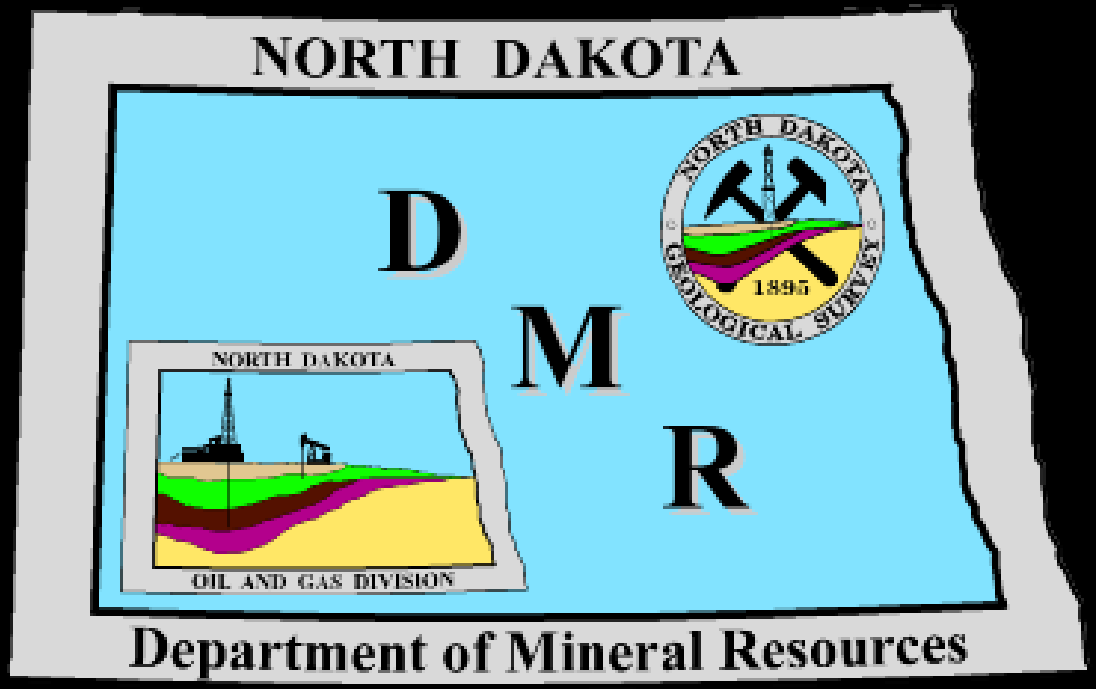
North Dakota Department of Mineral Resources



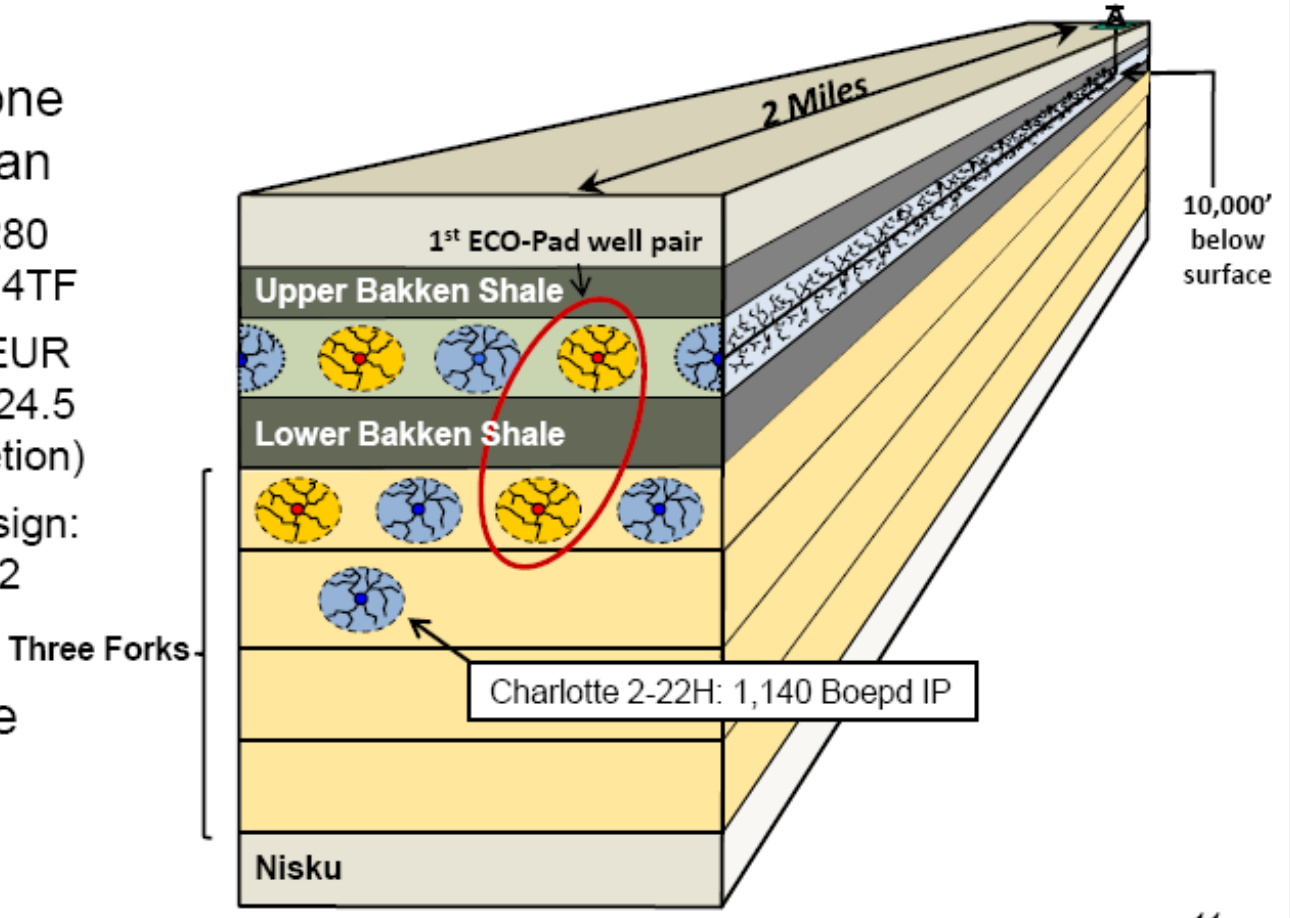
http://www.oilgas.nd.gov *http://www.state.nd.us/ndgs*

600 East Boulevard Ave. - Dept 405
Bismarck, ND 58505-0840
(701) 328-8020 (701) 328-8000

Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

Bakken Development Plan

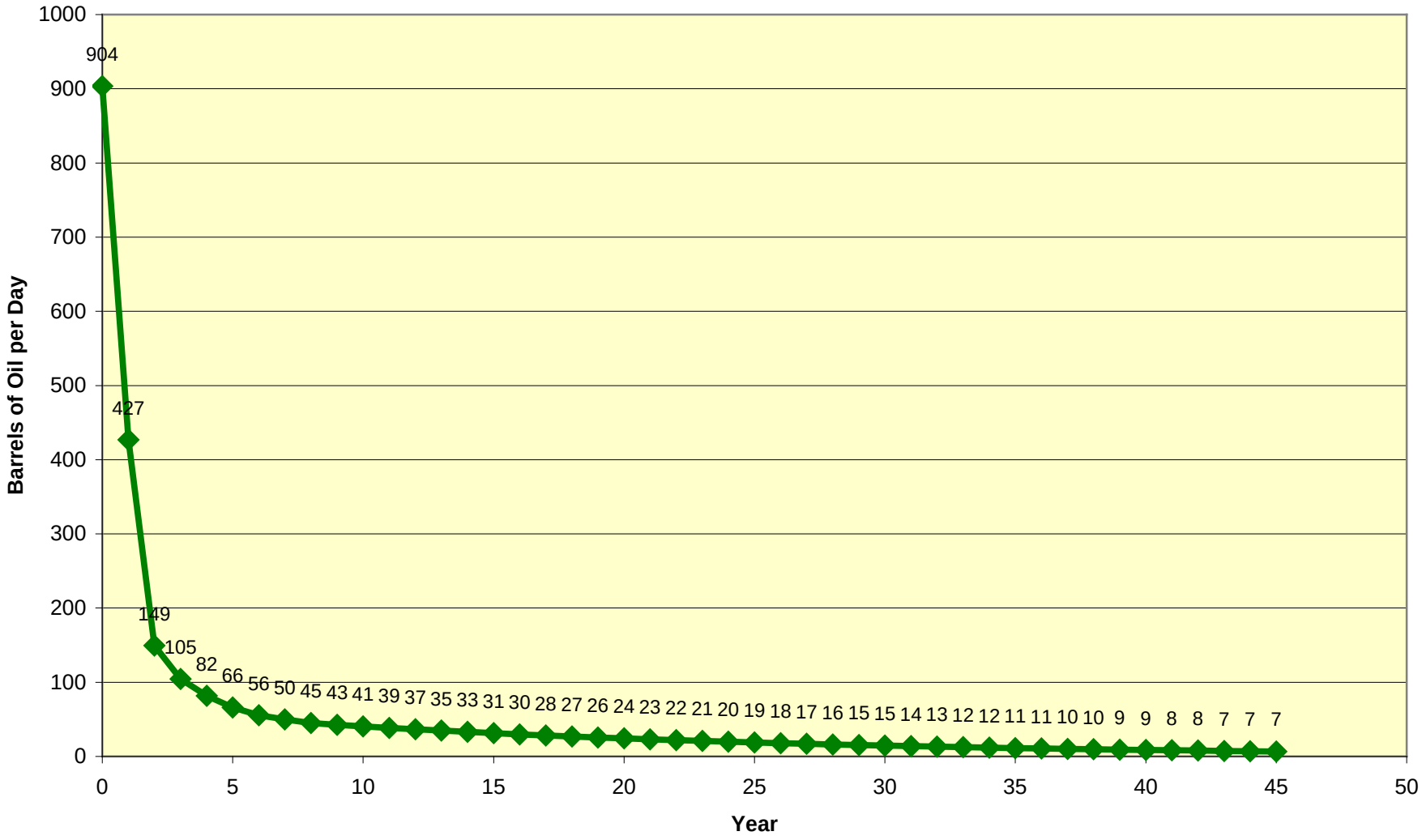
- Original dual-zone development plan
  - 8 wells per 1,280 acres – 4 MB, 4TF
  - 603,000 Boe EUR per well (avg. 24.5 stages/completion)
  - ECO-Pad® design: 2 wells south, 2 wells north
- Additional Three Forks potential



Western North Dakota

- 1,100 to 2,700 wells/year = 2,000 expected
  - 100-225 rigs = 12,000 – 27,000 jobs
  - Another 10,000-15,000 jobs building infrastructure
  - 200 rigs can drill the wells needed to secure leases in 1 year
  - 225 rigs can drill the wells needed to develop spacing units in 16 years
  - 35,000-40,000 new wells = 45,000-50,000 long term jobs

Typical Bakken Well Production



A typical 2012 North Dakota Bakken well will produce for 45 years

If economic, enhanced oil recovery efforts can extend the life of the well

In those 45 years the average Bakken well:

