



June 7, 2019

HG Energy

Operator Name: HG Energy
 Well Name: EJ May 147
 County/Parish: Lincoln County
 State: WV
 Rig Name: Noah Horn 777
 Job Number: LWV3116219

This is to certify the surveys performed on the referenced well by Professional Directional Ent., Inc. are true and correct MWD Surveys, data provided as follows:

Surveyor	Surveyed Depths	Projection to Bit	Dates Performed	Type of Survey
ProDirectional	471'MD – 2,661'MD	2,726'MD	05/20/19 – 05/23/19	MWD-OWSG

Sincerely,

John Jordan
 Well Planning Analyst
 Professional Directional

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 Environmental Protection

850 Conroe Park West Drive | Conroe, TX 77303 | Phone: 936.441.7266
 prodirectional.com

HG Energy LLC

Well: E.J. May No. 147

Site: E.J. May

Project: Lincoln County, West Virginia UTM83

Design: plan2

Rig: Noah Horn 777

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
390.00	390.00	Pittsburgh coal
1616.00	1680.95	Big Lime
1815.00	1923.31	Big Injun
1910.00	2039.09	Shale
2310.00	2526.61	Coffee Shale
2330.00	2550.98	Berea
2341.00	2564.39	Berea Mid tgt
2352.00	2577.80	Berea Base

Section Details

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	V Sect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	550.00	0.00	0.00	550.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 3°/100' build
3	1712.21	34.87	1.50	1641.80	342.72	8.97	3.00	1.50	342.84	Begin 34.87° tangent
4	2564.39	34.87	1.50	2341.00	829.72	21.73	0.00	0.00	830.00	Berea target @ 2341 TVD
5	2567.55	34.87	1.50	2360.00	842.95	22.07	0.00	0.00	843.24	Base Berea
6	2737.55	34.87	1.50	2483.07	928.67	24.32	0.00	0.00	928.99	PBHLTD 2737.55 MD/2483.08 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	V Sect	Annotation
471.00	1.20	129.35	470.97	-3.13	3.81	-3.03	MWD surveys
2661.00	27.12	357.47	2433.64	876.98	6.35	876.75	Survey @ 2661.00 MD 2433.64 TVD
2726.00	26.50	358.00	2491.65	906.18	5.19	906.00	Survey projected to 2726.00 MD 2491.65 TVD

Geodetic System: Universal Transverse Mercator
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1980
 Zone: Zone 17N (84 W to 78 W)

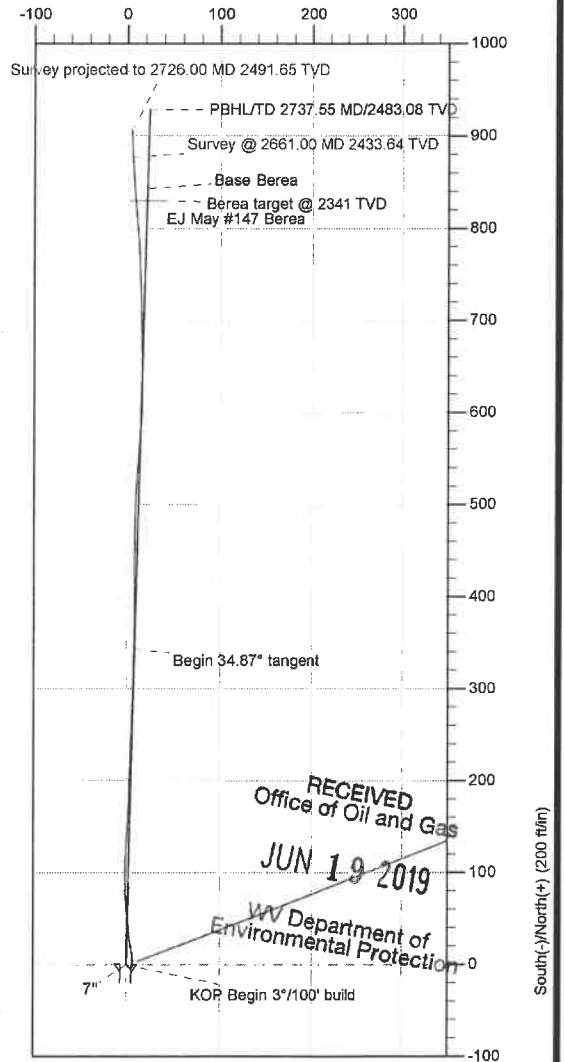
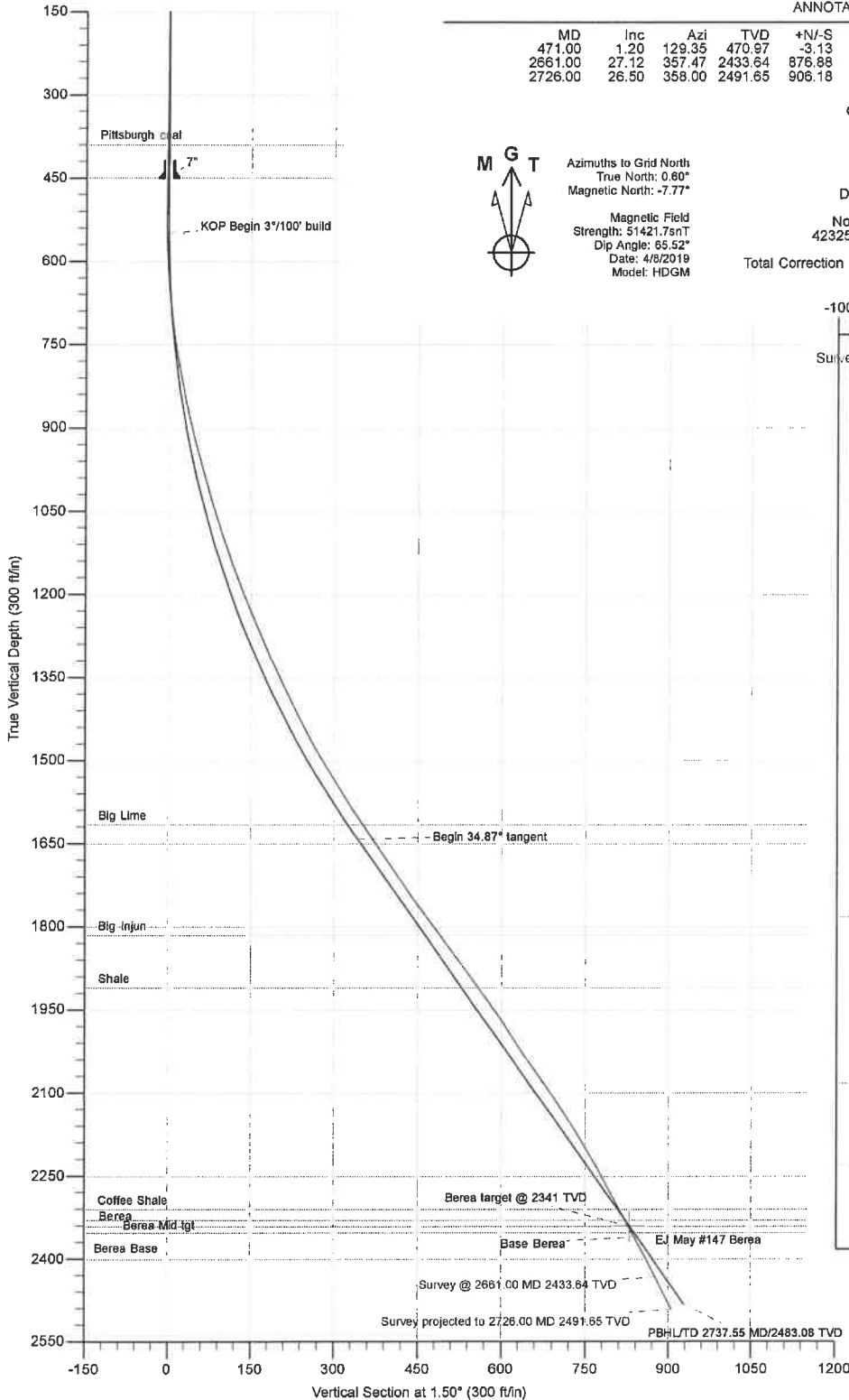
System Datum: Mean Sea Level
 Depth Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)

