be shown in the fracture equations below, there is enough potential BOP pressure here to create a fracture at the 18" Shoe, *i.e.*, 7,727 psi, much greater than the 5,484 psi needed.

Sufficient pressure is available to possibly fracture the formation at the 18" Shoe, even with some pressure drops caused by restrictions at the Production Casing Hanger and open collapse disks. A fracture at the 18" Shoe could explain why the BOP pressures were much lower than expected. If insufficient pressure was available to fracture the formation at the 18" Shoe, then Scenario #3 could be ruled out. Fracture pressure can be easily calculated and the mud pressures were sufficient to fracture, as shown below.

First I calculated the mud pressure density for the heavy 16.4 ppg mud used during the Top Kill Momentum Kill.

Equation 18: Mud Pressure Density Calculation

(Mud Weight	x	Conversion Factor)	=	Mud Pressure Density
(16.4 ppg	x	0.052)	=	0.85 psi/ft

Then, I calculated the hydrostatic pressure of mud at the 18" Shoe similar to the calculation I did earlier for the flowing well with oil.

Equation 19: Hydrostatic Pressure of Mud at 18" Shoe Calculation

(Mud Pressure Density	x	(Depth of 18" Casing Shoe	-	BOP Depth at Mudline))	=	Static Mud Pressure at 18" Shoe
(0.85	x	(8,969 ft	-	5,067 ft))	=	3,316 psi

This result represents the pressure imposed by the Top Kill mud with no BOP pressure. Adding the BOP pressure of 4,200 psi seen during the Top Kill operation (Figure 8, above), I determined the total pressure at the collapse disks.

Equation 20: Calculate Top Kill Dynamic Mud Pressure at 18" Casing Shoe

(Static Mud Pressure at Casing Shoe	+	BOP Pressure during top Kill)	=	Total Dynamic Mud Pressure at 18" Shoe
(4,200 psi	+	3,316 psi)	=	7,516 psi