Company	NORTHEAST NATURAL ENERGY LLC
Prepared For	Jay Hewitt
Well Name	MIP UNIT3H
Surface Location	Lat: 39 36 6.42, Long: 79 58 34.04
UWI Number	4706101707
Well License Number	AFE: 100333-612
Formation	Marcellus
Objective	Provide equipment and materials to set 3 plugs from 8000 ft to 6100 ft in 8.75 in OH with 10% excess.
Service From District	Weston
District Phone	(304) 269-1939
Proposal Number	1
Date	9/01/2015
Primary Contact	Conrad Longman
File Name	MIP 3H.docx

WELL DATA SUMMARY

The cementing program incorporates the following data:
All depths take the rig floor as reference

Section MD :	8030.0 ft
Section TVD :	8030.0 ft

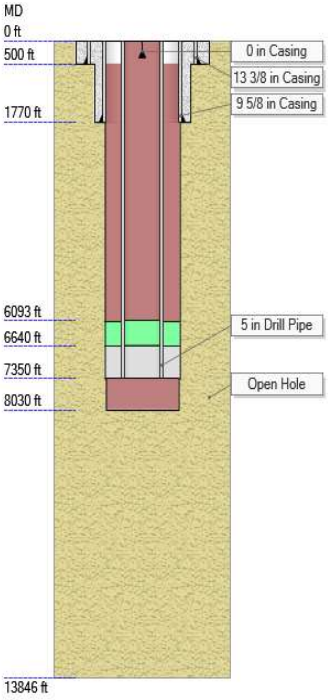
Rig Floor Elev	0.0 ft
Mud Returns Depth :	0.0 ft

Tubulars and Casing Hardware

	MD ft	OD in	Weight lb/ft	Grade	ID in	Thread	Collapse psi	Burst psi	Joint ft
Prev Casing	1770.0	9 5/8	40.0	J-55	8.835	Official	2570	3950	40.0
	500.0	13 3/8	54.5	J-55	12.615	Official	1130	2730	40.0
	0.0	0	0.0		0	Official	0	0	40.0
Workstring	7350.0	5	19.5	X-95	4.276	API	12030	12040	40.0

Dart/Ball Launch Manifold	N/a

Note : previous casing (and riser) collapse and burst security not verified



Open Hole

Total OH Volume :	465.6 bbl
Minimum Diameter :	8.750 in
Maximum Diameter :	8.750 in

Mean Diameter :	8.750 in
Mean Ann. Excess :	10 %
Mean Eq. Diameter :	9.008 in

Note : 10% excess

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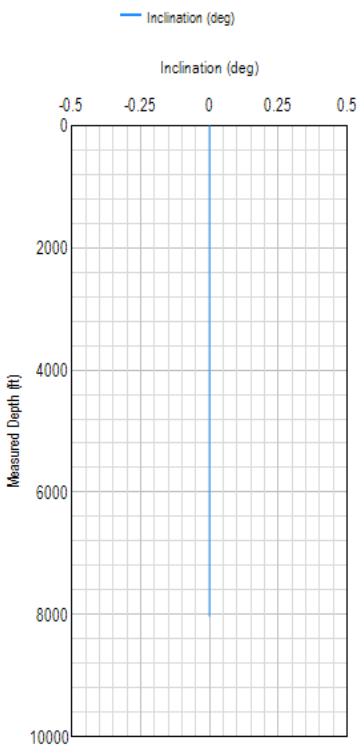
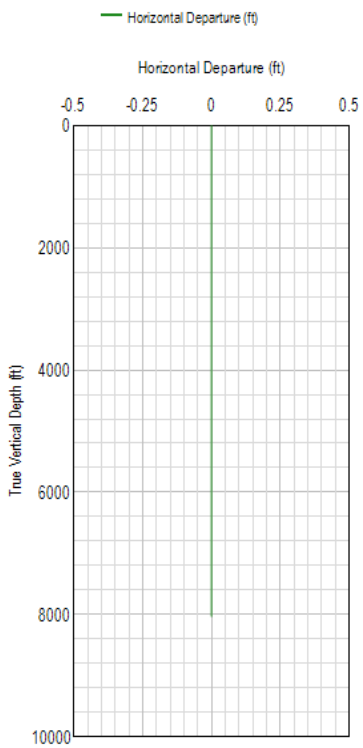
Directional Survey





