

VERDAD RESOURCES

WATTENBERG FIELD

ARNOLD 02N-64W-24

HELEN 24-16H

Wellbore #1

Plan: Design #1

Standard Planning Report

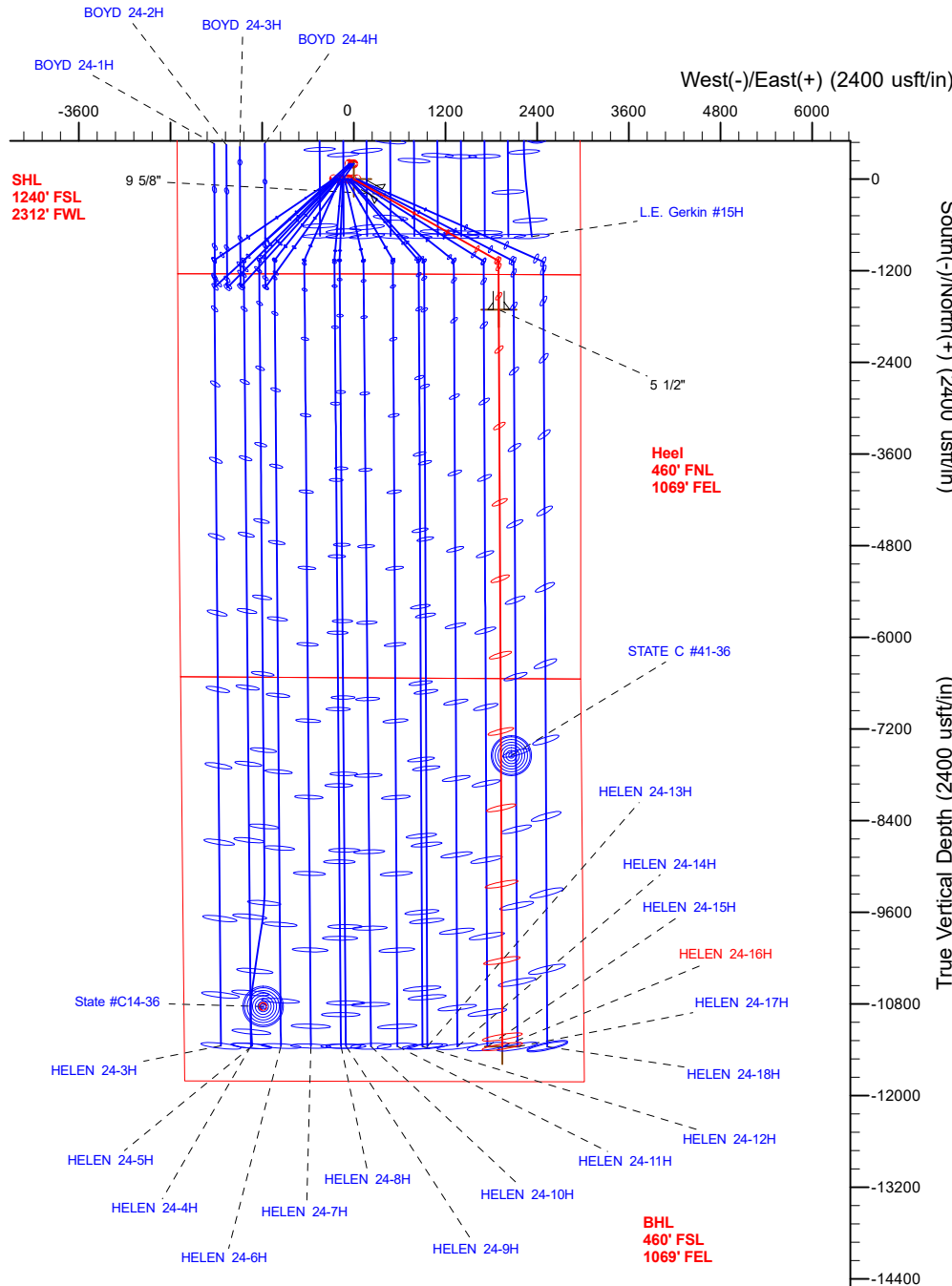
02 November, 2017

Project: WATTENBERG FIELD
Site: ARNOLD 02N-64W-24
Well: HELEN 24-16H
Wellbore: Wellbore #1
Design: Design #1

VERDAD RESOURCES

CASING DETAILS

TVD	MD	Name	Size
1700.00	1770.33	9 5/8"	9-5/8
7000.00	7876.40	5 1/2"	5-1/2

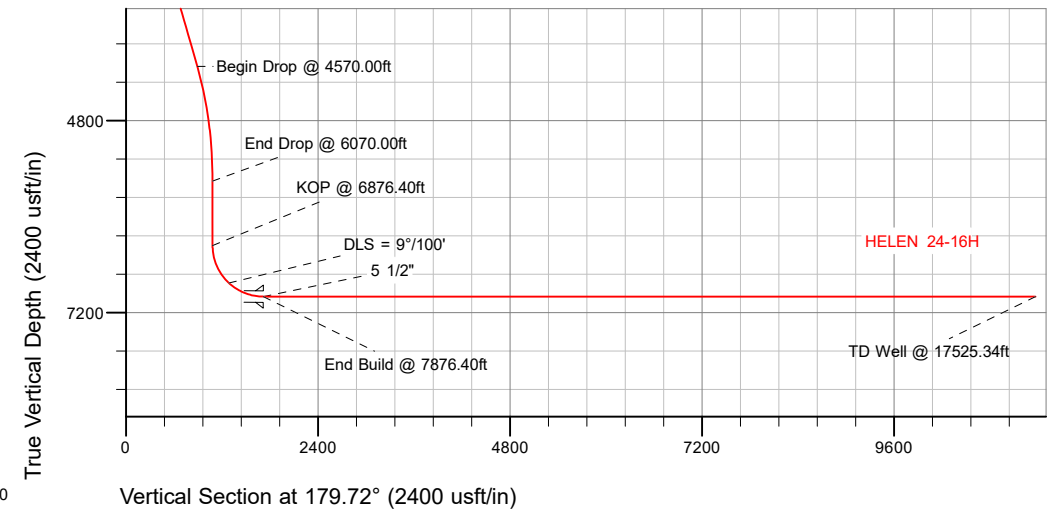


SECTION DETAILS

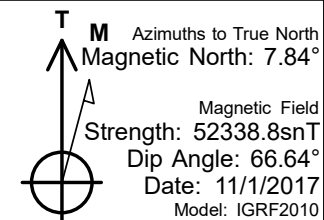
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	
3	1750.00	30.00	119.50	1682.39	-189.00	334.05	2.00	119.50	190.63	
4	4570.00	30.00	119.50	4124.59	-883.31	1561.25	0.00	0.00	890.93	
5	6070.00	0.00	0.00	5556.98	-1072.31	1895.30	2.00	-180.00	1081.56	
6	6876.40	0.00	0.00	6363.38	-1072.31	1895.30	0.00	0.00	1081.56	
7	7876.40	90.00	179.72	7000.00	-1708.92	1898.40	9.00	179.72	1718.18	
8	17525.34	90.00	179.72	7000.00	-11357.74	1945.37	0.00	0.00	11367.12	HELEN 24-16H_BHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
HELEN 24-16H_SHL	0.00	0.00	0.00	40.120051	-104.500864
HELEN 24-16H_BHL	7000.00	-11357.74	1945.37	40.088872	-104.493911



