



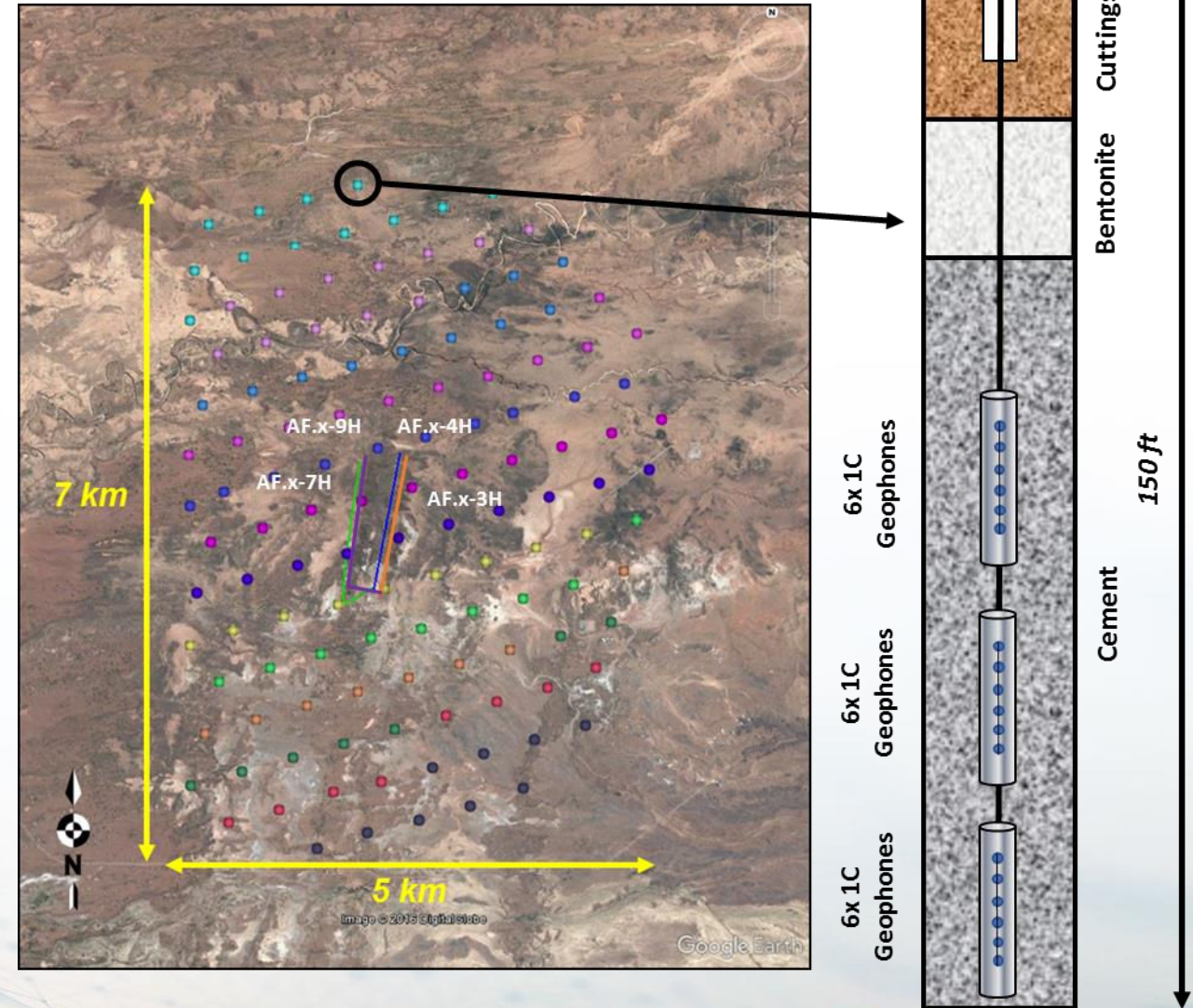
Understanding the Vaca Muerta Formation

No photography or video recording prohibited

BuriedArray™

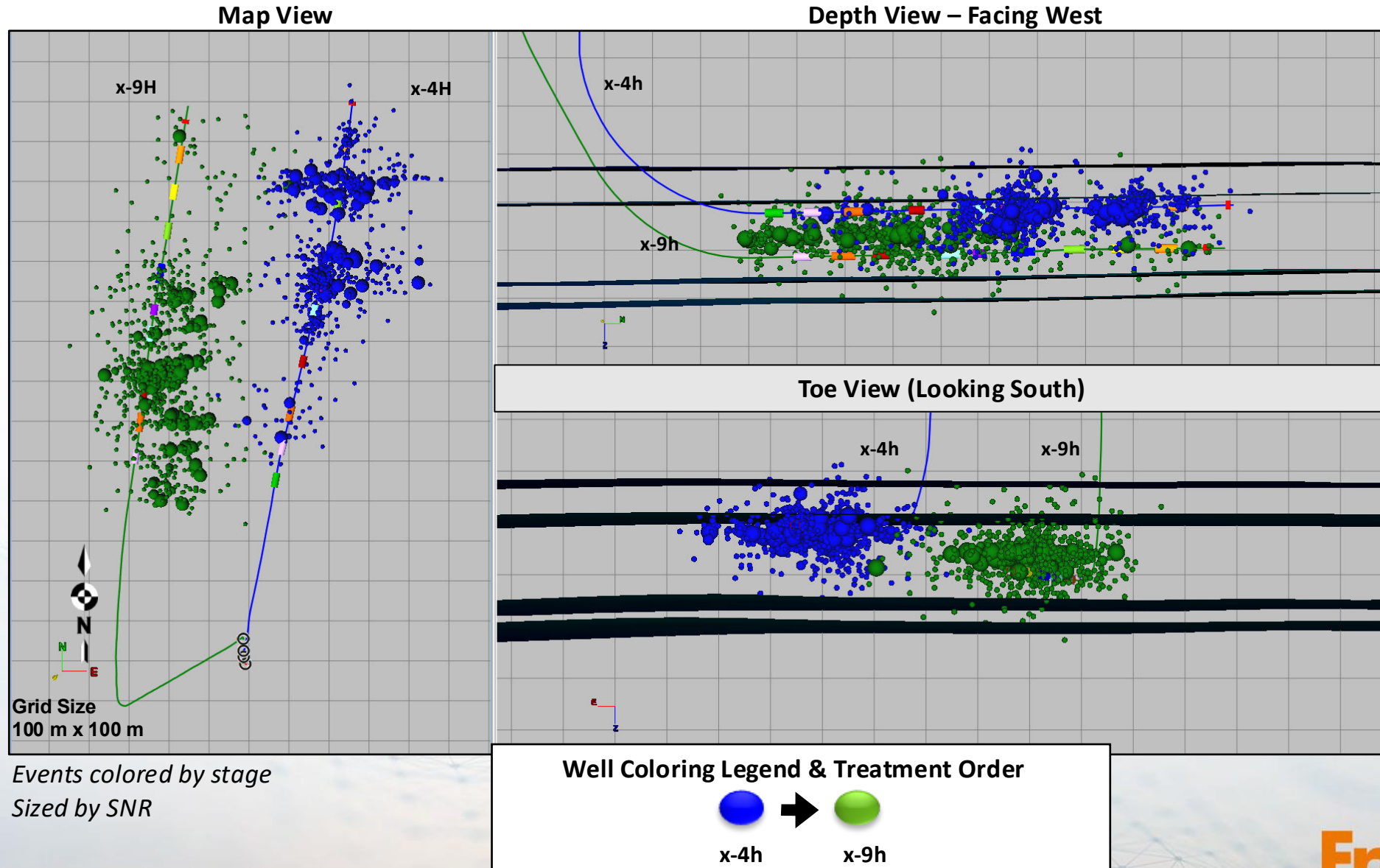
Vaca Muerta BuriedArray™

- The near-surface microseismic array covers ca. 35 km²
- Total station count is 126 (378 channels)
 - Each station has 3 levels at 20m, 25m, and 50m depth
- Target formation: Vaca Muerta
- Average target depth: 2400m SubSea & 2480m SubSea

