

**4th Annual
ND Reclamation Conference**

**Target Bakken
Today and for Tomorrow**



Presented by: Kathleen Neset

Bakken Basics

- Geology
 - Horizontal Drilling
 - Fracture Stimulation
-
- What's New
-
- US Lifts Oil Export Ban
-
- Reclamation Review

US Shale Fields – oil and gas



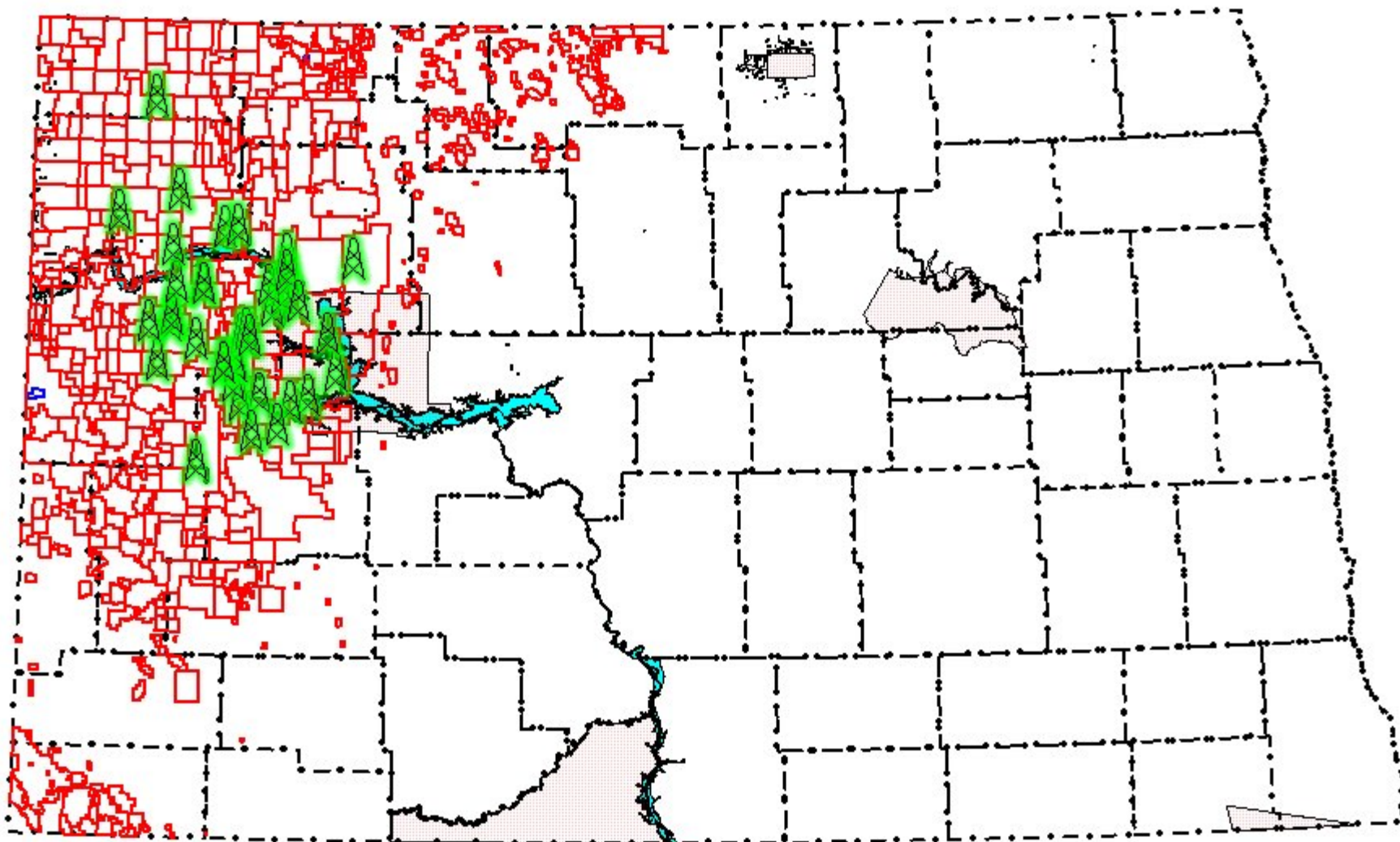
Largest oil play in lower 48 states



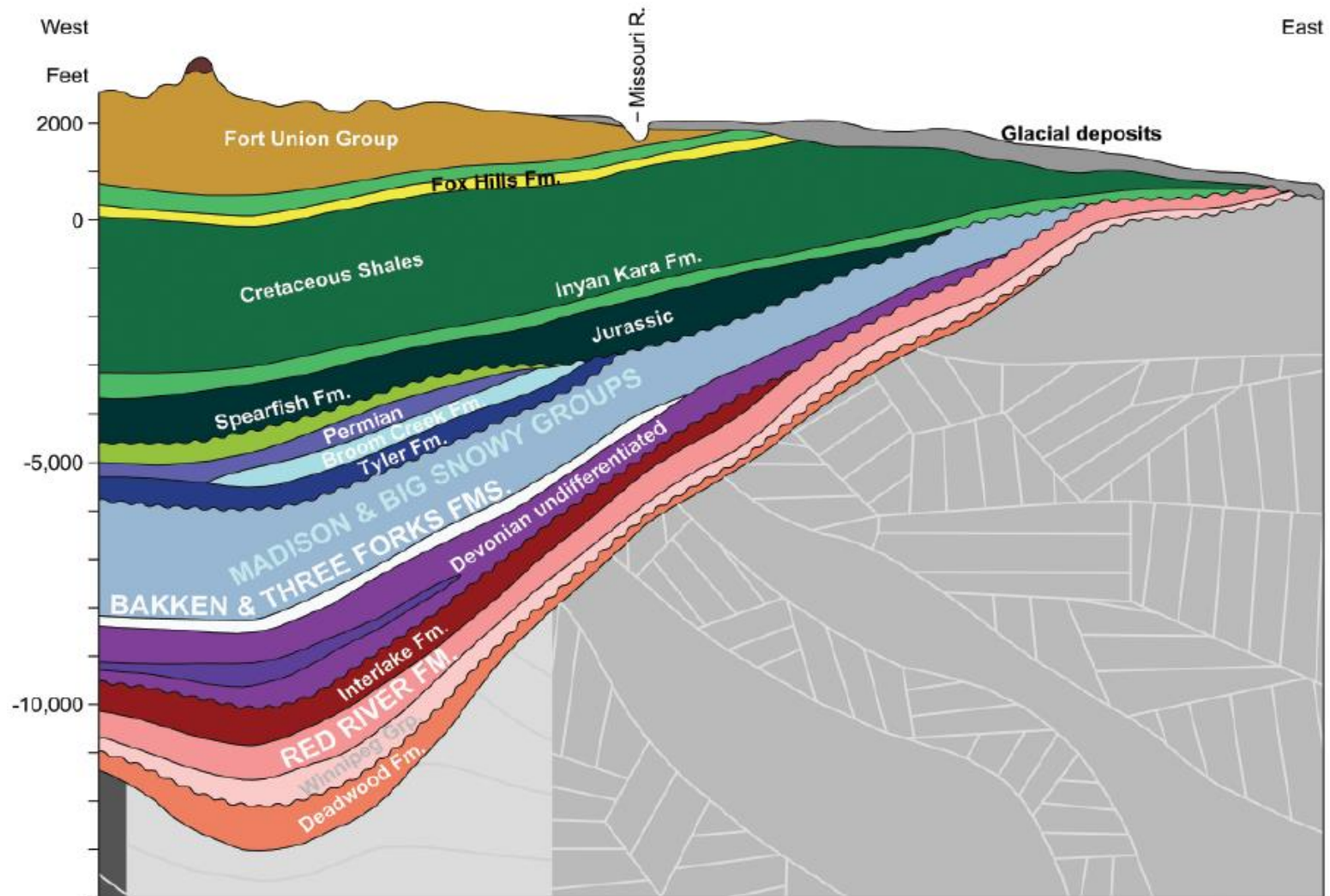
- Williston Basin
- Bakken Formation

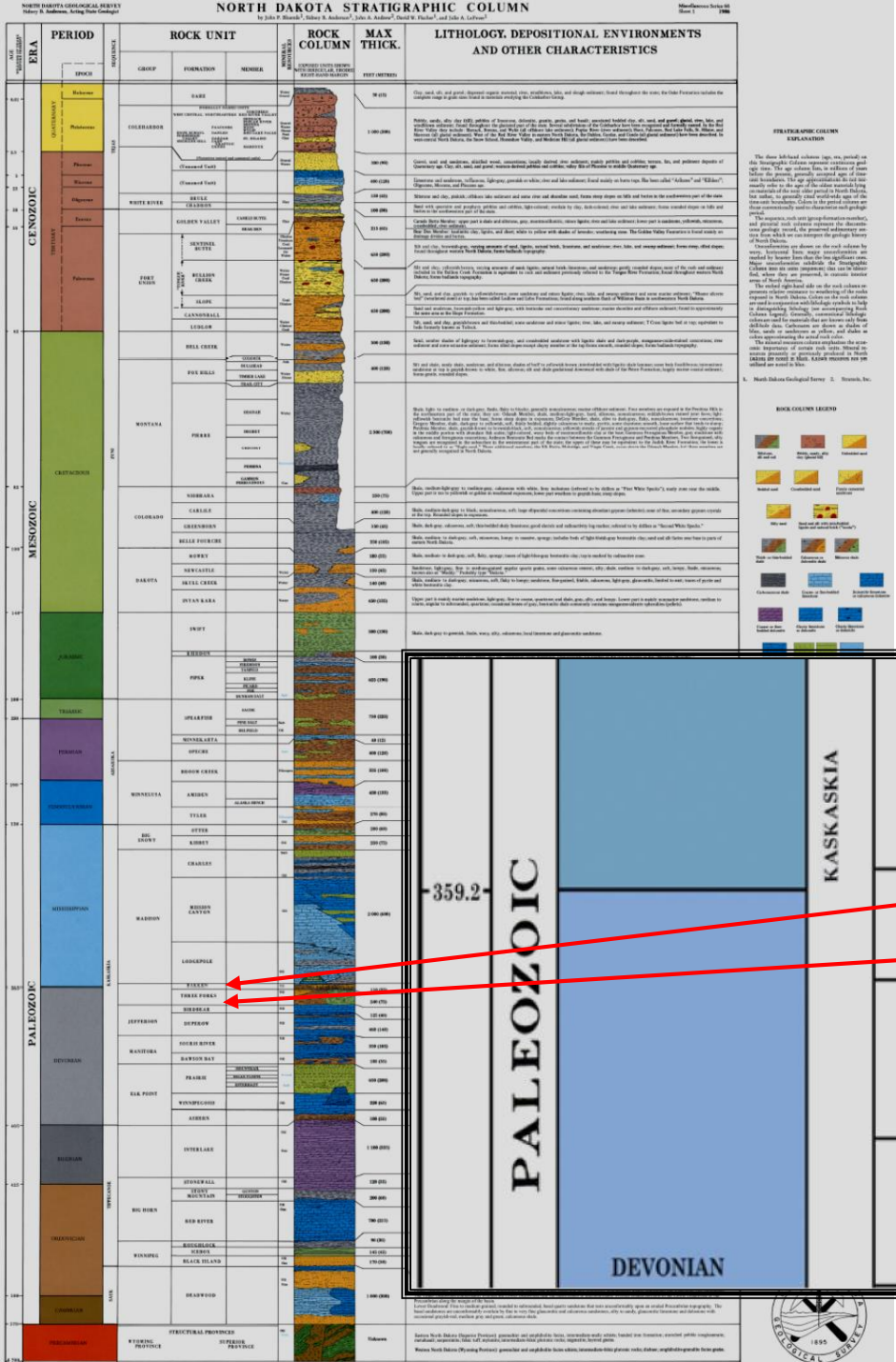
Active Drilling Rigs in ND

