

12/28/2018



**EJ May 149
Lincoln County, WV
Noah Horn 294 Rig**

September 13, 2018

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Office of Oil and Gas

Survey Certification Report SEP 27 2018

WV Department of
Environmental Protection

12/28/2018



PRODIRECTIONAL

Survey Certification Letter

September 13, 2018

HG Energy

Operator Name: HG Energy
Well Name: EJ May 149
County/Parish: Lincoln County
State: WV
Rig Name: Noah Horn 294
Job Number: LWV3111818

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	507'MD – 2,697'MD	2,762'MD	09/07/18 – 09/09/18	MWD-OWSG

Sincerely,

John Jordan
Well Planning Analyst
Professional Directional

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Office of Oil and Gas

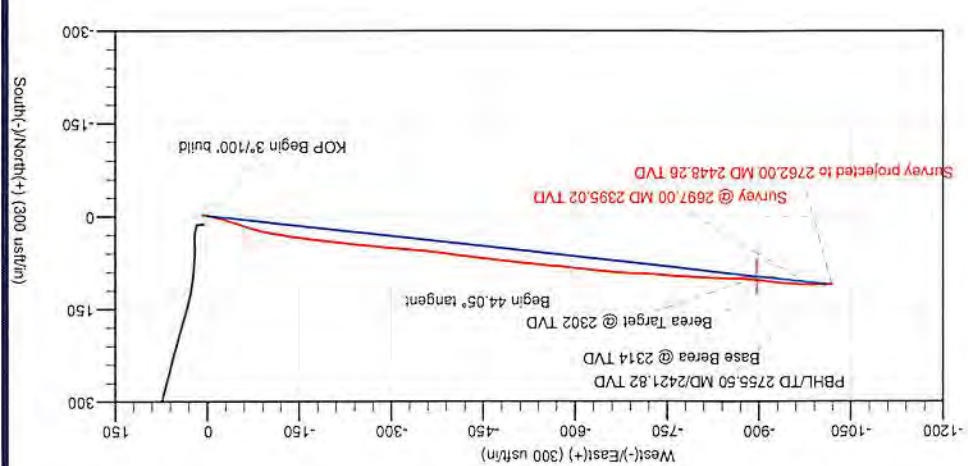
SEP 27 2018

WV Department of
Environmental Protection

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

prodirectional.com

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Environmental Protection
PRODIRECTIONAL



Total Correction (M->T): To convert a Magnetic Direction to a True Direction, Subtract 8.35°

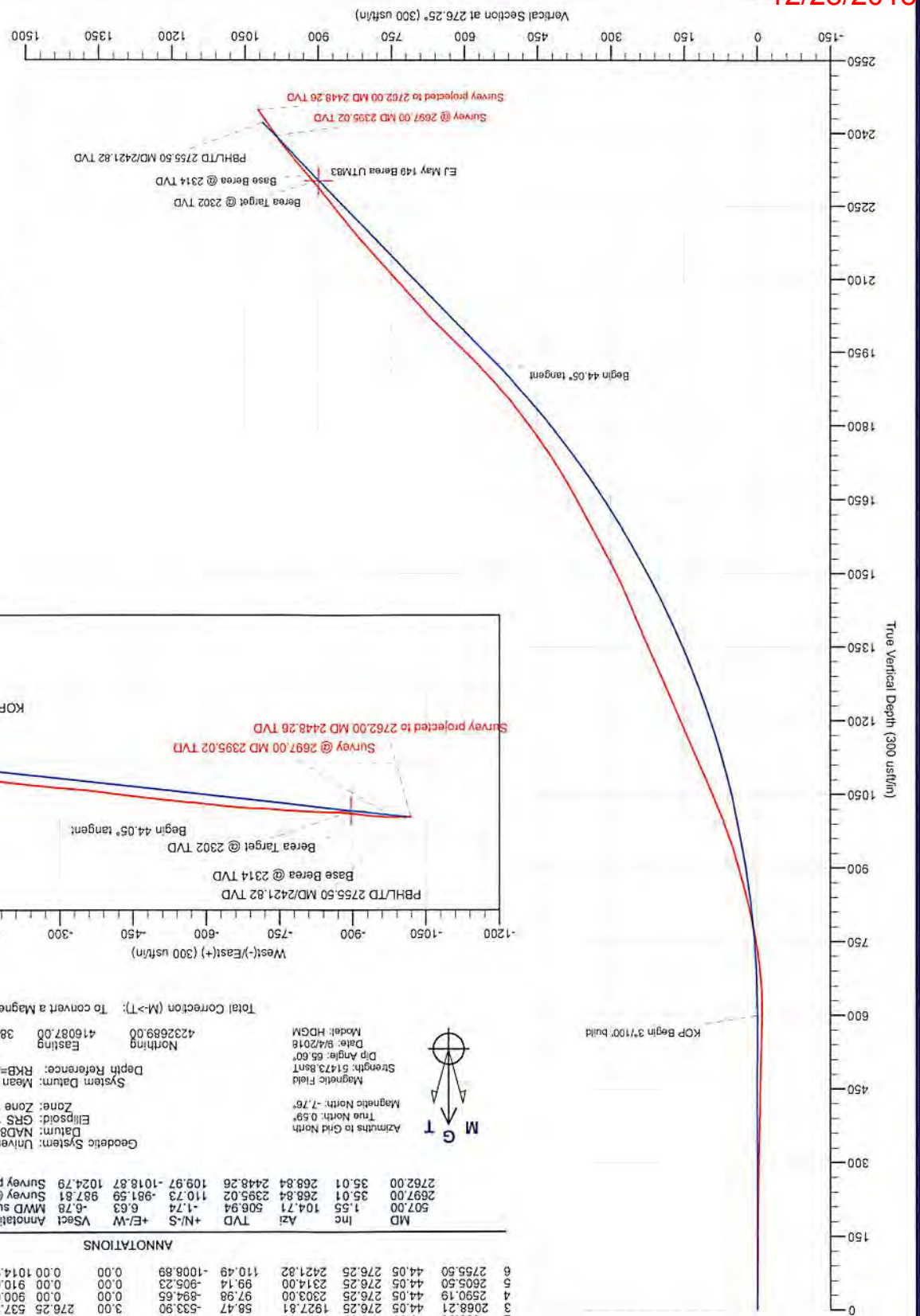
Geodetic System: Universal Transverse Mercator	System Datum: Mean Sea Level	Depth Reference: RKB=804+6 @ 810.00usft	Northings	432689.00	Easting	416087.00	Latitude	38° 14' 17.8481 N	Longitude	81° 57' 31.8904 W
Datum: NAD83 West Virginia - HARN	Ellipsoid: GRS 1980	Zone: Zone 17N (64 W to 78 W)	MWD surveys	6.78	987.81	1024.79	Survey @ 2697.00 MD 2395.02 TVD	Survey projected to 2762.00 MD 2448.26 TVD		
Mag North: 0.59°	Magnetic North: -7.76°	Magnetic Field	507.00	1.55	104.71	506.94	-1.74	6.63	-6.78	
True North: 0.59°	Mag North: -7.76°	Dip Angle: 65.60°	2697.00	35.01	268.84	2395.02	110.73	-981.59	987.81	
Strength: 51473.8ant	Model: HDGM	Date: 8/4/2018	2762.00	35.01	268.84	2448.26	109.97	-1018.87	1024.79	