Produces approximately 615,000 barrels of oil

Generates about $20 million net profit

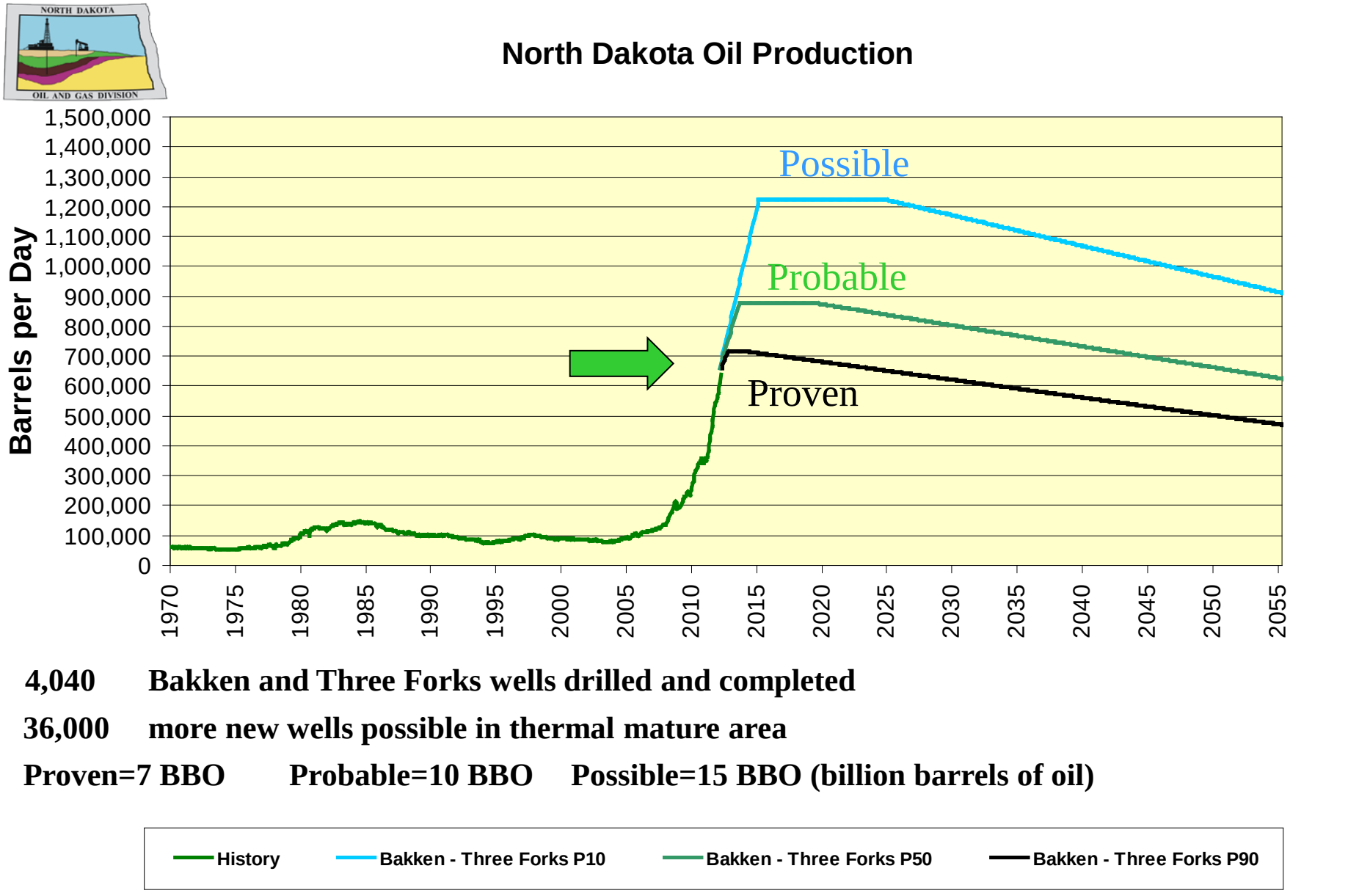
Pays approximately $4,325,000 in taxes
- $2,100,000 gross production taxes
- $1,800,000 extraction tax
- $425,000 sales tax

Pays royalties of $7,300,000 to mineral owners

Pays salaries and wages of $2,125,000

Pays operating expenses of $2,300,000

Cost $9,000,000 to drill and complete

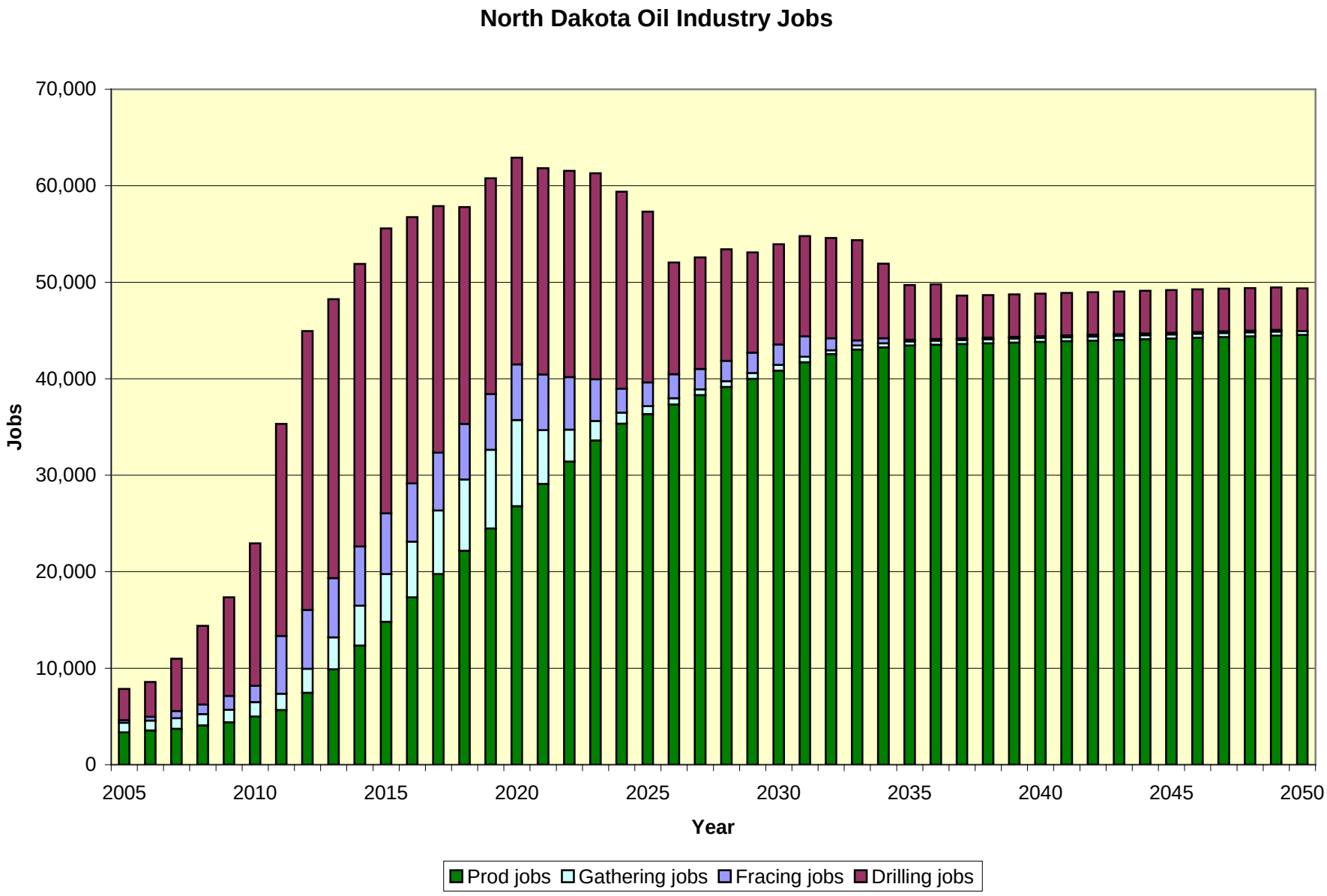


4,040 Bakken and Three Forks wells drilled and completed

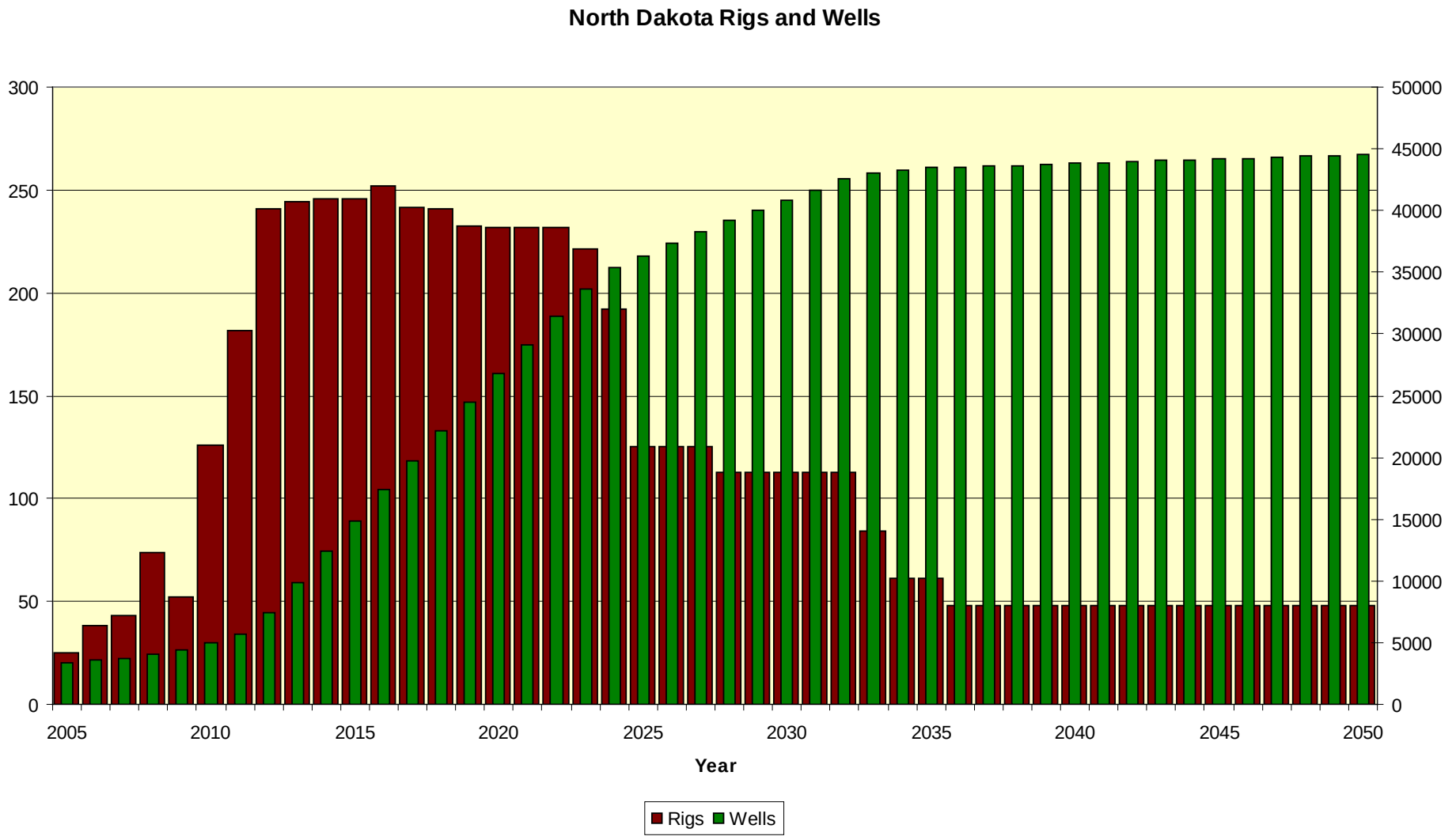
36,000 more new wells possible in thermal mature area

