

Advantages of Plunger-Assisted Gas Lift (PAGL) over Conventional Gas Lift in the Eagle Ford Shale Play

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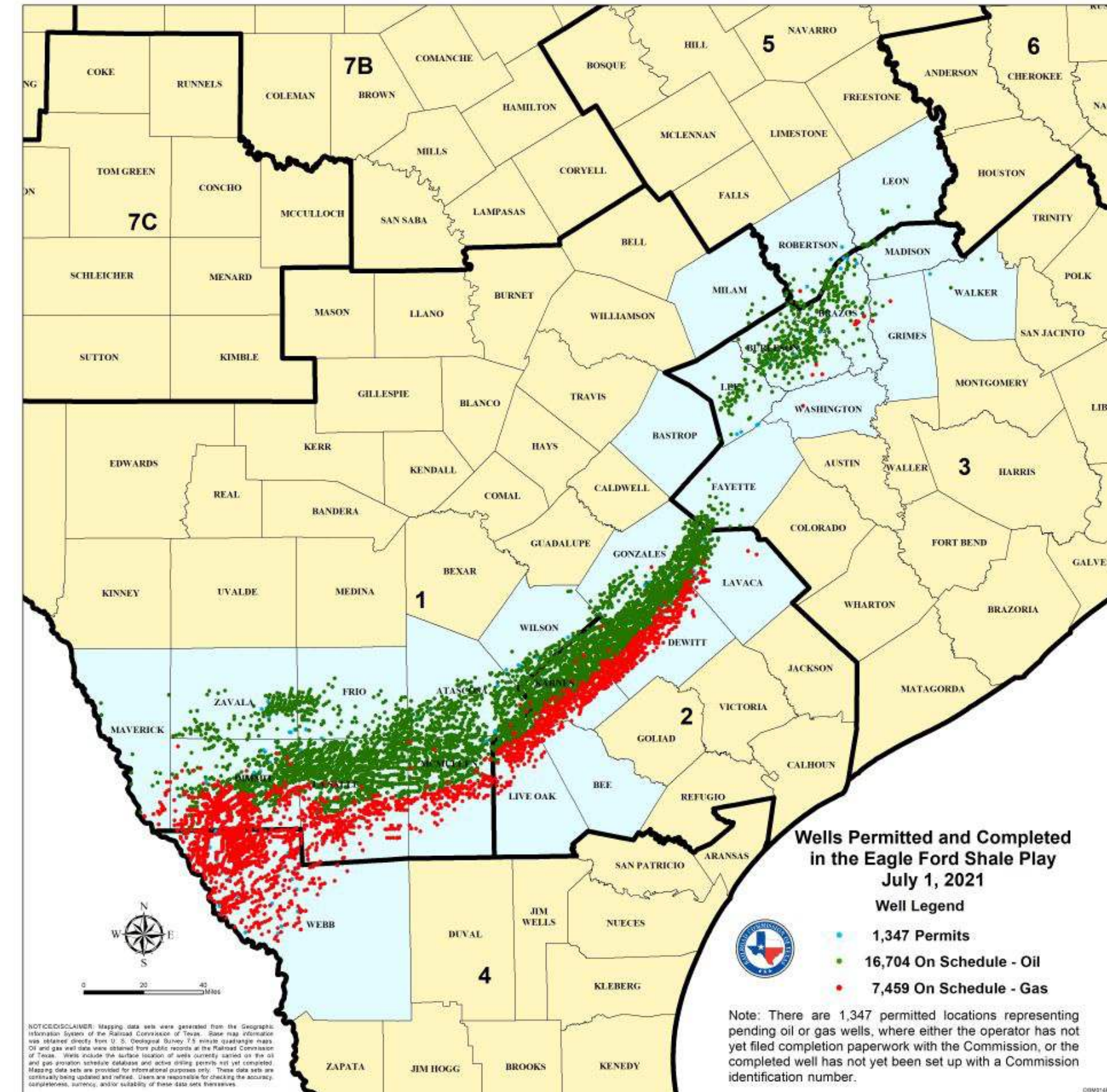
This case study focuses on the efficiencies gained and the cost-savings realized by an operator (Validus Energy) in the Eagle Ford basin.

- Installing plunger-assisted gas lift (PAGL) over a gas lift system.
- Track production and pressure of the candidate wells before and after the addition of the plunger

Validus Energy is a Denver-based exploration and production company focused on the operation of a large-scale portfolio including drilling locations and producing wells, located primarily in the Eagle Ford Shale. Their operations team is experienced and dedicated to profitable management of their assets while mitigating their impact on the environment and ensuring the safety of their employees, contractors, and communities.

The Eagle Ford Shale is a hydrocarbon-producing geological formation of significant importance due to its capability of producing both natural gas and oil.

Although rod-pumped wells are a prolific lift-type in this play¹, Gas lift has been used extensively in many of the producing counties.



As the gas usage efficiency of a gas lift system declines due to a decline in liquid production, a plunger can be combined with gas lift can optimize production, lower the flowing bottom hole pressure (FBHP), and extend the gas usage life span of the artificial-lift system.

Many operators also experience mitigation of paraffin and scale issues with the addition of a plunger to the gas lift system.



Validus inherited over 400 wells with a portion of the wells requiring optimization and improvements upon acquisition of the assets.

PAGL application was selected to optimize these wells:

- By-Pass or Continuous Flow Plunger was selected for scope of work
 - Reduce shut-in times
 - Operate in higher gas and liquid volumes



PAGL installation is to determine operating point of the existing gas lift system:

Ways to determine POI:

