Characterization of Potential Carbon Sequestration Targets in New York State

Brian Slater[1], Alexa Stolorow[1], Langhorne Smith[1]
Kathryn Tamulonis[2], John Conrad[3]
[1]NY State Museum
[2]Cornell University
[3]Conrad Geoscience Corp.

Reservoir Characterization Group
at the New York State Museum

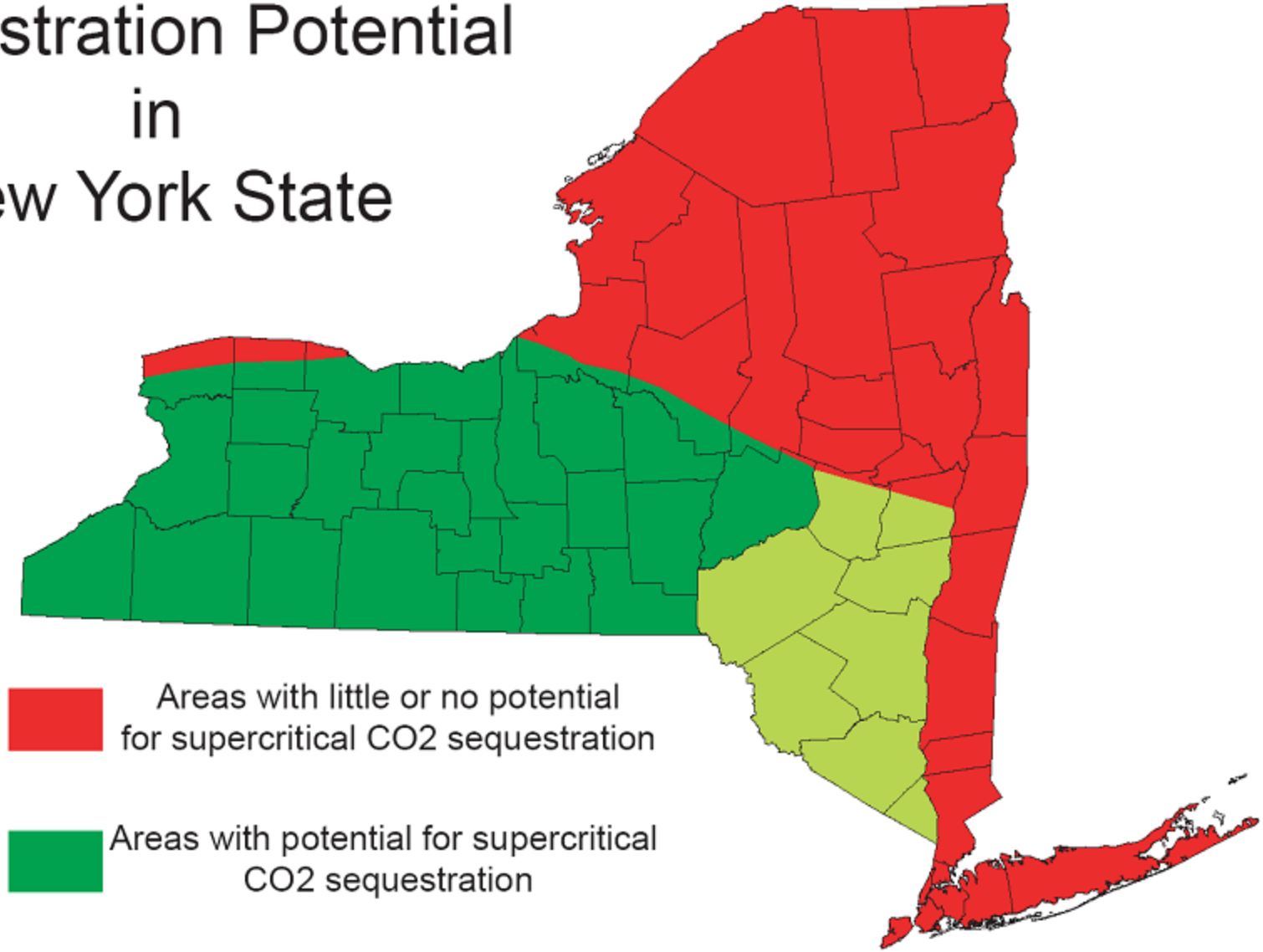
CORNELL UNIVERSITY FOUNDED A.D. 1865

MRCSP
MIDWEST REGIONAL CARBON SEQUESTRATION PARTNERSHIP

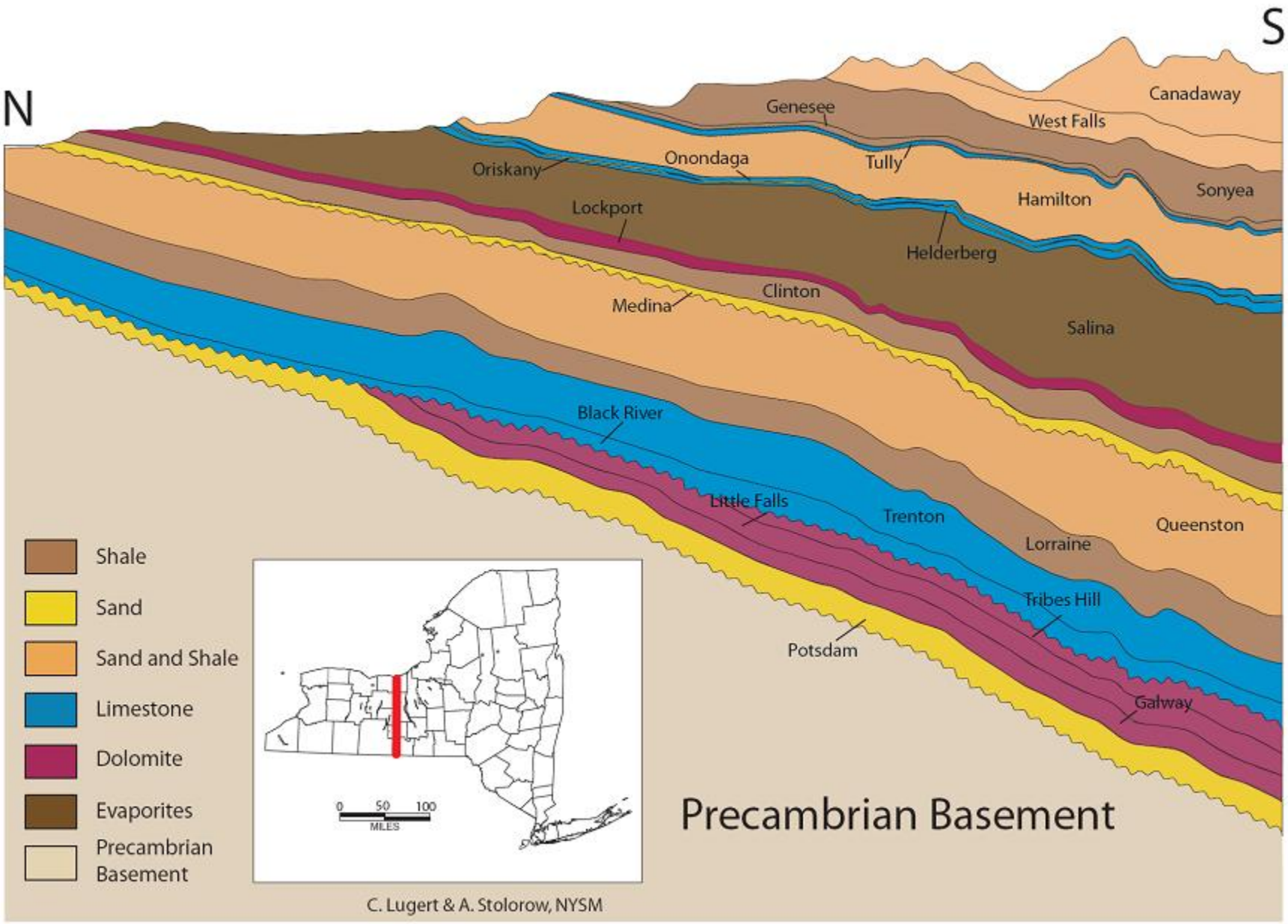
NYSERDA

CONRAD GEOSCIENCE CORP.
ENVIRONMENTAL CONSULTANTS

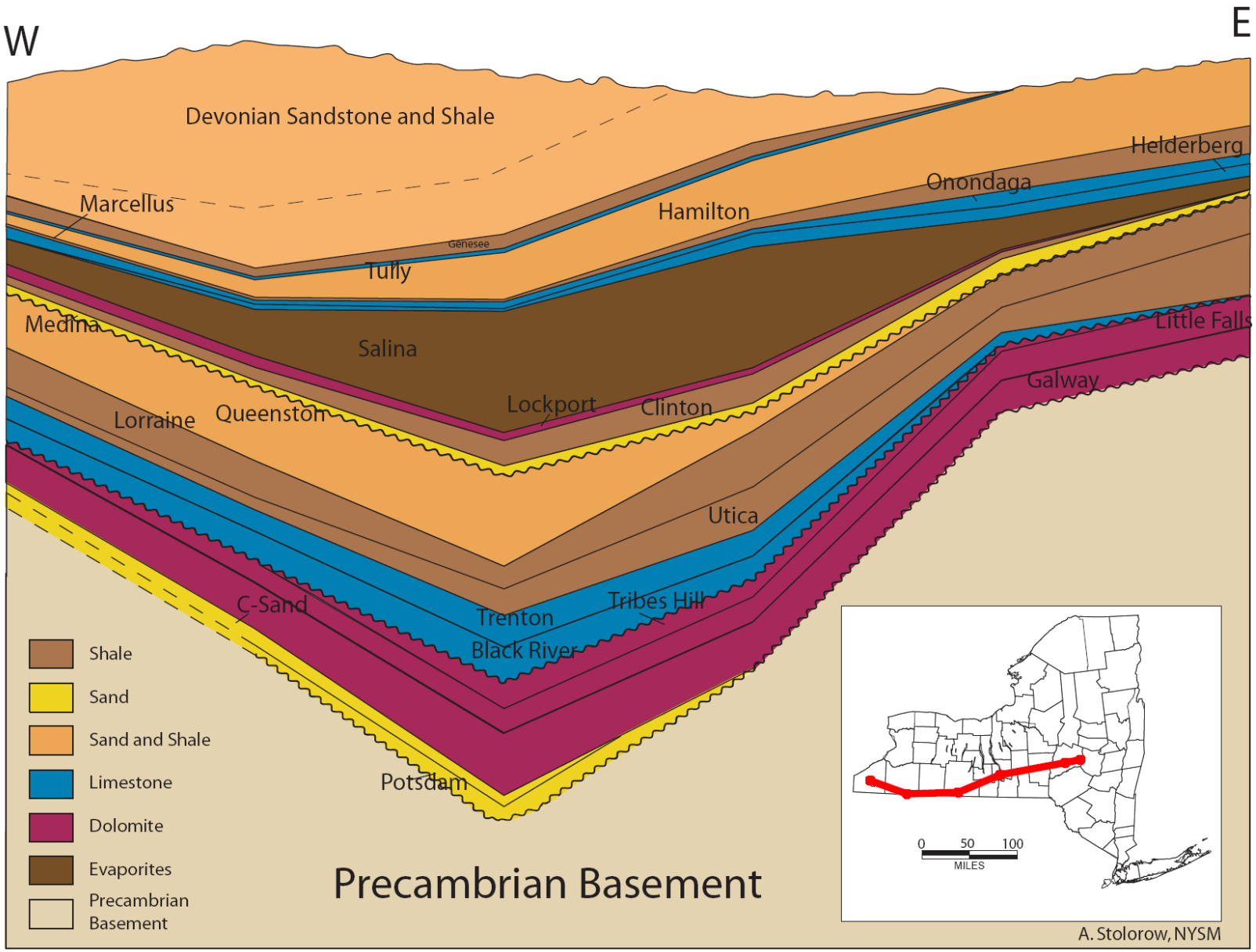
Sequestration Potential in New York State