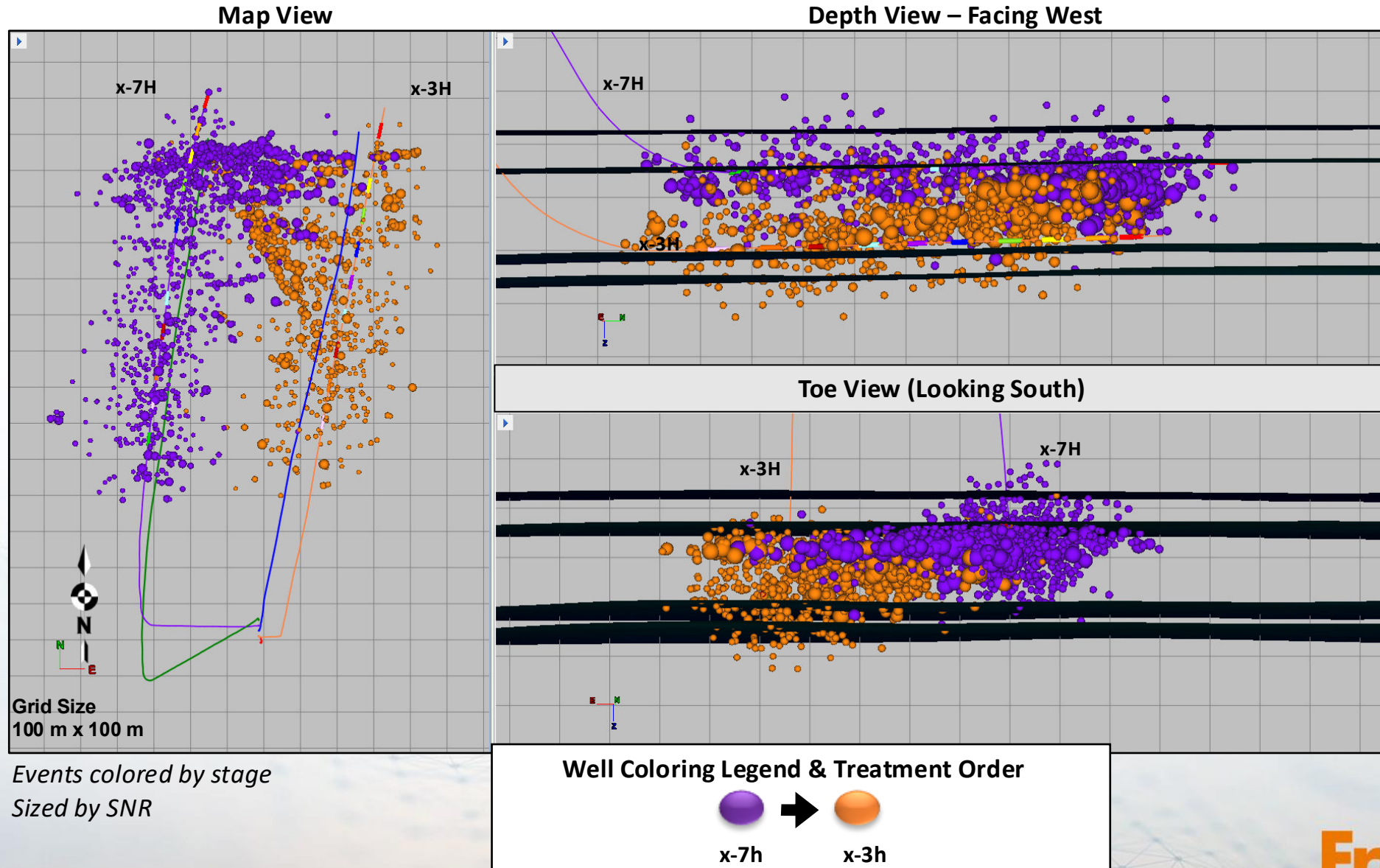


Microseismic Events

Event Locations (First Well Pair)



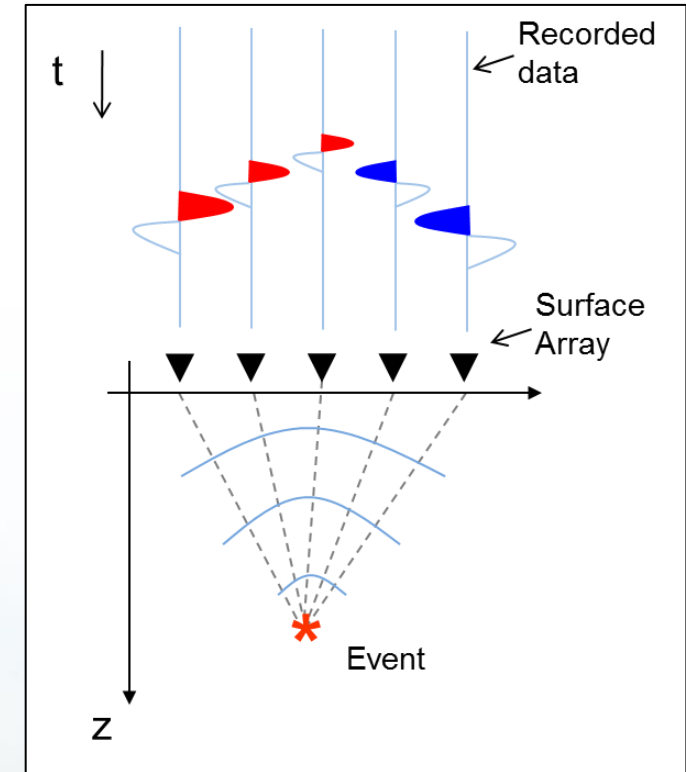
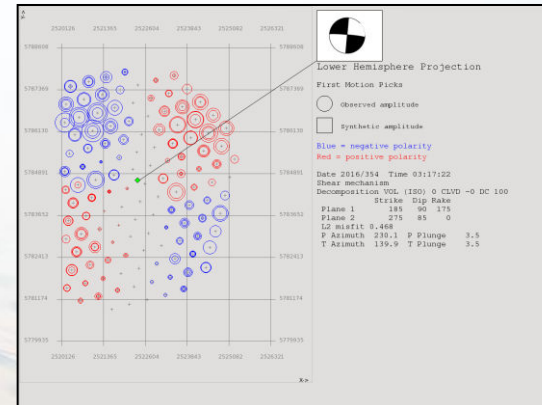
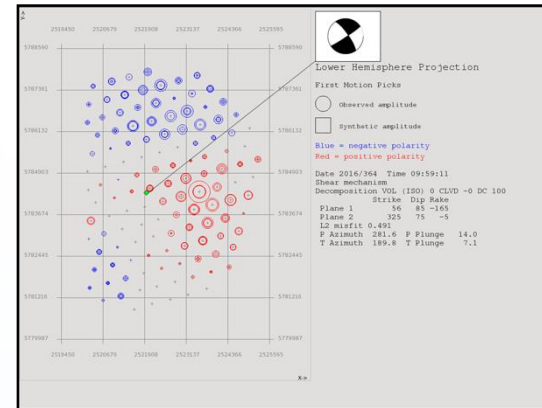
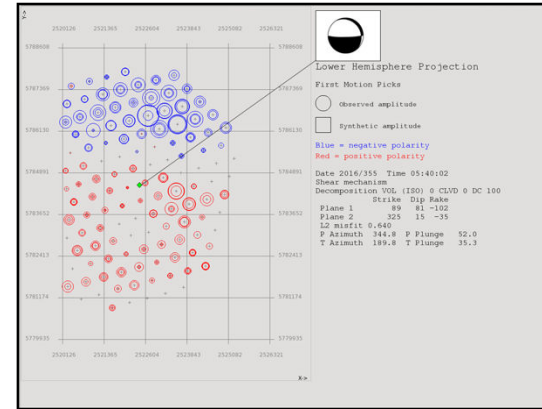
Event Locations (Second Well Pair)