Sec	MD	Inc	Azi	TVD	+N/S	+E/W	Vsect	Annotations
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 37100' build
2	600.00	0.00	0.00	600.00	0.00	0.00	0.00	Begin 44.05° tangent
3	2068.21	44.05	1927.81	1927.81	0.00	0.00	0.00	Bere Target @ 2302 TVD
4	2390.19	44.05	2303.00	2303.00	0.00	0.00	0.00	Base Berea @ 2314 TVD
5	2505.50	44.05	2314.00	2314.00	99.14	-906.23	0.00	
6	2755.50	44.05	2762.25	2421.82	110.49	-1008.89	0.00	PBH/LTD 2755.50 MD/2421.82 TVD

Section Details

Well: E.J. May No. 149
Site: E.J. May
Project: Lincoln County, West Virginia UTM83
Design: plan2
Rig:

HG Energy LLC





Survey Report

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	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 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 149					
Well Position	+N/-S	0.00 usft	Northing:	4,232,689.00 m	Latitude:	38° 14' 17.8461 N
	+E/-W	0.00 usft	Easting:	416,087.00 m	Longitude:	81° 57' 31.8904 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	804.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	276.25	

Survey Program	Date	9/9/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
507.00	2,697.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	RECEIVED Office of Oil and Gas SEP 27 2018
2,762.00	2,762.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

Survey	WV Department of Environmental Protection									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
507.00	1.55	104.71	506.94	-1.74	6.63	-6.78	0.31	0.31	0.00	
MWD surveys										
537.00	1.51	100.02	536.93	-1.91	7.41	-7.58	0.44	-0.13	-15.63	
567.00	1.60	94.49	566.92	-2.01	8.22	-8.39	0.58	0.30	-18.43	
597.00	0.51	62.77	596.91	-1.99	8.76	-8.92	3.99	-3.63	-105.73	
627.00	1.27	281.36	626.91	-1.86	8.55	-8.70	5.66	2.53	-471.37	
657.00	3.18	273.26	656.89	-1.75	7.39	-7.54	6.44	6.37	-27.00	
687.00	5.42	278.67	686.80	-1.49	5.16	-5.29	7.58	7.47	18.03	
717.00	7.59	280.74	716.60	-0.90	1.81	-1.90	7.27	7.23	6.90	