Vertical Section at 179.72° (2400 usft/in)



WELL DETAILS: HELEN 24-16H

GL = 4923'

RKB = 20' @ 4943.00usft (Drilling Rig)

Plan: Design #1 (HELEN 24-16H/Wellbore #1)

Created By: _____ Date: 11/03/2017
Reviewed: _____ Date: _____

Project	WATTENBERG FIELD		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	ARNOLD 02N-64W-24				
Site Position:		Northing:	1,288,352.76 usft	Latitude:	40.120602
From:	Lat/Long	Easting:	3,279,352.74 usft	Longitude:	-104.501071
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.65 °

Well	HELEN 24-16H					
Well Position	+N/-S	-200.73 usft	Northing:	1,288,152.70 usft	Latitude:	40.120051
	+E/-W	57.89 usft	Easting:	3,279,412.89 usft	Longitude:	-104.500864
Position Uncertainty		3.28 usft	Wellhead Elevation:		Ground Level:	4,923.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/1/2017	7.84	66.64	52,338.78982186

Design	Design #1				
Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.00	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	179.72	

Plan Survey Tool Program	Date	11/1/2017			
Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks	
1	0.00	1,700.00	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	
				Fixed:v2:standard declination	
2	1,700.00	17,525.34	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	
				Fixed:v2:standard declination	

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	
250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,750.00	30.00	119.50	1,682.39	-189.00	334.05	2.00	2.00	0.00	119.50	
4,570.00	30.00	119.50	4,124.59	-883.31	1,561.25	0.00	0.00	0.00	0.00	
6,070.00	0.00	0.00	5,556.98	-1,072.31	1,895.30	2.00	-2.00	-7.97	-180.00	
6,876.40	0.00	0.00	6,363.38	-1,072.31	1,895.30	0.00	0.00	0.00	0.00	
7,876.40	90.00	179.72	7,000.00	-1,708.92	1,898.40	9.00	9.00	17.97	179.72	
17,525.34	90.00	179.72	7,000.00	-11,357.74	1,945.37	0.00	0.00	0.00	0.00	HELEN 24-16H_BHL

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
250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00
Begin Nudge @ 250.00ft									
300.00	1.00	119.50	300.00	-0.21	0.38	0.22	2.00	2.00	0.00
400.00	3.00	119.50	399.93	-1.93	3.42	1.95	2.00	2.00	0.00
500.00	5.00	119.50	499.68	-5.37	9.49	5.41	2.00	2.00	0.00
600.00	7.00	119.50	599.13	-10.52	18.59	10.61	2.00	2.00	0.00
700.00	9.00	119.50	698.15	-17.37	30.70	17.52	2.00	2.00	0.00
800.00	11.00	119.50	796.63	-25.92	45.81	26.14	2.00	2.00	0.00
900.00	13.00	119.50	894.44	-36.16	63.91	36.47	2.00	2.00	0.00
1,000.00	15.00	119.50	991.46	-48.07	84.96	48.48	2.00	2.00	0.00
1,100.00	17.00	119.50	1,087.58	-61.64	108.95	62.17	2.00	2.00	0.00
1,200.00	19.00	119.50	1,182.68	-76.86	135.84	77.52	2.00	2.00	0.00
1,300.00	21.00	119.50	1,276.65	-93.70	165.61	94.51	2.00	2.00	0.00
1,400.00	23.00	119.50	1,369.36	-112.14	198.21	113.11	2.00	2.00	0.00
1,500.00	25.00	119.50	1,460.71	-132.17	233.61	133.31	2.00	2.00	0.00
1,600.00	27.00	119.50	1,550.59	-153.76	271.76	155.08	2.00	2.00	0.00
1,700.00	29.00	119.50	1,638.88	-176.87	312.62	178.40	2.00	2.00	0.00
1,750.00	30.00	119.50	1,682.39	-189.00	334.05	190.63	2.00	2.00	0.00
End Nudge @ 1750.00ft									
1,770.33	30.00	119.50	1,700.00	-194.00	342.90	195.68	0.00	0.00	0.00
9 5/8"									
1,800.00	30.00	119.50	1,725.70	-201.31	355.81	203.04	0.00	0.00	0.00
1,900.00	30.00	119.50	1,812.30	-225.93	399.33	227.88	0.00	0.00	0.00
2,000.00	30.00	119.50	1,898.90	-250.55	442.84	252.71	0.00	0.00	0.00
2,100.00	30.00	119.50	1,985.50	-275.17	486.36	277.54	0.00	0.00	0.00
2,200.00	30.00	119.50	2,072.11	-299.79	529.88	302.38	0.00	0.00	0.00
2,300.00	30.00	119.50	2,158.71	-324.41	573.40	327.21	0.00	0.00	0.00
2,400.00	30.00	119.50	2,245.31	-349.03	616.92	352.04	0.00	0.00	0.00
2,500.00	30.00	119.50	2,331.91	-373.66	660.43	376.88	0.00	0.00	0.00
2,600.00	30.00	119.50	2,418.52	-398.28	703.95	401.71	0.00	0.00	0.00
2,700.00	30.00	119.50	2,505.12	-422.90	747.47	426.55	0.00	0.00	0.00
2,800.00	30.00	119.50	2,591.72	-447.52	790.99	451.38	0.00	0.00	0.00
2,900.00	30.00	119.50	2,678.32	-472.14	834.50	476.21	0.00	0.00	0.00
3,000.00	30.00	119.50	2,764.93	-496.76	878.02	501.05	0.00	0.00	0.00
3,100.00	30.00	119.50	2,851.53	-521.38	921.54	525.88	0.00	0.00	0.00
3,200.00	30.00	119.50	2,938.13	-546.00	965.06	550.71	0.00	0.00	0.00
3,300.00	30.00	119.50	3,024.73	-570.62	1,008.58	575.55	0.00	0.00	0.00
3,400.00	30.00	119.50	3,111.34	-595.25	1,052.09	600.38	0.00	0.00	0.00
3,500.00	30.00	119.50	3,197.94	-619.87	1,095.61	625.21	0.00	0.00	0.00
3,600.00	30.00	119.50	3,284.54	-644.49	1,139.13	650.05	0.00	0.00	0.00
3,700.00	30.00	119.50	3,371.14	-669.11	1,182.65	674.88	0.00	0.00	0.00
3,800.00	30.00	119.50	3,457.75	-693.73	1,226.16	699.71	0.00	0.00	0.00
3,900.00	30.00	119.50	3,544.35	-718.35	1,269.68	724.55	0.00	0.00	0.00
4,000.00	30.00	119.50	3,630.95	-742.97	1,313.20	749.38	0.00	0.00	0.00
4,100.00	30.00	119.50	3,717.55	-767.59	1,356.72	774.22	0.00	0.00	0.00
4,200.00	30.00	119.50	3,804.16	-792.22	1,400.24	799.05	0.00	0.00	0.00
4,300.00	30.00	119.50	3,890.76	-816.84	1,443.75	823.88	0.00	0.00	0.00
4,400.00	30.00	119.50	3,977.36	-841.46	1,487.27	848.72	0.00	0.00	0.00
4,500.00	30.00	119.50	4,063.96	-866.08	1,530.79	873.55	0.00	0.00	0.00
4,570.00	30.00	119.50	4,124.59	-883.31	1,561.25	890.93	0.00	0.00	0.00
Begin Drop @ 4570.00ft									
4,600.00	29.40	119.50	4,150.65	-890.63	1,574.19	898.32	2.00	-2.00	0.00
4,700.00	27.40	119.50	4,238.61	-914.05	1,615.58	921.94	2.00	-2.00	0.00
4,800.00	25.40	119.50	4,328.17	-935.95	1,654.28	944.02	2.00	-2.00	0.00
4,900.00	23.40	119.50	4,419.24	-956.29	1,690.23	964.54	2.00	-2.00	0.00
5,000.00	21.40	119.50	4,511.69	-975.05	1,723.40	983.46	2.00	-2.00	0.00
5,100.00	19.40	119.50	4,605.41	-992.22	1,753.73	1,000.77	2.00	-2.00	0.00
5,200.00	17.40	119.50	4,700.29	-1,007.76	1,781.21	1,016.45	2.00	-2.00	0.00
5,300.00	15.40	119.50	4,796.22	-1,021.66	1,805.78	1,030.47	2.00	-2.00	0.00
5,400.00	13.40	119.50	4,893.07	-1,033.91	1,827.42	1,042.82	2.00	-2.00	0.00
5,500.00	11.40	119.50	4,990.73	-1,044.48	1,846.11	1,053.49	2.00	-2.00	0.00
5,600.00	9.40	119.50	5,089.09	-1,053.37	1,861.82	1,062.45	2.00	-2.00	0.00
5,700.00	7.40	119.50	5,188.01	-1,060.56	1,874.54	1,069.71	2.00	-2.00	0.00