Courtesy of the NDIC



Williston Basin Deposition - ND





North Dakota Stratigraphic Column

Bakken Formation

~360 Million Years Old

Paleozoic Era

Mississippian/Devonian Period

~110' thick

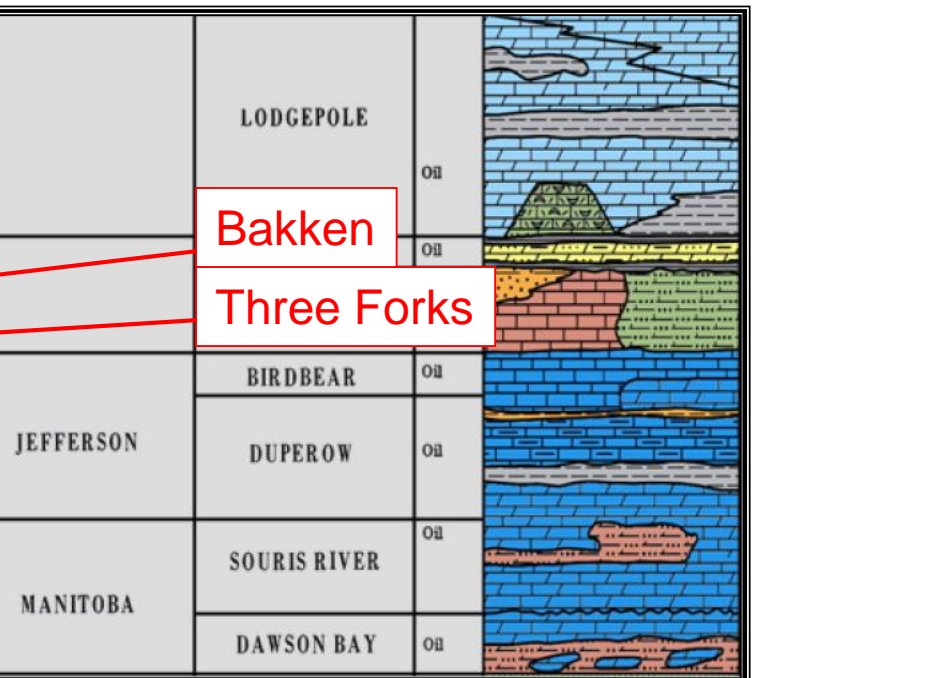
Three Forks/Sanish

~370 Million Years Old

Paleozoic Era

Devonian Period

~240' thick



Stratigraphy

Mississippian	Lodgepole Formation	“False Bakken” Pelmatozoan limestone
	Bakken Formation	upper
middle		
lower		
Devonian	Three Forks Formation	“Sanish”

