



1" = 100'
FEET MD

COMPANY : ANADARKO PETROLEUM
WELL : VONDERLAGE 29C-31HZ
FIELD : DJ WATTENBERG
COUNTY : WELD
STATE : CO
COUNTRY : USA
API WELL No. : 05-123-36016-00

LAT:40°10'31"N LON:104°49'23"W
X:3,189,135 Y:1,307,442 NAD83
SEC:31 TWP:3N RANG:

DIRECTIONAL ROP

BOREHOLE RECORD

DEVIATION RECORD

8 3/4	0	7930	00 - 17	0	6951
6 1/8	7630	11781	17 - 90	6951	7766

	90 +/ -3	7766	11781
--	----------	------	-------

[illegible]

CASING RECORD

[illegible]

7	0	7736		
---	---	------	--	--

DRILLING CO.: ENSIGN DRILLING CO.

RIG : 123

LWD UNIT NO.: N/A DISTRICT : CASPER

SPUD DATE : 23-JUL-13

LWD START DATE : 01-AUG-13 DEPTH : 7728 ft

LWD END DATE : 03-AUG-13 DEPTH : 11781 ft

TOTAL DEPTH : 11781 ft

RUN DATA

RUN NUMBER	1					
START DATE	01-AUG-13					
START TIME	18:20					
END DATE	03-AUG-13					
END TIME	22:30					
DEPTH IN ft	7938					
DEPTH OUT ft	11781					
LOG TOP ft	7728					
LOG BOTTOM ft	11741					
HOLE SIZE in	6 1/8					
MUD DATA @ ft	10476					
MUD TYPE	WATER BASED					
DENSITY lb/gal	9.70					
VISCOSITY s/qt	38					
pH	8.4					
FLUID LOSS cm3/30	7.2					
SALINITY ppm	1200					
Rm ohmm @ deg F	0.065 @ 80					
Rmf ohmm @ deg F	@					

MAX REC TEMP deg F	238					
Rm @ MAX TEMP ohmm	0.023					
LWD ENGINEER #1	R. BAGBY					
LWD ENGINEER #2	B. JOHNSON					
LWD ENGINEER #3	B. SCHMIDT					

REMARKS

ANADARKO PETROLEUM CORPORATION AFE# 2067268.DRL
PATHFINDER JOB #: 13CAS0202

ALL LOGGING DATA IS MEMORY ONLY UNLESS STATED OTHERWISE.
ALL REFERENCES TO LOG TOP, LOG BOTTOM, OR LOGGING TOOL DEPTH REFER TO THE GAMMA-RAY SENSOR UNLESS STATED OTHERWISE.
ALL ANNOTATIONS IN THE DEPTH TRACK ARE REFERENCED TO BIT DEPTH.

THIRD PARTY DEPTH TRACKING PROVIDED BY PASON.

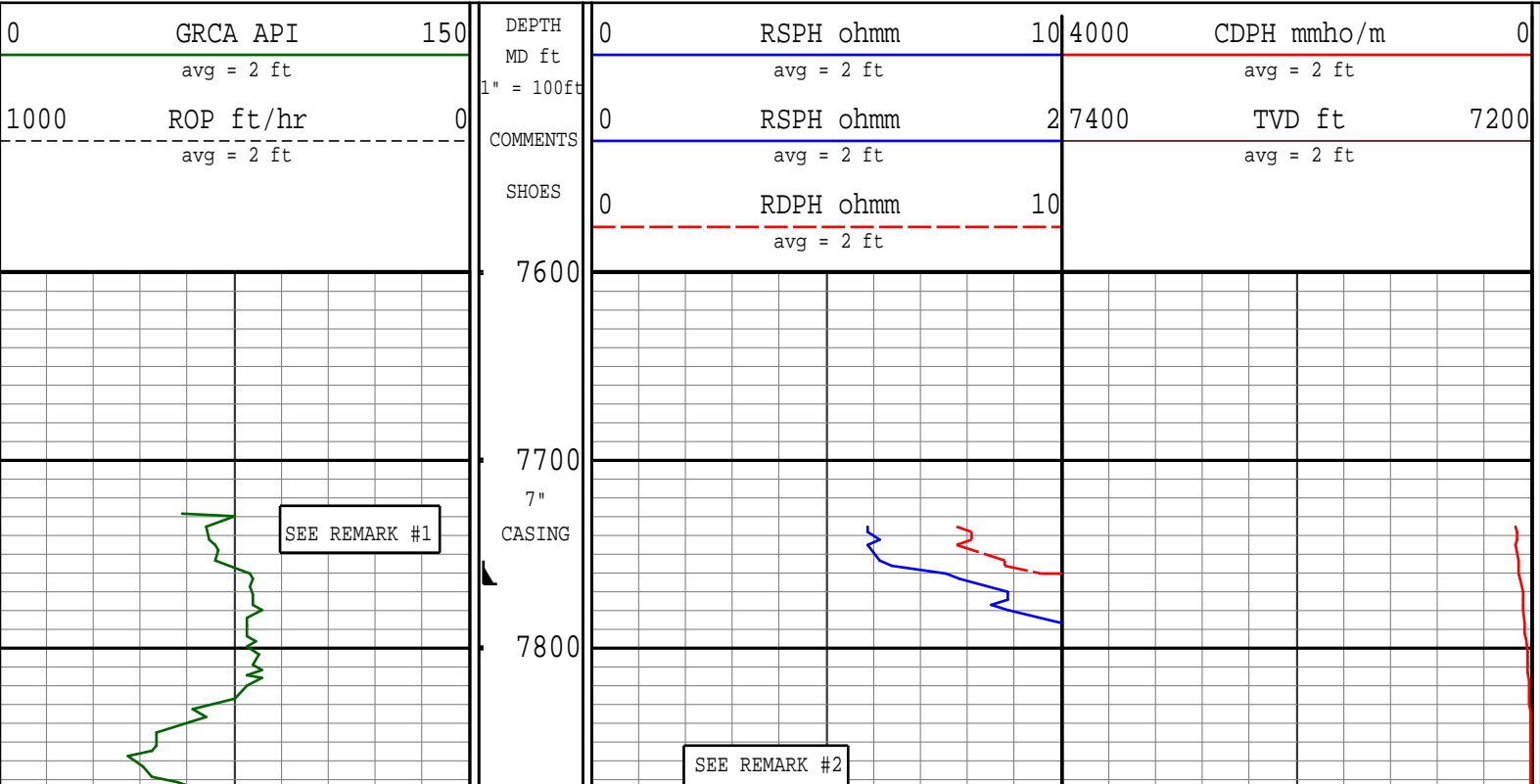
RUN #1: 4 3/4" HDS-1L/AWR LOGGING RUN.

