



 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

Monday, June 10, 2019
 WELL WORK PERMIT
 Horizontal 6A / New Drill

TUG HILL OPERATING, LLC
 380 SOUTHPOINTE BLVD
 CANONSBURG, PA 15317

Re: Permit approval for OLD CROW N-5HM
 47-051-02208-00-00

This well work permit is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to any additional specific conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas Inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days of completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

Per 35 CSR 4-5.2.g this permit will expire in two (2) years from the issue date unless 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: OLD CROW N-5HM
 Farm Name: DONNA VIVIAN YOHO (TOP)
 U.S. WELL NUMBER: 47-051-02208-00-00
 Horizontal 6A New Drill
 Date Issued: 6/10/2019

PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.
2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than one hundred (100) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
7. 24 hours prior to the initiation of the completion process the operator shall notify the Chief or his designee.
8. During the completion process the operator shall monitor annular pressures and report any anomaly noticed to the chief or his designee immediately.
9. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
10. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

06/14/2019

API Number: _____

PERMIT CONDITIONS

11. The operator shall provide to the Office of Oil and Gas the dates of each of the following within 30 days of their occurrence: completion of construction of the well pad, commencement of drilling, cessation of drilling, completion of any other permitted well work, and completion of the well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov.

Area of Review

Sources of information to Support 35CSR8 - 5.11: 9.3 et seq.

Description of process to identify potential pathways for well communication during hydraulic fracturing activities.

Data Sources Reviewed:

1. IHS Well Data service: Public nationwide data service that pulls directly from State agency Oil and Gas databases
2. Farm Maps
3. Topo Maps: Recent and older (contact WVGES)
4. Check with DPS

Contacted Devin Ducoeur 724-705-0444, dducoeur@dpslandservices.com DPS GIS (12/10/2018) to have him make maps of the wellbores with his information. DPS utilizes WVGES maps for their mapping seems it as the best publicly available. See attached map he provided.

Request maps for:

1. Wellbore with IHS All Wells Layer
2. Map with Farm lines overlain and any well spots identified on Farm Maps
3. More recent (1970s vintage) topos and older topos

Discussion with Phil Dinterman WVGES GIS Department (7/15/2016)

