Hydrothermal Hydrocarbon Accumulations

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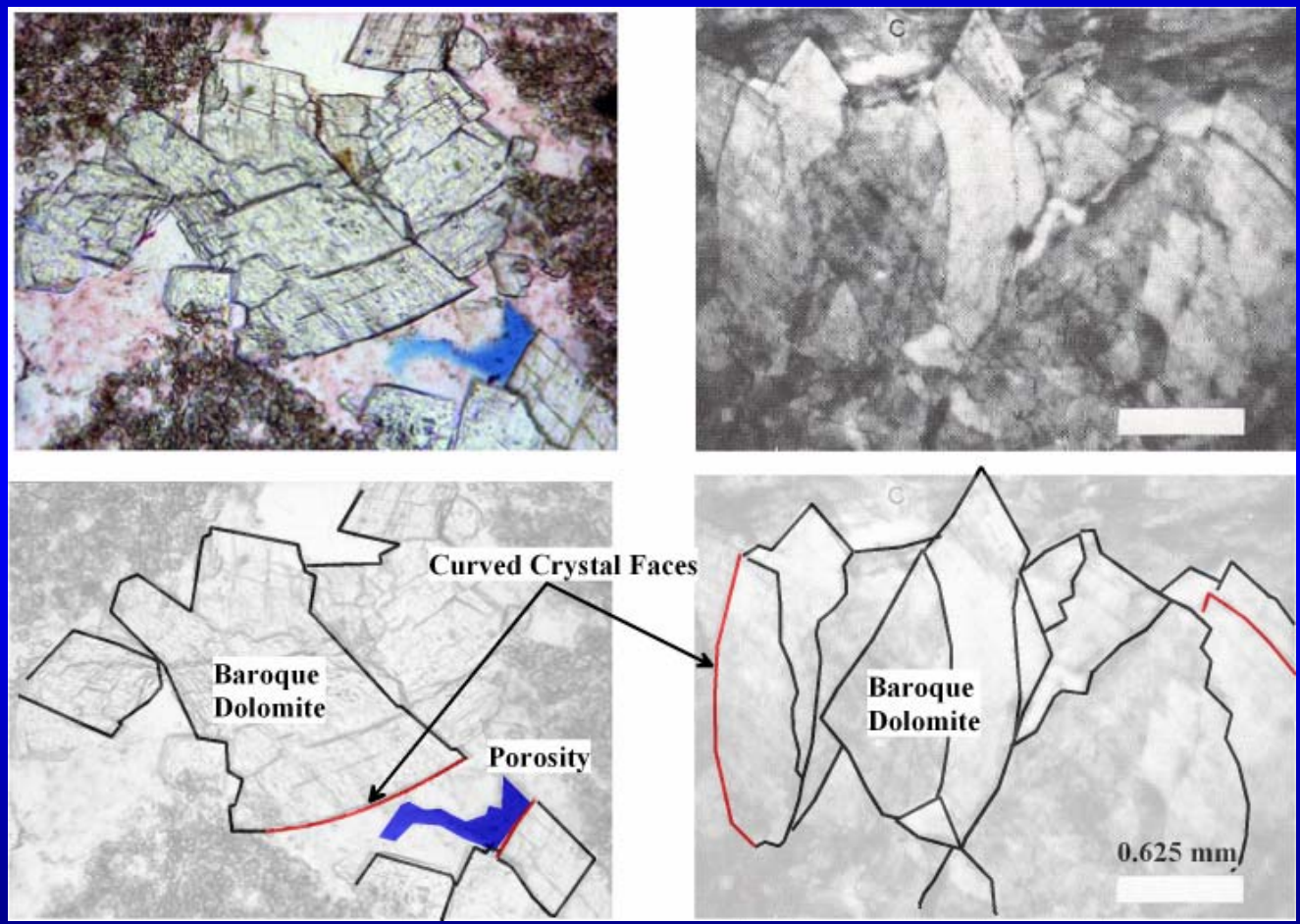
Outline

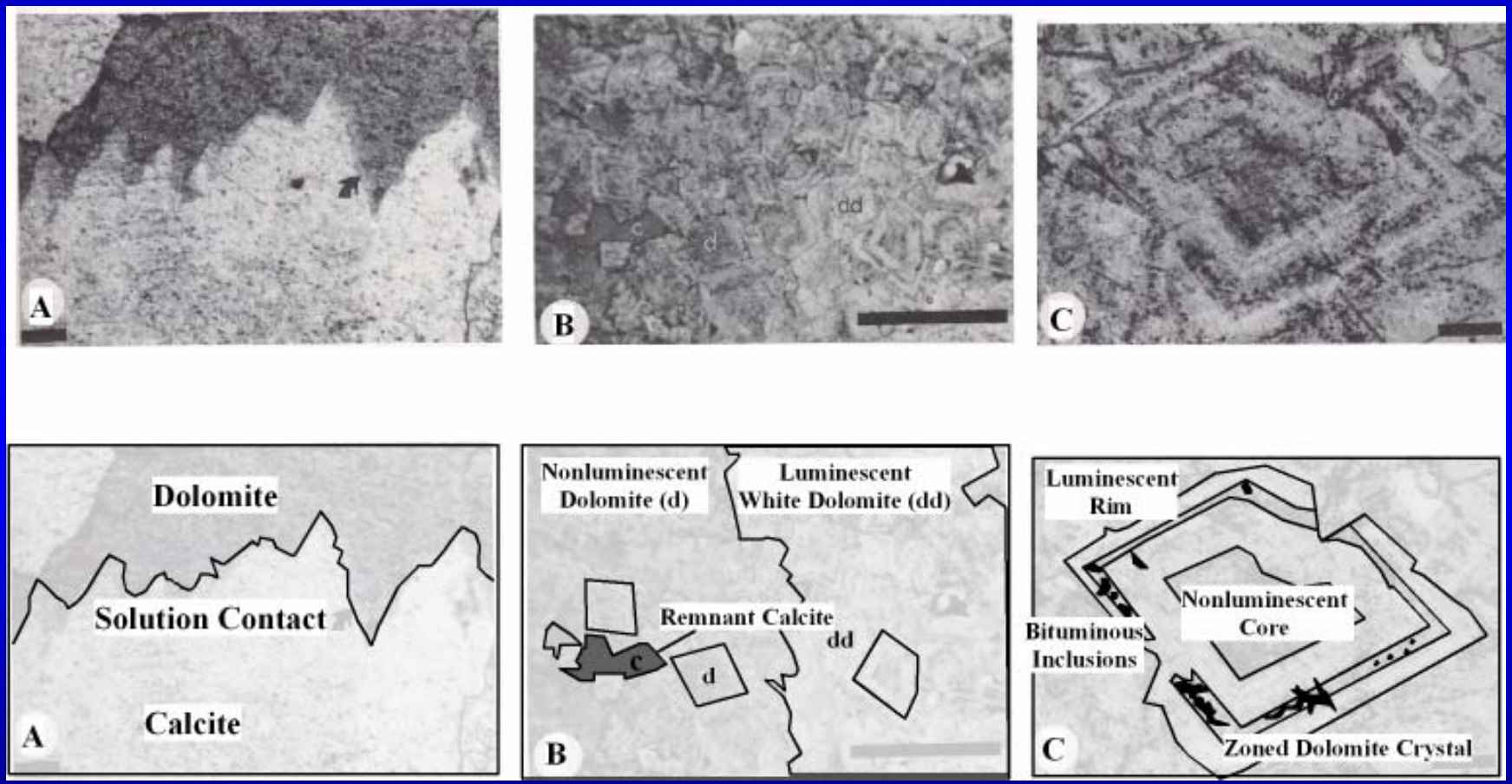
- Hydrothermal Dolomite
- Hydrothermal Hydrocarbon Systems
  - Distinguishing Features
  - Mode of Occurrence
  - Regional Characteristics
  - Illustration of Components
- Newfoundland Potential
- Summary

