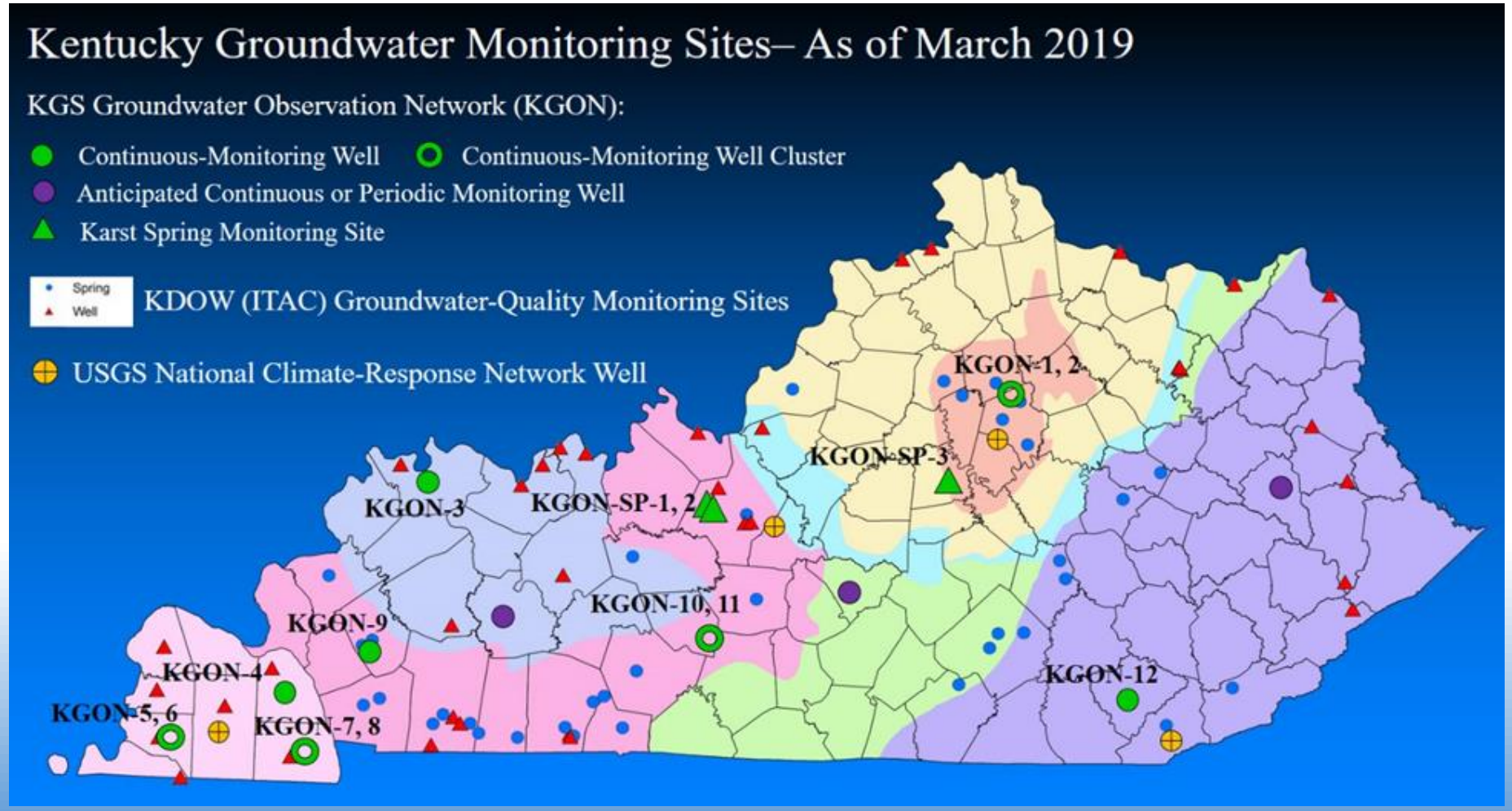
- One benefit of compiling these data: Useful in estimating and mapping aquifer properties along OHAA:
  - $T = K_{(H)} \times$ thickness
  - $K_{(H)}$ can be measured/estimated for sand, gravel, etc.



