

State of West Virginia  
Department of Environmental Protection - Office of Oil and Gas  
Well Operator's Report of Well Work

API 47-091-01280 County Taylor District Flemington  
Quad Rosemont 7.5 Pad Name Armstrong Reynolds Field/Pool Name Unknown  
Farm name Ridenour, Pauline W. Well Number 4HM  
Operator (as registered with the OOG) PDC Mountaineer, LLC  
Address 120 Genesis Blvd. City Bridgeport State WV Zip 26330

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey  
Top hole Northing 4350793.372592 Easting 574981.312107  
Landing Point of Curve Northing 4350723.185275 Easting 575413.159085  
Bottom Hole Northing 4352118.205134 Easting 574946.182563

Elevation (ft) 1410' GL Type of Well  New  Existing Type of Report  Interim  Final  
Permit Type  Deviated  Horizontal  Horizontal 6A  Vertical Depth Type  Deep  Shallow  
Type of Operation  Convert  Deepen  Drill  Plug Back  Redrilling  Rework  Stimulate  
Well Type  Brine Disposal  CBM  Gas  Oil  Secondary Recovery  Solution Mining  Storage  Other \_\_\_\_\_  
Type of Completion  Single  Multiple Fluids Produced  Brine  Gas  NGL  Oil  Other Frac fluid  
Drilled with  Cable  Rotary

Drilling Media Surface hole  Air  Mud  Fresh Water Intermediate hole  Air  Mud  Fresh Water  Brine  
Production hole  Air  Mud  Fresh Water  Brine

Mud Type(s) and Additive(s)

Surface: Air with soap & treated water as needed.

Bottom Hole: Synthetic based mud averaging 12+ ppg & 47 Vis.

Date permit issued 04/30/2013 Date drilling commenced 10/23/2013 Date drilling ceased 11/13/2013  
Date completion activities began 01/06/2014 Date completion activities ceased 02/20/2014  
Verbal plugging (Y/N) N/A Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

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Freshwater depth(s) ft Est: 130' Open mine(s) (Y/N) depths N  
Salt water depth(s) ft Est: 1011' Void(s) encountered (Y/N) depths N  
Coal depth(s) ft Est: 48', 82', 151', & 516' Cavern(s) encountered (Y/N) depths N  
Is coal being mined in area (Y/N) N

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Reviewed by:

*Edward Reynolds*

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API 47-091 - 01280 Farm name Ridenour, Pauline W. Well number 4HM

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/ N) * Provide details below*
Conductor	30"	20"	124'	New	H-40 / 94#	N/A	N/A
Surface	17 1/2"	13 3/8"	583'	New	J-55 / 54.5#	126'	Y
Coal	N/A						
Intermediate 1	12 1/4"	9 5/8"	2861'	New	J-55 / 40#	65'	Y
Intermediate 2							
Intermediate 3							
Production	8 1/2"	5 1/2"	12,747'	New	P-110 / 20#	None	Y
Tubing							
Packer type and depth set							

Comment Details N/A

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	N/A						
Surface	Class A	787	15.6	1.18	928	Surface	14
Coal	N/A						
Intermediate 1	Class A	951	15.6	1.18	1122	Surface	37.5
Intermediate 2							
Intermediate 3							
Production	L: Class A / T: Type 1	1807 / 1583	Both: 14.5	Both: 1.18	3976	Surface	N/A
Tubing							

Drillers TD (ft) 13,761' Loggers TD (ft) 13,761'  
 Deepest formation penetrated Marcellus Shale Plug back to (ft) N/A  
 Plug back procedure N/A

Kick off depth (ft) Nudge & control surface, begin kick off at 4600'

Check all wireline logs run  caliper  density  deviated/directional  induction  
 neutron  resistivity  gamma ray  temperature  sonic

Well cored  Yes  No  Conventional  Sidewall Were cuttings collected  Yes  No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING

13 3/8" Surface String: Ran a total of 5 centralizers every other joint starting at first joint above shoe. Ran 1 basket at Joint #13 (126' from surface).  
 9 5/8" Intermediate String: Ran a total of 13 centralizers every 220 feet starting at Joint #1. Ran a basket at Joint 64 (depth from surface was 65').  
 5 1/2" Production String: Spira-glide centralizers on the first 218 joints (to a depth of 3770' below surface). Bow Spring centralizers every 4 joints after that into surface casing at 2405' depth total of 30.

