



# Revitalizing the Fayetteville Shale

Challenges of the past fading to the technology of today

# 2025 Fayetteville Reintroduction

*Shale we step into the past?*



## Upstream

- ~5,300 operated wells
- 100% HBP acreage with High WI/NRI
- Current gross production of ~760 MMcfd

## Infrastructure

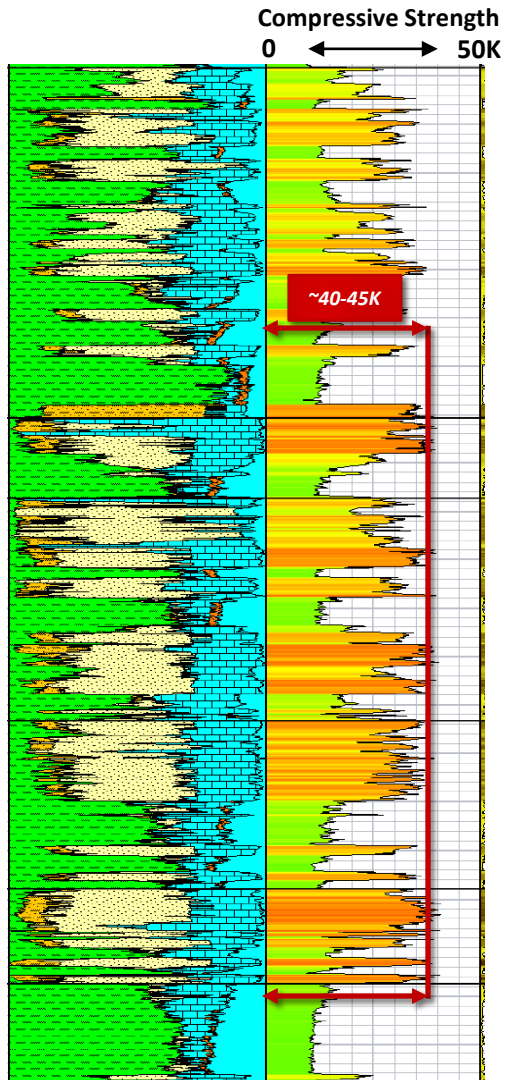
- Over 3,000 miles of buried gathering pipeline
- One of the largest compression fleets in the US with ~400,000 HP
  - 80 Compressor stations

## Drilling Performance Impact

- Improved to 450 upside locations
- 2.7% IRR increase per 1000' LL
- Full program contributes 30% volume growth, with a 30% IRR

# Application Overview

You're going to do *WHAT!?*



## ■ The early days 2010-2016

- Spud air rig utilized to drill surface and part of the production vertical
- Air drill through the Hale sands into the Hale shale
- Bring in big rig for drilling curve lateral on OBM
- A few operators started moving towards fluid drilling in the late stages of the programs
  - Drilled PDC into ORR sands
  - 2 Roller cones through the hale sands
- The movement from air to OBM drilling was to eliminate some hole problems with air and mist drill
- Average offset Lateral length 5,609'

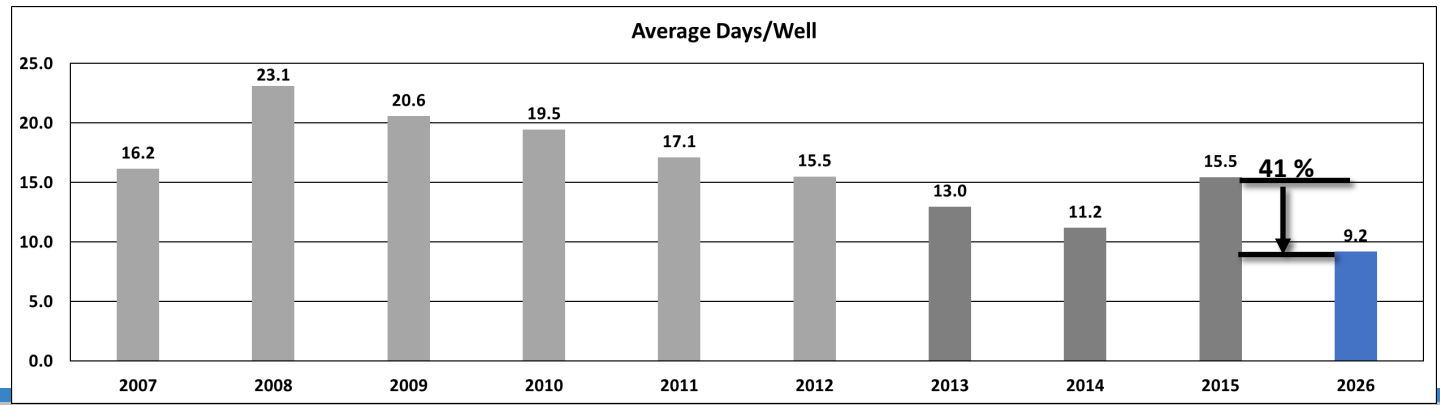
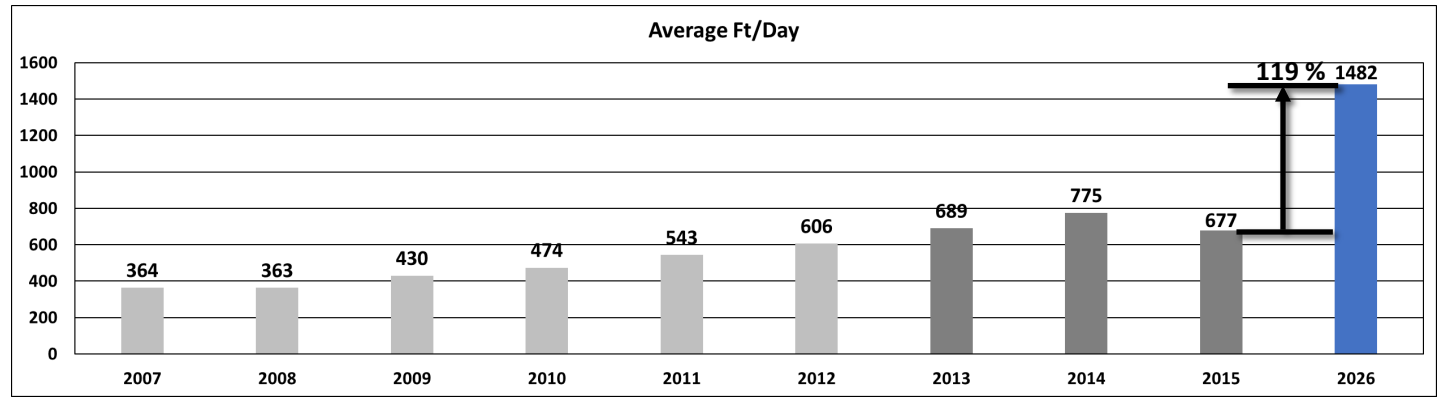
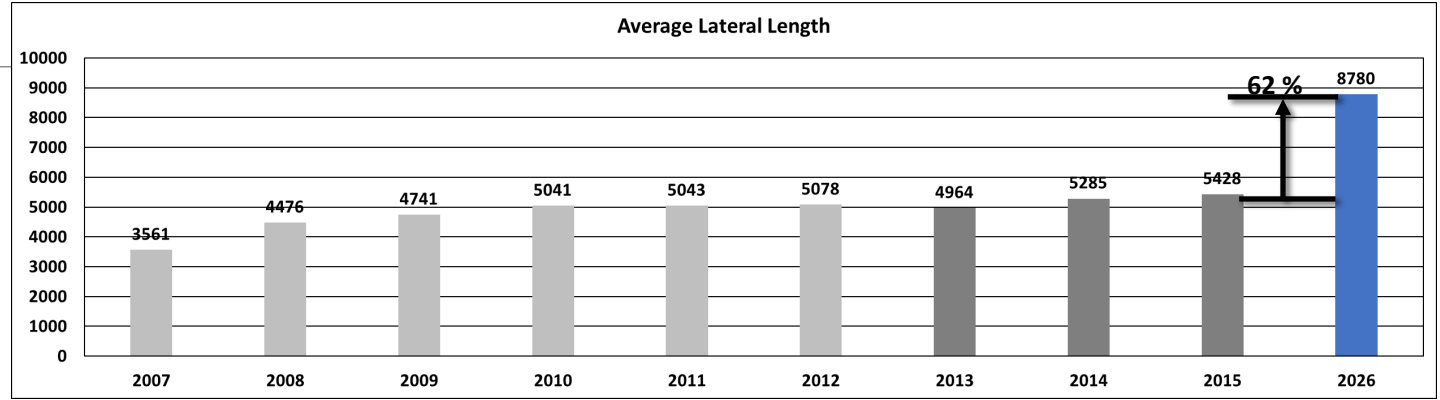
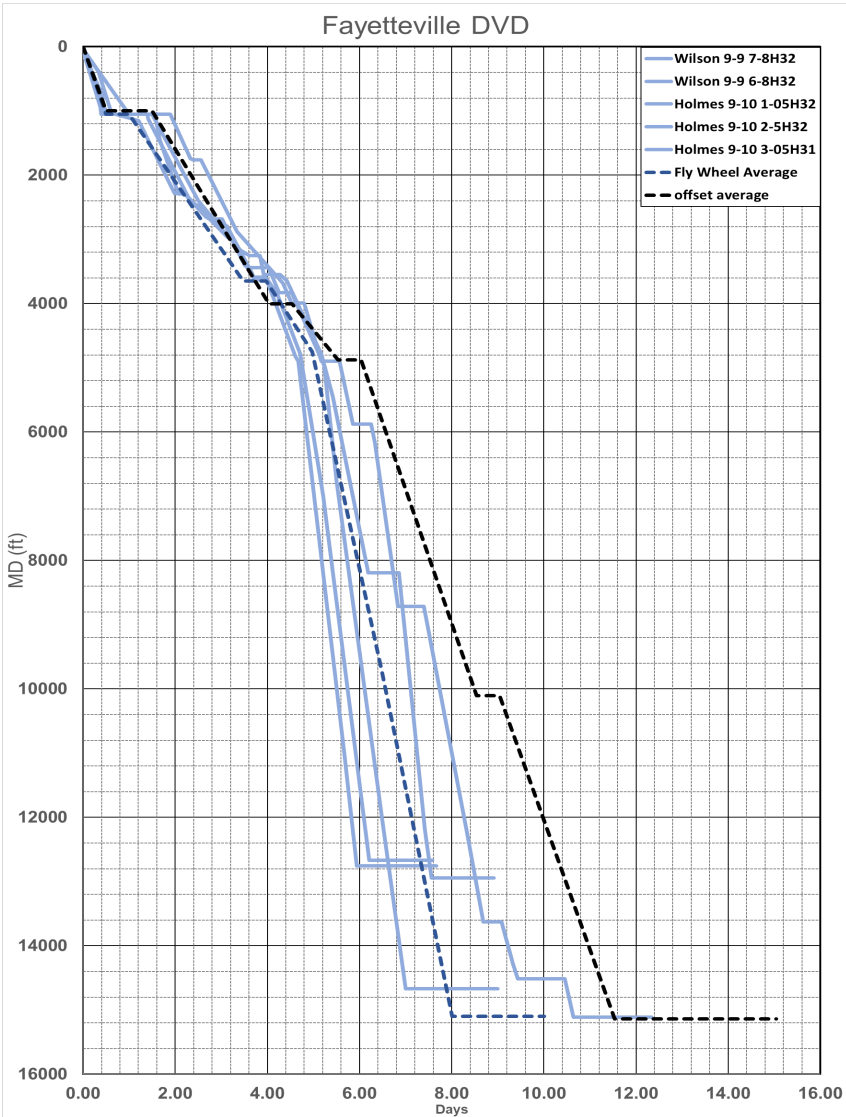
## ■ Modern Drilling Flywheel Approach