Proven=7 BBO Probable=10 BBO Possible=15 BBO (billion barrels of oil)

Expected Case



Expected Case



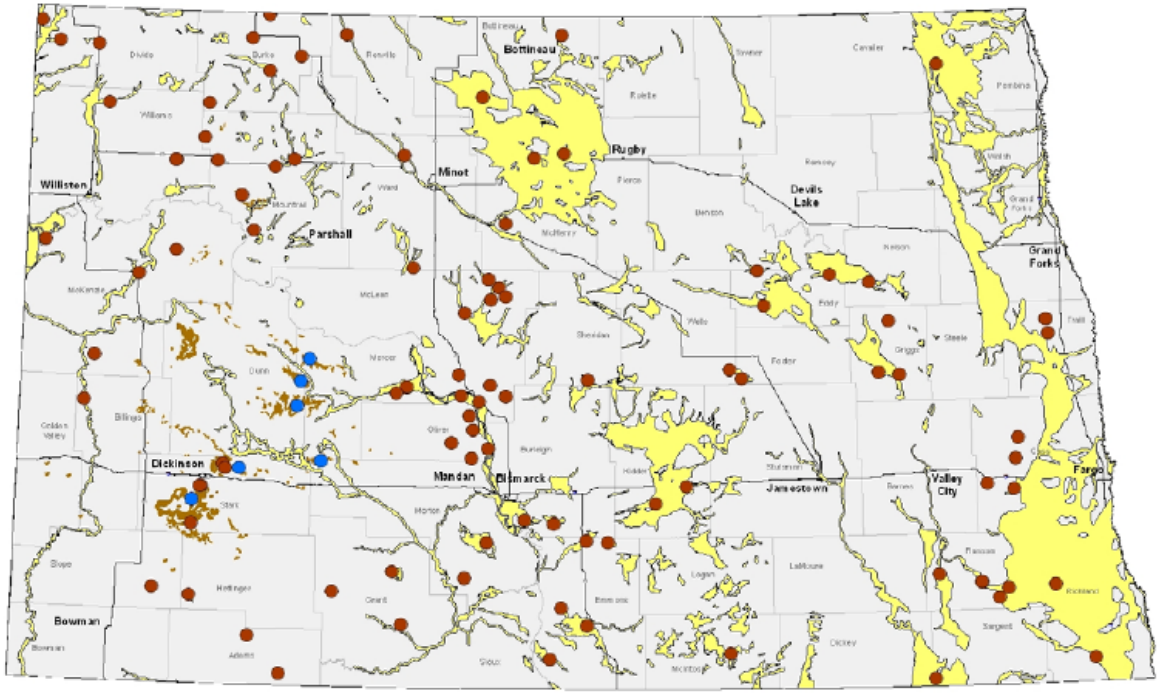
PROPPANT PROJECT

Photomicrograph of sand grains collected in McHenry County.

Photomicrograph of ceramic proppant from a batch that was used in a Bakken well in North Dakota. This proppant was manufactured in China.

Millions of tons of sand and ceramic proppants are used every year in the Williston Basin, part of a multi-billion dollar industry. The Geological Survey has collected 125 sand samples throughout the state in our search for deposits that could be utilized for oil and gas proppants in the well fracing process. We are in the process of performing preliminary analysis on those samples to determine if any would fit the proppant criteria. We have also collected clay samples and will be testing those samples for their kaolin content to determine their suitability in the manufacturing of ceramic proppants.

Under the second phase of this project, the ten most promising sand samples will undergo full ISO analysis (including bulk density, specific gravity, crush resistance, etc), mineralogy (XRD), and stack conductivity analysis to determine which are the most suitable proppant candidates and we will continue to evaluate the clay beds.



Locations of sand samples (red dots) and clay samples (blue dots) collected during this study. The areas in yellow are known sand deposits and the areas in brown are kaolinitic claystones within the Golden Valley Formation.

The North Dakota Way

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Oil and Gas Subscription: ArcIMS Viewer

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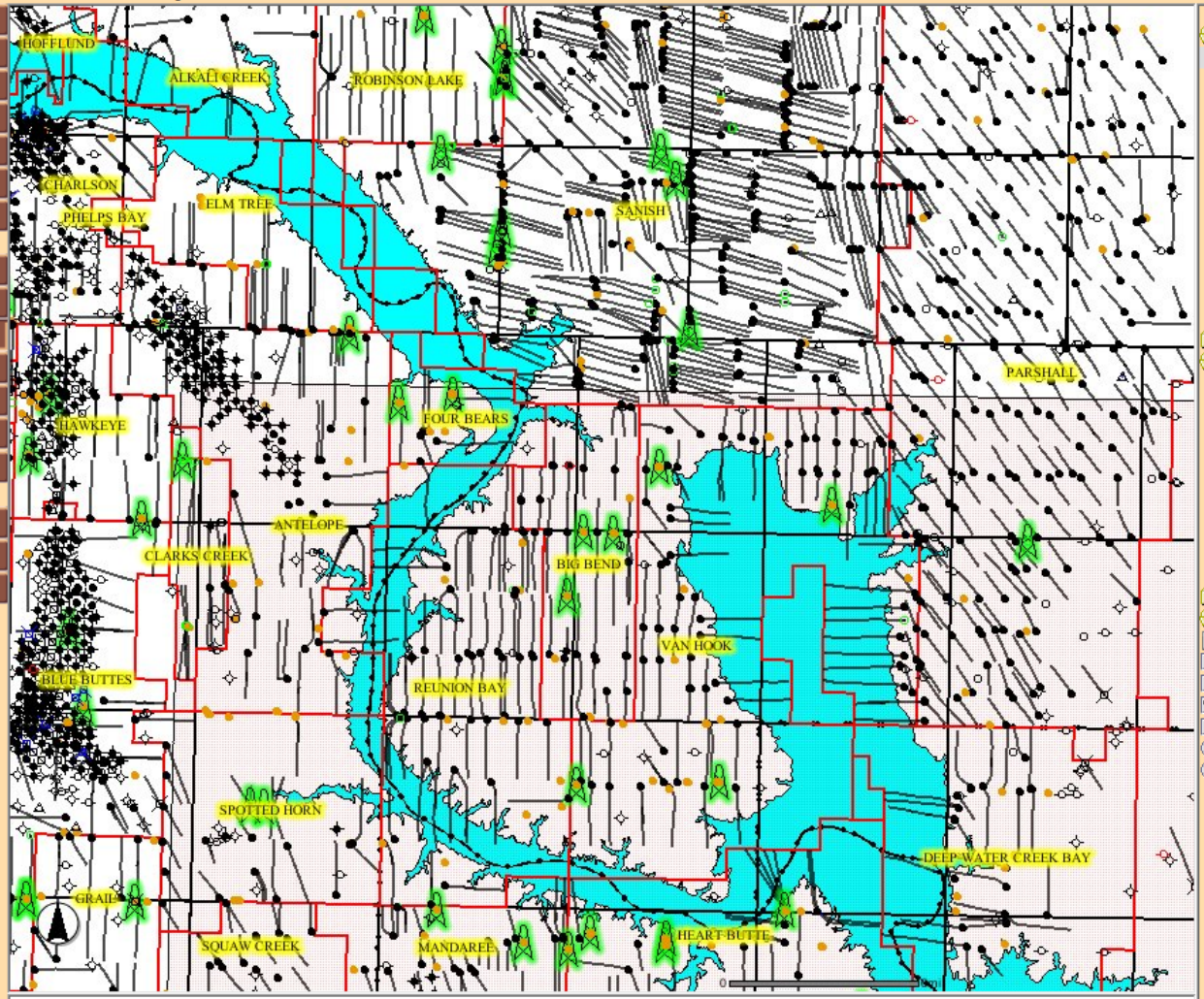
Find Section



ND OIL & GAS LAYERS

- Oil and Gas
  - Wells
  - 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

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Pan

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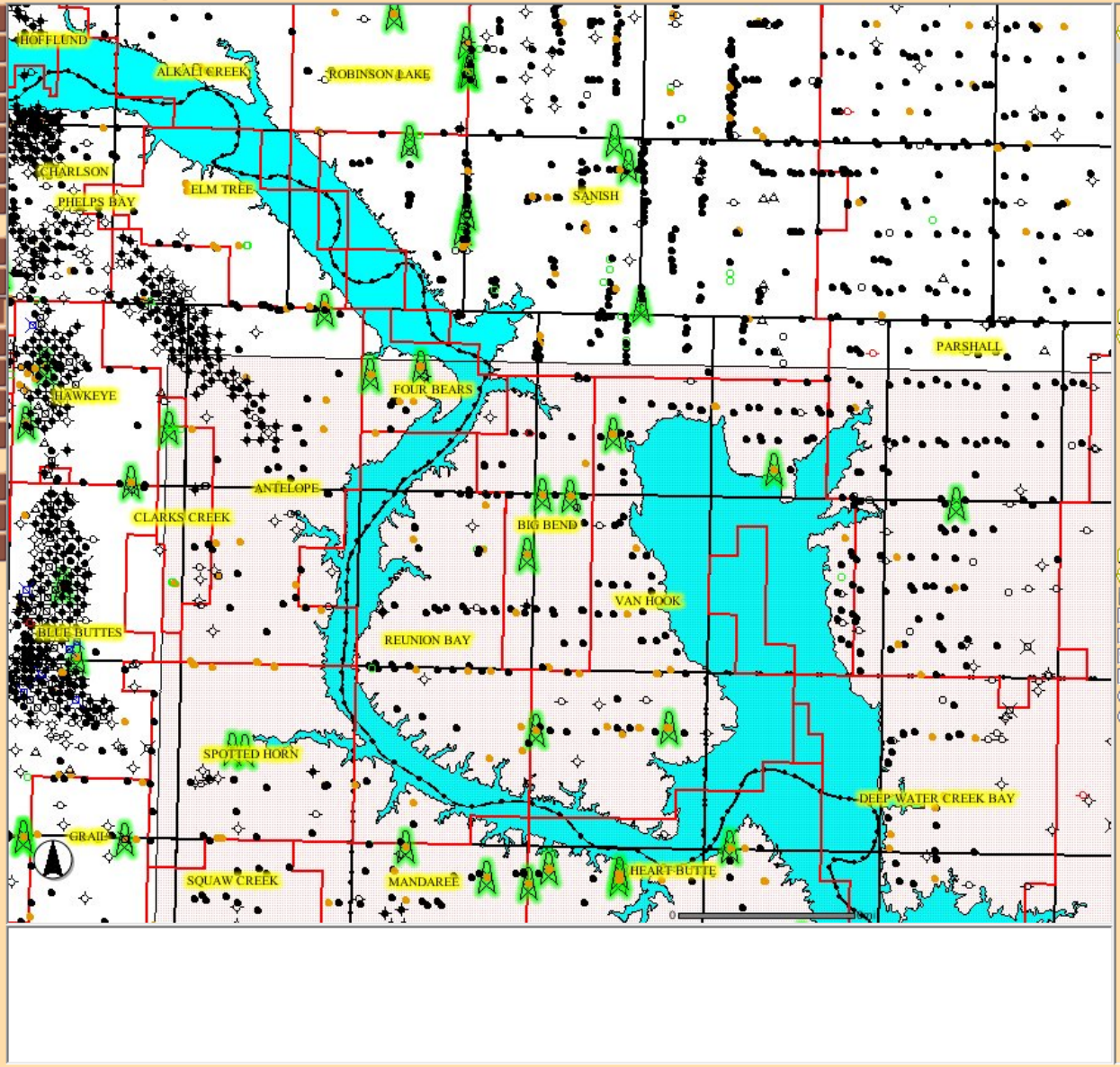
Find Section