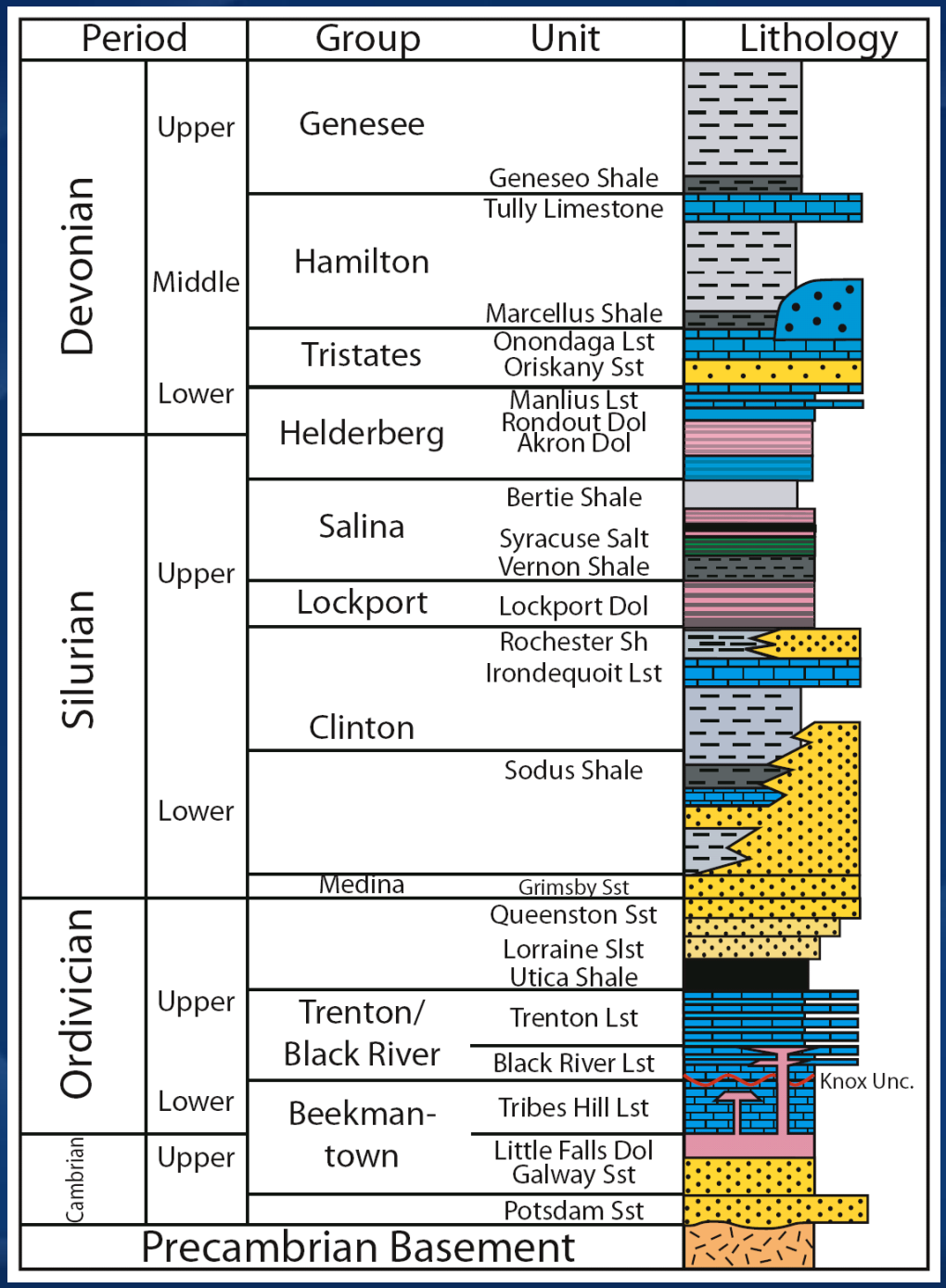


Schematic North-South Cross Section of New York State



Schematic East-West Cross Section of New York State





CAP ROCK

CAP ROCK

TARGET

CAP ROCK

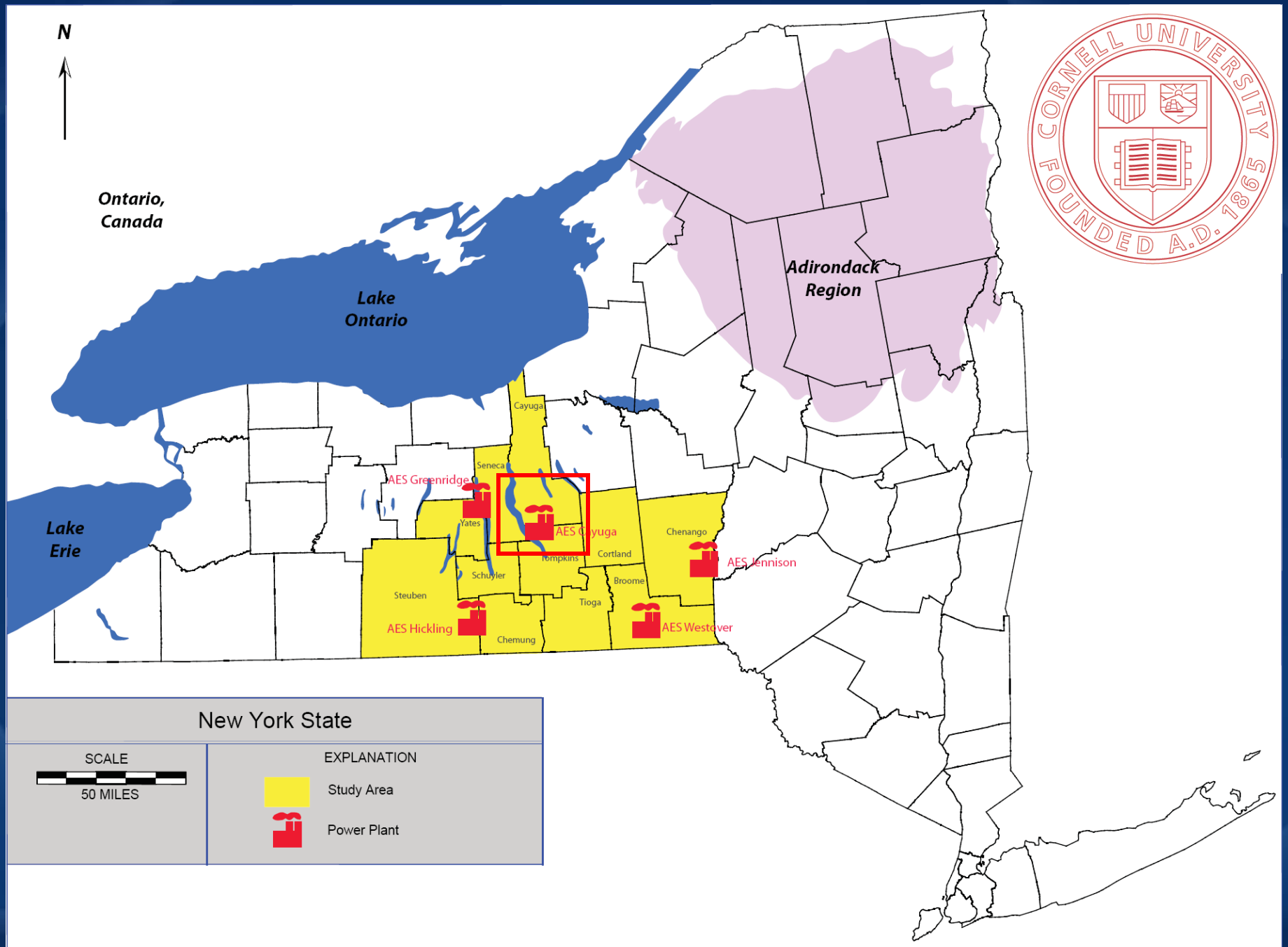
TARGET

CAP ROCK

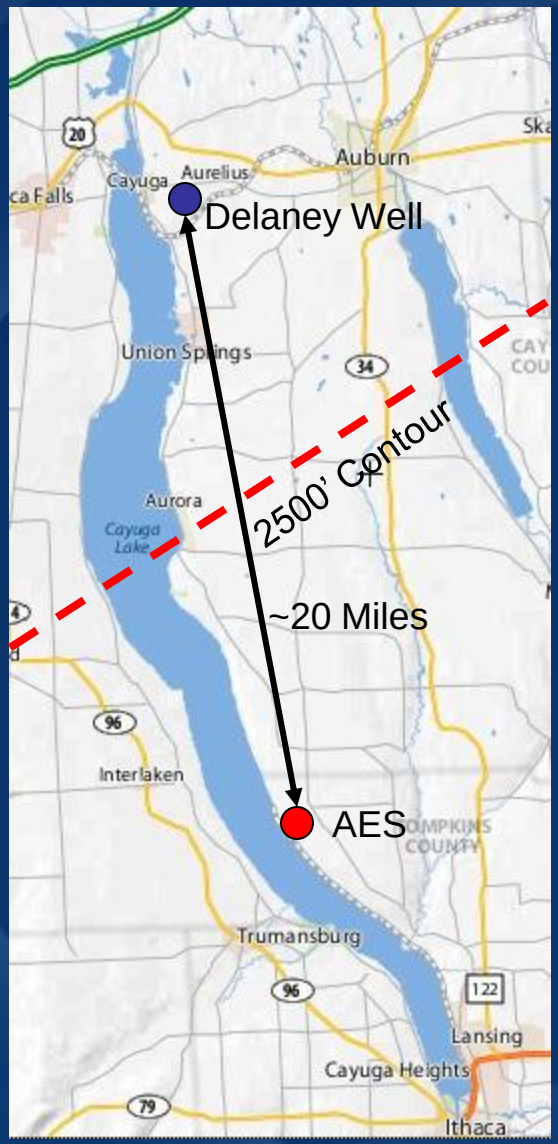
TARGET

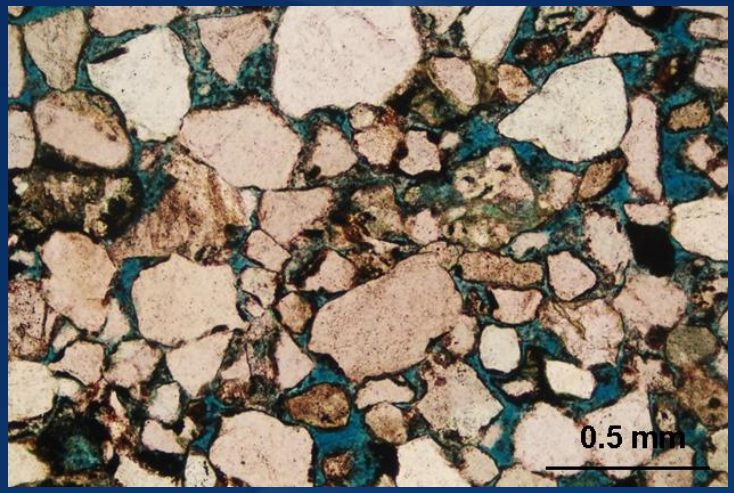
CAP ROCK

TARGET

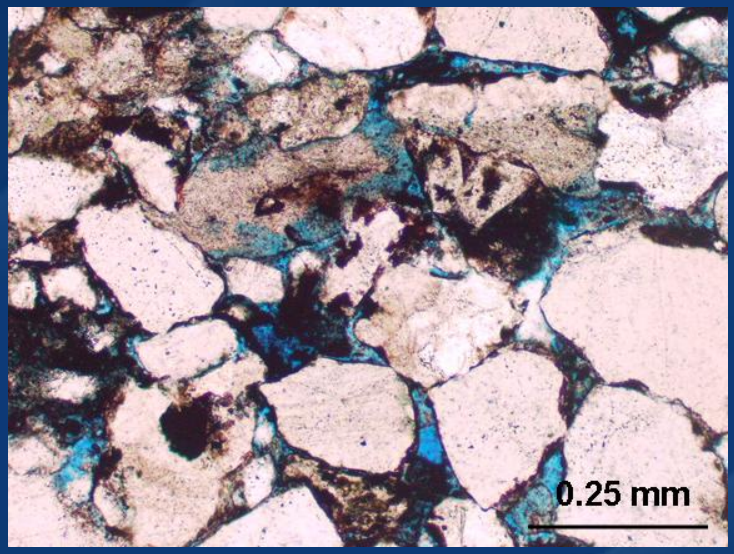

N
Ontario,
Canada
Lake
Ontario
Lake
Erie
Adirondack
Region
Cayuga
Seneca
Yates
Tompkins
Cortland
Schuyler
Steuben
Chemung
Tioga
Broome
Chenango
AES Greenridge
AES Cayuga
AES Jennison
AES Hickling
AES Westover
New York State
SCALE
50 MILES
EXPLANATION
Study Area
Power Plant

Delaney Well (31-011-13645-00-00)



