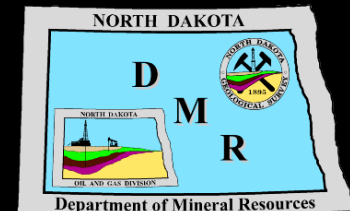


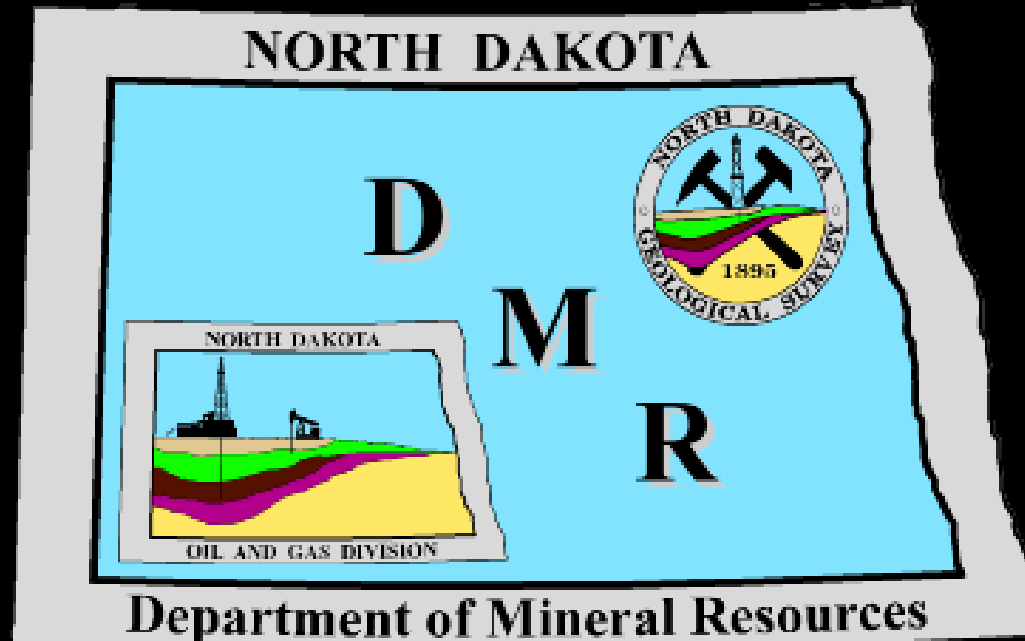
# ***DEVELOPMENT OF THE BAKKEN RESOURCE***

*National Conference  
of State Legislatures*

*Bismarck, ND–June 11, 2014*



# North Dakota Department of Mineral Resources



*<https://www.dmr.nd.gov/oilgas/>*

*<https://www.dmr.nd.gov/ndgs/>*

*600 East Boulevard Ave. - Dept 405*

*Bismarck, ND 58505-0840*

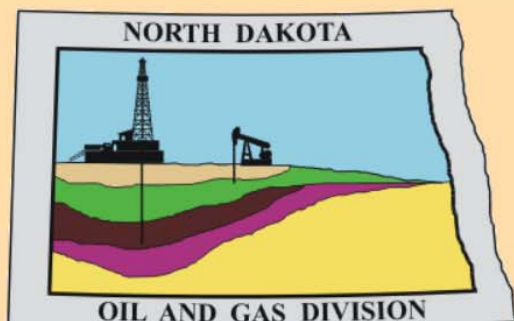
*(701) 328-8020      (701) 328-8000*

Services

Rules & Regulations  
Forms  
Hearing Dockets  
Active Drilling Rigs  
Daily Activity Reports  
Confidential Well List  
General Statistics  
Seismic  
Well Search  
Report a Spill/Incident  
Gathering Lines  
GIS Map Server  
Publications  
Surface Mineral Owner  
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Contact Us

Employee Directory  
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## Welcome to the North Dakota Industrial Commission, Department of Oil and Gas Division, Home page.

[Director's Cut - 05/13/2014](#) and [Recent Presentations](#)

The Director's Cut is an update on current activity in the North Dakota oil patch from the Director of the Oil and Gas Division.  
( [View past Director's Cut](#) | [Webinars](#) )

View [press releases](#) from the Oil and Gas Division

### [North Dakota Industrial Commission Permitting Policies](#)

### ["Diesel fuel" in HF stimulation now requires UIC approval](#)

### [Bakken and Three Forks Information!](#)

### [Class VI Primacy Application for the authority to regulate the Geologic Storage of Carbon Dioxide](#)

Available on the ND Petroleum Council web site are the [Surface Owner Information Center](#), the [Royalty Owner Information Center](#) and the [Petroleum Council](#) that were used at the [2012 Williston Basin Petroleum Conference](#).

The Oil and Gas Division regulates the drilling and production of oil and gas in North Dakota. Our mission is to encourage and promote the development, production, and utilization of oil and gas in the state in such a manner as will prevent waste, maximize economic recovery, and fully protect the correlative rights of all owners to the end that the landowners, the royalty owners, the producers, and the general public realize the greatest possible good from these vital natural resources.

**Phone:** (701) 328-8020

**Fax:** (701) 328-8022

**Mail:**

NDIC Oil and Gas Division  
600 East Boulevard Ave Dept 405  
Bismarck, ND 58505-0840

**General Shipping:**

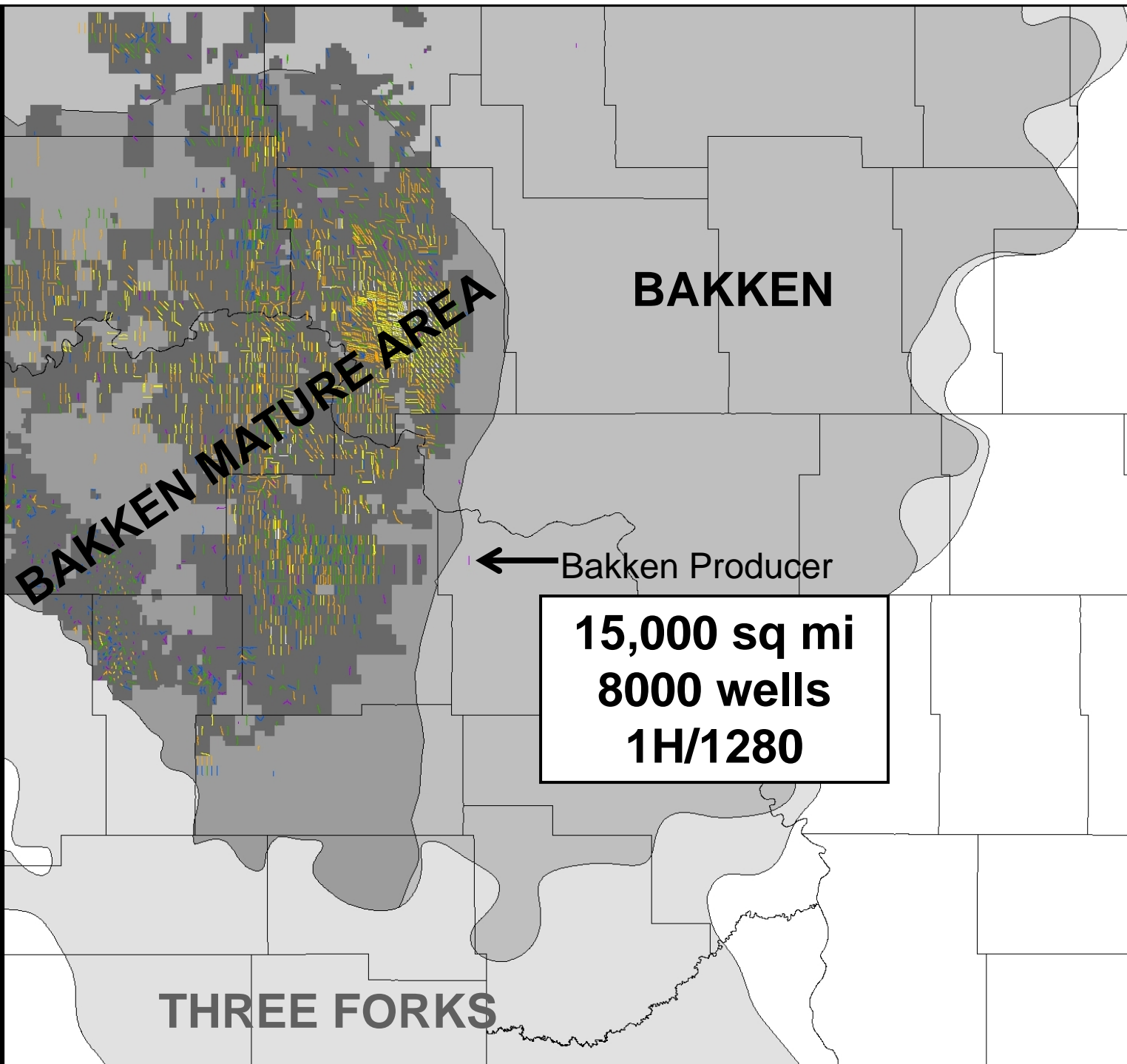
# North Dakota Development

- **Resource Play**
- **Development**
  - **Uniform Spacing—orderly development**
  - **Multi-well locations—small footprint**
  - **Energy Corridors—industry & residents**
- **Bakken Results**

*Bruce E. Hicks  
Assistant Director  
NDIC-DMR-OGD  
Bismarck, ND*

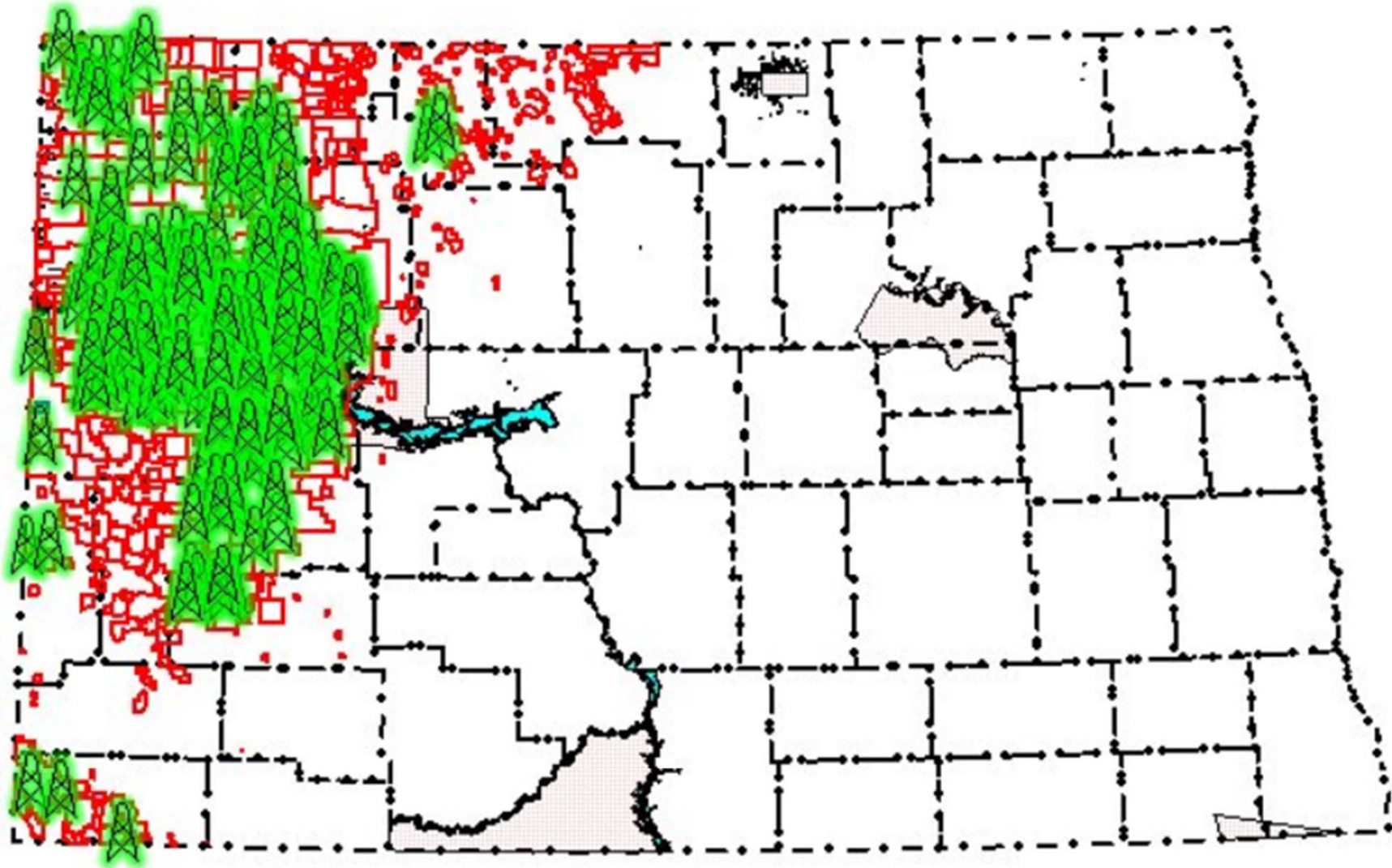
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## **NORTH DAKOTA – 188 DRILLING RIGS – JUNE 2014**



**Current drilling activity is focused  
in Mountrail, Dunn, McKenzie, and Williams Counties.**

# TYPICAL HORIZONTAL OIL WELL



- Drill with fresh water
- Total depth below lowest potable water
- Run in hole with surface casing
- Cement casing back to surface of ground
- 1<sup>st</sup> layer of surface water protection



