PRESENTED BY JAKE AND JASON ZHANG

A Geologic Analysis of the McNinch Field, Ness and Trego Counties, KS

GEOLOGY 535
12.1.2017

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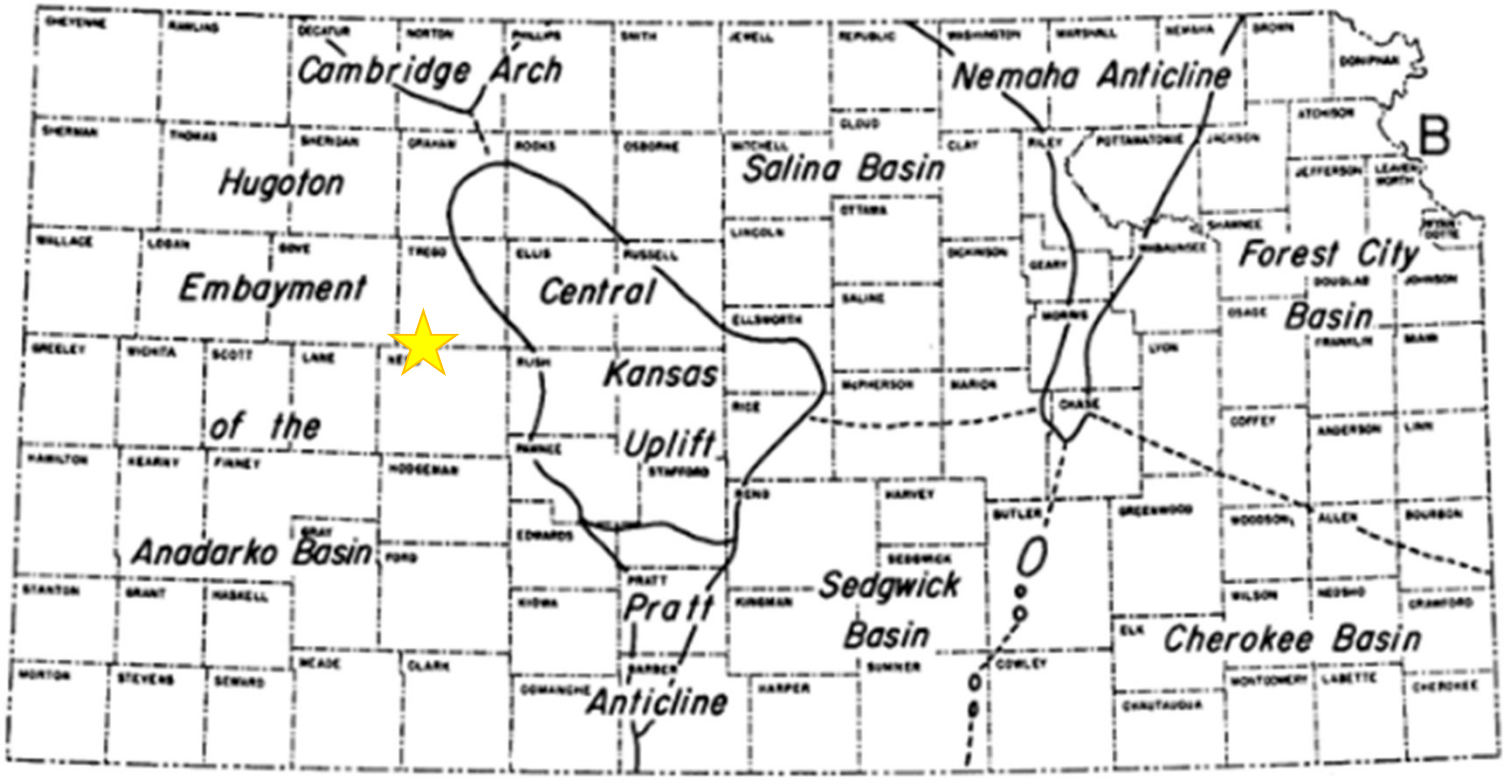
Outline

- Field location
- Brief petroleum system overview
- Field history
- Geologic setting
- Petrophysical parameters
- Production forecast
- Economics

MCNINCH FIELD LOCATION



Merriam, 1963

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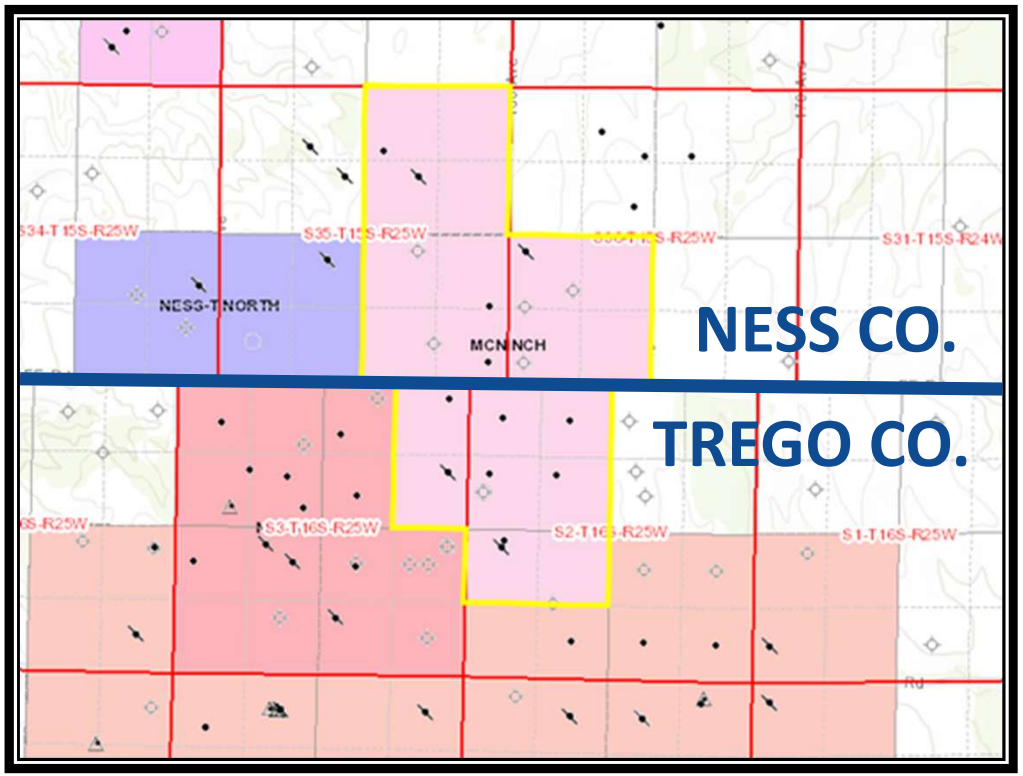
MCNINCH FIELD LOCATION CONT'D



KGS, 2017

- Spans ~800 geographic acres
- Sections:
  - 35-15S-25W
  - 36-15S-25W
  - 21-6S-25W
  - 3-16S-25W
- Data collected in surrounding sections
- Miss. Stages at surface
  - Osagian, Warsaw, Salem