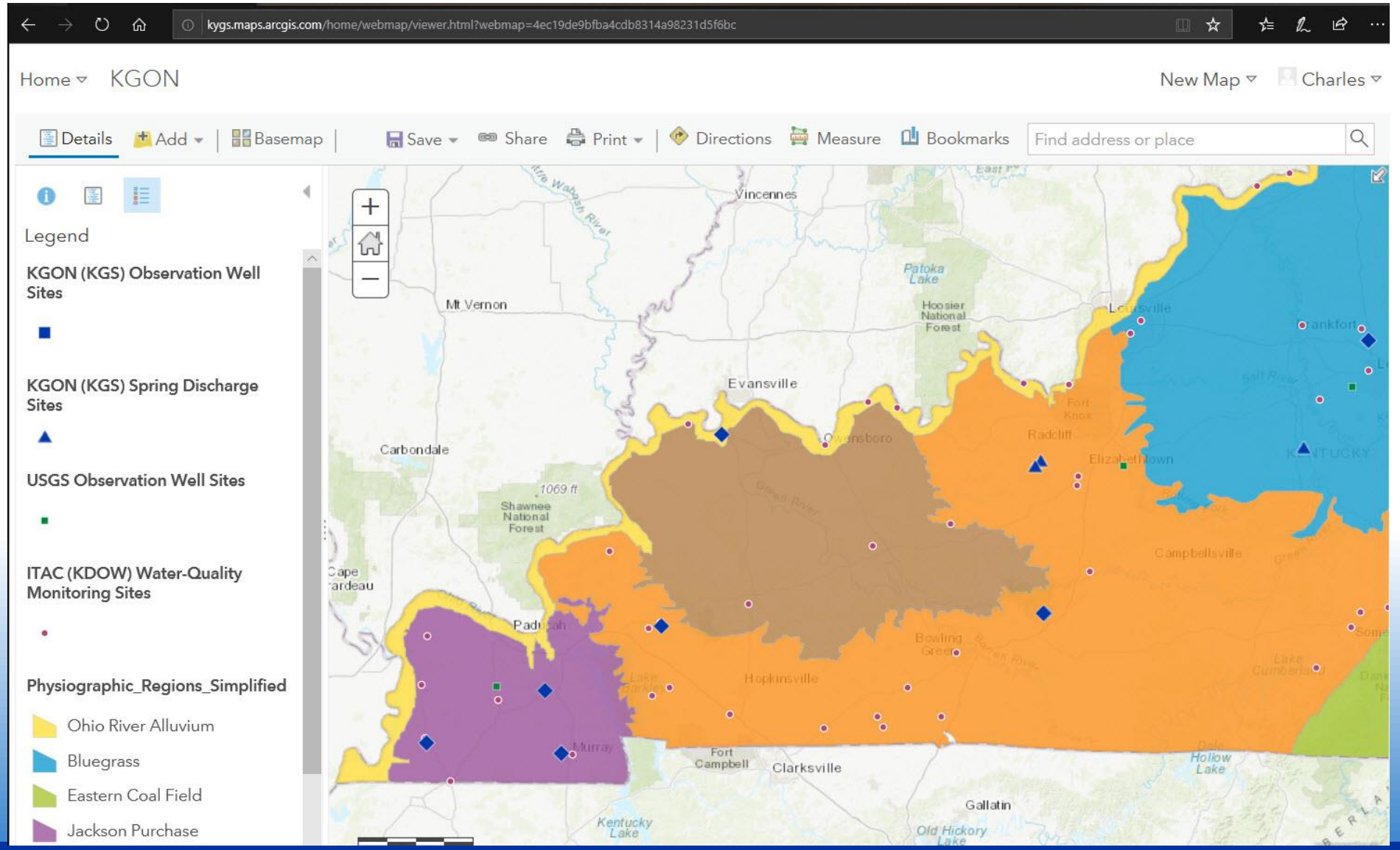
Groundwater Monitoring Network Update

KGS Kentucky Groundwater Observation Network:

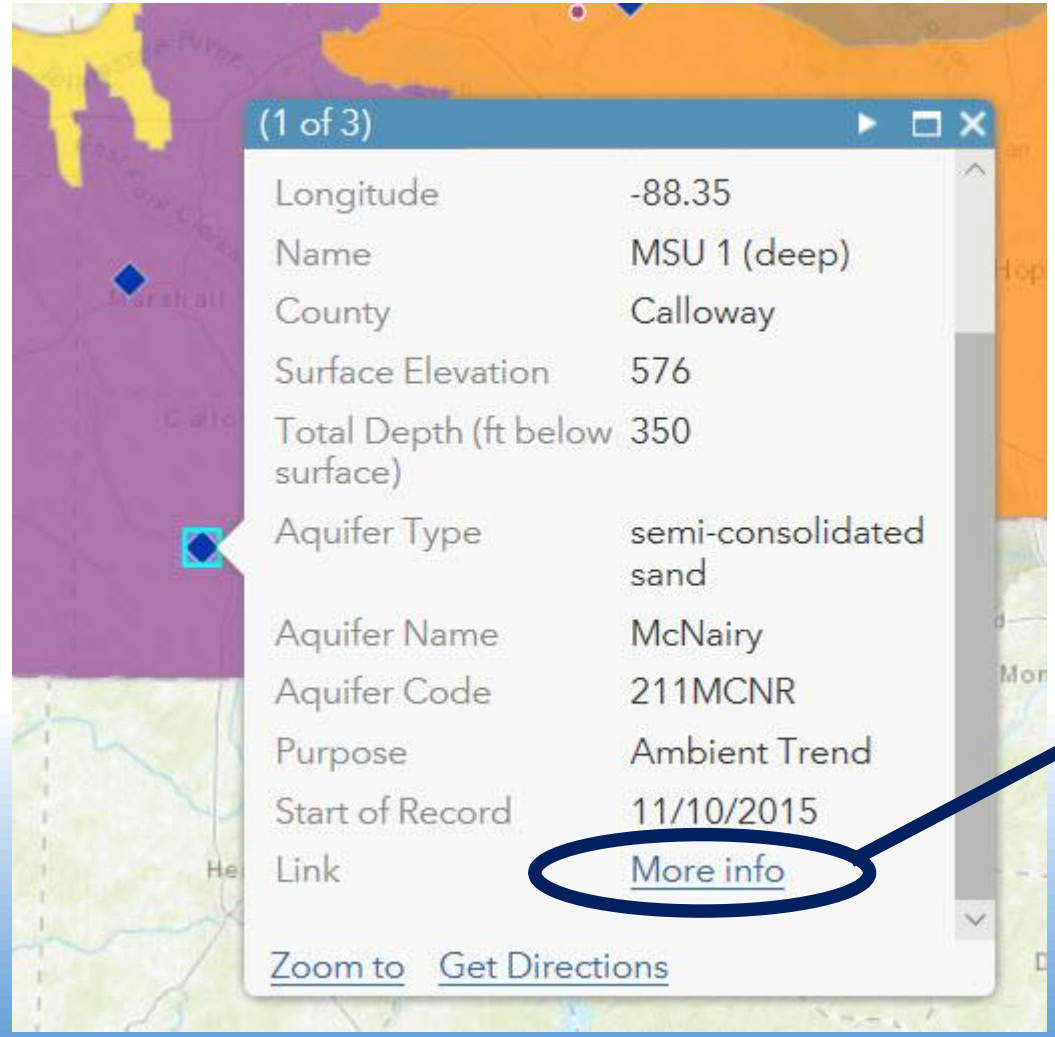
- At present, active KGON sites include
  - 12 observation wells.
  - 3 karst springs.
- A new webpage has been created to provide public access to all active groundwater monitoring data.