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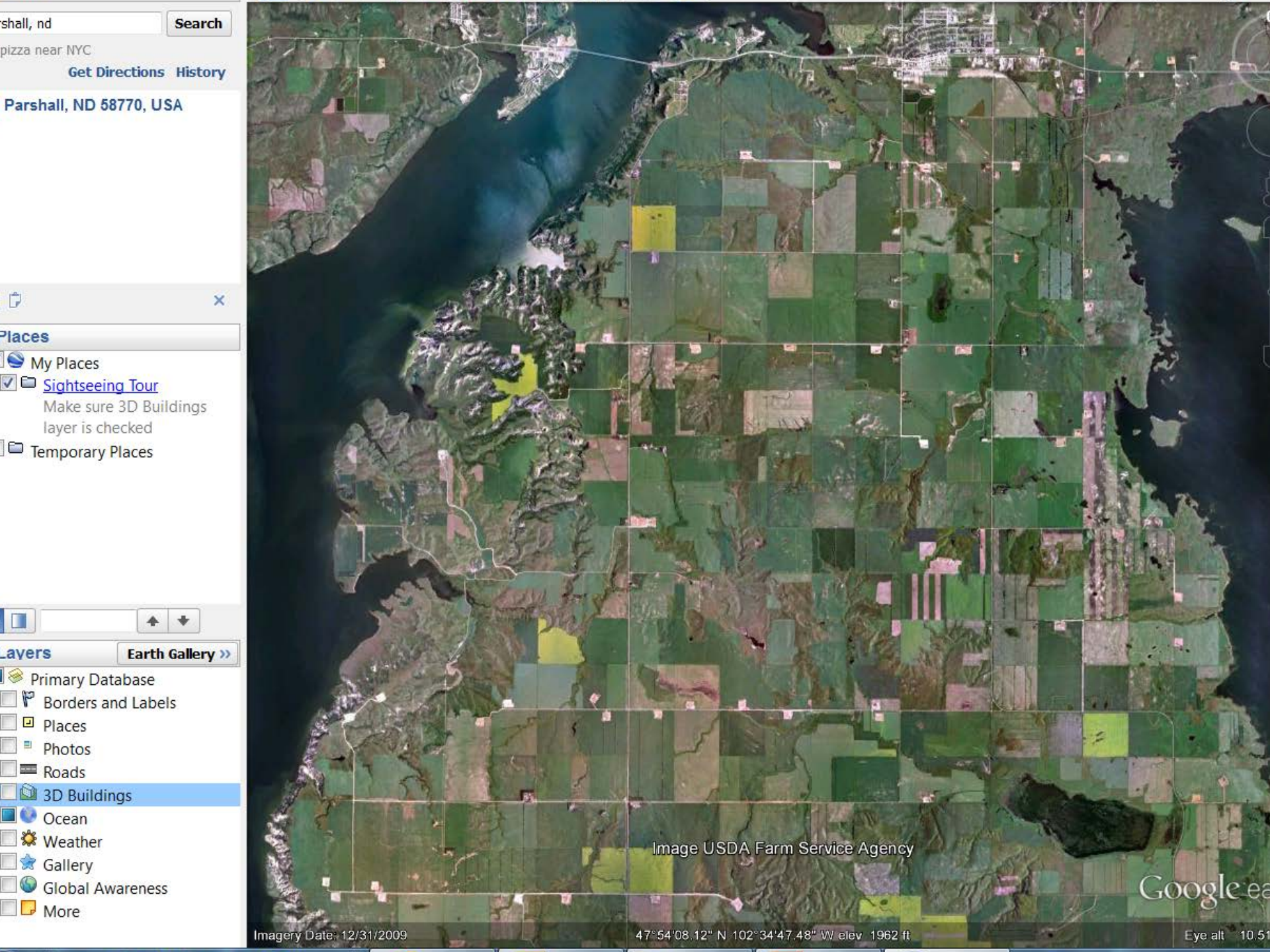
Vern Whitten Photography

Six Wells on a Single Pad

Vern Whitten Photography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3D Buildings
Ocean
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Image USDA Farm Service Agency
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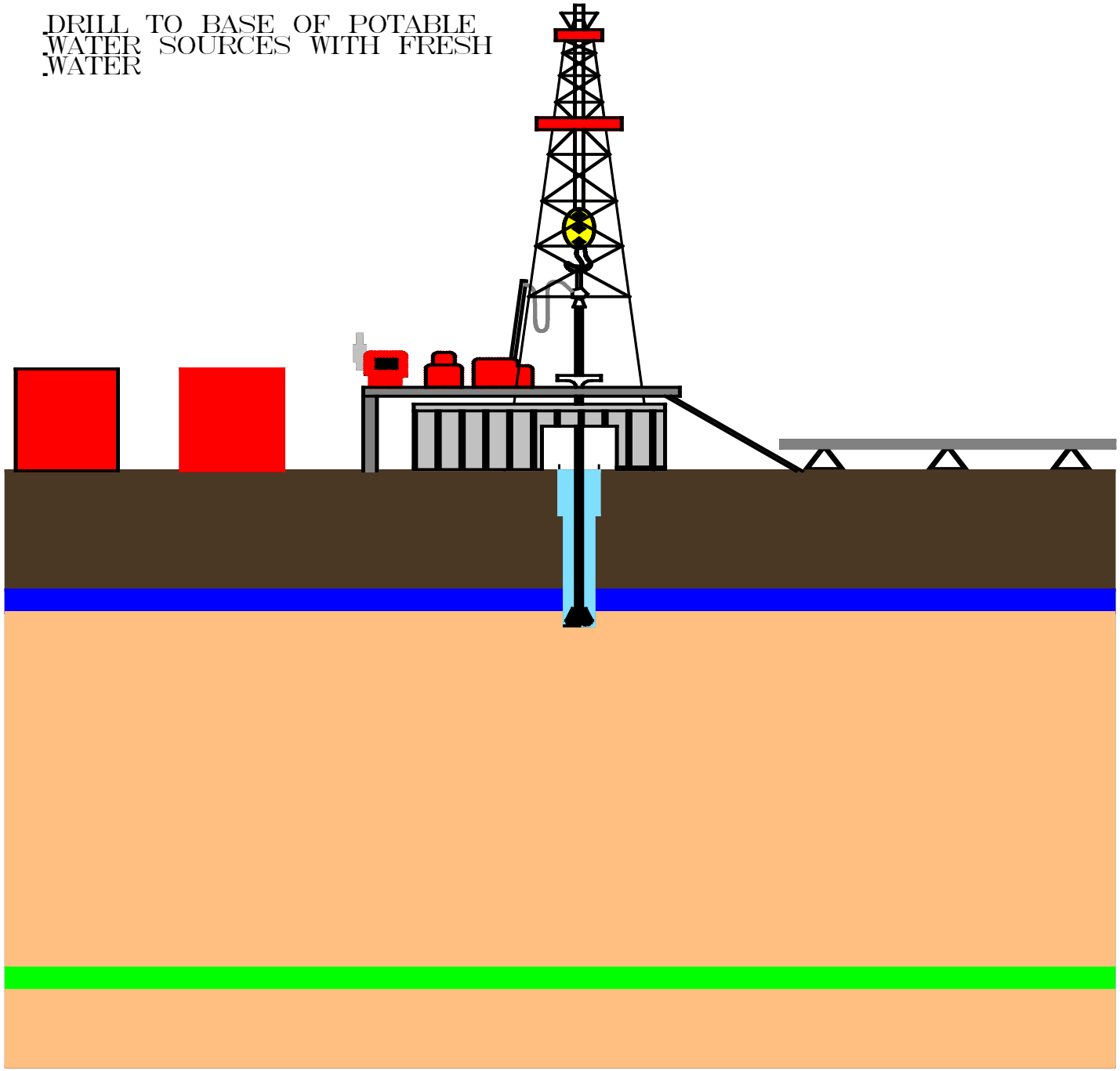
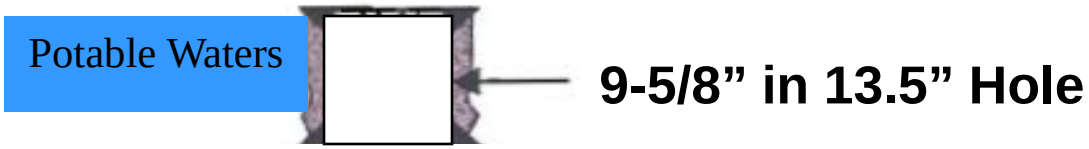
Imagery Date: 12/31/2009
47°54'08.12" N 102°34'47.48" W elev 1962 ft
Eye alt 10.51

Oil and gas well locations are built (stockpiling top soil and lining reserve pits) to make reclamation easier.