Note : Vertical Hole

Formation

Top MD ft	Bottom MD ft	Bottom TVD ft	Frac Top ED lb/gal	Frac Bottom ED lb/gal	Pore Top ED lb/gal	Pore Bottom ED lb/gal	Lithology	Res. Fluid	Name
0.0	13846.0	13846.0	19.25	19.25	8.28	8.28	Sandstone		

Temperature

Name	Top MD ft	Bottom MD ft	Bottom TVD ft	Temperature degF	Temp. Gradient degF/100ft	Temp. Rel. Gradient degF/100ft	Sea Current ft/min
Surface	0.0	0.0	0.0	55	0.00		0.00
BHST	0.0	7350.0	7350.0	136	1.10	1.10	0.00
Rock	7350.0	8030.0	8030.0	143	1.10	1.10	0.00
Rock	8030.0	13846.0	13846.0	207	1.10	1.10	0.00

Source of temperature data : 1.1 degF/100ft Gradient

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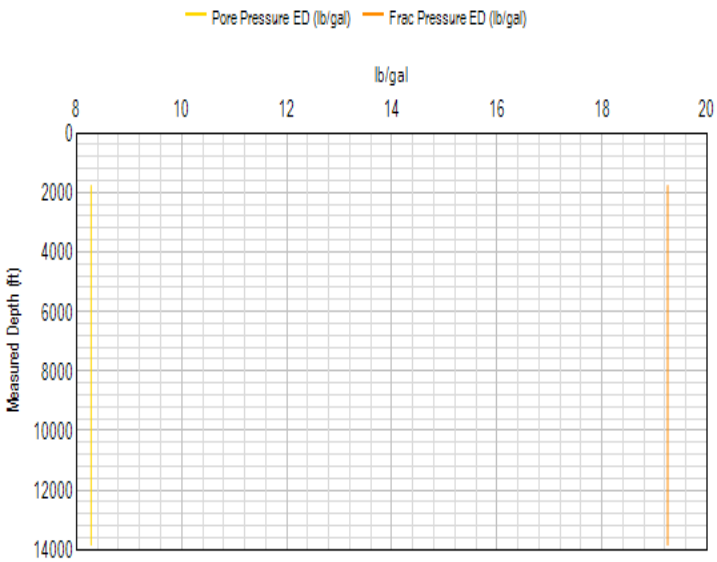

