

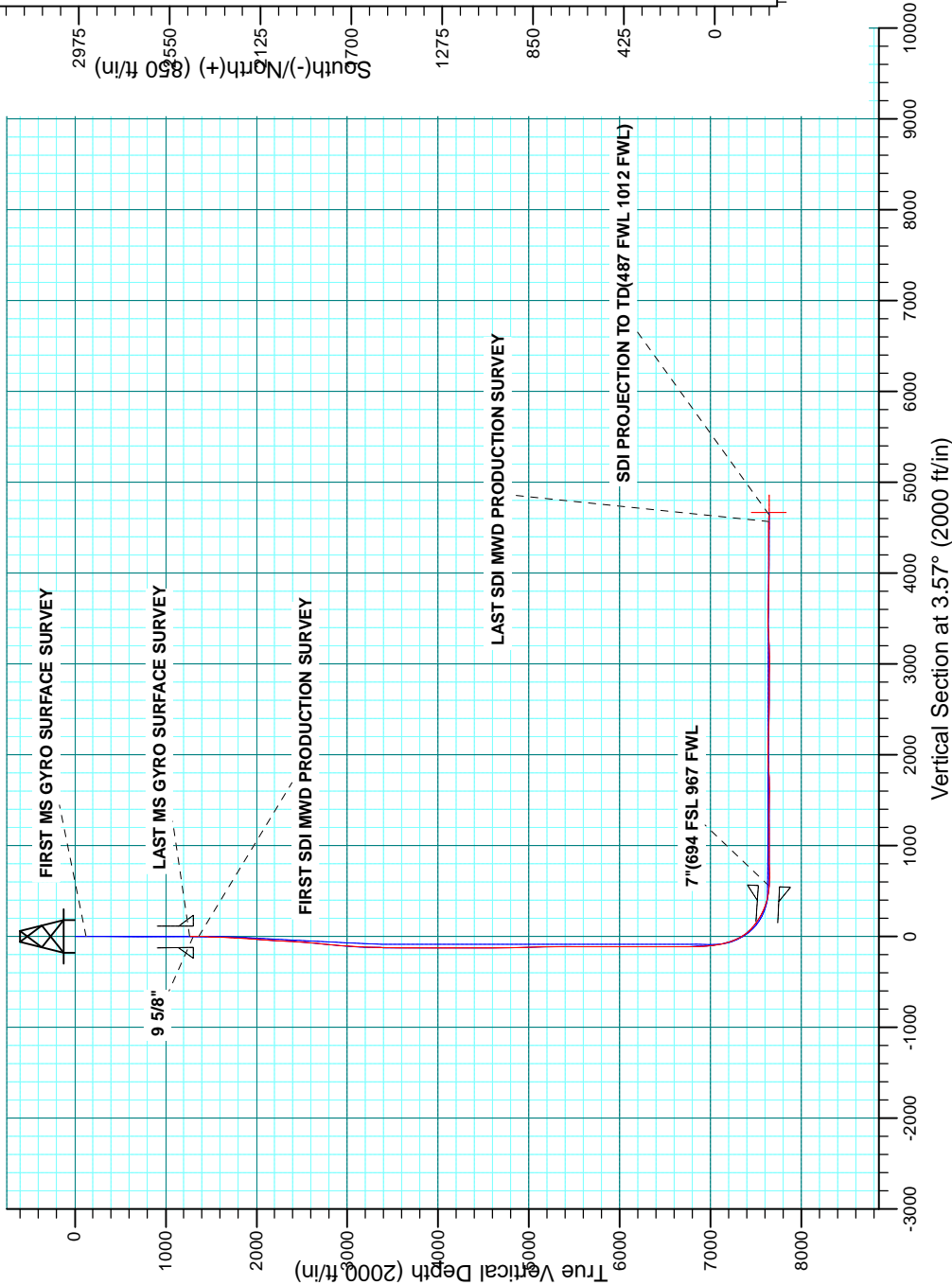


Project: COLORADO NORTHERN ZONE - 83
Site: WARDELL 4G-7H
Well: WARDELL 4G-7H
Wellbore: OH
Design: OH



