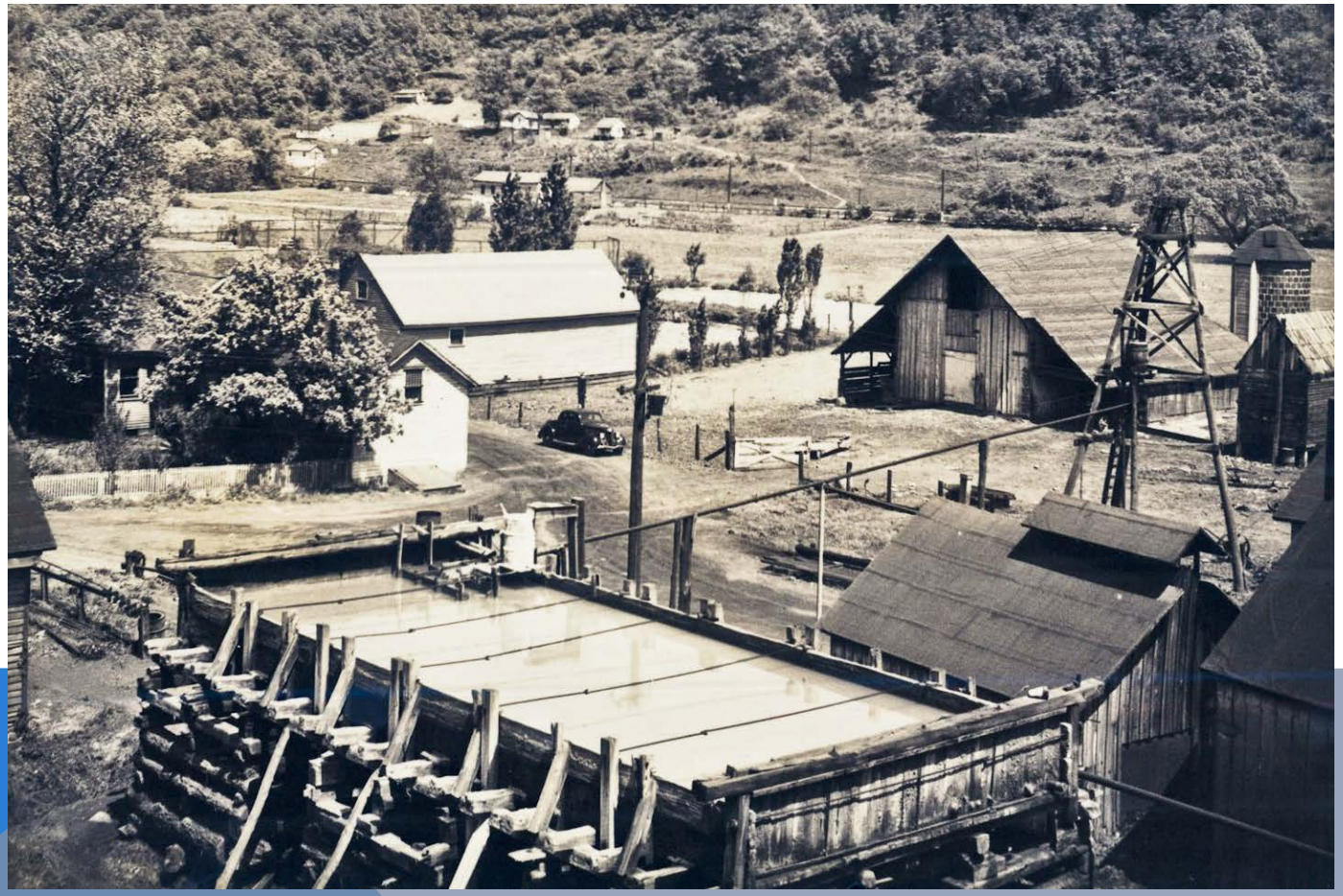
GROUNDWATER TRACING IN MINE POOLS ABOVE THE CABIN CREEK OILFIELD IN KANAWHA COUNTY, WEST VIRGINIA

IN THE BEGINNING THERE WAS SALT



J.Q. DICKINSON SALT WORKS 1938

Nuttall Sandstones

AND NOW WE HAVE SALT AGAIN

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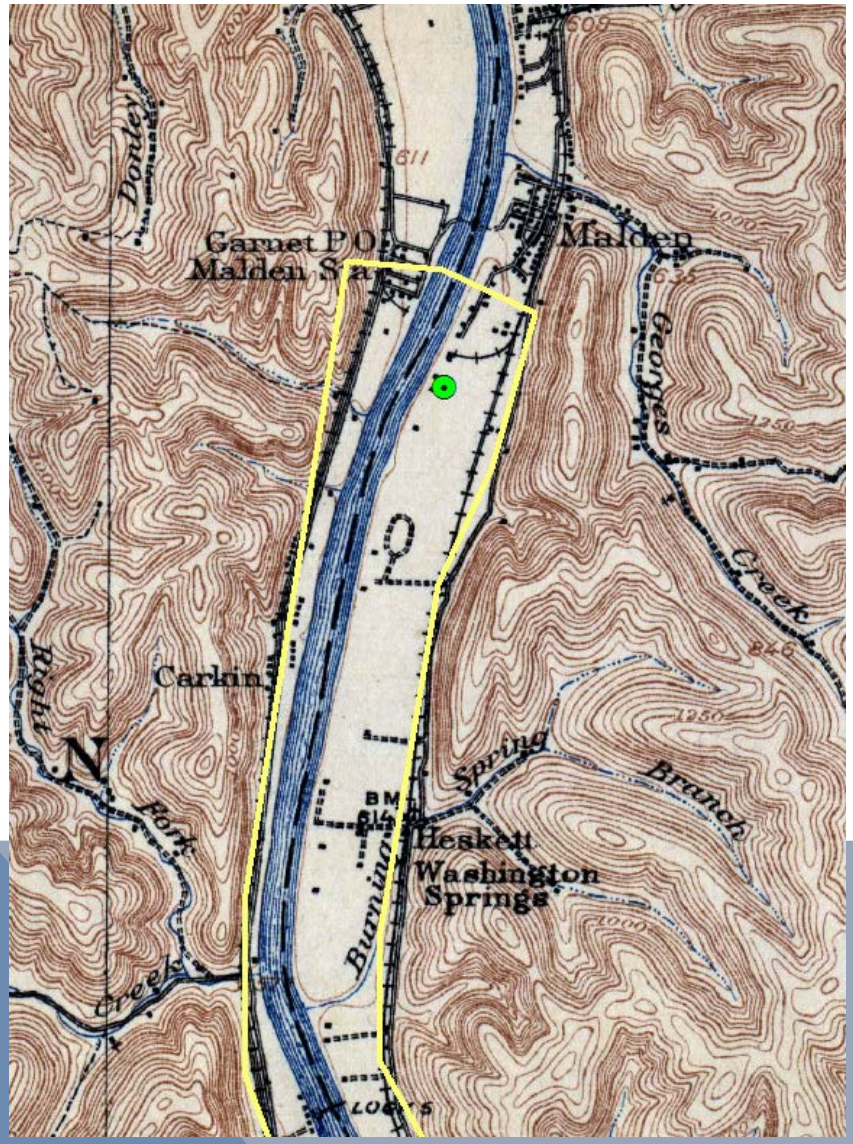
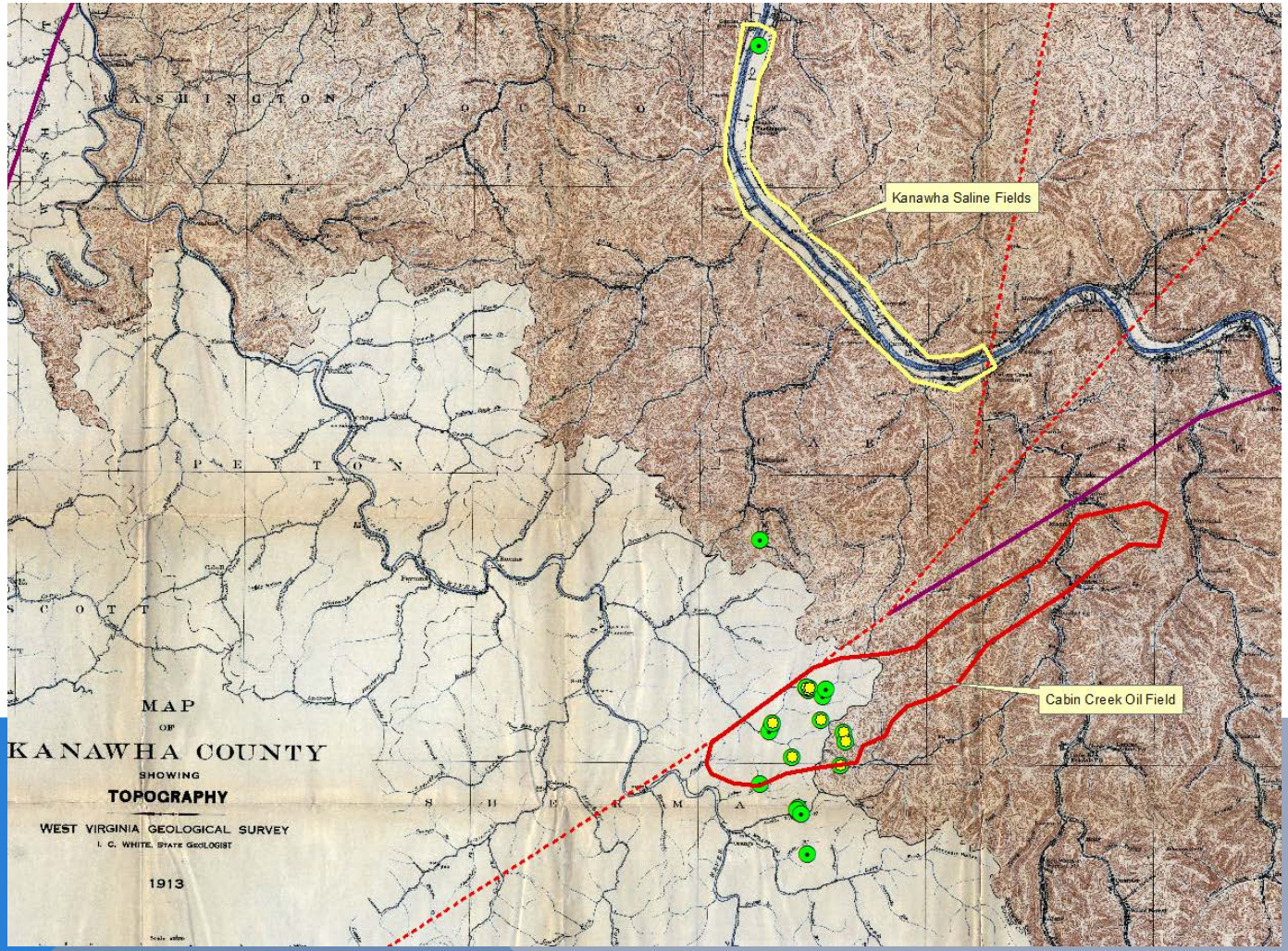
WHICH BEGOT OIL