.DRILL TO BASE OF POTABLE
.WATER SOURCES WITH FRESH
.WATER

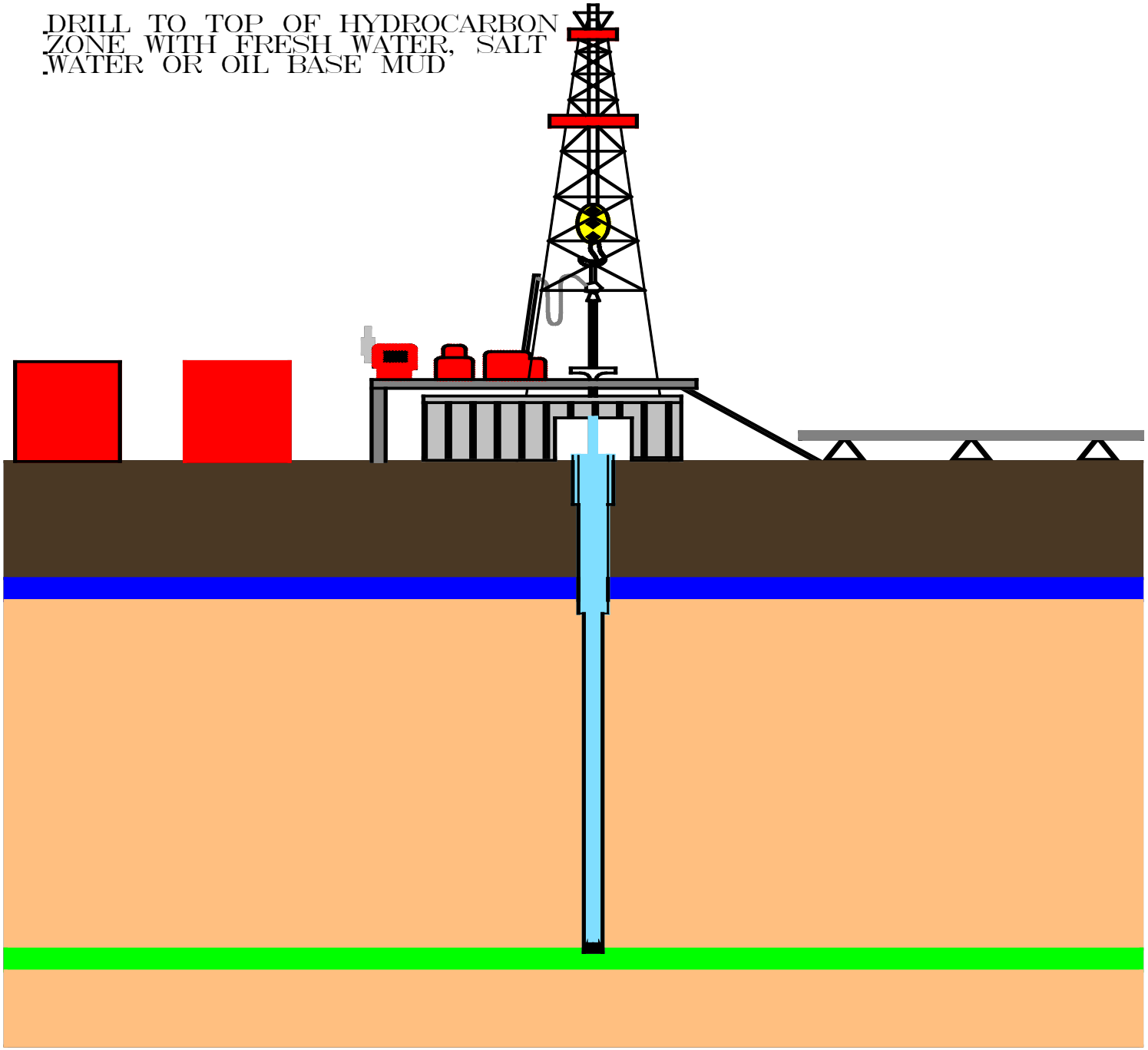


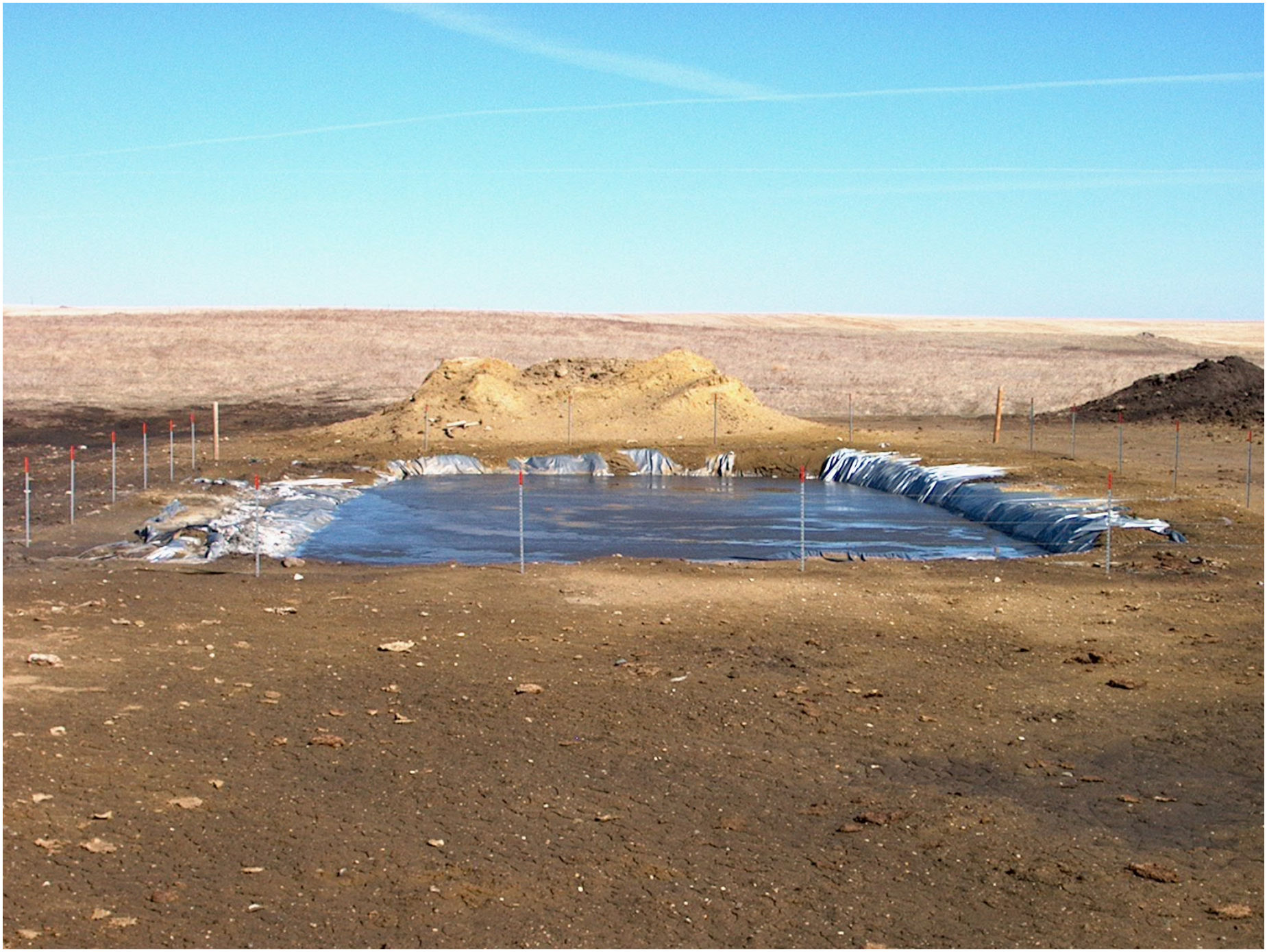
TYPICAL HORIZONTAL OIL WELL



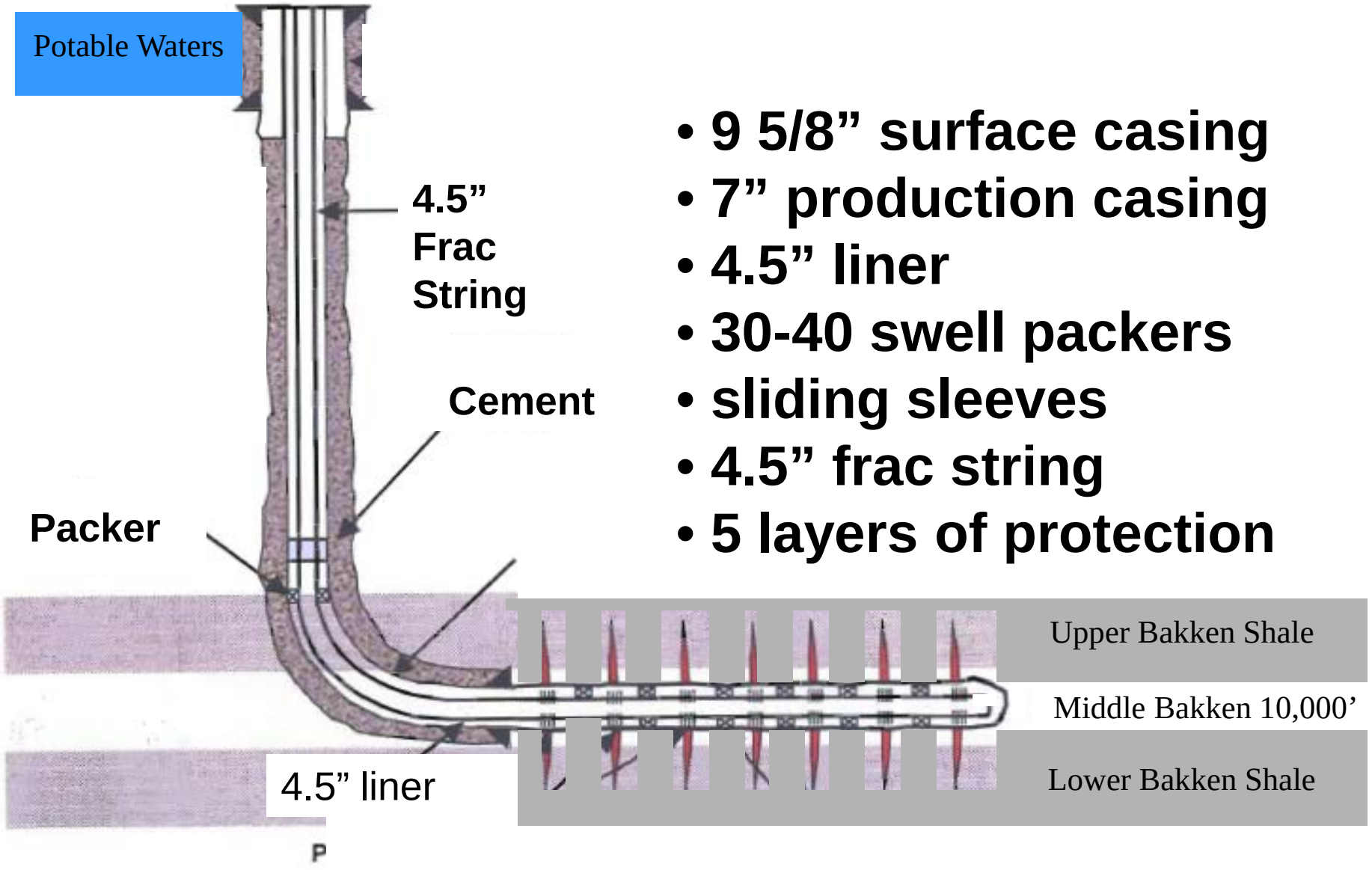
- **Drill with fresh water**
- **Total depth below lowest potable water**
- **Run in hole with surface casing**
- **1st layer of surface water protection**
- **Cement casing back to surface of ground**
- **2nd layer of surface water protection**

