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west virginia department of environmental protection

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

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Monday, October 19, 2020  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

TUG HILL OPERATING, LLC  
380 SOUTHPOINTE BOULEVARD, PLAZA II  
SUITE 200  
CANONSBURG, PA 15317

Re: Permit Modification Approval for TEN HIGH 1S-16HU  
47-051-02028-00-00

**Modified for an additional string of intermediate casing and deviation prognosis.**

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

Operator's Well Number: TEN HIGH 1S-16HU  
Farm Name: LAWRENCE & SHIRLEY CONKLE ESTS  
U.S. WELL NUMBER: 47-051-02028-00-00  
Horizontal 6A New Drill  
Date Modification Issued: October 19, 2020

Promoting a healthy environment.



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west virginia department of environmental protection

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Oil and Gas Conservation Commission  
601 57<sup>th</sup> Street SE, Charleston, WV 25304  
304-414-1239

Randall M. Albert, Chairman  
dep.wv.gov

July 22, 2020

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

RE: Application for Deep Well Permit – API #47-051-02028

COMPANY: Tug Hill Operating, LLC

FARM: Lawrence & Shirley Conkle Ests      Ten High 1S-16HU

COUNTY: Marshall      DISTRICT: Meade      QUAD: Glen Easton

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
4. Provided a plat showing that the productive interval of the well meets the requirements of the Rules of the Commission W. Va. C.S.R. § 39-1-4.2.

Sincerely,

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

Susan Rose  
Administrator

\*\*Heaven Hill 3N-10HU 47-051-02016; Heaven Hill 3-6HU 47-051-01968; Heaven Hill 3-7HU 47-051-01969; Heaven Hill 3-8HU 47-051-01967; Ten High 1N-11HU 47-051-01960; Ten High 1N-12HU 47-051-01961; Ten High 1N-13HU 47-051-01965; Ten High 1S-14HU 47-051-01966; Ten High 1S-15HU 47-051-02027; Ten High 1S-17HU 47-051-02033; Hudson S-12HU 47-051-02292; Hudson S-11HU 47-051-02296; Hudson S-13HU 47-051-02293; Ten High 1N-20HU 47-051-02021; Fitzgerald S-18HU 47-051-02325

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 Meade Glen Easton 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Ten High 1S-16HU Well Pad Name: Ten High

3) Farm Name/Surface Owner: Lawrence & Shirley Conkle, ests Public Road Access: Shepherd Ridge Lane CR 21/9

4) Elevation, current ground: 1310' Elevation, proposed post-construction: 1310'

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

(b) If Gas Shallow  Deep   
Horizontal

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 11,622' - 11,761' thickness of 139' and anticipated pressure of approx. 9500 psi

8) Proposed Total Vertical Depth: 11,911'

9) Formation at Total Vertical Depth: Trenton

10) Proposed Total Measured Depth: 21,437'

11) Proposed Horizontal Leg Length: 9,103.60'

12) Approximate Fresh Water Strata Depths: 70', 1059'

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: Sewickly Coal - 968' and Pittsburgh Coal - 1053'

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

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

(a) If Yes, provide Mine Info: Name: Marshall County Coal Co. / Marshall County Mine  
Depth: 1020' TVD and 290' subsea level  
Seam: Pittsburgh #8  
Owner: Murray Energy / Consolidated Coal Co.

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## 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	100'	100'	216FT^3(CTS)
Fresh Water	24"	NEW	S60	125.45	1,126'	1,126'	1,309FT^3(CTS)
Coal	18.625"	NEW	J55	106	2,800'	2,800'	2,371FT^3(CTS)
Intermediate #1	*13.325"	NEW	P110	68	6,800'	6,800'	4,382FT^3(CTS)
Intermediate #2	9.625"	NEW	P110	47	10,739'	10,739'	3,514FT^3(CTS)
Production	5.5"	NEW	P110	23	21,437'	21,437'	5,093FT^3(CTS)
Tubing	2 7/8"	NEW	P110	6.5#		11,431'	
Liners							

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"	38	1.0	2333	1866	CLASS A	1.2
Fresh Water	24"	28	0.75	2750	1330	SEE #24	1.2
Coal	18.625"	22	.531	2740	1140	SEE #24	1.2
Intermediate #1	*13.325"	17	0.455	6910	2340	SEE #24	1.99
Intermediate #2	9.625"	12.25	0.472	10730	7210	SEE #24	1.99
Production	5.5"	8.5	0.415	14530	10864	SEE #24	1.18
Tubing	2 7/8"						
Liners							

\*Intermediate #1: To run if needed.

*ju 9/19/19*

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WW-6B  
(10/14)

4705102028 MOD  
API NO. 47-051 -  
OPERATOR WELL NO. Ten High 1S-16HU  
Well Pad Name: Ten High  
JG 9/16/19

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. 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 23,312,500 lb proppant and 360,428 bbl of water. Max rate = 80 bpm; max psi = 12,000#.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 16.2

22) Area to be disturbed for well pad only, less access road (acres): 5.92

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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**Conductor and Fresh Water Casing Cement:**

*Premium NE-1 + 2% CaCl*

- Premium NE-1 – Class A Portland API Spec
- CaCl – Calcium Chloride

**Coal Casing Cement:**

*Premium NE-1 + 1.5% CaCl + Flake*

- Premium NE-1 – Class A Portland API spec
- CaCl – Calcium Chloride
- CelloFlake

**Intermediate Casing Cement:**

Lead: *Premium NE-1 + 5% BA-90 + .85% R-3 + 3% KCl + .75 gals/100sk FP-13L + 1% MPA-170*

Tail: *Premium NE-1 + .1% R-3 + 5% KCl + 1% CD-32 + .4% FL-52 + .2% ASA-301 + .6% Sodium Metasilicate*

- Premium NE-1 – Class A Portland API spec
- BA-90 – Gas Migration Mitigator
- R-3 – Cement Retarder
- KCl – Potassium Chloride
- FP-13L – Anti-Foaming Agent
- MPA-170 – Gelling Agent
- CD-32 – Dispersant
- FL-52 – Fluid Loss Agent
- ASA-301 – Free Water Control Agent
- Sodium Metasilicate – Extending Agent

**Kick Off Plug:**

*Class H Cement + 1% CD-32 + .7% Sodium Metasilicate + .1% R-3 + .75 gal/100sk FP-13L*

- CD-32 – Dispersant
- Sodium Metasilicate – Extending Agent
- R-3 – Cement Retarder
- FP-13L – Anti-Foaming Agent

**Production Casing Cement:**

Lead: *50:50 (Poz:Class H) + .3% R-3 + .3% MPA-250 + .75 gal/100sk FP-13L*

Tail: *25:75 (Poz:Class H) + .3% R-3 + .3% MPA-250 + .375 gal/100sk FP-13L*

- R-3 – Cement Retarder
- MPA-250 – Gelling Agent
- FP-13L – Anti-Foaming Agent

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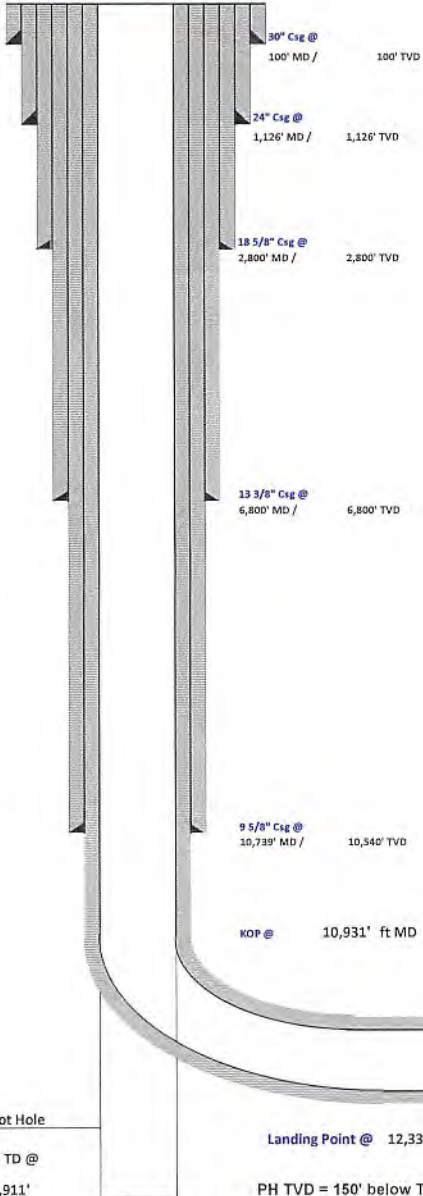


**WELL NAME:** Ten High 15-16HU  
**STATE:** West Virginia **COUNTY:** Marshall  
**DISTRICT:** Meade  
**DF Elev:** 1,343' **GL Elev:** 1,310'  
**TD:** 9,102'  
**TH Latitude:** 39.80678565  
**TH Longitude:** -80.68088006  
**BH Latitude:** 39.827092  
**BH Longitude:** -80.700379

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FORMATION TOPS	
Formation	Depth TVD
Deepest Fresh Water	1,059'
Sewickley Coal	968'
Pittsburgh Coal	1,053'
Blg Lime	2,082'
Berea	2,706'
Tully	6,639'
Marcellus	6,746'
Onondaga	6,798'
Salina	7,530'
Lockport	8,595'
Utica	11,446'
Point Pleasant	11,622'
Landing Depth	11,679'
Trenton	11,761'
Pilot Hole TD	11,911'

CASING SUMMARY							
Type	Hole Size (in)	Csg Size (in)	Depth (MD)	Depth (TVD)	Weight (lb/ft)	Grade	Top of Cement
Conductor	36	30	100'	100'	8W	BW	Surface
Surface	28	24	1,126'	1,126'	125.45	S60	Surface
Intermediate 1	22	18 5/8	2,800'	2,800'	106	J55	Surface
Intermediate 2	17	13 3/8	6,800'	6,800'	68	P110	Surface
Intermediate 3	12 1/4	9 5/8	10,739'	10,540'	47	HP110	Surface
Production	8 1/2	5 1/2	21,437'	11,837'	23	HCP110	Surface

	CEMENT SUMMARY			DRILLING DETAILS	
	Sacks	Class	Density	Fluid Type	Centralizer Notes
Conductor	291	A	15.6	Air	None
Surface	1,478	A	15.6	Air	3 Centralizers at equal distance
Intermediate 1	2,345	A	15	Air	1 Centralizer every other jt
Intermediate 2	4,280	A	15	Air	1 Centralizer every other jt
Intermediate 3	2,651	A	14.5	Air	1 Centralizer every other jt
Production	4,490	A	15	Air / SOBMM	1 every other joint in lateral; 1 per joint in curve; 1 every other jt to sfc

4705102028

*Handwritten signature and date: 9/2/19*

Pilot Hole  
 PH TD @ 11,911'  
 Landing Point @ 12,335' MD / 11,679' TVD  
 PH TVD = 150' below Trenton Top

