



A Schlumberger Company

RESISTIVITY
GAMMA-RAY
CONDUCTIVITY

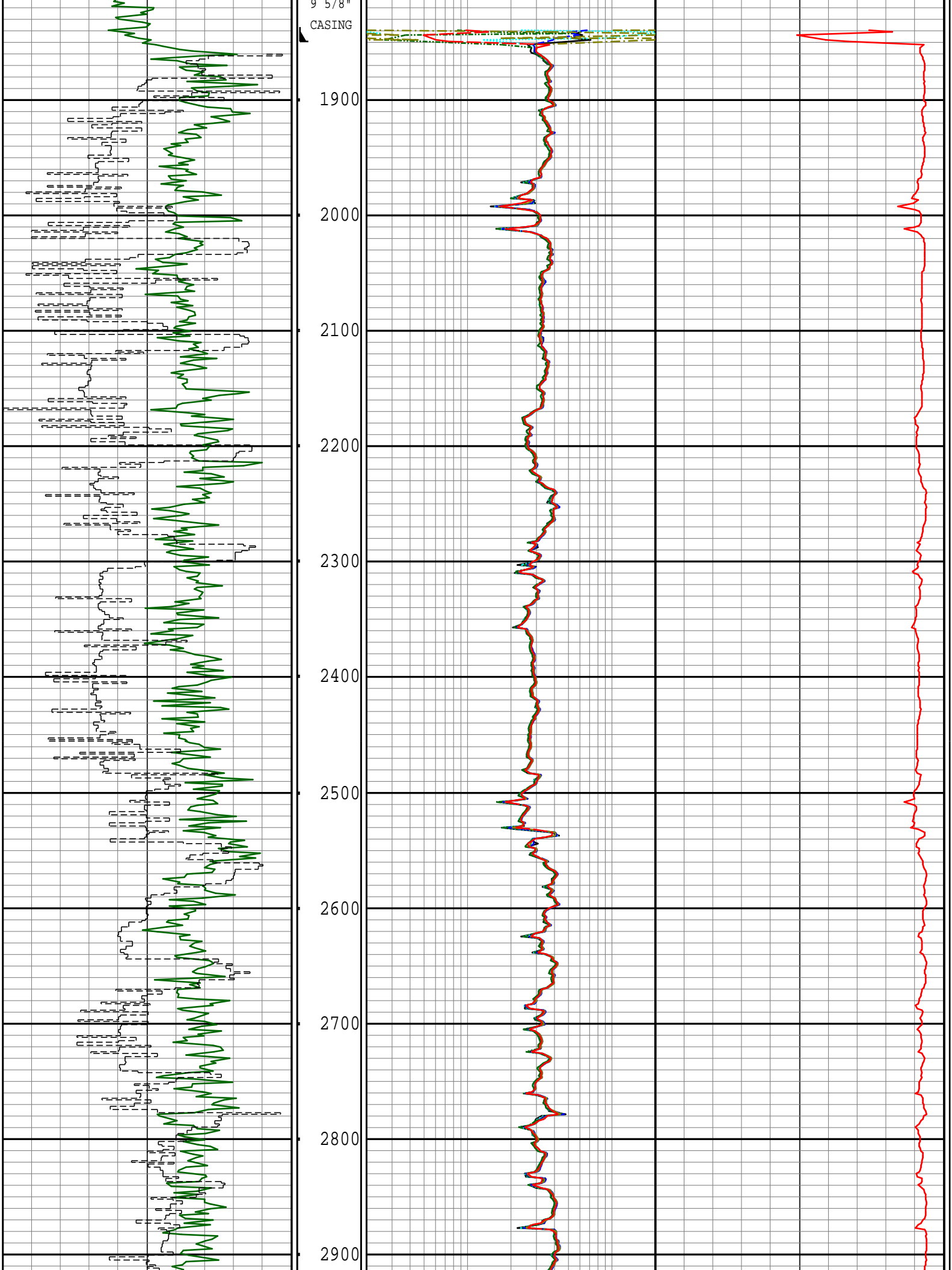
1" = 100'
FEET MD

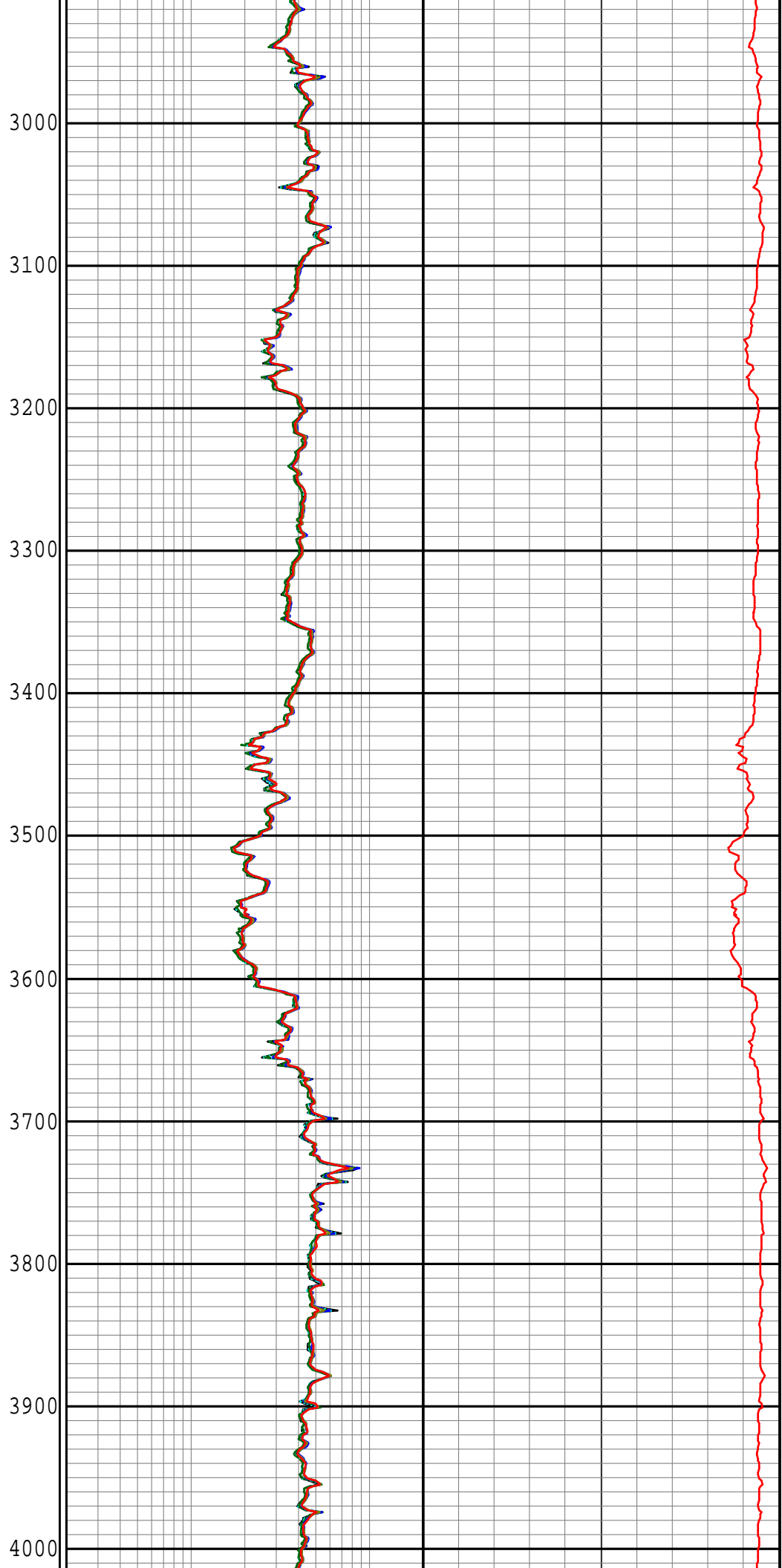
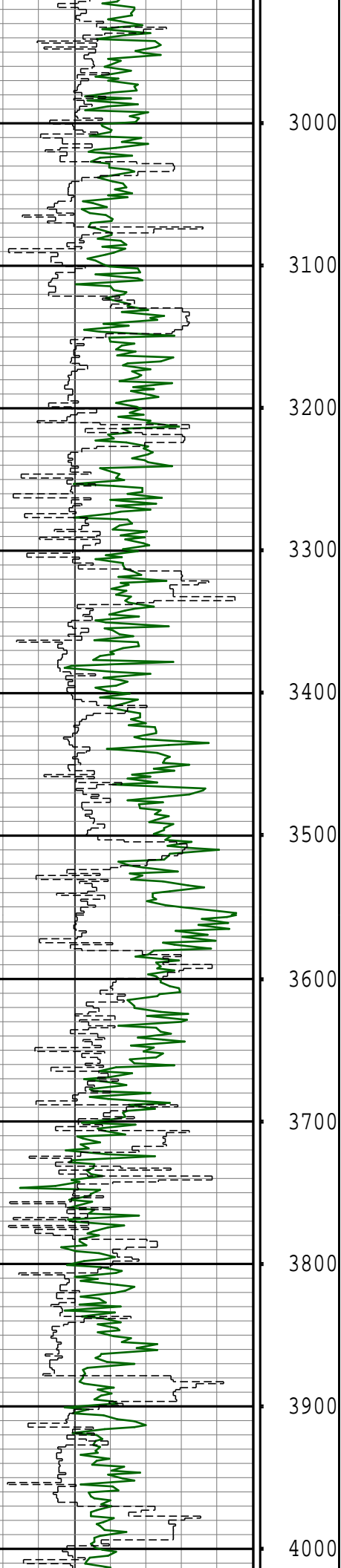
COMPANY : NOBLE ENERGY INC WELL : WELLS RANCH AA11-637 FIELD : WATTENBERG COUNTY : WELD STATE : CO COUNTRY : USA API No.: 05-123-41253										COMPANY : NOBLE ENERGY INC WELL : WELLS RANCH AA11-637 FIELD : WATTENBERG COUNTY : WELD STATE : CO COUNTRY : USA API WELL No.: 05-123-41253																			
DEPTH REF. : ROTARY TABLE ELEVATION : 30.00 ft (ROTARY TABLE - GROUND LEVEL) ALTITUDE : 4855.00 ft (GROUND LEVEL - MEAN SEA LEVEL)										WELL LOCATION LAT:40°29'55"N LON:104°23'42"W X:3,307,273 Y:1,426,409' NAD83 SEC:11 TWP:06N RANGE:63W										OTHER SERVICES DIRECTIONAL ROP									
BOREHOLE RECORD															DEVIATION RECORD														
HOLE SIZE in		FROM ft		TO ft		INCLINATION deg		FROM ft		TO ft																			
13 1/2		0		1861		00 - 06		0		2229																			
8 3/4		0		7227		06 +/-3		2229		4016																			
8 1/2		7227		13827		06 - 01		4016		4300																			
						01 +/-3		4300		6005																			
						01 - 90		6005		7177																			
						90 +/-1		7177		13827																			
CASING RECORD																													
CASING SIZE in		FROM ft		TO ft																									
9 5/8		0		1850																									