# TYPICAL HORIZONTAL OIL WELL

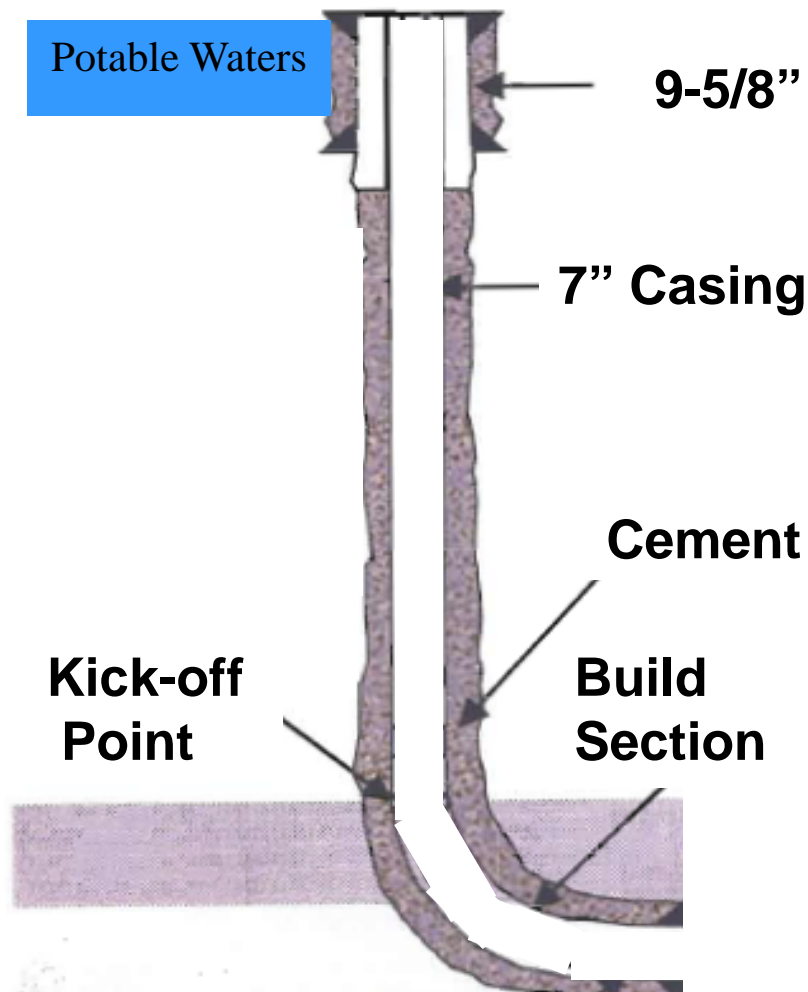
Potable Waters

9-5/8" @ 2500'

KOP @  
10500'

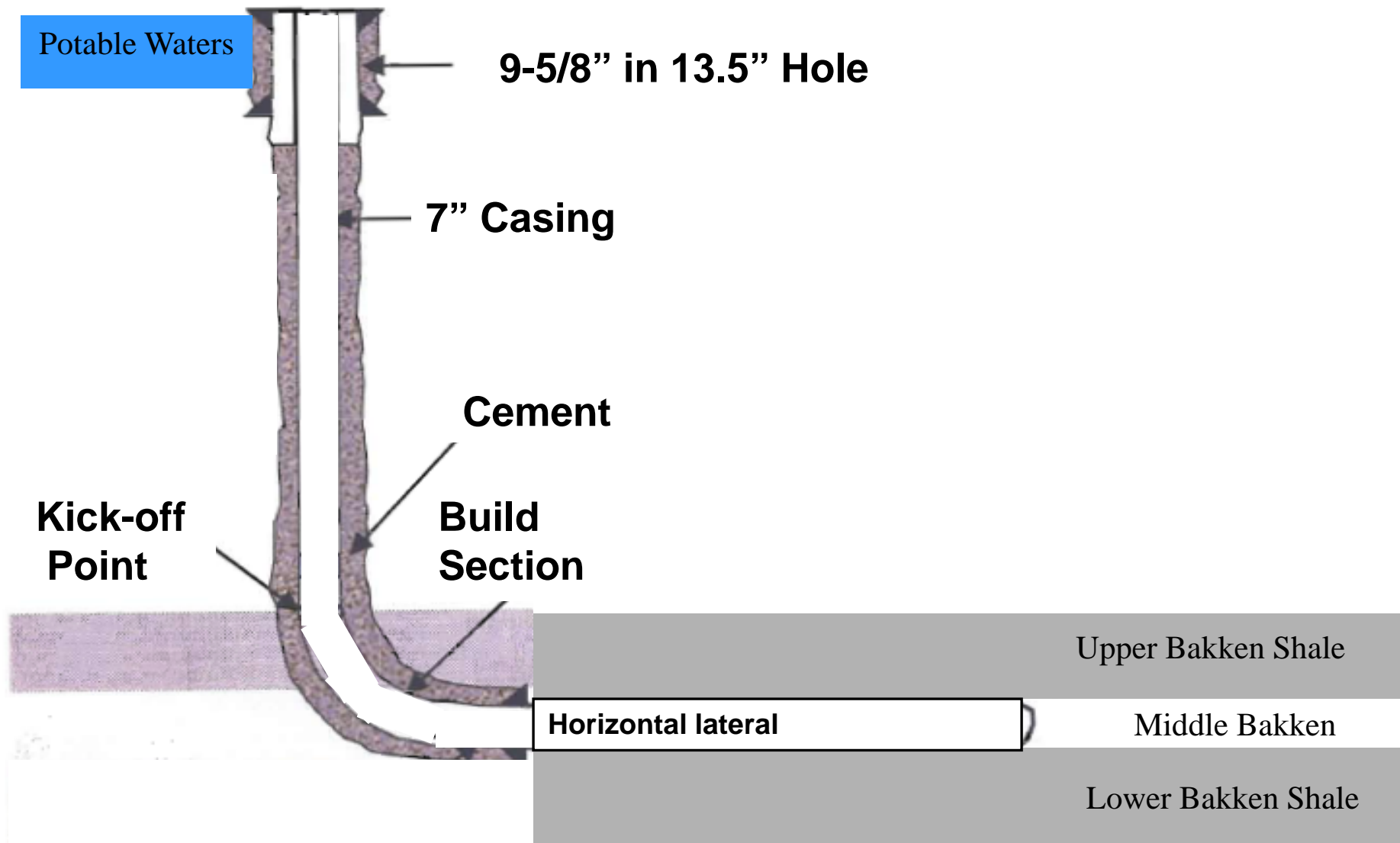
- Drill vertically to kick-off point
- Run in hole with bent assembly
- Downhole mud motor

# TYPICAL HORIZONTAL OIL WELL

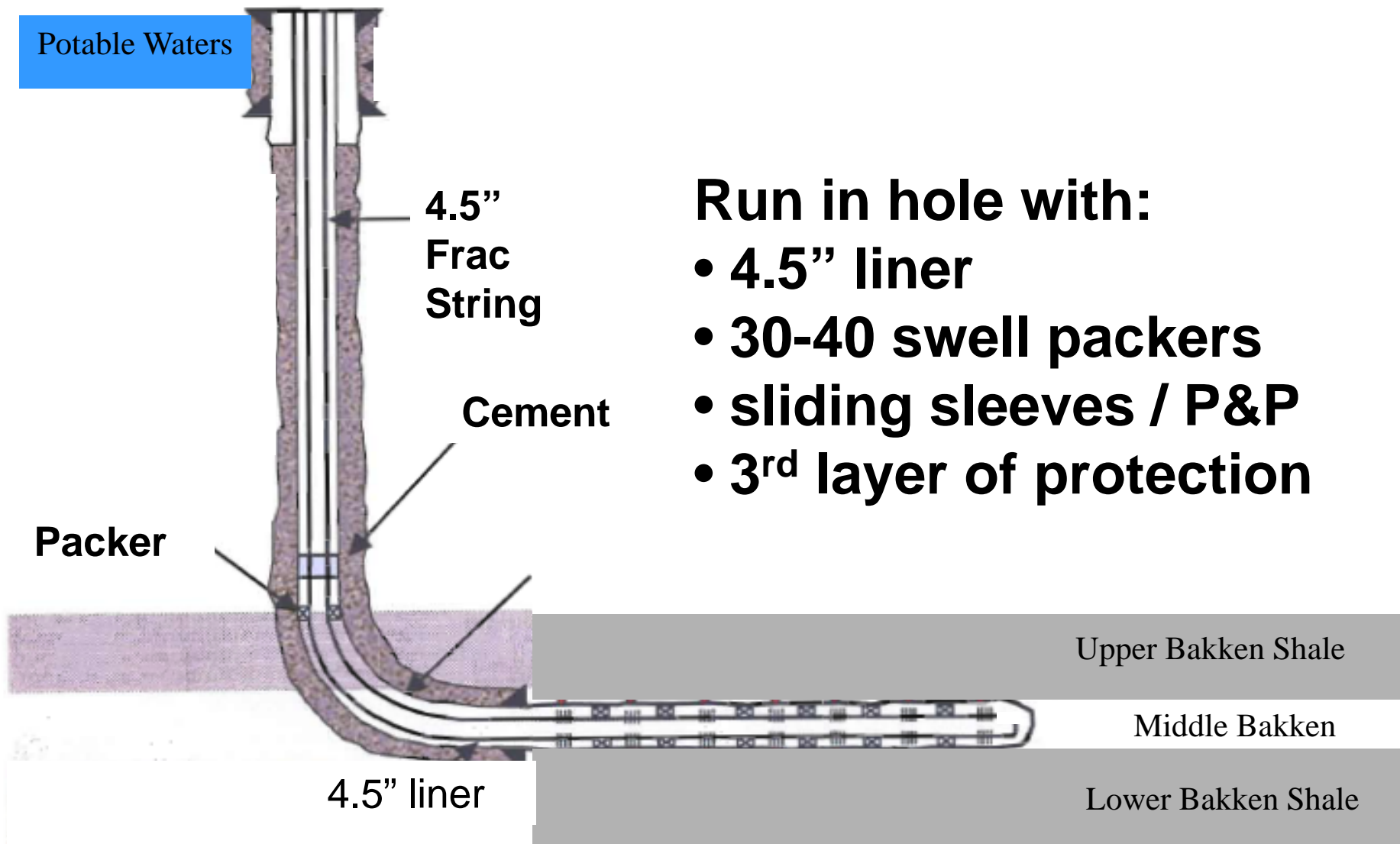


- Drill 8-3/4" hole to pay
- Run in hole with 7" casing
- Cement 7" casing
- 2<sup>nd</sup> layer of protection