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)	
5,800.00	5.40	119.50	5,287.38	-1,066.05	1,884.24	1,075.25	2.00	-2.00	0.00	
5,900.00	3.40	119.50	5,387.08	-1,069.83	1,890.91	1,079.06	2.00	-2.00	0.00	
6,000.00	1.40	119.50	5,486.99	-1,071.89	1,894.56	1,081.13	2.00	-2.00	0.00	
6,070.00	0.00	0.00	5,556.98	-1,072.31	1,895.30	1,081.56	2.00	-2.00	-170.71	
End Drop @ 6070.00ft										
6,100.00	0.00	0.00	5,586.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,200.00	0.00	0.00	5,686.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,300.00	0.00	0.00	5,786.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,400.00	0.00	0.00	5,886.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,500.00	0.00	0.00	5,986.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,600.00	0.00	0.00	6,086.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,700.00	0.00	0.00	6,186.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,800.00	0.00	0.00	6,286.98	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
6,876.40	0.00	0.00	6,363.38	-1,072.31	1,895.30	1,081.56	0.00	0.00	0.00	
KOP @ 6876.40ft										
6,900.00	2.12	179.72	6,386.98	-1,072.75	1,895.30	1,082.00	9.00	9.00	761.53	
6,950.00	6.62	179.72	6,436.82	-1,076.56	1,895.32	1,085.81	9.00	9.00	0.00	
7,000.00	11.12	179.72	6,486.21	-1,084.27	1,895.36	1,093.52	9.00	9.00	0.00	
7,050.00	15.62	179.72	6,534.84	-1,095.83	1,895.42	1,105.08	9.00	9.00	0.00	
7,100.00	20.12	179.72	6,582.41	-1,111.18	1,895.49	1,120.43	9.00	9.00	0.00	
7,150.00	24.62	179.72	6,628.64	-1,130.20	1,895.58	1,139.45	9.00	9.00	0.00	
7,200.00	29.12	179.72	6,673.22	-1,152.80	1,895.69	1,162.05	9.00	9.00	0.00	
7,250.00	33.62	179.72	6,715.90	-1,178.82	1,895.82	1,188.07	9.00	9.00	0.00	
7,300.00	38.12	179.72	6,756.41	-1,208.11	1,895.96	1,217.37	9.00	9.00	0.00	
7,350.00	42.62	179.72	6,794.49	-1,240.49	1,896.12	1,249.75	9.00	9.00	0.00	
7,400.00	47.12	179.72	6,829.91	-1,275.76	1,896.29	1,285.01	9.00	9.00	0.00	
DLS = 9°/100'										
7,450.00	51.62	179.72	6,862.46	-1,313.70	1,896.48	1,322.95	9.00	9.00	0.00	
7,500.00	56.12	179.72	6,891.93	-1,354.08	1,896.67	1,363.33	9.00	9.00	0.00	
7,550.00	60.62	179.72	6,918.14	-1,396.64	1,896.88	1,405.89	9.00	9.00	0.00	
7,600.00	65.12	179.72	6,940.94	-1,441.13	1,897.10	1,450.38	9.00	9.00	0.00	
7,650.00	69.62	179.72	6,960.17	-1,487.27	1,897.32	1,496.52	9.00	9.00	0.00	
7,700.00	74.12	179.72	6,975.72	-1,534.77	1,897.55	1,544.03	9.00	9.00	0.00	
7,750.00	78.62	179.72	6,987.49	-1,583.35	1,897.79	1,592.61	9.00	9.00	0.00	
7,800.00	83.12	179.72	6,995.42	-1,632.71	1,898.03	1,641.96	9.00	9.00	0.00	
7,850.00	87.62	179.72	6,999.45	-1,682.53	1,898.27	1,691.79	9.00	9.00	0.00	
7,876.40	90.00	179.72	7,000.00	-1,708.92	1,898.40	1,718.18	9.00	9.00	0.00	
End Build @ 7876.40ft - 5 1/2"										
7,900.00	90.00	179.72	7,000.00	-1,732.52	1,898.52	1,741.78	0.00	0.00	0.00	
8,000.00	90.00	179.72	7,000.00	-1,832.52	1,899.00	1,841.78	0.00	0.00	0.00	
8,100.00	90.00	179.72	7,000.00	-1,932.52	1,899.49	1,941.78	0.00	0.00	0.00	
8,200.00	90.00	179.72	7,000.00	-2,032.52	1,899.98	2,041.78	0.00	0.00	0.00	
8,300.00	90.00	179.72	7,000.00	-2,132.52	1,900.46	2,141.78	0.00	0.00	0.00	
8,400.00	90.00	179.72	7,000.00	-2,232.52	1,900.95	2,241.78	0.00	0.00	0.00	
8,500.00	90.00	179.72	7,000.00	-2,332.52	1,901.44	2,341.78	0.00	0.00	0.00	
8,600.00	90.00	179.72	7,000.00	-2,432.51	1,901.92	2,441.78	0.00	0.00	0.00	
8,700.00	90.00	179.72	7,000.00	-2,532.51	1,902.41	2,541.78	0.00	0.00	0.00	
8,800.00	90.00	179.72	7,000.00	-2,632.51	1,902.90	2,641.78	0.00	0.00	0.00	
8,900.00	90.00	179.72	7,000.00	-2,732.51	1,903.38	2,741.78	0.00	0.00	0.00	
9,000.00	90.00	179.72	7,000.00	-2,832.51	1,903.87	2,841.78	0.00	0.00	0.00	
9,100.00	90.00	179.72	7,000.00	-2,932.51	1,904.36	2,941.78	0.00	0.00	0.00	
9,200.00	90.00	179.72	7,000.00	-3,032.51	1,904.84	3,041.78	0.00	0.00	0.00	
9,300.00	90.00	179.72	7,000.00	-3,132.51	1,905.33	3,141.78	0.00	0.00	0.00	
9,400.00	90.00	179.72	7,000.00	-3,232.50	1,905.82	3,241.78	0.00	0.00	0.00	
9,500.00	90.00	179.72	7,000.00	-3,332.50	1,906.30	3,341.78	0.00	0.00	0.00	
9,600.00	90.00	179.72	7,000.00	-3,432.50	1,906.79	3,441.78	0.00	0.00	0.00	
9,700.00	90.00	179.72	7,000.00	-3,532.50	1,907.28	3,541.78	0.00	0.00	0.00	
9,800.00	90.00	179.72	7,000.00	-3,632.50	1,907.76	3,641.78	0.00	0.00	0.00	
9,900.00	90.00	179.72	7,000.00	-3,732.50	1,908.25	3,741.78	0.00	0.00	0.00	
10,000.00	90.00	179.72	7,000.00	-3,832.50	1,908.74	3,841.78	0.00	0.00	0.00	
10,100.00	90.00	179.72	7,000.00	-3,932.50	1,909.22	3,941.78	0.00	0.00	0.00	
10,200.00	90.00	179.72	7,000.00	-4,032.49	1,909.71	4,041.78	0.00	0.00	0.00	
10,300.00	90.00	179.72	7,000.00	-4,132.49	1,910.20	4,141.78	0.00	0.00	0.00	
10,400.00	90.00	179.72	7,000.00	-4,232.49	1,910.69	4,241.78	0.00	0.00	0.00	
10,500.00	90.00	179.72	7,000.00	-4,332.49	1,911.17	4,341.78	0.00	0.00	0.00	
10,600.00	90.00	179.72	7,000.00	-4,432.49	1,911.66	4,441.78	0.00	0.00	0.00	