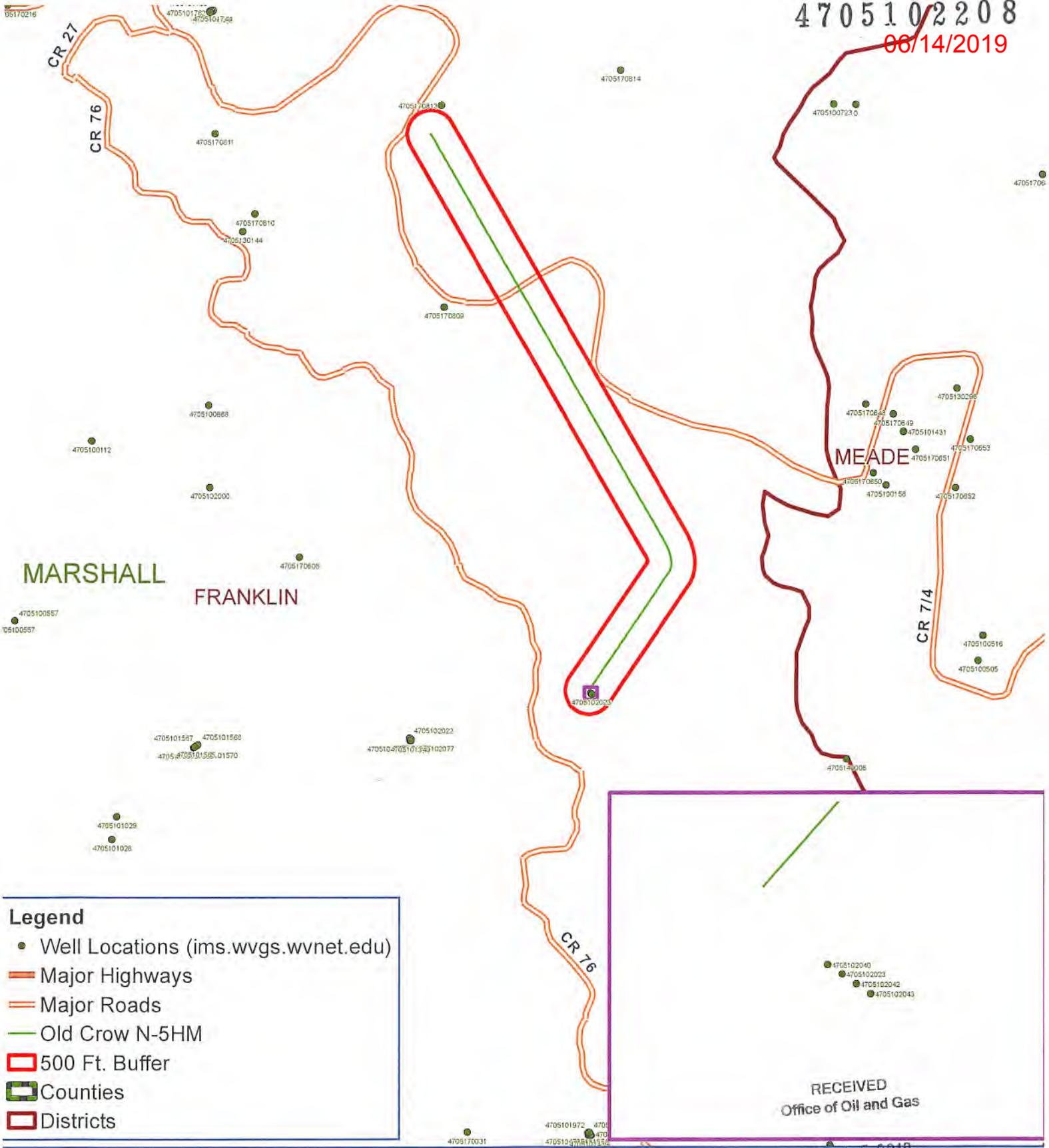
- WVGES has plotted every well spot they have access to and are aware of with that contains a coordinate. 30000, 70000, and 90000 series wells are available via the WVGES online map. Some locations aren't great due to vintage and manipulation of maps through time
- 30000 series – any well drilled prior to 1929 – APIs were not assigned to original wells
- 70000 series – Well spots pulled from old Farm line maps that the WVGES has access to
- 90000 series – Any sources that the WVGES has access that shows a well spot but has no additional supporting information. DEP does not have 90000 series on their maps.
- There can be duplication between wells in the 3 series
- Phil indicated that other Operators are providing a screenshot of the WVGES map with their planned well and using that for permits

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4705102208
06/14/2019



Legend

- Well Locations (ims.wvgs.wvnet.edu)
- Major Highways
- Major Roads
- Old Crow N-5HM
- 500 Ft. Buffer
- Counties
- Districts

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Old Crow N - 5HM Franklin District Marshall County, WV



WV Department of
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WW-6B
(04/15)

API NO. 47-051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

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: Old Crow N-5HM Well Pad Name: Old Crow

3) Farm Name/Surface Owner: Donna Yoho Public Road Access: Rines Ridge Road (County Route 76)

4) Elevation, current ground: 1286' Elevation, proposed post-construction: 1264.99'

5) Well Type (a) Gas Oil Underground Storage

Other _____

(b) If Gas Shallow Deep

Horizontal

Handwritten signature and date: 1/23/19

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus is the target formation at a depth of 6550' - 6601', thickness of 51' and an anticipated approximate pressure of 3800 psi.

8) Proposed Total Vertical Depth: 6,701'

9) Formation at Total Vertical Depth: Onondaga

10) Proposed Total Measured Depth: 17,796' ✓

11) Proposed Horizontal Leg Length: 9,930.03' ✓

12) Approximate Fresh Water Strata Depths: 70'; 886'

13) Method to Determine Fresh Water Depths: Use shallow offset wells to determine deepest freshwater, or determine using pre-drill tests, testing while drilling or petrophysical evaluation of resistivity.