Stress Analysis

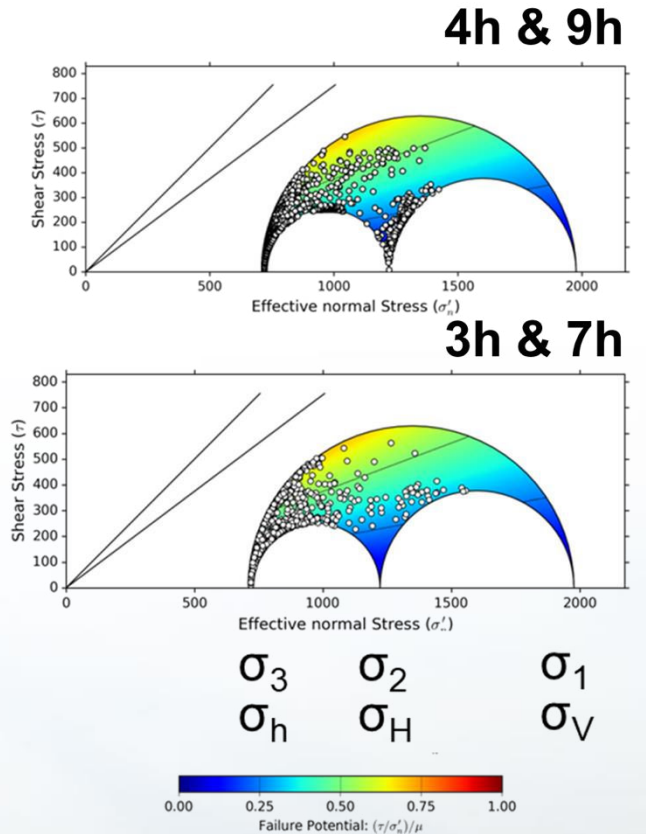
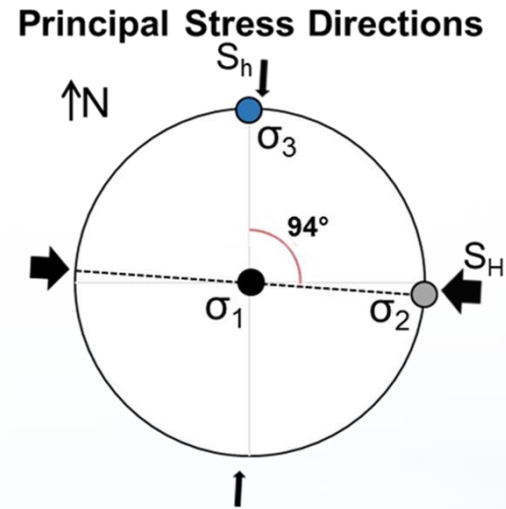
Geomechanics

- Three dominant focal mechanisms:
- One vertical dip-slip mechanism striking at 90°
- Two sets of strike-slip fractures, one striking at 150° and the other at 50° .
- These mechanisms are consistent with published studies for the basin.



Geomechanics

- Fracture propagation orientation follows orientation of conductive natural fractures as well as maximum horizontal stress
 - Maximum horizontal stress was determined at 94° azimuth
 - 90° strike is aligned with S_H
 - 50° and 150° strike is aligned with conductive natural fractures



$$SH_{max} = \sigma_2 = \phi (\sigma_1 - \sigma_3) + \sigma_3$$

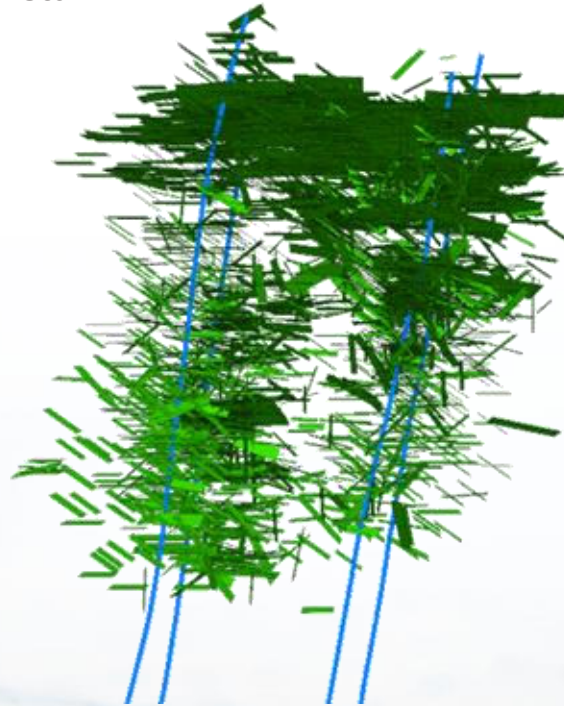
Fracture Geometry

Discrete Fracture Network Modeling

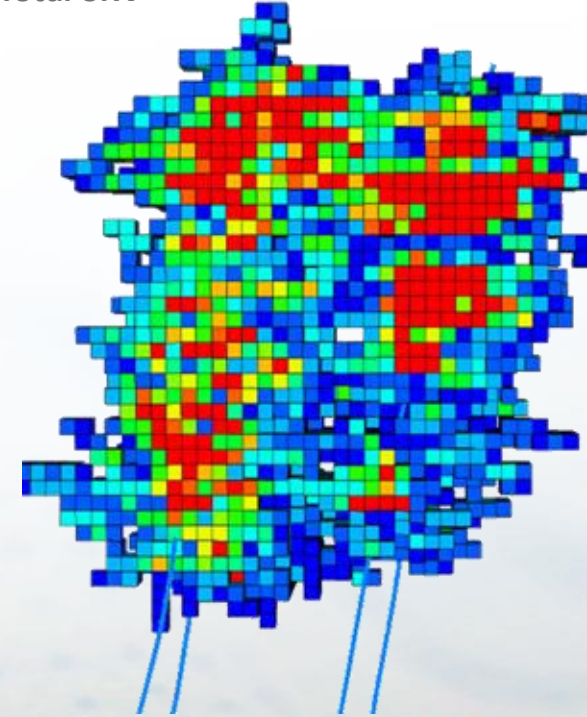
Events



Total DFN

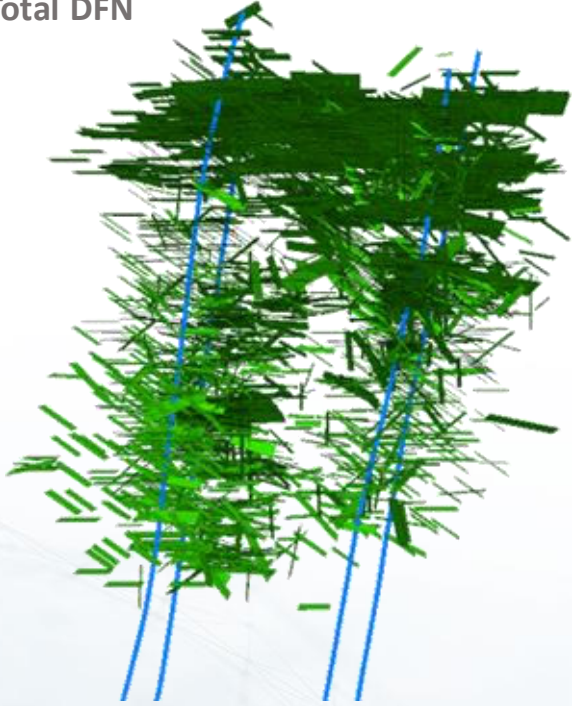


Total SRV

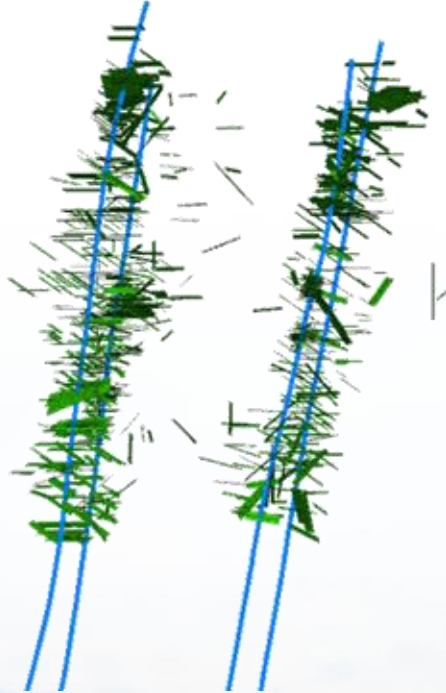


Where is the Proppant ?