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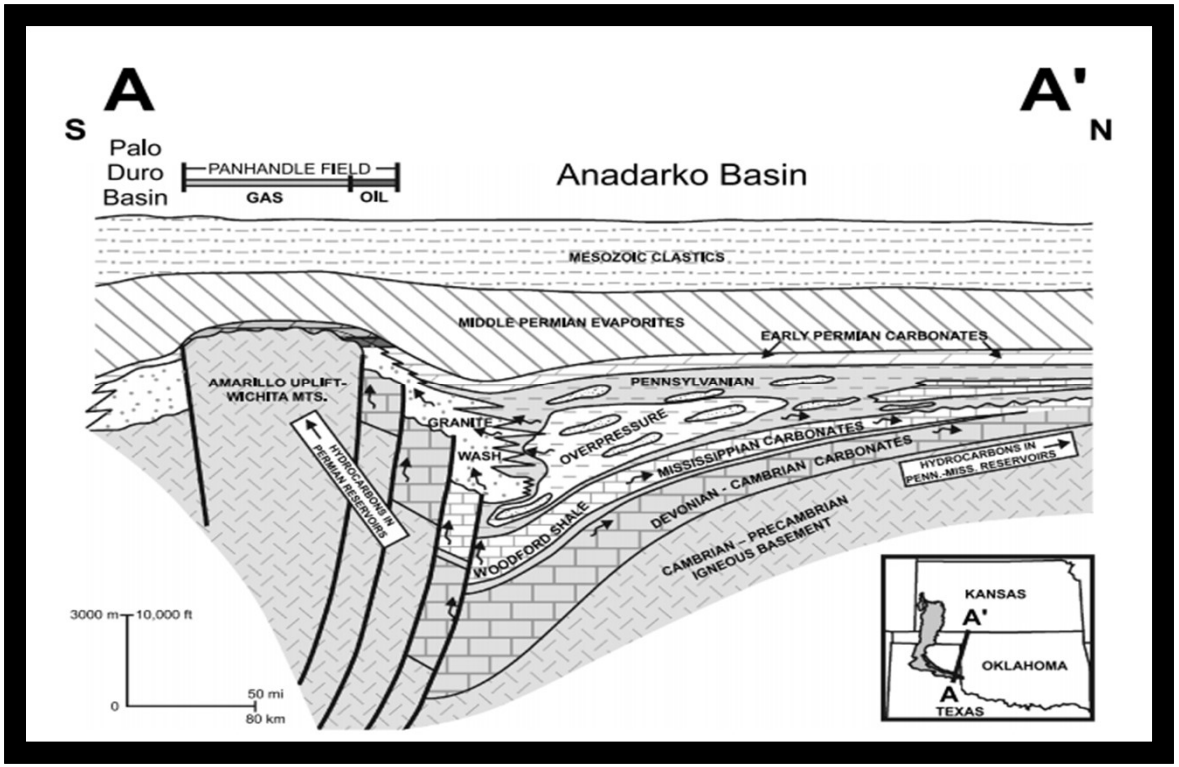
BRIEF PETROLEUM SYSTEM OVERVIEW



SORENSON, 2005

- Oil generated in southern OK, TX panhandle
- Woodford shale source rock
  - Possibly Springer sands
- Critical moment ~220-320 Million years ago
- Migrated through Mississippian system
  - TX, OK, KS, NE
- Not all oil migrated north

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FIELD HISTORY

Field Inception

- First oil production in 1987
  - Double Eagle Exploration Co., LLC's McNinch 'B' 1
  - 24-hr IP: 130 STB/day (field record)
  - 4 total wells (75% success rate)

Drilling Campaigns

- 7 step-out wells drilled in 1988 (86% success rate)
- 2 wells drilled in 1989 (50% success rate)
- 3 wells drilled in 1990 (67% success rate)
- 4 wells drilled in 2010
  - 1 D&A (Double Eagle), 3 Oil (Palomino Petroleum, Inc.)

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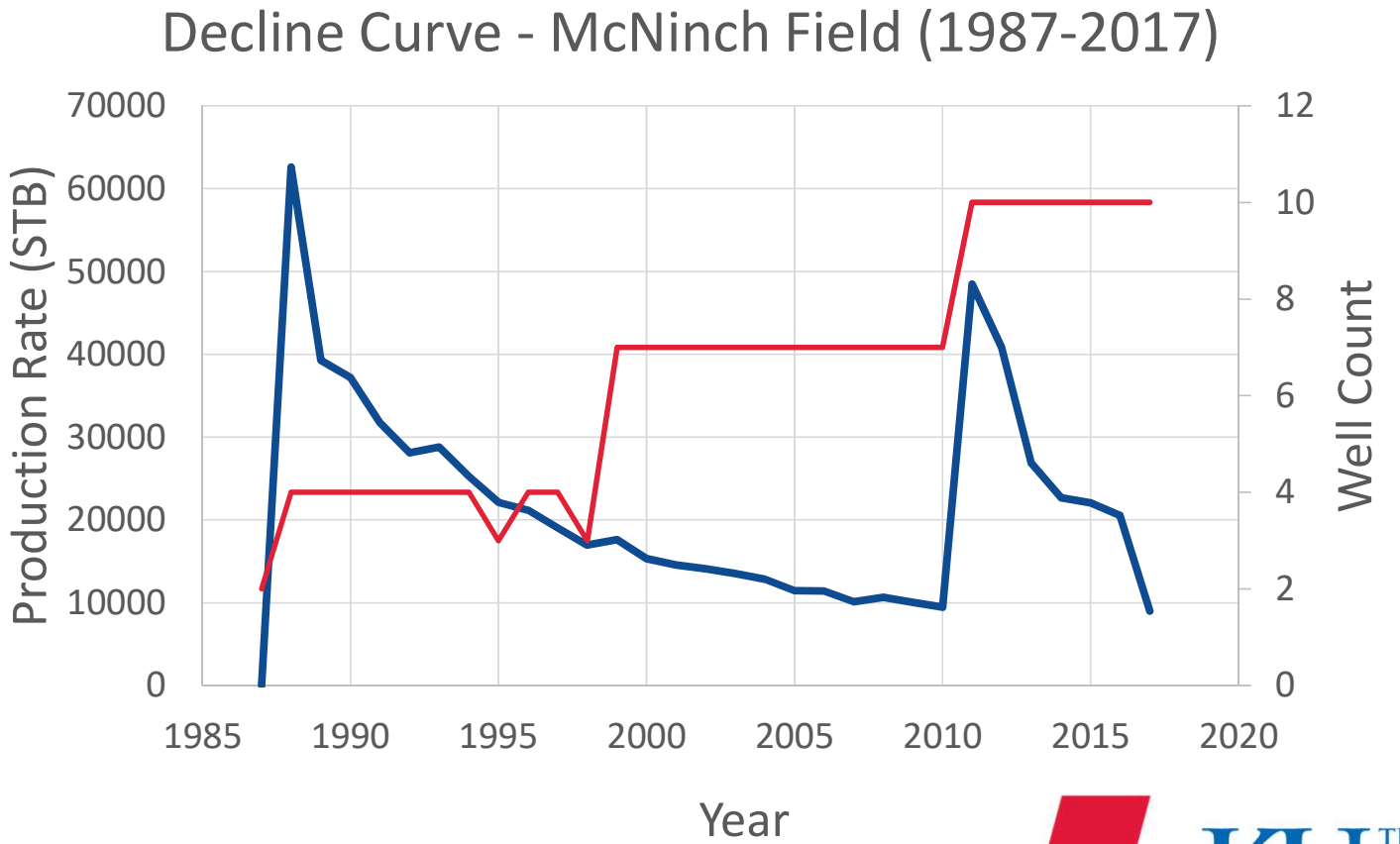
VISUAL FIELD HISTORY