Bakken 9030 Shale



9170 Middle Bakken Siltstone



Mud Motors

Drillpipe

**Non-magnetic
Drill Collar**

Bent Sub

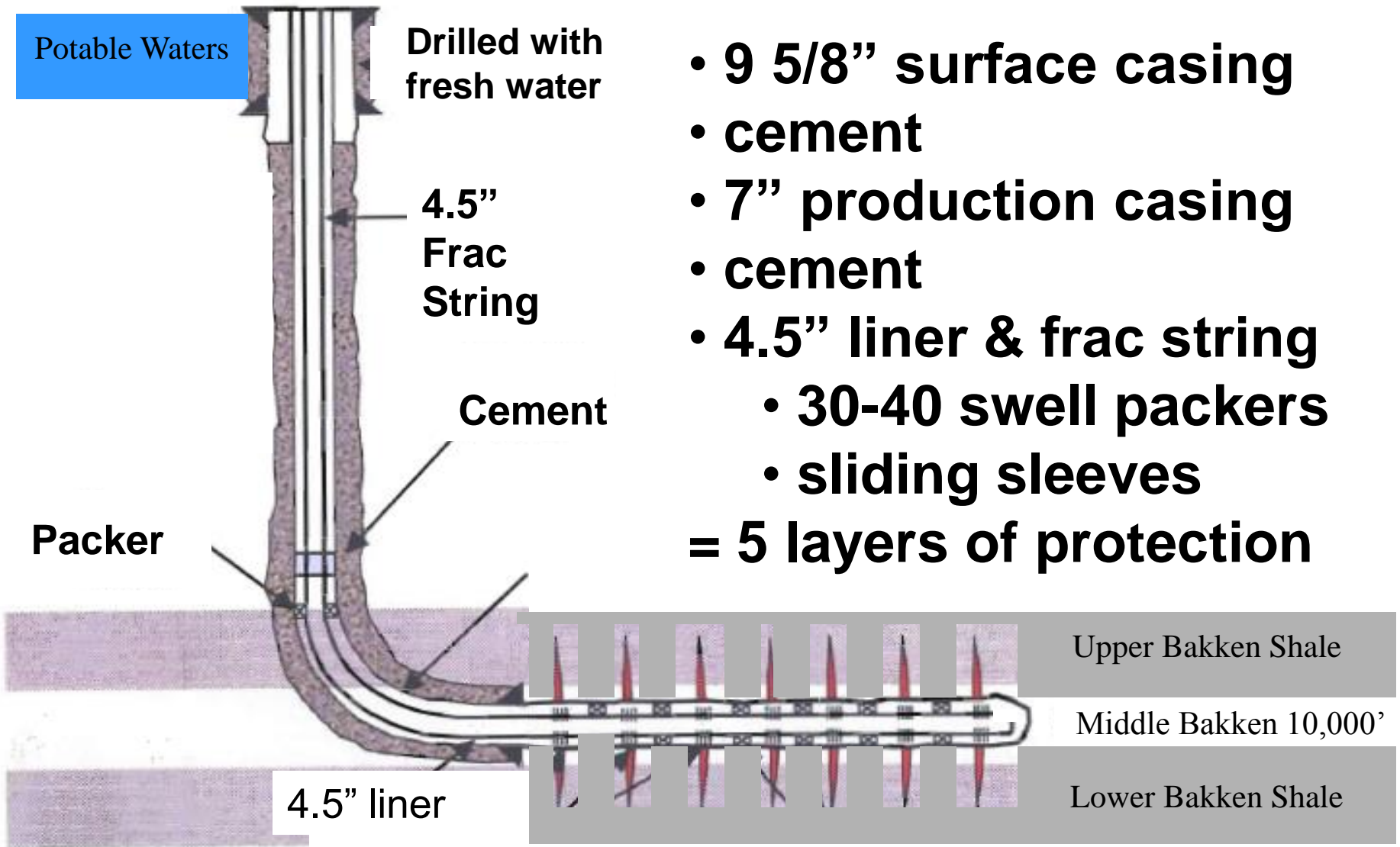
Mud Motor

**Rotating
Sub**





TYPICAL HORIZONTAL OIL WELL



Life Without



??

- ▶ Commonly thought of uses of Crude Oil: Transportation – heating – plastics – synthetic fibers – asphalt – lubricants – rubber (average tire is made of 8 gallons of crude oil).
- ▶ Little Thought of Uses of Crude Oil: adhesives, cosmetics, food (fertilizers, chewing gum, preservatives, flavorings) – medicines (benzenes to make pain medications).
- ▶ Alternative Sources of Energy: wind – solar – nuclear.
- ▶ All of the above energy – includes petroleum.

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Fuel



The most obvious example on this list, but justifiably number one: the combined sources of gasoline, diesel, and jet fuel account for around 72% of petroleum consumption. The petroleum refining process is complex, and these types of fuel may chemically differ by only the slightest degree. Despite this, different types of fuel can vary greatly in their physical properties and attributes, although they are essentially used for the same purposes.



lubricants

influence your daily life whether you realize it or not: they're found in a vast array of everyday items. A lubricant is simply a substance that reduces friction between moving surfaces, and its ability to do so is known as lubricity. Perhaps the most common lubricant is motor oil, which is used to protect internal combustion engines. Other common lubricants include grease and paraffin wax, the latter of which is found in candles. Since some lubricants can contain as much as 90% oil, they are almost a pure petroleum byproduct.



Nearly all plastics are made from petrochemicals – and plastic, needless to say, is absolutely everywhere. If you look around, you'll find that a great deal of your things are made, at least partially, with plastic. From your iPod to that bottle of Mountain Dew you're drinking, plastics form a bigger part of our daily lives than our own mother: annually, roughly 4-5% of the total U.S. petroleum consumption is dedicated to the manufacture of plastic products.



No matter how organic you like your food, it's hard to find food that hasn't been touched by the oil industry to some degree. Petroleum byproducts are used in many synthetic fertilizers and pesticides. The use of petrochemicals is also widespread in food preservatives, flavorings, and colorings. Oil helps the agriculture industry produce more food, cultivate it faster, and keep it fresh for longer. It also helps to pollute the atmosphere. Petroleum-based polymers are incidentally also found in your chewing gum – a difficult truth to swallow if I've ever tasted one.



Petroleum based fibers are durable, readily available, and easy to maintain. Combined with the fact that they are generally cheaper than natural fabrics, synthetic fibers are becoming increasingly popular in the world of fashion and home goods. Although cotton may be the most common fiber in your underwear drawer, your sock drawer might tell a different story.

In addition to most of the clothes that don't come in direct contact with your "region," there are plenty of other fabrics that use synthetic fibers (think curtains, couches, carpet, etc.). Some of the most common types are rayon, nylon, spandex, acrylic, and polyester. So the next time you put on a piece of clothing, bear in mind that you're practically wearing the black stuff.



Asphalt, also known as bitumen, is a semi-solid form of petroleum and can be either natural or refined. Its main purpose is to act as the glue between various minerals, creating a material known as asphalt concrete. There over 11 million miles of paved road in the world, which equates to a fair amount of oil. The sticky substance is sometimes confused with tar, which is a similar black material produced during the distillation of coal.



If you look at the list of ingredients on a cleaning product, you'll find a list of things you've never heard of and probably can't pronounce. With components that can kill you or just make your table shine, the average cleaning solution is a mixture of some seriously synthetic chemical substances (their labels contain poison warnings for a reason). Many of these substances are petrochemicals – like glycerin, for example, which is commonly found in laundry and dish detergents.

