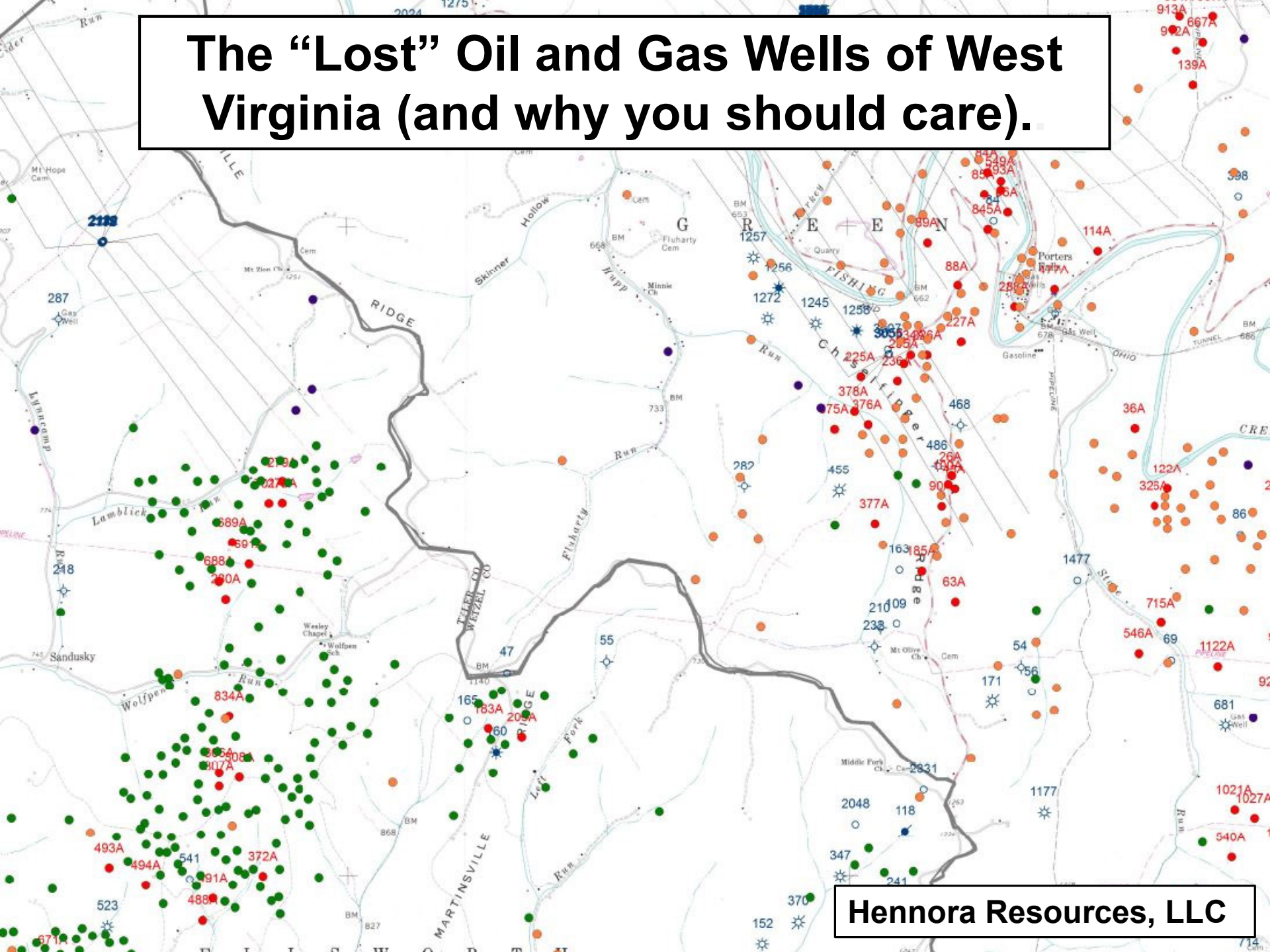


The "Lost" Oil and Gas Wells of West Virginia (and why you should care).



