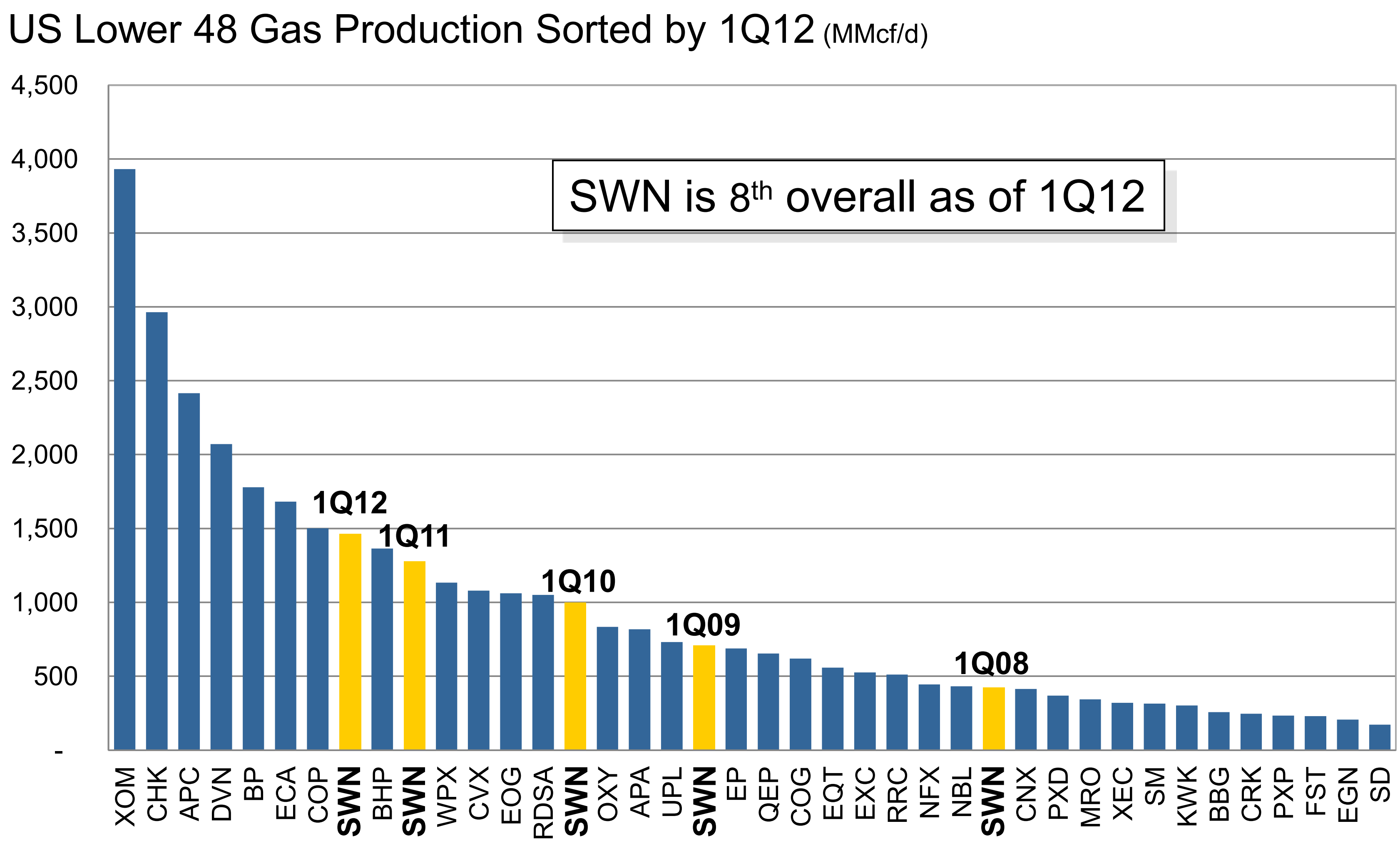
Natural Gas – A National Treasure

NECPUC Symposium

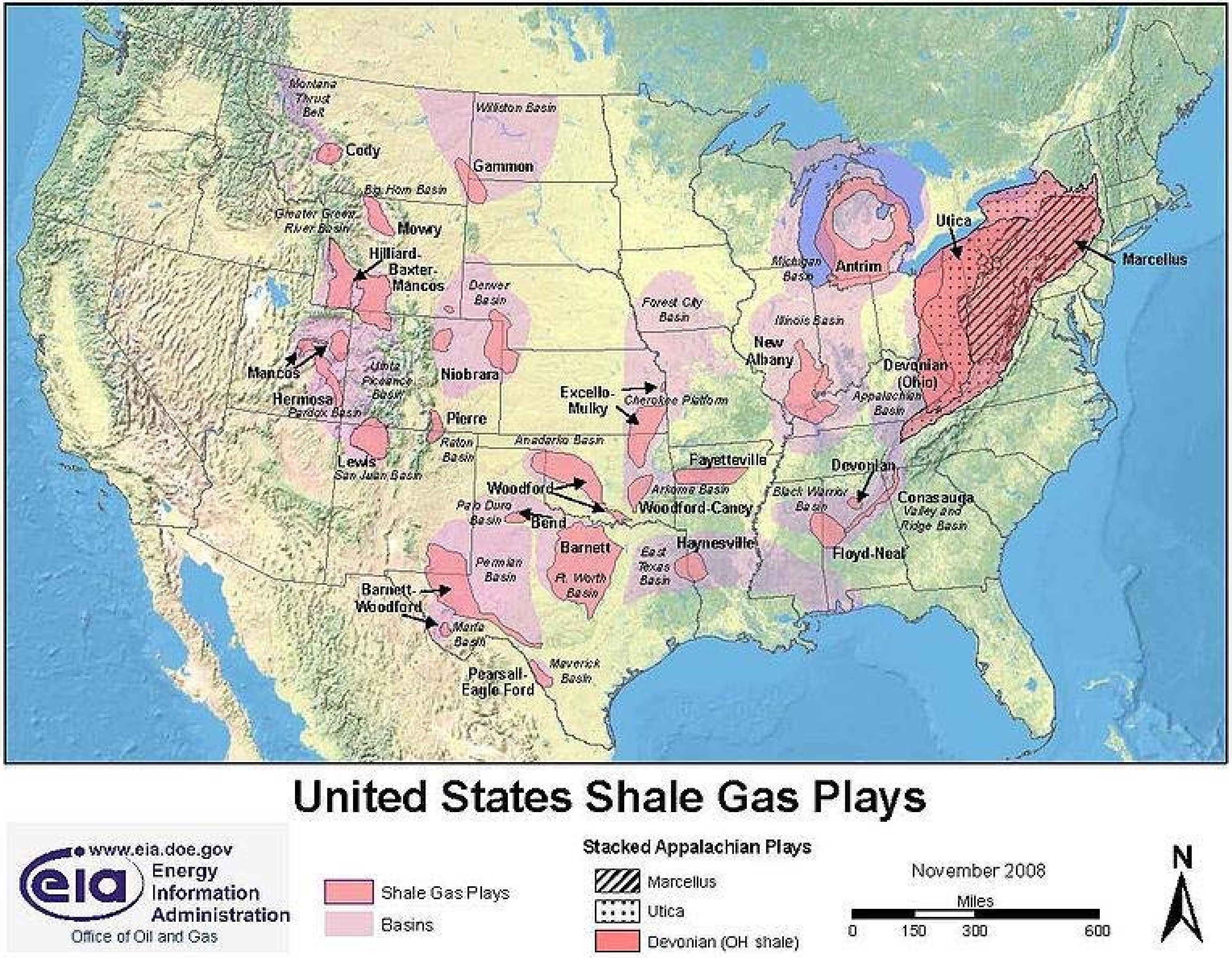
5/21/2012

Who is Southwestern Energy?

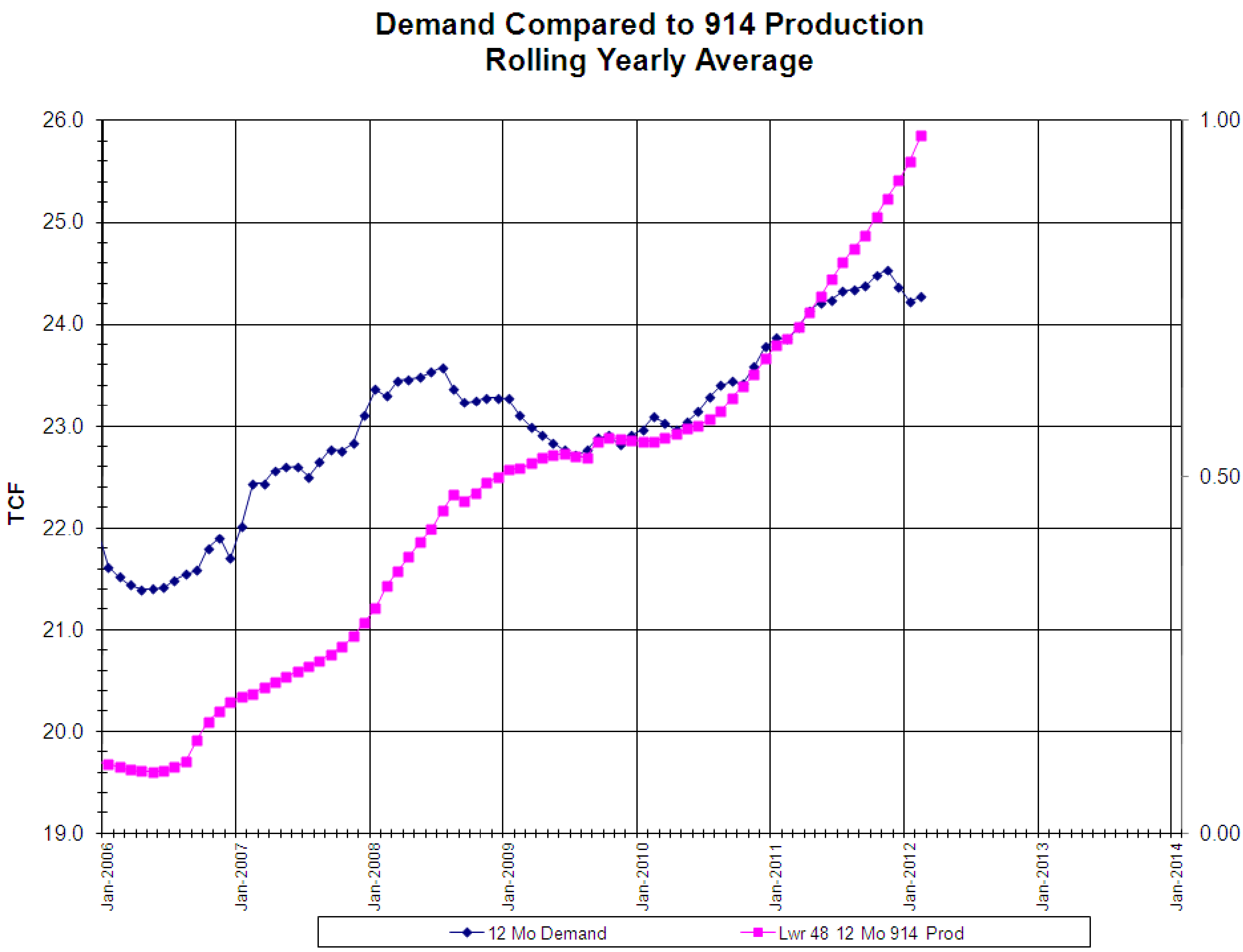


Source: Public company reports, Southwestern Energy

United States Shale Gas Plays



The Current Gas Issue



Major US Plays

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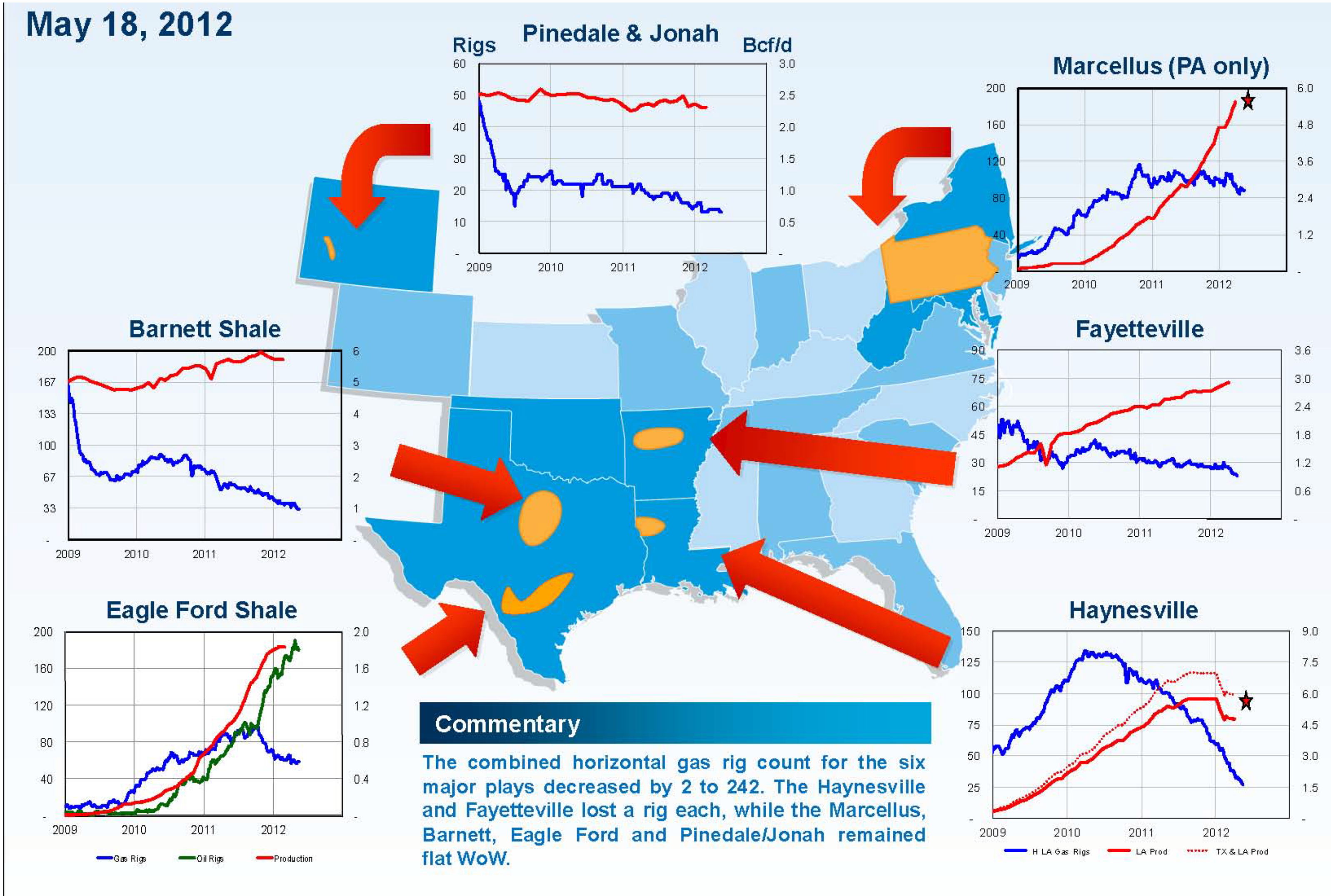
May 18, 2012