14) Approximate Saltwater Depths: 1,740'

15) Approximate Coal Seam Depths: Sewickley Coal - 788' and Pittsburgh Coal - 880'

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

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

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WW-6B
(04/15)API NO. 47- 051 - 06/14/2019
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

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	13 3/8"	NEW	J55	54.5#	976'	976'	1028ft ³ (CTS)
Coal	13 3/8"	NEW	J55	54.5#	976'	976'	1028ft ³ (CTS)
Intermediate	9 5/8"	NEW	J55	36#	2,931'	2,931'	966ft ³ (CTS)
Production	5 1/2"	NEW	P110	20#	17,796'	17,796' ✓	4507ft ³ (CTS)
Tubing	2 3/8"	NEW	N80	4.7#	8,401'		
Liners							

Handwritten: OK
1/23/19

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	13 3/8"	17.5"	.33	2,740	2,192	SEE #24	1.2
Coal	13 3/8"	17.5"	.33	2,740	2,192	SEE #24	1.2
Intermediate	9 5/8"	12 1/4"	.352	3,520	2,816	SEE #24	1.19
Production	5 1/2"	8 7/8" _ 8 3/4"	.361	12,640	10,112	SEE #24	1.17/1.19
Tubing	2 3/8"		.19	11,200	8,960		
Liners							

PACKERS

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

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WW-6B
(10/14)

API NO. 47-051 = **06/14/2019**
 OPERATOR WELL NO. Old Crow N-5HM
 Well Pad Name: Old Crow

11/23/19

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

Drill through the Marcellus tagging less than 100' from the top of the Onondaga to get depths and log data. Plug back to proposed kick off point. Drill the horizontal section to planned and proposed TD. Run casing and cement to surface. Run Bond Log from app. 60 deg to surface. Make clean out run and stimulate.

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

Well to completed with approximately 24,820,000 lb. proppant and 383,735 barrels of water.
 Max rate = 80bpm; max psi = 9,000#.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 19.18 acres

22) Area to be disturbed for well pad only, less access road (acres): 6.64 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 other joint. Production casing will have one centralizer every other joint in lateral, one centralizer every joint through curve, one centralizer every other 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.



Tug Hill Operating, LLC Casing and Cement Program

Old Crow N-5HM

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	13 3/8"	J55	17 1/2"	976'	CTS
Intermediate	9 5/8"	J55	12 1/4"	2,931'	CTS
Production	5 1/2"	CYHP110	8 7/8 x 8 3/4"	17,796'	CTS

Cement

- Conductor: Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Conductor Cement mixed at 15.6 ppg, Y=1.2
- Surface: Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Surface Cement mixed at 15.6 ppg, Y=1.2
- Intermediate: Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.19
- Kick Off Plug: Class H Cement + 1% CD-32 + .7% Sodium Metasilicate + .1% R-3 + .75 gal/100sk FP-13L - KOP Plug
- 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 = 1.19

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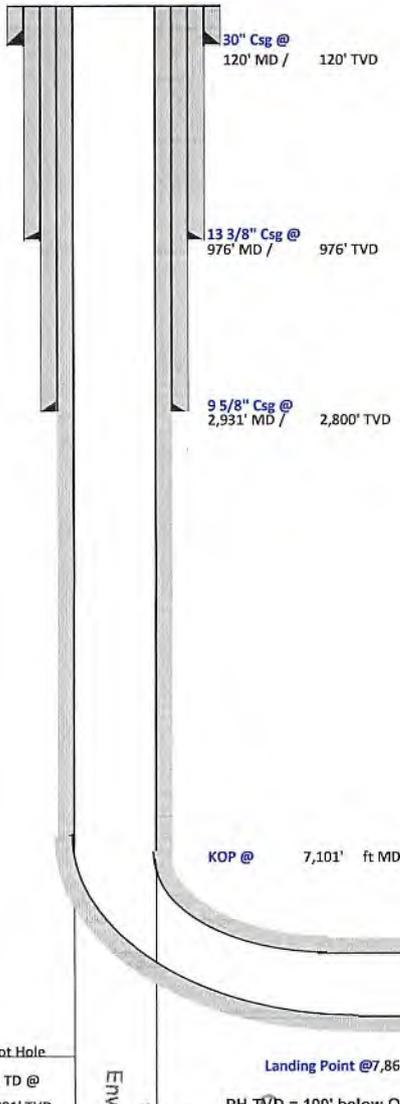