KGS Data, 2017

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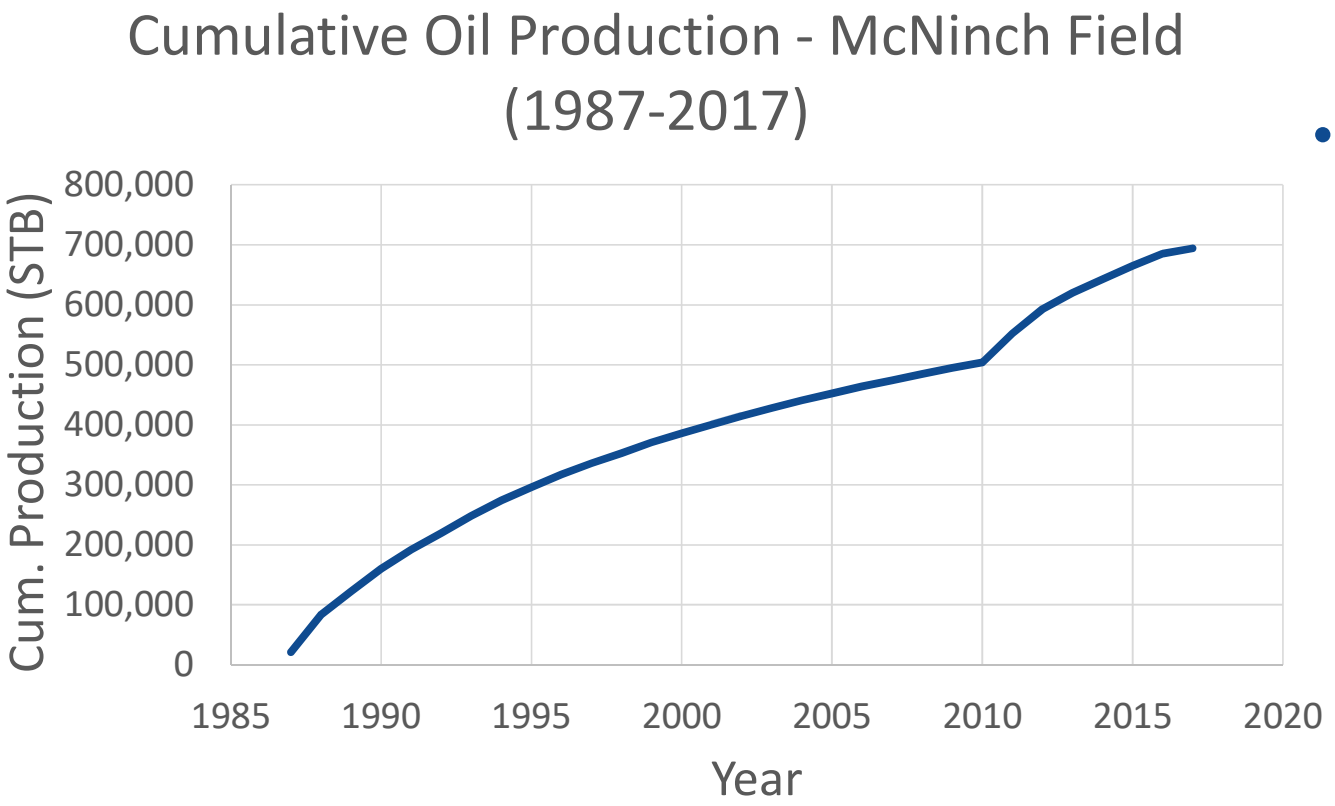
PRODUCTION HISTORY



KGS Data, 2017

- **Cum Production To-Date:** 694,099 STB
- **OOIP:** 2,720,022 STB
- **RF:** 26%

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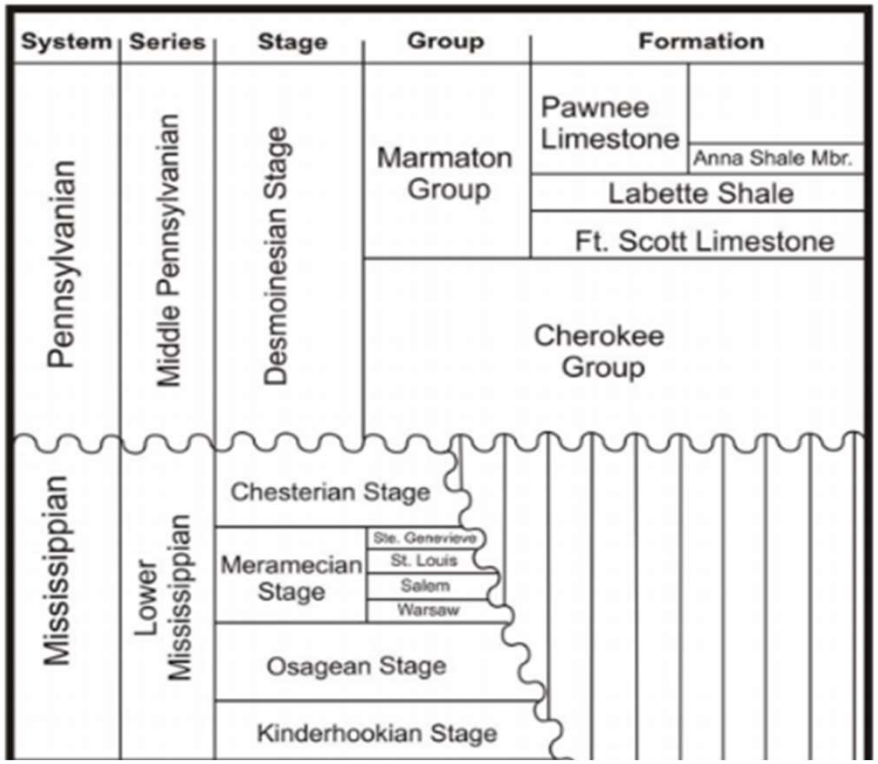
GEOLOGIC SETTING

- Western flanks of Central Kansas Uplift
- Upper Mississippian dolomite production
  - Cherokee group seal
- Karst structure anticlines
  - Doline initiated
- Actual stage within Mississippian system unknown



Ramaker, 2009

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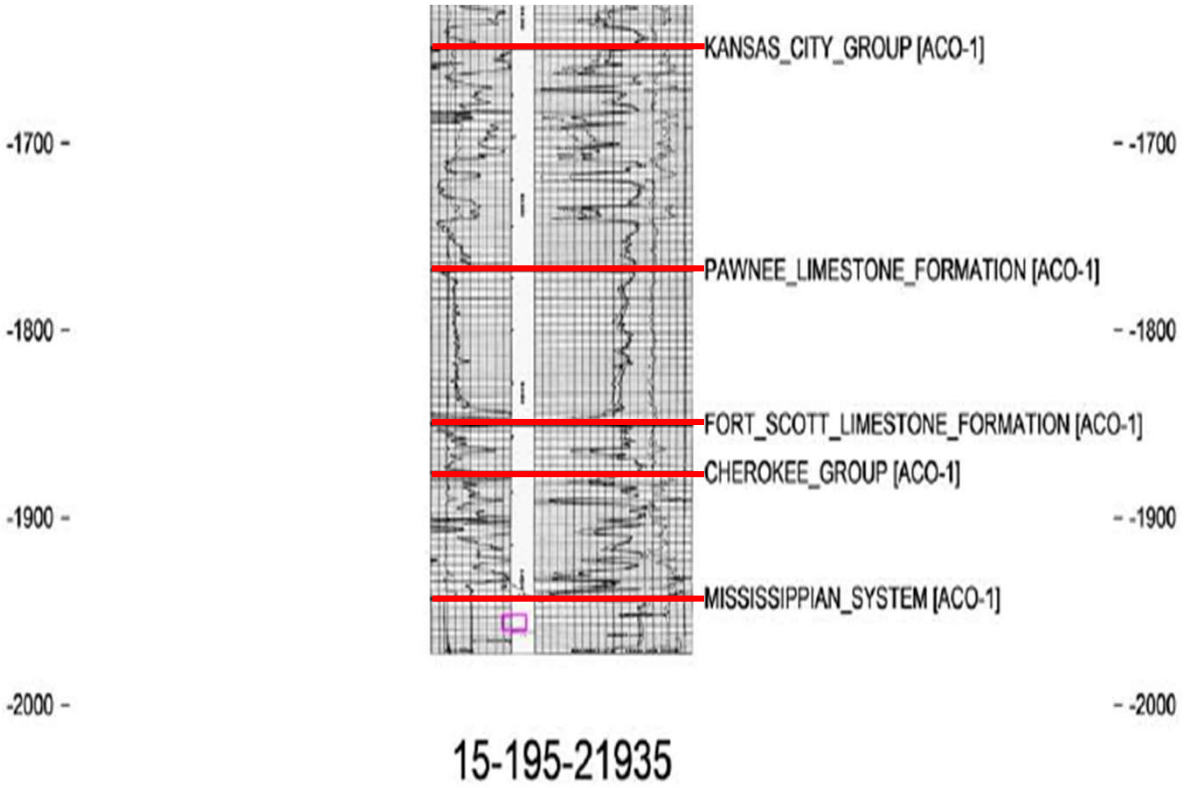
TYPELOG