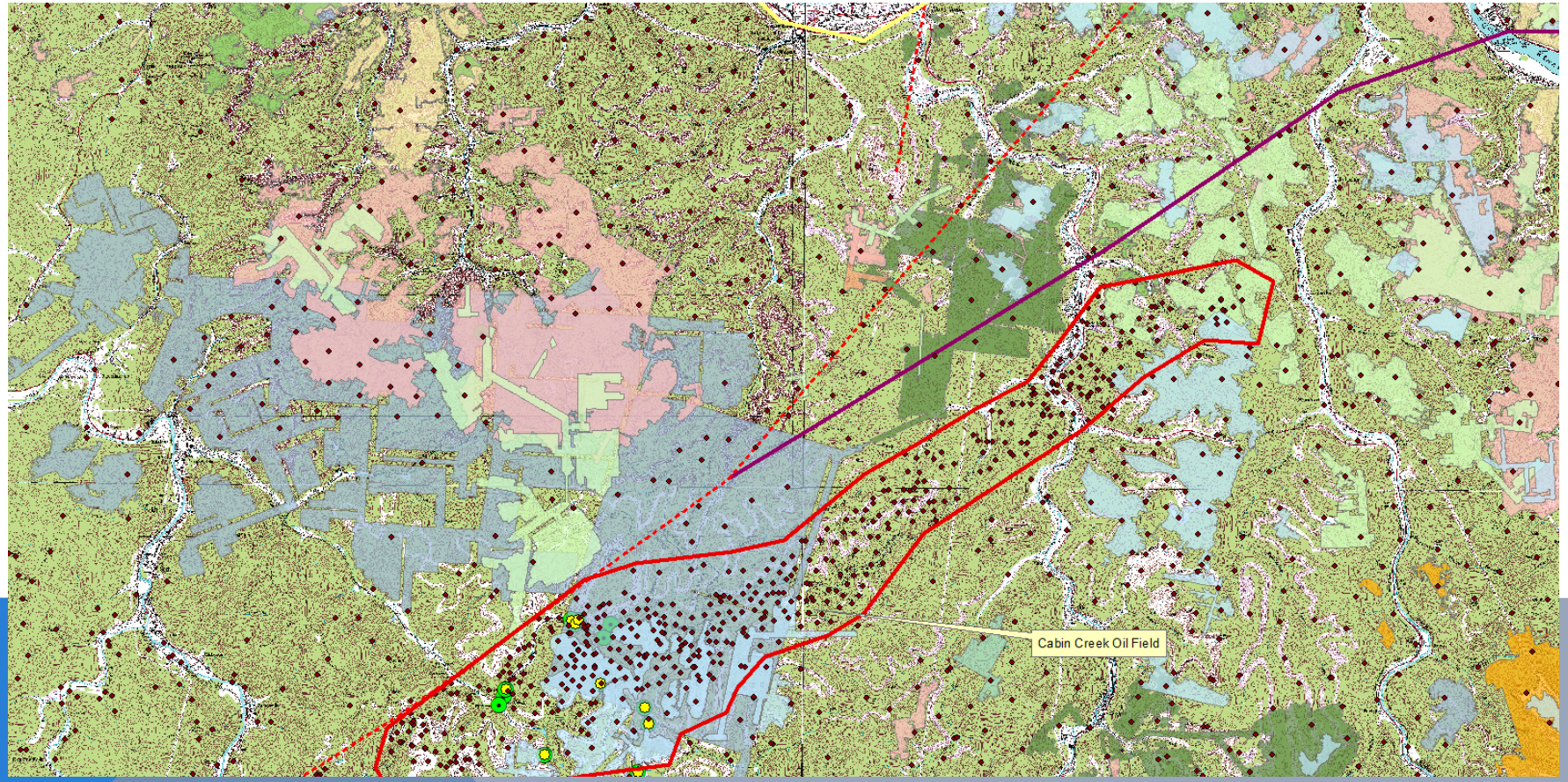


MORE SPECIFICALLY THE CABIN CREEK OIL FIELD

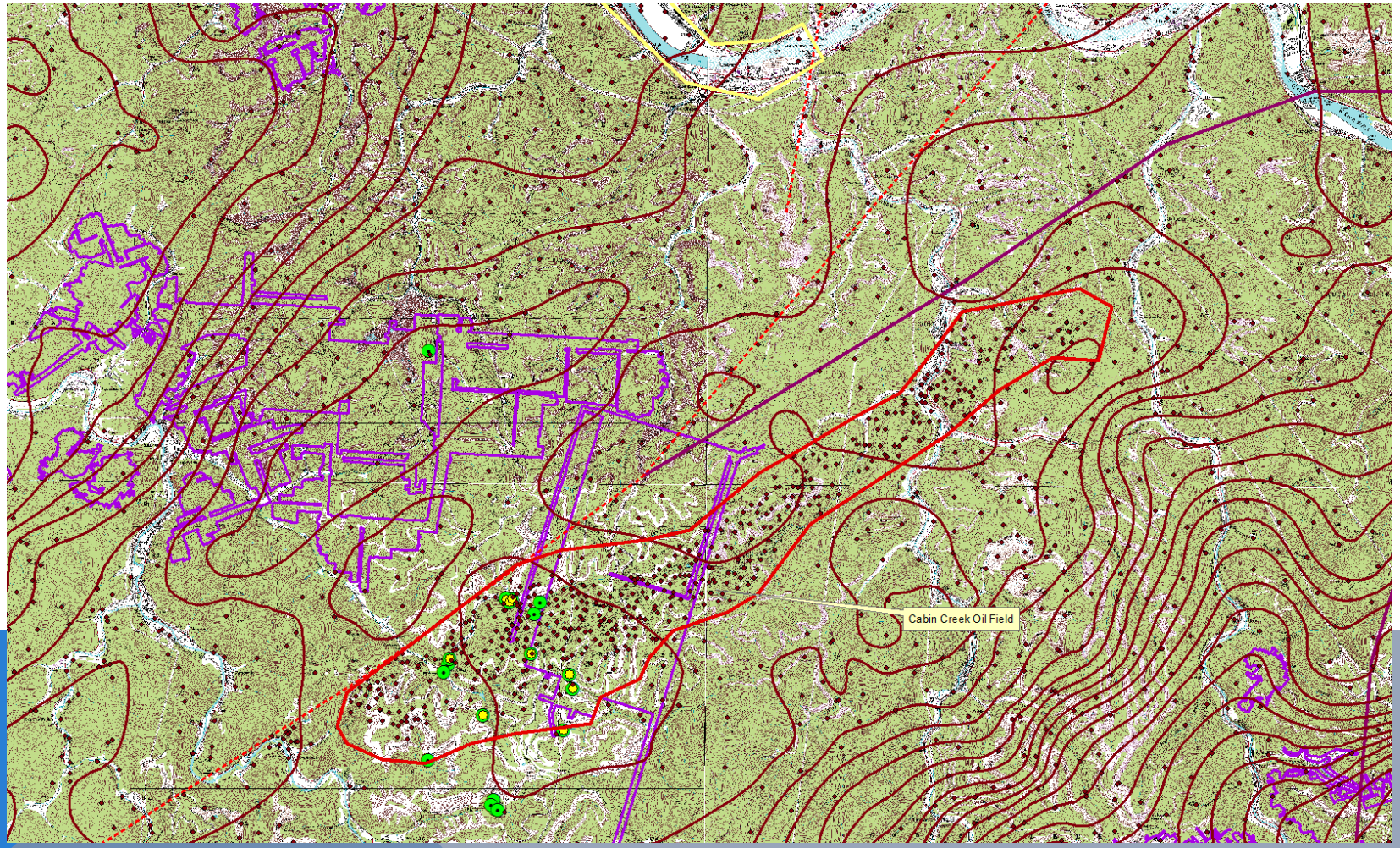