WAS WELL COMPLETED AS SHOT HOLE  Yes  No DETAILS

WAS WELL COMPLETED OPEN HOLE?  Yes  No DETAILS

WERE TRACERS USED  Yes  No TYPE OF TRACER(S) USED

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02/12/2016

API 47- 091 - 01280 Farm name Ridenour, Pauline W. Well number 4HM

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
1	01/11/14	13516	13672	50	Marcellus
2	01/24/14	13393	13517	50	Marcellus
3	01/25/14	13238	13362	50	Marcellus
4	01/25/14	13083	13207	50	Marcellus
5	01/25/14	12928	13052	50	Marcellus
6	01/26/14	12773	12897	50	Marcellus
7	01/26/14	12618	12742	50	Marcellus
8	01/27/14	12463	12587	50	Marcellus
9	01/27/14	12308	12432	50	Marcellus
10	01/28/14	12155	12277	50	Marcellus
11	01/28/14	11998	12122	50	Marcellus
12	01/29/14	11843	11967	50	Marcellus
13	01/29/14	11688	11812	50	Marcellus
14	01/29/14	11533	11657	50	Marcellus
15	01/29/14	11378	11502	50	Marcellus
16	01/30/14	11223	11347	50	Marcellus

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbbls)	Amount of Nitrogen/other (units)
1	01/22/14	80	7653	8948	5622	224228	4294	NA
2	01/25/14	78	7662	7595	5682	234303	4408	NA
3	01/25/14	81	7728	8591	5431	224077	4335	NA
4	01/25/14	82	7575	8745	5302	224733	4129	NA
5	01/26/14	80	7480	8457	5902	205707	3950	NA
6	01/26/14	79	7716	8200	6035	223747	4155	NA
7	01/26/14	81	7410	8101	6004	219294	4028	NA
8	01/27/14	80	7380	8262	5362	218606	4089	NA
9	01/27/14	80	7446	8231	5245	219735	4046	NA
10	01/28/14	80	7360	8159	5847	225473	4110	NA
11	01/28/14	80	7400	8347	6196	220695	3989	NA
12	01/29/14	81	7524	8384	6180	222537	4135	NA
13	01/29/14	79	7442	8065	5343	222017	4109	NA
14	01/29/14	80	7073	8134	6059	221034	4031	NA
15	01/30/14	80	6968	7777	5831	222930	3976	NA
16	01/30/14	80	7094	7691	5433	226265	4143	NA

Please insert additional pages as applicable.

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API 47- 091 - 01280 Farm name Ridenour, Pauline W. Well number 4HM

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
17	01/30/14	11068	11184	50	Marcellus
18	02/02/14	10913	11037	50	Marcellus
19	02/02/14	10758	10882	50	Marcellus
20	02/03/14	10603	10727	50	Marcellus
21	02/04/14	10448	10572	50	Marcellus
22	02/04/14	10293	10417	50	Marcellus
23	02/05/14	10138	10262	50	Marcellus
24	02/05/14	9983	10107	50	Marcellus
25	02/05/14	9828	9952	50	Marcellus
26	02/05/14	9673	9797	50	Marcellus
27	02/06/14	9518	9642	50	Marcellus
28	02/06/14	9361	9487	50	Marcellus
29	02/07/14	9208	9332	50	Marcellus
30	02/07/14	9053	9177	50	Marcellus
31	02/07/14	8898	9022	50	Marcellus
32	02/08/14	8743	8867	50	Marcellus

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
17	02/02/14	83	8318	8399	5672	241706	4099	NA
18	02/02/14	83	7429	7602	5978	223004	4093	NA
19	02/03/14	79	7607	8711	5537	219493	4048	NA
20	02/04/14	80	7647	8540	5478	142388	3395	NA
21	02/04/14	80	7457	8134	5996	221934	4077	NA
22	02/04/14	77	7412	8355	6135	226317	3981	NA
23	02/05/14	79	7619	8251	5332	208897	5201	NA
24	02/05/14	80	7519	8074	6217	204771	4587	NA
25	02/05/14	75	6987	8006	6060	217956	3862	NA
26	02/06/14	75	6962	7789	5549	222363	3985	NA
27	02/06/14	77	7756	8235	6291	219473	4043	NA
28	02/06/14	77	7172	7984	6357	220678	3959	NA
29	02/07/14	79	7214	7943	6086	222998	4793	NA
30	02/07/14	79	7290	8424	5753	221681	4127	NA
31	02/08/14	73	7408	7848	5715	96058	4308	NA
32	02/08/14	80	7760	8768	4923	244350	4078	NA

Please insert additional pages as applicable.

