



Energen Resources

Lea County, NM (NAD83 NME)

Angus State 24-35 16

451H

OH

Plan: Plan 1 01-17-18

Standard Planning Report

17 January, 2018



Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 451H
Company:	Energen Resources	TVD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Project:	Lea County, NM (NAD83 NME)	MD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Site:	Angus State 24-35 16	North Reference:	Grid
Well:	451H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Project	Lea County, NM (NAD83 NME)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site		Angus State 24-35 16			
Site Position:		Northing:	446,521.50 usft	Latitude:	32° 13' 26.26039 N
From:	Map	Easting:	836,449.10 usft	Longitude:	103° 22' 44.45733 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.51 °

Well	451H					
Well Position	+N/-S	0.00 usft	Northing:	446,521.50 usft	Latitude:	32° 13' 26.26039 N
	+E/-W	0.00 usft	Easting:	836,449.10 usft	Longitude:	103° 22' 44.45733 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,382.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/17/2018	6.80	59.93	48,020

Design	Plan 1 01-17-18			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	179.46

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	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	
2,299.97	6.00	269.46	2,299.42	-0.15	-15.69	2.00	2.00	0.00	269.46	
4,679.16	6.00	269.46	4,665.58	-2.50	-264.34	0.00	0.00	0.00	0.00	
4,979.13	0.00	0.00	4,965.00	-2.65	-280.03	2.00	-2.00	0.00	180.00	
11,451.17	0.00	0.00	11,437.04	-2.65	-280.03	0.00	0.00	0.00	0.00	
12,351.17	90.00	179.46	12,010.00	-575.58	-274.61	10.00	10.00	19.94	179.46	
16,429.17	90.00	179.46	12,010.00	-4,653.40	-236.00	0.00	0.00	0.00	0.00	BHL - Angus State

Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 451H
Company:	Energen Resources	TVD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Project:	Lea County, NM (NAD83 NME)	MD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Site:	Angus State 24-35 16	North Reference:	Grid
Well:	451H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

