

87.04782

HG Energy, LLC
Roane County, West Virginia
J.H. Starr #107
J.H. Starr #107

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

16 July, 2015

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2015
The DIRECTIONAL DRILLING COMPANY
WV Department of
Environmental Protection
10/23/2015

HP
Survey Report - Geographic



87-04782

Company: HG Energy, LLC	Local Co-ordinate Reference: Well J.H. Starr #107
Project: Roane County, West Virginia	TVD Reference: WELL @ 1105.0usft (Decker #9)
Site: J.H. Starr #107	MD Reference: WELL @ 1105.0usft (Decker #9)
Well: J.H. Starr #107	North Reference: Grid
Wellbore: Wellbore #1	Survey Calculation Method: Minimum Curvature
Design: Wellbore #1	Database: Compass

Project	Roane County, West Virginia		
Map System:	Universal Transverse Mercator	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site J.H. Starr #107

Site Position:		Northing:	14,058,508.40 usft	Latitude:	38° 42' 49.200 N
From:	Lat/Long	Easting:	1,558,348.27 usft	Longitude:	81° 17' 15.800 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.18 °

Well J.H. Starr #107

Well Position	+N/-S	0.0 usft	Northing:	14,058,508.40 usft	Latitude:	38° 42' 49.200 N
	+E/-W	0.0 usft	Easting:	1,558,348.27 usft	Longitude:	81° 17' 15.800 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	1,097.0 usft

Wellbore Wellbore #1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	6/26/2015	-7.99	66.35	51,917

Design Wellbore #1

Audit Notes:

Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
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Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	329.87

Survey Program	Date 7/16/2015		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
500.0	2,555.0	MWD (Wellbore #1)	MWD default
			Description
			MWD - Standard

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.0	0.00	0.00	0.0	0.0	0.0	14,058,508.40	1,558,348.27	38° 42' 49.200 N	81° 17' 15.800 W
500.0	0.00	0.00	500.0	0.0	0.0	14,058,508.40	1,558,348.27	38° 42' 49.200 N	81° 17' 15.800 W
First Survey @ 500' MD / 500' TVD									
528.0	0.71	148.10	528.0	-0.1	0.1	14,058,508.25	1,558,348.36	38° 42' 49.199 N	81° 17' 15.799 W
558.0	0.49	189.70	558.0	-0.4	0.2	14,058,507.97	1,558,348.44	38° 42' 49.196 N	81° 17' 15.798 W
588.0	0.22	198.47	588.0	-0.6	0.1	14,058,507.79	1,558,348.40	38° 42' 49.194 N	81° 17' 15.798 W
618.0	0.80	334.11	618.0	-0.5	0.0	14,058,507.92	1,558,348.29	38° 42' 49.195 N	81° 17' 15.800 W
648.0	1.50	350.11	648.0	0.1	-0.1	14,058,508.49	1,558,348.13	38° 42' 49.201 N	81° 17' 15.802 W
678.0	2.78	342.48	678.0	1.2	-0.4	14,058,509.58	1,558,347.84	38° 42' 49.212 N	81° 17' 15.805 W
708.0	3.49	337.99	707.9	2.7	-1.0	14,058,511.12	1,558,347.28	38° 42' 49.227 N	81° 17' 15.813 W
738.0	4.68	332.17	737.8	4.6	-1.9	14,058,513.04	1,558,346.37	38° 42' 49.246 N	81° 17' 15.824 W
768.0	5.48	329.57	767.7	7.0	-3.2	14,058,515.36	1,558,345.07	38° 42' 49.269 N	81° 17' 15.841 W

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Survey Report - Geographic



Company: HG Energy, LLC
Project: Roane County, West Virginia
Site: J.H. Starr #107
Well: J.H. Starr #107
Wellbore: Wellbore #1
Design: Wellbore #1

Local Co-ordinate Reference: Well J.H. Starr #107
TVD Reference: WELL @ 1105.0usft (Decker #9)
MD Reference: WELL @ 1105.0usft (Decker #9)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass

Survey

Table with 10 columns: Measured Depth (usft), Inclination (°), Azimuth (°), Vertical Depth (usft), +N-S (usft), +E-W (usft), Map Northing (usft), Map Easting (usft), Latitude, Longitude. Contains 48 rows of survey data.

