

Program to Determine the Uniqueness of Three Forks Bench Reserves, Determine Optimal Well Density in the Bakken Pool, and Optimize Bakken Production

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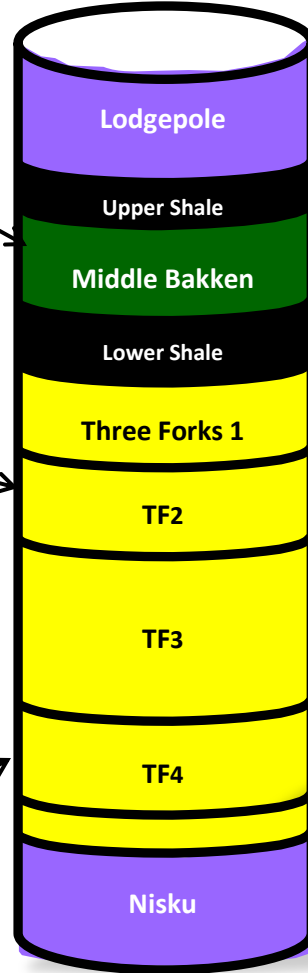
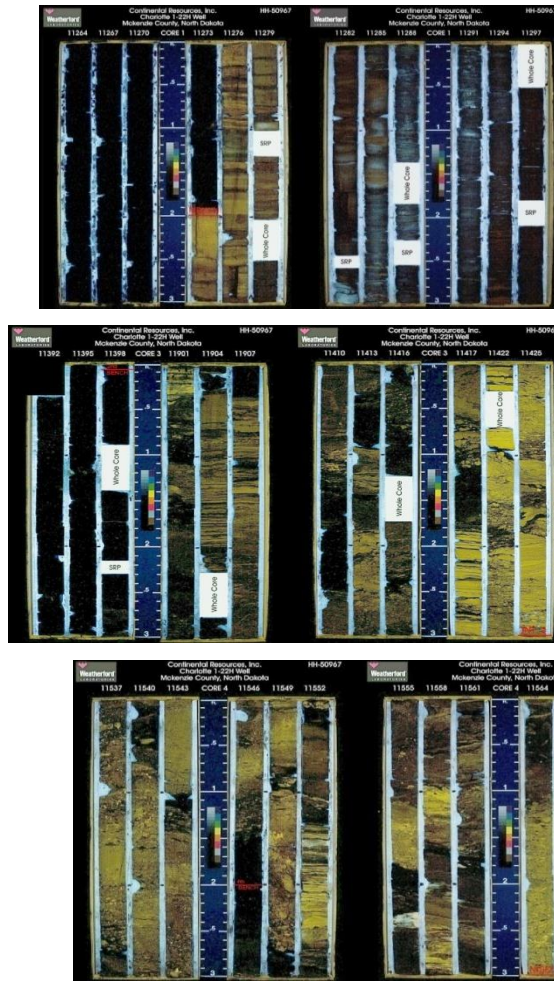
Program Goals

- Maximize oil production from Bakken and Three Forks wells by employing an “all of the above” approach, including:
 - Advanced reservoir characterization.
 - Improved drilling/stimulation/completion/production techniques and sequences.
 - Optimizing wellsite surface operations:
 - ◆ Reduce costs
 - ◆ Reduce development and operation impacts to surrounding landowners
 - ◆ Reduce demands on surrounding infrastructure and water sources