Hydrothermal Dolomite

"Baroque or Saddle" Dolomite



Replacement Dolomite



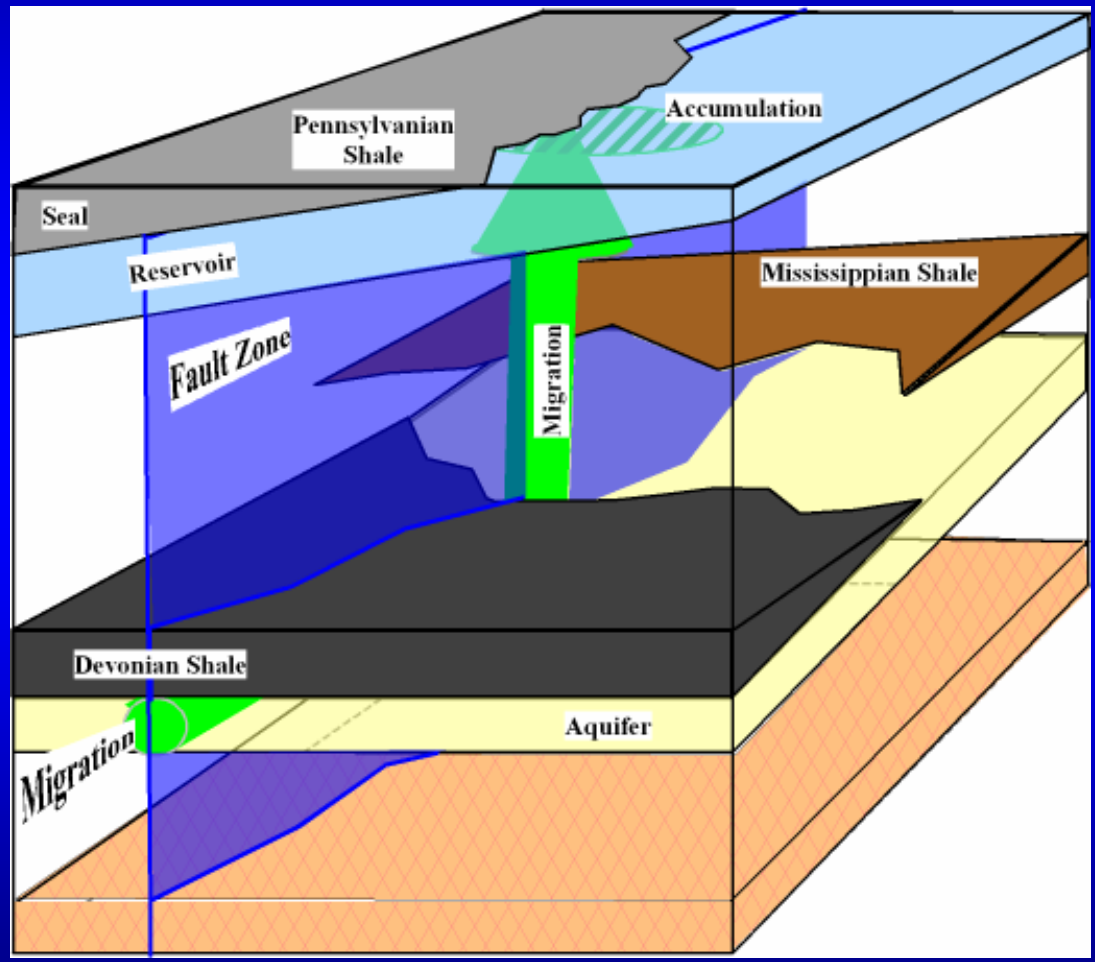
Distinguishing Features

- Effective porosity is substantially younger than the host rock
- Effective porosity results from fabric selective diagenesis immediately to or contemporaneously with hydrocarbon charge
- Diagenetic temperatures are low (50^{o} to 200^{o}C), but typically higher than the geothermal gradient

Mode of Occurrence

- Most recognized accumulations are in dolostone, but reservoirs also occur in sandstones.
- Most are in relatively undeformed rocks bordering foreland deeps or in foreland thrust belts
- Accumulations are localized by geologic features including karst or cave breccias, shale unit depositional margins, facies tracts, reactivated faults, and basement highs that permit vertical fluid migration.

Mode of Occurrence



Diagenesis

- Diagenesis consists mainly of dolomitization, brecciation, calcite and feldspar dissolution and authigenic over-growth or crystallization of feldspar, quartz and clay minerals.
- Aqueous solutions associated with hydrocarbons are basinal brines, typically containing 10 - 30 weight percent salt with low P_h and E_h.
- Associated sulfide mineralization is common with the sphalerite, galena, pyrite, and marcasite as the usual sulfide species.