Commentary

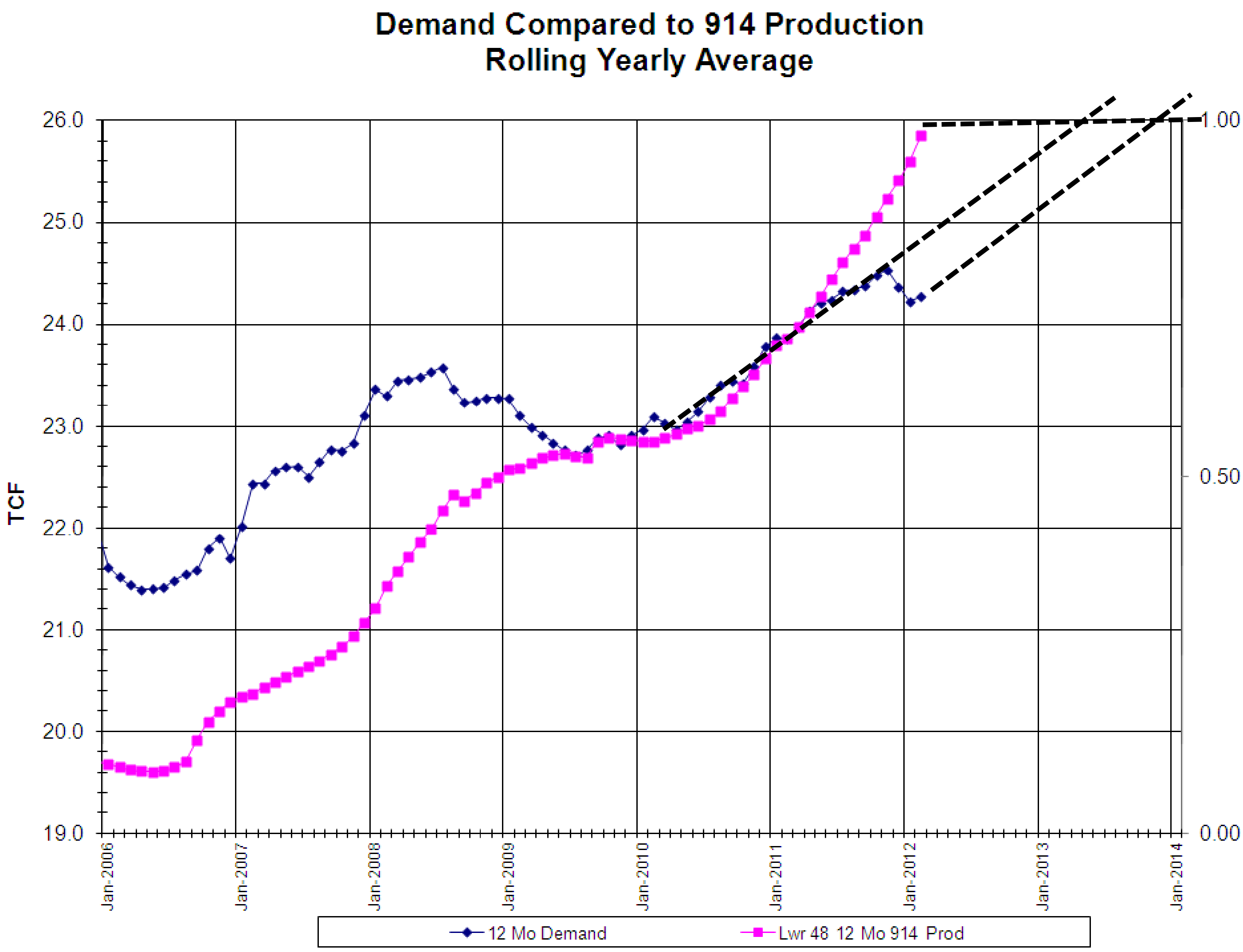
The combined horizontal gas rig count for the six major plays decreased by 2 to 242. The Haynesville and Fayetteville lost a rig each, while the Marcellus, Barnett, Eagle Ford and Pinedale/Jonah remained flat WoW.

(Based on data from Baker Hughes, Smith Bits, PIRA, Pi/Dwights & HPDI)

★ *PIRA Pipeline Flow Data: Haynesville includes both Texas and Louisiana*

$\frac{R^2}{A} \rightarrow V^+$®

Supply Demand Balance



National Treasure Example – Fayetteville Shale

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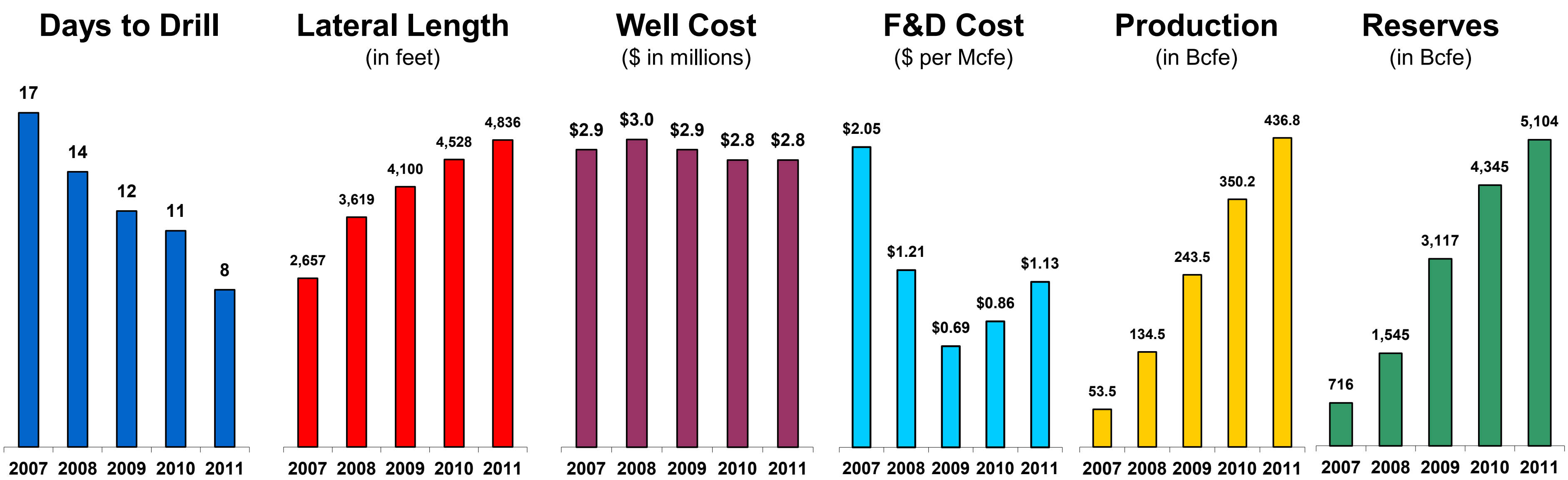
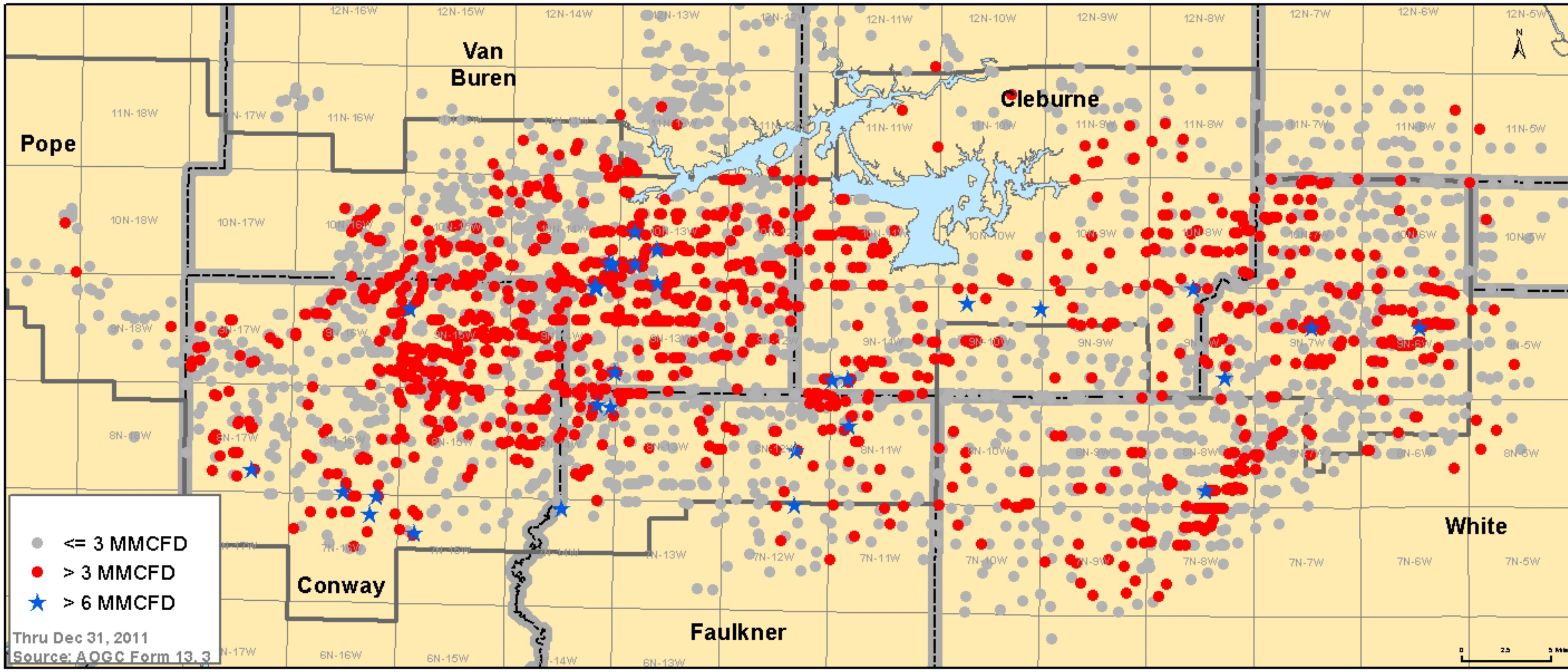


- **SWN currently producing 2 BCF per day gross**
- **SWN reached 2 TCF – 7.5 years from 1st production in early May 2012**

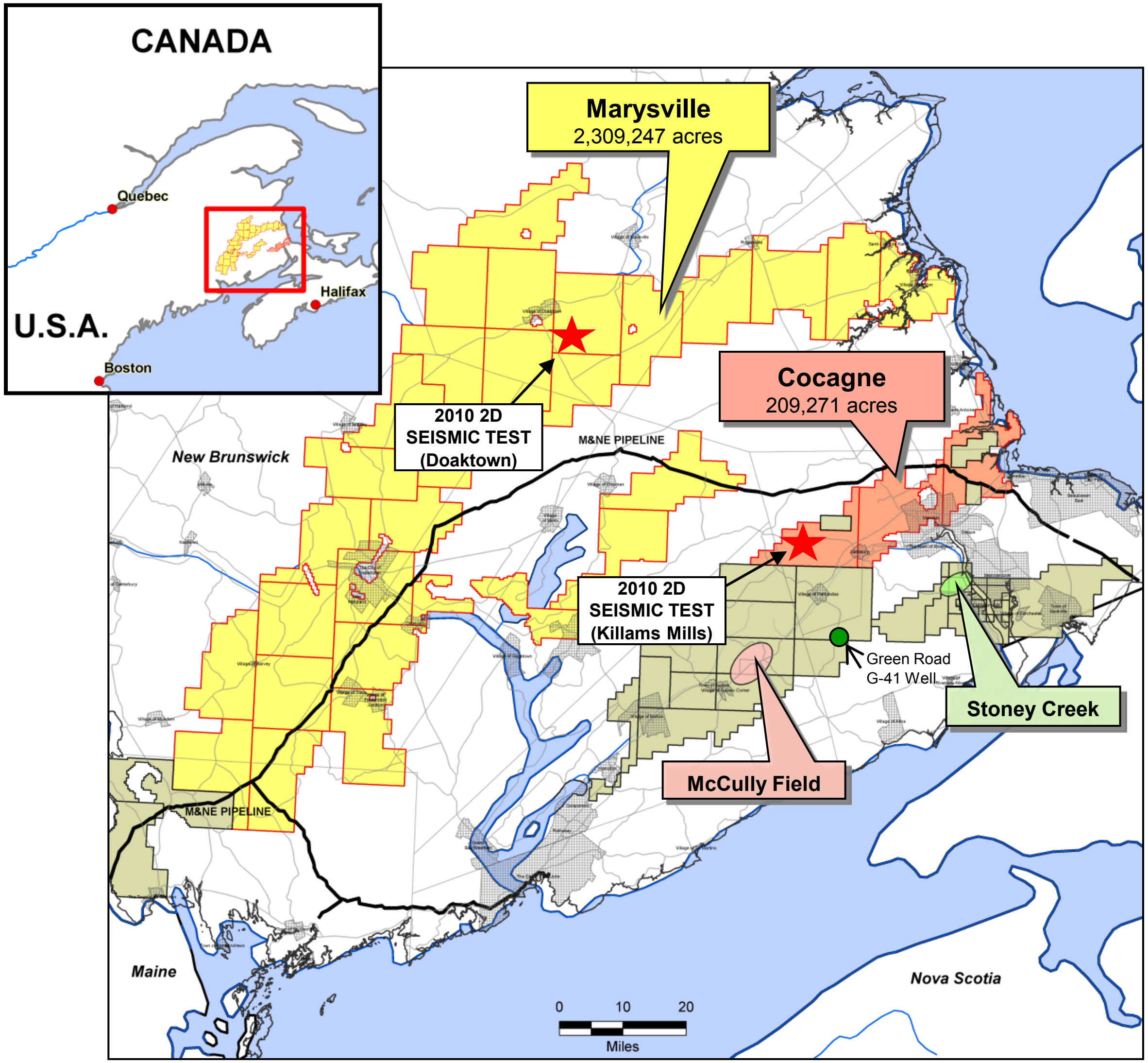
Fayetteville Shale – Many Years of Drilling



- SWN holds approx. 925,000 net acres in the Fayetteville Shale play (approx 1,400 sq. miles).
- Mississippian-age shale, geological equivalent of the Barnett Shale in north Texas.
- SWN discovered the Fayetteville Shale and has first mover advantage – average acreage cost of $253 per acre with a 15% royalty and average working interest of 74%.
- We plan to drill approximately 425-435 operated wells in 2012.

Notes: Rates are AOGC Form 13 and Form 3 test rates.

New Brunswick, Canada Project



- SWN currently holds exploration licenses to over 2.5 million acres within the Maritimes Basin
- Principal targets are the conventional and unconventional sandstone and shale reservoirs of the Horton Group (Frederick Brook Shale)
- Oil and gas production from fields along southern flank:
  - McCully – reserves 190 bcfg
  - Stoney Creek – cum 800,000 bo, 30 bcfg
- 3-year initial exploration license to complete work program
  - $47MM total work commitment with options for multiple 5-year extension leases
  - $14.2MM invested in 2011; $13.2MM investment planned for 2012

What Makes a Project Unconventional?