Hennora Resources, LLC

Appalachian Basin:



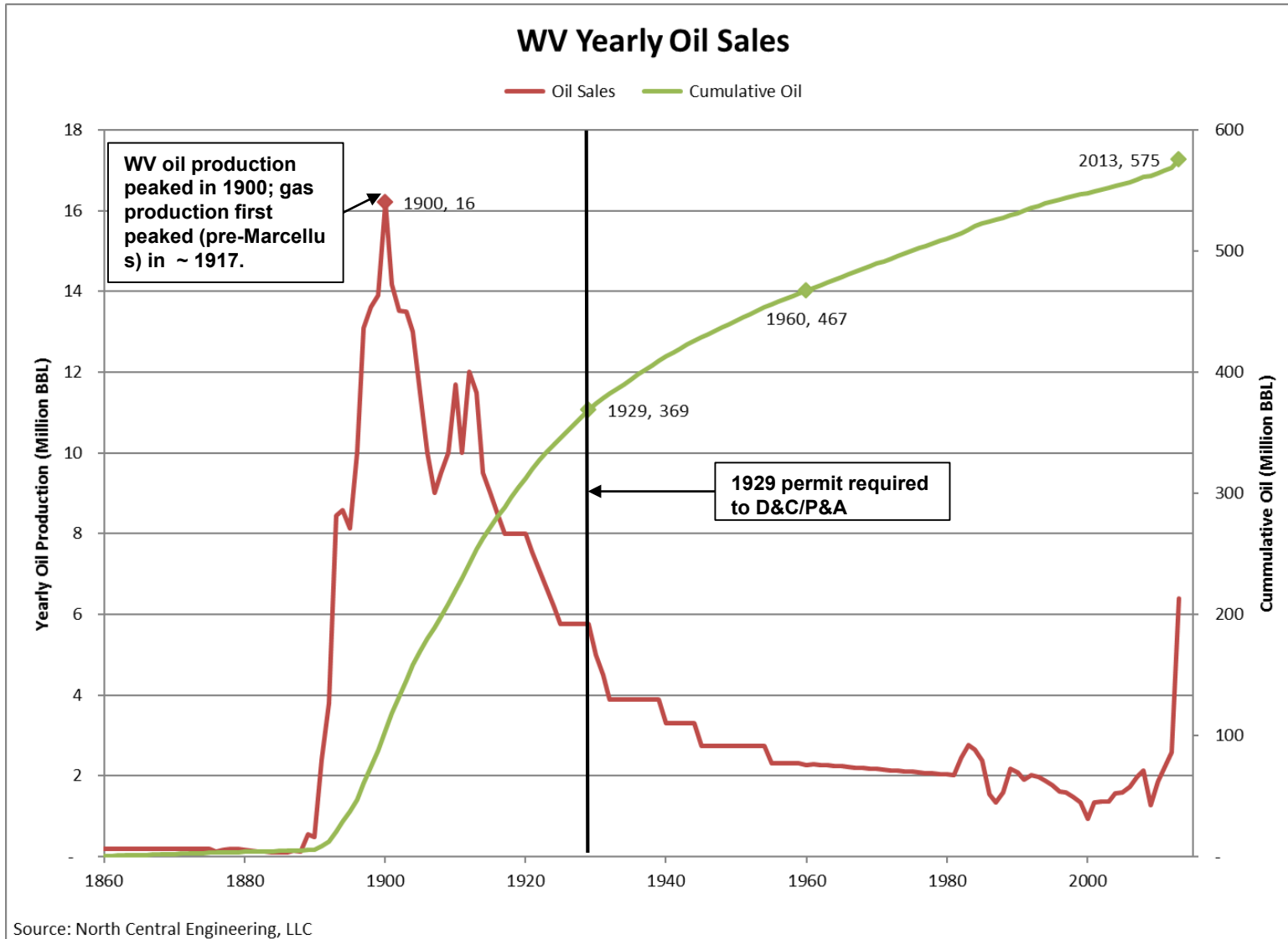
Overview of talk:

- A few important dates in West Virginia's oil history.
- What are we attempting to accomplish?
- Why are we attempting it?
- The source(s) used in our data set.
- Tyler County, West Virginia Case Study.
- Conclusions.



0044—Pumping an Oil Well, Wetzel County, W. Va., U. S. A.

A few Important Dates:



What are we trying to accomplish:



- **Digitize, georeference, and capture (in a database) oil and gas well spots from pre-1929 generated maps (pre permit).**
- **More accurately locate existing “known” wells (post 1929).**
- **Sources include: multiple oil and gas operating company maps, coal companies, and governmental agency report maps (out of print).**
- **Partner has been collecting and archiving these maps over a 30+ year career spent in West Virginia’s Oil and Gas Industry.**
- **Most obtained via “dumpster diving” or donated when companies dissolved or were acquired.**
- **Partner also has thousands of original plats and well records that are not publicly available.**