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Medicines



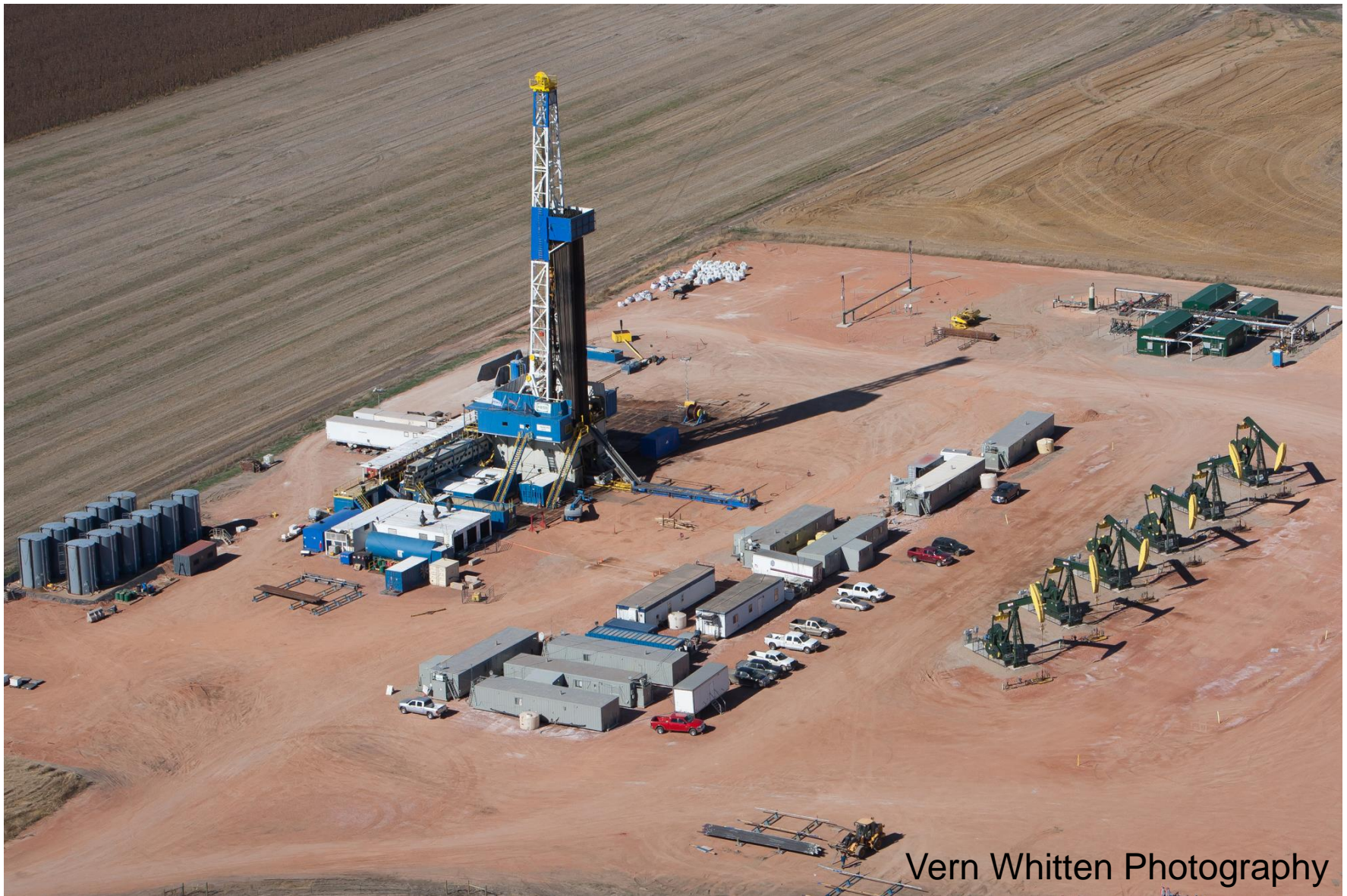
Many of today's medications are derived from benzene, and benzene in turn is derived from petroleum. Almost all over-the-counter pain medications, such as aspirin, are based on this petrochemical. Although it seems counterintuitive, petroleum based products are used extensively in homeopathy. Some have related the rise in petroleum engineering to the rise of modern medicine.



Due to its thermal stability and strength, synthetic rubber is sometimes preferred over latex as the chosen material in the world of manufacturing. The substance is commonly found in sporting goods, shoes, and tires. The average tire is made using around 8 gallons of oil. Synthetic rubber is also commonly used in wire and cable insulation. The main factor inhibiting its use is the high cost compared to natural rubber.



Think of the new cream you just purchased – which you're about to rub all over your face – as the decayed mass of millions of dead organisms. Since petroleum-based products can make up to 80% of a cosmetic's ingredients, that's essentially what you're paying for. The most common components are oils, waxes, perfumes, dyes, and other petrochemicals (chemical products derived from petroleum). Petroleum byproducts are also found in your shampoos, conditioners, and hair dyes.



Vern Whitten Photography

Near Ross, ND

6 wells producing - drilling 7-12 - and 11-18 coming soon

Updates

- Oil Export Ban lifted Dec 2015
 - Ban was put in place in 1973 following Arab oil embargo
 - Crude oil export was banned – refined oil was not allowed to be exported
 - US Oil production is up 90% since 2008 – gas prices below \$2.00
 - US exported 400,000 bbls oil to Canada during ban – one of only exemptions
 - Supply and demand – supply of oil on world market is high
 - Biggest market for export may be Asian – in addition of European

Updates

- DUCS – drilled but uncompleted wells.
- Enhanced oil recovery
 - CO2 injection – Remove 90% of hydrocarbons from Bakken reservoir rock and 60% from Bakken shales.
 - Dominated by fracture flow – not rock matrix.
 - Continued study needed – lab to the field.
 - Phase I and Phase II
- What will change the outlook for crude oil:
 - Supply and Demand
 - Geo-political situation
 - Crude oil export approved – long term benefit to industry.

A landscape photograph showing a river winding through a vibrant green field. In the background, there are mountains under a sky filled with large, white and grey clouds. The text is overlaid on the upper portion of the image.