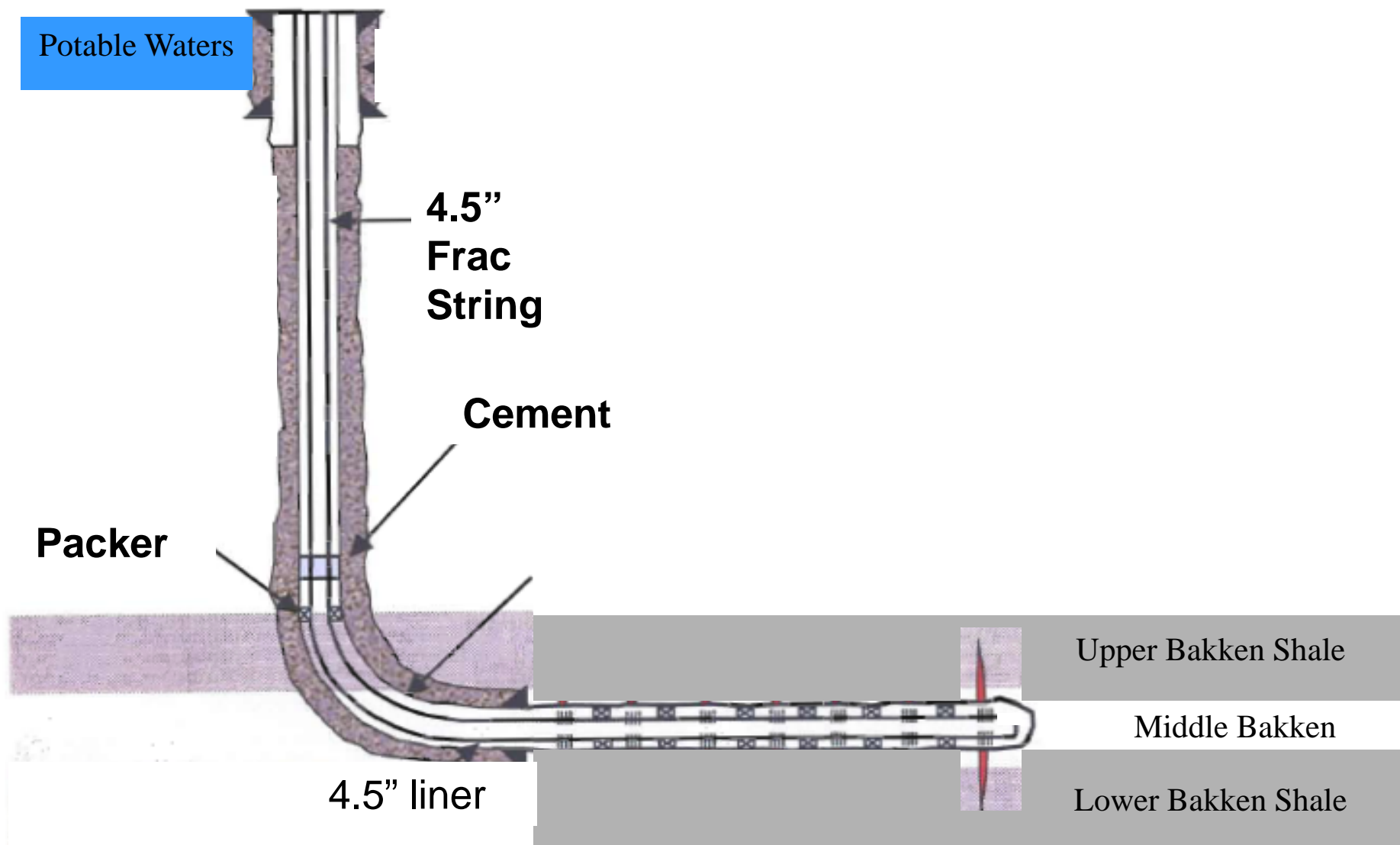
# TYPICAL HORIZONTAL OIL WELL



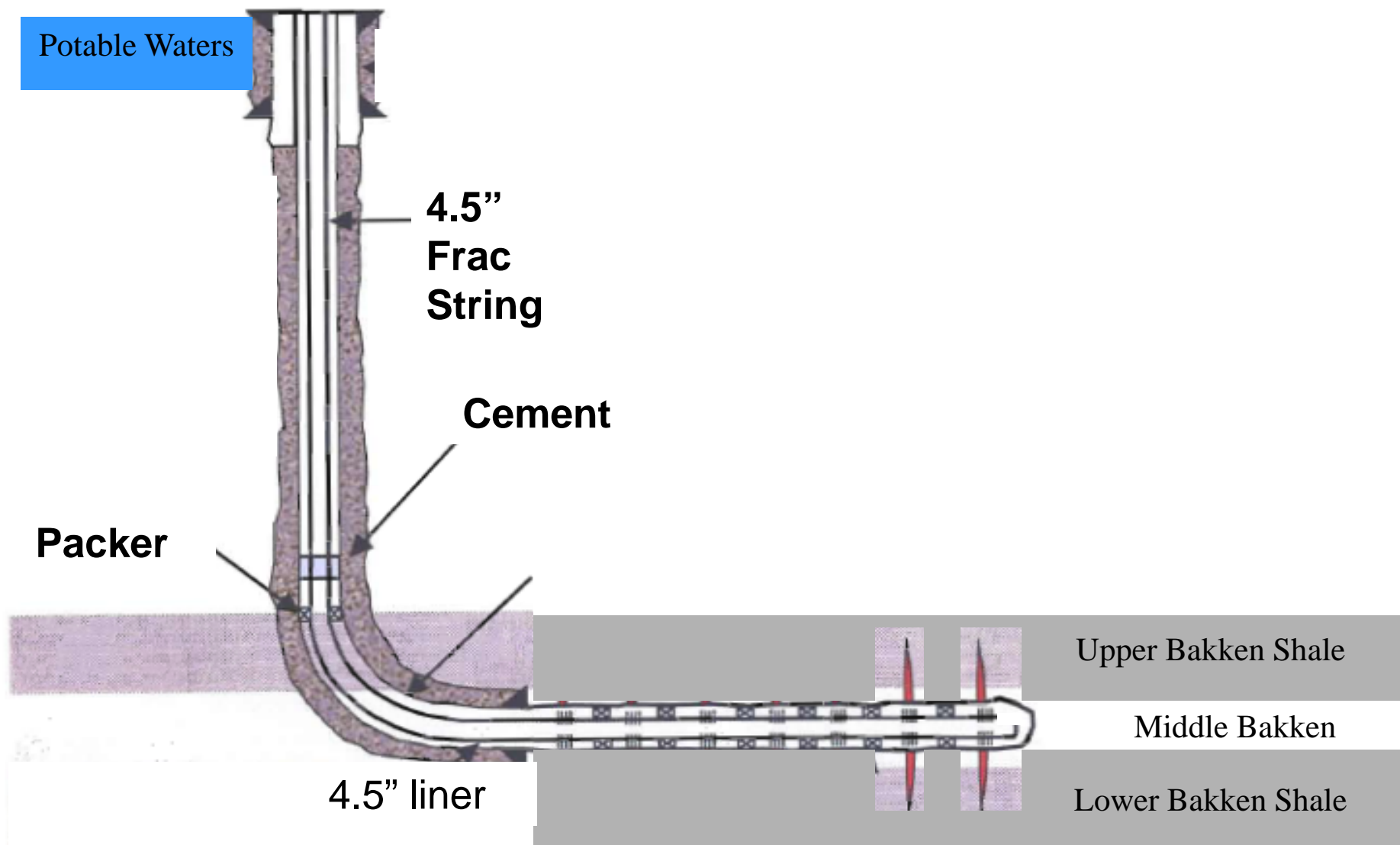
# TYPICAL HORIZONTAL OIL WELL



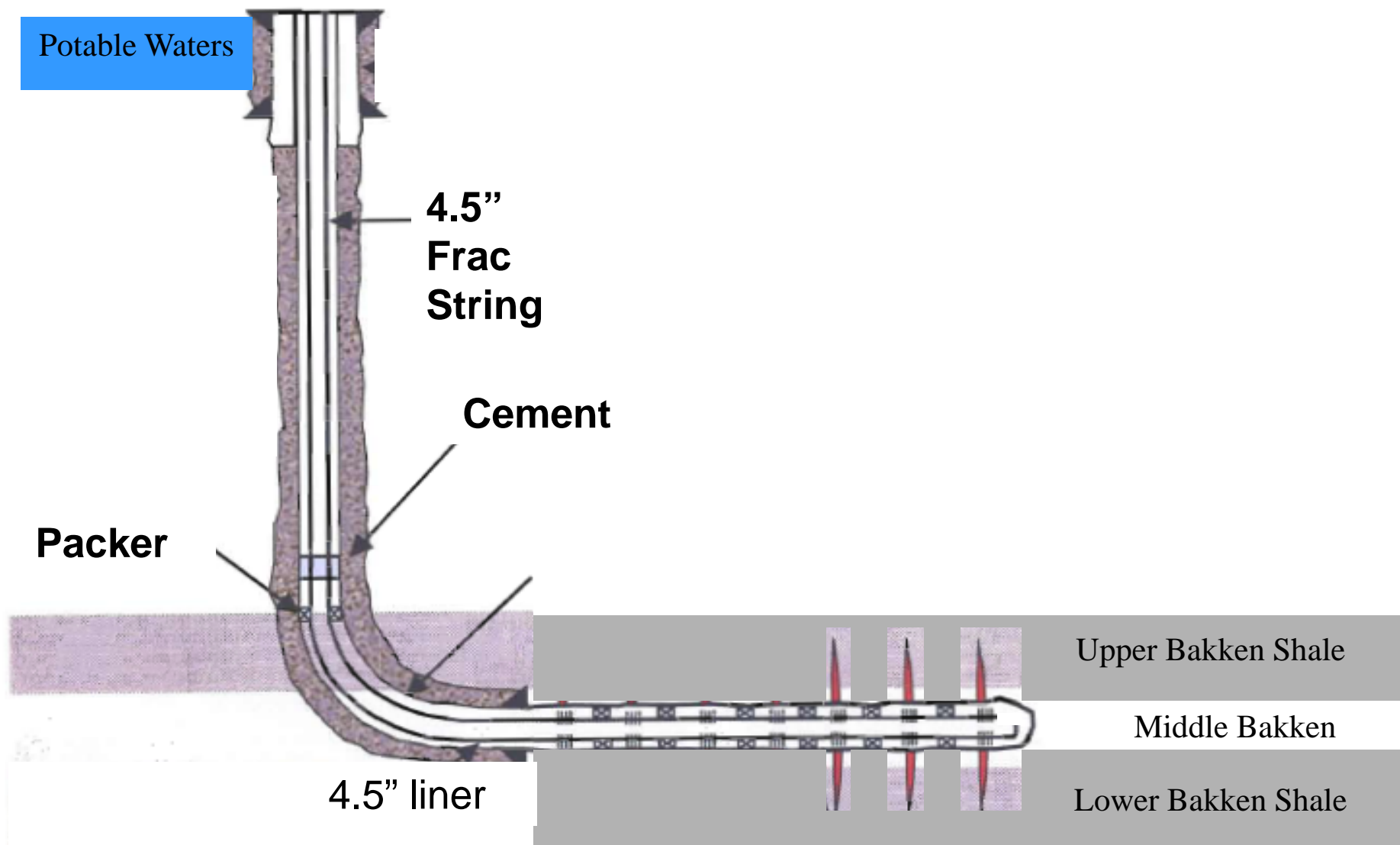
# TYPICAL HORIZONTAL OIL WELL



# TYPICAL HORIZONTAL OIL WELL

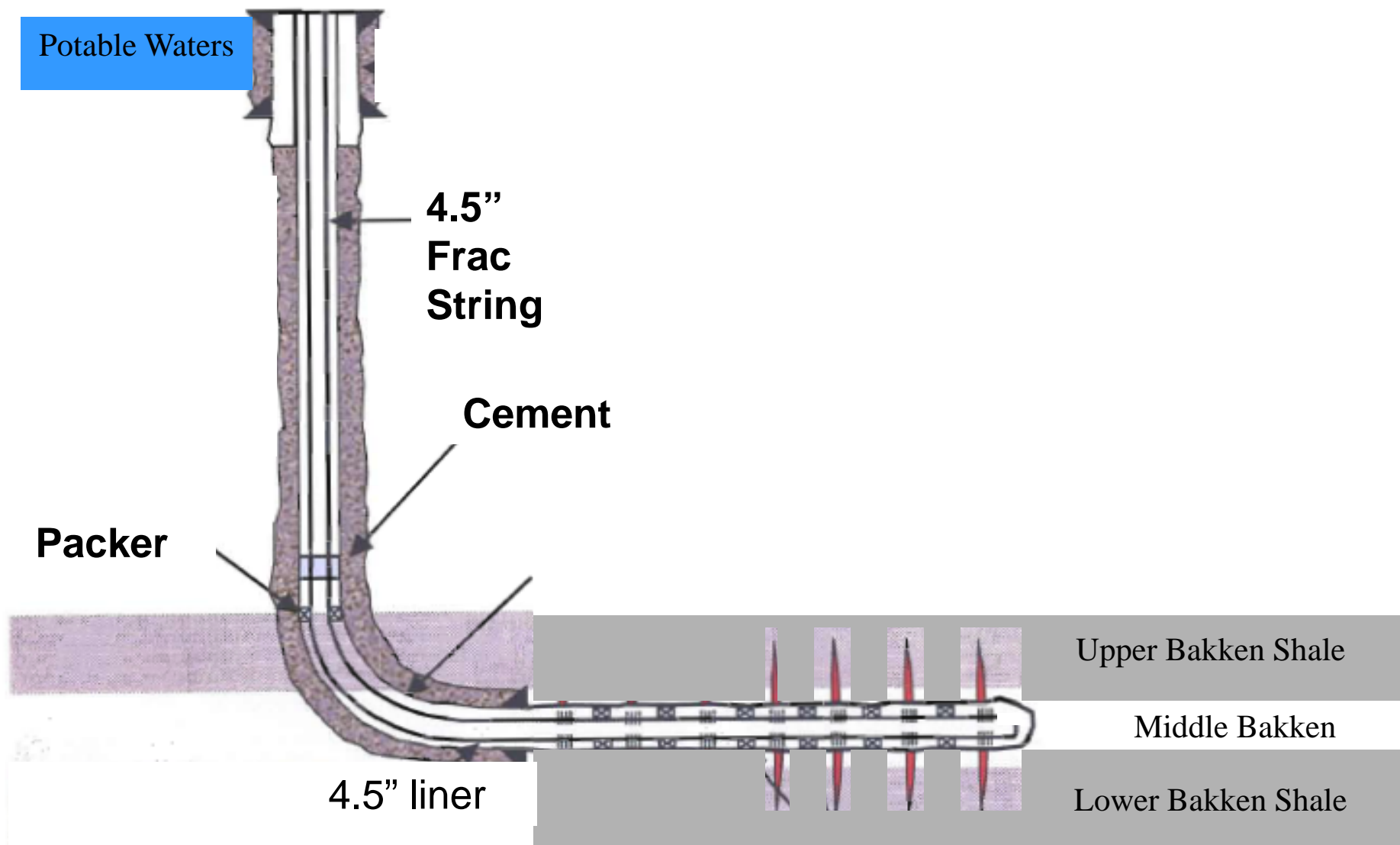


# TYPICAL HORIZONTAL OIL WELL

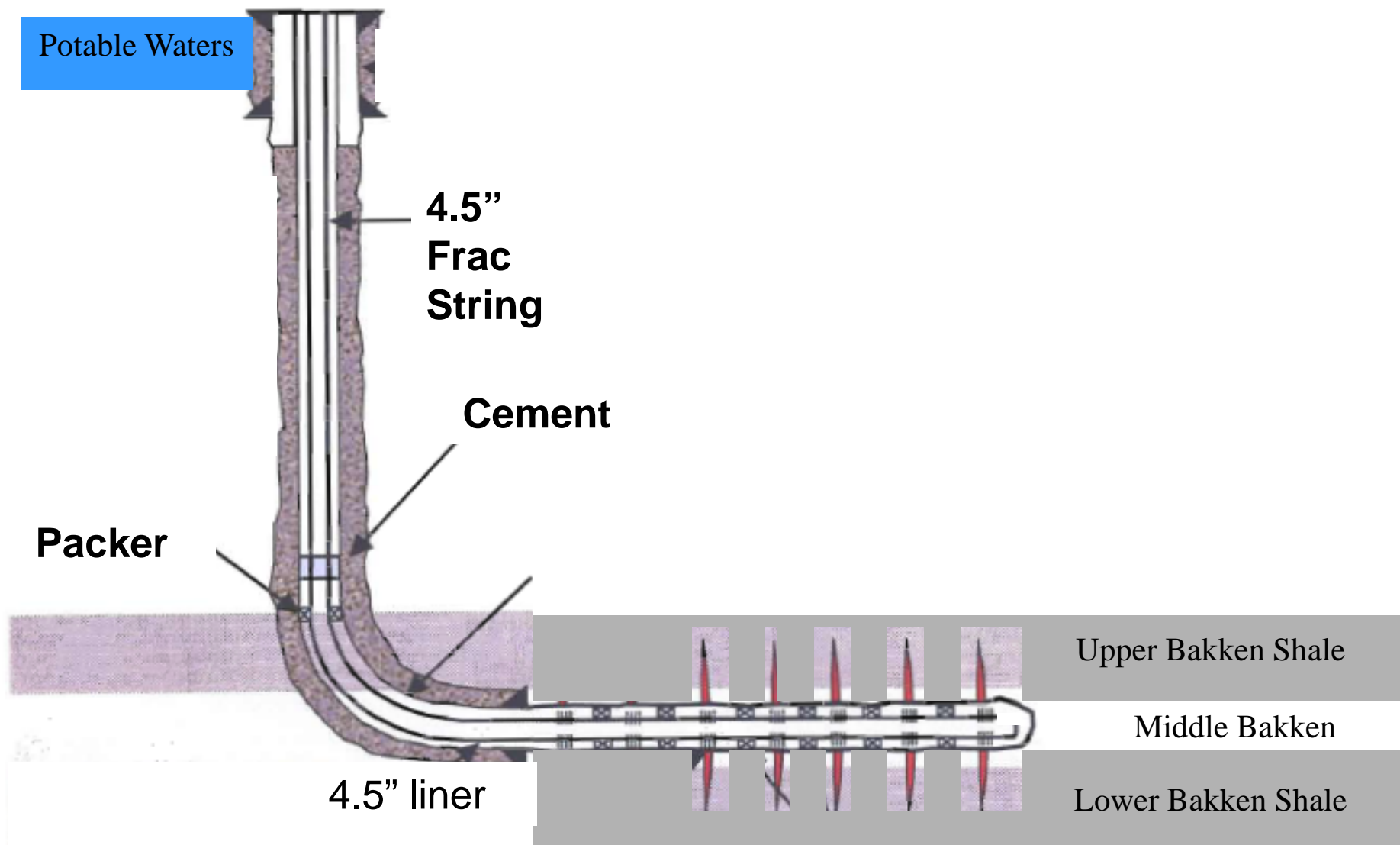




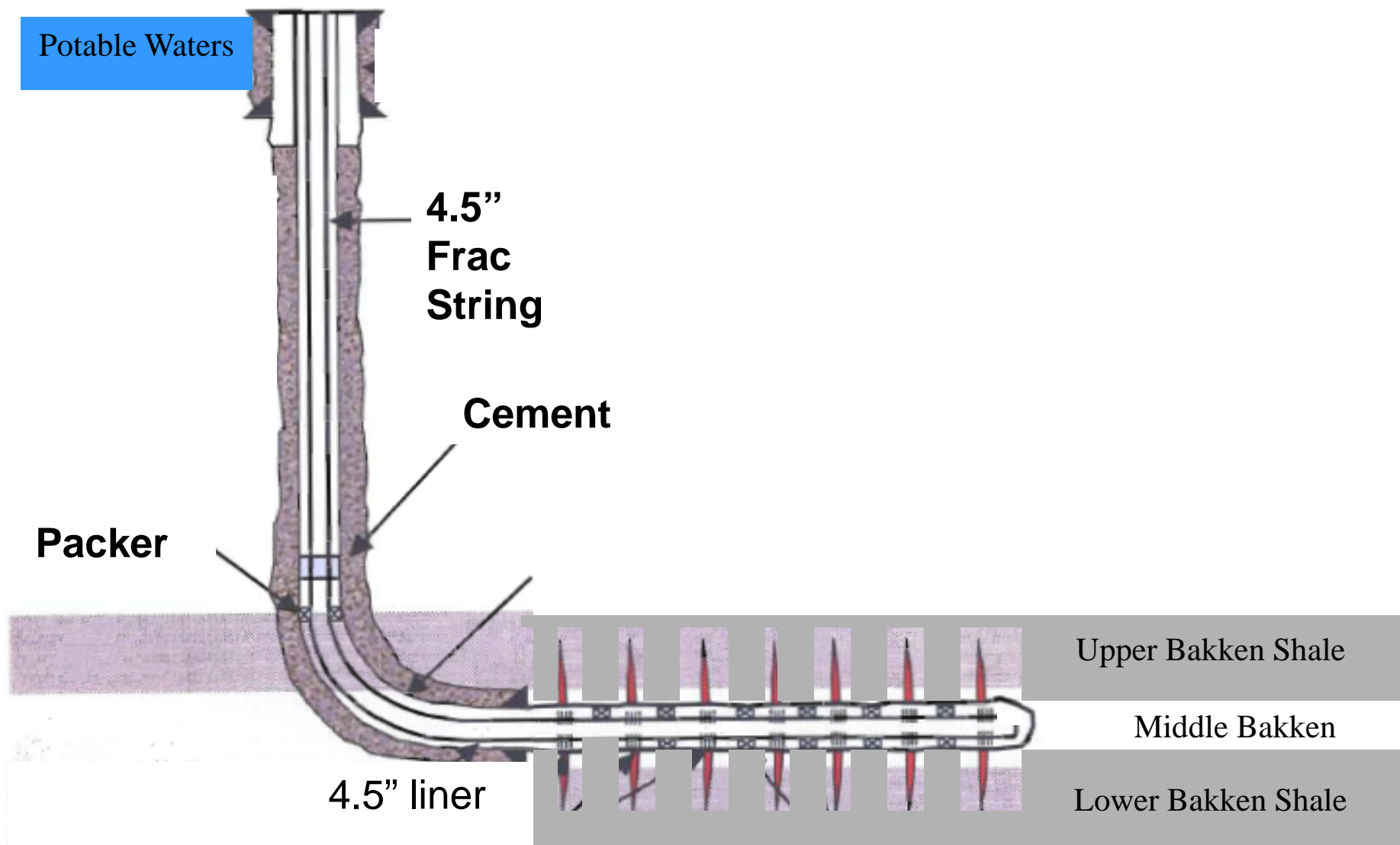
# TYPICAL HORIZONTAL OIL WELL



# TYPICAL HORIZONTAL OIL WELL



# TYPICAL HORIZONTAL OIL WELL



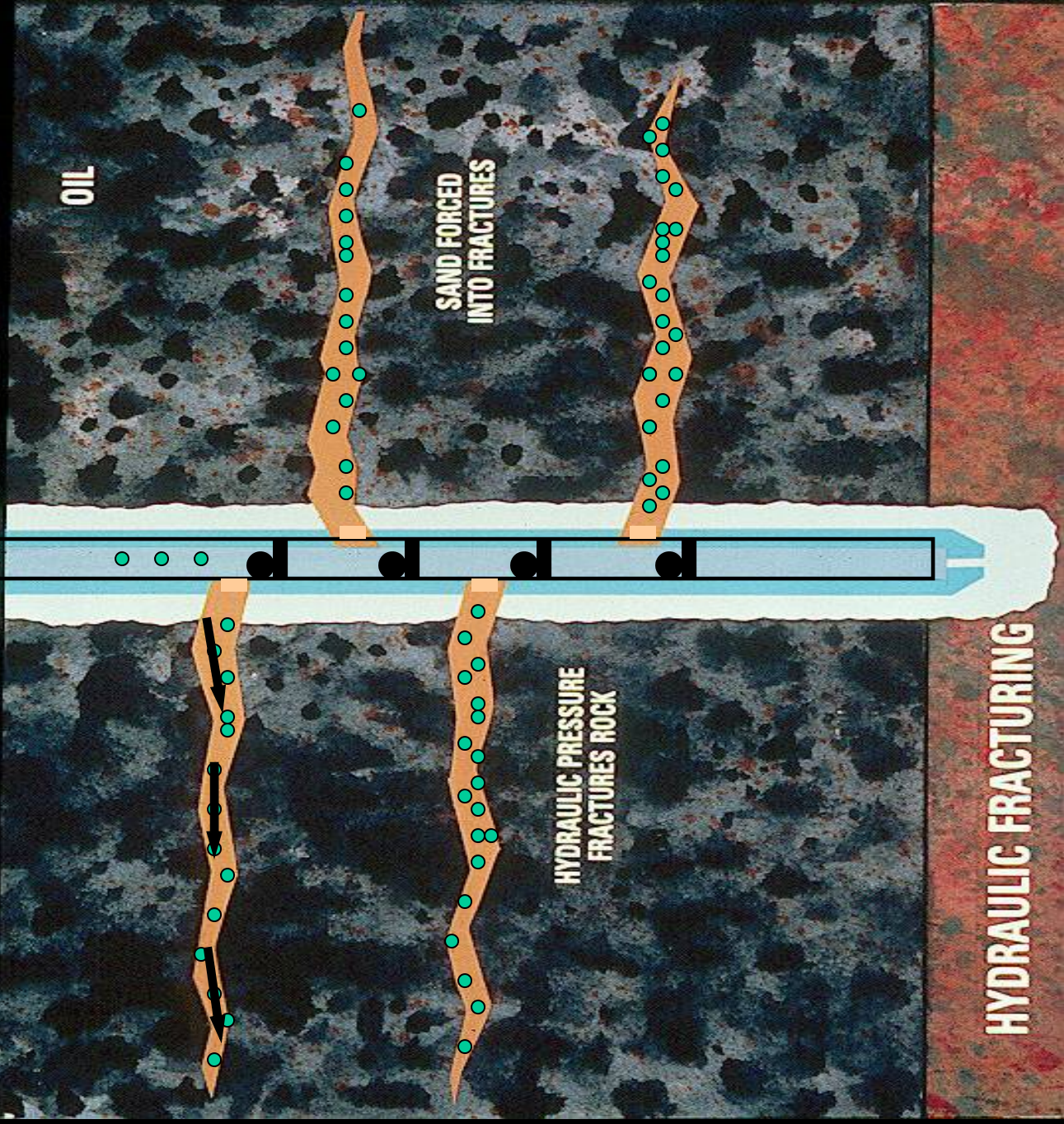


OIL

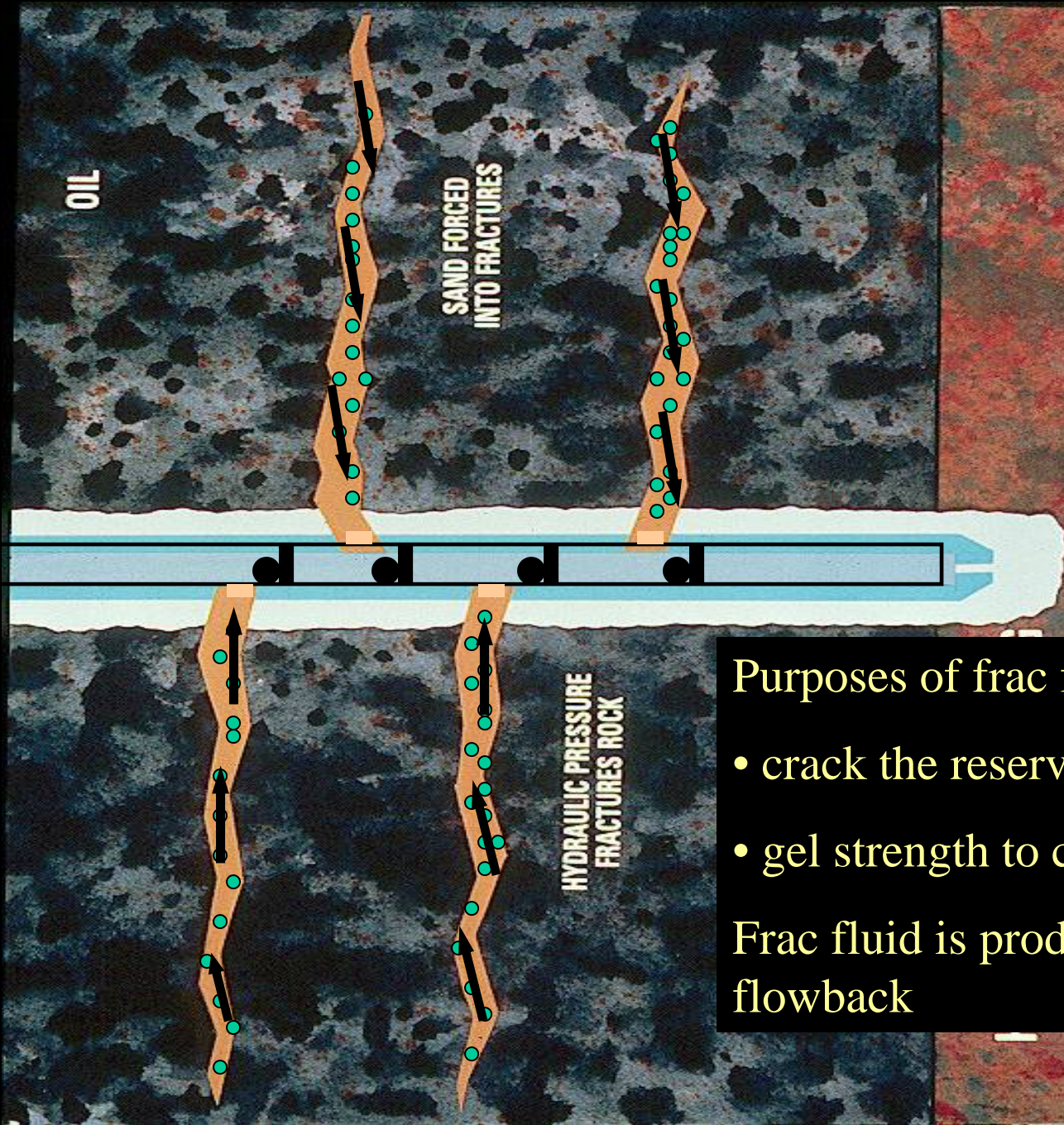
SAND FORCED  
INTO FRACTURES

HYDRAULIC PRESSURE  
FRACTURES ROCK

HYDRAULIC FRACTURING





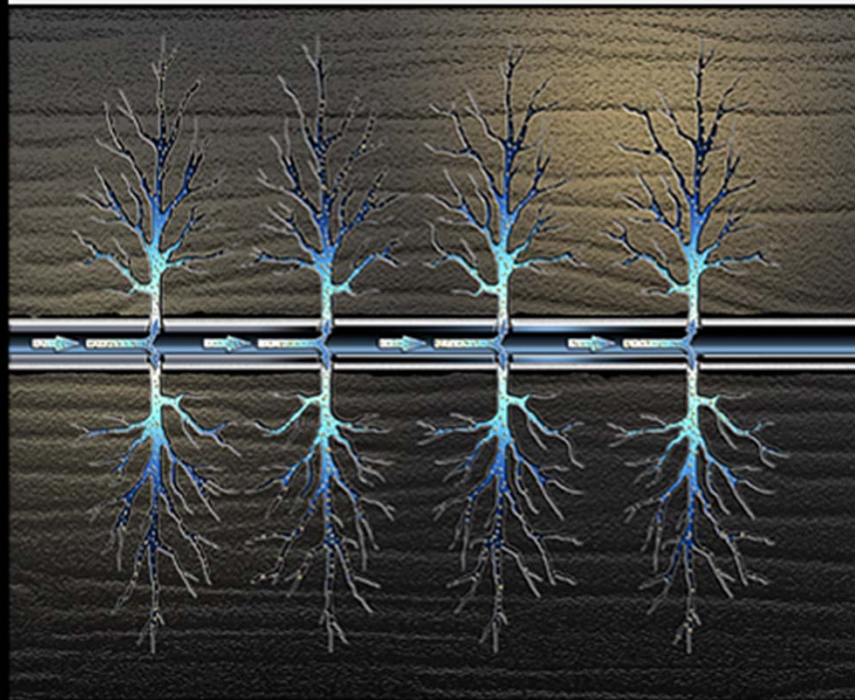


### Purposes of frac fluid

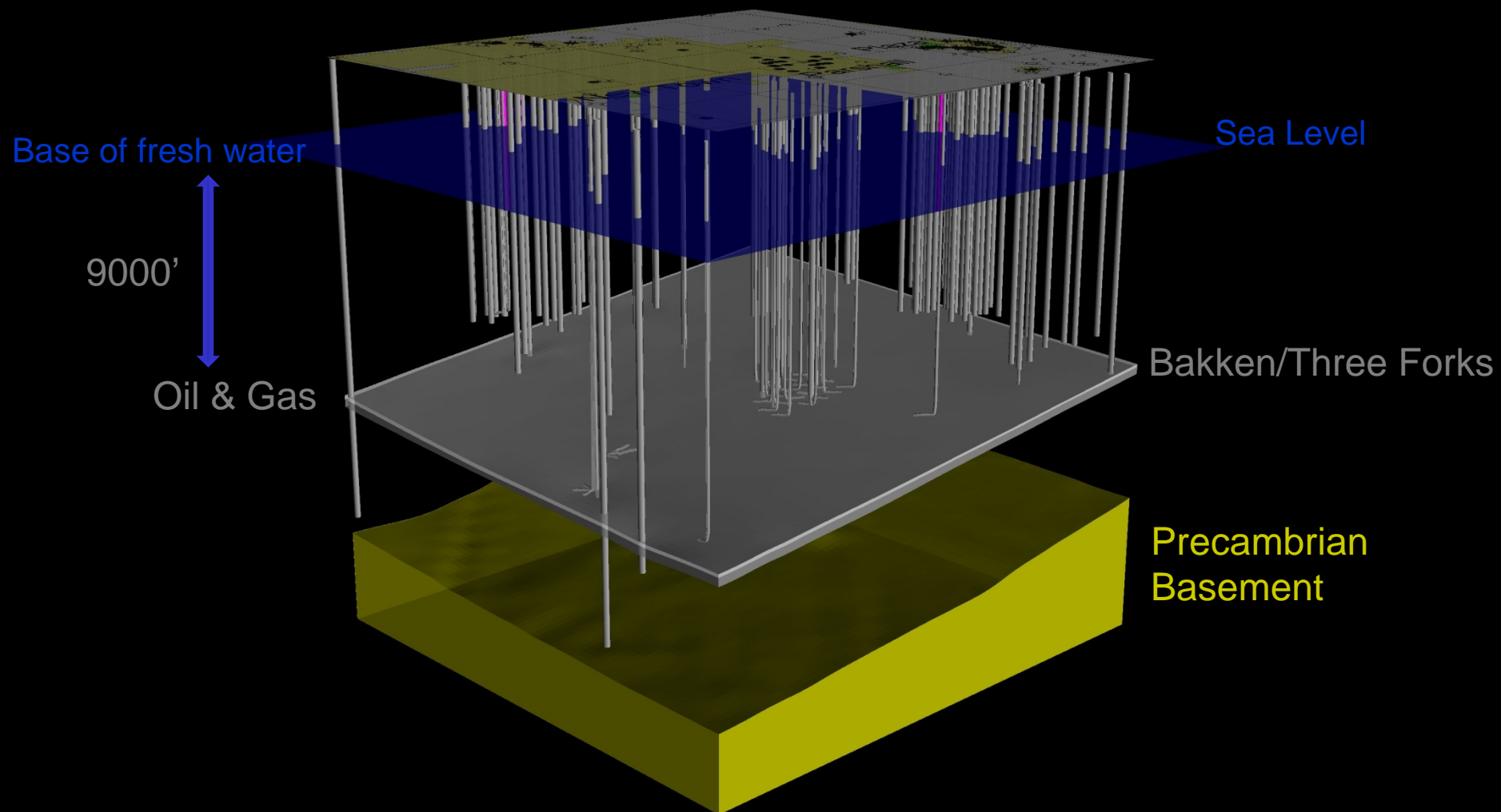
- crack the reservoir
- gel strength to carry sand