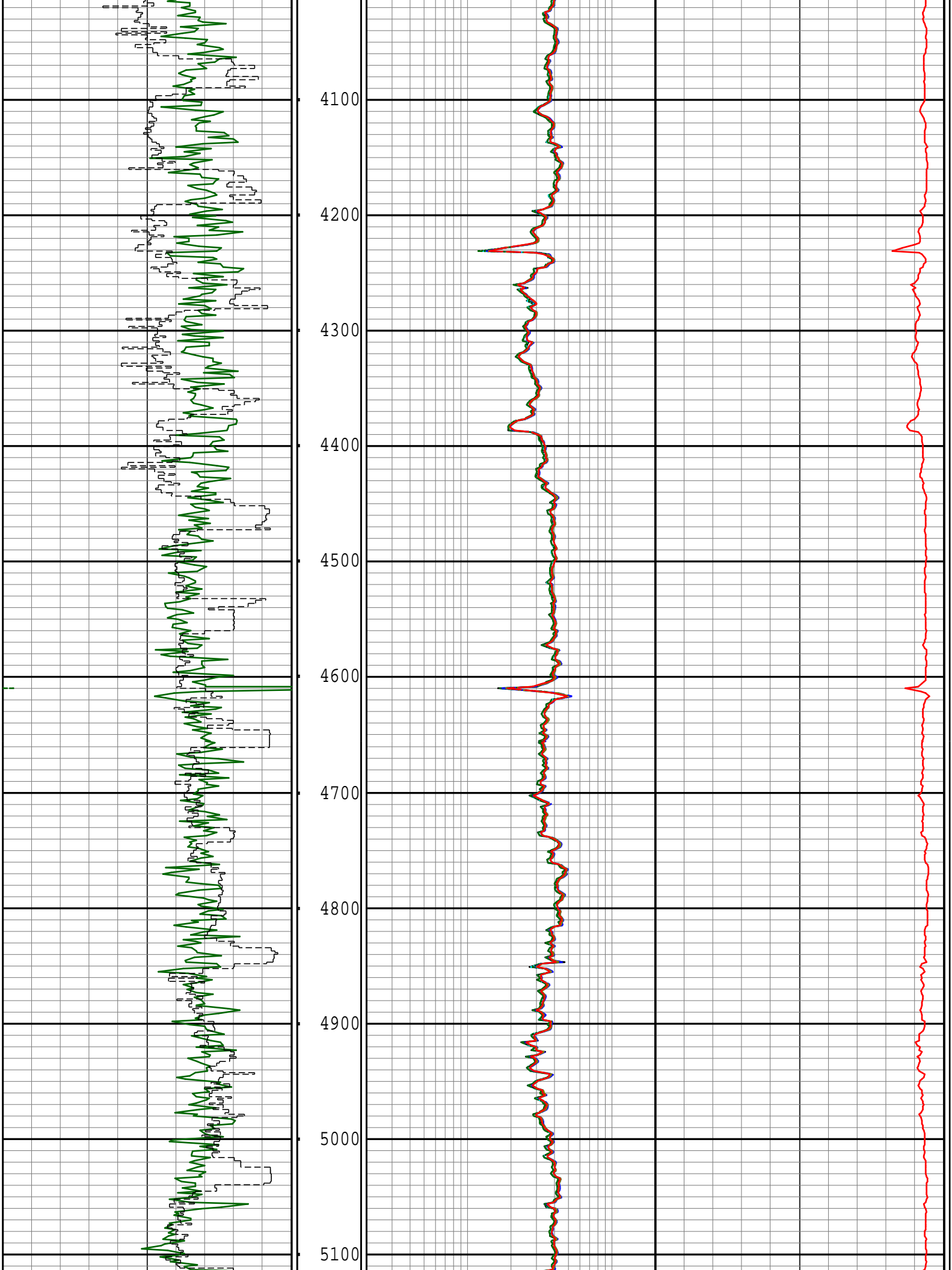
RUN DATA											
RUN NUMBER		1	3								
START DATE		01-JUN-15	03-JUN-15								
START TIME		10:45	16:30								
END DATE		02-JUN-15	06-JUN-15								
END TIME		19:45	08:30								
DEPTH IN	ft	1861	7227								
DEPTH OUT	ft	6451	13827								
LOG TOP	ft	1850	7172								
LOG BOTTOM	ft	6348	13784								
HOLE SIZE	in	8 3/4	8 1/2								
MUD DATA @	ft	5772	13827								
MUD TYPE		WATER BASE	WATER BASE								
DENSITY	lb/gal	8.95	10.00								
VISCOSITY	s/qt	28	38								
pH		10.5	10.1								
FLUID LOSS	cm3/30	27.1									
SALINITY	ppm	2400	34972								
Rm ohmm	@ deg F	@	0.200 @ 68								
Rmf ohmm	@ deg F	@	0.150 @ 68								

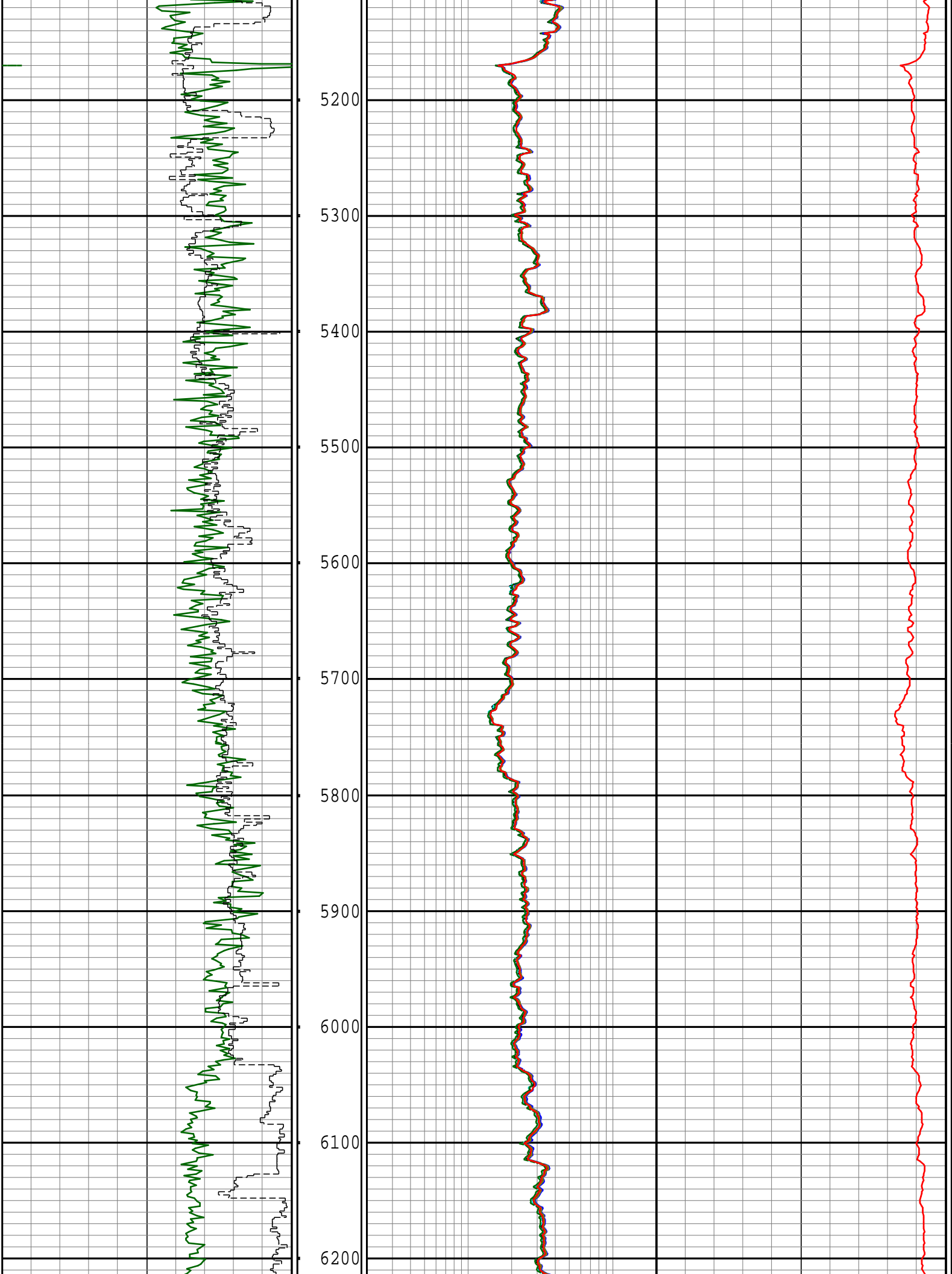
REMARKS
NOBLE ENERGY INC AFE #: 201005
PATHFINDER JOB #: 15CC00477
ALL LOGGING DATA IS MEMORY UNLESS STATED OTHERWISE.
ALL REFERENCES TO LOG TOP, LOG BOTTOM, OR LOGGING TOOL DEPTH REFER TO THE GAMMA-RAY SENSOR UNLESS STATED OTHERWISE. SENSOR OFFSETS FOR THE OTHER LOGGING TOOLS ARE SHOWN IN THE BHA REPORT ON THE LOG TRAILER.
ALL ANNOTATIONS IN THE DEPTH TRACK ARE REFERENCED TO BIT DEPTH.
THIRD PARTY DEPTH TRACKING PROVIDED BY PASON.
RUN #1: 6 3/4" AWR LOGGING RUN (ENSIGN DIR).
RUN #2: 6 1/2" MOTOR ONLY RUN (ENSIGN DIR/GR).
RUN #3: 6 3/4" SLIMPULSE DIR/GR LOGGING RUN.
REMARK #1: GAMMA-RAY LOGGED THOUGH CASING FROM 1765'-1850'MD (1765'-1850'TVD).
REMARK #2: GAMMA-RAY FROM 6348'-7172'MD (6322'-6710'TVD) SUPPLIED BY ENSIGN DIRECTIONAL.
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 : RX6 V7.01 Release 11May2015
Plot Time : 16-Jun-2015 12:51