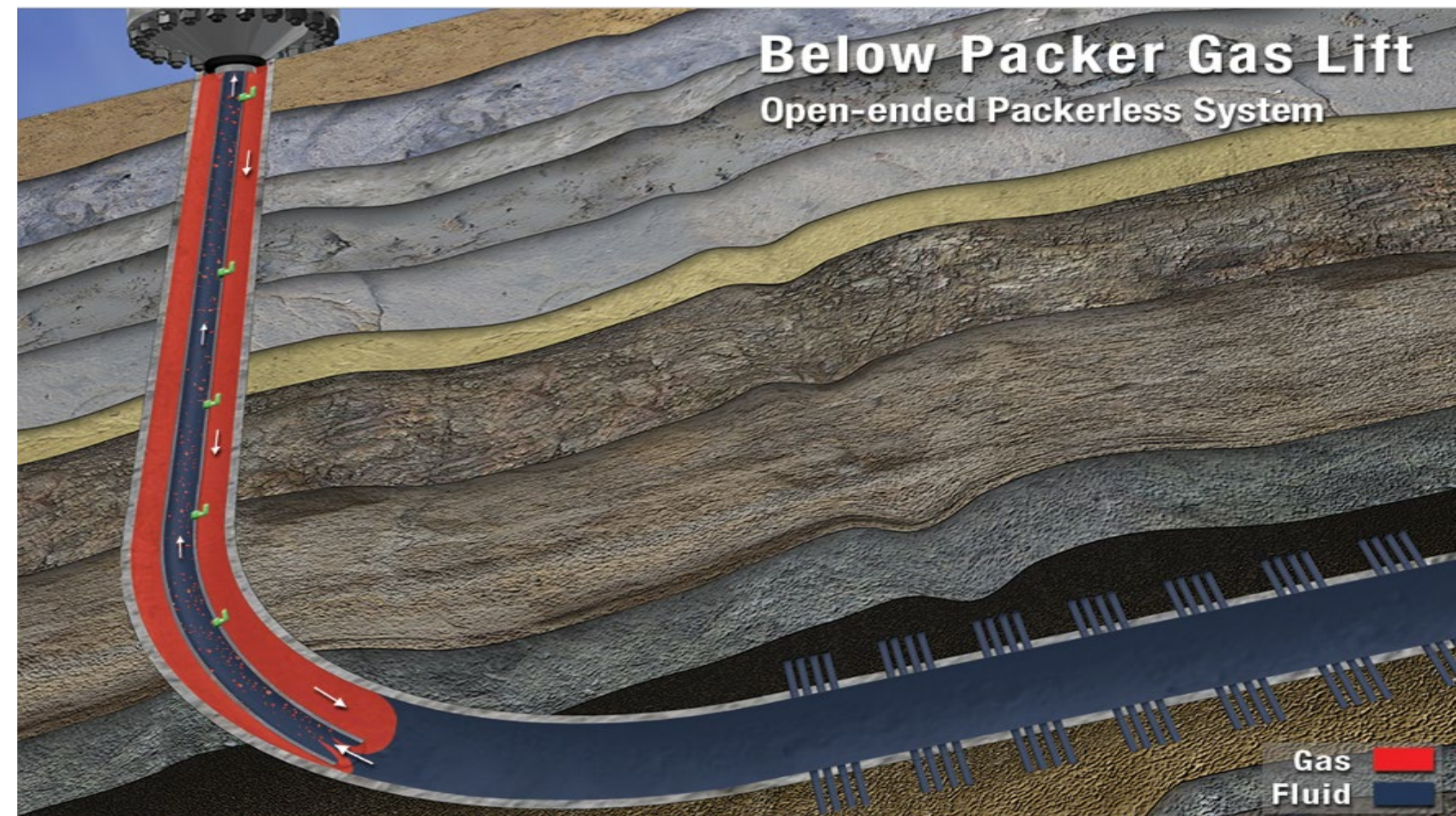
- Read current injection pressure.
- Compare wellhead casing pressure to PSC pressure of gas lift valves installed in the well.
- Run multiphase flowing gradient against installed design to predict injection point.
- Run Flowing Pressure/Temperature Gradient to identify operating point of injection

PAGL installation is to determine operating point of the existing gas lift system:

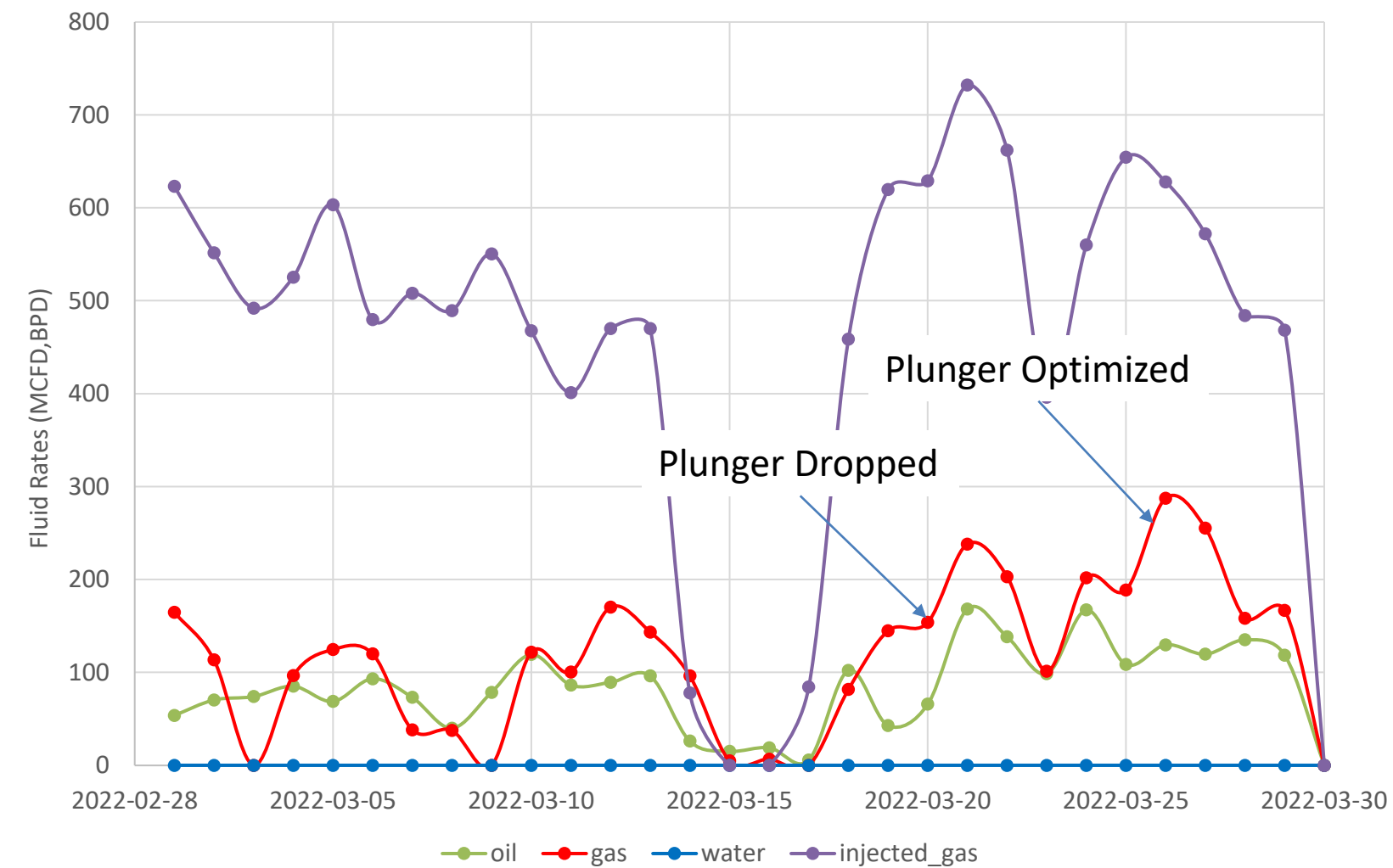
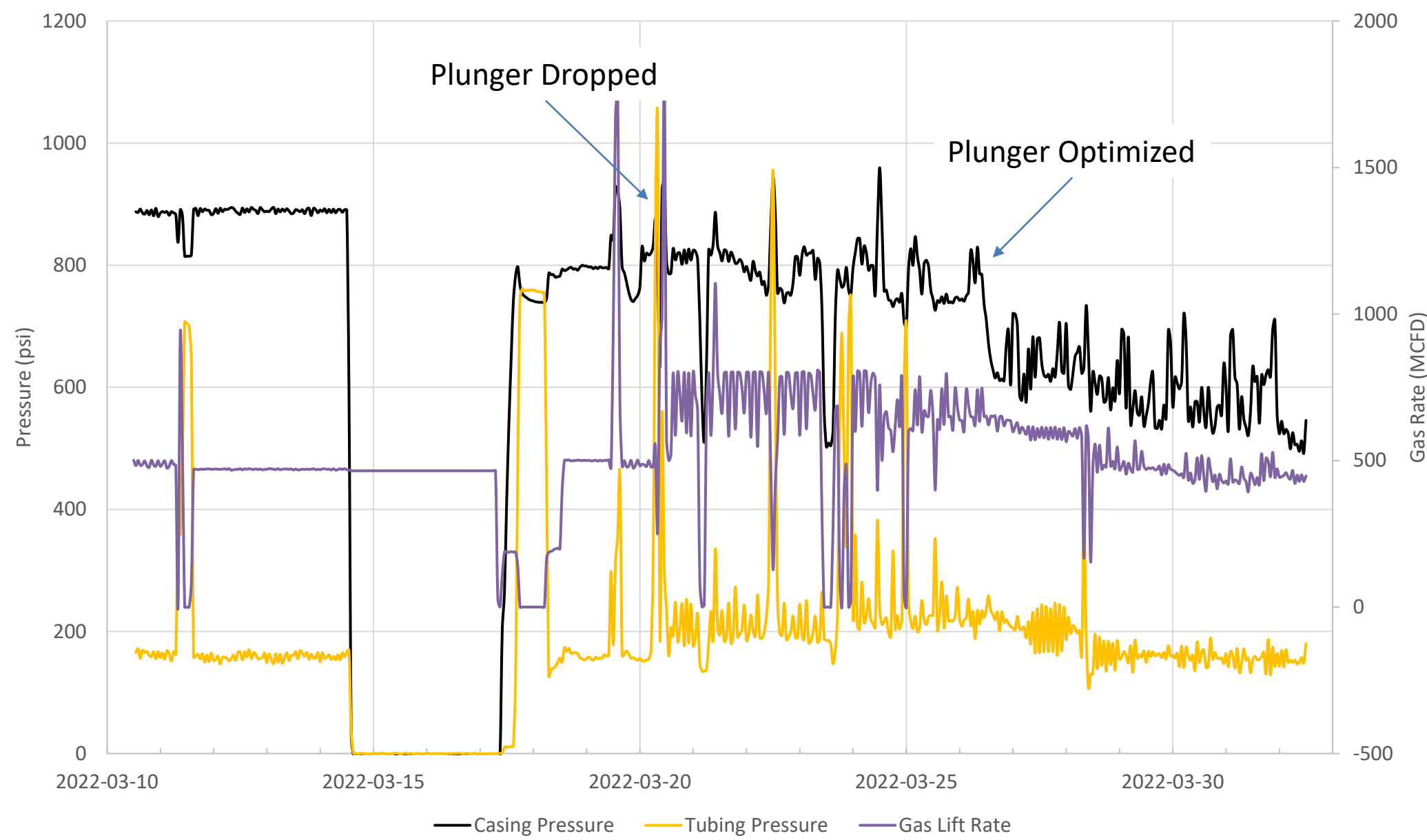
1. Monitor the injection casing pressure.
2. Ensure that the well is not operating/injecting on multiple valves.
3. Determine where plunger equipment should be installed.
4. Bumper spring was landed above the EOT.