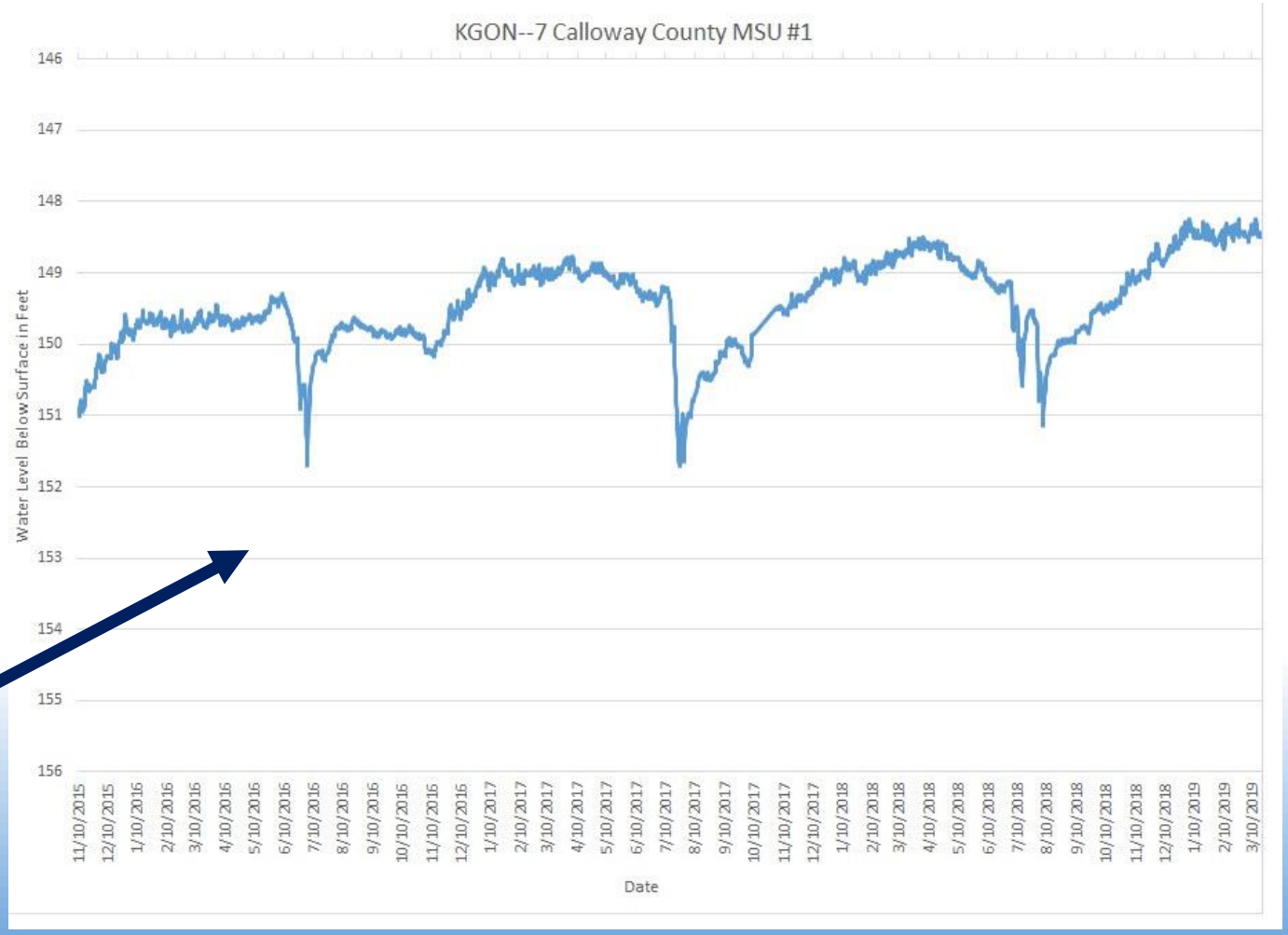


New Interactive Web Page Developed for All Active Groundwater Monitoring Networks:

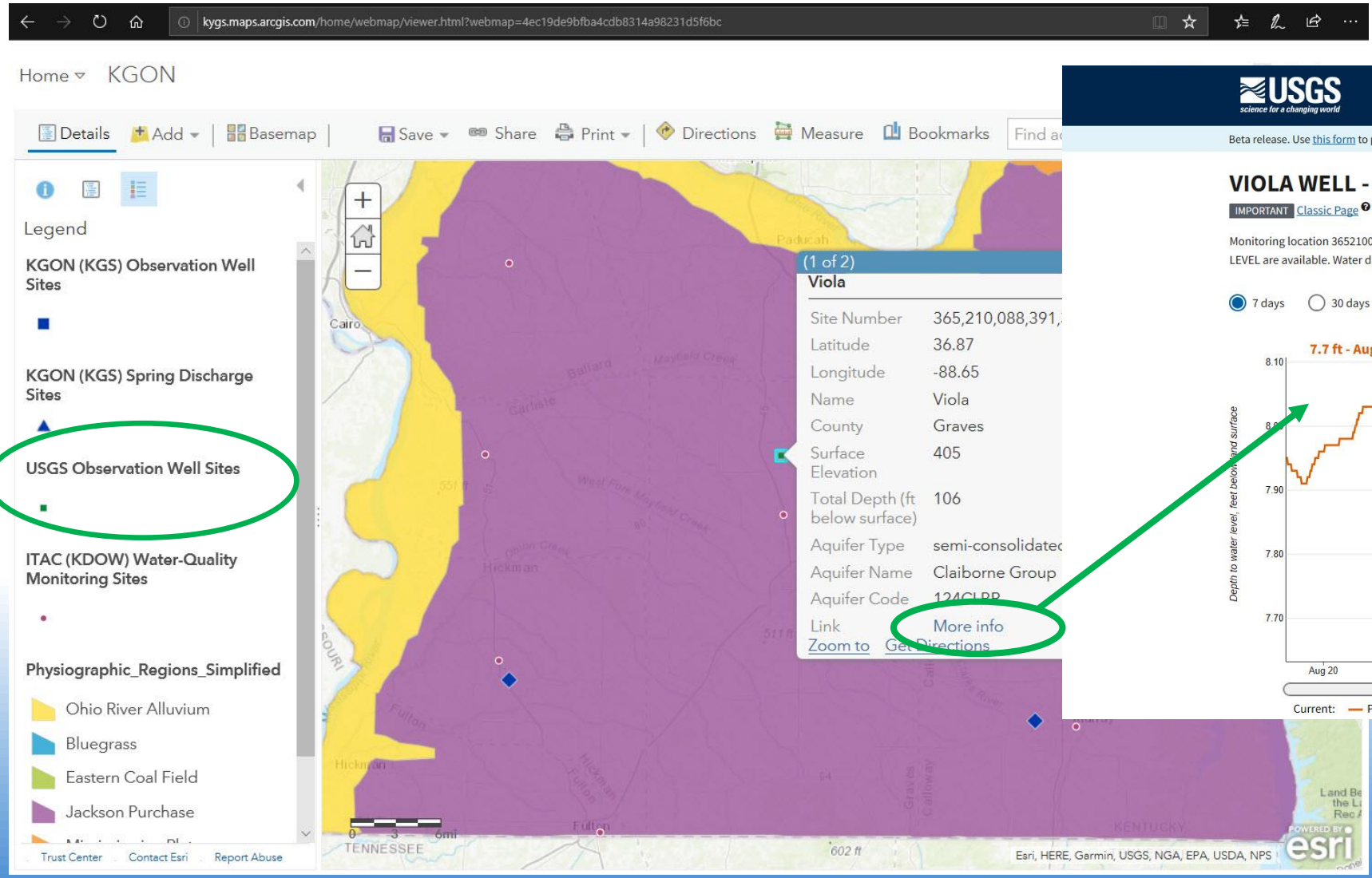


KGS KGON Well Info and Data Accessed Via Webpage

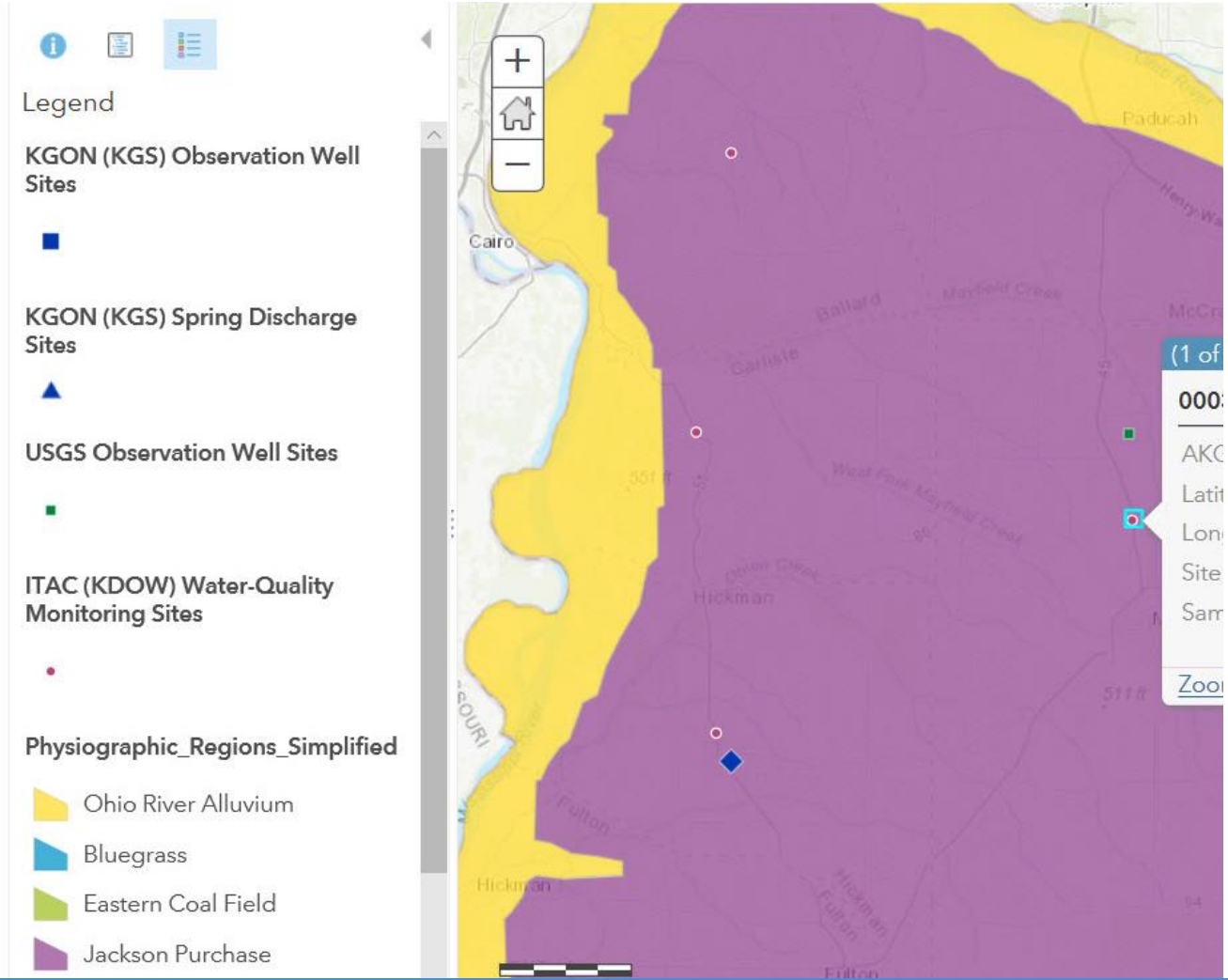