Frac fluid is produced back as flowback

**Hydraulic Fracturing:** Mixture of water, sand and chemicals pressurized and pumped into the well to form microscopic fractures in shale.





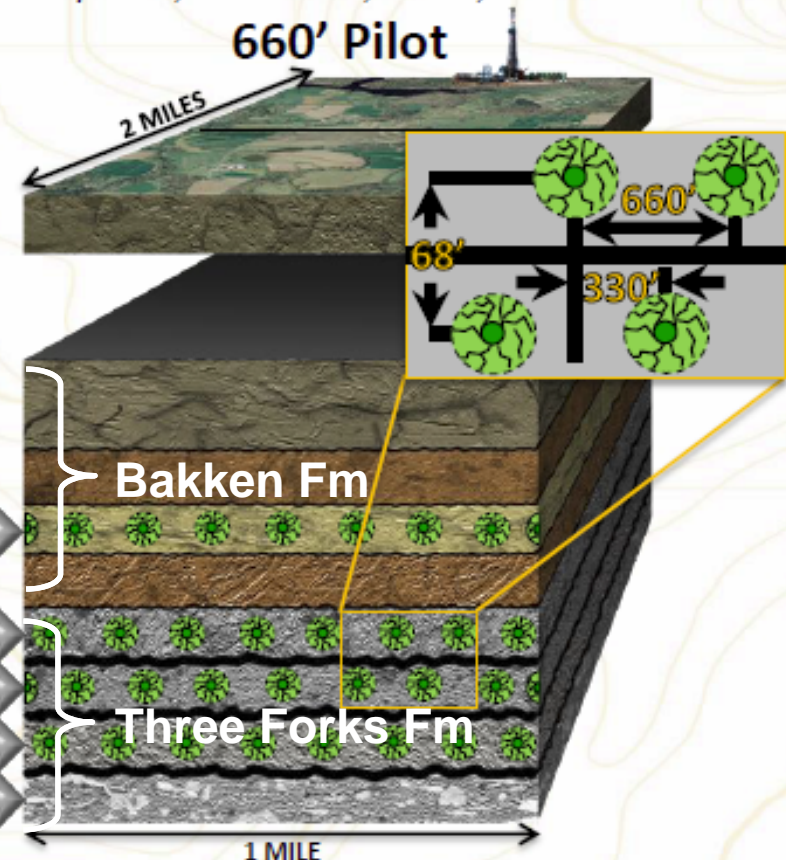
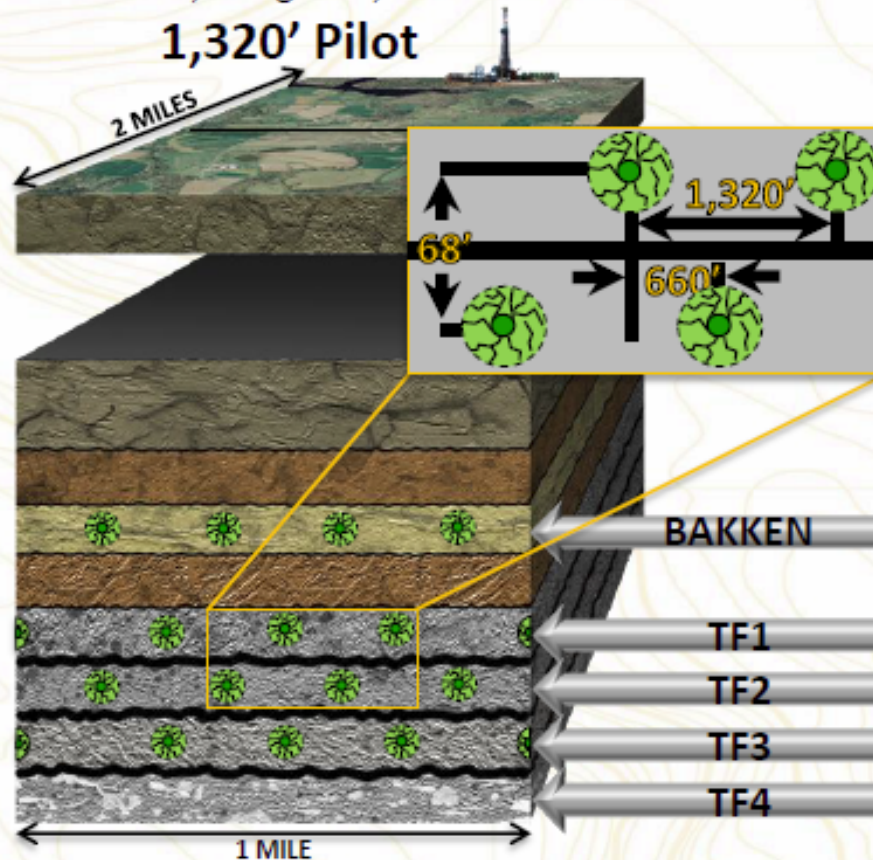




# 1,320' & 660' Pilot Density Projects: 2013-14

*Hawkinson, Tangsrud, and Rollefstad*

*Wahpeton, Lawrence, Mack, and Hartman*



- 3 project areas
- 1,320 ft. same-zone spacing
- 34 new wells (gross)

- 4 project areas
- 660 ft. same-zone spacing
- 31 new wells (gross)

# North Dakota Development

- Resource Play
- **Development**
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- Bakken Results

# ArcIMS Viewer



Townships

Rec	Township	Tdir	Range	Rdir	TWPRNG	TWPTEXT	RNGTEXT
1	156	N	90	W	156090	T156N	R 90W

ND OI

- ☒ Oil and Gas
- ☒ Water
- ☒ Petroleum
- ☒ Right of Way
- ☒ Directional