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HP
Survey Report - Geographic



Company: HG Energy, LLC
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 Site: J.H. Starr #107
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 MD Reference: WELL @ 1105.0usft (Decker #9)
 North Reference: Grid
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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
2,448.0	41.49	329.86	2,195.0	694.1	-413.4	14,059,202.50	1,557,934.91	38° 42' 56.051 N	81° 17' 21.045 W
2,478.0	39.81	328.47	2,217.7	710.9	-423.4	14,059,219.28	1,557,924.90	38° 42' 56.216 N	81° 17' 21.172 W
2,555.0	39.81	328.47	2,276.9	752.9	-449.2	14,059,261.30	1,557,899.12	38° 42' 56.631 N	81° 17' 21.499 W

TD @ 2555' MD / 2277' TVD

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
500.0	500.0	0.0	0.0	First Survey @ 500' MD / 500' TVD
2,555.0	2,276.9	752.9	-449.2	TD @ 2555' MD / 2277' TVD

Checked By: _____ Approved By: _____ Date: _____

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HG Energy, LLC
Roane County, West Virginia
J.H. Starr #107
J.H. Starr #107
Wellbore #1

Design: Wellbore #1

HG Energy EOW Report

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Environmental Protection

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HG Energy EOW Report



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Well: J.H. Starr #107	North Reference: Grid
Wellbore: Wellbore #1	Survey Calculation Method: Minimum Curvature
Design: Wellbore #1	Database: Compass

Project: Roane County, West Virginia	System Datum: Mean Sea Level
Map System: Universal Transverse Mercator	
Geo Datum: NAD83 West Virginia - HARN	
Map Zone: Zone 17N (84 W to 78 W)	

Site: J.H. Starr #107	Northings: 14,058,508.39 usft	Latitude: 38° 42' 49.200 N
Site Position:	Eastings: 1,558,348.27 usft	Longitude: 81° 17' 15.800 W
From: Lat/Long	Slot Radius: 13-3/16 "	Grid Convergence: -0.18 °
Position Uncertainty: 0.0 usft		

Well: J.H. Starr #107	Northings: 14,058,508.39 usft	Latitude: 38° 42' 49.200 N
Well Position:	Eastings: 1,558,348.27 usft	Longitude: 81° 17' 15.800 W
Position Uncertainty: 0.0 usft	Wellhead Elevation: 0.0 usft	Ground Level: 1,097.0 usft

Wellbore: Wellbore #1	Model Name: IGRF2015	Sample Date: 6/26/2015	Declination (°): -7.99	Dip Angle (°): 66.35	Field Strength (nT): 51,917
------------------------------	-----------------------------	-------------------------------	-------------------------------	-----------------------------	------------------------------------

Design: Wellbore #1	Version: 1.0	Phase: ACTUAL	Tie On Depth: 0.0
Audit Notes:	Depth From (TVD) (usft): 0.0	+N-S (usft): 0.0	Direction (°): 329.87
Vertical Section:	From (usft): 500.0	To (usft): 2,555.0	MWD default: MWD - Standard

Survey Program: Survey (Wellbore)	Date: 7/16/2015
From (usft): 500.0	To (usft): 2,555.0
Wellbore: Wellbore #1	Tool Name: MWD default
Survey (Wellbore #1): MWD - Standard	Description: MWD - Standard

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West Virginia Department of
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MD Reference: WELL @ 1105.0usft (Decker #9)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Closure Distance (usft)	Closure Azimuth (°)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.0	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.0	0.00	
First Survey @ 500' MD / 500' TVD										
528.0	0.71	148.10	528.0	-0.1	0.1	-0.2	2.54	0.2	148.10	
558.0	0.49	189.70	558.0	-0.4	0.2	-0.5	1.58	0.5	158.70	
588.0	0.22	198.47	588.0	-0.6	0.1	-0.6	0.92	0.6	168.15	
618.0	0.80	334.11	618.0	-0.5	0.0	-0.4	3.23	0.5	177.76	
648.0	1.50	350.11	648.0	0.1	-0.1	0.2	2.55	0.2	304.52	
678.0	2.78	342.48	678.0	1.2	-0.4	1.2	4.36	1.3	340.08	
708.0	3.49	337.99	707.9	2.7	-1.0	2.8	2.50	2.9	340.02	
738.0	4.68	332.17	737.8	4.6	-1.9	5.0	4.20	5.0	337.74	
768.0	5.48	329.57	767.7	7.0	-3.2	7.6	2.77	7.7	335.33	
798.0	6.10	328.38	797.6	9.6	-4.8	10.7	2.10	10.7	333.52	
828.0	7.20	326.09	827.4	12.5	-6.6	14.1	3.77	14.1	331.96	
858.0	8.00	326.71	857.1	15.8	-8.8	18.1	2.68	18.1	330.74	
888.0	8.88	328.78	886.8	19.5	-11.2	22.5	3.10	22.5	330.17	
918.0	9.99	328.91	916.4	23.7	-13.7	27.4	3.70	27.4	329.93	
948.0	10.91	329.70	945.9	28.4	-16.5	32.8	3.10	32.8	329.83	
978.0	11.80	330.58	975.3	33.5	-19.4	38.7	3.02	38.7	329.88	
1,008.0	12.51	332.17	1,004.6	39.1	-22.5	45.1	2.62	45.1	330.09	
1,038.0	13.70	333.10	1,033.8	45.1	-25.6	51.9	4.03	51.9	330.43	
1,068.0	14.58	333.67	1,062.9	51.7	-28.9	59.2	2.97	59.2	330.80	
1,098.0	15.69	334.77	1,091.9	58.7	-32.3	67.0	3.82	67.0	331.20	
1,128.0	16.88	334.77	1,120.7	66.3	-35.9	75.4	3.97	75.4	331.60	
1,158.0	17.90	334.29	1,149.3	74.4	-39.7	84.3	3.43	84.4	331.91	
1,188.0	18.69	332.39	1,177.8	82.8	-43.9	93.7	3.30	93.8	332.05	
1,218.0	19.49	330.27	1,206.1	91.4	-48.7	103.5	3.53	103.6	331.98	