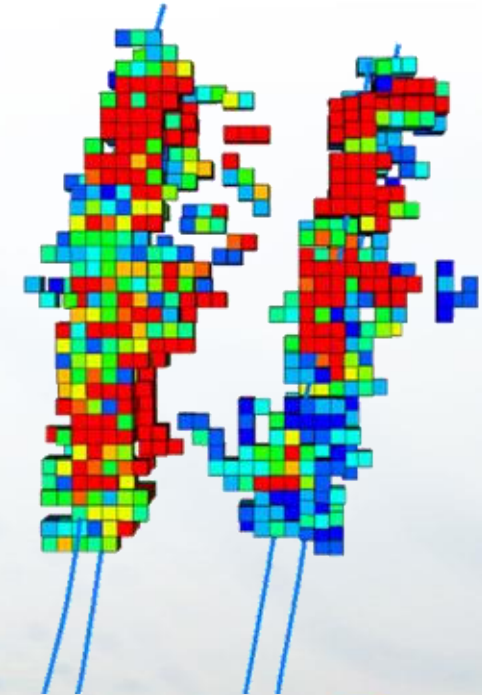
Total DFN



Propped DFN

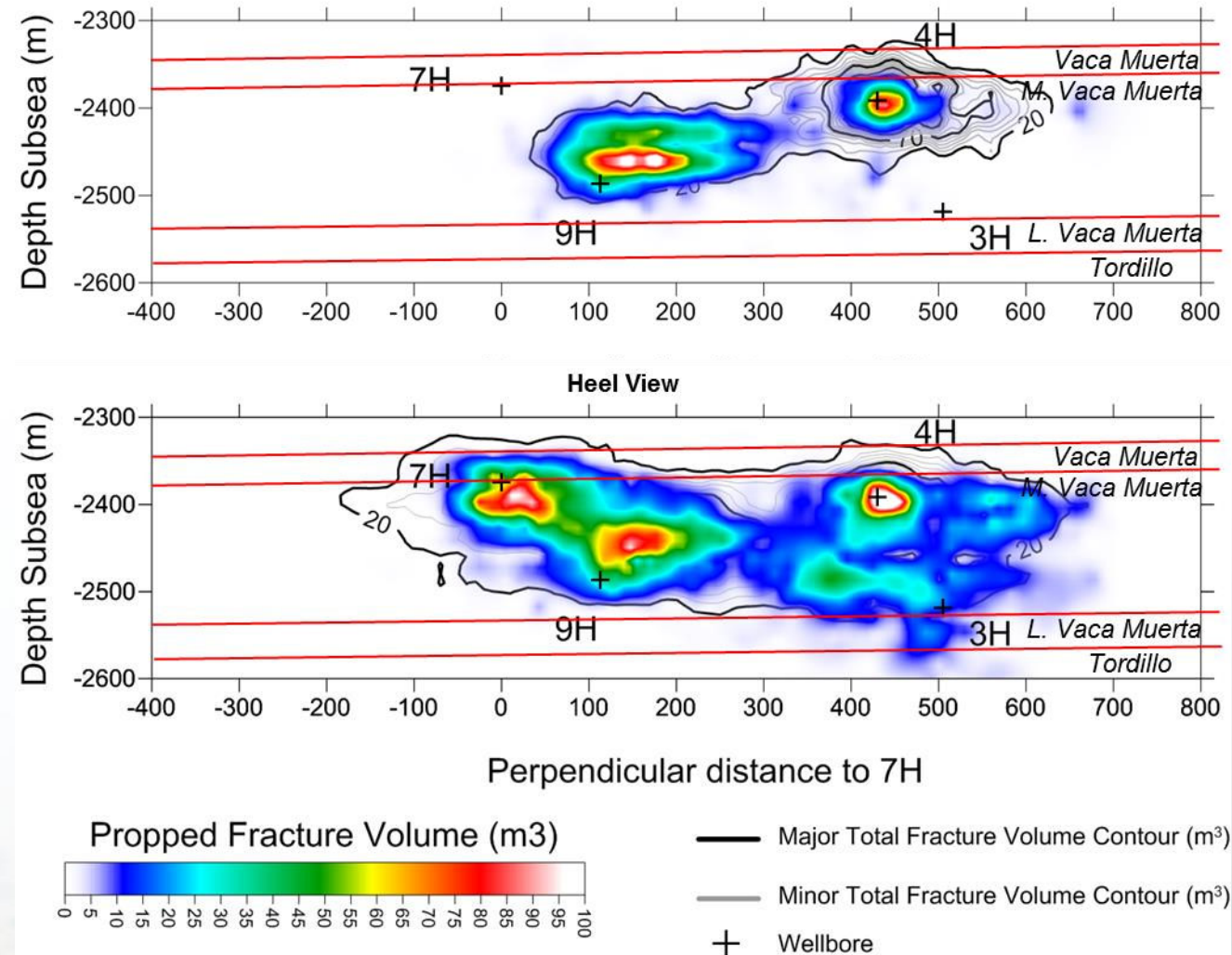


Propped SRV



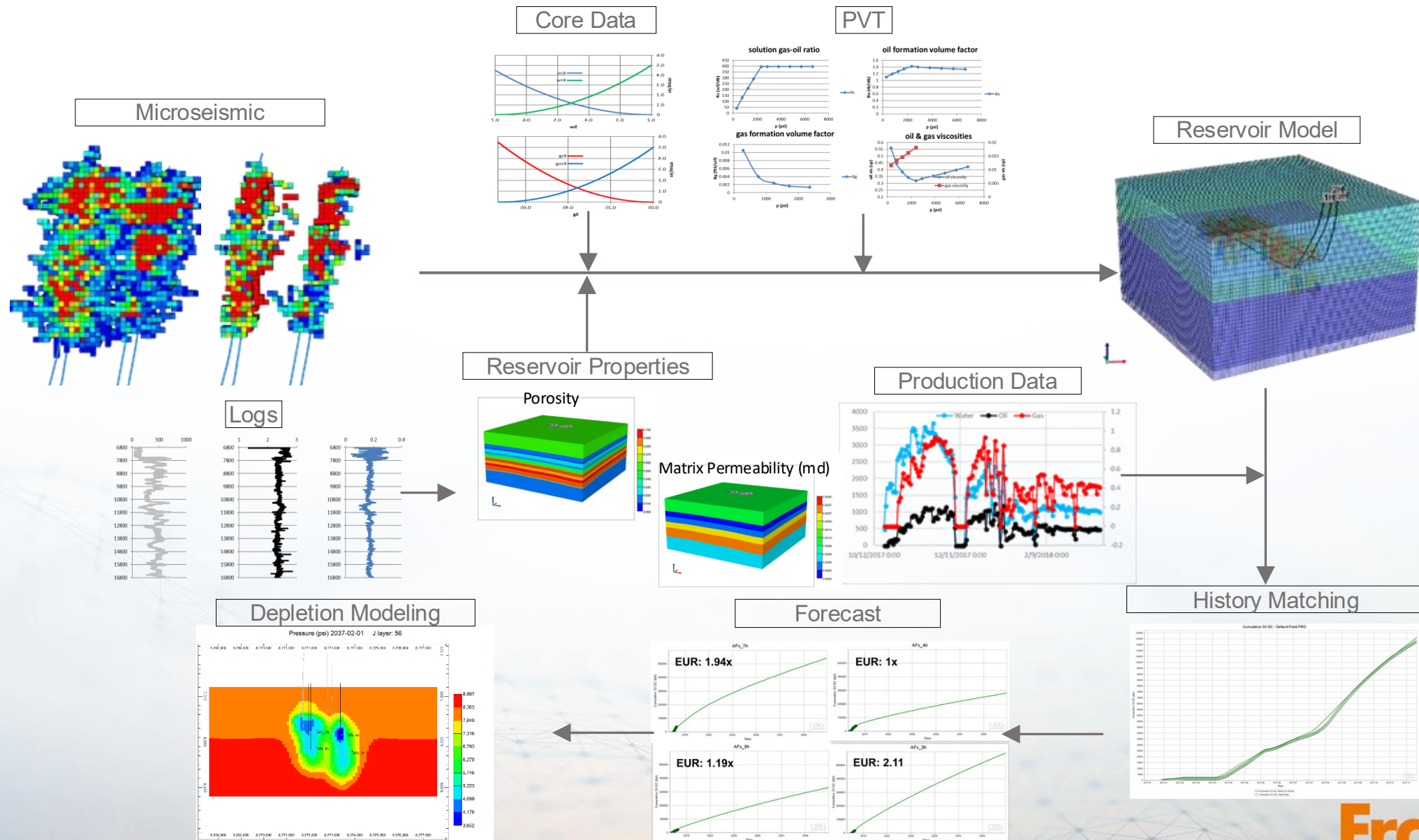
Fracture Geometry

- Differences in propped volume are associated with differences in treatment design
- Western wells show better height containment in target zone indicating optimum staggering pattern
- Interaction between wells of the second pair is related to created fracture network from the first pair