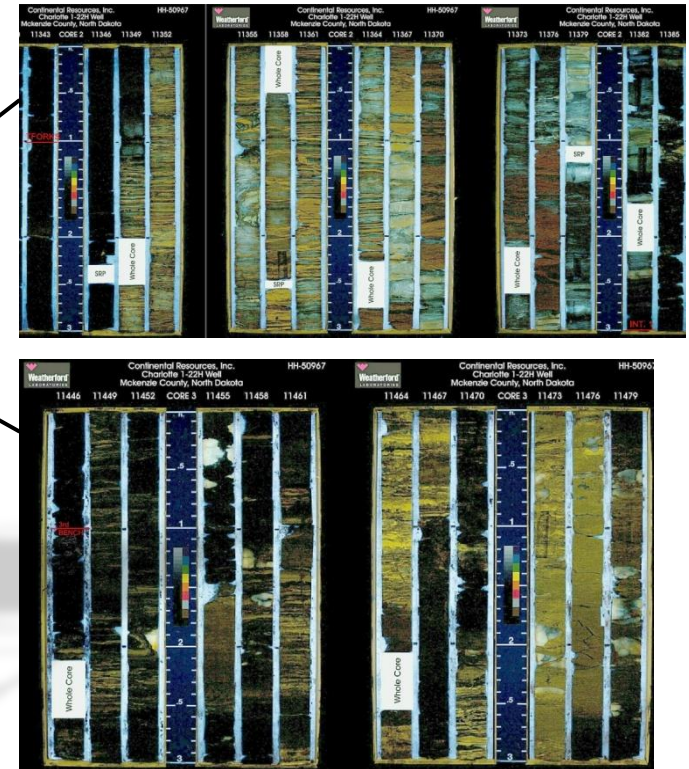
Project Description

- *Pilot hole logs, core data, other data gathering from multiple wells to create a 3-D picture of what happens during and after the hydraulic fracture treatments in a multistage horizontal well. Continental will analyze this data set to:*
 - *Assess total resource available in the second and third benches of the Three Forks Formation (separate and unique?).*
 - *Confirm whether these benches are distinct and independent of the existing Middle Bakken.*
 - *Predict areas of future sweet spots.*
 - *Site logistics, waste management, on-site hydrocarbon utilization, water management, process optimization, and systems failure analysis with an eye on decreased environmental impact.*
- Phase I – Drilling 11 New Wells
 - Phase II – Completions
 - Phase III – Reservoir Engineering
 - Phase IV – Expansion Applications via 3-D Seismic
 - Phase V – Optimization of Wellsite Operations

Bakken Petroleum System Redefined



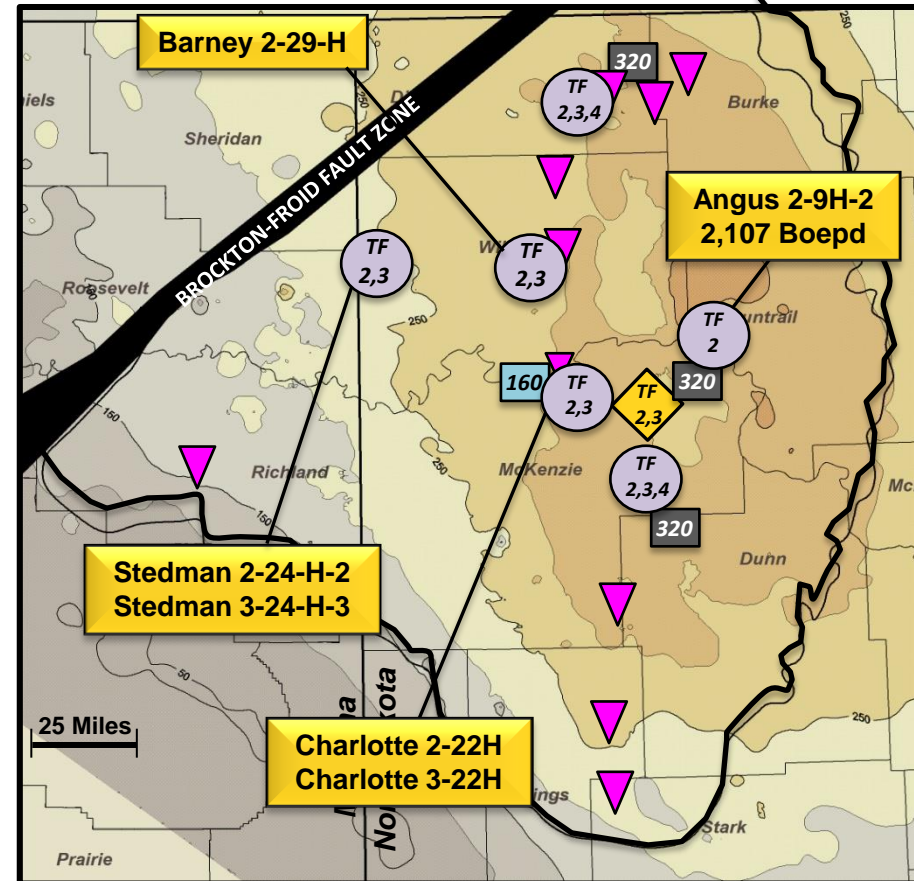
Charlotte 1-22H core photos (UV light)
308' with 154' of oil fluorescence



CLR: Deep Three Forks Development

- 🔥 10-well coring program (2012)
- 🔥 Lower TF exploration net capex 2013
 - Productivity Project
 - Exploratory and appraisal: \$123MM net cost (20 gross wells)
 - Pilot Density Projects
 - Three 320-acre density tests: \$161MM net cost (34 gross wells)
 - One 160-acre density test: \$36MM net cost (13 gross wells)