Berea Sandstone

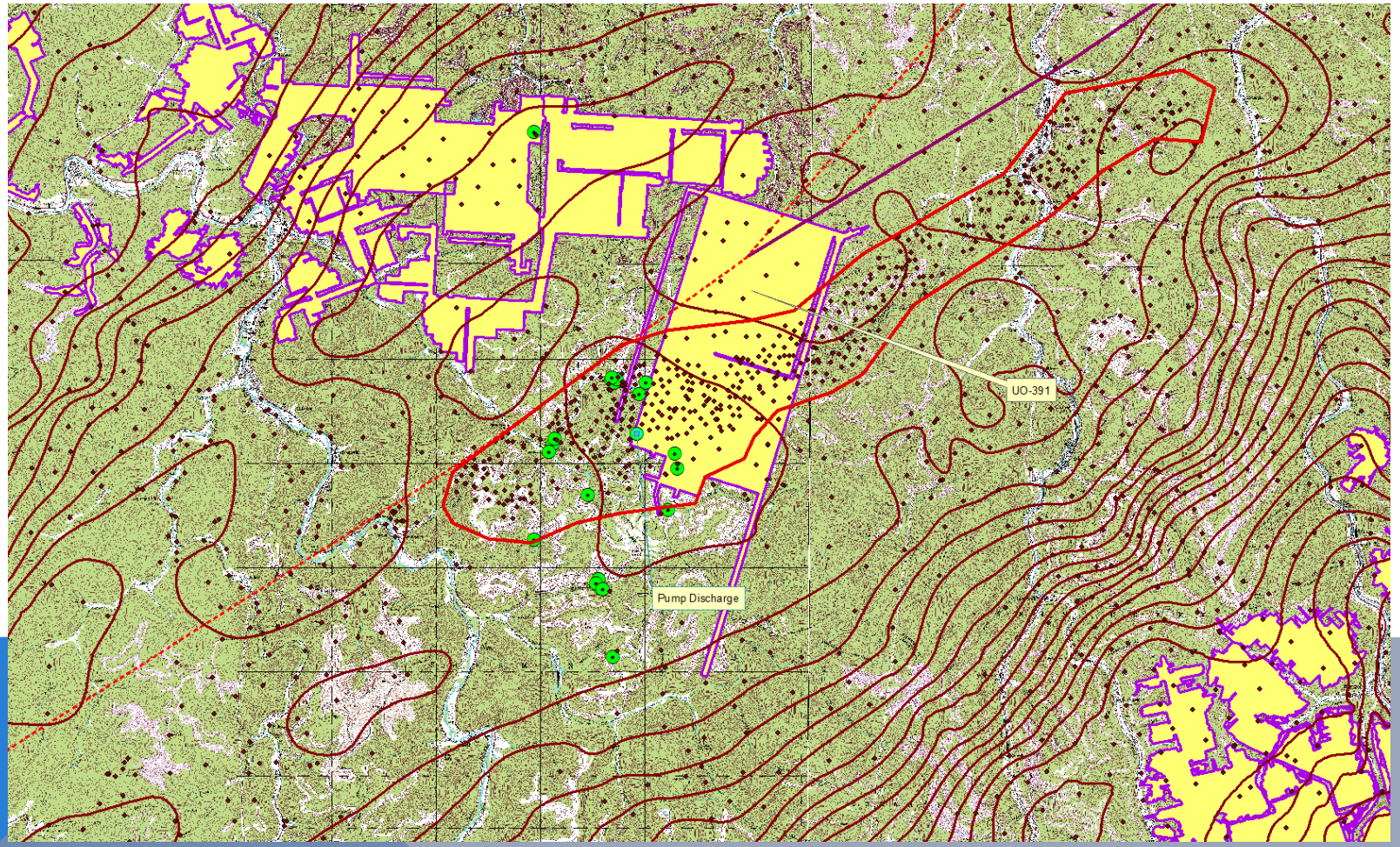
MINE POOLS IN AT LEAST FOR FOUR COAL SEAMS