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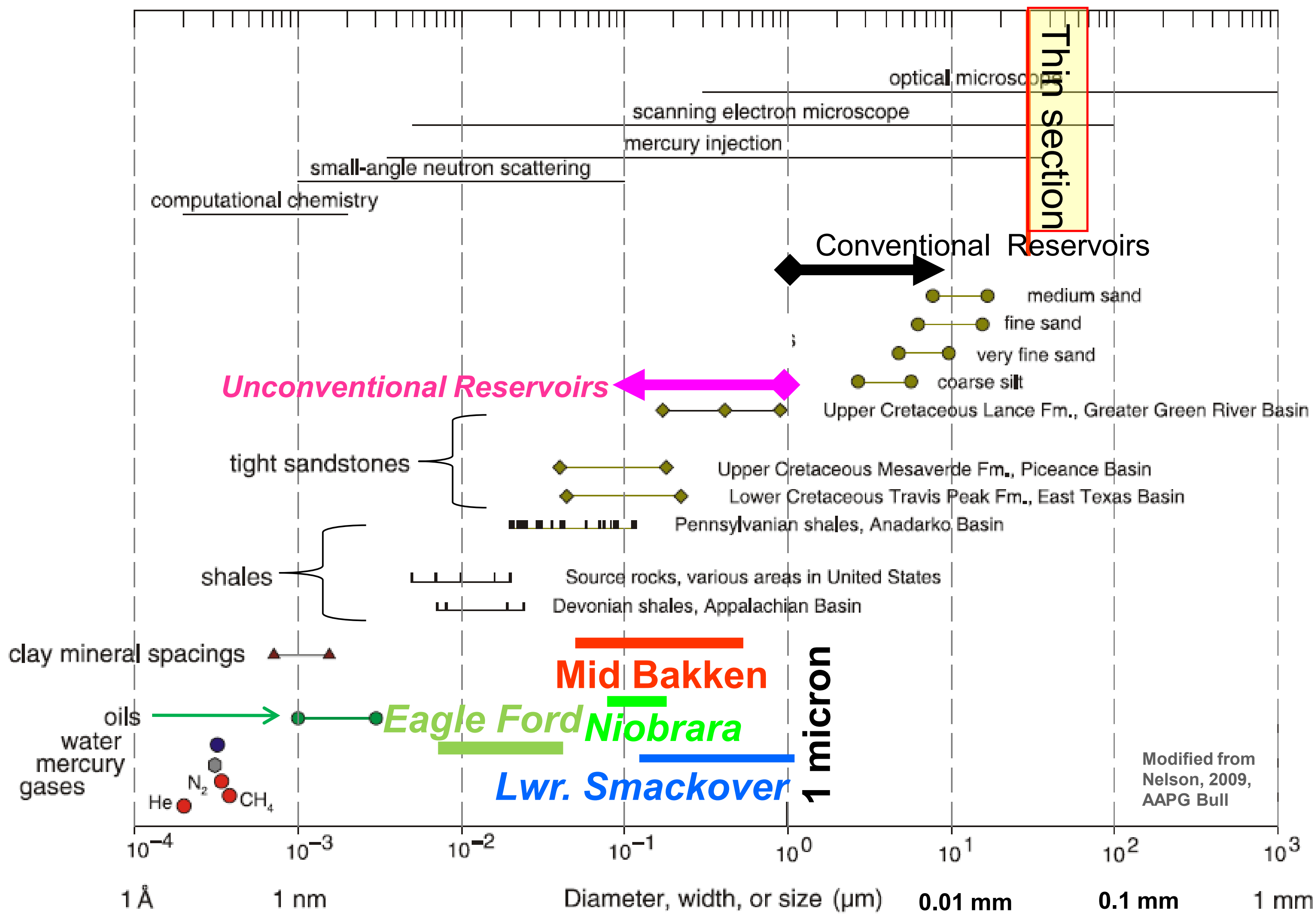

Eclipse - AR-LA

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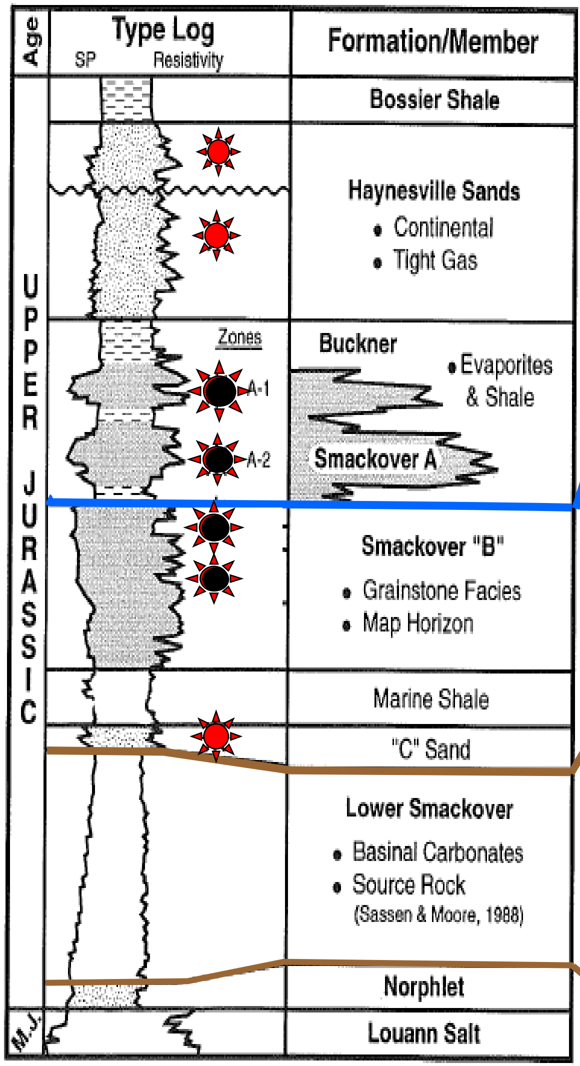
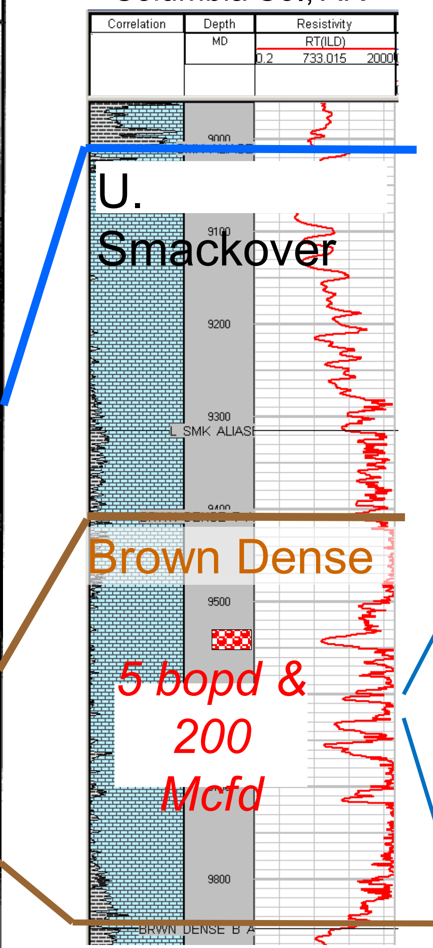
Jurassic Stratigraphy



Type Log

Lewis #B-1

Columbia Co., AR



"Brown Dense" is the largest source rock system in the US

Conventional: 3.4 billion BO & 38 TCFG onshore.

Source rock estimated to have generated 2.5 Trillion BOE (onshore and offshore)

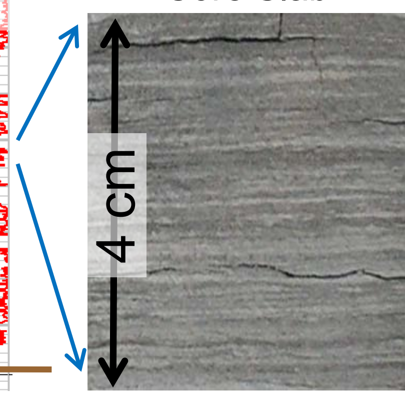
Kerogen Type: I & IIS: Oil-prone kerogen (algal, amorphous, bacteria), sulfur-rich

TOC: 0.06 – 8.42% (up to 60%)

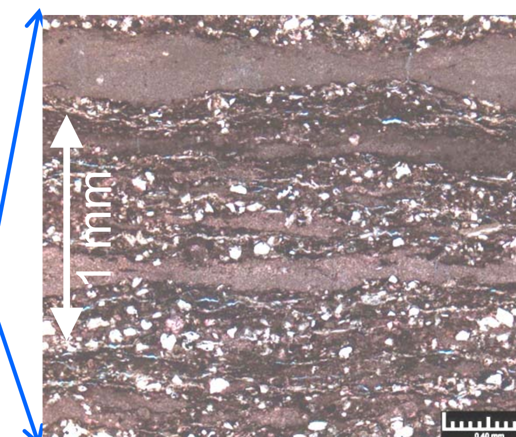
TOC Avg.: 0.58% (not corrected for Ro)

Laminated carbonate & kerogen (mm scale), in core and thin section below

Core Slab



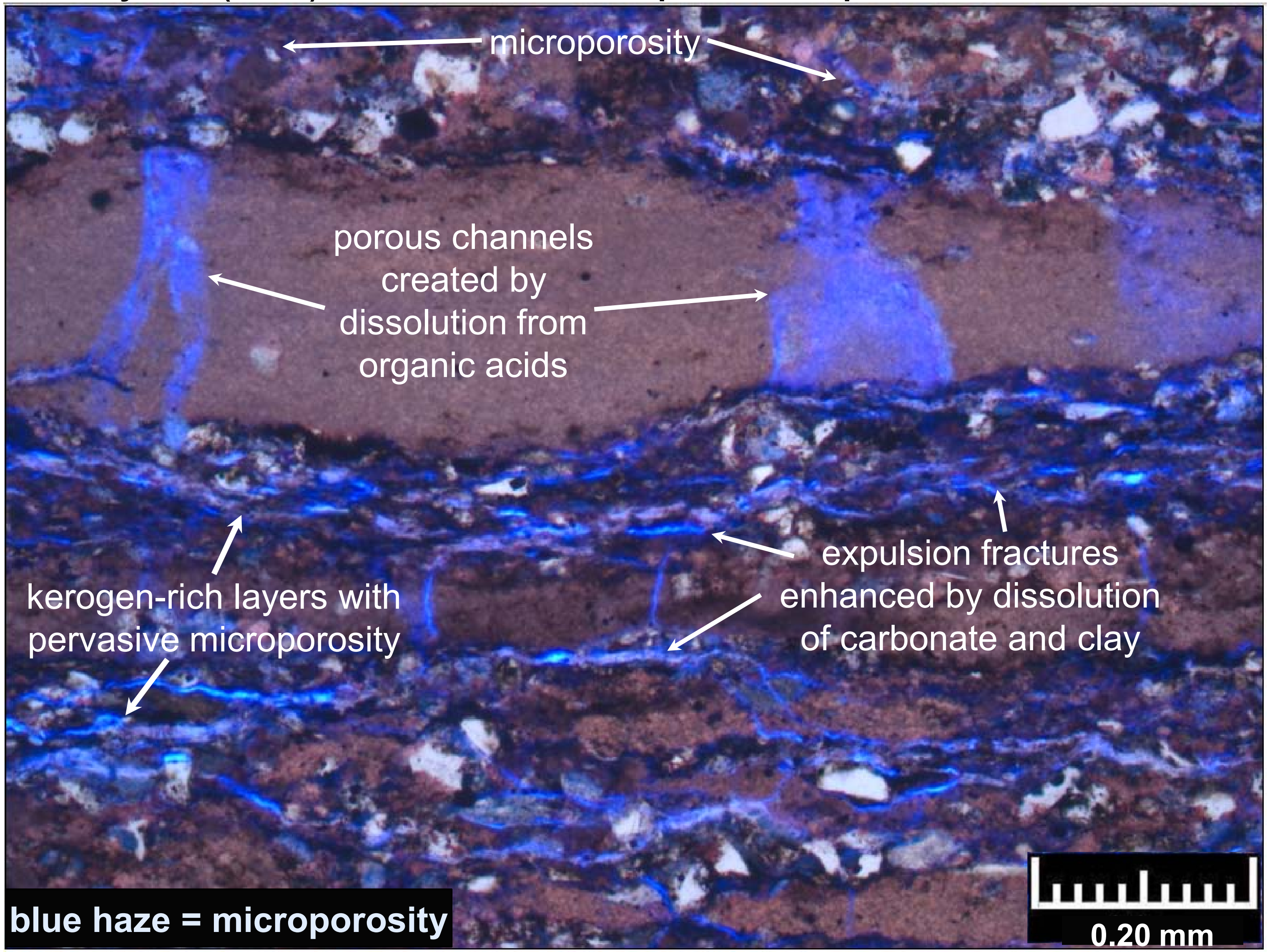
Thin Section 50X



Eclipse - Brown Dense Thin Section

Interlaminated carbonate source rock with microporosity

Talley #B-1 (9190'), offset to Location #2: phi = 11.3%, perm = 0.154 md, 100x.