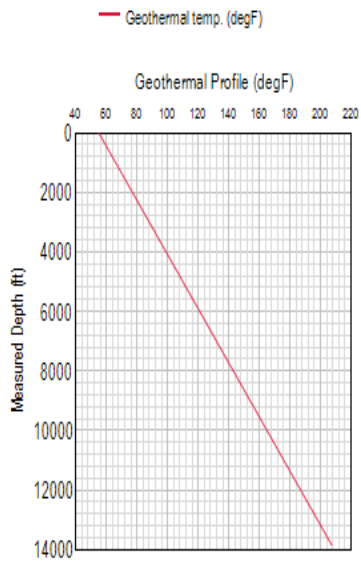

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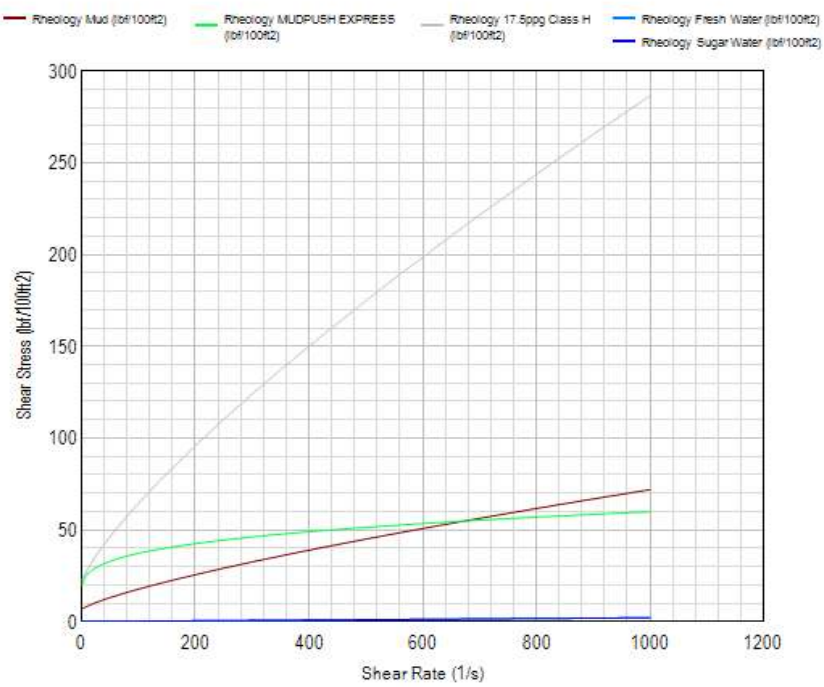
FLUIDS SUMMARY

Rheology and density of compressible fluids are displayed at standard conditions, ie. **P = 1 atm** and **T = 20 degC** (65 degF)

Fluids					
Type	**Name**	**Density** lb/gal	**K** lbf.s^n/ft2	**n**	**Ty** lbf/100ft2
Drilling Fluid	Mud	12.50	3.30E-3	0.77	6.44
Spacer	MUDPUSH EXPRESS	13.50	6.04E-2	0.29	13.79
Slurry	17.5ppg Class H	17.50	1.14E-2	0.79	21.10
Drilling Fluid	Fresh Water	8.32	2.09E-5	1.00	0.00
Wash	Sugar Water	8.31	2.09E-5	1.00	0.00



Fluid Density and Rheology Tolerance
Mud – properties to be verified prior to job with mud engineer, contact engineer onshore if deviation is outside the range below density difference from planned : +/- 0.2 ppg
Spacer – properties to be verified prior to job, see contingency plans if deviation is outside the range below density difference from planned : +/- 0.2 ppg
Slurry – cement slurry should be batch mixed within the range described below, see contingency plans if there is mismatch between designed density and slurry volume density difference from planned : +/- 0.2 ppg

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FLUID PLACEMENT

Volume Balance Objectives

Volume Balance Model: **Optimize Slurry & Spacer**

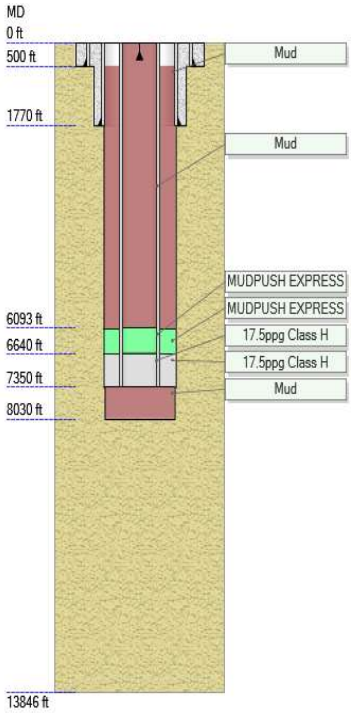
Original Fluid:	Mud	Rat Hole Fluid:	Mud	Displ. Fluid:	Mud

Top Spacer:	MUDPUSH EXPRESS	set Total Volume to:	39.7 bbl
Top Slurry:	17.5ppg Class H	set Length to:	650.0 ft

Annulus is **not** filled during POOH.

