

Horizontal Well Completions: Motivation & Methods

May 8th 2019

Introductions

- **Kelly Blackwood**
 - **Vice President, Browng Oil Company, Inc.**

Overview

- Petroleum Engineering 101
- Why we fracture stimulate
- Permeability concepts
- Horizontal well objectives
- Horizontal well challenges

Darcy's Equation

$$Q=K*A*\Delta P/\mu*L$$

K-Permeability (Flow Capacity, Darcy)

A – Area (acres)

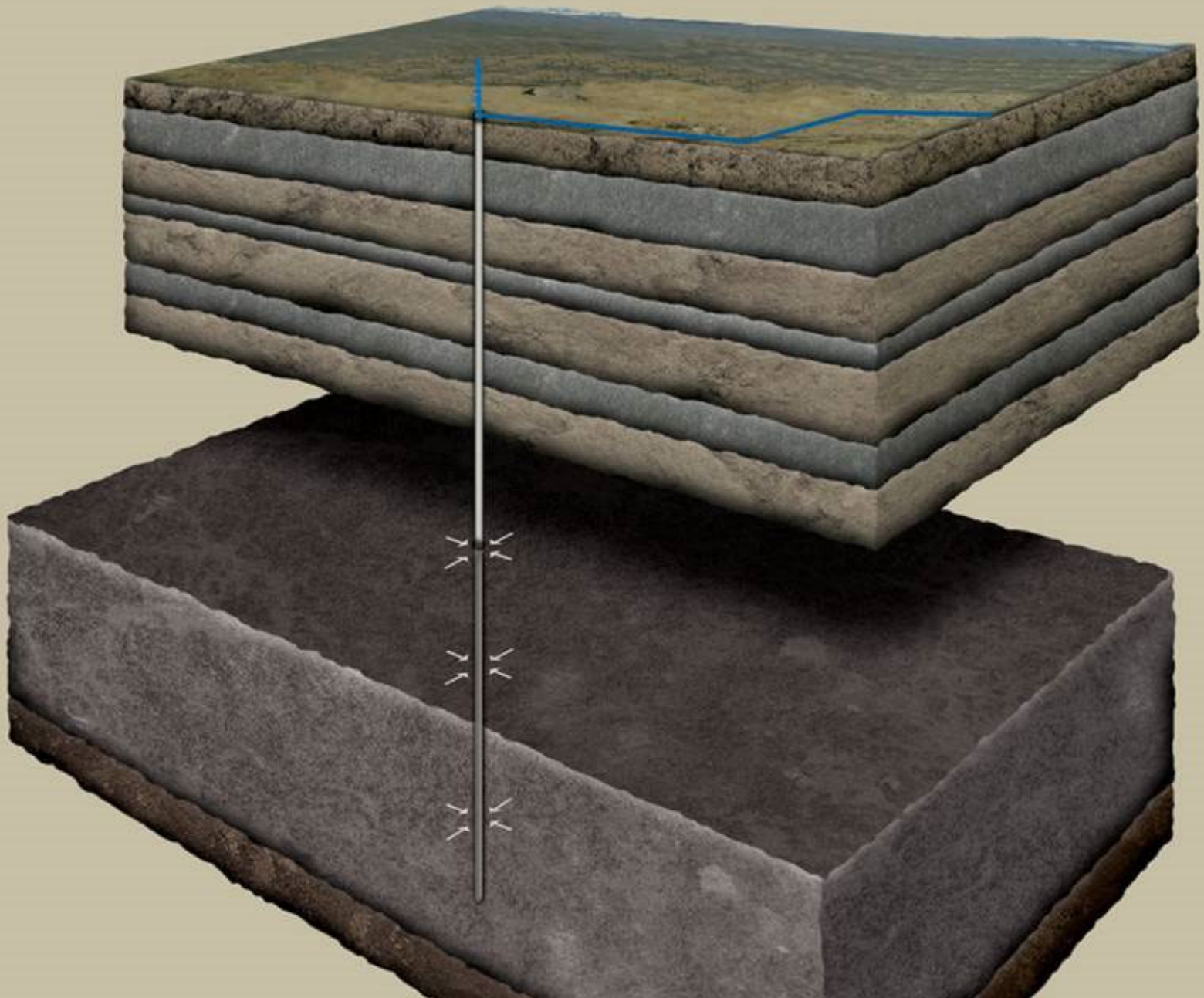
ΔP – Pressure Drop (psi)