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)	
10,700.00	90.00	179.72	7,000.00	-4,532.49	1,912.15	4,541.78	0.00	0.00	0.00	
10,800.00	90.00	179.72	7,000.00	-4,632.49	1,912.63	4,641.78	0.00	0.00	0.00	
10,900.00	90.00	179.72	7,000.00	-4,732.49	1,913.12	4,741.78	0.00	0.00	0.00	
11,000.00	90.00	179.72	7,000.00	-4,832.49	1,913.61	4,841.78	0.00	0.00	0.00	
11,100.00	90.00	179.72	7,000.00	-4,932.48	1,914.09	4,941.78	0.00	0.00	0.00	
11,200.00	90.00	179.72	7,000.00	-5,032.48	1,914.58	5,041.78	0.00	0.00	0.00	
11,300.00	90.00	179.72	7,000.00	-5,132.48	1,915.07	5,141.78	0.00	0.00	0.00	
11,400.00	90.00	179.72	7,000.00	-5,232.48	1,915.55	5,241.78	0.00	0.00	0.00	
11,500.00	90.00	179.72	7,000.00	-5,332.48	1,916.04	5,341.78	0.00	0.00	0.00	
11,600.00	90.00	179.72	7,000.00	-5,432.48	1,916.53	5,441.78	0.00	0.00	0.00	
11,700.00	90.00	179.72	7,000.00	-5,532.48	1,917.01	5,541.78	0.00	0.00	0.00	
11,800.00	90.00	179.72	7,000.00	-5,632.48	1,917.50	5,641.78	0.00	0.00	0.00	
11,900.00	90.00	179.72	7,000.00	-5,732.47	1,917.99	5,741.78	0.00	0.00	0.00	
12,000.00	90.00	179.72	7,000.00	-5,832.47	1,918.47	5,841.78	0.00	0.00	0.00	
12,100.00	90.00	179.72	7,000.00	-5,932.47	1,918.96	5,941.78	0.00	0.00	0.00	
12,200.00	90.00	179.72	7,000.00	-6,032.47	1,919.45	6,041.78	0.00	0.00	0.00	
12,300.00	90.00	179.72	7,000.00	-6,132.47	1,919.93	6,141.78	0.00	0.00	0.00	
12,400.00	90.00	179.72	7,000.00	-6,232.47	1,920.42	6,241.78	0.00	0.00	0.00	
12,500.00	90.00	179.72	7,000.00	-6,332.47	1,920.91	6,341.78	0.00	0.00	0.00	
12,600.00	90.00	179.72	7,000.00	-6,432.47	1,921.39	6,441.78	0.00	0.00	0.00	
12,700.00	90.00	179.72	7,000.00	-6,532.47	1,921.88	6,541.78	0.00	0.00	0.00	
12,800.00	90.00	179.72	7,000.00	-6,632.46	1,922.37	6,641.78	0.00	0.00	0.00	
12,900.00	90.00	179.72	7,000.00	-6,732.46	1,922.85	6,741.78	0.00	0.00	0.00	
13,000.00	90.00	179.72	7,000.00	-6,832.46	1,923.34	6,841.78	0.00	0.00	0.00	
13,100.00	90.00	179.72	7,000.00	-6,932.46	1,923.83	6,941.78	0.00	0.00	0.00	
13,200.00	90.00	179.72	7,000.00	-7,032.46	1,924.31	7,041.78	0.00	0.00	0.00	
13,300.00	90.00	179.72	7,000.00	-7,132.46	1,924.80	7,141.78	0.00	0.00	0.00	
13,400.00	90.00	179.72	7,000.00	-7,232.46	1,925.29	7,241.78	0.00	0.00	0.00	
13,500.00	90.00	179.72	7,000.00	-7,332.46	1,925.78	7,341.78	0.00	0.00	0.00	
13,600.00	90.00	179.72	7,000.00	-7,432.45	1,926.26	7,441.78	0.00	0.00	0.00	
13,700.00	90.00	179.72	7,000.00	-7,532.45	1,926.75	7,541.78	0.00	0.00	0.00	
13,800.00	90.00	179.72	7,000.00	-7,632.45	1,927.24	7,641.78	0.00	0.00	0.00	
13,900.00	90.00	179.72	7,000.00	-7,732.45	1,927.72	7,741.78	0.00	0.00	0.00	
14,000.00	90.00	179.72	7,000.00	-7,832.45	1,928.21	7,841.78	0.00	0.00	0.00	
14,100.00	90.00	179.72	7,000.00	-7,932.45	1,928.70	7,941.78	0.00	0.00	0.00	
14,200.00	90.00	179.72	7,000.00	-8,032.45	1,929.18	8,041.78	0.00	0.00	0.00	
14,300.00	90.00	179.72	7,000.00	-8,132.45	1,929.67	8,141.78	0.00	0.00	0.00	
14,400.00	90.00	179.72	7,000.00	-8,232.45	1,930.16	8,241.78	0.00	0.00	0.00	
14,500.00	90.00	179.72	7,000.00	-8,332.44	1,930.64	8,341.78	0.00	0.00	0.00	
14,600.00	90.00	179.72	7,000.00	-8,432.44	1,931.13	8,441.78	0.00	0.00	0.00	
14,700.00	90.00	179.72	7,000.00	-8,532.44	1,931.62	8,541.78	0.00	0.00	0.00	
14,800.00	90.00	179.72	7,000.00	-8,632.44	1,932.10	8,641.78	0.00	0.00	0.00	
14,900.00	90.00	179.72	7,000.00	-8,732.44	1,932.59	8,741.78	0.00	0.00	0.00	
15,000.00	90.00	179.72	7,000.00	-8,832.44	1,933.08	8,841.78	0.00	0.00	0.00	
15,100.00	90.00	179.72	7,000.00	-8,932.44	1,933.56	8,941.78	0.00	0.00	0.00	
15,200.00	90.00	179.72	7,000.00	-9,032.44	1,934.05	9,041.78	0.00	0.00	0.00	
15,300.00	90.00	179.72	7,000.00	-9,132.43	1,934.54	9,141.78	0.00	0.00	0.00	
15,400.00	90.00	179.72	7,000.00	-9,232.43	1,935.02	9,241.78	0.00	0.00	0.00	
15,500.00	90.00	179.72	7,000.00	-9,332.43	1,935.51	9,341.78	0.00	0.00	0.00	
15,600.00	90.00	179.72	7,000.00	-9,432.43	1,936.00	9,441.78	0.00	0.00	0.00	
15,700.00	90.00	179.72	7,000.00	-9,532.43	1,936.48	9,541.78	0.00	0.00	0.00	
15,800.00	90.00	179.72	7,000.00	-9,632.43	1,936.97	9,641.78	0.00	0.00	0.00	
15,900.00	90.00	179.72	7,000.00	-9,732.43	1,937.46	9,741.78	0.00	0.00	0.00	
16,000.00	90.00	179.72	7,000.00	-9,832.43	1,937.94	9,841.78	0.00	0.00	0.00	
16,100.00	90.00	179.72	7,000.00	-9,932.43	1,938.43	9,941.78	0.00	0.00	0.00	
16,200.00	90.00	179.72	7,000.00	-10,032.42	1,938.92	10,041.78	0.00	0.00	0.00	
16,300.00	90.00	179.72	7,000.00	-10,132.42	1,939.40	10,141.78	0.00	0.00	0.00	
16,400.00	90.00	179.72	7,000.00	-10,232.42	1,939.89	10,241.78	0.00	0.00	0.00	
16,500.00	90.00	179.72	7,000.00	-10,332.42	1,940.38	10,341.78	0.00	0.00	0.00	
16,600.00	90.00	179.72	7,000.00	-10,432.42	1,940.87	10,441.78	0.00	0.00	0.00	
16,700.00	90.00	179.72	7,000.00	-10,532.42	1,941.35	10,541.78	0.00	0.00	0.00	
16,800.00	90.00	179.72	7,000.00	-10,632.42	1,941.84	10,641.78	0.00	0.00	0.00	
16,900.00	90.00	179.72	7,000.00	-10,732.42	1,942.33	10,741.78	0.00	0.00	0.00	
17,000.00	90.00	179.72	7,000.00	-10,832.41	1,942.81	10,841.78	0.00	0.00	0.00	
17,100.00	90.00	179.72	7,000.00	-10,932.41	1,943.30	10,941.78	0.00	0.00	0.00	
17,200.00	90.00	179.72	7,000.00	-11,032.41	1,943.79	11,041.78	0.00	0.00	0.00	