.DRILL TO TOP OF HYDROCARBON
.ZONE WITH FRESH WATER, SALT
.WATER OR OIL BASE MUD



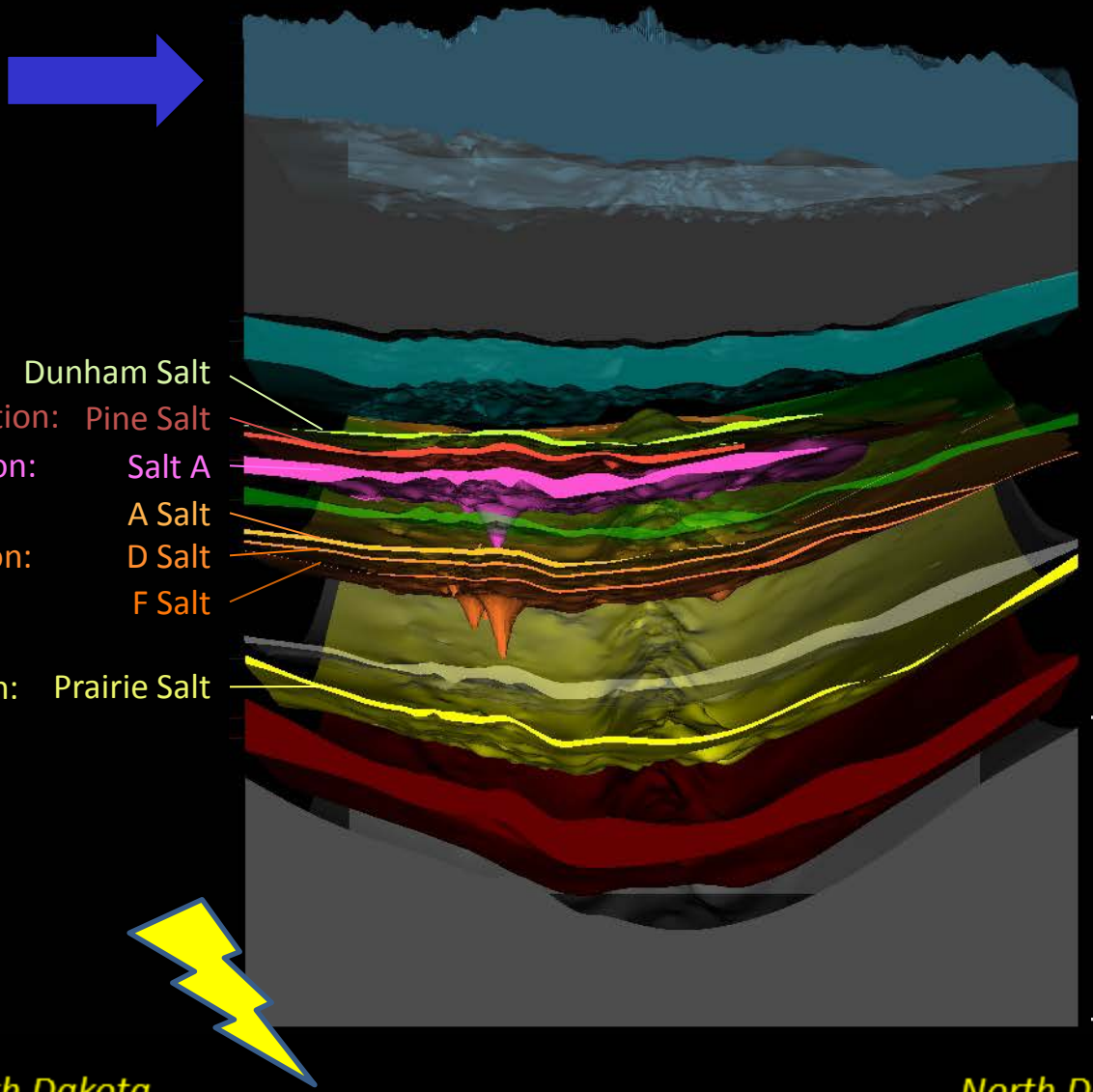


TYPICAL HORIZONTAL OIL WELL



- 9 5/8” surface casing
- 7” production casing
- 4.5” liner
- 30-40 swell packers
- sliding sleeves
- 4.5” frac string
- 5 layers of protection

Significant Salt Intervals of Northwestern North Dakota



Piper Formation: Dunham Salt
Spearfish Formation: Pine Salt
Opeche Formation: Salt A
A Salt
Charles Formation: D Salt
F Salt
Prairie Formation: Prairie Salt

Fresh Water Zone
Shallow Gas Zone
Dakota Group
Spearfish Formation
Tyler Formation
Madison Group
Bakken-Three Forks
Prairie Formation
Red River Formation
Precambrian Basement

North Dakota Geological Survey

North Dakota Depart. of Mineral Resources

Find a Well

Back To Search

Next Page

Page 1 of 5 Go

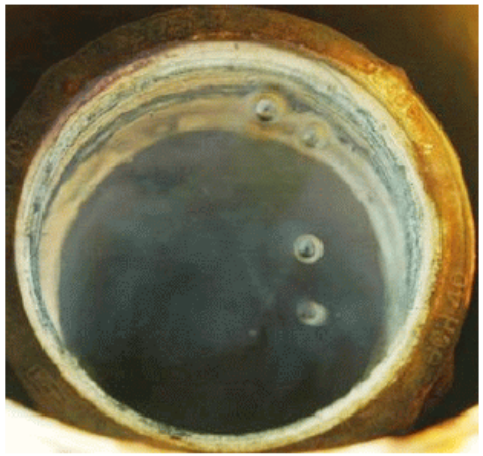
API No.	Job Date	State	County	Operator	WellName	Well Type	Latitude	Longitude	Datum
33-025-01132	4/13/2011	North Dakota	Dunn	XTO Energy/ExxonMobil	Alwin Federal 12X-19	Oil	47.627564	-102.967017	NAD83
33-105-01913	4/18/2011	North Dakota	Williams	XTO Energy/ExxonMobil	Lonnie 31X-3	Oil	48.196639	-102.880264	NAD83
33-105-01824	5/14/2011	North Dakota	Williams	XTO Energy/ExxonMobil	Allen 21X-17	Oil	48.254792	-103.058819	NAD83
33-105-01825	4/28/2011	North Dakota	Williams	XTO Energy/ExxonMobil	Woodrow 34X-32	Oil	48.198603	-103.053617	NAD83
33-053-03113	3/22/2011	North Dakota	Mc Kenzie	XTO Energy/ExxonMobil	101 Federal 21X-24	Oil	47.546178	-104.000694	NAD83
33-105-01948	2/26/2011	North Dakota	Williams	XTO Energy/ExxonMobil	Normark 24X-31	Oil	48.460233	-103.008811	NAD83
33-105-01899	2/17/2011	North Dakota	Williams	XTO Energy/ExxonMobil	Michael State 31X-16	Oil	48.167464	-103.031950	NAD83
33-025-01165	5/9/2011	North Dakota	Dunn	Marathon Oil	Lucky Fleckenstien #34-20H	Oil	47.264306	-102.330608	NAD83
33-025-01173	5/3/2011	North Dakota	Dunn	Marathon Oil	Wardner #24-35H	Oil	47.245872	-102.445641	NAD83

SHALLOW GAS PROJECT

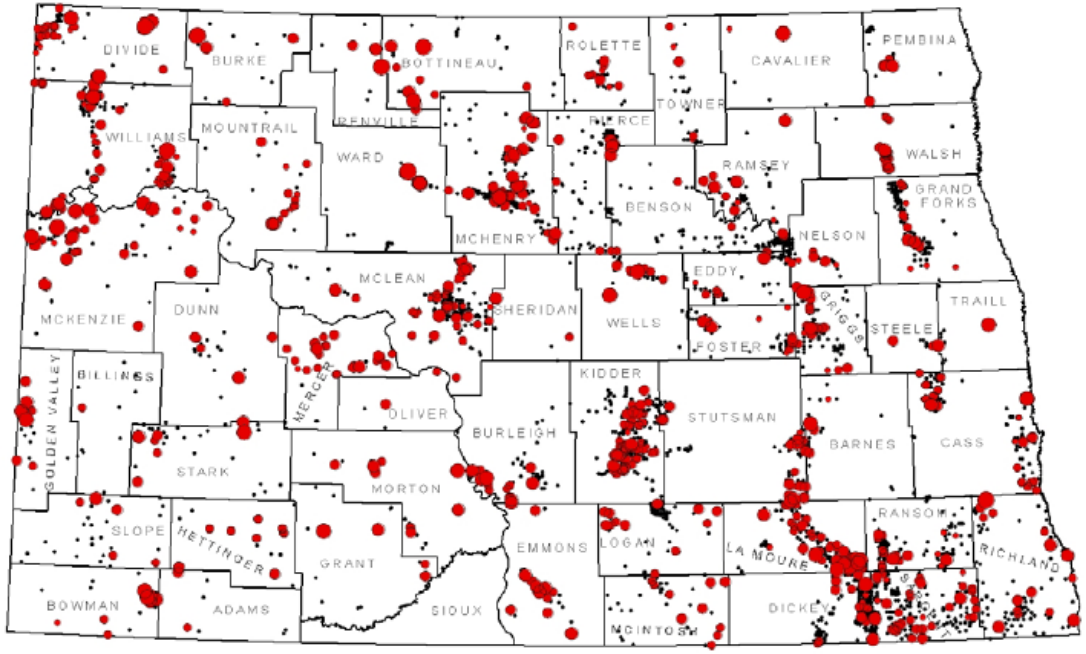
The Geological Survey tested 4,325 NDSWC monitoring wells for methane in 52 of the 53 counties in North Dakota from 2006-2010.

The Geological Survey recently completed phase I of a study of shallow natural gas in North Dakota. We investigated 9,400 ND State Water Commission monitoring well sites, tested 4,325 wells, and detected methane in 905 wells. Approximately 20% of the wells contained detectable gas.

During the second phase of the project, thirty groundwater samples, primarily from eastern North Dakota, will be analyzed for dissolved gas composition, isotopes, and general chemistry. This will enable us to determine the source of the gas and identify chemical groundwater signatures that might assist the oil and gas industry in natural gas exploration.

