



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street, S.E.
Charleston, WV 25304
(304) 926-0450
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary
www.dep.wv.gov

Tuesday, April 7, 2020
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

TUG HILL OPERATING, LLC
380 SOUTHPOINTE BLVD

CANONSBURG, PA 15317

Re: Permit Modification Approval for ARMSTRONG S-12HU
47-051-02258-00-00

Modified Lateral for a TMD of 20,559' with AOR and SSP

TUG HILL OPERATING, LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin
Chief

A blue ink signature of James A. Martin, written in a cursive style.

Operator's Well Number: ARMSTRONG S-12HU
Farm Name: CONSOL RCPC, LLC.
U.S. WELL NUMBER: 47-051-02258-00-00
Horizontal 6A New Drill
Date Modification Issued: April 7, 2020

Promoting a healthy environment.



west virginia department of environmental protection

Oil and Gas Conservation Commission
601 57th Street SE, Charleston, WV 25304
304-926-0499 Ext 1274

Randall M. Albert, Chairman
dep.wv.gov

February 19, 2020

Department of Environmental Protection
Office of Oil and Gas
Charleston, WV 25304

RE: Application for Deep Well Permit – API #47-051-02258

COMPANY: Tug Hill Operating, LLC

FARM: CONSOL RCPC, LLC Armstrong 1S-12HU

COUNTY: Marshall DISTRICT: Franklin QUAD: Powhatan Point

The deep well review of the application for the above company is Approved to drill to Trenton for Point Pleasant completion.

The applicant has complied with the provision of Chapter 22C-9, of the Code of West Virginia, nineteen hundred and thirty-one (1931), as amended, Oil and Gas Conservation Commission as follows:

1. Comments to Notice of Deviation filed? No
2. Provided a certified copy of duly acknowledged and recorded consent and easement form from all surface owners? Yes
3. Provided a tabulation of all deep wells within one mile of the proposed location, including the API number of all deep wells: **yes; Docket 292-293 Exception Location Hearing
4. Provided a plat showing that the proposed location is a distance of 400 feet from the nearest lease line or unit boundary with the exception of the toe which is 10 feet from the nearest lease line or unit boundary and showing the following wells drilled to or capable of producing from the objective formation within 3,000 feet of the proposed location.

Sincerely,

A handwritten signature in blue ink that reads "Susan Rose".

Susan Rose
Administrator

WW-6B
(04/15)

4705102258 *moy*
API NO. 47-051

OPERATOR WELL NO. Armstrong S-12HU
Well Pad Name: Armstrong

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: Tug Hill Operating, LLC 494510851 Marshall Franklin Powhatan Point 7
Operator ID County District Quadrangle

2) Operator's Well Number: Armstrong S-12HU Well Pad Name: Armstrong

3) Farm Name/Surface Owner: CONSOL RCPC, LLC Public Road Access: Burch Ridge Road - CR 29

4) Elevation, current ground: 1279.12' Elevation, proposed post-construction: 1279.12'

5) Well Type (a) Gas x Oil _____ Underground Storage _____
Other _____

(b) If Gas Shallow _____ Deep x _____
Horizontal x _____

JM
2/4/2020

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):

Point Pleasant is the target formation at a depth of 11,267' - 11,147' - thickness of 120' and anticipated pressure of approx. 9500 psi.

8) Proposed Total Vertical Depth: 11,417'

9) Formation at Total Vertical Depth: Trenton, plug back to Reedsville

10) Proposed Total Measured Depth: 20,559'

11) Proposed Horizontal Leg Length: 8,636.77'

12) Approximate Fresh Water Strata Depths: 70' ; 870'

13) Method to Determine Fresh Water Depths: Offset well reports or noticeable flow at the flowline or when need to start soaping

14) Approximate Saltwater Depths: 2,167'

15) Approximate Coal Seam Depths: Sewickley Coal - 776' ; Pittsburgh Coal - 869'

16) Approximate Depth to Possible Void (coal mine, karst, other): none

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes _____ No x _____

(a) If Yes, provide Mine Info: Name: _____

Depth: _____

Seam: _____

Owner: _____

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18) CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	30"	NEW	BW	BW	120'	120'	259FT^3(CTS)
Fresh Water	20"	NEW	J55	106.5#	970'	970'	1,568FT^3(CTS)
Coal	13 3/8"	NEW	J55	54.5#	2751'	2751'	1,940FT^3(CTS)
Intermediate	9 5/8"	NEW	HPP110	47#	10,262'	10,262'	3,351FT^3(CTS)
Production	5 1/2"	NEW	P110	23#	20,558'	20,558'	4,783FT^3(CTS)
Tubing	2 7/8"	NEW	P110	6.5#		11,576'	
Liners							

J
11/7/19

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	36"	1.0	2,333	1,866	CLASS A	1.2
Fresh Water	20"	26"	.5	2,410	1,928	SEE # 24	1.2
Coal	13 3/8"	17 1/2"	.38	2,740	2,192	SEE #24	1.2
Intermediate	9 5/8"	12 1/4"	.472	10,730	6,968	SEE #24	1.99
Production	5 1/2"	8 1/2"	.415	16,510	10,864	SEE #24	1.18
Tubing	2 7/8"			11,385	11,624		
Liners							

PACKERS

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

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WW-6B
(10/14)

API NO. 47- 051 -
OPERATOR WELL NO. Armstrong S-12HU
Well Pad Name: Armstrong

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2/4/2020

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill through the Point Pleasant and TD Pilot Hole 150' into the Trenton. Log vertical section and run a solid cement plug back to proposed KOP (11,076'). Drill curve and lateral per proposed well plan, run and cement production casing. Perform CBL from 60 deg to surface, make cleanout run, and stimulate.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Well to be completed with approximately 21,587,500 lb proppant and 333,759 bbl of water. Max rate = 80 bpm; max psi = 12,000#.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 12.64 acres

22) Area to be disturbed for well pad only, less access road (acres): 3.21 acres

23) Describe centralizer placement for each casing string:

Will run 3 centralizers on surface casing at equal distance. Intermediate will have 1 centralizer every third joint. Production casing will have one centralizer every third joint in lateral, one centralizer every joint through curve, one centralizer every third joint to surface.

24) Describe all cement additives associated with each cement type:

*See Attachment

25) Proposed borehole conditioning procedures:

Will circulate a minimum of 3 hours at TD, short trip to curve, circulate bottoms up, check for flow, POOH

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*Note: Attach additional sheets as needed.

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4705102258 *MOD*

WELL NAME: Armstrong S-12HU COUNTY: Marshall
STATE: WV DISTRICT: Franklin
D# Elev: 1,279' 6L Elev: 1,279'
TD: 20,559'
TH Latitude: 39.753853
TH Longitude: -80.80829333
BH Latitude: 39.72895701
BH Longitude: -80.78817501

Formation	Depth TVD
Deepest Fresh Water	870'
Sewickley Coal	776'
Pittsburgh Coal	869'
Big Lime	2,048'
Berea	2,590'
Tully	6,390'
Marcellus	6,449'
Onondaga	6,501'
Salina	7,193'
Leakport	8,222'
Utica	10,892'
Point Pleasant	11,147'
Landing Depth	11,197'
Trenton	11,267'
Pilot Hole TD	11,417'

Type	Hole Size (in)	Csg Size (in)	Depth (MD)	Depth (TVD)	Weight (lb/ft)	Grade	Top of Cement
Conductor	36	30	120'	120'	BW	BW	Surface
Surface	26	20	970'	970'	106.5	J55	Surface
Intermediate 1	17 1/2	13 3/8	2,751'	2,750'	84.5	J55	Surface
Intermediate 2	12 1/4	9 5/8	10,262'	10,089'	47	HPP110	Surface
Production	8 1/2	5 1/2	20,559'	11,347'	23	HCP110	Surface

Sacks	Class	Density	Fluid Type	DRILLING DETAILS	
				Centralizer Notes	
398	A	15.6	Air	None	
1,691	A	15.6	Air	3 Centralizers at equal distance	
2,103	A	15	Air	1 Centralizer every other ft	
2,828	A	14.5	Air	1 Centralizer every other ft	
4,306	A	15	Air / SOBIM	1 every other joint in lateral; 1 per joint in curve; 1 every other ft to s/c	

11/17/19



30" Csg @ 120' MD / 120' TVD

20" Csg @ 970' MD / 970' TVD

13 3/8" Csg @ 2,751' MD / 2,750' TVD

9 5/8" Csg @ 10,262' MD / 10,089' TVD

KOP @ 11,076' ft MD

Landing Point @ 11,924' MD / 11,197' TVD

PH TD = 150' below Trenton Top

Pilot Hole
PH TD @ 11,417'

Lateral TD @ 20,559' ft MD
11,347' ft TVD

4705102258 M&D



Tug Hill Operating, LLC Casing and Cement Program

Armstrong S-12HU

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	20"	J55	26"	970'	CTS
Intermediate 1	13 3/8"	J55	17 1/2"	2,751'	CTS
Intermediate 2	9 5/8"	HPP110	12 1/4"	10,262'	CTS
Production	5 1/2"	HCP110	8 1/2"	20,559'	CTS

Cement

Surface: Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Surface Cement mixed at 15.6 ppg, Y=1.2

Intermediate 1: Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.2

Intermediate 2: Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.99

Production: 50:50 Poz: Premium NE-1 + .1% bwoc ASA-301 + 60lb/sk ASCA-1 + .35% bwoc BA-10A + .25% bwoc MPA-170, 44 lb sack + .5% bwoc R-3 + .75 gals/100sk FP-13L – Production Cement mixed at 15.2ppg, Y = 1.18