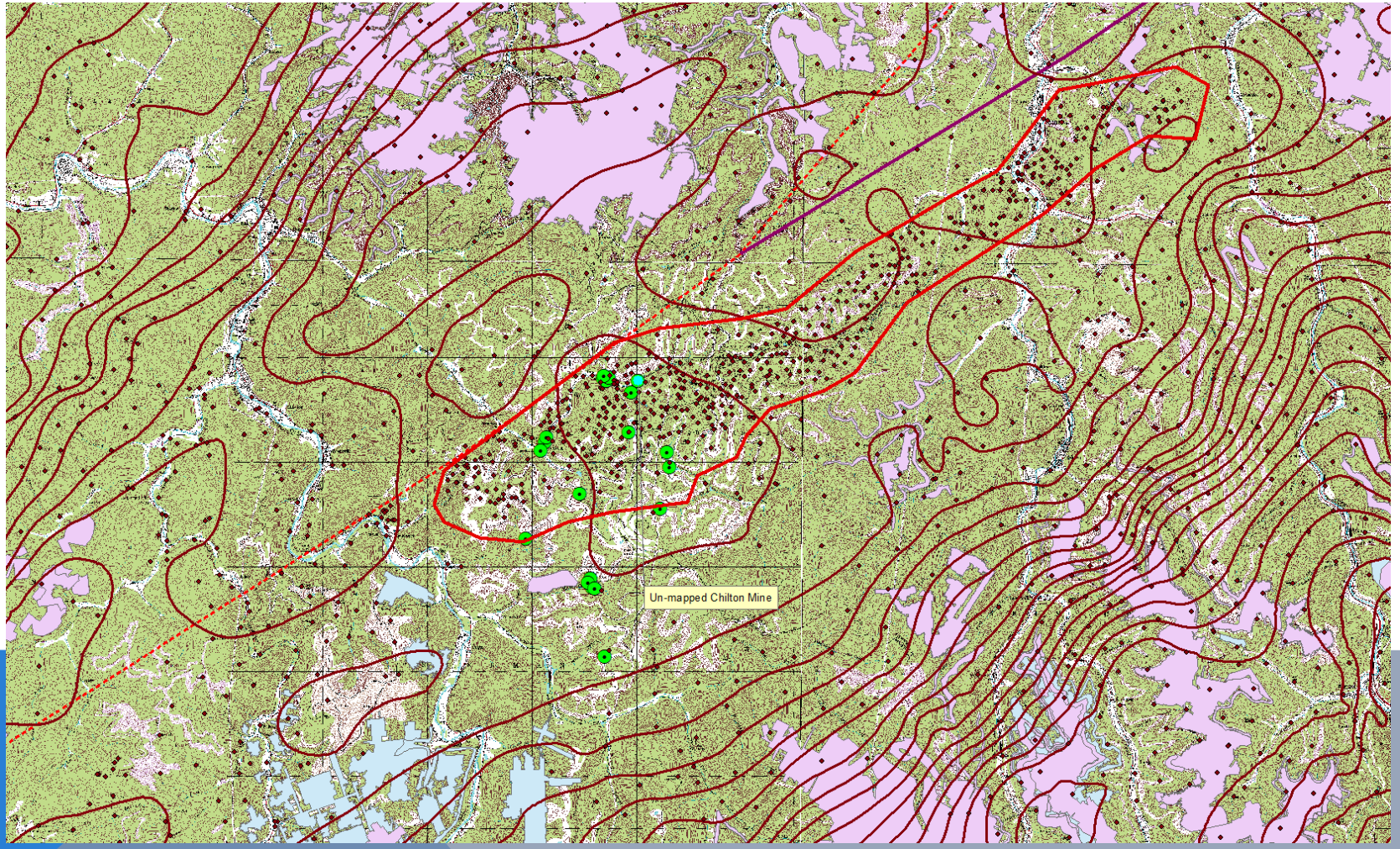
EAGLE COAL SEAM STRUCTURE



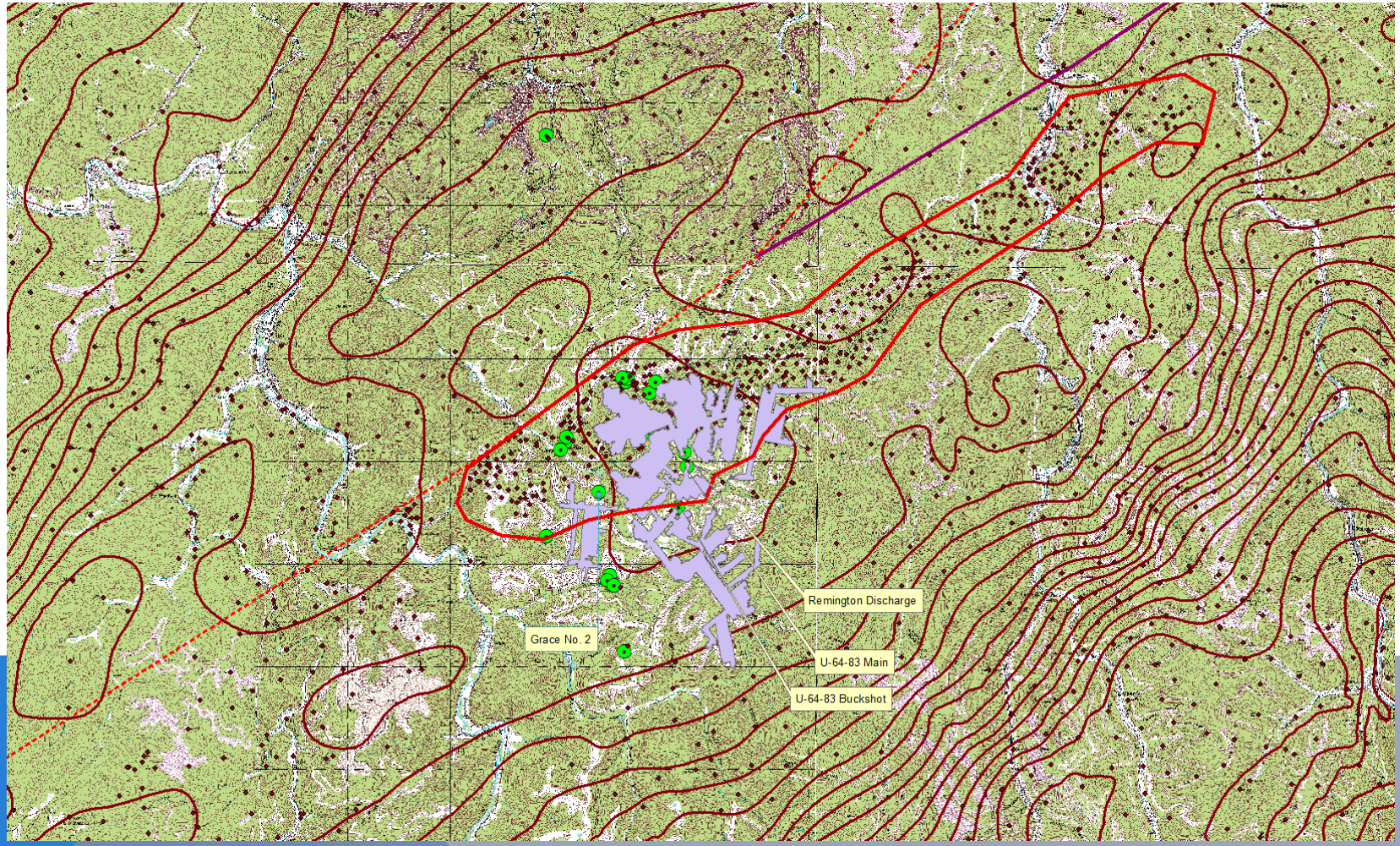
EAGLE SEAM SAMPLING



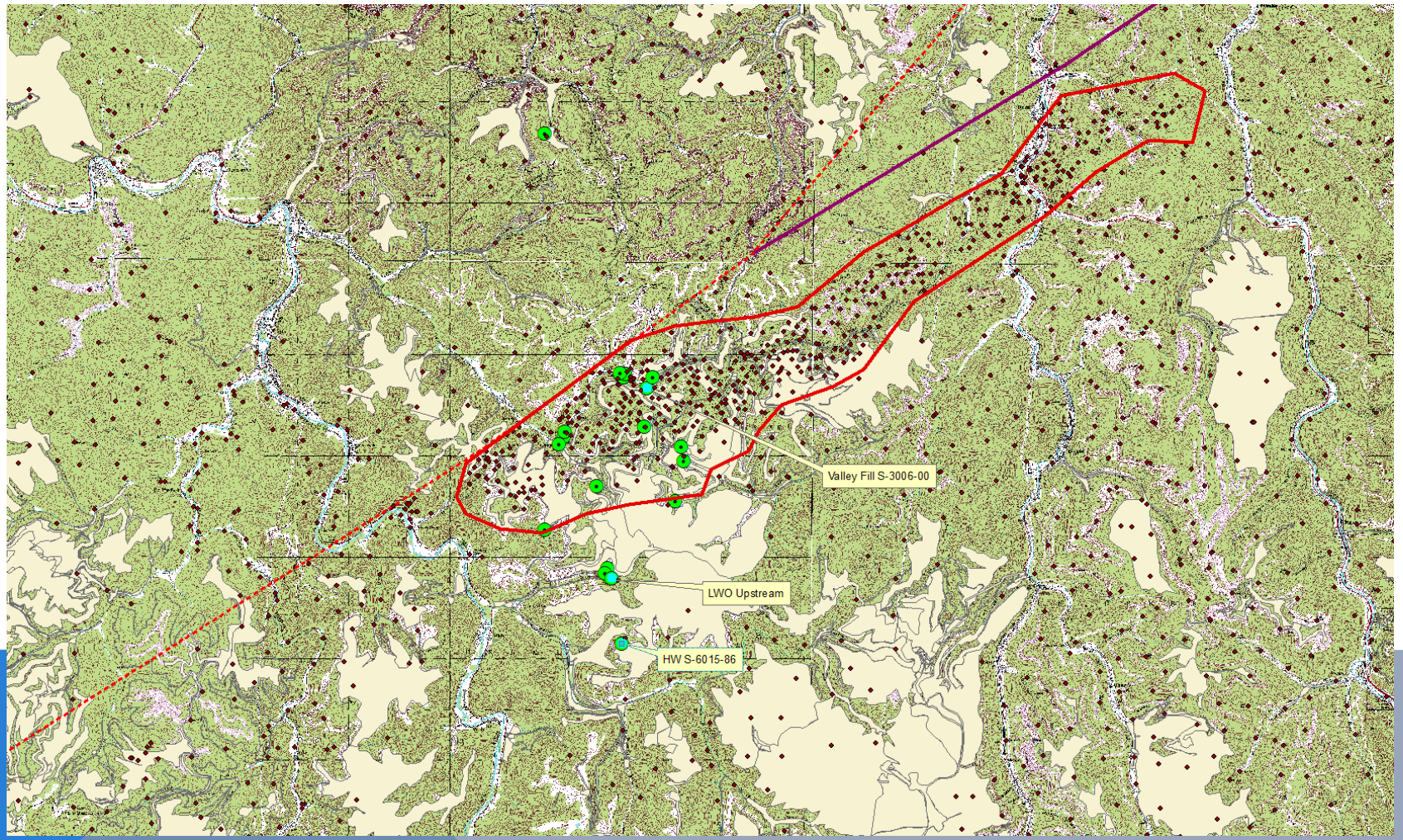
SO CALLED CHILTON



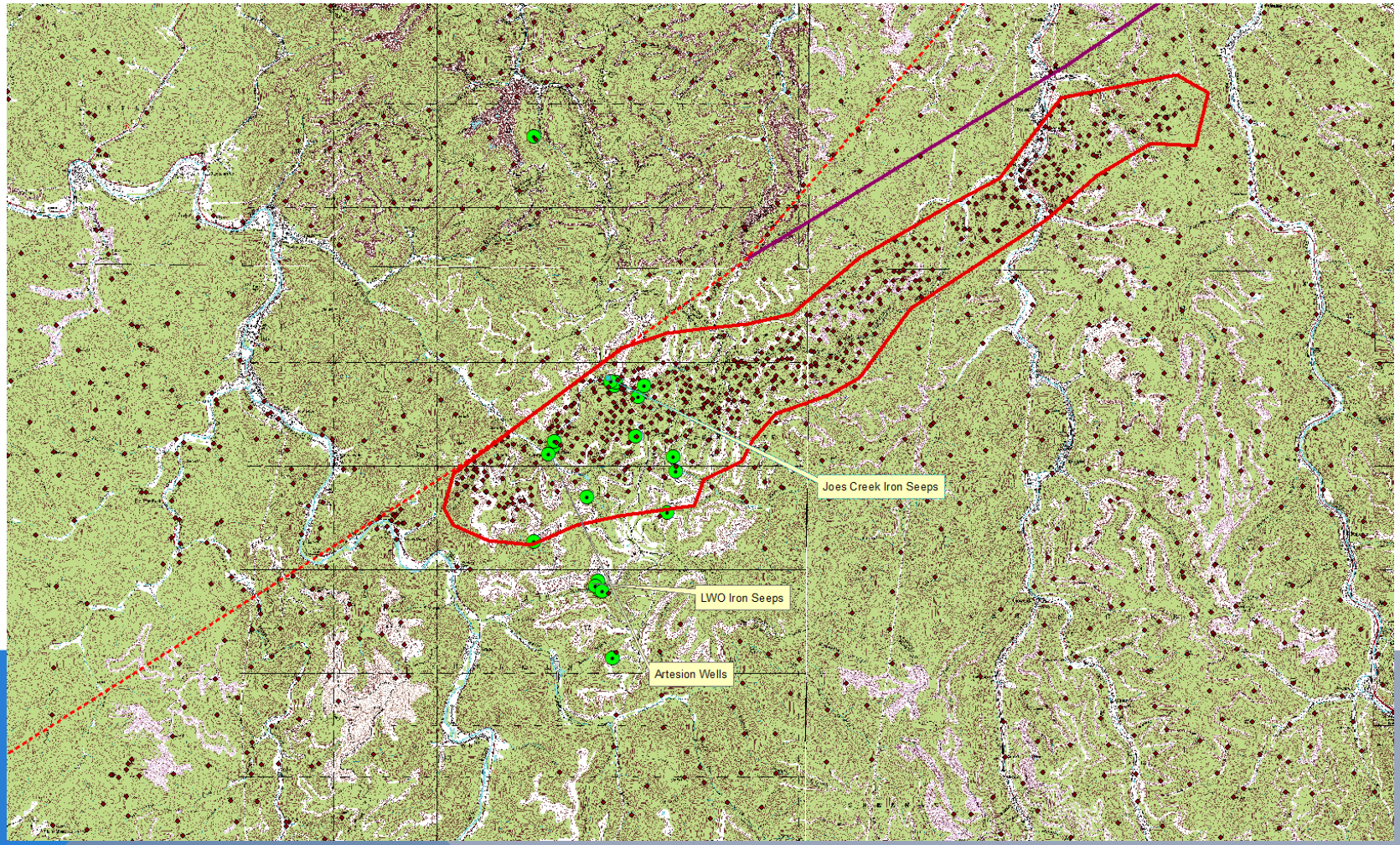
STOCKTON AND STOCKBURG



SURFACE MINING



GROUND WATER SITES



THE ANALYSIS

Cation/Anion

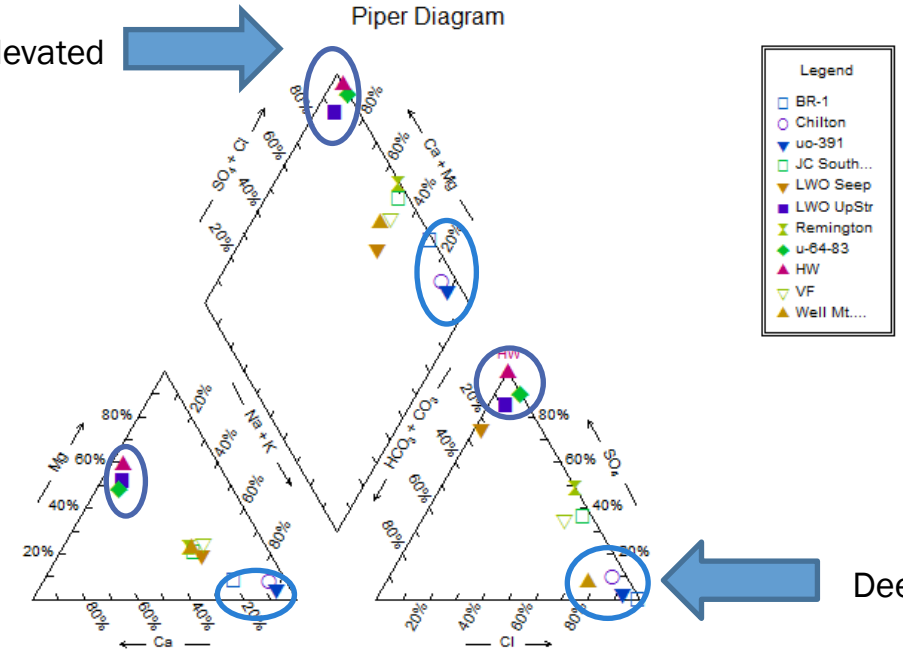
