



Gamma Ray

Company: Noble Energy

1:1200 TVD

Well: Freedom Federal LC21-630

Field: Weld County

Driller's Depth

Country: Weld State: Colorado Country: United States

Status: Final Print

Surface Location: Latitude: 39° 41' 48.00" N Longitude: 106° 01' 00.00" W

Other Services: Wellbore Surveys

API No: 0512342803

Job ID: 8597123

SEC: 22 TOWN: 9N RGE: 59W

Permanent Datum (P.D.): Mean Sea Level

Log Measured From: Rig Floor

Elevation: 4882.00 ft

Above P.D. 30.00 ft

Elev. KB: 4912.00 ft Elev. DF: 4882.00 ft Elev. GL: 4882.00 ft

Dates: Interval Logged

Magnetic Field Reference

Date From: 2017-07-14 Top: (ft) 1926.00

Date To: 2017-07-15 Bottom: (ft) 11073.00

Spud Date: 2017-07-13

Azi Reference North: Grid Dip Angle: (deg) 67.08

Total Magnetic Field Strength: (nT) 7

Mag to Reference North Correction: (deg) 6.72 E

Borehole Record

Casing Record

Hole Size (in)

From (ft)

To (ft)

Size (in)

Weight (lb/ft)

From (ft)

To (ft)

8.500

1938.00

11085.00

9.625

36.00

30.00

1928.00

Mud Record

Deviation Record

Type

From (ft)

To (ft)

Hole Size (in)

Interval (ft)

Inc | Azi (Start)

Inc | Azi (End)

Oil Based Mud

30.00

11085.00

8.500

9147.00

0.26 | 184.19

90.18 | 267.13

Acquisition System

Software Version

Other

Baker Hughes Cadence

RT4.1

4.0.7570.8

Rig: H&P 524

Contractor: Helmerich & Payne Drilling Co

District: RMA

Unit: D&E

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Log Run Summary

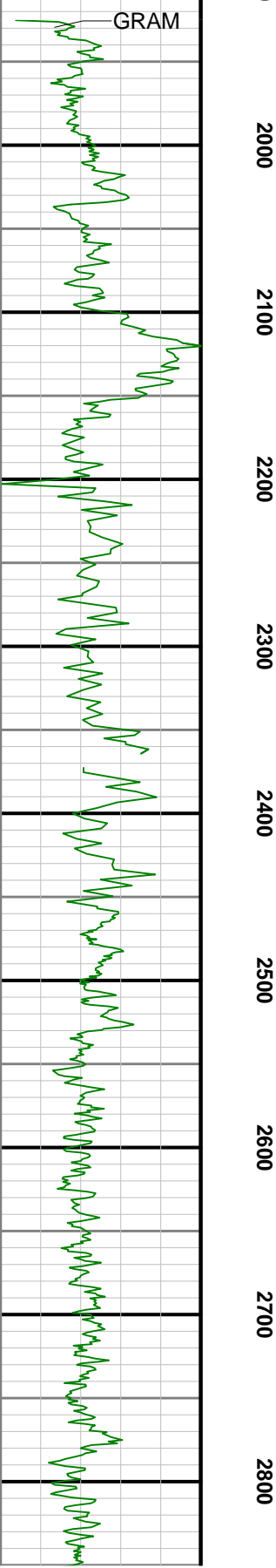
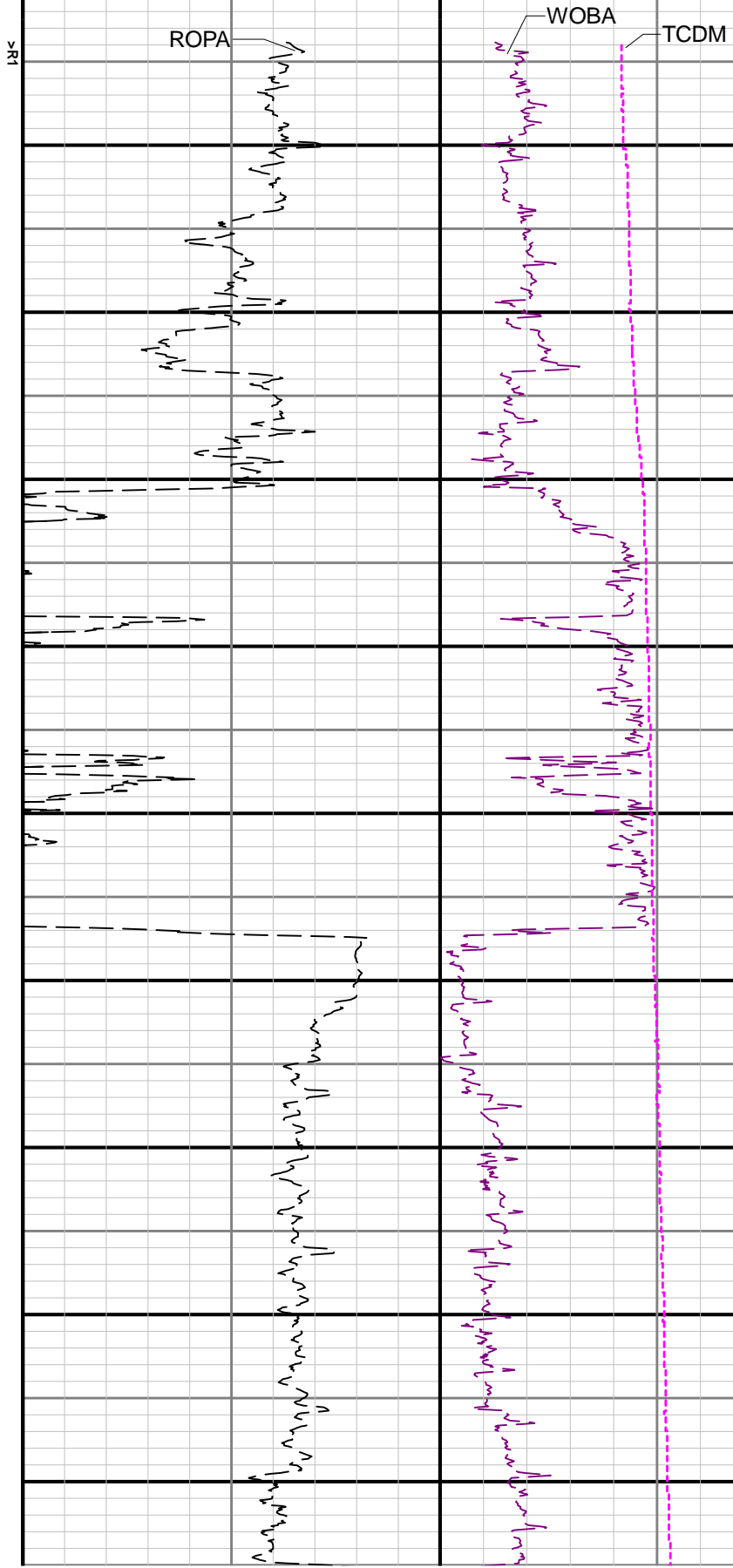
Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours (h)
						Top (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	2.00	AutoTrak Curve	1926.00	6374.00	1938.00	6386.00	2017-07-13 09:28	2017-07-14 02:28	15.40
2	2	8.500	PDC	2.00	AutoTrak Curve	6374.00	11073.00	6386.00	11085.00	2017-07-14 11:55	2017-07-15 10:05	21.72