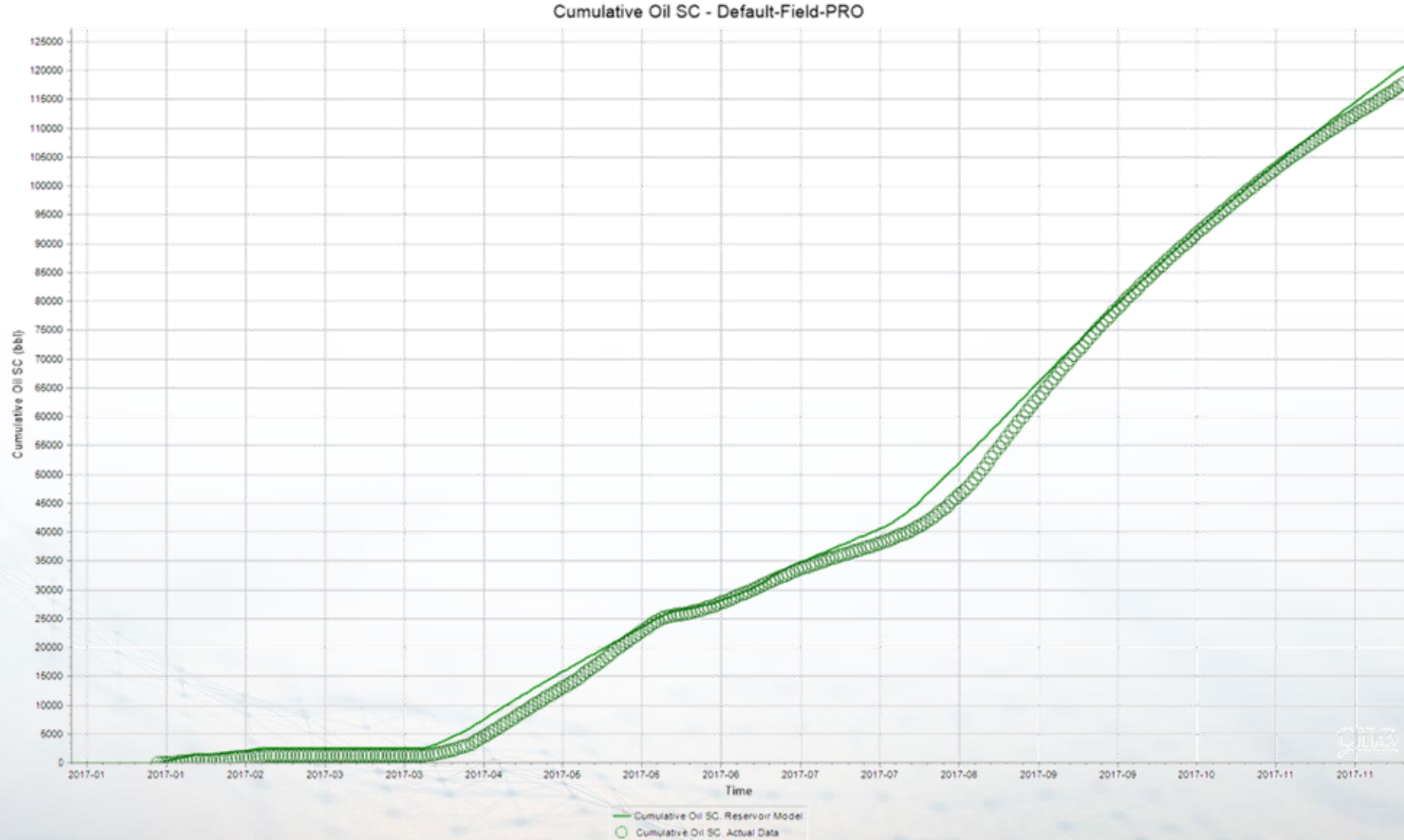


Depletion Modeling

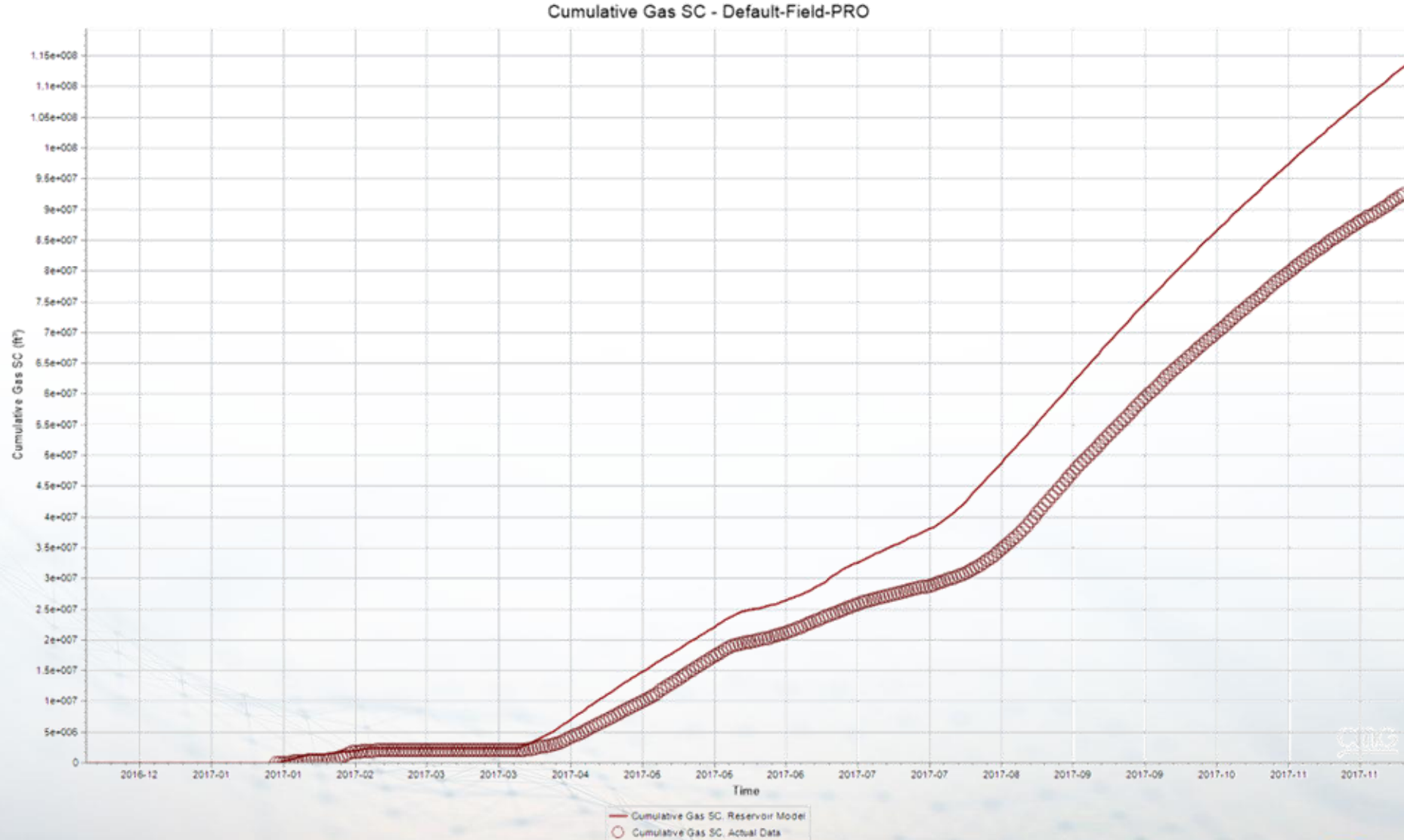
Reservoir simulation Workflow



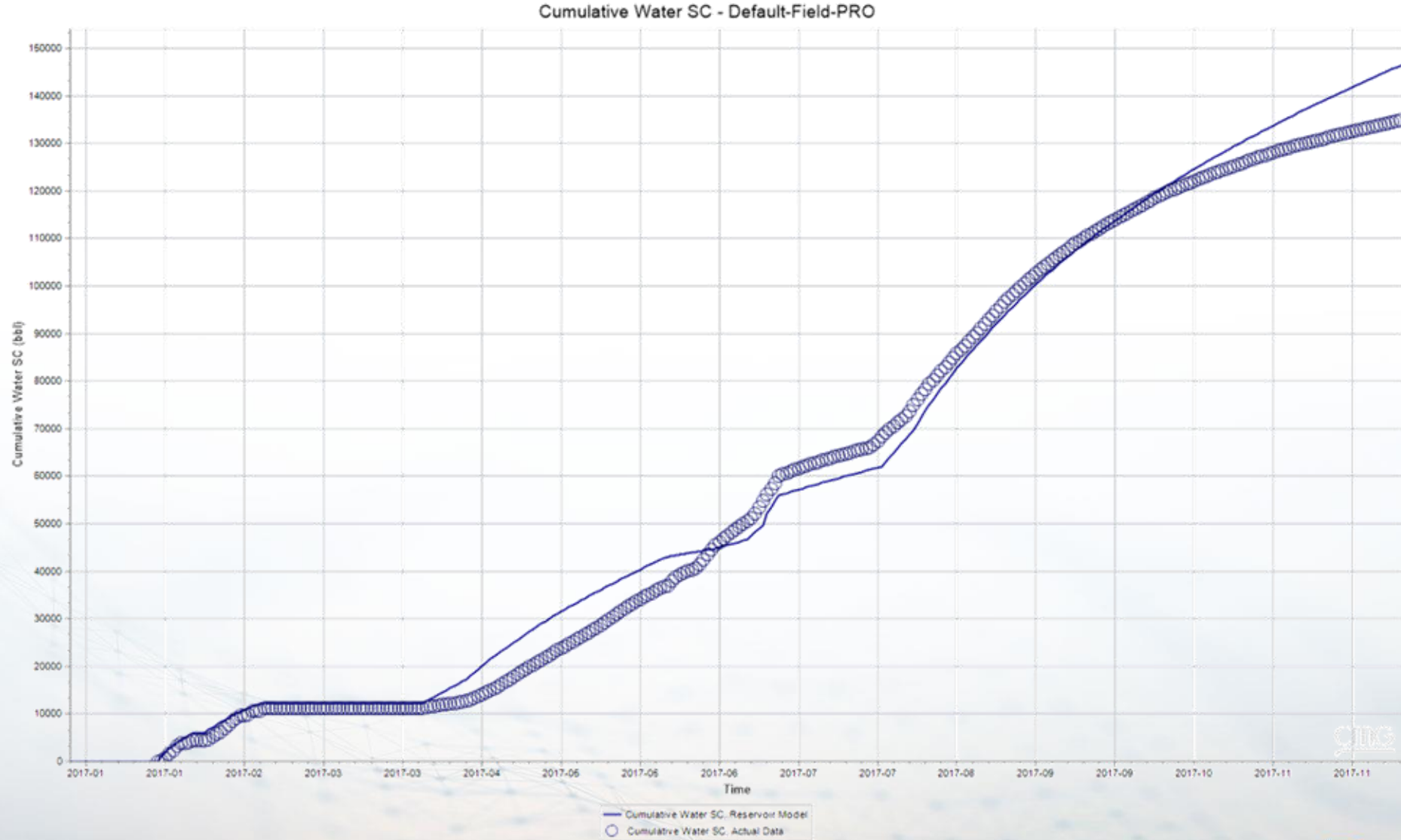
Cumulative Oil Production (Pad)