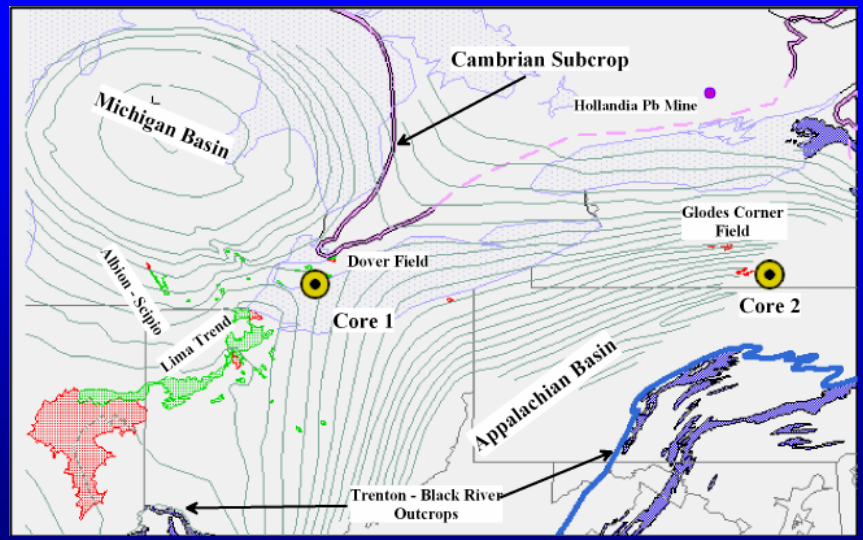
Regional Characteristics

- Similar accumulations occur in districts that cover hundreds of square kilometers
- Systems include one or more regional aquifers (usually sandstone units) that have high fluid transmissivity.
- Regional aquifers may link districts with highly variable reservoir characteristics