Lateral TD @ 21,437' ft MD  
 11,837' ft TVD

*Handwritten note: MWD*

4705102028 MOD



**Tug Hill Operating, LLC Casing and Cement Program**

**Ten High 1S-16HU**

**Casing**

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	100'	CTS
Surface	24"	S60	28"	1,126'	CTS
Intermediate 1	18 5/8"	J55	22"	2,800'	CTS
Intermediate 2	13 3/8"	P110	17"	6,800'	CTS
Intermediate 3	9 5/8"	HP110	12 1/4"	10,739'	CTS
Production	5 1/2"	HCP110	8 1/2"	21,437'	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 15.0 ppg, Y=1.2
- Intermediate 2: Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.0 ppg, Y=1.2
- Intermediate 3: Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 14.5 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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4705102028 MOD



# Well Site Safety Plan

## Tug Hill Operating, LLC

*ju*  
9/6/19

Well Name: Ten High 1S-16HU

Pad Location: Ten High

Marshall County, West Virginia

UTM (meters), NAD83, Zone 17:

NORTHING -4,406,361.38

EASTING -527,316.63

September 2019

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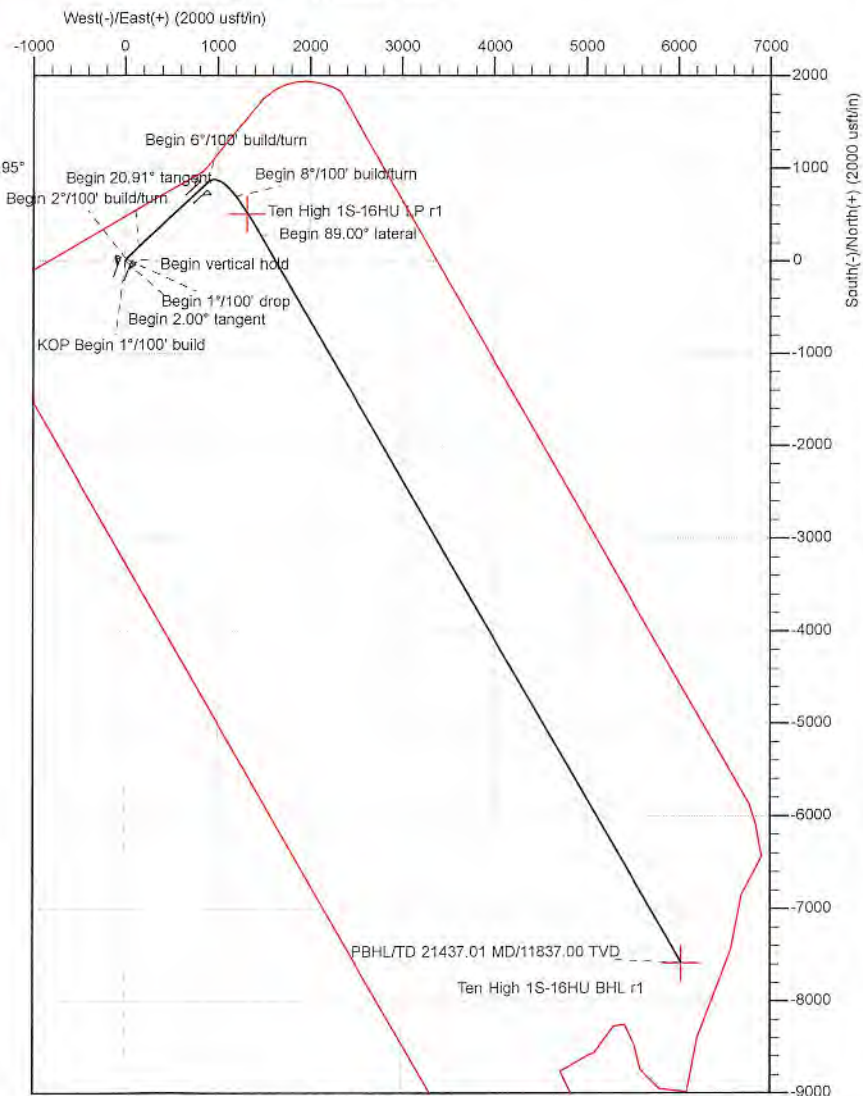
Well: Ten High 1S-16HU (D)  
 Site: Ten High  
 Project: Marshall County, West Virginia  
 Design: rev4  
 Rig: Nabors X08

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

System Datum: Mean Sea Level  
 Depth Reference: RKB=1310+33 @ 1343.00usft (Nabors X08)

Northing 14456537.28 Easting 1730037.97 Latitude 39.80678565 Longitude -80.68088006

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.95°



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	2033.00	0.00	0.00	2033.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 1"/100' build
3	2233.00	2.00	20.00	2232.96	3.28	1.19	1.00	20.00	-1.82	Begin 2.00° tangent
4	2733.00	2.00	20.00	2732.65	19.68	7.16	0.00	0.00	-10.93	Begin 1"/100' drop
5	2933.00	0.00	20.00	2932.61	22.96	8.36	1.00	180.00	-12.75	Begin vertical hold section
6	7033.39	0.00	20.00	7033.00	22.96	8.36	0.00	20.00	-12.75	Begin 2"/100' build/turn
7	8078.85	20.91	46.73	8055.41	152.26	145.73	2.00	46.73	-28.28	Begin 20.91° tangent
8	10931.28	20.91	46.73	10720.00	850.00	887.00	0.00	0.00	-112.07	Begin 6"/100' build/turn
9	11781.07	45.00	143.80	11467.34	701.56	1195.50	6.00	115.43	196.27	Begin 8"/100' build/turn
10	12335.09	89.00	149.80	11678.68	283.03	1464.02	8.00	8.61	690.94	Begin 89.00° lateral
11	21437.02	89.00	149.80	11837.00	-7682.54	6041.44	0.00	0.00	9695.05	PBHL/TD 21437.01 MD/11837.00 TVD

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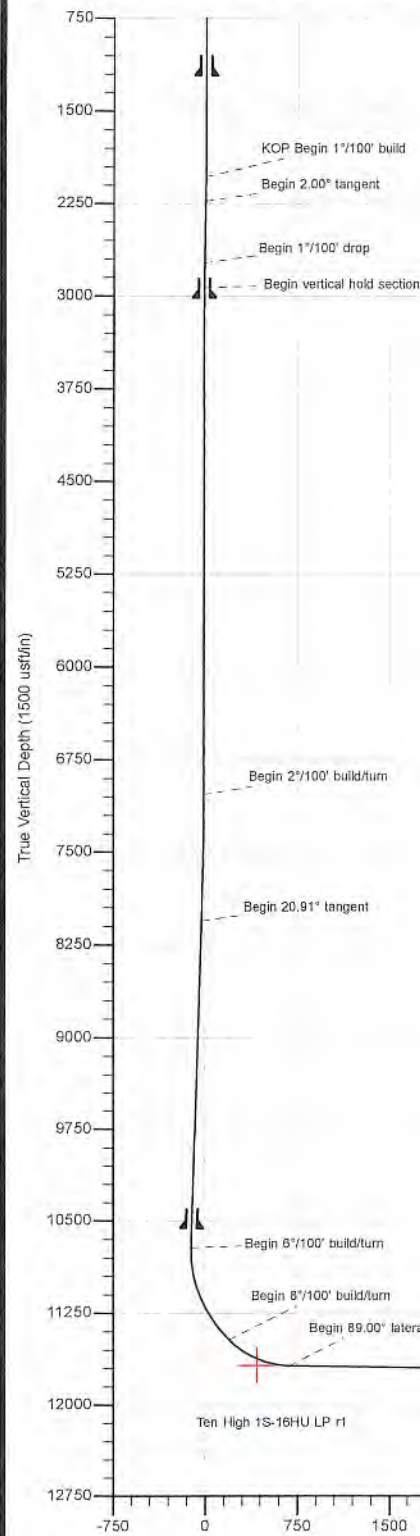
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Azimuths to Grid North  
 True North: -0.20°  
 Magnetic North: -8.95°

Magnetic Field  
 Strength: 52041.1snT  
 Dip Angle: 66.87°  
 Date: 9/1/2018  
 Model: IGRF2015



Vertical Section at 141.45° (1500 usft/in)

4705102028 MOD



Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

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

<b>Site</b>	Ten High				
<b>Site Position:</b>		<b>Northing:</b>	14,456,545.60 usft	<b>Latitude:</b>	39.80680885
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,730,001.41 usft	<b>Longitude:</b>	-80.68101011
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.20 °

<b>Well</b>	Ten High 1S-16HU (D)					
<b>Well Position</b>	<b>+N-S</b>	0.00 usft	<b>Northing:</b>	14,456,537.28 usft	<b>Latitude:</b>	39.80678565
	<b>+E-W</b>	0.00 usft	<b>Easting:</b>	1,730,037.97 usft	<b>Longitude:</b>	-80.68088006
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	0.00 usft	<b>Ground Level:</b>	1,310.00 usft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	9/1/2018	-8.75	66.87	52,041.07638316

<b>Design</b>	rev4			
<b>Audit Notes:</b>				
<b>Version:</b>	<b>Phase:</b>	PLAN	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (°)</b>
	0.00	0.00	0.00	141.45

<b>Plan Survey Tool Program</b>	<b>Date</b>	9/15/2018		
<b>Depth From (usft)</b>	<b>Depth To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Remarks</b>
1	0.00	21,437.02 rev4 (Original Hole)	MWD	
			MWD - Standard	

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4705102028 *Mon*



Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,033.00	0.00	0.00	2,033.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,233.00	2.00	20.00	2,232.96	3.28	1.19	1.00	1.00	0.00	0.00	20.00
2,733.00	2.00	20.00	2,732.65	19.68	7.16	0.00	0.00	0.00	0.00	0.00
2,933.00	0.00	20.00	2,932.61	22.96	8.36	1.00	-1.00	0.00	180.00	
7,033.39	0.00	20.00	7,033.00	22.96	8.36	0.00	0.00	0.00	20.00	
8,078.85	20.91	46.73	8,055.41	152.26	145.73	2.00	2.00	2.56	46.73	
10,931.28	20.91	46.73	10,720.00	850.00	887.00	0.00	0.00	0.00	0.00	
11,781.07	45.00	143.80	11,467.34	701.56	1,195.50	6.00	2.83	11.42	115.43	
12,335.09	89.00	149.80	11,678.68	283.03	1,464.02	8.00	7.94	1.08	8.61	
21,437.02	89.00	149.80	11,837.00	-7,582.54	6,041.44	0.00	0.00	0.00	0.00	Ten High 1S-16HU Bf