Northings: 4232516.00 Eastings: 415516.00 Latitude: 38° 14' 12.0413 N Longitude: 81° 57' 55.3021 W

Total Correction (M->T): To convert a Magnetic Direction to a True Direction, Subtract 8.5° West(-)/East(+) (200 ft/in)



Azimuths to Grid North
 True North: 0.60°
 Magnetic North: -7.77°
 Magnetic Field Strength: 51421.75nT
 Dip Angle: 65.52°
 Date: 4/8/2019
 Model: HDGM



Survey Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 147
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Site:	E.J. May	MD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Well:	E.J. May No. 147	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Lincoln County, West Virginia UTM83		
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	E.J. May				
Site Position:		Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
From:	Map	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 147					
Well Position	+N/-S	0.00 ft	Northing:	4,232,516.00 m	Latitude:	38° 14' 12.0413 N
	+E/-W	0.00 ft	Easting:	415,516.00 m	Longitude:	81° 57' 55.3021 W
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	840.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	HDGM	4/8/2019	(°)	(°)	(nT)
			-8.37	65.52	51,421.70000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.00	0.00	0.00	1.50	

Survey Program	Date	5/23/2019			
From	To	Survey (Wellbore)	Tool Name	Description	
(ft)	(ft)				
471.00	2,661.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	
2,726.00	2,726.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

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Survey	[Redacted]									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn	
Depth	(°)	(°)	Depth	(ft)	(ft)	Section	Rate	Rate	Rate	
(ft)			(ft)			(ft)	(°/100usft)	(°/100usft)	(°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
471.00	1.20	129.35	470.97	-3.13	3.81	-3.03	0.25	0.25	0.00	
MWD surveys										
501.00	1.70	129.18	500.96	-3.61	4.40	-3.49	1.67	1.67	-0.57	
531.00	1.65	106.10	530.94	-4.01	5.16	-3.87	2.24	-0.17	-76.93	
561.00	1.89	49.11	560.93	-3.80	5.95	-3.65	5.67	0.80	-189.97	
591.00	3.05	20.89	590.90	-2.73	6.61	-2.56	5.49	3.87	-94.07	
621.00	4.00	5.67	620.85	-0.95	7.00	-0.76	4.42	3.17	-50.73	
651.00	5.36	358.24	650.75	1.49	7.06	1.68	4.95	4.53	-24.77	
681.00	6.42	355.71	680.59	4.57	6.89	4.75	3.64	3.53	-8.43	

WV Department of
Environmental Protection

Survey Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 147
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Site:	E.J. May	MD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Well:	E.J. May No. 147	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