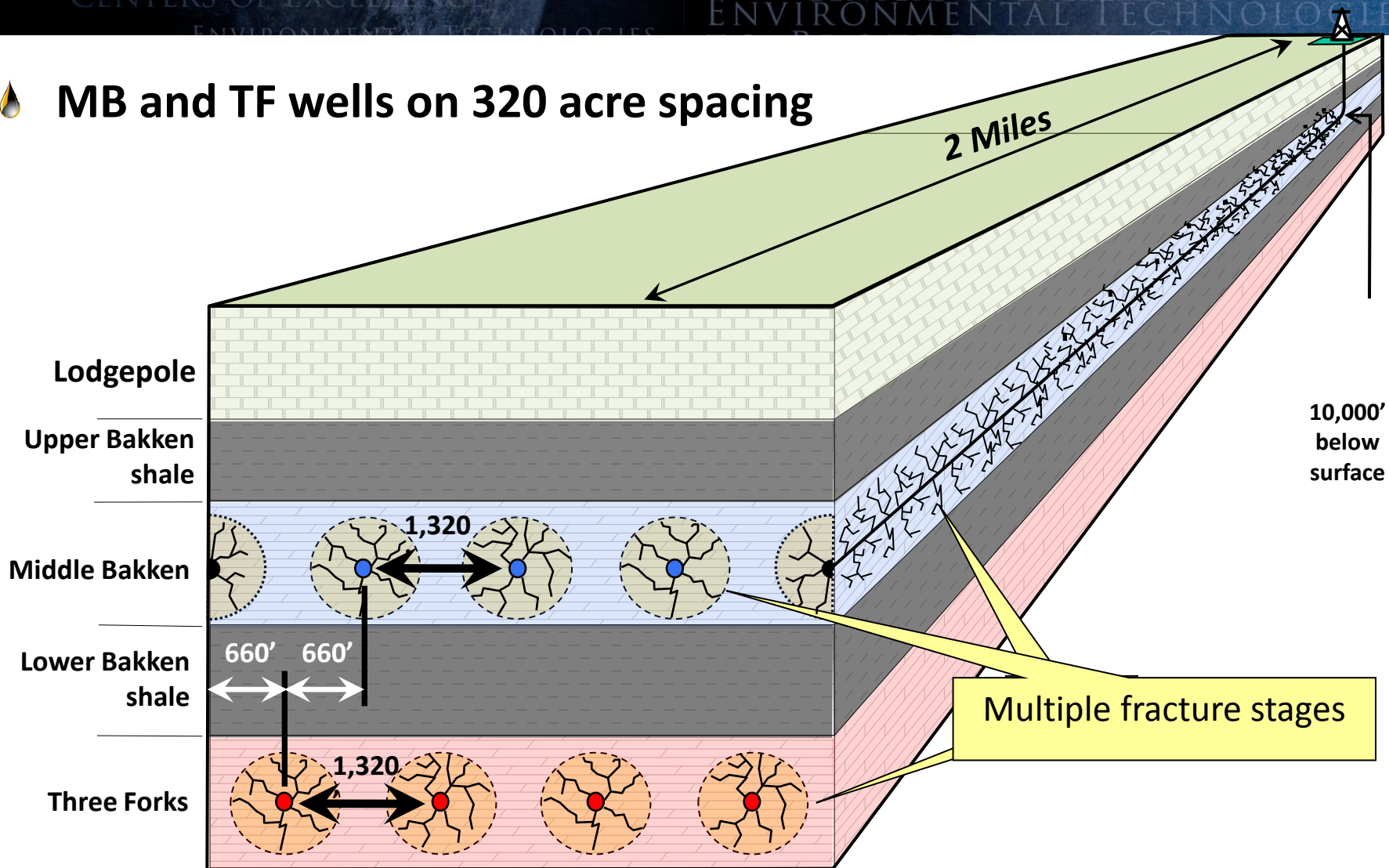
Three Forks Isopach Map



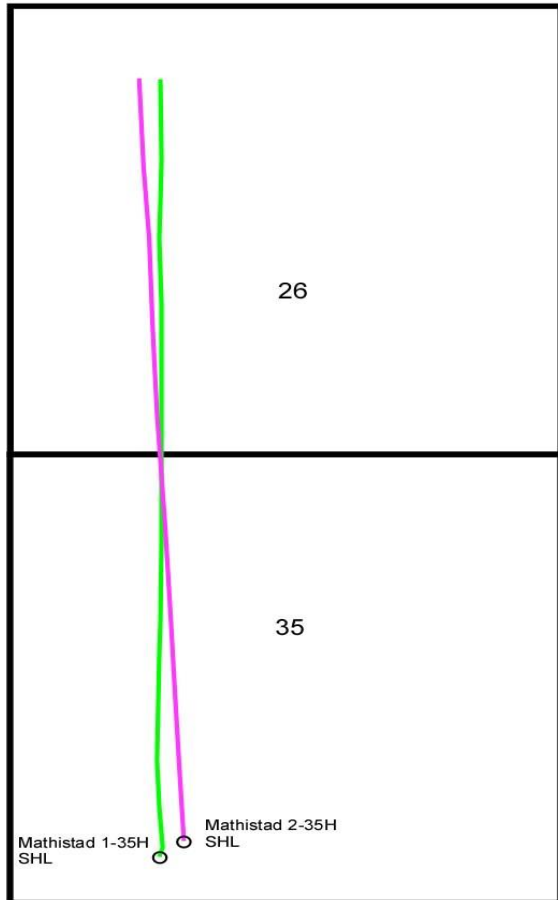
▼ CLR Core Location
 ◆ Other Lower TF Producer
 (TF) CLR Lower TF Producer
160 160-acre development
 320 320-acre development