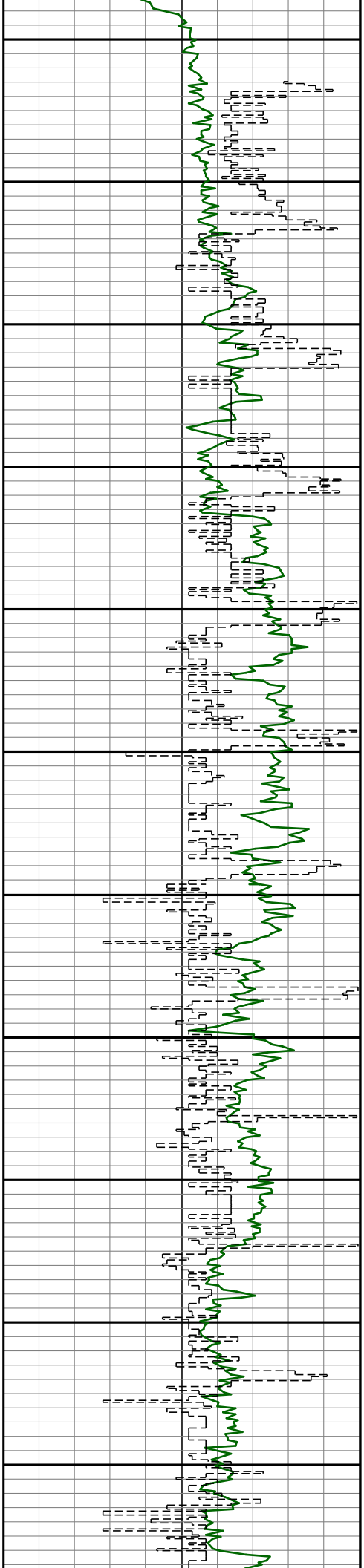
REMARK #1: GAMMA-RAY AND RESISTIVITY FROM 7728'-7895'MD (7335'-7332'TVD) ARE TRANSMITTED ONLY.
REMARK #2: GAMMA-RAY AND RESISTIVITY FROM 7728-7897'MD (7735'-7332'TVD) LOGGED WHILE REAMING 48 HOURS AFTER DRILLING. ROP IS NOT AVAILABLE OVER THE CORRESPONDING INTERVAL.

NOTICE - All interpretations are opinions based on inferences from electrical or other measurements and we do not guarantee the accuracy or correctness of any interpretations. We shall not, except in the case of gross or willful negligence on our part, be liable or responsible for loss, costs, damages or expenses incurred or sustained by anyone as a result of any interpretations made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