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)
711.00	7.10	353.09	710.38	8.08	6.54	8.25	2.49	2.27	-8.73
741.00	8.12	352.01	740.11	12.02	6.02	12.17	3.43	3.40	-3.60
771.00	9.30	350.53	769.77	16.51	5.33	16.64	4.00	3.93	-4.93
801.00	10.74	351.21	799.31	21.66	4.50	21.77	4.82	4.80	2.27
831.00	11.47	352.83	828.75	27.38	3.70	27.47	2.65	2.43	5.40
861.00	12.31	353.58	858.10	33.52	2.97	33.59	2.85	2.80	2.50
891.00	13.07	355.35	887.37	40.08	2.34	40.13	2.85	2.53	5.90
921.00	14.25	355.28	916.52	47.14	1.76	47.17	3.93	3.93	-0.23
951.00	14.88	354.33	945.56	54.65	1.08	54.66	2.25	2.10	-3.17
981.00	15.60	354.74	974.50	62.50	0.33	62.49	2.43	2.40	1.37
1,011.00	16.12	356.64	1,003.36	70.68	-0.29	70.65	2.45	1.73	6.33
1,041.00	16.74	358.48	1,032.14	79.16	-0.64	79.11	2.70	2.07	6.13
1,071.00	17.51	0.47	1,060.81	87.99	-0.72	87.94	3.23	2.57	6.63
1,101.00	18.57	0.87	1,089.33	97.28	-0.61	97.23	3.56	3.53	1.33
1,131.00	19.50	1.57	1,117.69	107.06	-0.40	107.01	3.19	3.10	2.33
1,161.00	20.29	1.75	1,145.90	117.26	-0.11	117.22	2.64	2.63	0.60
1,191.00	20.93	3.01	1,173.98	127.81	0.33	127.78	2.60	2.13	4.20
1,221.00	21.58	3.71	1,201.94	138.67	0.97	138.65	2.33	2.17	2.33
1,251.00	21.93	3.29	1,229.80	149.77	1.65	149.76	1.28	1.17	-1.40
1,281.00	22.60	2.84	1,257.57	161.12	2.26	161.12	2.30	2.23	-1.50
1,311.00	23.77	1.82	1,285.14	172.92	2.74	172.93	4.12	3.90	-3.40
1,341.00	25.06	2.24	1,312.46	185.31	3.18	185.33	4.34	4.30	1.40
1,371.00	25.59	2.20	1,339.58	198.14	3.67	198.16	1.77	1.77	-0.13
1,401.00	25.41	2.10	1,366.65	211.04	4.16	211.08	0.62	-0.60	-0.33
1,431.00	25.67	1.82	1,393.72	223.97	4.60	224.01	0.96	0.87	-0.93
1,461.00	26.80	1.25	1,420.63	237.22	4.95	237.27	3.86	3.77	-1.90
1,491.00	27.84	2.02	1,447.28	250.99	5.35	251.04	3.66	3.47	1.47
1,521.00	28.96	2.46	1,473.67	265.24	5.91	265.31	3.80	3.73	1.47
1,551.00	30.13	2.31	1,499.77	280.03	6.52	280.10	3.91	3.90	-0.60
1,581.00	31.06	1.92	1,525.60	295.28	7.08	295.37	3.17	3.10	-1.30
1,611.00	31.23	0.93	1,551.27	310.79	7.47	310.88	1.80	0.57	1.30
1,641.00	31.92	0.85	1,576.83	326.50	7.71	326.59	2.30	2.30	-0.27
1,671.00	33.12	1.50	1,602.13	342.62	8.05	342.72	4.17	4.00	2.17
1,701.00	34.16	1.48	1,627.10	359.24	8.48	359.34	3.47	3.47	-0.07
1,731.00	34.04	0.76	1,651.94	376.05	8.81	376.16	1.40	-0.40	-2.40
1,761.00	34.02	0.46	1,676.81	392.84	8.99	392.94	0.56	-0.07	-1.00
1,791.00	33.75	359.53	1,701.71	409.57	8.98	409.66	1.95	-0.90	-3.10
1,821.00	33.84	359.40	1,726.64	426.25	8.83	426.34	0.38	0.30	-0.43
1,851.00	34.89	0.18	1,751.40	443.19	8.77	443.26	3.80	3.50	2.60
1,881.00	36.03	0.30	1,775.84	460.59	8.84	460.66	3.81	3.80	0.40
1,911.00	37.04	1.38	1,799.94	478.45	9.11	478.52	3.99	3.37	3.60
1,941.00	37.35	2.01	1,823.84	496.57	9.64	496.66	1.64	1.03	2.10
1,971.00	36.33	2.82	1,847.85	514.55	10.40	514.64	3.77	-3.40	2.70

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Survey Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 147
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Site:	E.J. May	MD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Well:	E.J. May No. 147	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

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)
2,001.00	35.64	3.87	1,872.13	532.14	11.43	532.26	3.09	-2.30	3.50
2,031.00	35.59	4.20	1,896.52	549.57	12.65	549.71	0.66	-0.17	1.10
2,061.00	35.80	4.81	1,920.88	567.02	14.03	567.19	1.38	0.70	2.03
2,091.00	34.68	3.80	1,945.38	584.28	15.33	584.48	4.21	-3.73	-3.37
2,121.00	33.45	2.35	1,970.23	601.06	16.24	601.28	4.91	-4.10	-4.83
2,151.00	32.83	0.60	1,995.35	617.45	16.66	617.67	3.80	-2.07	-5.83
2,181.00	33.10	359.56	2,020.52	633.77	16.68	633.99	2.09	0.90	-3.47
2,211.00	33.96	359.79	2,045.53	650.34	16.59	650.56	2.90	2.87	0.77
2,241.00	34.36	359.03	2,070.36	667.19	16.42	667.39	1.95	1.33	-2.53
2,271.00	34.62	358.80	2,095.08	684.17	16.09	684.36	0.97	0.87	-0.77
2,301.00	33.98	359.50	2,119.87	701.08	15.84	701.25	2.51	-2.13	2.33
2,331.00	32.44	359.18	2,144.97	717.51	15.65	717.67	5.17	-5.13	-1.07
2,361.00	31.08	358.94	2,170.47	733.29	15.39	733.45	4.55	-4.53	-0.80
2,391.00	30.25	357.92	2,196.28	748.59	14.98	748.72	3.27	-2.77	-3.40
2,421.00	29.97	357.07	2,222.23	763.62	14.32	763.74	1.70	-0.93	-2.83
2,451.00	29.29	357.35	2,248.31	778.44	13.60	778.53	2.31	-2.27	0.93
2,481.00	28.14	355.67	2,274.62	792.82	12.72	792.88	4.68	-3.83	-5.60
2,511.00	27.32	354.62	2,301.17	806.73	11.54	806.76	3.18	-2.73	-3.50
2,541.00	27.13	353.97	2,327.85	820.39	10.18	820.37	1.18	-0.63	-2.17
2,571.00	29.03	355.52	2,354.32	834.45	8.89	834.40	6.78	6.33	5.17
2,601.00	28.62	356.15	2,380.60	848.87	7.84	848.79	1.70	-1.37	2.10
2,631.00	27.87	357.11	2,407.03	863.05	7.01	862.93	2.92	-2.50	3.20
2,661.00	27.12	357.47	2,433.64	876.88	6.35	876.75	2.56	-2.50	1.20
Survey @ 2661.00 MD 2433.64 TVD									
2,726.00	26.50	358.00	2,491.65	906.18	5.19	906.00	1.02	-0.95	0.82
Survey projected to 2726.00 MD 2491.65 TVD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
471.00	470.97	-3.13	3.81	MWD surveys
2,661.00	2,433.64	876.88	6.35	Survey @ 2661.00 MD 2433.64 TVD
2,726.00	2,491.65	906.18	5.19	Survey projected to 2726.00 MD 2491.65 TVD