WELL NAME: Old Crow N-5HM
 STATE: WV COUNTY: Marshall
 DISTRICT: Franklin
 DF Elev: 1,265' GL Elev: 1,265'
 TD: 17,796'
 TH Latitude: 39.77853828
 TH Longitude: -80.76311519
 BH Latitude: 39.810589
 BH Longitude: -80.775062

FORMATION TOPS	
Formation	Depth TVD
Deepest Fresh Water	886
Sewickley Coal	788
Pittsburgh Coal	880
Big Lime	2077
Weir	2431
Berea	2626
Gordon	2971
Rhinestreet	5944
Geneseo/Burkett	6434
Tully	6469
Hamilton	6504
Marcellus	6550
Landing Depth	6590
Onondaga	6601
Pilot Hole Depth	6701

CASING SUMMARY							
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	17.5	13 3/8	976'	976'	54.5	J55	Surface
Intermediate 1	12 1/4	9 5/8	2,931'	2,800'	36	J55	Surface
Production	8 7/8 x 8 3/4	5 1/2	17,796'	6,417'	20	CYHP110	Surface

CEMENT SUMMARY				DRILLING DETAILS	
	Sacks	Class	Density	Fluid Type	Centralizer Notes
Conductor	338	A	15.6	Air	None
Surface	1,034	A	15.6	Air	3 Centralizers at equal distance
Intermediate 1	955	A	15	Air	1 Centralizer every other jt
Production	4,173	A	14.5	Air / SOBM	1 every other joint in lateral; 1 per joint in curve; 1 every other jt to sfc



JM
1/23/19

Pilot Hole
 PH TD @ 6,701' TVD
 Landing Point @ 7,868' MD / 6,590' TVD
 PH TD = 100' below Onondaga Top

Lateral TD @ 17,796' ft MD
 6,417' ft TVD

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Well: Old Crow N-05 HM (slot A)
Site: Old Crow Pad
Project: Marshall County, West Virginia
Design: rev1
 SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSeet	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 1°/100' build
3	1000.00	5.00	34.37	999.37	18.00	12.31	1.00	34.37	13.85	Begin 5.00° tangent
4	1301.78	5.00	34.37	1300.00	39.71	27.16	0.00	0.00	30.56	Begin 2°/100' build
5	2790.00	34.76	34.37	2683.83	452.79	309.67	2.00	0.00	348.50	Begin 34.76° tangent
6	7101.22	34.76	34.37	6225.51	2481.93	1697.36	0.00	0.00	1910.25	Begin 10°/100' build/turn
7	7868.21	91.00	329.75	6590.00	3086.80	1614.95	10.00	-68.16	2514.11	Begin 91.00° lateral section
8	17796.47	91.00	329.75	6417.00	11661.91	-3385.83	0.00	0.00	2143.47	PBHL/TD 17796.46 MD 6417.00 TVD