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API 47- 091 - 01280 Farm name Ridenour, Pauline W. Well number 4HM

PRODUCING FORMATION(S)	DEPTHS
Marcellus Shale	7833' - 7910' TVD 8570' - 13,761' MD

Please insert additional pages as applicable.

GAS TEST  Build up  Drawdown  Open Flow OIL TEST  Flow  Pump

SHUT-IN PRESSURE Surface NT psi Bottom Hole NT psi DURATION OF TEST N/A hrs

OPEN FLOW Gas 8,102 mcfpd Oil 0 bpd NGL 0 bpd Water 978 bpd GAS MEASURED BY  Estimated  Orifice  Pilot

LITHOLOGY/ FORMATION	TOP DEPTH IN FT NAME TVD	BOTTOM DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H.S. ETC)
	0		0		
Little Lime	1513	1526	1515	1528	Due to air/fluid rotary drilling, fresh water, salt water, & coal are estimated from surrounding wells and reported on page 1.
Big Lime	1551	1687	1553	1689	
Big Injun	1687	1725	1689	1727	
Gantz	1963	2043	1965	2045	
50 Foot	2076	2125	2078	2127	
30 Foot	2126	2157	2128	2159	
4th Sand	2491	2537	2494	2540	
5th Sand	2601	2647	2604	2650	
Benson	4656	4698	4659	4701	
Sycamore	6920	7030	7415	7554	
Tully	7607	7664	8225	8350	
Hamilton	7664	7833	8350	8570	
Marcellus	7833	7910	8570	13,761	Continuous shows of gas while drilling

Please insert additional pages as applicable.


Drilling Contractor Pioneer Energy Services  
Address 1083 N Eighty-Eight Rd City Rices Landing State PA Zip 15357

Logging Company Phoenix Technology Services USA Inc  
Address Foster Plaza 5 Suite 300, 651 Holiday Drive City Pittsburgh State PA Zip 15220

Cementing Company Baker Hughes  
Address Rt 2, Box 506, 837 Philippi Pike City Clarksburg State WV Zip 26301

Stimulating Company Baker Hughes  
Address Rt 2, Box 506, 837 Philippi Pike City Clarksburg State WV Zip 26301

Please insert additional pages as applicable.

Completed by Bob Williamson Telephone 304-808-6296  
Signature  Title Sr Geologist Date 04/21/2014 RECEIVED Office of Oil and Gas

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

JAN 13 2016  
02/12/2016  
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# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	1/22/2014
Job End Date:	2/8/2014
State:	West Virginia
County:	Taylor
API Number:	47-091-01280-00-00
Operator Name:	PDC Energy
Well Name and Number:	Armstrong Reynolds 4HM
Longitude:	-80.13070300
Latitude:	39.30313500
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	7,800
Total Base Water Volume (gal):	5,836,446
Total Base Non Water Volume:	0



## Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Water	PDC	Base Fluid					
			Water	NA	100.00000	87.32374	None
Sand (Proppant)	Baker Hughes	Proppant					
			Silica Substrate	NA	100.00000	12.38799	None
MaxPerm 20A	Baker Hughes	Friction Reducer					
			Aliphatic hydrocarbon	Proprietary	30.00000	0.03881	None
			Oxyalkylated alcohol	Proprietary	5.00000	0.01647	None
Hydrochloric Acid (15%)	Baker Hughes	Acidizing					
			Hydrochloric Acid	7647-01-0	15.00000	0.01279	None
GasFlo G	Baker Hughes	Surfactant					
			Methanol	67-56-1	30.00000	0.01226	None
SC-30	X-Chem	Scale Inhibitor					
			Sodium polyacrylate	Proprietary	30.00000	0.01511	None
GBW 5	Baker Hughes	Frac gel breaker					
			Ammonium persulphate	7727-54-0	100.00000	0.01162	None
ADOX 3125/8125	Dupont	Biocide					
			Sodium Chlorite	7758-19-2	25.00000	0.01127	None
Reagent A	X-Chem	Biocide					
			Hydrogen chloride	7647-01-0	32.00000	0.01087	None