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4705102258 *Mad*



Well Site Safety Plan

Tug Hill Operating, LLC

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11/7/19

Well Name: Armstrong S-12HU

Pad Location: Armstrong Pad

Marshall County, West Virginia

UTM (meters), NAD83, Zone 17:

Northing: 4,400,455.46

Easting: 516,422.64

Updated November 2019

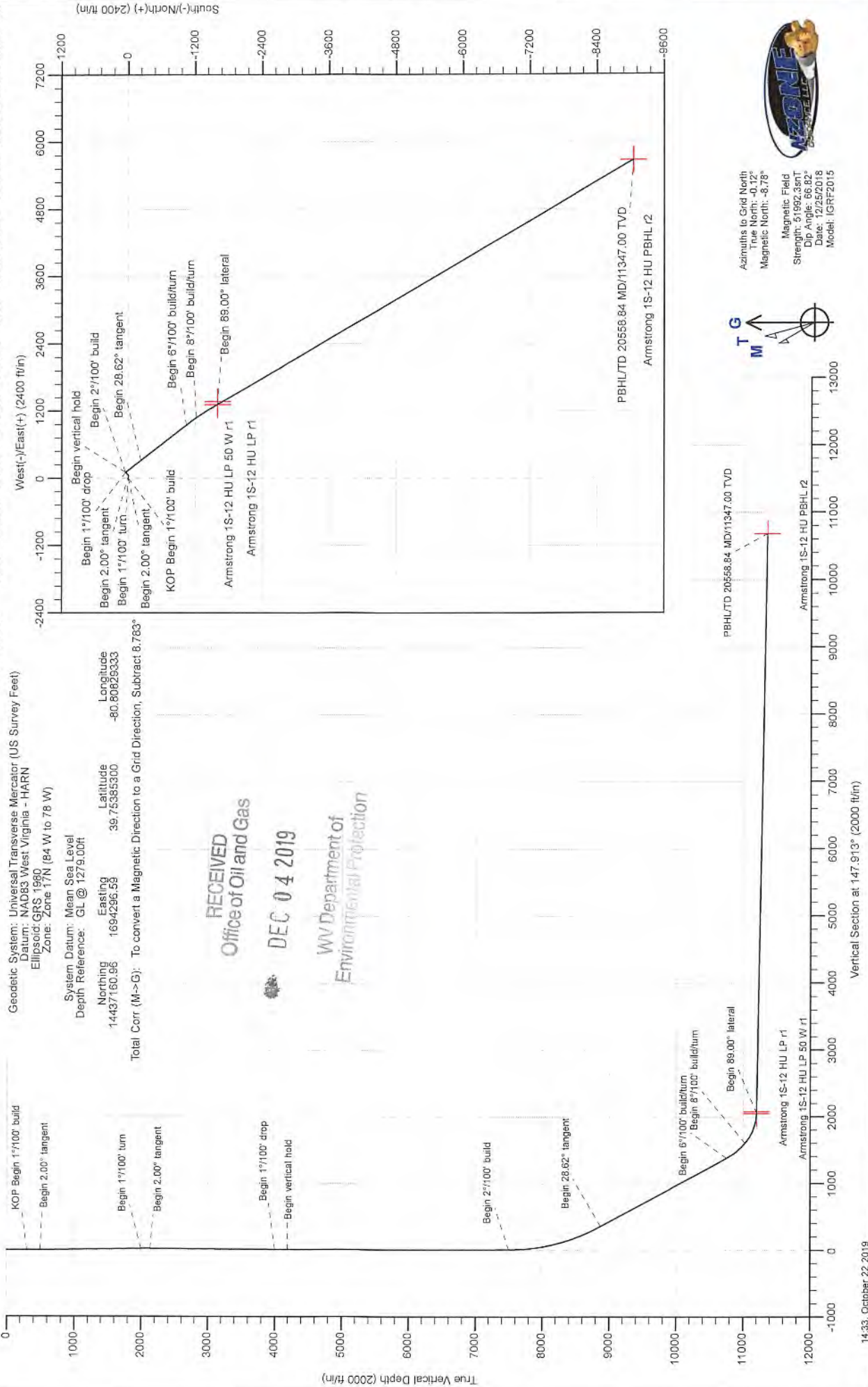
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Well: Armstrong 1S-12 HU (slot N)
 Site: Armstrong Pad
 Project: Marshall County, West Virginia
 Design: rev2
 Rig:



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	VSect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 1°/100° build
3	500.00	2.00	85.000	499.96	0.30	3.48	1.00	85.000	1.59	Begin 2.00° tangent
4	2000.95	2.00	95.000	2000.00	4.87	55.66	0.00	0.000	25.44	Begin 1°/100° turn
5	2137.74	2.00	45.000	2136.71	6.77	59.73	1.00	109.989	25.99	Begin 2.00° tangent
6	4002.17	2.00	45.000	4000.00	52.78	105.74	0.00	0.000	11.45	Begin 1°/100° drop
7	4202.17	0.00	45.000	4199.96	55.24	108.20	1.00	160.000	10.67	Begin vertical hold
8	7502.21	0.00	45.000	7500.00	55.24	108.20	0.00	45.000	10.67	Begin 2°/100° build
9	8933.40	28.62	142.178	8672.40	-221.33	322.91	2.00	142.178	359.05	Begin 28.62° tangent
10	11075.84	50.00	142.178	10752.99	-1032.06	952.28	0.00	0.000	1380.26	Begin 6°/100° build/turn
11	11434.56	50.00	148.280	11028.98	-1216.39	1082.78	6.00	8.590	1605.76	Begin 8°/100° build/turn
12	11923.67	88.00	149.697	11197.01	-1598.28	1319.42	8.00	5.419	2055.02	Begin 89.00° lateral
13	20558.84	88.00	149.697	11347.00	-9052.53	5875.78	0.00	0.000	0684.70	PBHL/TD 20558.84 MD/11347.00 TVD

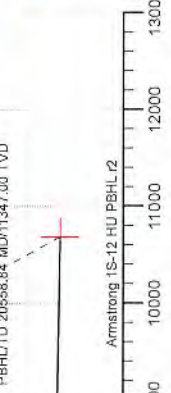
Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1960
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level
 Depth Reference: GL @ 1279.00ft
 Northing: 14437160.96
 Easting: 1694296.39
 Latitude: 39.75385300
 Longitude: -80.80629333

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.783°



MagField
 Strength: 51992.35nT
 Dip Angle: 66.82°
 Date: 12/25/2018
 Model: IGRF2015





Planning Report - Geographic

4705102258 *MON*

Database:	DB_Aug1919_v14	Local Co-ordinate Reference:	Well Armstrong 1S-12 HU (slot N)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1279.00ft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1279.00ft
Site:	Armstrong Pad	North Reference:	Grid
Well:	Armstrong 1S-12 HU (slot N)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev2		

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

Site	Armstrong Pad				
Site Position:		Northing:	14,437,151.34 usft	Latitude:	39.75382662
From:	Lat/Long	Easting:	1,694,289.43 usft	Longitude:	-80.80831890
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.123 °

Well	Armstrong 1S-12 HU (slot N)					
Well Position	+N/-S	0.00 ft	Northing:	14,437,160.96 usft	Latitude:	39.75385300
	+E/-W	0.00 ft	Easting:	1,694,296.59 usft	Longitude:	-80.80829333
Position Uncertainty		0.00 ft	Wellhead Elevation:		Ground Level:	1,279.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	12/25/2018	-8.660	66.817	51,992.27170932

Design	rev2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	147.913

Plan Survey Tool Program	Date	10/22/2019		
Depth From (ft)	Depth To (ft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	20,558.84 rev2 (Original Hole)	MWD MWD - Standard	

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Database:	DB_Aug1919_v14	Local Co-ordinate Reference:	Well Armstrong 1S-12 HU (slot N)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1279.00ft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1279.00ft
Site:	Armstrong Pad	North Reference:	Grid
Well:	Armstrong 1S-12 HU (slot N)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev2		

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.000	
300.00	0.00	0.000	300.00	0.00	0.00	0.00	0.00	0.00	0.000	
500.00	2.00	85.000	499.96	0.30	3.48	1.00	1.00	0.00	85.000	
2,000.95	2.00	85.000	2,000.00	4.87	55.66	0.00	0.00	0.00	0.000	
2,137.74	2.00	45.000	2,136.71	6.77	59.73	1.00	0.00	-29.24	-109.989	
4,002.17	2.00	45.000	4,000.00	52.78	105.74	0.00	0.00	0.00	0.000	
4,202.17	0.00	45.000	4,199.96	55.24	108.20	1.00	-1.00	0.00	180.000	
7,502.21	0.00	45.000	7,500.00	55.24	108.20	0.00	0.00	0.00	45.000	
8,933.40	28.62	142.178	8,872.40	-221.33	322.91	2.00	2.00	6.79	142.178	
11,075.84	28.62	142.178	10,753.00	-1,032.06	952.28	0.00	0.00	0.00	0.000	
11,434.56	50.00	146.280	11,028.98	-1,216.39	1,082.78	6.00	5.96	1.14	8.590	
11,923.67	89.00	149.697	11,197.01	-1,598.28	1,319.42	8.00	7.97	0.70	5.419	
20,558.84	89.00	149.697	11,347.00	-9,052.53	5,675.78	0.00	0.00	0.00	0.000	Armstrong 1S-12 HU