Data Source: Coal Companies



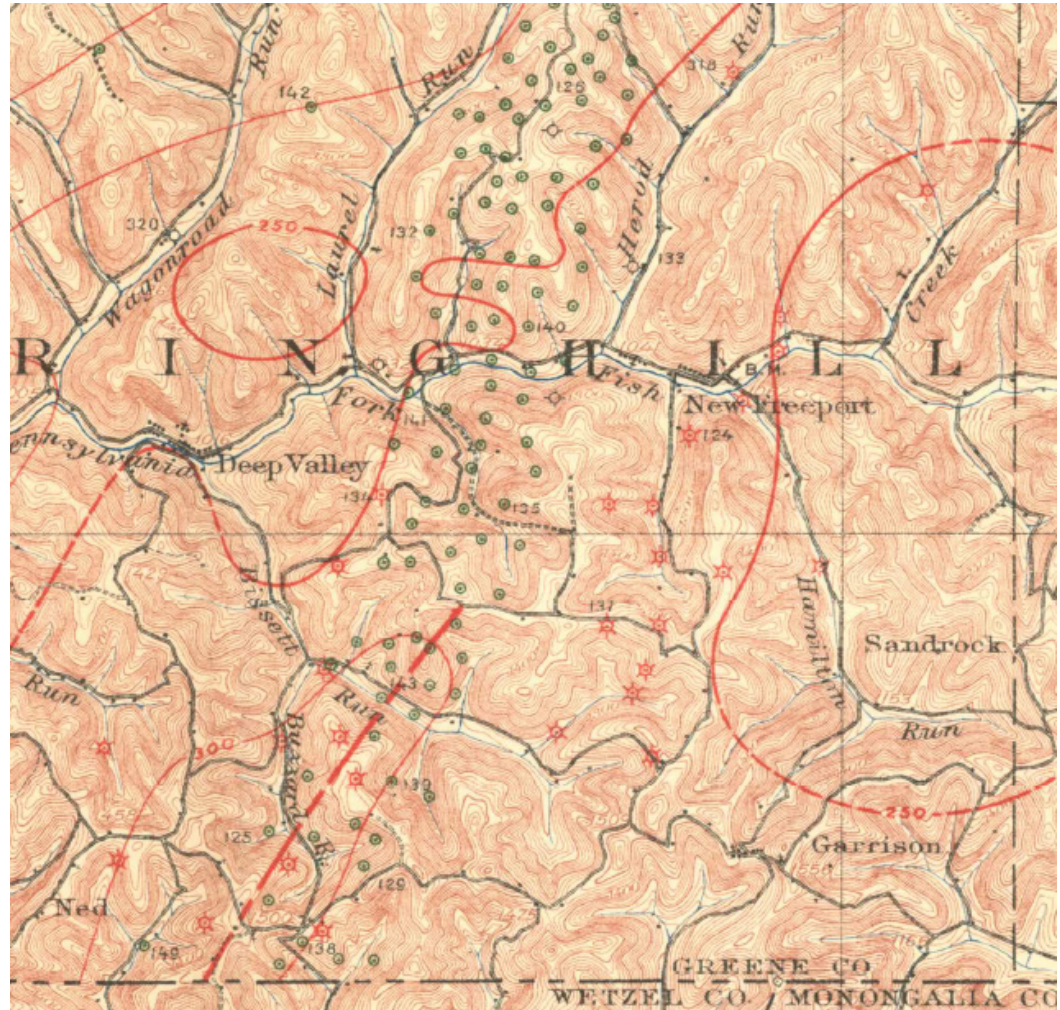
- Example is from Wetzel County (1915).
- Coal Operator maps don't typically show well specific information.
- Their maps do show geopolitical boundaries, roads, railroads, survey benchmarks, etc.
- Used primarily to cross reference Oil and Gas operator maps.
- Have over 3000 covering Northern WV but not used as of yet.



Data Source: Government Agency



- Example is from out of print USGS publication Greene County PA and Wetzel County WV (1906).
- Highly detailed.
- Easily georeferenced.
- Often show producing horizon information (shows, produced fluid type, etc.).
- Have not used to add well spots to WV database (yet).