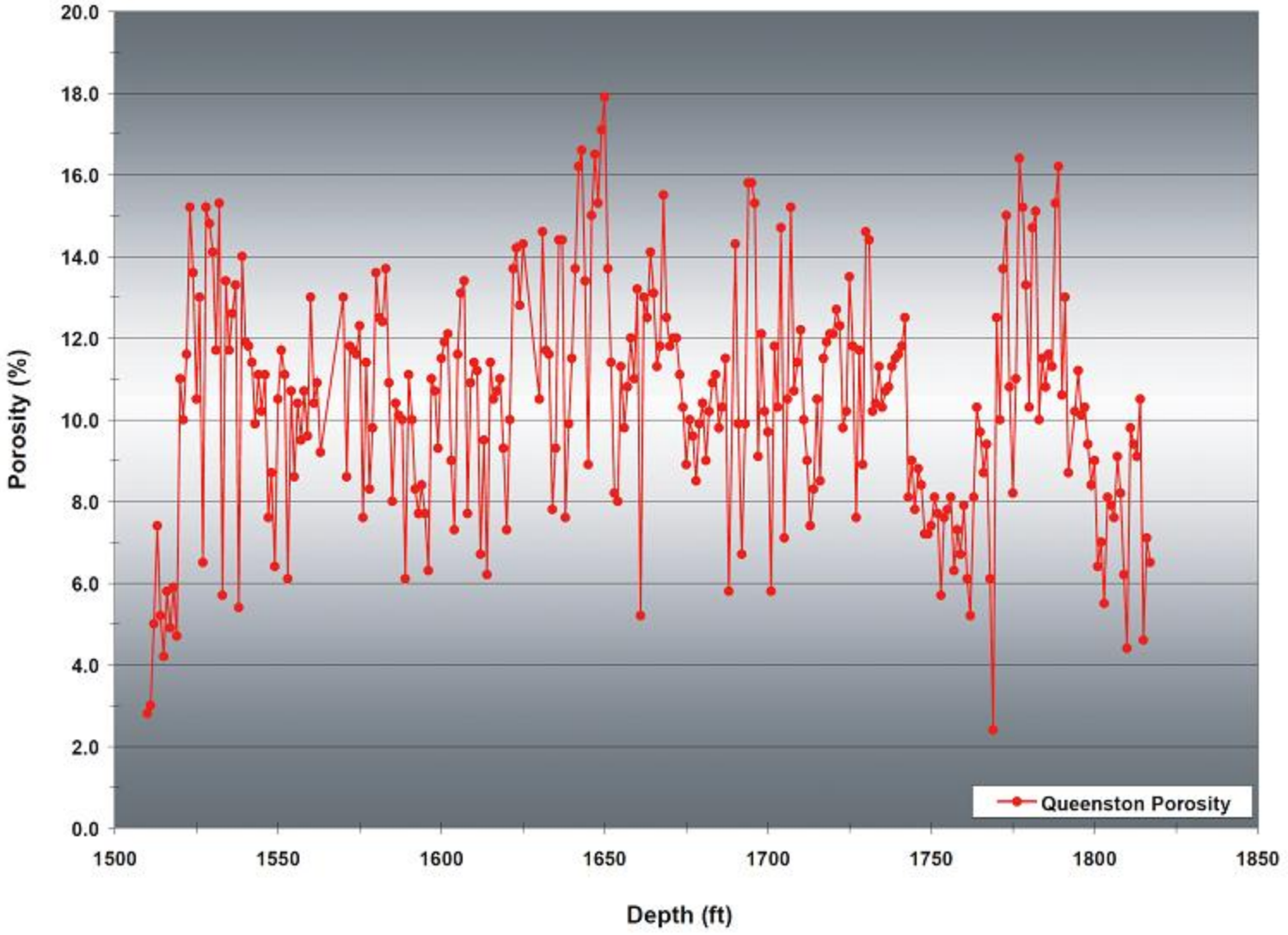


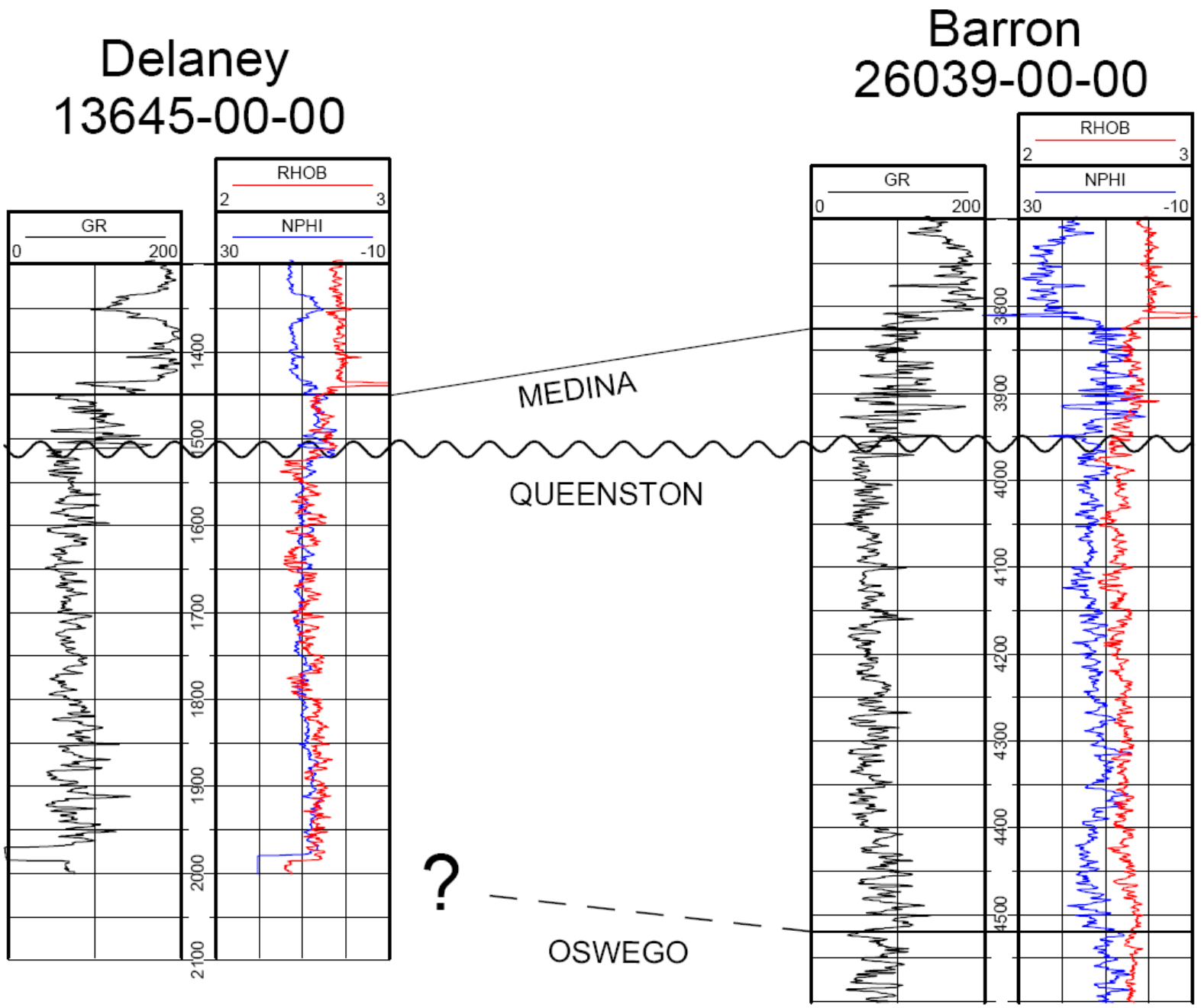
1634.5'

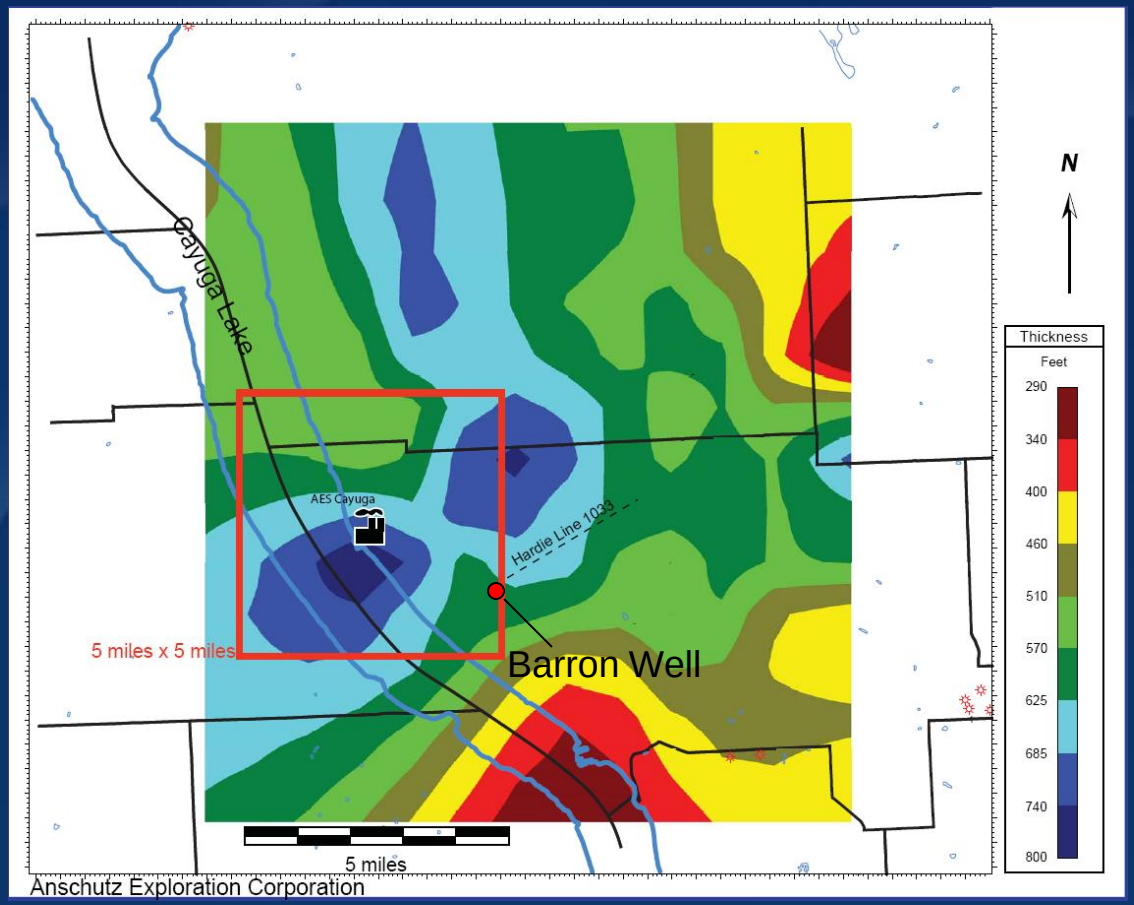


1640'

Porosity In the Delaney Well




Delaney
13645-00-00
Barron
26039-00-00
GR
0
200
RHOB
2
3
NPHI
30
-10
1400
1500
1600
1700
1800
1900
2000
2100
3800
3900
4000
4100
4200
4300
4400
4500
MEDINA
QUEENSTON
?
OSWEGO



- High Resolution Isopach Map shows that the AES Power Plant lies in what appears to have been a channel during deposition of the Queenston and therefore has a thicker section of the formation.

- Capacity Calculations indicate that the 25 square mile area surround the plant could hold up to 38.5 million tons of CO_2 (16 years of output from the AES power plant).

$$CO_2 \text{ Sequestration Mass} = \frac{CO_2 \text{ Density} \times \text{Reservoir Thickness} \times \text{Reservoir Area} \times \text{porosity} \times (1-\text{water saturation})}{2200}$$

40.5 lbs/ft^3 — CO_2 Density

600 feet — Reservoir Thickness

16,000 acres — Reservoir Area

10% — porosity

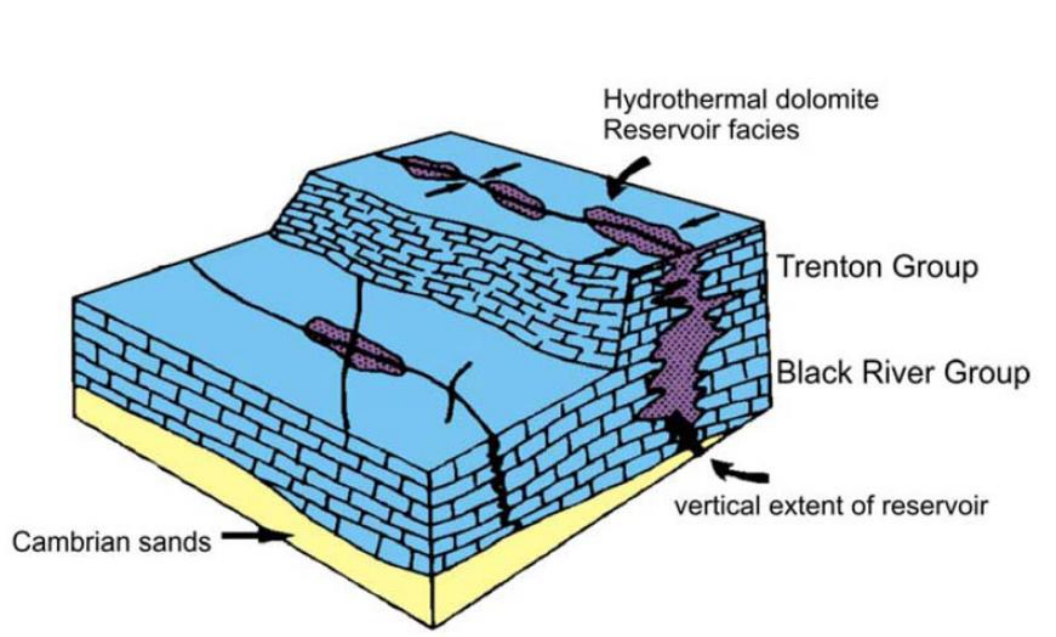
95% — water saturation

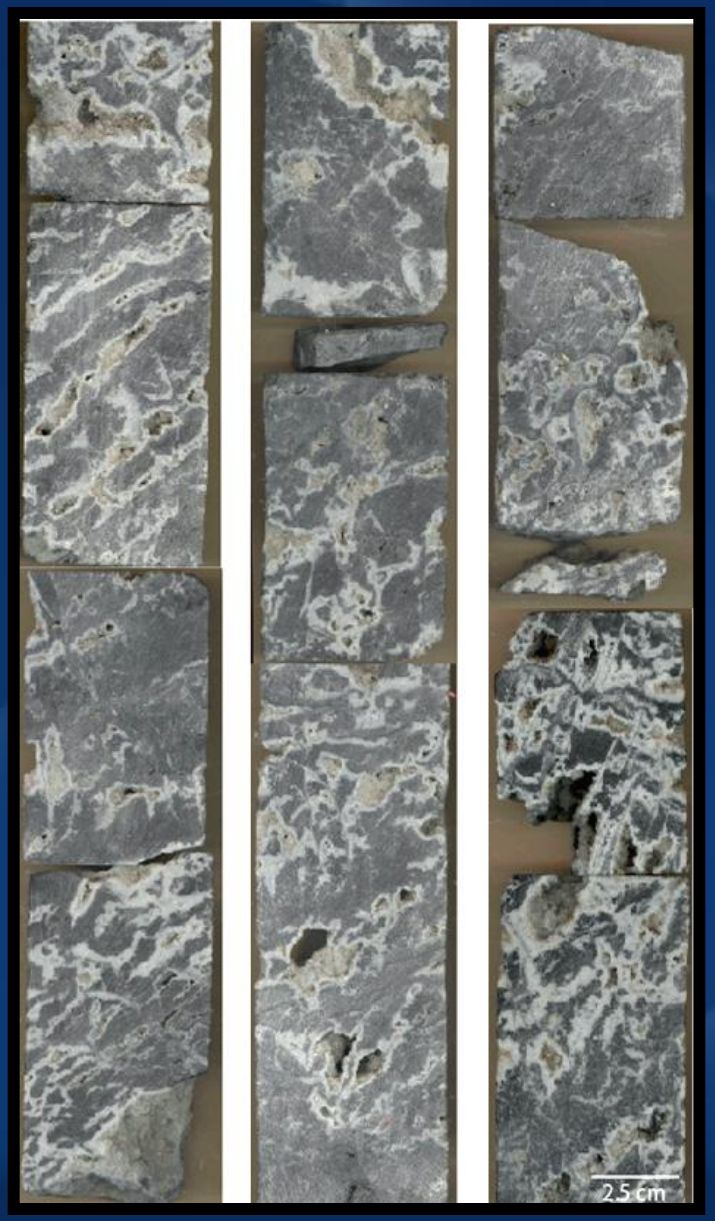
2200 — Conversion factor (1 metric ton = 2200 lbs)