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Planning Report - Geographic

4705102258 *map*

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Database: DB_Aug1919_v14
Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Armstrong Pad
Well: Armstrong 1S-12 HU (slot N)
Wellbore: Original Hole
Design: rev2

Local Co-ordinate Reference: Well Armstrong 1S-12 HU (slot N)
TVD Reference: GL @ 1279.00ft
MD Reference: GL @ 1279.00ft
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.000	0.00	0.00	0.00	14,437,160.96	1,694,296.59	39.75385300	-80.80829333	
100.00	0.00	0.000	100.00	0.00	0.00	14,437,160.96	1,694,296.59	39.75385300	-80.80829333	
200.00	0.00	0.000	200.00	0.00	0.00	14,437,160.96	1,694,296.59	39.75385300	-80.80829333	
300.00	0.00	0.000	300.00	0.00	0.00	14,437,160.96	1,694,296.59	39.75385300	-80.80829333	
KOP Begin 1°/100' build										
400.00	1.00	85.000	399.99	0.08	0.87	14,437,161.04	1,694,297.46	39.75385321	-80.80829024	
500.00	2.00	85.000	499.96	0.30	3.48	14,437,161.26	1,694,300.07	39.75385382	-80.80828096	
Begin 2.00° tangent										
600.00	2.00	85.000	599.90	0.61	6.95	14,437,161.57	1,694,303.55	39.75385463	-80.80826859	
700.00	2.00	85.000	699.84	0.91	10.43	14,437,161.87	1,694,307.02	39.75385545	-80.80825621	
800.00	2.00	85.000	799.78	1.22	13.91	14,437,162.18	1,694,310.50	39.75385626	-80.80824384	
900.00	2.00	85.000	899.72	1.52	17.38	14,437,162.48	1,694,313.98	39.75385708	-80.80823147	
1,000.00	2.00	85.000	999.65	1.83	20.86	14,437,162.78	1,694,317.45	39.75385789	-80.80821910	
1,100.00	2.00	85.000	1,099.59	2.13	24.34	14,437,163.09	1,694,320.93	39.75385871	-80.80820672	
1,200.00	2.00	85.000	1,199.53	2.43	27.81	14,437,163.39	1,694,324.41	39.75385952	-80.80819435	
1,300.00	2.00	85.000	1,299.47	2.74	31.29	14,437,163.70	1,694,327.88	39.75386034	-80.80818198	
1,400.00	2.00	85.000	1,399.41	3.04	34.77	14,437,164.00	1,694,331.36	39.75386115	-80.80816961	
1,500.00	2.00	85.000	1,499.35	3.35	38.24	14,437,164.31	1,694,334.84	39.75386197	-80.80815723	
1,600.00	2.00	85.000	1,599.29	3.65	41.72	14,437,164.61	1,694,338.31	39.75386278	-80.80814486	
1,700.00	2.00	85.000	1,699.23	3.95	45.20	14,437,164.91	1,694,341.79	39.75386360	-80.80813249	
1,800.00	2.00	85.000	1,799.17	4.26	48.67	14,437,165.22	1,694,345.27	39.75386441	-80.80812012	
1,900.00	2.00	85.000	1,899.11	4.56	52.15	14,437,165.52	1,694,348.74	39.75386523	-80.80810774	
2,000.00	2.00	85.000	1,999.05	4.87	55.63	14,437,165.83	1,694,352.22	39.75386604	-80.80809537	
2,000.95	2.00	85.000	2,000.00	4.87	55.66	14,437,165.83	1,694,352.25	39.75386605	-80.80809525	
Begin 1°/100' turn										
2,100.00	1.90	55.735	2,098.99	5.95	58.74	14,437,166.91	1,694,355.33	39.75386899	-80.80808428	
2,137.74	2.00	45.000	2,136.71	6.77	59.73	14,437,167.72	1,694,356.32	39.75387123	-80.80808077	
Begin 2.00° tangent										
2,200.00	2.00	45.000	2,198.93	8.30	61.26	14,437,169.26	1,694,357.85	39.75387544	-80.80807530	
2,300.00	2.00	45.000	2,298.87	10.77	63.73	14,437,171.73	1,694,360.32	39.75388220	-80.80806650	
2,400.00	2.00	45.000	2,398.81	13.24	66.20	14,437,174.20	1,694,362.79	39.75388897	-80.80805770	
2,500.00	2.00	45.000	2,498.75	15.71	68.67	14,437,176.66	1,694,365.26	39.75389573	-80.80804890	
2,600.00	2.00	45.000	2,598.69	18.17	71.13	14,437,179.13	1,694,367.73	39.75390249	-80.80804010	
2,700.00	2.00	45.000	2,698.63	20.64	73.60	14,437,181.60	1,694,370.19	39.75390925	-80.80803130	
2,800.00	2.00	45.000	2,798.56	23.11	76.07	14,437,184.07	1,694,372.66	39.75391602	-80.80802250	
2,900.00	2.00	45.000	2,898.50	25.58	78.54	14,437,186.54	1,694,375.13	39.75392278	-80.80801370	
3,000.00	2.00	45.000	2,998.44	28.04	81.00	14,437,189.00	1,694,377.60	39.75392954	-80.80800490	
3,100.00	2.00	45.000	3,098.38	30.51	83.47	14,437,191.47	1,694,380.06	39.75393631	-80.80799610	
3,200.00	2.00	45.000	3,198.32	32.98	85.94	14,437,193.94	1,694,382.53	39.75394307	-80.80798730	
3,300.00	2.00	45.000	3,298.26	35.45	88.41	14,437,196.41	1,694,385.00	39.75394983	-80.80797850	
3,400.00	2.00	45.000	3,398.20	37.92	90.88	14,437,198.87	1,694,387.47	39.75395659	-80.80796971	
3,500.00	2.00	45.000	3,498.14	40.38	93.34	14,437,201.34	1,694,389.94	39.75396336	-80.80796091	
3,600.00	2.00	45.000	3,598.08	42.85	95.81	14,437,203.81	1,694,392.40	39.75397012	-80.80795211	
3,700.00	2.00	45.000	3,698.02	45.32	98.28	14,437,206.28	1,694,394.87	39.75397688	-80.80794331	
3,800.00	2.00	45.000	3,797.96	47.79	100.75	14,437,208.75	1,694,397.34	39.75398364	-80.80793451	
3,900.00	2.00	45.000	3,897.89	50.25	103.21	14,437,211.21	1,694,399.81	39.75399041	-80.80792571	
4,000.00	2.00	45.000	3,997.83	52.72	105.68	14,437,213.68	1,694,402.27	39.75399717	-80.80791691	
4,002.17	2.00	45.000	4,000.00	52.78	105.74	14,437,213.73	1,694,402.33	39.75399732	-80.80791672	
Begin 1°/100' drop										
4,100.00	1.02	45.000	4,097.80	54.60	107.56	14,437,215.56	1,694,404.15	39.75400231	-80.80791022	
4,200.00	0.02	45.000	4,197.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792	
4,202.17	0.00	45.000	4,199.96	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792	
Begin vertical hold										
4,300.00	0.00	0.000	4,297.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792	



Planning Report - Geographic

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 WV Department of
 Environmental Protection

Database: DB_Aug1919_v14
Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Armstrong Pad
Well: Armstrong 1S-12 HU (slot N)
Wellbore: Original Hole
Design: rev2