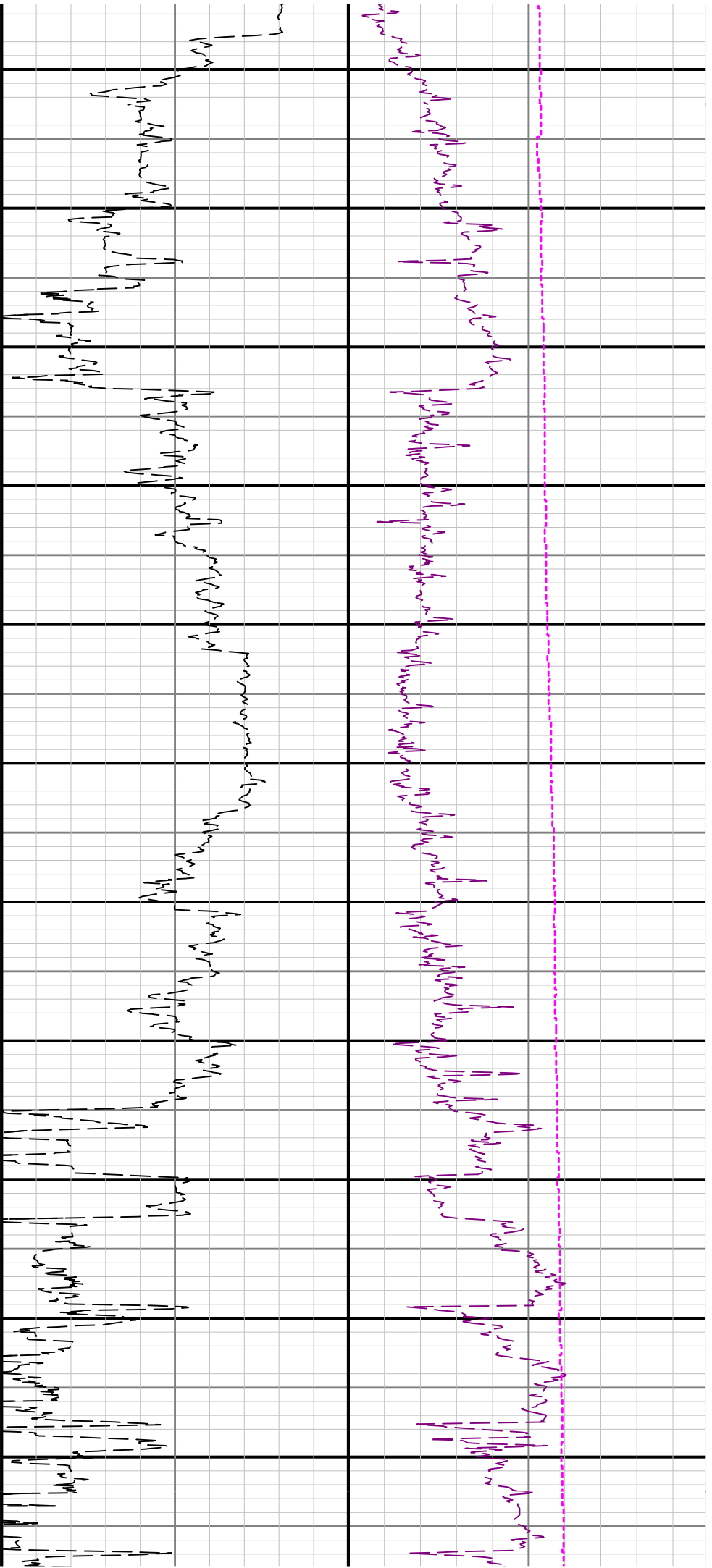
Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Steven Cano	2017-07-12	2017-07-15	Ty Jackson	2017-07-12	2017-07-15			