Volume Balance Results

String Volume:	130.5 bbl	Underdispl.:	0.1 bbl	Displ. Volume:	108.2 bbl
TOC after POOH:	6700.0 ft	Cement Length after POOH:	650.0 ft		



Fluid Placement in Annulus

Fluid Name	Top MD ft	Bottom MD ft	Length ft	Volume bbl	Surface Density lb/gal
Mud	0.0	6098.3	6098.3	329.7	12.50
MUDPUSH EXPRESS	6098.3	6642.5	544.2	30.0	13.50
17.5ppg Class H	6642.5	7350.0	707.5	39.0	17.50

Fluid Placement in Pipe

Fluid Name	Top MD ft	Bottom MD ft	Length ft	Volume bbl	Surface Density lb/gal
Mud	1.4	6092.6	6091.3	108.2	12.50
MUDPUSH EXPRESS	6092.6	6639.7	547.0	9.7	13.50
17.5ppg Class H	6639.7	7350.0	710.3	12.6	17.50

Note: Surface densities of compressible fluids are calculated at surface conditions, ie. **P = 1 atm** and **T = 55 degF**

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PUMPING SCHEDULE

Volume and rate of compressible fluids are calculated at surface conditions, ie. **P = 1 atm** and **T = 55 degF**

Pumping Schedule						
Fluid Name	**Stage Volume** bbl	**Pump Rate** bbl/min	**Stage Time** hr:mn	**Cum. Time** hr:mn	**Comment**	**Inj. Temp.** degF
MUDPUSH EXPRESS	30.0	3.0	00:09	00:09		68
17.5ppg Class H	51.6	3.0	00:17	00:27		68
MUDPUSH EXPRESS	9.7	3.0	00:03	00:30		68
Mud	108.2	3.0	00:36	01:06		68

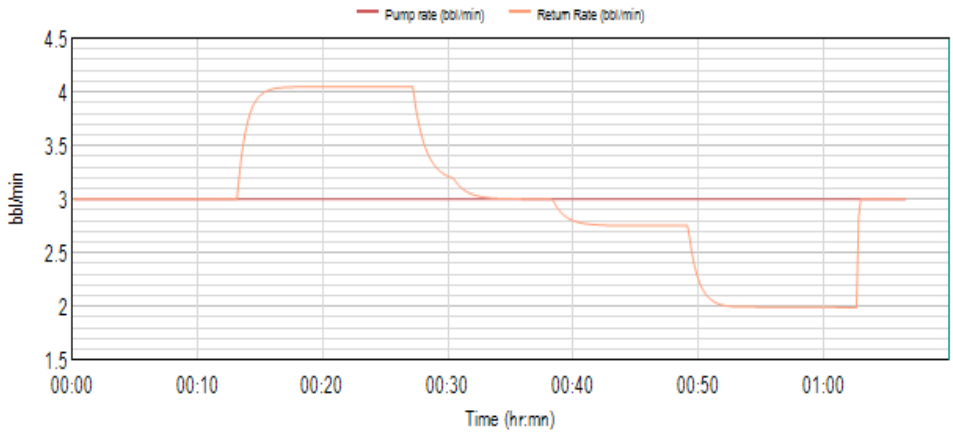
Displacement Volume Considerations		
	Volume bbl	**Variation** bbl
Theoretical displacement volume	108.3	
Underdisplacement		-0.1
Final Displacement	108.2	

Pump Rate Tolerance

Based on the tickening times available, results of hydraulic simulation and fluid placement simulations, pump rates should be kept between the following limits:

Spacer train :	2.0 bbl/min to	4.0 bbl/min
Cement slurry :	2.0 bbl/min to	4.0 bbl/min
Displacement :	2.0 bbl/min to	4.0 bbl/min

Slow down rates related to casing hardware operation should be respected.
Pauses in the jobs are only estimates – all efforts should be made during the operation to minimize these times.