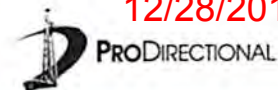


Survey Report

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Buld Rate (°/100usft)	Turn Rate (°/100usft)
747.00	9.50	282.82	746.27	0.02	-2.55	2.53	6.45	6.37	6.93
777.00	10.87	283.18	775.80	1.21	-7.72	7.80	4.57	4.57	1.20
807.00	12.10	283.39	805.19	2.58	-13.53	13.73	4.10	4.10	0.70
837.00	13.96	285.01	834.42	4.25	-20.08	20.43	6.32	6.20	5.40
867.00	15.08	286.24	863.46	6.28	-27.33	27.85	3.87	3.73	4.10
897.00	16.54	287.51	892.33	8.65	-35.15	35.88	5.00	4.87	4.23
927.00	17.92	288.25	920.98	11.38	-43.60	44.58	4.66	4.60	2.47
957.00	19.51	288.39	949.39	14.41	-52.74	53.99	5.30	5.30	0.47
987.00	20.56	287.66	977.58	17.59	-62.51	64.06	3.60	3.50	-2.43
1,017.00	21.37	286.17	1,005.59	20.71	-72.78	74.60	3.23	2.70	-4.97
1,047.00	22.70	283.94	1,033.40	23.63	-83.65	85.72	5.24	4.43	-7.43
1,077.00	23.59	281.63	1,060.99	26.23	-95.15	97.44	4.24	2.97	-7.70
1,107.00	23.95	280.53	1,088.44	28.55	-107.01	109.49	1.90	1.20	-3.67
1,137.00	23.90	280.76	1,115.86	30.80	-118.97	121.62	0.35	-0.17	0.77
1,167.00	23.76	279.30	1,143.31	32.91	-130.91	133.71	2.02	-0.47	-4.87
1,197.00	23.30	276.88	1,170.81	34.60	-142.76	145.68	3.57	-1.53	-8.07
1,227.00	23.25	276.54	1,198.37	35.98	-154.53	157.53	0.48	-0.17	-1.13
1,257.00	23.46	276.96	1,225.91	37.38	-166.34	169.43	0.89	0.70	1.40
1,287.00	23.81	276.96	1,253.40	38.84	-178.28	181.45	1.17	1.17	0.00
1,317.00	23.34	276.32	1,280.89	40.23	-190.20	193.45	1.78	-1.57	-2.13
1,347.00	23.74	276.49	1,308.40	41.56	-202.11	205.43	1.35	1.33	0.57
1,377.00	23.86	276.80	1,335.84	42.97	-214.13	217.54	0.58	0.40	1.03
1,407.00	23.42	276.58	1,363.33	44.37	-226.08	229.57	1.50	-1.47	-0.78
1,437.00	22.88	275.81	1,390.91	45.64	-237.80	241.36	2.06	-1.80	-2.57
1,467.00	23.13	276.07	1,418.52	46.85	-249.47	253.08	0.90	0.83	0.87
1,497.00	23.51	276.34	1,446.07	48.14	-261.27	264.96	1.32	1.27	0.90
1,527.00	24.96	276.14	1,473.43	49.48	-273.51	277.27	4.84	4.83	-0.67
1,557.00	26.21	276.00	1,500.49	50.85	-286.40	290.23	4.17	4.17	-0.47
1,587.00	27.70	275.23	1,527.23	52.17	-299.93	303.63	5.10	4.97	-2.57
1,617.00	28.78	275.14	1,553.66	53.46	-314.07	318.02	3.60	3.60	-0.30
1,647.00	28.85	275.01	1,579.94	54.74	-328.47	332.48	0.31	0.23	-0.43
1,677.00	28.07	274.79	1,606.32	55.96	-342.71	346.77	2.62	-2.60	-0.73
1,707.00	28.28	275.33	1,632.76	57.21	-356.82	360.93	1.10	0.70	1.80
1,737.00	29.12	276.62	1,659.08	58.71	-371.15	375.34	3.48	2.80	4.30
1,767.00	30.50	277.48	1,685.11	60.54	-385.95	390.25	4.82	4.60	2.87
1,797.00	31.83	277.32	1,710.78	62.54	-401.35	405.77	4.44	4.43	-0.53
1,827.00	33.43	276.99	1,736.04	64.55	-417.40	421.94	5.37	5.33	-1.10
1,857.00	35.21	277.02	1,760.82	66.62	-434.18	438.85	5.93	5.93	0.10
1,887.00	36.33	276.93	1,785.16	68.75	-451.59	456.39	3.74	3.73	-0.30
1,917.00	36.96	276.71	1,809.23	70.87	-469.37	474.29	2.15	2.10	-0.73
1,947.00	38.18	276.60	1,833.00	72.99	-487.54	492.58	4.07	4.07	-0.37
1,977.00	39.90	276.73	1,856.31	75.18	-506.30	511.48	5.74	5.73	0.43
2,007.00	42.08	276.16	1,878.95	77.39	-525.86	531.16	7.37	7.27	-1.90

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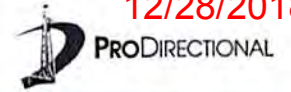
Survey Report

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,037.00	42.94	275.48	1,901.06	79.45	-546.02	551.43	3.25	2.87	-2.27
2,067.00	43.33	274.67	1,922.96	81.26	-566.45	571.93	2.26	1.30	-2.70
2,097.00	44.13	275.23	1,944.63	83.05	-587.11	592.67	2.66	2.67	1.87
2,127.00	45.53	275.91	1,965.91	85.10	-608.16	613.81	4.93	4.67	2.27
2,157.00	45.75	276.60	1,986.88	87.44	-629.48	635.26	1.80	0.73	2.30
2,187.00	44.37	275.68	2,008.08	89.71	-650.60	656.50	5.09	-4.60	-3.07
2,217.00	42.72	274.45	2,029.82	91.54	-671.18	677.16	6.18	-5.50	-4.10
2,247.00	41.07	272.31	2,052.15	92.73	-691.18	697.16	7.28	-5.50	-7.13
2,277.00	42.27	272.91	2,074.56	93.64	-711.10	717.07	4.22	4.00	2.00
2,307.00	42.76	274.05	2,096.67	94.87	-731.34	737.32	3.04	1.63	3.80
2,337.00	42.84	274.84	2,118.69	96.45	-751.66	757.69	1.81	0.27	2.63
2,367.00	42.04	273.35	2,140.83	97.90	-771.85	777.92	4.28	-2.67	-4.97
2,397.00	40.96	271.87	2,163.29	98.81	-791.70	797.76	4.86	-3.60	-4.93
2,427.00	40.50	271.33	2,186.03	99.35	-811.27	817.27	1.93	-1.53	-1.80
2,457.00	39.41	271.63	2,209.02	99.85	-830.53	836.46	3.69	-3.63	1.00
2,487.00	38.71	272.74	2,232.32	100.57	-849.42	855.32	3.30	-2.33	3.70
2,517.00	38.16	273.19	2,255.82	101.53	-868.04	873.94	2.06	-1.83	1.50
2,547.00	38.00	274.05	2,279.43	102.70	-886.51	892.42	1.85	-0.53	2.87
2,577.00	40.93	276.47	2,302.59	104.46	-905.49	911.48	11.03	9.77	8.07
2,607.00	41.52	277.00	2,325.16	106.78	-925.12	931.25	2.29	1.97	1.77
2,637.00	40.75	275.69	2,347.75	108.96	-944.74	950.98	3.85	-2.57	-4.37
2,667.00	38.11	272.99	2,370.92	110.42	-963.73	970.02	10.49	-8.80	-9.00
2,697.00	35.01	268.84	2,395.02	110.73	-981.59	987.81	13.21	-10.33	-13.83
Survey @ 2697.00 MD 2395.02 TVD									
2,762.00	35.01	268.84	2,448.26	109.97	-1,018.87	1,024.79	0.00	0.00	0.00
Survey projected to 2762.00 MD 2448.26 TVD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
507.00	506.94	-1.74	6.63	MWD surveys
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2,762.00	2,448.26	109.97	-1,018.87	Survey projected to 2762.00 MD 2448.26 TVD