WELL DETAILS: WARDELL 4G-7H GL				
5021 & KB 25 @ 5046.00ft (HP 311)				
+N/-S 0.00	+E/-W 0.00	Northing 1328723.06	Easting 3219699.35	Latitude 40.2330670 Longitude -104.7130900

PROJECT DETAILS: COLORADO NORTHERN ZONE - 83	
Geodetic System: US State Plane 1983	
Datum: North American Datum 1983	
Ellipsoid: GRS 1980	
Zone: Colorado Northern Zone	
Location: SECTION 7 T3N R65W	
System Datum: Mean Sea Level	



BHL
487 FNL 1012 FWL
LAT: 40.2457858
LONG: -104.7120452

7"
694 FSL 967 FWL
LAT: 40.2345582
LONG: -104.7122830

US ROCKIES REGION PLANNING

COLORADO NORTHERN ZONE - 83

WARDELL 4G-7H

WARDELL 4G-7H

OH

Design: OH

Standard Survey Report

01 December, 2014

Company:	US ROCKIES REGION PLANNING	Local Co-ordinate Reference:	Well WARDELL 4G-7H
Project:	COLORADO NORTHERN ZONE - 83	TVD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Site:	WARDELL 4G-7H	MD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Well:	WARDELL 4G-7H	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Denver Sales

Project	COLORADO NORTHERN ZONE - 83, KERR MCGEE OIL & GAS ONSHORE LP		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		WARDELL 4G-7H, SECTION 7 T3N R65W			
Site Position:		Northing:	1,328,723.07 usft	Latitude:	40.2330670
From:	Lat/Long	Easting:	3,219,699.36 usft	Longitude:	-104.7130900
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in	Grid Convergence:	0.51 °

Well	WARDELL 4G-7H, 150 FSL 744 FWL					
Well Position	+N/-S	0.00 ft	Northing:	1,328,723.06 usft	Latitude:	40.2330670
	+E/-W	0.00 ft	Easting:	3,219,699.36 usft	Longitude:	-104.7130900
Position Uncertainty		0.00 ft	Wellhead Elevation:	0.00 ft	Ground Level:	5,021.00 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2014	10/16/2014	8.47	66.80	52,589

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	3.57	

Survey Program	Date	12/1/2014			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
25.00	1,269.00	Survey #1 SURFACE MS GYRO (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s	
1,367.00	12,143.00	Survey #2 SDI MWD PRODUCTION (OH)	SDI_MWD+CRUST_1.0	SDI MWD + Crustal anomaly, Version 1.0	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	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	
25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	
125.00	0.29	111.15	125.00	-0.09	0.24	-0.08	0.29	0.29	0.00	
FIRST MS GYRO SURFACE SURVEY										
225.00	0.23	192.42	225.00	-0.38	0.43	-0.35	0.34	-0.06	81.27	
325.00	0.18	26.83	325.00	-0.43	0.46	-0.41	0.41	-0.05	-165.59	
425.00	0.18	254.27	425.00	-0.34	0.38	-0.31	0.33	0.00	-132.56	
525.00	0.34	90.49	525.00	-0.38	0.52	-0.35	0.52	0.16	-163.78	
625.00	0.37	213.62	625.00	-0.65	0.64	-0.61	0.62	0.03	123.13	
725.00	0.49	192.49	724.99	-1.34	0.37	-1.31	0.20	0.12	-21.13	

Company:	US ROCKIES REGION PLANNING	Local Co-ordinate Reference:	Well WARDELL 4G-7H
Project:	COLORADO NORTHERN ZONE - 83	TVD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Site:	WARDELL 4G-7H	MD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Well:	WARDELL 4G-7H	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Denver Sales