Data Source: pre-1929 O&G Operator



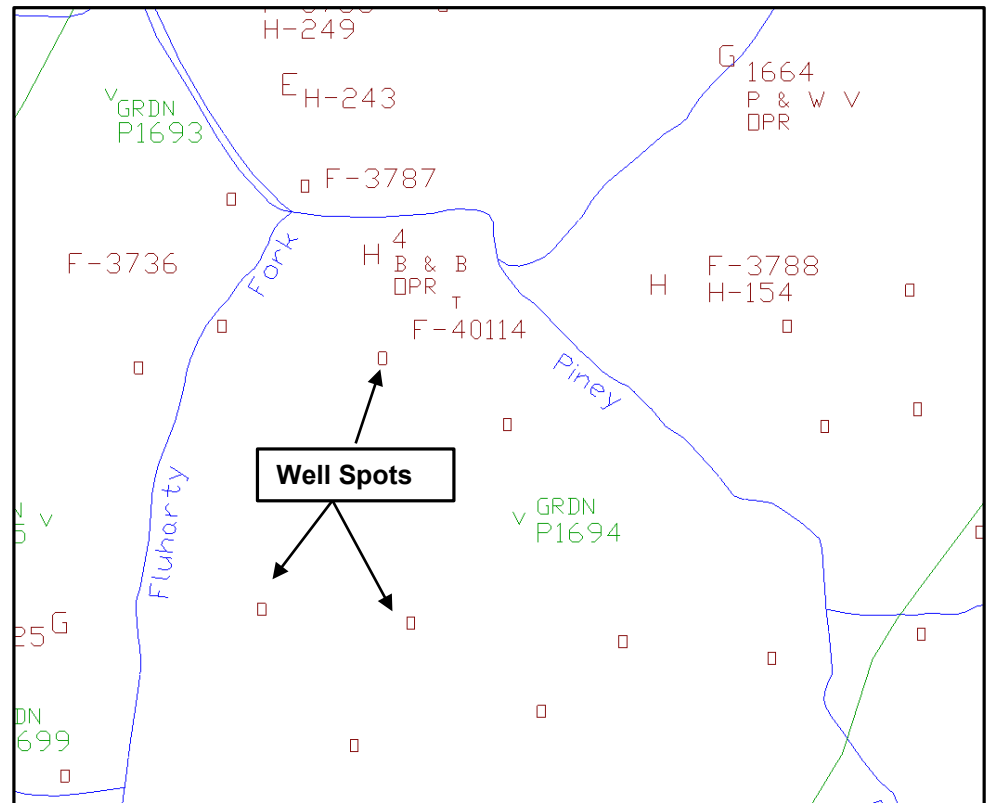
- Example is from partners proprietary collection. Ritchie-Wirt County line
- Map is on Vellum ~ 24' x 10'.
- Operating company map made turn of 19th - 20th centuries. Partner has similar maps made by 3 companies active at that time.
- Partner has spent \$\$\$\$ to have professionally scanned.
- Detailed Geopolitical boundaries, easy to Georeference.
- Map has IP's, BHP's, and producing zone information.
- Only a handful of these wells appear on WVGES website.



Data Source: pre-1929 O&G Operator



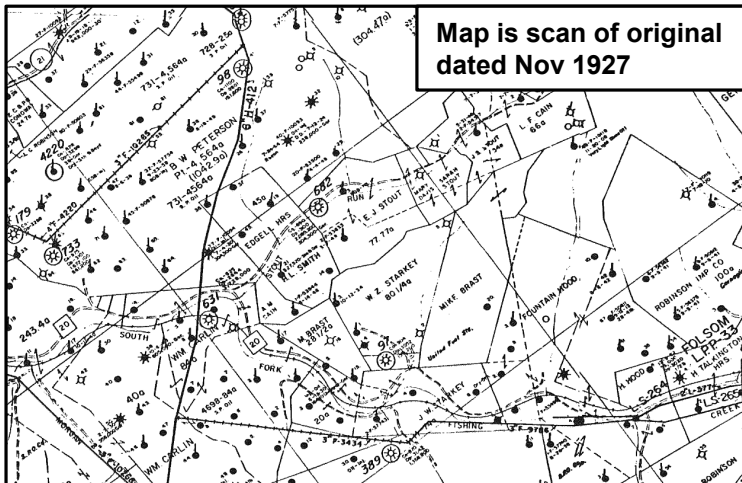
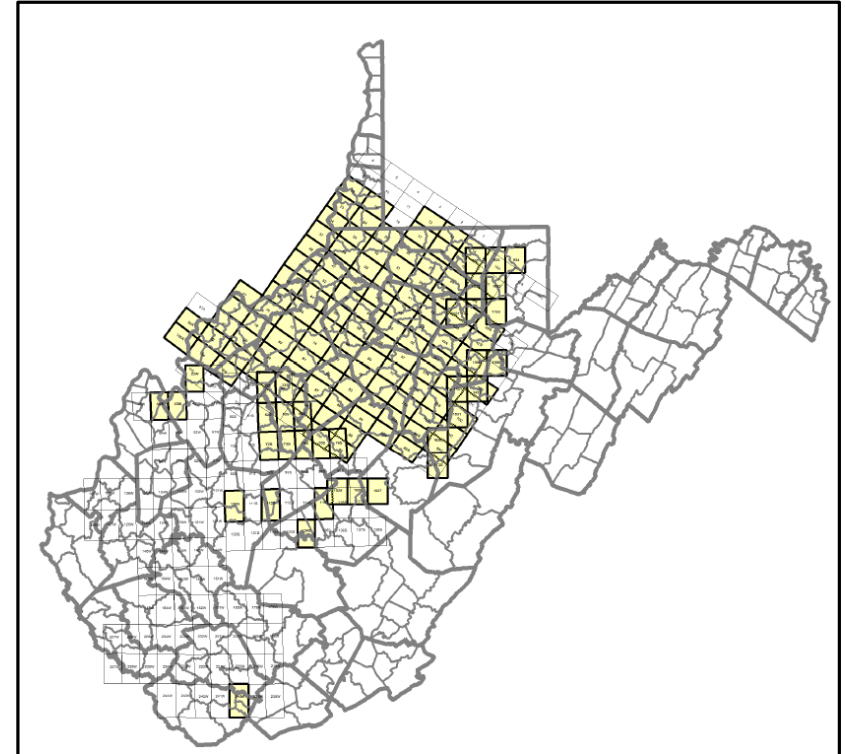
- Example is from partners proprietary collection (Tyler County).
- Large WV based Independent with 100+ year history (no longer in business) created AutoCAD drawings of their old maps (early 1990's).
- Contain well spot locations, locally some well information (TD, IP, etc.), pipelines, lease numbers, etc.
- Have for every quadrangle in the State that contains an Oil and Gas well or pipeline.