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Survey Report - Geographic



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 147
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Lincoln County, West Virginia UTM83		
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	E.J. May				
Site Position:		Northing:	4,232,693.00 m	Latitude:	38° 14' 17.9765 N
From:	Map	Easting:	416,089.00 m	Longitude:	81° 57' 31.8099 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 147					
Well Position	+N/-S	0.00 ft	Northing:	4,232,516.00 m	Latitude:	38° 14' 12.0413 N
	+E/-W	0.00 ft	Easting:	415,516.00 m	Longitude:	81° 57' 55.3021 W
Position Uncertainty	0.00 ft		Wellhead Elevation:	ft	Ground Level:	840.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	HDGM	4/8/2019	(°) -8.37	(°) 65.52	(nT) 51,421.70000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.00	0.00	0.00	1.50	

Survey Program	Date	5/23/2019			
From	To	Survey (Wellbore)	Tool Name	Description	
(ft)	(ft)				
471.00	2,661.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	
2,726.00	2,726.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

Survey										
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Map	Map	Latitude	Longitude	
Depth	(°)	(°)	Depth	(ft)	(ft)	Northing	Easting			
(ft)			(ft)			(m)	(m)			
0.00	0.00	0.00	0.00	0.00	0.00	4,232,516.00	415,516.00	38° 14' 12.0413 N	81° 57' 55.3021 W	
471.00	1.20	129.35	470.97	-3.13	3.81	4,232,515.05	415,517.16	38° 14' 12.0108 N	81° 57' 55.2539 W	
MWD surveys										
501.00	1.70	129.18	500.96	-3.61	4.40	4,232,514.91	415,517.34	38° 14' 12.0061 N	81° 57' 55.2464 W	
531.00	1.65	106.10	530.94	-4.01	5.16	4,232,514.78	415,517.57	38° 14' 12.0022 N	81° 57' 55.2369 W	
561.00	1.89	49.11	560.93	-3.80	5.95	4,232,514.85	415,517.81	38° 14' 12.0043 N	81° 57' 55.2270 W	
591.00	3.05	20.89	590.90	-2.73	6.61	4,232,515.17	415,518.01	38° 14' 12.0150 N	81° 57' 55.2189 W	
621.00	4.00	5.67	620.85	-0.95	7.00	4,232,515.72	415,518.13	38° 14' 12.0327 N	81° 57' 55.2142 W	
651.00	5.36	358.24	650.75	1.49	7.06	4,232,516.46	415,518.15	38° 14' 12.0568 N	81° 57' 55.2138 W	
681.00	6.42	355.71	680.59	4.57	6.89	4,232,517.40	415,518.10	38° 14' 12.0872 N	81° 57' 55.2163 W	
711.00	7.10	353.09	710.38	8.08	6.54	4,232,518.47	415,517.99	38° 14' 12.1219 N	81° 57' 55.2212 W	