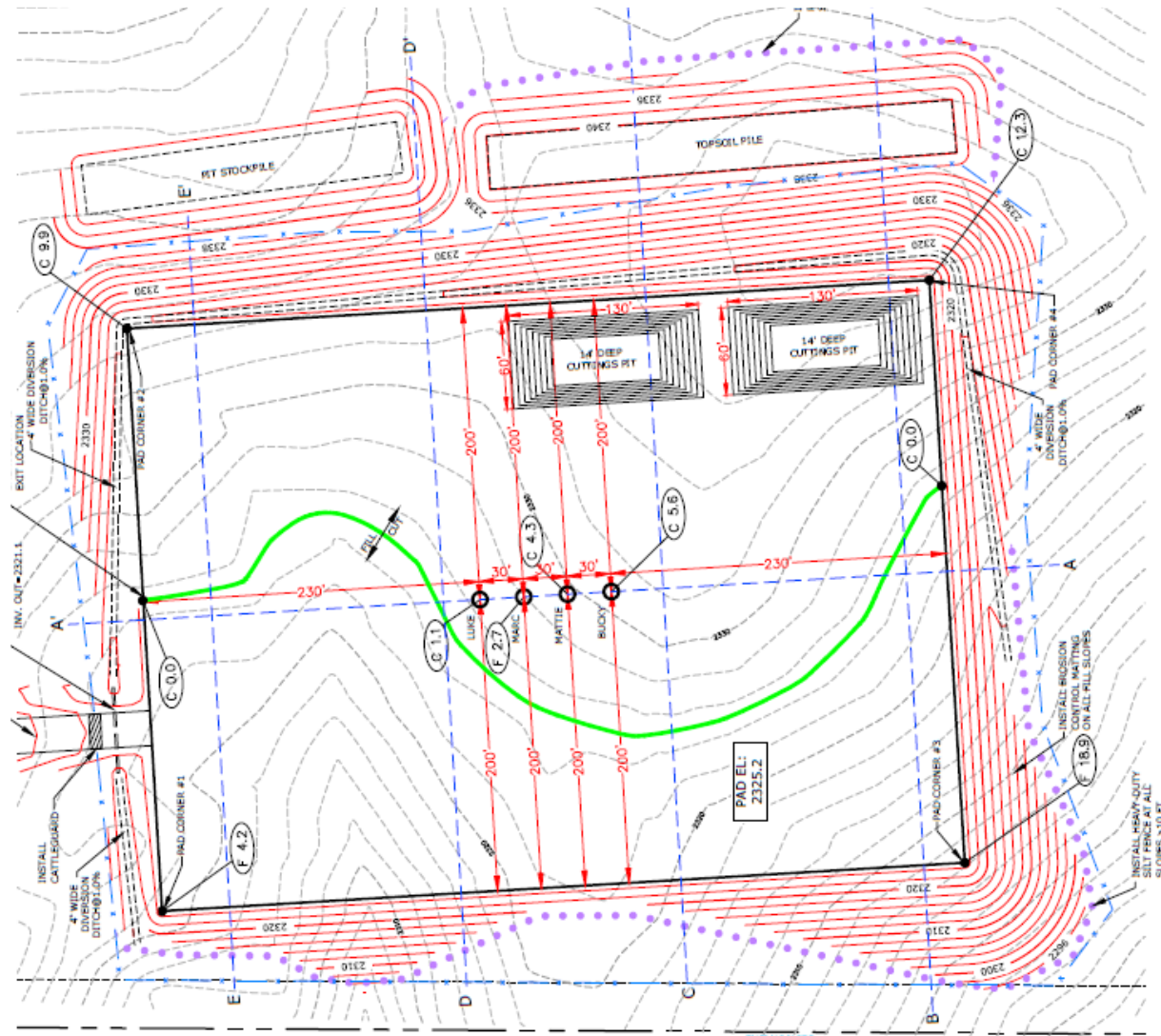
**“We do not inherit the Earth from our Ancestors,
we borrow it from our Children.”**