= 38.5 million metric tons

from *SPE Monographs, Vol 22*

Hydrothermal Dolomite Reservoirs

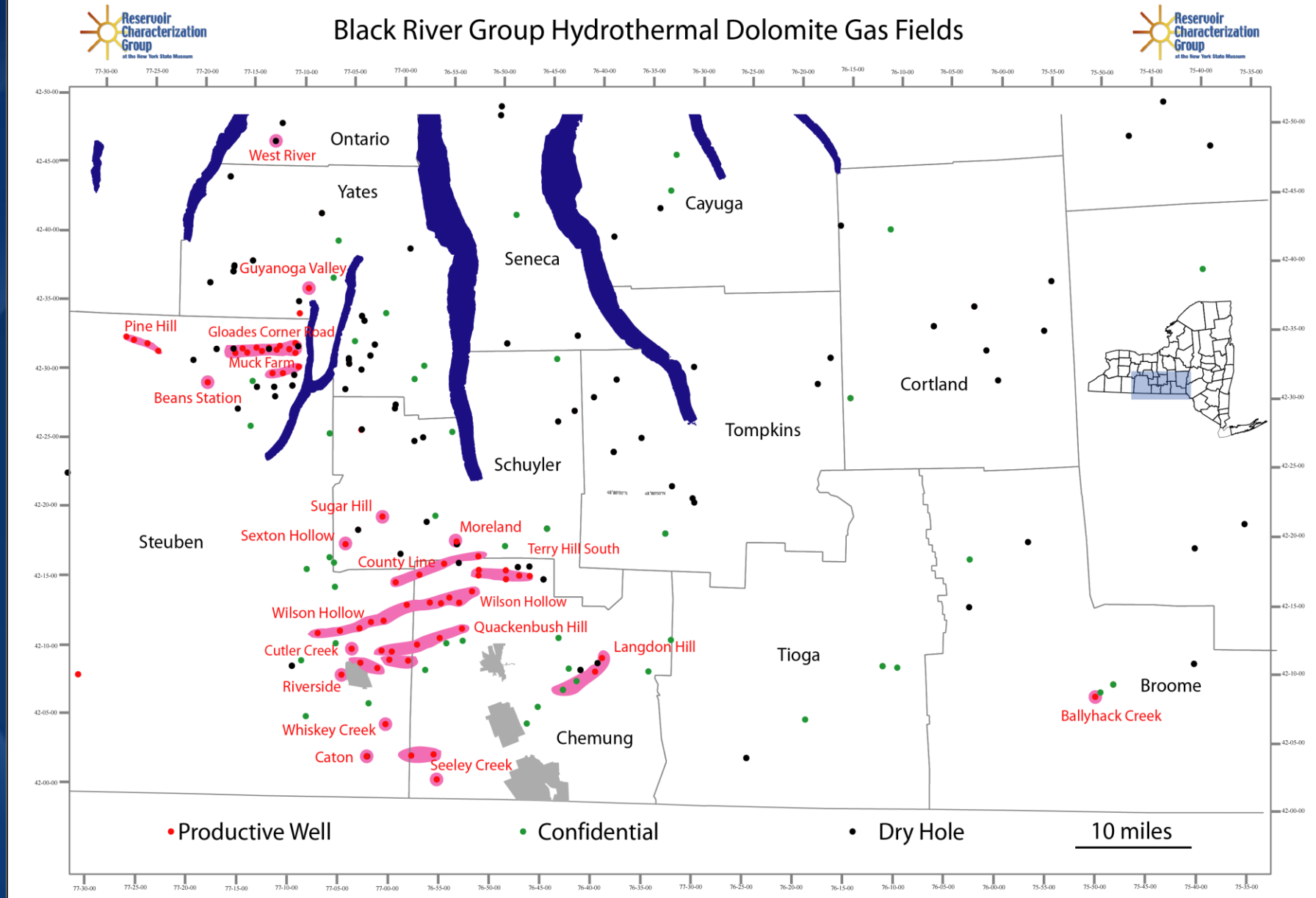




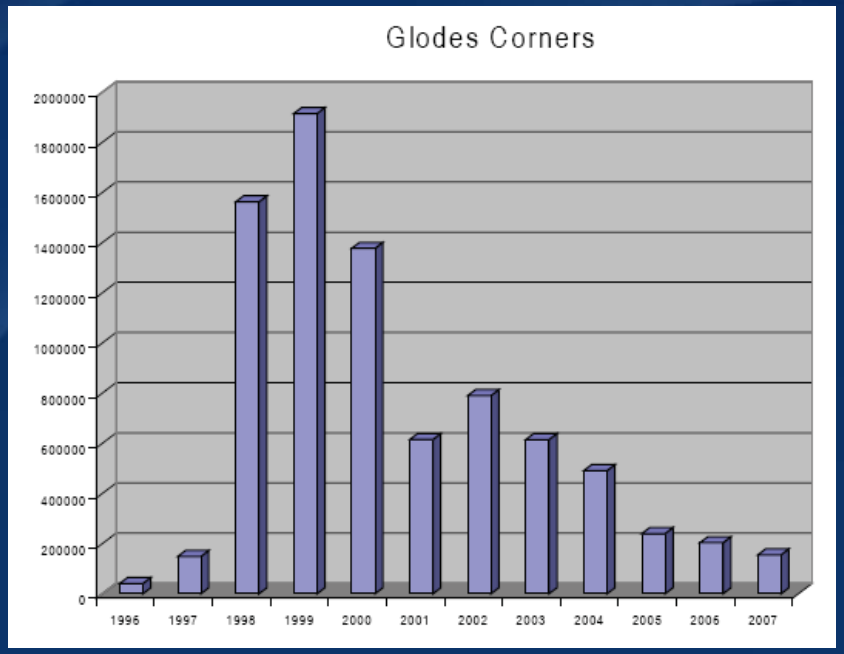
Whiteman #1 well

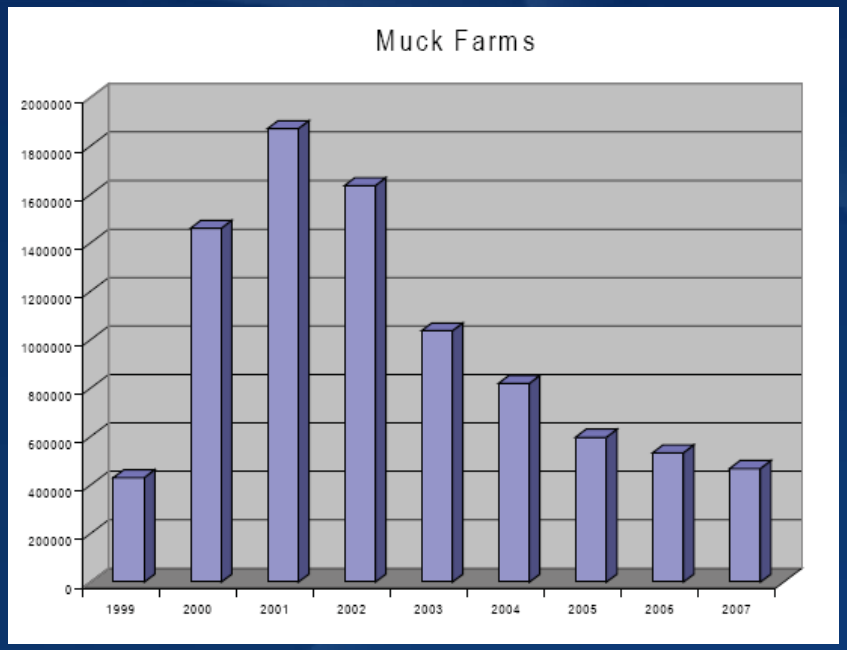
- From County Line Field
- Well has produced about 0.5 BCF to date
- Vuggy porosity lines with saddle dolomite
- Permeability up to >10 darcies in some whole core measurements

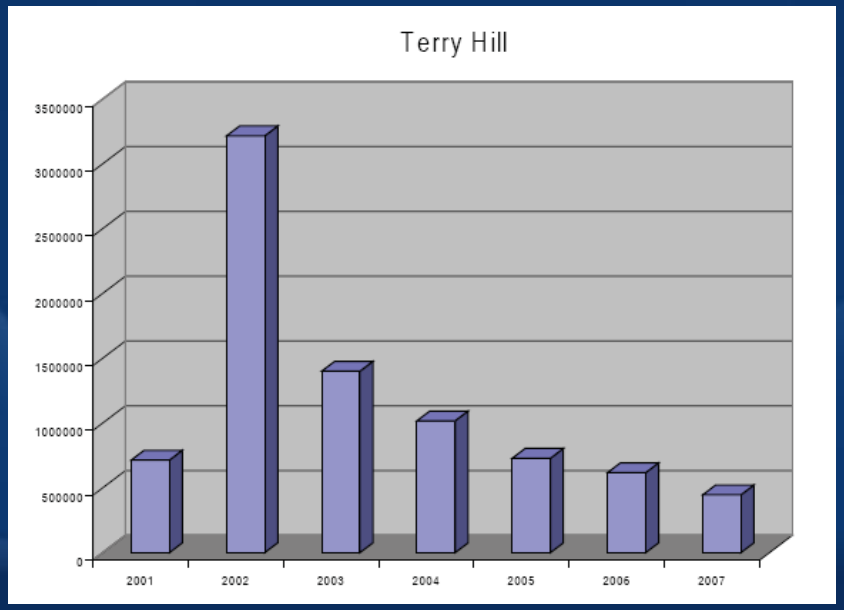
Black River Group Hydrothermal Dolomite Gas Fields