Past: Dual Reservoir Development

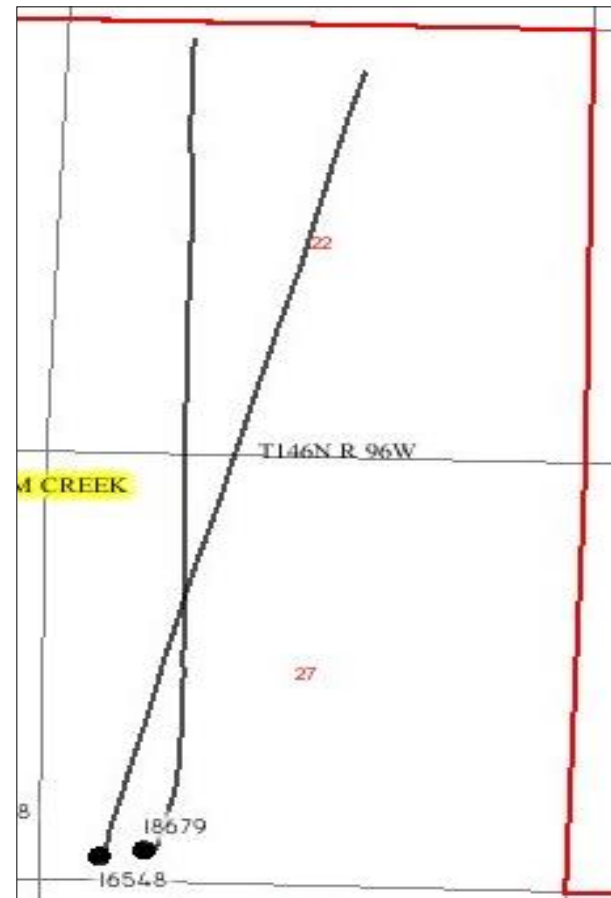
🔥 MB and TF wells on 320 acre spacing



Mathistad 1-35H and 2-35H wells
McKenzie Co., North Dakota
T150N R96W



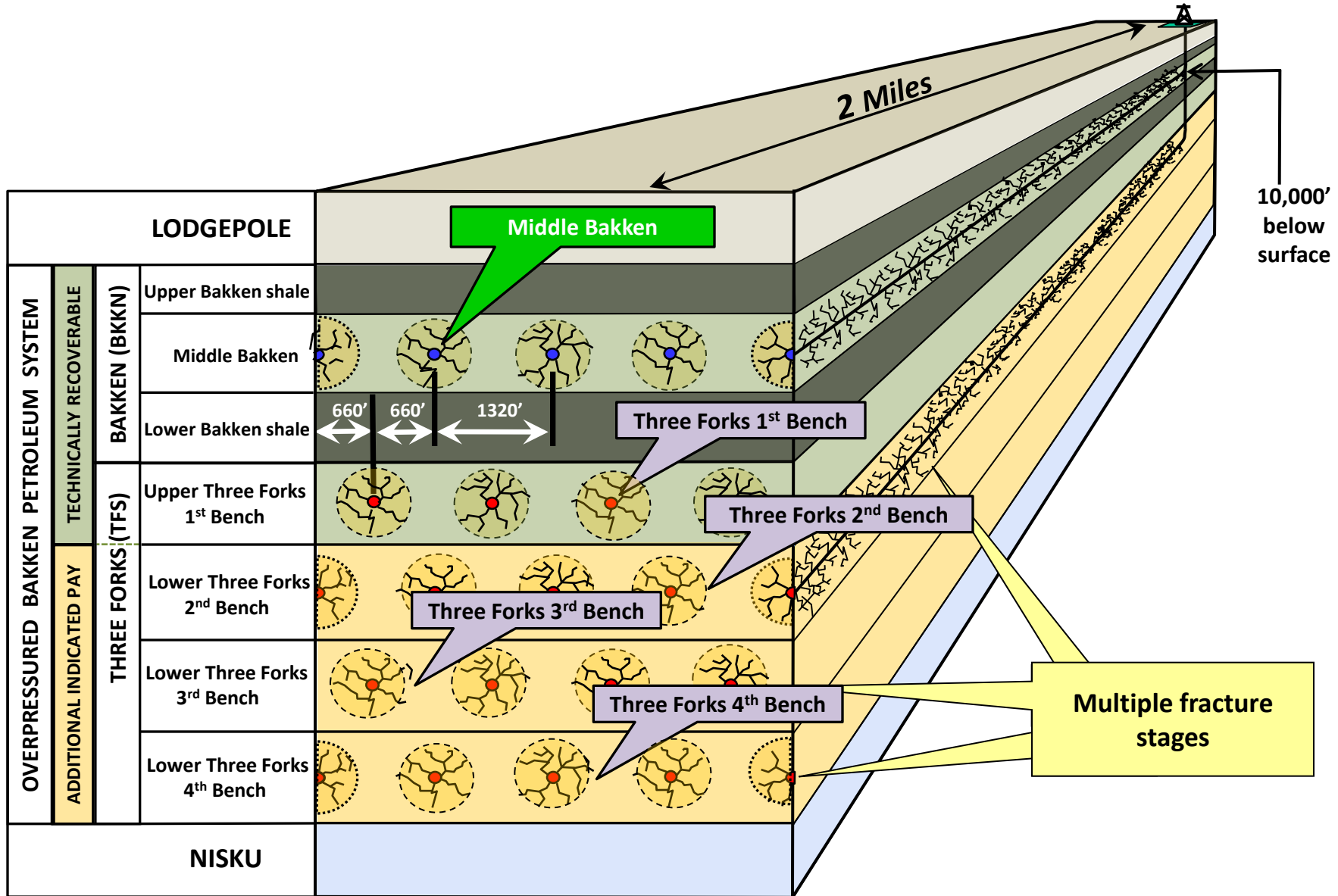
Medicine Hole 14-27H and 2-27H wells
Dunn Co., North Dakota