- Planned to drill all sections on fluid surface through production
- Drilled surface on WBM
- Production drill with OBM
- Betting on modern PDC technology to drill vertical
  - Average 3 bits per vertical
- Curve/Lateral RSS implemented after first well
  - First pad average 9,955' Lateral
  - Second pad averaged 8,000' Lateral

5 ½" Production Casing

# 2025 Fayetteville Infill Development Program

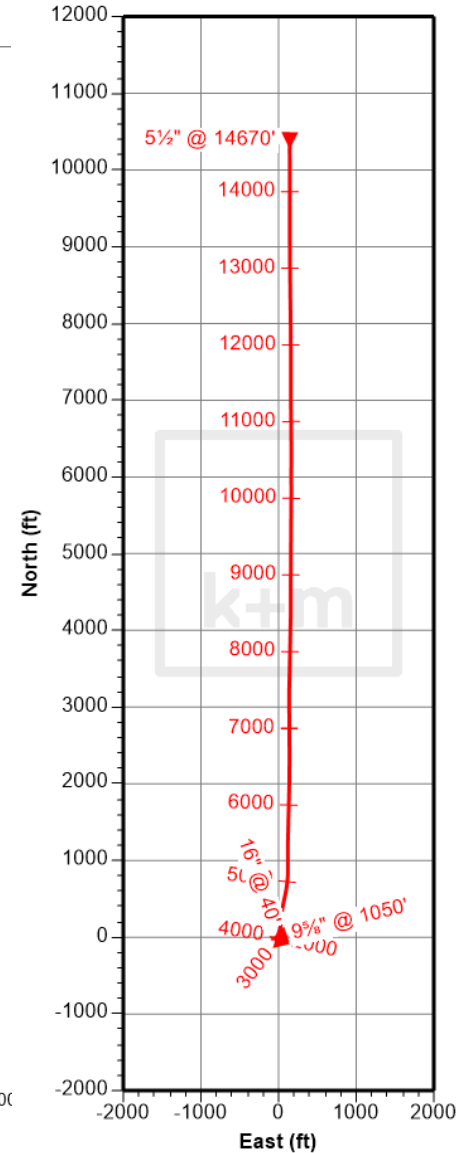
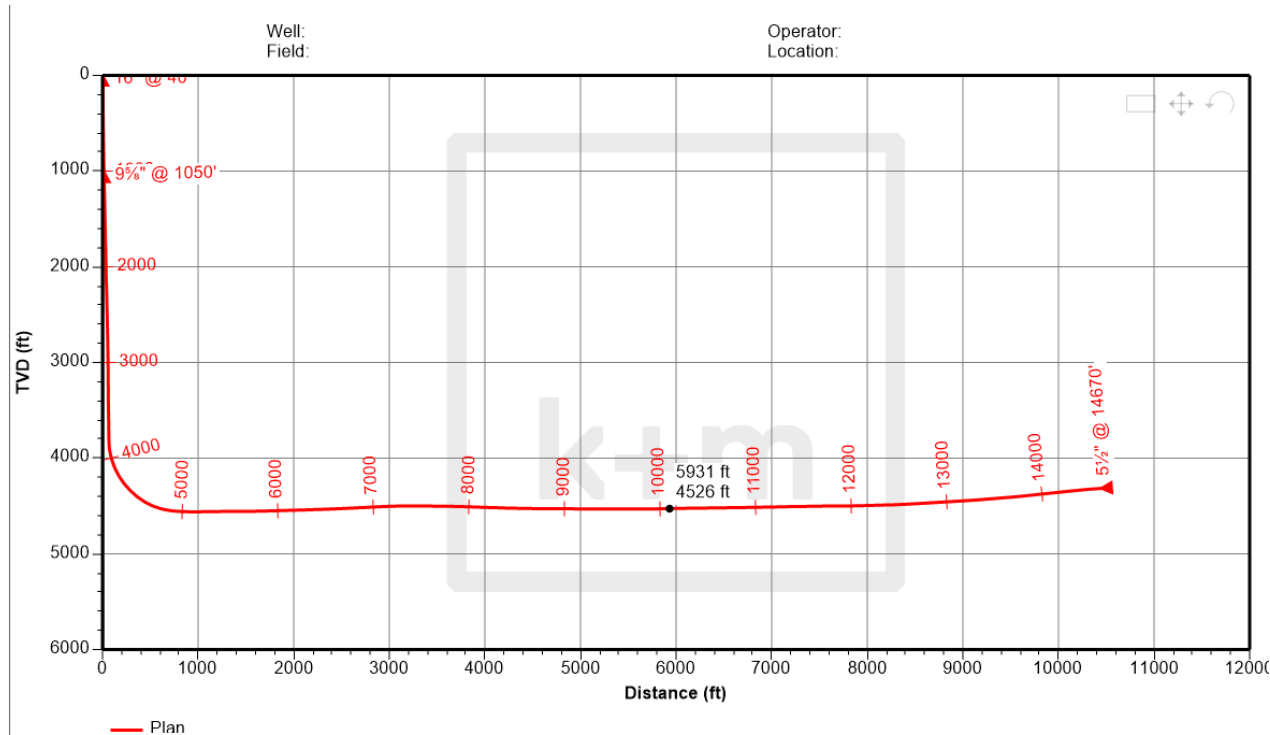
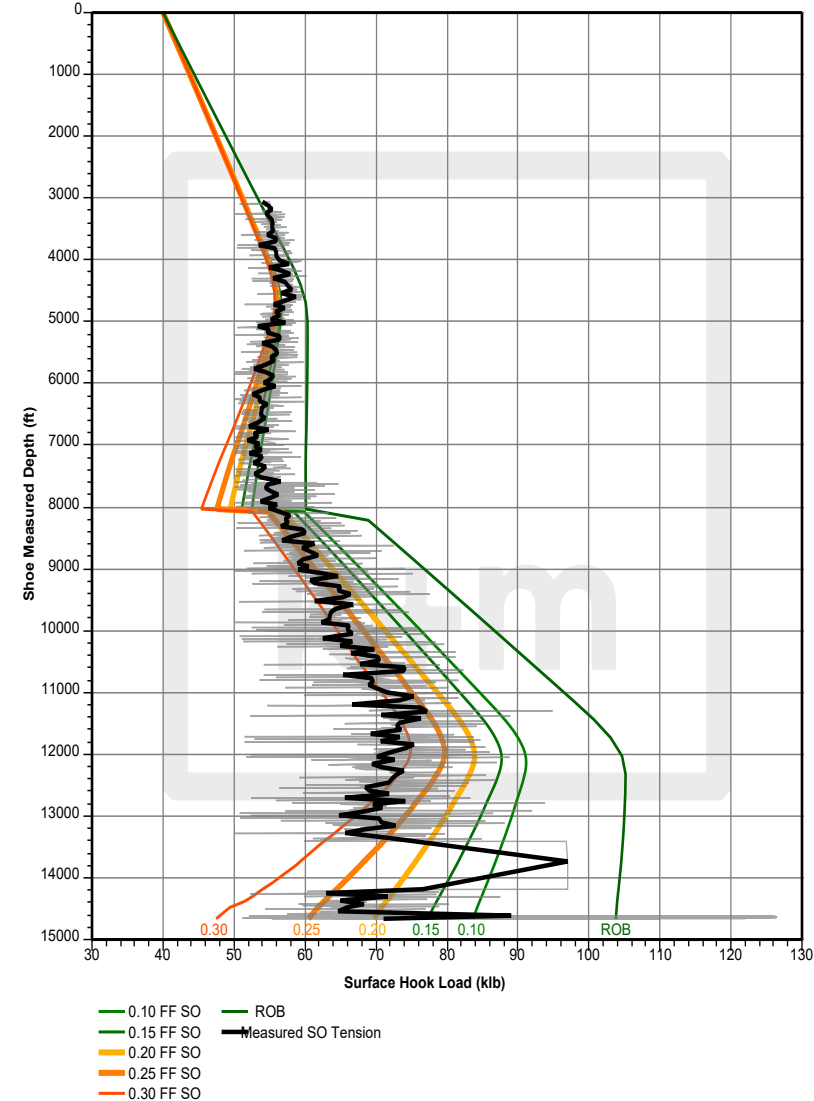
## Appraisal Program Pad Summary