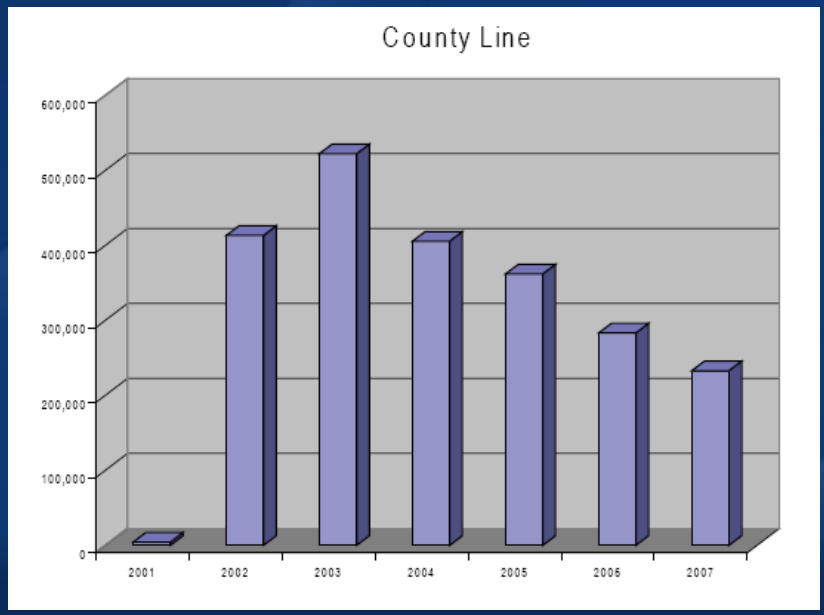


Trenton Black River Production

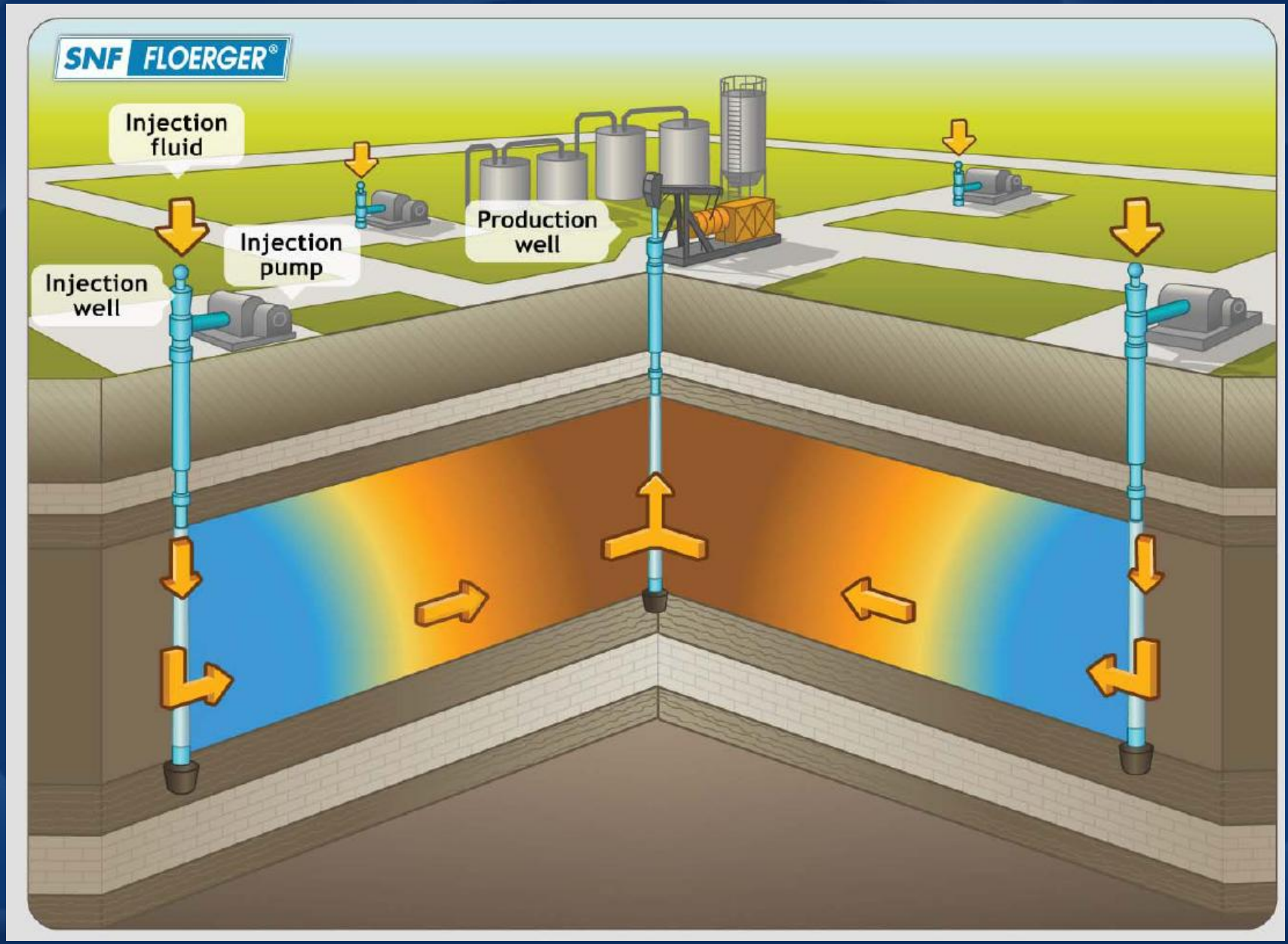


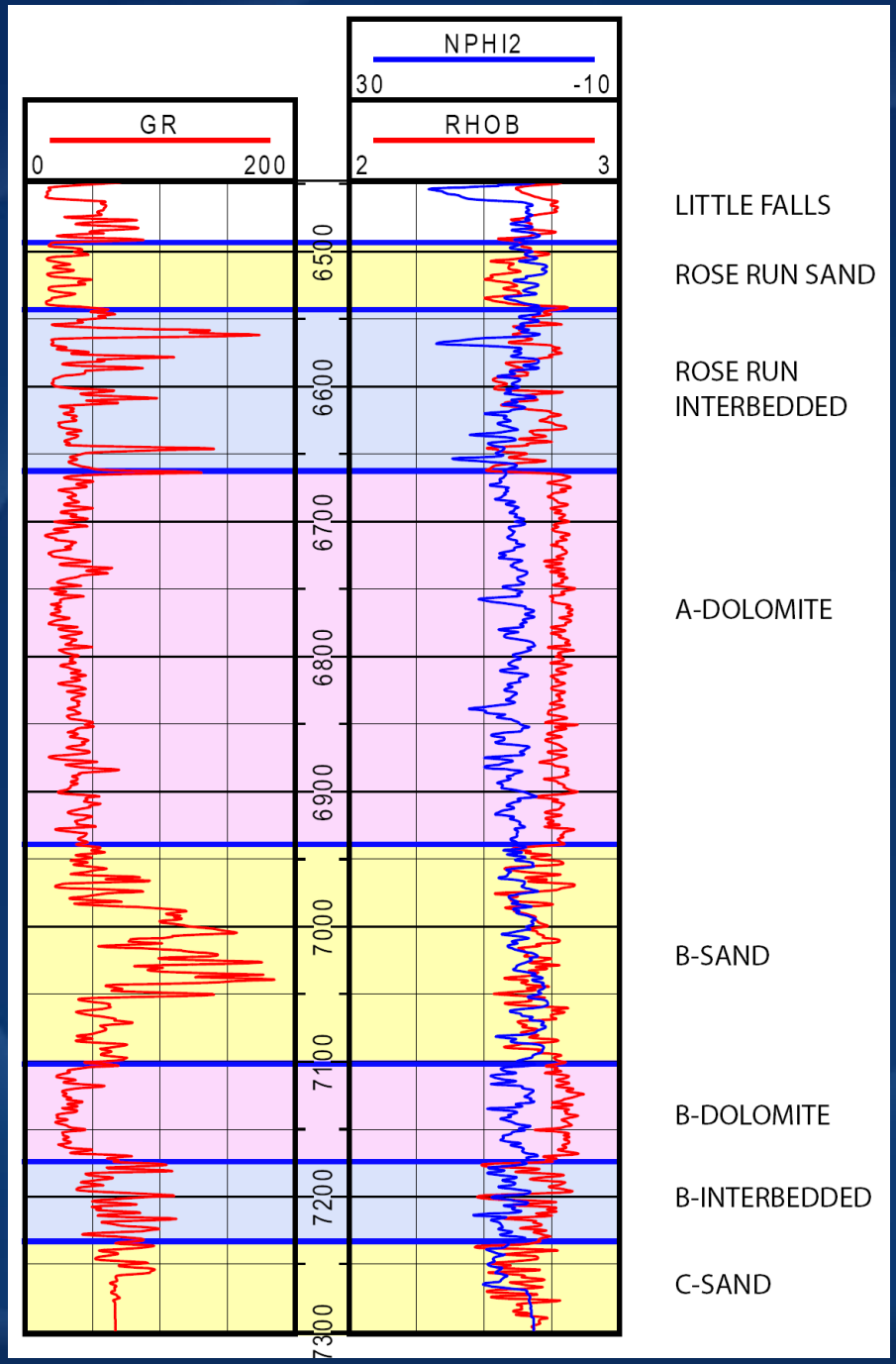






Enhanced Oil/Gas Recovery

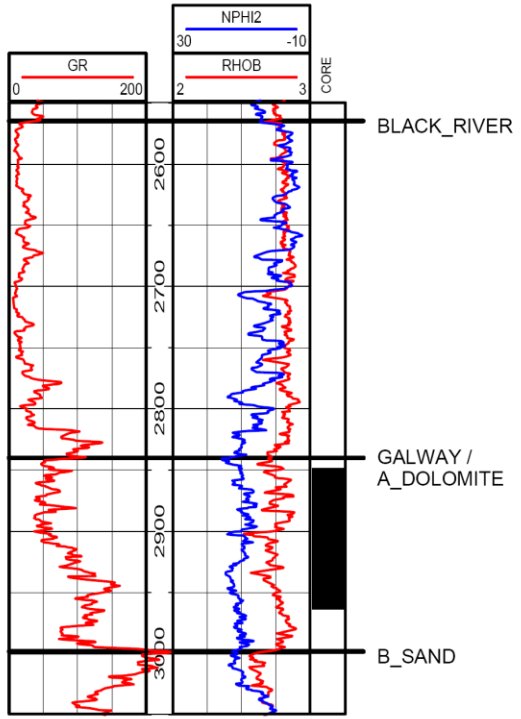


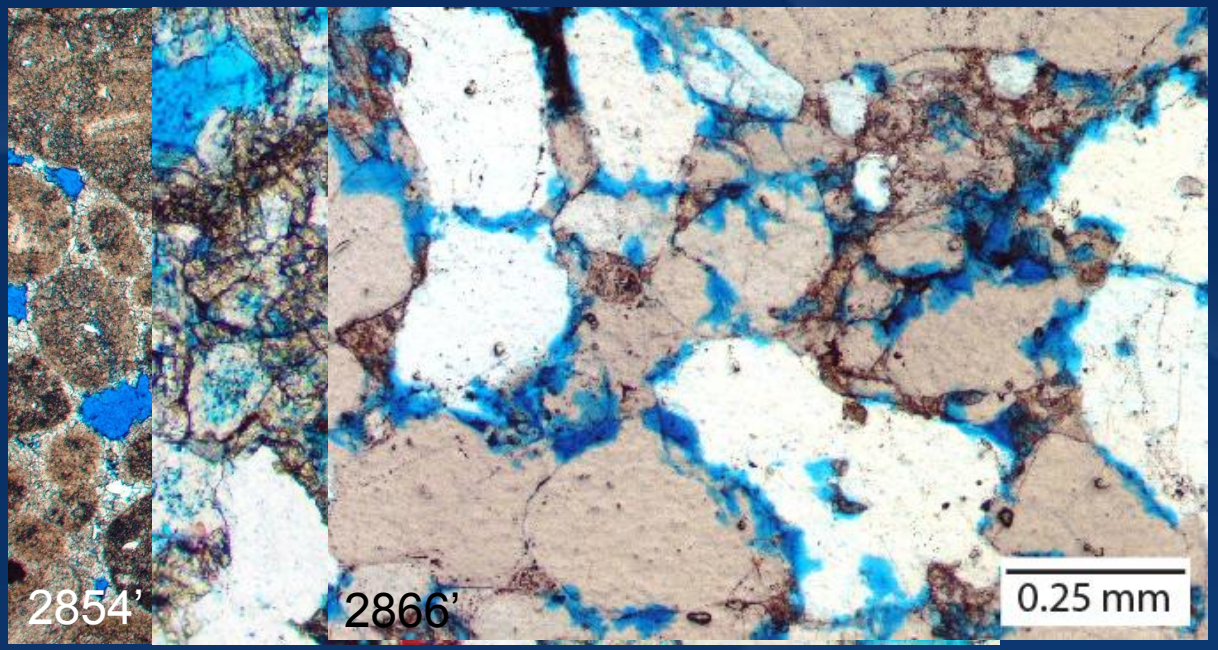


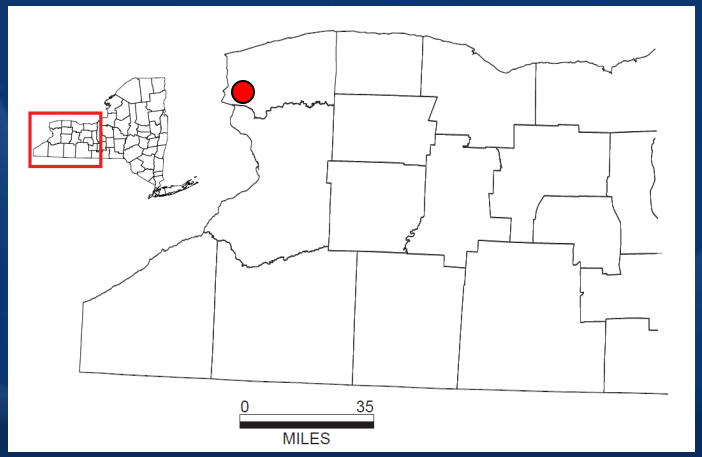
The Galway Formation is made up of 3 sandy sections (Rose Run, B-Sand, C-Sand), 2 dolomitic sections (A-Dolomite and B-Dolomite), and 2 interbedded transition zones (Rose Run Interbedded and B-Interbedded)

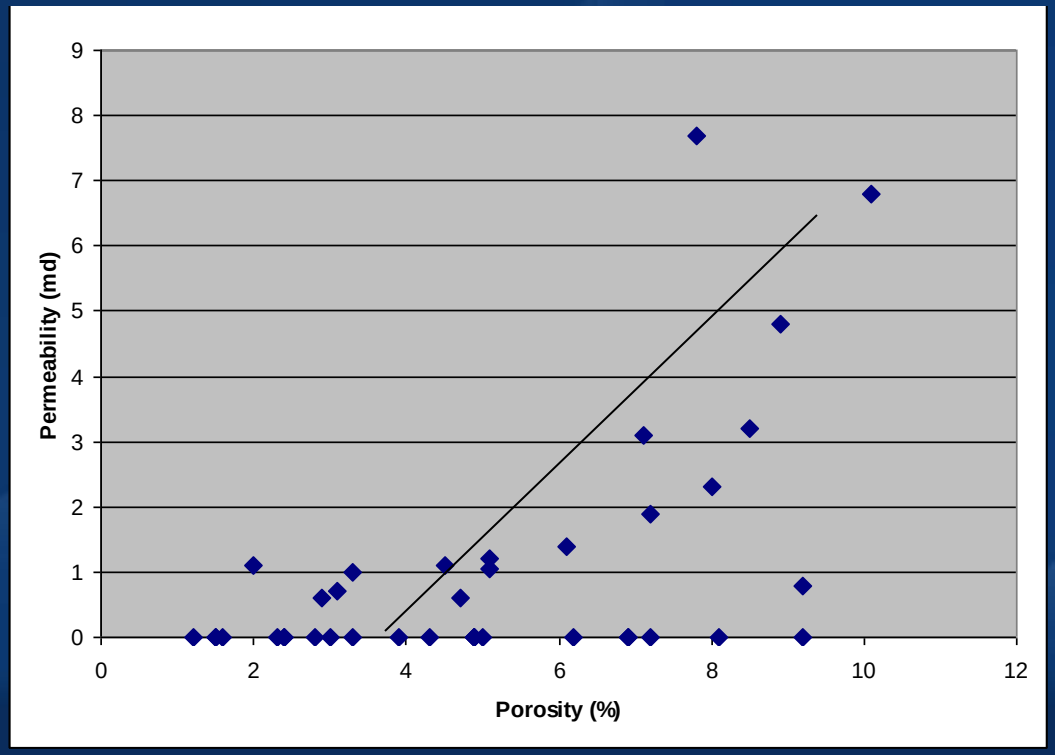
Although these sections may be labeled or depicted as sandstones and dolomites, the range of lithology more accurately varies from dolomitic sand to sandy dolomite.