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)
17,300.00	90.00	179.72	7,000.00	-11,132.41	1,944.27	11,141.78	0.00	0.00	0.00
17,400.00	90.00	179.72	7,000.00	-11,232.41	1,944.76	11,241.78	0.00	0.00	0.00
17,500.00	90.00	179.72	7,000.00	-11,332.41	1,945.25	11,341.78	0.00	0.00	0.00
17,525.34	90.00	179.72	7,000.00	-11,357.74	1,945.37	11,367.12	0.00	0.00	0.00
TD Well @ 17525.34ft									

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name		Casing Diameter (")	Hole Diameter (")
1,770.33	1,700.00	9 5/8"		9-5/8	13-1/2
7,876.40	7,000.00	5 1/2"		5-1/2	8-1/2

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
250.00	250.00	0.00	0.00	Begin Nudge @ 250.00ft	
1,750.00	1,682.39	-189.00	334.05	End Nudge @ 1750.00ft	
4,570.00	4,124.59	-883.31	1,561.25	Begin Drop @ 4570.00ft	
6,070.00	5,556.98	-1,072.31	1,895.30	End Drop @ 6070.00ft	
6,876.40	6,363.38	-1,072.31	1,895.30	KOP @ 6876.40ft	
7,400.00	6,829.91	-1,275.76	1,896.29	DLS = 9°/100'	
7,876.40	7,000.00	-1,708.92	1,898.40	End Build @ 7876.40ft	
17,525.34	7,000.00	-11,357.74	1,945.37	TD Well @ 17525.34ft	