- ☒ Directional
- ☒ Horizontal
- ☒ Horizontal
- ☒ Categorical
- ☒ Oil and Gas
- ☒ Urban
- ☒ Industrial
- ☒ Drilling
- ☒ Seismic
- ☒ Geological
- ☒ Other
- ☒ Reclamation
- ☒ Coal
- ☒ River
- ☒ Lake
- ☒ Imagery
- ☒ Topographic
- ☒ Topographic
- ☒ NAIP

R



Power

Download Shape Files



### ND OIL & GAS LAYERS

- ☒ Oil and Gas
  - ☐ Wells
  - ☐ Permit Status Before Spud
  - ☐ Rig Location
  - ☐ Directional Surveys
  - ☐ Directional Legs
  - ☐ Horizontal Surveys
  - ☐ Horizontal Legs
  - ☐ Cases Docketed
  - ☒ Oil Fields
  - ☐ Unit Boundaries
  - ☐ Inspector Areas
- ☒ Drilling / Spacing
- ☐ Seismic
- ☐ Gas Plants
- ☒ Other
- ☐ Imagery
  - ☐ Topo/DRG 250k
  - ☐ Topo/DRG 100k
  - ☐ NAIP 2009

Refresh Map

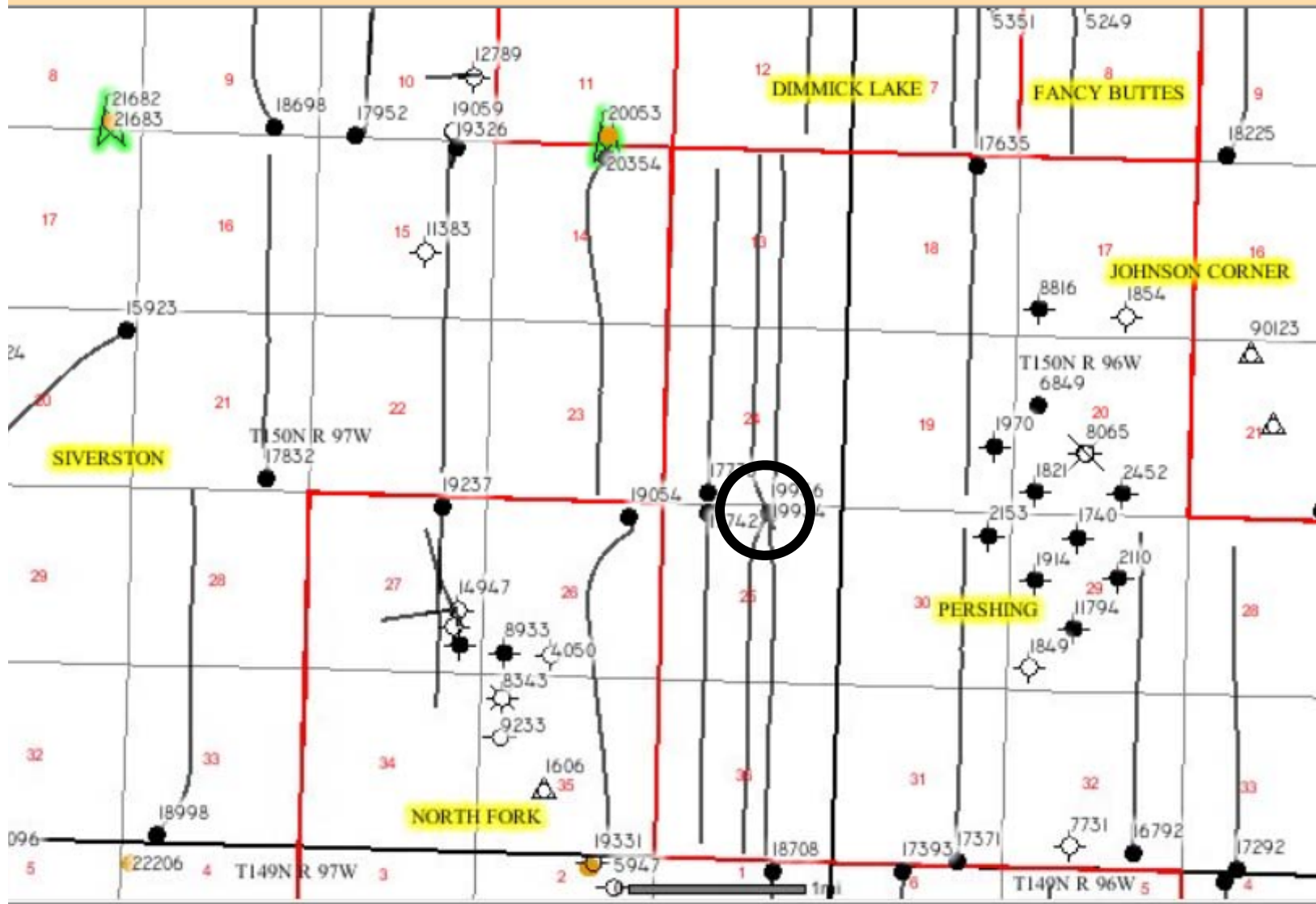
☒ Auto Refresh

Help:

- A closed group, click to open.
- An open group, click to close.
- A map layer.