# Drilling Torque and Drag Operations

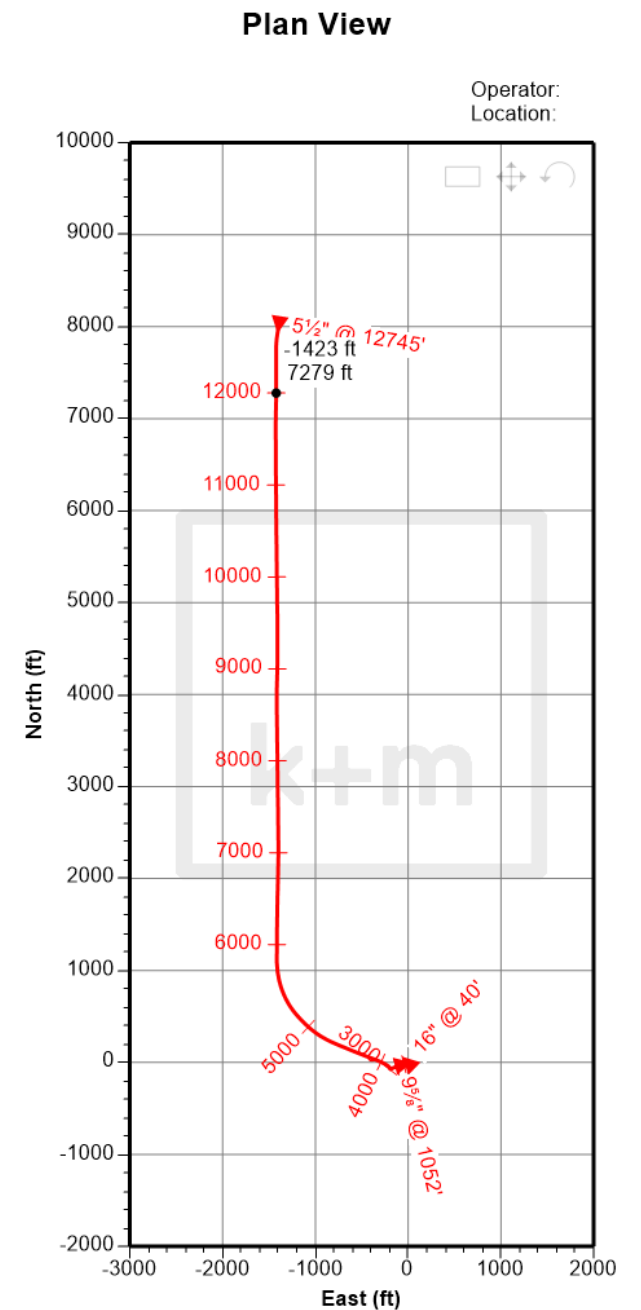
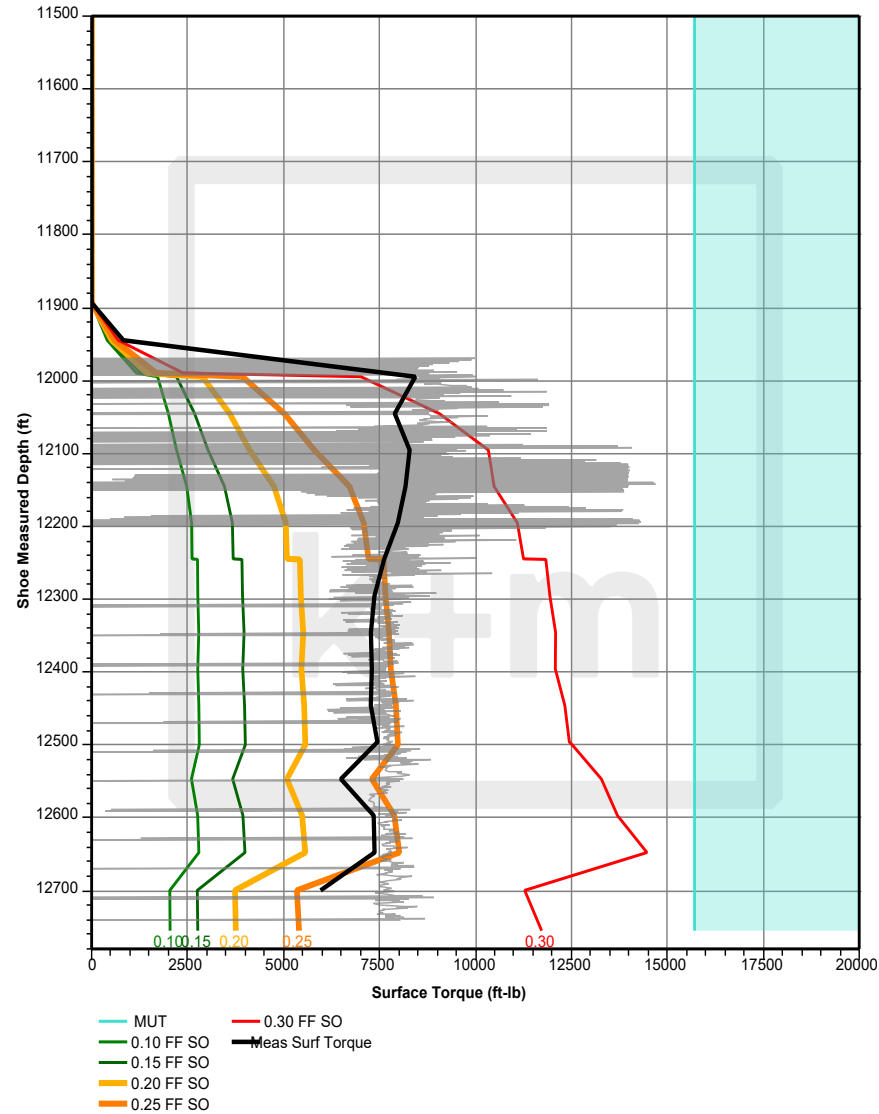
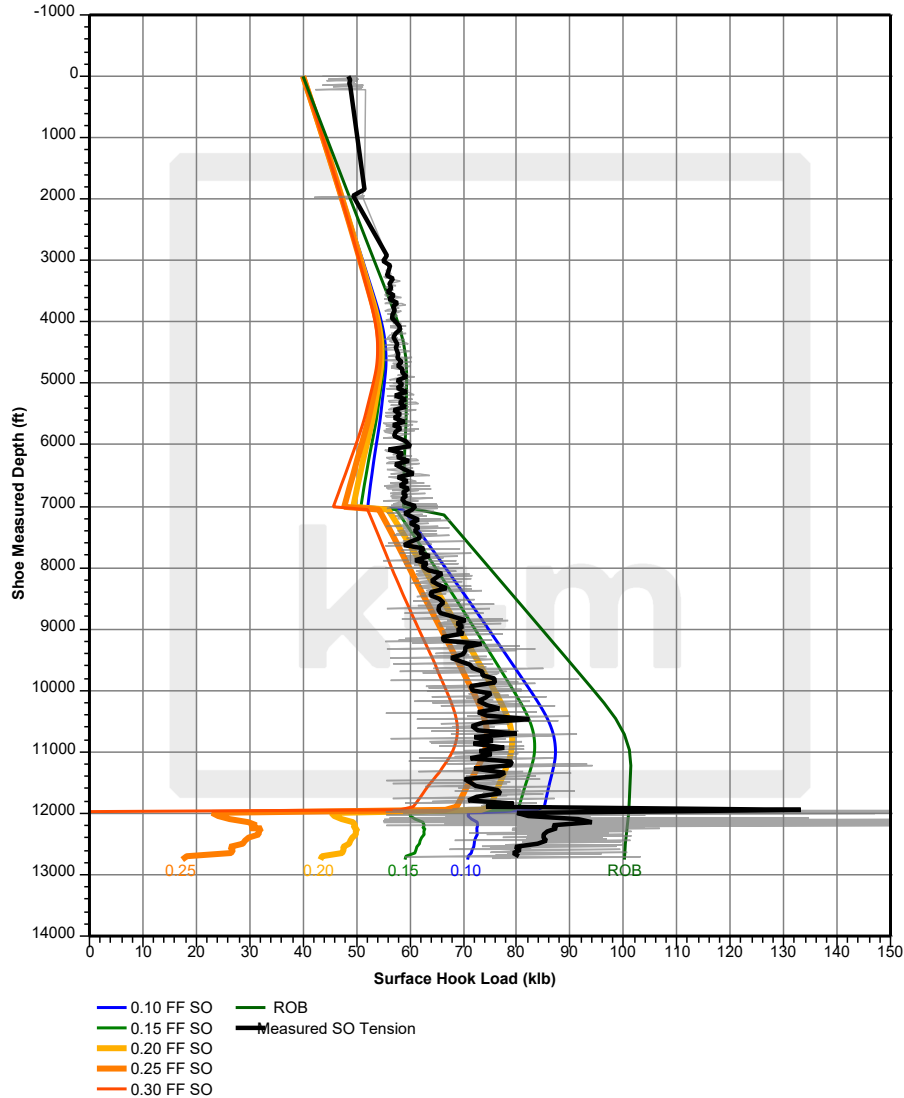
## Torque and Drag Calibrations