Regulatory Considerations for Unconventional Drilling

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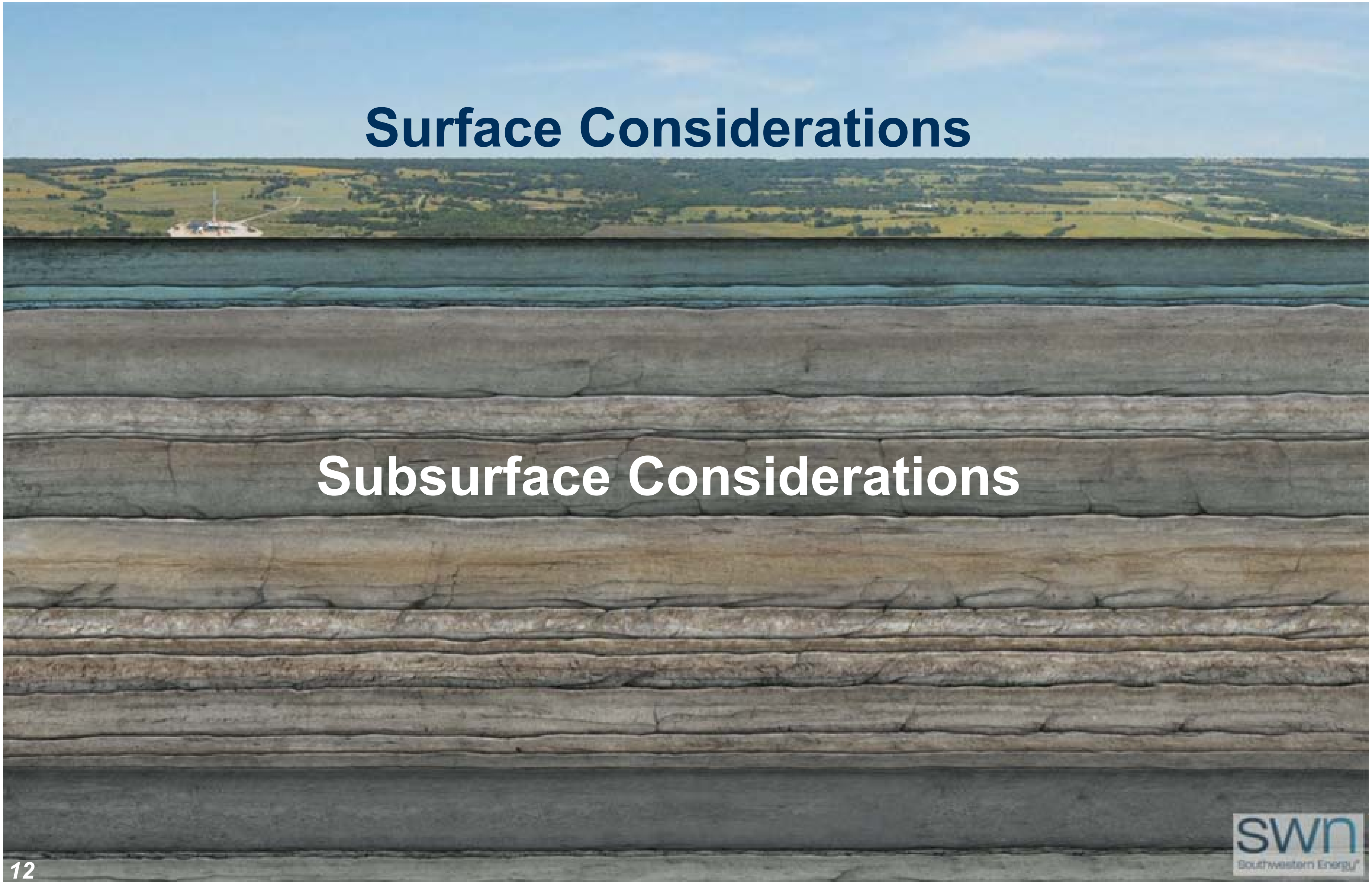
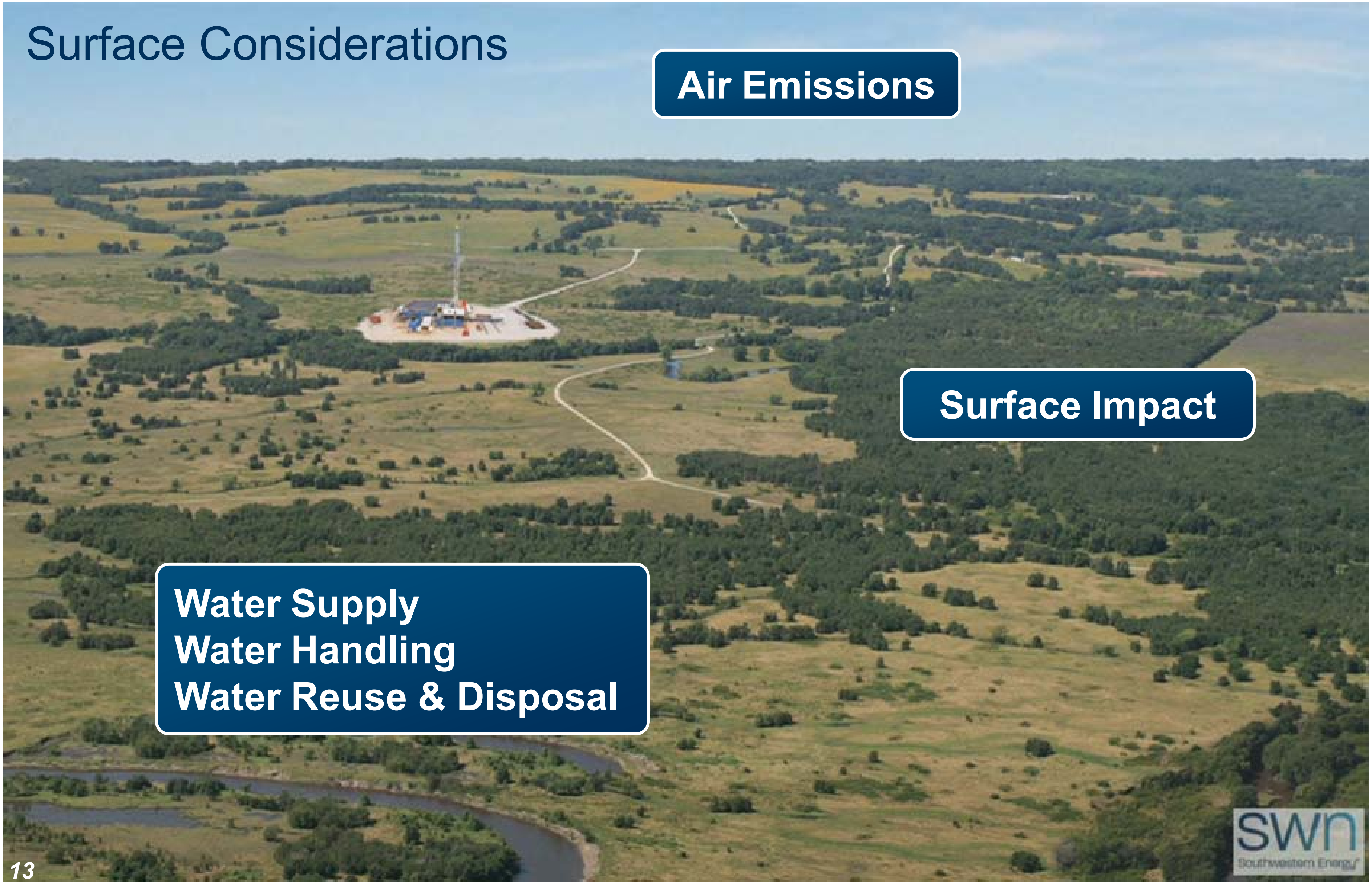
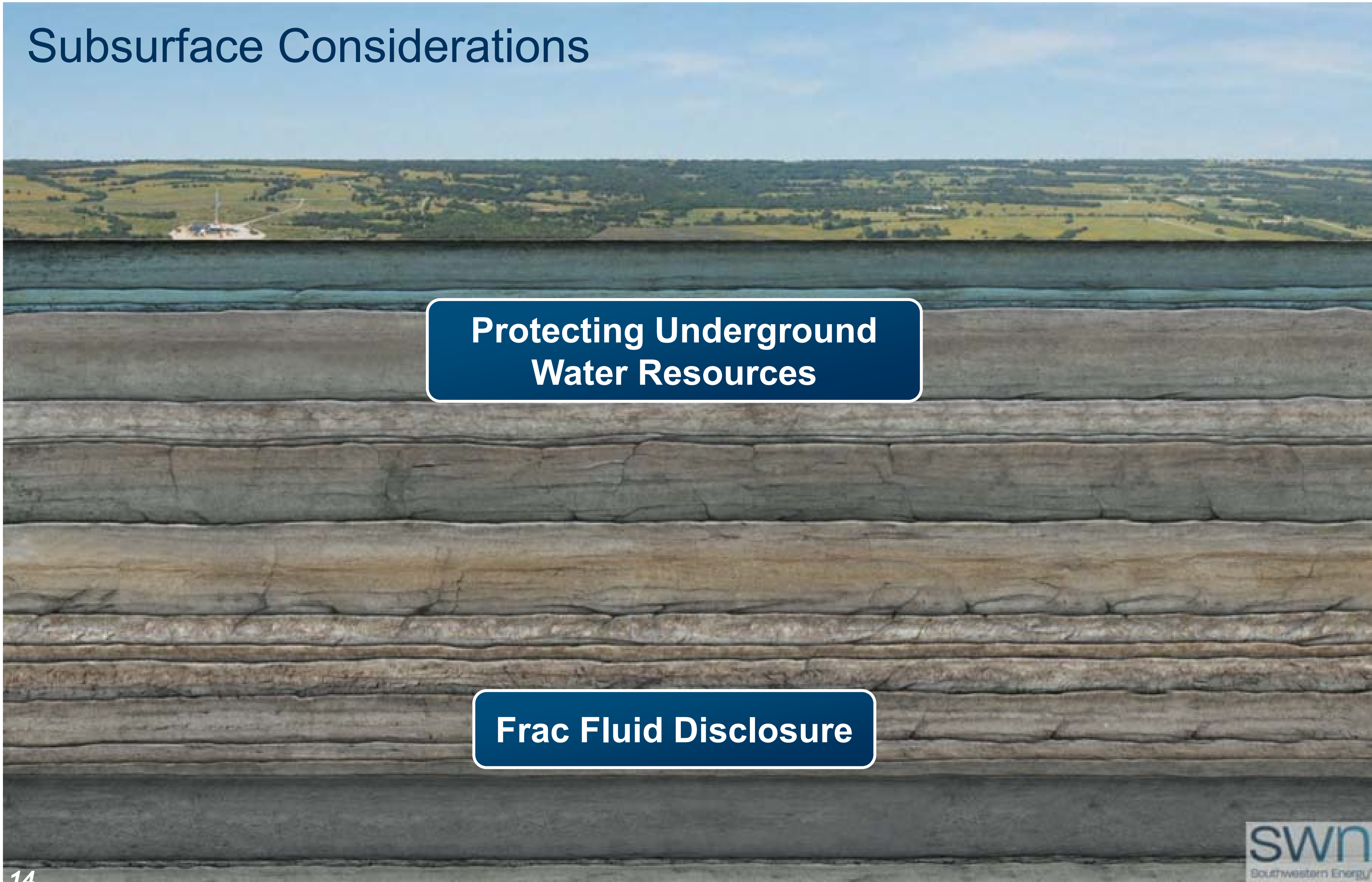


Regulatory Considerations



Regulatory Considerations

Subsurface Considerations



Well Integrity is the Key

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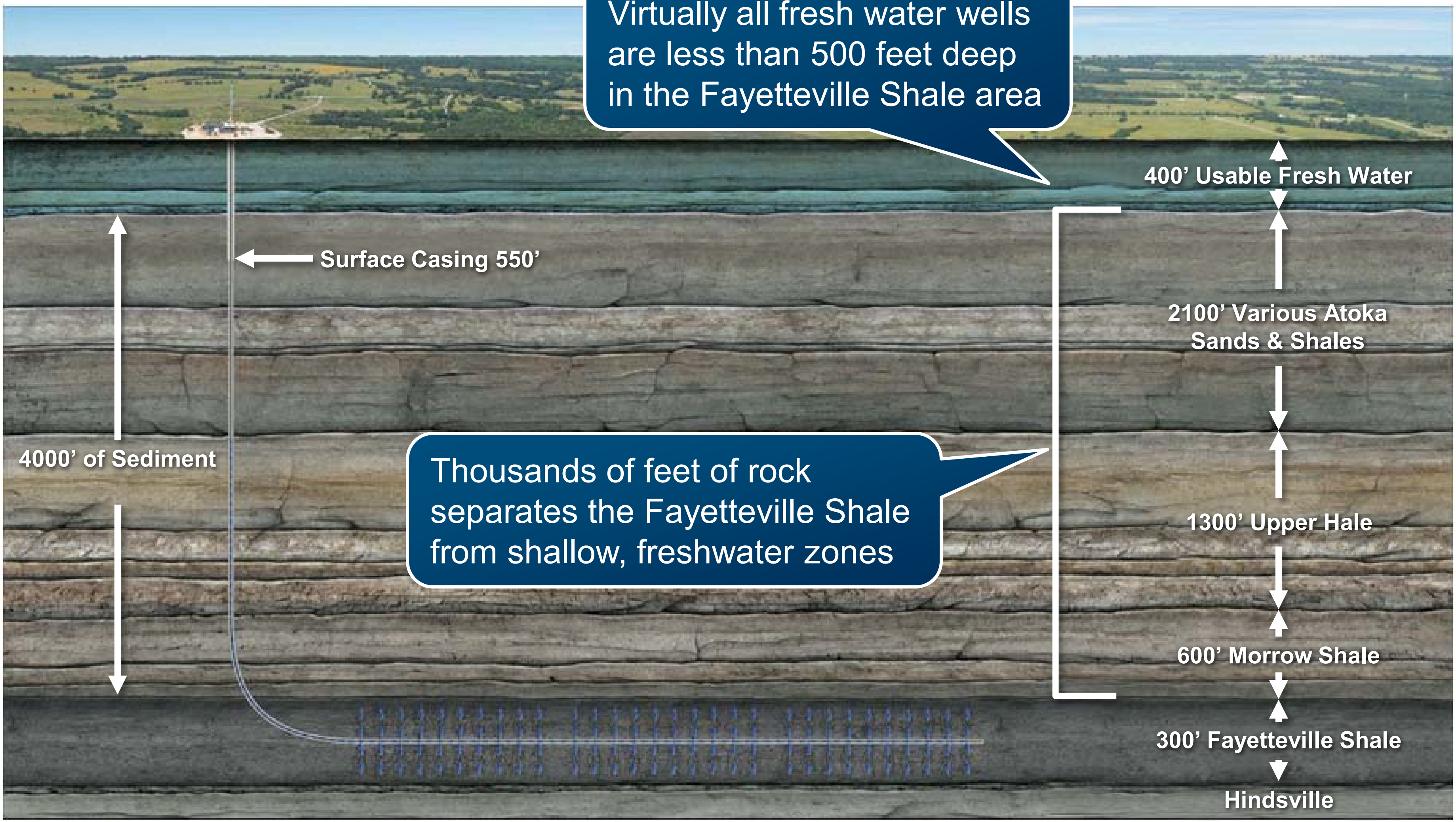
1 Evaluate Stratigraphic Confinement

2 Well Construction Standards

3 Evaluate Mechanical Integrity of Well

4 Monitor Frac Job & Producing Well

1. Evaluating Stratigraphic Confinement



Cross sectional view

Microseismic Evaluation of Stimulation Treatment

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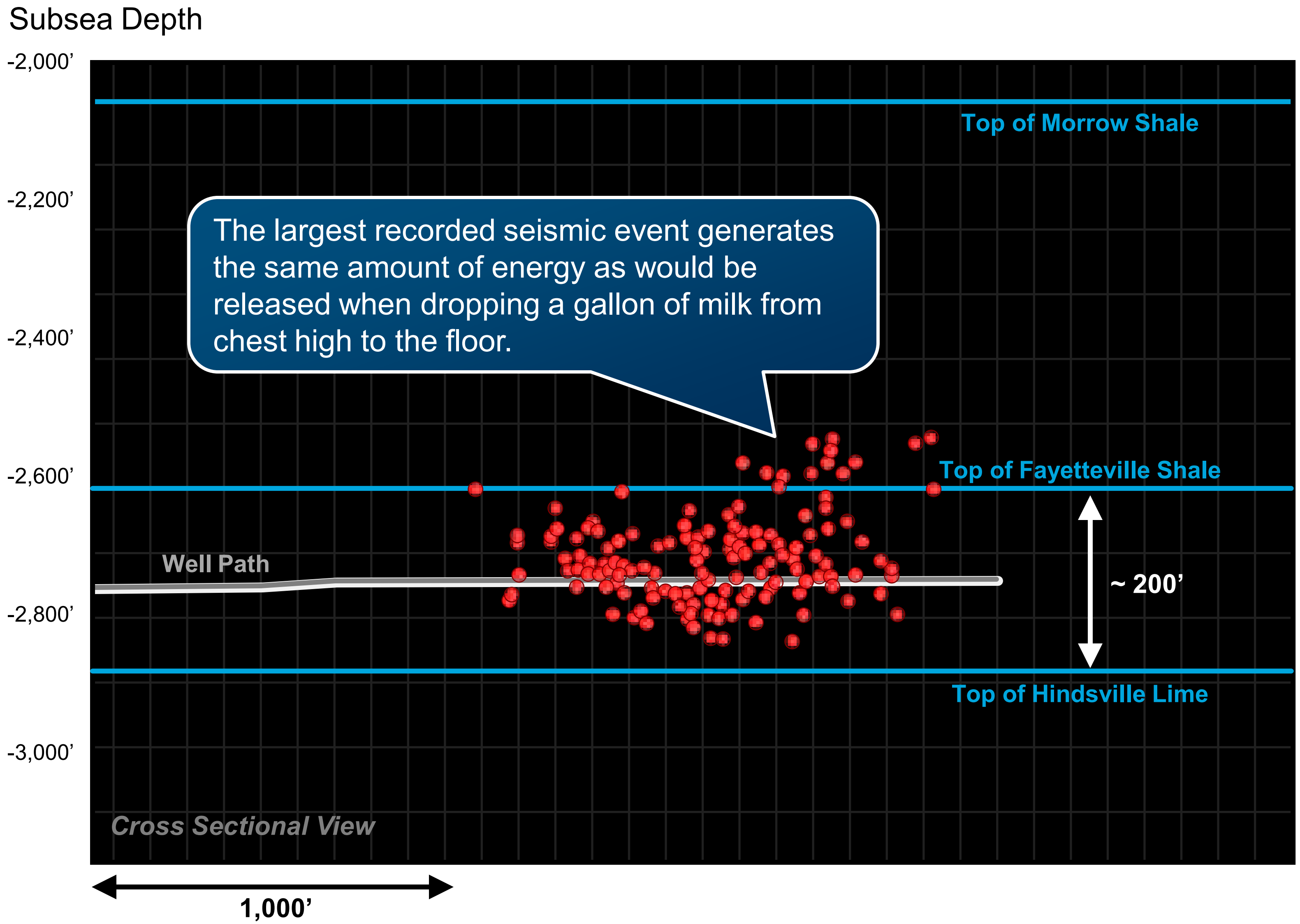
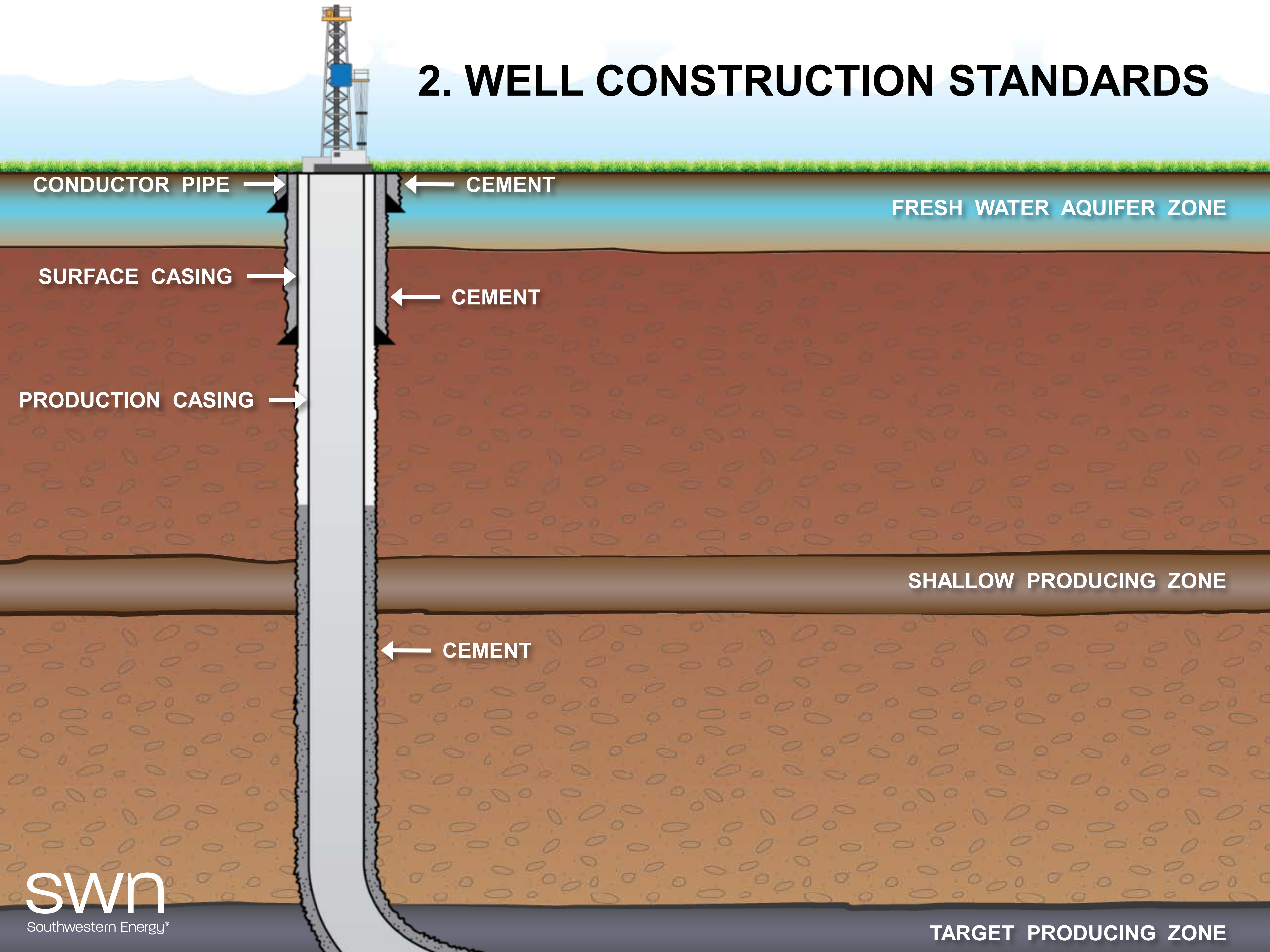


