

COG OPERATING, LLC

Lea County, NM
Petrus D State 18H
18H

Lateral

Plan: Plan #1

Standard Planning Report

15 December, 2014

Section Distances
Sec6,T17S,R33E
SHL - Unit P
330'FSL, 150'FEL
PP
337'FSL, 330'FEL
PBHL - Unit M
330'FSL, 330'FWL

FEB 05 2015
62

Archer

Planning Report

Database:	EDM R5000.1 MULTI	Local Co-ordinate Reference:	Well 18H
Company:	COG OPERATING, LLC	TVD Reference:	4224'GL @ 4224.00usft (Planning)
Project:	Lea County, NM	MD Reference:	4224'GL @ 4224.00usft (Planning)
Site:	Petrus D State 18H	North Reference:	Grid
Well:	18H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Lateral		
Design:	Plan #1		

Project:	Lea County, NM		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site		Petrus D State 18H			
Site Position:		Northing:	676,132.10 usft	Latitude:	32° 51' 25.69 N
From:	Map	Easting:	696,337.00 usft	Longitude:	103° 41' 38.27 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.200 in	Grid Convergence:	0.35 °

Well	18H					
Well Position	+N-S	0.00 usft	Northing:	676,132.10 usft	Latitude:	32° 51' 25.69 N
	+E-W	0.00 usft	Easting:	696,337.00 usft	Longitude:	103° 41' 38.27 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,224.00 usft

Wellbore	Lateral				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/12/2014	7.20	60.93	48,658

Design:	Plan #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.00	0.00	0.00	269.43

Plan Sections										
Measured Depth	Inclination	Azimuth	Vertical Depth	+N-S	+E-W	Dogleg Rate	Build Rate	Turn Rate	TFO	Target
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(°/100usft)	(°/100usft)	(°/100usft)	(°)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5,629.21	0.00	0.00	5,629.21	0.00	0.00	0.00	0.00	0.00	0.00	
6,456.48	91.00	272.00	6,150.00	18.50	-529.64	11.00	11.00	0.00	272.00	
6,553.61	91.00	269.09	6,148.31	19.42	-626.73	3.00	0.00	-3.00	-89.97	
10,767.45	91.00	269.09	6,074.76	-47.80	-4,839.40	0.00	0.00	0.00	0.00	Petrus 18H PBHL

Archer

Planning Report

Database:	EDM R5000.1 MULTI	Local Co-ordinate Reference:	Well 18H
Company:	COG OPERATING, LLC	TVD Reference:	4224'GL @ 4224.00usft (Planning)
Project:	Lea County, NM	MD Reference:	4224'GL @ 4224.00usft (Planning)
Site:	Petrus D State 18H	North Reference:	Grid
Well:	18H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Lateral		
Design:	Plan #1		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,800.00	0.00	0.00	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,900.00	0.00	0.00	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	5,000.00	0.00	0.00	0.00	0.00	0.00	0.00
5,100.00	0.00	0.00	5,100.00	0.00	0.00	0.00	0.00	0.00	0.00
5,200.00	0.00	0.00	5,200.00	0.00	0.00	0.00	0.00	0.00	0.00
5,300.00	0.00	0.00	5,300.00	0.00	0.00	0.00	0.00	0.00	0.00