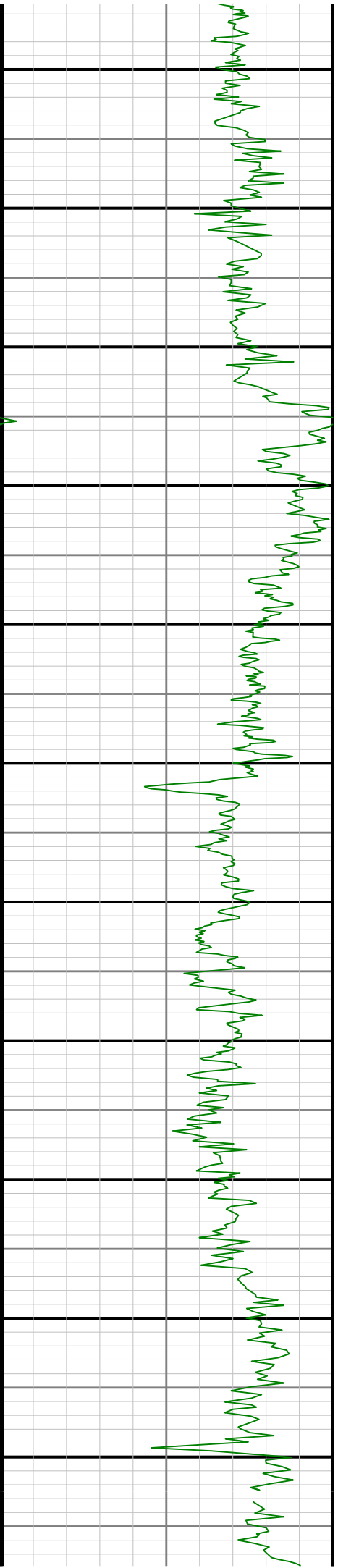


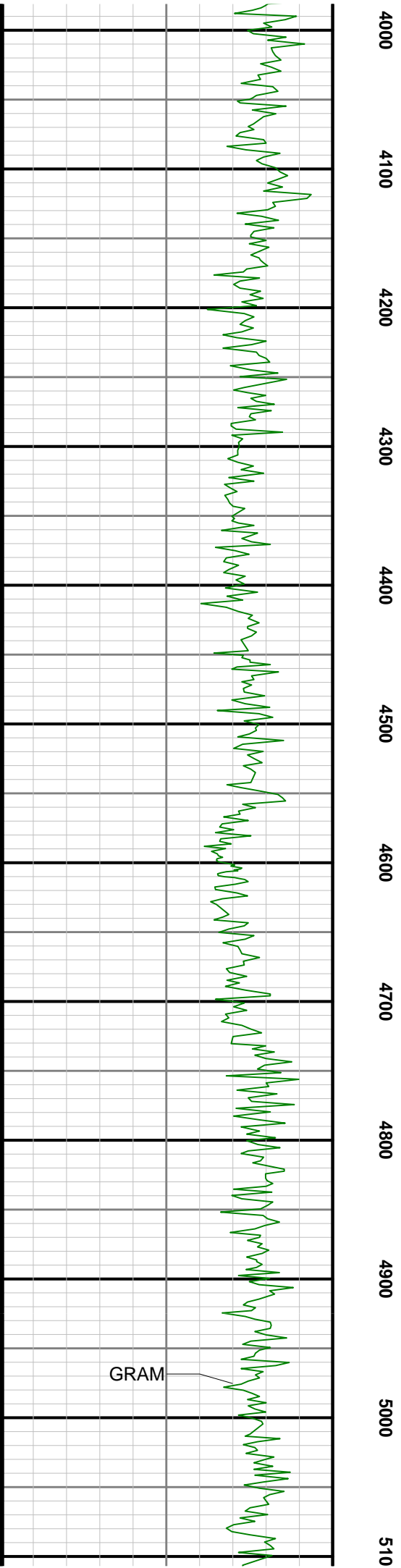