- Kansas City Group down
- Shows difficulty in obtaining log data for Mississippian
- Open-hole Miss. Production
  - Pennsylvanian shale seal above
  - Sporadic chert/conglomerate above shale

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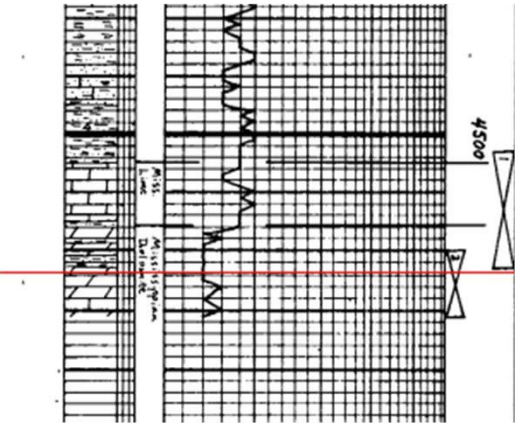
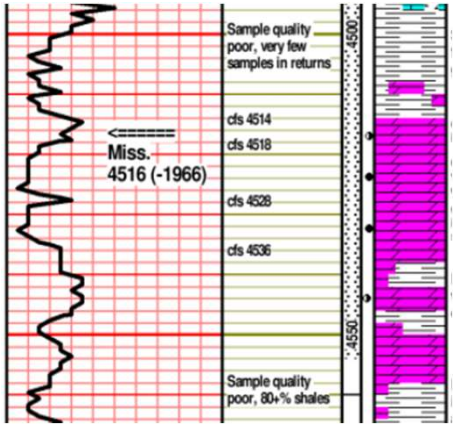
GEOLOGIC FACIES



- 15-135-22830
- Perfs at 4523-4531 ft(TVD)
- Upper seal shale
- Lower seal shale
- Trap Mississippian dolomite



- 15-195-22984
- Perf at 4501-4526 ft(TVD)
- Upper seal shale
- Lower seal shale
- Trap Mississippian dolomite

Mississippian System:

- Upper 8-10 ft limestone
- Remainder dolomite (main producing stages)
  - Finely crystalline
  - Fossiliferous
  - Fair to good vugular porosity
    - Possibly fossil-cast
  - Fair permeability

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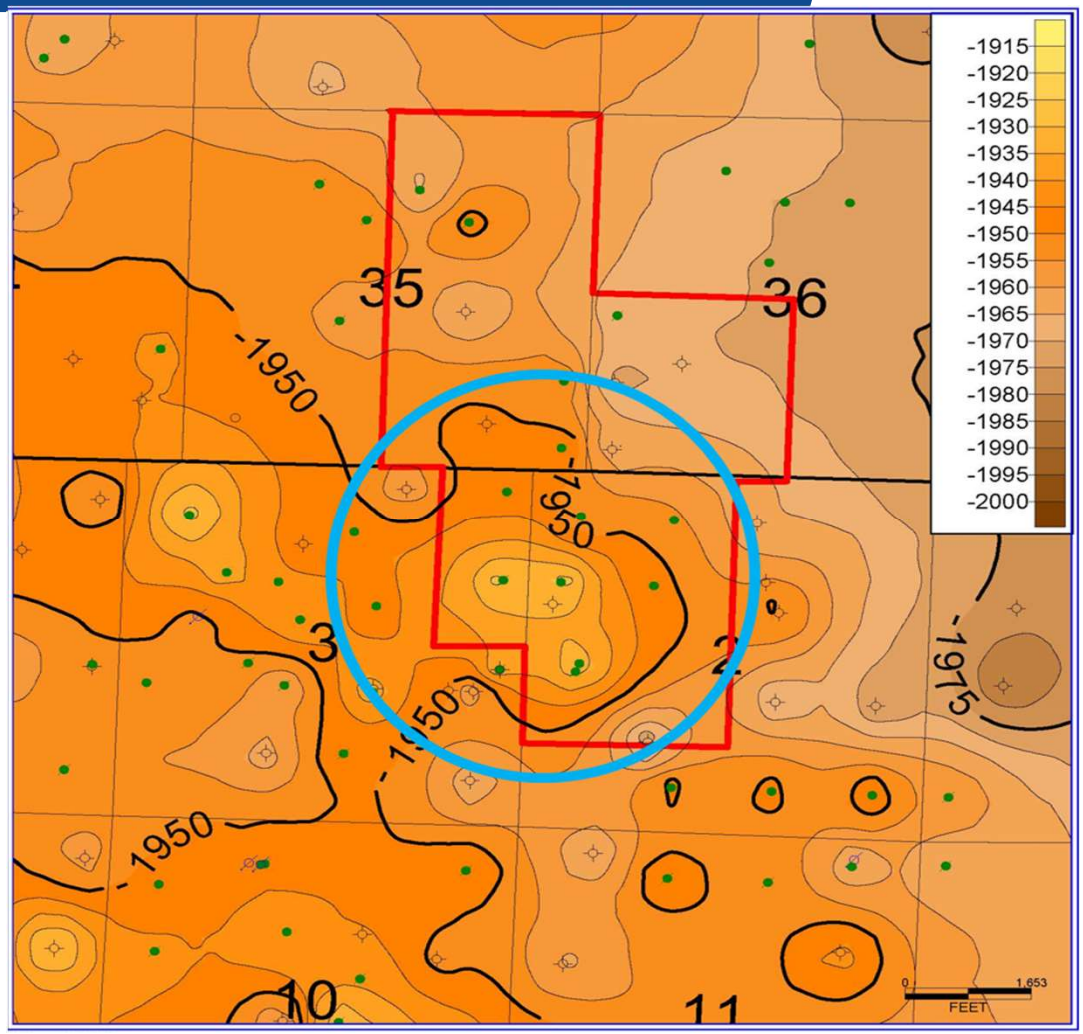
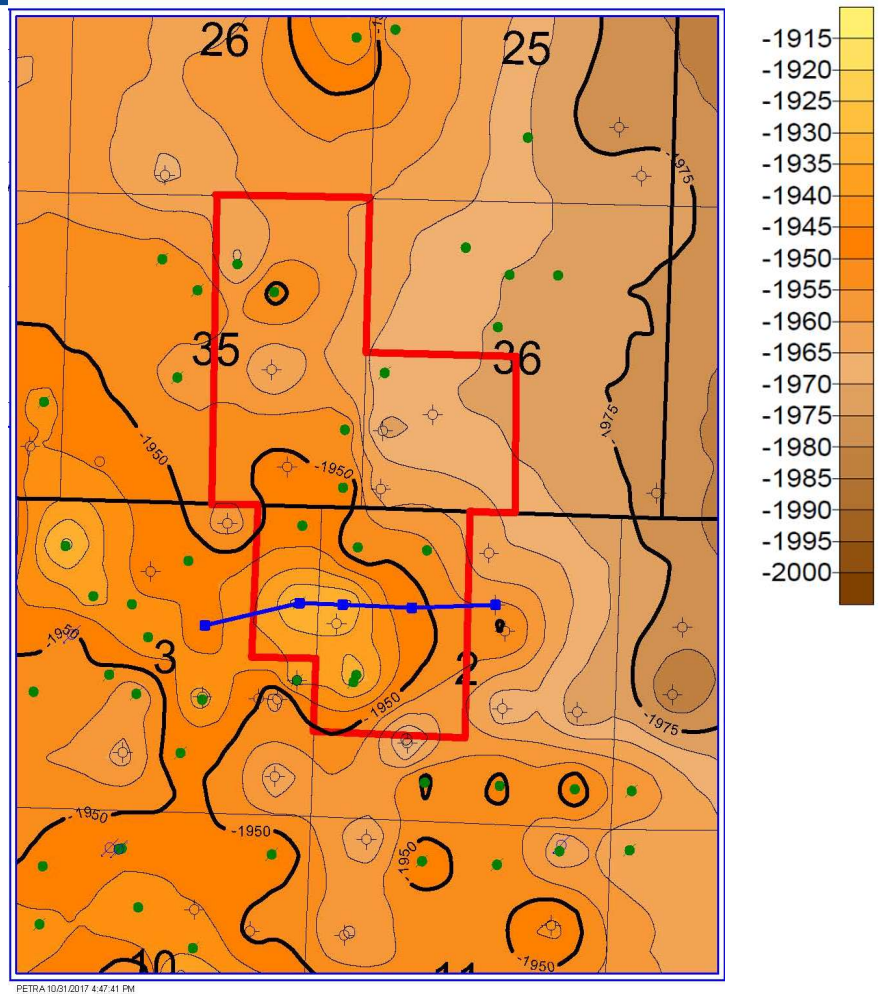
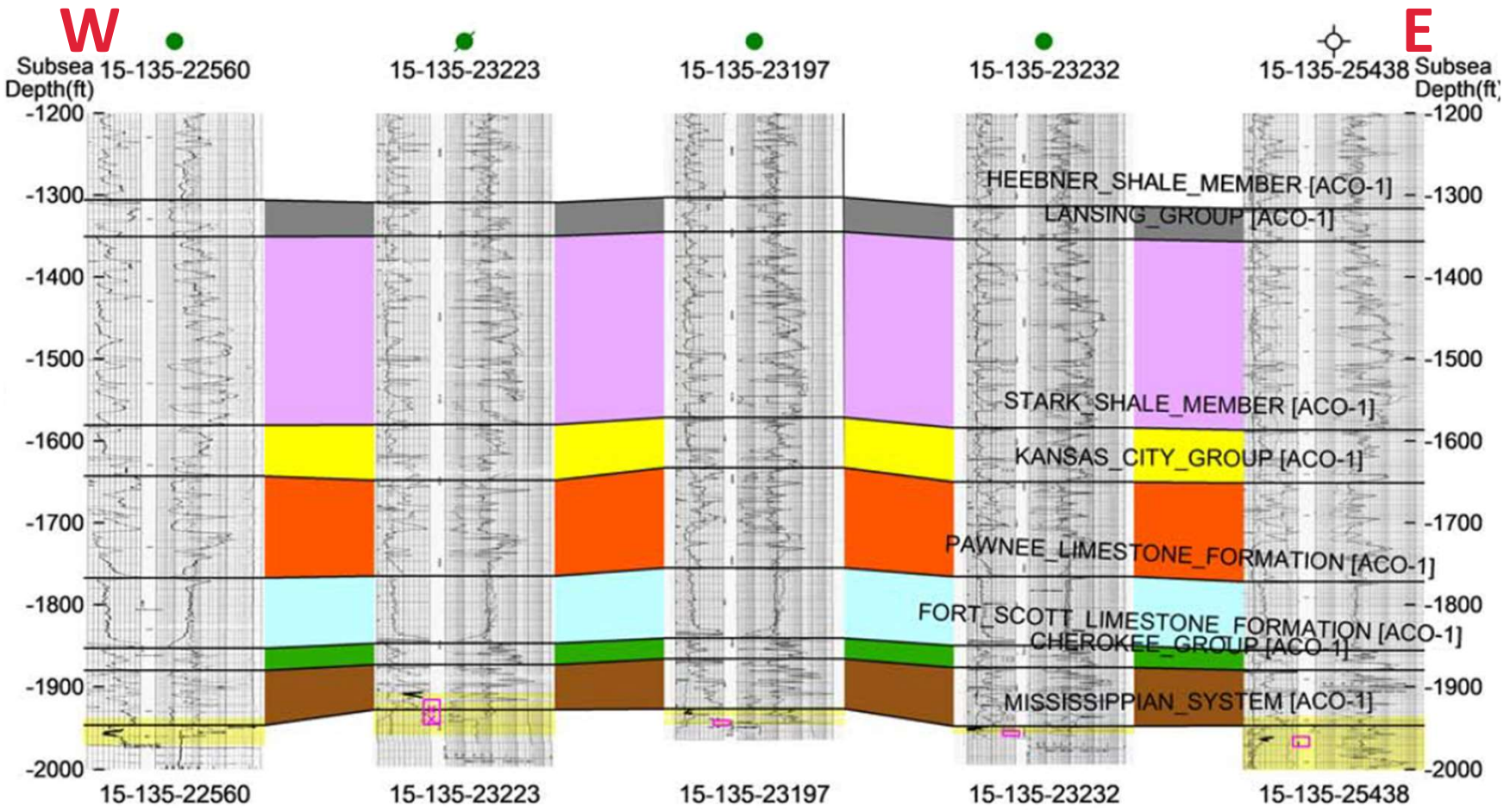
KARST STRUCTURES IN MCNINCH FIELD