Well A is a maturing gas-lifted well.

- Packer-Less Wellbore Set up w/ unloading Gas Lift Valves
- 2 7/8" Production Tubing
- EOT @ 10,189' MD
- Injection Gas Rate = 600 mcfd
- Total Liquid Production = 75 bfpd



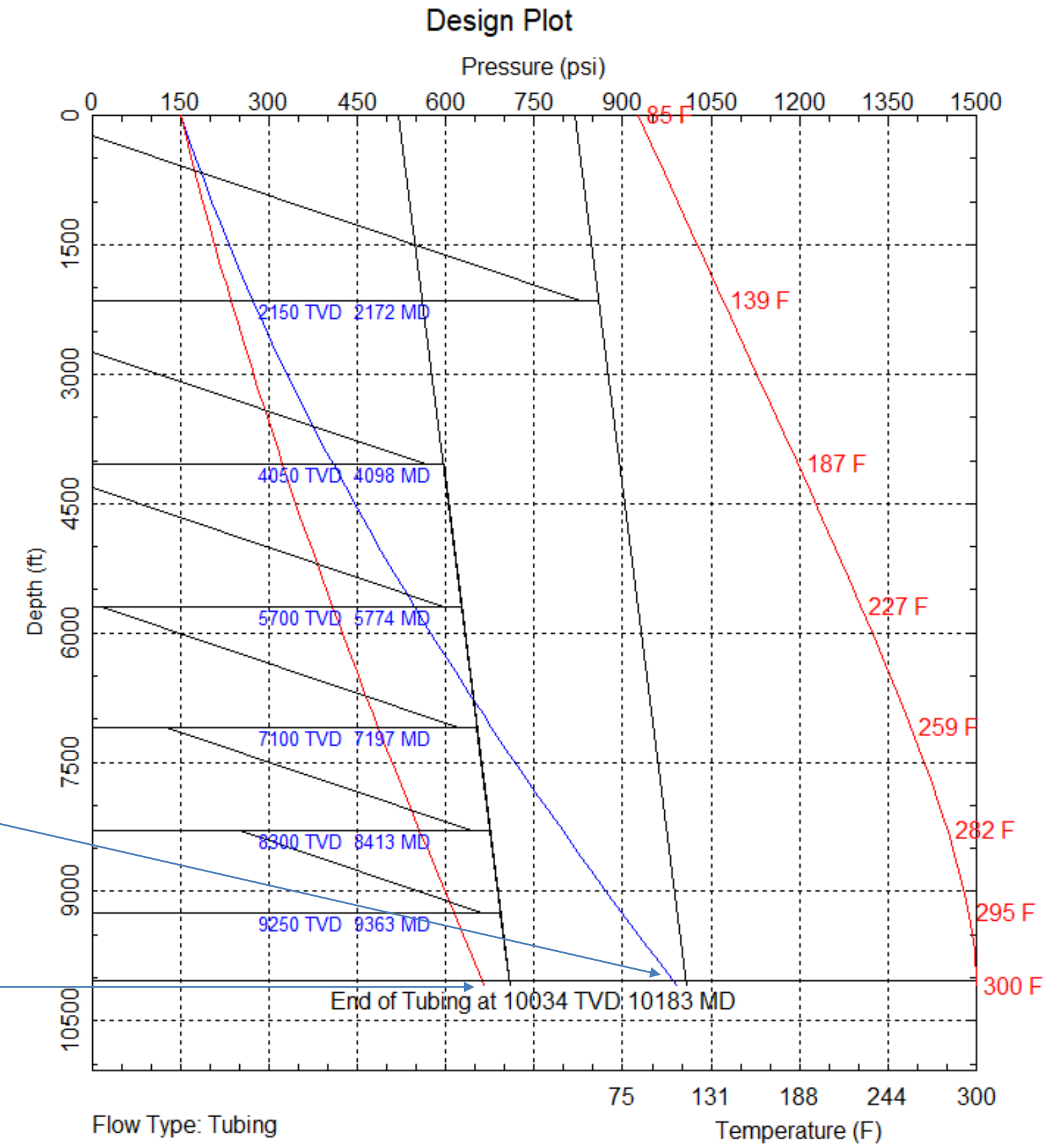
Well A (EOT 10,189' MD)