VERDAD RESOURCES

WATTENBERG FIELD

ARNOLD 02N-64W-24

HELEN 24-16H

Wellbore #1

Design #1

Anticollision Summary Report

02 November, 2017

Reference	Design #1		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 9,999.98 usft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.45 Sigma	Casing Method:	Added to Error Values

Survey Tool Program	Date 11/2/2017			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	1,700.00	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination
1,700.00	17,525.34	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
2N-64W-13 L.E. GERKIN EAST PAD						
L.E. Gerkin #12H - Red Hawk Petroleum Planned Well - P	7,144.10	16,446.50	639.57	436.93	3.156	CC, ES, SF
L.E. Gerkin #9H - Red Hawk Petroleum Planned Well - P	7,142.20	16,541.50	1,472.84	1,220.66	5.840	CC, ES
L.E. Gerkin #9H - Red Hawk Petroleum Planned Well - P	7,150.00	16,541.50	1,472.88	1,220.68	5.840	SF
L.E. Gerkin #10H - Red Hawk Petroleum Planned Well - P	7,142.57	16,489.70	1,178.79	934.01	4.816	CC, ES, SF
L.E. Gerkin #11H - Red Hawk Petroleum Planned Well - P	7,142.89	16,457.40	897.84	666.74	3.885	CC, ES, SF
L.E. Gerkin #13H - Red Hawk Petroleum Planned Well - P	7,144.43	16,448.80	451.05	319.08	3.418	CC, ES, SF
L.E. Gerkin #14H - Red Hawk Petroleum Planned Well - P	7,144.83	16,481.10	432.93	298.13	3.212	CC, ES, SF
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	7,145.21	16,511.10	600.34	373.30	2.644	CC
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	7,150.00	16,511.10	600.37	373.19	2.643	ES, SF
2N-64W-13 L.E. GERKIN WEST PAD						
L.E. Gerkin #6H - Red Hawk Petroleum Planned Well - P	7,119.71	16,431.70	2,371.29	2,116.44	9.305	CC, ES, SF
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	7,100.00	16,464.00	2,068.38	1,816.27	8.204	SF
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	7,120.14	16,464.00	2,068.21	1,816.17	8.206	CC, ES
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	7,100.00	16,517.20	1,768.41	1,519.93	7.117	SF
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	7,121.28	16,517.20	1,768.20	1,519.85	7.120	CC, ES
2N-64W-13 Offsets						
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	250.00	179.00	7,877.47	7,867.73	808.864	CC
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	600.00	528.13	7,883.07	7,861.42	364.032	ES
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	7,450.00	6,808.54	8,944.90	8,656.58	31.024	SF
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	250.00	210.00	8,314.27	8,303.61	779.752	CC
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	400.00	359.93	8,316.49	8,300.84	531.282	ES
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	7,450.00	6,822.46	9,947.11	9,666.51	35.450	SF
2N-64W-24 Offsets						
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	4,430.29	3,954.59	1,815.93	1,634.34	10.000	CC
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	6,900.00	6,337.98	1,872.16	1,596.73	6.797	ES
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	7,050.00	6,485.84	1,894.39	1,613.54	6.745	SF
2N-64W-36 Offsets						
State #C14-36 - Noble Energy PR Well - No Surveys	16,985.23	6,971.00	3,128.78	2,630.61	6.281	CC
State #C14-36 - Noble Energy PR Well - No Surveys	17,000.00	6,971.00	3,128.81	2,630.49	6.279	ES
State #C14-36 - Noble Energy PR Well - No Surveys	17,100.00	6,971.00	3,130.88	2,631.66	6.271	SF
STATE C #41-36 - Prima Exploration P/A Well - No Surve	13,716.70	6,929.00	136.02	-284.44	0.323	Level 1, CC, ES, SF