Fee (Hooker Chemical)
31-063-06669-00-00

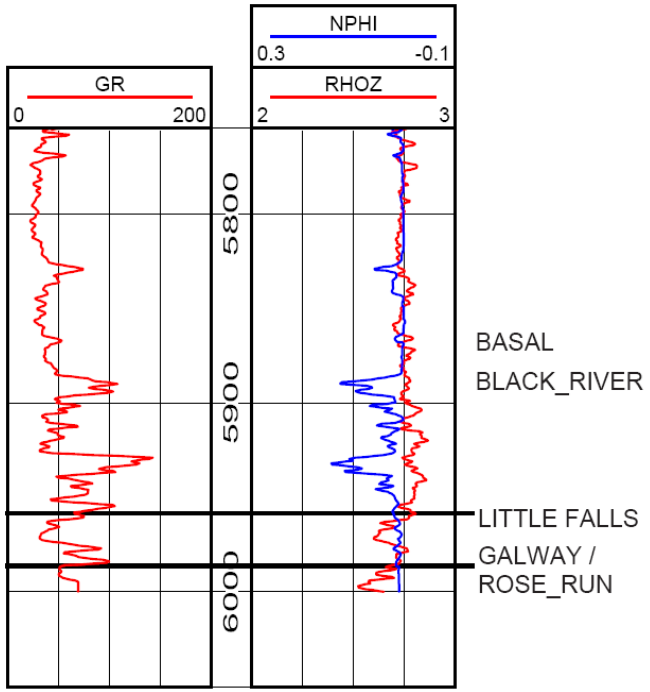


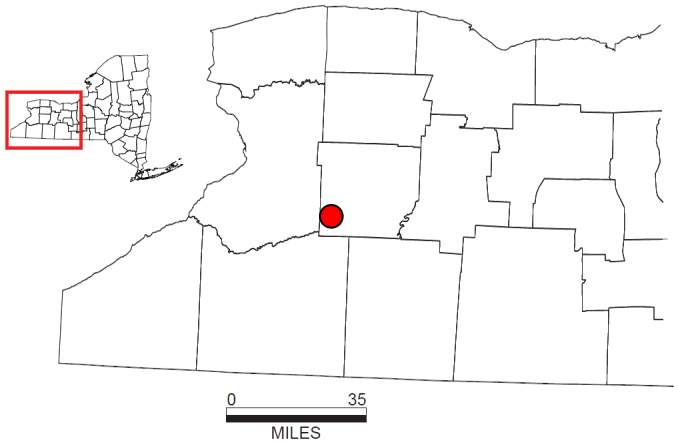


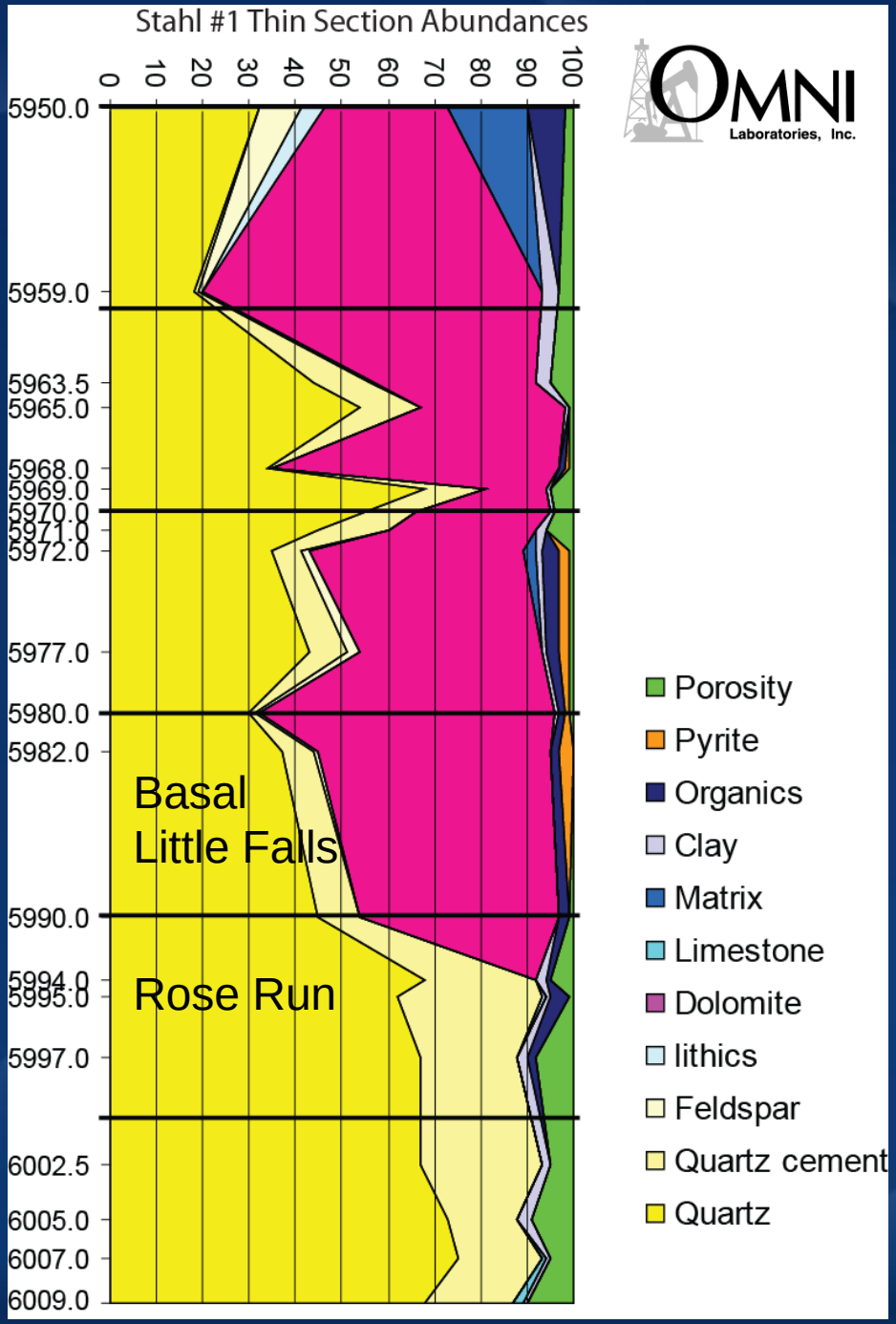




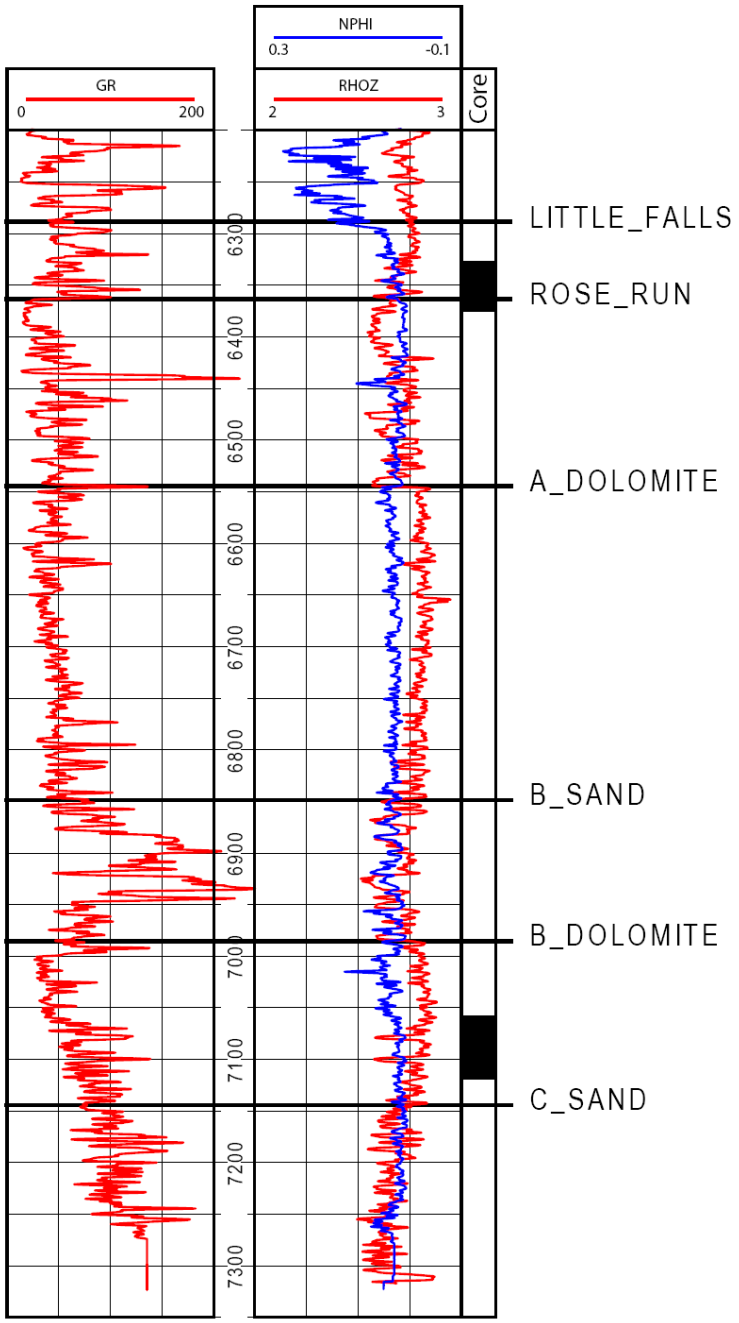
Stahl 1
31-121-22655-00-00

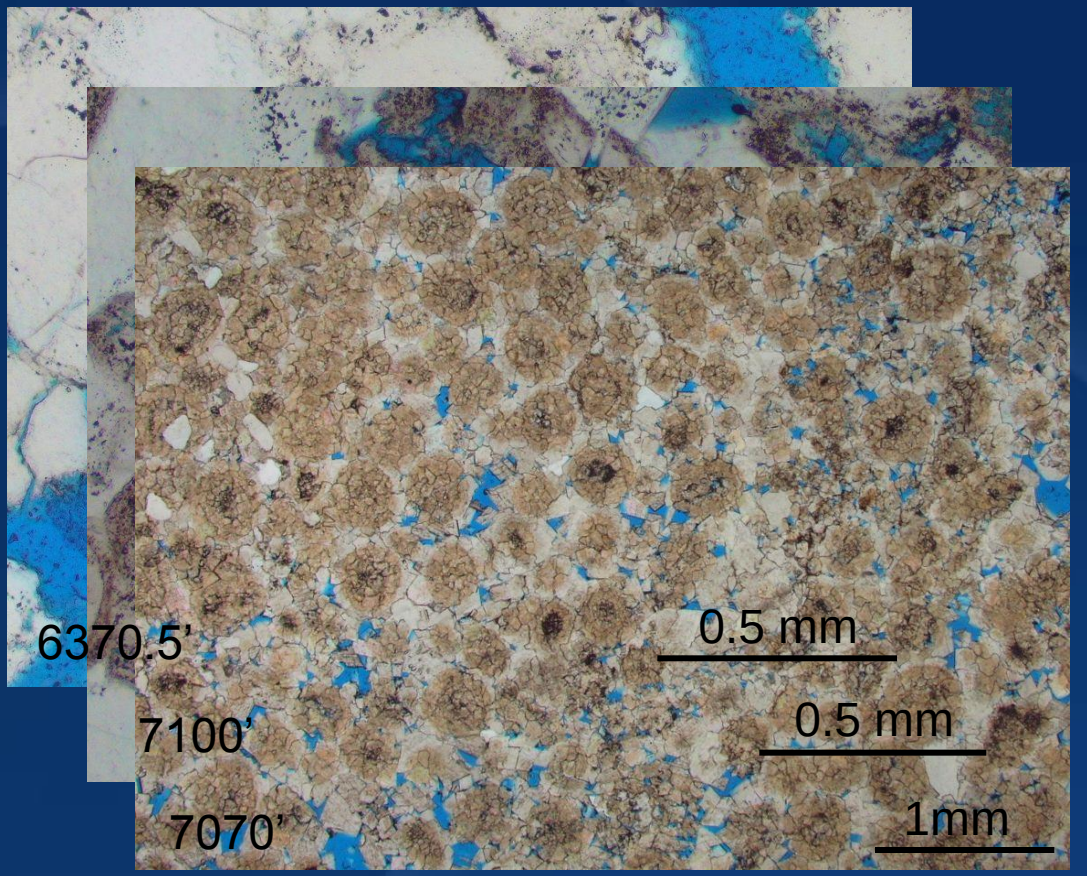