Well A: Modeled FBHP

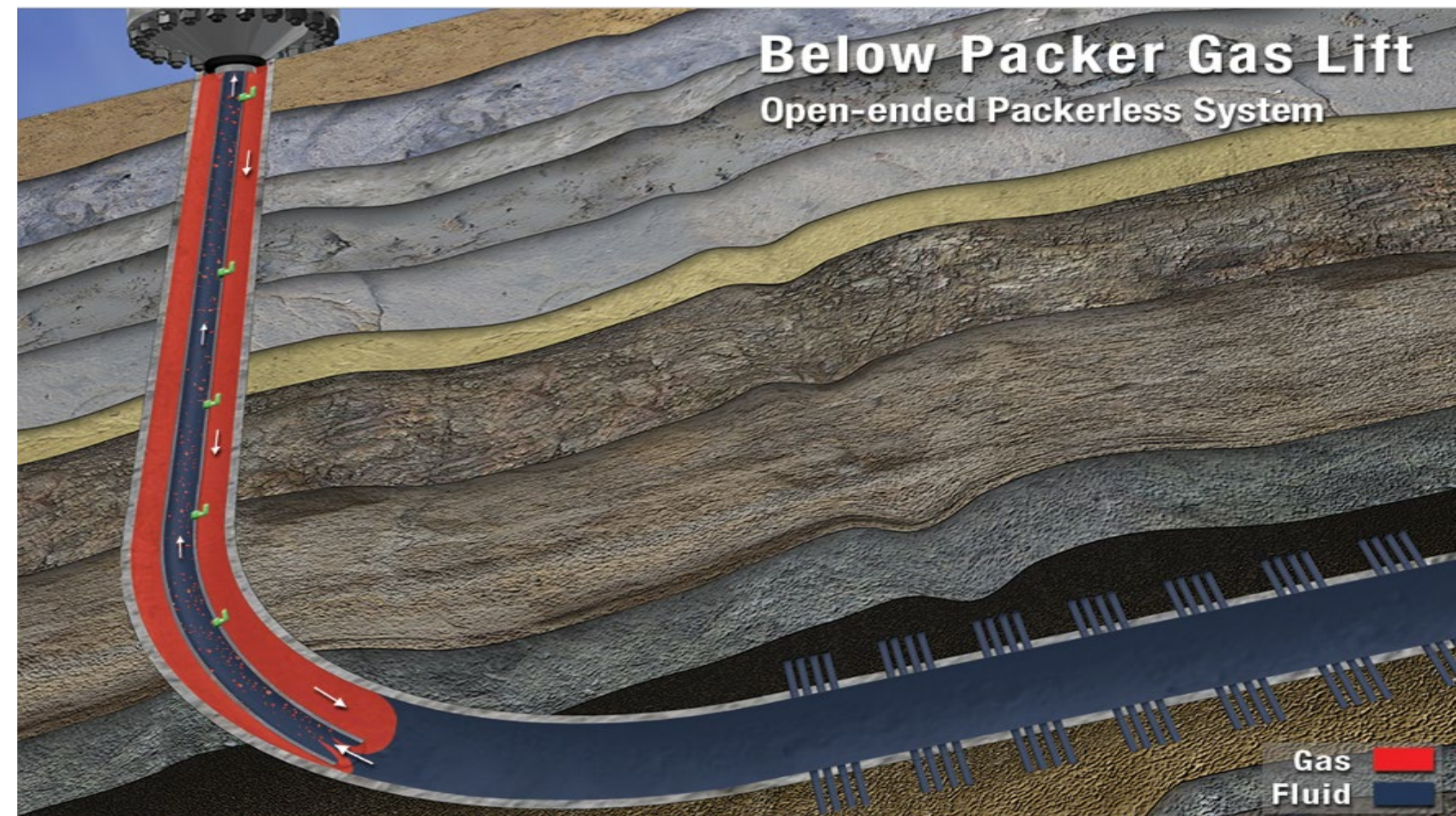
Modeled FBHP prior to Plunger Lift installation