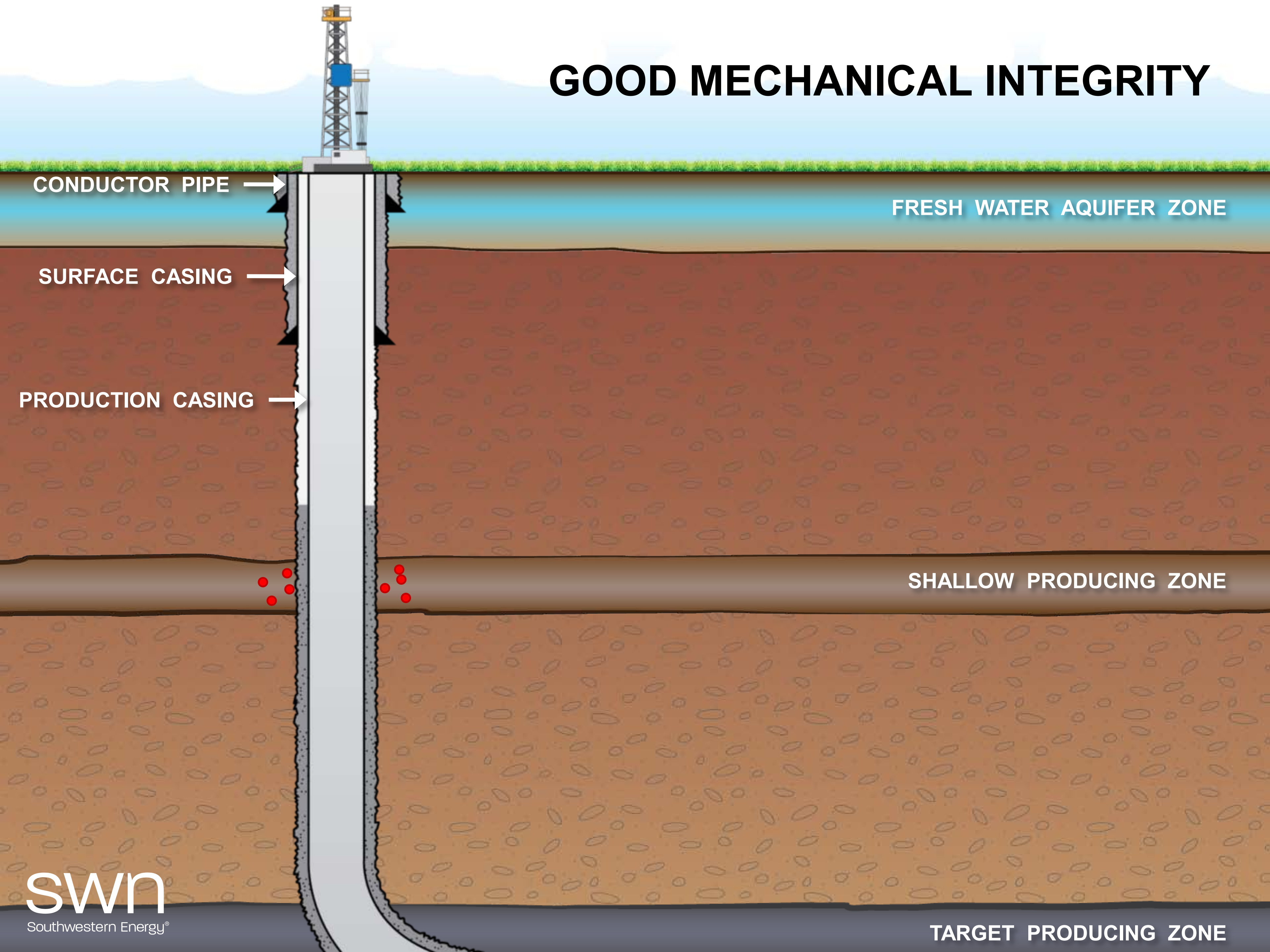
2. WELL CONSTRUCTION STANDARDS



3. Evaluating Mechanical Integrity of Well

- Internal Mechanical Integrity
  - Verify appropriateness of proposed casing program (e.g., size, grade, minimum internal yield pressure, etc.)
  - Test casing string to ensure it can withstand maximum stimulation pressure

- External Mechanical Integrity
  - Verify quality of cement
  - Identify top of cement
  - Test cement job (FIT, CBL, etc.) when operations indicate inadequate coverage


GOOD MECHANICAL INTEGRITY
CONDUCTOR PIPE
FRESH WATER AQUIFER ZONE
SURFACE CASING
PRODUCTION CASING
SHALLOW PRODUCING ZONE
TARGET PRODUCING ZONE
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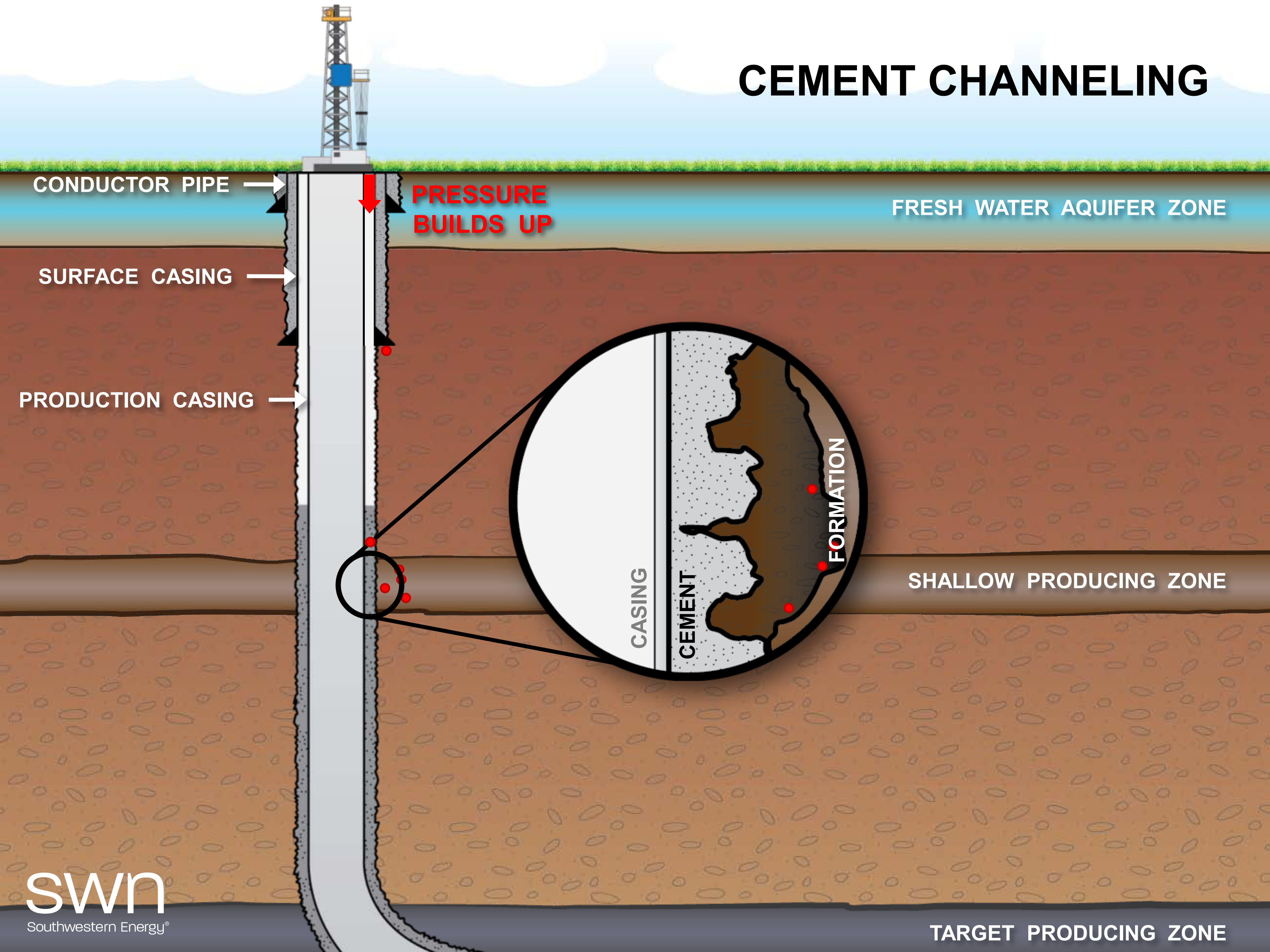
CEMENT CHANNELING
CONDUCTOR PIPE
PRESSURE BUILDS UP
FRESH WATER AQUIFER ZONE
SURFACE CASING
PRODUCTION CASING
CASING
CEMENT
FORMATION
SHALLOW PRODUCING ZONE
TARGET PRODUCING ZONE
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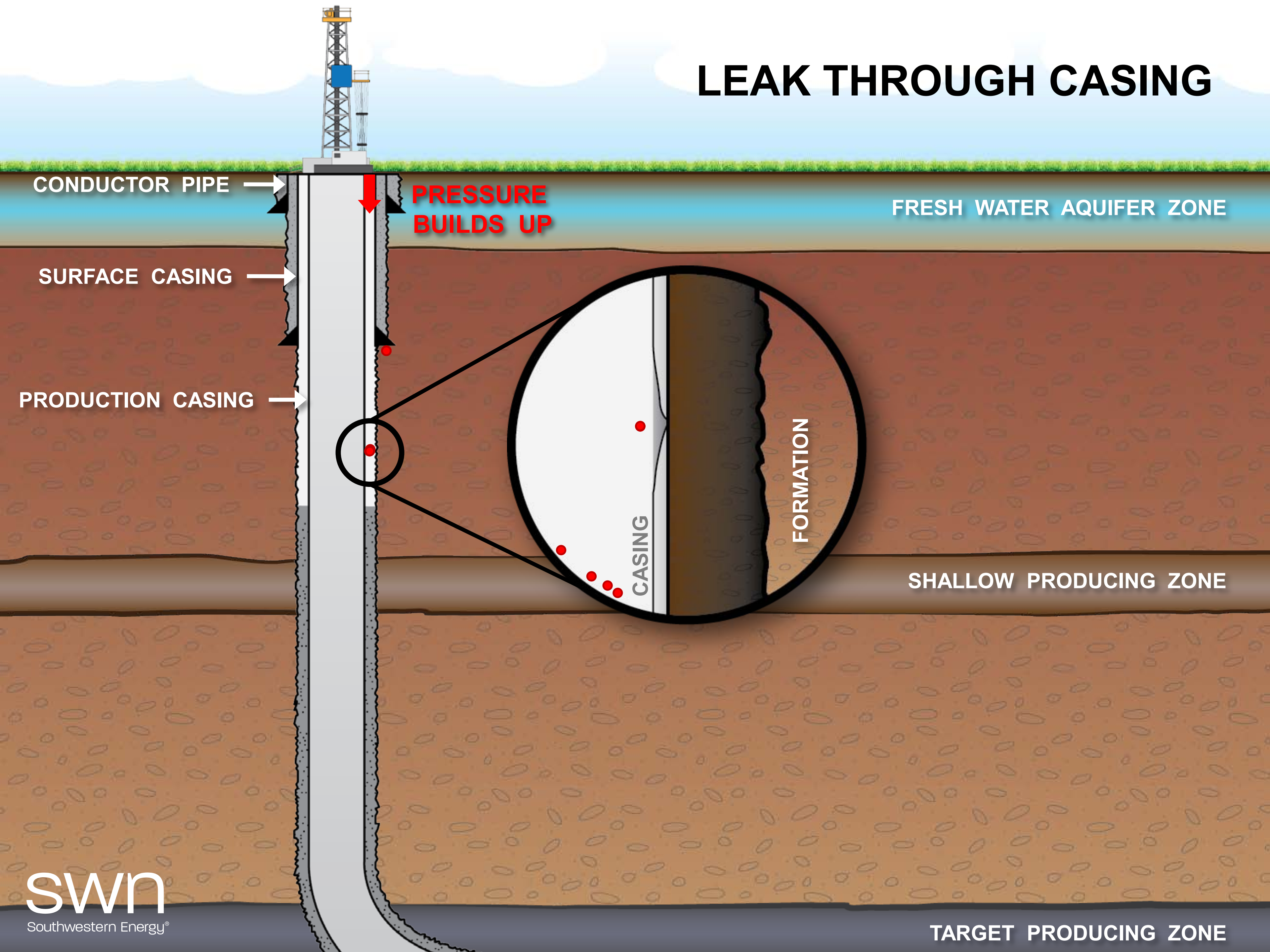
LEAK THROUGH CASING