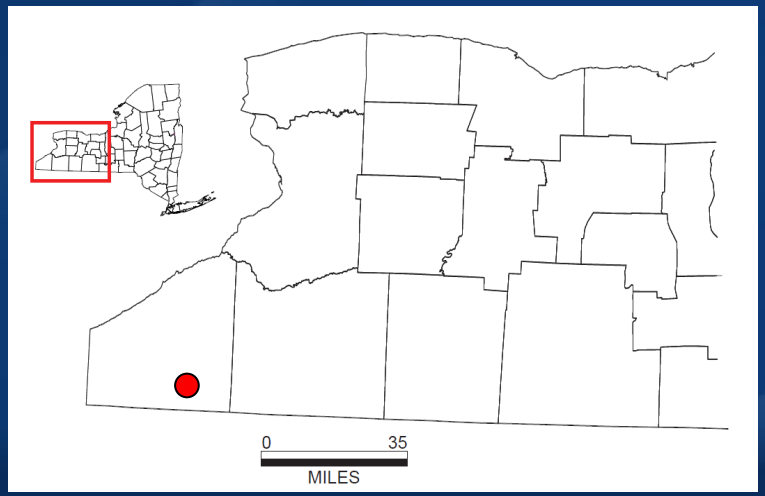




Miller 2
31-013-25737-00-00

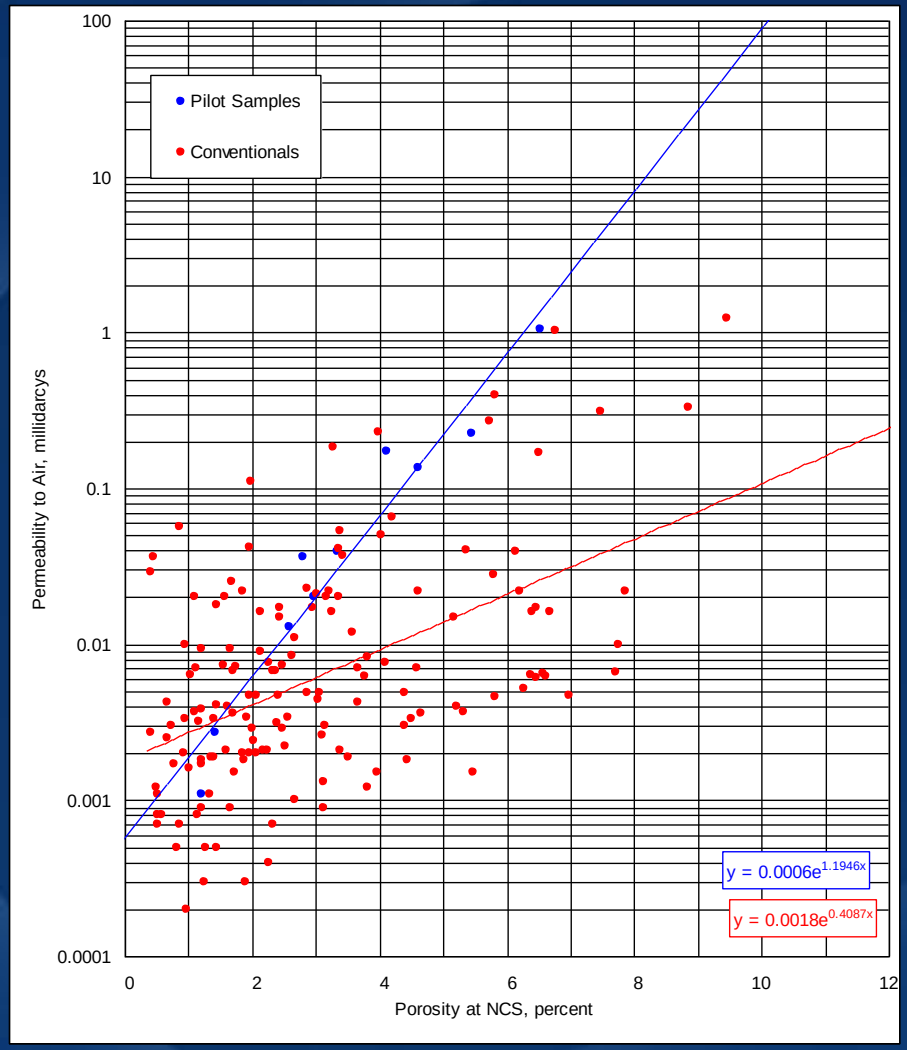




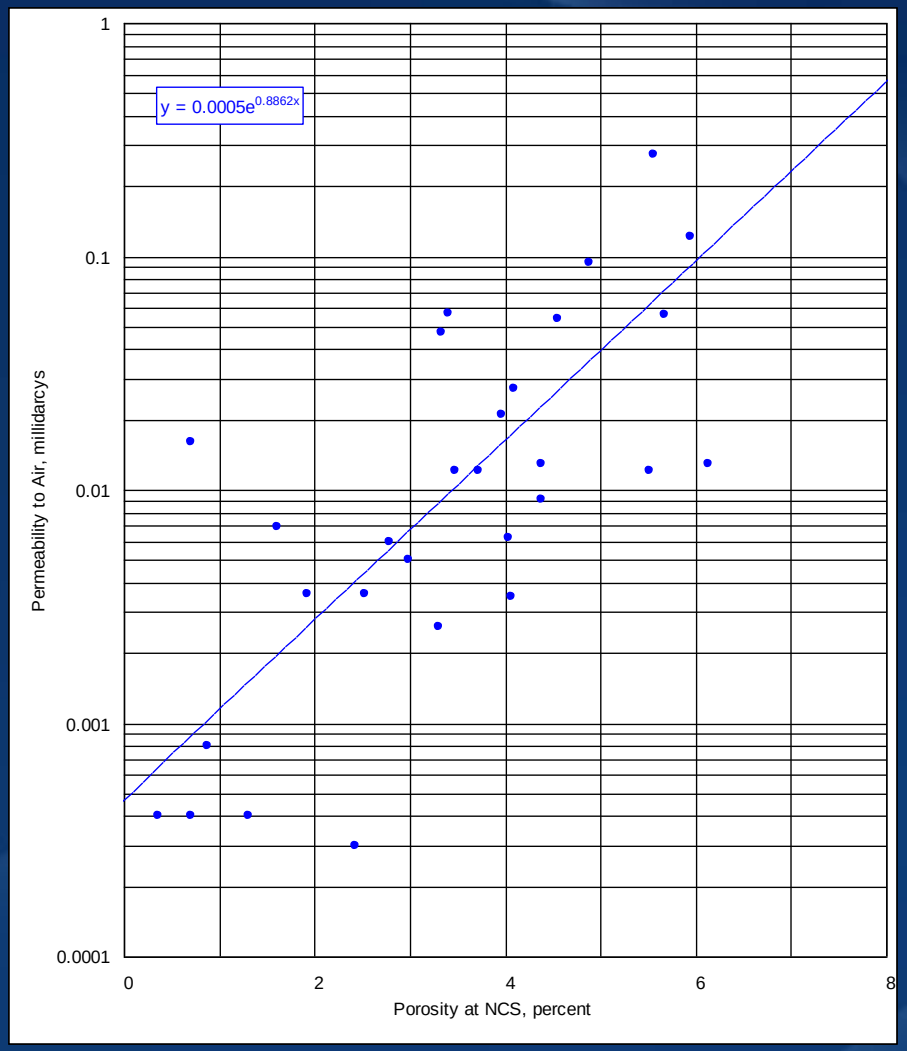


Lab Results

Conventional Core Plugs



Sidewall Cores



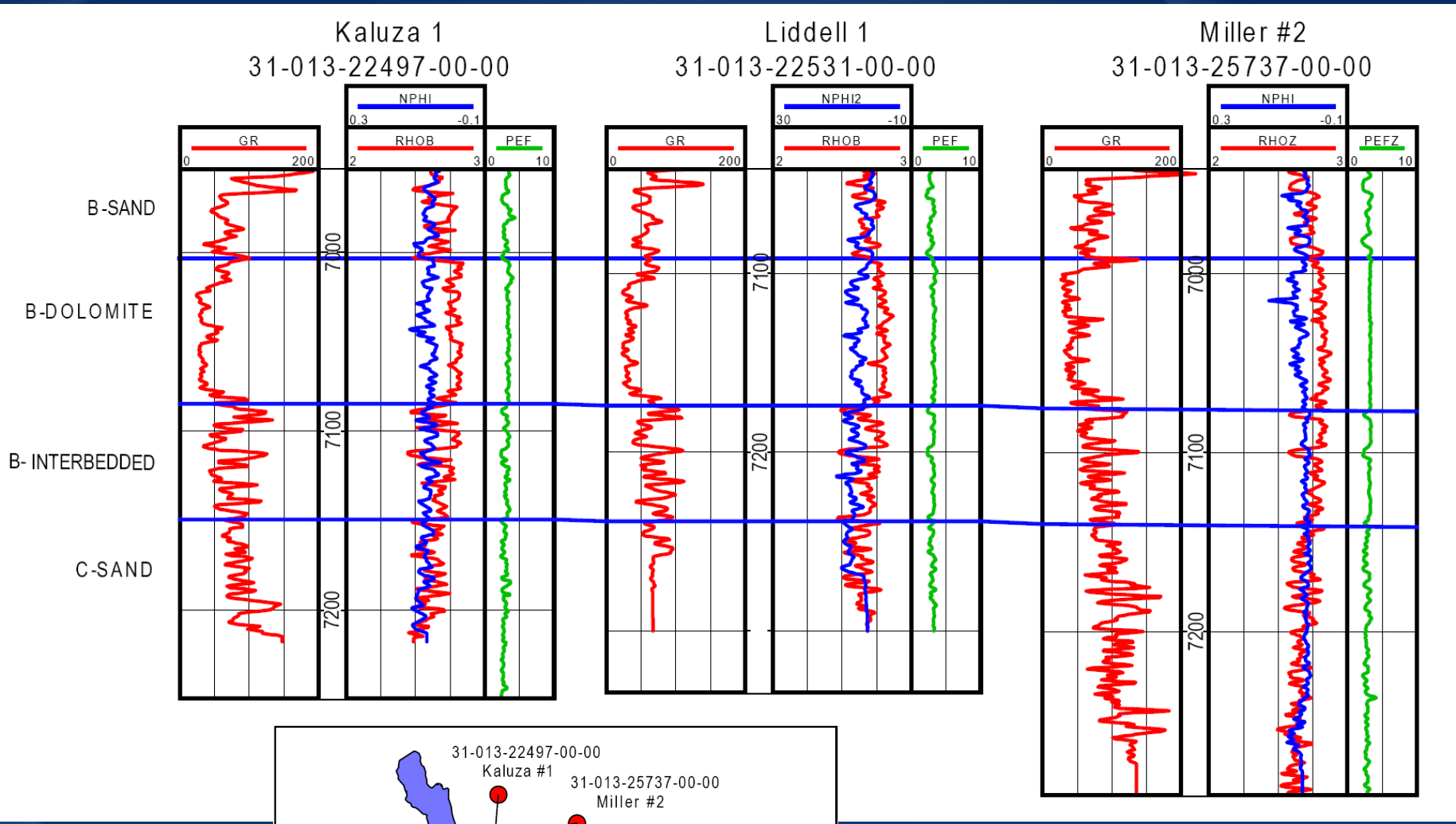
OMNI Laboratories, Inc.