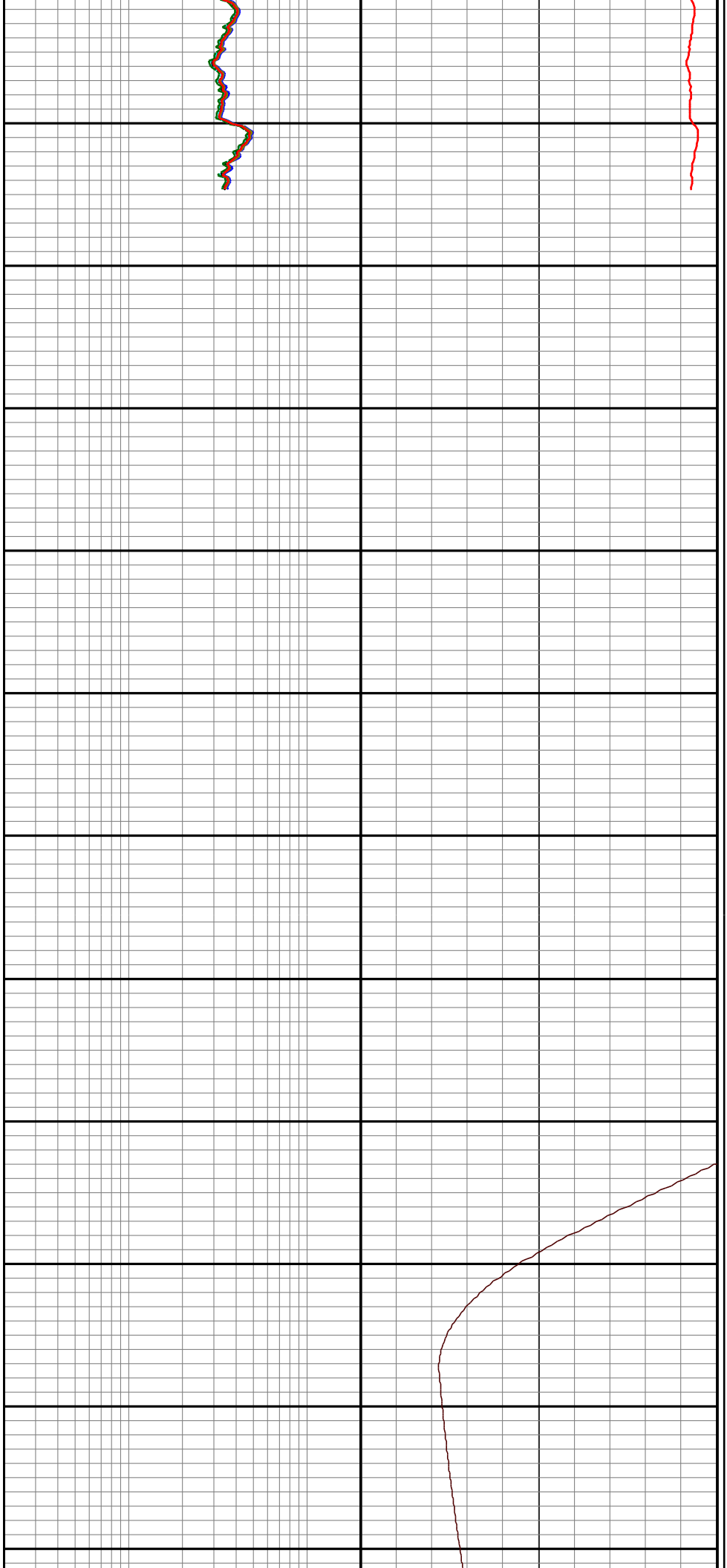
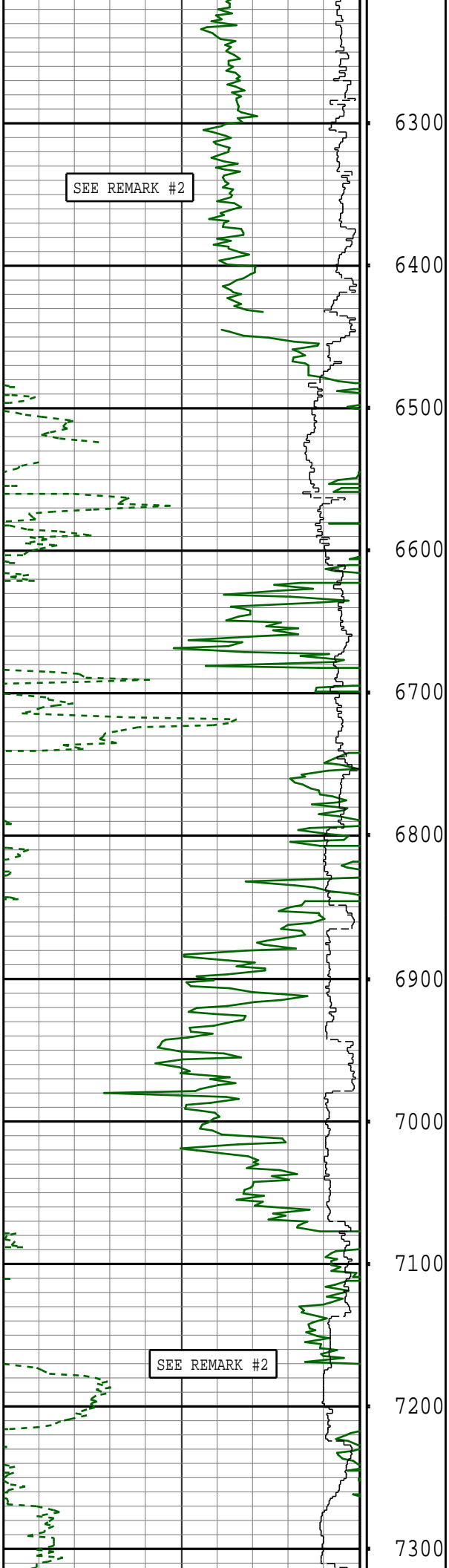
[illegible]