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
825.00	0.15	285.19	824.99	-1.72	0.15	-1.71	0.52	-0.34	92.70
925.00	0.51	250.91	924.99	-1.83	-0.40	-1.86	0.40	0.36	-34.28
1,025.00	0.05	294.93	1,024.99	-1.96	-0.86	-2.01	0.48	-0.46	44.02
1,125.00	0.26	235.91	1,124.99	-2.07	-1.08	-2.13	0.24	0.21	-59.02
1,225.00	0.35	329.71	1,224.99	-1.93	-1.43	-2.02	0.45	0.09	93.80
1,269.00	0.44	277.01	1,268.99	-1.80	-1.66	-1.90	0.82	0.20	-119.77
LAST MS GYRO SURFACE SURVEY									
1,305.00	0.30	305.46	1,304.99	-1.73	-1.88	-1.84	0.63	-0.39	79.02
9 5/8"									
1,367.00	0.39	13.21	1,366.99	-1.43	-1.96	-1.55	0.63	0.15	109.28
FIRST SDI MWD PRODUCTION SURVEY									
1,459.00	0.65	160.94	1,458.98	-1.61	-1.72	-1.72	1.09	0.28	160.58
1,550.00	3.16	141.15	1,549.93	-4.06	0.02	-4.05	2.81	2.76	-21.75
1,655.00	5.67	117.93	1,654.61	-8.74	6.42	-8.32	2.89	2.39	-22.11
1,746.00	7.56	113.98	1,745.01	-13.28	15.87	-12.27	2.14	2.08	-4.34
1,838.00	8.59	116.68	1,836.09	-18.82	27.54	-17.07	1.19	1.12	2.93
1,929.00	11.01	114.40	1,925.76	-25.47	41.52	-22.83	2.69	2.66	-2.51
2,020.00	13.53	116.41	2,014.67	-33.79	58.97	-30.05	2.81	2.77	2.21
2,112.00	13.48	114.39	2,104.13	-43.01	78.38	-38.04	0.52	-0.05	-2.20
2,204.00	13.24	108.68	2,193.64	-50.81	98.13	-44.60	1.46	-0.26	-6.21
2,295.00	12.40	103.26	2,282.38	-56.39	117.51	-48.96	1.61	-0.92	-5.96
2,386.00	11.84	109.74	2,371.35	-61.78	135.81	-53.21	1.62	-0.62	7.12
2,478.00	10.10	112.76	2,461.67	-68.09	152.13	-58.49	1.99	-1.89	3.28
2,570.00	9.30	119.21	2,552.36	-74.84	166.06	-64.36	1.47	-0.87	7.01
2,661.00	9.48	130.58	2,642.14	-83.31	178.17	-72.05	2.04	0.20	12.49
2,752.00	9.59	126.46	2,731.89	-92.69	189.96	-80.68	0.76	0.12	-4.53
2,844.00	9.89	123.47	2,822.56	-101.60	202.71	-88.78	0.64	0.33	-3.25
2,935.00	10.00	123.96	2,912.20	-110.32	215.78	-96.67	0.15	0.12	0.54
3,026.00	9.38	121.83	3,001.90	-118.64	228.64	-104.18	0.79	-0.68	-2.34
3,118.00	8.66	122.84	3,092.76	-126.36	240.83	-111.11	0.80	-0.78	1.10
3,209.00	6.53	116.39	3,182.96	-132.37	251.22	-116.47	2.52	-2.34	-7.09
3,301.00	4.36	108.71	3,274.54	-135.82	259.22	-119.41	2.48	-2.36	-8.35
3,394.00	3.65	116.45	3,367.31	-138.27	265.22	-121.49	0.96	-0.76	8.32
3,491.00	1.42	111.83	3,464.21	-140.09	269.10	-123.07	2.31	-2.30	-4.76
3,582.00	0.54	348.20	3,555.20	-140.09	270.06	-123.01	1.95	-0.97	-135.86
3,771.00	0.54	221.44	3,744.20	-139.89	269.29	-122.85	0.51	0.00	-67.07
3,865.00	0.12	114.73	3,838.20	-140.26	269.08	-123.23	0.62	-0.45	-113.52
3,959.00	0.05	102.52	3,932.20	-140.31	269.21	-123.28	0.08	-0.07	-12.99
4,053.00	0.30	108.17	4,026.19	-140.40	269.49	-123.35	0.27	0.27	6.01
4,148.00	0.50	144.13	4,121.19	-140.81	269.96	-123.73	0.33	0.21	37.85
4,242.00	0.54	141.03	4,215.19	-141.49	270.48	-124.37	0.05	0.04	-3.30
4,336.00	0.50	286.80	4,309.19	-141.71	270.37	-124.60	1.06	-0.04	155.07
4,431.00	0.81	234.67	4,404.18	-141.98	269.43	-124.93	0.67	0.33	-54.87
4,525.00	0.75	344.75	4,498.18	-141.77	268.72	-124.77	1.36	-0.06	117.11