Local Co-ordinate Reference: Well Armstrong 1S-12 HU (slot N)
TVD Reference: GL @ 1279.00ft
MD Reference: GL @ 1279.00ft
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
4,400.00	0.00	45.000	4,397.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
4,500.00	0.00	0.000	4,497.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
4,600.00	0.00	45.000	4,597.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
4,700.00	0.00	0.000	4,697.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
4,800.00	0.00	45.000	4,797.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
4,900.00	0.00	0.000	4,897.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,000.00	0.00	0.000	4,997.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,100.00	0.00	0.000	5,097.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,200.00	0.00	45.000	5,197.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,300.00	0.00	45.000	5,297.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,400.00	0.00	0.000	5,397.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,500.00	0.00	45.000	5,497.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,600.00	0.00	0.000	5,597.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,700.00	0.00	0.000	5,697.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,800.00	0.00	0.000	5,797.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
5,900.00	0.00	45.000	5,897.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,000.00	0.00	0.000	5,997.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,100.00	0.00	45.000	6,097.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,200.00	0.00	45.000	6,197.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,300.00	0.00	0.000	6,297.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,400.00	0.00	0.000	6,397.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,500.00	0.00	0.000	6,497.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,600.00	0.00	45.000	6,597.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,700.00	0.00	0.000	6,697.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,800.00	0.00	45.000	6,797.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
6,900.00	0.00	0.000	6,897.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,000.00	0.00	45.000	6,997.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,100.00	0.00	0.000	7,097.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,200.00	0.00	0.000	7,197.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,300.00	0.00	45.000	7,297.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,400.00	0.00	0.000	7,397.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,500.00	0.00	45.000	7,497.79	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
7,502.21	0.00	45.000	7,500.00	55.24	108.20	14,437,216.20	1,694,404.80	39.75400408	-80.80790792
Begin 2°/100' build									
7,600.00	1.96	142.178	7,597.77	53.92	109.23	14,437,214.88	1,694,405.82	39.75400045	-80.80790429
7,700.00	3.96	142.178	7,697.63	49.85	112.39	14,437,210.81	1,694,408.98	39.75398925	-80.80789307
7,800.00	5.96	142.178	7,797.26	43.03	117.69	14,437,203.99	1,694,414.28	39.75397048	-80.80787427
7,900.00	7.96	142.178	7,896.51	33.46	125.11	14,437,194.42	1,694,421.70	39.75394416	-80.80784793
8,000.00	9.96	142.178	7,995.29	21.17	134.66	14,437,182.13	1,694,431.25	39.75391034	-80.80781406
8,100.00	11.96	142.178	8,093.46	6.15	146.31	14,437,167.11	1,694,442.90	39.75386904	-80.80777271
8,200.00	13.96	142.178	8,190.91	-11.55	160.06	14,437,149.40	1,694,456.65	39.75382033	-80.80772393
8,300.00	15.96	142.178	8,287.52	-31.94	175.88	14,437,129.02	1,694,472.48	39.75376425	-80.80766778
8,400.00	17.96	142.178	8,383.17	-54.97	193.77	14,437,105.98	1,694,490.36	39.75370088	-80.80760433
8,500.00	19.96	142.178	8,477.74	-80.63	213.68	14,437,080.33	1,694,510.28	39.75363030	-80.80753366
8,600.00	21.96	142.178	8,571.12	-108.88	235.61	14,437,052.08	1,694,532.21	39.75355259	-80.80745584
8,700.00	23.96	142.178	8,663.20	-139.69	259.53	14,437,021.27	1,694,556.12	39.75346784	-80.80737099
8,800.00	25.96	142.178	8,753.86	-173.02	285.40	14,436,987.94	1,694,581.99	39.75337617	-80.80727919
8,900.00	27.96	142.178	8,842.99	-208.82	313.20	14,436,952.14	1,694,609.79	39.75327767	-80.80718057
8,933.40	28.62	142.178	8,872.40	-221.33	322.90	14,436,939.63	1,694,619.50	39.75324327	-80.80714613
Begin 28.62° tangent									
9,000.00	28.62	142.178	8,930.86	-246.53	342.47	14,436,914.43	1,694,639.06	39.75317394	-80.80707671
9,100.00	28.62	142.178	9,018.64	-284.37	371.85	14,436,876.59	1,694,668.44	39.75306985	-80.80697248
9,200.00	28.62	142.178	9,106.41	-322.21	401.22	14,436,838.75	1,694,697.81	39.75296575	-80.80686825
9,300.00	28.62	142.178	9,194.19	-360.05	430.60	14,436,800.91	1,694,727.19	39.75286165	-80.80676402



Planning Report - Geographic

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DEC 04 2019
WV Department of Environmental Protection

Database: DB_Aug1919_v14
Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Armstrong Pad
Well: Armstrong 1S-12 HU (slot N)
Wellbore: Original Hole
Design: rev2

Local Co-ordinate Reference: Well Armstrong 1S-12 HU (slot N)
TVD Reference: GL @ 1279.00ft
MD Reference: GL @ 1279.00ft
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Table with 11 columns: Measured Depth (ft), Inclination (°), Azimuth (°), Vertical Depth (ft), +N/-S (ft), +E/-W (ft), Map Northing (usft), Map Easting (usft), Latitude, Longitude. Rows include depth intervals from 9,400.00 to 14,100.00 ft and lateral sections starting with 'Begin 6°/100' build/turn', 'Begin 8°/100' build/turn', and 'Begin 89.00° lateral'.



4705102258 Mo D

Environmental Protection
WV Department of
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Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,200.00	89.00	149.697	11,236.55	-3,563.30	2,467.81	14,433,597.66	1,696,764.40	39.74405230	-80.79954121
14,300.00	89.00	149.697	11,238.28	-3,649.63	2,518.26	14,433,511.34	1,696,814.84	39.74381492	-80.79936243
14,400.00	89.00	149.697	11,240.02	-3,735.95	2,568.71	14,433,425.01	1,696,865.29	39.74357754	-80.79918365
14,500.00	89.00	149.697	11,241.76	-3,822.28	2,619.16	14,433,338.69	1,696,915.74	39.74334015	-80.79900486
14,600.00	89.00	149.697	11,243.49	-3,908.60	2,669.60	14,433,252.37	1,696,966.19	39.74310277	-80.79882608
14,700.00	89.00	149.697	11,245.23	-3,994.93	2,720.05	14,433,166.04	1,697,016.64	39.74286539	-80.79864730
14,800.00	89.00	149.697	11,246.97	-4,081.25	2,770.50	14,433,079.72	1,697,067.09	39.74262800	-80.79846852
14,900.00	89.00	149.697	11,248.71	-4,167.57	2,820.95	14,432,993.39	1,697,117.54	39.74239062	-80.79828975
15,000.00	89.00	149.697	11,250.44	-4,253.90	2,871.40	14,432,907.07	1,697,167.99	39.74215324	-80.79811097
15,100.00	89.00	149.697	11,252.18	-4,340.22	2,921.85	14,432,820.74	1,697,218.44	39.74191585	-80.79793219
15,200.00	89.00	149.697	11,253.92	-4,426.55	2,972.30	14,432,734.42	1,697,268.88	39.74167847	-80.79775342
15,300.00	89.00	149.697	11,255.65	-4,512.87	3,022.75	14,432,648.10	1,697,319.33	39.74144108	-80.79757465
15,400.00	89.00	149.697	11,257.39	-4,599.20	3,073.20	14,432,561.77	1,697,369.78	39.74120370	-80.79739588
15,500.00	89.00	149.697	11,259.13	-4,685.52	3,123.64	14,432,475.45	1,697,420.23	39.74096631	-80.79721711
15,600.00	89.00	149.697	11,260.86	-4,771.84	3,174.09	14,432,389.12	1,697,470.68	39.74072893	-80.79703834
15,700.00	89.00	149.697	11,262.60	-4,858.17	3,224.54	14,432,302.80	1,697,521.13	39.74049154	-80.79685957
15,800.00	89.00	149.697	11,264.34	-4,944.49	3,274.99	14,432,216.48	1,697,571.58	39.74025416	-80.79668080
15,900.00	89.00	149.697	11,266.08	-5,030.82	3,325.44	14,432,130.15	1,697,622.03	39.74001677	-80.79650204
16,000.00	89.00	149.697	11,267.81	-5,117.14	3,375.89	14,432,043.83	1,697,672.48	39.73977938	-80.79632327
16,100.00	89.00	149.697	11,269.55	-5,203.47	3,426.34	14,431,957.50	1,697,722.92	39.73954200	-80.79614451
16,200.00	89.00	149.697	11,271.29	-5,289.79	3,476.79	14,431,871.18	1,697,773.37	39.73930461	-80.79596575
16,300.00	89.00	149.697	11,273.02	-5,376.11	3,527.24	14,431,784.86	1,697,823.82	39.73906722	-80.79578699
16,400.00	89.00	149.697	11,274.76	-5,462.44	3,577.69	14,431,698.53	1,697,874.27	39.73882983	-80.79560823
16,500.00	89.00	149.697	11,276.50	-5,548.76	3,628.13	14,431,612.21	1,697,924.72	39.73859245	-80.79542947
16,600.00	89.00	149.697	11,278.23	-5,635.09	3,678.58	14,431,525.88	1,697,975.17	39.73835506	-80.79525071
16,700.00	89.00	149.697	11,279.97	-5,721.41	3,729.03	14,431,439.56	1,698,025.62	39.73811767	-80.79507196
16,800.00	89.00	149.697	11,281.71	-5,807.74	3,779.48	14,431,353.23	1,698,076.07	39.73788028	-80.79489321
16,900.00	89.00	149.697	11,283.45	-5,894.06	3,829.93	14,431,266.91	1,698,126.52	39.73764289	-80.79471445
17,000.00	89.00	149.697	11,285.18	-5,980.38	3,880.38	14,431,180.59	1,698,176.96	39.73740550	-80.79453570
17,100.00	89.00	149.697	11,286.92	-6,066.71	3,930.83	14,431,094.26	1,698,227.41	39.73716811	-80.79435695
17,200.00	89.00	149.697	11,288.66	-6,153.03	3,981.28	14,431,007.94	1,698,277.86	39.73693072	-80.79417820
17,300.00	89.00	149.697	11,290.39	-6,239.36	4,031.73	14,430,921.61	1,698,328.31	39.73669333	-80.79399945
17,400.00	89.00	149.697	11,292.13	-6,325.68	4,082.18	14,430,835.29	1,698,378.76	39.73645594	-80.79382071
17,500.00	89.00	149.697	11,293.87	-6,412.01	4,132.62	14,430,748.97	1,698,429.21	39.73621855	-80.79364196
17,600.00	89.00	149.697	11,295.60	-6,498.33	4,183.07	14,430,662.64	1,698,479.66	39.73598116	-80.79346322
17,700.00	89.00	149.697	11,297.34	-6,584.65	4,233.52	14,430,576.32	1,698,530.11	39.73574377	-80.79328447
17,800.00	89.00	149.697	11,299.08	-6,670.98	4,283.97	14,430,489.99	1,698,580.56	39.73550638	-80.79310573
17,900.00	89.00	149.697	11,300.82	-6,757.30	4,334.42	14,430,403.67	1,698,631.00	39.73526898	-80.79292699
18,000.00	89.00	149.697	11,302.55	-6,843.63	4,384.87	14,430,317.35	1,698,681.45	39.73503159	-80.79274825
18,100.00	89.00	149.697	11,304.29	-6,929.95	4,435.32	14,430,231.02	1,698,731.90	39.73479420	-80.79256951
18,200.00	89.00	149.697	11,306.03	-7,016.28	4,485.77	14,430,144.70	1,698,782.35	39.73455681	-80.79239077
18,300.00	89.00	149.697	11,307.76	-7,102.60	4,536.22	14,430,058.37	1,698,832.80	39.73431941	-80.79221204
18,400.00	89.00	149.697	11,309.50	-7,188.92	4,586.67	14,429,972.05	1,698,883.25	39.73408202	-80.79203330
18,500.00	89.00	149.697	11,311.24	-7,275.25	4,637.11	14,429,885.72	1,698,933.70	39.73384463	-80.79185457
18,600.00	89.00	149.697	11,312.97	-7,361.57	4,687.56	14,429,799.40	1,698,984.15	39.73360723	-80.79167584
18,700.00	89.00	149.697	11,314.71	-7,447.90	4,738.01	14,429,713.08	1,699,034.60	39.73336984	-80.79149711
18,800.00	89.00	149.697	11,316.45	-7,534.22	4,788.46	14,429,626.75	1,699,085.05	39.73313244	-80.79131838
18,900.00	89.00	149.697	11,318.19	-7,620.55	4,838.91	14,429,540.43	1,699,135.49	39.73289505	-80.79113965
19,000.00	89.00	149.697	11,319.92	-7,706.87	4,889.36	14,429,454.10	1,699,185.94	39.73265765	-80.79096092
19,100.00	89.00	149.697	11,321.66	-7,793.19	4,939.81	14,429,367.78	1,699,236.39	39.73242026	-80.79078220
19,200.00	89.00	149.697	11,323.40	-7,879.52	4,990.26	14,429,281.46	1,699,286.84	39.73218286	-80.79060347
19,300.00	89.00	149.697	11,325.13	-7,965.84	5,040.71	14,429,195.13	1,699,337.29	39.73194547	-80.79042475
19,400.00	89.00	149.697	11,326.87	-8,052.17	5,091.16	14,429,108.81	1,699,387.74	39.73170807	-80.79024602
19,500.00	89.00	149.697	11,328.61	-8,138.49	5,141.60	14,429,022.48	1,699,438.19	39.73147067	-80.79006730
19,600.00	89.00	149.697	11,330.34	-8,224.82	5,192.05	14,428,936.16	1,699,488.64	39.73123328	-80.78988858