Conclusion from Dual Zone Tests

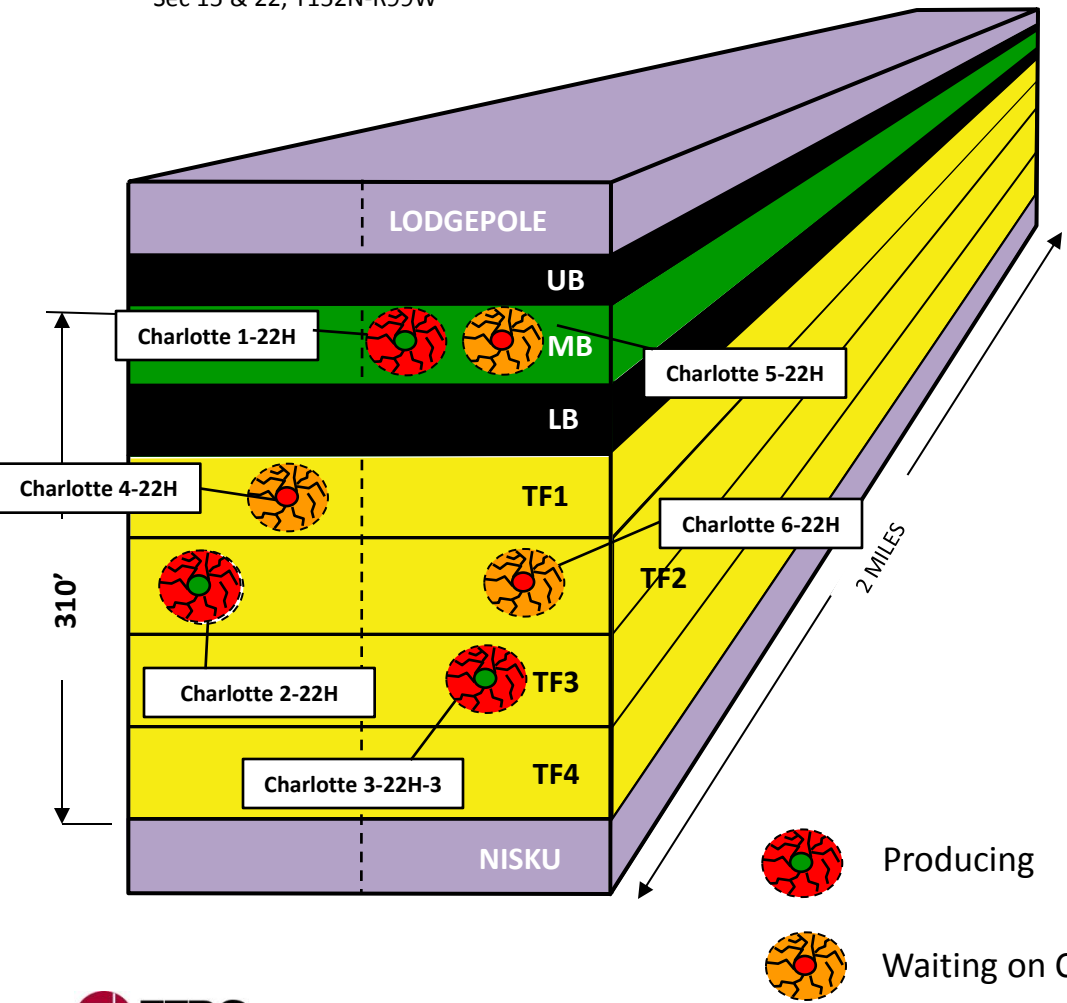
- Neither zone can be adequately drained by completion in another zone
- Limited connectivity will require wells in both zones to adequately harvest the reserves
- Reserves from MB and TF are similar in magnitude

