

Slim Hole Liner Drilling through Depleted Sands in the Gulf of Mexico

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Outline

- Introduction and Background Information
- Planning
- Equipment
- Modeling
- Execution
- Results
- Summary



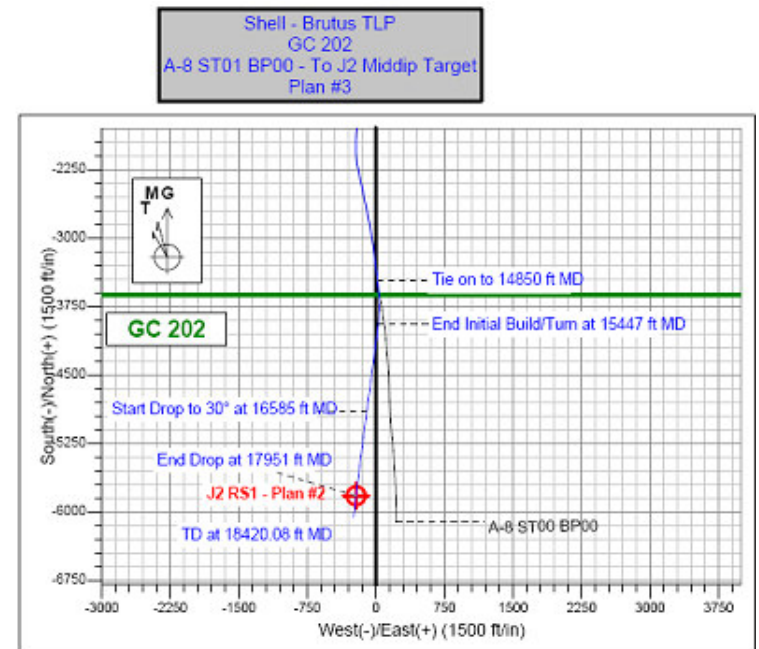
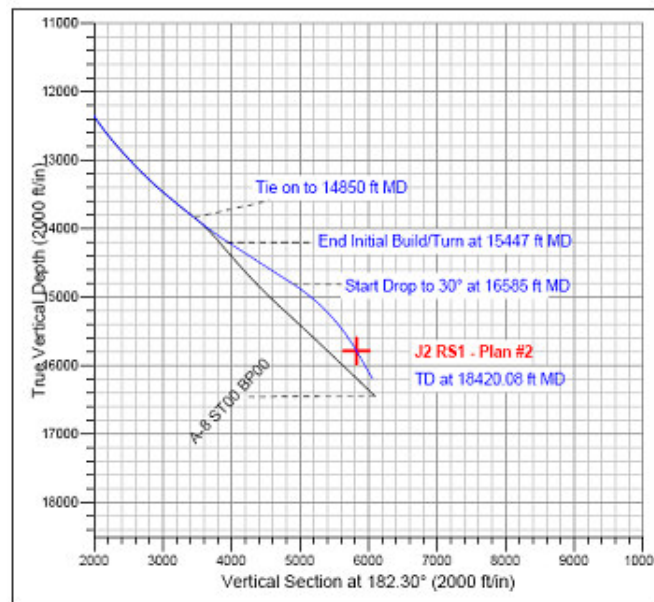
Background Brutus TLP Information

- Located in Green Canyon Block 158, 202
- 2,985' of water
- First oil in 2001
- 8 slot Tension Leg Platform
- Wells set up for multiple slim hole sidetracks out of either 7 5/8" 47.1# or 8 5/8" 60.7#
- Rig just cold stacked after successful campaign
- Unplanned well failure



Objective

- Sidetrack the A8 well to an updip location in the same sand package
- 50 degrees at KOP of 14,800' MD, 3500' section, 58 degree sail angle
- 5 1/2" 13Cr production casing