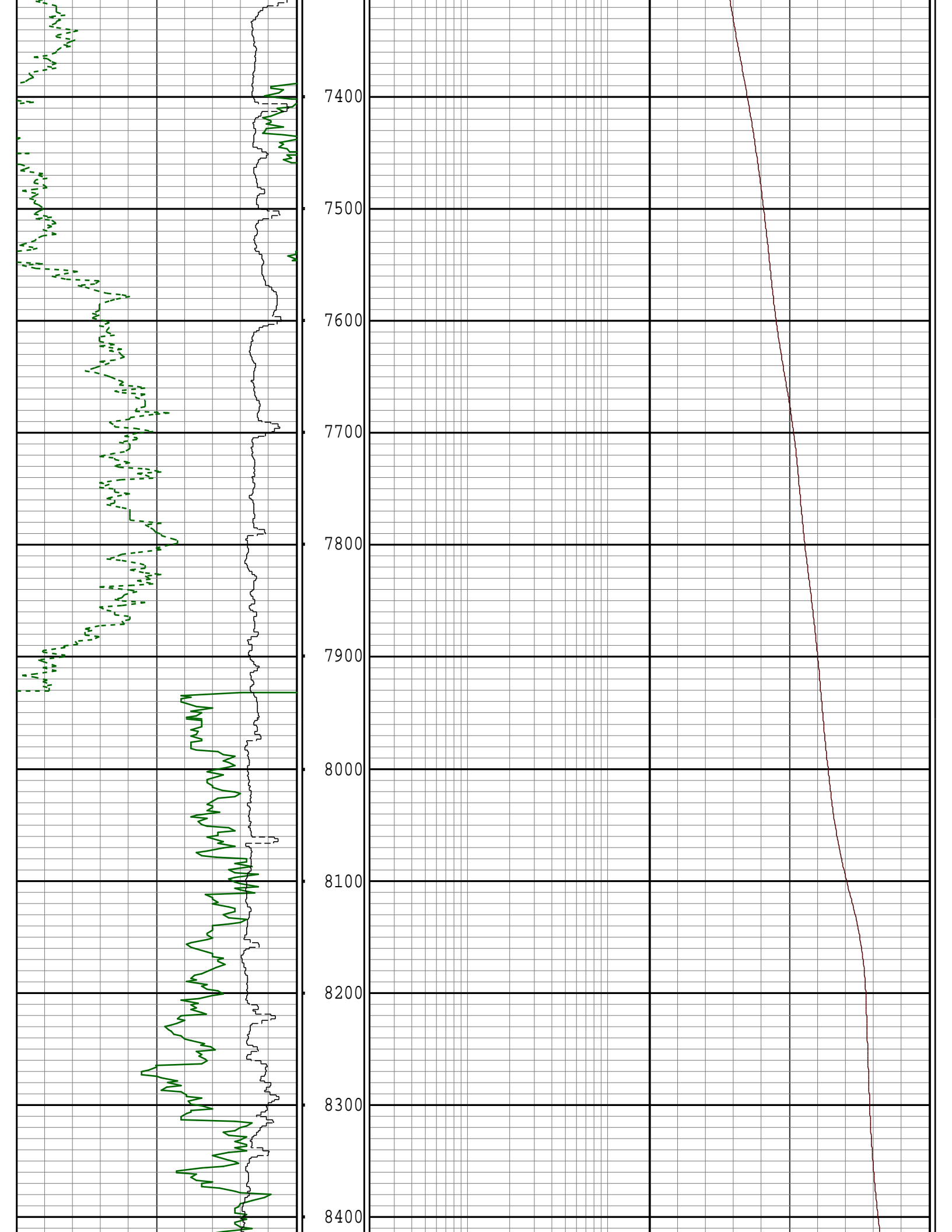


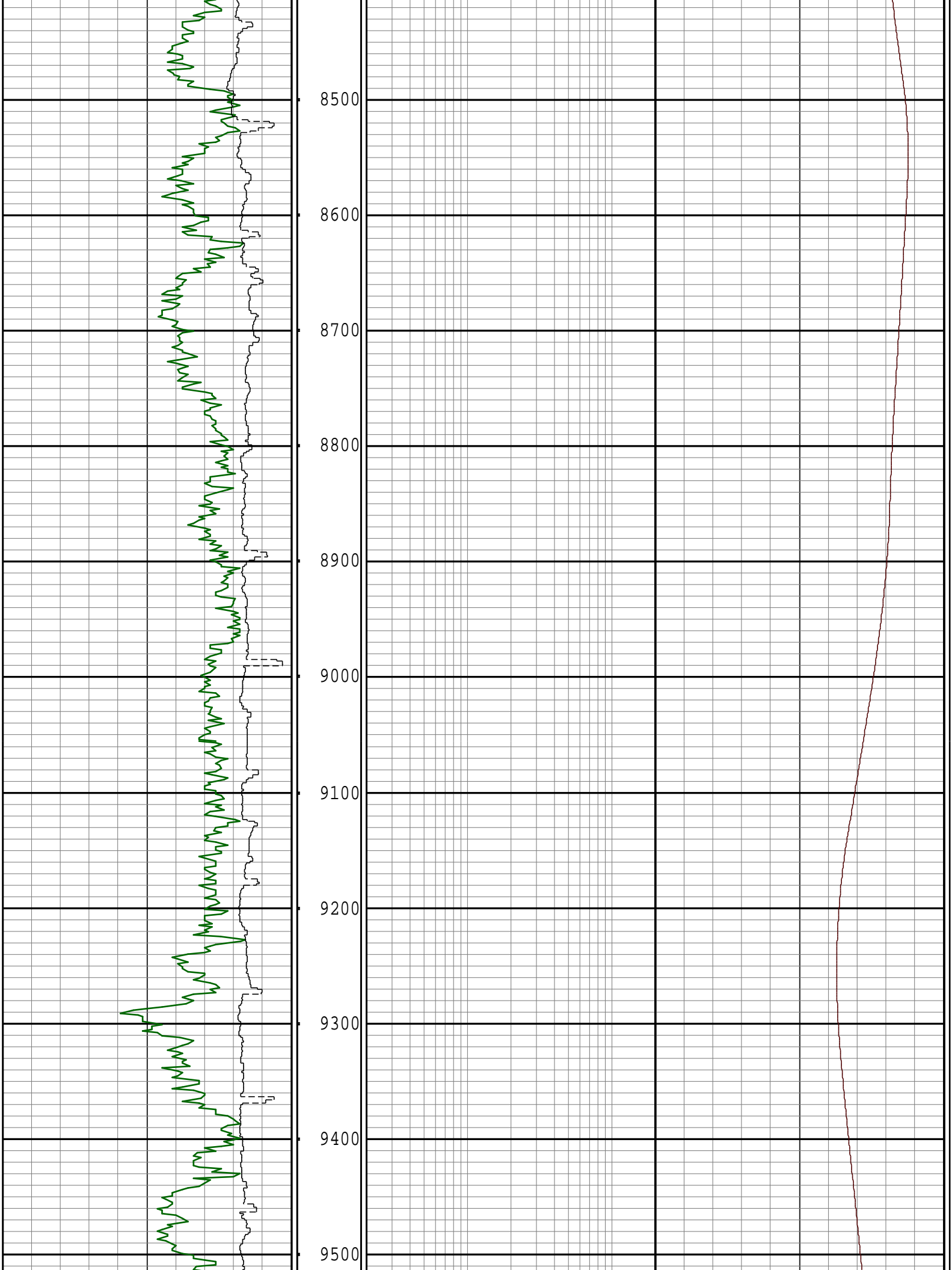


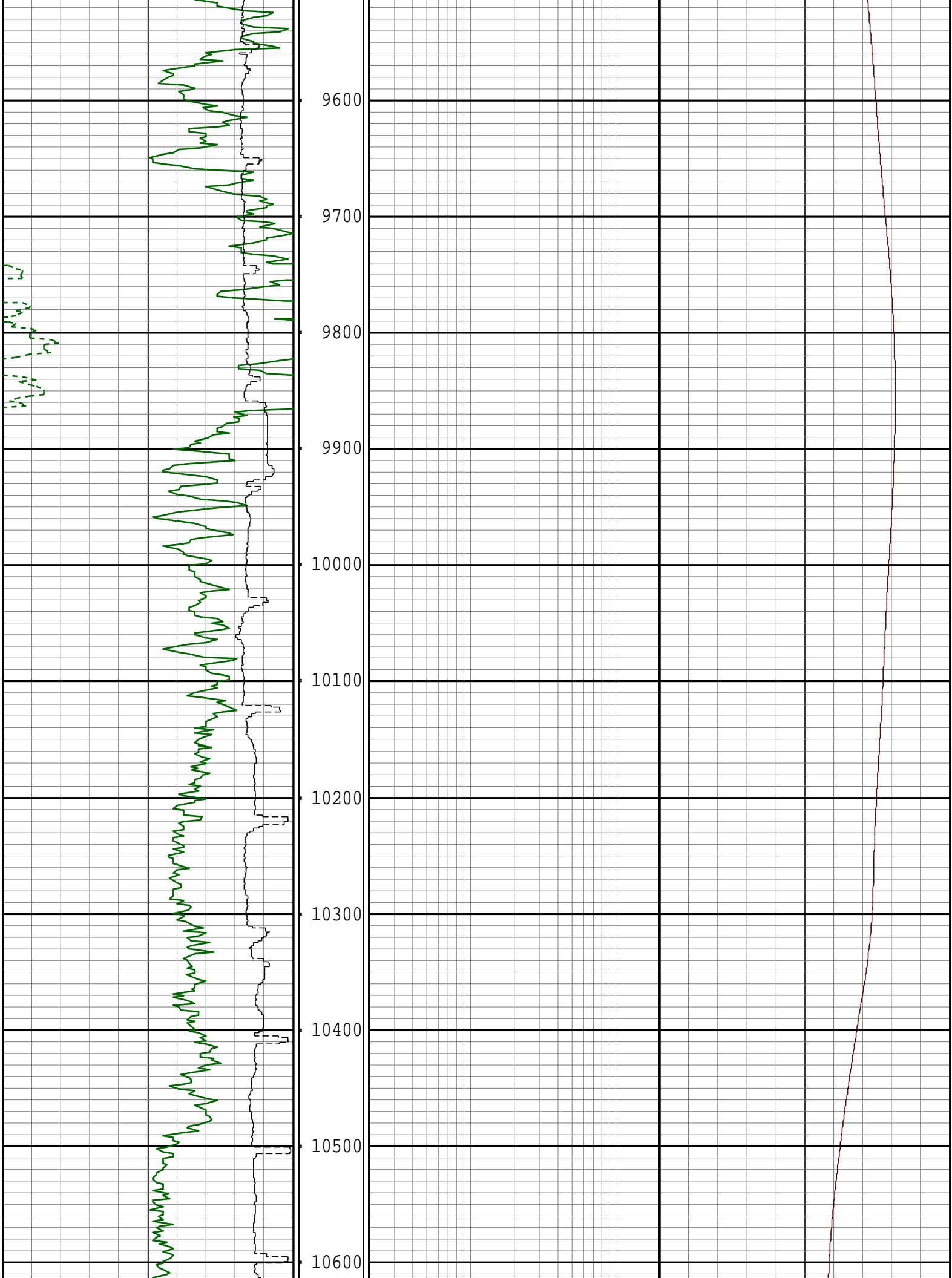


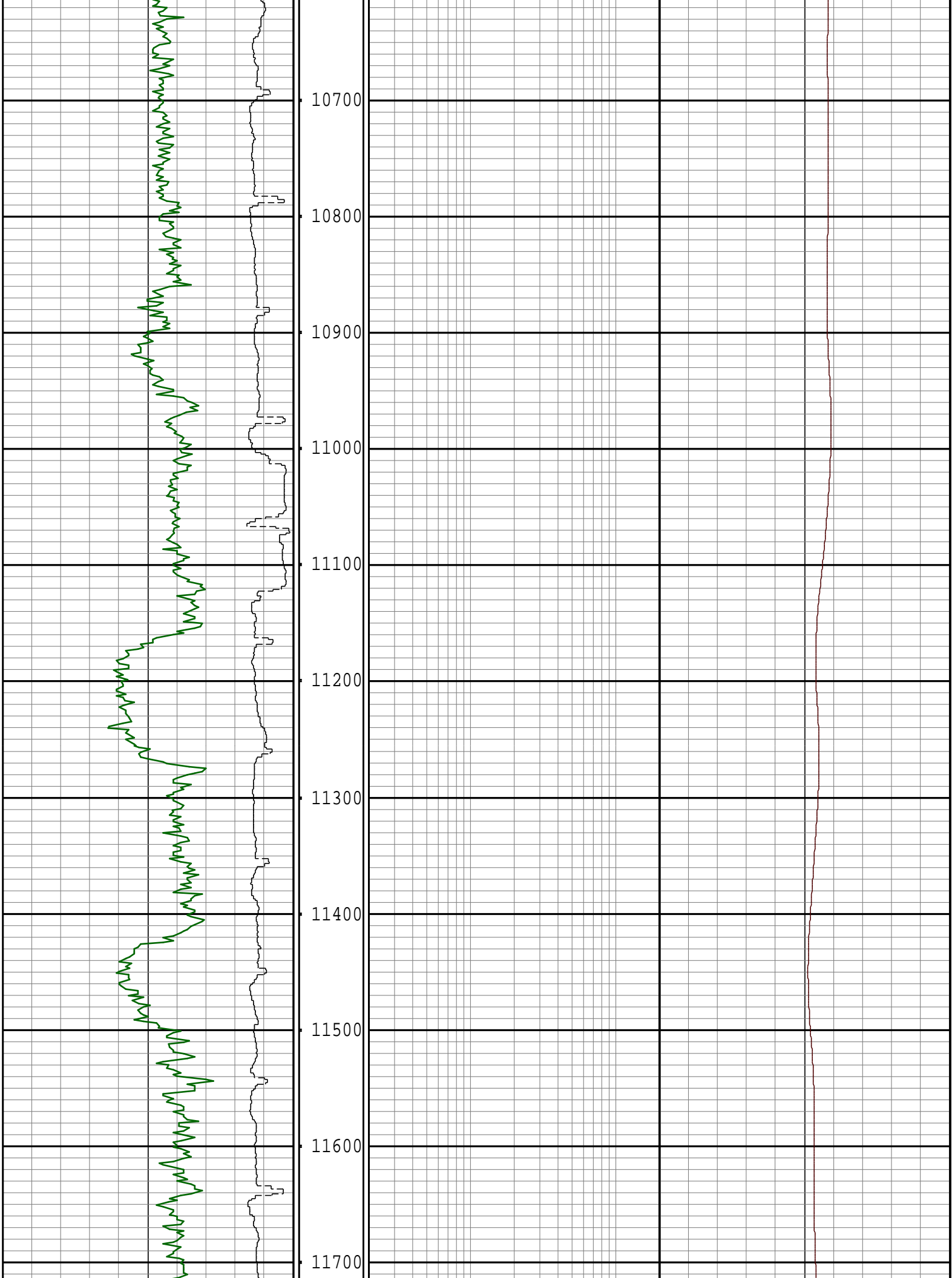


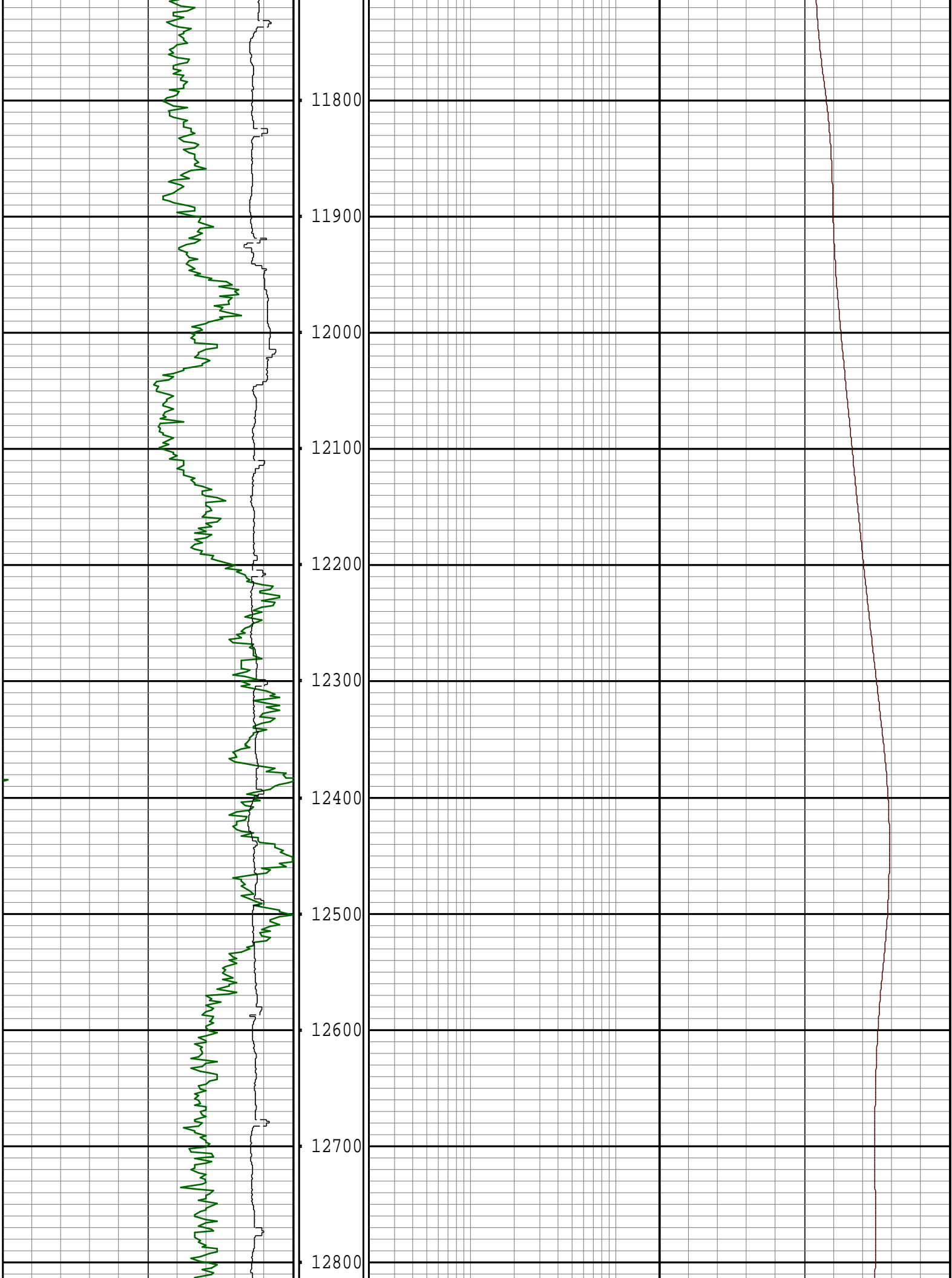


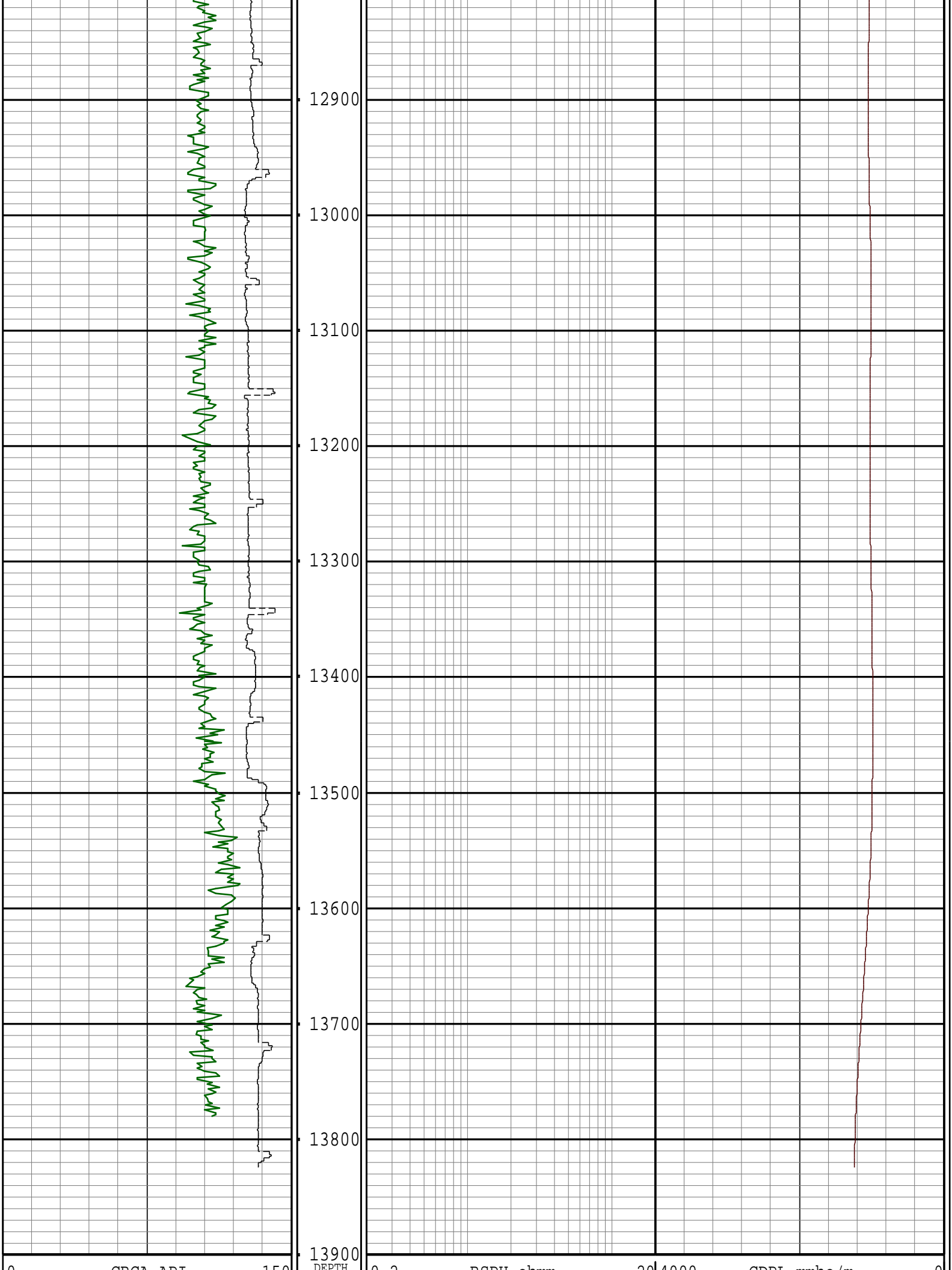












GRCA API 150			RSPH ohmm 20			CDPL mmH2O/m 0		
avg = 2 ft			avg = 2 ft			avg = 2 ft		
150	GRCA API	300	0.2	RMPH ohmm	20	6715	TVD ft	6695
avg = 2 ft			avg = 2 ft			avg = 2 ft		
2000	ROP ft/hr	0	0.2	RDPH ohmm	20			
avg = 2 ft			avg = 2 ft					
			0.2	RSPL ohmm	20			
			avg = 2 ft					
			0.2	RMPL ohmm	20			
			avg = 2 ft					
			0.2	RDPL ohmm	20			
			avg = 2 ft					

Survey Report

Vertical Section Plane: 269.79°	Total Correction: 7.54° East to Grid
Calculation Method: Minimum Curvature	Survey Reference: Wellhead
North Aligned to: Grid North	Well: WELLS RANCH AA11-637
RT: 30' ROTARY TABLE TO GROUND LEVEL	FIELD: WATTENBURG