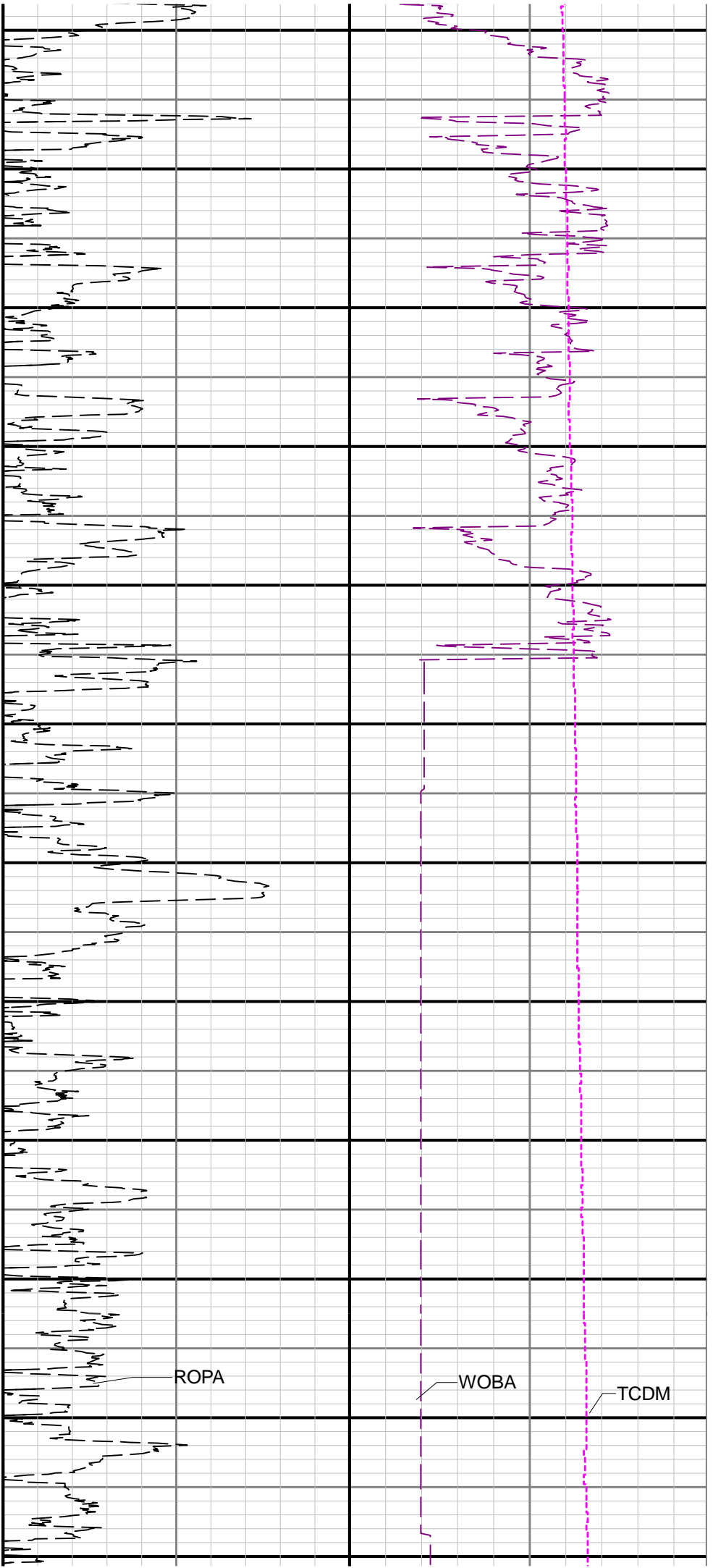
degF