Survey Report - Geographic



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Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude
741.00	8.12	352.01	740.11	12.02	6.02	4,232,519.67	415,517.84	38° 14' 12.1608 N	81° 57' 55.2282 W
771.00	9.30	350.53	769.77	16.51	5.33	4,232,521.04	415,517.62	38° 14' 12.2051 N	81° 57' 55.2374 W
801.00	10.74	351.21	799.31	21.66	4.50	4,232,522.61	415,517.37	38° 14' 12.2560 N	81° 57' 55.2485 W
831.00	11.47	352.83	828.75	27.38	3.70	4,232,524.35	415,517.13	38° 14' 12.3125 N	81° 57' 55.2592 W
861.00	12.31	353.58	858.10	33.52	2.97	4,232,526.22	415,516.91	38° 14' 12.3731 N	81° 57' 55.2692 W
891.00	13.07	355.35	887.37	40.08	2.34	4,232,528.22	415,516.71	38° 14' 12.4379 N	81° 57' 55.2780 W
921.00	14.25	355.28	916.52	47.14	1.76	4,232,530.37	415,516.54	38° 14' 12.5076 N	81° 57' 55.2882 W
951.00	14.88	354.33	945.56	54.65	1.08	4,232,532.66	415,516.33	38° 14' 12.5819 N	81° 57' 55.2957 W
981.00	15.60	354.74	974.50	62.50	0.33	4,232,535.06	415,516.10	38° 14' 12.6594 N	81° 57' 55.3062 W
1,011.00	16.12	356.64	1,003.36	70.68	-0.29	4,232,537.55	415,515.91	38° 14' 12.7402 N	81° 57' 55.3149 W
1,041.00	16.74	358.48	1,032.14	79.16	-0.64	4,232,540.13	415,515.80	38° 14' 12.8239 N	81° 57' 55.3205 W
1,071.00	17.51	0.47	1,060.81	87.99	-0.72	4,232,542.82	415,515.78	38° 14' 12.9113 N	81° 57' 55.3227 W
1,101.00	18.57	0.87	1,089.33	97.28	-0.61	4,232,545.65	415,515.81	38° 14' 13.0031 N	81° 57' 55.3225 W
1,131.00	19.50	1.57	1,117.69	107.06	-0.40	4,232,548.64	415,515.88	38° 14' 13.0999 N	81° 57' 55.3211 W
1,161.00	20.29	1.75	1,145.90	117.26	-0.11	4,232,551.75	415,515.97	38° 14' 13.2008 N	81° 57' 55.3188 W
1,191.00	20.93	3.01	1,173.98	127.81	0.33	4,232,554.96	415,516.10	38° 14' 13.3052 N	81° 57' 55.3146 W
1,221.00	21.58	3.71	1,201.94	138.67	0.97	4,232,558.27	415,516.30	38° 14' 13.4126 N	81° 57' 55.3080 W
1,251.00	21.93	3.29	1,229.80	149.77	1.65	4,232,561.65	415,516.50	38° 14' 13.5224 N	81° 57' 55.3010 W
1,281.00	22.60	2.84	1,257.57	161.12	2.26	4,232,565.11	415,516.69	38° 14' 13.6347 N	81° 57' 55.2949 W
1,311.00	23.77	1.82	1,285.14	172.92	2.74	4,232,568.71	415,516.83	38° 14' 13.7514 N	81° 57' 55.2904 W
1,341.00	25.06	2.24	1,312.46	185.31	3.18	4,232,572.49	415,516.97	38° 14' 13.8740 N	81° 57' 55.2865 W
1,371.00	25.59	2.20	1,339.58	198.14	3.67	4,232,576.40	415,517.12	38° 14' 14.0008 N	81° 57' 55.2820 W
1,401.00	25.41	2.10	1,366.65	211.04	4.16	4,232,580.33	415,517.27	38° 14' 14.1285 N	81° 57' 55.2776 W
1,431.00	25.67	1.82	1,393.72	223.97	4.60	4,232,584.27	415,517.40	38° 14' 14.2564 N	81° 57' 55.2737 W
1,461.00	26.80	1.25	1,420.63	237.22	4.95	4,232,588.31	415,517.51	38° 14' 14.3875 N	81° 57' 55.2710 W
1,491.00	27.84	2.02	1,447.28	250.99	5.35	4,232,592.51	415,517.63	38° 14' 14.5236 N	81° 57' 55.2679 W
1,521.00	28.96	2.46	1,473.67	265.24	5.91	4,232,596.85	415,517.80	38° 14' 14.6646 N	81° 57' 55.2627 W
1,551.00	30.13	2.31	1,499.77	280.03	6.52	4,232,601.36	415,517.99	38° 14' 14.8109 N	81° 57' 55.2569 W
1,581.00	31.06	1.92	1,525.60	295.28	7.08	4,232,606.01	415,518.16	38° 14' 14.9618 N	81° 57' 55.2519 W
1,611.00	31.23	0.93	1,551.27	310.79	7.47	4,232,610.73	415,518.28	38° 14' 15.1152 N	81° 57' 55.2491 W
1,641.00	31.92	0.85	1,576.83	326.50	7.71	4,232,615.52	415,518.35	38° 14' 15.2705 N	81° 57' 55.2481 W
1,671.00	33.12	1.50	1,602.13	342.62	8.05	4,232,620.44	415,518.45	38° 14' 15.4300 N	81° 57' 55.2460 W
1,701.00	34.16	1.48	1,627.10	359.24	8.48	4,232,625.50	415,518.58	38° 14' 15.5943 N	81° 57' 55.2428 W
1,731.00	34.04	0.76	1,651.94	376.05	8.81	4,232,630.63	415,518.68	38° 14' 15.7606 N	81° 57' 55.2409 W
1,761.00	34.02	0.46	1,676.81	392.84	8.99	4,232,635.74	415,518.74	38° 14' 15.9266 N	81° 57' 55.2408 W
1,791.00	33.75	359.53	1,701.71	409.57	8.98	4,232,640.84	415,518.74	38° 14' 16.0920 N	81° 57' 55.2430 W
1,821.00	33.84	359.40	1,726.64	426.25	8.83	4,232,645.93	415,518.69	38° 14' 16.2570 N	81° 57' 55.2471 W
1,851.00	34.89	0.18	1,751.40	443.19	8.77	4,232,651.09	415,518.67	38° 14' 16.4244 N	81° 57' 55.2501 W
1,881.00	36.03	0.30	1,775.84	460.59	8.84	4,232,656.39	415,518.69	38° 14' 16.5965 N	81° 57' 55.2515 W
1,911.00	37.04	1.38	1,799.94	478.45	9.11	4,232,661.84	415,518.77	38° 14' 16.7731 N	81° 57' 55.2505 W
1,941.00	37.35	2.01	1,823.84	496.57	9.64	4,232,667.36	415,518.94	38° 14' 16.9524 N	81° 57' 55.2461 W
1,971.00	36.33	2.82	1,847.85	514.55	10.40	4,232,672.84	415,519.17	38° 14' 17.1302 N	81° 57' 55.2390 W
2,001.00	35.64	3.87	1,872.13	532.14	11.43	4,232,678.20	415,519.48	38° 14' 17.3043 N	81° 57' 55.2284 W
2,031.00	35.59	4.20	1,896.52	549.57	12.65	4,232,683.51	415,519.86	38° 14' 17.4767 N	81° 57' 55.2153 W
2,061.00	35.80	4.81	1,920.88	567.02	14.03	4,232,688.83	415,520.28	38° 14' 17.6494 N	81° 57' 55.2003 W
2,091.00	34.68	3.80	1,945.38	584.28	15.33	4,232,694.09	415,520.67	38° 14' 17.8202 N	81° 57' 55.1863 W
2,121.00	33.45	2.35	1,970.23	601.06	16.24	4,232,699.21	415,520.95	38° 14' 17.9862 N	81° 57' 55.1771 W
2,151.00	32.83	0.60	1,995.35	617.45	16.66	4,232,704.20	415,521.08	38° 14' 18.1483 N	81° 57' 55.1740 W
2,181.00	33.10	359.56	2,020.52	633.77	16.68	4,232,709.18	415,521.08	38° 14' 18.3097 N	81° 57' 55.1758 W
2,211.00	33.96	359.79	2,045.53	650.34	16.59	4,232,714.23	415,521.06	38° 14' 18.4736 N	81° 57' 55.1792 W
2,241.00	34.36	359.03	2,070.36	667.19	16.42	4,232,719.36	415,521.00	38° 14' 18.6401 N	81° 57' 55.1835 W
2,271.00	34.62	358.80	2,095.08	684.17	16.09	4,232,724.54	415,520.90	38° 14' 18.8080 N	81° 57' 55.1898 W
2,301.00	33.98	359.50	2,119.87	701.08	15.84	4,232,729.69	415,520.83	38° 14' 18.9751 N	81° 57' 55.1952 W
2,331.00	32.44	359.18	2,144.97	717.51	15.65	4,232,734.70	415,520.77	38° 14' 19.1375 N	81° 57' 55.1997 W
2,361.00	31.08	358.94	2,170.47	733.29	15.39	4,232,739.51	415,520.69	38° 14' 19.2936 N	81° 57' 55.2050 W