Database:	DB_Aug1919_v14	Local Co-ordinate Reference:	Well Armstrong 1S-12 HU (slot N)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1279.00ft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1279.00ft
Site:	Armstrong Pad	North Reference:	Grid
Well:	Armstrong 1S-12 HU (slot N)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev2		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,700.00	89.00	149.697	11,332.08	-8,311.14	5,242.50	14,428,849.84	1,699,539.08	39.73099588	-80.78970986
19,800.00	89.00	149.697	11,333.82	-8,397.46	5,292.95	14,428,763.51	1,699,589.53	39.73075848	-80.78953115
19,900.00	89.00	149.697	11,335.56	-8,483.79	5,343.40	14,428,677.19	1,699,639.98	39.73052109	-80.78935243
20,000.00	89.00	149.697	11,337.29	-8,570.11	5,393.85	14,428,590.86	1,699,690.43	39.73028369	-80.78917372
20,100.00	89.00	149.697	11,339.03	-8,656.44	5,444.30	14,428,504.54	1,699,740.88	39.73004629	-80.78899500
20,200.00	89.00	149.697	11,340.77	-8,742.76	5,494.75	14,428,418.21	1,699,791.33	39.72980889	-80.78881629
20,300.00	89.00	149.697	11,342.50	-8,829.09	5,545.20	14,428,331.89	1,699,841.78	39.72957149	-80.78863758
20,400.00	89.00	149.697	11,344.24	-8,915.41	5,595.65	14,428,245.57	1,699,892.23	39.72933409	-80.78845887
20,500.00	89.00	149.697	11,345.98	-9,001.73	5,646.09	14,428,159.24	1,699,942.68	39.72909669	-80.78828016
20,558.84	89.00	149.697	11,347.00	-9,052.53	5,675.78	14,428,108.45	1,699,972.36	39.72895701	-80.78817501

PBHL/TD 20558.84 MD/11347.00 TVD

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Armstrong 1S-12 HU LP	0.00	0.000	11,197.00	-1,598.24	1,369.37	14,435,562.73	1,695,665.96	39.74945563	-80.80343357
- hit/miss target									
- Shape									
- plan misses target center by 43.15ft at 11948.83ft MD (11197.44 TVD, -1620.00 N, 1332.12 E)									
- Point									
Armstrong 1S-12 HU LP	0.00	0.000	11,197.00	-1,598.24	1,319.37	14,435,562.73	1,695,615.96	39.74945593	-80.80361147
- plan misses target center by 0.02ft at 11923.61ft MD (11197.00 TVD, -1598.22 N, 1319.39 E)									
- Point									
Armstrong 1S-12 HU PB	0.00	0.000	11,347.00	-9,052.53	5,675.78	14,428,108.45	1,699,972.36	39.72895700	-80.78817500
- plan hits target center									
- Point									

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
300.00	300.00	0.00	0.00	KOP Begin 1°/100' build
500.00	499.96	0.30	3.48	Begin 2.00° tangent
2,000.95	2,000.00	4.87	55.66	Begin 1°/100' turn
2,137.74	2,136.71	6.77	59.73	Begin 2.00° tangent
4,002.17	4,000.00	52.78	105.74	Begin 1°/100' drop
4,202.17	4,199.96	55.24	108.20	Begin vertical hold
7,502.21	7,500.00	55.24	108.20	Begin 2°/100' build
8,933.40	8,872.40	-221.33	322.90	Begin 28.62° tangent
11,075.84	10,753.00	-1,032.06	952.28	Begin 6°/100' build/turn
11,434.56	11,028.98	-1,216.39	1,082.78	Begin 8°/100' build/turn
11,923.67	11,197.01	-1,598.28	1,319.42	Begin 89.00° lateral
20,558.84	11,347.00	-9,052.53	5,675.78	PBHL/TD 20558.84 MD/11347.00 TVD

 RECEIVED
 Office of Oil and Gas

DEC 04 2019

 WV Department of
 Environmental Protection

ARMSTRONG LEASE WELL 1S-12HU 551.5786± ACRES

(+) DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

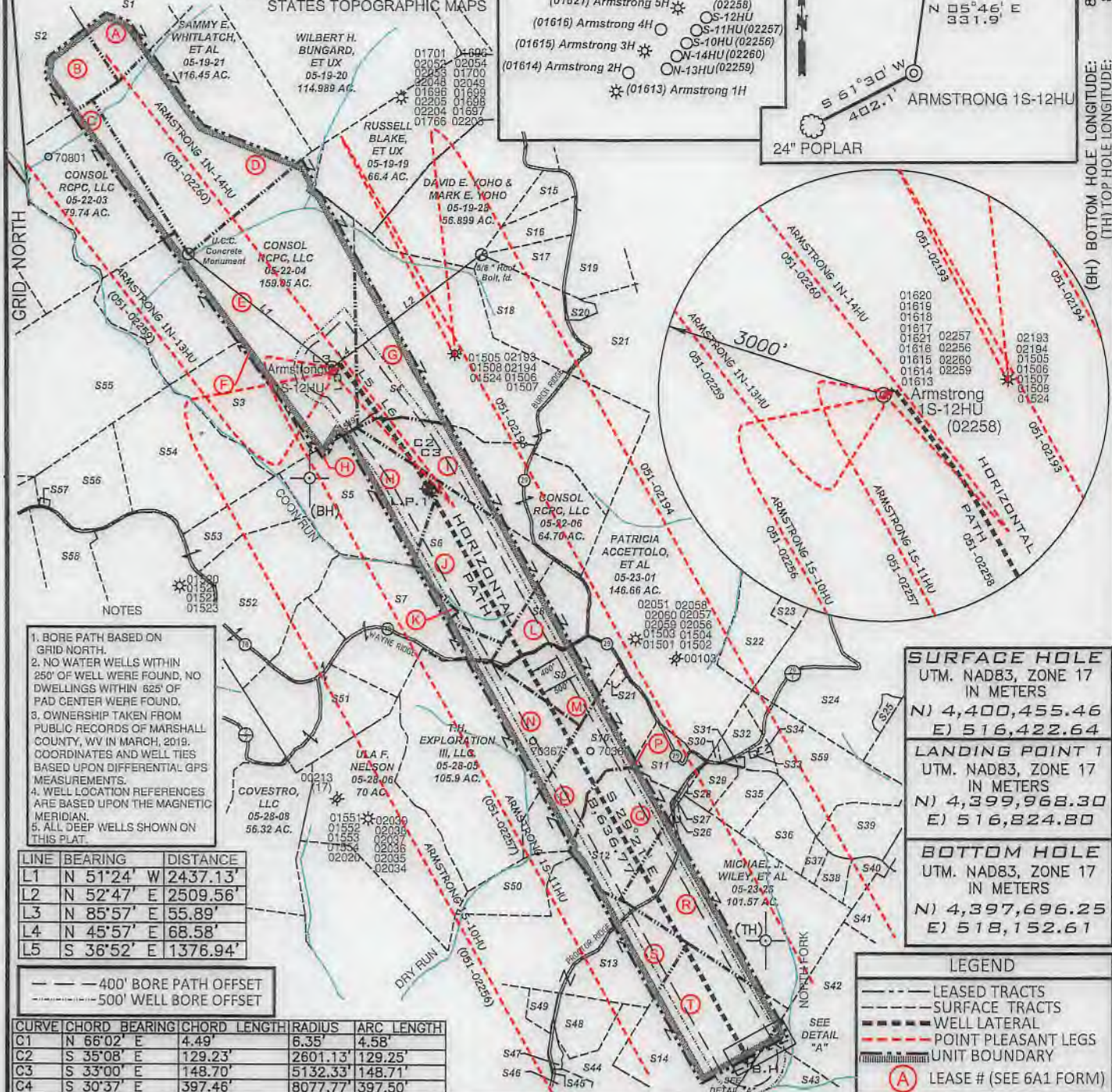
DETAIL (01620) Armstrong 9H
 SKETCH "A" (01619) Armstrong 8H
 SCALE 1"=200' Armstrong 7H (01618)
 (01617) Armstrong 6H
 (01621) Armstrong 5H (02258)
 (01616) Armstrong 4H (02257)
 (01615) Armstrong 3H (02256)
 (01614) Armstrong 2H (02255)
 (01613) Armstrong 1H