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
805.00	0.00	0.00	805.00	0.00	0.00	0.00	0.00	0.00	0.00
Rustler									
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 2.00°/100' Build									
2,100.00	2.00	269.46	2,099.98	-0.02	-1.75	0.00	2.00	2.00	0.00
2,200.00	4.00	269.46	2,199.84	-0.07	-6.98	0.00	2.00	2.00	0.00
2,299.97	6.00	269.46	2,299.42	-0.15	-15.69	0.00	2.00	2.00	0.00
Hold 6.00° Inc at 269.46° Azm									
2,300.00	6.00	269.46	2,299.45	-0.15	-15.69	0.00	0.00	0.00	0.00
2,400.00	6.00	269.46	2,398.90	-0.25	-26.14	0.00	0.00	0.00	0.00
2,500.00	6.00	269.46	2,498.36	-0.35	-36.60	0.00	0.00	0.00	0.00
2,600.00	6.00	269.46	2,597.81	-0.45	-47.05	0.00	0.00	0.00	0.00
2,700.00	6.00	269.46	2,697.26	-0.54	-57.50	0.00	0.00	0.00	0.00
2,800.00	6.00	269.46	2,796.71	-0.64	-67.95	0.00	0.00	0.00	0.00
2,900.00	6.00	269.46	2,896.17	-0.74	-78.40	0.00	0.00	0.00	0.00
3,000.00	6.00	269.46	2,995.62	-0.84	-88.85	0.00	0.00	0.00	0.00
3,100.00	6.00	269.46	3,095.07	-0.94	-99.30	0.00	0.00	0.00	0.00
3,200.00	6.00	269.46	3,194.52	-1.04	-109.75	0.00	0.00	0.00	0.00
3,300.00	6.00	269.46	3,293.98	-1.14	-120.21	0.01	0.00	0.00	0.00
3,400.00	6.00	269.46	3,393.43	-1.24	-130.66	0.01	0.00	0.00	0.00
3,500.00	6.00	269.46	3,492.88	-1.34	-141.11	0.01	0.00	0.00	0.00
3,600.00	6.00	269.46	3,592.33	-1.43	-151.56	0.01	0.00	0.00	0.00
3,700.00	6.00	269.46	3,691.78	-1.53	-162.01	0.01	0.00	0.00	0.00
3,800.00	6.00	269.46	3,791.24	-1.63	-172.46	0.01	0.00	0.00	0.00
3,900.00	6.00	269.46	3,890.69	-1.73	-182.91	0.01	0.00	0.00	0.00
4,000.00	6.00	269.46	3,990.14	-1.83	-193.36	0.01	0.00	0.00	0.00
4,100.00	6.00	269.46	4,089.59	-1.93	-203.81	0.01	0.00	0.00	0.00
4,200.00	6.00	269.46	4,189.05	-2.03	-214.27	0.01	0.00	0.00	0.00
4,300.00	6.00	269.46	4,288.50	-2.13	-224.72	0.01	0.00	0.00	0.00
4,400.00	6.00	269.46	4,387.95	-2.23	-235.17	0.01	0.00	0.00	0.00
4,500.00	6.00	269.46	4,487.40	-2.33	-245.62	0.01	0.00	0.00	0.00
4,600.00	6.00	269.46	4,586.86	-2.42	-256.07	0.01	0.00	0.00	0.00
4,679.16	6.00	269.46	4,665.58	-2.50	-264.34	0.01	0.00	0.00	0.00
Begin 2.00°/100' Drop									
4,700.00	5.58	269.46	4,686.32	-2.52	-266.45	0.01	2.00	-2.00	0.00
4,800.00	3.58	269.46	4,785.99	-2.60	-274.44	0.01	2.00	-2.00	0.00
4,900.00	1.58	269.46	4,885.88	-2.64	-278.94	0.01	2.00	-2.00	0.00
4,979.13	0.00	0.00	4,965.00	-2.65	-280.03	0.01	2.00	-2.00	0.00
Begin Vertical Hold									
5,104.13	0.00	0.00	5,090.00	-2.65	-280.03	0.01	0.00	0.00	0.00
base Salt									
5,309.13	0.00	0.00	5,295.00	-2.65	-280.03	0.01	0.00	0.00	0.00
Top Delaware Group									
5,344.13	0.00	0.00	5,330.00	-2.65	-280.03	0.01	0.00	0.00	0.00
Bell Canyon									
6,289.13	0.00	0.00	6,275.00	-2.65	-280.03	0.01	0.00	0.00	0.00
Cherry Canyon									
7,764.13	0.00	0.00	7,750.00	-2.65	-280.03	0.01	0.00	0.00	0.00
Brushy Canyon									
8,974.13	0.00	0.00	8,960.00	-2.65	-280.03	0.01	0.00	0.00	0.00
Bone Spring									
9,269.13	0.00	0.00	9,255.00	-2.65	-280.03	0.01	0.00	0.00	0.00

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Site:	Angus State 24-35 16	North Reference:	Grid
Well:	451H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