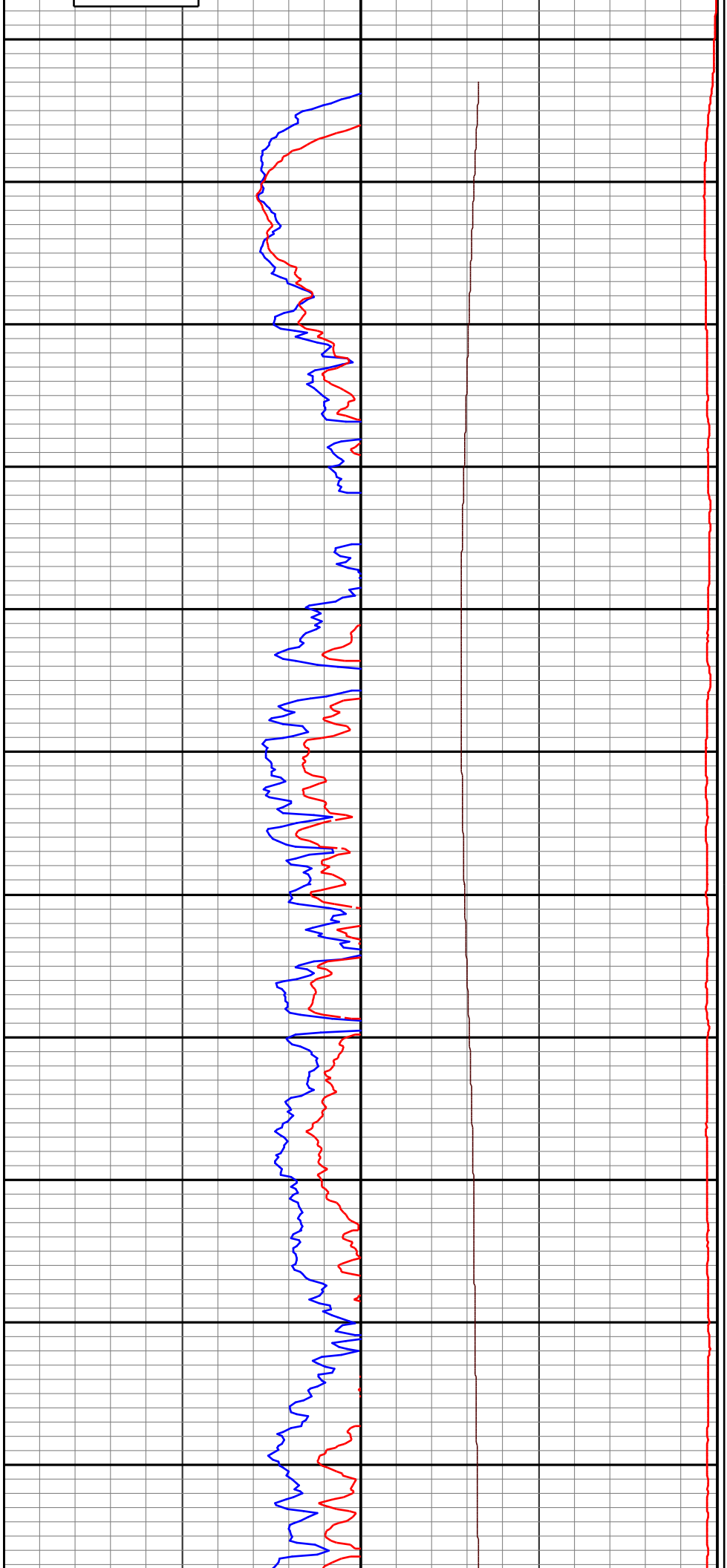
PATHFINDER - A Schlumberger Company

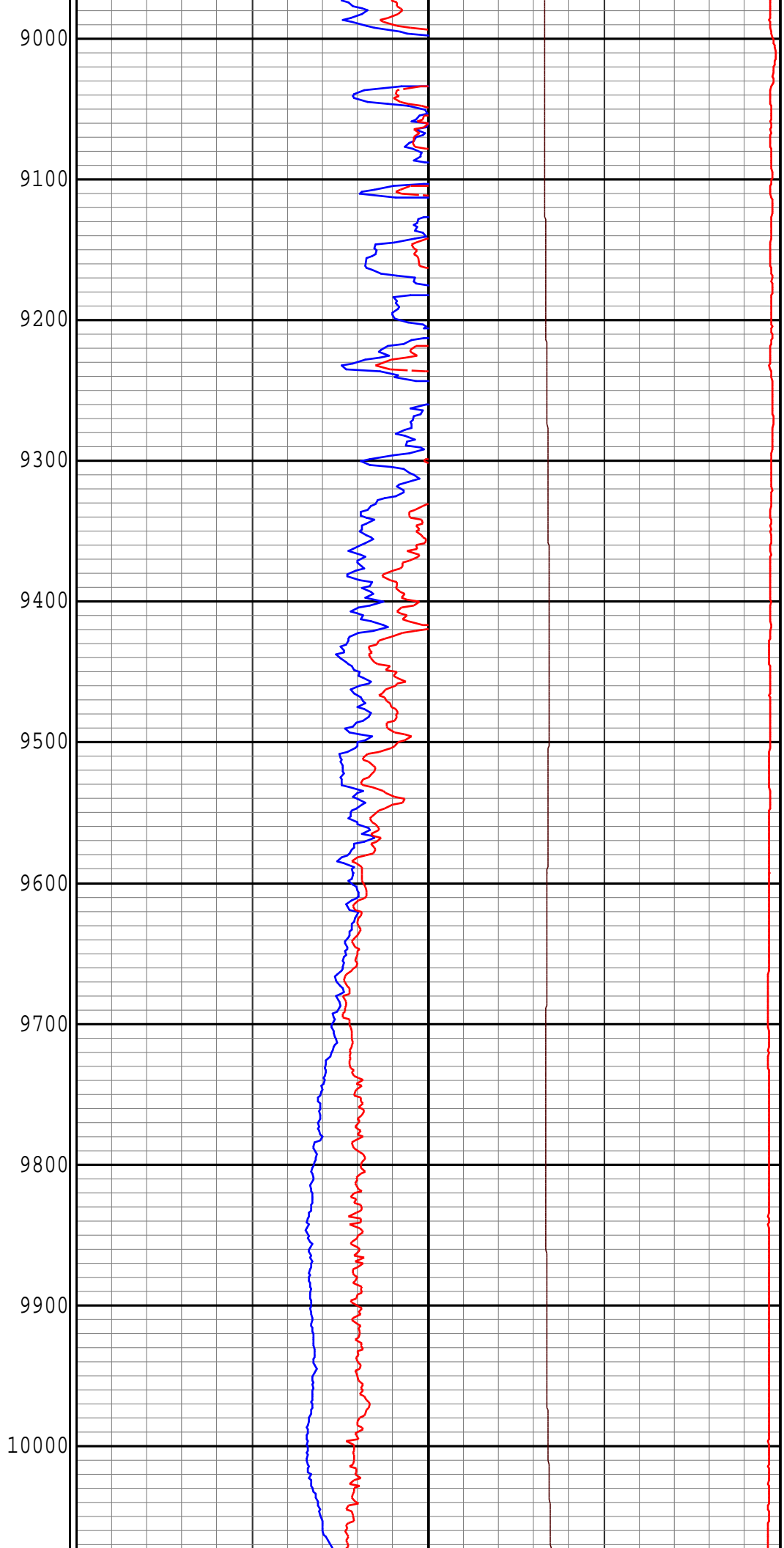
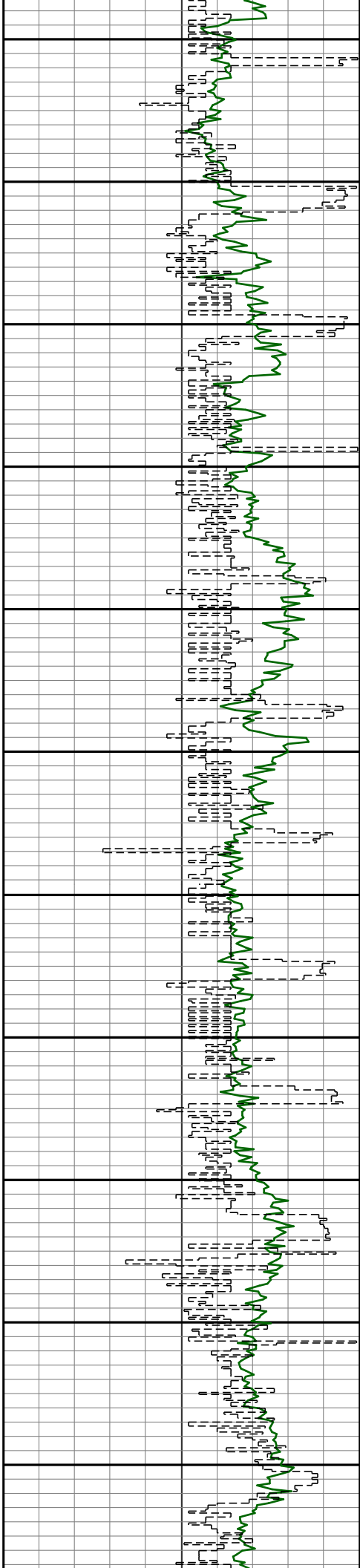
Version No : RX5 V6.04D Release 13Dec2012
Plot Time : 04-Aug-2013 00:11