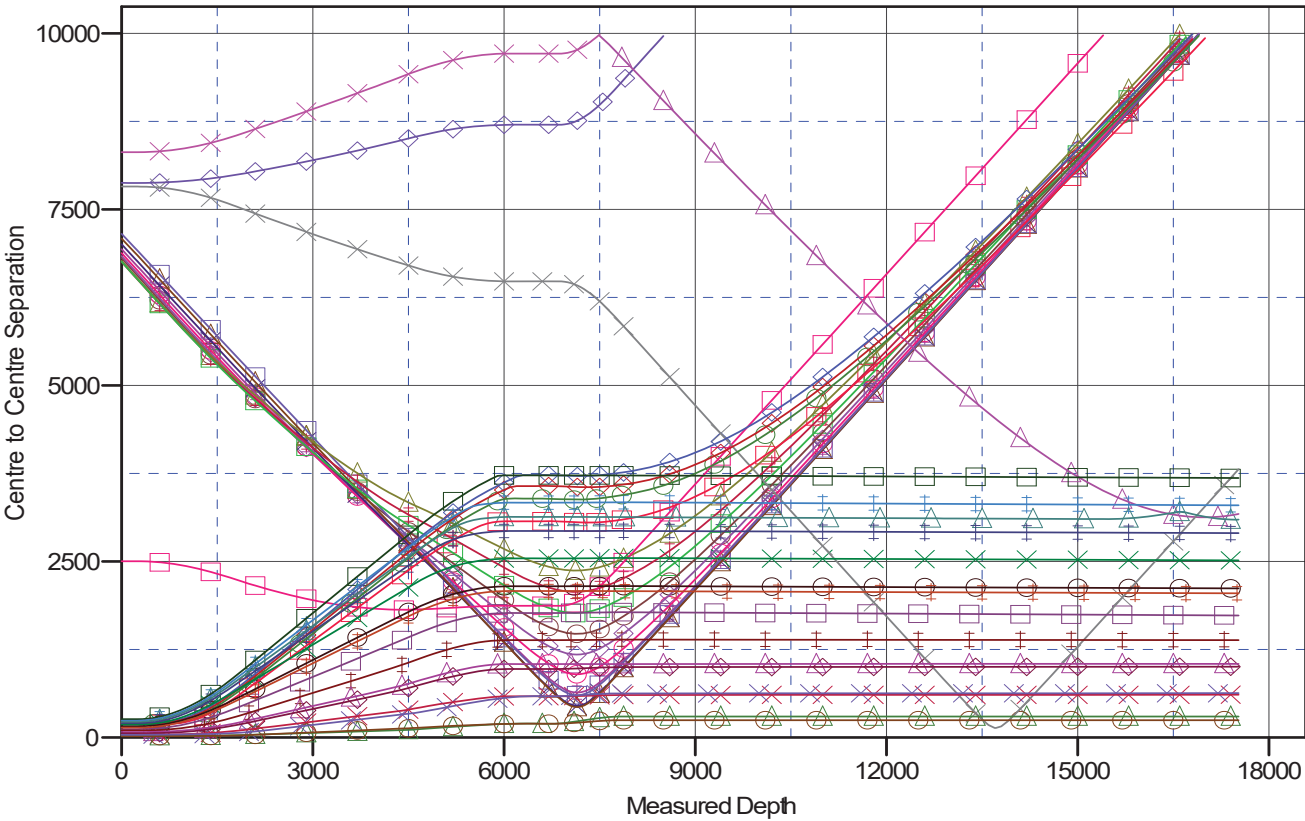
Summary

Site Name Offset Well - Wellbore - Design	Reference	Offset	Distance		Separation Factor	Warning
	Measured Depth (usft)	Measured Depth (usft)	Between Centres (usft)	Between Ellipses (usft)		
ARNOLD 02N-64W-24						
BOYD 24-1H - Wellbore #1 - Design #1	250.00	250.00	208.90	201.30	27.464	CC, ES
BOYD 24-1H - Wellbore #1 - Design #1	700.00	707.43	225.42	216.94	26.590	SF
BOYD 24-2H - Wellbore #1 - Design #1	250.00	250.00	203.88	196.27	26.804	CC
BOYD 24-2H - Wellbore #1 - Design #1	300.00	302.08	203.91	196.26	26.651	ES
BOYD 24-2H - Wellbore #1 - Design #1	700.00	711.27	213.92	205.45	25.239	SF
BOYD 24-3H - Wellbore #1 - Design #1	498.87	510.02	200.01	192.09	25.238	CC
BOYD 24-3H - Wellbore #1 - Design #1	500.00	511.18	200.01	192.08	25.228	ES
BOYD 24-3H - Wellbore #1 - Design #1	800.00	814.07	211.09	202.21	23.775	SF
BOYD 24-4H - Wellbore #1 - Design #1	676.23	696.23	193.83	185.46	23.161	CC, ES
BOYD 24-4H - Wellbore #1 - Design #1	900.00	919.14	204.15	194.78	21.796	SF
HELEN 24-10H - Wellbore #1 - Design #1	250.37	251.38	119.98	112.37	15.772	CC, ES
HELEN 24-10H - Wellbore #1 - Design #1	17,513.16	16,946.74	1,734.60	1,210.66	3.311	SF
HELEN 24-11H - Wellbore #1 - Design #1	251.45	252.50	100.12	92.52	13.161	CC, ES
HELEN 24-11H - Wellbore #1 - Design #1	17,519.69	17,065.31	1,383.39	857.71	2.632	SF
HELEN 24-12H - Wellbore #1 - Design #1	253.38	254.47	79.99	72.38	10.511	CC, ES
HELEN 24-12H - Wellbore #1 - Design #1	17,525.34	17,257.01	1,046.97	518.20	1.980	SF
HELEN 24-13H - Wellbore #1 - Design #1	250.00	250.00	60.13	52.53	7.905	CC, ES
HELEN 24-13H - Wellbore #1 - Design #1	17,525.34	17,041.57	1,007.51	491.80	1.954	SF
HELEN 24-14H - Wellbore #1 - Design #1	250.00	250.00	39.99	32.39	5.258	CC
HELEN 24-14H - Wellbore #1 - Design #1	300.00	300.56	40.03	32.38	5.232	ES
HELEN 24-14H - Wellbore #1 - Design #1	17,525.34	17,212.43	607.74	94.03	1.183	Level 2, SF
HELEN 24-15H - Wellbore #1 - Design #1	250.00	250.00	20.14	12.53	2.647	CC
HELEN 24-15H - Wellbore #1 - Design #1	17,525.34	17,247.01	298.48	-74.50	0.800	Level 1, ES, SF
HELEN 24-17H - Wellbore #1 - Design #1	250.00	250.00	19.86	12.25	2.611	CC
HELEN 24-17H - Wellbore #1 - Design #1	17,525.34	17,442.74	246.91	-197.82	0.555	Level 1, ES, SF
HELEN 24-18H - Wellbore #1 - Design #1	278.74	277.39	39.99	32.36	5.241	CC
HELEN 24-18H - Wellbore #1 - Design #1	400.00	397.12	40.07	32.32	5.166	ES
HELEN 24-18H - Wellbore #1 - Design #1	17,525.34	17,509.54	630.10	124.52	1.246	Level 2, SF
HELEN 24-3H - Wellbore #1 - Design #1	250.00	253.00	260.10	252.49	34.189	CC, ES
HELEN 24-3H - Wellbore #1 - Design #1	17,525.34	17,266.86	3,687.16	3,160.10	6.996	SF
HELEN 24-4H - Wellbore #1 - Design #1	250.00	252.00	239.96	232.35	31.544	CC, ES
HELEN 24-4H - Wellbore #1 - Design #1	17,525.34	17,093.67	3,298.98	2,772.67	6.268	SF
HELEN 24-5H - Wellbore #1 - Design #1	250.00	252.00	220.11	212.50	28.934	CC, ES
HELEN 24-5H - Wellbore #1 - Design #1	17,525.34	17,336.26	3,095.03	2,570.10	5.896	SF
HELEN 24-6H - Wellbore #1 - Design #1	250.00	252.00	199.97	192.36	26.287	CC, ES
HELEN 24-6H - Wellbore #1 - Design #1	17,525.34	17,092.09	2,903.16	2,376.22	5.510	SF
HELEN 24-7H - Wellbore #1 - Design #1	250.00	252.00	180.11	172.50	23.676	CC, ES
HELEN 24-7H - Wellbore #1 - Design #1	17,525.34	16,959.80	2,516.33	1,990.47	4.785	SF
HELEN 24-8H - Wellbore #1 - Design #1	250.00	252.00	159.98	152.37	21.030	CC, ES
HELEN 24-8H - Wellbore #1 - Design #1	17,525.34	17,013.55	2,118.43	1,591.64	4.021	SF
HELEN 24-9H - Wellbore #1 - Design #1	250.00	251.00	140.12	132.51	18.420	CC, ES
HELEN 24-9H - Wellbore #1 - Design #1	17,509.22	17,171.04	2,048.00	1,519.55	3.876	SF

Reference Depths are relative to RKB = 20' @ 4943.00usft (Drilling Rig)
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-16H
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.65°