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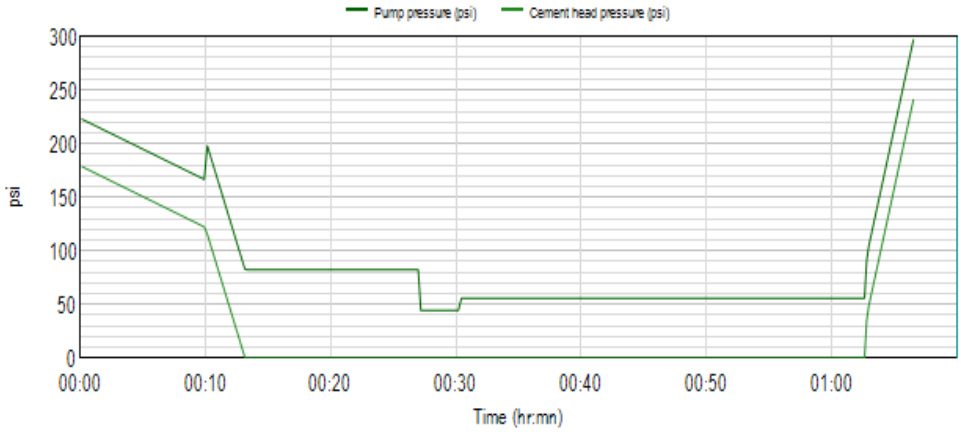

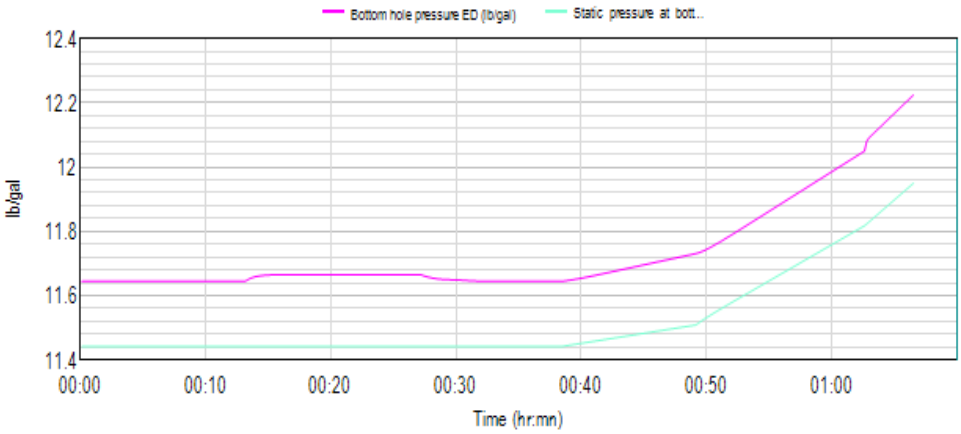

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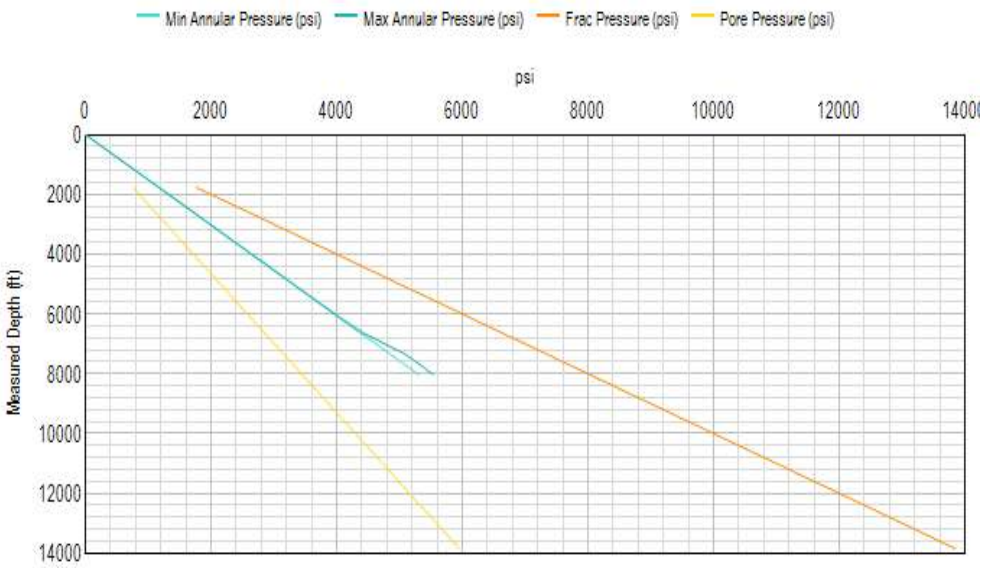
WELL SECURITY