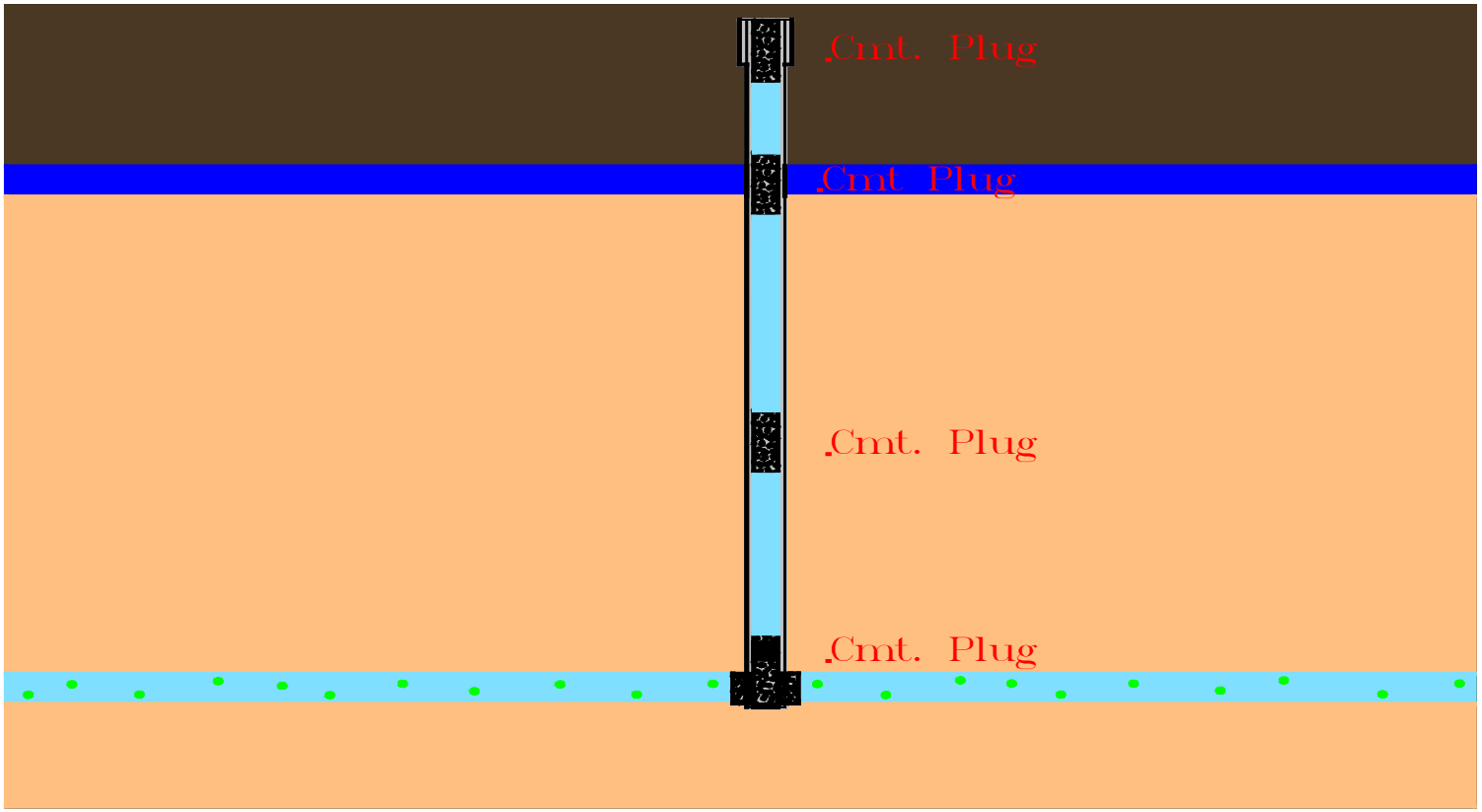


Methane bubbling to the surface in a two-inch NDSWC monitoring well.



Monitoring wells that contained methane are indicated with red dots, black dots are wells that contained no detectable methane. The red dots are sized to reflect the concentration of methane -- the higher the concentration, the larger the dot.

PLUG AND ABANDON



BTA Oil Producers. JV-P#1. Near Rider Field
NDIC File No. 14857. SE SE 15-140-103.
Panoramic Reclamation photo taken looking 070
towards middle of location. May 1, 2001. dwn.

Well was plugged in 07/1998

Reclamation work in 09/1998

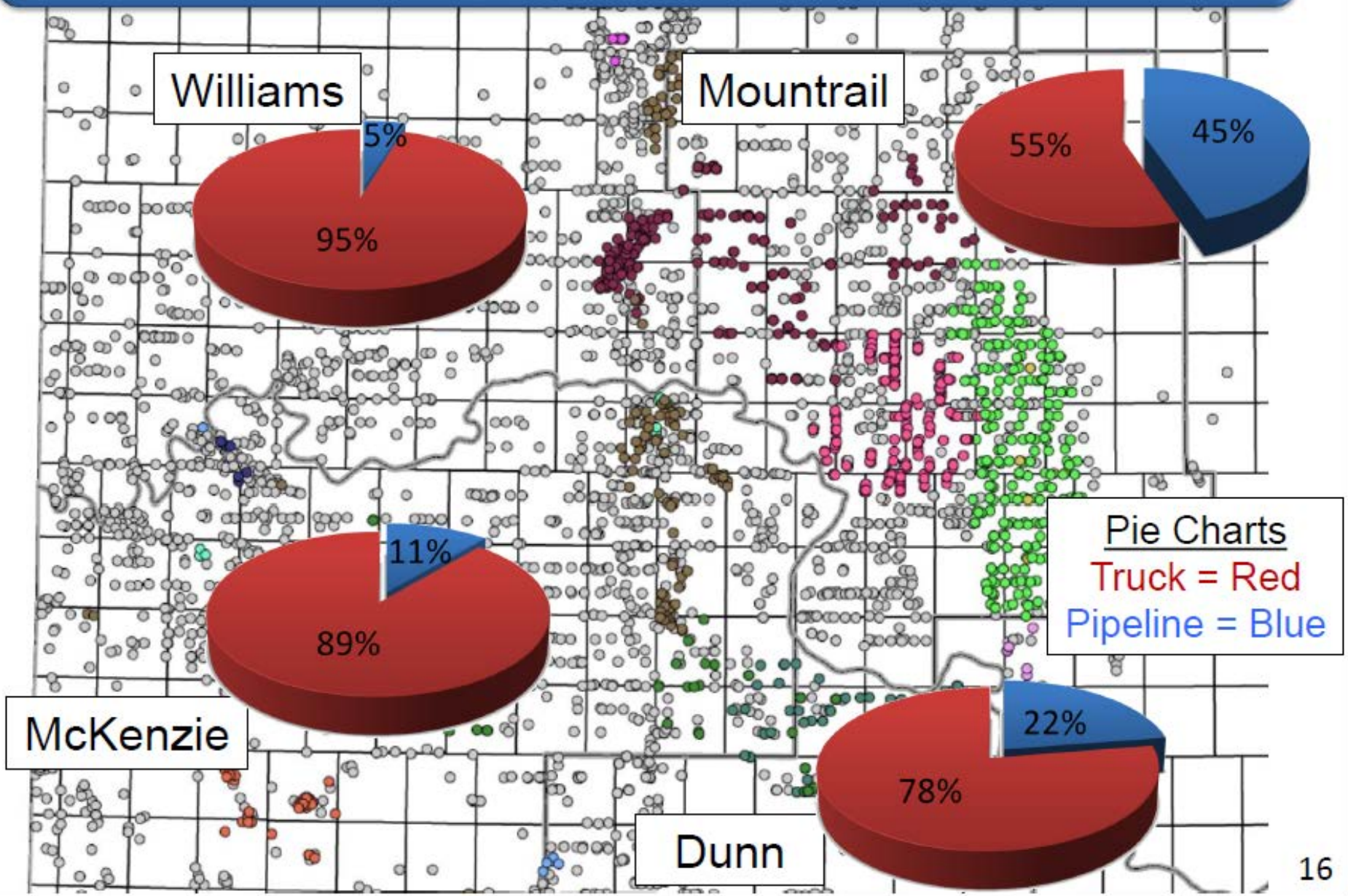
Seeded in Spring of 1999

BTA Oil Producers - JV-P#1 - Rider Field.
NDIC File No. 14857. SE SE 15-140-103.
Panoramic photo looking east. Photo taken from butte to west on 7/2/2002.

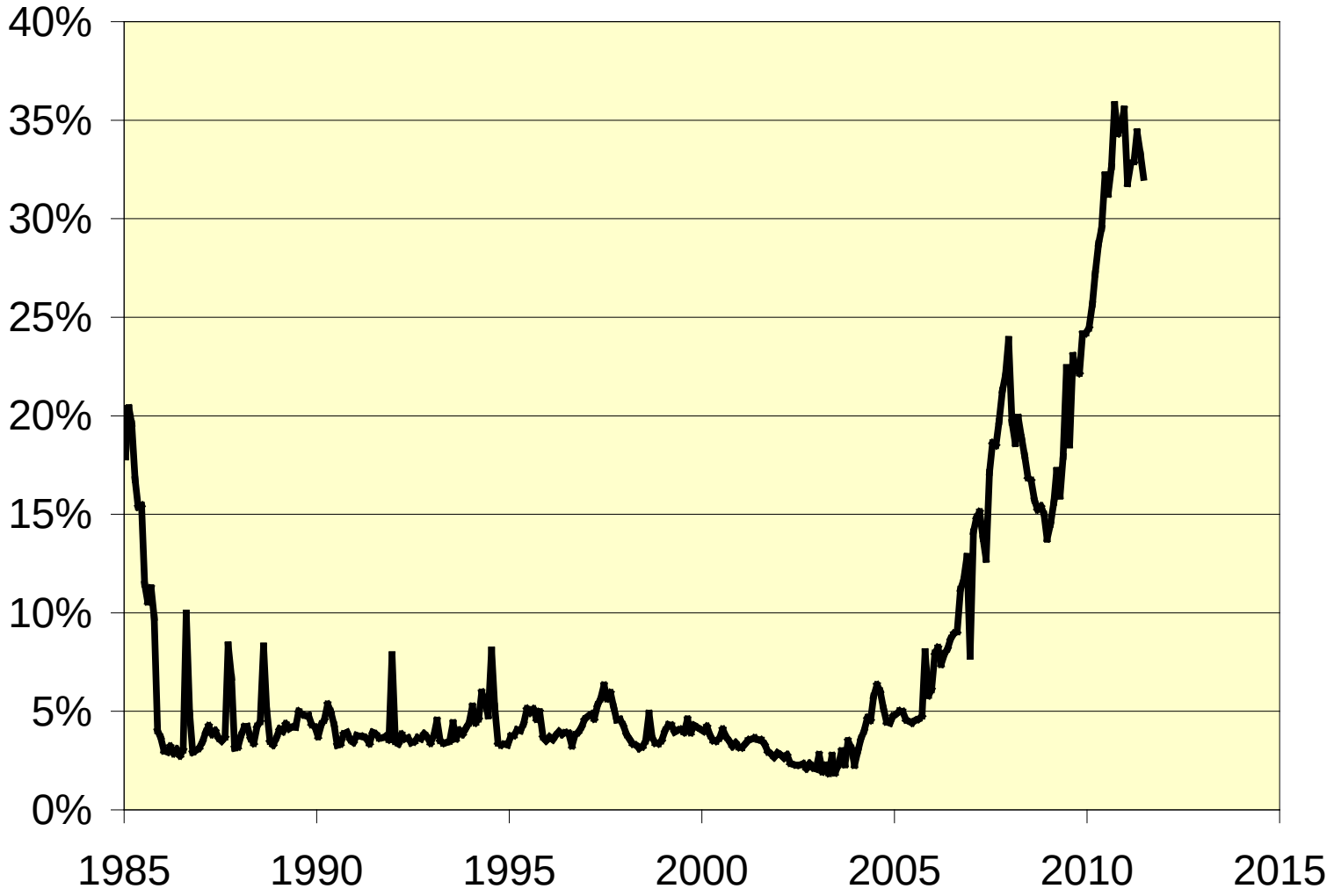
BTA Oil Producers. JV-P#1. Near Rider and Knutson Fields.
NDIC File No. 14857. SE SE 15-140-103.
Panoramic photo looking east from butte west of location.
Photo taken on May 7th, 2003. dwn.