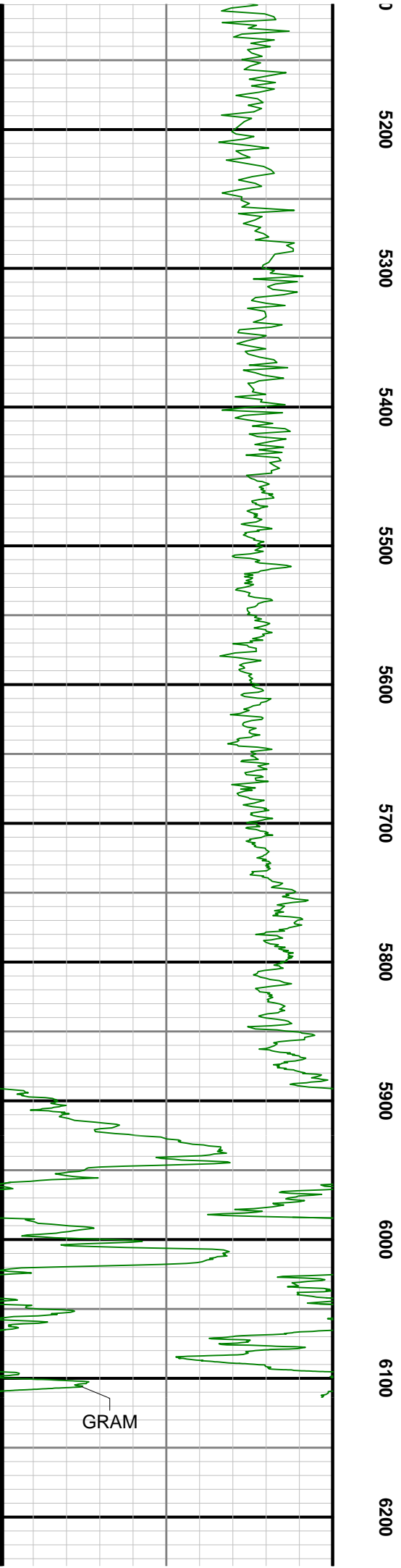
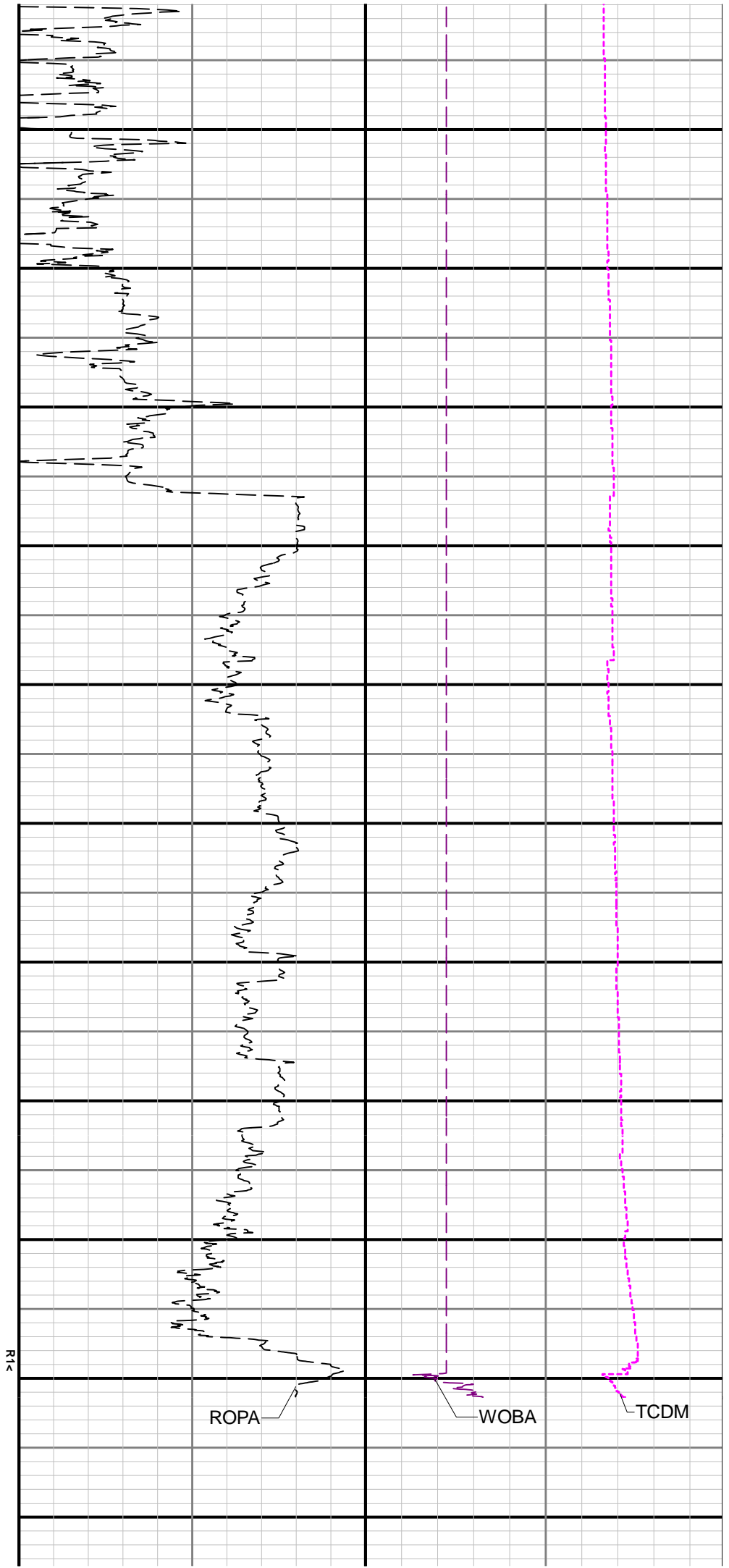




2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900







Gamma Ray - Apparent 3 ft Average GRAM		TVD 1:1200 feet	Depth Averaged ROP 3 ft Average ROPA		Weight On Bit, Average 1 ft Average WOBA	
0	150		1000	0	0	50
API			ft/h		klb	
					Downhole Temperature TCDM	
					0	250
					degF	

Directional Survey Summary												
Latitude: 0° 00' 00" N				Longitude: 0° 00' 00" W								
North Reference: Grid				Drill Depth Zero: Rig Floor								
Vertical Datum is: Mean Sea Level				Vertical Datum to DDZ: (ft) 30.00								
Vertical Section North: (m) N/A				Vertical Section East: (m) N/A								
Vertical Section Azimuth: (deg) N/A												
Grid Convergence: (deg) N/A				Magnetic Declination: (deg) N/A								
Total Correction: (deg) 6.72				TVD Calculation Method: Minimum Curvature								
Magnetic Correction: N/A				Local Magnetic Field: (nT) 7								
Local Magnetic Dip Angle: (deg) 67.08				Local Gravity Field: (m/s2) N/A								