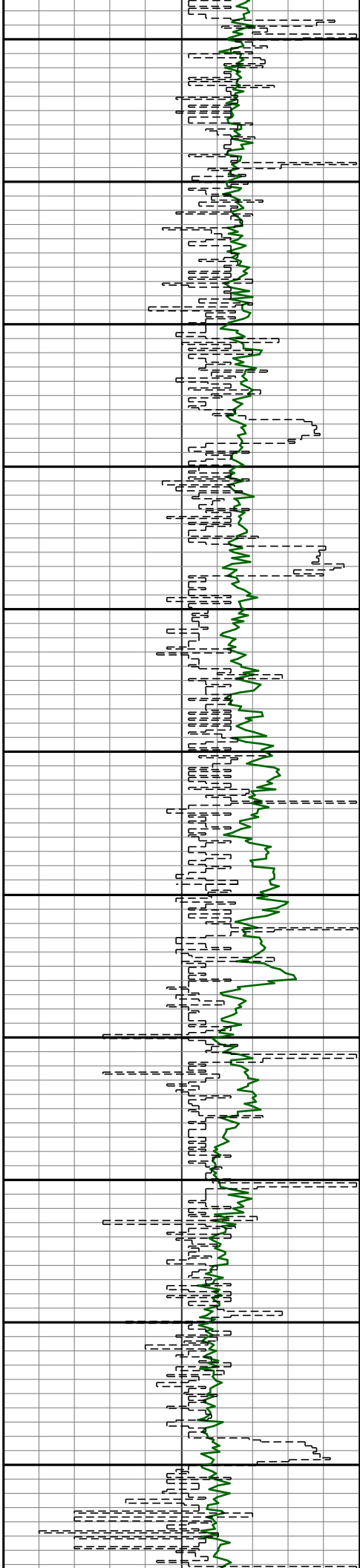




7900
8000
8100
8200
8300
8400
8500
8600
8700
8800
8900







10100

10200

10300

10400

10500

10600

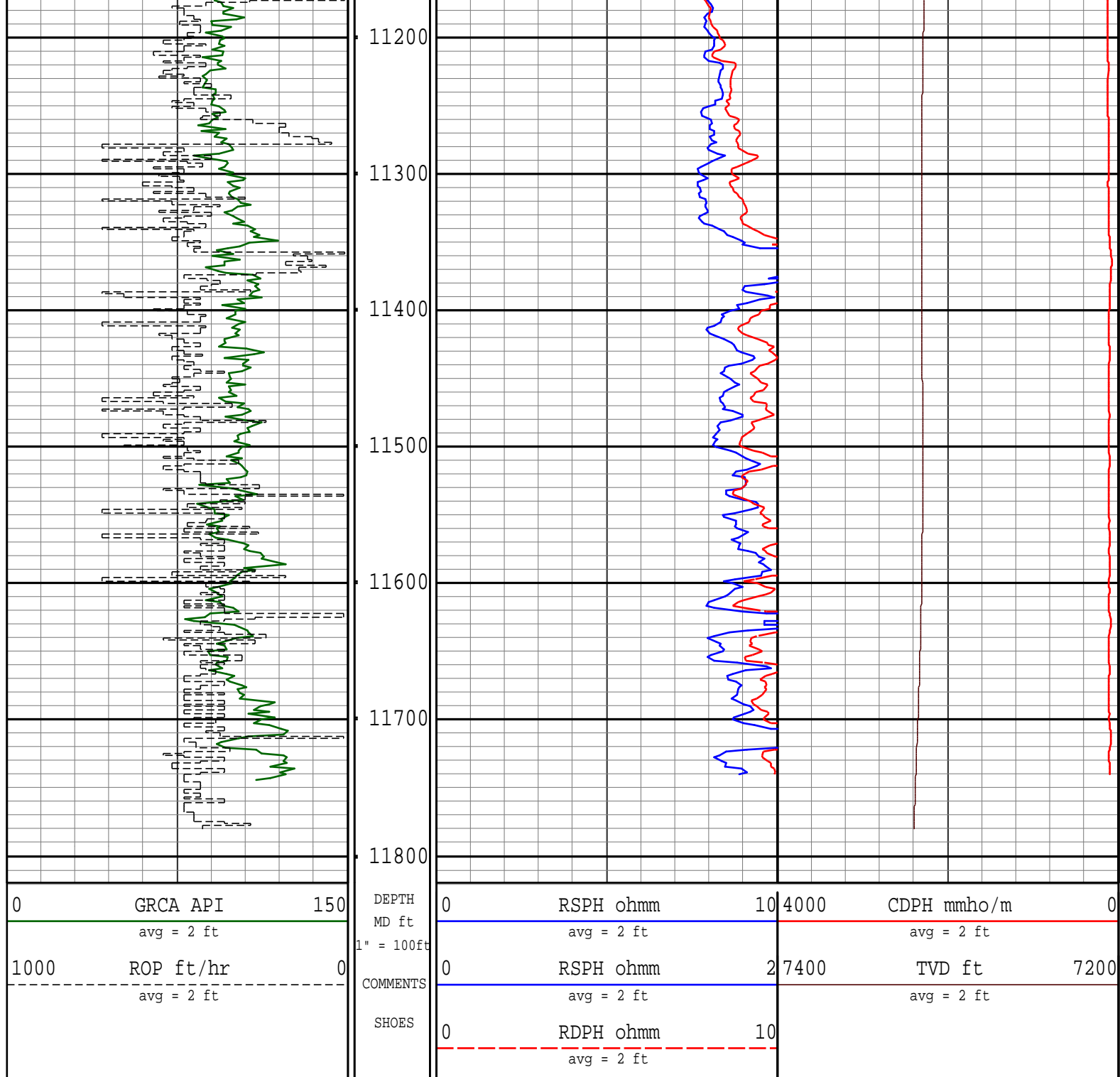
10700

10800

10900

11000

11100



Vertical Section Plane: 355.84°	Total Correction: 8.60° East to True
Calculation Method: Minimum Curvature	Survey Reference: Rotary Table
North Aligned to: True North	Well: VONDERLAGE 29C-31HZ
RT: 13' ROTARY TABLE TO GROUND LEVEL	FIELD: DJ WATTENBERG