- First well to utilize RSS in curve and lateral
- 9,703' lateral
- ~4,500' TVD 2.2:1 LL to TVD
- Casing floated to bottom with out issues
- .25-.30 FF seen while running casing



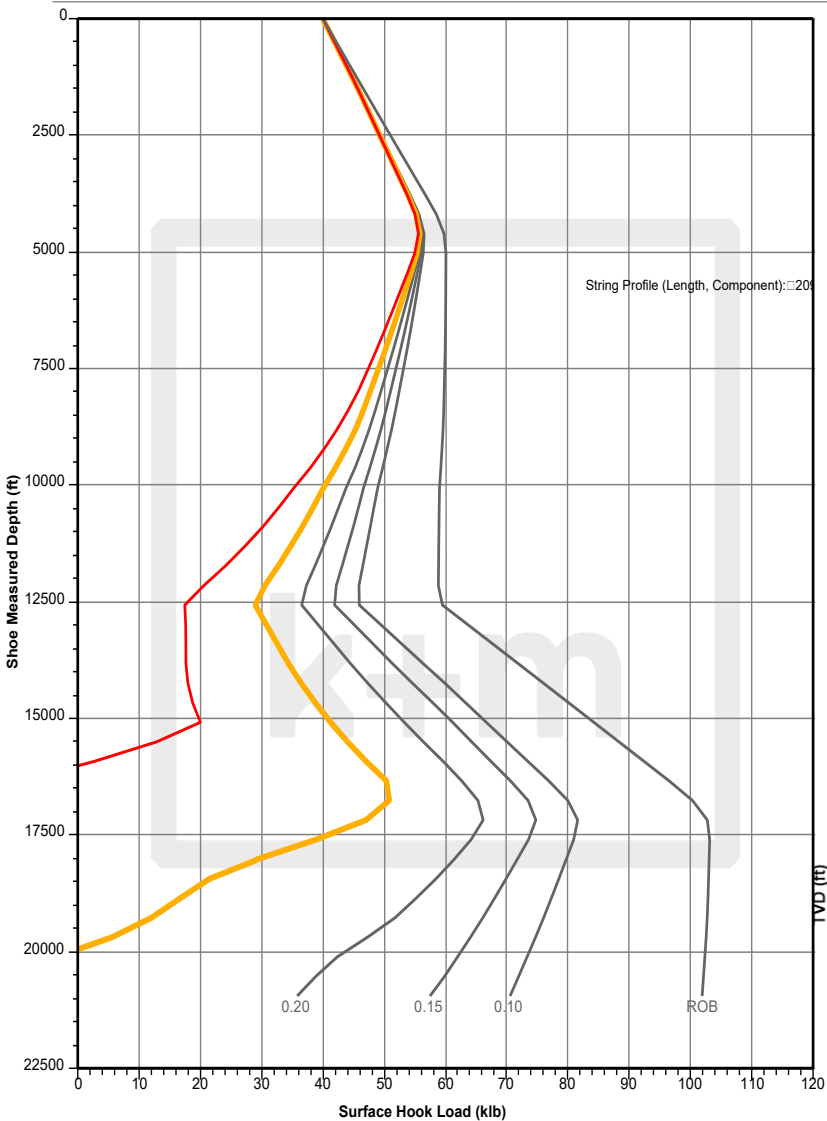
# Drilling Torque and Drag Operations

## Torque and Drag Calibrations

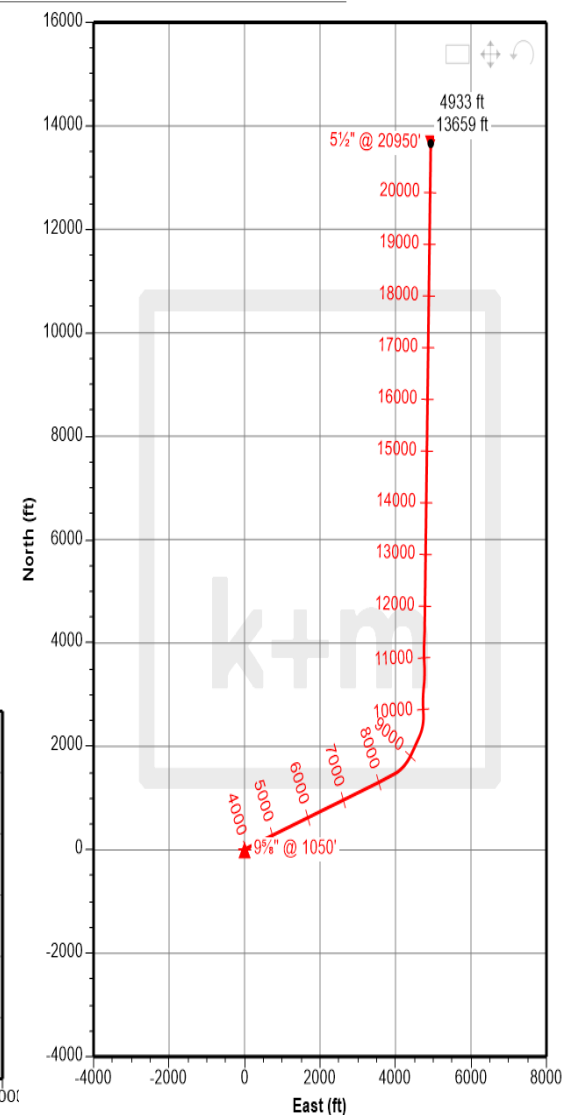
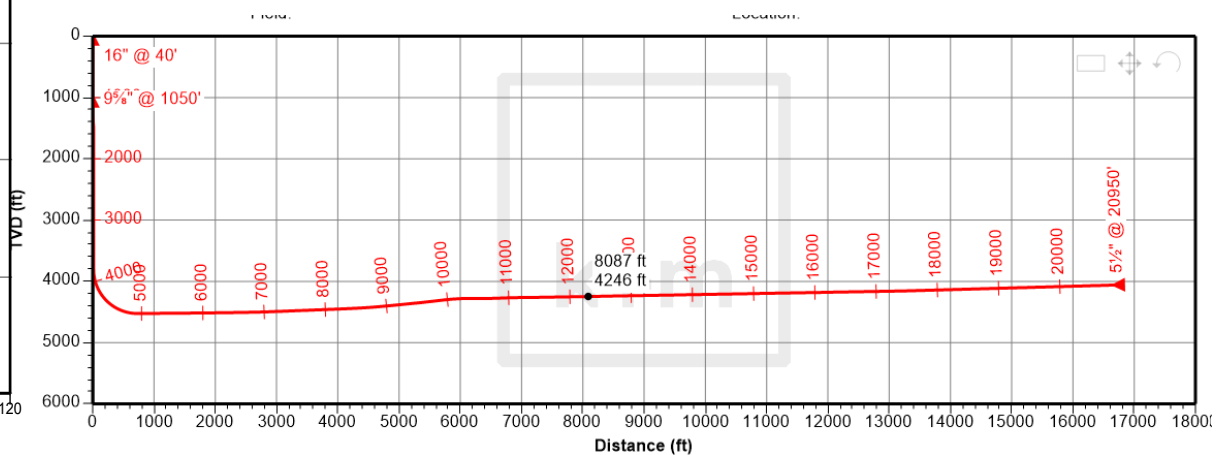