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Site:	Petrus D' State 18H	North Reference:	Grid
Well:	18H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Lateral		
Design:	Plan #1		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,400.00	0.00	0.00	5,400.00	0.00	0.00	0.00	0.00	0.00	0.00
5,500.00	0.00	0.00	5,500.00	0.00	0.00	0.00	0.00	0.00	0.00
5,600.00	0.00	0.00	5,600.00	0.00	0.00	0.00	0.00	0.00	0.00
5,629.21	0.00	0.00	5,629.21	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 11.00									
5,650.00	2.29	272.00	5,649.99	0.01	-0.41	0.41	11.00	11.00	0.00
5,700.00	7.79	272.00	5,699.78	0.17	-4.80	4.80	11.00	11.00	0.00
5,750.00	13.29	272.00	5,748.92	0.49	-13.93	13.93	11.00	11.00	0.00
5,800.00	18.79	272.00	5,796.96	0.97	-27.73	27.72	11.00	11.00	0.00
5,850.00	24.29	272.00	5,843.45	1.61	-46.07	46.05	11.00	11.00	0.00
5,900.00	29.79	272.00	5,887.97	2.40	-68.78	68.75	11.00	11.00	0.00
5,950.00	35.29	272.00	5,930.10	3.34	-95.64	95.60	11.00	11.00	0.00
6,000.00	40.79	272.00	5,969.47	4.41	-126.42	126.37	11.00	11.00	0.00
6,050.00	46.29	272.00	6,005.70	5.62	-160.83	160.76	11.00	11.00	0.00
6,100.00	51.79	272.00	6,038.47	6.93	-198.55	198.47	11.00	11.00	0.00
6,150.00	57.29	272.00	6,067.46	8.35	-239.23	239.14	11.00	11.00	0.00
6,200.00	62.79	272.00	6,092.43	9.87	-282.50	282.39	11.00	11.00	0.00
6,250.00	68.29	272.00	6,113.12	11.45	-327.97	327.84	11.00	11.00	0.00
6,300.00	73.79	272.00	6,129.37	13.10	-375.21	375.06	11.00	11.00	0.00
6,350.00	79.29	272.00	6,141.00	14.80	-423.79	423.62	11.00	11.00	0.00
6,400.00	84.79	272.00	6,147.93	16.53	-473.26	473.07	11.00	11.00	0.00
6,450.00	90.29	272.00	6,150.07	18.27	-523.16	522.95	11.00	11.00	0.00
6,456.48	91.00	272.00	6,150.00	18.50	-529.64	529.43	11.00	11.00	0.00
Start DLS 3.00 TFO -89.97									
6,500.00	91.00	270.69	6,149.24	19.52	-573.14	572.92	3.00	0.00	-3.00
6,553.61	91.00	269.09	6,148.31	19.42	-626.73	626.51	3.00	0.00	-3.00
Start 4213.85 hold at 6553.60 MD									
6,600.00	91.00	269.09	6,147.50	18.68	-673.11	672.90	0.00	0.00	0.00
6,700.00	91.00	269.09	6,145.75	17.08	-773.09	772.88	0.00	0.00	0.00
6,800.00	91.00	269.09	6,144.01	15.49	-873.06	872.86	0.00	0.00	0.00
6,900.00	91.00	269.09	6,142.26	13.89	-973.03	972.84	0.00	0.00	0.00
7,000.00	91.00	269.09	6,140.51	12.29	-1,073.00	1,072.83	0.00	0.00	0.00
7,100.00	91.00	269.09	6,138.77	10.70	-1,172.97	1,172.81	0.00	0.00	0.00
7,200.00	91.00	269.09	6,137.02	9.10	-1,272.95	1,272.79	0.00	0.00	0.00
7,300.00	91.00	269.09	6,135.28	7.51	-1,372.92	1,372.78	0.00	0.00	0.00
7,400.00	91.00	269.09	6,133.53	5.91	-1,472.89	1,472.76	0.00	0.00	0.00
7,500.00	91.00	269.09	6,131.79	4.32	-1,572.86	1,572.74	0.00	0.00	0.00
7,600.00	91.00	269.09	6,130.04	2.72	-1,672.83	1,672.72	0.00	0.00	0.00
7,700.00	91.00	269.09	6,128.30	1.13	-1,772.81	1,772.71	0.00	0.00	0.00
7,800.00	91.00	269.09	6,126.55	-0.47	-1,872.78	1,872.69	0.00	0.00	0.00
7,900.00	91.00	269.09	6,124.81	-2.06	-1,972.75	1,972.67	0.00	0.00	0.00
8,000.00	91.00	269.09	6,123.06	-3.66	-2,072.72	2,072.66	0.00	0.00	0.00
8,100.00	91.00	269.09	6,121.32	-5.25	-2,172.69	2,172.64	0.00	0.00	0.00
8,200.00	91.00	269.09	6,119.57	-6.85	-2,272.67	2,272.62	0.00	0.00	0.00
8,300.00	91.00	269.09	6,117.83	-8.44	-2,372.64	2,372.61	0.00	0.00	0.00
8,400.00	91.00	269.09	6,116.08	-10.04	-2,472.61	2,472.59	0.00	0.00	0.00
8,500.00	91.00	269.09	6,114.33	-11.63	-2,572.58	2,572.57	0.00	0.00	0.00
8,600.00	91.00	269.09	6,112.59	-13.23	-2,672.55	2,672.55	0.00	0.00	0.00
8,700.00	91.00	269.09	6,110.84	-14.82	-2,772.53	2,772.54	0.00	0.00	0.00
8,800.00	91.00	269.09	6,109.10	-16.42	-2,872.50	2,872.52	0.00	0.00	0.00
8,900.00	91.00	269.09	6,107.35	-18.01	-2,972.47	2,972.50	0.00	0.00	0.00
9,000.00	91.00	269.09	6,105.61	-19.61	-3,072.44	3,072.49	0.00	0.00	0.00
9,100.00	91.00	269.09	6,103.86	-21.20	-3,172.41	3,172.47	0.00	0.00	0.00