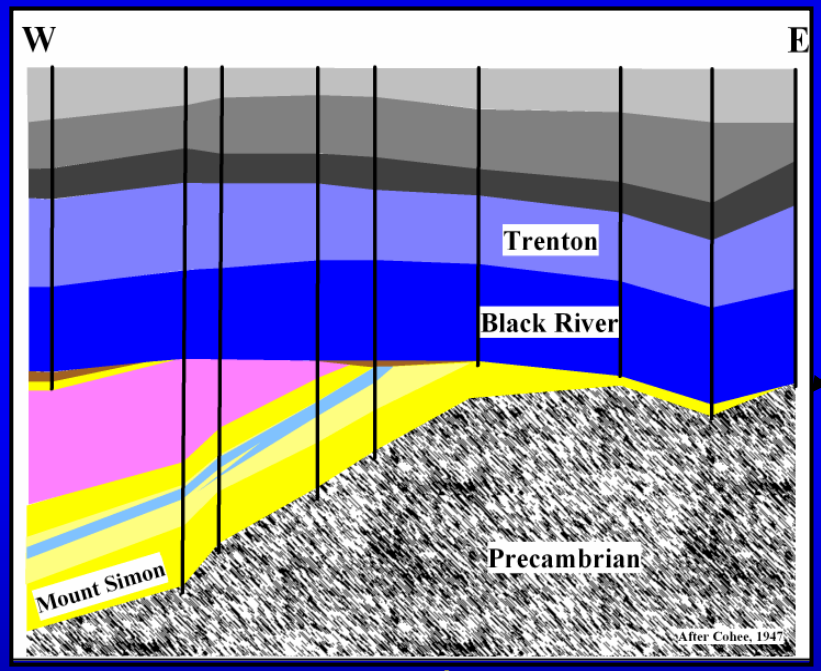
Hydrothermal Dolomite Reservoirs

1 - Ontario Packstone

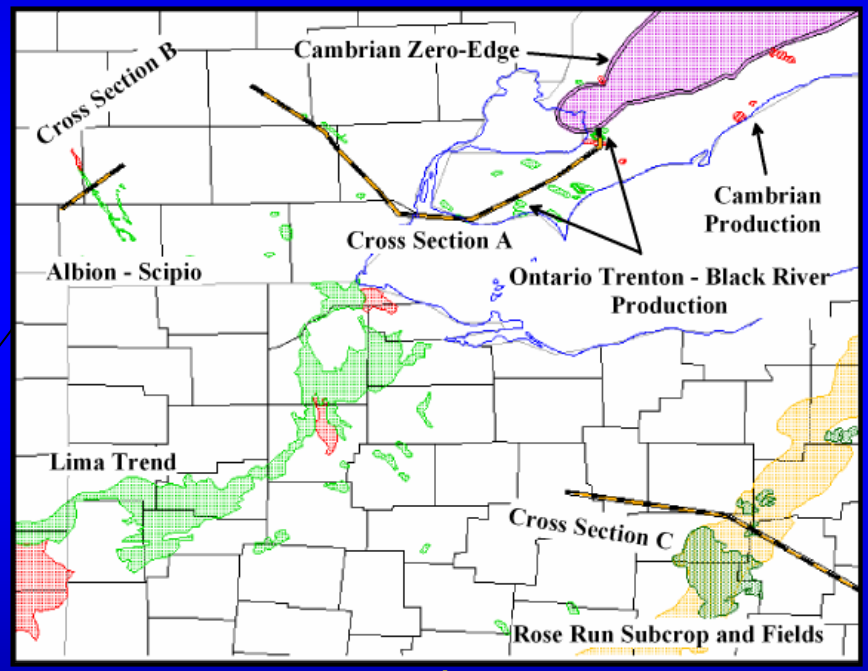
2 - New York Wackestone



Aquifers and Migration

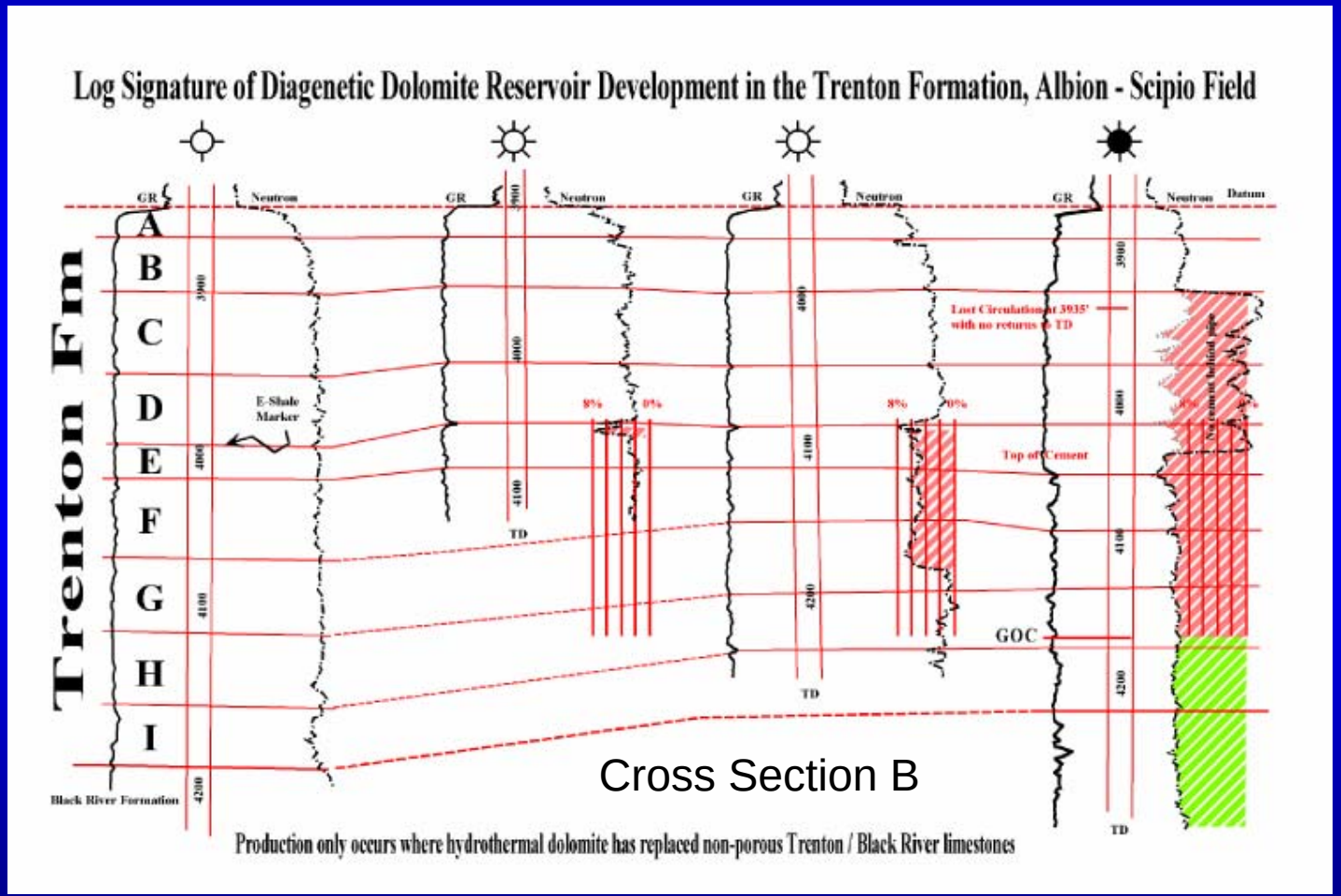


Cross Section A



Index Map

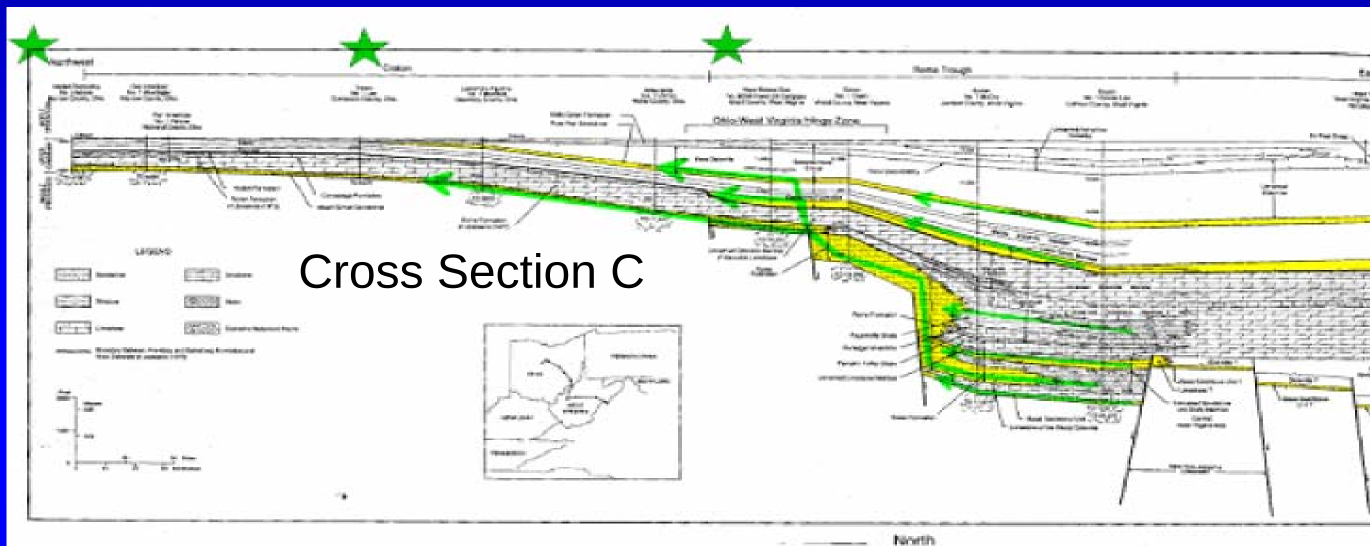