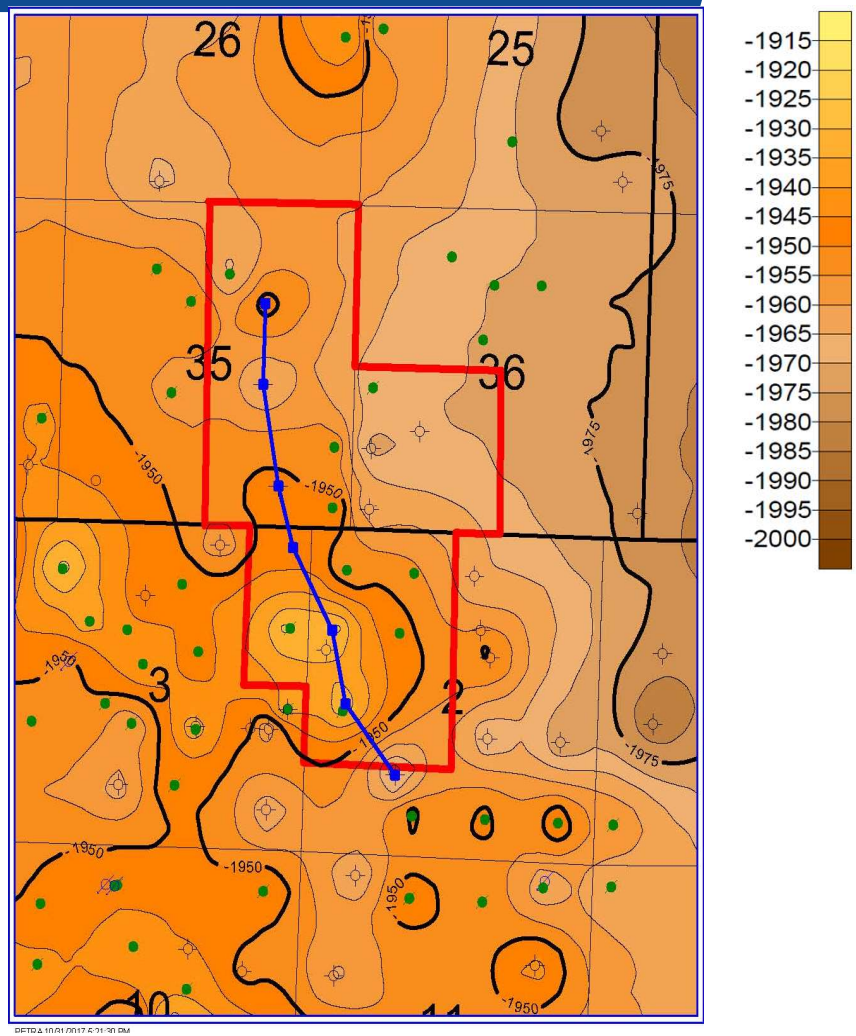
MAP VIEW OF E-W CROSS-SECTION



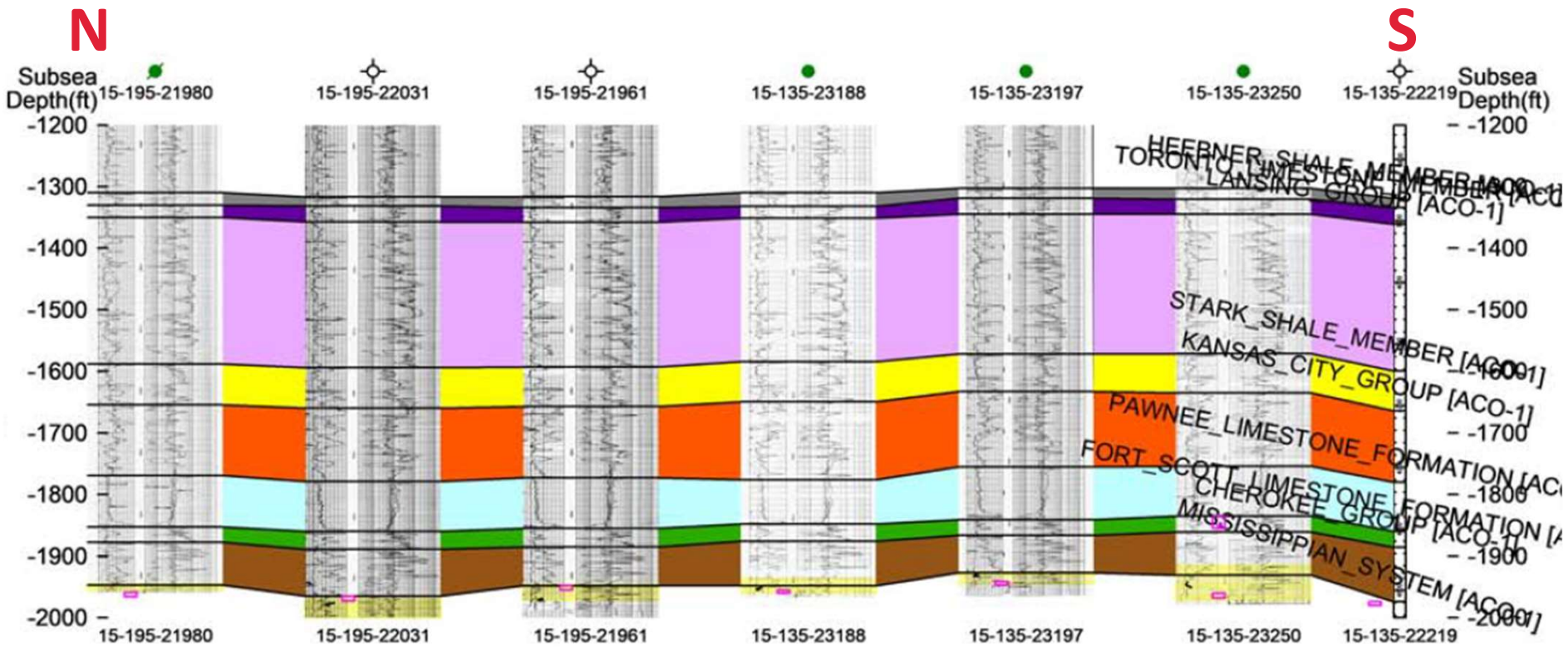
E-W CROSS SECTION OF MCNINCH FIELD



MAP VIEW OF N-S CROSS-SECTION

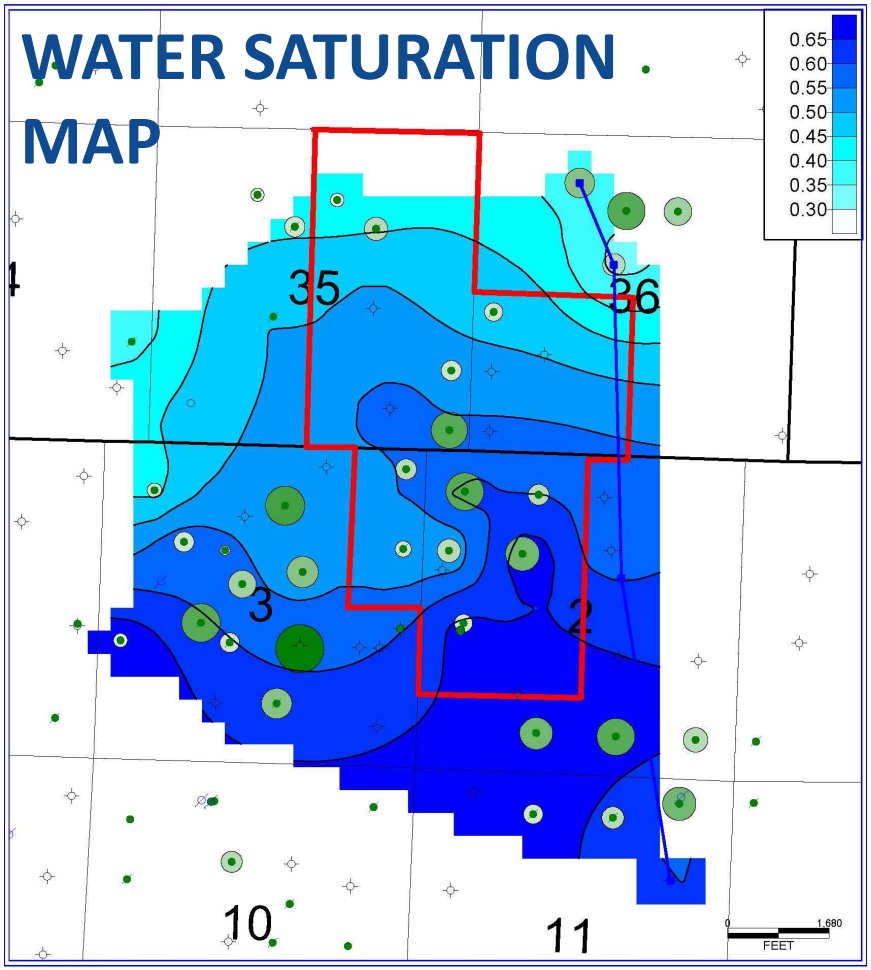


N-S CROSS SECTION OF MCNINCH FIELD

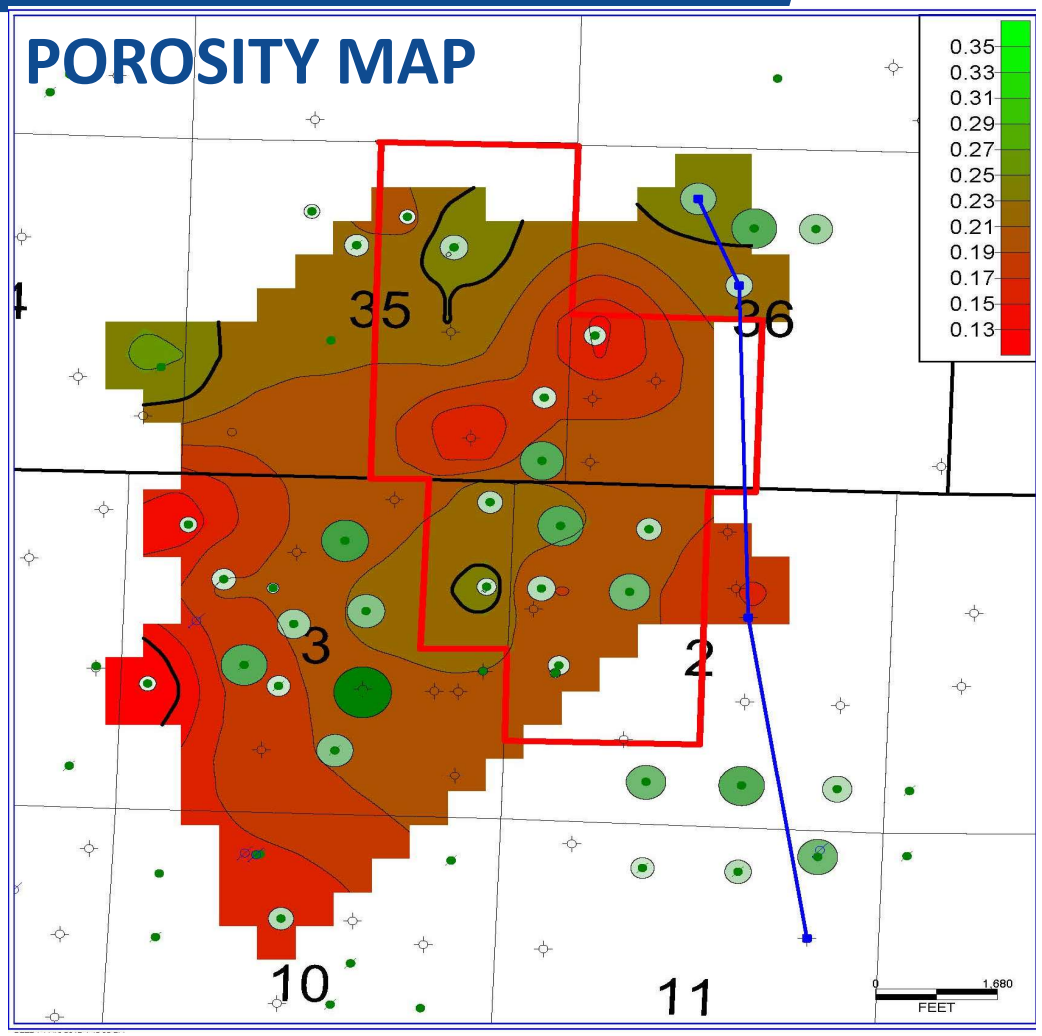


PETROPHYSICAL PARAMETERS

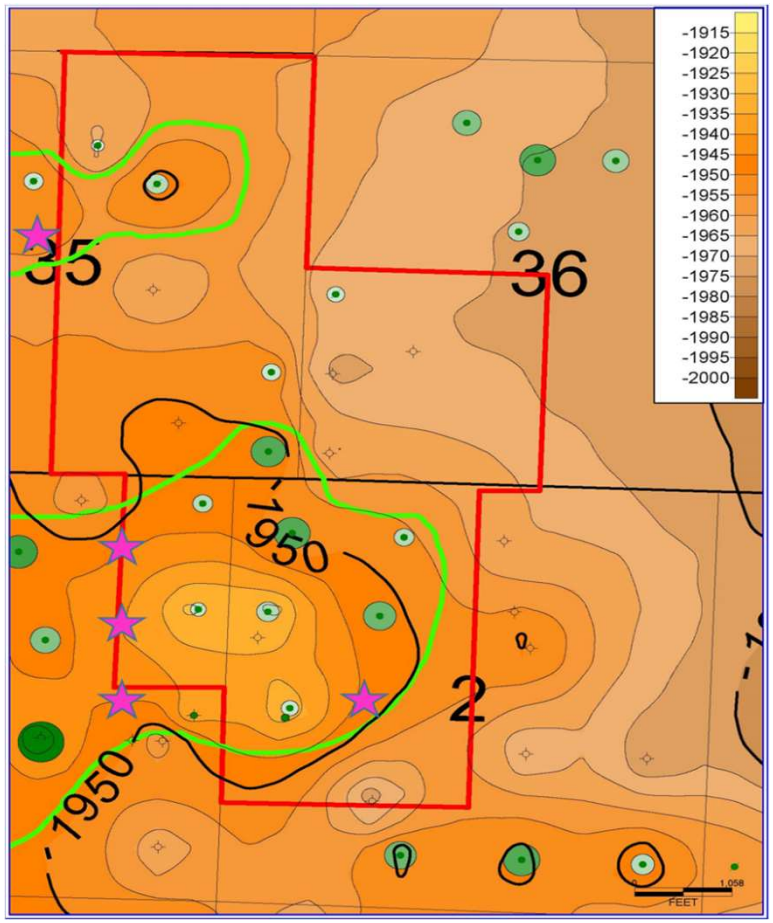