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: GL @ 1265.00usft

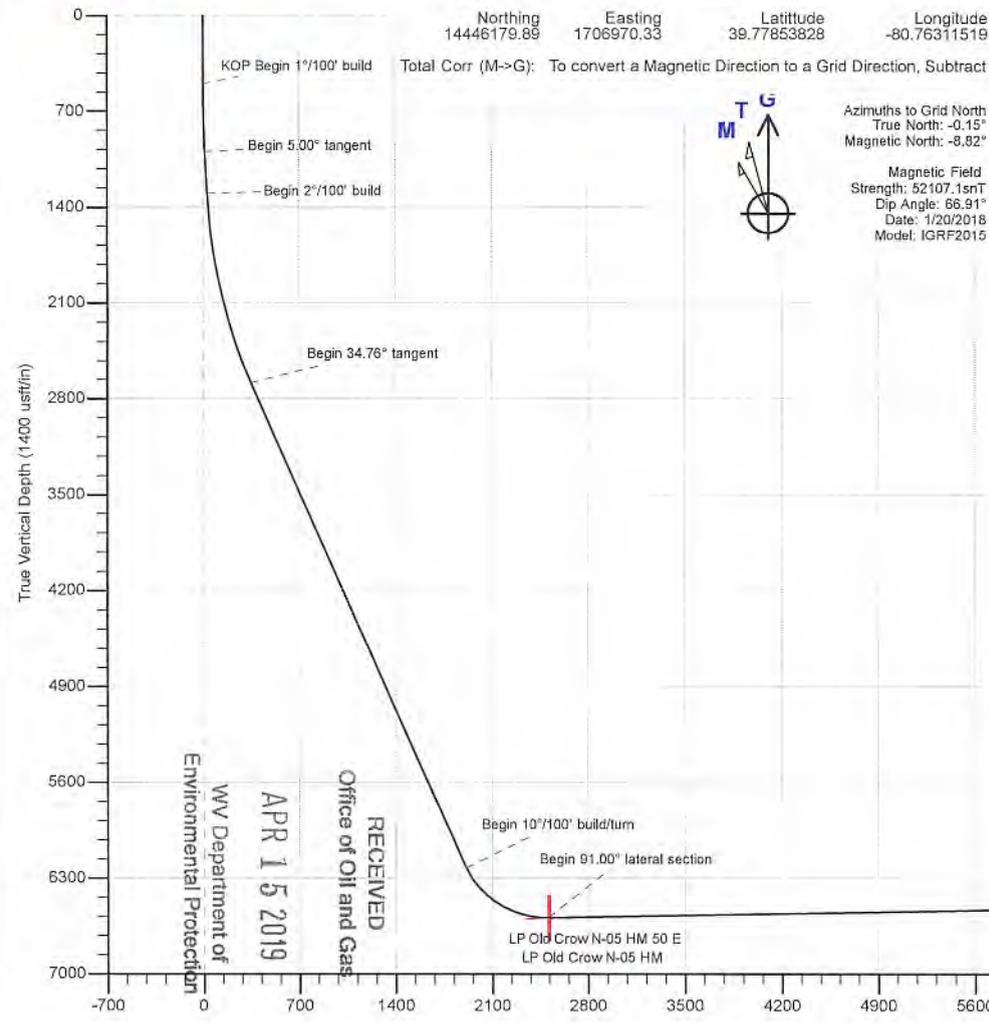
Northing: 14446179.89 Easting: 1706970.33 Latitude: 39.77853828 Longitude: -80.76311519