JAN 13 2016

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6/7

Reagent B	X-Chem	Biocide					
			Sodium Hypochlorite	7681-52-9	15.00000	0.00085	None
Ferrotrol 300L	Baker Hughes	Iron Control					
			Citric Acid	77-92-9	60.00000	0.00033	None
CI-14	Baker Hughes	Corrosion Inhibitor					
			Methanol	67-56-1	100.00000	0.00013	None
			Polyoxyalkylenes	Proprietary	30.00000	0.00004	None
			Fatty acids	Proprietary	10.00000	0.00001	None
			Olefin	Proprietary	5.00000	0.00001	None
			Propargyl alcohol	107-19-7	5.00000	0.00001	None

Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS.

- \* Total Water Volume sources may include fresh water, produced water, and/or recycled water
- \*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided. Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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**PDC MOUNTAINEER, LLC.**  
**WELL NO. ARMSTRONG/REYNOLDS 4HM**

**NOTES:**  
 -PLAT ORIENTATION, CORNERS, AND WELL REFERENCES ARE BASED UPON THE GRID NORTH MERIDIAN FOR THE WV STATE PLANE COORDINATE SYSTEM, NORTH ZONE NAD 83. WELL LOCATION REFERENCE TIES ARE BASED UPON THE MAGNETIC MERIDIAN.

-THERE ARE NO WATER WELLS LOCATED WITHIN 250' OF WELL 4HM.

○ = MONUMENT FOUND  
 IRON REBAR UNLESS NOTED OTHERWISE.

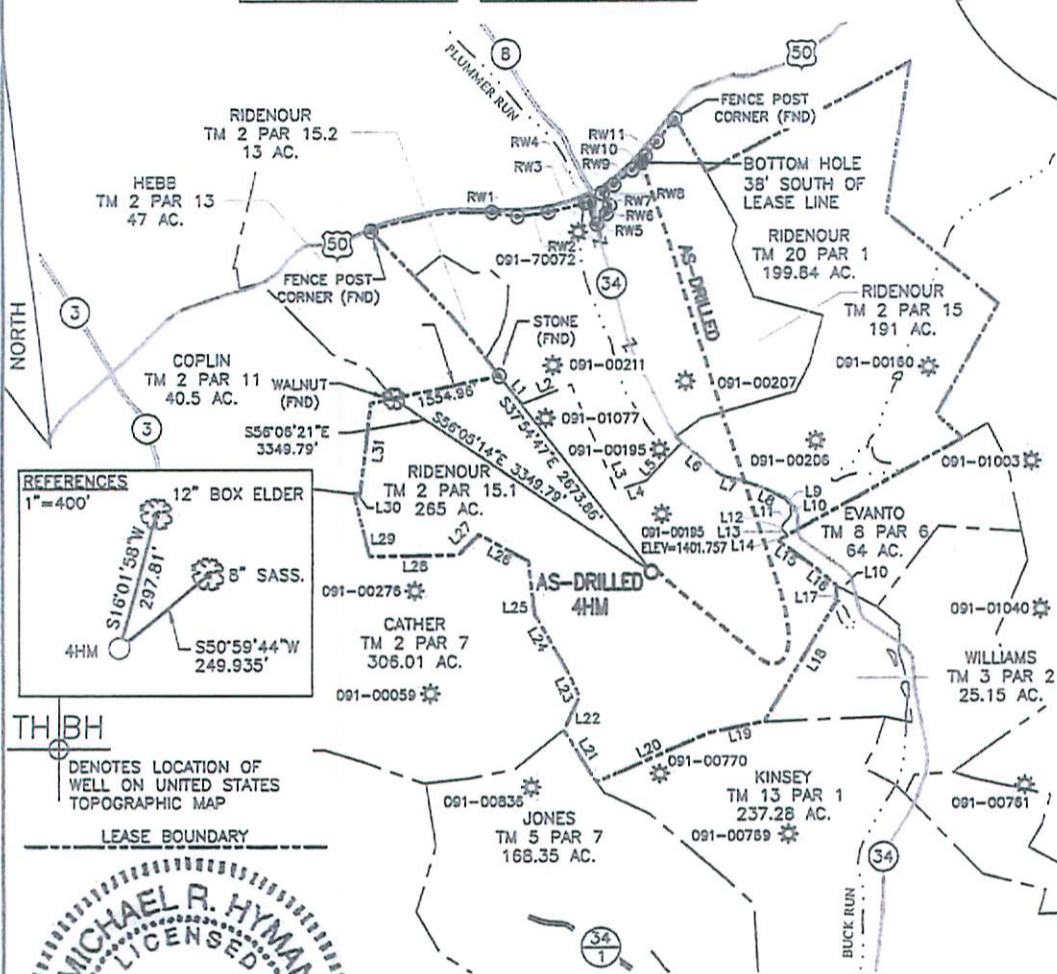
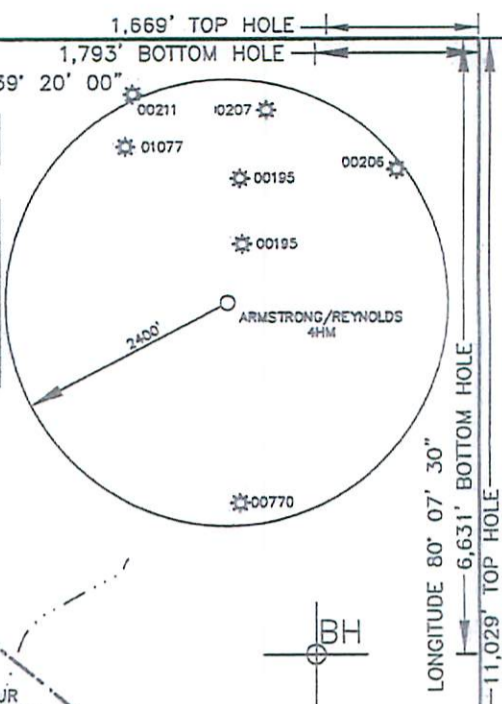
L1	S36°45'00"E	394.00'
L2	N71°57'00"E	567.00'
L3	S19°17'00"E	1243.00'
L4	N74°57'00"E	355.00'
L5	N47°11'00"E	548.00'
L6	S48°55'00"E	549.00'
L7	S70°30'00"E	437.00'