Current Development: Bakken & Three Forks



Multiple Bench Testing

1280 acres
Sec 15 & 22, T152N-R99W

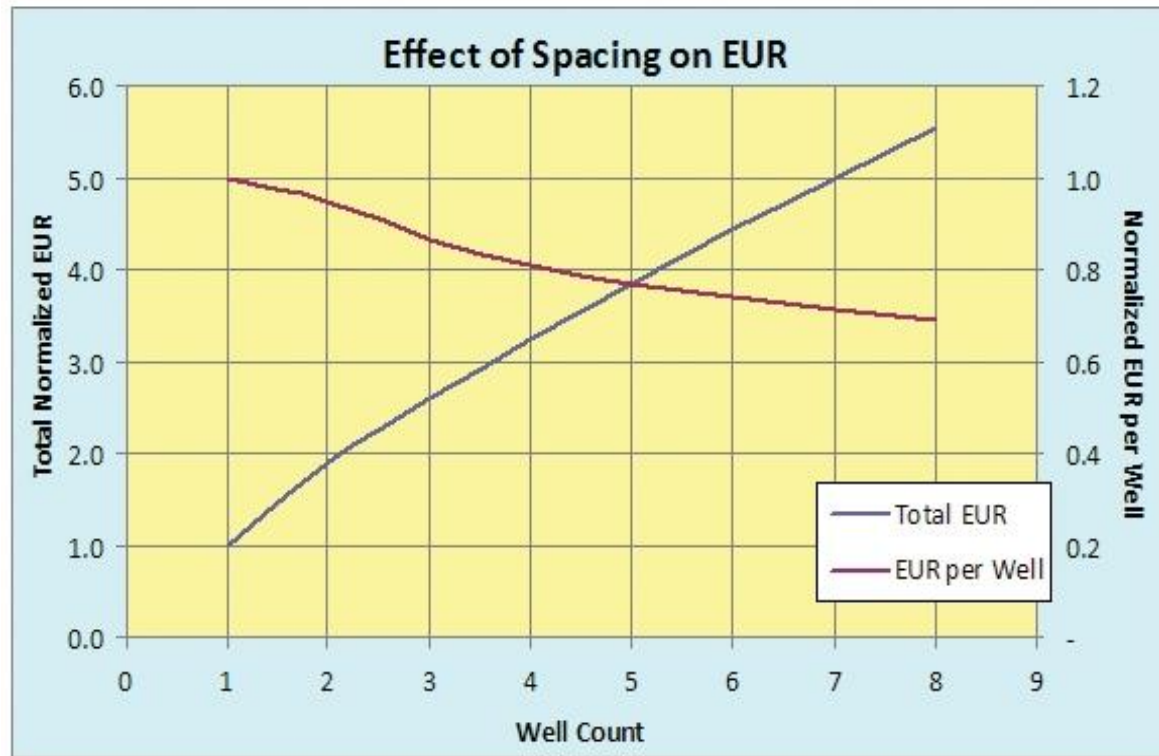


- 🔥 Charlotte 1,280 acre unit
- 🔥 Producing zones today
 - 🔥 Middle Bakken
 - 🔥 2nd bench TF
 - 🔥 3rd bench TF
- 🔥 WOC- MB, TF1 & TF2
- 🔥 First unit to have wellbores in 4 different zones