# North Dakota Development

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# ND OIL & GAS

- ☒ Oil and Gas
  - ☒ Wells
  - ☒ Rig Location
  - ☒ Directional
  - ☒ Directional
  - ☒ Horizontal
  - ☒ Horizontal
  - ☒ Cases Drilled
  - ☒ Oil Fields
  - ☒ Unit Boundaries
  - ☒ Inspector
  - ☒ Drilling / Seismic
  - ☒ Seismic
  - ☒ Gas Plants
- ☒ Other
  - ☒ Imagery
  - ☒ Topo/DRG 2
  - ☒ Topo/DRG 1
  - ☒ NAIP 2009

Refresh

☒ Auto Refresh

Help:

- ☒ A closed group, click to open
- ☒ An open group, click to close
- ☒ A map layer.
- ☒ A hidden group/layer, click to show
- ☒ A visible group/layer, click to hide
- ☒ A visible layer, but not at the top
- ☒ A partially visible group/layer





Vern Whitten Photography



# North Dakota Development

- Resource Play
- **Development**
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- Bakken Results



## Energy Corridor

- uniform development
- pipelines, electrical, traffic
- less impact on adjacent roads

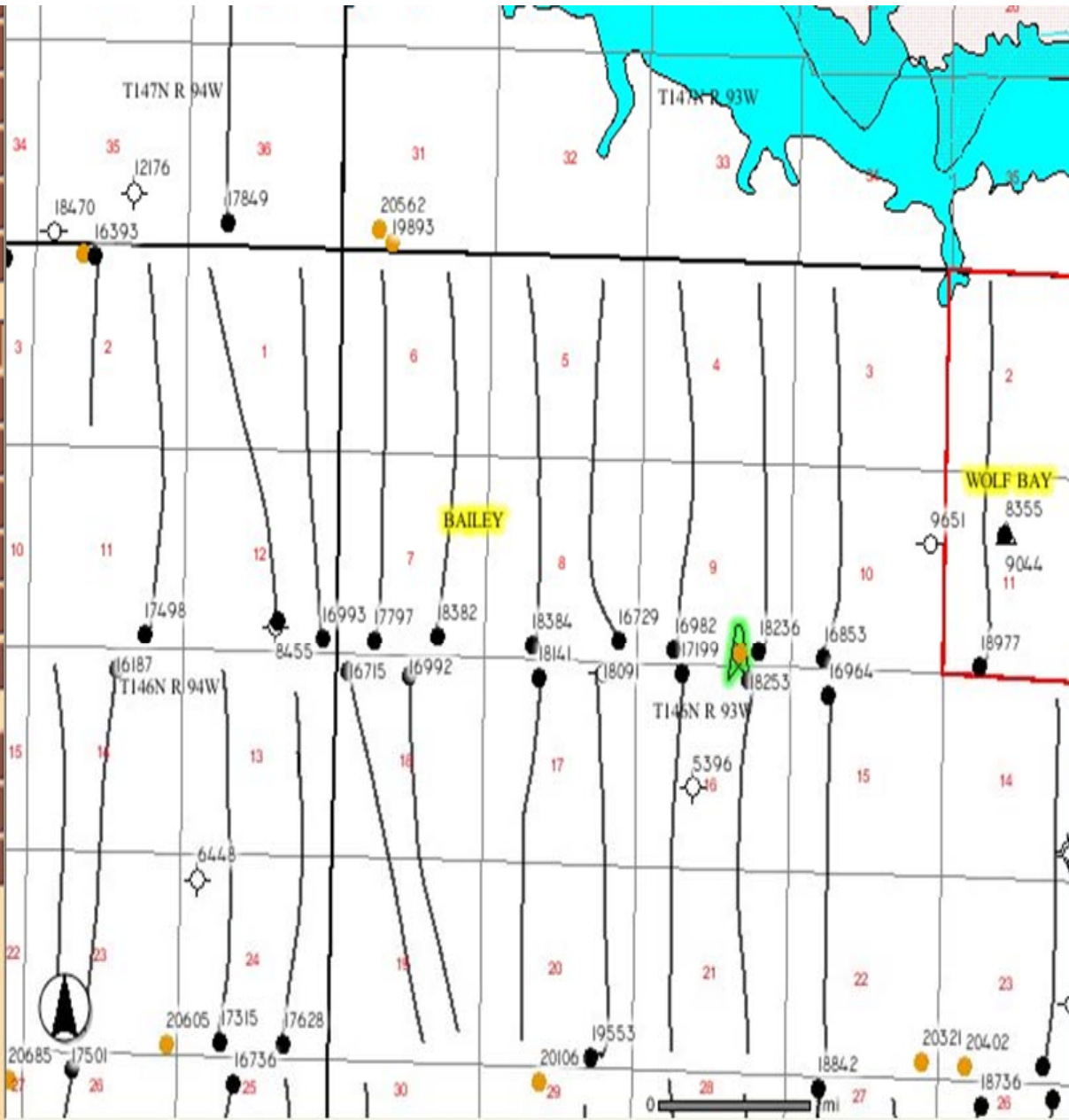
Vern Whitten Photography



View Entire State  
Previous View  
Near Selection  
Search  
Generate PDF

Zoom In  
Zoom Out  
Pan  
Rect Identify  
Select Object  
Buffer  
Distance

Find Well  
Find Field/Unit  
Find Section



Major Rivers  
Selection cleared.

- ☒ Rig Location
- ☒ Directional Surveys
- ☒ Directional Legs
- ☒ Horizontal Surveys
- ☒ Horizontal Legs
- ☒ Cases Docketed
- ☒ Oil Fields
- ☒ Unit Boundaries
- ☒ Inspector Areas
- ☒ Drilling / Spacing
- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Reservations
- ☒ Corporate Boundaries
- ☒ Rivers and Roads
- ☒ County Roads
- ☒ Major Roads
- ☒ Major Rivers
- ☒ Missouri River
- ☒ Land Ownership
- ☒ Imagery
- ☒ Topo/DRG 250k
- ☒ Topo/DRG 100k
- ☒ NAIP 2009

Refresh Map

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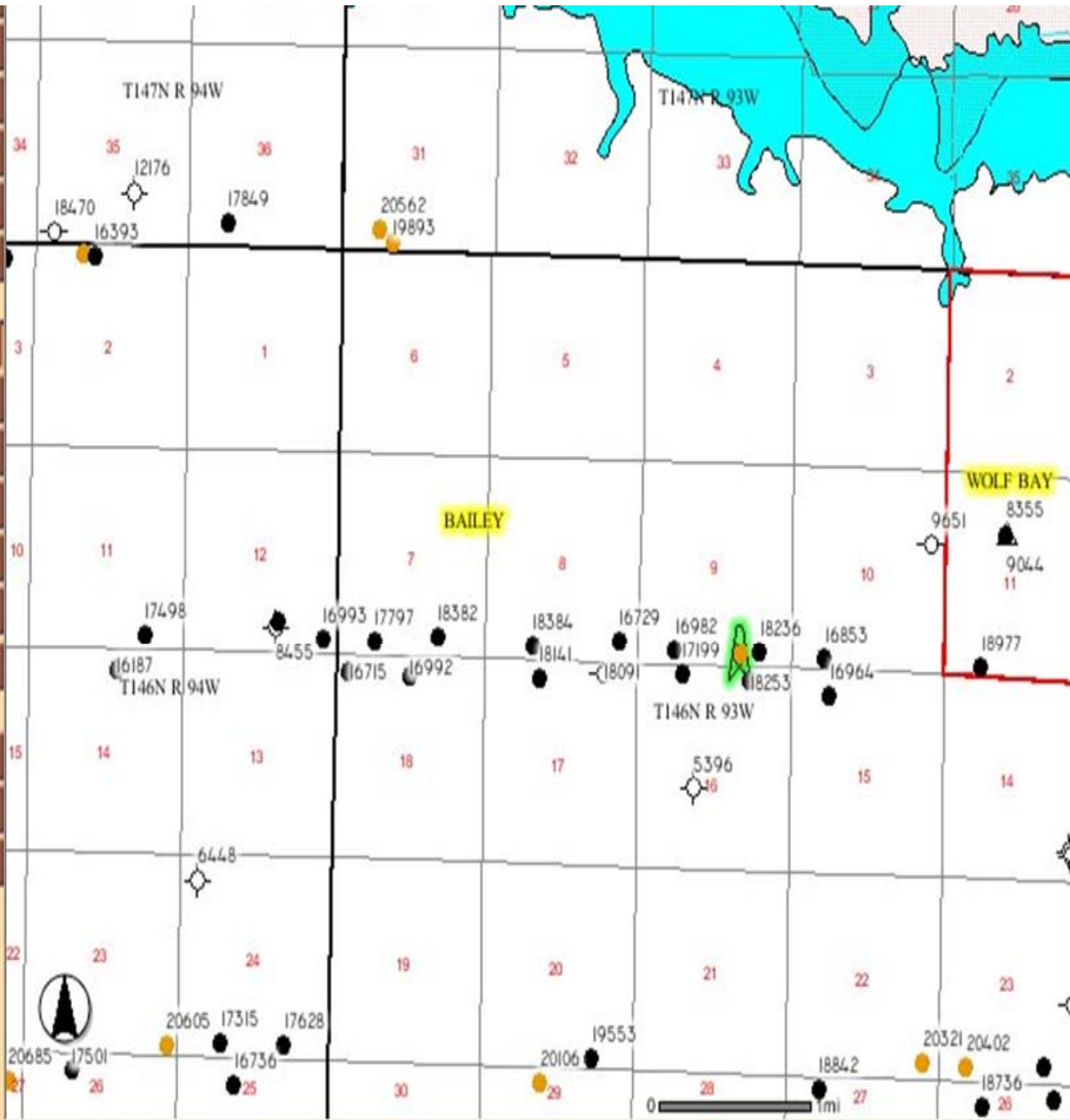
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Refresh Map

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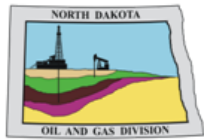
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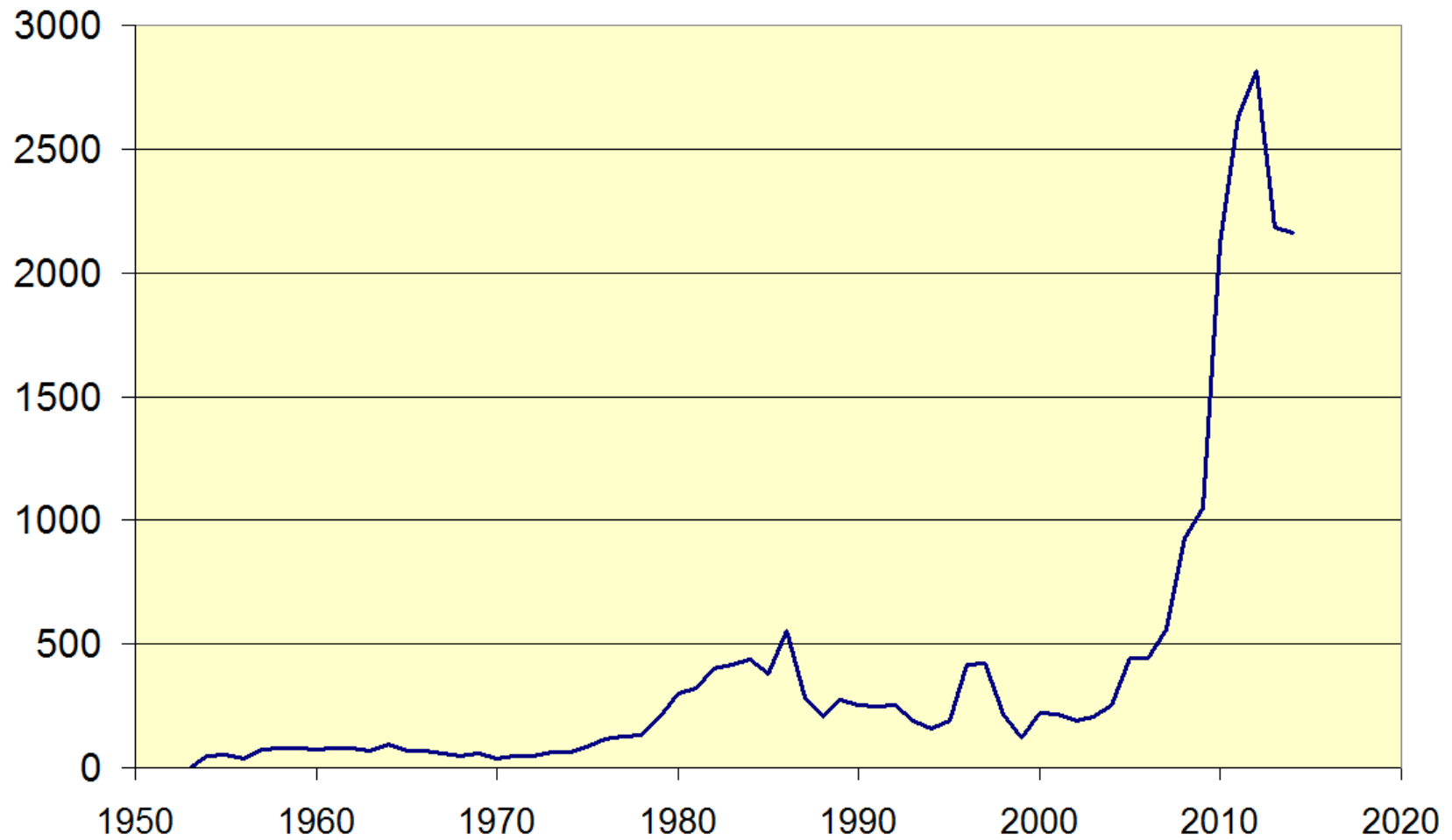


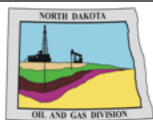
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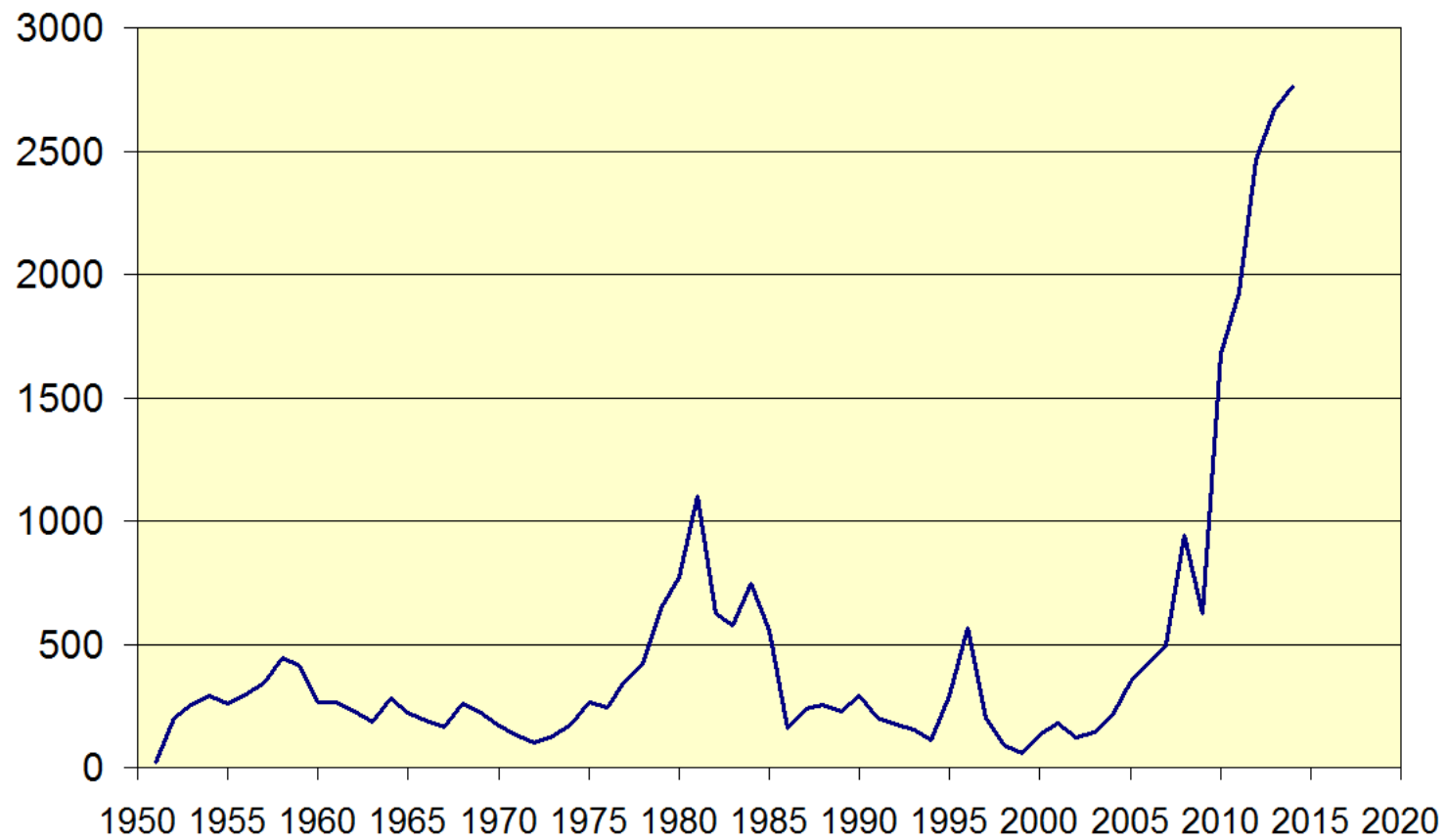