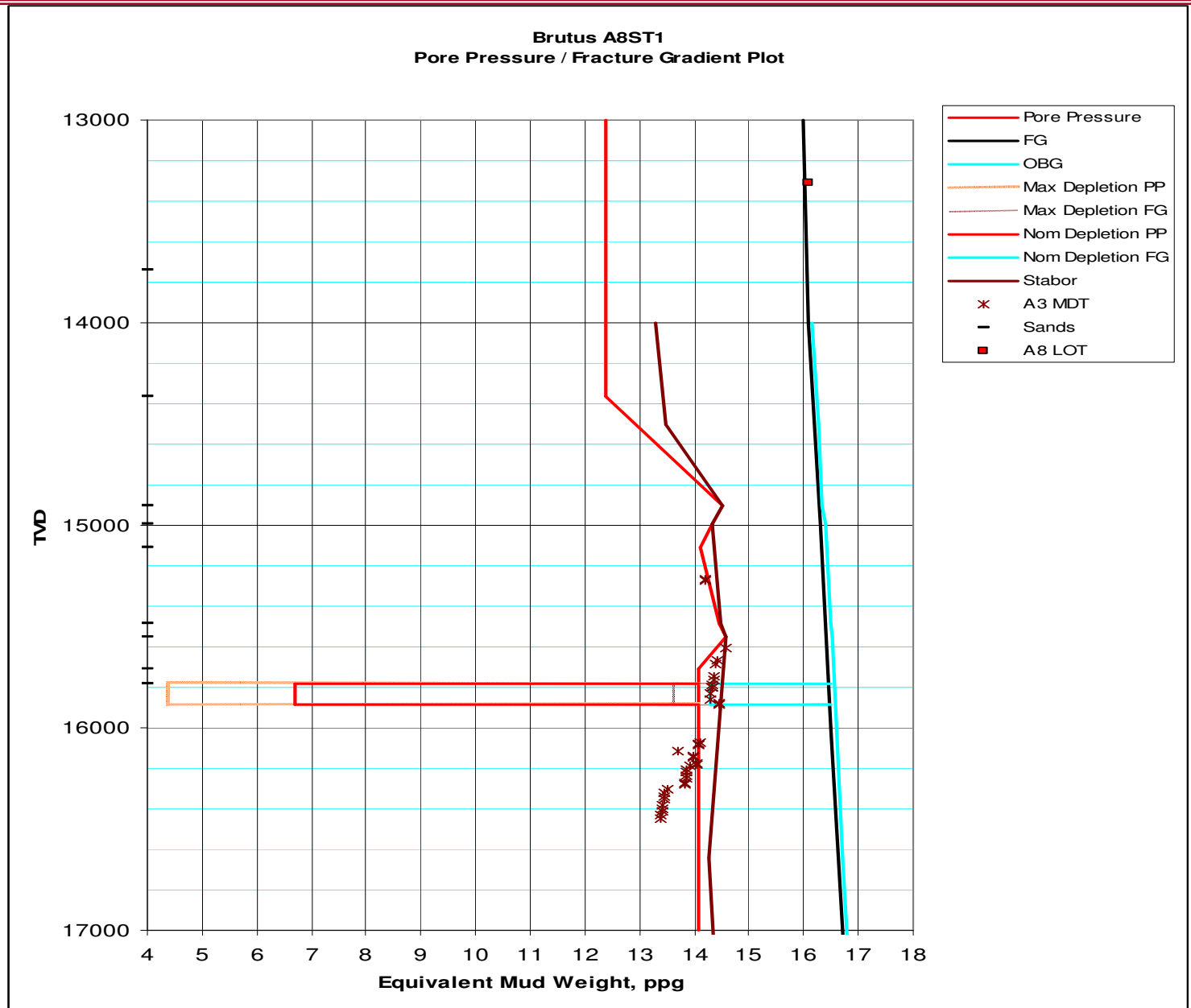


Pore Pressure

- 14.6 ppg in G2B sand
- 4.39 ppg in J2 sand
- 14.6 ppg minimum for hole stability
- 14.3ppg Fracture gradient, 13.6 ppg with max depletion
- ECD's 1.2 ppg

Case for MPD?

- Would require approval from MMS to lower static mud weight below pore pressure
- Liner drilling chosen to take advantage of the smear effect while drilling and to avoid tripping pipe with depleted sands exposed.