1688.00	7.40	196.10	1684.05	94.00	-45.49	48.55 S	40.42 W	63.17	219.78	2.69
1781.00	8.30	194.90	1776.18	93.00	-57.45	60.79 S	43.81 W	74.93	215.78	0.98
1875.00	7.70	196.10	1869.26	94.00	-69.77	73.40 S	47.30 W	87.32	212.80	0.66
1968.00	8.80	201.20	1961.30	93.00	-82.05	86.02 S	51.60 W	100.31	210.96	1.42
2058.00	9.50	199.90	2050.15	90.00	-95.05	99.42 S	56.62 W	114.41	209.66	0.81
2148.00	11.30	204.20	2138.67	90.00	-109.59	114.45 S	62.76 W	130.53	208.74	2.18
2238.00	12.20	201.60	2226.79	90.00	-125.92	131.33 S	69.87 W	148.76	208.01	1.16
2328.00	13.90	203.10	2314.46	90.00	-144.09	150.12 S	77.62 W	169.00	207.34	1.93
2418.00	14.90	201.30	2401.63	90.00	-164.15	170.84 S	86.06 W	191.30	206.74	1.22
2508.00	14.90	205.40	2488.61	90.00	-184.66	192.08 S	95.23 W	214.39	206.37	1.17
2599.00	15.70	203.40	2576.38	91.00	-205.76	213.95 S	105.14 W	238.38	206.17	1.05
2689.00	17.10	204.40	2662.72	90.00	-228.17	237.17 S	115.44 W	263.78	205.95	1.59
2779.00	16.90	202.20	2748.79	90.00	-251.52	261.34 S	125.85 W	290.06	205.71	0.75
2869.00	16.70	197.70	2834.95	90.00	-275.24	285.77 S	134.72 W	315.93	205.24	1.46
2959.00	16.20	195.40	2921.27	90.00	-299.07	310.19 S	141.99 W	341.14	204.60	0.91
3049.00	14.20	194.80	3008.11	90.00	-321.35	332.97 S	148.14 W	364.44	203.99	2.23
3139.00	12.90	188.10	3095.61	90.00	-341.60	353.59 S	152.38 W	385.03	203.31	2.26
3229.00	12.20	180.60	3183.47	90.00	-360.90	373.05 S	153.89 W	403.54	202.42	1.97
3319.00	11.90	182.80	3271.48	90.00	-379.59	391.82 S	154.45 W	421.17	201.51	0.61
3409.00	11.40	190.60	3359.64	90.00	-397.40	409.84 S	156.54 W	438.71	200.90	1.83
3499.00	8.50	195.10	3448.27	90.00	-412.28	425.00 S	159.91 W	454.09	200.62	3.33
3589.00	7.60	208.80	3537.39	90.00	-423.56	436.64 S	164.51 W	466.60	200.64	2.35
3679.00	7.40	222.00	3626.63	90.00	-432.57	446.17 S	171.25 W	477.90	201.00	1.92
3769.00	6.00	232.00	3716.02	90.00	-439.20	453.37 S	178.84 W	487.37	201.53	2.02
3859.00	4.80	240.10	3805.62	90.00	-443.46	458.14 S	185.81 W	494.39	202.08	1.58
3950.00	4.20	267.50	3896.35	91.00	-445.01	460.19 S	192.44 W	498.80	202.69	2.43
4040.00	3.40	278.40	3986.15	90.00	-444.34	459.94 S	198.37 W	500.90	203.33	1.19
4130.00	2.40	309.10	4076.04	90.00	-442.47	458.36 S	202.48 W	501.09	203.83	2.01
4220.00	4.20	312.00	4165.88	90.00	-438.80	454.97 S	206.39 W	499.59	204.40	2.01
4310.00	2.90	332.20	4255.71	90.00	-434.33	450.75 S	209.90 W	497.22	204.97	1.98
4400.00	2.10	24.30	4345.64	90.00	-430.80	447.23 S	210.28 W	494.20	205.18	2.57
4490.00	1.80	35.00	4435.59	90.00	-428.25	444.57 S	208.79 W	491.16	205.16	0.52
4760.00	1.00	324.60	4705.52	270.00	-422.95	439.18 S	207.73 W	485.82	205.31	0.64
4850.00	0.90	321.30	4795.51	90.00	-421.70	437.98 S	208.62 W	485.13	205.47	0.13
4940.00	1.10	301.40	4885.49	90.00	-420.61	436.98 S	209.80 W	484.74	205.65	0.44
5030.00	0.80	300.00	4975.48	90.00	-419.76	436.22 S	211.08 W	484.61	205.82	0.33
5120.00	0.90	306.70	5065.47	90.00	-418.94	435.48 S	212.19 W	484.43	205.98	0.16
5210.00	1.00	285.30	5155.46	90.00	-418.22	434.85 S	213.52 W	484.44	206.15	0.41
5300.00	1.10	268.40	5245.44	90.00	-417.92	434.67 S	215.14 W	485.00	206.33	0.36
5390.00	1.40	259.30	5335.42	90.00	-418.00	434.90 S	217.08 W	486.07	206.53	0.40
5480.00	1.60	220.80	5425.39	90.00	-419.02	436.05 S	218.98 W	487.95	206.67	1.12