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Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
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<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
100.00	0.00	0.00	100.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
200.00	0.00	0.00	200.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
300.00	0.00	0.00	300.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
400.00	0.00	0.00	400.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
500.00	0.00	0.00	500.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
600.00	0.00	0.00	600.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
700.00	0.00	0.00	700.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
800.00	0.00	0.00	800.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
900.00	0.00	0.00	900.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,000.00	0.00	0.00	1,000.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,100.00	0.00	0.00	1,100.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,200.00	0.00	0.00	1,200.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,300.00	0.00	0.00	1,300.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,400.00	0.00	0.00	1,400.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,500.00	0.00	0.00	1,500.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,600.00	0.00	0.00	1,600.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,700.00	0.00	0.00	1,700.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,800.00	0.00	0.00	1,800.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
1,900.00	0.00	0.00	1,900.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
2,000.00	0.00	0.00	2,000.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
2,033.00	0.00	0.00	2,033.00	0.00	0.00	14,456,537.28	1,730,037.97	39.80678565	-80.68088006
<b>KOP Begin 1°/100' build</b>									
2,100.00	0.67	20.00	2,100.00	0.37	0.13	14,456,537.65	1,730,038.10	39.80678666	-80.68087958
2,200.00	1.67	20.00	2,199.98	2.29	0.83	14,456,539.57	1,730,038.80	39.80679192	-80.68087707
2,233.00	2.00	20.00	2,232.96	3.28	1.19	14,456,540.56	1,730,039.16	39.80679465	-80.68087577
<b>Begin 2.00° tangent</b>									
2,300.00	2.00	20.00	2,299.92	5.48	1.99	14,456,542.76	1,730,039.96	39.80680067	-80.68087289
2,400.00	2.00	20.00	2,399.86	8.76	3.19	14,456,546.04	1,730,041.16	39.80680967	-80.68086860
2,500.00	2.00	20.00	2,499.80	12.04	4.38	14,456,549.32	1,730,042.35	39.80681866	-80.68086431
2,600.00	2.00	20.00	2,599.74	15.32	5.57	14,456,552.60	1,730,043.54	39.80682766	-80.68086002
2,700.00	2.00	20.00	2,699.67	18.59	6.77	14,456,555.88	1,730,044.74	39.80683665	-80.68085573
2,733.00	2.00	20.00	2,732.65	19.68	7.16	14,456,556.96	1,730,045.13	39.80683962	-80.68085431
<b>Begin 1°/100' drop</b>									
2,800.00	1.33	20.00	2,799.63	21.51	7.83	14,456,558.79	1,730,045.80	39.80684464	-80.68085191
2,900.00	0.33	20.00	2,899.61	22.87	8.32	14,456,560.15	1,730,046.29	39.80684837	-80.68085013
2,933.00	0.00	20.00	2,932.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
<b>Begin vertical hold section</b>									
3,000.00	0.00	20.00	2,999.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,100.00	0.00	20.00	3,099.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,200.00	0.00	20.00	3,199.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,300.00	0.00	20.00	3,299.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,400.00	0.00	20.00	3,399.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,500.00	0.00	20.00	3,499.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,600.00	0.00	20.00	3,599.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,700.00	0.00	20.00	3,699.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,800.00	0.00	20.00	3,799.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
3,900.00	0.00	20.00	3,899.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,000.00	0.00	20.00	3,999.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,100.00	0.00	20.00	4,099.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,200.00	0.00	20.00	4,199.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,300.00	0.00	20.00	4,299.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,400.00	0.00	20.00	4,399.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002
4,500.00	0.00	20.00	4,499.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002



Planning Report - Geographic

Database:	DB_Jul2216dt_v14	Local Co-ordinate Reference:	Well Ten High 1S-16HU (D)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1310+33 @ 1343.00usft (Nabors X08)
Project:	Marshall County, West Virginia	MD Reference:	RKB=1310+33 @ 1343.00usft (Nabors X08)
Site:	Ten High	North Reference:	Grid
Well:	Ten High 1S-16HU (D)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,600.00	0.00	20.00	4,599.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
4,700.00	0.00	20.00	4,699.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
4,800.00	0.00	20.00	4,799.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
4,900.00	0.00	20.00	4,899.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,000.00	0.00	20.00	4,999.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,100.00	0.00	20.00	5,099.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,200.00	0.00	20.00	5,199.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,300.00	0.00	20.00	5,299.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,400.00	0.00	20.00	5,399.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,500.00	0.00	20.00	5,499.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,600.00	0.00	20.00	5,599.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,700.00	0.00	20.00	5,699.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,800.00	0.00	20.00	5,799.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
5,900.00	0.00	20.00	5,899.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,000.00	0.00	20.00	5,999.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,100.00	0.00	20.00	6,099.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,200.00	0.00	20.00	6,199.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,300.00	0.00	20.00	6,299.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,400.00	0.00	20.00	6,399.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,500.00	0.00	20.00	6,499.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,600.00	0.00	20.00	6,599.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,700.00	0.00	20.00	6,699.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,800.00	0.00	20.00	6,799.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
6,900.00	0.00	20.00	6,899.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
7,000.00	0.00	20.00	6,999.61	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
7,033.39	0.00	0.00	7,033.00	22.96	8.36	14,456,560.24	1,730,046.32	39.80684862	-80.68085002	
<b>Begin 2°/100' build/turn</b>										
7,100.00	1.33	46.73	7,099.61	23.49	8.92	14,456,560.77	1,730,046.89	39.80685007	-80.68084800	
7,200.00	3.33	46.73	7,199.52	26.28	11.88	14,456,563.56	1,730,049.85	39.80685770	-80.68083742	
7,300.00	5.33	46.73	7,299.23	31.45	17.38	14,456,568.74	1,730,055.35	39.80687166	-80.68081777	
7,400.00	7.33	46.73	7,398.61	39.01	25.41	14,456,576.30	1,730,063.38	39.80689254	-80.68078907	
7,500.00	9.33	46.73	7,497.55	48.95	35.97	14,456,588.23	1,730,073.93	39.80691972	-80.68075138	
7,600.00	11.33	46.73	7,595.93	61.24	49.02	14,456,598.52	1,730,086.99	39.80695335	-80.68070472	
7,700.00	13.33	46.73	7,693.61	75.88	64.58	14,456,613.16	1,730,102.54	39.80699339	-80.68064916	
7,800.00	15.33	46.73	7,790.50	92.84	82.60	14,456,630.13	1,730,120.57	39.80703981	-80.68058476	
7,900.00	17.33	46.73	7,886.46	112.11	103.08	14,456,649.40	1,730,141.04	39.80709254	-80.68051161	
8,000.00	19.33	46.73	7,981.38	133.67	125.98	14,456,670.96	1,730,163.95	39.80715151	-80.68042979	
8,078.85	20.91	46.73	8,055.41	152.26	145.73	14,456,689.55	1,730,183.70	39.80720237	-80.68035923	
<b>Begin 20.91° tangent</b>										
8,100.00	20.91	46.73	8,075.17	157.44	151.22	14,456,694.72	1,730,189.19	39.80721653	-80.68033959	
8,200.00	20.91	46.73	8,168.58	181.90	177.21	14,456,719.18	1,730,215.18	39.80728345	-80.68024675	
8,300.00	20.91	46.73	8,262.00	206.36	203.20	14,456,743.64	1,730,241.17	39.80735037	-80.68015390	
8,400.00	20.91	46.73	8,355.41	230.82	229.19	14,456,768.10	1,730,267.16	39.80741729	-80.68006105	
8,500.00	20.91	46.73	8,448.83	255.28	255.17	14,456,792.56	1,730,293.14	39.80748421	-80.67996821	
8,600.00	20.91	46.73	8,542.24	279.74	281.16	14,456,817.03	1,730,319.13	39.80755113	-80.67987536	
8,700.00	20.91	46.73	8,635.66	304.20	307.15	14,456,841.49	1,730,345.12	39.80761805	-80.67978252	
8,800.00	20.91	46.73	8,729.07	328.66	333.14	14,456,865.95	1,730,371.10	39.80768497	-80.67968967	
8,900.00	20.91	46.73	8,822.49	353.13	359.12	14,456,890.41	1,730,397.09	39.80775190	-80.67959682	
9,000.00	20.91	46.73	8,915.90	377.59	385.11	14,456,914.87	1,730,423.08	39.80781882	-80.67950398	
9,100.00	20.91	46.73	9,009.32	402.05	411.10	14,456,939.33	1,730,449.07	39.80788574	-80.67941113	
9,200.00	20.91	46.73	9,102.73	426.51	437.09	14,456,963.79	1,730,475.05	39.80795266	-80.67931828	
9,300.00	20.91	46.73	9,196.15	450.97	463.07	14,456,988.25	1,730,501.04	39.80801958	-80.67922544	
9,400.00	20.91	46.73	9,289.56	475.43	489.06	14,457,012.72	1,730,527.03	39.80808650	-80.67913259	
9,500.00	20.91	46.73	9,382.98	499.89	515.05	14,457,037.18	1,730,553.02	39.80815342	-80.67903974	