Data Source: pre-1929 O&G Operator



- Map showing proprietary operator well spot maps obtained by partner.
- These represent the maps from just one single operator obtained by partner.
- Have coverage from 3 additional historic WV operators.
- Completion & P&A info, cum's, IP, etc, pressure (sometimes).



Why are we doing this?:



**Tyler County, WV Mentioned as
Candidate for \$10B NGL Storage Hub**

MARCH 09, 2018

**MANCHIN: BILL GUARANTEES LOANS FOR GAS STORAGE HUBS
PARKERSBURG NEWS & SENTINEL**

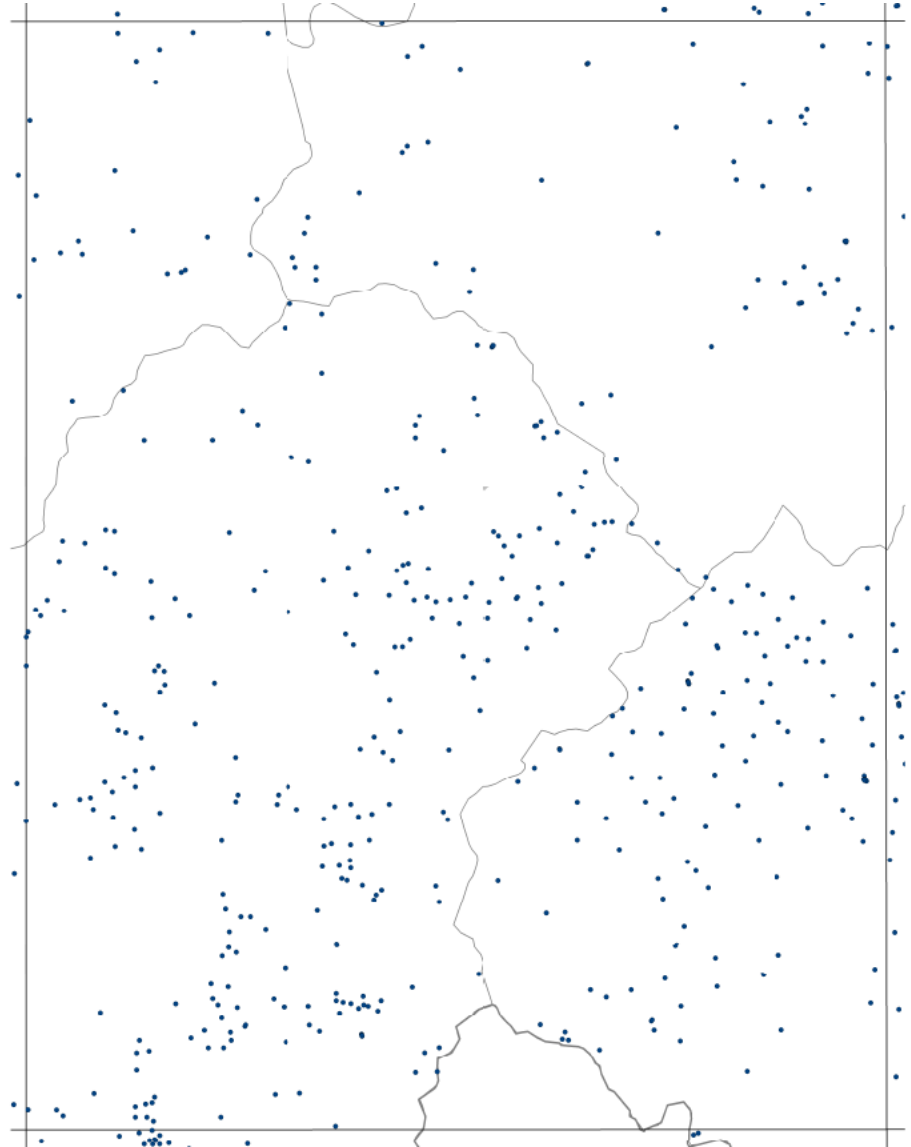
Ethane Storage Could Bring 100,000 Jobs to the Ohio Valley