Modeled FBHP after Plunger Lift installation

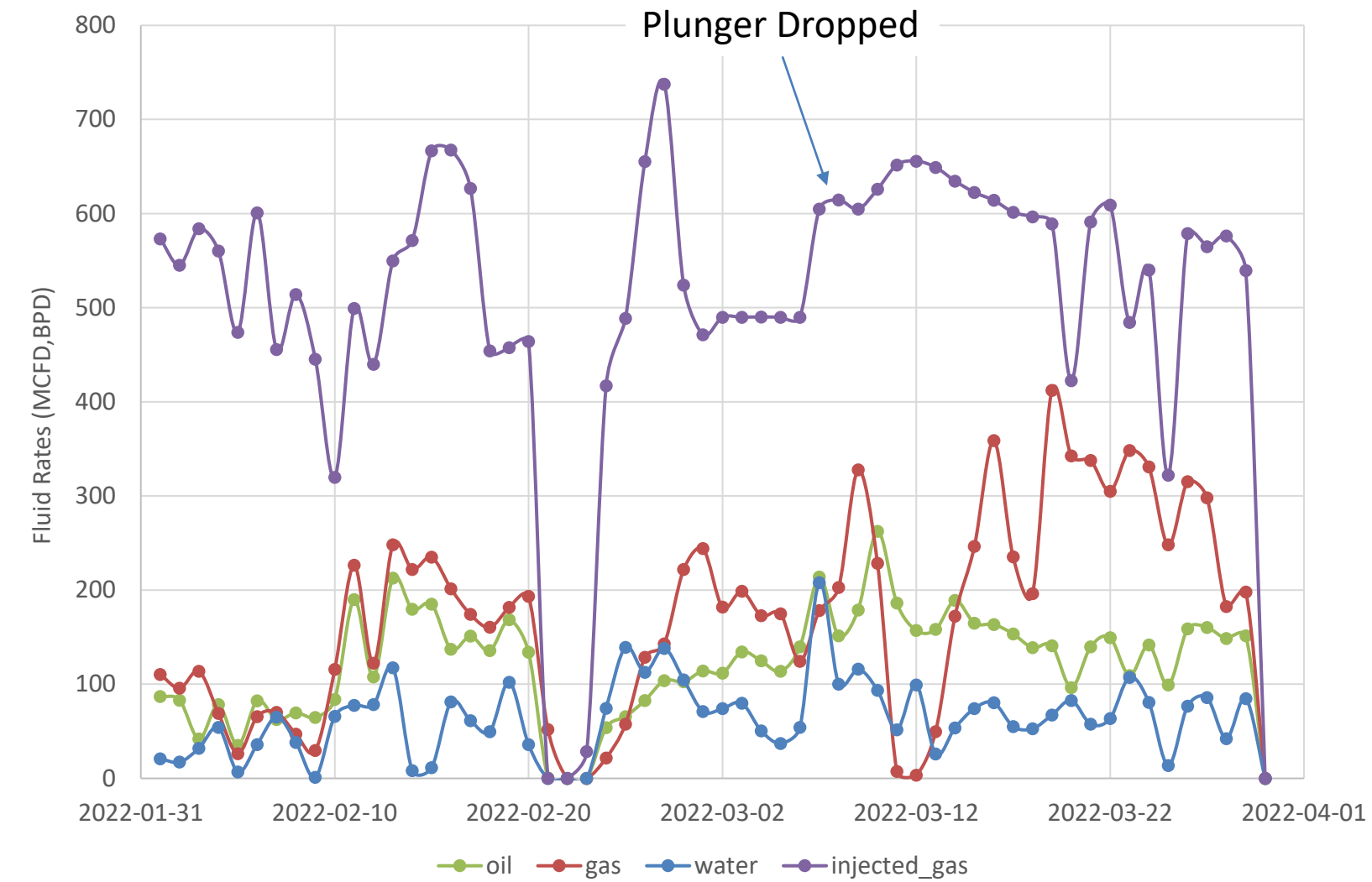
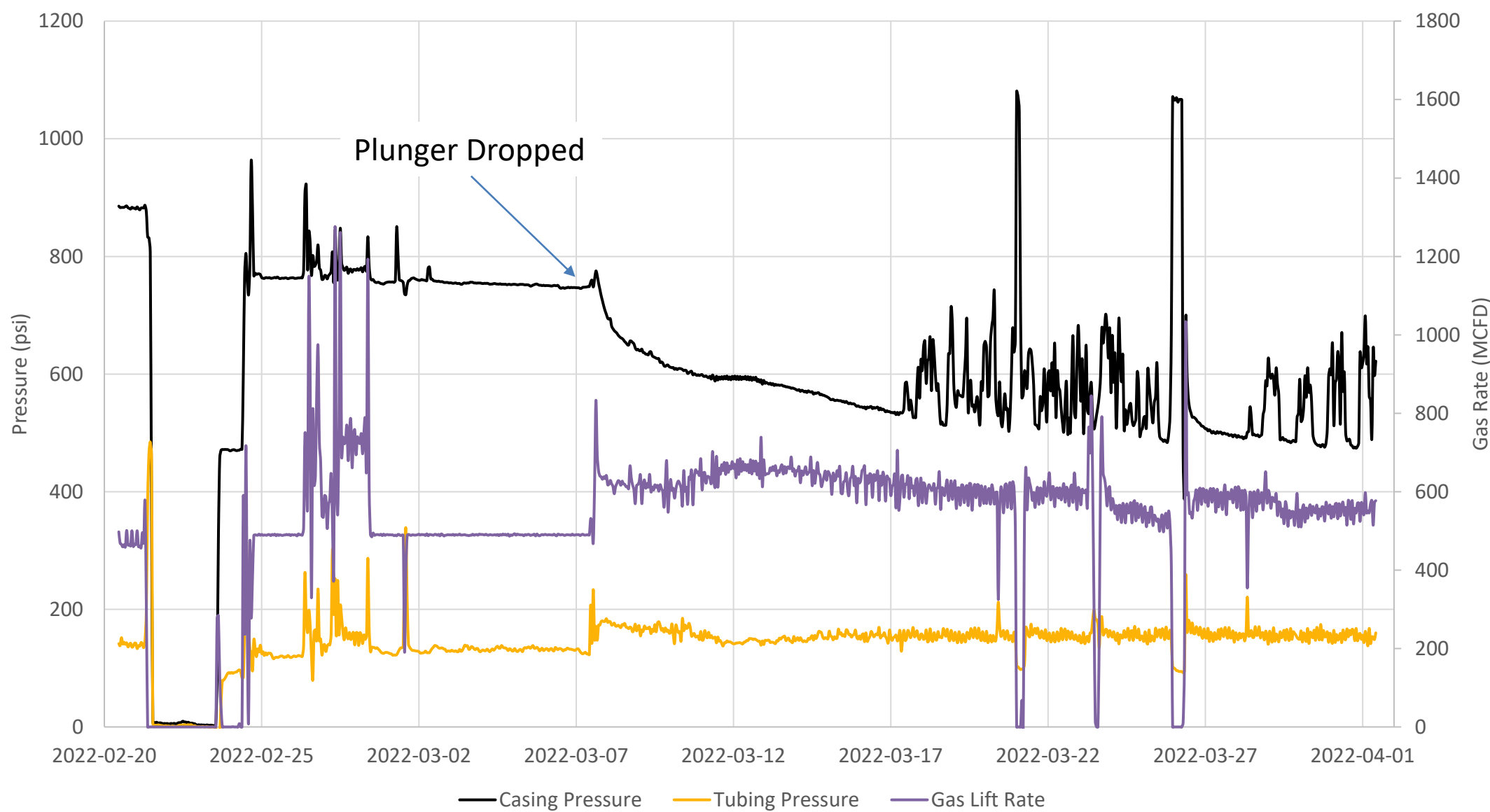


Well B is a maturing gas-lifted well.