Reservoir Development

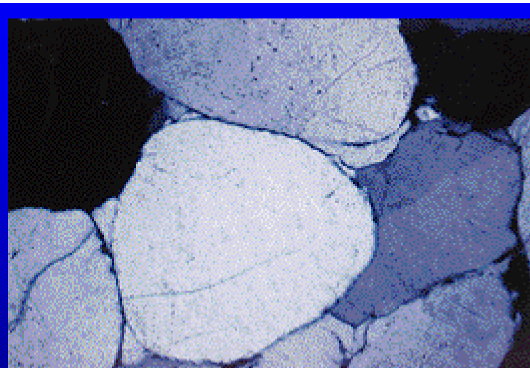


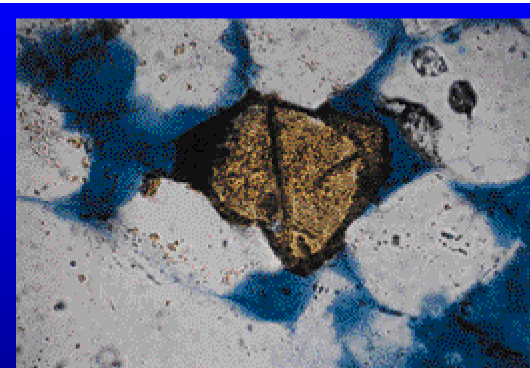
Clastic Diagenesis

N

S

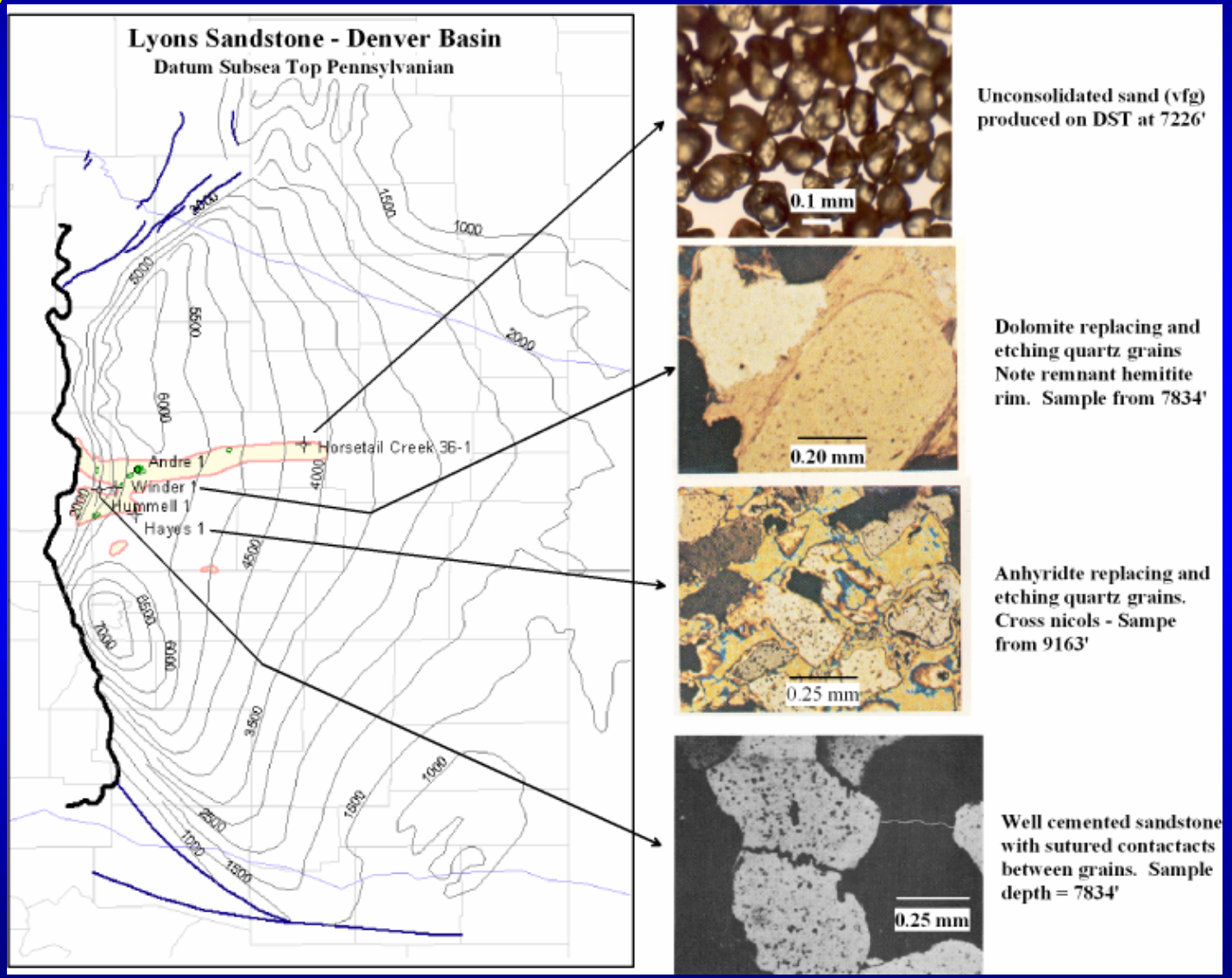






Basal Sandstone Photomicrographs

Hydrothermal Clastic Reservoirs



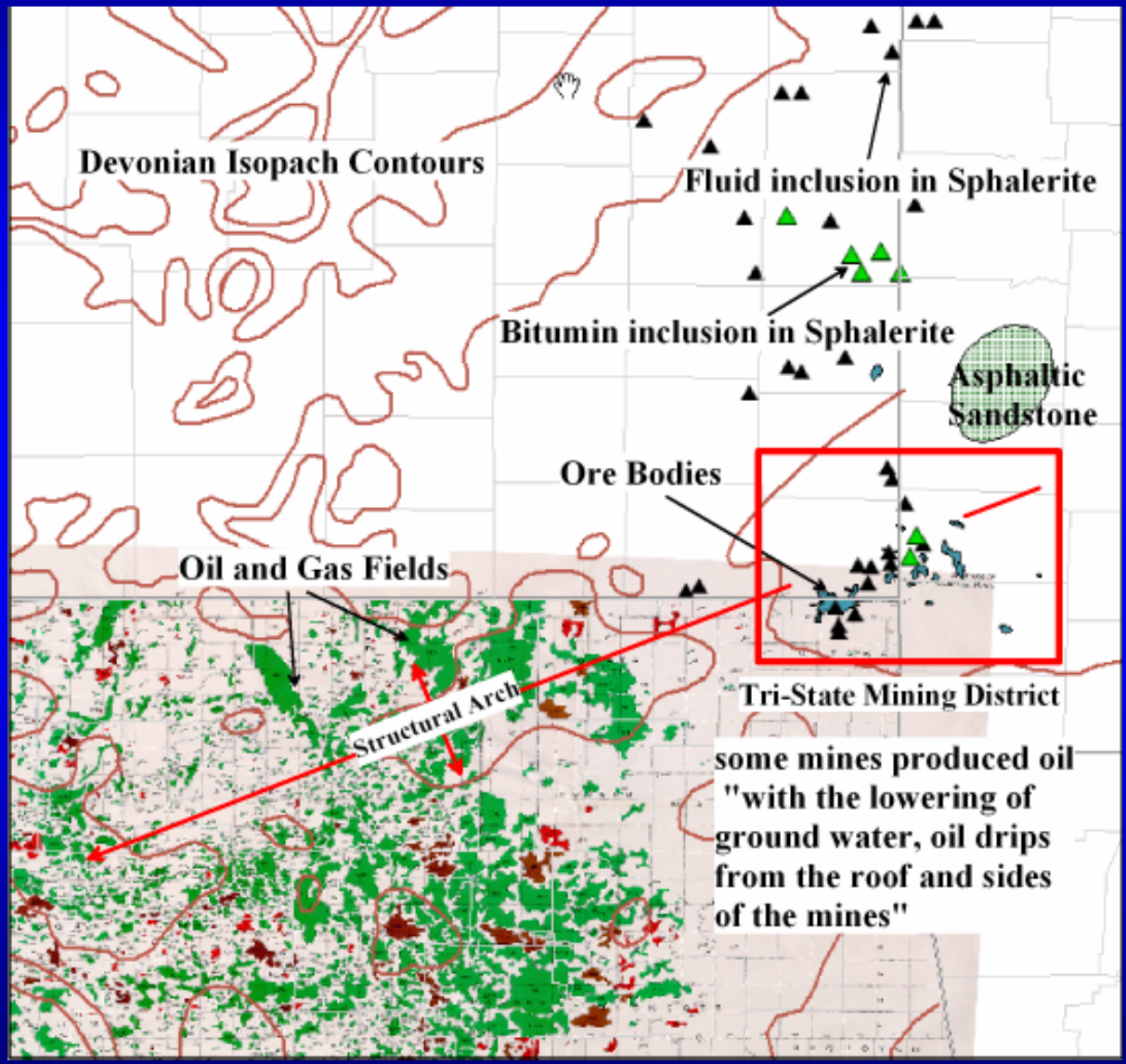
Unconsolidated sand (vfg) produced on DST at 7226'