Tie-In / Projection	Measured Depth (ft)	Inclination (deg)	Azimuth (deg)	Temperature (degF)	North (ft)	East (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Course Length (ft)	Dog Leg Severity (deg/100ft)	Build Rate (deg/100ft)	Turn Rate (deg/100ft)
Tie-In	0.00	0.00	0.00	N/A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	84.94	0.26	184.19	N/A	-0.19	-0.01	84.94	0.02	84.94	0.31	0.31	-206.98
	178.64	0.54	199.01	N/A	-0.82	-0.17	178.64	0.19	93.70	0.32	0.30	15.82
	270.39	0.48	220.20	N/A	-1.52	-0.56	270.38	0.59	91.75	0.21	-0.07	23.10
	365.09	0.33	213.35	N/A	-2.05	-0.97	365.08	1.01	94.70	0.17	-0.16	-7.23
	459.65	0.24	119.75	N/A	-2.38	-0.95	459.64	0.99	94.56	0.44	-0.10	-98.98
	554.90	0.16	167.69	N/A	-2.61	-0.74	554.89	0.80	95.25	0.19	-0.08	50.33
	648.67	0.29	200.01	N/A	-2.96	-0.80	648.66	0.86	93.77	0.19	0.14	34.47
	743.14	0.37	137.12	N/A	-3.41	-0.67	743.13	0.74	94.47	0.37	0.08	-66.57
	837.66	0.32	57.12	N/A	-3.49	-0.24	837.65	0.31	94.52	0.47	-0.05	-84.64
	932.18	0.03	306.43	N/A	-3.33	-0.04	932.17	0.11	94.52	0.35	-0.31	-117.11
	1026.87	0.06	316.66	N/A	-3.28	-0.09	1026.86	0.16	94.69	0.03	0.03	10.80
	1121.38	0.15	115.21	N/A	-3.30	-0.02	1121.37	0.08	94.51	0.22	0.10	167.76
	1216.23	0.10	155.94	N/A	-3.43	0.13	1216.22	-0.06	94.85	0.10	-0.05	42.94
	1310.96	0.57	147.29	N/A	-3.90	0.42	1310.94	-0.34	94.73	0.50	0.50	-9.13
	1405.43	0.39	167.14	N/A	-4.61	0.74	1405.41	-0.65	94.47	0.26	-0.19	21.01
	1500.10	0.53	176.87	N/A	-5.36	0.84	1500.08	-0.73	94.67	0.17	0.15	10.28
	1594.43	0.21	207.59	N/A	-5.95	0.78	1594.41	-0.66	94.33	0.39	-0.34	32.57
	1688.96	0.28	201.98	N/A	-6.31	0.62	1688.93	-0.49	94.53	0.08	0.07	-5.93
	1783.69	0.23	97.09	N/A	-6.55	0.72	1783.66	-0.58	94.73	0.43	-0.05	-110.73
	1878.16	0.29	148.59	N/A	-6.78	1.03	1878.13	-0.89	94.47	0.25	0.06	54.51
	1929.00	0.34	163.29	N/A	-7.03	1.14	1928.97	-1.00	50.84	0.19	0.10	28.91
	1978.00	0.35	174.86	N/A	-7.32	1.20	1977.97	-1.05	49.00	0.14	0.02	23.61
	2072.00	0.07	267.30	N/A	-7.61	1.16	2071.97	-1.01	94.00	0.38	-0.30	98.34
	2166.00	0.11	275.23	N/A	-7.61	1.02	2165.97	-0.86	94.00	0.04	0.04	8.44
	2261.00	0.13	262.99	N/A	-7.61	0.82	2260.97	-0.66	95.00	0.03	0.02	-12.88
	2355.00	0.04	187.30	N/A	-7.66	0.71	2354.97	-0.55	94.00	0.13	-0.10	-80.52
	2450.00	0.10	343.97	N/A	-7.61	0.68	2449.97	-0.53	95.00	0.14	0.06	164.92
	2545.00	1.52	286.71	N/A	-7.17	-0.55	2544.96	0.69	95.00	1.55	1.49	-60.27
	2639.00	3.32	299.39	N/A	-5.47	-4.11	2638.87	4.23	94.00	1.99	1.91	13.49
	2733.00	5.05	310.33	N/A	-1.46	-9.64	2732.62	9.67	94.00	2.02	1.84	11.64
	2828.00	7.47	315.89	N/A	5.68	-17.13	2827.05	17.01	95.00	2.62	2.55	5.85
	2922.00	8.22	313.01	N/A	14.65	-26.29	2920.17	25.99	94.00	0.90	0.80	-3.06
	3017.00	8.13	310.12	N/A	23.61	-36.40	3014.20	35.90	95.00	0.44	-0.09	-3.04
	3111.00	8.18	311.62	N/A	32.34	-46.48	3107.25	45.80	94.00	0.23	0.05	1.60
	3206.00	8.19	316.63	N/A	41.75	-56.18	3201.28	55.31	95.00	0.75	0.01	5.27
	3300.00	8.24	311.82	N/A	51.11	-65.80	3294.32	64.73	94.00	0.73	0.05	-5.12
	3395.00	6.83	289.03	N/A	57.49	-76.21	3388.52	75.01	95.00	3.45	-1.48	-23.99
	3490.00	4.69	245.20	N/A	57.70	-85.08	3483.08	83.88	95.00	4.98	-2.25	-46.14
	3584.00	3.57	214.47	N/A	53.68	-90.23	3576.84	89.10	94.00	2.59	-1.19	-32.69
	3679.00	1.09	122.06	N/A	50.76	-91.14	3671.78	90.07	95.00	3.97	-2.61	-97.27
	3774.00	0.06	136.52	N/A	50.24	-90.34	3766.77	89.28	95.00	1.09	-1.08	15.22
	3868.00	0.13	179.35	N/A	50.10	-90.30	3860.77	89.25	94.00	0.10	0.07	45.56
	3963.00	0.25	103.28	N/A	49.94	-90.10	3955.77	89.05	95.00	0.27	0.13	-80.07
	4057.00	0.19	67.43	N/A	49.96	-89.76	4049.77	88.71	94.00	0.16	-0.06	-38.14
	4152.00	0.09	162.81	N/A	49.95	-89.59	4144.77	88.54	95.00	0.23	-0.11	100.40
	4246.00	0.09	132.74	N/A	49.83	-89.51	4238.77	88.47	94.00	0.05	0.00	-31.99
	4341.00	0.10	33.04	N/A	49.84	-89.41	4333.77	88.37	95.00	0.15	0.01	-104.95
	4436.00	0.16	99.02	N/A	49.89	-89.24	4428.77	88.19	95.00	0.16	0.06	69.45
	4625.00	0.03	181.51	N/A	49.80	-88.98	4617.77	87.93	189.00	0.08	-0.07	43.65
	4719.00	0.22	341.14	N/A	49.95	-89.03	4711.77	87.99	94.00	0.26	0.20	169.82
	4814.00	0.19	198.94	N/A	49.97	-89.15	4806.77	88.10	95.00	0.41	-0.03	-149.68