4705102028 MOD



Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
9,600.00	20.91	46.73	9,476.39	524.35	541.04	14,457,061.64	1,730,579.00	39.80822034	-80.67894689	
9,700.00	20.91	46.73	9,569.81	548.81	567.02	14,457,086.10	1,730,604.99	39.80828726	-80.67885405	
9,800.00	20.91	46.73	9,663.22	573.28	593.01	14,457,110.56	1,730,630.98	39.80835418	-80.67876120	
9,900.00	20.91	46.73	9,756.63	597.74	619.00	14,457,135.02	1,730,656.97	39.80842110	-80.67866835	
10,000.00	20.91	46.73	9,850.05	622.20	644.99	14,457,159.48	1,730,682.95	39.80848802	-80.67857550	
10,100.00	20.91	46.73	9,943.46	646.66	670.97	14,457,183.94	1,730,708.94	39.80855494	-80.67848265	
10,200.00	20.91	46.73	10,036.88	671.12	696.96	14,457,208.41	1,730,734.93	39.80862186	-80.67838980	
10,300.00	20.91	46.73	10,130.29	695.58	722.95	14,457,232.87	1,730,760.92	39.80868878	-80.67829695	
10,400.00	20.91	46.73	10,223.71	720.04	748.93	14,457,257.33	1,730,786.90	39.80875570	-80.67820410	
10,500.00	20.91	46.73	10,317.12	744.50	774.92	14,457,281.79	1,730,812.89	39.80882262	-80.67811125	
10,600.00	20.91	46.73	10,410.54	768.97	800.91	14,457,306.25	1,730,838.88	39.80888954	-80.67801841	
10,700.00	20.91	46.73	10,503.95	793.43	826.90	14,457,330.71	1,730,864.87	39.80895646	-80.67792556	
10,800.00	20.91	46.73	10,597.37	817.89	852.88	14,457,355.17	1,730,890.85	39.80902338	-80.67783271	
10,900.00	20.91	46.73	10,690.78	842.35	878.87	14,457,379.63	1,730,916.84	39.80909030	-80.67773986	
10,931.28	20.91	46.73	10,720.00	850.00	887.00	14,457,387.28	1,730,924.97	39.80911123	-80.67771081	
<b>Begin 6°/100' build/turn</b>										
11,000.00	19.48	57.96	10,784.52	864.49	905.65	14,457,401.78	1,730,943.62	39.80915084	-80.67764421	
11,100.00	18.82	76.21	10,879.07	877.19	935.48	14,457,414.48	1,730,973.45	39.80918543	-80.67753784	
11,200.00	19.96	94.03	10,973.48	879.84	968.20	14,457,417.13	1,731,006.16	39.80919238	-80.67742131	
11,300.00	22.62	108.90	11,066.72	872.41	1,003.44	14,457,409.69	1,731,041.41	39.80917161	-80.67729589	
11,400.00	26.35	120.28	11,157.76	854.97	1,040.84	14,457,392.25	1,731,078.80	39.80912335	-80.67716297	
11,500.00	30.76	128.82	11,245.61	827.72	1,079.96	14,457,365.00	1,731,117.93	39.80904813	-80.67702399	
11,600.00	35.60	135.31	11,329.30	790.96	1,120.40	14,457,328.24	1,731,158.37	39.80894677	-80.67688048	
11,700.00	40.72	140.40	11,407.92	745.09	1,161.70	14,457,282.37	1,731,199.66	39.80882039	-80.67673402	
11,781.07	45.00	143.80	11,467.34	701.56	1,195.50	14,457,238.84	1,731,233.47	39.80870051	-80.67661422	
<b>Begin 8°/100' build/turn</b>										
11,800.00	46.50	144.11	11,480.55	690.59	1,203.48	14,457,227.88	1,731,241.44	39.80867032	-80.67658595	
11,900.00	54.42	145.54	11,544.17	627.58	1,247.82	14,457,164.86	1,731,285.78	39.80849682	-80.67642887	
12,000.00	62.36	146.71	11,596.54	556.90	1,295.21	14,457,094.19	1,731,333.18	39.80830227	-80.67626102	
12,100.00	70.31	147.73	11,636.65	479.95	1,344.74	14,457,017.23	1,731,382.71	39.80809044	-80.67608566	
12,200.00	78.26	148.64	11,663.72	398.21	1,395.43	14,456,935.50	1,731,433.40	39.80786546	-80.67590620	
12,300.00	86.21	149.50	11,677.22	313.28	1,446.31	14,456,850.56	1,731,484.28	39.80763172	-80.67572614	
12,335.09	89.00	149.80	11,678.68	283.03	1,464.02	14,456,820.31	1,731,501.99	39.80754846	-80.67566347	
<b>Begin 89.00° lateral</b>										
12,400.00	89.00	149.80	11,679.81	226.93	1,496.66	14,456,764.22	1,731,534.63	39.80739409	-80.67554795	
12,500.00	89.00	149.80	11,681.55	140.52	1,546.95	14,456,677.80	1,731,584.92	39.80715627	-80.67537000	
12,600.00	89.00	149.80	11,683.29	54.10	1,597.24	14,456,591.39	1,731,635.21	39.80691845	-80.67519204	
12,700.00	89.00	149.80	11,685.03	-32.32	1,647.53	14,456,504.97	1,731,685.50	39.80668063	-80.67501409	
12,800.00	89.00	149.80	11,686.77	-118.73	1,697.83	14,456,418.55	1,731,735.79	39.80644280	-80.67483614	
12,900.00	89.00	149.80	11,688.51	-205.15	1,748.12	14,456,332.14	1,731,786.08	39.80620498	-80.67465819	
13,000.00	89.00	149.80	11,690.25	-291.56	1,798.41	14,456,245.72	1,731,836.38	39.80598716	-80.67448024	
13,100.00	89.00	149.80	11,691.99	-377.98	1,848.70	14,456,159.30	1,731,886.67	39.80572933	-80.67430229	
13,200.00	89.00	149.80	11,693.73	-464.40	1,898.99	14,456,072.89	1,731,936.96	39.80549151	-80.67412434	
13,300.00	89.00	149.80	11,695.47	-550.81	1,949.28	14,455,986.47	1,731,987.25	39.80525369	-80.67394640	
13,400.00	89.00	149.80	11,697.21	-637.23	1,999.57	14,455,900.05	1,732,037.54	39.80501586	-80.67376845	
13,500.00	89.00	149.80	11,698.95	-723.65	2,049.86	14,455,813.64	1,732,087.83	39.80477804	-80.67359051	
13,600.00	89.00	149.80	11,700.68	-810.06	2,100.15	14,455,727.22	1,732,138.12	39.80454021	-80.67341257	
13,700.00	89.00	149.80	11,702.42	-896.48	2,150.44	14,455,640.80	1,732,188.41	39.80430239	-80.67323462	
13,800.00	89.00	149.80	11,704.16	-982.90	2,200.73	14,455,554.39	1,732,238.70	39.80406456	-80.67305668	
13,900.00	89.00	149.80	11,705.90	-1,069.31	2,251.02	14,455,467.97	1,732,288.99	39.80382674	-80.67287875	
14,000.00	89.00	149.80	11,707.64	-1,155.73	2,301.31	14,455,381.55	1,732,339.28	39.80358891	-80.67270081	
14,100.00	89.00	149.80	11,709.38	-1,242.15	2,351.60	14,455,295.14	1,732,389.57	39.80335109	-80.67252287	
14,200.00	89.00	149.80	11,711.12	-1,328.56	2,401.90	14,455,208.72	1,732,439.86	39.80311326	-80.67234494	
14,300.00	89.00	149.80	11,712.86	-1,414.98	2,452.19	14,455,122.30	1,732,490.15	39.80287543	-80.67216700	

4705102028 MOD



Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
14,400.00	89.00	149.80	11,714.60	-1,501.40	2,502.48	14,455,035.89	1,732,540.44	39.80263761	-80.67198907	
14,500.00	89.00	149.80	11,716.34	-1,587.81	2,552.77	14,454,949.47	1,732,590.74	39.80239978	-80.67181114	
14,600.00	89.00	149.80	11,718.08	-1,674.23	2,603.06	14,454,863.05	1,732,641.03	39.80216195	-80.67163321	
14,700.00	89.00	149.80	11,719.82	-1,760.65	2,653.35	14,454,776.64	1,732,691.32	39.80192413	-80.67145528	
14,800.00	89.00	149.80	11,721.56	-1,847.06	2,703.64	14,454,690.22	1,732,741.61	39.80168630	-80.67127735	
14,900.00	89.00	149.80	11,723.30	-1,933.48	2,753.93	14,454,603.81	1,732,791.90	39.80144847	-80.67109943	
15,000.00	89.00	149.80	11,725.04	-2,019.90	2,804.22	14,454,517.39	1,732,842.19	39.80121064	-80.67092150	
15,100.00	89.00	149.80	11,726.78	-2,106.31	2,854.51	14,454,430.97	1,732,892.48	39.80097281	-80.67074358	
15,200.00	89.00	149.80	11,728.51	-2,192.73	2,904.80	14,454,344.56	1,732,942.77	39.80073498	-80.67056565	
15,300.00	89.00	149.80	11,730.25	-2,279.15	2,955.09	14,454,258.14	1,732,993.06	39.80049715	-80.67038773	
15,400.00	89.00	149.80	11,731.99	-2,365.56	3,005.38	14,454,171.72	1,733,043.35	39.80025932	-80.67020981	
15,500.00	89.00	149.80	11,733.73	-2,451.98	3,055.67	14,454,085.31	1,733,093.64	39.80002149	-80.67003189	
15,600.00	89.00	149.80	11,735.47	-2,538.40	3,105.96	14,453,998.89	1,733,143.93	39.79978366	-80.66985398	
15,700.00	89.00	149.80	11,737.21	-2,624.81	3,156.26	14,453,912.47	1,733,194.22	39.79954583	-80.66967606	
15,800.00	89.00	149.80	11,738.95	-2,711.23	3,206.55	14,453,826.06	1,733,244.51	39.79930800	-80.66949814	
15,900.00	89.00	149.80	11,740.69	-2,797.65	3,256.84	14,453,739.64	1,733,294.81	39.79907017	-80.66932023	
16,000.00	89.00	149.80	11,742.43	-2,884.06	3,307.13	14,453,653.22	1,733,345.10	39.79883234	-80.66914232	
16,100.00	89.00	149.80	11,744.17	-2,970.48	3,357.42	14,453,566.81	1,733,395.39	39.79859451	-80.66896441	
16,200.00	89.00	149.80	11,745.91	-3,056.89	3,407.71	14,453,480.39	1,733,445.68	39.79835668	-80.66878649	
16,300.00	89.00	149.80	11,747.65	-3,143.31	3,458.00	14,453,393.97	1,733,495.97	39.79811885	-80.66860859	
16,400.00	89.00	149.80	11,749.39	-3,229.73	3,508.29	14,453,307.56	1,733,546.26	39.79788101	-80.66843068	
16,500.00	89.00	149.80	11,751.13	-3,316.14	3,558.58	14,453,221.14	1,733,596.55	39.79764318	-80.66825277	
16,600.00	89.00	149.80	11,752.87	-3,402.56	3,608.87	14,453,134.72	1,733,646.84	39.79740535	-80.66807486	
16,700.00	89.00	149.80	11,754.61	-3,488.98	3,659.16	14,453,048.31	1,733,697.13	39.79716751	-80.66789696	
16,800.00	89.00	149.80	11,756.35	-3,575.39	3,709.45	14,452,961.89	1,733,747.42	39.79692968	-80.66771906	
16,900.00	89.00	149.80	11,758.08	-3,661.81	3,759.74	14,452,875.47	1,733,797.71	39.79669185	-80.66754116	
17,000.00	89.00	149.80	11,759.82	-3,748.23	3,810.03	14,452,789.06	1,733,848.00	39.79645401	-80.66736325	
17,100.00	89.00	149.80	11,761.56	-3,834.64	3,860.32	14,452,702.64	1,733,898.29	39.79621618	-80.66718535	
17,200.00	89.00	149.80	11,763.30	-3,921.06	3,910.62	14,452,616.22	1,733,948.58	39.79597834	-80.66700746	
17,300.00	89.00	149.80	11,765.04	-4,007.48	3,960.91	14,452,529.81	1,733,998.87	39.79574051	-80.66682956	
17,400.00	89.00	149.80	11,766.78	-4,093.89	4,011.20	14,452,443.39	1,734,049.17	39.79550267	-80.66665166	
17,500.00	89.00	149.80	11,768.52	-4,180.31	4,061.49	14,452,356.97	1,734,099.46	39.79526484	-80.66647377	
17,600.00	89.00	149.80	11,770.26	-4,266.73	4,111.78	14,452,270.56	1,734,149.75	39.79502700	-80.66629588	
17,700.00	89.00	149.80	11,772.00	-4,353.14	4,162.07	14,452,184.14	1,734,200.04	39.79478917	-80.66611798	
17,800.00	89.00	149.80	11,773.74	-4,439.56	4,212.36	14,452,097.72	1,734,250.33	39.79455133	-80.66594009	
17,900.00	89.00	149.80	11,775.48	-4,525.98	4,262.65	14,452,011.31	1,734,300.62	39.79431349	-80.66576220	
18,000.00	89.00	149.80	11,777.22	-4,612.39	4,312.94	14,451,924.89	1,734,350.91	39.79407566	-80.66558431	
18,100.00	89.00	149.80	11,778.96	-4,698.81	4,363.23	14,451,838.48	1,734,401.20	39.79383782	-80.66540643	
18,200.00	89.00	149.80	11,780.70	-4,785.23	4,413.52	14,451,752.06	1,734,451.49	39.79359998	-80.66522854	
18,300.00	89.00	149.80	11,782.44	-4,871.64	4,463.81	14,451,665.64	1,734,501.78	39.79336215	-80.66505066	
18,400.00	89.00	149.80	11,784.18	-4,958.06	4,514.10	14,451,579.23	1,734,552.07	39.79312431	-80.66487277	
18,500.00	89.00	149.80	11,785.91	-5,044.48	4,564.39	14,451,492.81	1,734,602.36	39.79288647	-80.66469489	
18,600.00	89.00	149.80	11,787.65	-5,130.89	4,614.69	14,451,406.39	1,734,652.65	39.79264863	-80.66451701	
18,700.00	89.00	149.80	11,789.39	-5,217.31	4,664.98	14,451,319.98	1,734,702.94	39.79241079	-80.66433913	
18,800.00	89.00	149.80	11,791.13	-5,303.73	4,715.27	14,451,233.56	1,734,753.23	39.79217295	-80.66416125	
18,900.00	89.00	149.80	11,792.87	-5,390.14	4,765.56	14,451,147.14	1,734,803.53	39.79193511	-80.66398337	
19,000.00	89.00	149.80	11,794.61	-5,476.56	4,815.85	14,451,060.73	1,734,853.82	39.79169727	-80.66380550	
19,100.00	89.00	149.80	11,796.35	-5,562.98	4,866.14	14,450,974.31	1,734,904.11	39.79145943	-80.66362762	
19,200.00	89.00	149.80	11,798.09	-5,649.39	4,916.43	14,450,887.89	1,734,954.40	39.79122159	-80.66344975	
19,300.00	89.00	149.80	11,799.83	-5,735.81	4,966.72	14,450,801.48	1,735,004.69	39.79098375	-80.66327187	
19,400.00	89.00	149.80	11,801.57	-5,822.22	5,017.01	14,450,715.06	1,735,054.98	39.79074591	-80.66309400	
19,500.00	89.00	149.80	11,803.31	-5,908.64	5,067.30	14,450,628.64	1,735,105.27	39.79050807	-80.66291613	
19,600.00	89.00	149.80	11,805.05	-5,995.06	5,117.59	14,450,542.23	1,735,155.56	39.79027023	-80.66273826	
19,700.00	89.00	149.80	11,806.79	-6,081.47	5,167.88	14,450,455.81	1,735,205.85	39.79003239	-80.66256040	
19,800.00	89.00	149.80	11,808.53	-6,167.89	5,218.17	14,450,369.39	1,735,256.14	39.78979455	-80.66238253	