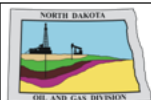
## North Dakota Industrial Commission Cases Heard



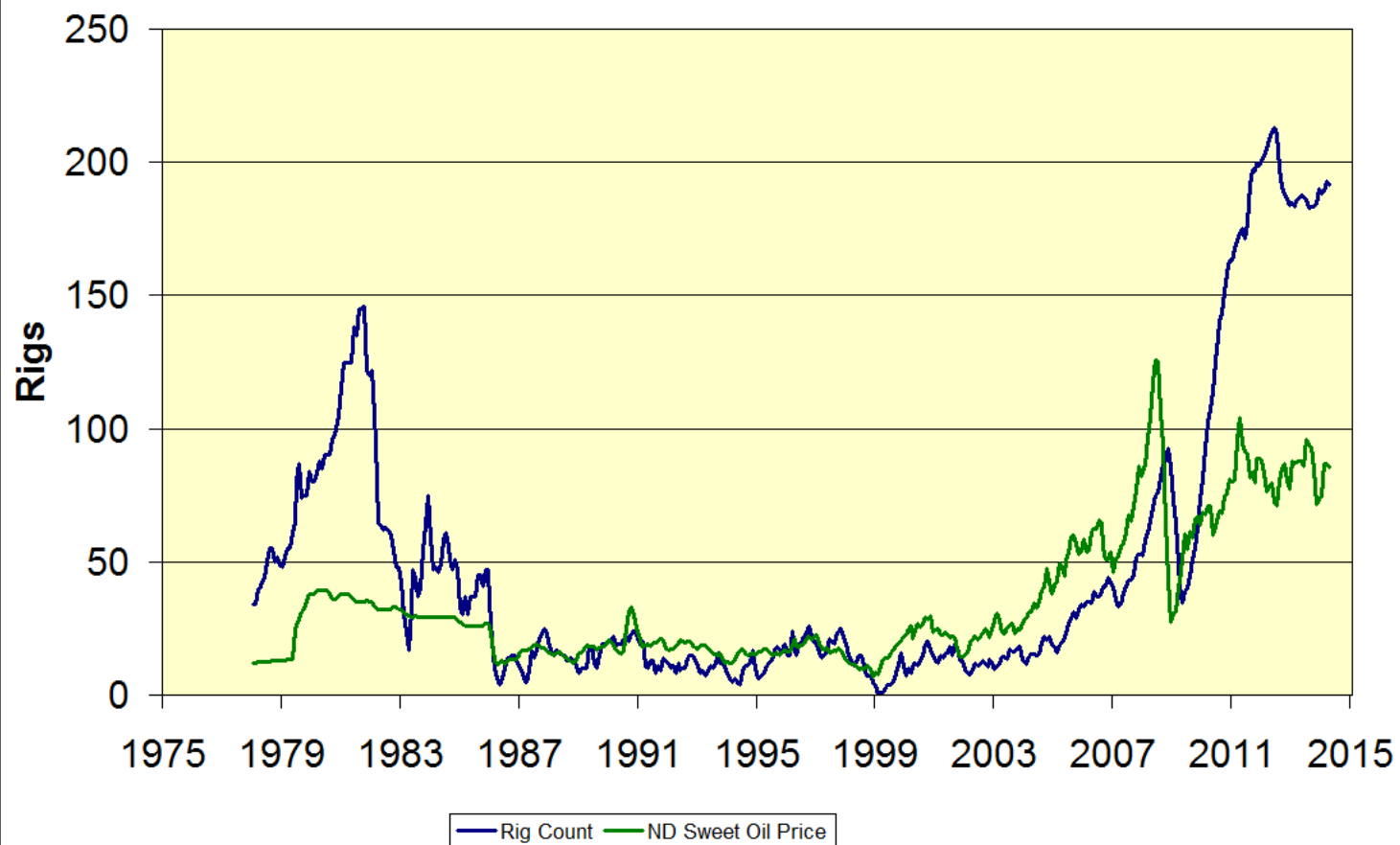


## North Dakota New Well Permits Issued





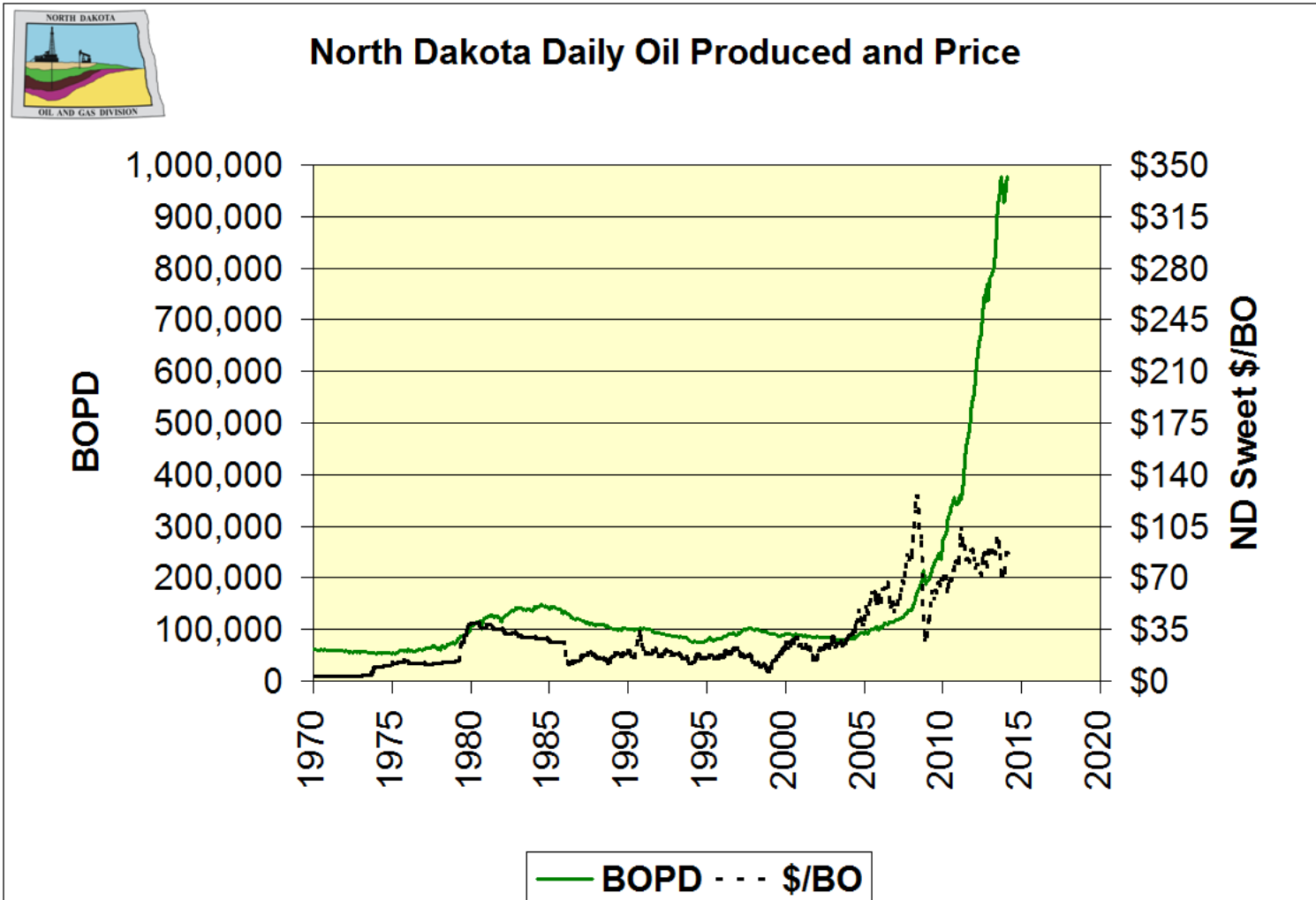
## North Dakota Average Monthly Rig Count



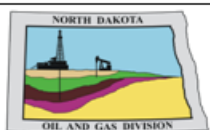


# WELLS

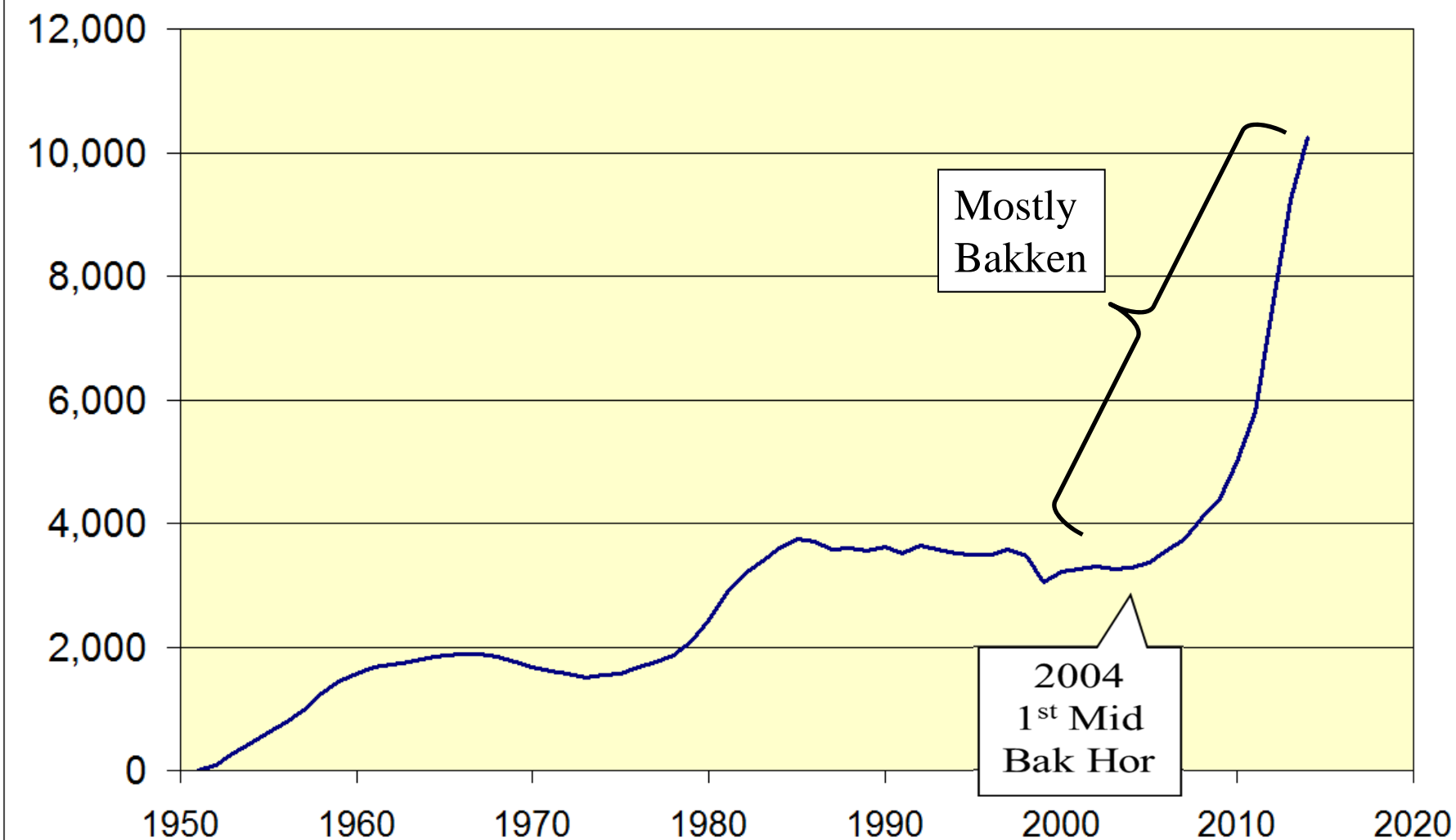
- **10,457 wells currently producing**
  - **7,194 Bakken**
- **1,000 more to secure leases**
- **40,000 additional development wells**
  - **188 rigs – another 18 years**
- **Bakken Pool – 4 targets = more wells**



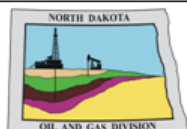
**Production 977,051 bopd (appr 914,003 from Bakken—94%)**