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)
ORGIN OF WELL AT SURFACE.											
0.00	0.00	0.00	0.00	0.00	0.00	0.00 N	0.00 W	0.00	304.65	0.00	
THE FOLLOWING ARE GYRO SURVEYS.											
64.21	0.54	164.30	64.21		-0.08	0.29 S	0.08 E	0.30	164.58		
158.12	0.79	154.34	158.11	93.91	-0.48	1.30 S	0.48 E	1.39	159.72	0.29	
252.03	0.28	179.38	252.02	93.91	-0.76	2.11 S	0.76 E	2.25	160.14	0.59	
345.94	0.29	221.79	345.93	93.91	-0.60	2.52 S	0.61 E	2.59	166.45	0.22	
439.85	0.44	256.14	439.84	93.91	-0.09	2.78 S	0.10 E	2.78	177.97	0.28	
533.76	0.32	159.60	533.75	93.91	0.17	3.11 S	0.16 W	3.12	182.94	0.61	
627.67	0.28	160.37	627.65	93.91	0.00	3.58 S	0.01 E	3.58	179.86	0.04	
721.58	0.21	131.78	721.56	93.91	-0.20	3.91 S	0.21 E	3.91	176.87	0.15	
815.49	0.26	140.23	815.47	93.91	-0.46	4.19 S	0.48 E	4.21	173.48	0.06	
909.40	0.40	132.12	909.38	93.91	-0.84	4.57 S	0.86 E	4.65	169.37	0.16	
1003.31	0.39	153.19	1003.29	93.91	-1.23	5.07 S	1.25 E	5.23	166.21	0.15	
1097.22	0.38	141.25	1097.20	93.91	-1.56	5.60 S	1.58 E	5.82	164.21	0.09	
1191.13	0.36	144.35	1191.10	93.91	-1.93	6.09 S	1.95 E	6.39	162.22	0.03	
1285.04	0.28	136.10	1285.01	93.91	-2.26	6.49 S	2.28 E	6.88	160.63	0.10	
1378.95	0.23	136.86	1378.92	93.91	-2.55	6.79 S	2.57 E	7.26	159.28	0.05	
1472.86	0.20	140.59	1472.83	93.91	-2.78	7.06 S	2.80 E	7.59	158.34	0.03	
1566.77	0.17	224.65	1566.74	93.91	-2.78	7.28 S	2.81 E	7.81	158.91	0.27	
1660.68	0.24	122.18	1660.65	93.91	-2.85	7.49 S	2.88 E	8.02	158.97	0.34	
1754.59	0.24	195.53	1754.56	93.91	-2.96	7.78 S	2.99 E	8.34	158.97	0.31	
1848.50	0.22	192.02	1848.47	93.91	-2.87	8.15 S	2.90 E	8.65	160.40	0.03	
THE FOLLOWING ARE ENSIGN DIRECTIONAL SURVEYS.											
1953.00	0.43	270.38	1952.97	104.50	-2.44	8.34 S	2.47 E	8.70	163.52	0.42	
2045.00	2.02	76.50	2044.95	92.00	-3.67	7.96 S	3.70 E	8.78	155.08	2.65	
2137.00	3.91	62.87	2136.83	92.00	-8.05	6.15 S	8.07 E	10.15	127.32	2.18	
2229.00	5.63	75.71	2228.51	92.00	-15.22	3.61 S	15.23 E	15.65	103.32	2.19	
2321.00	7.29	74.13	2319.92	92.00	-25.22	0.90 S	25.22 E	25.24	92.04	1.81	
2412.00	6.90	70.10	2410.22	91.00	-35.92	2.54 N	35.92 E	36.01	85.95	0.70	
2504.00	6.37	69.82	2501.61	92.00	-45.92	6.18 N	45.90 E	46.32	82.33	0.58	
2596.00	8.08	75.97	2592.87	92.00	-57.00	9.51 N	56.97 E	57.75	80.52	2.04	
2690.00	8.61	76.76	2685.88	94.00	-70.27	12.73 N	70.22 E	71.37	79.73	0.58	
2785.00	8.17	74.12	2779.86	95.00	-83.70	16.20 N	83.64 E	85.19	79.04	0.61	
2879.00	7.78	74.56	2872.95	94.00	-96.27	19.72 N	96.20 E	98.20	78.41	0.42	
2974.00	7.34	74.13	2967.13	95.00	-108.32	23.09 N	108.23 E	110.67	77.95	0.47	
3069.00	7.25	73.51	3061.36	95.00	-119.91	26.46 N	119.82 E	122.70	77.55	0.13	
3163.00	7.34	85.11	3154.60	94.00	-131.59	28.65 N	131.49 E	134.57	77.71	1.57	
3258.00	6.72	86.25	3248.89	95.00	-143.19	29.53 N	143.08 E	146.10	78.34	0.67	
3353.00	8.09	80.02	3343.09	95.00	-155.32	31.05 N	155.21 E	158.29	78.69	1.67	
3447.00	6.51	79.31	3436.33	94.00	-167.08	33.19 N	166.96 E	170.23	78.76	1.68	
3542.00	6.42	69.12	3530.73	95.00	-177.35	36.08 N	177.22 E	180.85	78.49	1.21	
3732.00	7.08	69.21	3719.41	190.00	-198.25	44.02 N	198.09 E	202.92	77.47	0.35	
3826.00	7.16	67.54	3812.68	94.00	-209.09	48.32 N	208.92 E	214.43	76.98	0.24	
3921.00	7.69	75.54	3906.89	95.00	-220.73	52.17 N	220.54 E	226.63	76.69	1.22	
4016.00	6.37	71.76	4001.17	95.00	-231.91	55.40 N	231.71 E	238.24	76.55	1.47	
4110.00	4.40	83.45	4094.76	94.00	-240.45	57.45 N	240.24 E	247.01	76.55	2.39	
4205.00	2.55	94.43	4189.58	95.00	-246.18	57.70 N	245.97 E	252.65	76.80	2.06	
4300.00	0.62	38.36	4284.54	95.00	-248.61	57.94 N	248.40 E	255.06	76.87	2.38	
4394.00	1.41	351.42	4378.53	94.00	-248.75	59.48 N	248.54 E	255.56	76.54	1.15	
4489.00	2.28	310.12	4473.48	95.00	-247.14	61.86 N	246.92 E	254.55	75.94	1.62	
4584.00	1.76	318.38	4568.42	95.00	-244.74	64.16 N	244.50 E	252.78	75.30	0.63	
4679.00	1.89	252.99	4663.38	95.00	-242.27	64.80 N	242.04 E	250.56	75.01	2.08	
4773.00	1.23	189.53	4757.36	94.00	-240.62	63.35 N	240.39 E	248.59	75.24	1.84	
4868.00	0.88	282.82	4850.82	95.00	-238.75	62.52 N	238.52 E	246.82	75.75	2.12	

4868.00	2.99	223.02	4852.29	95.00	-238.75	60.53 N	238.53 E	246.09	75.76	2.19
4963.00	3.08	200.25	4947.16	95.00	-236.16	56.32 N	235.95 E	242.58	76.57	1.26
5058.00	3.78	216.69	5041.99	95.00	-233.39	51.42 N	233.20 E	238.80	77.57	1.26
5153.00	3.43	250.09	5136.81	95.00	-228.83	47.94 N	228.66 E	233.63	78.16	2.21
5247.00	2.02	280.67	5230.71	94.00	-224.56	47.29 N	224.38 E	229.31	78.10	2.10
5342.00	1.67	258.00	5325.66	95.00	-221.56	47.31 N	221.39 E	226.38	77.94	0.85
5437.00	1.23	252.99	5420.63	95.00	-219.23	46.72 N	219.06 E	223.98	77.96	0.48
5531.00	0.92	224.60	5514.61	94.00	-217.73	45.89 N	217.56 E	222.35	78.09	0.65
5626.00	0.62	204.91	5609.61	95.00	-216.97	44.88 N	216.81 E	221.41	78.30	0.42
5721.00	1.05	222.66	5704.60	95.00	-216.16	43.78 N	216.00 E	220.39	78.54	0.52
5816.00	1.45	199.72	5799.57	95.00	-215.16	42.00 N	215.01 E	219.07	78.95	0.67
5910.00	1.54	191.46	5893.54	94.00	-214.50	39.65 N	214.36 E	217.99	79.52	0.25
6005.00	1.19	154.72	5988.52	95.00	-214.66	37.50 N	214.52 E	217.78	80.08	0.97
6100.00	7.29	265.20	6083.27	95.00	-209.06	36.11 N	208.93 E	212.03	80.20	8.20
6194.00	13.40	264.93	6175.70	94.00	-192.25	34.64 N	192.12 E	195.22	79.78	6.50
6289.00	19.38	258.25	6266.80	95.00	-165.81	30.46 N	165.70 E	168.47	79.59	6.59
6384.00	23.10	266.70	6355.35	95.00	-131.74	26.17 N	131.64 E	134.22	78.76	5.06

Survey Report											
Vertical Section Plane: 269.79°						Total Correction: 7.54° East to Grid					
Calculation Method: Minimum Curvature						Survey Reference: Wellhead					
North Aligned to: Grid North						Well: WELLS RANCH AA11-637					
RT: 30' ROTARY TABLE TO GROUND LEVEL						FIELD: WATTENBURG					

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)
6420.00	23.56	270.21	6388.41	36.00	-117.49	25.79 N	117.40 E	120.19	77.61	4.07	
6514.00	32.26	282.17	6471.46	94.00	-74.08	31.16 N	73.97 E	80.27	67.15	10.97	
6609.00	46.86	283.22	6544.51	95.00	-15.29	44.51 N	15.12 E	47.01	18.77	15.38	
6704.00	60.48	275.13	6600.72	95.00	60.01	56.20 N	60.22 W	82.37	313.02	15.87	
6798.00	72.18	270.04	6638.41	94.00	145.83	59.90 N	146.05 W	157.85	292.30	13.39	
6893.00	74.19	269.51	6665.89	95.00	236.76	59.54 N	236.98 W	244.34	284.10	2.18	
6988.00	79.47	269.50	6687.53	95.00	329.23	58.74 N	329.44 W	334.64	280.11	5.56	
7082.00	81.01	268.19	6703.46	94.00	421.85	56.87 N	422.06 W	425.87	277.67	2.14	
7177.00	90.40	267.00	6710.57	95.00	516.40	52.89 N	516.60 W	519.30	275.85	9.96	
THE FOLLOWING ARE PATHFINDER MWD SURVEYS.											
7275.00	90.62	266.02	6709.70	98.00	614.24	46.93 N	614.41 W	616.20	274.37	1.03	
7370.00	90.89	266.66	6708.45	95.00	709.06	40.87 N	709.21 W	710.39	273.30	0.73	
7464.00	90.62	266.42	6707.21	94.00	802.90	35.19 N	803.03 W	803.80	272.51	0.38	
7559.00	90.45	266.28	6706.32	95.00	897.72	29.15 N	897.84 W	898.31	271.86	0.23	
7654.00	90.82	267.58	6705.27	95.00	992.60	24.06 N	992.69 W	992.98	271.39	1.42	
7745.00	90.38	268.03	6704.31	91.00	1083.54	20.57 N	1083.62 W	1083.81	271.09	0.69	
7837.00	90.58	268.35	6703.54	92.00	1175.50	17.67 N	1175.57 W	1175.70	270.86	0.41	
7929.00	90.38	268.14	6702.77	92.00	1267.46	14.85 N	1267.52 W	1267.61	270.67	0.31	
8022.00	90.52	268.20	6702.04	93.00	1360.42	11.88 N	1360.47 W	1360.52	270.50	0.16	
8114.00	91.24	268.59	6700.63	92.00	1452.38	9.30 N	1452.43 W	1452.46	270.37	0.89	
8206.00	90.14	269.75	6699.52	92.00	1544.37	7.97 N	1544.41 W	1544.43	270.30	1.74	
8298.00	90.17	269.96	6699.27	92.00	1636.37	7.74 N	1636.41 W	1636.42	270.27	0.23	
8390.00	90.48	269.87	6698.75	92.00	1728.36	7.60 N	1728.40 W	1728.42	270.25	0.35	
8482.00	90.65	270.96	6697.84	92.00	1820.35	8.27 N	1820.40 W	1820.41	270.26	1.20	
8574.00	89.76	269.64	6697.52	92.00	1912.35	8.75 N	1912.39 W	1912.41	270.26	1.73	
8666.00	89.72	269.84	6697.93	92.00	2004.34	8.33 N	2004.39 W	2004.41	270.24	0.22	
8757.00	89.72	270.24	6698.38	91.00	2095.34	8.40 N	2095.39 W	2095.40	270.23	0.44	
8852.00	89.86	270.04	6698.73	95.00	2190.34	8.63 N	2190.39 W	2190.40	270.23	0.26	
8947.00	89.45	269.33	6699.30	95.00	2285.34	8.11 N	2285.38 W	2285.40	270.20	0.86	
9041.00	89.24	269.51	6700.37	94.00	2379.33	7.15 N	2379.37 W	2379.38	270.17	0.29	
9136.00	89.24	269.40	6701.63	95.00	2474.32	6.25 N	2474.36 W	2474.37	270.14	0.12	
9231.00	89.86	269.78	6702.38	95.00	2569.32	5.57 N	2569.35 W	2569.36	270.12	0.76	
9326.00	90.41	270.13	6702.15	95.00	2664.31	5.50 N	2664.35 W	2664.36	270.12	0.69	
9420.00	90.48	270.15	6701.42	94.00	2758.31	5.73 N	2758.35 W	2758.36	270.12	0.08	
9515.00	90.45	270.22	6700.65	95.00	2853.30	6.03 N	2853.34 W	2853.35	270.12	0.08	
9609.00	90.31	270.01	6700.03	94.00	2947.30	6.22 N	2947.34 W	2947.35	270.12	0.27	
9704.00	90.45	270.07	6699.40	95.00	3042.30	6.29 N	3042.34 W	3042.35	270.12	0.16	
9799.00	90.21	269.91	6698.85	95.00	3137.29	6.27 N	3137.34 W	3137.35	270.11	0.30	
9894.00	89.86	269.89	6698.79	95.00	3232.29	6.10 N	3232.34 W	3232.34	270.11	0.37	
9988.00	89.73	269.59	6699.13	94.00	3326.29	5.68 N	3326.34 W	3326.34	270.10	0.35	
10083.00	89.79	269.87	6699.53	95.00	3421.29	5.23 N	3421.33 W	3421.34	270.09	0.30	
10178.00	89.72	269.87	6699.94	95.00	3516.29	5.01 N	3516.33 W	3516.34	270.08	0.07	
10273.00	89.90	270.26	6700.25	95.00	3611.29	5.12 N	3611.33 W	3611.34	270.08	0.45	
10367.00	89.24	269.38	6700.96	94.00	3705.29	4.83 N	3705.33 W	3705.33	270.07	1.17	
10462.00	89.35	269.50	6702.12	95.00	3800.28	3.90 N	3800.32 W	3800.32	270.06	0.17	
10556.00	89.55	269.84	6703.03	94.00	3894.27	3.36 N	3894.31 W	3894.31	270.05	0.42	
10651.00	90.00	269.83	6703.40	95.00	3989.27	3.08 N	3989.31 W	3989.31	270.04	0.47	
10745.00	90.03	269.51	6703.38	94.00	4083.27	2.54 N	4083.31 W	4083.31	270.04	0.34	
10840.00	89.90	269.71	6703.43	95.00	4178.27	1.90 N	4178.31 W	4178.31	270.03	0.25	
10935.00	90.28	269.95	6703.28	95.00	4273.27	1.61 N	4273.30 W	4273.30	270.02	0.47	
11029.00	89.72	269.44	6703.28	94.00	4367.27	1.11 N	4367.30 W	4367.30	270.01	0.81	
11124.00	89.48	268.75	6703.95	95.00	4462.26	0.39 S	4462.29 W	4462.29	270.00	0.77	
11219.00	90.31	270.05	6704.12	95.00	4557.25	1.38 S	4557.28 W	4557.28	269.98	1.62	
11314.00	89.69	268.97	6704.12	95.00	4652.25	2.19 S	4652.27 W	4652.27	269.97	1.31	
11408.00	89.69	269.12	6704.63	94.00	4746.24	3.76 S	4746.26 W	4746.26	269.95	0.16	
11503.00	90.38	270.19	6704.57	95.00	4841.24	4.33 S	4841.26 W	4841.26	269.95	1.34	
11598.00	89.93	269.83	6704.31	95.00	4936.24	4.32 S	4936.26 W	4936.26	269.95	0.61	
11693.00	90.14	269.91	6704.26	94.00	5030.24	4.52 S	5030.26 W	5030.26	269.95	0.24	