Planning Report - Geographic

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,900.00	89.00	149.80	11,810.27	-6,254.31	5,268.46	14,450,282.98	1,735,306.43	39.78955671	-80.66220466
20,000.00	89.00	149.80	11,812.01	-6,340.72	5,318.75	14,450,196.56	1,735,356.72	39.78931886	-80.66202680
20,100.00	89.00	149.80	11,813.74	-6,427.14	5,369.05	14,450,110.14	1,735,407.01	39.78908102	-80.66184894
20,200.00	89.00	149.80	11,815.48	-6,513.56	5,419.34	14,450,023.73	1,735,457.30	39.78884318	-80.66167108
20,300.00	89.00	149.80	11,817.22	-6,599.97	5,469.63	14,449,937.31	1,735,507.60	39.78860533	-80.66149322
20,400.00	89.00	149.80	11,818.96	-6,686.39	5,519.92	14,449,850.89	1,735,557.89	39.78836749	-80.66131536
20,500.00	89.00	149.80	11,820.70	-6,772.81	5,570.21	14,449,764.48	1,735,608.18	39.78812965	-80.66113750
20,600.00	89.00	149.80	11,822.44	-6,859.22	5,620.50	14,449,678.06	1,735,658.47	39.78789180	-80.66095964
20,700.00	89.00	149.80	11,824.18	-6,945.64	5,670.79	14,449,591.64	1,735,708.76	39.78765396	-80.66078179
20,800.00	89.00	149.80	11,825.92	-7,032.06	5,721.08	14,449,505.23	1,735,759.05	39.78741611	-80.66060393
20,900.00	89.00	149.80	11,827.66	-7,118.47	5,771.37	14,449,418.81	1,735,809.34	39.78717827	-80.66042608
21,000.00	89.00	149.80	11,829.40	-7,204.89	5,821.66	14,449,332.39	1,735,859.63	39.78694043	-80.66024823
21,100.00	89.00	149.80	11,831.14	-7,291.31	5,871.95	14,449,245.98	1,735,909.92	39.78670258	-80.66007036
21,200.00	89.00	149.80	11,832.88	-7,377.72	5,922.24	14,449,159.56	1,735,960.21	39.78646473	-80.65989253
21,300.00	89.00	149.80	11,834.62	-7,464.14	5,972.53	14,449,073.15	1,736,010.50	39.78622689	-80.65971468
21,400.00	89.00	149.80	11,836.36	-7,550.56	6,022.82	14,448,986.73	1,736,060.79	39.78598904	-80.65953683
21,437.01	89.00	149.80	11,837.00	-7,582.54	6,041.44	14,448,954.75	1,736,079.41	39.78590101	-80.65947101
<b>PBHL/TD 21437.01 MD/11837.00 TVD</b>									
21,437.02	89.00	149.80	11,837.00	-7,582.54	6,041.44	14,448,954.74	1,736,079.41	39.78590100	-80.65947100

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Ten High 1S-16HU LP r1 - hit/miss target - Shape - Point	0.00	0.00	11,873.00	506.27	1,316.46	14,457,043.55	1,731,354.43	39.80816300	-80.67618600
- plan misses target center by 48.20usft at 12080.29usft MD (11629.75 TVD, 495.54 N, 1334.85 E)									
Ten High 1S-16HU BHL - plan hits target center - Point	0.00	0.01	11,837.00	-7,582.54	6,041.44	14,448,954.74	1,736,079.41	39.78590100	-80.65947100

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
1,208.00	1,208.00	20" Casing @ 1175 TVD	20	24	
3,013.39	3,013.00	13 3/8" Casing @ 2980 TVD	13-3/8	17-1/2	
10,757.86	10,558.00	9 5/8" Casing @ 10525 TVD	9-5/8	12-1/4	

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Planning Report - Geographic

4705102028 MOD

<b>Database:</b>	DB_Jul2216dt_v14	<b>Local Co-ordinate Reference:</b>	Well Ten High 1S-16HU (D)
<b>Company:</b>	Tug Hill Operating LLC	<b>TVD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Project:</b>	Marshall County, West Virginia	<b>MD Reference:</b>	RKB=1310+33 @ 1343.00usft (Nabors X08)
<b>Site:</b>	Ten High	<b>North Reference:</b>	Grid
<b>Well:</b>	Ten High 1S-16HU (D)	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Original Hole		
<b>Design:</b>	rev4		

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,033.00	2,033.00	0.00	0.00	KOP Begin 1°/100' build
2,233.00	2,232.96	3.28	1.19	Begin 2.00° tangent
2,733.00	2,732.65	19.68	7.16	Begin 1°/100' drop
2,933.00	2,932.61	22.96	8.36	Begin vertical hold section
7,033.39	7,033.00	22.96	8.36	Begin 2°/100' build/turn
8,078.85	8,055.41	152.26	145.73	Begin 20.91° tangent
10,931.28	10,720.00	850.00	887.00	Begin 6°/100' build/turn
11,781.07	11,467.34	701.56	1,195.50	Begin 8°/100' build/turn
12,335.09	11,678.68	283.03	1,464.02	Begin 89.00° lateral
21,437.01	11,837.00	-7,582.54	6,041.44	PBHL/TD 21437.01 MD/11837.00 TVD

RECEIVED  
Office of Oil and Gas

NOV 14 2019

WV Department of  
Environmental Protection

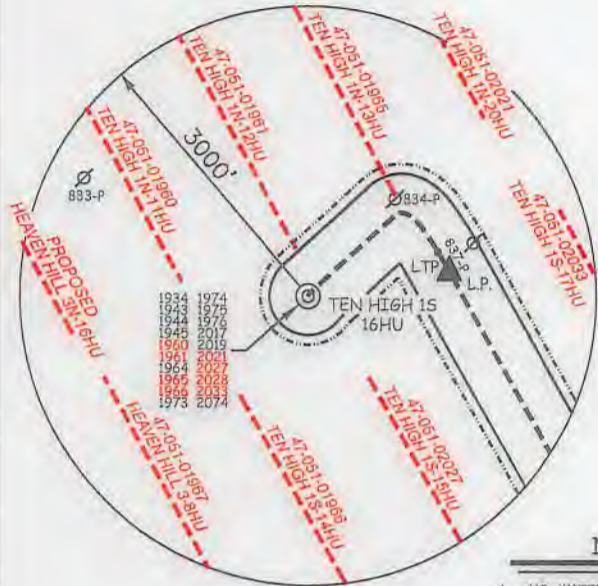
**TEN HIGH 1S LEASE  
UTICA UNIT - 623.86 AC. ±  
WELL 16HU  
TUG HILL OPERATING**

T.H. LATITUDE 39°50'00"  
B.H. LATITUDE 39°47'30"

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)  
 NAD'83 S.P.C.(FT) N. 478,152.80 E. 1,636,758.08  
 NAD'83 GEO. LAT-(N) 39.806786 LONG-(W) 80.680880  
 NAD'83 UTM (M) N. 4,406,361.38 E. 527,316.63  
**LANDING POINT**  
 NAD'83 S.P.C.(FT) N. 478,411.4 E. 1,638,227.1  
 NAD'83 GEO. LAT-(N) 39.807548 LONG-(W) 80.675663  
 NAD'83 UTM (M) N. 4,406,447.6 E. 527,762.9  
**BOTTOM HOLE**  
 NAD'83 S.P.C.(FT) N. 470,467.8 E. 1,642,674.0  
 NAD'83 GEO. LAT-(N) 39.785901 LONG-(W) 80.659471  
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T.H. LONGITUDE 80°40'00"  
B.H. LONGITUDE 80°37'30"  
2,101' B.H.  
9,671' T.H.

B.H.



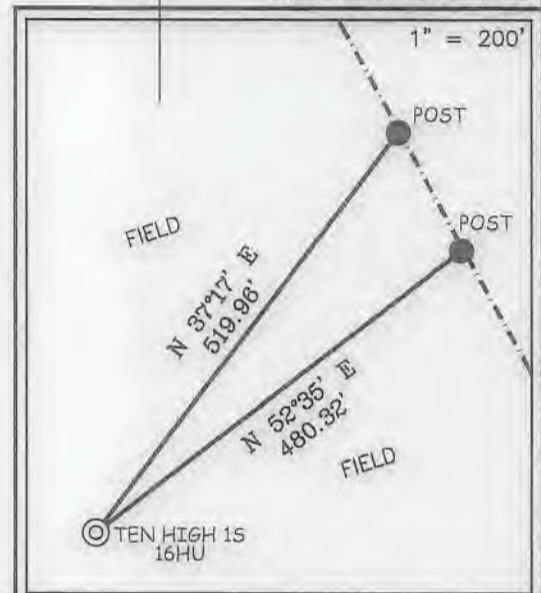
**NOTES ON SURVEY**

- NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.
- WELL SPOT CIRCLE & TOPO MARK SCALE IS 1"=2000'.
- PROPOSED LATERAL OR TOP HOLE OF TEN HIGH 1S-16HU (47-051-02028) IS WITHIN 3000' OF THE TOP HOLES OR LATERALS OF THE FOLLOWING:  
 HEAVEN HILL 3-8HU (47-051-01967),  
 PROPOSED HEAVEN HILL 3N-16HU,  
 TEN HIGH 1N-11HU (47-051-01960),  
 TEN HIGH 1N-12HU (47-051-01961),  
 TEN HIGH 1N-13HU (47-051-01965),  
 TEN HIGH 1S-14HU (47-051-01966),  
 TEN HIGH 1S-15HU (47-051-02027),  
 TEN HIGH 1S-17HU (47-051-02033),  
 TEN HIGH 1N-20HU (47-051-02021),  
 PROPOSED HUDSON S-11HU.