Company:	US ROCKIES REGION PLANNING	Local Co-ordinate Reference:	Well WARDELL 4G-7H
Project:	COLORADO NORTHERN ZONE - 83	TVD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Site:	WARDELL 4G-7H	MD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Well:	WARDELL 4G-7H	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Denver Sales

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,619.00	0.90	354.76	4,592.17	-140.44	268.49	-123.45	0.22	0.16	10.65
4,713.00	0.83	348.99	4,686.16	-139.04	268.29	-122.06	0.12	-0.07	-6.14
4,808.00	0.54	310.42	4,781.15	-138.08	267.82	-121.13	0.56	-0.31	-40.60
4,902.00	0.87	327.44	4,875.14	-137.19	267.10	-120.29	0.41	0.35	18.11
4,996.00	1.31	358.90	4,969.13	-135.51	266.70	-118.64	0.77	0.47	33.47
5,090.00	2.58	5.54	5,063.07	-132.33	266.88	-115.46	1.37	1.35	7.06
5,185.00	1.63	14.99	5,158.01	-128.90	267.44	-111.99	1.06	-1.00	9.95
5,279.00	0.51	354.01	5,251.99	-127.19	267.74	-110.27	1.24	-1.19	-22.32
5,374.00	0.42	314.77	5,346.98	-126.52	267.45	-109.62	0.34	-0.09	-41.31
5,468.00	0.32	321.78	5,440.98	-126.07	267.04	-109.20	0.12	-0.11	7.46
5,562.00	0.74	284.54	5,534.98	-125.72	266.29	-108.89	0.56	0.45	-39.62
5,657.00	0.62	232.67	5,629.97	-125.87	265.29	-109.11	0.64	-0.13	-54.60
5,751.00	0.61	109.14	5,723.97	-126.35	265.36	-109.58	1.15	-0.01	-131.42
5,846.00	0.74	102.51	5,818.96	-126.65	266.43	-109.81	0.16	0.14	-6.98
5,940.00	0.78	86.83	5,912.96	-126.74	267.66	-109.83	0.22	0.04	-16.68
6,034.00	0.14	187.78	6,006.95	-126.82	268.29	-109.87	0.87	-0.68	107.39
6,129.00	0.47	241.01	6,101.95	-127.12	267.93	-110.19	0.42	0.35	56.03
6,223.00	0.86	259.92	6,195.94	-127.43	266.90	-110.57	0.47	0.41	20.12
6,317.00	1.01	267.47	6,289.93	-127.59	265.38	-110.82	0.21	0.16	8.03
6,412.00	1.09	261.82	6,384.92	-127.76	263.65	-111.09	0.14	0.08	-5.95
6,506.00	0.84	264.56	6,478.90	-127.95	262.07	-111.38	0.27	-0.27	2.91
6,600.00	1.09	307.62	6,572.89	-127.47	260.68	-110.99	0.79	0.27	45.81
6,695.00	1.09	306.62	6,667.87	-126.38	259.24	-109.99	0.02	0.00	-1.05
6,789.00	1.26	310.01	6,761.85	-125.18	257.73	-108.89	0.20	0.18	3.61
6,883.00	0.95	327.30	6,855.84	-123.86	256.52	-107.65	0.48	-0.33	18.39
6,978.00	3.48	1.30	6,950.76	-120.32	256.16	-104.13	2.89	2.66	35.79
7,072.00	8.79	6.89	7,044.19	-110.33	257.08	-94.11	5.68	5.65	5.95
7,166.00	12.44	3.57	7,136.57	-93.09	258.58	-76.80	3.94	3.88	-3.53
7,261.00	19.77	356.92	7,227.78	-66.79	258.35	-50.58	7.94	7.72	-7.00
7,355.00	27.56	354.57	7,313.81	-29.21	255.43	-13.25	8.35	8.29	-2.50
7,450.00	38.16	352.04	7,393.50	21.88	249.27	37.36	11.25	11.16	-2.66
7,544.00	49.07	351.20	7,461.46	85.93	239.79	100.69	11.62	11.61	-0.89
7,638.00	57.13	356.36	7,517.87	160.57	231.83	174.69	9.63	8.57	5.49
7,733.00	63.47	356.43	7,564.92	242.88	226.65	256.53	6.67	6.67	0.07
7,827.00	70.41	358.92	7,601.72	329.24	223.19	342.50	7.77	7.38	2.65
7,922.00	77.12	0.21	7,628.27	420.40	222.52	433.44	7.18	7.06	1.36
8,002.00	85.16	1.75	7,640.58	499.36	223.88	512.33	10.23	10.05	1.93
8,046.00	86.72	1.98	7,643.69	543.23	225.31	556.20	3.59	3.55	0.51
7"(694 FSL 967 FWL)									
8,076.00	87.79	2.13	7,645.13	573.17	226.38	586.16	3.59	3.55	0.51
8,108.00	87.89	1.54	7,646.33	605.13	227.40	618.12	1.87	0.31	-1.84
8,202.00	90.91	1.63	7,647.32	699.08	230.00	712.05	3.21	3.21	0.10
8,296.00	89.09	2.61	7,647.32	793.01	233.48	806.01	2.20	-1.94	1.04