WVU study looks at possible \$36B investment

Tyler County Case Study:



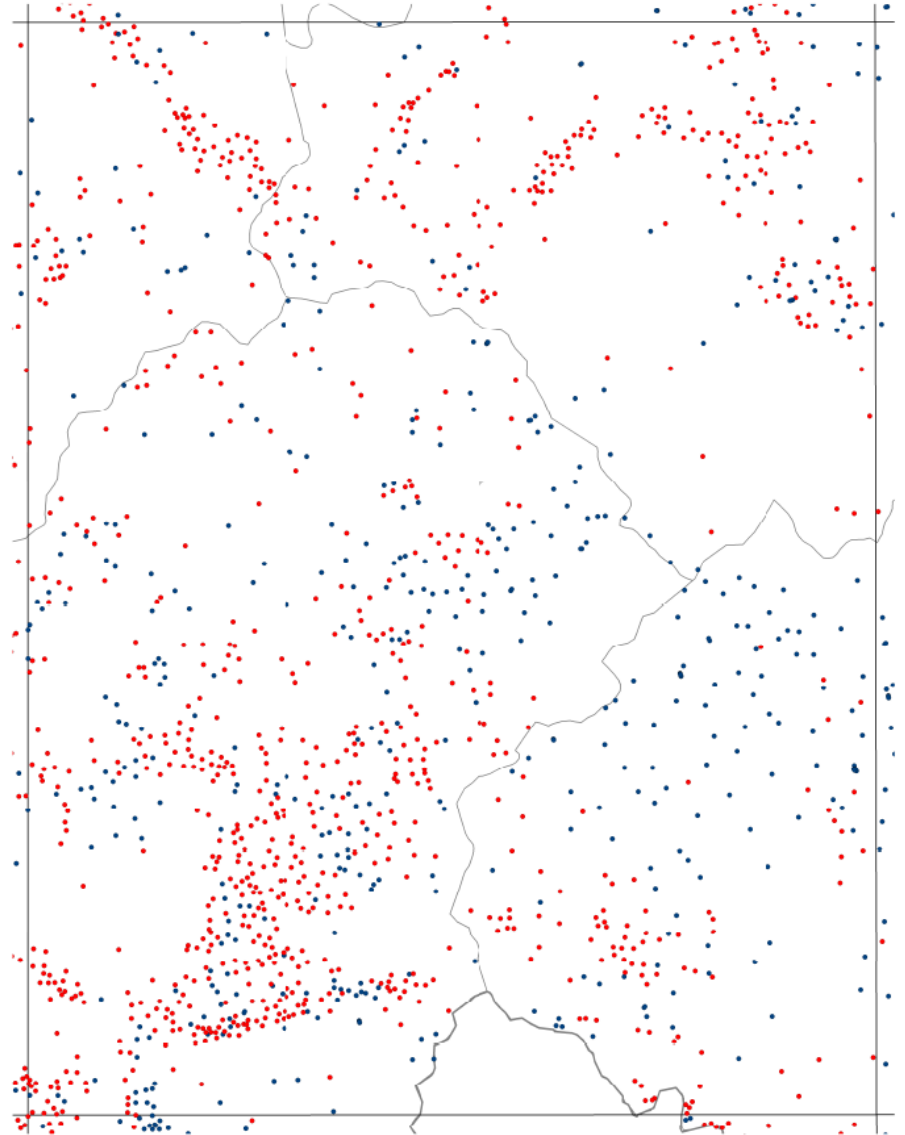
- A single Quadrangle located in Tyler County, West Virginia.
- Map of all publicly available vertical oil and gas wells (IHS, Drilling Info, etc.).