5570.00	1.70	157.40	5515.36	90.00	-421.17	438.24 S	219.29 W	490.04	206.58	1.93
5660.00	1.10	147.80	5605.34	90.00	-423.20	440.20 S	218.32 W	491.36	206.38	0.71
5750.00	1.00	121.10	5695.32	90.00	-424.42	441.34 S	217.19 W	491.88	206.20	0.55
5840.00	0.80	125.40	5785.31	90.00	-425.27	442.11 S	216.00 W	492.05	206.04	0.23
5930.00	0.50	63.80	5875.31	90.00	-425.52	442.30 S	215.14 W	491.84	205.94	0.79
6021.00	0.80	78.20	5966.30	91.00	-425.29	441.99 S	214.16 W	491.14	205.85	0.37
6111.00	0.90	75.20	6056.29	90.00	-425.08	441.68 S	212.86 W	490.30	205.73	0.12
6201.00	0.80	68.10	6146.28	90.00	-424.76	441.27 S	211.59 W	489.38	205.62	0.16
6291.00	0.90	59.90	6236.27	90.00	-424.25	440.68 S	210.40 W	488.33	205.52	0.17
6381.00	0.40	55.70	6326.26	90.00	-423.79	440.15 S	209.53 W	487.47	205.46	0.56
6471.00	0.20	11.50	6416.26	90.00	-423.48	439.82 S	209.24 W	487.05	205.44	0.32
6561.00	0.80	7.60	6506.26	90.00	-422.71	439.04 S	209.12 W	486.30	205.47	0.67
6651.00	0.70	11.60	6596.25	90.00	-421.57	437.88 S	208.93 W	485.17	205.51	0.13
6741.00	0.70	11.10	6686.24	90.00	-420.51	436.80 S	208.71 W	484.10	205.54	0.01
6801.00	0.90	12.70	6746.24	60.00	-419.70	435.98 S	208.54 W	483.29	205.56	0.34
6831.00	2.20	7.10	6776.23	30.00	-418.91	435.18 S	208.42 W	482.51	205.59	4.36
6861.00	5.70	1.40	6806.15	30.00	-416.87	433.12 S	208.31 W	480.61	205.69	11.73
6891.00	9.70	358.50	6835.88	30.00	-412.86	429.10 S	208.34 W	477.00	205.90	13.39
6921.00	13.10	358.70	6865.28	30.00	-406.93	423.17 S	208.48 W	471.74	206.23	11.33
6951.00	16.90	357.30	6894.25	30.00	-399.18	415.42 S	208.76 W	464.92	206.68	12.72

Survey Report												
Vertical Section Plane: 355.84°						Total Correction: 8.60° East to True						
Calculation Method: Minimum Curvature						Survey Reference: Rotary Table						
North Aligned to: True North						Well: VONDERLAGE 29C-31HZ						
RT: 13' ROTARY TABLE TO GROUND LEVEL						FIELD: DJ WATTENBERG						
Measured Depth (ft)	Inclination (deg)	Azimuth (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	Rect Co-ord North (ft)	Rect Co-ord East (ft)	Closure Distance (ft)	Closure Direction (deg)	Dog-leg Severity (dg/hft)	Temp (deg F)	
6981.00	18.20	356.50	6922.85	30.00	-390.13	406.38 S	209.26 W	457.09	207.24	4.41		
7011.00	19.60	357.80	6951.24	30.00	-380.42	396.68 S	209.74 W	448.71	207.87	4.87		
7041.00	23.10	359.30	6979.17	30.00	-369.51	385.76 S	210.00 W	439.22	208.56	11.81		
7071.00	26.70	359.40	7006.38	30.00	-356.91	373.13 S	210.14 W	428.24	209.39	12.00		
7101.00	30.10	0.00	7032.77	30.00	-342.67	358.87 S	210.21 W	415.90	210.36	11.37		
7131.00	34.30	0.30	7058.15	30.00	-326.74	342.89 S	210.17 W	402.17	211.51	14.01		
7161.00	38.40	358.70	7082.30	30.00	-308.99	325.11 S	210.34 W	387.22	212.90	14.03		
7191.00	41.90	358.40	7105.23	30.00	-289.68	305.78 S	210.83 W	371.41	214.59	11.68		
7221.00	45.50	358.50	7126.92	30.00	-268.97	285.06 S	211.39 W	354.89	216.56	12.00		
7251.00	46.70	357.50	7147.72	30.00	-247.37	263.46 S	212.14 W	338.25	218.84	4.67		
7281.00	47.90	356.80	7168.06	30.00	-225.33	241.44 S	213.24 W	322.12	221.45	4.35		
7311.00	50.30	356.70	7187.70	30.00	-202.66	218.80 S	214.53 W	306.42	224.44	8.00		
7341.00	53.70	358.00	7206.17	30.00	-179.03	195.19 S	215.61 W	290.84	227.85	11.84		