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Survey Report - Geographic

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Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

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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 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 149					
Well Position	+N/-S	0.00 usft	Northing:	4,232,689.00 m	Latitude:	38° 14' 17.8461 N
	+E/-W	0.00 usft	Easting:	416,087.00 m	Longitude:	81° 57' 31.8904 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	804.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (")	Dip Angle (")	Field Strength (nT)
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (")	
	0.00	0.00	0.00	276.25	

Survey Program	Date	9/9/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	RECEIVED Office of Oil and Gas SEP 27 2018
507.00	2,697.00	MWD (Original Hole)	MWD	OWSG MWD - Standard	
2,762.00	2,762.00	Projection (Original Hole)	MWD	OWSG MWD - Standard	

										WV Department of Environmental Protection	
Survey	Measured Depth (usft)	Inclination (")	Azimuth (")	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude	
	0.00	0.00	0.00	0.00	0.00	0.00	4,232,689.00	416,087.00	38° 14' 17.8461 N	81° 57' 31.8904 W	
	507.00	1.55	104.71	506.94	-1.74	6.63	4,232,688.47	416,089.02	38° 14' 17.8295 N	81° 57' 31.8070 W	
	MWD surveys										
	537.00	1.51	100.02	536.93	-1.91	7.41	4,232,688.42	416,089.26	38° 14' 17.8279 N	81° 57' 31.7972 W	
	567.00	1.60	94.49	566.92	-2.01	8.22	4,232,688.39	416,089.51	38° 14' 17.8270 N	81° 57' 31.7871 W	
	597.00	0.51	62.77	596.91	-1.99	8.76	4,232,688.40	416,089.67	38° 14' 17.8273 N	81° 57' 31.7804 W	
	627.00	1.27	281.36	626.91	-1.86	8.55	4,232,688.44	416,089.61	38° 14' 17.8286 N	81° 57' 31.7830 W	
	657.00	3.18	273.26	656.89	-1.75	7.39	4,232,688.47	416,089.25	38° 14' 17.8296 N	81° 57' 31.7975 W	
	687.00	5.42	278.67	686.80	-1.49	5.16	4,232,688.55	416,088.57	38° 14' 17.8319 N	81° 57' 31.8255 W	
	717.00	7.59	280.74	716.60	-0.90	1.81	4,232,688.73	416,087.55	38° 14' 17.8373 N	81° 57' 31.8676 W	
	747.00	9.50	282.82	746.27	0.02	-2.55	4,232,689.01	416,086.22	38° 14' 17.8460 N	81° 57' 31.9223 W	



Survey Report - Geographic

Company: HG Energy LLC
 Project: Lincoln County, West Virginia UTM83
 Site: E.J. May
 Well: E.J. May No. 149
 Wellbore: Original Hole
 Design: Surveys Original Hole

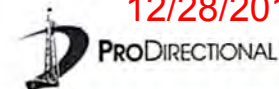
Local Co-ordinate Reference: Well E.J. May No. 149
 TVD Reference: RKB=804+6 @ 810.00usft
 MD Reference: RKB=804+6 @ 810.00usft
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: DB_Jul2216dt_v14

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WV Department of
 Environmental Protection