Status	Description	Min. Pressure Margin psi	at Depth ft	at Time hr:mn
Success	Fracturing	598	1770.0	01:06
Success	Production/Influx	388	1770.0	01:06
Success	Burst	11799	0.0	01:06
Success	Collapse	10992	4429.1	00:46

Well Control



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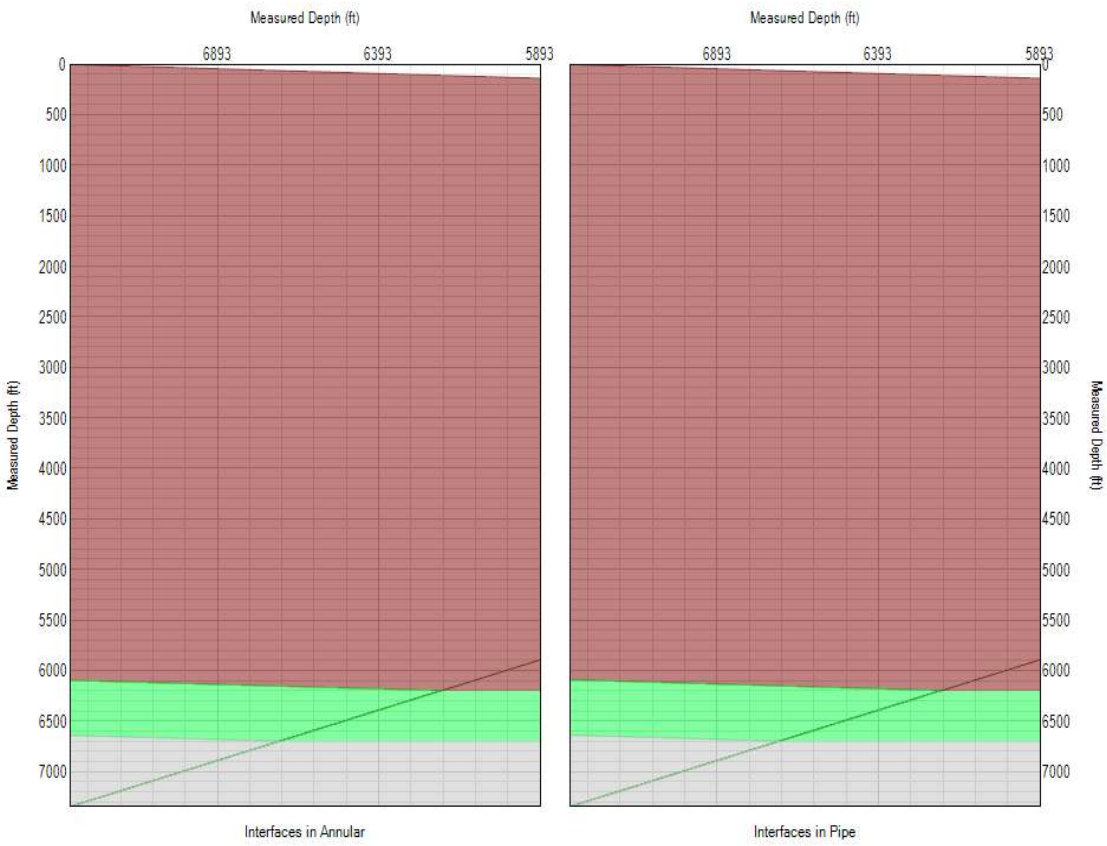
STATIC PULL OUT OF HOLE (POOH)

POOH Summary				
Final DP depth :	5892.6 ft		Theoretical Top of Plug:	6700.0 ft
POOH Length :	1457.4 ft		Theoretical Plug Length :	650.0 ft
POOH Speed :	TBD		Plug Bottom :	7350.0 ft

Top of uncontaminated cement after POOH :	**6700.0 ft**
Uncontaminated cement length after POOH :	**650.0 ft**
Contaminated cement length after POOH :	0.0 ft

POOH Results Summary



Note : Simulation assumes that fluids are free to balance themselves.