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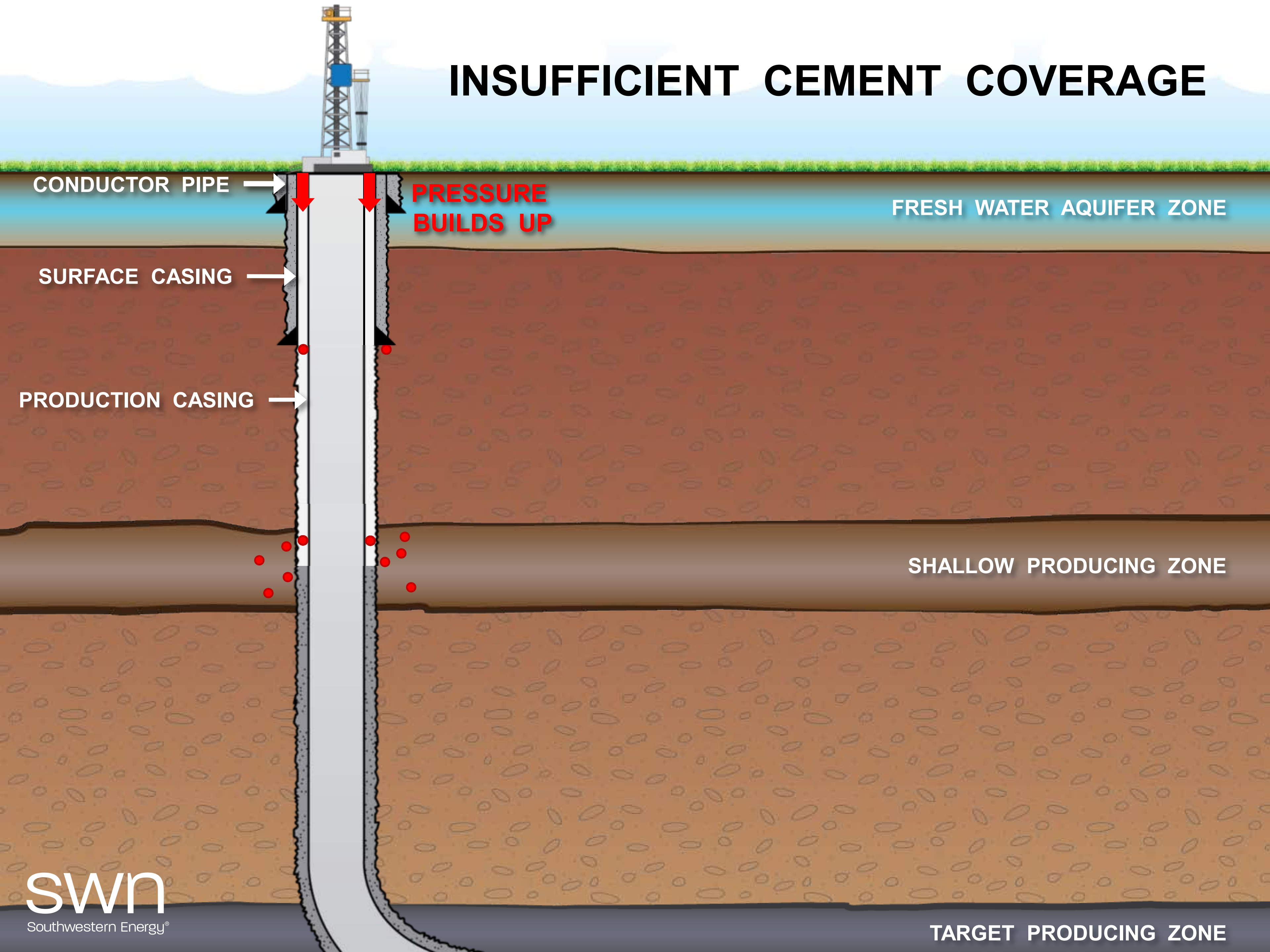
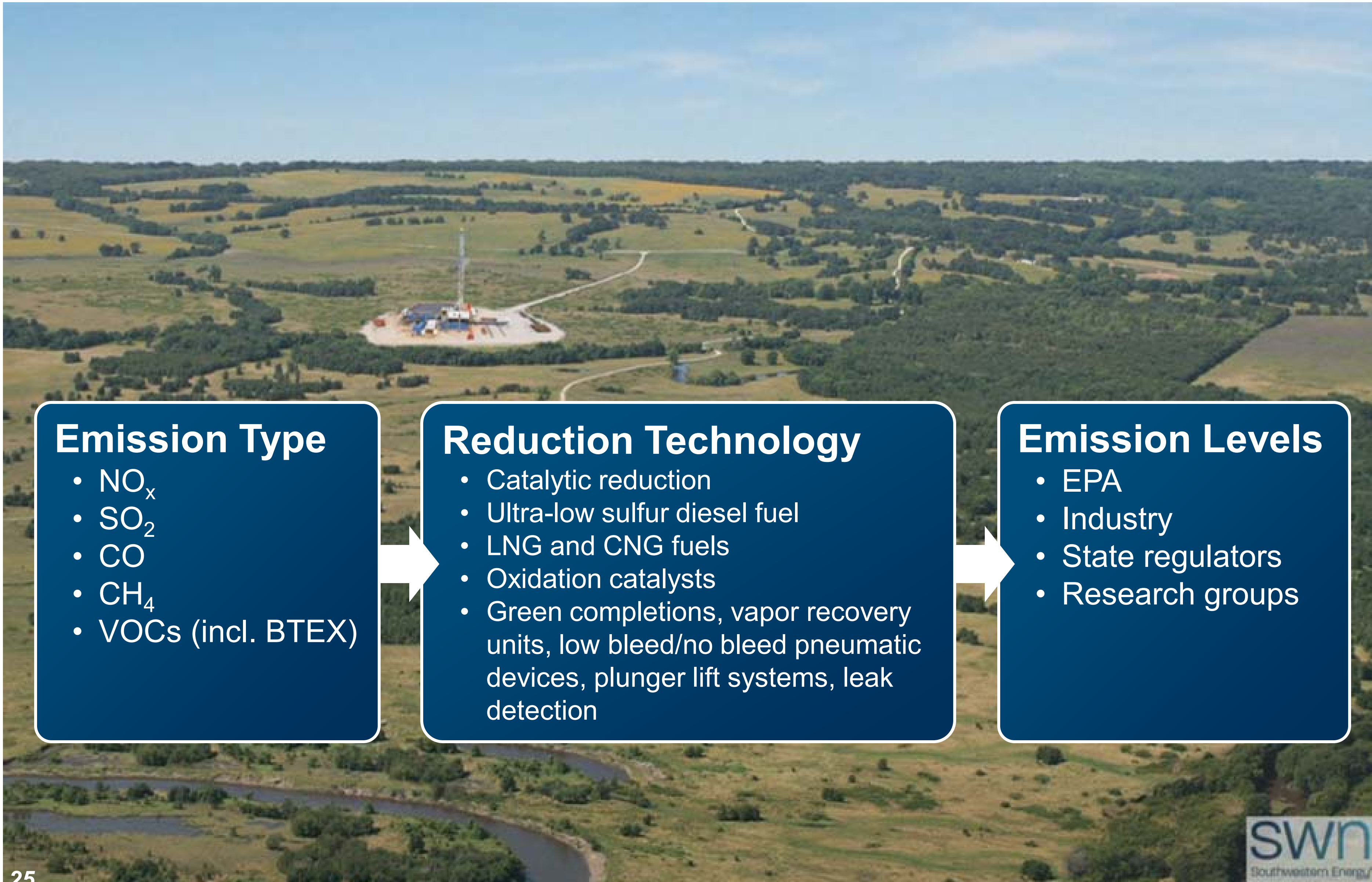
INSUFFICIENT CEMENT COVERAGE



Surface Considerations

Regulating Air Emissions



Emission Type
- NO_x
- SO_2
- CO
- CH_4
- VOCs (incl. BTEX)

Reduction Technology
- Catalytic reduction
- Ultra-low sulfur diesel fuel
- LNG and CNG fuels
- Oxidation catalysts
- Green completions, vapor recovery units, low bleed/no bleed pneumatic devices, plunger lift systems, leak detection

Emission Levels
- EPA
- Industry
- State regulators
- Research groups

Surface Considerations

Water Issues

Water Supply
Water Handling
Water Reuse & Disposal

Water Supply

Volume and Rate of Withdrawals
Fayetteville Shale

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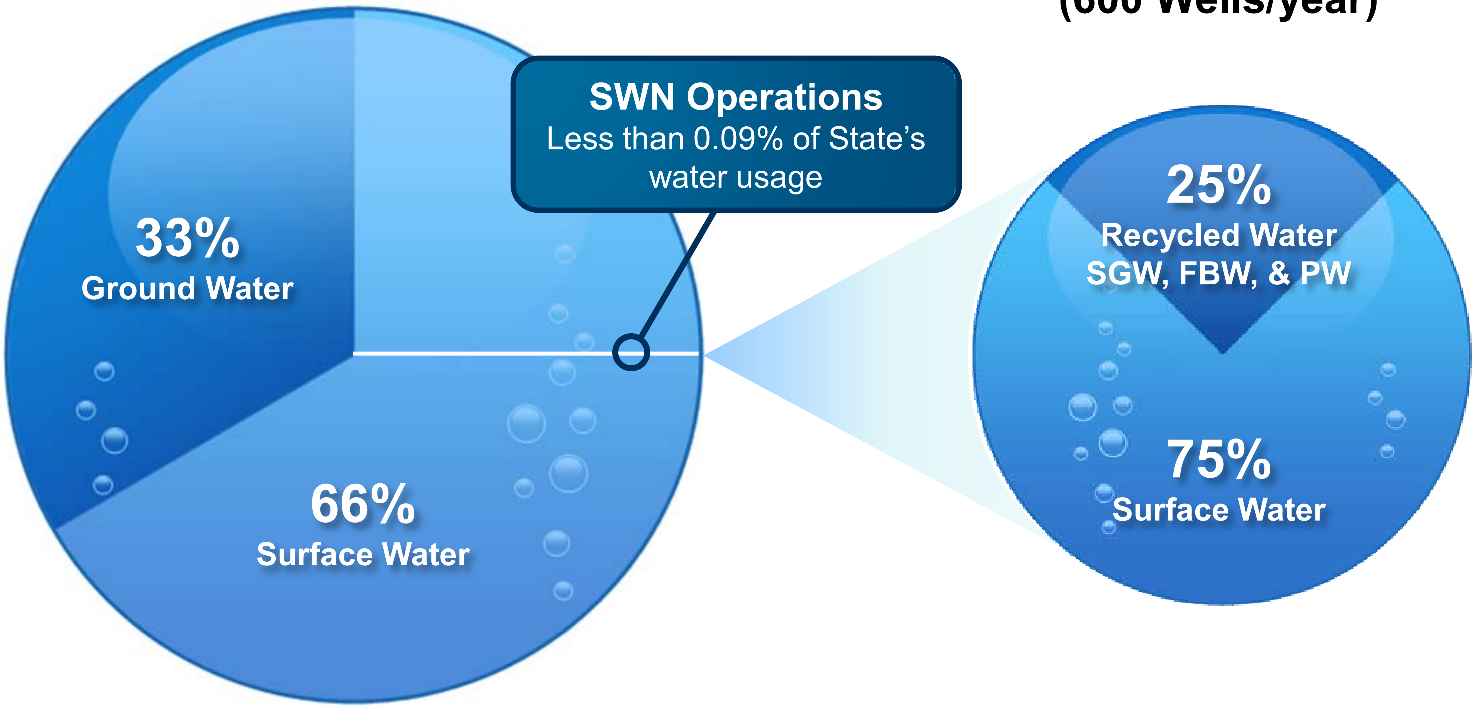
Statewide:
11,500 million gallons/day

SWN Operations:
10 million gallons/day
(600 Wells/year)