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude
777.00	10.87	283.18	775.80	1.21	-7.72	4,232,689.37	416,084.65	38° 14' 17.8572 N	81° 57' 31.9873 W
807.00	12.10	283.39	805.19	2.58	-13.53	4,232,689.79	416,082.88	38° 14' 17.8702 N	81° 57' 32.0604 W
837.00	13.96	285.01	834.42	4.25	-20.08	4,232,690.30	416,080.88	38° 14' 17.8860 N	81° 57' 32.1427 W
867.00	15.08	286.24	863.46	6.28	-27.33	4,232,690.92	416,078.67	38° 14' 17.9053 N	81° 57' 32.2338 W
897.00	16.54	287.51	892.33	8.65	-35.15	4,232,691.64	416,076.29	38° 14' 17.9280 N	81° 57' 32.3321 W
927.00	17.92	288.25	920.98	11.38	-43.60	4,232,692.47	416,073.71	38° 14' 17.9542 N	81° 57' 32.4385 W
957.00	19.51	288.39	949.39	14.41	-52.74	4,232,693.40	416,070.92	38° 14' 17.9832 N	81° 57' 32.5535 W
987.00	20.56	287.66	977.58	17.59	-62.51	4,232,694.37	416,067.95	38° 14' 18.0136 N	81° 57' 32.6764 W
1,017.00	21.37	286.17	1,005.59	20.71	-72.78	4,232,695.32	416,064.82	38° 14' 18.0434 N	81° 57' 32.8056 W
1,047.00	22.70	283.94	1,033.40	23.63	-83.65	4,232,696.21	416,061.50	38° 14' 18.0711 N	81° 57' 32.9422 W
1,077.00	23.59	281.63	1,060.99	26.23	-95.15	4,232,697.00	416,058.00	38° 14' 18.0957 N	81° 57' 33.0867 W
1,107.00	23.95	280.53	1,088.44	28.55	-107.01	4,232,697.71	416,054.38	38° 14' 18.1174 N	81° 57' 33.2357 W
1,137.00	23.90	280.76	1,115.86	30.80	-118.97	4,232,698.39	416,050.74	38° 14' 18.1384 N	81° 57' 33.3859 W
1,167.00	23.76	279.30	1,143.31	32.91	-130.91	4,232,699.04	416,047.10	38° 14' 18.1581 N	81° 57' 33.5358 W
1,197.00	23.30	276.88	1,170.81	34.60	-142.76	4,232,699.55	416,043.49	38° 14' 18.1736 N	81° 57' 33.6847 W
1,227.00	23.25	276.54	1,198.37	35.98	-154.53	4,232,699.97	416,039.90	38° 14' 18.1861 N	81° 57' 33.8324 W
1,257.00	23.46	276.96	1,225.91	37.38	-166.34	4,232,700.40	416,036.30	38° 14' 18.1987 N	81° 57' 33.9807 W
1,287.00	23.81	276.96	1,253.40	38.84	-178.28	4,232,700.84	416,032.66	38° 14' 18.2119 N	81° 57' 34.1306 W
1,317.00	23.34	276.32	1,280.89	40.23	-190.20	4,232,701.27	416,029.03	38° 14' 18.2244 N	81° 57' 34.2801 W
1,347.00	23.74	276.49	1,308.40	41.56	-202.11	4,232,701.67	416,025.40	38° 14' 18.2364 N	81° 57' 34.4296 W
1,377.00	23.86	276.80	1,335.84	42.97	-214.13	4,232,702.10	416,021.73	38° 14' 18.2490 N	81° 57' 34.5805 W
1,407.00	23.42	276.58	1,363.33	44.37	-226.08	4,232,702.53	416,018.09	38° 14' 18.2616 N	81° 57' 34.7305 W
1,437.00	22.88	275.81	1,390.91	45.64	-237.80	4,232,702.92	416,014.52	38° 14' 18.2730 N	81° 57' 34.8777 W
1,467.00	23.13	276.07	1,418.52	46.85	-249.47	4,232,703.29	416,010.96	38° 14' 18.2838 N	81° 57' 35.0240 W
1,497.00	23.51	276.34	1,446.07	48.14	-261.27	4,232,703.68	416,007.36	38° 14' 18.2953 N	81° 57' 35.1722 W
1,527.00	24.96	276.14	1,473.43	49.48	-273.51	4,232,704.08	416,003.63	38° 14' 18.3073 N	81° 57' 35.3258 W
1,557.00	26.21	276.00	1,500.49	50.85	-286.40	4,232,704.50	415,999.71	38° 14' 18.3195 N	81° 57' 35.4875 W
1,587.00	27.70	275.23	1,527.23	52.17	-299.93	4,232,704.91	415,995.58	38° 14' 18.3312 N	81° 57' 35.6574 W
1,617.00	28.78	275.14	1,553.66	53.46	-314.07	4,232,705.30	415,991.27	38° 14' 18.3425 N	81° 57' 35.8347 W
1,647.00	28.85	275.01	1,579.94	54.74	-328.47	4,232,705.69	415,986.88	38° 14' 18.3536 N	81° 57' 36.0155 W
1,677.00	28.07	274.79	1,606.32	55.96	-342.71	4,232,706.06	415,982.54	38° 14' 18.3642 N	81° 57' 36.1942 W
1,707.00	28.28	275.33	1,632.76	57.21	-356.82	4,232,706.44	415,978.24	38° 14' 18.3752 N	81° 57' 36.3713 W
1,737.00	29.12	276.62	1,659.08	58.71	-371.15	4,232,706.90	415,973.87	38° 14' 18.3885 N	81° 57' 36.5511 W
1,767.00	30.50	277.48	1,685.11	60.54	-385.95	4,232,707.46	415,969.36	38° 14' 18.4051 N	81° 57' 36.7369 W
1,797.00	31.83	277.32	1,710.78	62.54	-401.35	4,232,708.07	415,964.67	38° 14' 18.4233 N	81° 57' 36.9301 W
1,827.00	33.43	276.99	1,736.04	64.55	-417.40	4,232,708.68	415,959.78	38° 14' 18.4416 N	81° 57' 37.1316 W
1,857.00	35.21	277.02	1,760.82	66.62	-434.18	4,232,709.31	415,954.66	38° 14' 18.4603 N	81° 57' 37.3423 W
1,887.00	36.33	276.93	1,785.16	68.75	-451.59	4,232,709.96	415,949.35	38° 14' 18.4795 N	81° 57' 37.5608 W
1,917.00	36.96	276.71	1,809.23	70.87	-469.37	4,232,710.61	415,943.94	38° 14' 18.4987 N	81° 57' 37.7840 W
1,947.00	38.18	276.60	1,833.00	72.99	-487.54	4,232,711.25	415,938.40	38° 14' 18.5178 N	81° 57' 38.0121 W
1,977.00	39.90	276.73	1,856.31	75.18	-506.30	4,232,711.92	415,932.68	38° 14' 18.5376 N	81° 57' 38.2476 W
2,007.00	42.08	276.16	1,878.95	77.39	-525.86	4,232,712.59	415,926.72	38° 14' 18.5574 N	81° 57' 38.4930 W
2,037.00	42.94	275.48	1,901.06	79.45	-546.02	4,232,713.22	415,920.57	38° 14' 18.5756 N	81° 57' 38.7461 W
2,067.00	43.33	274.67	1,922.96	81.26	-566.45	4,232,713.77	415,914.34	38° 14' 18.5915 N	81° 57' 39.0025 W
2,097.00	44.13	275.23	1,944.63	83.05	-587.11	4,232,714.32	415,908.05	38° 14' 18.6071 N	81° 57' 39.2618 W
2,127.00	45.53	275.91	1,965.91	85.10	-608.16	4,232,714.94	415,901.63	38° 14' 18.6252 N	81° 57' 39.5259 W
2,157.00	45.75	276.60	1,986.88	87.44	-629.48	4,232,715.66	415,895.13	38° 14' 18.6461 N	81° 57' 39.7935 W
2,187.00	44.37	275.68	2,008.08	89.71	-650.60	4,232,716.35	415,888.70	38° 14' 18.6664 N	81° 57' 40.0585 W
2,217.00	42.72	274.45	2,029.82	91.54	-671.18	4,232,716.91	415,882.42	38° 14' 18.6824 N	81° 57' 40.3168 W
2,247.00	41.07	272.31	2,052.15	92.73	-691.18	4,232,717.27	415,876.33	38° 14' 18.6921 N	81° 57' 40.5676 W
2,277.00	42.27	272.91	2,074.56	93.64	-711.10	4,232,717.55	415,870.26	38° 14' 18.6990 N	81° 57' 40.8175 W
2,307.00	42.76	274.05	2,096.67	94.87	-731.34	4,232,717.92	415,864.09	38° 14' 18.7091 N	81° 57' 41.0714 W
2,337.00	42.84	274.84	2,118.69	96.45	-751.66	4,232,718.40	415,857.89	38° 14' 18.7227 N	81° 57' 41.3263 W
2,367.00	42.04	273.35	2,140.83	97.90	-771.85	4,232,718.84	415,851.74	38° 14' 18.7349 N	81° 57' 41.5797 W
2,397.00	40.96	271.87	2,163.29	98.81	-791.70	4,232,719.12	415,845.69	38° 14' 18.7418 N	81° 57' 41.8287 W