Third-Party* Simulation Supports 160-Acre Spacing

Conclusions of third party simulation:

- 8 wells per zone
- 1st well recovers 1.0 MMBoe
- 8 wells recover 5.6 MMBoe
- 8 wells average 700 MBoe per well (70% of 1-well scenario)



*Ryder Scott Co. LP, Reservoir Solutions, June-August 2012 /Vol. 15 No. 2

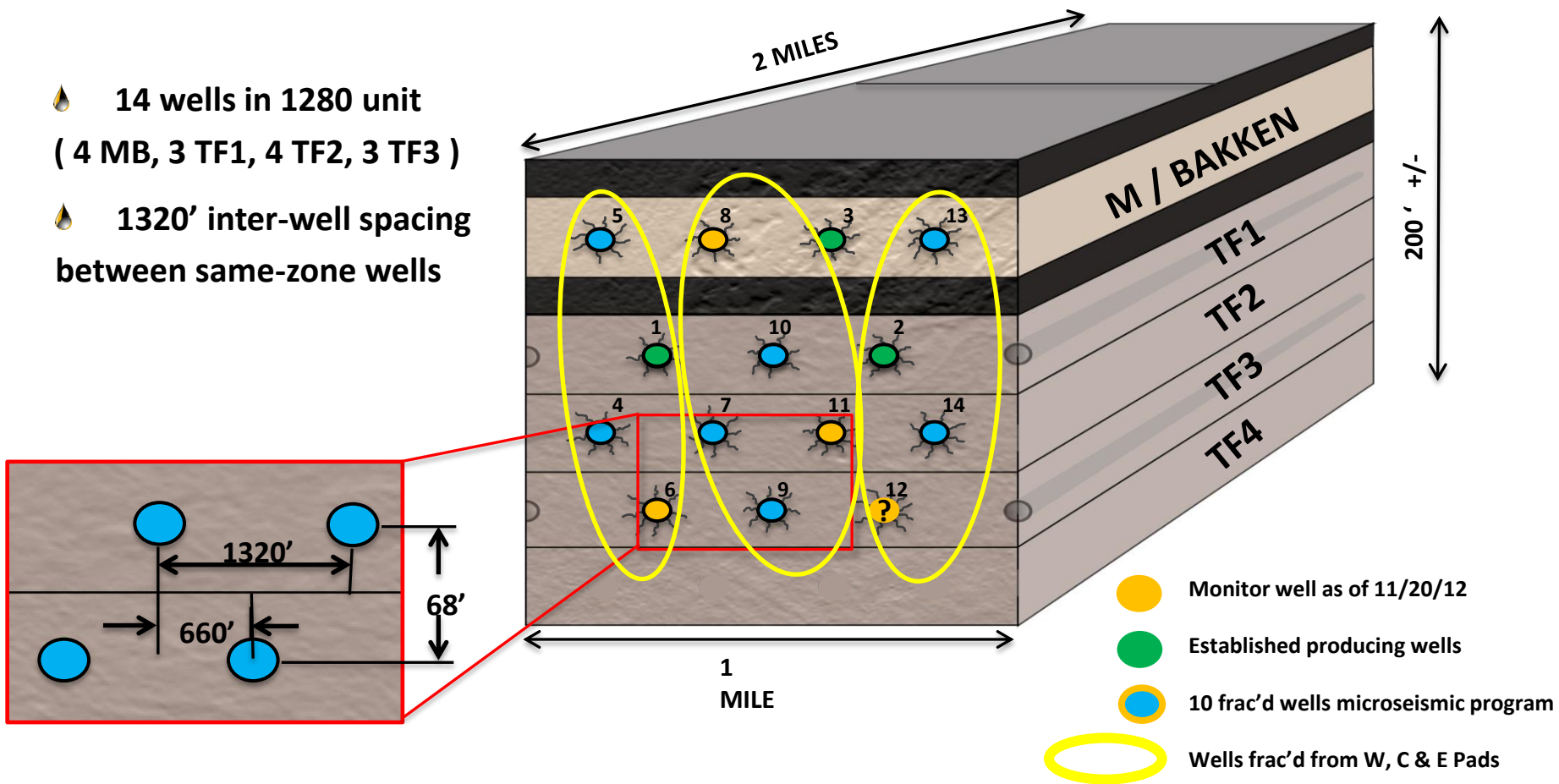
- 1280-acre unit
- 6900 psi
- 45 ft net pay
- 1,000 psi FBHP
- 8.4% porosity
- 1,100 BFPD IP