μ - Viscosity (cp)

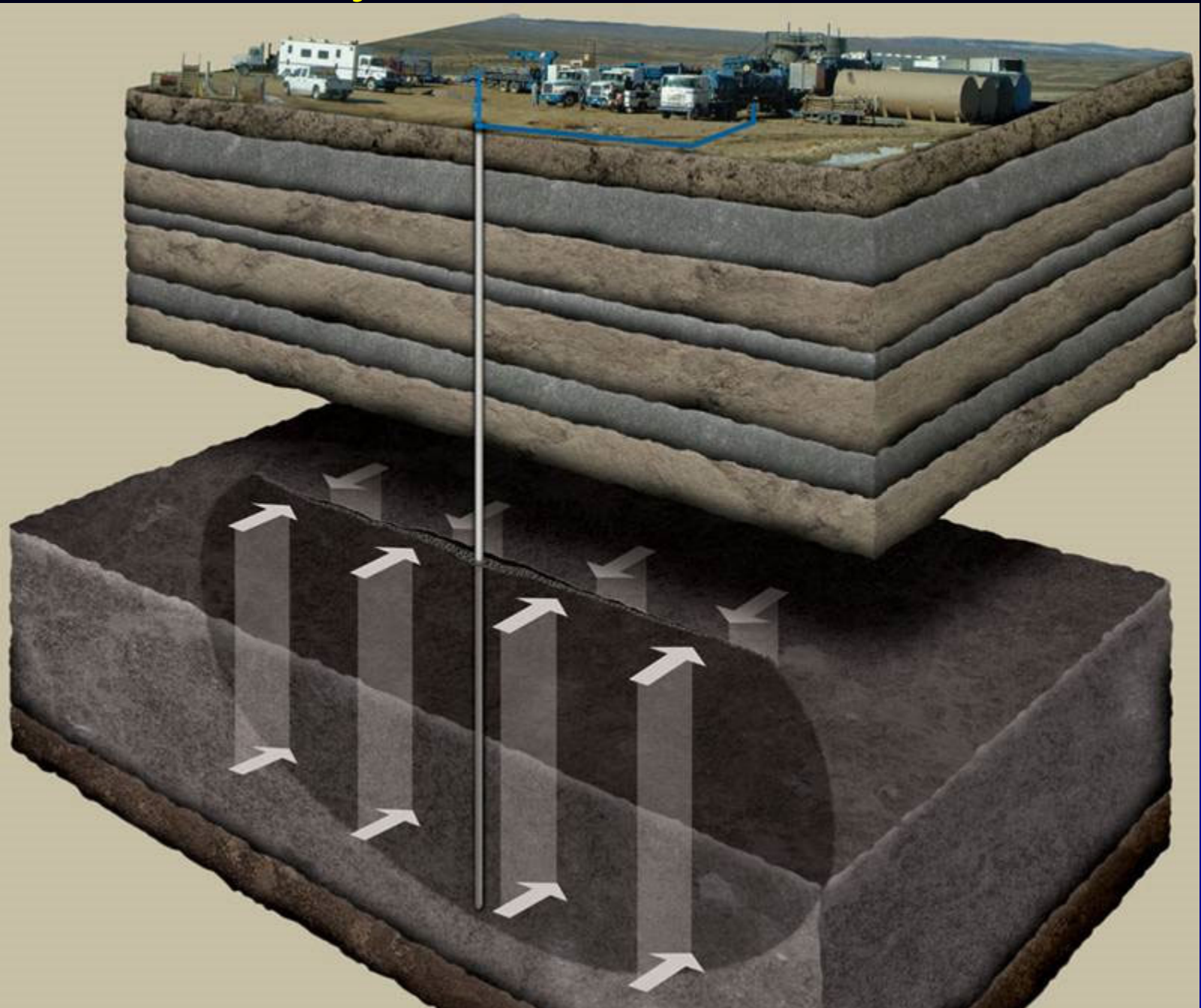
L – Length (feet)

$K_{\text{conventional}} \gggggggggg K_{\text{resource}}$

Why Fracture Stimulate?