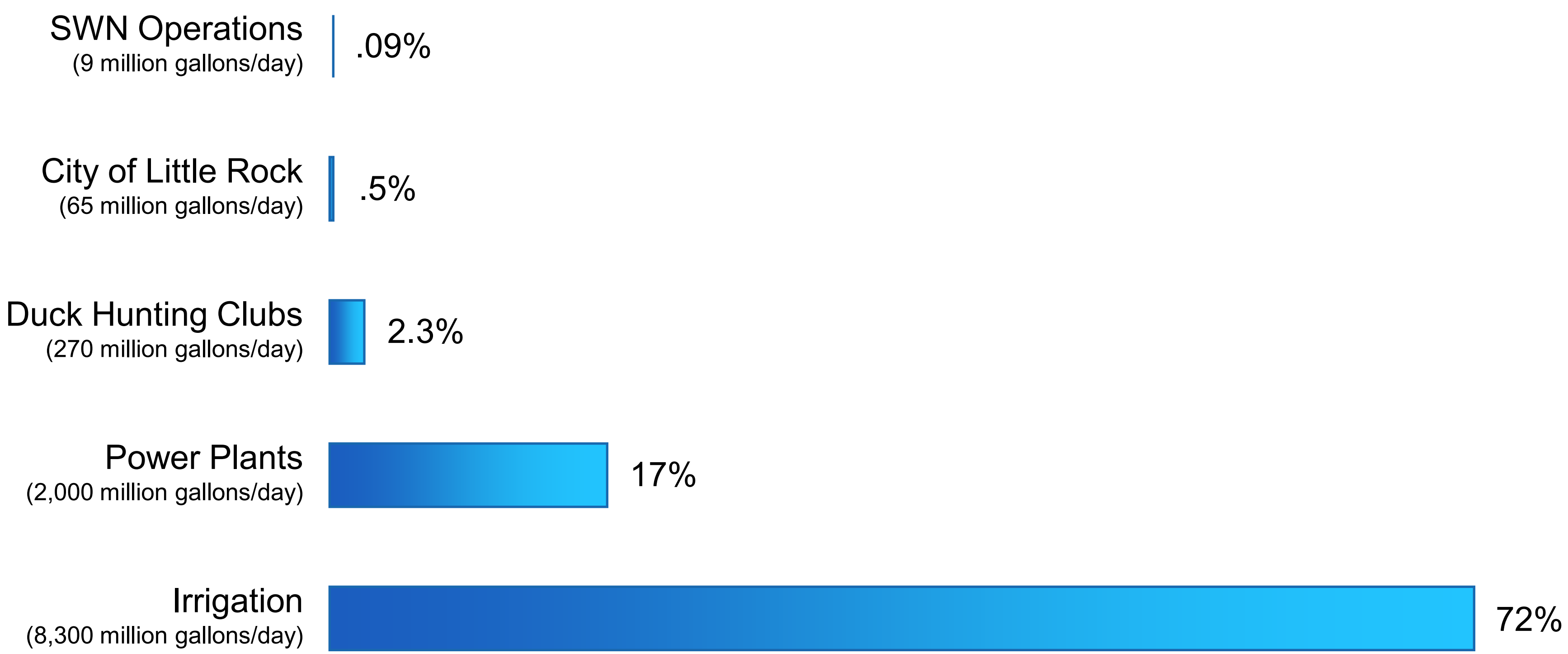


Source: U.S. Geological Survey, Central Arkansas Water, Southwestern Energy

Comparison to Other Activities

Arkansas Water Uses

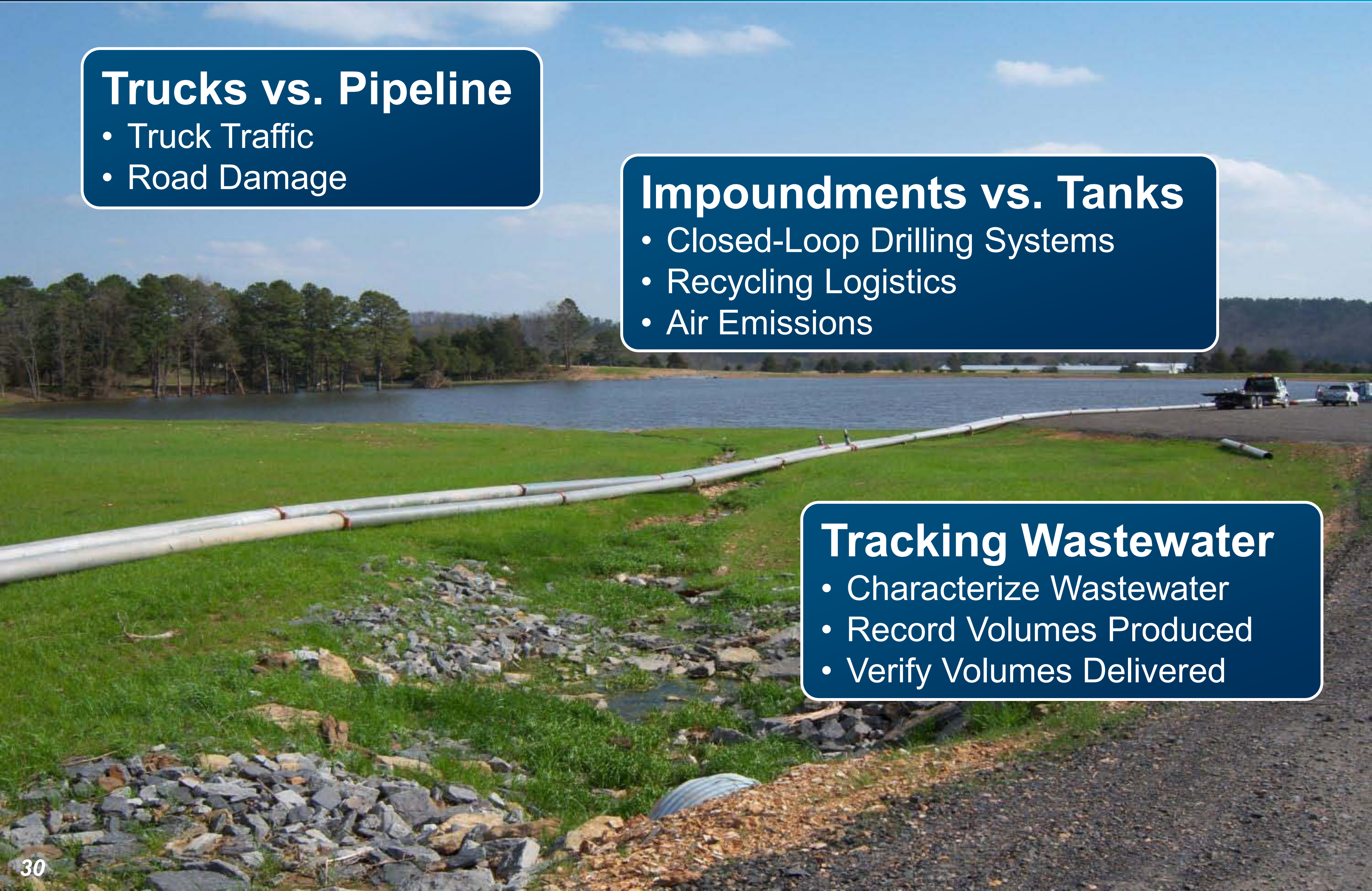
Percent of Statewide Water Consumption (not all categories included)



Total Statewide Consumption: 11,500 million gallons per day

Source: U.S. Geological Survey, Central Arkansas Water, Southwestern Energy estimates.

Water Handling



Trucks vs. Pipeline
- Truck Traffic
- Road Damage

Impoundments vs. Tanks
- Closed-Loop Drilling Systems
- Recycling Logistics
- Air Emissions

Tracking Wastewater
- Characterize Wastewater
- Record Volumes Produced
- Verify Volumes Delivered

Water Reuse & Disposal

Water Recycling & Reuse

- Reduces fresh water demand
- Reduces impact on roads and related infrastructure
- Reduces amount of wastewater requiring disposal

Water Treatment Facilities

- Flowback & produced water chemistry
- Capacity & Capability limitations (NORM, DBPs, heavy metals)
- Central vs. drill site facilities

Water Disposal Wells

- Geological & hydrological limitations
- NIMBY concerns
- Induced seismicity considerations

Water Cycle for Hydraulic Fracturing Operations

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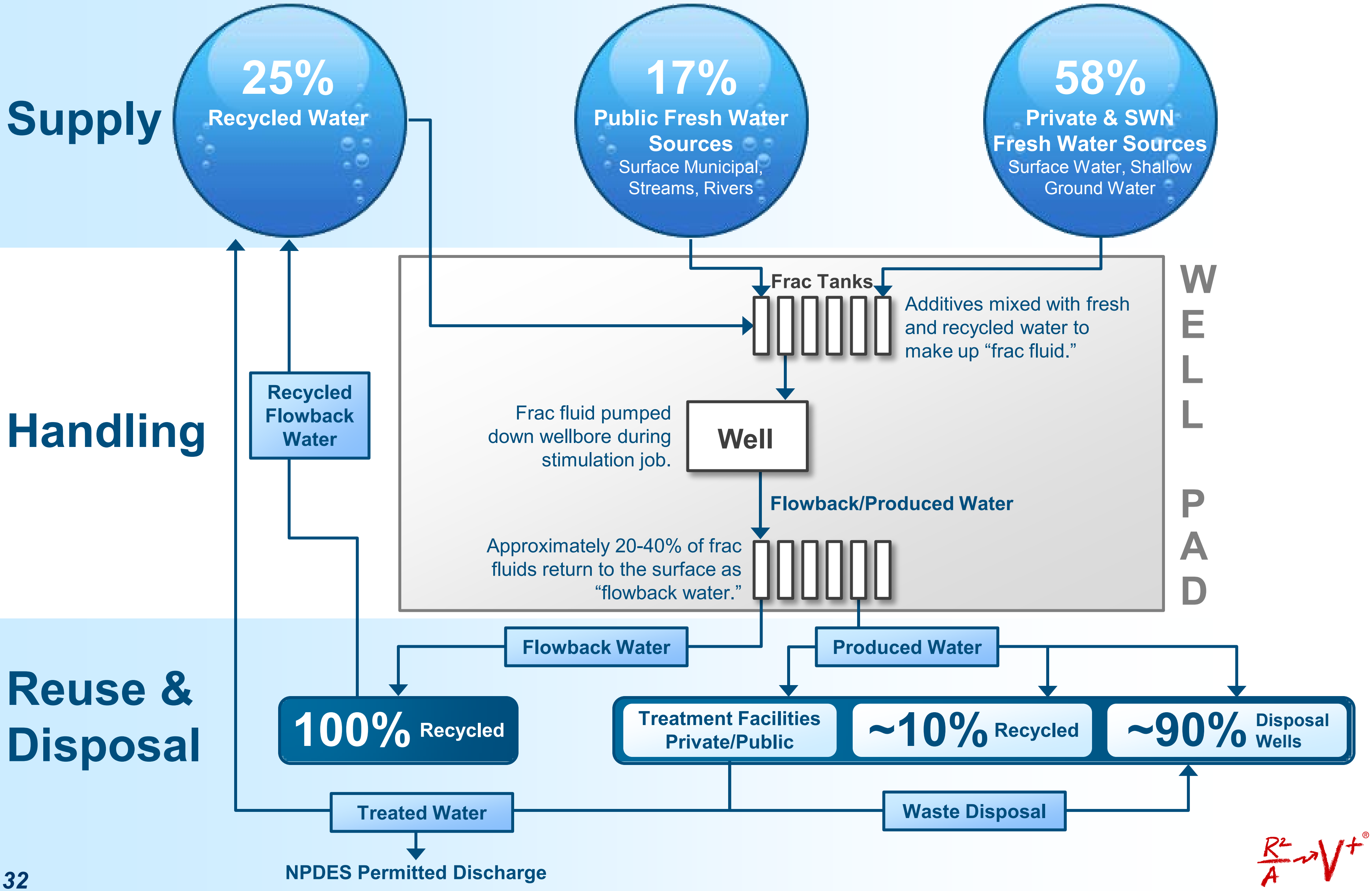
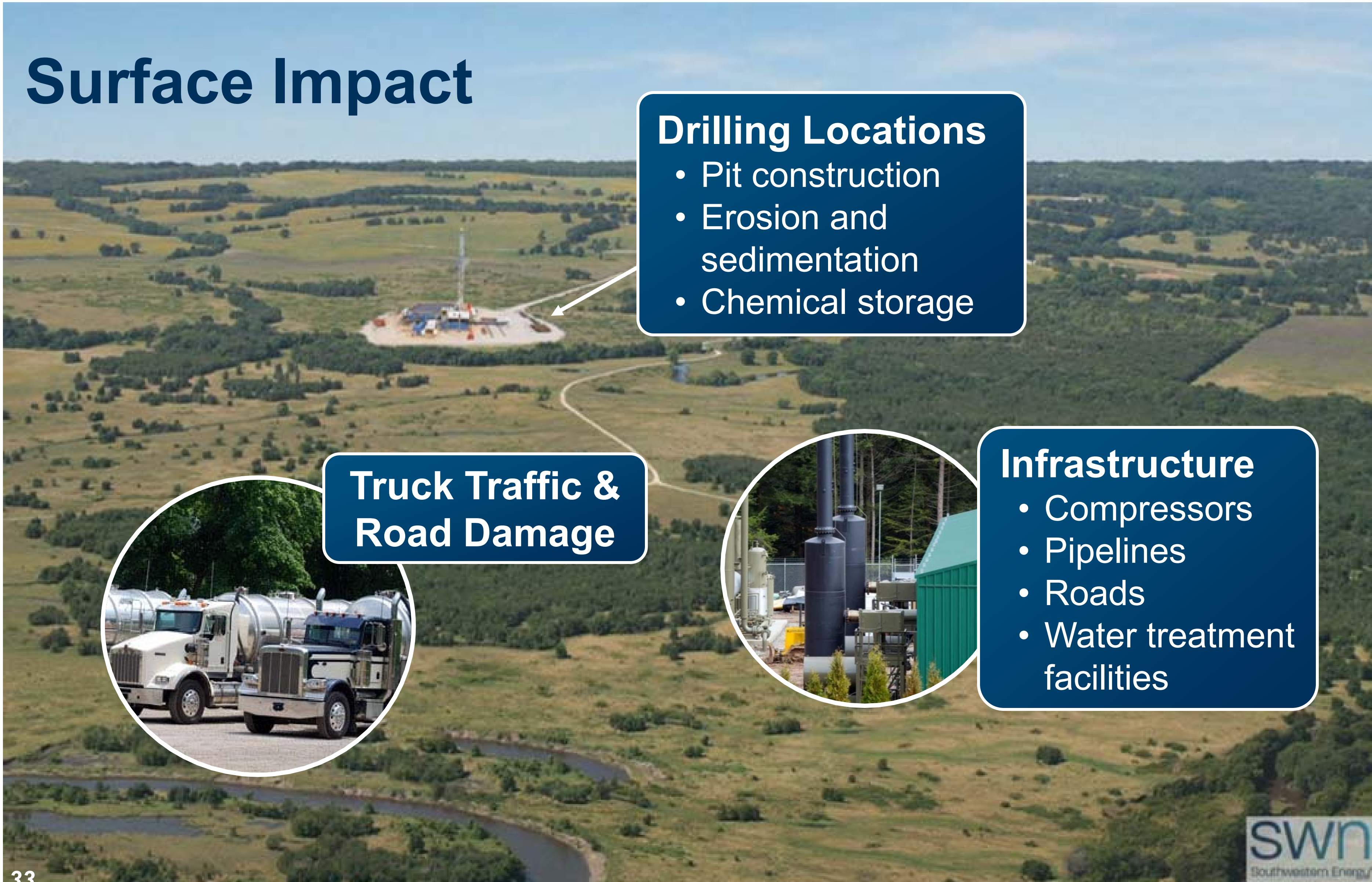


Surface Considerations



Perception Change due to Shale Drilling

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Top Positives

	Issues	Overall	Counties Johnson	Wise
1	Availability of good jobs	0.36	0.28	0.45
2	Med. and health care services	0.13	0	0.27
3	Quality of local schools	0.10	0.03	0.17
4	Fire protection services	0.10	0.04	0.16
5	Local police protection	0.06	0.03	0.10

Getting worse	-1
Staying the same	0
Getting better	1

Source:Gene L. Theodori, Sam Houston State University

Surface Considerations
Perception Change due to Shale Drilling

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Top Negatives

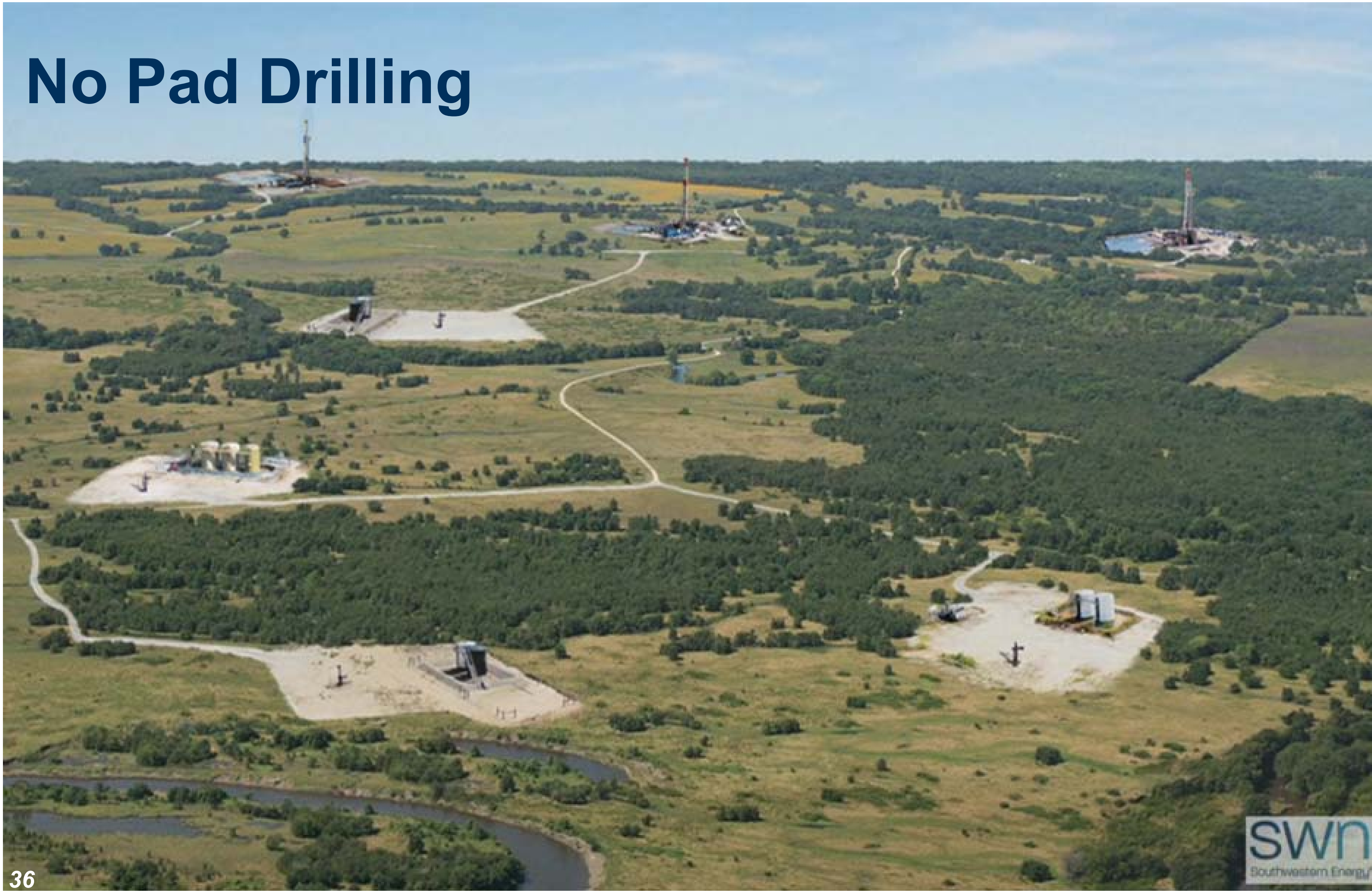
			Counties	
	Issues	Overall	Johnson	Wise
30	Increased truck traffic	-0.73	-0.72	-0.73
29	Amount of freshwater used	-0.56	-0.53	-0.59
28	High tax rates	-0.43	-0.35	-0.51
27	Noise pollution	-0.41	-0.40	-0.43
26	Water pollution	-0.39	-0.26	-0.53