Tyler County Case Study:



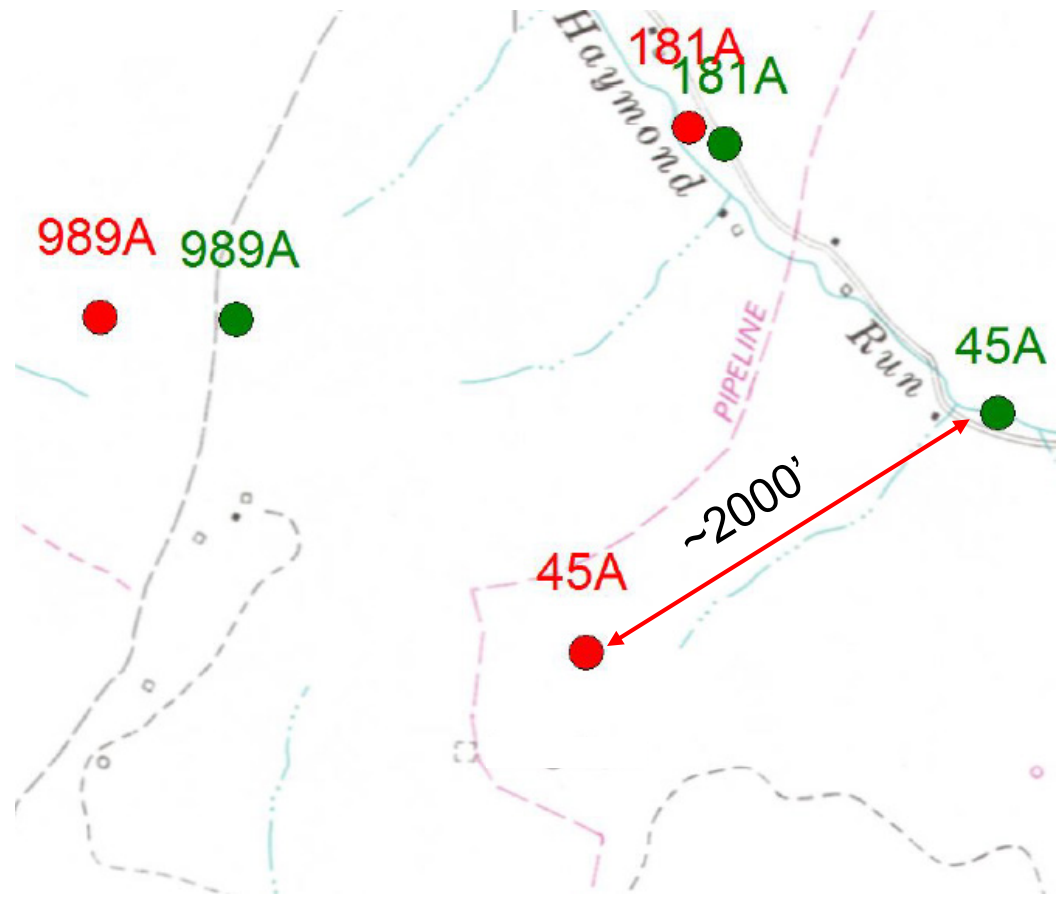
- A single Quadrangle located in Tyler County, West Virginia.
- Map of all wells in Quad using multiple proprietary sources.
- Wells only added that could be cross referenced with more than one source.
- 4300 added just in Tyler County.



Tyler County Case Study:



- Additionally most old wells that are publicly available are mapped incorrectly.
- The reason is that the old wells were originally spotted so many miles West and South of 15' Quadrangle X or Y instead of feet.
- Well spots in red are the ones obtained via WVGES, IHS, etc.
- Well spots in green are actual locations based on proprietary maps that also use historic lease lines & property boundaries.



Why are we doing this?: We want this..



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MARCH 09, 2018

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PARKERSBURG NEWS & SENTINEL**

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Not this.....



- 2001 Hutchinson Kansas
- Gas from solution mined salt cavern (propane storage) migrated 7 miles.
- Caused by casing leak in storage field.
- Encountered multiple, improperly abandoned and unknown old wells.
- 2 fatalities, town of 41,000 people evacuated for several months.
- The existence of old, improperly plugged wells must be accounted for.
- Not an insurmountable obstacle.
- Just requires work....



Photo by Hutchinson Fire Department.