Dolomite replacing and etching quartz grains Note remnant hemitite rim. Sample from 7834'

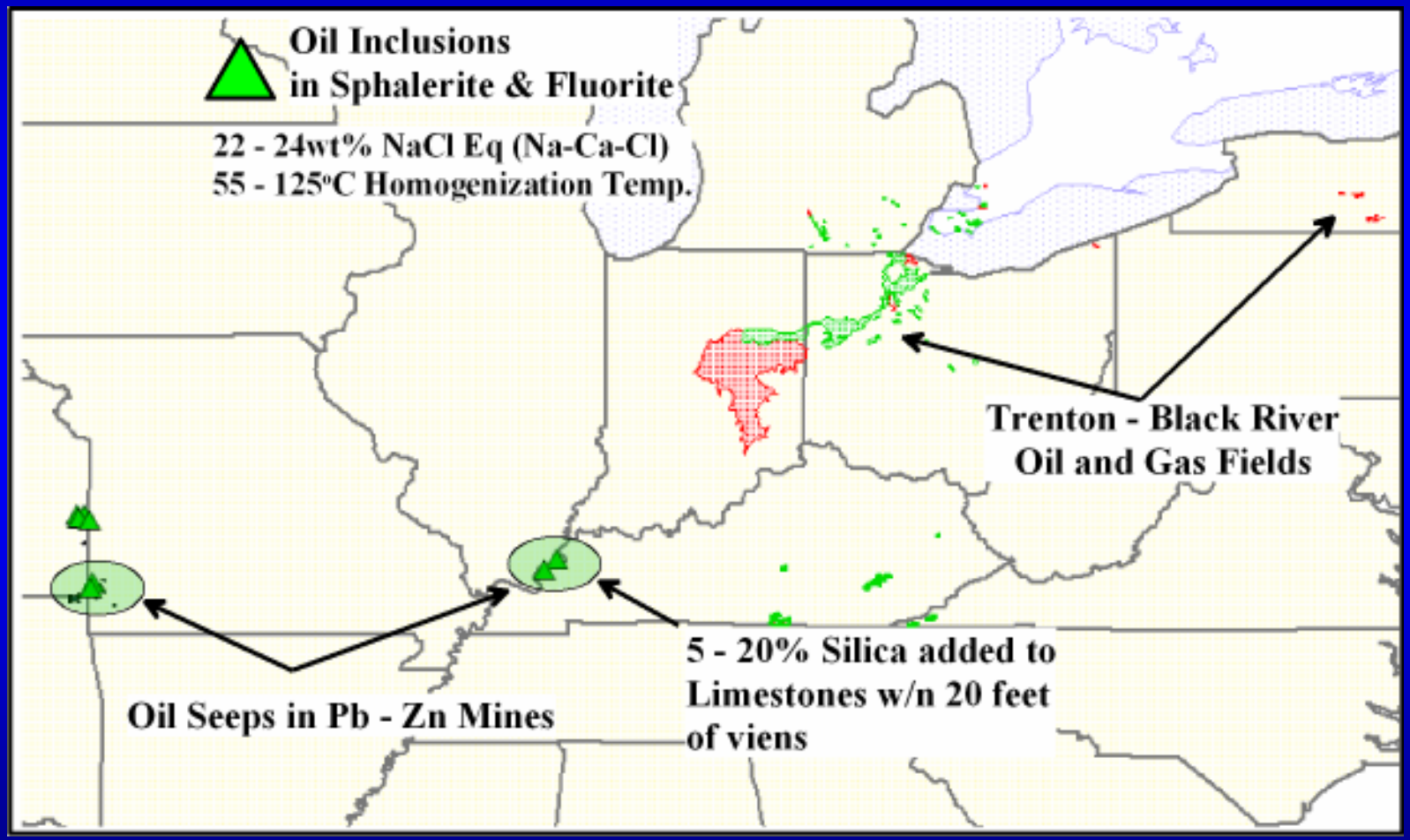
Anhyridte replacing and etching quartz grains. Cross nicols - Sampe from 9163'

Well cemented sandstone with sutured contactacts between grains. Sample depth = 7834'