Survey Report - Geographic

Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (m)	Map Easting (m)	Latitude	Longitude	
2,427.00	40.50	271.33	2,186.03	99.35	-811.27	4,232,719.29	415,839.72	38° 14' 18.7452 N	81° 57' 42.0741 W	
2,457.00	39.41	271.63	2,209.02	99.85	-830.53	4,232,719.44	415,833.85	38° 14' 18.7482 N	81° 57' 42.3156 W	
2,487.00	38.71	272.74	2,232.32	100.57	-849.42	4,232,719.66	415,828.10	38° 14' 18.7534 N	81° 57' 42.5525 W	
2,517.00	38.16	273.19	2,255.82	101.53	-868.04	4,232,719.95	415,822.42	38° 14' 18.7610 N	81° 57' 42.7861 W	
2,547.00	38.00	274.05	2,279.43	102.70	-886.51	4,232,720.31	415,816.79	38° 14' 18.7706 N	81° 57' 43.0178 W	
2,577.00	40.93	276.47	2,302.59	104.46	-905.49	4,232,720.84	415,811.01	38° 14' 18.7861 N	81° 57' 43.2560 W	
2,607.00	41.52	277.00	2,325.16	106.78	-925.12	4,232,721.55	415,805.02	38° 14' 18.8070 N	81° 57' 43.5024 W	
2,637.00	40.75	275.69	2,347.75	108.96	-944.74	4,232,722.22	415,799.04	38° 14' 18.8266 N	81° 57' 43.7486 W	
2,667.00	38.11	272.99	2,370.92	110.42	-963.73	4,232,722.66	415,793.25	38° 14' 18.8390 N	81° 57' 43.9869 W	
2,697.00	35.01	268.84	2,395.02	110.73	-981.59	4,232,722.75	415,787.81	38° 14' 18.8402 N	81° 57' 44.2108 W	
Survey @ 2697.00 MD 2395.02 TVD										
2,762.00	35.01	268.84	2,448.26	109.97	-1,018.87	4,232,722.52	415,776.45	38° 14' 18.8289 N	81° 57' 44.6781 W	
Survey projected to 2762.00 MD 2448.26 TVD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment	
507.00	506.94	-1.74	6.63	MWD surveys	
2,697.00	2,395.02	110.73	-981.59	Survey @ 2697.00 MD 2395.02 TVD	
2,762.00	2,448.26	109.97	-1,018.87	Survey projected to 2762.00 MD 2448.26 TVD	

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Completion Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	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 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.59 °

Well	E.J. May No. 149					
Well Position	+N-S	0.00 usft	Northing:	4,232,689.00 m	Latitude:	38° 14' 17.8461 N
	+E-W	0.00 usft	Easting:	416,087.00 m	Longitude:	81° 57' 31.8904 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	804.00 usft

Wellbore	Original Hole					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)	
	HDGM	9/4/2018	-8.35	65.60	51,473.80000000	

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:		Depth From (TVD) (usft)	+N-S (usft)	+E-W (usft)	Direction (°)
		0.00	0.00	0.00	276.25

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Completion Report



Company:	HG Energy LLC	Local Co-ordinate Reference:	Well E.J. May No. 149
Project:	Lincoln County, West Virginia UTM83	TVD Reference:	RKB=804+6 @ 810.00usft
Site:	E.J. May	MD Reference:	RKB=804+6 @ 810.00usft
Well:	E.J. May No. 149	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
507.00	2,697.00	MWD (Original Hole)	MWD	OWSG MWD - Standard
2,762.00	2,762.00	Projection (Original Hole)	MWD	OWSG MWD - Standard

MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	DLeg (*/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (")	Northing (m)	Easting (m)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,232,689.00	416,087.00
507.00	1.55	104.71	506.94	0.31	-1.74	6.63	6.86	104.71	4,232,688.47	416,089.02
MWD surveys										
537.00	1.51	100.02	536.93	0.44	-1.91	7.41	7.66	104.47	4,232,688.42	416,089.26
567.00	1.60	94.49	566.92	0.58	-2.01	8.22	8.46	103.77	4,232,688.39	416,089.51
597.00	0.51	62.77	596.91	3.99	-1.99	8.76	8.98	102.78	4,232,688.39	416,089.67
627.00	1.27	281.36	626.91	5.66	-1.86	8.55	8.75	102.27	4,232,688.43	416,089.61
657.00	3.18	273.26	656.89	6.44	-1.75	7.39	7.60	103.29	4,232,688.47	416,089.25
687.00	5.42	278.67	686.80	7.58	-1.49	5.16	5.37	106.06	4,232,688.55	416,088.57
717.00	7.59	280.74	716.60	7.27	-0.90	1.81	2.03	116.47	4,232,688.72	416,087.55
747.00	9.50	282.82	746.27	6.45	0.02	-2.55	2.55	270.35	4,232,689.00	416,086.22
777.00	10.87	283.18	775.80	4.57	1.21	-7.72	7.81	278.91	4,232,689.37	416,084.65
807.00	12.10	283.39	805.19	4.10	2.58	-13.53	13.77	280.81	4,232,689.79	416,082.88
837.00	13.96	285.01	834.42	6.32	4.25	-20.08	20.53	281.94	4,232,690.29	416,080.88
867.00	15.08	286.24	863.46	3.87	6.28	-27.33	28.04	282.94	4,232,690.91	416,078.67
897.00	16.54	287.51	892.33	5.00	8.65	-35.15	36.19	283.83	4,232,691.64	416,076.29
927.00	17.92	288.25	920.98	4.66	11.38	-43.60	45.06	284.63	4,232,692.47	416,073.71
957.00	19.51	288.39	949.39	5.30	14.41	-52.74	54.67	285.28	4,232,693.39	416,070.93
987.00	20.56	287.66	977.58	3.60	17.59	-62.51	64.94	285.71	4,232,694.36	416,067.95
1,017.00	21.37	286.17	1,005.59	3.23	20.71	-72.78	75.67	285.88	4,232,695.31	416,064.82
1,047.00	22.70	283.94	1,033.40	5.24	23.63	-83.65	86.92	285.77	4,232,696.20	416,061.50

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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. 149
 Wellbore: Original Hole
 Design: Surveys Original Hole

Local Co-ordinate Reference: Well E.J. May No. 149
 TVD Reference: RKB=804+6 @ 810.00usft
 MD Reference: RKB=804+6 @ 810.00usft
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	DLeg (*100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (m)	Easting (m)
1,077.00	23.59	281.63	1,060.99	4.24	26.23	-95.15	98.70	285.41	4,232,697.00	416,058.00
1,107.00	23.95	280.53	1,088.44	1.90	28.55	-107.01	110.76	284.94	4,232,697.70	416,054.38
1,137.00	23.90	280.76	1,115.86	0.35	30.80	-118.97	122.89	284.51	4,232,698.39	416,050.74
1,167.00	23.76	279.30	1,143.31	2.02	32.91	-130.91	134.98	284.11	4,232,699.03	416,047.10
1,197.00	23.30	276.88	1,170.81	3.57	34.60	-142.76	146.89	283.62	4,232,699.55	416,043.49
1,227.00	23.25	276.54	1,198.37	0.48	35.98	-154.53	158.67	283.11	4,232,699.97	416,039.90
1,257.00	23.46	276.96	1,225.91	0.89	37.38	-166.34	170.49	282.67	4,232,700.39	416,036.30
1,287.00	23.81	276.96	1,253.40	1.17	38.84	-178.28	182.46	282.29	4,232,700.84	416,032.66
1,317.00	23.34	276.32	1,280.89	1.78	40.23	-190.20	194.41	281.94	4,232,701.26	416,029.03
1,347.00	23.74	276.49	1,308.40	1.35	41.56	-202.11	206.34	281.62	4,232,701.67	416,025.40
1,377.00	23.86	276.80	1,335.84	0.58	42.97	-214.13	218.40	281.35	4,232,702.10	416,021.73
1,407.00	23.42	276.58	1,363.33	1.50	44.37	-226.08	230.39	281.10	4,232,702.52	416,018.09
1,437.00	22.88	275.81	1,390.91	2.06	45.64	-237.80	242.15	280.86	4,232,702.91	416,014.52
1,467.00	23.13	276.07	1,418.52	0.90	46.85	-249.47	253.83	280.64	4,232,703.28	416,010.96
1,497.00	23.51	276.34	1,446.07	1.32	48.14	-261.27	265.67	280.44	4,232,703.67	416,007.36
1,527.00	24.96	276.14	1,473.43	4.84	49.48	-273.51	277.95	280.25	4,232,704.08	416,003.63
1,557.00	26.21	276.00	1,500.49	4.17	50.85	-286.40	290.87	280.07	4,232,704.50	415,999.71
1,587.00	27.70	275.23	1,527.23	5.10	52.17	-299.93	304.43	279.87	4,232,704.90	415,995.58
1,617.00	28.78	275.14	1,553.66	3.60	53.46	-314.07	318.58	279.66	4,232,705.29	415,991.27
1,647.00	28.85	275.01	1,579.94	0.31	54.74	-328.47	333.00	279.46	4,232,705.68	415,986.88
1,677.00	28.07	274.79	1,606.32	2.62	55.96	-342.71	347.25	279.27	4,232,706.06	415,982.54
1,707.00	28.28	275.33	1,632.76	1.10	57.21	-356.82	361.38	279.11	4,232,706.44	415,978.24
1,737.00	29.12	276.62	1,659.08	3.48	58.71	-371.15	375.76	278.99	4,232,706.89	415,973.87
1,767.00	30.50	277.48	1,685.11	4.82	60.54	-385.95	390.67	278.91	4,232,707.45	415,969.36
1,797.00	31.83	277.32	1,710.78	4.44	62.54	-401.35	406.19	278.86	4,232,708.06	415,964.67
1,827.00	33.43	276.99	1,736.04	5.37	64.55	-417.40	422.36	278.79	4,232,708.68	415,959.78
1,857.00	35.21	277.02	1,760.82	5.93	66.62	-434.18	439.26	278.72	4,232,709.30	415,954.66