# Torque and Drag Operations

## Casing Run: Floated (17# 5 1/2" Production Casing)

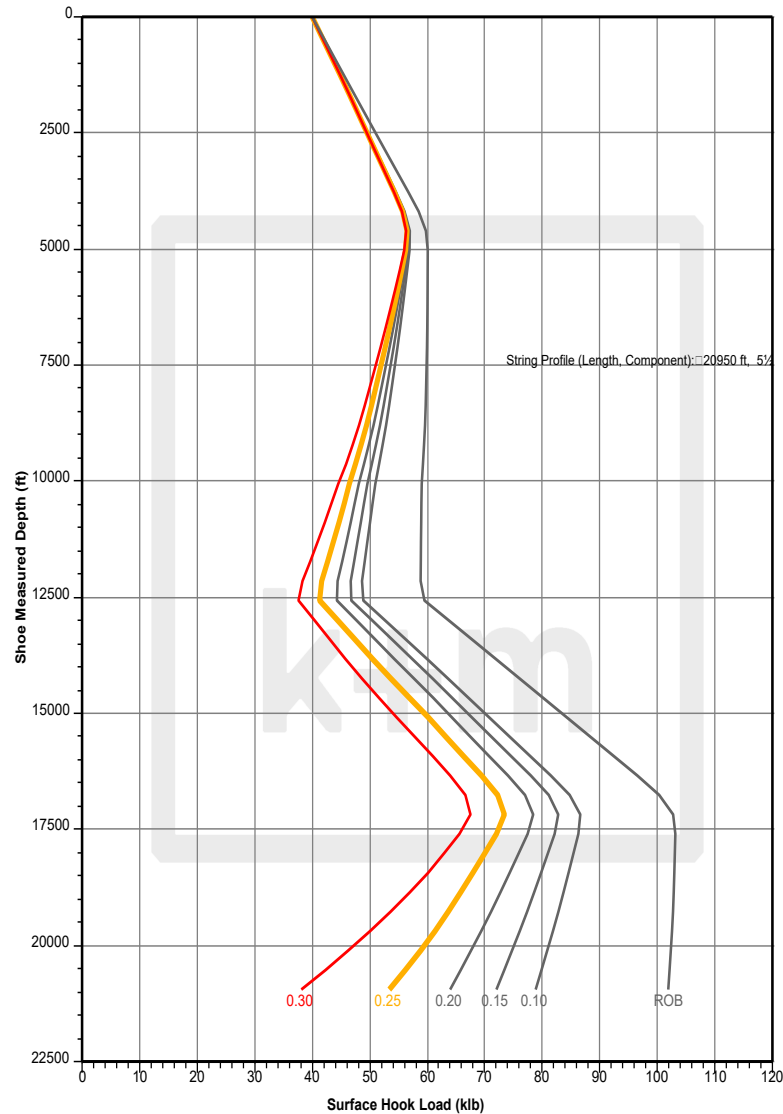


- Most aggressive well path for first pad
- ~4,200' TVD with ~ 16,000' lateral 3.8:1 LL to TVD
- Optimized Aril lock depth is ~3,500' in the lateral ~8,400 MD
- Floating in casing alone is not enough based on .25-.3 FF

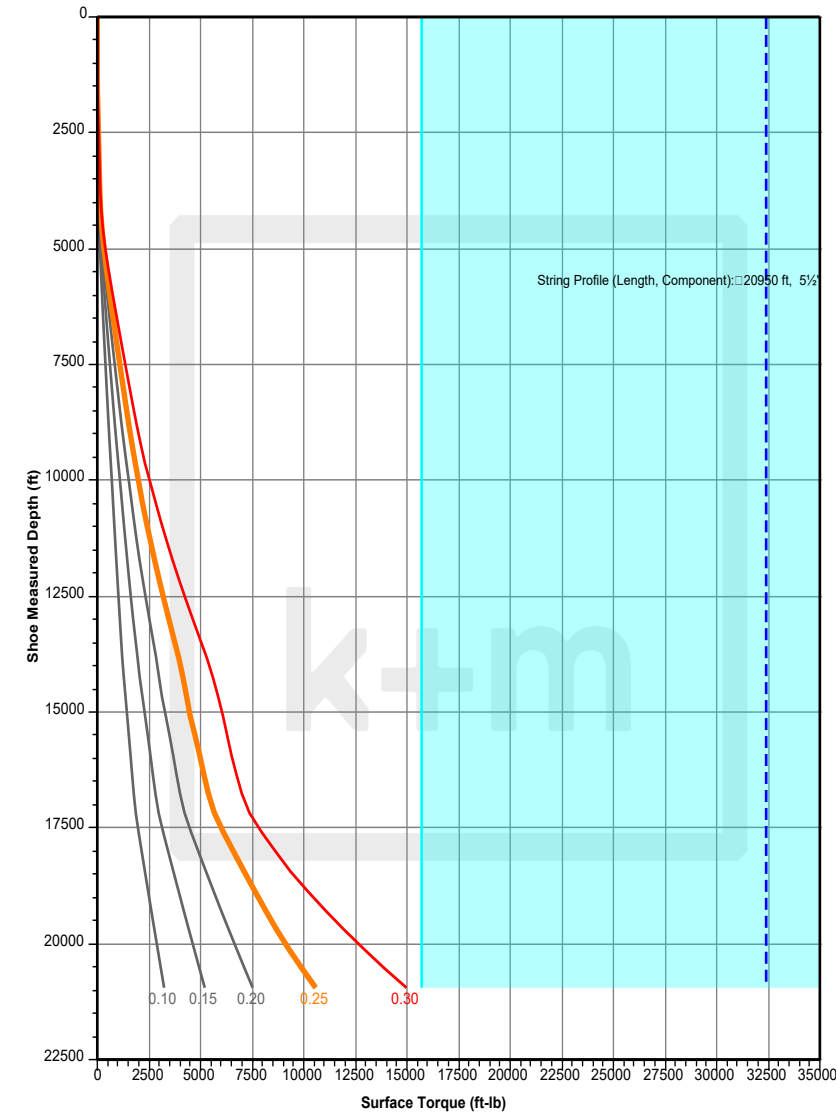


# Drilling Torque and Drag Operations

Casing Run: Floated + Dry Ream (17# 5 1/2" Production Casing)