Archer

Planning Report

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Project:	Lea County, NM	MD Reference:	4224'GL @ 4224.00usft (Planning)
Site:	Petrus D State 18H	North Reference:	Grid
Well:	18H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Lateral		
Design:	Plan #1		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
9,200.00	91.00	269.09	6,102.12	-22.80	-3,272.39	3,272.45	0.00	0.00	0.00	
9,300.00	91.00	269.09	6,100.37	-24.39	-3,372.36	3,372.43	0.00	0.00	0.00	
9,400.00	91.00	269.09	6,098.63	-25.99	-3,472.33	3,472.42	0.00	0.00	0.00	
9,500.00	91.00	269.09	6,096.88	-27.58	-3,572.30	3,572.40	0.00	0.00	0.00	
9,600.00	91.00	269.09	6,095.14	-29.18	-3,672.27	3,672.38	0.00	0.00	0.00	
9,700.00	91.00	269.09	6,093.39	-30.77	-3,772.25	3,772.37	0.00	0.00	0.00	
9,800.00	91.00	269.09	6,091.65	-32.37	-3,872.22	3,872.35	0.00	0.00	0.00	
9,900.00	91.00	269.09	6,089.90	-33.96	-3,972.19	3,972.33	0.00	0.00	0.00	
10,000.00	91.00	269.09	6,088.15	-35.56	-4,072.16	4,072.32	0.00	0.00	0.00	
10,100.00	91.00	269.09	6,086.41	-37.15	-4,172.13	4,172.30	0.00	0.00	0.00	
10,200.00	91.00	269.09	6,084.66	-38.75	-4,272.11	4,272.28	0.00	0.00	0.00	
10,300.00	91.00	269.09	6,082.92	-40.34	-4,372.08	4,372.26	0.00	0.00	0.00	
10,400.00	91.00	269.09	6,081.17	-41.94	-4,472.05	4,472.25	0.00	0.00	0.00	
10,500.00	91.00	269.09	6,079.43	-43.53	-4,572.02	4,572.23	0.00	0.00	0.00	
10,600.00	91.00	269.09	6,077.68	-45.13	-4,671.99	4,672.21	0.00	0.00	0.00	
10,700.00	91.00	269.09	6,075.94	-46.72	-4,771.97	4,772.20	0.00	0.00	0.00	
10,767.45	91.00	269.09	6,074.76	-47.80	-4,839.40	4,839.64	0.00	0.00	0.00	
TD at 10767.45										

Design Targets										
Target Name	Dip Angle (°)	Dip Dir (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude		Longitude
Petrus 18H Surface - plan hits target center - Point	0.00	0.00	0.00	0.00	0.00	676,132.10	696,337.00	32° 51' 25.69 N		103° 41' 38.27 W
Petrus 18H PP - plan misses target center by 180.20usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	5.32	-180.12	676,137.41	696,156.88	32° 51' 25.76 N		103° 41' 40.38 W
Petrus 18H PBHL - plan hits target center - Point	0.00	0.00	6,074.76	-47.80	-4,839.40	676,084.30	691,497.60	32° 51' 25.51 N		103° 42' 35.00 W