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Well:	WARDELL 4G-7H	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Denver Sales

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
8,390.00	91.47	3.54	7,646.86	886.87	238.52	900.00	2.72	2.53	0.99
8,484.00	89.83	1.76	7,645.79	980.76	242.87	993.98	2.57	-1.74	-1.89
8,579.00	89.56	0.82	7,646.30	1,075.73	245.01	1,088.90	1.03	-0.28	-0.99
8,672.00	91.47	3.85	7,645.46	1,168.63	248.80	1,181.86	3.85	2.05	3.26
8,861.00	89.60	4.66	7,643.70	1,357.09	262.82	1,370.83	1.08	-0.99	0.43
8,955.00	88.26	2.18	7,645.45	1,450.90	268.42	1,464.80	3.00	-1.43	-2.64
9,049.00	89.46	0.98	7,647.32	1,544.84	271.01	1,558.72	1.81	1.28	-1.28
9,143.00	91.17	357.91	7,646.81	1,638.82	270.10	1,652.46	3.74	1.82	-3.27
9,237.00	92.88	358.43	7,643.48	1,732.71	267.10	1,745.98	1.90	1.82	0.55
9,331.00	92.68	359.56	7,638.93	1,826.58	265.46	1,839.57	1.22	-0.21	1.20
9,425.00	91.81	1.21	7,635.24	1,920.51	266.09	1,933.35	1.98	-0.93	1.76
9,520.00	90.13	3.80	7,633.63	2,015.39	270.24	2,028.31	3.25	-1.77	2.73
9,614.00	89.09	4.76	7,634.27	2,109.12	277.26	2,122.30	1.51	-1.11	1.02
9,708.00	88.35	3.16	7,636.37	2,202.87	283.75	2,216.27	1.87	-0.79	-1.70
9,802.00	88.56	2.73	7,638.91	2,296.71	288.57	2,310.23	0.51	0.22	-0.46
9,897.00	88.76	2.91	7,641.13	2,391.57	293.25	2,405.19	0.28	0.21	0.19
9,991.00	89.13	1.75	7,642.86	2,485.48	297.07	2,499.15	1.30	0.39	-1.23
10,085.00	88.29	0.02	7,644.98	2,579.44	298.52	2,593.02	2.05	-0.89	-1.84
10,179.00	89.56	357.88	7,646.74	2,673.40	296.80	2,686.69	2.65	1.35	-2.28
10,273.00	89.76	357.62	7,647.30	2,767.32	293.11	2,780.20	0.35	0.21	-0.28
10,368.00	91.64	0.53	7,646.14	2,862.29	291.57	2,874.89	3.65	1.98	3.06
10,462.00	87.92	356.76	7,646.50	2,956.23	289.35	2,968.51	5.63	-3.96	-4.01
10,556.00	88.59	353.47	7,649.36	3,049.83	281.35	3,061.43	3.57	0.71	-3.50
10,650.00	91.78	352.87	7,649.06	3,143.15	270.17	3,153.87	3.45	3.39	-0.64
10,697.00	94.02	352.26	7,646.68	3,189.69	264.10	3,199.95	4.94	4.77	-1.30
10,792.00	94.16	355.89	7,639.90	3,283.93	254.32	3,293.39	3.81	0.15	3.82
10,839.00	93.15	357.56	7,636.91	3,330.75	251.64	3,339.96	4.15	-2.15	3.55