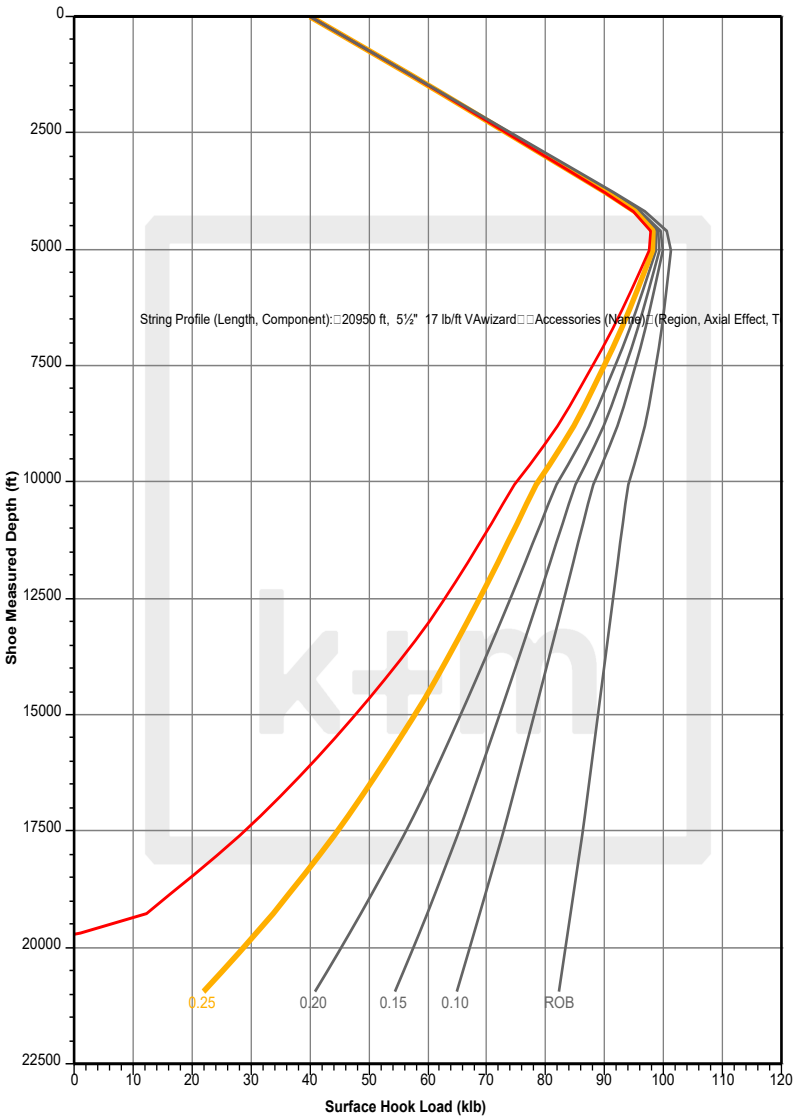


- Rotating 30 RPM at 45 ft/min run in speed
- Starting rotation as early as 12,500'
- This will ensure keep casing moving smoothly
- Towards TD slowing running speeds may be needed
- Dry rotating in hole at .25 FF based on calibration
- Modeled torque is 10,640 Ft/LBS which is 67.7 % of max make up torque
- 17# casing is marginally built for best case scenario