L8	S60°15'00"E	300.00'
L9	S38°15'00"E	108.00'
L10	S02°24'00"W	105.00'
L11	S44°13'00"W	138.00'
L12	S25°18'00"W	43.00'
L13	S43°44'00"E	97.00'
L14	S64°27'00"W	123.00'
L15	S51°10'00"E	427.35'
L16	S47°30'00"E	366.46'
L17	S21°45'00"E	225.39'
L18	S35°05'00"W	1505.95'
L19	S82°18'00"W	603.41'
L20	S70°05'00"W	1351.02'
L21	N28°07'00"W	670.07'
L22	N28°57'00"E	399.96'
L23	N21°22'00"W	259.88'
L24	N26°30'00"W	754.22'
L25	N03°00'00"W	565.64'
L26	N58°15'00"W	605.38'
L27	S49°30'00"W	310.53'
L28	N87°09'00"W	960.14'

L29	N10°00'00"W	694.65'
L30	S81°45'00"E	64.02'
L31	N11°00'00"E	955.02'

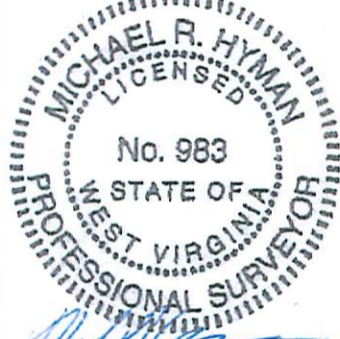
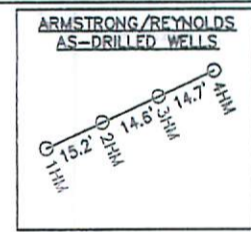
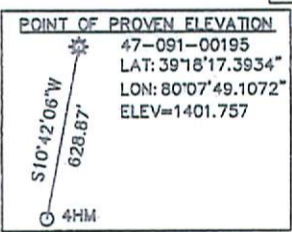
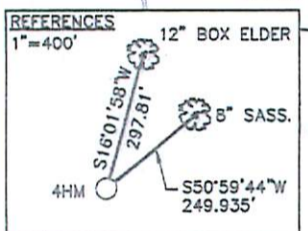
RW1	S80°15'18"E	279.36'
RW2	N82°00'24"E	337.42'
RW3	N78°21'22"E	412.37'
RW4	N75°06'36"E	36.22'
RW5	N41°49'35"E	155.33'
RW6	N20°53'41"E	94.00'
RW7	N30°25'53"W	156.00'
RW8	N53°26'46"E	156.40'
RW9	N50°35'02"E	259.00'
RW10	N43°11'33"E	207.30'
RW11	N38°54'15"E	201.27'