WV Department of Environmental Protection

SEP 27 2018

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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. 149
 Wellbore: Original Hole
 Design: Surveys Original Hole

Local Co-ordinate Reference: Well E.J. May No. 149
 TVD Reference: RKB=804+6 @ 810.00usft
 MD Reference: RKB=804+6 @ 810.00usft
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	DLeg (*/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (m)	Easting (m)
1,887.00	36.33	276.93	1,785.16	3.74	68.75	-451.59	456.79	278.66	4,232,709.95	415,949.36
1,917.00	36.96	276.71	1,809.23	2.15	70.87	-489.37	474.69	278.59	4,232,710.60	415,943.94
1,947.00	38.18	276.60	1,833.00	4.07	72.99	-487.54	492.97	278.51	4,232,711.25	415,938.40
1,977.00	39.90	276.73	1,856.31	5.74	75.18	-506.30	511.86	278.45	4,232,711.92	415,932.68
2,007.00	42.08	276.16	1,878.95	7.37	77.39	-525.86	531.52	278.37	4,232,712.59	415,926.72
2,037.00	42.94	275.48	1,901.06	3.25	79.45	-546.02	551.77	278.28	4,232,713.22	415,920.57
2,067.00	43.33	274.67	1,922.96	2.26	81.26	-566.45	572.25	278.16	4,232,713.77	415,914.34
2,097.00	44.13	275.23	1,944.63	2.96	83.05	-587.11	592.96	278.05	4,232,714.31	415,908.05
2,127.00	45.53	275.91	1,965.91	4.93	85.10	-608.16	614.09	277.97	4,232,714.94	415,901.63
2,157.00	45.75	276.60	1,986.88	1.80	87.44	-629.48	635.53	277.91	4,232,715.65	415,895.13
2,187.00	44.37	275.68	2,008.08	5.09	89.71	-650.60	656.75	277.85	4,232,716.35	415,888.70
2,217.00	42.72	274.45	2,029.82	6.18	91.54	-671.18	677.40	277.77	4,232,716.90	415,882.42
2,247.00	41.07	272.31	2,052.15	7.28	92.73	-691.18	697.37	277.64	4,232,717.26	415,876.33
2,277.00	42.27	272.91	2,074.56	4.22	93.64	-711.10	717.24	277.50	4,232,717.54	415,870.26
2,307.00	42.76	274.05	2,096.67	3.04	94.87	-731.33	737.46	277.39	4,232,717.92	415,864.09
2,337.00	42.84	274.84	2,118.69	1.81	96.45	-751.66	757.82	277.31	4,232,718.40	415,857.89
2,367.00	42.04	273.35	2,140.83	4.28	97.90	-771.85	778.03	277.23	4,232,718.84	415,851.74
2,397.00	40.96	271.87	2,163.29	4.86	98.81	-791.70	797.85	277.11	4,232,719.12	415,845.69
2,427.00	40.50	271.33	2,186.03	1.93	99.35	-811.27	817.33	276.98	4,232,719.28	415,839.72
2,457.00	39.41	271.63	2,209.02	3.69	99.85	-830.53	836.51	276.86	4,232,719.43	415,833.85
2,487.00	38.71	272.74	2,232.32	3.30	100.57	-849.42	855.35	276.75	4,232,719.65	415,828.10
2,517.00	38.16	273.19	2,255.82	2.06	101.53	-868.04	873.96	276.67	4,232,719.95	415,822.42
2,547.00	38.00	274.05	2,279.43	1.85	102.70	-886.51	892.44	276.61	4,232,720.30	415,816.79
2,577.00	40.93	276.47	2,302.59	11.03	104.46	-905.49	911.50	276.58	4,232,720.84	415,811.01
2,607.00	41.52	277.00	2,325.16	2.29	106.78	-925.12	931.27	276.58	4,232,721.55	415,805.02
2,637.00	40.75	275.69	2,347.75	3.85	108.96	-944.74	951.00	276.58	4,232,722.21	415,799.04
2,667.00	38.11	272.99	2,370.92	10.49	110.42	-963.73	970.03	276.54	4,232,722.66	415,793.25

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 SEP 27 2018

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Completion Report



Company: HG Energy LLC	Local Co-ordinate Reference: Well E.J. May No. 149
Project: Lincoln County, West Virginia UTM83	TVD Reference: RKB=804+6 @ 810.00usft
Site: E.J. May	MD Reference: RKB=804+6 @ 810.00usft
Well: E.J. May No. 149	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Jul2216dt_v14

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	DLeg (°/100usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (m)	Easting (m)
2,697.00	35.01	268.84	2,395.02	13.21	110.73	-981.59	987.81	276.44	4,232,722.75	415,787.81
Survey @ 2697.00 MD 2395.02 TVD										
2,762.00	35.01	268.84	2,448.26	0.00	109.97	-1,018.87	1,024.79	276.16	4,232,722.52	415,776.45
Survey projected to 2762.00 MD 2448.26 TVD										

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
507.00	506.94	-1.74	6.63	MWD surveys
2,697.00	2,395.02	110.73	-981.59	Survey @ 2697.00 MD 2395.02 TVD
2,762.00	2,448.26	109.97	-1,018.87	Survey projected to 2762.00 MD 2448.26 TVD

Checked By: _____ Approved By: _____ Date: _____

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