- Mean Sw: 47%
  - High: 68%
  - Low: 18%
- Mean Φ: 22%
  - High: 35%
  - Low: 13%
- IP Bubbles
  - Correlate w/ Sw
  - Correlate w/ Φ
- OOIP: 2,720,022 STB



PETROPHYSICAL PARAMETERS CONT'D



FIELD POTENTIAL



- Water Oil Contact at ~1960ft
- Determined location of main structural traps within field
  - WOC between:
    - Lowest oil producing wells
    - Highest water producing wells
  - Dry holes within boundary Ft. Scott wells
- Purple stars denote potential future field step-out locations
  - Likely only possible if boundaries expanded

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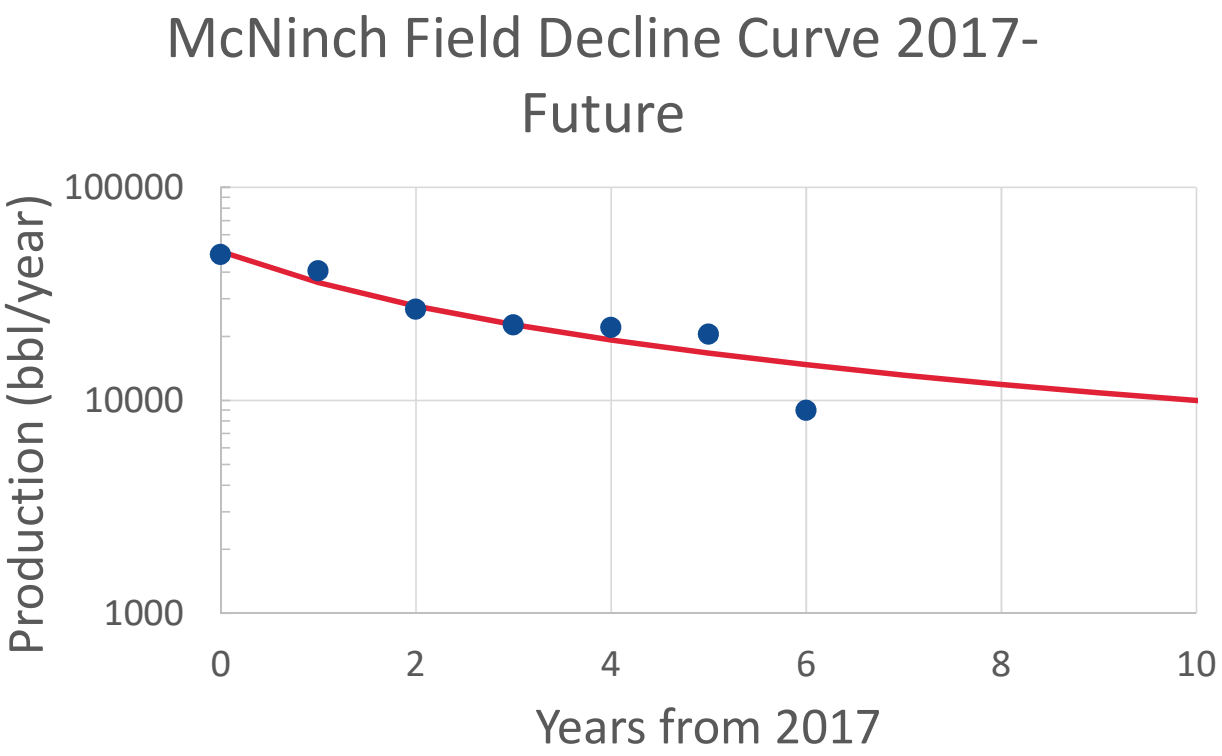
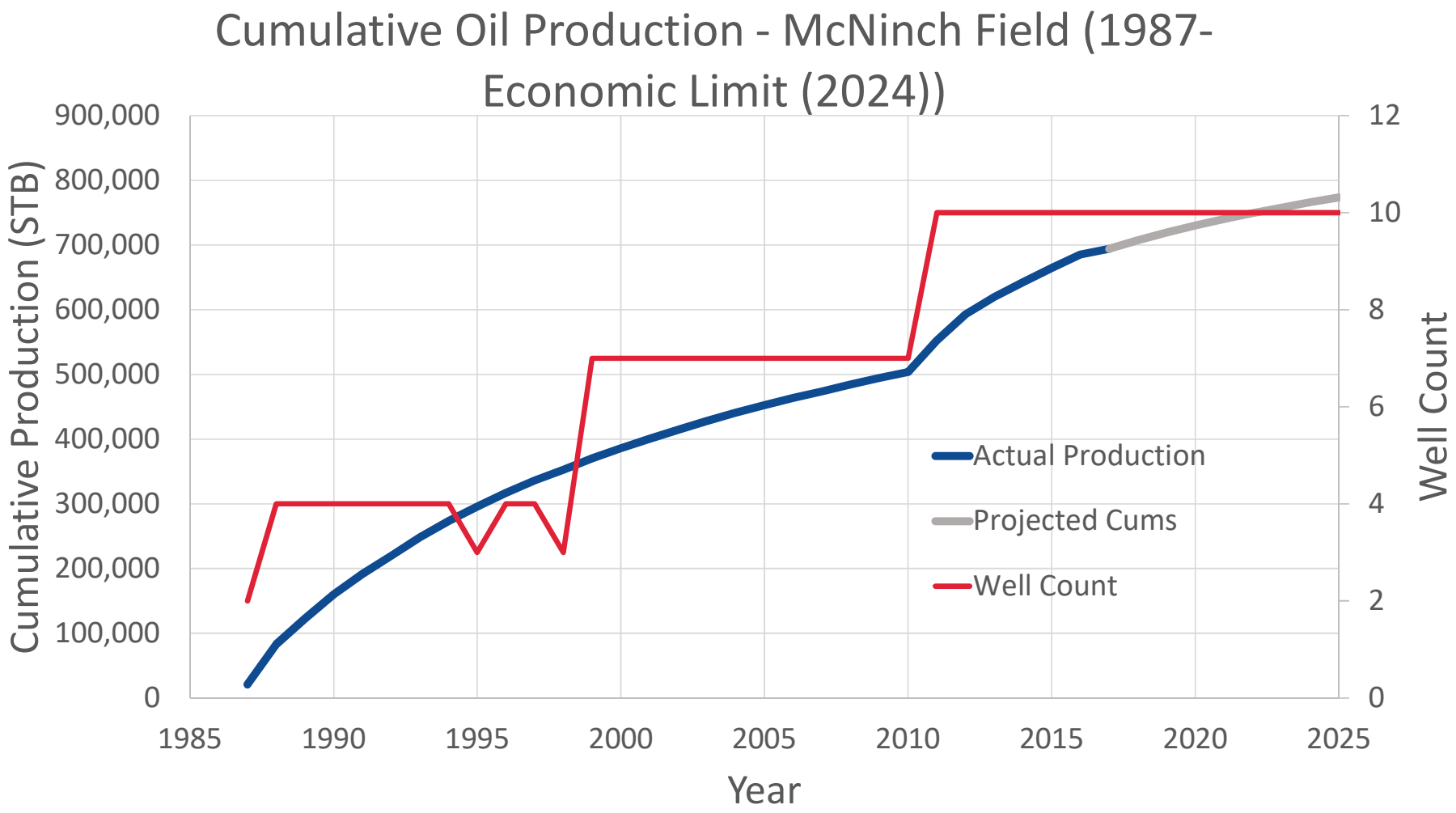
PRODUCTION FORECAST