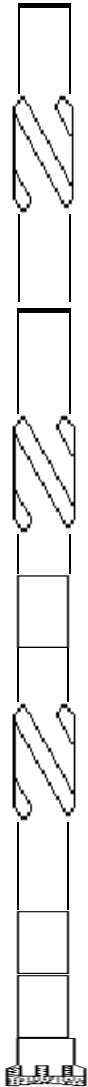


Equipment Issues

- Not enough lead time to build a liner hanger with packer. Plan was to use Baker HRD Liner Setting Sleeve readily available
- 8,000 psi isolation needed at liner top. Baker Reactive swellable element to be stabbed in after a liner top squeeze job
- Pipe was available from another project, 5.5" 23# 13Cr with HYD 513 connections



Liner Drilling String

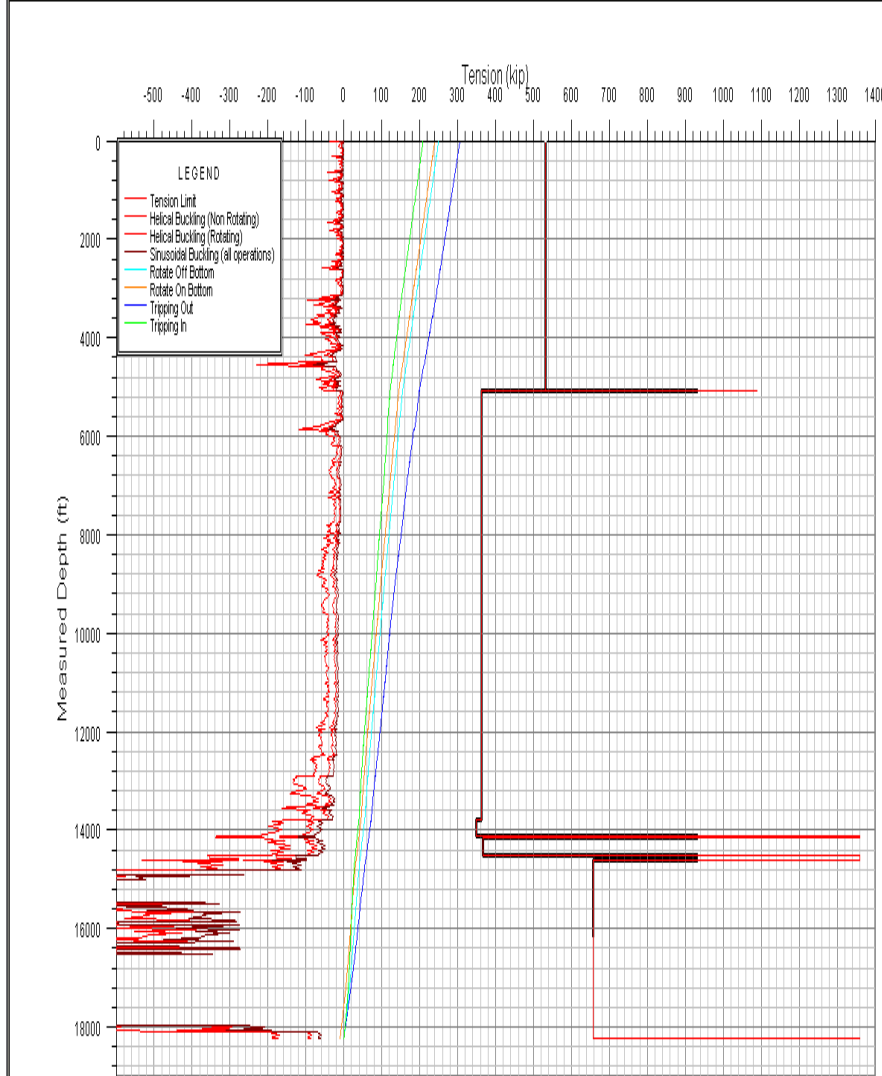


- 7- 6 1/8" Halliburton Protech mold on centralizers mid joint
- Weatherford Sure Seal double valve float collar
- XO
- Baker rupture sub set for 4800 psi
- Security DBS FM2643 PDC bit, no jets
- 2 Wearsox centralizer beneath liner top