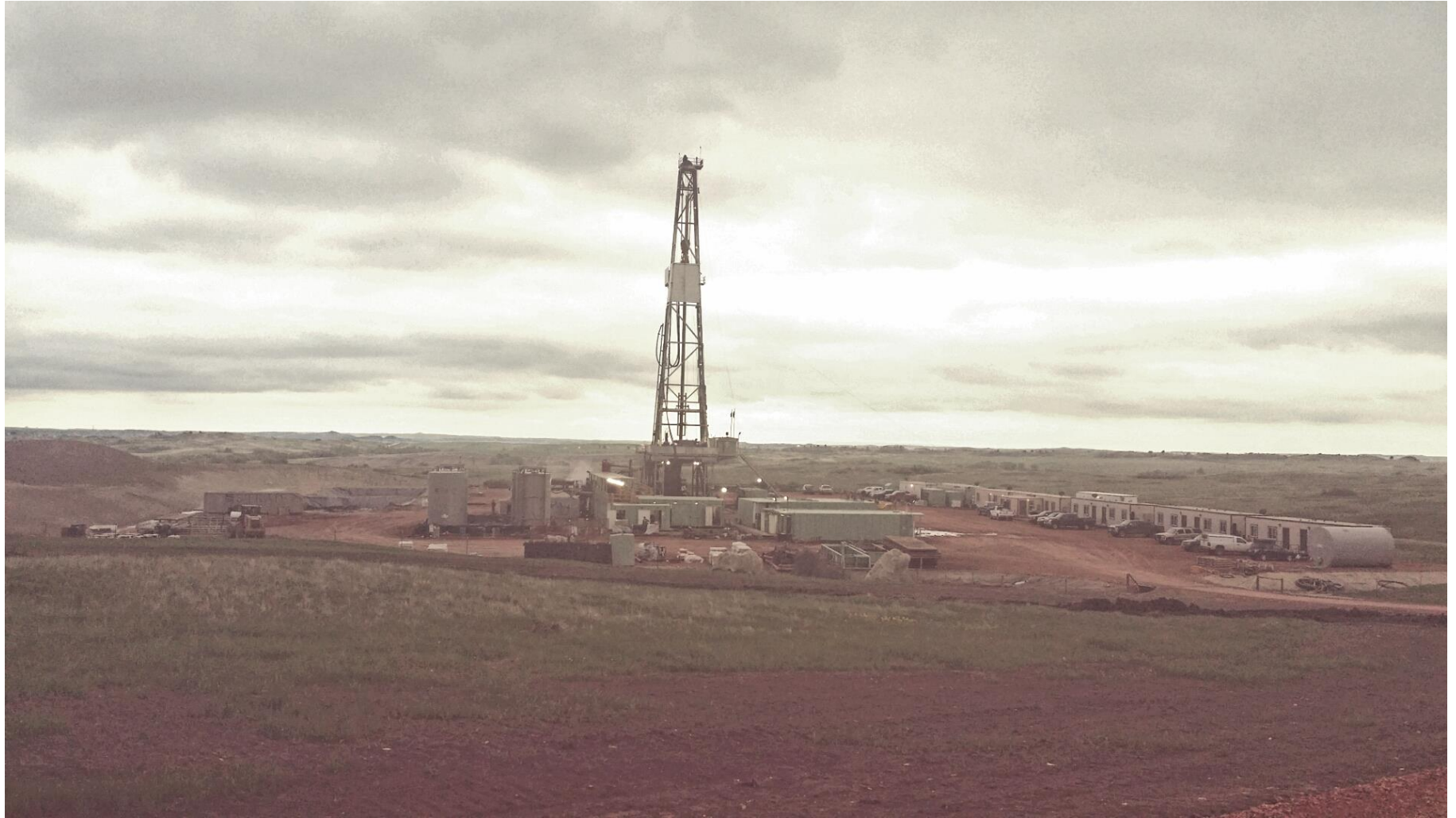
Native Proverb

Bristol Bay Native Corporation

Reclamation plans begin prior to construction.

Gather baseline data before completing easement documents.
Take pictures.
Take soil samples.
Describe the plant community. Document current drainage patterns.