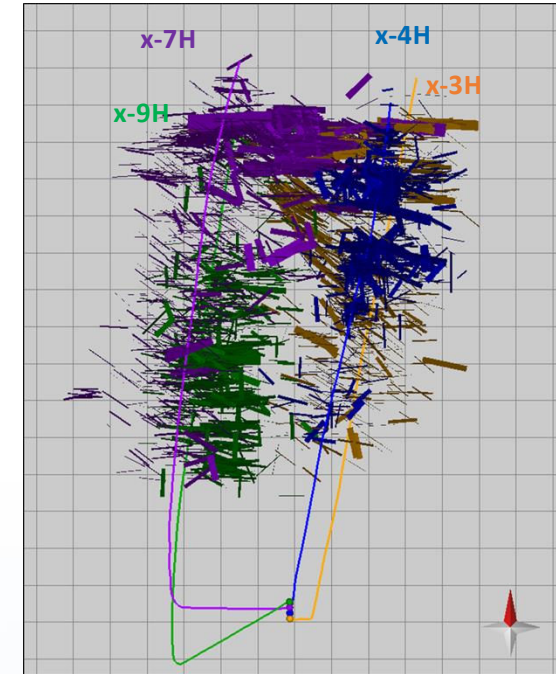
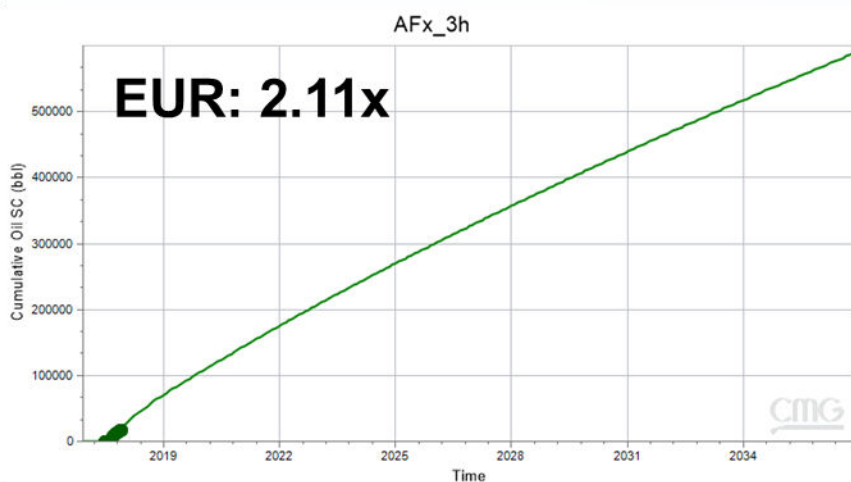
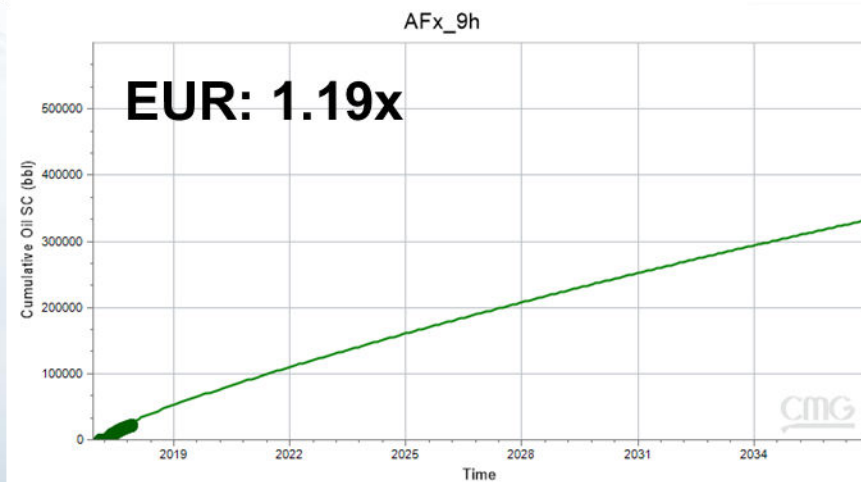
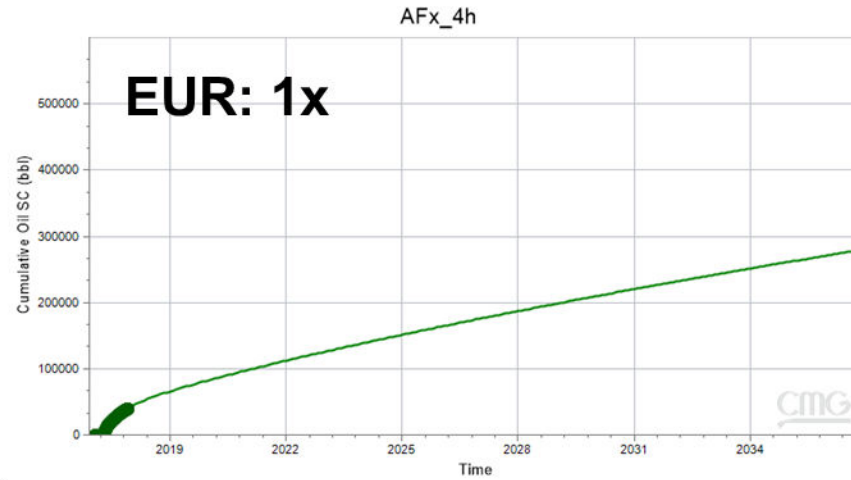
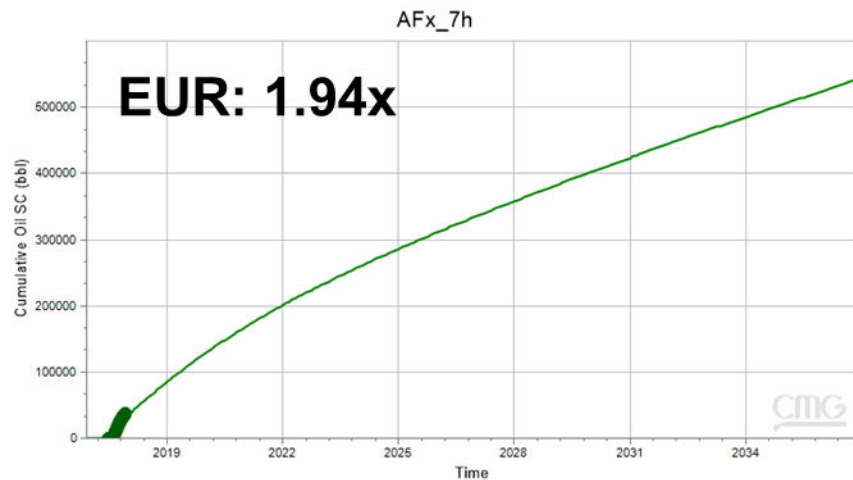
Cumulative Gas Production (Pad)