- Magnesium and Sulfate
- Calcium and Carbonate
- Sodium/Potassium and Chloride

Tracer Elements

- Barium, Strontium, and Bromide
- Selenium

PIPER DIAGRAM

Shallow and Elevated

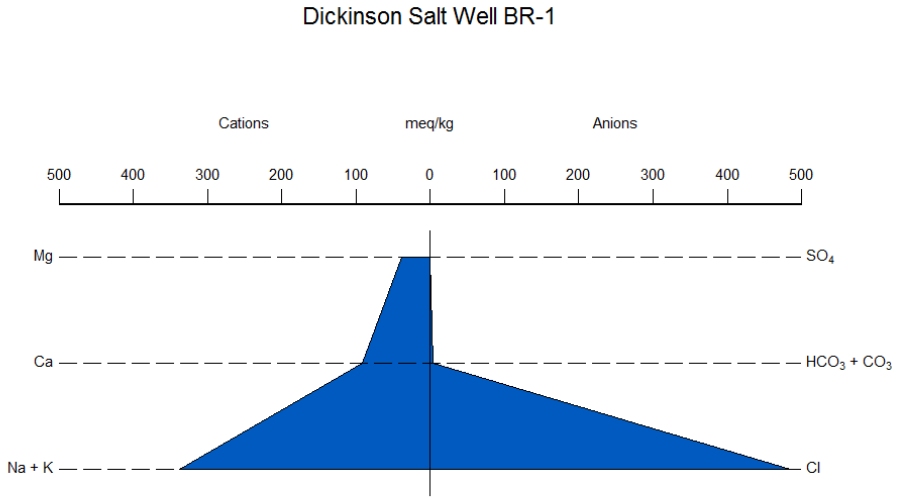


Deep Water

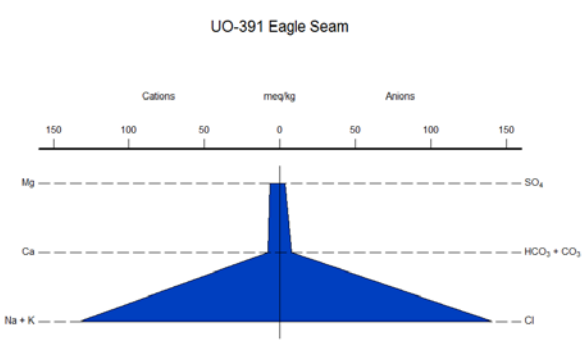
DEEP WATERS

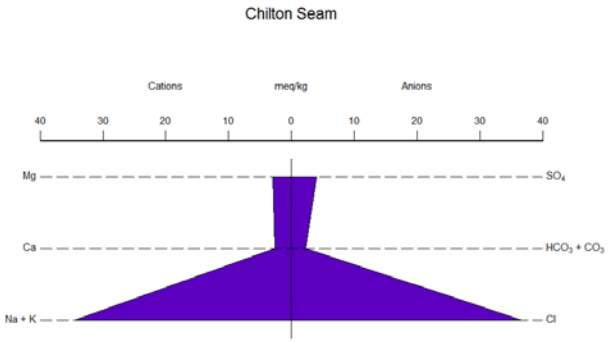