7371.00	56.30	0.00	7223.38	30.00	-154.50	170.62 S	216.04 W	275.29	231.70	10.24	
7401.00	59.10	1.50	7239.41	30.00	-129.24	145.27 S	215.70 W	260.06	236.04	10.25	
7431.00	61.40	1.40	7254.29	30.00	-103.32	119.24 S	215.04 W	245.88	240.99	7.67	
7461.00	63.90	1.50	7268.08	30.00	-76.80	92.60 S	214.37 W	233.51	246.64	8.34	
7491.00	66.80	0.90	7280.59	30.00	-49.66	65.34 S	213.80 W	223.56	253.01	9.84	
7521.00	69.20	0.20	7291.82	30.00	-21.94	37.53 S	213.53 W	216.80	260.03	8.29	
7551.00	71.00	0.20	7302.03	30.00	6.18	9.32 S	213.43 W	213.64	267.50	6.00	
7581.00	72.30	359.70	7311.48	30.00	34.59	19.15 N	213.46 W	214.32	275.13	4.61	
7611.00	75.00	358.90	7319.92	30.00	63.32	47.93 N	213.81 W	219.12	282.64	9.36	
7641.00	78.10	358.60	7326.90	30.00	92.45	77.10 N	214.45 W	227.89	289.77	10.38	
TIED INTO CATHEDRAL EM SURVEY AT 7692'MD.											
7692.00	86.70	357.30	7333.64		142.92	127.57 N	216.26 W	251.08	300.54		
THE FOLLOWING ARE PATHFINDER MWD SURVEYS.											
7766.00	92.68	356.12	7334.04	74.00	216.88	201.41 N	220.51 W	298.65	312.41	8.24	194.99
7856.00	89.87	355.07	7332.04	90.00	306.84	291.11 N	227.42 W	369.41	322.00	3.33	191.38
7946.00	87.67	353.39	7333.97	90.00	396.78	380.63 N	236.46 W	448.10	328.15	3.08	191.38
8036.00	88.20	354.14	7337.21	90.00	486.66	470.04 N	246.23 W	530.63	332.35	1.02	191.38
8126.00	88.55	353.66	7339.77	90.00	576.57	559.49 N	255.79 W	615.19	335.43	0.66	191.38
8216.00	88.55	355.46	7342.04	90.00	666.52	649.05 N	264.32 W	700.81	337.84	2.00	191.38
8303.00	89.69	356.95	7343.38	87.00	753.50	735.85 N	270.07 W	783.85	339.85	2.16	194.99
8396.00	90.57	356.52	7343.17	93.00	846.49	828.70 N	275.37 W	873.25	341.62	1.05	198.61
8486.00	91.19	358.70	7341.79	90.00	936.43	918.60 N	279.12 W	960.07	343.10	2.52	198.61
8576.00	91.80	0.17	7339.44	90.00	1026.22	1008.56 N	280.01 W	1046.71	344.48	1.77	202.22
8666.00	91.19	359.33	7337.09	90.00	1115.98	1098.53 N	280.40 W	1133.75	345.68	1.15	205.83
8756.00	90.22	357.07	7335.98	90.00	1205.89	1188.47 N	283.23 W	1221.76	346.60	2.73	205.83
8847.00	90.84	359.03	7335.14	91.00	1296.81	1279.41 N	286.33 W	1311.06	347.39	2.26	209.45
8937.00	90.48	358.08	7334.10	90.00	1386.70	1369.38 N	288.60 W	1399.46	348.10	1.13	209.45
9027.00	90.22	358.18	7333.55	90.00	1476.63	1459.33 N	291.53 W	1488.16	348.70	0.31	213.06
9117.00	90.04	358.69	7333.35	90.00	1566.54	1549.29 N	293.99 W	1576.94	349.26	0.60	213.06
9207.00	90.66	0.72	7332.80	90.00	1656.32	1639.28 N	294.45 W	1665.52	349.82	2.36	213.06
9297.00	90.57	359.16	7331.83	90.00	1746.09	1729.28 N	294.55 W	1754.18	350.33	1.74	216.68
9387.00	90.04	359.46	7331.35	90.00	1835.92	1819.27 N	295.63 W	1843.13	350.77	0.68	216.68
9477.00	89.96	359.60	7331.35	90.00	1925.73	1909.26 N	296.37 W	1932.13	351.18	0.18	216.68
9567.00	89.43	0.85	7331.83	90.00	2015.47	1999.26 N	296.02 W	2021.06	351.58	1.51	216.68
9657.00	89.69	0.97	7332.52	90.00	2105.11	2089.25 N	294.59 W	2109.91	351.97	0.32	220.29
9747.00	89.69	359.67	7333.01	90.00	2194.83	2179.24 N	294.09 W	2199.00	352.31	1.44	220.29
9837.00	90.48	1.88	7332.88	90.00	2284.49	2269.23 N	292.87 W	2288.05	352.65	2.61	220.29
9927.00	90.13	2.34	7332.40	90.00	2373.95	2359.16 N	289.55 W	2376.87	353.00	0.64	223.91
10017.00	91.28	2.87	7331.29	90.00	2463.32	2449.06 N	285.46 W	2465.64	353.35	1.41	223.91
10107.00	91.01	1.26	7329.49	90.00	2552.77	2538.98 N	282.22 W	2554.62	353.66	1.81	223.91
10197.00	90.31	1.18	7328.46	90.00	2642.36	2628.96 N	280.31 W	2643.86	353.91	0.78	227.52
10287.00	89.16	0.89	7328.87	90.00	2731.99	2718.94 N	278.68 W	2733.18	354.15	1.32	227.52
10377.00	90.13	0.82	7329.43	90.00	2821.64	2808.93 N	277.34 W	2822.58	354.36	1.08	227.52
10467.00	91.54	359.91	7328.12	90.00	2911.35	2898.91 N	276.76 W	2912.09	354.55	1.87	227.52
10557.00	91.89	0.16	7325.43	90.00	3001.07	2988.87 N	276.71 W	3001.65	354.71	0.48	227.52
10647.00	91.63	359.39	7322.66	90.00	3090.81	3078.83 N	277.06 W	3091.27	354.86	0.90	231.13
10737.00	92.07	0.10	7319.75	90.00	3180.56	3168.78 N	277.46 W	3180.90	355.00	0.93	231.13
10827.00	91.63	0.35	7316.85	90.00	3270.25	3258.73 N	277.11 W	3270.49	355.14	0.56	231.13
10917.00	91.10	358.94	7314.71	90.00	3360.02	3348.70 N	277.67 W	3360.19	355.26	1.67	231.13
11007.00	91.36	358.15	7312.77	90.00	3449.90	3438.65 N	279.95 W	3450.03	355.35	0.92	234.75
11097.00	89.08	358.64	7312.43	90.00	3539.80	3528.61 N	282.47 W	3539.90	355.42	2.59	234.75
11187.00	88.99	359.39	7313.94	90.00	3629.65	3618.58 N	284.02 W	3629.71	355.51	0.84	234.75
11277.00	89.60	357.28	7315.05	90.00	3719.55	3708.53 N	286.63 W	3719.59	355.58	2.44	234.75
11367.00	90.22	356.72	7315.19	90.00	3809.53	3798.41 N	291.34 W	3809.56	355.61	0.93	234.75
11457.00	90.40	357.23	7314.71	90.00	3899.51	3888.28 N	296.09 W	3899.54	355.65	0.60	238.36
11547.00	89.69	355.27	7314.63	90.00	3989.51	3978.08 N	301.98 W	3989.53	355.66	2.32	238.36
11637.00	88.90	355.26	7315.74	90.00	4079.50	4067.77 N	309.41 W	4079.52	355.65	0.88	238.36
11696.00	88.29	355.10	7317.19	59.00	4138.47	4126.54 N	314.36 W	4138.50	355.64	1.07	238.36