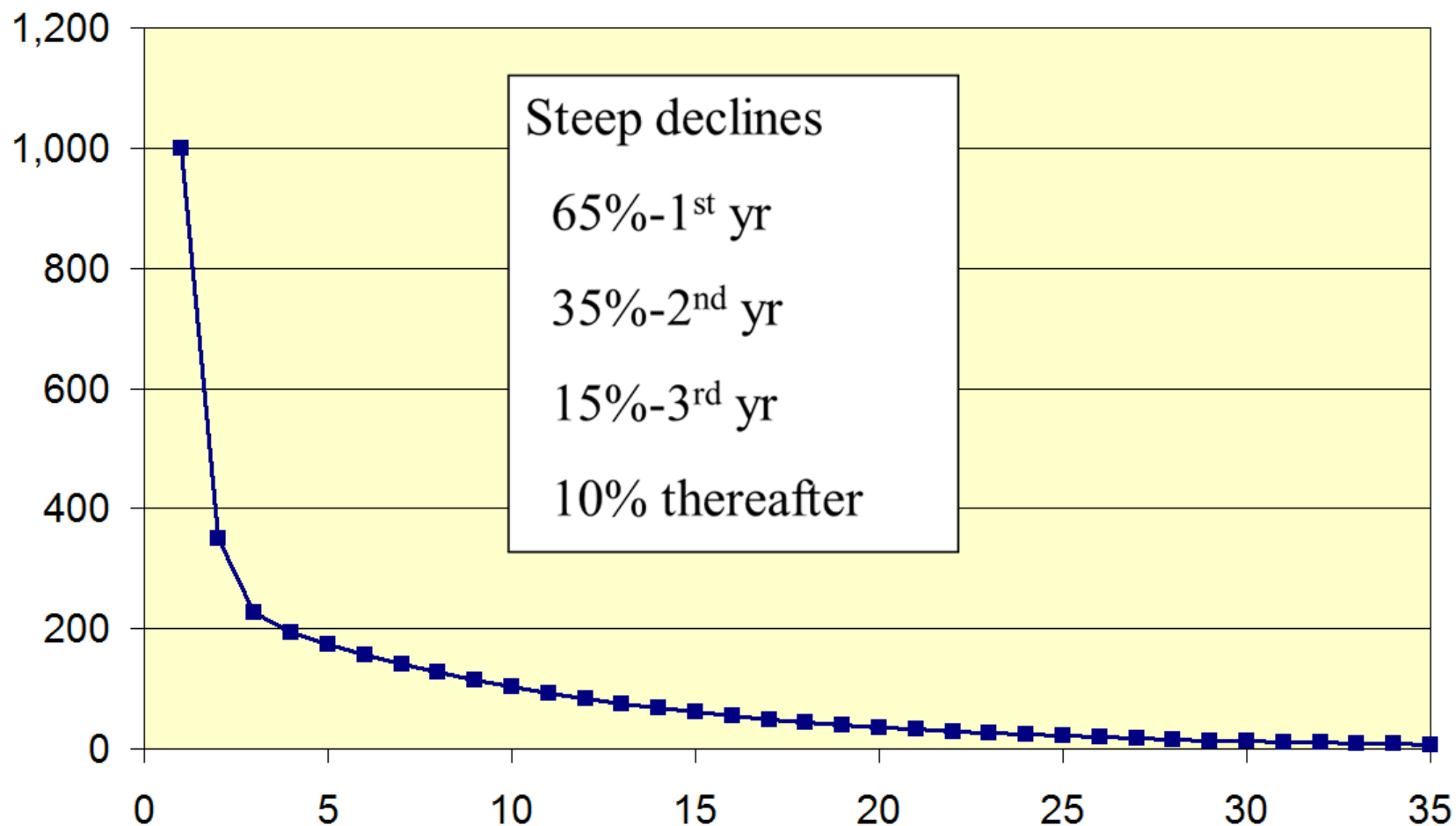
## North Dakota Wells Producing



**10,457 total wells – 7,194 Bakken horizontal (69%)**



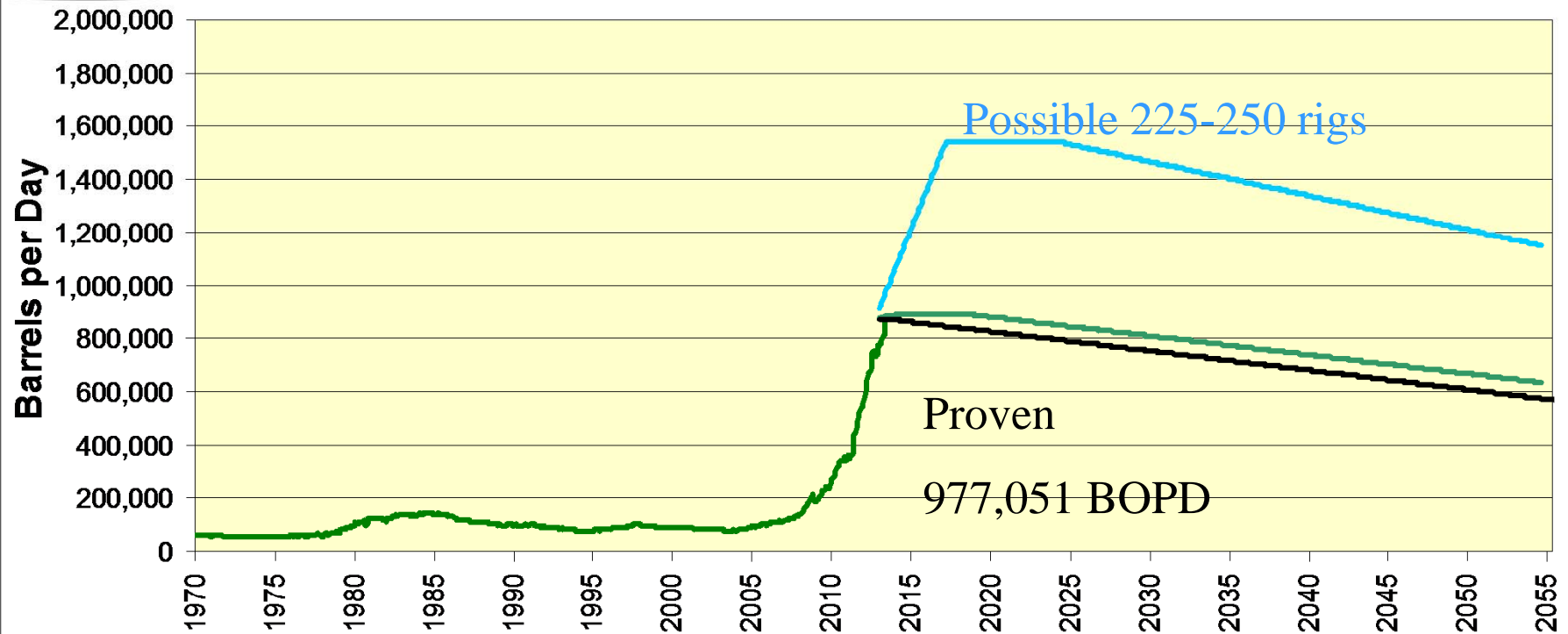
## Typical Bakken/Three Forks Performance







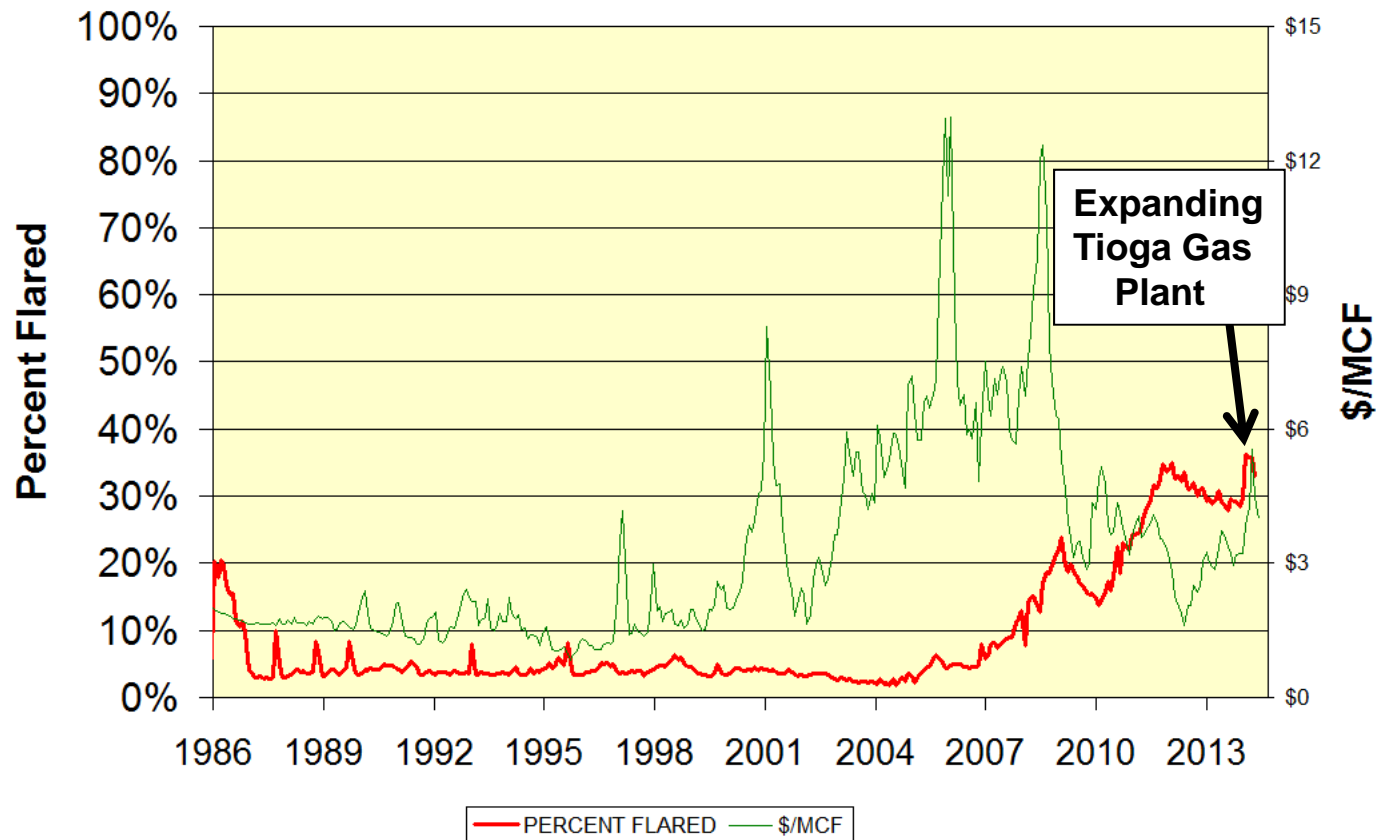
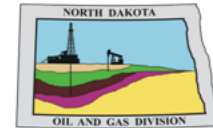
## North Dakota Oil Production

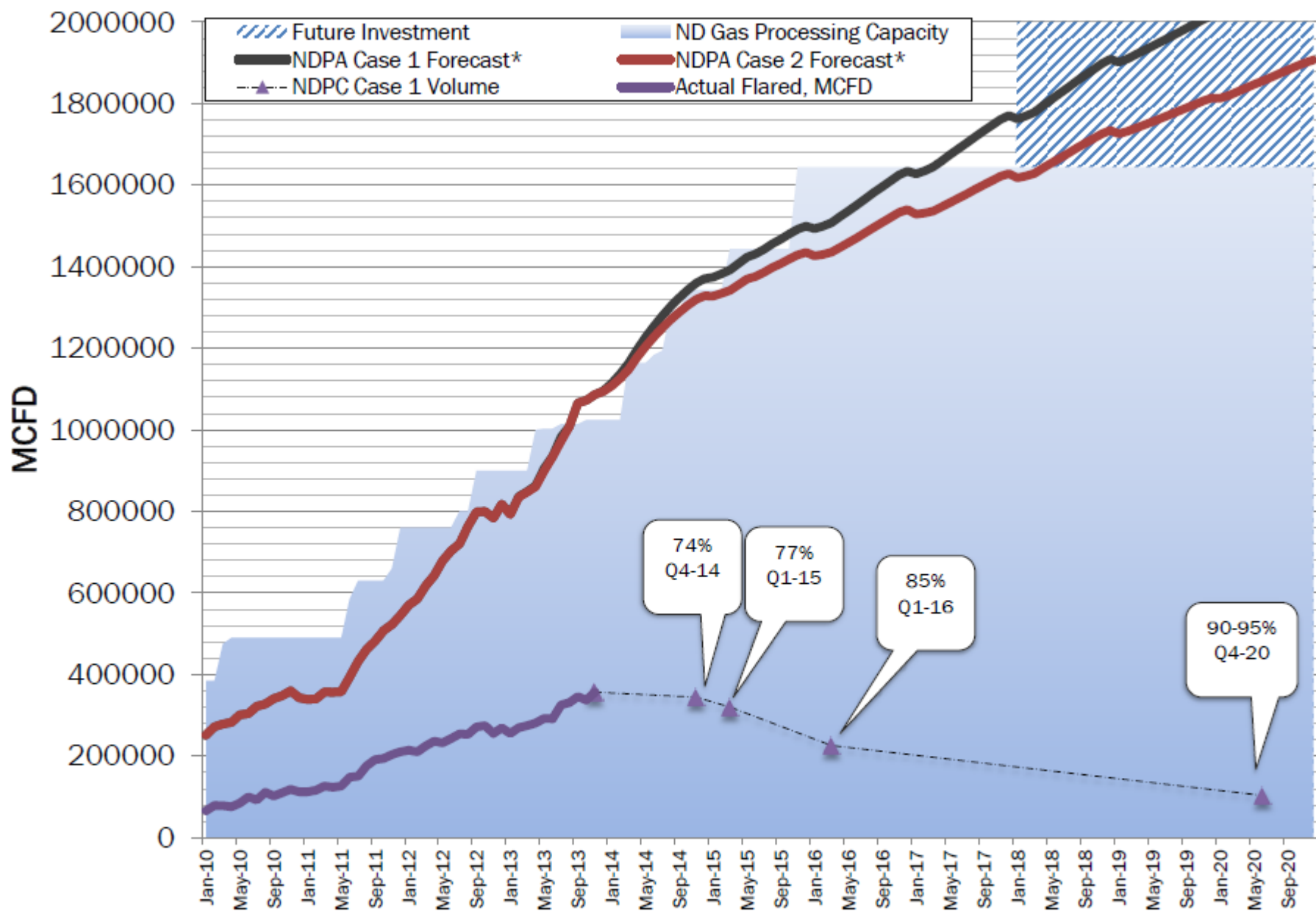


**7,194** Bakken and Three Forks wells drilled and completed  
**40,000** more new wells possible in thermal mature area

History Bakken - Three Forks P10 Bakken - Three Forks P50 Bakken - Three Forks P90

## North Dakota Monthly Gas Flared





\* NDPA Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning

# WHAT'S AHEAD

- **Spearfish horizontal play**
- **Tyler horizontal play**
- **Three Forks—testing lower benches**
- **Enhanced Recovery in Bakken**



## Reclaimed Location