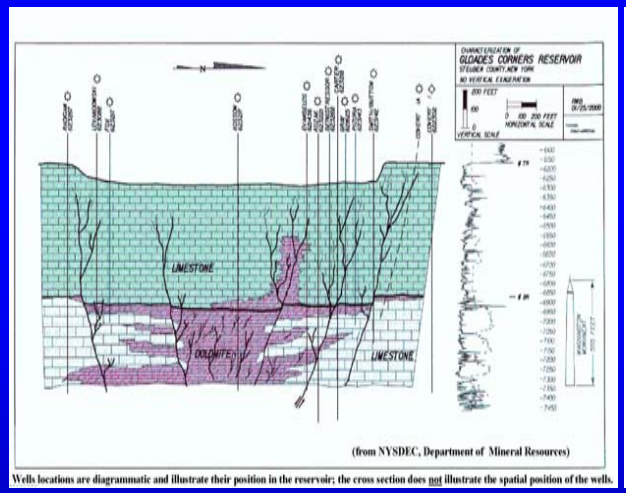
MVT Mineralization and Hydrocarbons



Fluid Inclusion Data



Newfoundland ?



Glodes Corner Field, New York

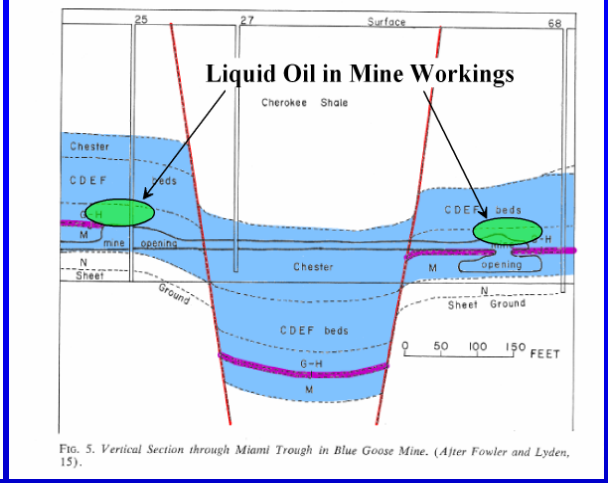
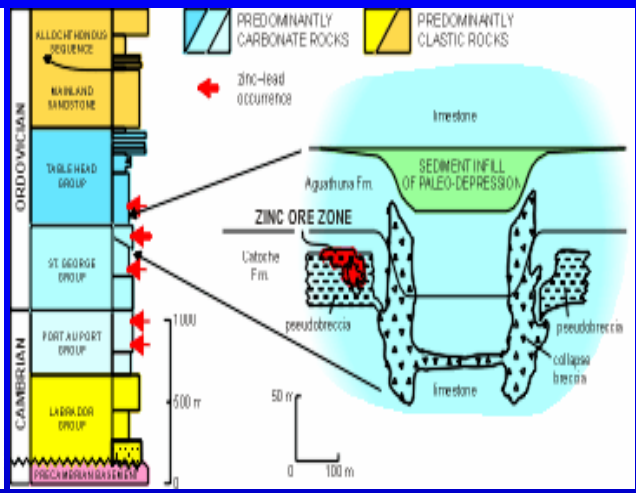


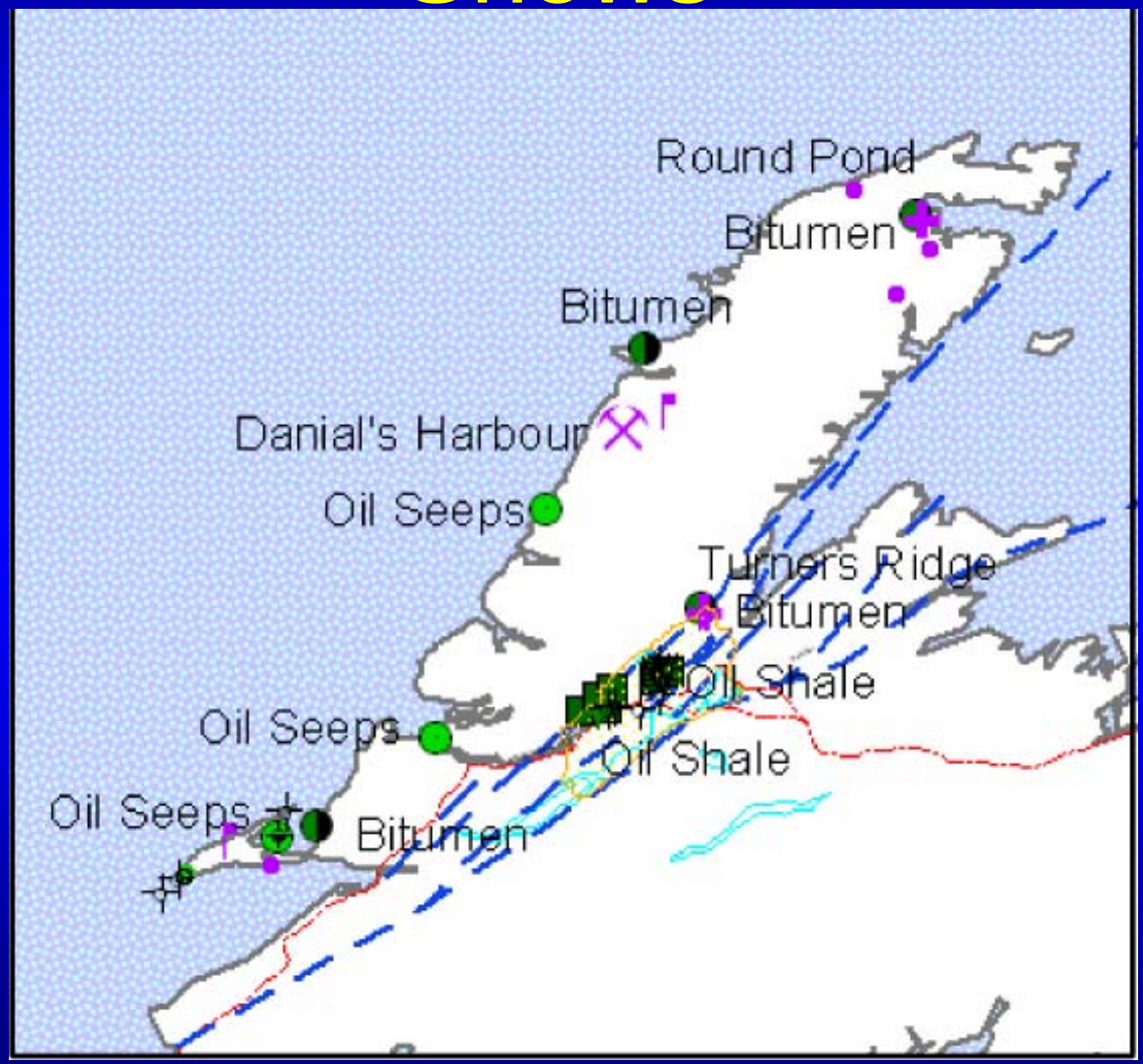
FIG. 5. *Vertical Section through Miami Trough in Blue Goose Mine. (After Fowler and Lyden, 15).*