11092.00	90.14	269.99	6704.26	94.00	5030.24	4.33 S	5030.20 W	5030.20	269.99	0.24
11787.00	90.62	270.36	6703.63	95.00	5125.23	4.31 S	5125.25 W	5125.25	269.95	0.69
11881.00	90.07	270.00	6703.06	94.00	5219.23	4.01 S	5219.25 W	5219.25	269.96	0.70
11976.00	90.41	269.88	6702.66	95.00	5314.23	4.11 S	5314.25 W	5314.25	269.96	0.38
12071.00	90.45	270.08	6701.95	95.00	5409.22	4.14 S	5409.25 W	5409.25	269.96	0.21
12165.00	90.45	270.34	6701.21	94.00	5503.22	3.80 S	5503.24 W	5503.24	269.96	0.28
12260.00	90.52	270.11	6700.41	95.00	5598.21	3.43 S	5598.24 W	5598.24	269.96	0.25
12355.00	90.52	270.50	6699.55	95.00	5693.20	2.92 S	5693.23 W	5693.23	269.97	0.41
12449.00	89.97	270.69	6699.14	94.00	5787.19	1.94 S	5787.23 W	5787.23	269.98	0.62
12544.00	89.52	269.77	6699.57	95.00	5882.19	1.56 S	5882.22 W	5882.22	269.98	1.08
12638.00	89.86	270.30	6700.08	94.00	5976.19	1.50 S	5976.22 W	5976.22	269.99	0.67
12733.00	90.07	269.99	6700.13	95.00	6071.18	1.26 S	6071.22 W	6071.22	269.99	0.39
12827.00	89.90	269.32	6700.16	94.00	6165.18	1.83 S	6165.22 W	6165.22	269.98	0.74
12922.00	90.03	269.24	6700.22	95.00	6260.18	3.02 S	6260.21 W	6260.21	269.97	0.16

Survey Report

Vertical Section Plane: 269.79°						Total Correction: 7.54° East to Grid					
Calculation Method: Minimum Curvature						Survey Reference: Wellhead					
North Aligned to: Grid North						Well: WELLS RANCH AA11-637					
RT: 30' ROTARY TABLE TO GROUND LEVEL						FIELD: WATTENBURG					
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)
13016.00	90.14	269.33	6700.08	94.00	6354.18	4.20 S	6354.20 W	6354.20	269.96	0.15	
13111.00	89.90	269.47	6700.04	95.00	6449.17	5.19 S	6449.20 W	6449.20	269.95	0.29	
13205.00	90.00	269.44	6700.13	94.00	6543.17	6.09 S	6543.19 W	6543.20	269.95	0.11	
13299.00	90.10	269.41	6700.04	94.00	6637.17	7.03 S	6637.19 W	6637.19	269.94	0.11	
13394.00	90.03	269.25	6699.94	95.00	6732.17	8.14 S	6732.18 W	6732.19	269.93	0.18	
13489.00	89.97	268.28	6699.94	95.00	6827.15	10.19 S	6827.16 W	6827.17	269.91	1.02	
13583.00	89.76	266.00	6700.16	94.00	6921.04	14.88 S	6921.04 W	6921.05	269.88	2.44	
13678.00	89.69	266.53	6700.61	95.00	7015.86	21.07 S	7015.83 W	7015.86	269.83	0.56	
13772.00	89.76	266.84	6701.06	94.00	7109.72	26.50 S	7109.67 W	7109.72	269.79	0.34	
13785.00	89.86	266.84	6701.11	13.00	7122.71	27.22 S	7122.65 W	7122.71	269.78	0.77	
STRAIGHT LINE PROJECTION TO BIT DEPTH AT 13827'MD.											
13827.00	89.86	266.84	6701.21	42.00	7164.65	29.53 S	7164.59 W	7164.65	269.76	0.00	

PATHFINDER ENERGY SERVICES - TOOL CODES & DESCRIPTIONS

HDS1M	HIGH SPEED DIRECTIONAL SURVEY MULTILINK TOOL	CLSSM	COMPENSATED LONG SPACE SONIC TOOL
HDS1L	HIGH SPEED DIRECTIONAL SURVEY GAMMA TOOL	SCLSS	SLIM COMPENSATED LONG SPACE SONIC MULTILINK TOOL
HDS1R	HIGH SPEED DIRECTIONAL SURVEY GAMMA RETRIEVABLE TOOL	DPM	DYNAMIC PRESSURE MODULE
AWR	ARRAY WAVE RESISTIVITY GAMMA MULTILINK TOOL	PZIG	AT-BIT INCLINATION AND GAMMA RAY
CWRGM	COMPENSATED WAVE RESISTIVITY GAMMA MULTILINK TOOL	2DRS	2D ROTARY STEERING TOOL
SCWR	SLIM COMPENSATED WAVE RESISTIVITY TOOL	3DRS	3D ROTARY STEERING TOOL
DNSCM	DENSITY NEUTRON STANDOFF CALIPER MULTILINK TOOL	DFT	DRILLING FORMATION TESTER

PATHFINDER ENERGY SERVICES - MNEMONICS LIST

GENERAL			
AHV	ANNULAR HOLE VOLUME TICKS	ROP	RATE OF PENETRATION
AHVT	ANNULAR HOLE VOLUME-ACCUMULATIVE TOTAL	GRW	RAW GAMMA RAY
BHV	BOREHOLE VOLUME TICKS	GRC	CALIBRATED GAMMA RAY
BHVT	BOREHOLE VOLUME-ACCUMULATIVE TOTAL	GREC	ENVIRONMENTALLY CORRECTED GAMMA RAY
DEPT	MEASURED DEPTH	RM	RESISTIVITY OF MUD
MTVD	MEASURED TRUE VERTICAL DEPTH	RMF	RESISTIVITY OF MUD FILTRATE
INC	INCLINATION	SHOES	CASING SHOE SYMBOLS
AZI	AZIMUTH	SURVS	SURVEY TEXT SYMBOLS

4 3/4" SCWR			
C15A	CWR ATTENUATION CONDUCTIVITY (15")	R35A	CWR ATTENUATION RESISTIVITY (35")
C15P	CWR PHASE CONDUCTIVITY (15")	R35P	CWR PHASE RESISTIVITY (35")
C35A	CWR ATTENUATION CONDUCTIVITY (35")	UL1A	UNCOMPENSATED 15" ATTENUATION RESISTIVITY LOWER
C35P	CWR PHASE CONDUCTIVITY (35")	UL1P	UNCOMPENSATED 15" PHASE RESISTIVITY LOWER
CWRFET	CWR FORMATION EXPOSURE TIME	UL3A	UNCOMPENSATED 35" ATTENUATION RESISTIVITY LOWER
GRC	CALIBRATED GAMMA RAY	UL3P	UNCOMPENSATED 35" PHASE RESISTIVITY LOWER