TOP HOLE LATITUDE: 39°47'30"
 BOTTOM HOLE LATITUDE: 39°45'00"

REFERENCES SCALE 1"=400'
 12" BLACK LOCUST
 N 85°46' E
 331.9'

402.1' W
 S 61°30' W
 24" POPLAR

ARMSTRONG 1S-12HU



- NOTES
1. BORE PATH BASED ON GRID NORTH.
 2. NO WATER WELLS WITHIN 250' OF WELL WERE FOUND, NO DWELLINGS WITHIN 825' OF PAD CENTER WERE FOUND.
 3. OWNERSHIP TAKEN FROM PUBLIC RECORDS OF MARSHALL COUNTY, WV IN MARCH, 2019. COORDINATES AND WELL TIES BASED UPON DIFFERENTIAL GPS MEASUREMENTS.
 4. WELL LOCATION REFERENCES ARE BASED UPON THE MAGNETIC MERIDIAN.
 5. ALL DEEP WELLS SHOWN ON THIS PLAT.

LINE	BEARING	DISTANCE
L1	N 51°24' W	2437.13'
L2	N 52°47' E	2509.56'
L3	N 85°57' E	55.89'
L4	N 45°57' E	68.58'
L5	S 36°52' E	1376.94'

--- 400' BORE PATH OFFSET
 - - - 500' WELL BORE OFFSET

CURVE	CHORD	BEARING	CHORD LENGTH	RADIUS	ARC LENGTH
C1	N 66°02' E	4.49'	6.35'	4.58'	
C2	S 35°08' E	129.23'	2601.13'	129.25'	
C3	S 33°00' E	148.70'	5132.33'	148.71'	
C4	S 30°37' E	397.46'	8077.77'	397.50'	

SURFACE HOLE
 UTM, NAD83, ZONE 17
 IN METERS
 N) 4,400,455.46
 E) 516,422.64

LANDING POINT 1
 UTM, NAD83, ZONE 17
 IN METERS
 N) 4,399,968.30
 E) 516,824.80

BOTTOM HOLE
 UTM, NAD83, ZONE 17
 IN METERS
 N) 4,397,696.25
 E) 518,152.61

LEGEND

- LEASE TRACTS
- - - SURFACE TRACTS
- - - WELL LATERAL
- - - POINT PLEASANT LEGS
- - - UNIT BOUNDARY
- (A) LEASE # (SEE 6A1 FORM)

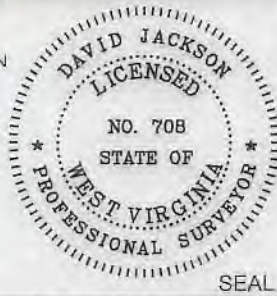
FILE NUMBER _____
 DRAWING NUMBER: ARMSTRONG_1S-12HU_REV2
 SCALE 1" = 2000'
 MINIMUM DEGREE OF ACCURACY 1/200
 PROVEN SOURCE OF ELEVATION SUBMETER MAPPING
GRADE GPS

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

P.S. David L Jackson
 708



JACKSON SURVEYING INC.
 P.O. Box 1460
 Clarksburg, WV 26302
 304-623-5851



WVDEP
 OFFICE OF OIL & GAS
 601 57TH STREET, SE
 CHARLESTON, WV 25304

DATE: JULY 22, 2019
 REVISED: NOVEMBER 05, 2019
 OPERATORS WELL NO. Armstrong 1S-12HU

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___
 (IF "GAS") PRODUCTION X STORAGE ___ DEEP X SHALLOW ___
 LOCATION ELEVATION 1279.12' WATERSHED (HUC 10) FRENCH CREEK - OHIO RIVER
 DISTRICT FRANKLIN COUNTY MARSHALL
 QUADRANGLE POWHATAN POINT 7.5' LEASE NUMBER SEE WW-6A1 Form

SURFACE OWNER CONSOL RCPC, LLC. ACREAGE 159.05
 OIL & GAS ROYALTY OWNER CONSOL RCPC, LLC. LEASE ACREAGE 159.05
 PROPOSED WORK: DRILL X CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION ___
 PERFORATE NEW FORMATION ___ OTHER PHYSICAL CHANGE (SPECIFY) _____

TARGET FORMATION POINT PLEASANT ESTIMATED DEPTH TVD: 11,417' TMD: 20,559'

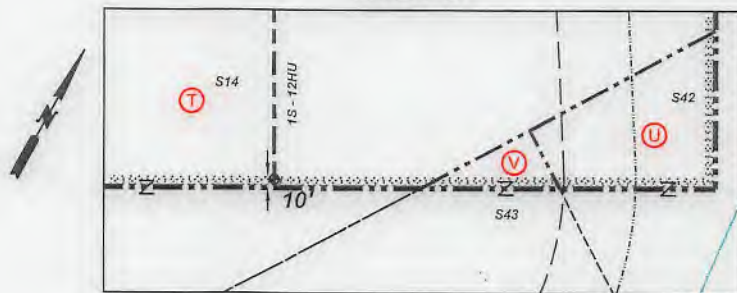
WELL OPERATOR TUG HILL OPERATING, LLC DESIGNATED AGENT DIANNA STAMPER
1320 SOUTH UNIVERSITY DRIVE, SUITE 500 ADDRESS 5400 D BIG TYLER ROAD
FORT WORTH, TX 76107 ADDRESS CHARLESTON, WV 25313

COUNTY NAME
 PERMIT

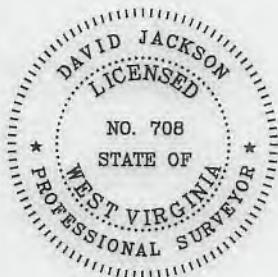
**ARMSTRONG LEASE
WELL 1S-12HU
551.5786± ACRES**

Number	TAX MAP-PARCEL	SURFACE OWNER	ACRES
S1	A 05-19-3	Milton R. & Linda L. Neal	72.01
S2	B 05-19-22	George A. Knuth & Kelly A. Knuth	71.0
S3	F 05-22-17	Consol RCPC, LLC	37.5
S4	G 05-22-5	Consol RCPC, LLC	134.425
S5	H 05-22-10	T.H. Exploration III, LLC.	58.40
S6	J 05-22-8	T.H. Exploration III, LLC.	48.44
S7	K 05-22-9	T.H. Exploration III, LLC.	63.44
S8	L 05-22-7.1	XcL Midstream Operating, LLC. & Atinum Marcellus I, LLC.	20.68
S9	M 05-22-7	Patricia Accettolo, et al	25.02
S10	O 05-23-28	Gregg D. Minor	39.43
S11	P 05-23-28.2	Tammac Holdings Corp.	10.8
S12	Q 05-23-27	Michael J. Wiley, et al	33.140
S13	S 05-26-2	Edwin Booth Anderson & Mark W. Booth	67.5
S14	T 05-26-5	Michael J. Wiley, et al	65.0
S15	05-19-27	David E. Yoho & Mark E. Yoho	7.041
S16	05-19-26	Roger J. & Beth E. James	9.977
S17	05-19-25	David E. Yoho & Mark E. Yoho	9.976
S18	05-19-18.2	Paul V. & Carol Neely	32.672
S19	05-19-24	Mark E. Yoho	15.436
S20	05-19-18.1	Mark E. Yoho, et ux	2.57
S21	05-19-18	Mark E. Yoho, et ux	55.948
S22	05-23-2	Daniel J. & Danielle D. Lilley	70.0
S23	05-23-2.2	Jessica N. & Andrew L. Jones	7.636
S24	05-23-4	Abe J. Hochstetler	100.7
S25	05-23-4.1	XcL Midstream Operating, LLC	2.16
S26	05-23-25	Arthur A. Wiley	0.43
S27	05-23-24	Michael J. Wiley, et al	0.25
S28	05-23-23	Michael J. Wiley, et al	1.0
S29	05-23-22	Daniel D. Rhyand & Laurel R. Greene	6.25
S30	05-23-29	James Wiley	0.25
S31	05-23-21	Mark A. Yoho & Mark E. Yoho	0.588
S32	05-23-18.1	Mark A. Yoho	7.8
S33	05-23-20	Christian Church	0.19
S34	05-23-19	Doty Cemetery	1.0
S35	05-23-17.1	Curtis E. Hall et ux	10.051
S36	05-23-17.2	Dick Rowan, Jr & Carol J. Rowan	14.920
S37	05-23-17.4	Tammy D. Meadows	2.605
S38	05-23-17	Tammy & Thomas E. Brown	4.62
S39	05-23-16	Roy Friend Yoho, Sr.	18.03
S40	05-23-17.3	William & Katherine Flewelling	5.018
S41	05-23-14	Dominion Transmission Inc.	59.5
S42	U 05-26-7	Dominion Transmission Inc.	71.0
S43	V 05-26-6	Heartwood Forestland Fund VII LP	36.17
S44	05-26-4.4	Otis F. & Glenda M. Rush	39.436
S45	05-26-4.1	Otis S. Rush, et ux	12.188
S46	05-26-4.3	Crystal & Randolph F. Matask	2.253
S47	05-26-4.2	Otis S. Rush, et ux	1.58
S48	05-26-4.6	Otis F. Rush, Jr.	12.268
S49	05-26-4	James R. & Melody Anderson	3.887
S50	05-26-1	Edwin Booth Anderson & Mark W. Booth	12.94
S51	05-28-4	T.H. Exploration III, LLC.	48.44
S52	05-22-11	T.H. Exploration III, LLC.	55.65
S53	05-22-12	T.H. Exploration III, LLC.	61.49
S54	05-22-16	Edward R. Yoho, Jr.	57
S55	05-22-18	Edward R. Yoho, Jr.	77.13
S56	05-22-15	Edward R. Yoho, Jr.	25.5
S57	05-22-14	Consol RCPC, LLC	0.3
S58	05-22-13	John M. Moore, Teresa R. Moore & Andrea S. Moore	40.57
S59	05-23-18	Abe J. Hochstetler	35.38