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 WV Department of Environmental Protection
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HP HG Energy EOW Report

Company: HG Energy, LLC
 Project: Roane County, West Virginia
 Site: J.H. Starr #107
 Well: J.H. Starr #107
 Wellbore: Wellbore #1
 Design: Wellbore #1

Local Co-ordinate Reference: Well J.H. Starr #107
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 MD Reference: WELL @ 1105.0usft (Decker #9)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: Compass

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Closure Distance (usft)	Closure Azimuth (°)
1,248.0	20.19	328.20	1,234.4	100.2	-53.9	113.7	3.31	113.7	331.73
1,278.0	20.68	327.19	1,262.5	109.0	-59.5	124.1	2.01	124.2	331.39
1,308.0	21.39	328.40	1,290.5	118.0	-65.4	134.9	2.55	134.9	331.02
1,338.0	22.18	324.50	1,318.3	127.2	-71.7	146.0	3.53	146.0	330.60
1,368.0	22.71	323.27	1,346.1	136.5	-78.4	157.4	2.36	157.4	330.11
1,398.0	23.42	322.61	1,373.7	145.8	-85.5	169.1	2.52	169.1	329.61
1,428.0	23.60	322.70	1,401.2	155.4	-92.8	180.9	0.61	180.9	329.15
1,458.0	24.08	322.30	1,428.6	165.0	-100.2	193.0	1.69	193.0	328.74
1,488.0	24.70	322.87	1,455.9	174.8	-107.7	205.2	2.21	205.3	328.37
1,518.0	25.41	323.18	1,483.1	185.0	-115.3	217.9	2.41	218.0	328.06
1,548.0	26.20	324.90	1,510.1	195.5	-123.0	230.8	3.63	231.0	327.83
1,578.0	27.49	325.78	1,536.9	206.7	-130.7	244.4	4.50	244.5	327.69
1,608.0	28.68	326.88	1,563.4	218.4	-138.5	258.4	4.33	258.6	327.62
1,638.0	30.18	327.98	1,589.5	230.9	-146.5	273.2	5.31	273.4	327.61
1,668.0	31.42	327.98	1,615.3	243.9	-154.6	288.5	4.13	288.7	327.63
1,698.0	32.61	328.20	1,640.7	257.4	-163.0	304.4	3.99	304.7	327.65
1,728.0	34.11	328.47	1,665.7	271.4	-171.7	320.9	5.02	321.1	327.69
1,758.0	35.71	329.79	1,690.3	286.2	-180.5	338.1	5.90	338.3	327.76
1,788.0	37.52	331.20	1,714.4	301.7	-189.3	356.0	6.65	356.2	327.90
1,818.0	39.90	332.39	1,737.8	318.3	-198.1	374.7	8.31	374.9	328.10
1,848.0	42.60	333.67	1,760.4	335.9	-207.1	394.5	9.43	394.6	328.34
1,878.0	44.10	334.29	1,782.2	354.4	-216.1	415.0	5.20	415.1	328.62
1,908.0	44.72	333.40	1,803.6	373.2	-225.4	435.9	2.93	436.0	328.87
1,938.0	44.59	331.60	1,825.0	391.9	-235.1	457.0	4.24	457.1	329.04
1,968.0	44.59	331.77	1,846.3	410.5	-245.1	478.1	0.40	478.1	329.16
1,998.0	44.59	331.91	1,867.7	429.1	-255.1	499.1	0.33	499.1	329.27
2,028.0	44.72	331.20	1,889.0	447.6	-265.1	520.2	1.72	520.2	329.36