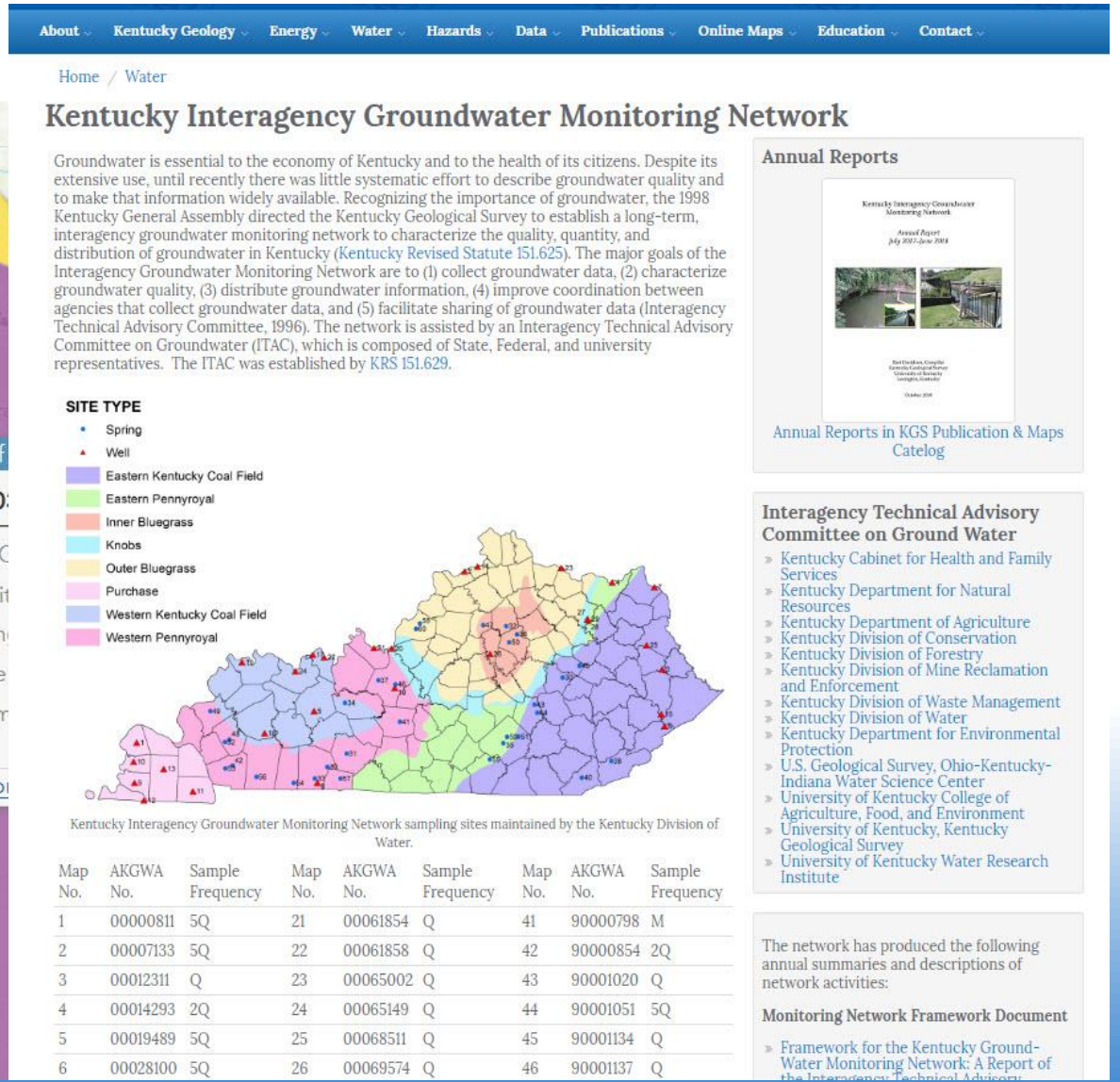


KGS Webpage Links to Other GW Monitoring Networks– To USGS Sites

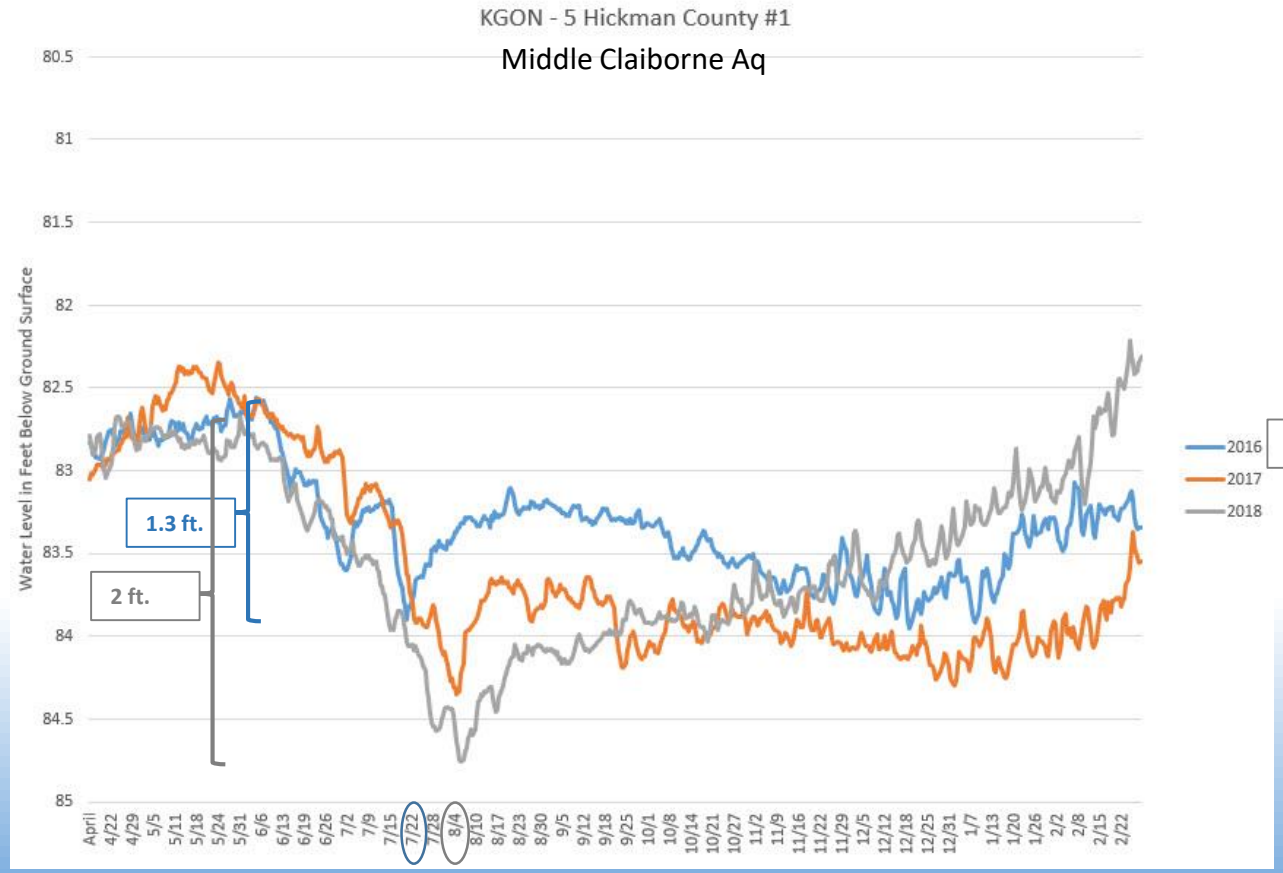