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
5,629.21	5,629.21	0.00	0.00	Start Build 11.00	
6,456.48	6,150.00	18.50	-529.64	Start DLS 3.00 TFO -89.97	
6,553.61	6,148.31	19.42	-626.73	Start 4213.85 hold at 6553.60 MD	
10,767.45	6,074.76	-47.80	-4,839.40	TD at 10767.45	

COG OPERATING, LLC

Field: Lea County, NM
Site: Petrus D State 18H
Well: 18H
Wellbore: Lateral
Plan: Plan #1

Name
Petrus 18H PP
Petrus 18H Surface
Petrus 18H PBHL

TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
0.00	5.32	-180.12	676137.42	696156.88	32° 51' 25.76 N	103° 41' 40.38 W	Point
0.00	0.00	0.00	676132.10	696337.00	32° 51' 25.69 N	103° 41' 38.27 W	Point
6074.76	-47.80	-4839.40	676084.30	691497.60	32° 51' 25.51 N	103° 42' 35.00 W	Point

TARGET DETAILS

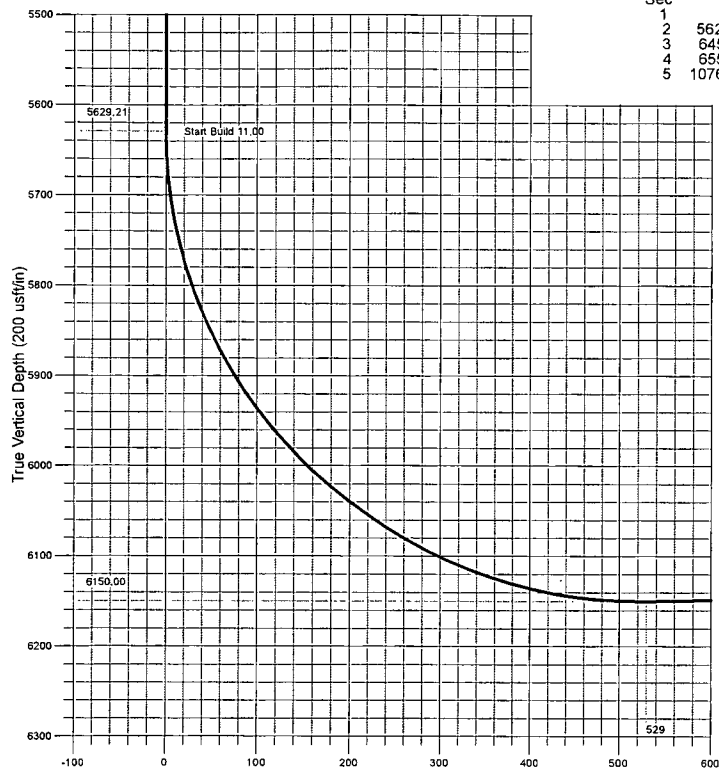


Azimuths to Grid North
True North: -0.35°
Magnetic North: 6.85°

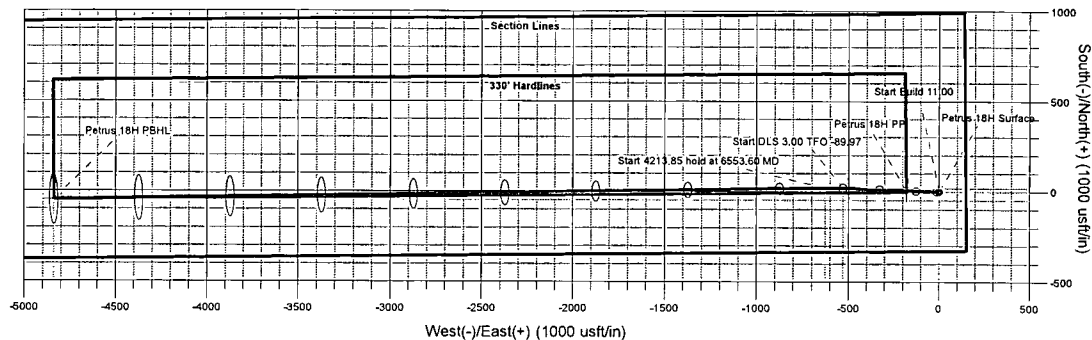
Magnetic Field
Strength: 48657.6nT
Dip Angle: 60.93°
Date: 12/12/2014
Model: HDGM