Very High TDS, Na, K and Cl

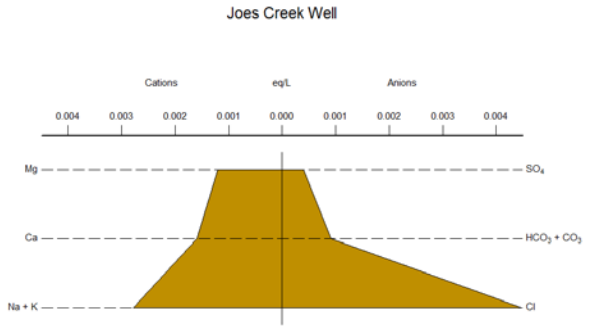
Very High Barium, Strontium and Bromide
Very Low Selenium



DEEP SOURCE MINE POOLS AND JOES CREEK WELLS



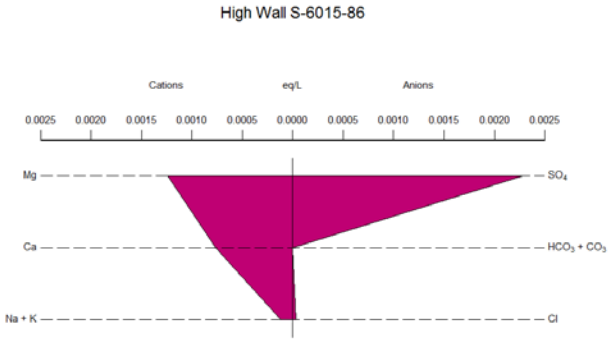


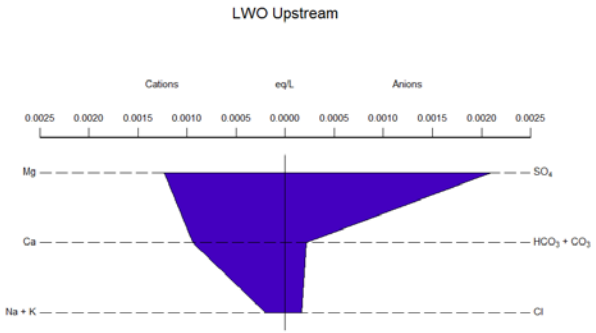


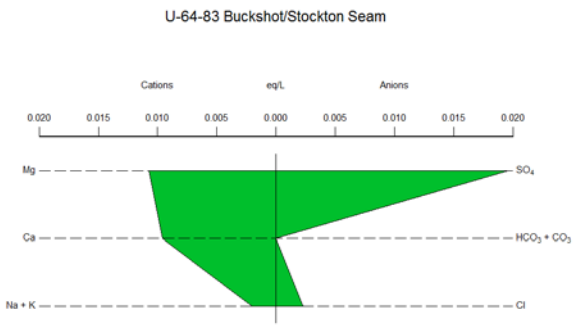
Progressively Higher TDS, Na, K and Cl with increasing depth.