- Packer-Less Wellbore Set up w/ unloading Gas Lift Valves
- 2 7/8" Production Tubing
- EOT @ 10,389' MD
- Injection Gas Rate = 600 mcfd
- Total Liquid Production = 200 bfpd



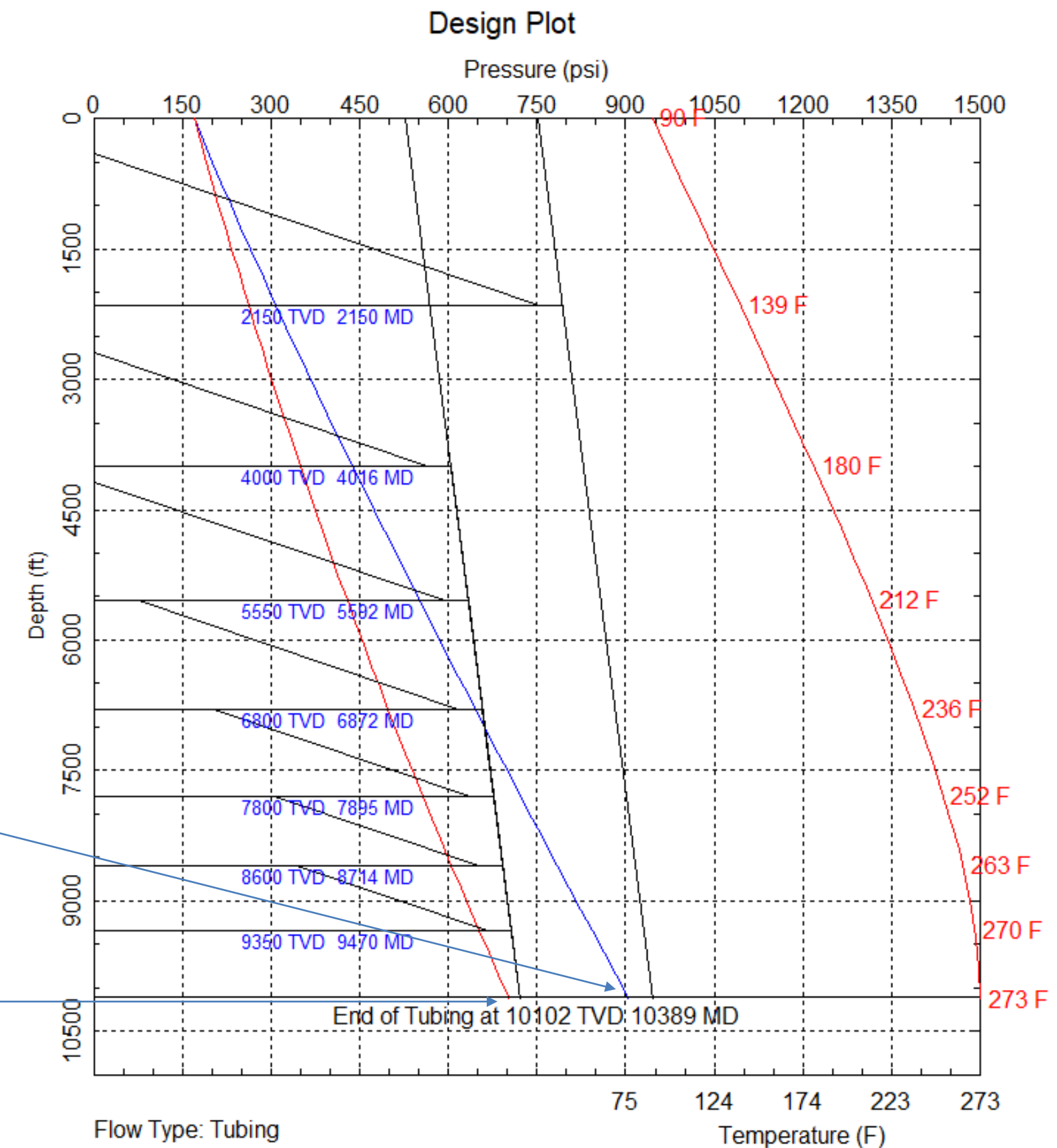
Well B (EOT 10,389' MD)



Well B: Modeled FBHP

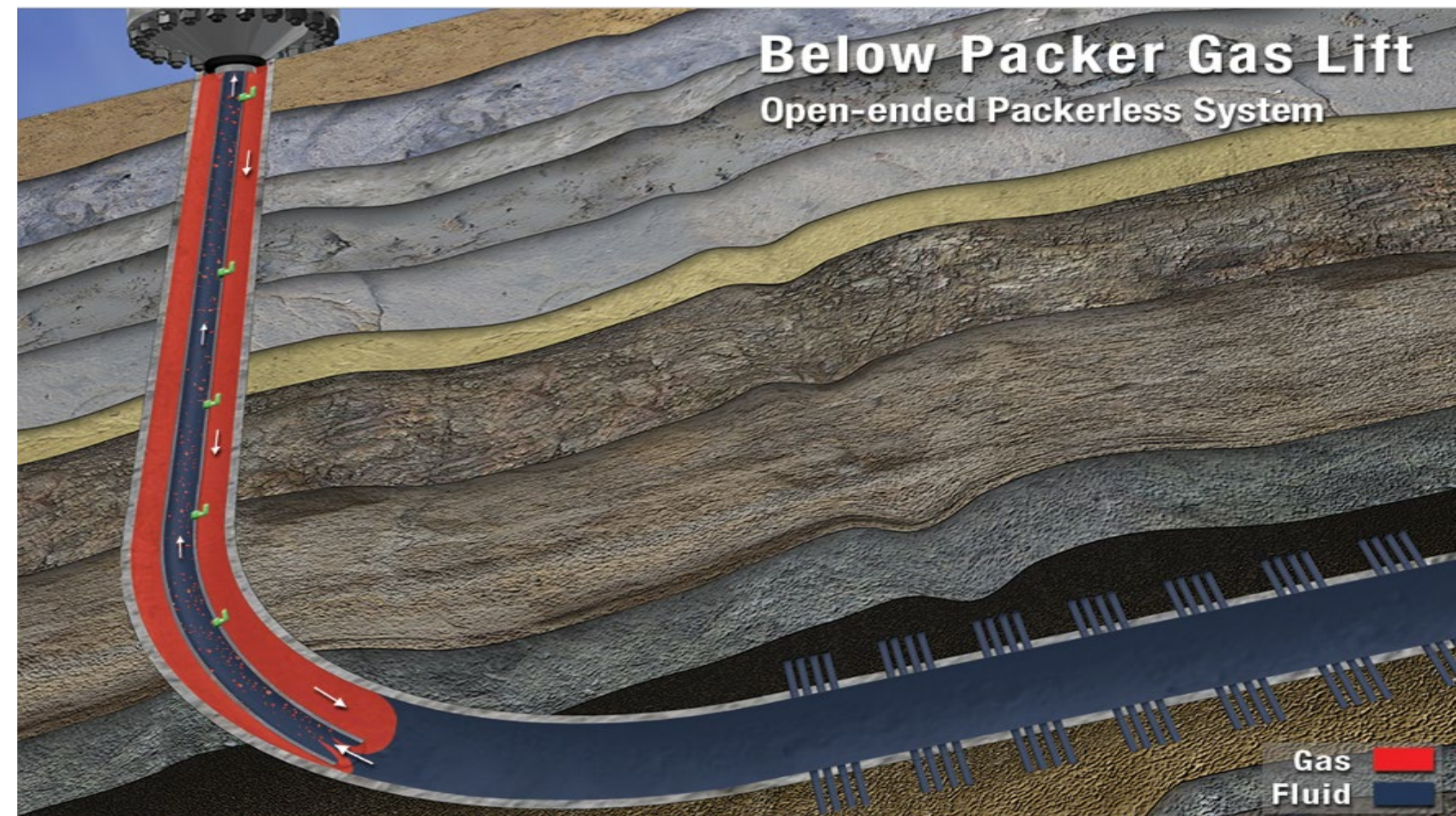
Modeled FBHP prior to Plunger Lift installation