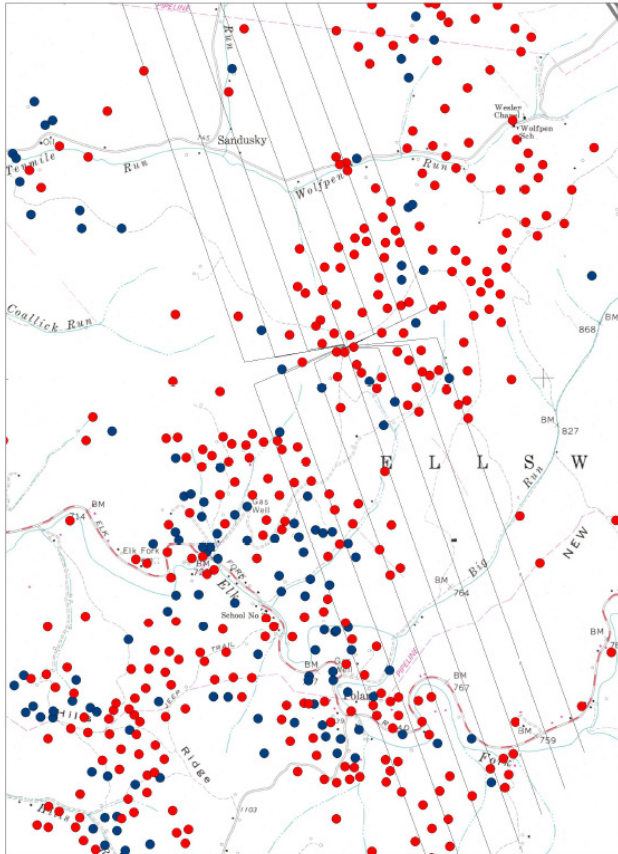


Photo by CUDD.

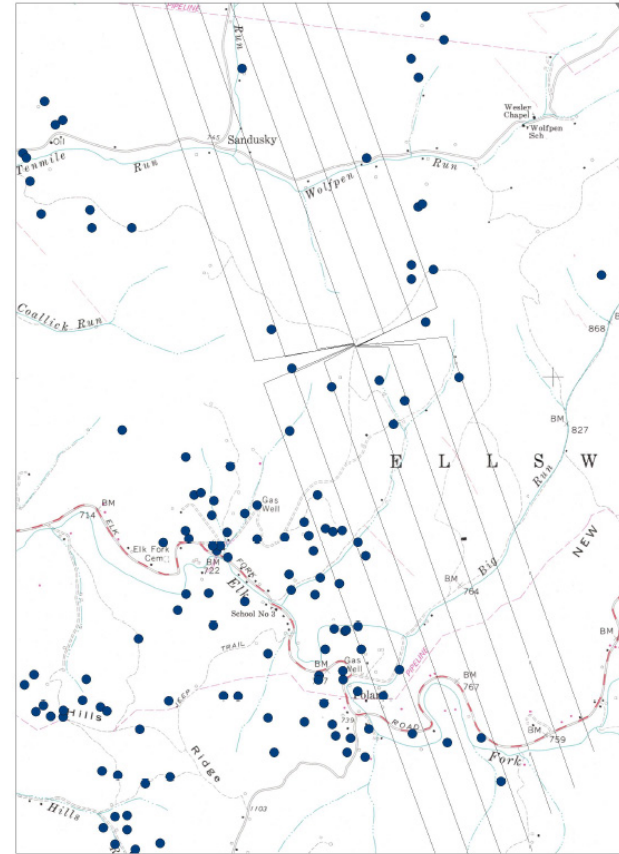
Pad Location Selection:



Well Spots from Historic Operator Maps



Publicly Available Well Spots



Conclusions:



- **There are thousands of “unknown an unlocated” oil and gas wells in West Virginia.**
- **Over 4,300 just in Tyler County, West Virginia.**
- **Many, if not most, that are known are spotted incorrectly.**
- **We are creating a digital well spot database that locates these well spots (known and unknown) using a wide variety of historic data sources.**
- **Our dataset is by no means the end all be all.**
- **Its another source of information that can be used to mitigate and manage risk associated with storage field candidate selection and horizontal drilling.**

Questions:



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Appendix:



Why are we doing this?:



- NPR story from 2015 Harrison County, WV.
- Picked up by multiple “anti” news outlets.
- Landowner claimed Marcellus well that’s toe was ½ mile from this location caused old well to blow cement plug out while frac’ing.
- Lots of moss on this “plug”
- There is an element of the public that will attribute anything unusual to industry (either through malice or ignorance).



"It was probably drilled around 1910. It had been plugged. I'm not sure what date. And we discovered in about 2010 or 2011 that this plug was actually blown out of the ground," Dave Hill said.

GLYNIS BOARD / WVPB