Getting worse	-1
Staying the same	0
Getting better	1

Source:Gene L. Theodori, Sam Houston State University

$\frac{R^2}{A} \rightarrow V^+$®

Surface Considerations



Surface Considerations

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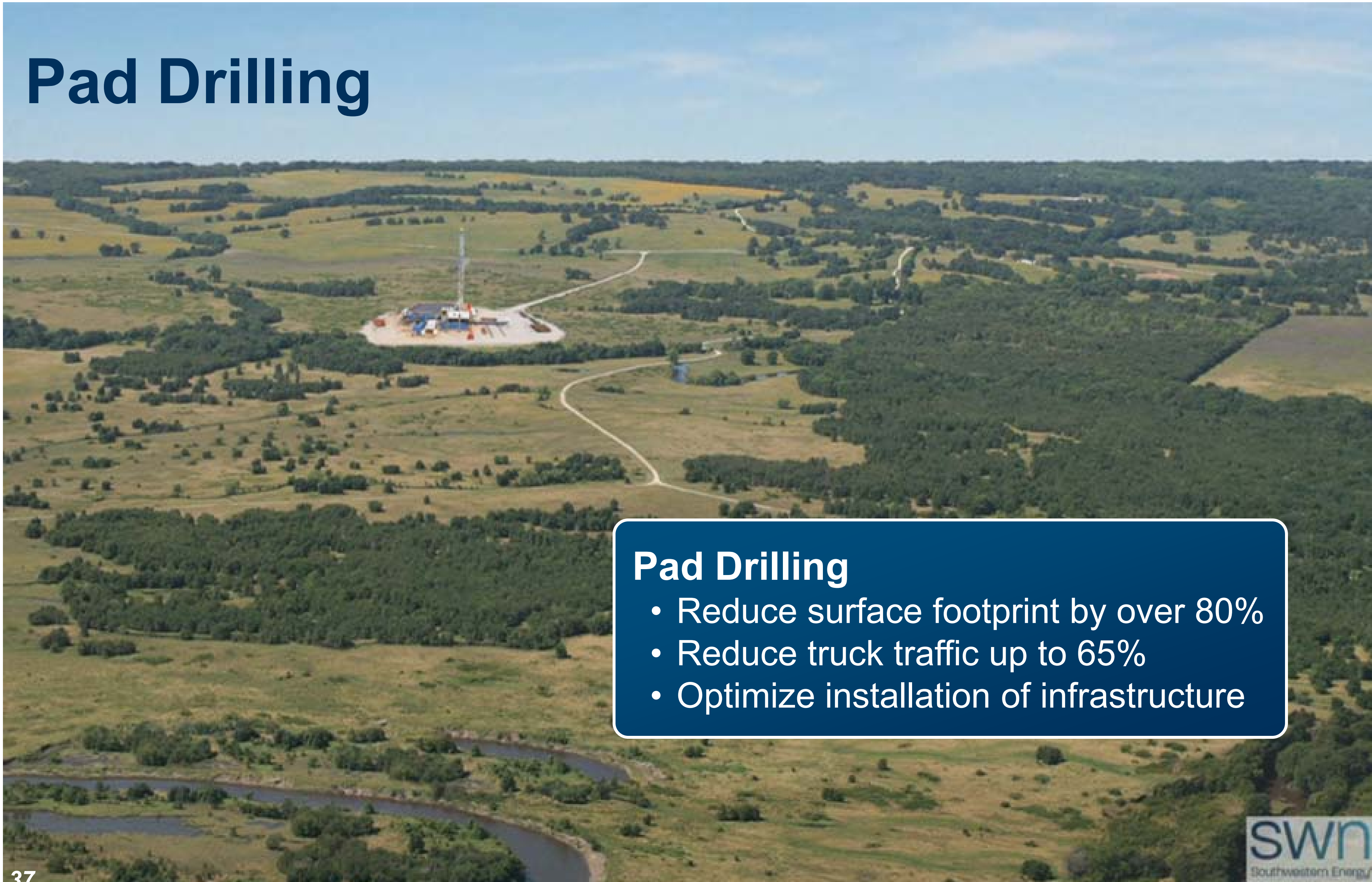
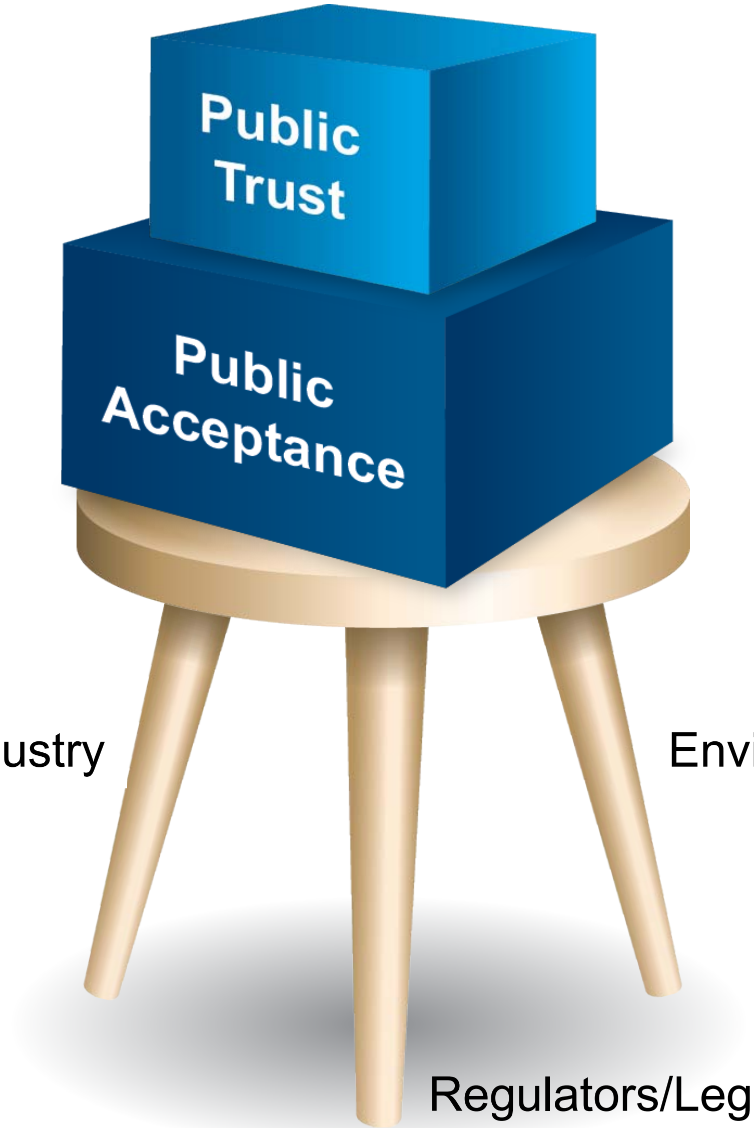
Pad Drilling



Pad Drilling
- Reduce surface footprint by over 80%
- Reduce truck traffic up to 65%
- Optimize installation of infrastructure

Fulfilling the Promise of Natural Gas



Straight talk/open dialogue

Debate the real issues

Regulation without the politics

The Promise of this National Treasure

PUC's

+

Power Generators

+

Natural Gas Industry

=

Better Environment

Less Expensive Energy

Energy Security

Appendix

Weekly North American Drilling Report

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May 18, 2012

U.S. Drilling Rigs

Rig Types	Change	This Week
Gas	2 (up)	600
Oil	10 (up)	1,382
Misc.	-	4
Total	12 (up)	**1,986**

Natural Gas Rigs

Rig Types	Change	This Week
Horizontal	1 (down)	451
Vertical	1 (up)	80
Directional	2 (up)	69

Oil Rigs

Rig Types	Change	This Week
Horizontal	6 (down)	809
Vertical	5 (up)	449
Directional	11 (up)	124

U.S. Drilling Rigs

Natural Gas Rigs

Oil Rigs

Commentary

Total US drilling rig count increased by 12 rigs to 1,986. This increase was driven by oil rig additions. In the oil category, the directional (+11) and vertical (+5) classes offset a 6 rig loss in the horizontal class. In the gas category, small gains in the directional (+2) and vertical (+1) class made up for a single rig loss in the horizontal class.

The Canadian rig count gained a total of 3 rigs. A 6 rig increase in the oil category, offset a 3 rig loss in the gas category.

Canadian Drilling Rigs

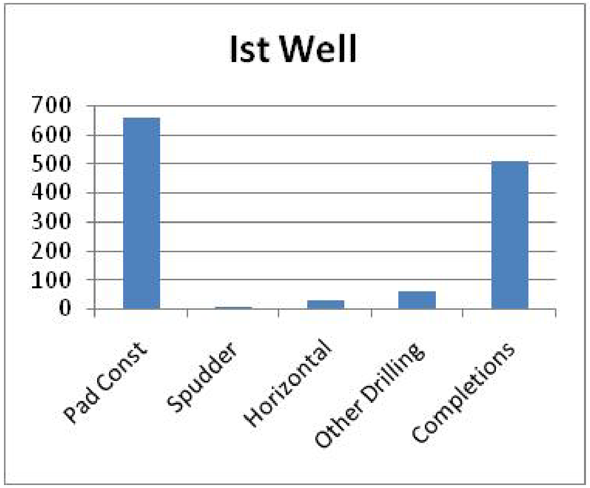
Rig Types	Change	This Week
Gas	3 (down)	47
Oil	6 (up)	76
Total	3 (up)	**123**

(Based on data from Baker Hughes & Smith Bits)

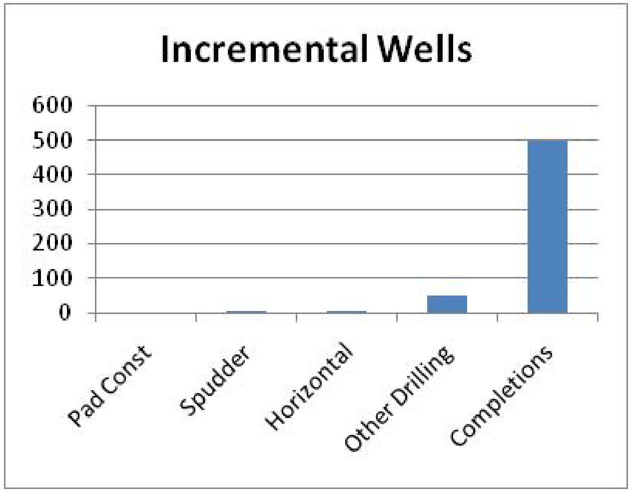
$\frac{R^2}{A} \rightarrow V^+$®

Intensity Creates Visibility

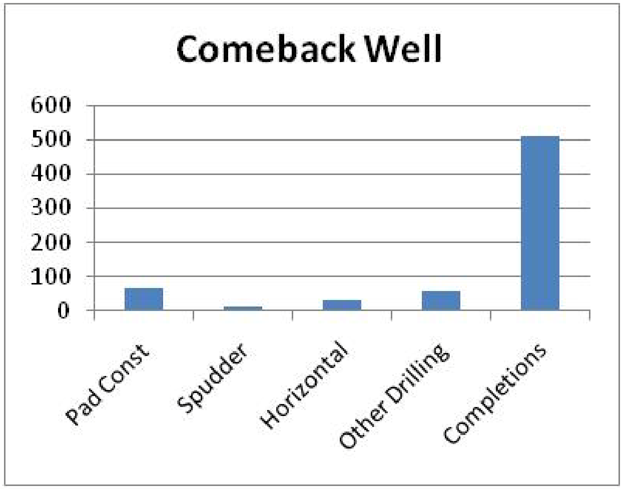
1,275 trucks



550 trucks



675 trucks



Note: Graphs includes water activity through 60 days after first sale.

Characteristics of a Shale Play

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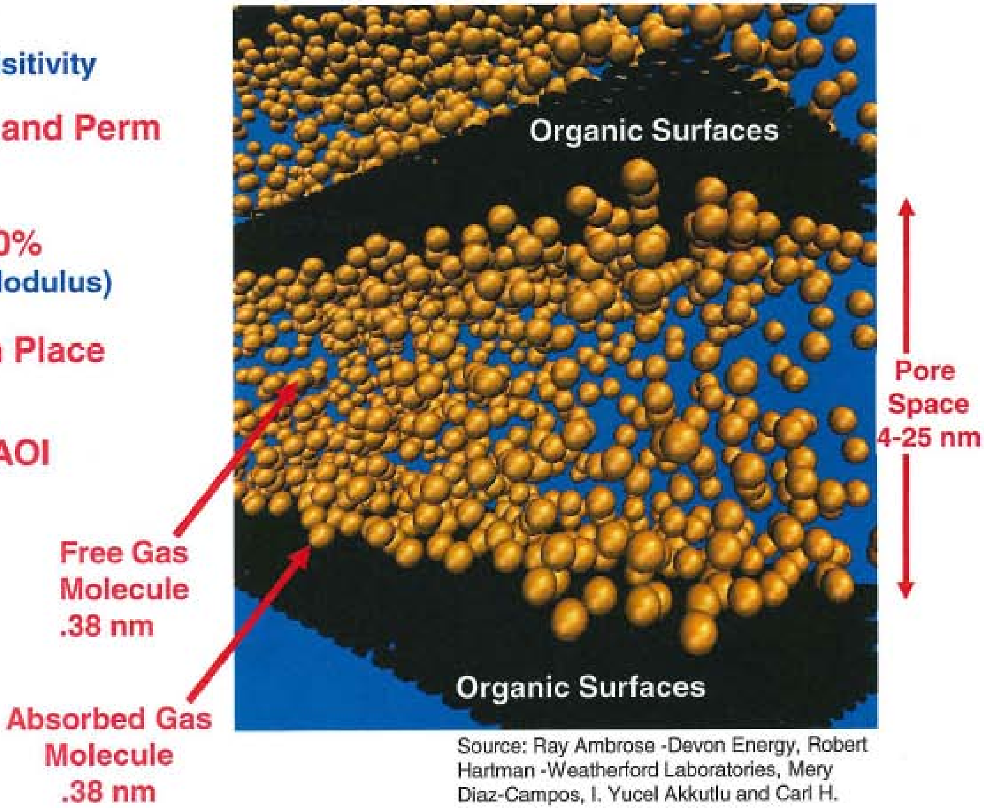
- High present day TOC, Kerogen Content, Type, & Richness
  - RockEval, TOC, S1/S2, S2/S3, HI, OI, NOC,PI, FIT, NGSL
- Thermal Maturity >1.3% Ro (Gas Window)
  - Vitrinite Reflectance, TMAX, TAI, FIT, Resisitivity
- Observed/Measured Porosity usually >4% and Perm
  - Cores, D-N logs, SEM, Epifluorescence,
- Brittle Rock – Silica/Carbonate content >40%
  - Dipole sonic (Poissons Ratio & Youngs Modulus)
- Sufficient Thickness and quality for Gas In Place
  - Isopach maps: 50-400' gross thickness
- Mudlog Gas Shows prevalent throughout AOI
  - C1-C5
- Free Gas vs. Absorbed Gas
  - Micropores vs. Van de Waal effects of hydrocarbon gases on atomic carbon



Source: Ray Ambrose -Devon Energy, Robert Hartman -Weatherford Laboratories, Mery Diaz-Campos, I. Yucel Akkutlu and Carl H. Sondergeld -University of Oklahoma

Regulatory Considerations