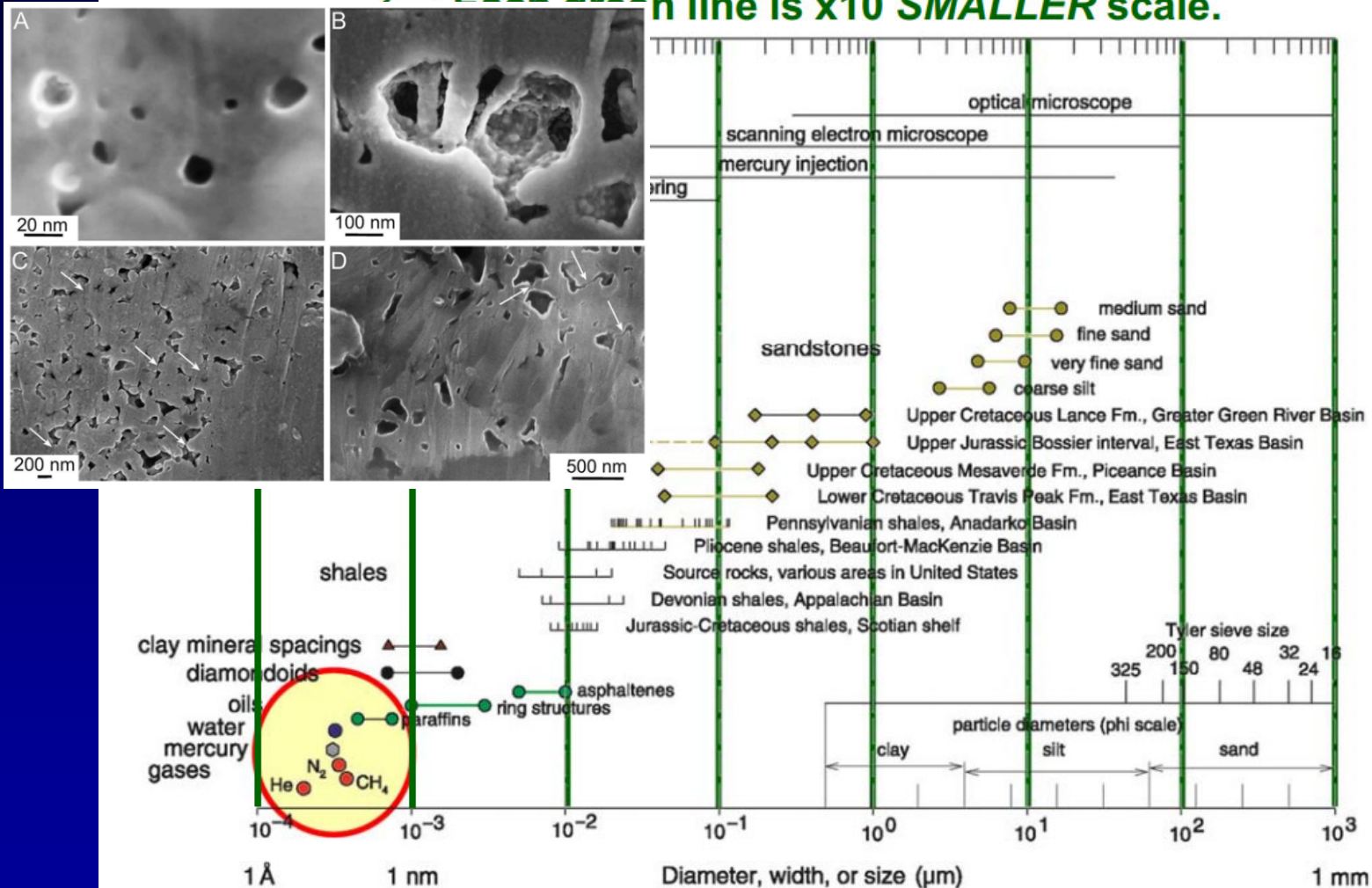


Why Fracture Stimulate?