Likewise Barium, Strontium and Bromide

SURFACE MINE AND ELEVATED MINE POOL DOMINATED IMPACTS



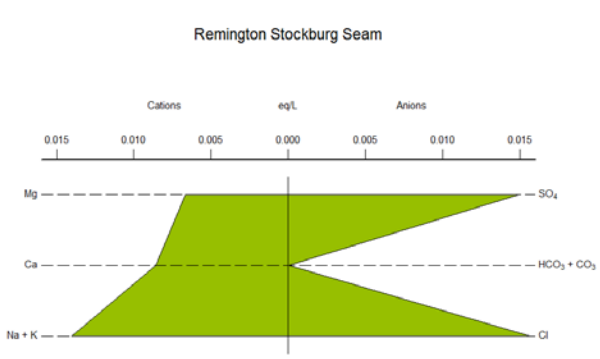


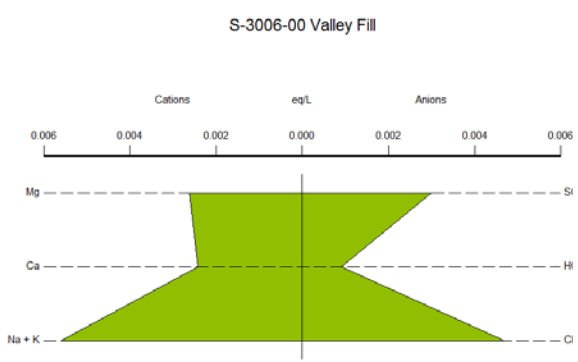


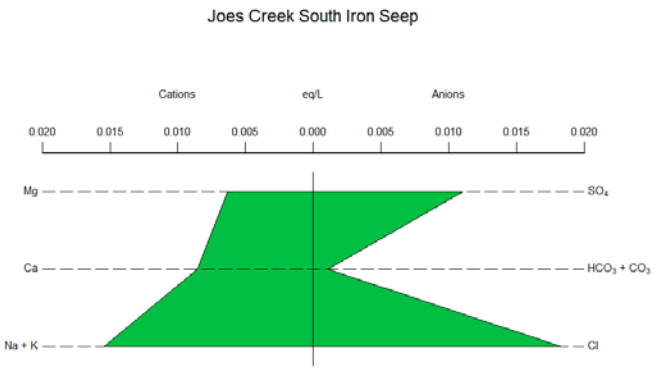
High Sulfates and elevated Magnesium and Calcium

Low Barium, Strontium and Bromide

ELEVATED POOL WITH DEEP WATER INFLUENCE



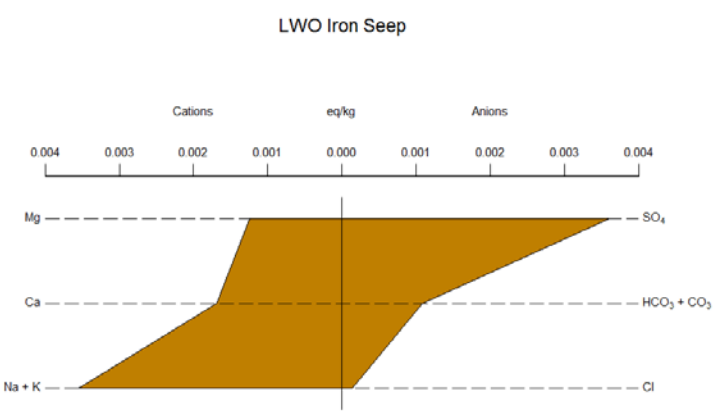


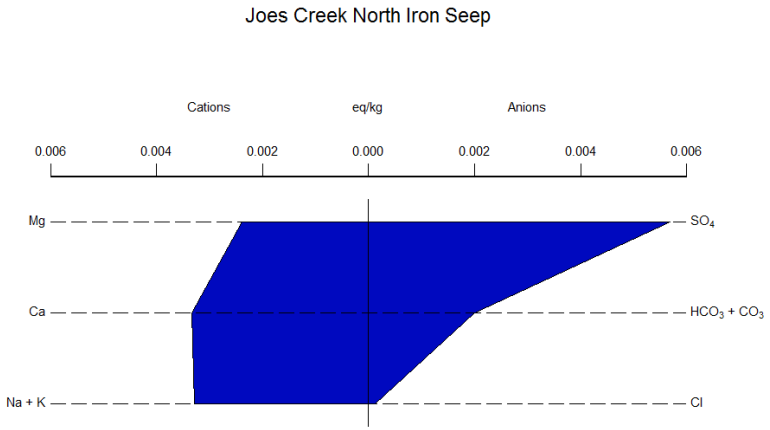


LOOKING ACROSS JOES CREEK

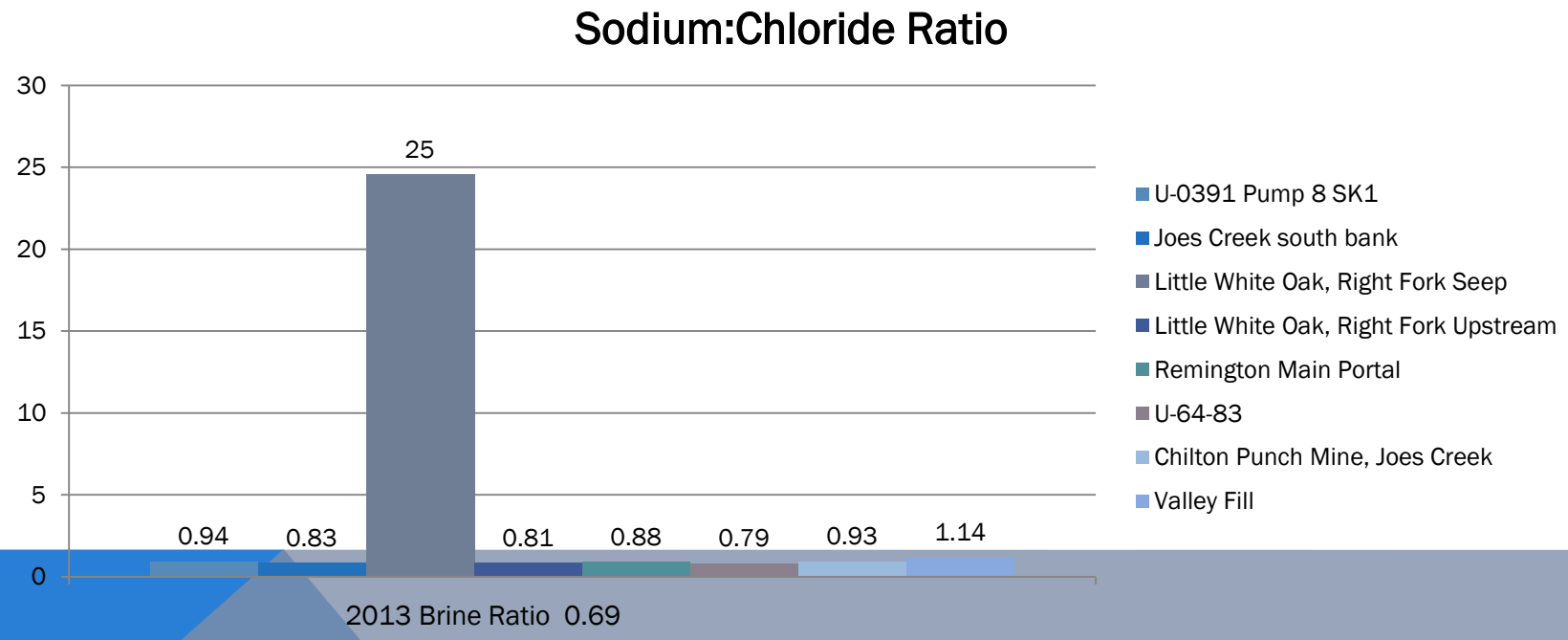
https://www.google.com/maps/@38.1054799,-81.5443866,3a,75y,236.25h,89.25t/data=!3m8!1e1!3m6!1s-1MCDZOBWXYY%2FWOJCjRXlITI%2FAAAAAAAADF8%2Flv-HmWxsRaQgqyN-JzNjOg88kj-SZDdlwCLIB!2e4!3e11!6s%2F%2Flh4.googleusercontent.com%2F-1MCDZOBWXYY%2FWOJCjRXlITI%2FAAAAAAAADF8%2Flv-HmWxsRaQgqyN-JzNjOg88kj-SZDdlwCLIB%2Fw203-h100-k-no-pi-0.002033262-ya349.95224-ro3.4524739-fo100%2F!7i5376!8i2688