Efficient use of acreage= less impact



miles of gravel
road needed
reduced 10 fold

miles of pipeline
needed reduced
10 fold

Energy Corridors

Image USDA Farm Service Agency

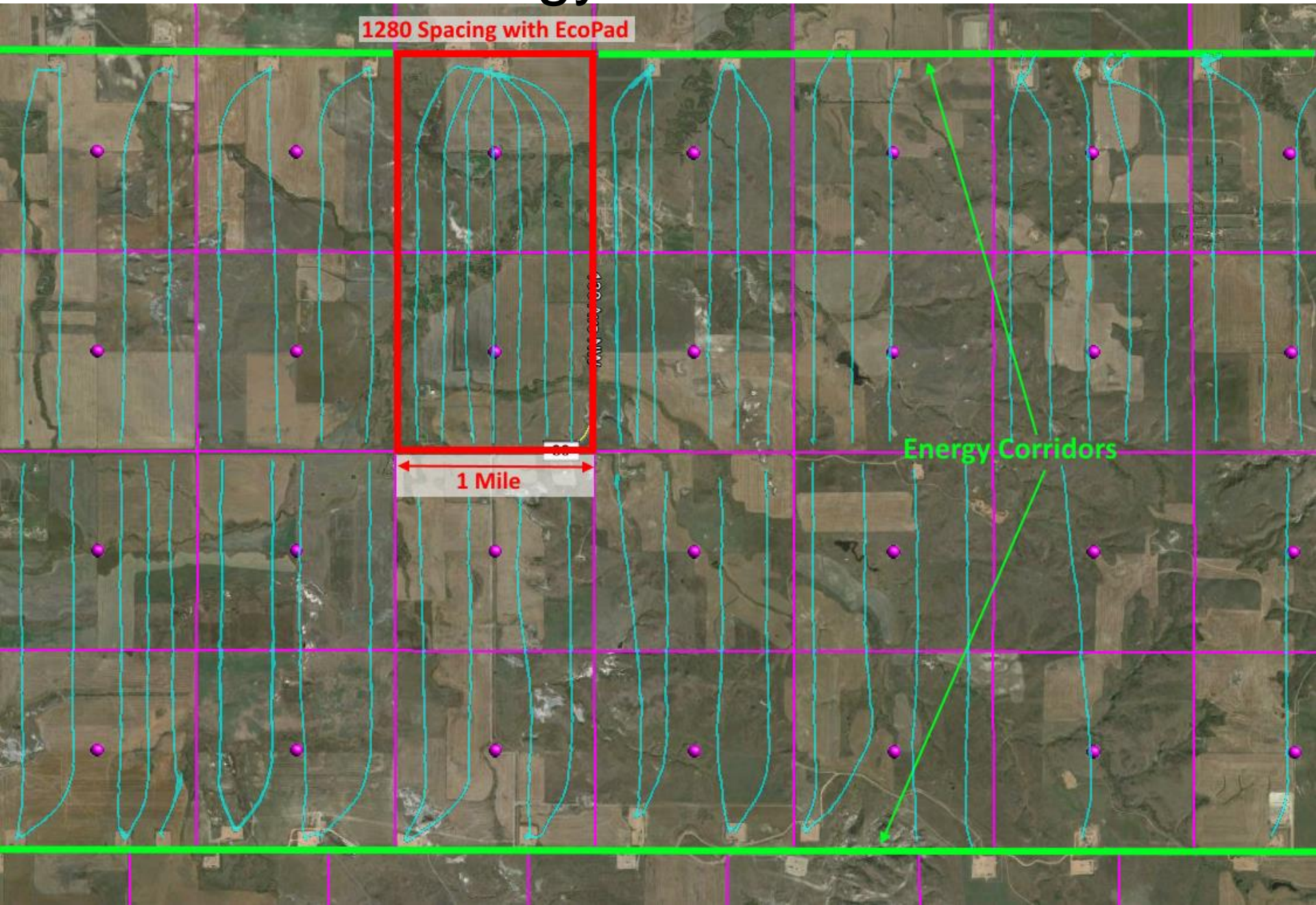
Google earth

Imagery Date: 12/31/2009

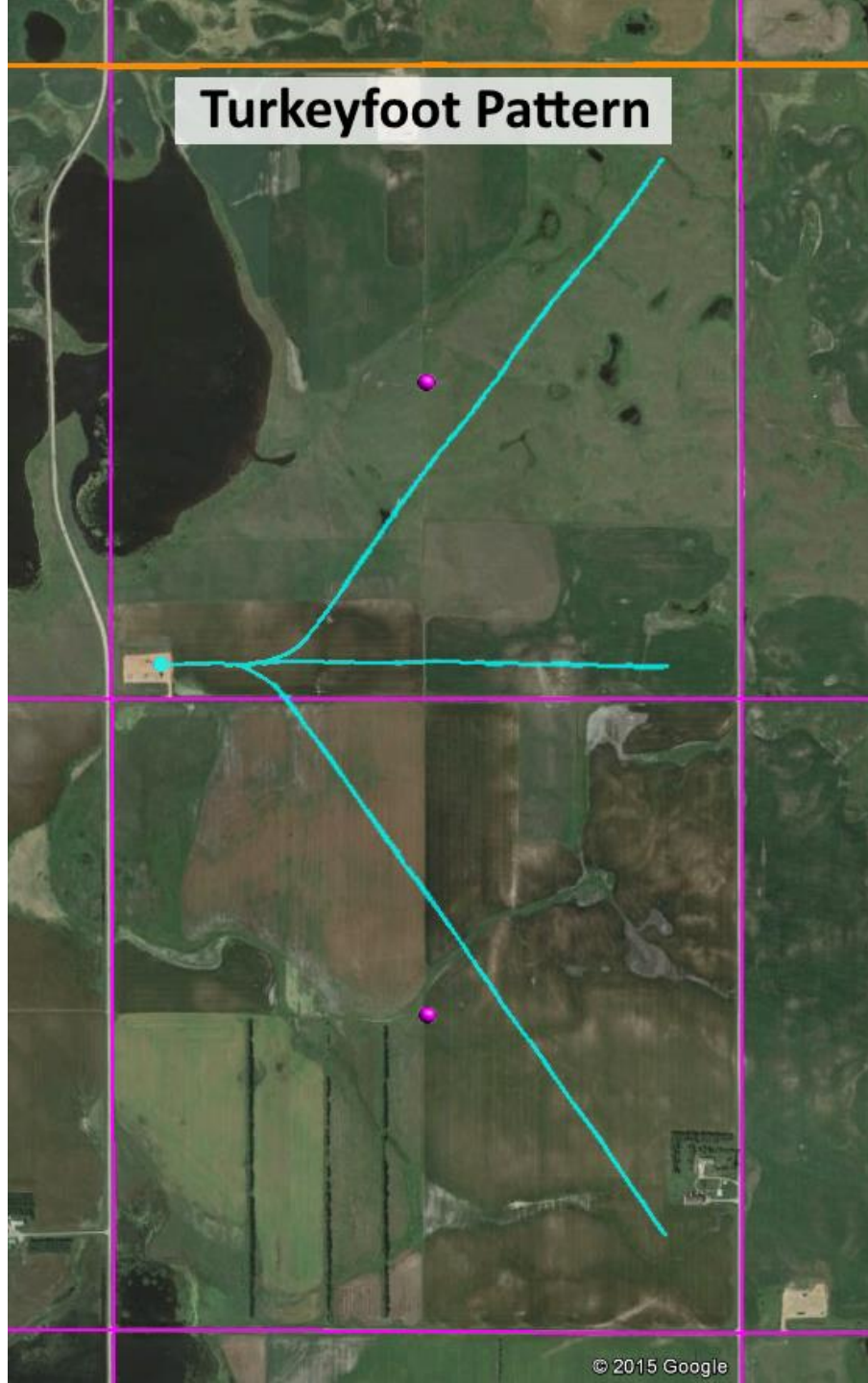
47° 54' 08.12" N 102° 34' 47.48" W elev 1962 ft

Eye alt 10.51 mi

Energy Corridor



Turkeyfoot Pattern



Reclamation Review

- Bonding is required for oil and gas lease operations.
- Footprint of well locations has gotten smaller – from about 10 acres to 4 to 5 acres per well pad.
- If an operator does not satisfactorily reclaim – bond is forfeited.
- Orphan wellsite reclamation fund.

Regulation Entities

- Bureau of Land Management and US Forest Service for Federal Lands
- ND Industrial Commission and Department of Mineral Resources for State land.
- ND Department of Health for private land.

Intermediate or interim reclamation of a wellsite in McKenzie Co.



photo by
Sarah
Christianson

Interim reclamation of all disturbed areas not needed for active production operations is a best management practice that also reduces costs and increases the effectiveness of final reclamation.





Before and after pipeline right-of-way reclamation.

From: Visual Resource Management, Final Reclamation, Part 5 on the BLM's BMP website



Photos courtesy
TransCanada Keystone XL



www.insideenergy.org
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A Salt Water Spill is the most difficult reclamation to successful



www.fuelix.com



www.fuelix.com



www.kxnews.com



Approximately 20,600
barrel oil spill



North Dakota Mediation Service