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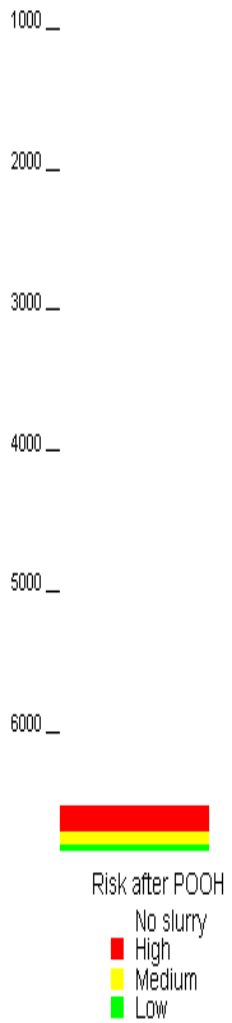
FINAL CONTAMINATION RISK (AFTER POOH)

POOH Summary				
Final DP depth :	5892.6 ft		Theoretical Top of Plug:	6700.0 ft

Theoretical Top of Plug (based on slurry volume)	6700.0 ft
Initial Top of Plug from POOH (Uncontaminated POOH Simulation)	6700.0 ft
Estimated Top of Cement after POOH (Final POOH Simulation)	**≥ 6705.0 ft**
	≤ 6808.4 ft

Final Contamination Risk



Note : Simulation assumes that fluids are free to balance themselves

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PLUG OPERATION SUMMARY

Overview of the cementing operation (temperatures, fluid types, rates and general notes)
All depths take the rig floor as reference

Well & Rig Information

Rig Type :	Land	Objective :			
Section MD :	**8030.0 ft**	Mud Returns :	Land	Water Depth :	0.0ft
Section TVD :	8030.0 ft	Mud Returns Depth :	0.0 ft	Air Gap :	0.0 ft
Well deviation :	0 deg			Mudline Depth :	0.0 ft

Placement & Post-Placement Conditions

Top :	**6700.0 ft**	Mechanical Separator :	No	POOH depth :	5892.6 ft
Length :	650.0 ft			POOH Speed :	
Bottom :	**7350.0 ft**	Pipe Rotation / Reciprocation :	TBD	Circ. rate :	TBD
Support :	**Bottom Plug**			Circ. direction :	

String type and configuration :	N/a

Design Considerations

17.5ppg Class H		MUDPUSH EXPRESS		Mud	
Cement Type :	**Slurry**	Spacer Type :	**Spacer**	Mud Type :	Water Based / Fresh Water
Slurry Dens. :	17.50 lb/gal	Spacer Dens. :	13.50 lb/gal	Mud Dens. :	12.50 lb/gal

Volume Balance Model :	**Optimize Slurry & Spacer**	Underdispl. :	-0.1 bbl

Pumping Schedule

Fluid Name	**Stage Volume** bbl	**Pump Rate** bbl/min	**Stage Time** hr:mn	**Comment**	**Inj. Temp.** degF
MUDPUSH EXPRESS	30.0	3.0	00:09		68
17.5ppg Class H	51.6	3.0	00:17		68
MUDPUSH EXPRESS	9.7	3.0	00:03		68
Mud	108.2	3.0	00:36		68

Temperature Simulation

Pre-job Circ. Rate :	TBD	BHST	136 degF
Pre-job Circ. Time :	TBD	Simulated BHCT	120 degF

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Fluid rates are calculated at P = 15 psi and T = 68 degF