The North Dakota Challenges

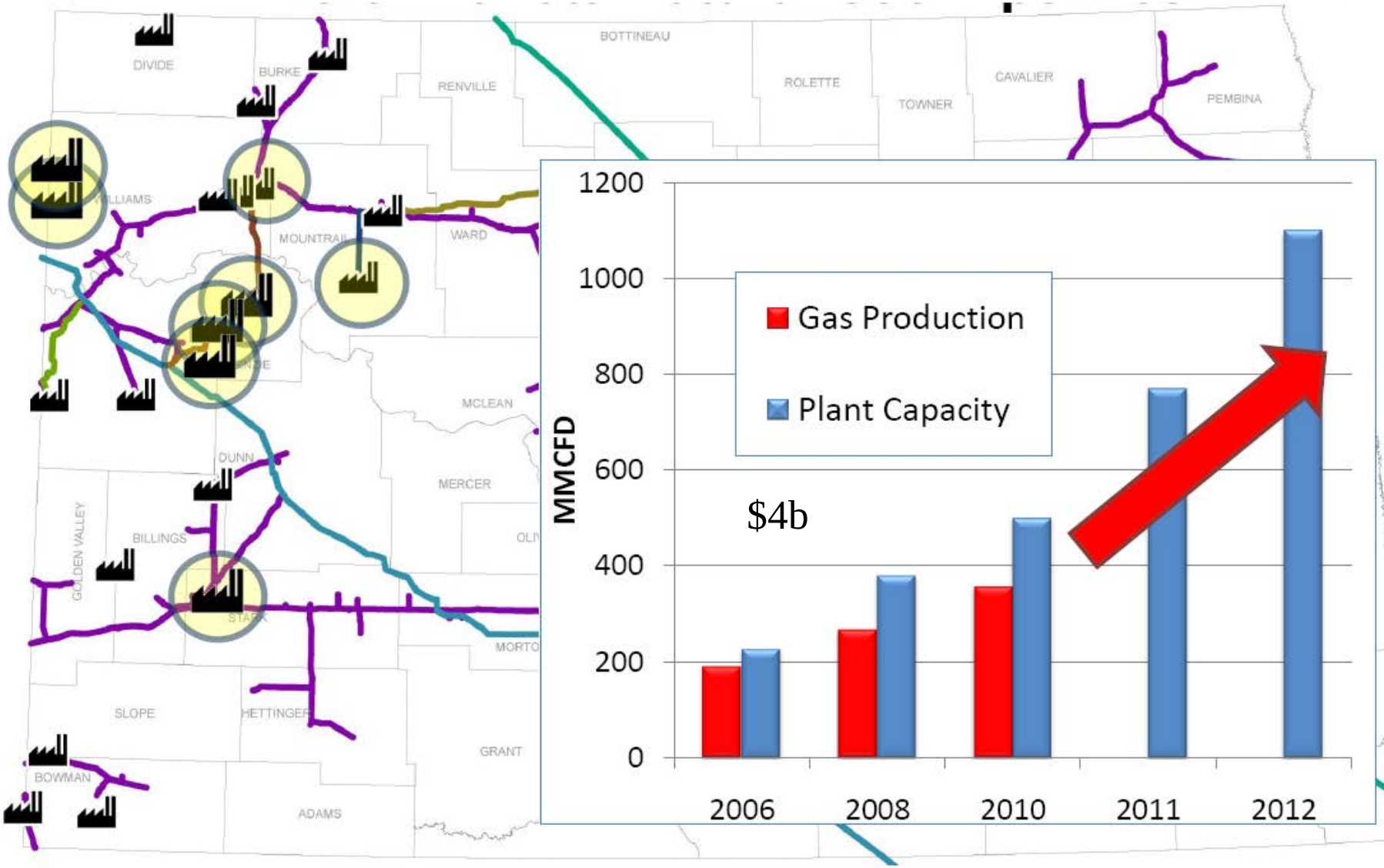
North Dakota Crude Gathering



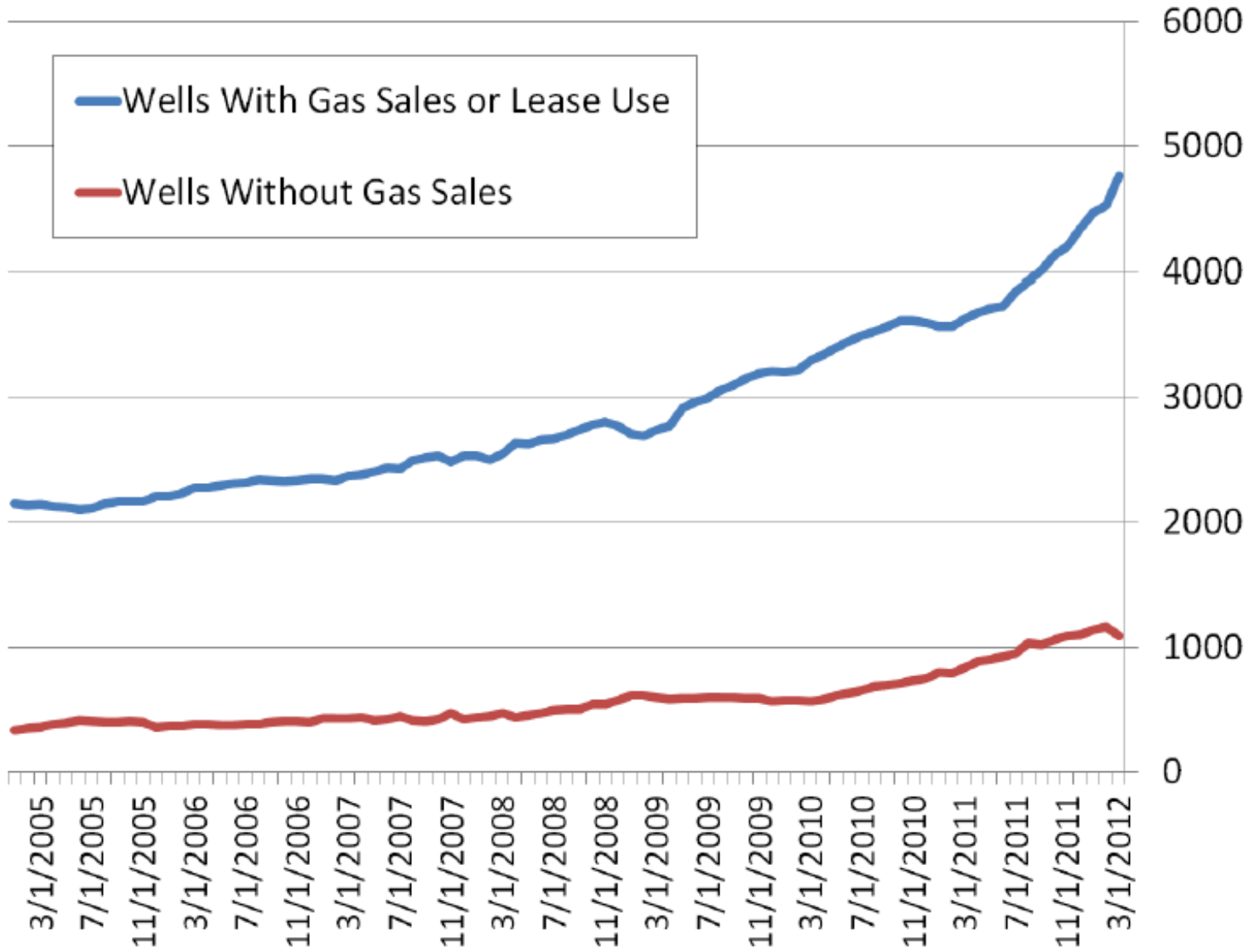
North Dakota Monthly Gas Flared



New or Expanding Gas Plants

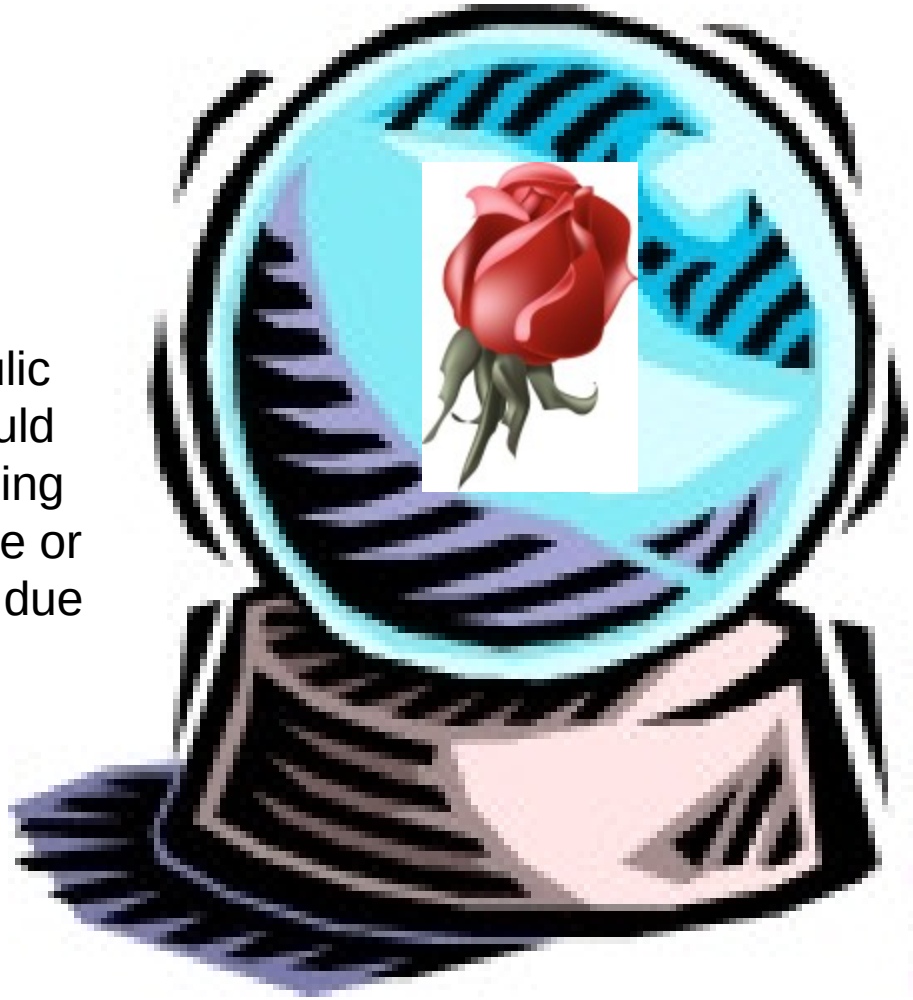


ND Gas Gathering Statistics



Draft BLM Hydraulic Fracturing rule could double federal drilling permit approval time or worse. Comments due 7/10/12

Current administration budget contains tax changes that could reduce drilling capital 35-50%



The future looks promising for sustained Bakken/Three Forks development

Draft EPA guidance on diesel fuel in hydraulic fracturing could triple drilling permit approval time or worse. Comments due 7/9/12

World and U.S. economies continue to struggle. If China joins the downward spiral oil price could fall enough to make some areas uneconomic