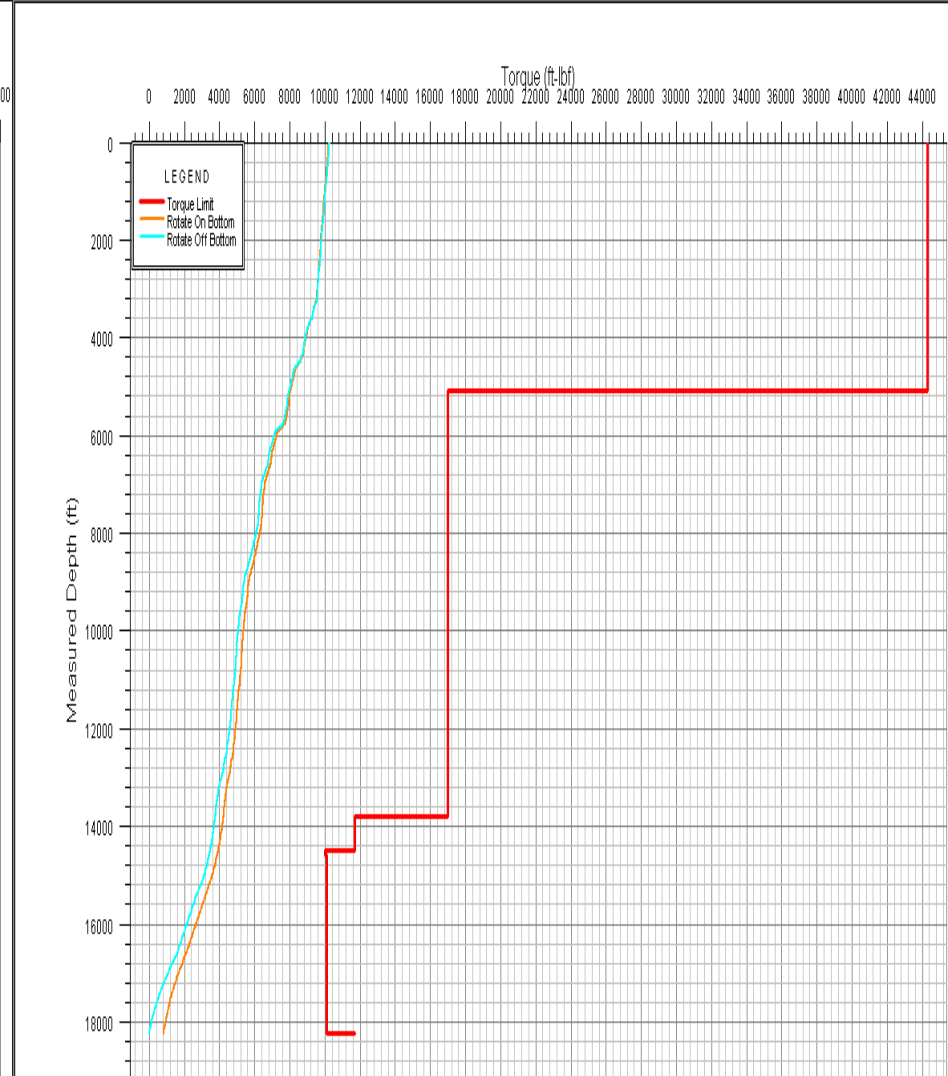


Modeling

Torque Drag Effective Tension Graph

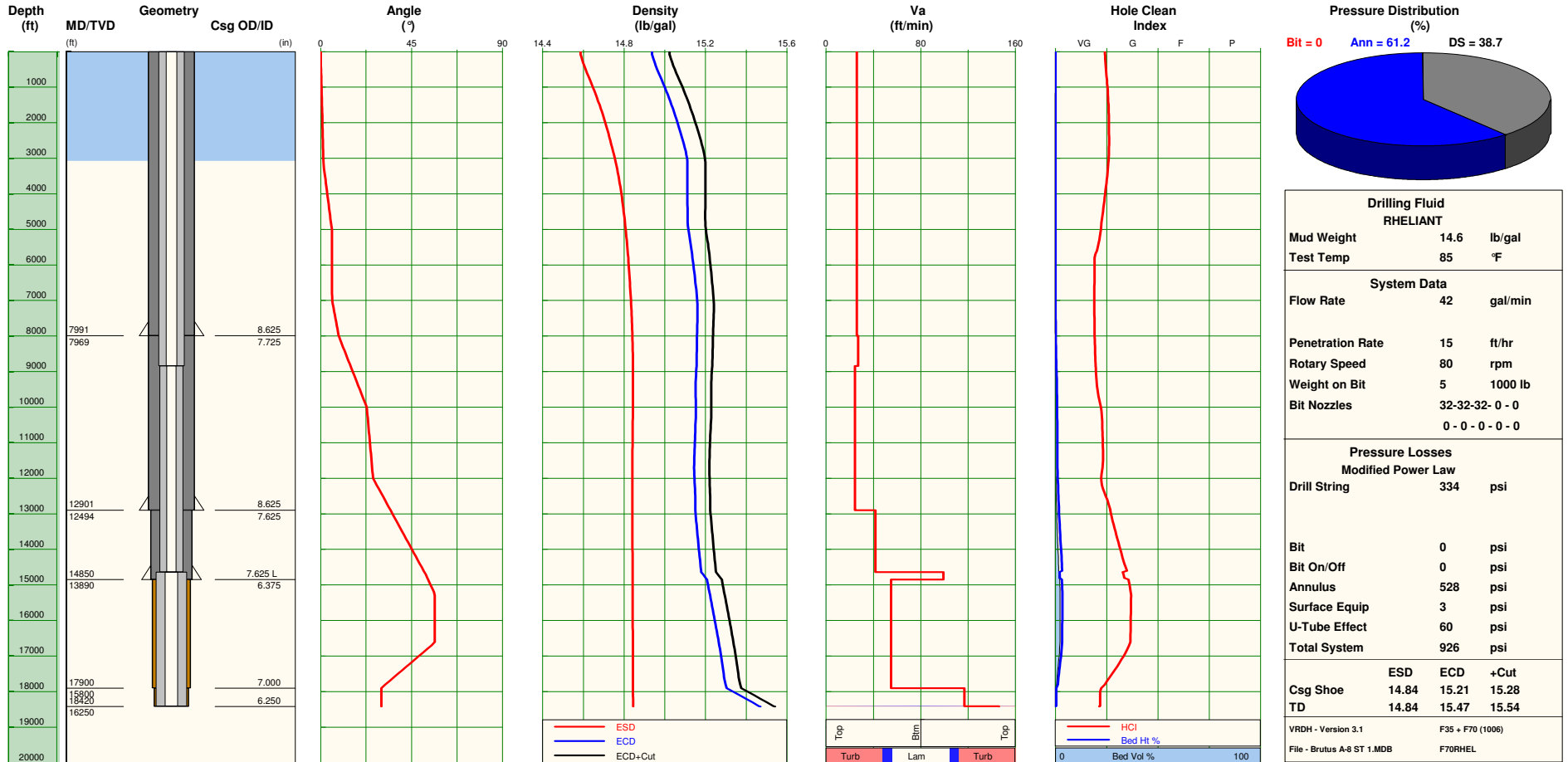


Torque Drag Normal Torque Graph



Liner Drilling Hydraulics

 VIRTUAL HYDRAULICS*	©1995-2006 M-I L.L.C. <small>*Mark of M-I L.L.C.</small>	Drill in Liner Rheliant	MD: 18420 ft TVD: 16250 ft Bit Size: 6.25 in Date: 8/8/2008	Operator: Sepco Well Name: OCS-G- 7995 A-8 ST1 Location: Green Canyon Blk 158 Country:
				



Drilling Fluid		
RHELIANT		
Mud Weight	14.6	lb/gal
Test Temp	85	°F
System Data		
Flow Rate	42	gal/min
Penetration Rate	15	ft/hr
Rotary Speed	80	rpm
Weight on Bit	5	1000 lb
Bit Nozzles	32-32-32- 0 - 0	
	0 - 0 - 0 - 0 - 0	
Pressure Losses		
Modified Power Law		
Drill String	334	psi
Bit	0	psi
Bit On/Off	0	psi
Annulus	528	psi
Surface Equip	3	psi
U-Tube Effect	60	psi
Total System	926	psi
Csg Shoe	ESD 14.84	ECD 15.21 +Cut 15.28
TD	14.84	15.47 15.54
VRDH - Version 3.1		F35 + F70 (1006)
File - Brutus A-8 ST 1.MDB		F70RHEL