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 Site: J.H. Slarr #107
 Well: J.H. Slarr #107
 Wellbore: Wellbore #1
 Design: Wellbore #1

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Survey	MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D/Leg (°/100usft)	Closure Distance (usft)	Closure Azimuth (°)	
	2,058.0	44.50	329.79	1,910.4	465.9	-275.5	541.3	3.38	541.3	329.41	
	2,088.0	44.81	329.57	1,931.7	484.1	-286.1	562.3	1.15	562.4	329.42	
	2,118.0	44.81	329.31	1,953.0	502.3	-296.9	583.5	0.61	583.5	329.42	
	2,148.0	43.79	328.78	1,974.5	520.3	-307.6	604.4	3.62	604.4	329.41	
	2,178.0	43.39	328.60	1,996.2	538.0	-318.4	625.1	1.40	625.1	329.38	
	2,208.0	42.51	328.20	2,018.2	555.4	-329.1	645.5	3.07	645.6	329.35	
	2,238.0	42.60	328.38	2,040.3	572.6	-339.8	665.8	0.50	665.9	329.32	
	2,268.0	42.60	327.59	2,062.4	589.9	-350.5	686.1	1.78	686.2	329.28	
	2,298.0	42.91	328.78	2,084.4	607.2	-361.3	706.5	2.88	706.5	329.25	
	2,328.0	43.00	327.98	2,106.4	624.6	-372.0	726.9	1.84	727.0	329.22	
	2,358.0	42.11	328.47	2,128.5	641.8	-382.7	747.2	3.17	747.2	329.20	
	2,388.0	42.42	329.48	2,150.7	659.1	-393.1	767.4	2.49	767.4	329.19	
	2,418.0	42.82	330.10	2,172.7	676.7	-403.3	787.7	1.93	787.7	329.21	
	2,448.0	41.49	329.86	2,195.0	694.1	-413.4	807.8	4.47	807.9	329.22	
	2,478.0	39.81	328.47	2,217.7	710.9	-423.4	827.4	6.36	827.4	329.22	
	2,555.0	39.81	328.47	2,276.9	752.9	-449.2	876.6	0.00	876.7	329.18	
	TD @ 2555' MD / 2277' TVD										

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N-S (usft)	Local Coordinates +E-W (usft)	Comment
500.0	500.0	0.0	0.0	First Survey @ 500' MD / 500' TVD
2555.0	2,276.9	752.9	-449.2	TD @ 2555' MD / 2277' TVD

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Company Name: HG Energy, LLC
 J.H. Starr #107
 Roane County, West Virginia
 Rig: Decker 9
 Created By: Shane Robbins
 Date: 7/16/2015

J.H. Starr #107
 Roane County, West Virginia
 Q150530 & AM-150457
 Design #1

DESIGN TARGET DETAILS

Name	TVD	+K/S	4E/W	Northing	Easting	Latitude	Longitude
Target J.H. Starr #107	212.0	636.3	-370.41	1609146.67	152787.28	39° 42' 56.500" N	81° 17' 25.500" W
-plan this target center							

ANNOTATIONS

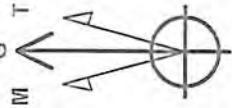
ID	Tag	Tag	Tag	4E/W	VSE	Displacement	Annotation
510	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
511	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
512	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
513	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
514	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
515	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
516	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
517	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
518	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
519	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
520	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
521	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
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599	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD
600	636.3	636.3	636.3	636.3	636.3	636.3	ID @ 510 MD / 500' TVD

PROJECT DETAILS:

Roane County, West Virginia
 Geodetic System: Universal Transverse Mercator
 Datum: NAD83 West Virginia - IARRN
 Ellipsoid: GRS 1980
 Zone: 17N (84 W to 78 W)
 System Datum: Mean Sea Level