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)
1st Bone Spring									
10,164.13	0.00	0.00	10,150.00	-2.65	-280.03	0.01	0.00	0.00	0.00
1st Bone Spring Sand									
10,294.13	0.00	0.00	10,280.00	-2.65	-280.03	0.01	0.00	0.00	0.00
2nd Bone Spring									
10,694.13	0.00	0.00	10,680.00	-2.65	-280.03	0.01	0.00	0.00	0.00
2nd Bone Spring Sand									
11,269.13	0.00	0.00	11,255.00	-2.65	-280.03	0.01	0.00	0.00	0.00
3rd Bone Spring									
11,451.17	0.00	0.00	11,437.04	-2.65	-280.03	0.01	0.00	0.00	0.00
KOP2, Begin 10.00°/100° Build									
11,500.00	4.88	179.46	11,485.81	-4.73	-280.01	2.09	10.00	10.00	0.00
11,600.00	14.88	179.46	11,584.21	-21.87	-279.85	19.23	10.00	10.00	0.00
11,700.00	24.88	179.46	11,678.13	-55.84	-279.53	53.20	10.00	10.00	0.00
11,735.68	28.45	179.46	11,710.00	-71.85	-279.38	69.21	10.00	10.00	0.00
3rd Bone Spring Sand									
11,800.00	34.88	179.46	11,764.72	-105.60	-279.06	102.96	10.00	10.00	0.00
11,900.00	44.88	179.46	11,841.36	-169.64	-278.45	167.00	10.00	10.00	0.00
12,000.00	54.88	179.46	11,905.71	-246.01	-277.73	243.38	10.00	10.00	0.00
12,100.00	64.88	179.46	11,955.82	-332.40	-276.91	329.77	10.00	10.00	0.00
12,200.00	74.88	179.46	11,990.17	-426.17	-276.02	423.55	10.00	10.00	0.00
12,300.00	84.88	179.46	12,007.71	-524.49	-275.09	521.87	10.00	10.00	0.00
12,351.17	90.00	179.46	12,010.00	-575.58	-274.61	572.97	10.00	10.00	0.00
LP, Hold 90.00° Inc at 179.46° Azm - Target Zone									
12,400.00	90.00	179.46	12,010.00	-624.42	-274.15	621.80	0.00	0.00	0.00
12,500.00	90.00	179.46	12,010.00	-724.41	-273.20	721.80	0.00	0.00	0.00
12,600.00	90.00	179.46	12,010.00	-824.41	-272.25	821.80	0.00	0.00	0.00
12,700.00	90.00	179.46	12,010.00	-924.40	-271.31	921.80	0.00	0.00	0.00
12,800.00	90.00	179.46	12,010.00	-1,024.40	-270.36	1,021.80	0.00	0.00	0.00
12,900.00	90.00	179.46	12,010.00	-1,124.39	-269.41	1,121.80	0.00	0.00	0.00
13,000.00	90.00	179.46	12,010.00	-1,224.39	-268.47	1,221.80	0.00	0.00	0.00
13,100.00	90.00	179.46	12,010.00	-1,324.38	-267.52	1,321.80	0.00	0.00	0.00
13,200.00	90.00	179.46	12,010.00	-1,424.38	-266.57	1,421.80	0.00	0.00	0.00
13,300.00	90.00	179.46	12,010.00	-1,524.37	-265.63	1,521.80	0.00	0.00	0.00
13,400.00	90.00	179.46	12,010.00	-1,624.37	-264.68	1,621.80	0.00	0.00	0.00
13,500.00	90.00	179.46	12,010.00	-1,724.37	-263.73	1,721.80	0.00	0.00	0.00
13,600.00	90.00	179.46	12,010.00	-1,824.36	-262.79	1,821.80	0.00	0.00	0.00
13,700.00	90.00	179.46	12,010.00	-1,924.36	-261.84	1,921.80	0.00	0.00	0.00
13,800.00	90.00	179.46	12,010.00	-2,024.35	-260.89	2,021.80	0.00	0.00	0.00
13,900.00	90.00	179.46	12,010.00	-2,124.35	-259.95	2,121.80	0.00	0.00	0.00
14,000.00	90.00	179.46	12,010.00	-2,224.34	-259.00	2,221.80	0.00	0.00	0.00
14,100.00	90.00	179.46	12,010.00	-2,324.34	-258.05	2,321.80	0.00	0.00	0.00
14,200.00	90.00	179.46	12,010.00	-2,424.33	-257.10	2,421.80	0.00	0.00	0.00
14,300.00	90.00	179.46	12,010.00	-2,524.33	-256.16	2,521.80	0.00	0.00	0.00
14,400.00	90.00	179.46	12,010.00	-2,624.33	-255.21	2,621.80	0.00	0.00	0.00
14,500.00	90.00	179.46	12,010.00	-2,724.32	-254.26	2,721.80	0.00	0.00	0.00
14,600.00	90.00	179.46	12,010.00	-2,824.32	-253.32	2,821.80	0.00	0.00	0.00
14,700.00	90.00	179.46	12,010.00	-2,924.31	-252.37	2,921.80	0.00	0.00	0.00
14,800.00	90.00	179.46	12,010.00	-3,024.31	-251.42	3,021.80	0.00	0.00	0.00
14,900.00	90.00	179.46	12,010.00	-3,124.30	-250.48	3,121.80	0.00	0.00	0.00
15,000.00	90.00	179.46	12,010.00	-3,224.30	-249.53	3,221.80	0.00	0.00	0.00
15,100.00	90.00	179.46	12,010.00	-3,324.29	-248.58	3,321.80	0.00	0.00	0.00
15,200.00	90.00	179.46	12,010.00	-3,424.29	-247.64	3,421.80	0.00	0.00	0.00

Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 451H
Company:	Energen Resources	TVD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Project:	Lea County, NM (NAD83 NME)	MD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Site:	Angus State 24-35 16	North Reference:	Grid
Well:	451H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

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)
15,300.00	90.00	179.46	12,010.00	-3,524.29	-246.69	3,521.80	0.00	0.00	0.00
15,400.00	90.00	179.46	12,010.00	-3,624.28	-245.74	3,621.80	0.00	0.00	0.00
15,500.00	90.00	179.46	12,010.00	-3,724.28	-244.80	3,721.80	0.00	0.00	0.00
15,600.00	90.00	179.46	12,010.00	-3,824.27	-243.85	3,821.80	0.00	0.00	0.00
15,700.00	90.00	179.46	12,010.00	-3,924.27	-242.90	3,921.80	0.00	0.00	0.00
15,800.00	90.00	179.46	12,010.00	-4,024.26	-241.96	4,021.80	0.00	0.00	0.00
15,900.00	90.00	179.46	12,010.00	-4,124.26	-241.01	4,121.80	0.00	0.00	0.00
16,000.00	90.00	179.46	12,010.00	-4,224.25	-240.06	4,221.80	0.00	0.00	0.00
16,100.00	90.00	179.46	12,010.00	-4,324.25	-239.12	4,321.80	0.00	0.00	0.00
16,200.00	90.00	179.46	12,010.00	-4,424.24	-238.17	4,421.80	0.00	0.00	0.00
16,300.00	90.00	179.46	12,010.00	-4,524.24	-237.22	4,521.80	0.00	0.00	0.00
16,400.00	90.00	179.46	12,010.00	-4,624.24	-236.28	4,621.80	0.00	0.00	0.00
16,429.17	90.00	179.46	12,010.00	-4,653.40	-236.00	4,650.97	0.00	0.00	0.00
TD at 16429.17									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
FTP - Angus State 24	0.00	0.00	12,010.00	-502.60	-275.30	446,018.90	836,173.80	32° 13' 21.31150 N	03° 22' 47.71377 W
- plan misses target center by 4.64usft at 12278.83usft MD (12005.44 TVD, -503.44 N, -275.29 E)									
- Point									
BHL - Angus State 24	0.00	0.00	12,010.00	-4,653.40	-236.00	441,868.10	836,213.10	32° 12' 40.23713 N	03° 22' 47.68498 W
- plan hits target center									
- Point									

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
805.00	805.00	Rustler			
5,104.13	5,090.00	base Salt			
5,309.13	5,295.00	Top Delaware Group			
5,344.13	5,330.00	Bell Canyon			
6,289.13	6,275.00	Cherry Canyon			
7,764.13	7,750.00	Brushy Canyon			
8,974.13	8,960.00	Bone Spring			
9,269.13	9,255.00	1st Bone Spring			
10,164.13	10,150.00	1st Bone Spring Sand			
10,294.13	10,280.00	2nd Bone Spring			
10,694.13	10,680.00	2nd Bone Spring Sand			
11,269.13	11,255.00	3rd Bone Spring			
11,735.68	11,710.00	3rd Bone Spring Sand			
12,351.17	12,010.00	Target Zone			

Database:	Compass 5000 GCR	Local Co-ordinate Reference:	Well 451H
Company:	Energen Resources	TVD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Project:	Lea County, NM (NAD83 NME)	MD Reference:	GL+KB @ 3412.00usft (Cactus 123)
Site:	Angus State 24-35 16	North Reference:	Grid
Well:	451H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 01-17-18		

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,000.00	2,000.00	0.00	0.00	KOP, Begin 2.00°/100' Build
2,299.97	2,299.42	-0.15	-15.69	Hold 6.00° Inc at 269.46° Azm
4,679.16	4,665.58	-2.50	-264.34	Begin 2.00°/100' Drop
4,979.13	4,965.00	-2.65	-280.03	Begin Vertical Hold
11,451.17	11,437.04	-2.65	-280.03	KOP2, Begin 10.00°/100' Build
12,351.17	12,010.00	-575.58	-274.61	LP, Hold 90.00° Inc at 179.46° Azm
16,429.17	12,010.00	-4,653.40	-236.00	TD at 16429.17