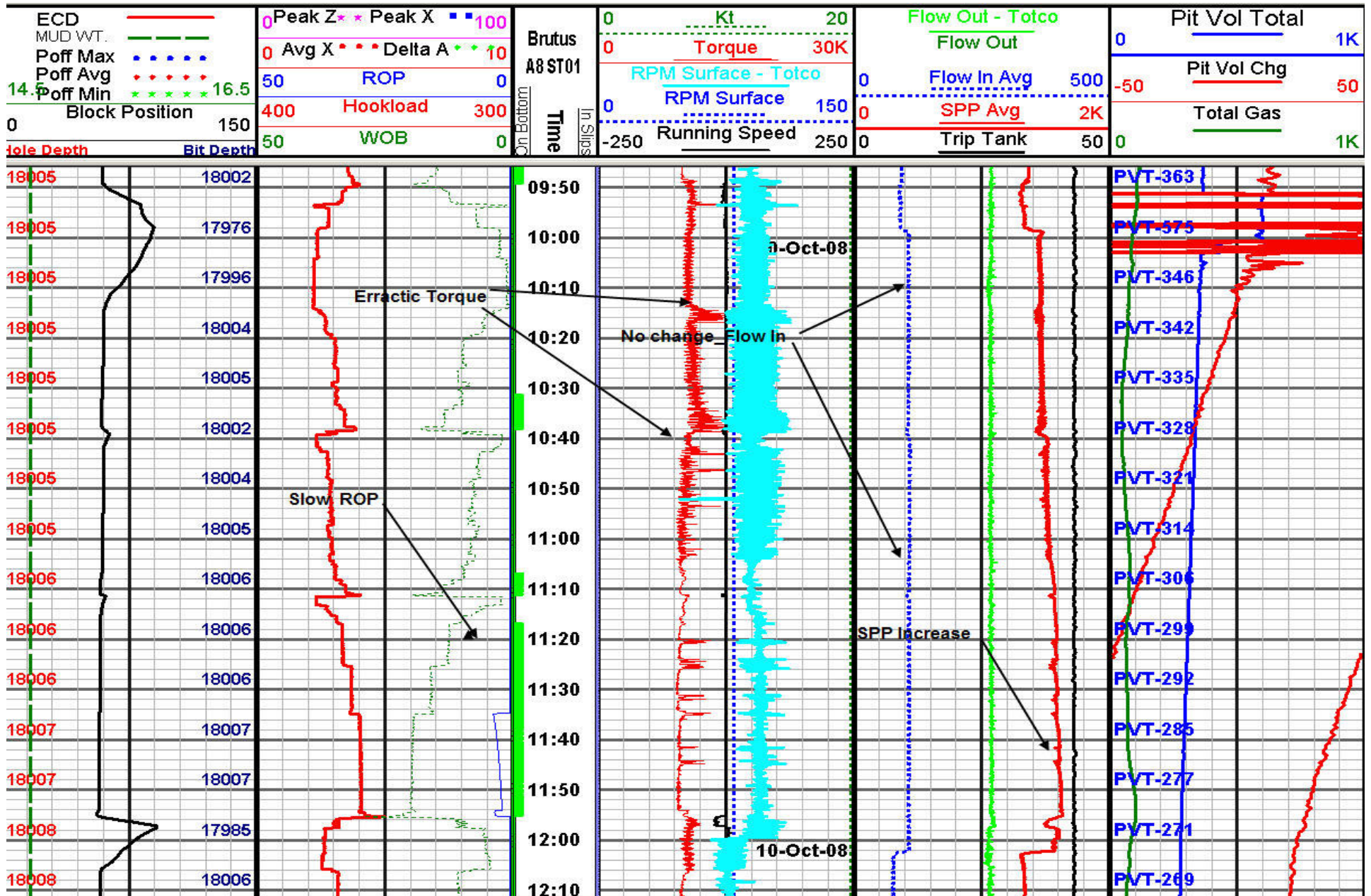


Execution

- Rotary Steerable with MWVD, PWVD
- 6 1/8" hole opened up to 7"
- Stopped 60' above depleted formation
- Dedicated clean out trip made to ensure hole was clean, work through some dog legs, and
- Reamed entire trip down
- Unfortunately losses began on trip in before the drilling began



Liner Drilling Beginning



Drilling Parameters

- PUMPING @ 2BPM WITH 1500 PSI.
- ROTATING 70-80 RPM WITH 10-13 TORQUE.
- BREAK OFF WALL TORQUE OF 14K.
- PUMPED 60 BBLS LCM PILL WHEN DRILLING J SANDS.
- - 1 BBL/MIN LOSSES.
- AVG ROP 12.6 INST 50



Results

- 462' Successfully drilled in
- Well completed and brought online
- Lost a total of 1 900 bbls while running liner(700) and drilling(1 200)
- 250 bbls ballooned back post cement job



Summary

Liner drilling was successfully used to drill and complete a challenging well. Unfortunately due to taking losses early we were unable to quantify the benefits of the smear effect. As assets in the Gulf of Mexico mature more wells will need to drill through depleted sands and liner drilling will become more prevalent in our business.