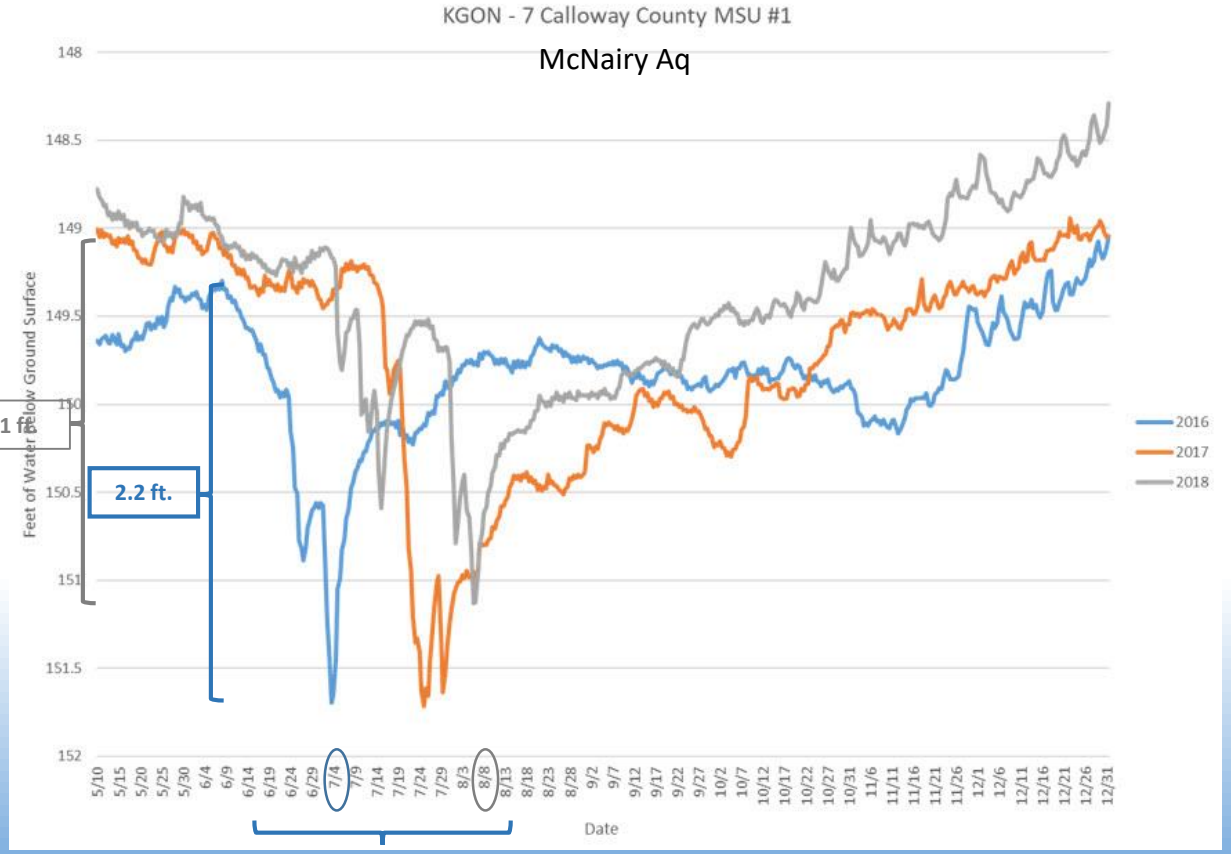
KGS Webpage Links to Other GW Monitoring Networks– To ITAC (DOW) GWQ Sites