- Established in 1984 as the North Dakota Agricultural Mediation Service
- Original intent was to help financially distressed farmers and ranchers through assistance with credit and financial matters and resolving disputes.
- 2011 Legislature expanded the agency's responsibilities to include dispute resolution of property issues related to energy development and landowner disputes with the ND Game and Fish.
- The North Dakota Department of Agriculture's Pipeline Restoration and Reclamation Oversight program connects landowners and tenants experiencing pipeline reclamation and restoration issues with an independent ombudsman.

For more
information:
www.nd.gov/ndda

ND Department of Agriculture

- Pipeline Restoration and Reclamation Oversight Program
- The North Dakota Department of Agriculture's pipeline restoration and reclamation oversight program connects landowners and tenants experiencing pipeline reclamation and restoration issues with an independent ombudsman.
- After notification of the issue, the ombudsman will conduct an on-site examination with the landowner or tenant to assess the situation. The ombudsman will then prepare a written report, contact the pipeline company detailing the findings and work with all parties to resolve the issues in a satisfactory and timely manner.
- The program also provides educational outreach to help landowners/tenants consider things such as pipeline pathways, type of pipeline installation, soil impacts, type of vegetation being reestablished, timelines and other issues before signing agreements.

ND Dept. of Ag
ND Mediation
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4752