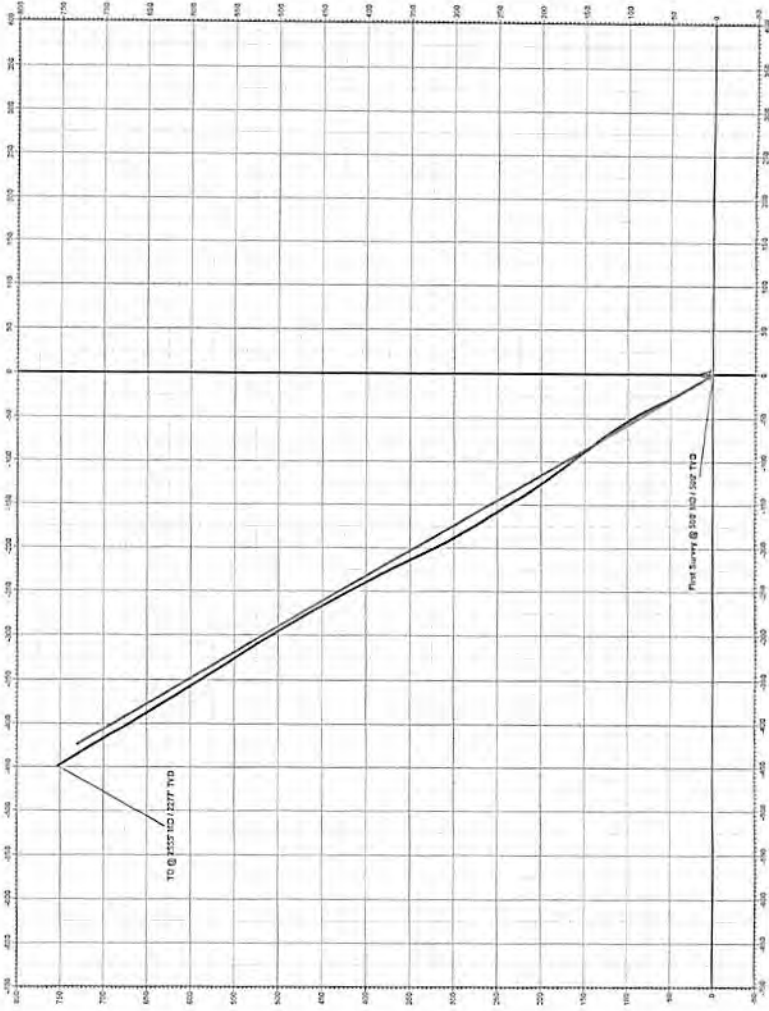
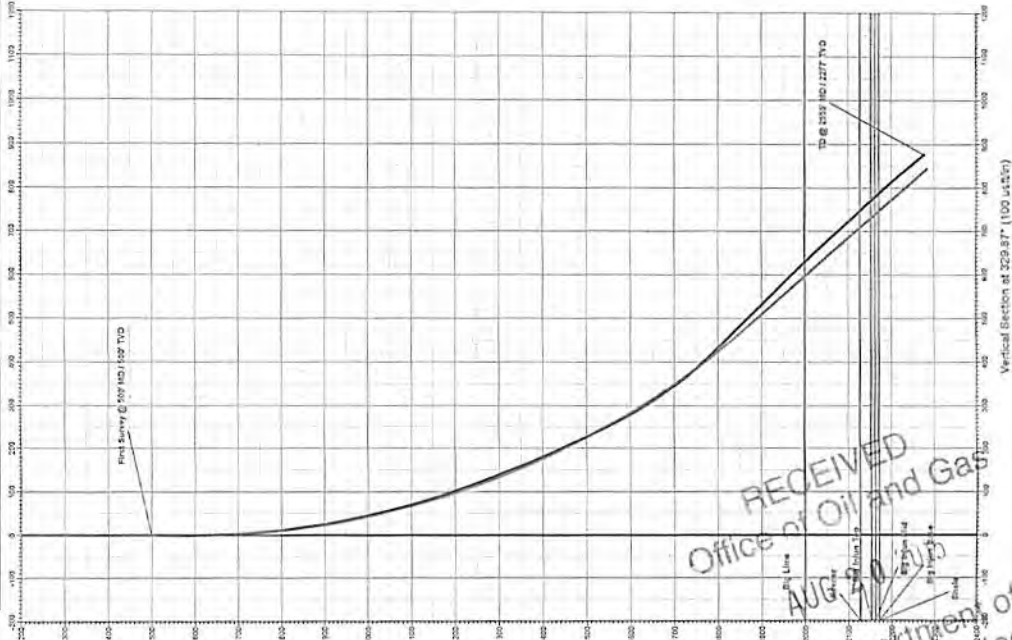
WELL DETAILS:

J.H. Starr #107
 Ground Level: 1077.0
 Longitude: 81° 17' 25.500" W
 Easting: 152787.28
 Latitude: 39° 42' 56.500" N



Azimuths to Grid North
 Correction: -7.81°
 Magnetic Field
 Strength: 51916.9nT
 Dip Angle: 66.35°
 Date: 6/26/2015
 Model: IGRF2015

HG Energy



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 AUG 20 2015
 WV Department of Environmental Protection
 10/23/2015