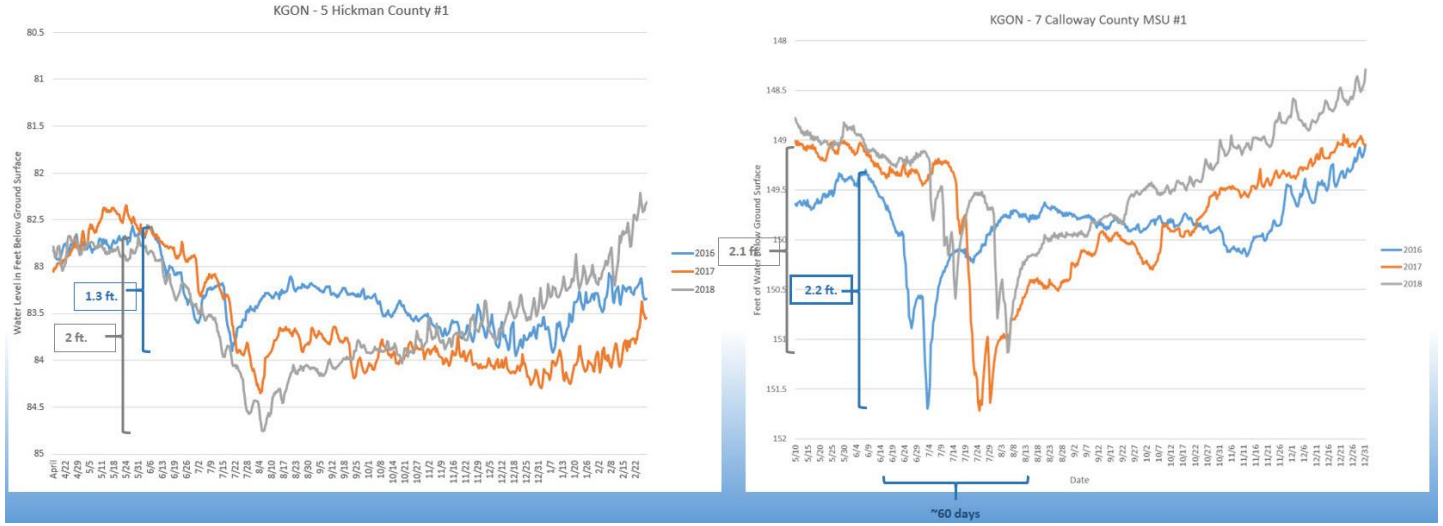
Interesting Water-Level Trends Emerging in KGON-JPA Deep Wells