	4909.00	0.03	271.50	N/A	49.82	-89.22	4901.77	88.18	95.00	0.19	-0.17	76.38
	5003.00	0.06	295.59	N/A	49.85	-89.29	4995.77	88.24	94.00	0.04	0.03	25.63
	5097.00	0.29	296.49	N/A	49.97	-89.55	5089.77	88.50	94.00	0.24	0.24	0.96
	5192.00	0.57	70.87	N/A	50.23	-89.32	5184.77	88.26	95.00	0.84	0.29	141.45
	5287.00	0.34	197.38	N/A	50.12	-88.95	5279.76	87.90	95.00	0.86	-0.24	133.17
	5381.00	0.10	4.88	N/A	49.94	-89.03	5373.76	87.98	94.00	0.47	-0.26	178.19
	5476.00	0.48	267.36	N/A	50.00	-89.42	5468.76	88.37	95.00	0.53	0.40	-102.65
	5570.00	10.13	275.35	N/A	50.76	-98.06	5562.25	97.00	94.00	10.27	10.27	8.50
	5608.00	13.41	280.22	N/A	51.85	-105.73	5599.45	104.64	38.00	9.01	8.63	12.82
	5703.00	20.82	274.78	N/A	55.22	-133.44	5690.18	132.27	95.00	7.97	7.80	-5.73
	5797.00	29.81	267.09	N/A	55.42	-173.51	5775.09	172.33	94.00	10.16	9.56	-8.18
	5892.00	38.21	267.39	N/A	52.88	-226.54	5853.77	225.40	95.00	8.84	8.84	0.32
	5986.00	47.05	269.60	N/A	51.31	-290.11	5922.86	288.99	94.00	9.54	9.40	2.35
	6080.00	56.14	269.23	N/A	50.55	-363.69	5981.20	362.57	94.00	9.68	9.67	-0.39
	6175.00	64.74	268.32	N/A	48.75	-446.23	6028.02	445.13	95.00	9.09	9.05	-0.96
	6269.00	70.08	267.57	N/A	45.63	-532.93	6064.12	531.88	94.00	5.73	5.68	-0.80
	6364.00	75.88	267.18	N/A	41.47	-623.63	6091.91	622.65	95.00	6.12	6.11	-0.41
	6460.00	83.61	270.76	N/A	39.81	-718.00	6109.00	717.03	96.00	8.85	8.05	3.73
	6554.00	90.43	274.12	N/A	43.81	-811.72	6113.88	810.64	94.00	8.08	7.26	3.57
	6649.00	90.62	271.62	N/A	48.57	-906.59	6113.01	905.39	95.00	2.64	0.20	-2.63
	6743.00	90.65	268.67	N/A	48.80	-1000.57	6111.97	999.35	94.00	3.14	0.03	-3.14
	6933.00	90.52	267.32	N/A	42.16	-1190.44	6110.03	1189.32	190.00	0.71	-0.07	-0.71
	7027.00	90.55	266.93	N/A	37.44	-1284.32	6109.15	1283.27	94.00	0.42	0.03	-0.41
	7122.00	90.55	265.32	N/A	31.02	-1379.09	6108.24	1378.16	95.00	1.69	0.00	-1.69
	7216.00	90.55	265.02	N/A	23.11	-1472.75	6107.34	1471.96	94.00	0.32	0.00	-0.32
	7311.00	90.55	263.74	N/A	13.81	-1567.29	6106.42	1566.67	95.00	1.35	0.00	-1.35
	7405.00	90.55	264.06	N/A	3.82	-1660.75	6105.52	1660.32	94.00	0.34	0.00	0.34
	7500.00	90.43	265.24	N/A	-5.04	-1755.33	6104.71	1755.07	95.00	1.25	-0.13	1.24
	7594.00	90.49	265.15	N/A	-12.91	-1849.00	6103.96	1848.87	94.00	0.12	0.06	-0.10
	7689.00	90.52	265.55	N/A	-20.61	-1943.68	6103.12	1943.70	95.00	0.42	0.03	0.42
	7783.00	90.46	266.15	N/A	-27.42	-2037.43	6102.31	2037.57	94.00	0.64	-0.06	0.64
	7878.00	90.52	268.05	N/A	-32.22	-2132.30	6101.50	2132.52	95.00	2.00	0.06	2.00
	7973.00	90.59	269.50	N/A	-34.25	-2227.28	6100.58	2227.51	95.00	1.53	0.07	1.53
	8067.00	90.62	270.37	N/A	-34.36	-2321.27	6099.59	2321.48	94.00	0.93	0.03	0.93