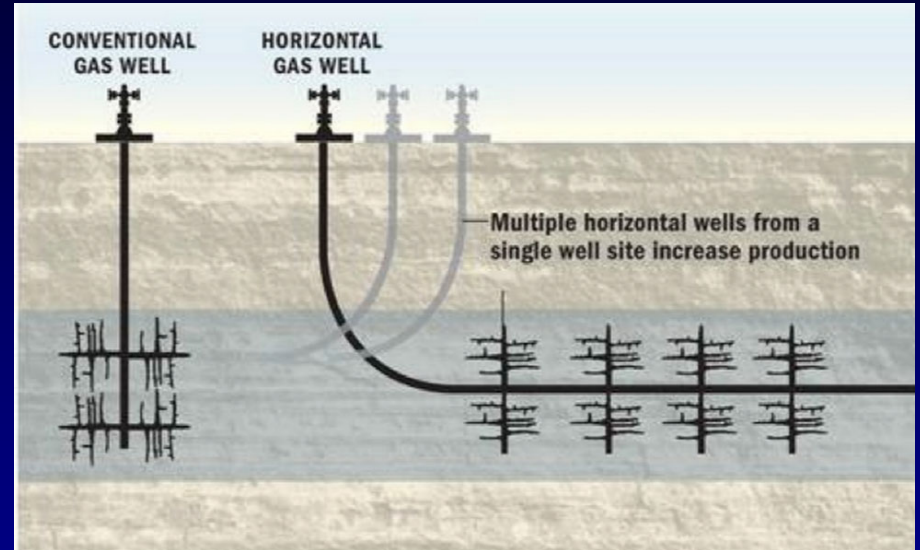
Perm Perspectives

Each green line is x10 SMALLER scale.



Why Horizontal?