Vacuum Dried @ 180F

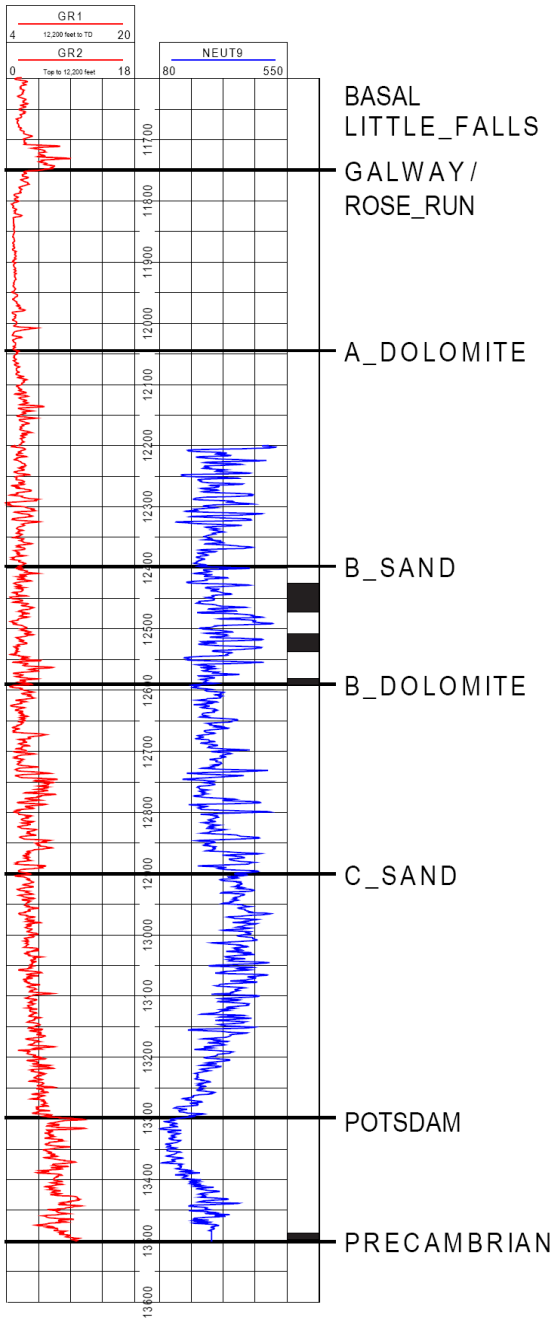
Net Confining Stress: 1200 psi

Weatherford LABORATORIES

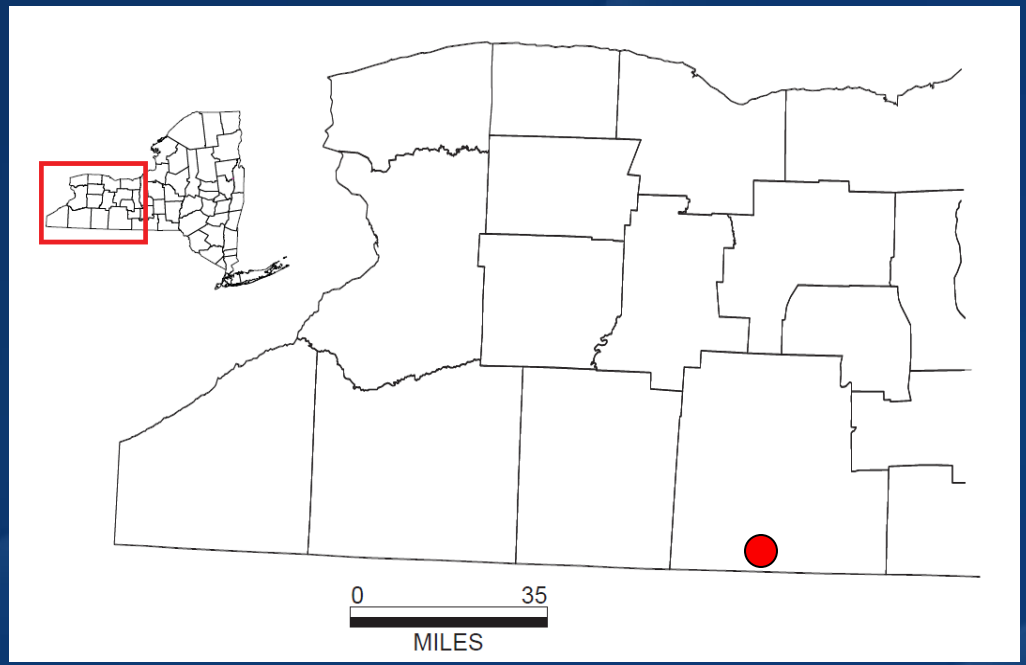
Comparison to Nearby Wells



Olin
31-101-03924-00-00

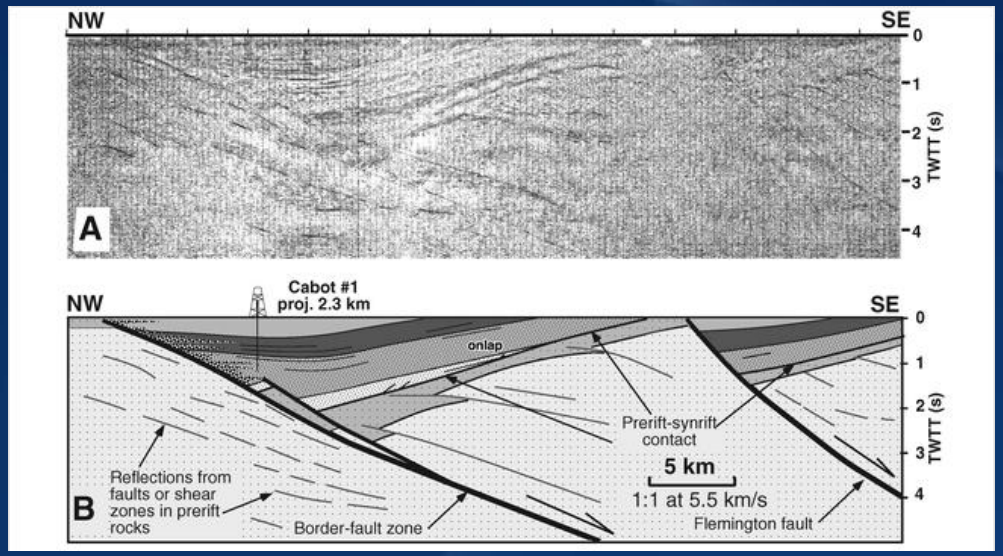


- Deepest Well in the state (13,500')
- 1,750 feet of Cambrian Sands
- Cored intervals will be studied in the future



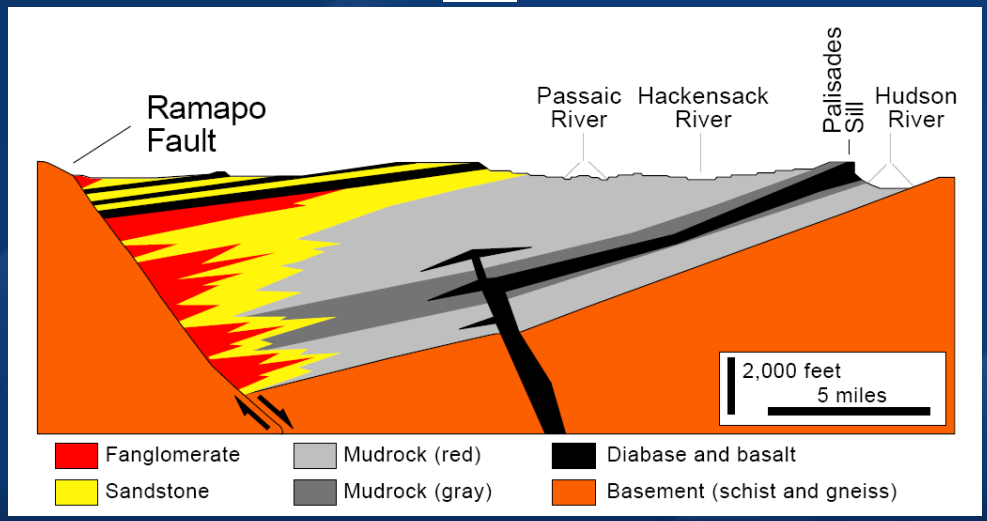
Newark Rift Basin

NB-1



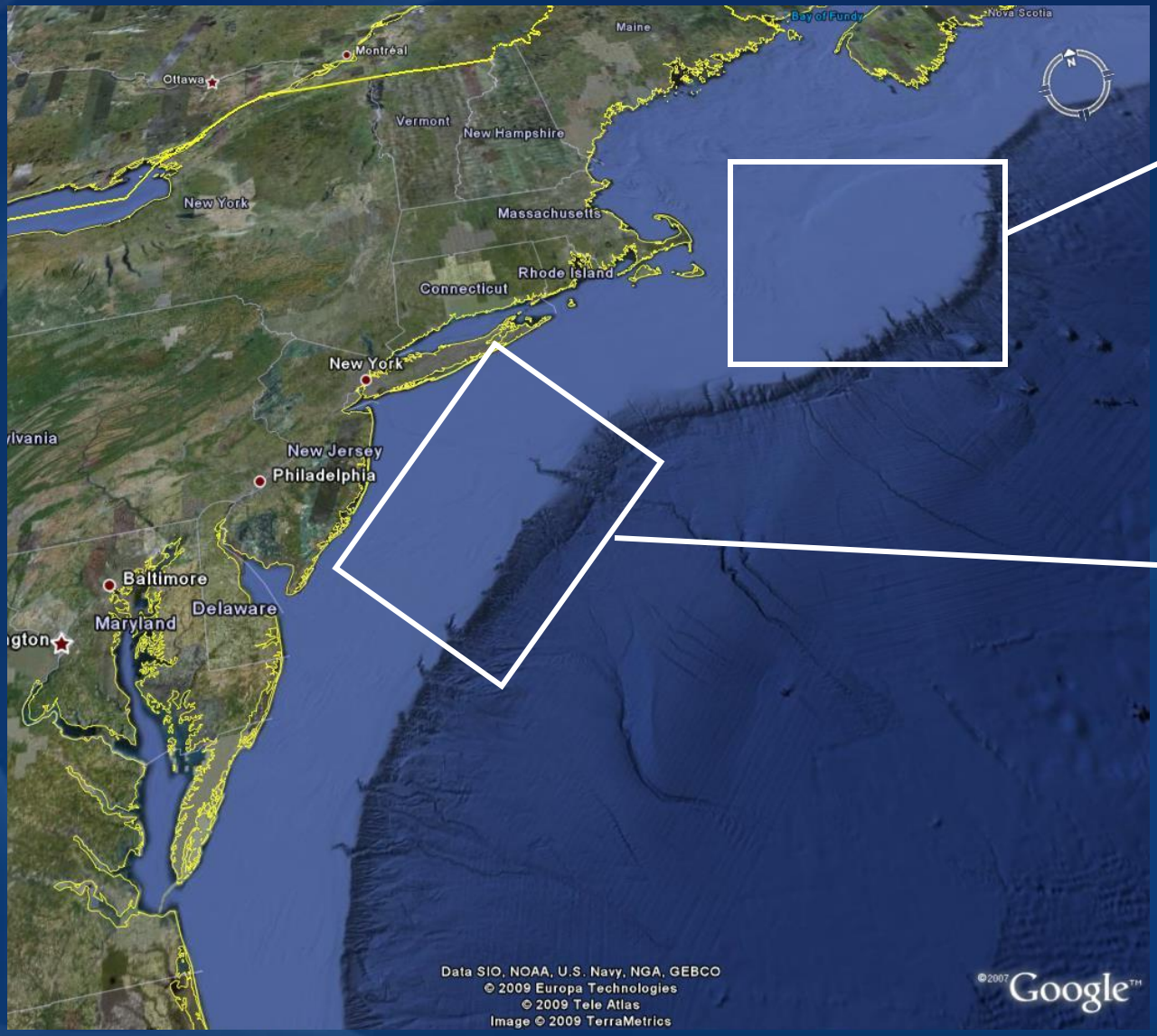
From Schlische et al, 2005

I-80



From USGS, 2003 http://3dparks.wr.usgs.gov/nyc/mesozoic/newarkbasin.htm

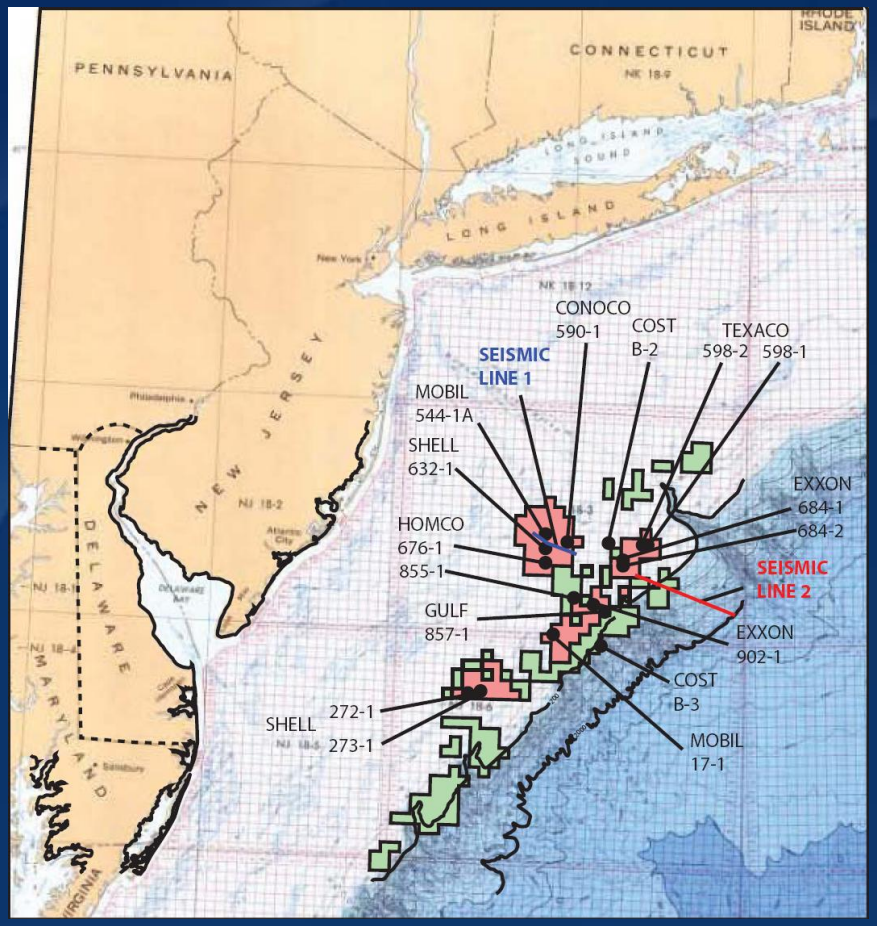
Offshore Sequestration

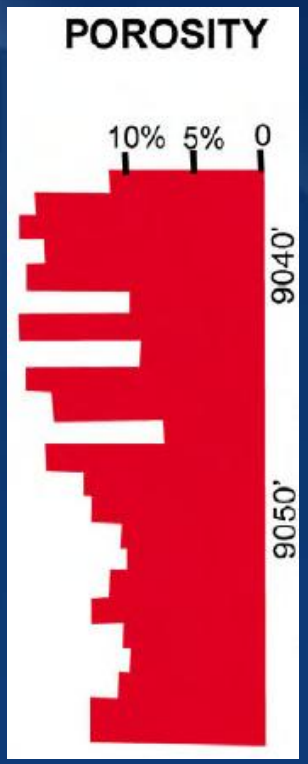


Georges Bank

Baltimore Canyon Trough

Baltimore Canyon Trough





Porosity

Facies / Lithology	n*	Sum (m)	Ave. Φ (%)	Range
Prograded shelf margin limestones	277	1823	2.4	0.0 - 17.0
Transitional marine sandstones	619	2800	6.1	0.0 - 29.0
Coastal Plain sandstones	1391	6212	8.7	0.0 - 33.0
Fine-grained deltaic sandstones	729	2385	9.2	0.0 - 28.0
Aggradded shelf-margin limetsones	189	1015	8.5	0.0 - 26.0
Limestone buildups	3	65	12.2	0.0 - 13.0
Chalky *Tubiphytes* packstone	84	26	6.3	0.0 - 31.1
Shoal-water oolite grainstone	53	222	17	0.0 - 36.0
Shelf-margin deltaic sandstones	163	1138	18.2	0.0 - 30.0

Permeability

n	Ave. K (md)**	Range
148	0.34	< 0.01 - 17
351	0.71	< 0.01 - 46
650	26.19	< 0.01 - 349
189	71.11	< 0.01 - 195
43	5.1	< 0.01 - 156
---	---	---
84	0.47	< 0.01 - 12.6
23	2.45	< 0.01 - 12.2
---	---	---

*n = number of beds

** Based on perm plug measurements

THANK YOU