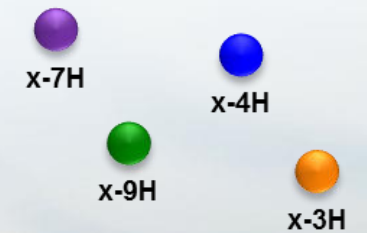
Cumulative Water Production (Pad)



Production Forecast

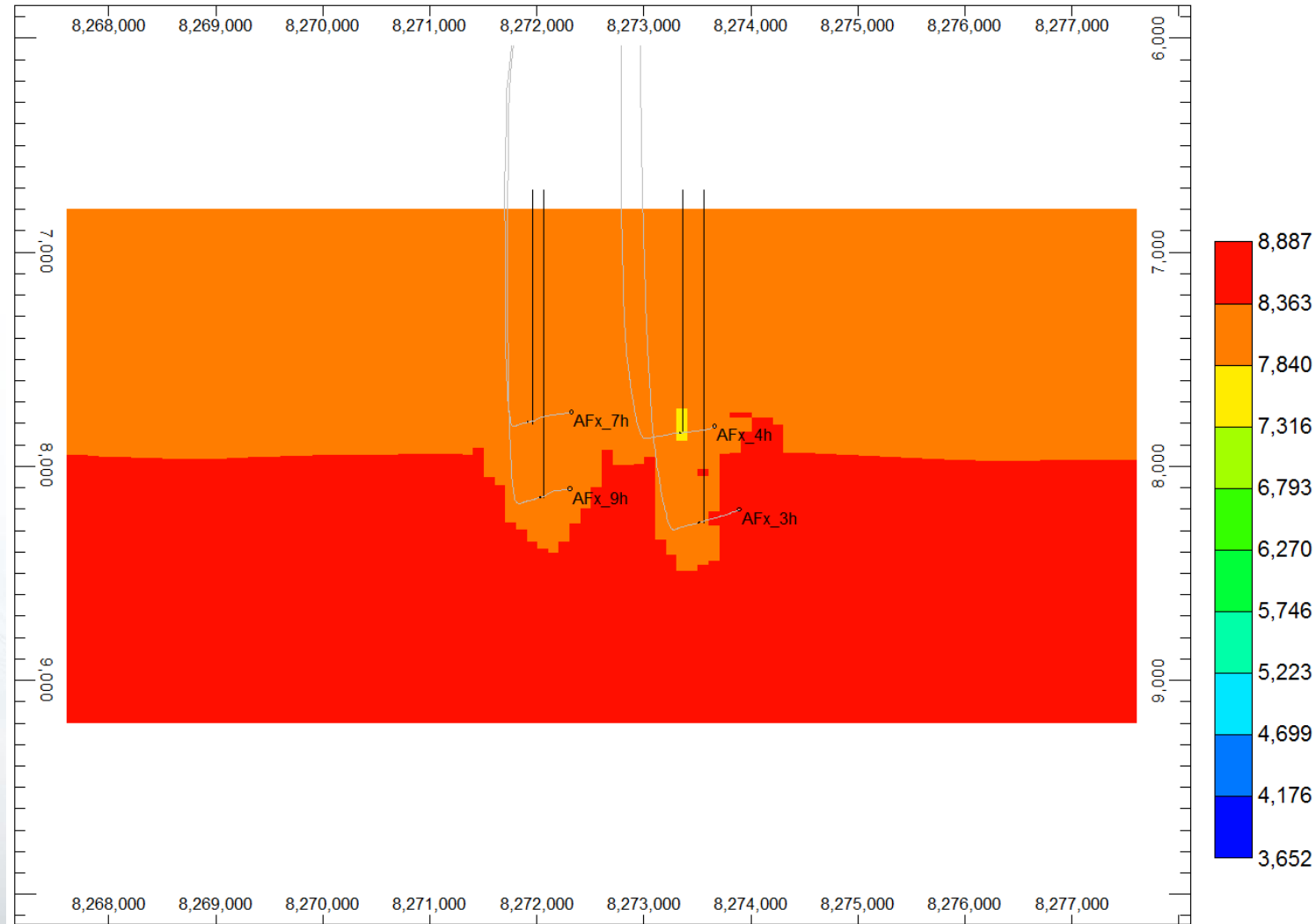


Heel View



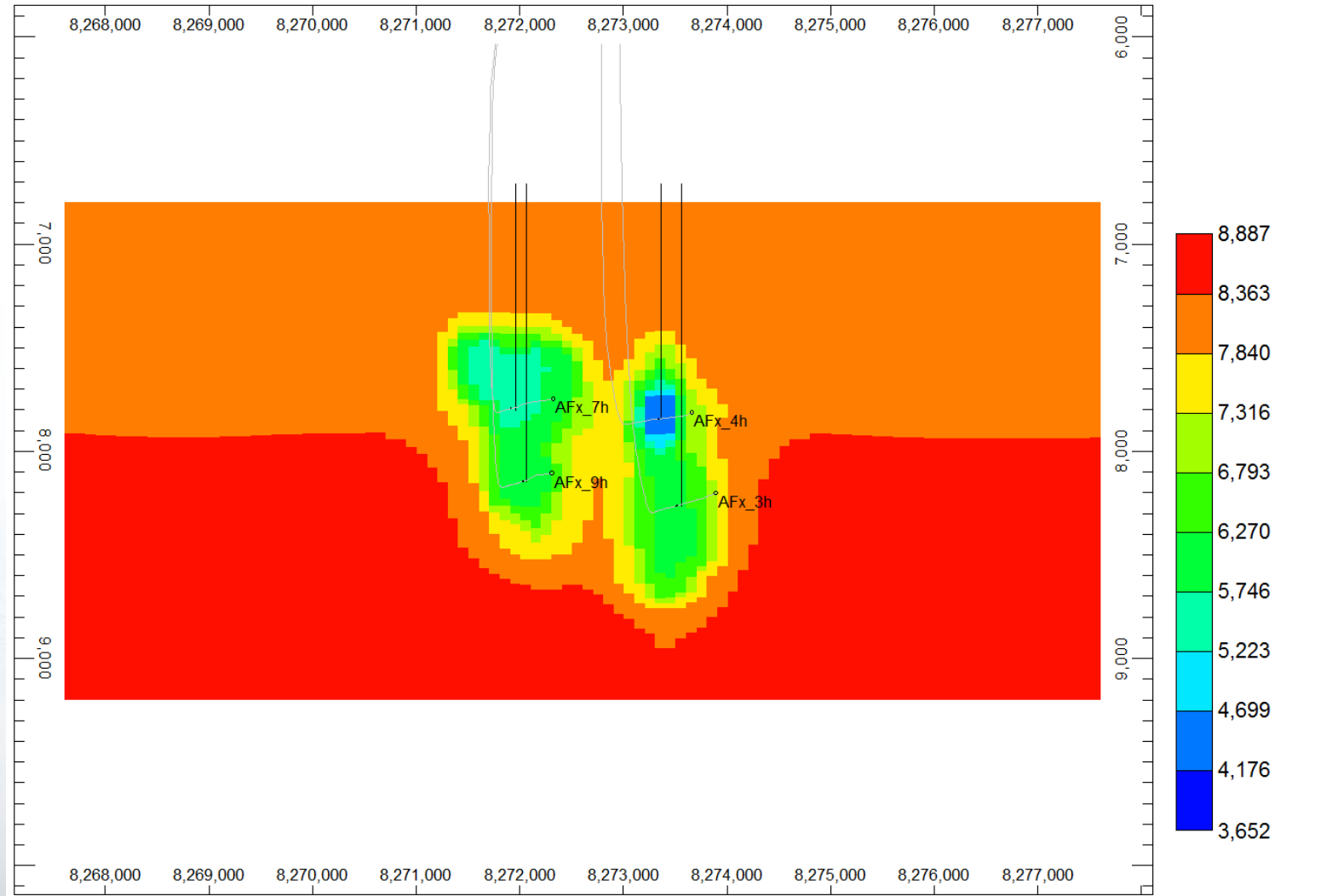
Pressure Depletion: Cross-Section (t=1a)