Modeled FBHP after Plunger Lift installation

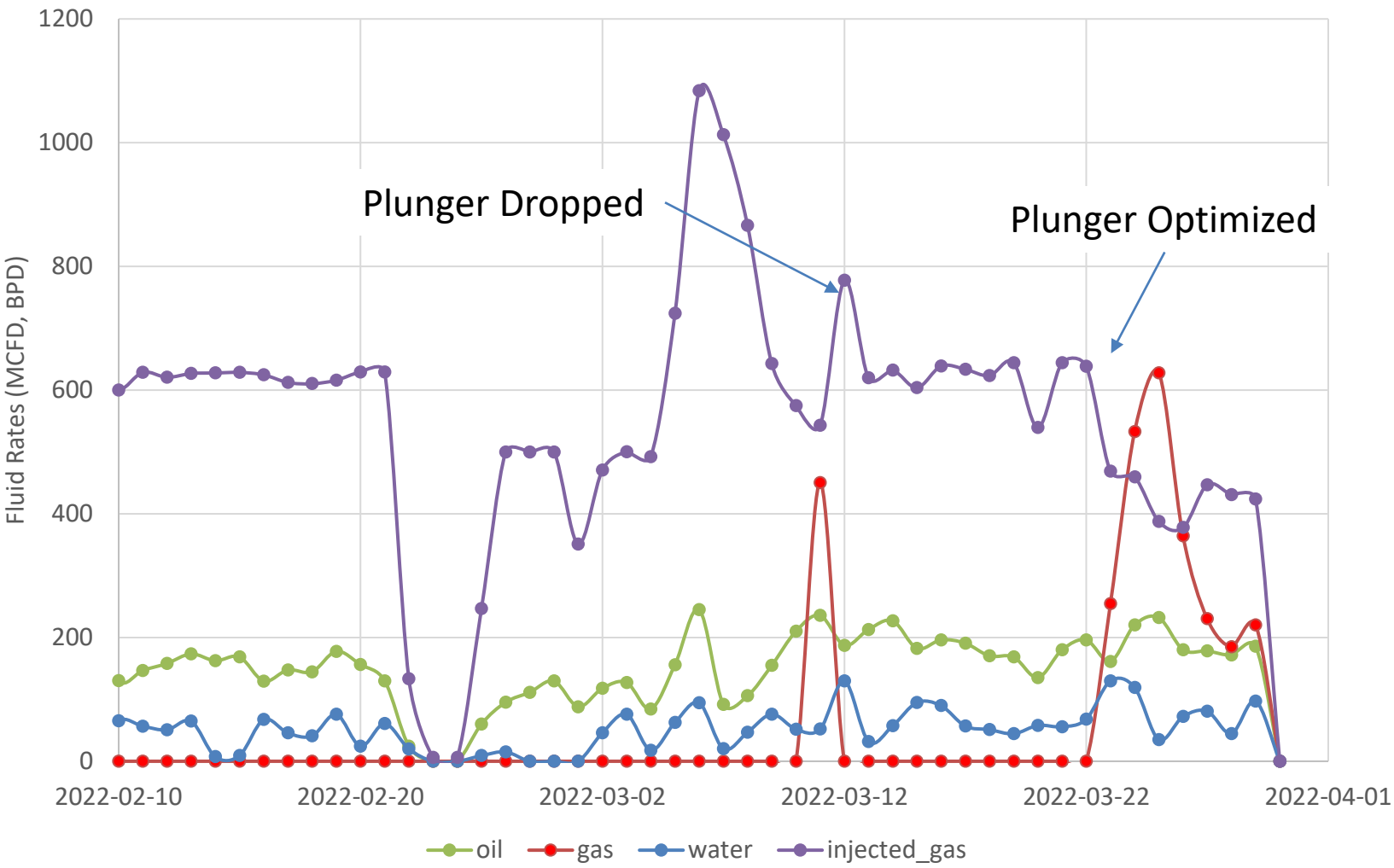
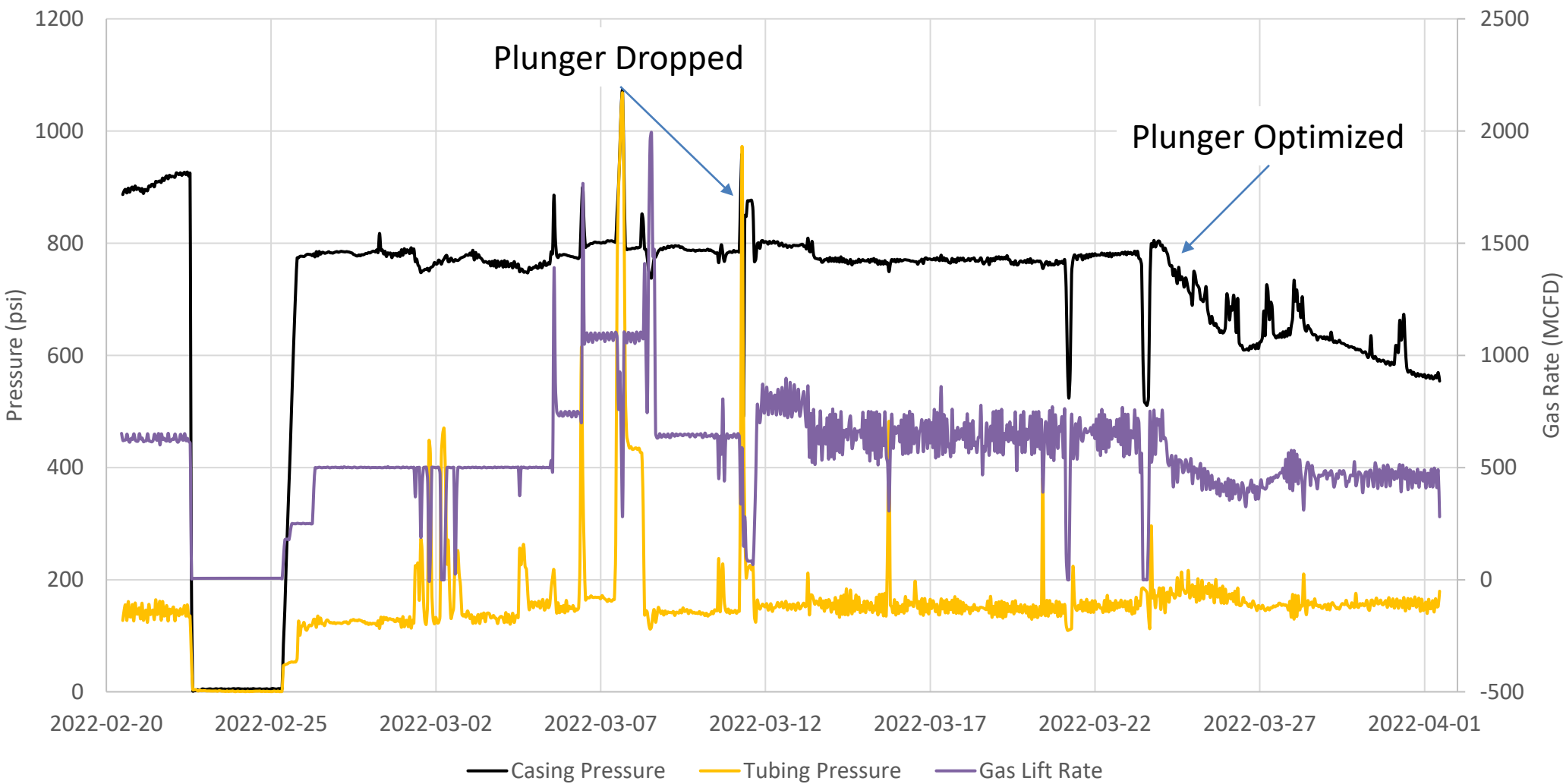