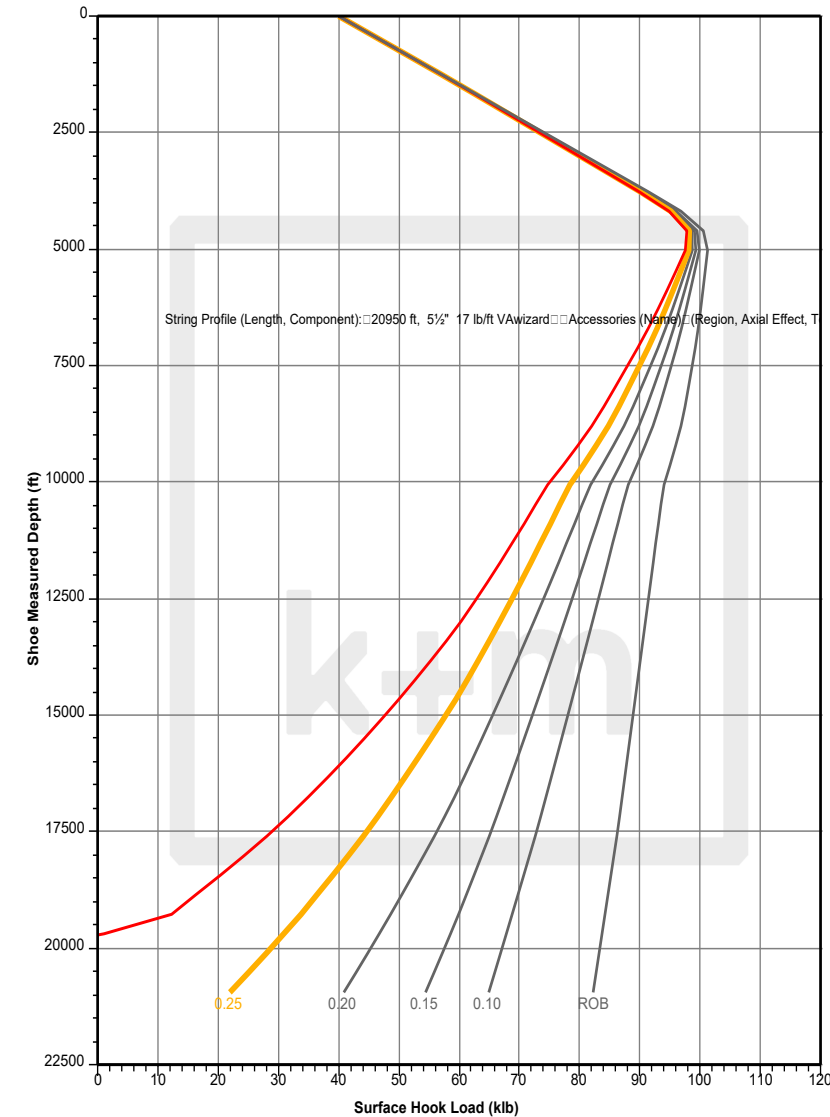


# Drilling Torque and Drag Operations

## Casing Run: Rotating and Pumping (17# 5 1/2" Production Casing)

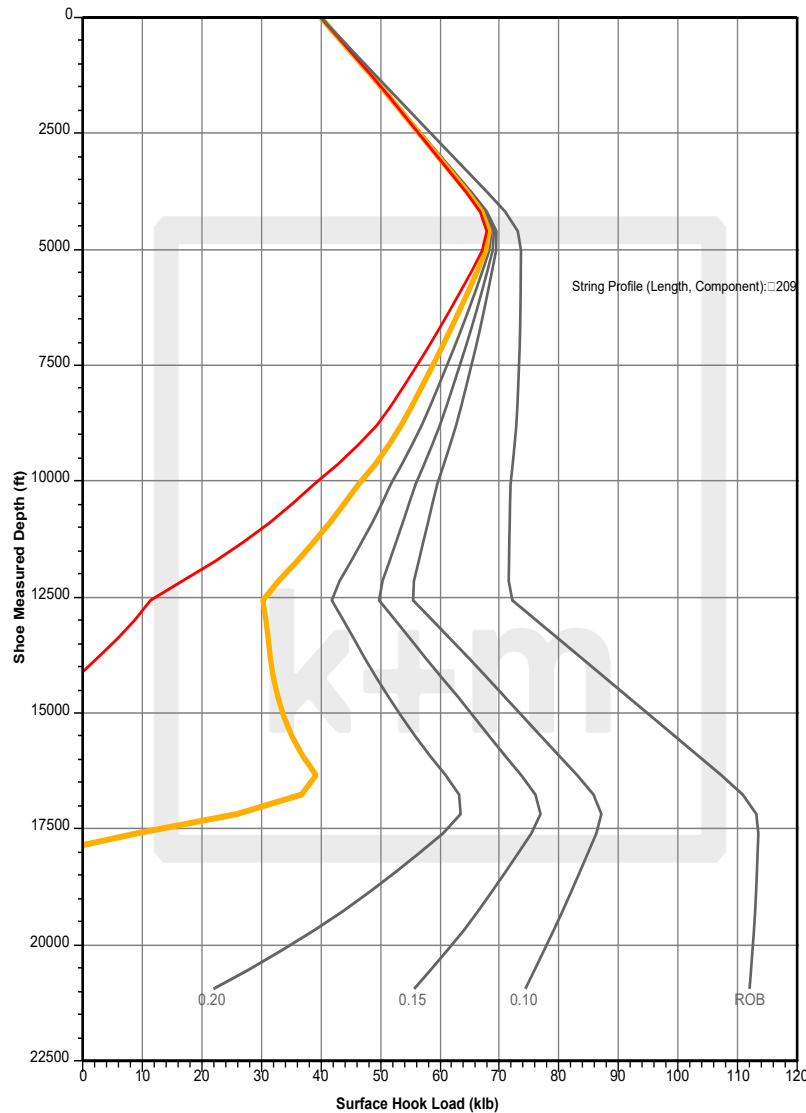


- Worst case scenario of needing to rupture air lock and circulate and rotate casing in hole
- We are only concerned with the part from 12,500' to TD
- On a .25 FF it shows we would be marginal at TD on hook load at 20 Klbs
- Looking at the chart the min hook load to maintain block weight and torque max is ~16,300'
- 17# 5 1/2" casing is under designed for filled casing, pumping and rotating



# Drilling Torque and Drag Operations

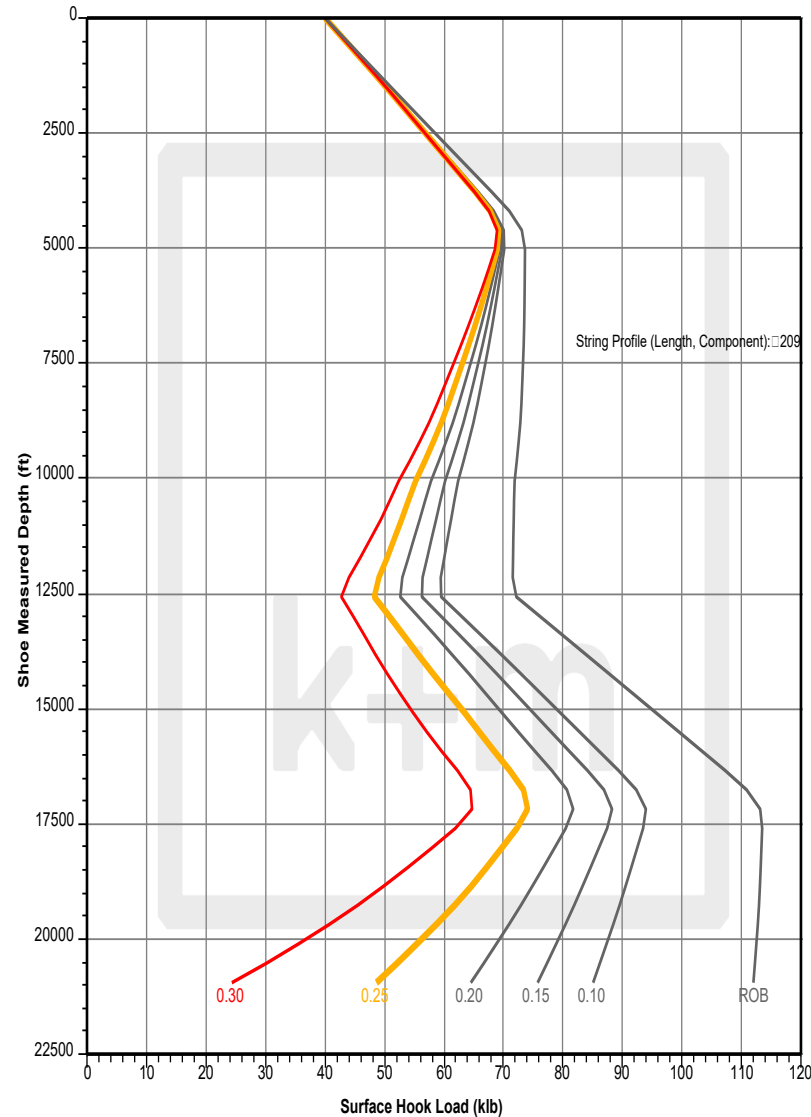
Casing Run: Floated (20# 5 1/2" Production Casing)



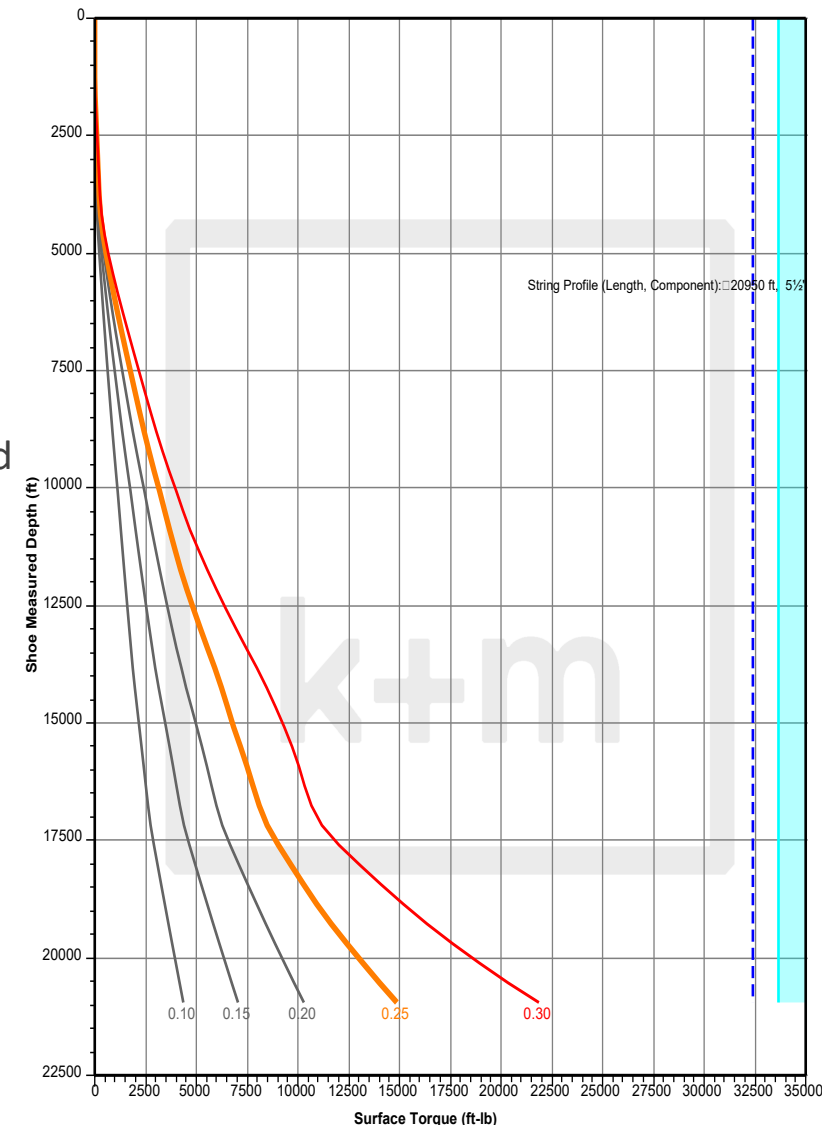
- Broom plot represents the running in hook loads floating in casing
- At this is before the air lock is put in the string and running in evacuated
- AT 12,500' we start filling casing with air lock but never gain hook load back to min requirements of 45-50 klbs to run in casing
- 20# casing will require floating and rotation to reach TD with casing
  - The point to start rotating is going to be closer to ~10,500' with the heavier casing