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	5629.21	0.00	0.00	5629.21	0.00	0.00	0.00	0.00	0.00	
3	6456.48	91.00	272.00	6150.00	18.50	-529.64	11.00	272.00	529.43	
4	6553.60	91.00	269.09	6148.31	19.42	-626.73	3.00	-89.97	626.51	
5	10767.45	91.00	269.09	6074.76	-47.80	-4839.40	0.00	0.00	4839.64	Petrus 18H PBHL

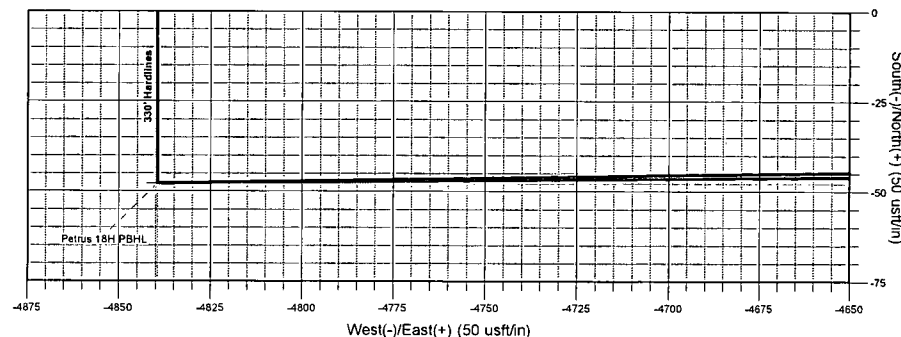


Vertical Section at 269.43° (200 usft/in)

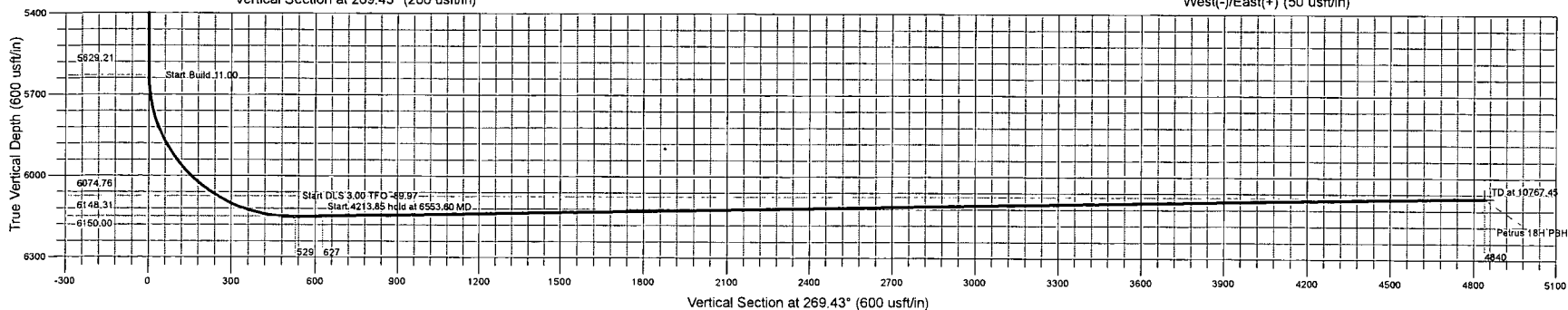


Section Distances

Sec 6, T17S, R33E
SHL - Unit P
330' FSL, 150' FEL
PP
337' FSL, 330' FEL
PBHL - Unit M
330' FSL, 330' FWL



West(-)/East(+) (50 usft/in)



Vertical Section at 269.43° (600 usft/in)

Archer

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Design: Plan #1 (18H/Lateral)
Created By: Ivonne Gonzalez
Date: 13:52, December 15 2014