Continental Resources

Hawkinson --- 22-27-147N-96W

1280 Acre Unit Full Development Project

- 🔥 14 wells in 1280 unit
(4 MB, 3 TF1, 4 TF2, 3 TF3)
- 🔥 1320' inter-well spacing
between same-zone wells







Phases I – IV (Hawkinson Project)

- Define reservoir drainage of the MBK, TF1, TF2 & TF3
- Confirm whether these formations are distinct and separate from each other
- Determine the optimal number of frac stages
- Determine appropriate well spacing required for most efficient reservoir drainage
- Increase spacing unit ultimate recovery
- Predict areas of future reservoir sweetspots

Phase V – Optimization of Wellsite Operations

- Consortium-based phase to help industry partners optimize oil and gas activities and improve the efficiency of operation.
- Project scope of work will be directed by the consortium (industry partners and OGRC representative), with priority along the following topic areas:
 - Site logistics
 - ◆ Focused on evaluation of equipment siting and workflow at multioperation and/or multiwell locations
 - Waste management
 - ◆ Focused on improved means of handling drilling and production wastes
 - Hydrocarbon utilization
 - ◆ Focused on improving the production of oil, gas, or natural gas liquids from wellsites (e.g., on-site utilization of natural gas prior to gathering)
 - Water management
 - ◆ Focused on technologies to limit demand for freshwater, decrease wastewater production, and reduce water/wastewater trucking to and from the wellsite
 - Process optimization and systems analysis
 - ◆ Focused on analysis of failures at the wellsite that affect production efficiency

Does This Work Address North Dakota Priorities – YES!

- Will this work reduce flaring? 
 - By surveying available technologies, assessing their application to ungathered locations, and demonstrating functional scaled technologies.
- Will this project reduce environmental impacts? 
 - By exploring surface operations that minimize truck traffic (resulting in decreased diesel emissions, decreased road damage, decreased maintenance costs, decreased road dust, and decreased incidence of spills).
 - By investigating technologies to recycle wastewater and decrease freshwater demand.
 - By minimizing land use impacts (wellpad footprints).
 - By addressing the NORM waste issue with science and outreach/education.
- Will this project help define Bakken system resources? 
 - By gathering new data with advanced tools to characterize the Middle Bakken and multiple benches of the Three Forks.
- Will this project maximize Bakken system recovery? 
 - By using new data to define two new, undeveloped zones, and by using new data to feed models that will help predict optimum well spacing to maximize resource extraction.
 - By reducing OPEX via focus on systems assessment toward holistic reservoir and operations management.

Budget

Project Expense	NDIC Share	Industry Share	Total Program
Total Labor	\$ 1,350,966	\$ 1,022,168	\$ 2,373,134
Other Direct	\$ 376,784	\$ 177,832	\$ 554,616
Subcontract – CLR	\$ 6,260,000	\$ –	\$ 6,260,000
Indirect on Subcontract	\$ 12,250	\$ –	\$
CLR Cost Share	\$ –	\$ 106,030,000	\$ 106,030,000
Total Project Cost	\$ 8,000,000	\$ 107,230,000	\$ 115,230,000

- Commercial partners
 - Continental Resources, Inc. (cash and major in-kind)
 - Marathon Oil Co. (cash and in-kind)
 - Whiting Petroleum Corp. (cash and in-kind)

Schedule

	Year 1				Year 2				Year 3			
	2013		2014		2015		2016		2016			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Phase I – Drilling 11 New Wells	█	█										
Phase II – Completions	█	█	█									
Phase III – Reservoir Engineering		█	█	█	█	█						
Phase IV – Expansion Applications via 3-D Seismic	█	█	█									
Phase V – Optimization of Wellsite Operations	█	█	█	█	█	█	█	█	█	█	█	█
Wellsite Optimization Fact Sheets		▼	▼	▼								
Reporting												
Quarterly Reports		▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Final Report												▼

Technological and Economic Impacts

- The subsurface portion of the proposed work is a one-of-a-kind effort to provide a 3-D picture of what is happening during and after hydraulic fracture treatments in multistage horizontal wells in the Middle Bakken and the first, second, and third benches of the Three Forks Formation – this has never been attempted.
 - This will develop previously unknown information regarding potential Bakken production, helping to determine the exact number of wellbores that need to be placed in each zone for proper development.
 - The potential economic impact of understanding the number of wells needed will lend confidence to the effort to build infrastructure in the region and will develop figures for the potential oil industry employment over the long term.
- The surface operations portion of this program has potential to bolster oil and gas industry operations by improving operational logistics, improving resource recovery, decreasing costs, reducing environmental impacts, and increasing revenue to the state and to producers

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