Survey Report - Geographic



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 147
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Site:	E.J. May	MD Reference:	RKB=840+8 @ 848.00ft (Noah Horn 777)
Well:	E.J. May No. 147	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude
2,391.00	30.25	357.92	2,196.28	748.59	14.98	4,232,744.17	415,520.56	38° 14' 19.4448 N	81° 57' 55.2122 W
2,421.00	29.97	357.07	2,222.23	763.62	14.32	4,232,748.76	415,520.36	38° 14' 19.5934 N	81° 57' 55.2224 W
2,451.00	29.29	357.35	2,248.31	778.44	13.60	4,232,753.27	415,520.14	38° 14' 19.7398 N	81° 57' 55.2334 W
2,481.00	28.14	355.67	2,274.62	792.82	12.72	4,232,757.66	415,519.88	38° 14' 19.8820 N	81° 57' 55.2462 W
2,511.00	27.32	354.62	2,301.17	806.73	11.54	4,232,761.90	415,519.52	38° 14' 20.0194 N	81° 57' 55.2628 W
2,541.00	27.13	353.97	2,327.85	820.39	10.18	4,232,766.06	415,519.10	38° 14' 20.1543 N	81° 57' 55.2817 W
2,571.00	29.03	355.52	2,354.32	834.45	8.89	4,232,770.34	415,518.71	38° 14' 20.2932 N	81° 57' 55.2997 W
2,601.00	28.62	356.15	2,380.60	848.87	7.84	4,232,774.74	415,518.39	38° 14' 20.4357 N	81° 57' 55.3148 W
2,631.00	27.87	357.11	2,407.03	863.05	7.01	4,232,779.06	415,518.13	38° 14' 20.5757 N	81° 57' 55.3271 W
2,661.00	27.12	357.47	2,433.64	876.88	6.35	4,232,783.28	415,517.94	38° 14' 20.7125 N	81° 57' 55.3371 W
Survey @ 2661.00 MD 2433.64 TVD									
2,726.00	26.50	358.00	2,491.65	906.18	5.19	4,232,792.21	415,517.58	38° 14' 21.0020 N	81° 57' 55.3555 W
Survey projected to 2726.00 MD 2491.65 TVD									

Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
471.00	470.97	-3.13	3.81	MWD surveys
2,661.00	2,433.64	876.88	6.35	Survey @ 2661.00 MD 2433.64 TVD
2,726.00	2,491.65	906.18	5.19	Survey projected to 2726.00 MD 2491.65 TVD

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Environmental Protection

HG Energy LLC

Lincoln County, West Virginia UTM83

E.J. May

E.J. May No. 147

Original Hole

Design: Surveys Original Hole

Completion Report

23 May, 2019



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WV Department of
Environmental Protection



Completion Report

Company: HG Energy LLC Project: Lincoln County, West Virginia UTM83 Site: E.J. May Well: E.J. May No. 147 Wellbore: Original Hole Design: Surveys Original Hole	Local Co-ordinate Reference: TVD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777) MD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777) North Reference: Grid Survey Calculation Method: Minimum Curvature Database: DB_Jul2216ct_v14	Well E.J. May No. 147 RKB=840+8 @ 848.00ft (Noah Horn 777) RKB=840+8 @ 848.00ft (Noah Horn 777) Grid Minimum Curvature DB_Jul2216ct_v14
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Project Lincoln County, West Virginia UTM83	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 E.J. May	Northing: 4,232,693.00 m	Latitude: 38° 14' 17.9765 N
Site Position: Map	Easting: 416,089.00 m	Longitude: 81° 57' 31.8099 W
Position Uncertainty: 0.00 ft	Slot Radius: 13-3/16 "	Grid Convergence: -0.59 °

Well E.J. May No. 147	Northing: 4,232,516.00 m	Latitude: 38° 14' 12.0413 N
Well Position +N/-S 0.00 ft	Easting: 415,516.00 m	Longitude: 81° 57' 55.3021 W
Position Uncertainty +E/-W 0.00 ft	Wellhead Elevation: ft	Ground Level: 840.00 ft

Wellbore Original Hole	Model Name HDGM	Sample Date 4/8/2019	Declination (°) -8.37	Dip Angle (°) 65.52	Field Strength (nT) 51,421,700,000,000
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Design Surveys Original Hole	Version: 1.0	Phase: ACTUAL	Tie On Depth: 0.00
Audit Notes:	Depth From (TVD) (ft) 0.00	+N/-S (ft) 0.00	+E/-W (ft) 0.00
Vertical Section:		Direction (°) 1.50	

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Completion Report

Company: HG Energy LLC
Project: Lincoln County, West Virginia UTM83
Site: E.J. May
Well: E.J. May No. 147
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference:
TVD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
MD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul2216dt_v14

Well E.J. May No. 147
 RKB=840+8 @ 848.00ft (Noah Horn 777)
 RKB=840+8 @ 848.00ft (Noah Horn 777)
 Grid
 Minimum Curvature
 DB_Jul2216dt_v14

Survey Program	From (ft)	To (ft)	Date	Survey (Wellbore)	Tool Name	Description
	471.00	2,661.00	5/23/2019	MWD (Original Hole)	MWD	OWSG MWD - Standard
	2,726.00	2,726.00		Projection (Original Hole)	MWD	OWSG MWD - Standard