Survey Report											
Vertical Section Plane: 355.84°						Total Correction: 8.60° East to True					
Calculation Method: Minimum Curvature						Survey Reference: Rotary Table					
North Aligned to: True North						Well: VONDERLAGE 29C-31HZ					
RT: 13' ROTARY TABLE TO GROUND LEVEL						FIELD: DJ WATTENBERG					
Measured Depth (ft)	Inclination (deg)	Azimuth (deg)	TVD (ft)	Course Length (ft)	Vertical Section (ft)	Rect Co-ord North (ft)	Rect Co-ord East (ft)	Closure Distance (ft)	Closure Direction (deg)	Dog-leg Severity (dg/hft)	Temp (deg F)
STRAIGHT LINE PROJECTION TO BIT DEPTH AT 11781'MD.											
11781.00	88.29	355.10	7319.73	85.00	4223.43	4211.19 N	321.62 W	4223.46	355.63	0.00	

EQUIPMENT DATA					
RUN NUMBER	1				
RES DTA	4573				
RES MANDREL	4573				
RES SIZE in	4 3/4				
RES VERIFIED					

RES VERIFIER						
API BLANKET	.0013					
HDS-1M DTA						
HDS-1M MANDREL						
HDS-1M SIZE in						
DNSC DTA						
DNSC MANDREL						
DNSC SIZE in						
DENSITY SOURCE NO.						
NEUTRON SOURCE NO.						
CLSS DTA						
CLSS MANDREL						
CLSS SIZE in						
DPM DTA						
DPM SIZE in						
DFT DTA						
DFT MANDREL						
DFT SIZE in						
PZIG UXM DTA						
PZIG LXM DTA						
PZIG SIZE in						

BOTTOM HOLE ASSEMBLY RECORD							
RUN #1		ft					
6 1/8" PDC BIT		0.90					
1.5° MUD MOTOR		28.54					
AWR (RES/GR)		20.33					
ABS (BATTERY)		19.56					
SUB		1.13					
HDS-1L (DIR/GR)		28.75					
X/O		1.90					
REAMER		7.35					
DP X 60		1799.99					
AGITATOR		21.49					
DP X 75		2250.20					
HWDP X 60		1870.03					
TOTAL BHA:		6050.17					
SENSOR OFFSETS:							
AWR INCLINATION		32.71					
AWR GAMMA-RAY		33.11					
AWR RESISTIVITY		39.44					
GAMMA-RAY		74.33					
DIRECTIONAL		82.41					

--	--	--	--	--	--	--	--



A Schlumberger Company

RESISTIVITY
GAMMA-RAY
CONDUCTIVITY

1" = 100'
FEET MD