Hot Topics

In
Well
Permitting

CASING REQUIREMENT
BURST PRESSURE EXAMPLE

Intermediate 9 5/8” Casing

36 #/ft, K-55, BTC

Barlow’s Formula

$$\text{Burst Pressure} = 0.875(2)(Y)(t)/D$$

$$P_b = 0.875(2)(55{,}000)(0.352 \text{ in.})/9.625 \text{ in.}$$

$$P_b = 3520 \text{ PSI}$$

Associated Pressure
of the Marcellus
at 6918 feet
is
4500 PSI

Formations & Csg Points	Depth, ft			Form. Temp. (F)	Pore Press. (EMW)	Frac Gradient (EMW)	Planned MW	Measure Depth (ft)
	MD	TVD	SS					
Conductor	*120*	*120*	*1,097*	-	-	-	-	120
Casing Point	*550*	*550*	*667*	*65*	-	-	*Air/ Mist*	550
Approximate fresh water strata ~200'								
							8.6	
				-	-	-		
							8.6	
Big Lime	2,057	2,057	*-840*					
							8.6	
Big Injun (Base)	2,512	2,512	*-1,295*					
							8.6	
Berea Sand	2,705	2,705	*-1,488*					
Casing Point	*2,800*	*2,800*	*-1,583*	*82*	-	*>18.0*	*SBM*	2,800

Program	Details
20" Conductor	
17 1/2" Surface	
Profile:	Vertical
Bit Type:	17-1/2" Hammer bit
BHA:	
Mud:	Air/ Mist
Surveys:	n/a
Logging:	n/a
Casing:	13.375in 54.5 # J-55 BTC set @ ~ 550 MD/550 TVD
Centralizers:	1 centralizer w/ stop collar 10 ft above float shoe. One Single Bow every joint to 100ft below surface.
Cement:	15.8 ppg BondCem gas tight single slurrry tail design to surface
Potential Drilling Problems:	
FIT/LOT: 14.0 ppg EMW	**12 1/4" Intermediate**
Profile:	Nudge and hold for anticollission
Bit Type:	PDC 7-blade, 16mm cutters; Smith MDSi716
BHA:	8" Directional Assy 6:7 Lobe 4.0 Stg 0.17 rpg, 620 DIFF
Mud:	SBM
Surveys:	Gyro MS, MWD EM Pulse
Logging:	n/a
Casing/Liner:	9.625in 36# J55 BTC set at 2800MD/ 2800TVD.
Liner Hanger:	n/a
Centralizers:	1 centek centralizer w/ stop collar 10 ft above float shoe. 1 centek centralizer w/ stop collar 10 ft above float collar. 1 centralizer every joint for the first 15 joints. One centralizer every 3 jnts to 100ft below surface.
Cement:	15.8 ppg, BondCem gas tight, single slurry tail design to surface
Potential Drilling Problems:	Slow ROP, DBR bit matrix

Gordon Sand	2,944	2,944	-1,727				8.6
Riley	4,804	4,804	-3,587				8.6
					-	-	8.6
Geneseo		6,823	-5,606	145	-	-	9.5
Tully		6,848	-5,631	150	-	-	9.5
Marcellus		6,918	-5,701	150	-	-	9.5
					-	-	9.5
Onondaga		7,000	-5,783	155	-	-	9.5

7,100

FIT/LOT: 15.0 ppg EMW	8 1/2" Production
Profile:	Vertical Pilot Hole
Bit Type:	8 1/2" Security FXD65 (vert)
BHA:	Directional Assembly (Steerable Motor) + EM w/ GR
Mud:	SBM
Surveys:	MWD EM Pulse
Logging:	Whole core across Marcellus target interval + Quad Combo WL Log
Casing/Liner:	n/a
Csg Hanger:	n/a
Centralizers:	n/a
Cement:	Plugback w/ (2) 600ft linear plugs to approximately 5800'md
Potential Drilling Problems:	
Notes / Comments:	

Maximum Surface Pressure

- P_{smax} = Maximum BHP – (Gas gradient * TVD)
- P_{smax} = (0.6505 psi/ft * TVD) – (Gas gradient * TVD)
- P_{smax} = (0.6505 * 6930) – (0.1 * 6930)
- P_{smax} = 4508 psi – 693 psi
- P_{smax} = 3815 psi

Maximum Anticipated Surface Pressure Based on Leak Off Test

- LOT indicates the formation under the 9 5/8” shoe fractures at an equivalent mud weight of 15 ppg.
- P_{frac} = (15 ppg * 0.052 * 2850 ft)
- P_{frac} = 2223 psi
- MASP = P_{frac} – (0.1 psi/ft * 2850 ft)
- MASP = 2223 psi – 285 psi
- MASP = 1938 psi

Burst Pressure Safety Factor is 20%

$1938_{masp} * 1.20 = 2326$ PSI

Burst Pressure rating of 3520 psi is greater than 2326 psi.

Additional Well Safety for Pad Drilling

- Anti Collision Protocol (Required)
- Deep Set Plugs on Surrounding Completed Wells

Permit Conditions Addressing Water Well or Natural Spring Testing Allowed by WV Code 22-6-11

- 35 CSR 4 -19.1.a
- 35 CSR 4 -19.1.c

35 CSR 4-19.1.A

- At the request of the surface owner all water wells or springs within 1000 feet of the proposed well that are actually utilized for human consumption, domestic animals or other general use shall be sampled and analyzed.

35 CSR 4-19.1.C

If the operator is unable to sample and analyze any water well or spring within one thousand (1,000) feet of the permitted well location, the Office of Oil and Gas requires the operator to sample, at a minimum, one water well or spring located between one thousand (1,000) feet and two thousand (2,000) feet of the permitted well location.

Water Testing Parameters for 22-6 Wells (Not H6A)

1. pH
2. Iron
3. Total Dissolved Solids
4. Chloride
5. Detergents (MBAS)
6. Any other parameters determined by operator

west virginia department of environmental protection

Jeffrey W. McLaughlin, B. S. Pet. Eng.

TECHNICAL ANALYST

Office of Oil & Gas
601 57th Street, SE
Charleston, WV 25304

Office: 304-926-0499 x 1614
Jeffrey.W.McLaughlin@wv.gov
Cell: 304-206-6769