12 Vanhorn Drive | P.O. Box 150 | Glenville, WV 26351 | 304.462.5634  
 1412 Kanawha Boulevard, East | Charleston, WV 25301 | 304.346.3952  
 254 East Beckley Bypass | Beckley, WV 25801 | 304.255.5296  
 slsvv.com

**REFERENCES**



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 REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 849 *C. Victor Moyers*



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.  
 DATE AUGUST 29, 20 17  
 REVISED 09/01/17, 01/12/18, 03/22/18, 04/05/18, 10/01/19, 11/12/19, & 07/08/20  
 OPERATORS WELL NO. TEN HIGH 1S-16HU  
 API WELL NO. **47 - 051 - 02028**  
 STATE COUNTY PERMIT

MOD HeA

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 8655P16HUR7.dwg  
 HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 2000'  
 TEN HIGH 1S-16HU Rev4

STATE OF WEST VIRGINIA  
 DIVISION OF ENVIRONMENTAL PROTECTION  
 OFFICE OF OIL AND GAS



WELL TYPE: OIL  GAS  INJECTION  WASTE DISPOSAL  IF "GAS" PRODUCTION  STORAGE  DEEP  SHALLOW   
 LOCATION: GROUND = 1,322.90' ELEVATION PROPOSED = 1,310.06' WATERSHED MIDDLE BOWMAN RUN OF FISH CREEK (HUC 10)  
 DISTRICT MEADE COUNTY MARSHALL QUADRANGLE GLEN EASTON 7.5'  
 SURFACE OWNER LAWRENCE & SHIRLEY CONKLE ESTS ACREAGE 139.79±  
 ROYALTY OWNER ANDY PAUL & JACKIE KUHN, ET AL - SEE ADDITIONAL SHEETS ACREAGE 139.79±  
 PROPOSED WORK: LEASE NO. SEE ADDITIONAL SHEETS  
 DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION   
 PERFORATE NEW FORMATION  PLUG AND ABANDON  CLEAN OUT AND REPLUG  OTHER   
 PHYSICAL CHANGE IN WELL (SPECIFY) \_\_\_\_\_ TARGET FORMATION POINT PLEASANT  
 ESTIMATED DEPTH TVD: 11,911' / TMD: 21,437'

COUNTY NAME PERMIT

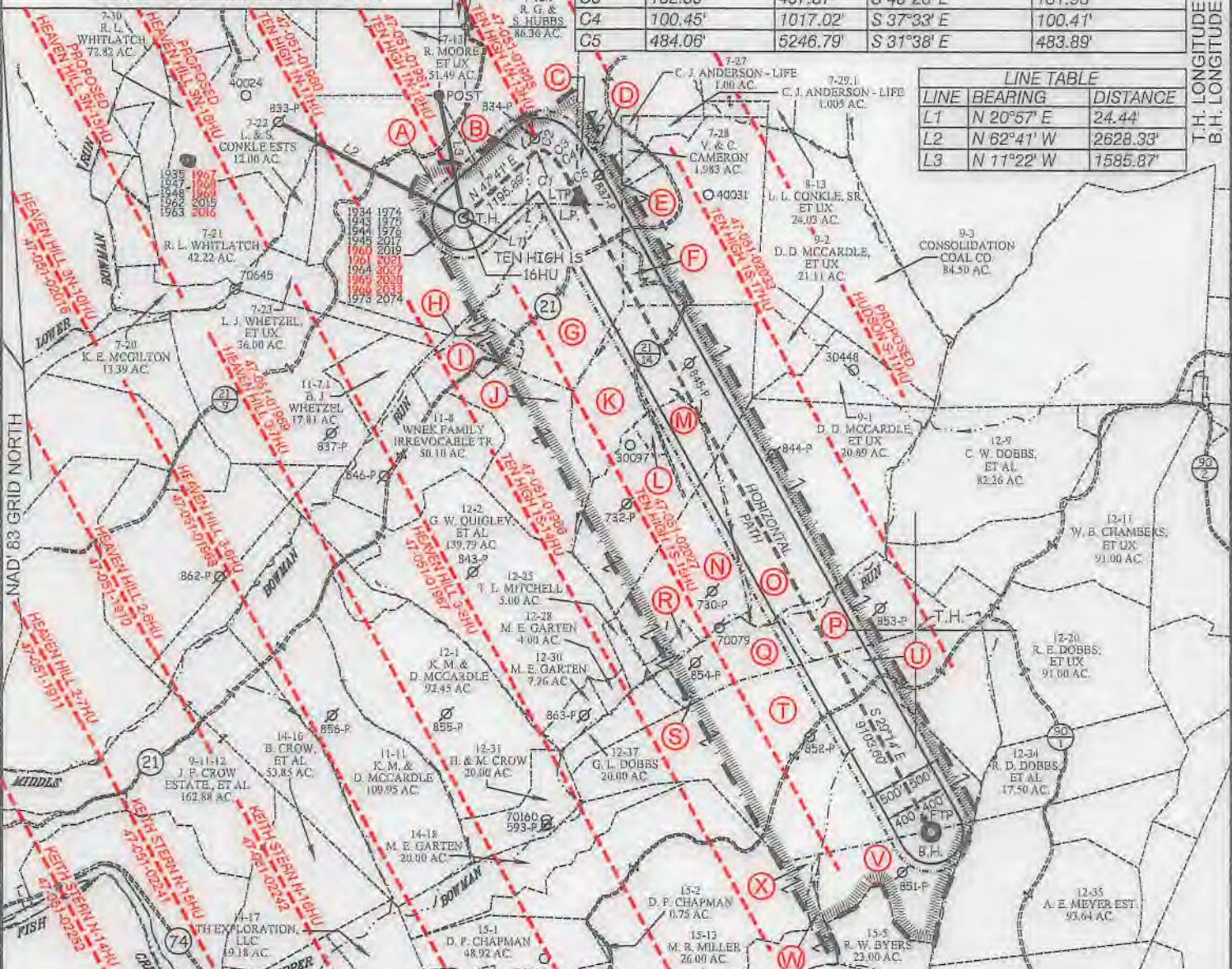
WELL OPERATOR TUG HILL OPERATING, LLC DESIGNATED AGENT DIANNA STAMPER  
 ADDRESS 1320 SOUTH UNIVERSITY DRIVE, SUITE 500 ADDRESS 5400 D BIG TYLER ROAD  
 FORT WORTH, TX 76107 CHARLESTON, WV 25313

**TEN HIGH 1S LEASE  
UTICA UNIT - 623.86 AC. ±  
WELL 16HU  
TUG HILL OPERATING**

T.H. LATITUDE 39°50'00"  
B.H. LATITUDE 39°47'30"

CURVE TABLE				
CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	83.53'	115.72'	N 63°42' E	81.73'
C2	94.07'	161.56'	S 73°31' E	92.75'
C3	132.39'	457.37'	S 48°26' E	131.93'
C4	100.45'	1017.02'	S 37°33' E	100.41'
C5	484.06'	5246.79'	S 31°38' E	483.89'

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N 20°57' E	24.44'
L2	N 62°41' W	2628.33'
L3	N 11°22' W	1585.87'



TAG	SURFACE OWNER	PARCEL	ACRES
A	LAWRENCE & SHIRLEY CONKLE ESTS	9-7-24	139.79
B	ROBERT G. HUBBS, ET AL	9-7-12.1	86.363
C	MARK H. FOX	9-7-11	75.37
D	W.V. DEPT. OF HIGHWAYS	9-7-11.1	3.63
E	NATHAN WILLIAMS	9-7-28.1	2.768
F	CAROL J. ANDERSON - LIFE	9-7-29	85.540
G	THOMAS R. & KIMBERLY WHITFIELD	9-7-25.2	76.40
H	THOMAS R. & KIMBERLY WHITFIELD	9-7-25.1	4.23

TAG	SURFACE OWNER	PARCEL	ACRES
I	THOMAS R. & KIMBERLY WHITFIELD	9-7-25	0.83
J	THOMAS R. & KIMBERLY WHITFIELD	9-12-4	54.02
K	DONALD DALE MCCARDLE, ET UX	9-12-5	75.28
L	DONALD DALE MCCARDLE, ET UX	9-12-6.1	2.620
M	DONALD DALE MCCARDLE, ET UX	9-12-6	53.38
N	DONALD DALE MCCARDLE, ET UX	9-12-7	53.00
O	DONALD DALE MCCARDLE, ET UX	9-12-8	117.85
P	OLIVER CROW	9-12-22	38.58
Q	EVERETT F. MOORE HEIRS	9-12-24	70.00
R	ROBERT MCCARDLE, ET UX	9-12-29	7.50
S	MICHAEL J. GUNTO, ET UX	9-12-23	10.00
T	DAVID P. CHAPMAN	9-12-32	150.00
U	DAVID P. CHAPMAN	9-12-21	50.00
V	DAVID P. CHAPMAN	9-12-33	32.00
W	ROBERT FRANK KOTSON, ET AL	9-15-4	26.40
X	SUSAN VAN DYNE	9-15-3	167.00



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254 East Beckley Bypass | Beckley, WV 25801 | 304.255.5296  
slswv.com

P.S. 849 *C. Victor Moyers*

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)  
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NAD'83 GEO. LAT-(N) 39.785901 LONG-(W) 80.659471  
NAD'83 UTM (M) N. 4,404,050.2 E. 529,158.1



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.