OLD SOURCE SEEPS

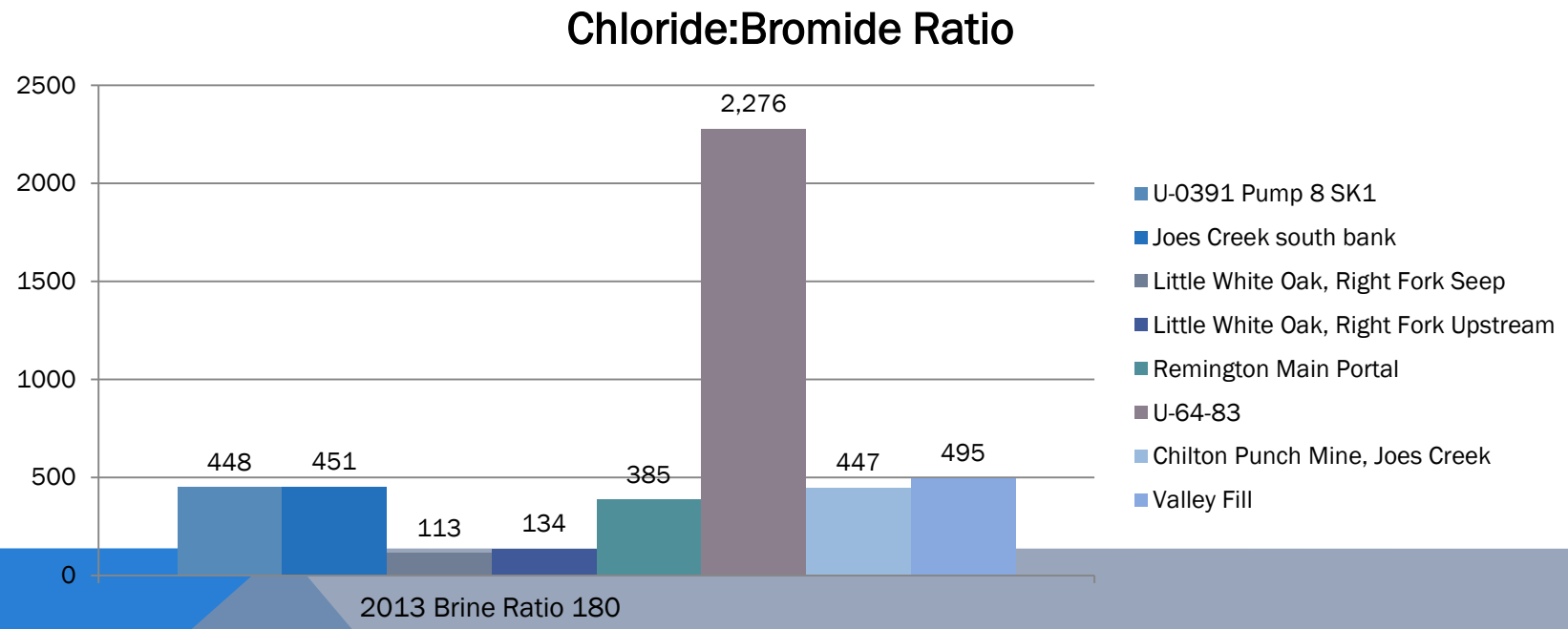




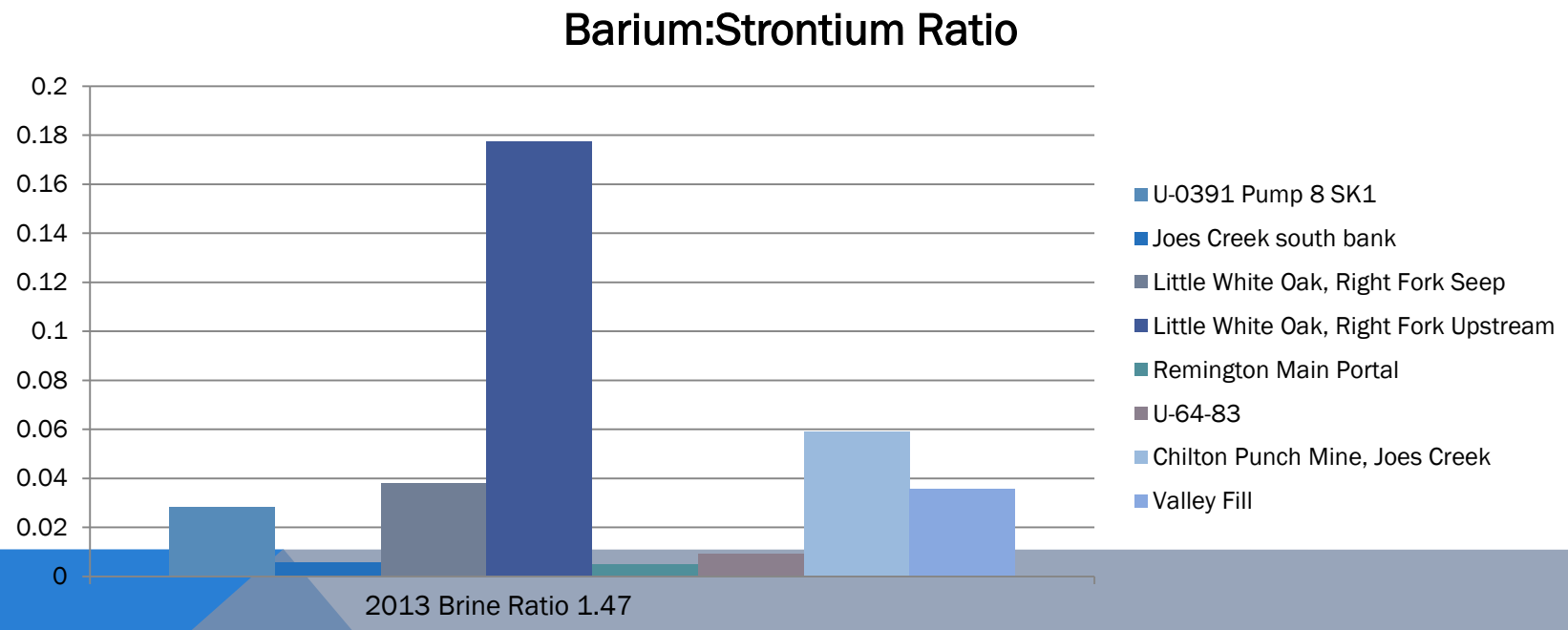
SODIUM TO CHLORIDE



CHLORIDE TO BROMIDE



BARIUM TO STRONTIUM



FINDINGS

1. Groundwater and mine pools show a variety of deep and shallow groundwater influences.
2. Cation/Anion Analysis can greatly help sort shallow and deep source ground water.
3. Barium, Strontium and Bromide levels help further differentiate ground water where shallow and deep source mixing is occurring.

QUESTIONS???