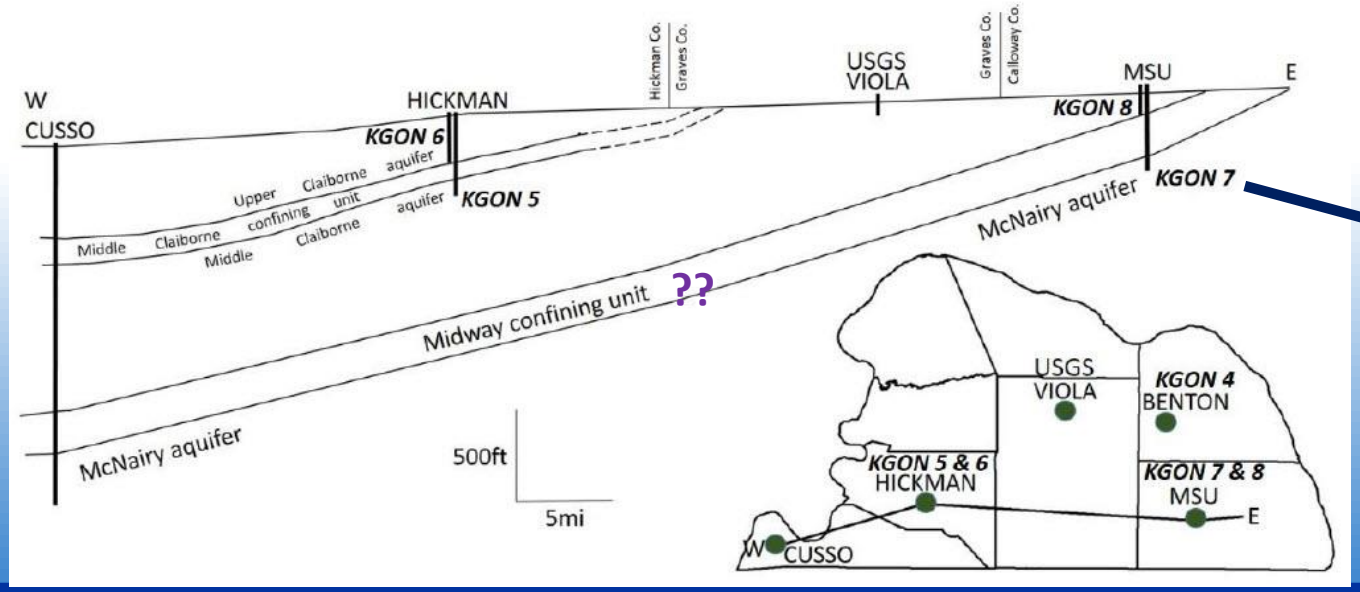


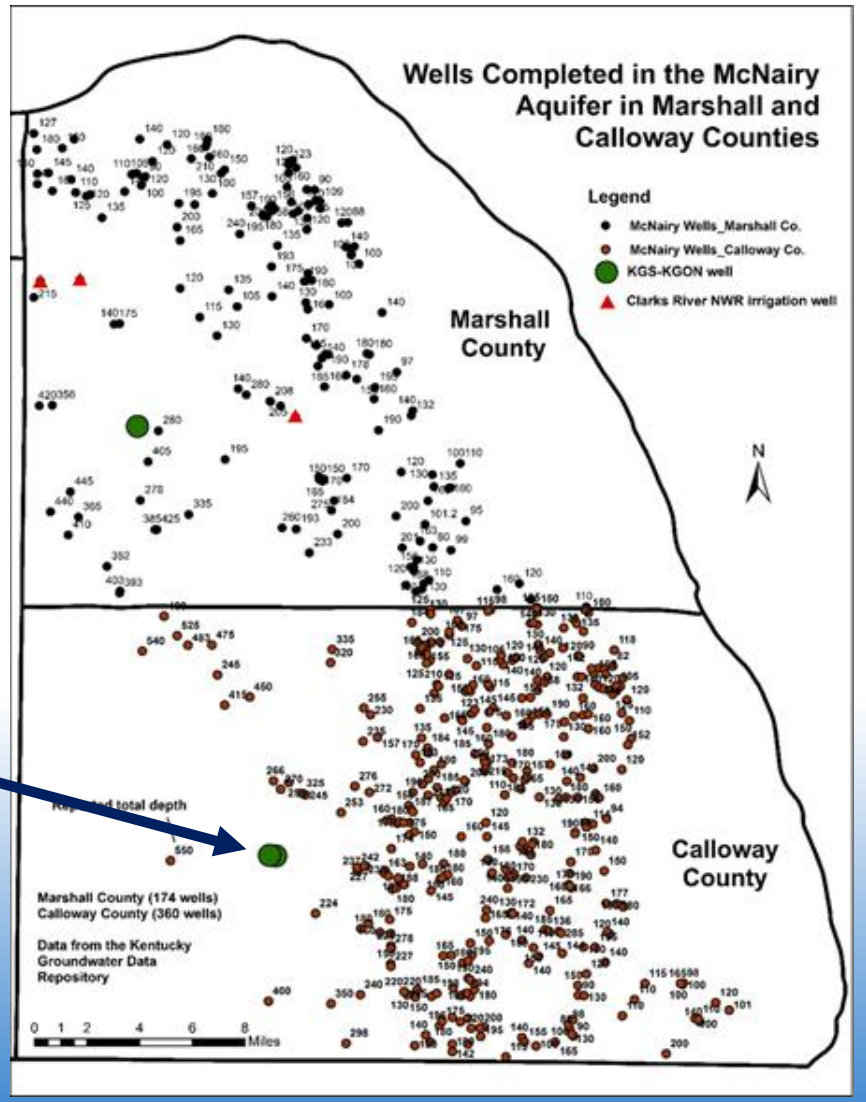


~60 days

Question: What Are the Causes of This Regional Pattern?

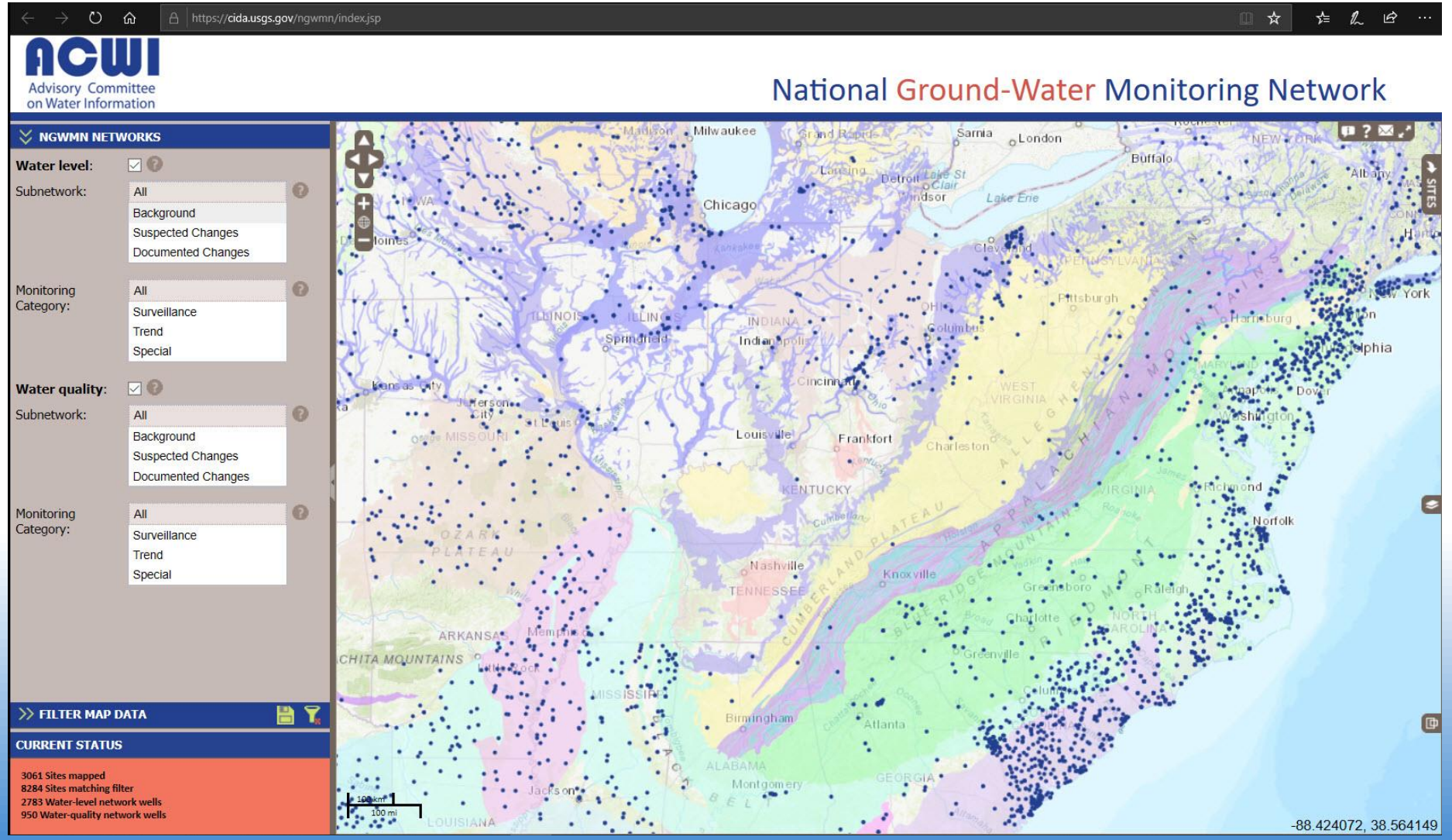






Inclusion of KGS KGON sites in the National Groundwater Monitoring Network

- Grant awarded by USGS in spring 2019.
- 2-year project to set-up as new data provider will begin in December, 2019.
- Will contribute water-level data continuously measured at 8 KGS-KGON sites.
- Status as NGMN data provider opens door to future funding support for ground-water monitoring network enhancement.



Ongoing and Future Activities

- Complete the current KGS Water Website revisions and “go live” with Groundwater Monitoring Networks and Aquifer Designation web page content.
- Add more content to the Aquifer Designation web page:
  - Continue working content for the Ohio River alluvial aquifer page.
  - Complete the data set needed for irrigation wells.
  - Physical hydrogeology and characteristics of Kentucky aquifers.
  - Aquifer test data.
- Karst hydrogeological database and webpage.
- Develop new interactive tools to improve groundwater data management, visualization, and analysis.