DETAIL "A"



47-051-02258 mob



P.S. 708 *David L Jackson*



**TUG HILL
OPERATING**

OPERATOR'S
WELL #: Armstrong 1S-12HU
DISTRICT: Franklin
COUNTY: Marshall
STATE: WV
API: 47-051-02258

WELL PLAT
PAGE 2 OF 4
DATE: 07/22/2019
REVISED: 11/05/2019

WW-6A1
(5/13)

Operator's Well No. Armstrong S-12HU

**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

(1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;

(2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
----------------------	-----------------------	-----------------------	---------	-----------

*See attached pages

[Faint, illegible text]

* **Co-tenancy utilization – At least 7 mineral owners in tract. At least 75% of the royalty owners have executed a lease on the tract. The interests of the remaining co-tenants were acquired pursuant to the Co-tenancy Modernization and Majority Protection Act.**

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Tug Hill Operating, LLC
 By: Amy L. Miller *[Signature]*
 Its: Permitting Specialist - Appalachia Region

Operator's Well No. Armstrong S - 12HU

WW-6A1 Supplement

4705102258 MOD

Lease No.	Tags	Parcel	Lessor	Lessee	Royalty	Book	Page	Assignment	Assignment	Assignment	
10*14023	A	5-19-3	MILTON R NEAL AND LINDA L NEAL	GASTAR EXPLORATION USA INC	1/8+	665	503	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14581	B	5-19-22	CAROL BORDNER	CHESAPEAKE APPALACHIA LLC	1/8+	693	609	NA	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14582	B	5-19-22	DALE F MCINTIRE	CHESAPEAKE APPALACHIA LLC	1/8+	694	104	NA	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14583	B	5-19-22	BRADLEY DEMENT AKA BRADLEY F DEMENT	CHESAPEAKE APPALACHIA LLC	1/8+	694	79	24/338 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14584	B	5-19-22	RAY F MCINTIRE AKA FRANCIS RAY MCINTIRE	CHESAPEAKE APPALACHIA LLC	1/8+	693	620	NA	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14585	B	5-19-22	WILBUR L BLAND	CHESAPEAKE APPALACHIA LLC	1/8+	694	543	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14586	B	5-19-22	CAROLYN MCINTIRE HICKERSON	CHESAPEAKE APPALACHIA LLC	1/8+	694	546	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC

4705102258mod

PERMITTED
UNIT OPERATIONS

5/23/21/2023

NY Department of
Environmental Conservation

Operator's Well No. Armstrong S - 12HU

WW-6A1 Supplement

10*14587	B	5-19-22	CHERYL FIDLER	CHESAPEAKE APPALACHIA LLC	1/8+	694	550	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14588	B	5-19-22	LLOYD E MCINTYRE II	CHESAPEAKE APPALACHIA LLC	1/8+	694	565	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14589	B	5-19-22	BETTY JEAN HARBOUR	CHESAPEAKE APPALACHIA LLC	1/8+	694	569	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14590	B	5-19-22	CHARLES HARBOUR CAROL J HARBOUR	CHESAPEAKE APPALACHIA LLC	1/8+	694	540	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14591	B	5-19-22	JUDY L MCINTYRE	CHESAPEAKE APPALACHIA LLC	1/8+	694	553	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14592	B	5-19-22	NORA JEAN TRUEX	CHESAPEAKE APPALACHIA LLC	1/8+	696	639	23/512 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14593	B	5-19-22	KEITH MCINTYRE AND TAMMY MCINTYRE	CHESAPEAKE APPALACHIA LLC	1/8+	696	17	23/479 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC

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10*14594	B	5-19-22	KAREN M ECKELBERRY	CHESAPEAKE APPALACHIA LLC	1/8+	696	13	Environmental Protection	23/512 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14595	B	5-19-22	JUDY A ADAMS	CHESAPEAKE APPALACHIA LLC	1/8+	696	643	23/512 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14596	B	5-19-22	MARY LEE LOWE	CHESAPEAKE APPALACHIA LLC	1/8+	696	9	23/512 Chesapeake Appalachia LLC to Statoil USA Onshore Properties	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14597	B	5-19-22	JACKIE MCINTIRE STEPHANIE A CRISS, POA	CHESAPEAKE APPALACHIA LLC	1/8+	702	218	NA	27/321 Chesapeake Appalachia LLC and Statoil USA Onshore Properties to Gastar Exploration USA Inc and Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14598	B	5-19-22	GEORGE A KNUTH ESTATE OF KATHRYN G NOFFSINGER MICHAEL E	GASTAR EXPLORATION USA INC	1/8+	741	523	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14599	B	5-19-22	MCINTIRE, GUARDIAN	GASTAR EXPLORATION INC	1/8+	839	522	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14600	B	5-19-22	PAMELA HARTZLER	GASTAR EXPLORATION INC	1/8+	839	525	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14601	B	5-19-22	FERRY MCINTIRE	GASTAR EXPLORATION INC	1/8+	840	158	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14608	C	5-22-3	CHESTNUT HOLDINGS INC	GASTAR EXPLORATION INC	1/8+	827	560	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14100	D	5-19-21	SAMMY WHITLATCH	GASTAR EXPLORATION USA INC	1/8+	665	369	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC	

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Well No.	Lease No.	Operator	Company	Share	Acres	Section	Operator's Well No.	Company			
10*14101	D	5-19-21	RICHARD WHITLATCH	GASTAR EXPLORATION USA INC	1/8+	665	366	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14102	D	5-19-21	GLORIA A TERRILL	GASTAR EXPLORATION USA INC	1/8+	698	633	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14103	D	5-19-21	ROSE R & JAMES N DAUGHERTY	GASTAR EXPLORATION USA INC	1/8+	698	635	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14104	D	5-19-21	GLENNA & DALE ANDERSON	GASTAR EXPLORATION USA INC	1/8+	698	625	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14105	D	5-19-21	WENDELL & CAROLYN RINE	GASTAR EXPLORATION USA INC	1/8+	698	627	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14106	D	5-19-21	GARY E RINE	GASTAR EXPLORATION USA INC	1/8+	698	629	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14107	D	5-19-21	ARCHIE WAYNE WHIPKEY	GASTAR EXPLORATION USA INC	1/8+	698	631	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14108	D	5-19-21	LOIS M MYERS	GASTAR EXPLORATION USA INC	1/8+	698	637	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14033	E	5-22-4	LAMOYNE BAKER	GASTAR EXPLORATION USA INC	1/8+	665	554	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14034	E	5-22-4	LAWRENCE C AND LORRAINE J MCWHORTER	GASTAR EXPLORATION USA INC	1/8+	665	391	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14035	E	5-22-4	PEGGY MAE WHITE	GASTAR EXPLORATION USA INC	1/8+	695	446	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14036	E	5-22-4	WILDA WINTERS	GASTAR EXPLORATION USA INC	1/8+	701	579	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14037	E	5-22-4	JUDITH L CHAMBERS	GASTAR EXPLORATION USA INC	1/8+	701	577	NA	23/353 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14039	E	5-22-4	CHESTNUT HOLDINGS LLC	GASTAR EXPLORATION USA INC	1/8+	827	554	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14507	F	5-22-17	MARY THERESA SOLEAU AND THOMAS SOLEAU	GASTAR EXPLORATION USA INC	1/8+	749	524	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC

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10*14508	F	5-22-17	JEAN W FOSTER	GASTAR EXPLORATION USA INC	1/8+	752	200	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14509	F	5-22-17	JAMES ROBERT WELLS	GASTAR EXPLORATION USA INC	1/8+	752	202	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14510	F	5-22-17	MARY AGNES CARROLL	GASTAR EXPLORATION USA INC	1/8+	749	528	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14511	F	5-22-17	ELIZABETH JANE KELLER	GASTAR EXPLORATION USA INC	1/8+	754	242	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14513	F	5-22-17	CAROLYN LYNN PORTER	GASTAR EXPLORATION USA INC	1/8+	767	256	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14514	F	5-22-17	CHARLES ARTHUR WELLS	GASTAR EXPLORATION USA INC	1/8+	768	494	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14515	F	5-22-17	JERRY TODD WELLS	GASTAR EXPLORATION USA INC	1/8+	773	572	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14516	F	5-22-17	JAMES NESBITT WELLS BY JOANIE WELLS AIF	GASTAR EXPLORATION USA INC	1/8+	773	570	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14517	F	5-22-17	CARL W BACH JR	GASTAR EXPLORATION INC	1/8+	852	250	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14518	F	5-22-17	RAE ELLEN FLOYD AND KENNETH FLOYD	GASTAR EXPLORATION INC	1/8+	854	599	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14519	F	5-22-17	DOUGLAS M BACH	GASTAR EXPLORATION INC	1/8+	854	597	NA	NA	NA	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*16471	F	5-22-17	CNX GAS COMPANY LLC	TH EXPLORATION, LLC	1/8+	905	155	NA	NA	NA	NA
10*16652	F	5-22-17	MARY JUDITH BRANSON AND MICHAEL L BRANSON	TH EXPLORATION, LLC	1/8+	942	35	NA	NA	NA	NA
10*16674	F	5-22-17	CHARLOTTE A KASTELIC	TH EXPLORATION, LLC	1/8+	942	37	NA	NA	NA	NA
10*26910	F	5-22-17	BRIDGET S AND DARRELL T GATES *	TH EXPLORATION, LLC	1/8+	1045	419	NA	NA	NA	NA

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10*26940	F	5-22-17	PATRICK N WELLS *	TH EXPLORATION, LLC	1/8+	1045	413	NA	NA	NA	NA	NA	NA
10*19529	G	5-22-5	CNX GAS COMPANY LLC	TH EXPLORATION, LLC	1/8+	733	500	NA	NA	NA	NA	NA	NA
10*14418	H	5-22-10	PPG INDUSTRIES, INC.	GASTAR EXPLORATION USA INC	1/8+	878	610	NA	NA	35/144 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*16471	I	5-22-6	CNX GAS COMPANY LLC	TH EXPLORATION, LLC	1/8+	905	155	NA	NA	NA	NA	NA	
10*14418	J	5-22-8	PPG INDUSTRIES, INC.	GASTAR EXPLORATION USA INC	1/8+	878	610	NA	NA	35/144 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14418	K	5-22-9	PPG INDUSTRIES, INC.	GASTAR EXPLORATION USA INC	1/8+	878	610	NA	NA	35/144 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14418	L	5-22-9	PPG INDUSTRIES, INC.	GASTAR EXPLORATION USA INC	1/8+	878	610	NA	NA	35/144 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*14128	M	5-22-7	LOUIS I ACCETTOLO & PATRICIA ACCETTOLO	GASTAR EXPLORATION USA INC	1/8+	703	280			23/353 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC	
10*21218	O	5-23-28	GREGG D MINOR	TH EXPLORATION, LLC	1/8+	952	647	NA	NA	NA	NA	NA	
10*22330	O	5-23-28	GREGG D MINOR	TH EXPLORATION, LLC	1/8+	963	156	NA	NA	NA	19/624 SWN Exchange	NA	
10*17190	P	5-23-28.2	MARK W. TENNANT CAROLYN L. TENNANT	CHESAPEAKE APPALACHIA LLC	1/8+	715	570	29/325 Chesapeake Appalachia LLC to Statoil USA Onshore Properties Inc	33/110 Chesapeake Appalachia LLC to SWN Production Company LLC	29/157 Gaster Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gaster Exploration USA Inc and Gastar Exploration Inc merger	41/256 SWN Production Company LLC to TH Exploration LLC	
10*14710	Q	5-23-27	ROBERT L. FRIEDLY	GASTAR EXPLORATION USA INC	1/8+	800	408	NA	NA	NA	21/41 Gaster Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gaster Exploration Inc to TH Exploration II LLC	
10*19421	Q	5-23-27	CAYCE DAVENPORT FRIEDLY	TH EXPLORATION, LLC	1/8+	940	262	NA	NA	NA	NA	NA	
10*19721	Q	5-23-27	MARK FRIEDLY AND ANNA FRIEDLY	TH EXPLORATION, LLC	1/8+	944	579	NA	NA	NA	NA	NA	

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10*14916	S	5-26-2	MARK W BOOTH	GASTAR EXPLORATION USA INC	1/8+	836	110	NA	32/428 Gastar Exploration USA Inc to Athum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14917	S	5-26-2	EDWIN BOOTH ANDERSON	GASTAR EXPLORATION USA INC	1/8+	836	108	NA	32/428 Gastar Exploration USA Inc to Athum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14742	T	5-26-5	SUSAN E GORE THE SAMUEL MILTON SHEETS TRUST PAULINE RUTH SHEETS TRUSTEE	GASTAR EXPLORATION USA INC	1/8+	790	505	NA	29/157 Gastar Exploration USA Inc to Athum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14744	T	5-26-5	RALPH B TAYLOR	GASTAR EXPLORATION USA INC	1/8+	794	485	NA	29/157 Gastar Exploration USA Inc to Athum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*17716	T	5-26-5	MICHAEL J AND BARBARA L WILEY	TH EXPLORATION, LLC	1/8+	919	638	NA	NA	NA	NA
10*17777	T	5-26-5	MICHELLE E AND ROBERT T BAKER	TH EXPLORATION, LLC	1/8+	921	128	NA	NA	NA	NA
10*21420	T	5-26-5	DAVID D BURKETT	TH EXPLORATION, LLC	1/8+	957	3	NA	NA	NA	NA
10*21421	T	5-26-5	BRYANNA FLYNN RANKIN	TH EXPLORATION, LLC	1/8+	957	5	NA	NA	NA	NA
10*21437	T	5-26-5	REBECCA MCMILLAN AND ROBERT MCMILLAN	TH EXPLORATION, LLC	1/8+	957	1	NA	NA	NA	NA
10*21821	T	5-26-5	LINDA K TAYLOR AND RAY P MAGEE	TH EXPLORATION, LLC	1/8+	951	631	NA	NA	NA	NA
10*25633	T	5-26-5	CHESTNUT HOLDINGS LLC	TH EXPLORATION, LLC	1/8+	1034	546	NA	NA	NA	NA
10*18343	U	5-26-7	DOMINION ENERGY TRANSMISSION INC VENABLE ROYALTY LTD A TEXAS LIMITED PARTNERSHIP	TH EXPLORATION, LLC	1/8+	936	79	NA	NA	NA	NA
10*22286	V	5-26-6	RUTH MAE DULANEY	AMERICAN PETROLEUM PARTNERS LLC	1/8+	926	133	NA	NA	NA	41/380 American Petroleum Partners LLC to TH Exploration LLC
10*14304	N	5-28-5	GASTAR EXPLORATION USA INC	1/8+	749	530	NA	NA	26/639 Gastar Exploration USA Inc to Athum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC

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10*14305	N	5-28-5	HELEN BOWMAN	GASTAR EXPLORATION USA INC	1/8+	749	362	NA	26/639 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14306	N	5-28-5	RANDY GODDARD	GASTAR EXPLORATION USA INC	1/8+	759	248	NA	NA	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC
10*14418	N	5-28-5	PPG INDUSTRIES, INC.	GASTAR EXPLORATION USA INC	1/8+	878	610	NA	35/144 Gastar Exploration USA Inc to Atinum Marcellus I LLC	21/41 Gastar Exploration USA Inc and Gastar Exploration Inc merger	36/9 Gastar Exploration Inc to TH Exploration II LLC

* Co-tenancy utilization – At least 7 mineral owners in tract. At least 75% of the royalty owners have executed a lease on the tract. The interests of the remaining co-tenants were acquired pursuant to the Co-tenancy Modernization and Majority Protection Act.

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WV Department of
Environmental Protection



TUG HILL

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UTICA MODIFICATION – PLEASE DELIVER TO SUSAN ROSE

November 26, 2019

WV DEP OFFICE OF OIL & GAS
ATTENTION: SUSAN ROSE
601 57TH STREET SE
CHARLESTON WV 25304-2345

VIA FEDEX

**RE: Armstrong S-12HU (H6A Drilling Modification)
Franklin District, Marshall County, WV**

Dear Susan:

Tug Hill Operating, LLC would like to submit the Armstrong S-12HU modification to lengthen the well. The proposed well is located within Franklin County, WV. Please find the following enclosed:

- Updated WW-6A1^B with inspector signature
- Updated well plat
- Updated Water Management Plan
- Updated Site Safety Plan

Please note that we only lengthened the well to within 10' of the unit boundary, and no new information was added to the WW-6A1 or 1500' offset list. If you have any questions or need any additional information, please feel free to call me at (304) 376-0111. Thank you for taking your time to review this application.

Sincerely,

AMY L. MILLER
PERMITTING SPECIALIST-APPALACHIA REGION
TUG HILL OPERATING, LLC

Enclosures

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Office of Oil and Gas

DEC 04 2019

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Environmental Protection