Survey	MD (ft)	Inc (°)	Azi (azimuth) (°)	TVD (ft)	DLeg (°/100usft)	N/S (ft)	E/W (ft)	Closure Distance (ft)	Closure Azimuth (°)	Northing (m)	Easting (m)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,232,516.00	415,516.00
	471.00	1.20	129.35	470.97	0.25	-3.13	3.81	4.93	129.35	4,232,515.05	415,517.16
MWD surveys	501.00	1.70	129.18	500.96	1.67	-3.61	4.40	5.69	129.34	4,232,514.90	415,517.34
	531.00	1.65	106.10	530.94	2.24	-4.01	5.16	6.54	127.83	4,232,514.78	415,517.57
	561.00	1.89	49.11	560.93	5.67	-3.80	5.95	7.06	122.59	4,232,514.84	415,517.81
	591.00	3.05	20.89	590.90	5.49	-2.73	6.61	7.15	112.48	4,232,515.17	415,518.01
	621.00	4.00	5.67	620.85	4.42	-0.95	7.00	7.06	97.71	4,232,515.71	415,518.13
	651.00	5.36	358.24	650.75	4.95	1.49	7.06	7.21	78.05	4,232,516.46	415,518.15
	681.00	6.42	355.71	680.59	3.64	4.57	6.89	8.27	56.46	4,232,517.39	415,518.10
	711.00	7.10	353.09	710.38	2.49	8.08	6.54	10.40	38.99	4,232,518.46	415,517.99
	741.00	8.12	352.01	740.11	3.43	12.02	6.02	13.44	26.62	4,232,519.66	415,517.84
	771.00	9.30	350.53	769.77	4.00	16.51	5.33	17.35	17.89	4,232,521.03	415,517.62
	801.00	10.74	351.21	799.31	4.82	21.66	4.50	22.13	11.74	4,232,522.60	415,517.37
	831.00	11.47	352.83	828.75	2.65	27.38	3.70	27.63	7.70	4,232,524.35	415,517.13
	861.00	12.31	353.58	858.10	2.85	33.52	2.97	33.65	5.07	4,232,526.22	415,516.91
	891.00	13.07	355.35	887.37	2.85	40.08	2.34	40.15	3.34	4,232,528.22	415,516.71
	921.00	14.00	355.28	916.52	3.93	47.14	1.76	47.17	2.14	4,232,530.37	415,516.54
	951.00	14.00	354.33	945.56	2.25	54.85	1.08	54.67	1.13	4,232,532.66	415,516.33
	981.00	15.00	352.74	974.50	2.43	62.50	0.33	62.51	0.30	4,232,535.05	415,516.10
	1,011.00	16.00	352.64	1,003.36	2.45	70.68	-0.29	70.68	359.77	4,232,537.54	415,515.91

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Completion Report

Company: HG Energy LLC
Project: Lincoln County, West Virginia UTM83
Site: E.J. May
Well: E.J. May No. 147
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well E.J. May No. 147
TVD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
MD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul22160ft_v14

MD (ft)	Inc (°)	Azi (azimuth) (°)	TVD (ft)	DLeg (°/100usft)	N/S (ft)	E/W (ft)	Closure Distance (ft)	Closure Azimuth (°)	Northing (m)	Easting (m)
1,041.00	16.74	358.48	1,032.14	2.70	79.16	-0.64	79.16	359.53	4,232,540.13	415,515.80
1,071.00	17.51	0.47	1,060.81	3.23	87.99	-0.72	87.99	359.53	4,232,542.82	415,515.78
1,101.00	18.57	0.87	1,089.33	3.56	97.28	-0.61	97.28	359.64	4,232,545.65	415,515.81
1,131.00	19.50	1.57	1,117.69	3.19	107.06	-0.40	107.06	359.78	4,232,548.63	415,515.88
1,161.00	20.29	1.75	1,145.90	2.84	117.26	-0.11	117.26	359.95	4,232,551.74	415,515.97
1,191.00	20.93	3.01	1,173.98	2.60	127.81	0.33	127.81	0.15	4,232,554.96	415,516.10
1,221.00	21.58	3.71	1,201.94	2.33	138.67	0.97	138.67	0.40	4,232,558.27	415,516.30
1,251.00	21.93	3.29	1,229.80	1.28	149.77	1.65	149.78	0.63	4,232,561.65	415,516.50
1,281.00	22.60	2.84	1,257.57	2.30	161.12	2.26	161.14	0.80	4,232,565.11	415,516.69
1,311.00	23.77	1.82	1,285.14	4.12	172.92	2.74	172.94	0.91	4,232,568.71	415,516.83
1,341.00	25.06	2.24	1,312.46	4.34	185.31	3.18	185.34	0.98	4,232,572.48	415,516.97
1,371.00	25.59	2.20	1,339.58	1.77	198.14	3.67	198.17	1.06	4,232,576.39	415,517.12
1,401.00	25.41	2.10	1,366.65	0.82	211.04	4.16	211.08	1.13	4,232,580.33	415,517.27
1,431.00	25.67	1.82	1,393.72	0.96	223.97	4.60	224.02	1.18	4,232,584.27	415,517.40
1,461.00	26.80	1.25	1,420.63	3.86	237.22	4.95	237.28	1.20	4,232,588.31	415,517.51
1,491.00	27.84	2.02	1,447.28	3.66	250.99	5.35	251.04	1.22	4,232,592.50	415,517.63
1,521.00	28.96	2.46	1,473.67	3.80	265.24	5.91	265.31	1.28	4,232,596.85	415,517.80
1,551.00	30.13	2.31	1,499.77	3.91	280.03	6.52	280.10	1.33	4,232,601.35	415,517.99
1,581.00	31.06	1.92	1,525.60	3.17	295.28	7.08	295.37	1.37	4,232,606.00	415,518.16
1,611.00	31.23	0.93	1,551.27	1.80	310.79	7.47	310.88	1.38	4,232,610.73	415,518.28
1,641.00	31.92	0.85	1,576.83	2.30	326.50	7.71	326.59	1.35	4,232,615.52	415,518.35
1,671.00	33.12	1.50	1,602.13	4.17	342.62	8.05	342.72	1.35	4,232,620.43	415,518.45
1,701.00	34.16	1.48	1,627.10	3.47	359.24	8.48	359.34	1.35	4,232,625.50	415,518.58
1,731.00	34.76	0.76	1,651.94	1.40	376.05	8.81	376.16	1.34	4,232,630.62	415,518.68
1,761.00	34.46	0.46	1,676.81	0.56	392.84	8.99	392.94	1.31	4,232,635.74	415,518.74
1,791.00	33.33	0.33	1,701.71	1.95	409.57	8.98	409.67	1.26	4,232,640.84	415,518.74
1,821.00	33.40	0.40	1,726.64	0.38	426.25	8.83	426.34	1.19	4,232,645.92	415,518.69