Well C is a maturing gas-lifted well.

- Packer-Less Wellbore Set up w/ unloading Gas Lift Valves
- 2 7/8" Production Tubing
- EOT @ 10,338' MD
- Injection Gas Rate = 650 mcfd
- Total Liquid Production = 110 bfpd



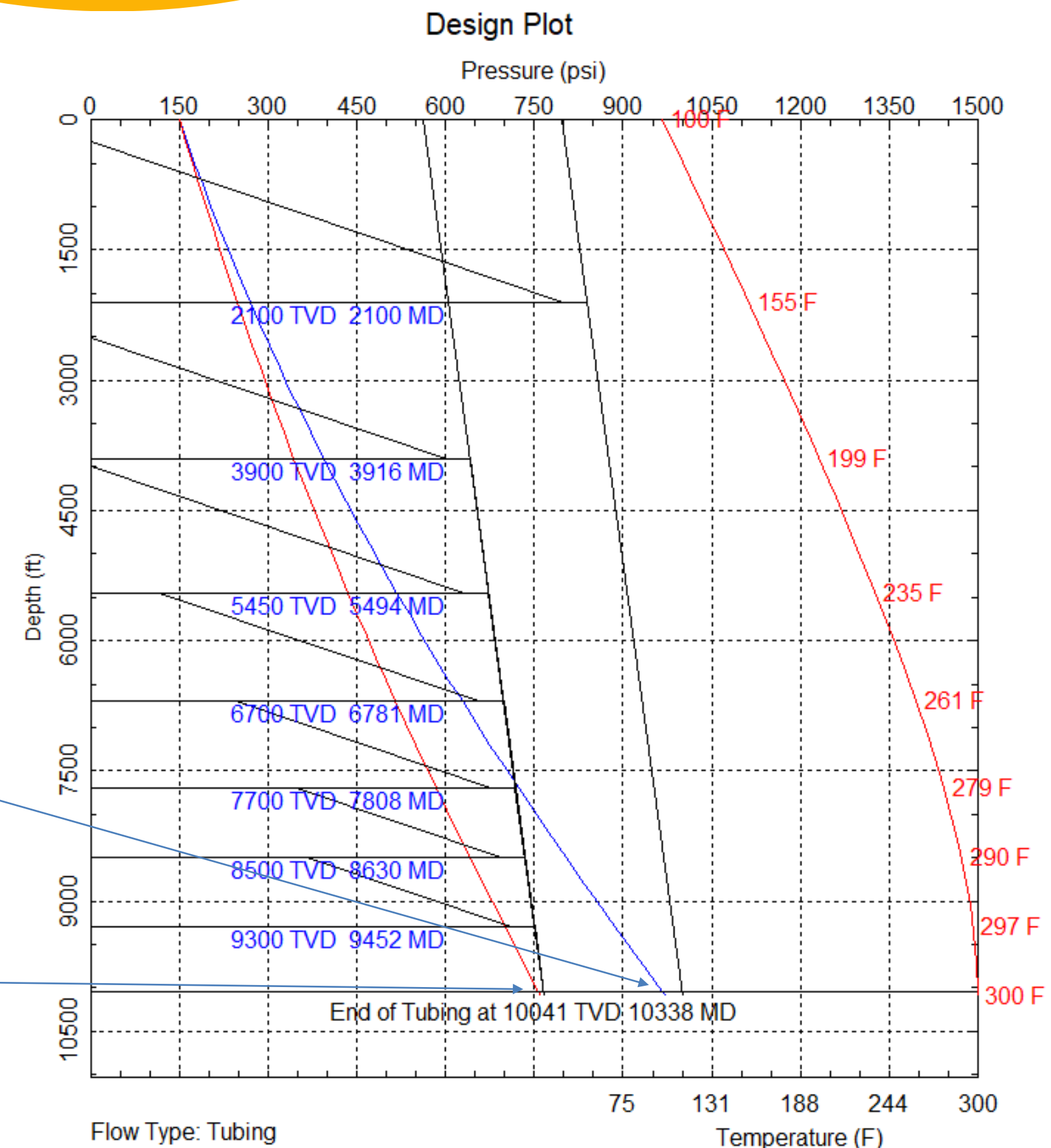
Well C (EOT 10,338' MD)



Well C: Modeled FBHP

Modeled FBHP prior to Plunger Lift installation

Modeled FBHP after Plunger Lift installation



Surface Injection Pressure Change

Well Name	Inj. Casing Pressure: Pre-Plunger Install (psi)	Inj. Casing Pressure: Post-Plunger Install (psi)	Percent Change
Well A	819	520	37%
Well B	752	527	30%
Well C	796	562	29%

A Pre and Post plunger installation casing pressure was recorded to confirm efficiency improvements and drawdown

Conclusions

- Addition of plunger decreased surface injection pressure
 - Improve efficiency of injection gas
 - Empirically yields a lower FBHP
- Example set showed a decrease in injection pressure by 32% on average
- Continued improvements focused on injection gas reduction
 - Target total gas rates of 70% of critical rate

Acknowledgements/Thanks & Questions

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