# Drilling Torque and Drag Operations

Casing Run: Floated + Dry Ream (20# 5 1/2" Production Casing)

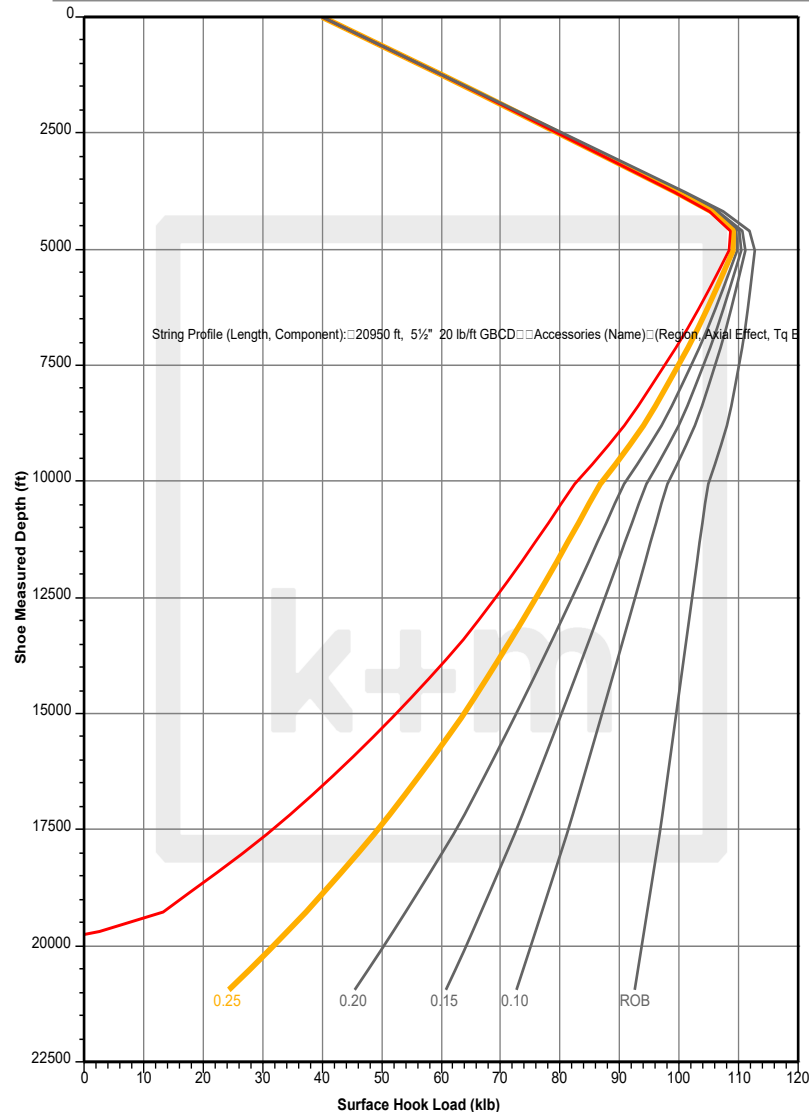


- Rotating 30 RPM at 45 ft/min run in speed
- Starting rotation as early as 10,500' when filling pipe may be needed to get casing to bottom
- Rotating casing without pumping will have our Hook load above block weight of 45-50 Klbs
- Reduce running speeds close to TD may be required
- Dry rotating in hole at .25 FF based on calibration
- 15,000 Ft/LBS which is 44.5 % of max Operating torque and 42% of max make up torque

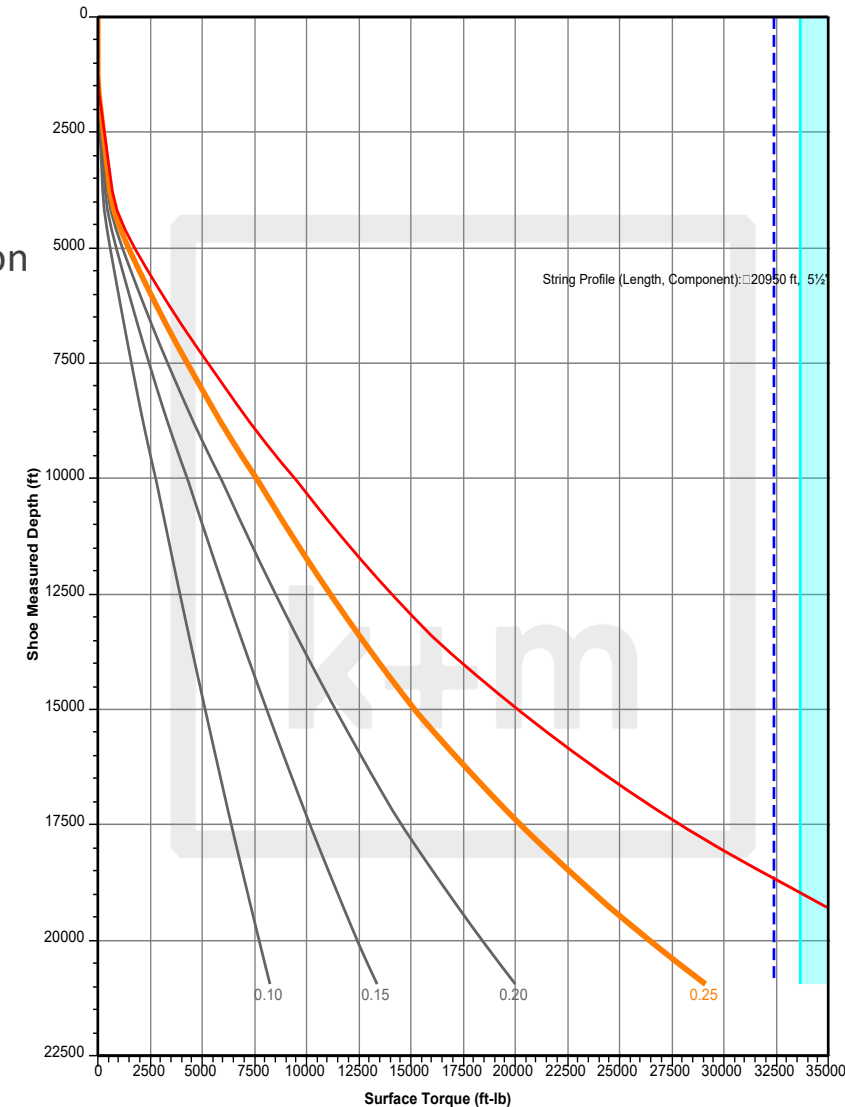


# Drilling Torque and Drag Operations

## Casing Run: Pumping and Rotating (20# 5 1/2" Production Casing)



- Worst case scenario of needing to rupture air lock and circulate and rotate casing in hole
- On a .25 FF it shows we would be marginal at TD on hook load at 20 Klbs
- 5.5 " 20 # GBCD max torque will not be reached running 30 ft/min
- Will most likely have to monitor and slow running speeds
- Running 10 ft/min reduces predicted torque to 17,800 ft/lbs at a .25 FF along with increasing running in hook load to ~75 klbs



# Program Challenges

*Drilling on the Dark side of the moon*

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## ▪ **Struggles of a five well appraisal program**

- Finding service companies that can service 3-6 hrs from home (OK, and East TX based companies)
- Having a large in basin service company selection is a luxury

## ▪ **Utilizing as many local vendors as possible**

- Service companies based in Arkansas were not prepared to handle the needs of the first five wells
- Cuttings and waste fluid haul off was the most affected by facilities not being open 24hrs and/or weekends
- Rig pace was more than a lot could handle and more than they thought it would be

## ▪ **Moving Forward**

- Having earlier communication with vendors in basin about staffing up for demand
- Leverage our multi basin operations for additional service company help

## ▪ **Drilling Challenges**

- Pushing the Lateral length and Trajectory (U,L,J type wells)
- 6.84 Average DDI for appraisal program, with 7.08 seen on the longest well
- First pad most difficult well be a 7.1DDI



**FLYWHEEL**  
E N E R G Y

**Questions?**