10,886.00	92.52	359.23	7,634.58	3,377.68	250.33	3,386.71	3.79	-1.34	3.55
10,933.00	90.23	1.92	7,633.45	3,424.65	250.80	3,433.62	7.51	-4.87	5.72
11,027.00	88.89	4.10	7,634.18	3,518.51	255.73	3,527.61	2.72	-1.43	2.32
11,121.00	89.06	3.44	7,635.86	3,612.29	261.91	3,621.59	0.72	0.18	-0.70
11,216.00	88.76	2.13	7,637.67	3,707.16	266.53	3,716.56	1.41	-0.32	-1.38
11,310.00	89.06	0.87	7,639.45	3,801.11	268.99	3,810.48	1.38	0.32	-1.34
11,405.00	89.50	359.67	7,640.65	3,896.10	269.43	3,905.32	1.35	0.46	-1.26
11,499.00	90.03	358.80	7,641.03	3,990.09	268.18	3,999.05	1.08	0.56	-0.93
11,593.00	89.97	359.41	7,641.03	4,084.08	266.71	4,092.76	0.65	-0.06	0.65
11,688.00	90.44	0.52	7,640.69	4,179.08	266.65	4,187.57	1.27	0.49	1.17
11,782.00	89.83	2.33	7,640.47	4,273.04	268.99	4,281.50	2.03	-0.65	1.93
11,876.00	90.10	2.63	7,640.53	4,366.95	273.06	4,375.48	0.43	0.29	0.32
11,971.00	90.27	4.44	7,640.22	4,461.77	278.92	4,470.48	1.91	0.18	1.91
12,065.00	88.76	4.17	7,641.02	4,555.50	285.97	4,564.46	1.63	-1.61	-0.29
LAST SDI MWD PRODUCTION SURVEY									
12,143.00	88.76	4.17	7,642.71	4,633.27	291.64	4,642.44	0.00	0.00	0.00
SDI PROJECTION TO TD(487 FWL 1012 FWL)									

Company:	US ROCKIES REGION PLANNING	Local Co-ordinate Reference:	Well WARDELL 4G-7H
Project:	COLORADO NORTHERN ZONE - 83	TVD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Site:	WARDELL 4G-7H	MD Reference:	GL 5021 & KB 25 @ 5046.00ft (HP 311)
Well:	WARDELL 4G-7H	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Denver Sales

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (in)	Hole Diameter (in)	
1,305.00	1,304.99	9 5/8"	9.625	13.500	
8,046.00	7,643.69	7"(694 FSL 967 FWL)	7.000	8.750	

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
125.00	125.00	-0.09	0.24	FIRST MS GYRO SURFACE SURVEY	
1,269.00	1,268.99	-1.80	-1.66	LAST MS GYRO SURFACE SURVEY	
1,367.00	1,366.99	-1.43	-1.96	FIRST SDI MWD PRODUCTION SURVEY	
12,065.00	7,641.02	4,555.50	285.97	LAST SDI MWD PRODUCTION SURVEY	
12,143.00	7,642.71	4,633.27	291.64	SDI PROJECTION TO TD(487 FWL 1012 FWL)	

Checked By: _____	Approved By: _____	Date: _____
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