	8256.00	90.43	270.25	N/A	-33.34	-2510.26	6097.86	2510.41	189.00	0.12	-0.10	-0.06
	8351.00	90.58	269.97	N/A	-33.16	-2605.25	6097.02	2605.39	95.00	0.33	0.16	-0.29
	8445.00	90.65	268.84	N/A	-34.13	-2699.24	6096.01	2699.37	94.00	1.20	0.07	-1.20
	8540.00	90.62	268.06	N/A	-36.70	-2794.20	6094.96	2794.36	95.00	0.82	-0.03	-0.82
	8634.00	90.74	267.71	N/A	-40.17	-2888.13	6093.84	2888.35	94.00	0.39	0.13	-0.37
	8729.00	90.62	267.10	N/A	-44.47	-2983.03	6092.71	2983.31	95.00	0.65	-0.13	-0.64
	8824.00	90.58	267.27	N/A	-49.14	-3077.91	6091.72	3078.27	95.00	0.18	-0.04	0.18
	8918.00	90.59	267.75	N/A	-53.22	-3171.81	6090.76	3172.24	94.00	0.51	0.01	0.51
	9013.00	90.59	267.43	N/A	-57.21	-3266.72	6089.78	3267.21	95.00	0.34	0.00	-0.34
	9107.00	90.62	267.83	N/A	-61.10	-3360.64	6088.79	3361.18	94.00	0.43	0.03	0.43
	9202.00	90.55	268.49	N/A	-64.15	-3455.58	6087.82	3456.17	95.00	0.70	-0.07	0.69
	9296.00	90.71	269.18	N/A	-66.06	-3549.56	6086.79	3550.16	94.00	0.75	0.17	0.73
	9391.00	90.68	269.75	N/A	-66.95	-3644.55	6085.63	3645.15	95.00	0.60	-0.03	0.60
	9485.00	90.49	269.55	N/A	-67.52	-3738.54	6084.67	3739.14	94.00	0.29	-0.20	-0.21
	9579.00	90.74	271.66	N/A	-66.53	-3832.52	6083.66	3833.08	94.00	2.26	0.27	2.24
	9674.00	90.15	272.67	N/A	-62.94	-3927.45	6082.93	3927.91	95.00	1.23	-0.62	1.06
	9769.00	90.40	272.46	N/A	-58.69	-4022.35	6082.47	4022.71	95.00	0.34	0.26	-0.22
	9863.00	90.37	270.47	N/A	-56.29	-4116.32	6081.84	4116.60	94.00	2.12	-0.03	-2.12
	9958.00	90.28	267.30	N/A	-58.14	-4211.28	6081.30	4211.59	95.00	3.34	-0.09	-3.34
	10052.00	90.31	266.00	N/A	-63.63	-4305.12	6080.82	4305.52	94.00	1.38	0.03	-1.38
	10147.00	90.28	266.03	N/A	-70.23	-4399.89	6080.33	4400.40	95.00	0.04	-0.03	0.03
	10242.00	90.34	264.97	N/A	-77.68	-4494.59	6079.81	4495.24	95.00	1.12	0.06	-1.12
	10336.00	90.31	264.98	N/A	-85.92	-4588.23	6079.28	4589.03	94.00	0.03	-0.03	0.01
	10431.00	90.31	265.48	N/A	-93.82	-4682.90	6078.77	4683.84	95.00	0.53	0.00	0.53
	10525.00	90.18	266.41	N/A	-100.46	-4776.66	6078.36	4777.72	94.00	1.00	-0.14	0.99
	10619.00	90.31	267.19	N/A	-105.71	-4870.52	6077.96	4871.66	94.00	0.84	0.14	0.83
	10714.00	90.28	267.59	N/A	-110.04	-4965.42	6077.47	4966.63	95.00	0.42	-0.03	0.42
	10809.00	90.37	267.49	N/A	-114.12	-5060.33	6076.93	5061.60	95.00	0.14	0.09	-0.11
	10903.00	90.37	267.74	N/A	-118.03	-5154.24	6076.33	5155.58	94.00	0.27	0.00	0.27
	10998.00	90.22	267.05	N/A	-122.34	-5249.14	6075.84	5250.55	95.00	0.74	-0.16	-0.73
	11061.00	90.18	267.13	N/A	-125.54	-5312.06	6075.62	5313.52	63.00	0.14	-0.06	0.13
Projection	11085.00	90.18	267.13	N/A	-126.74	-5336.03	6075.54	5337.51	24.00	0.00	0.00	0.00