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Completion Report



Well E.J. May No. 147
 RKB=840+8 @ 848.00ft (Noah Horn 777)
 RKB=840+8 @ 848.00ft (Noah Horn 777)
 Grid
 Minimum Curvature
 DB_Jul2216dt_v14

Local Co-ordinate Reference:
 TVD Reference:
 MD Reference:
 North Reference:
 Survey Calculation Method:
 Database:

HG Energy LLC
 Lincoln County, West Virginia UTM83
 E.J. May
 E.J. May No. 147
 Original Hole
 Surveys Original Hole

MD (ft)	Inc (°)	Azi (azimuth) (°)	TVD (ft)	DLeg (°/100usft)	N/S (ft)	E/W (ft)	Closure Distance (ft)	Closure Azimuth (°)	Northing (m)	Easting (m)
1,851.00	34.89	0.18	1,751.40	3.80	443.19	8.77	443.27	1.13	4,232,651.08	415,518.67
1,881.00	36.03	0.30	1,775.84	3.81	460.59	8.84	460.67	1.10	4,232,656.39	415,518.69
1,911.00	37.04	1.38	1,799.94	3.99	478.45	9.11	478.53	1.09	4,232,661.83	415,518.78
1,941.00	37.35	2.01	1,823.84	1.64	496.57	9.64	496.67	1.11	4,232,667.36	415,518.94
1,971.00	36.33	2.82	1,847.85	3.77	514.55	10.40	514.65	1.16	4,232,672.83	415,519.17
2,001.00	35.64	3.87	1,872.13	3.09	532.14	11.43	532.26	1.23	4,232,678.20	415,519.48
2,031.00	35.59	4.20	1,896.52	0.66	549.57	12.65	549.71	1.32	4,232,683.51	415,519.86
2,061.00	35.80	4.81	1,920.88	1.38	567.02	14.03	567.19	1.42	4,232,688.83	415,520.28
2,091.00	34.68	3.80	1,945.38	4.21	584.28	15.33	584.48	1.50	4,232,694.09	415,520.67
2,121.00	33.45	2.35	1,970.23	4.91	601.06	16.24	601.28	1.55	4,232,699.20	415,520.95
2,151.00	32.83	0.60	1,995.35	3.80	617.45	16.66	617.67	1.55	4,232,704.20	415,521.08
2,181.00	33.10	359.56	2,020.52	2.09	633.77	16.68	633.99	1.51	4,232,709.17	415,521.08
2,211.00	33.96	359.79	2,045.53	2.90	650.34	16.59	650.56	1.48	4,232,714.22	415,521.06
2,241.00	34.36	359.03	2,070.36	1.95	667.19	16.42	667.39	1.41	4,232,719.36	415,521.00
2,271.00	34.62	358.80	2,095.08	0.97	684.17	16.09	684.36	1.35	4,232,724.54	415,520.91
2,301.00	33.98	359.50	2,119.87	2.51	701.08	15.84	701.26	1.29	4,232,729.69	415,520.83
2,331.00	32.44	359.18	2,144.97	5.17	717.51	15.65	717.68	1.25	4,232,734.70	415,520.77
2,361.00	31.08	358.94	2,170.47	4.55	733.29	15.39	733.46	1.20	4,232,739.51	415,520.69
2,391.00	30.25	357.92	2,196.28	3.27	748.59	14.98	748.74	1.15	4,232,744.17	415,520.57
2,421.00	29.97	357.07	2,222.23	1.70	763.62	14.32	763.76	1.07	4,232,748.75	415,520.36
2,451.00	29.29	357.35	2,248.31	2.31	778.44	13.60	778.56	1.00	4,232,753.27	415,520.14
2,481.00	28.14	355.67	2,274.62	4.68	792.82	12.72	792.93	0.92	4,232,757.65	415,519.88
2,511.00	27.32	354.62	2,301.17	3.18	806.73	11.54	806.81	0.82	4,232,761.89	415,519.52
2,541.00	27.13	353.97	2,327.85	1.18	820.39	10.18	820.45	0.71	4,232,766.05	415,519.10
2,571.00	29.03	355.02	2,354.32	6.78	834.45	8.89	834.50	0.61	4,232,770.34	415,518.71
2,601.00	28.62	356.05	2,380.60	1.70	848.87	7.84	848.91	0.53	4,232,774.74	415,518.39
2,631.00	27.87	357.07	2,407.03	2.82	863.05	7.01	863.08	0.47	4,232,778.06	415,518.14

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Completion Report

Company: HG Energy LLC
Project: Lincoln County, West Virginia UTM83
Site: E.J. May
Well: E.J. May No. 147
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well E.J. May No. 147
TVD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
MD Reference: RKB=840+8 @ 848.00ft (Noah Horn 777)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Jul2216ct_v14

MD (ft)	Inc (°)	Azi (azimuth) (°)	TVD (ft)	DLeg (°/100ust)	N/S (ft)	E/W (ft)	Closure Distance (ft)	Closure Azimuth (°)	Northing (m)	Easting (m)
2,661.00	27.12	357.47	2,433.64	2.56	876.88	6.35	876.90	0.41	4,232,783.27	415,517.94
Survey @ 2661.00 MD 2433.64 TVD										
2,726.00	26.50	358.00	2,491.65	1.02	906.18	5.19	906.19	0.33	4,232,792.20	415,517.58
Survey projected to 2726.00 MD 2491.65 TVD										

Design Annotations	Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
	471.00	470.97	-3.13	3.81	MWD surveys
	2,661.00	2,433.64	876.88	6.35	Survey @ 2661.00 MD 2433.64 TVD
	2,726.00	2,491.65	906.18	5.19	Survey projected to 2726.00 MD 2491.65 TVD

Checked By: _____ Date: _____

Approved By: _____

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