**LEGEND**

- UNIT BOUNDARY
- LEASED TRACTS INSIDE UNIT BOUNDARY
- SURFACE LINE
- PROPOSED UTICA
- WELL LATERAL
- 400' OFFSET LINE
- 500' OFFSET LINE
- TIE LINE
- CREEK
- ROAD
- PROPOSED FIRST TAKE POINT
- PROPOSED LAST TAKE POINT
- COUNTY ROUTE
- PROPOSED WELL
- EXISTING WELL
- PERMITTED WELL
- SURFACE OWNER (SEE TABLE)
- LEASE # (SEE ADDITIONAL SHEETS)

SCALE 1" = 2000' FILE NO. 8655P16HUR7.dwg  
TEN HIGH 1S-16HU Rev4  
DATE AUGUST 29 20 17  
09/01/17, 01/12/18, 03/22/18, 04/05/18, 10/01/19,  
11/12/19, & 07/08/20  
OPERATORS WELL NO. TEN HIGH 1S-16HU  
API WELL NO. 47 — 051 — 02028  
NO. STATE COUNTY PERMIT

STATE OF WEST VIRGINIA  
DIVISION OF ENVIRONMENTAL PROTECTION  
OFFICE OF OIL AND GAS



HGA  
MOD

WELL OPERATOR TUG HILL OPERATING, LLC  
ADDRESS 1320 SOUTH UNIVERSITY DRIVE, SUITE 500  
FORT WORTH, TX 76107

DESIGNATED AGENT DIANNA STAMPER  
ADDRESS 5400 D BIG TYLER ROAD  
CHARLESTON, WV 25313

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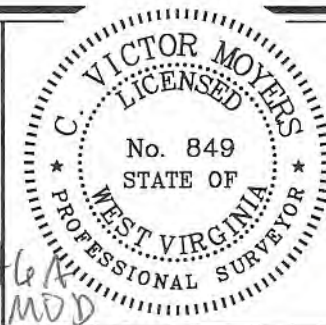
No.	Lease Name or No.	Tag	Parcel	Grantors, Lessors, etc.	Deed Book/Page	
1	10*15662	A	9-7-24	LARRY LEE CONKLE, ET AL	863	354
2	10*15501	B	9-7-12.1	RONALD AND EDNA MOORE	661	449
3	10*47051.094.0	C	9-7-11	MARK H FOX	864	163
4	10*19565	D	9-7-11.1	WEST VIRGINIA DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS	947	566
5	10*19183	E	9-7-28.1	EVELYN M WILLIAM	720	180
6	10*15524	F	9-7-29	CAROL J ANDERSON ETAL	901	563
7	10*15481	G	9-7-25.2	DEAN P RIGBY AND SUSAN RIGBY, ET AL	908	197
8	10*47051.303.1	H	9-7-25.1	THOMAS R WHITFIELD, ET AL	890	401
9	10*47051.303.1	I	9-7-25	THOMAS R WHITFIELD, ET AL	890	401
10	10*47051.303.2	I	9-7-25	KIMBERLY A WHITFIELD	890	403
11	10*15481	J	9-12-4	DEAN P RIGBY AND SUSAN RIGBY, ET AL	908	197
12	10*47051.222.1	K	9-12-5	DONALD D MCCARDLE AND LUCY MCCARDLE	879	314
13	10*47051.222.1	L	9-12-6.1	DONALD D MCCARDLE AND LUCY MCCARDLE	879	314
14	10*47051.222.1	M	9-12-6	DONALD D MCCARDLE AND LUCY MCCARDLE	879	314
15	10*16056	N	9-12-7	JEFFREY A LAUSIN AND KATHLEEN R LAUSIN, ET AL	942	443
16	10*47051.289.1	O	9-12-8	JANICE M HIXSON AND HARRY C HIXSON, ET AL	898	461
17	10*15474	P	9-12-22	CLARK C SAMPSON, ET AL	907	495
18	10*19724	Q	9-12-24	VENABLE ROYALTY LTD A TEXAS LIMITED PARTNERSHIP	935	216
19	10*15484	R	9-12-29	LISA R IMHOFF AND CHAD IMHOFF, ET AL	913	552
20	10*47051.311.0	S	9-12-23	MICHAEL J GUNTO AND ROSEMARY GUNTO	905	16
21	10*47051.140.1	T	9-12-32	DAVID P CHAPMAN & DEBORAH BORCK-CHAPMAN, ET AL	866	318
22	10*47051.140.1	U	9-12-21	DAVID P CHAPMAN & DEBORAH BORCK-CHAPMAN, ET AL	866	318
23	10*47051.140.1	V	9-12-33	DAVID P CHAPMAN & DEBORAH BORCK-CHAPMAN, ET AL	866	318
24	10*16402	W	9-15-4	VALERIE L WAGNER, ET AL	921	464
25	10*15752	X	9-15-3	KIM O CHAMBERS AND DEBRA CHAMBERS, ET AL	906	258

FILE NO. 8655P16HUR7.dwg  
 TEN HIGH 1S-16HU Rev4

DATE AUGUST 29, 20 17  
 09/01/17, 01/12/18, 03/22/18, 04/05/18, 10/01/19,  
 REVISED 11/12/19, & 07/08/20

OPERATORS WELL NO. TEN HIGH 1S-16HU

API WELL NO. 47 — 051 — 02028  
 STATE COUNTY PERMIT



STATE OF WEST VIRGINIA  
 DIVISION OF ENVIRONMENTAL PROTECTION  
 OFFICE OF OIL AND GAS



P.S. 849 *C. Victor Moyers*

WELL OPERATOR TUG HILL OPERATING, LLC  
 ADDRESS 1320 SOUTH UNIVERSITY DRIVE, SUITE 500  
 FORT WORTH, TX 76107

DESIGNATED AGENT DIANNA STAMPER  
 ADDRESS CT CORPORATION SYSTEM  
 5400 D BIG TYLER ROAD  
 CHARLESTON, WV 25313

COUNTY NAME

PERMIT

WW-6A1  
(5/13)

Operator's Well No. Ten High 1S-16HU

**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

**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. Morris *Amy Morris*  
 Its: Permitting Specialist - Appalachia Region













**MEMORANDUM OF AGREEMENT**


This Memorandum of Agreement is entered into this 16<sup>th</sup> day of February, 2018, between TUG HILL OPERATING, LLC (THQ), a Texas limited liability company, whose address is 1320 S. University Blvd., Suite 500, Fort Worth, TX 76107 and CHEVRON U.S.A., INC. (Chevron), a Pennsylvania corporation, whose address is 700 Cherrington Parkway, Coraopolis, PA 15108.

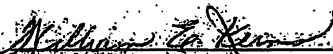
**PARTIES AND AGREEMENT REFERENCE:** THQ and Chevron entered into a letter agreement ("Letter Agreement") dated February 16<sup>th</sup>, 2018 (the "Commencement Date") outlining pursuit of definitive agreements to allow THQ the right to permit, drill, extract, produce and market oil and gas from those certain oil and gas interests controlled by Chevron in the Meade District of Marshall County, West Virginia, as more fully described in Exhibit A attached hereto, made a part hereof, and incorporated herein by reference.

1. **TERM:** The rights granted in the Letter Agreement will terminate upon the earlier of (i) one hundred eighty (180) days from the Commencement Date, (ii) Chevron's revocation of the rights granted in the Letter Agreement, or (iii) the parties entering into the definitive agreement described in the Letter Agreement. Upon termination of the Letter Agreement under subsection (i) or (ii) of the immediately preceding sentence, THQ will record a surrender of this Memorandum and withdraw any related well work permit requests.

2. **MEMORANDUM FOR RECORDING PURPOSES ONLY:** This Memorandum is for recording purposes only and does not supplement or supersede the parties' respective rights set forth in the Letter Agreement or other agreements.

IN WITNESS WHEREOF, the parties have signed their names hereto as of the date first above written.

Tug Hill Operating, LLC  
  
By: Sean Willis  
Its: VP, Engineering & Development Manager - Appalachia

Chevron U.S.A., Inc.  
  
By: William E. Kerns  
Its: Attorney-in-Fact

Marshall County  
Jan Pest, Clerk  
Instrument 1436705  
02/16/2018 @ 02:16:57 PM  
AGREEMENT  
Book 960 @ Page 409  
Pages Recorded 2  
Recording Cost \$ 11.00

STATE OF WEST VIRGINIA           §  
  §  
COUNTY OF MARSHALL           §

### ASSIGNMENT AND BILL OF SALE

This ASSIGNMENT AND BILL OF SALE (this "Assignment") dated as of February 7, 2019 (the "Signing Date"), but effective from and after 7:00 a.m., Eastern Standard Time on February 1, 2019 (the "Effective Date"), is made by Chevron U.S.A. Inc., a Pennsylvania corporation, with an address at 700 Cherrington Parkway, Coraopolis, PA 15108 ("Chevron" or "Assignor" ) to TH Exploration II, LLC and TH Exploration, LLC, Texas limited liability companies, with an address at 1320 S. University Drive, Suite 500, Fort Worth, TX 76107 (collectively "Assignee") and is accepted by Assignee upon the following terms and conditions.

### RECITALS

- A. Assignor desires to sell, convey, transfer, assign and deliver to Assignee Assignor's Crawford 1 well and certain related assets, including certain leasehold interests, located in Marshall County, West Virginia.
- B. Through an Acreage Trade Agreement to be executed contemporaneously with this Assignment, Assignor desires to transfer, convey and assign to Assignee certain of Assignor's oil and gas leasehold interests located in Marshall County, West Virginia in exchange for the transfer, conveyance and assignment to Assignor by Assignee certain of Assignee's oil and gas leasehold interests located in Marshall County, West Virginia.
- C. In consideration of the mutual promises set out in this Assignment, including execution of the Acreage Trade Agreement, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree to be bound by the terms of this Assignment.

### 1. DEFINITIONS

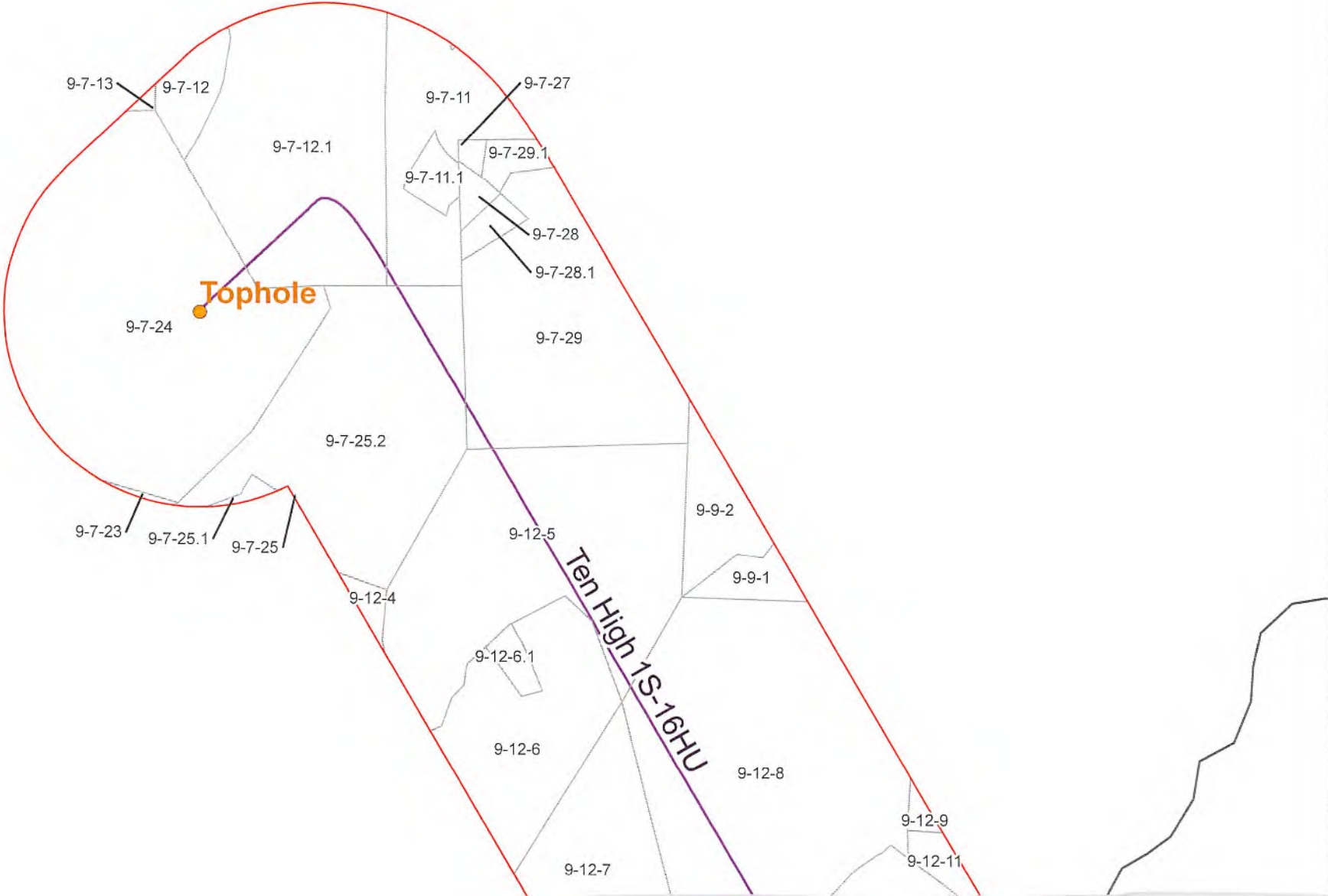
- 1.1 **Definitions.** As used in this Assignment, these words and expressions have the following meanings:

"**Acreage Trade Agreement**" means that certain Acreage Trade Agreement by and between Chevron U.S.A. Inc. and TH Exploration, LLC with an Effective Date of February 1, 2019 to be contemporaneously executed with this Assignment.

"**Act**" has the meaning given to such term in Section 9.1(C).

"**Affiliate**" means any legal entity which controls, is controlled by, or is under common control with, another legal entity. An entity is deemed to "control" another if it owns directly or indirectly at least fifty percent of either of the following: (A) the shares entitled to vote at a general election of directors of such

# Ten High 1S-16HU

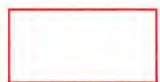





Coordinate System: NAD 1983 UTM Zone 17N  
 Projection: Transverse Mercator  
 Datum: North American 1983  
 false easting: 1,540,416.6997  
 false northing: 0.0000  
 centre meridian: -81.0000  
 scale factor: 0.9999  
 latitude of origin: 0.0000  
 Units: Foot US

**CONFIDENTIAL**



-  1500 Foot Buffer
-  Well of Interest

**Ten High 1S-16HU**  
 Operators within 1500 Feet of Well Borehole



**Offset Operators within 1500'**

**Ten High 1S - 16HU**

County	District	Parcel	Owner	Address
MARSHALL	MEADE	9-7-11	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-11.1	AEHUSA WOLFBERRY I	1200 Post Oak Blvd Houston, TX 77056
MARSHALL	MEADE	9-7-12	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-12.1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-13	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-23	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-24	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-25	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-25.1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-25.2	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-27	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-28	AEHUSA WOLFBERRY I	1200 Post Oak Blvd Houston, TX 77056
MARSHALL	MEADE	9-7-28.1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-29	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-7-29.1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-9-1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-9-2	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-4	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-5	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-6	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-6.1	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-7	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107

NOV 14 2019



MARSHALL	MEADE	9-12-8	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-9	CHEVRON USA INC	700 Cherrington Pkwy Moon, PA 15108
MARSHALL	MEADE	9-12-11	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-11	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-20	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-21	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-22	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-24	AEHUSA WOLFBERRY I	1200 Post Oak Blvd Houston, TX 77056
MARSHALL	MEADE	9-12-29	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-32	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-33	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-34	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-12-35	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-15-3	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-15-4	TH EXPLORATION LLC	1320 S. University Drive Suite 500 Fort Worth, TX 76107
MARSHALL	MEADE	9-15-5	RICHARD W. BYERS	16474 Fish Creek Road Cameron, WV 26033

RECEIVED  
Office of Oil and Gas

4 2019

Section



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west virginia department of environmental protection

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

Randall M. Albert, Chairman  
dep.wv.gov

November 27, 2019

Richard W. Byers  
16474 Fish Creek Rd  
Cameron WV 26033

91 7199 9991 7039 7118 9865

RE: Intentional Deviation of New Deep Well  
Tug Hill Operating, LLC – Ten High 1S-16HU

Dear Sir:

Please be advised that Tug Hill Operating, LLC, has applied to the Oil and Gas Conservation Commission for approval to intentionally deviate a new deep well. The Code of State Regulations Title 39 Section 1.4.10 requires that the Commission notify the offset operators of the applicants' intent to deviate the proposed well. You are receiving this notice because you are listed as an offset operator (unleased mineral owner is also an "offset operator") to the proposed well. Any offset operator has ten days to object to the Commission's granting approval to the proposed deviations. If you file an objection, the Commission will schedule a hearing and you will be notified of the date and time to attend.

A copy of the location plat is enclosed for your review. If no objection(s) are received within ten 10 days from the date of delivery, the application will be processed in the normal manner.

If you have any questions please call me at (304) 926-0499, extension 1274.

Sincerely,

A handwritten signature in black ink that reads 'Susan Rose'.  
Susan Rose  
Administrator

encl:



January 3, 2020

Dear Susan Rose:

The following is in response to your request for proof of delivery on your item with the tracking number: **9171 9999 9170 3971 1898 65**.

**Item Details**

<b>Status:</b>	Delivered, Left with Individual
<b>Status Date / Time:</b>	December 5, 2019, 10:50 am
<b>Location:</b>	ZIP Code 26033
<b>Postal Product:</b>	First-Class Mail®
<b>Extra Services:</b>	Certified Mail™
	Return Receipt Electronic

**Shipment Details**

**Weight:** 7lb, 8.1oz

**Recipient Signature**

Signature of Recipient:	<i>Richard P. Pappas</i>
Address of Recipient:	16474 Fish Creek

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Thank you for selecting the United States Postal Service® for your mailing needs. If you require additional assistance, please contact your local Post Office™ or a Postal representative at 1-800-222-1811.

Sincerely,  
United States Postal Service®  
475 L'Enfant Plaza SW  
Washington, D.C. 20260-0004



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west virginia department of environmental protection

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

Randall M. Albert, Chairman  
dep.wv.gov

November 27, 2019

AEHUSA WOLFBERRY I  
Attn: Young Lee  
1 Riverway, Suite 710  
Houston TX 77056

91 7199 9991 7039 7118 9711

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RE: Intentional Deviation of New Deep Well  
Tug Hill Operating, LLC – Ten High 1S-16HU

Dear Sir or Ma'am:

Please be advised that Tug Hill Operating, LLC, has applied to the Oil and Gas Conservation Commission for approval to intentionally deviate a new deep well. The Code of State Regulations Title 39 Section 1.4.10 requires that the Commission notify the offset operators of the applicants' intent to deviate the proposed well. You are receiving this notice because you are listed as an offset operator (unleased mineral owner is also an "offset operator") to the proposed well. Any offset operator has ten days to object to the Commission's granting approval to the proposed deviations. If you file an objection, the Commission will schedule a hearing and you will be notified of the date and time to attend.

A copy of the location plat is enclosed for your review. If no objection(s) are received within ten 10 days from the date of delivery, the application will be processed in the normal manner.

If you have any questions please call me at (304) 926-0499, extension 1274.

Sincerely,

A handwritten signature in black ink that reads 'Susan Rose' in a cursive script.

Susan Rose  
Administrator

encl:



January 3, 2020

Dear Susan Rose:

The following is in response to your request for proof of delivery on your item with the tracking number:  
**9171 9999 9170 3971 1897 11.**

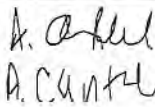
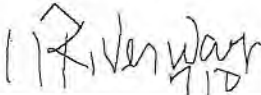
#### Item Details

<b>Status:</b>	Delivered, Left with Individual
<b>Status Date / Time:</b>	December 26, 2019, 1:51 pm
<b>Location:</b>	ZIP Code 77056
<b>Postal Product:</b>	First-Class Mail®
<b>Extra Services:</b>	Certified Mail™ Return Receipt Electronic

#### Shipment Details

<b>Weight:</b>	15lb, 0.7oz
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#### Recipient Signature

Signature of Recipient:	
Address of Recipient:	

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Sincerely,  
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Washington, D.C. 20260-0004



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west virginia department of environmental protection

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

Randall M. Albert, Chairman  
dep.wv.gov

November 27, 2019

Chevron USA Inc.  
700 Cherrington Parkway  
Coraopolis PA 15108

91 7199 9991 7039 7118 9902

RE: Intentional Deviation of New Deep Well  
Tug Hill Operating, LLC – Ten High 1S-16HU


Dear Sir or Ma'am:

Please be advised that Tug Hill Operating, LLC, has applied to the Oil and Gas Conservation Commission for approval to intentionally deviate a new deep well. The Code of State Regulations Title 39 Section 1.4.10 requires that the Commission notify the offset operators of the applicants' intent to deviate the proposed well. You are receiving this notice because you are listed as an offset operator (unleased mineral owner is also an "offset operator") to the proposed well. Any offset operator has ten days to object to the Commission's granting approval to the proposed deviations. If you file an objection, the Commission will schedule a hearing and you will be notified of the date and time to attend.

A copy of the location plat is enclosed for your review. If no objection(s) are received within ten 10 days from the date of delivery, the application will be processed in the normal manner.

If you have any questions please call me at (304) 926-0499, extension 1274.

Sincerely,

  
Susan Rose  
Administrator

encl:



January 3, 2020

Dear Susan Rose:

The following is in response to your request for proof of delivery on your item with the tracking number: **9171 9999 9170 3971 1899 02.**

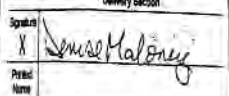

### Item Details

**Status:** Delivered, Left with Individual  
**Status Date / Time:** December 2, 2019, 1:41 pm  
**Location:** ZIP Code 15108  
**Postal Product:** First-Class Mail®  
**Extra Services:** Certified Mail™  
Return Receipt Electronic

### Shipment Details

**Weight:** 14lb, 10.3oz

### Recipient Signature

Signature of Recipient:	
Address of Recipient:	

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Washington, D.C. 20260-0004



January 3, 2020

Dear Susan Rose:

The following is in response to your request for proof of delivery on your item with the tracking number:  
**9171 9999 9170 3971 1898 96.**

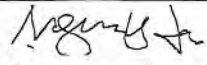
#### Item Details

<b>Status:</b>	Delivered, Left with Individual
<b>Status Date / Time:</b>	December 2, 2019, 2:22 pm
<b>Location:</b>	ZIP Code 76107
<b>Postal Product:</b>	First-Class Mail®
<b>Extra Services:</b>	Certified Mail™ Return Receipt Electronic

#### Shipment Details

<b>Weight:</b>	18lb, 11.2oz
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#### Recipient Signature

Signature of Recipient:	 Sigourney Samuel
Address of Recipient:	500

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