GREC	ENVIRONMENTALLY CORRECTED GAMMA RAY	UU1A	UNCOMPENSATED 15" ATTENUATION RESISTIVITY UPPER
GRFET	GAMMA RAY FORMATION EXPOSURE TIME	UU1P	UNCOMPENSATED 15" PHASE RESISTIVITY UPPER
R15A	CWR ATTENUATION RESISTIVITY (15")	UU3A	UNCOMPENSATED 35" ATTENUATION RESISTIVITY UPPER
R15P	CWR PHASE RESISTIVITY (15")	UU3P	UNCOMPENSATED 35" PHASE RESISTIVITY UPPER
6 3/4", 8", & 9 1/2" CWR			
C25A	CWR ATTENUATION CONDUCTIVITY (25")	R55A	CWR ATTENUATION RESISTIVITY (55")
C25P	CWR PHASE CONDUCTIVITY (25")	R55P	CWR PHASE RESISTIVITY (55")
C55A	CWR ATTENUATION CONDUCTIVITY (55")	UL2A	UNCOMPENSATED 25" ATTENUATION RESISTIVITY LOWER
C55P	CWR PHASE CONDUCTIVITY (55")	UL2P	UNCOMPENSATED 25" PHASE RESISTIVITY LOWER
CWRFET	CWR FORMATION EXPOSURE TIME	UL5A	UNCOMPENSATED 55" ATTENUATION RESISTIVITY LOWER
GRC	CALIBRATED GAMMA RAY	UL5P	UNCOMPENSATED 55" PHASE RESISTIVITY LOWER
GREC	ENVIRONMENTALLY CORRECTED GAMMA RAY	UU2A	UNCOMPENSATED 25" ATTENUATION RESISTIVITY UPPER
GRFET	GAMMA RAY FORMATION EXPOSURE TIME	UU2P	UNCOMPENSATED 25" PHASE RESISTIVITY UPPER
R25A	CWR ATTENUATION RESISTIVITY (25")	UU5A	UNCOMPENSATED 55" ATTENUATION RESISTIVITY UPPER
R25P	CWR PHASE RESISTIVITY (25")	UU5P	UNCOMPENSATED 55" PHASE RESISTIVITY UPPER
4 3/4", 6 3/4", 8", & 9 1/2" AWR			
GRCA	AWR CALIBRATED GAMMA RAY	RDPH	DEEP PHASE RESISTIVITY FROM 2 MHZ FREQUENCY
GRWA	AWR RAW GAMMA RAY	RSAH	SHALLOW ATTENUATION RESISTIVITY FROM 2 MHZ FREQUENCY
TEMP_A	TEMPERATURE FROM AWR TOOL	RMAH	MEDIUM ATTENUATION RESISTIVITY FROM 2 MHZ FREQUENCY
INC_A	AWR STATIC INCLINATION	RDAH	DEEP ATTENUATION RESISTIVITY FROM 2 MHZ FREQUENCY
INCD_A	AWR DYNAMIC INCLINATION	CSPL	SHALLOW PHASE CONDUCTIVITY FROM 500 KHZ FREQUENCY
RSPL	SHALLOW PHASE RESISTIVITY FROM 500 KHZ FREQUENCY	CMPL	MEDIUM PHASE CONDUCTIVITY FROM 500 KHZ FREQUENCY
RMPL	MEDIUM PHASE RESISTIVITY FROM 500 KHZ FREQUENCY	CDPL	DEEP PHASE CONDUCTIVITY FROM 500 KHZ FREQUENCY
RDPL	DEEP PHASE RESISTIVITY FROM 500 KHZ FREQUENCY	CSPH	SHALLOW PHASE CONDUCTIVITY FROM 2 MHZ FREQUENCY
RSAL	SHALLOW ATTENUATION RESISTIVITY FROM 500 KHZ FREQUENCY	CMPH	MEDIUM PHASE CONDUCTIVITY FROM 2 MHZ FREQUENCY
RMAL	MEDIUM ATTENUATION RESISTIVITY FROM 500 KHZ FREQUENCY	CDPH	DEEP PHASE CONDUCTIVITY FROM 2 MHZ FREQUENCY
RDAL	DEEP ATTENUATION RESISTIVITY FROM 500 KHZ FREQUENCY	ARFET	AWR FORMATION EXPOSURE TIME
RSPH	SHALLOW PHASE RESISTIVITY FROM 2 MHZ FREQUENCY	GAFET	AWR GAMMA RAY FORMATION EXPOSURE TIME
RMPH	MEDIUM PHASE RESISTIVITY FROM 2 MHZ FREQUENCY		
4 3/4", 6 3/4", 8" DNSC			
BS	BIT SIZE	NLIM	NEUTRON POROSITY (LIMESTONE MATRIX)
CALI	CALIPER	NNEAR	NEAR NEUTRON COUNT RATE
DDDN	DNSC DATA DENSITY (0 - 4 SAMPLES/FT)	NRAT	NEUTRON RATIO
DGAM	DENSITY GAMMA (NATURAL)	NSAC	ENVIRONMENTALLY CORRECTED NEUTRON
DNPH	NEUTRON POROSITY CORRECTION		
DNSFET	DNSC FORMATION EXPOSURE TIME	NSAN	NEUTRON POROSITY (SANDSTONE MATRIX)
DPE	PE CORRECTION	PE	PHOTOELECTRIC INDEX

DPHI	DENSITY POROSITY (GIVEN MATRIX)	PEMI	PHOTOELECTRIC INDEX (MINIMUM FILTER)
DHRM	DENSITY CORRECTION MINUS	RHOB	BULK DENSITY
DRHO	DENSITY CORRECTION	SDNP	STANDARD DEVIATION NEUTRON POROSITY
DRHP	DENSTIY CORRECTION PLUS	SDPE	STANDARD DEVIATION PE COMPUTATION
EDPH	DENSITY POROSITY-EVR PROCESSED	SDRH	STANDARD DEVIATION DENSITY
ENPH	NEUTRON POROSITY-EVR PROCESSED	SOA	UNWEIGHTED DENSITY STANDOFF
ERHO	BULK DENSITY-EVR PROCESSED	TBDN	TIME BEHIND DNSC
NDOL	NEUTRON POROSITY (DOLOMITE MATRIX)	WSOD	WEIGHTED STANDOFF DENSITY
NFAR	FAR NEUTRON COUNT RATE	WSON	WEIGHTED STANDOFF NEUTRON

4 3/4" SCLSS, 6 3/4" & 8" CLSS			
ACFET	ACOUSTIC FORMATION EXPOSURE TIME	SHS1	MAX SHEAR SEMBLANCE , UPPER XMITR
SO	ACOUSTIC TOOL STANDOFF	SHS2	MAX SHEAR SEMBLANCE , LOWER XMITR
SOFF	STANDOFF	SLS1	SHEAR SEMBLANCE MIN CUTOFF , UPPER XMITR
DTCU	DELTA T COMP , UPPER XMITR-FIELD PROCESSED	SLS2	SHEAR SEMBLANCE MIN CUTOFF , LOWER XMITR
DTCL	DELTA T COMP , LOWER XMITR-FIELD PROCESSED	WFT1	WAVEFORM XMITR1 , ALL 4 RCVRs (NON-PARSED)
DTP1	DELTA T COMP , UPPER XMITR-POST PROCESSED	WFT2	WAVEFORM XMITR2 , ALL 4 RCVRs (NON-PARSED)
DTP2	DELTA T COMP , LOWER XMITR-POST PROCESSED	W11C	PARSED WAVEFORM , XMITR 1 , RCVR 1
DTS1	DELTA T SHEAR , UPPER XMITR-POST PROCESSED	W12C	PARSED WAVEFORM , XMITR 1 , RCVR 2
DTS2	DELTA T SHEAR , LOWER XMITR-POST PROCESSED	W13C	PARSED WAVEFORM , XMITR 1 , RCVR 3
SEM1	SEMBLANCE , UPPER XMITR-POST PROCESSED	W14C	PARSED WAVEFORM , XMITR 1 , RCVR 4

SEMI	SEMBLANCE , UPPER XMITR-POST PROCESSED	W14C	PARSED WAVEFORM , XMITR 1 , RCVR 4
SEM2	SEMBLANCE , LOWER XMITR-POST PROCESSED	W21C	PARSED WAVEFORM , XMITR 2 , RCVR 1
SMX1	MAX COMP SEMBLANCE , UPPER XMITR	W22C	PARSED WAVEFORM , XMITR 2 , RCVR 2
SMX2	MAX COMP SEMBLANCE , LOWER XMITR	W23C	PARSED WAVEFORM , XMITR 2 , RCVR 3
SMN1	COMP SEMBLANCE MIN CUTOFF , UPPER XMITR	W24C	PARSED WAVEFORM , XMITR 2 , RCVR 4
SMN2	COMP SEMBLANCE MIN CUTOFF , LOWER XMITR		

4 3/4" , 6 3/4" , 8" & 9 1/2" DPM & QPM

ANPR	ANNULAR PRESSURE	KPOS1	KELLY POSITION
BDEPS	BIT DEPTH STAMP	MWC	MUD WEIGHT CALCULATED
DAPR	PRESSURE TOOL DIFFERENTIAL PRESSURE	MWI_P	MUD WEIGHT IN
DPPR	PRESSURE TOOL DRILL PIPE PRESSURE	SPP_I	STANDPIPE PRESSURE
ECDM	EQUIVALENT CIRCULATING DENSITY	SWOB	SURFACE WEIGHT ON BIT
HDEPS	HOLE DEPTH STAMP	TDPM	PRESSURE TOOL ANNULAR TEMPERATURE

6 3/4" DFT

DFGR	DFT GAMMA RAW	HYDA	HYDROSTATIC PRESSURE -- AFTER
DFGRC	DFT GAMMA CALIBRATED	HYDB	HYDROSTATIC PRESSURE -- BEFORE
DFANPR	DFT ANNULAR PRESSURE	FPRES	FORMATION PRESSURE
DFECD	DFT EQUIVALENT CIRCULATING DENSITY OF THE MUD		


4 3/4" , 6 3/4" PZIG

NBDINC	NEAR BIT DYNAMIC INCLINATION	NBGR	NEAR BIT GAMMA CALIBRATED
NBSINC	NEAR BIT STATIC INCLINATION	NBTMP	NEAR BIT TEMPERATURE
NBGR	NEAR BIT GAMMA RAW	NBIFET	NEAR BIT FORMATION EXPOSURE TIME

BOTTOM HOLE ASSEMBLY RECORD

[illegible]

SENSOR OFFSETS:		SENSOR OFFSETS:					
GAMMA-RAY	96.62	DIRECTIONAL	40.03				
RESISTIVITY	103.52	GAMMA-RAY	43.06				



A Schlumberger Company

RESISTIVITY
GAMMA-RAY
CONDUCTIVITY

1" = 100'
FEET MD