Blue Goose Mine, Tri-State District

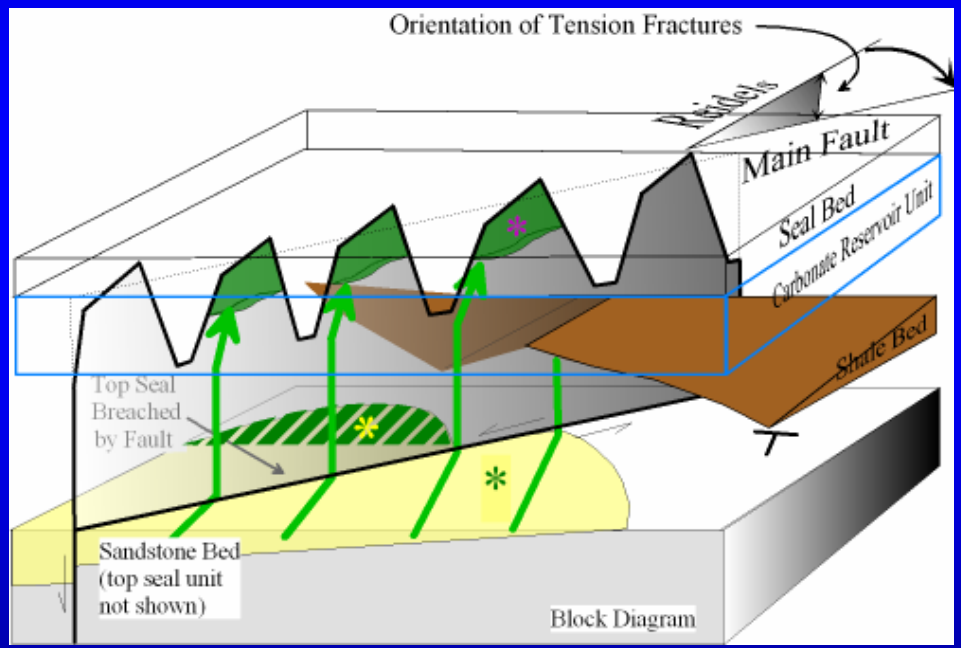


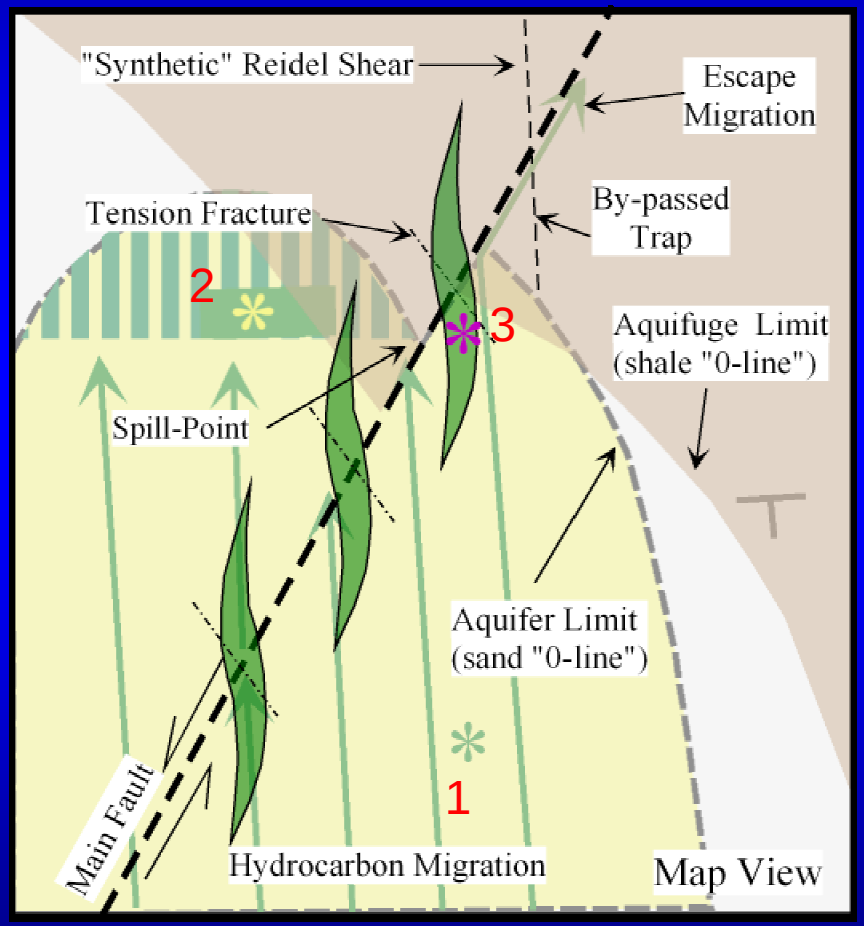
Daniel's Harbour - type mineralization

Mineralization and Hydrocarbon Shows



Summary


Orientation of Tension Fractures
Riedels
Main Fault
Seal Bed
Carbonate Reservoir Unit
Shale Bed
Top Seal
Breached
by Fault
Sandstone Bed
(top seal unit
not shown)
Block Diagram


"Synthetic" Reidel Shear
Escape
Migration
Tension Fracture
By-passed
Trap
2
3
Aquifuge Limit
(shale "0-line")
Spill-Point
Aquifer Limit
(sand "0-line")
1
Main Fault
Hydrocarbon Migration
Map View