Pressure (psi) 2018-02-01 J layer: 56



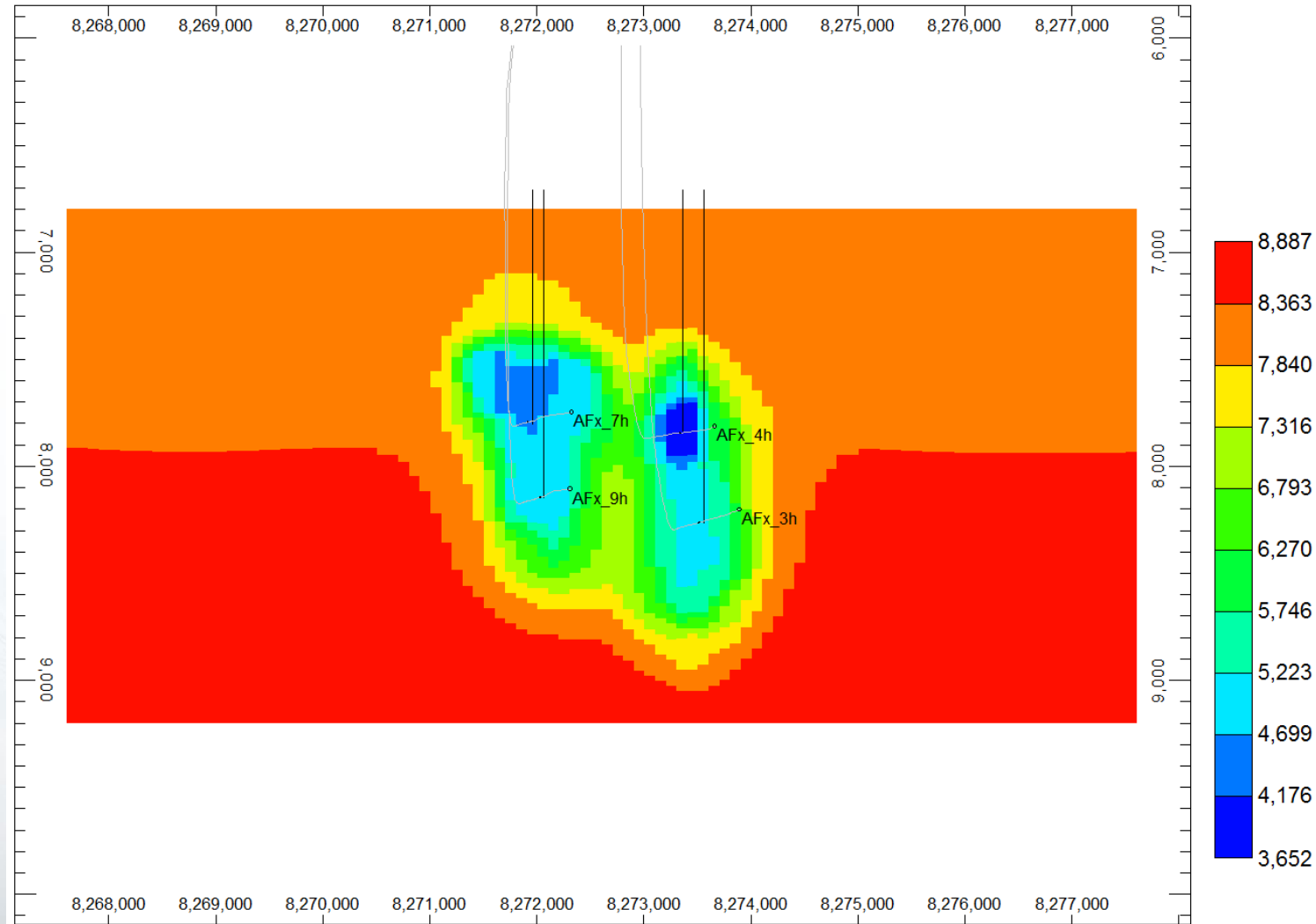
Pressure Depletion: Cross-Section (t=10a)

Pressure (psi) 2027-02-01 J layer: 56



Pressure Depletion: Cross-Section (t=20a)

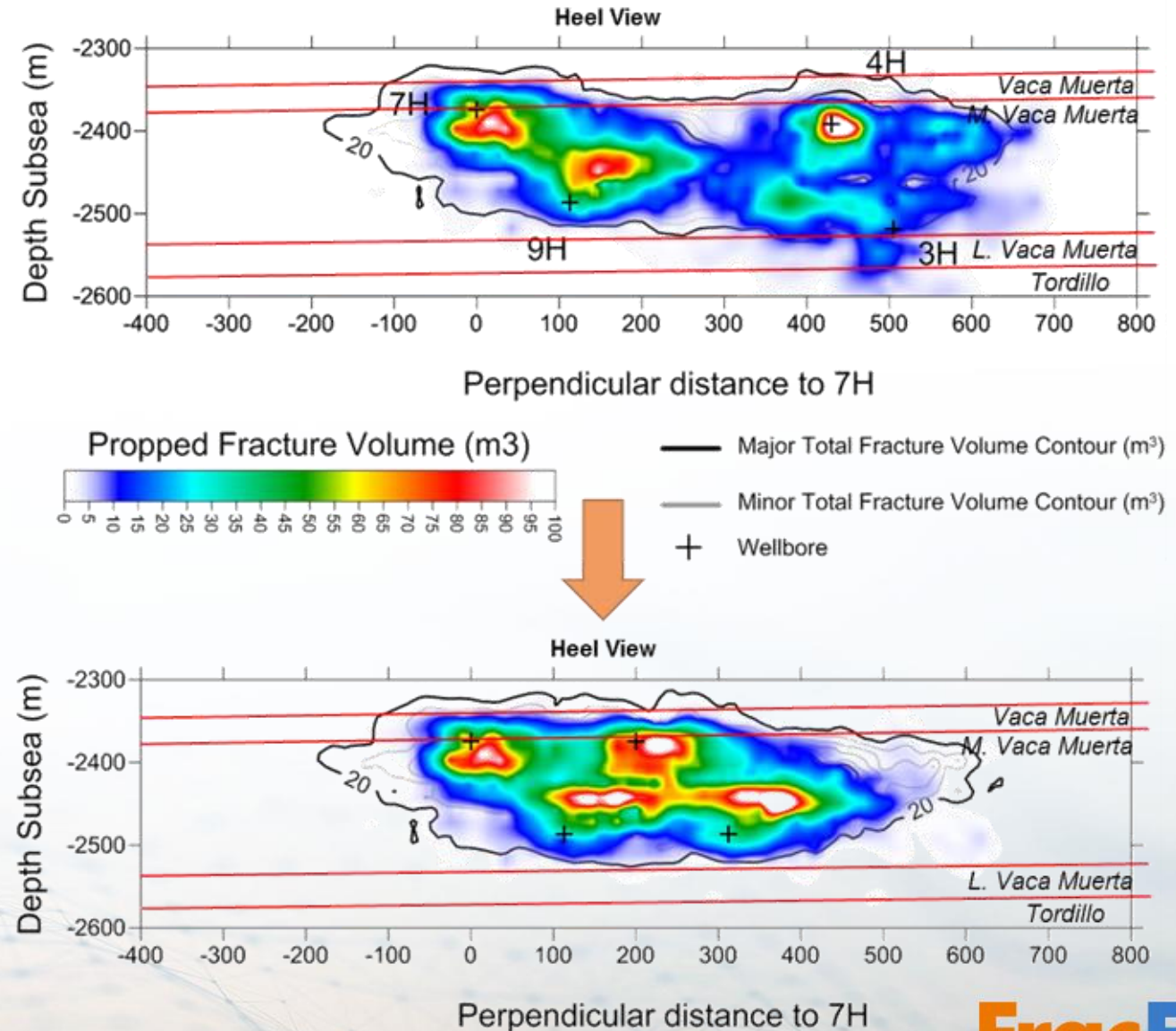
Pressure (psi) 2037-02-01 J layer: 56



Field Development

Field Development Scenario

- Microseismic analysis suggests a wellbore spacing of 200 m between wells in same targeted interval
- Western staggered horizontal offset of 115 m is suggested over Eastern staggered spacing of 75 m based on target zone containment



Conclusions

Summary

- BuriedArray delivered high-quality data with excellent event location accuracy.
- Fracture propagation is aligned with:
 - Maximum horizontal stress (95° azimuth)
 - Conductive natural fractures (50° and 150°)
- The majority of fractures have 90° strike (high failure potential, require low pore pressures) followed by 50° (medium failure potential, require slightly elevated pore pressures).
- Microseismic suggests wellbore spacing of 200 m in same targeted interval and horizontal offset between staggered wells of 115 m.