Ladder Plot



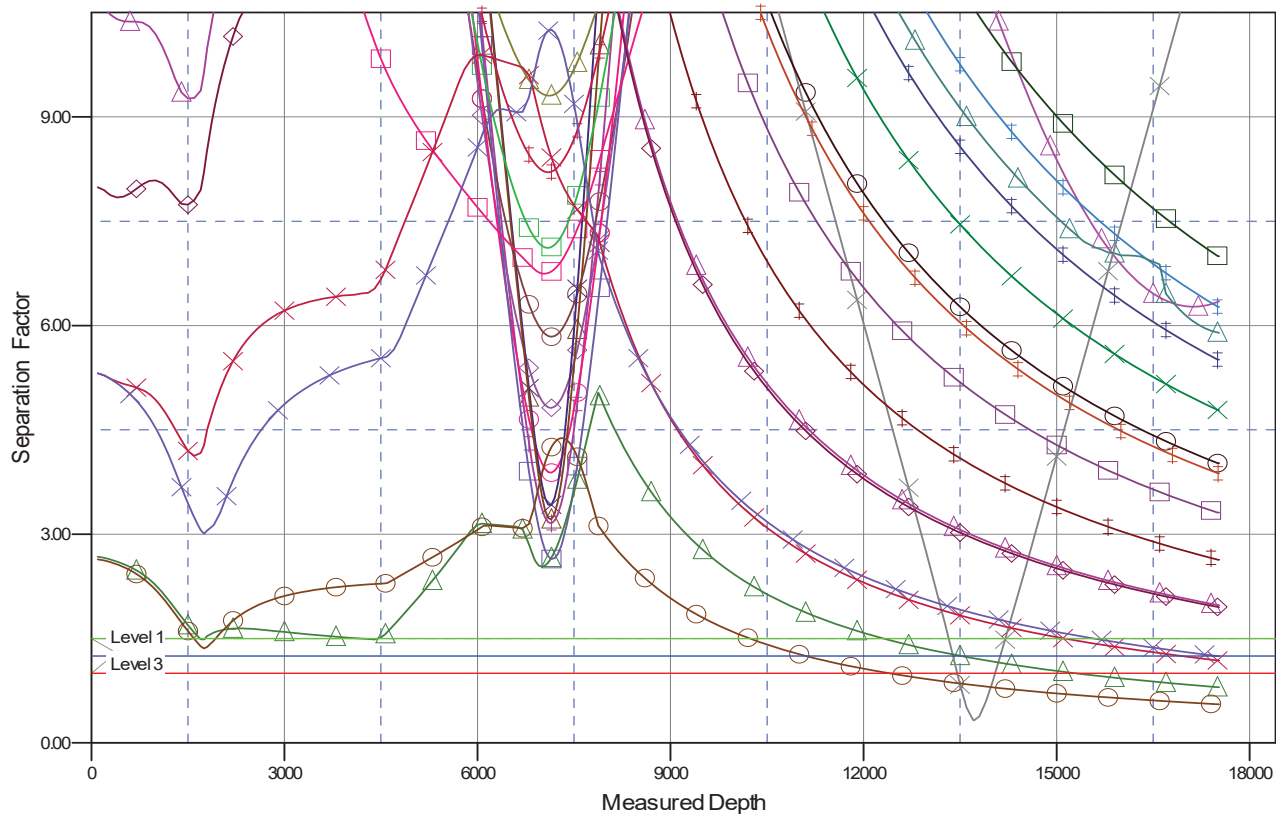
LEGEND

- | | | |
|---|--|---------------------------------------|
| L.E. Gein #12H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | MOCLINTOCK ET AL #1, Juniper Oil & Gas DAW Well, No Surveys V0 | HELEN24-15H Wellbore #1, Design #1 V0 |
| L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | State#C14-36, Noble Energy PR Well No Surveys V0 | HELEN24-17H Wellbore #1, Design #1 V0 |
| L.E. Gein #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | STATE#241-36, Prima Exploration PA Well No Surveys V0 | HELEN24-18H Wellbore #1, Design #1 V0 |
| L.E. Gein #11H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOYD24-1H Wellbore #1, Design #1 V0 | HELEN24-3H Wellbore #1, Design #1 V0 |
| L.E. Gein #13H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOYD24-2H Wellbore #1, Design #1 V0 | HELEN24-4H Wellbore #1, Design #1 V0 |
| L.E. Gein #14H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOYD24-3H Wellbore #1, Design #1 V0 | HELEN24-5H Wellbore #1, Design #1 V0 |
| L.E. Gein #15H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOYD24-4H Wellbore #1, Design #1 V0 | HELEN24-6H Wellbore #1, Design #1 V0 |
| L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-10H Wellbore #1, Design #1 V0 | HELEN24-7H Wellbore #1, Design #1 V0 |
| L.E. Gein #7H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-11H Wellbore #1, Design #1 V0 | HELEN24-8H Wellbore #1, Design #1 V0 |
| L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-12H Wellbore #1, Design #1 V0 | HELEN24-9H Wellbore #1, Design #1 V0 |
| ARNOLD #1, Barrett Resources PA Well No Surveys V0 | HELEN24-13H Wellbore #1, Design #1 V0 | |
| DARYL LARNOLD #1, Amoco DAW Well, No Surveys V0 | HELEN24-14H Wellbore #1, Design #1 V0 | |

Reference Depths are relative to RKB = 20' @ 4943.00usft (Drilling Rig)
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-16H
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.65°

Separation Factor Plot



LEGEND

L.E. Gein #12H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	MOCLINTOCK ET AL #1, Juniper Oil & Gas DAW Well, No Surveys V0	HELEN2415H Wellbore #1, Design #1 V0
L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	State CI 4-36, Noble Energy PRR Well No Surveys V0	HELEN2417H Wellbore #1, Design #1 V0
L.E. Gein #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	STATE 041-36, Prima Exploration PRR Well, No Surveys V0	HELEN2419H Wellbore #1, Design #1 V0
L.E. Gein #11H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD241H Wellbore #1, Design #1 V0	HELEN243H Wellbore #1, Design #1 V0
L.E. Gein #13H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD242H Wellbore #1, Design #1 V0	HELEN244H Wellbore #1, Design #1 V0
L.E. Gein #14H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD243H Wellbore #1, Design #1 V0	HELEN245H Wellbore #1, Design #1 V0
L.E. Gein #15H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD244H Wellbore #1, Design #1 V0	HELEN246H Wellbore #1, Design #1 V0
L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN2410H Wellbore #1, Design #1 V0	HELEN247H Wellbore #1, Design #1 V0
L.E. Gein #7H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN2411H Wellbore #1, Design #1 V0	HELEN248H Wellbore #1, Design #1 V0
L.E. Gein #6H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN2412H Wellbore #1, Design #1 V0	HELEN249H Wellbore #1, Design #1 V0
ARNOLD #1 Barret Resources PRR Well No Surveys V0	HELEN2413H Wellbore #1, Design #1 V0	
DARYL LARNOLD #1, Amoco DAW Well, No Surveys V0	HELEN2414H Wellbore #1, Design #1 V0	