LATITUDE 39° 20' 00"



**WELL NO. 4HM**  
**AS-DRILLED TOP HOLE**  
**STATE PLANE COORDINATES**  
 (NAD 83 NORTH ZONE)  
 N: 293149.430  
 E: 1790025.968  
 LAT: 39°18'11.28"  
 LON: 80°07'50.54"  
**UTM COORDINATES**  
 (NAD 83-METER)  
 N: 4350776.597  
 E: 574952.116

**WELL NO. 4HM**  
**AS-DRILLED BOTTOM HOLE**  
**STATE PLANE COORDINATES**  
 (NAD 83 NORTH ZONE)  
 N: 297548.456  
 E: 1789935.697  
 LAT: 39°18'54.75"  
 LON: 80°07'52.08"  
**UTM COORDINATES**  
 (NAD 83-METER)  
 N: 4352116.395  
 E: 574902.320



**AS-DRILLED PLAT**

Michael R. Hyman, P.S. 983  
 I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

FILE NO. <u>030-2175</u>	DATE <u>JUNE 3</u> , 2014
SCALE: <u>1"=2000'</u>	OPERATOR'S WELL NO. <u>ARMSTRONG/REYNOLDS NO. 4HM</u>
MINIMUM DEGREE OF ACCURACY: <u>1 in 2500</u>	API WELL NO. <u>47 - 091 - 01280</u>
PROVEN SOURCE OF ELEVATION: <u>OPUS SURVEY GRADE GPS</u>	STATE <u>47</u> COUNTY <u>091</u> PERMIT <u>01280</u>
WELL TYPE: OIL <input type="checkbox"/> GAS <input checked="" type="checkbox"/> LIQUID INJECTION <input type="checkbox"/> WASTE DISPOSAL <input type="checkbox"/> (IF "GAS"), PRODUCTION <input checked="" type="checkbox"/> STORAGE <input type="checkbox"/> DEEP <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/>	
LOCATION: ELEVATION: <u>1410.42'</u> WATER SHED: <u>BUCK RUN</u> WV Department of Environmental Protection	
DISTRICT: <u>FLEMINGTON</u> COUNTY: <u>TAYLOR</u>	
QUADRANGLE: <u>ROSEMONT 7.5'</u> ACREAGE: <u>265 AC±</u>	
SURFACE OWNER: <u>PAULINE W. RIDENOUR</u> LEASE ACREAGE: <u>735 AC+</u>	
OIL & GAS ROYALTY OWNER: <u>EUGENE ARMSTRONG &amp; T. MARIE REYNOLDS</u> LEASE NO. _____	
PROPOSED WORK: DRILL <input checked="" type="checkbox"/> CONVERT <input type="checkbox"/> DRILL DEEPER <input type="checkbox"/> REDRILL <input type="checkbox"/> FRACTURE OR STIMULATE <input checked="" type="checkbox"/> PERFORATE NEW FORMATION <input type="checkbox"/> PLUG OFF OLD FORMATION <input type="checkbox"/> OTHER PHYSICAL CHANGE IN WELL (SPECIFY) _____	
PLUG AND ABANDON _____ CLEAN OUT AND REPLUG _____	
TARGET FORMATION: <u>MARCELLUS SHALE</u> ESTIMATED DEPTH: <u>7,912' TVD / 13,760' MD</u>	
WELL OPERATOR: <u>PDC MOUNTAINEER, LLC.</u> DESIGNATED AGENT: <u>STEVEN JOHNSON</u>	
ADDRESS: <u>120 GENESIS BOULEVARD</u> ADDRESS: <u>120 GENESIS BOULEVARD</u> <u>BRIDGEPORT, WV 26330</u> <u>BRIDGEPORT, WV 26330</u>	

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