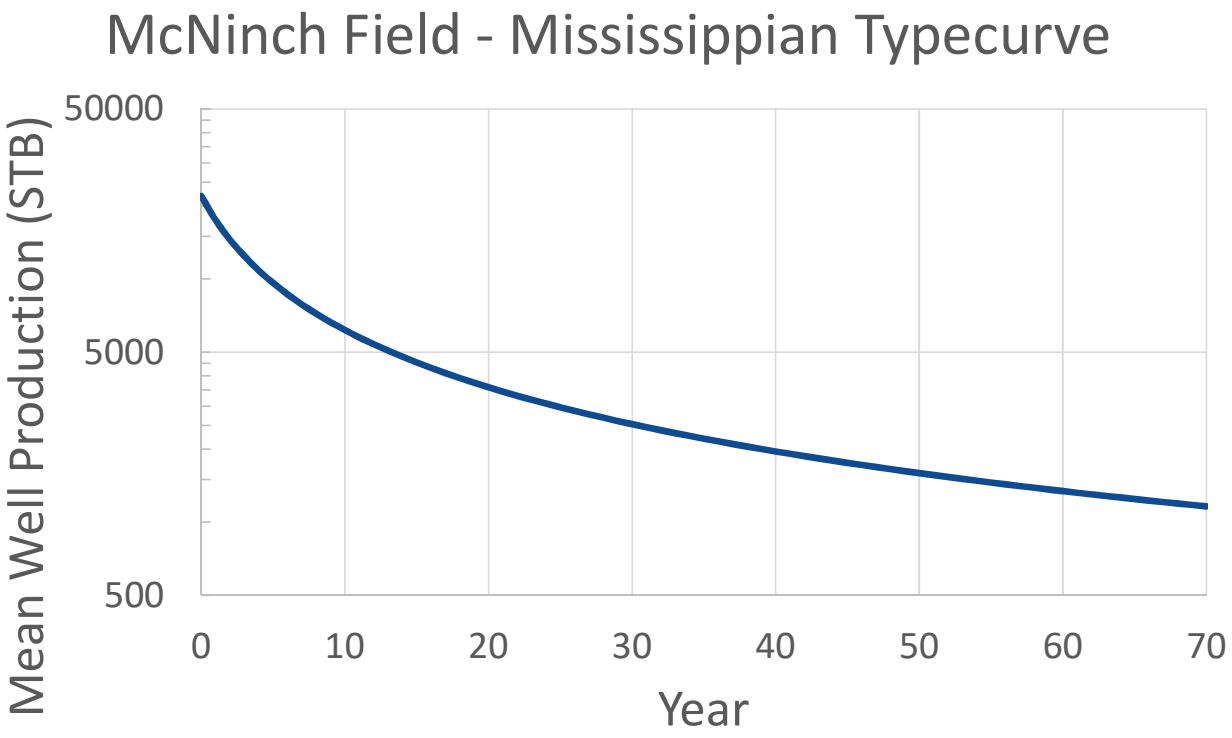


- Arp's Equation Parameters:
  - Qi: 50,000 STB/d
  - d: 0.4
  - b: 1 (harmonic)
- Based off current field configuration
- Econ Limit: 2024 (7 years)
- EUR: 773,551 STB
- RF_{2024}: 28%

UPDATED CUMULATIVE OIL PRODUCTION



MCNINCH FIELD MISSISSIPPIAN TYPECURVE



- Yearly decline curve
  - McNinch Field
  - Mississippian wells
- Determination
  - Qi: Mean 24-hr IP
    - Mult. By 365
  - d: Mean field decline
    - Constant well count
  - b: 1 (harmonic)

MCNINCH FIELD ECONOMICS

- Field value from cumulative production to-date in today's dollars

Discount Rate	Econ. Limit (Years)	Econ. Limit per well (bbl/day)	Value ($)
PV0	38	4	$ 15,578,292
PV10	38	4	$ 6,217,568
PV20	38	4	$ 3,831,696
PV30	38	4	$ 2,663,787

- Incremental economics for production forecasted 2017-Econ Limit

Discount Rate	Econ. Limit (Years)	Econ. Limit (bbl/day)	Value ($)
PV0	7	7580	$ 758,235
PV10	7	7580	$ 648,062
PV20	7	7580	$ 572,680
PV30	7	7580	$ 518,555

- Economics based on McNinch Mississippian Typecurve

Discount Rate	Econ. Limit (Years)	Econ. Limit per well (bbl/day)	Value ($)
PV0	66	4	$ 5,655,576
PV10	66	4	$ 2,670,574
PV20	66	4	$ 1,861,671
PV30	66	4	$ 1,468,102

Assumptions

- $50/BBL flat pricing
- $3000/mo LOE
- 12.5% royalties
- 8% tax rate
- Dry-hole CAPEX: $180,000
- Oil well CAPEX: $450,000

ACKNOWLEDGEMENTS

- Dr. Walton
- Kansas Geological Survey Staff
- Kansas Geological Society
- IHS

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