- K (perm) is fixed
- Area
 - Bigger Fracs
- Length
 - Longer laterals

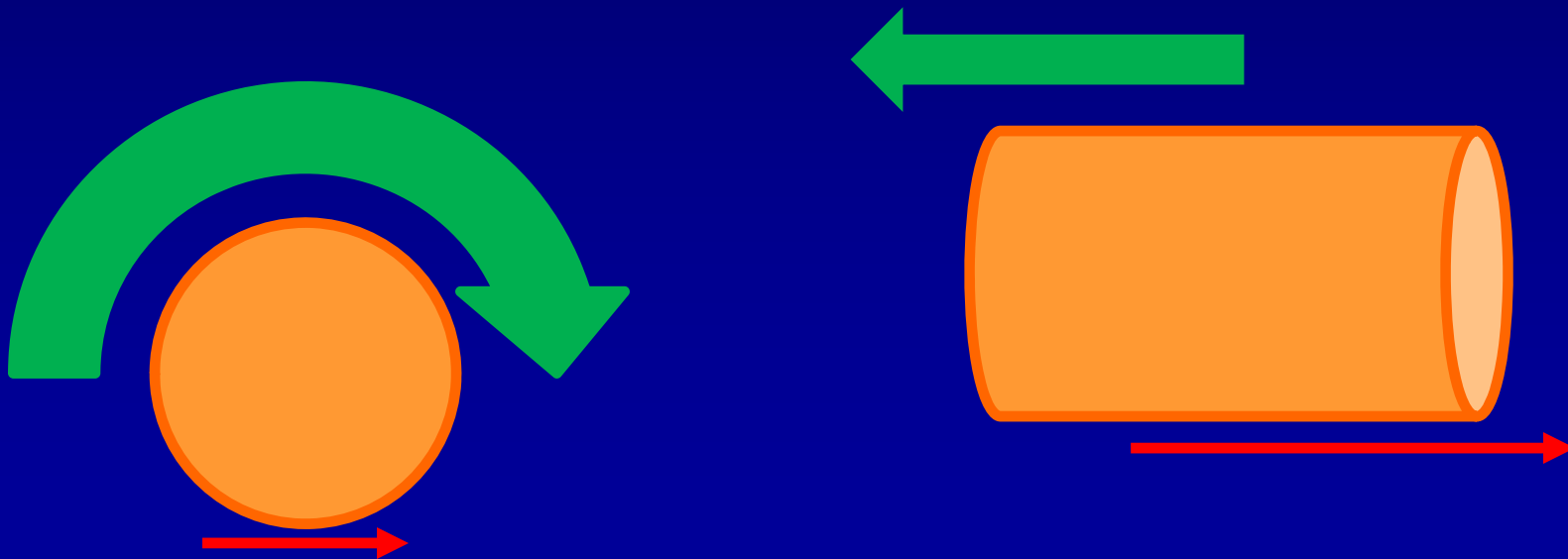


Horizontal Well: The Challenge

- Deliver a problem-free, horizontal well capable of producing economic quantities of hydrocarbons
- Drill a well two miles deep (TVD)
- Then drill that same well with a two mile lateral (TMD)
- Under budget
- Minimal “Spud to Sales”

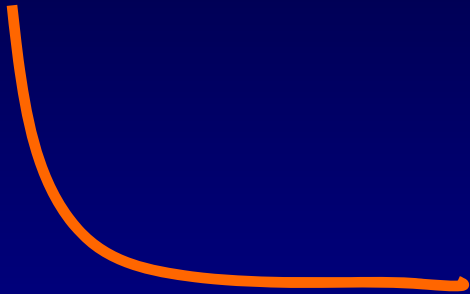
Torque & Drag

- Torque = Force * Distance (ft-lb)
- Drag = Force (lb)
- Static Friction

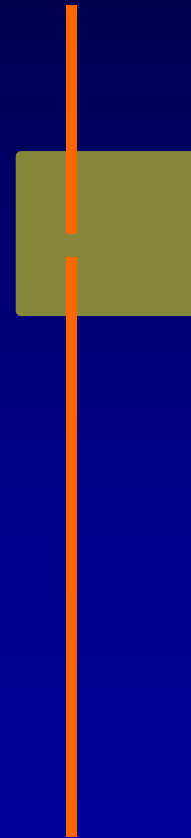
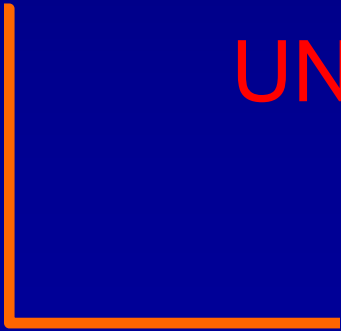


2D Well Profile & Plan

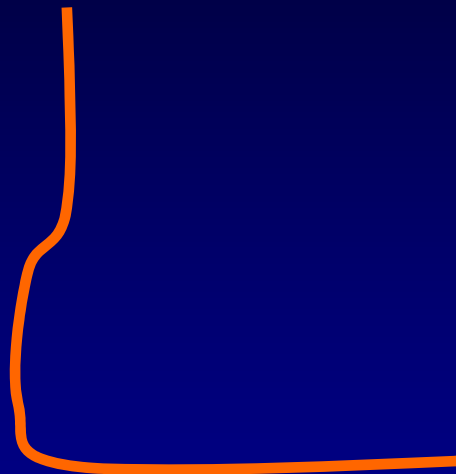
UNECONOMIC



UNECOMLETEABLE



3D Well Profile & Plan



ECONOMIC



COMPLETEABLE



Summary

- Resource plays and tight formations require massive hydraulic fracture treatments, and in most cases horizontal wells increase project economics.
- Horizontal wells are complex in nature and require substantial amounts of planning and modelling.

Questions