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.82°

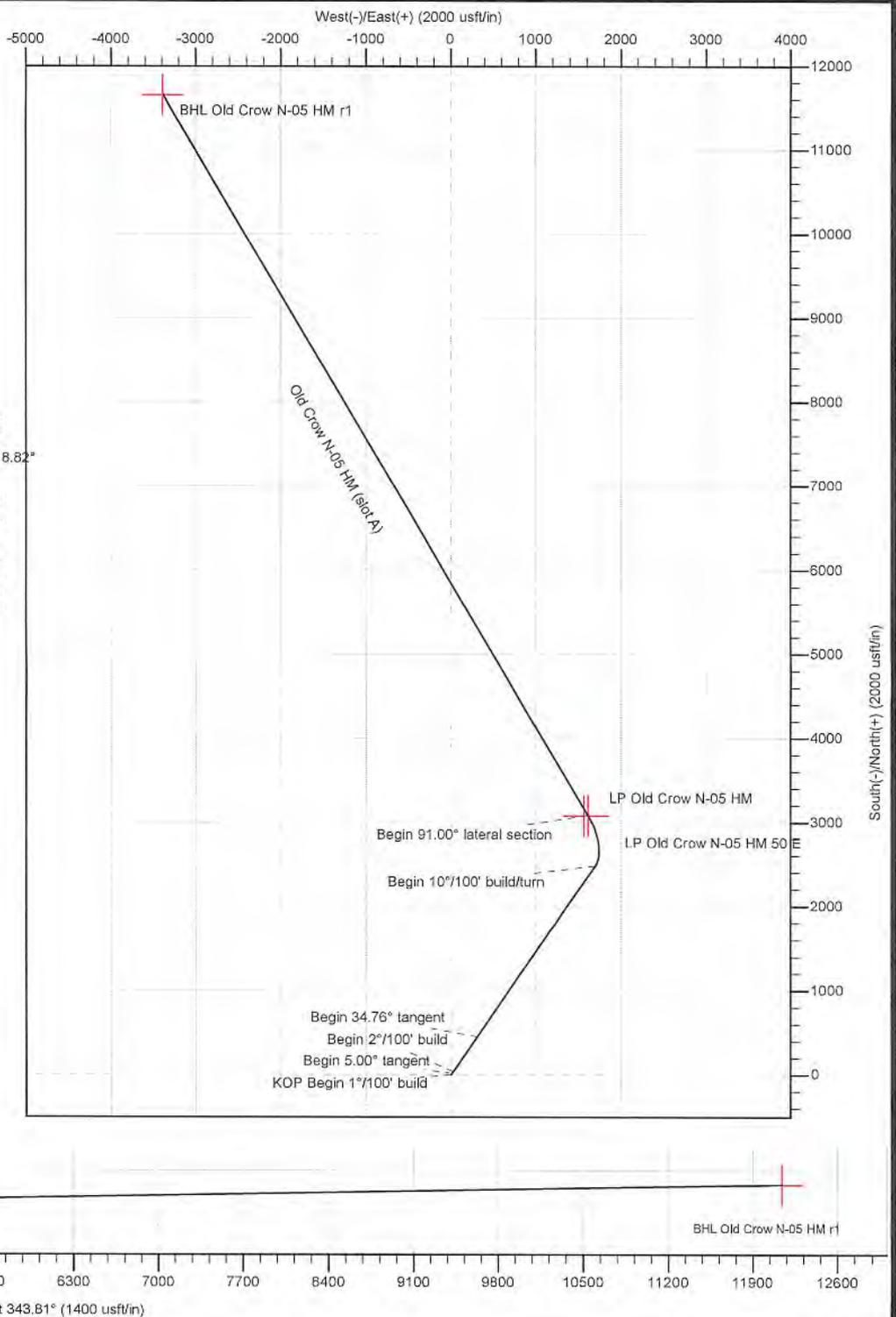


Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.82°

Magnetic Field
 Strength: 52107.1snT
 Dip Angle: 66.91°
 Date: 1/20/2018
 Model: IGRF2015



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Vertical Section at 343.81° (1400 usft/in)



Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

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	Old Crow Pad				
Site Position:		Northing:	14,446,179.89 usft	Latitude:	39.77853828
From:	Lat/Long	Easting:	1,706,970.33 usft	Longitude:	-80.76311519
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.15 °

Well	Old Crow N-05 HM (slot A)					
Well Position	+N/-S	0.00 usft	Northing:	14,446,179.89 usft	Latitude:	39.77853828
	+E/-W	0.00 usft	Easting:	1,706,970.33 usft	Longitude:	-80.76311519
Position Uncertainty		0.00 usft	Wellhead Elevation:		Ground Level:	1,265.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	1/20/2018	-8.67	66.91	52,107.11245362

Design	rev1				
Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.00	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	343.81	

Plan Survey Tool Program	Date	8/3/2018			
Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks	
1	0.00	17,796.36 rev1 (Original Hole)	MWD MWD - Standard		

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	RECEIVED	
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	Office of Oil and Gas	
1,000.00	5.00	34.37	999.37	18.00	12.31	1.00	1.00	0.00	34.37		
1,301.78	5.00	34.37	1,300.00	39.71	27.16	0.00	0.00	0.00	0.00	APR 15 2019	
2,790.00	34.76	34.37	2,683.83	452.79	309.67	2.00	2.00	0.00	0.00		
7,101.22	34.76	34.37	6,225.51	2,481.93	1,697.36	0.00	0.00	0.00	0.00		
7,868.21	91.00	329.75	6,590.00	3,086.80	1,614.95	10.00	7.33	-8.42	-68.16	WV Department of	
17,796.47	91.00	329.75	6,417.00	11,661.91	-3,385.83	0.00	0.00	0.00	0.00	Environment Protection	
										BHL Old Crow N-05 F	



Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

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	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
100.00	0.00	0.00	100.00	0.00	0.00	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
200.00	0.00	0.00	200.00	0.00	0.00	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
300.00	0.00	0.00	300.00	0.00	0.00	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
400.00	0.00	0.00	400.00	0.00	0.00	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
500.00	0.00	0.00	500.00	0.00	0.00	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
KOP Begin 1°/100' build										
600.00	1.00	34.37	599.99	0.72	0.49	14,446,180.61	1,706,970.82	39.77854026	-80.76311343	
700.00	2.00	34.37	699.96	2.88	1.97	14,446,182.77	1,706,972.30	39.77854618	-80.76310815	
800.00	3.00	34.37	799.86	6.48	4.43	14,446,186.37	1,706,974.76	39.77855605	-80.76309935	
900.00	4.00	34.37	899.67	11.52	7.88	14,446,191.41	1,706,978.21	39.77856986	-80.76308704	
1,000.00	5.00	34.37	999.37	18.00	12.31	14,446,197.68	1,706,982.64	39.77858761	-80.76307121	
Begin 5.00° tangent										
1,100.00	5.00	34.37	1,098.98	25.19	17.23	14,446,205.08	1,706,987.56	39.77860734	-80.76305363	
1,200.00	5.00	34.37	1,198.60	32.38	22.15	14,446,212.27	1,706,992.48	39.77862706	-80.76303605	
1,300.00	5.00	34.37	1,298.22	39.58	27.07	14,446,219.47	1,706,997.40	39.77864678	-80.76301847	
1,301.78	5.00	34.37	1,300.00	39.71	27.16	14,446,219.59	1,706,997.49	39.77864713	-80.76301816	
Begin 2°/100' build										
1,400.00	6.96	34.37	1,397.67	48.15	32.93	14,446,228.04	1,707,003.27	39.77867029	-80.76299751	
1,500.00	8.96	34.37	1,496.71	59.59	40.76	14,446,239.48	1,707,011.09	39.77870164	-80.76296957	
1,600.00	10.96	34.37	1,595.19	73.87	50.52	14,446,253.76	1,707,020.85	39.77874079	-80.76293467	
1,700.00	12.96	34.37	1,693.01	90.98	62.23	14,446,270.87	1,707,032.56	39.77878769	-80.76289285	
1,800.00	14.96	34.37	1,790.05	110.90	75.85	14,446,290.79	1,707,046.18	39.77884229	-80.76284418	
1,900.00	16.96	34.37	1,886.19	133.60	91.37	14,446,313.49	1,707,061.70	39.77890452	-80.76280871	
2,000.00	18.96	34.37	1,981.31	159.06	108.78	14,446,338.95	1,707,079.11	39.77897431	-80.76276650	
2,100.00	20.96	34.37	2,075.30	187.24	128.06	14,446,367.13	1,707,098.39	39.77905156	-80.76265764	
2,200.00	22.96	34.37	2,168.03	218.11	149.17	14,446,398.00	1,707,119.50	39.77913619	-80.76258220	
2,300.00	24.96	34.37	2,259.41	251.64	172.10	14,446,431.52	1,707,142.43	39.77922809	-80.76250028	
2,400.00	26.96	34.37	2,349.31	287.77	196.81	14,446,467.66	1,707,167.14	39.77932715	-80.76241198	
2,500.00	28.96	34.37	2,437.63	326.48	223.28	14,446,506.37	1,707,193.61	39.77943325	-80.76231740	
2,599.99	30.96	34.37	2,524.26	367.70	251.47	14,446,547.59	1,707,221.80	39.77954626	-80.76221666	
2,699.99	32.96	34.37	2,609.09	411.40	281.35	14,446,591.28	1,707,251.68	39.77966604	-80.76210988	
2,790.00	34.76	34.37	2,683.83	452.79	309.67	14,446,632.68	1,707,280.00	39.77977953	-80.76200872	
Begin 34.76° tangent										
2,799.99	34.76	34.37	2,692.04	457.50	312.88	14,446,637.39	1,707,283.21	39.77979242	-80.76199723	
2,899.99	34.76	34.37	2,774.19	504.56	345.07	14,446,684.45	1,707,315.40	39.77992144	-80.76188222	
2,999.99	34.76	34.37	2,856.34	551.63	377.26	14,446,731.52	1,707,347.59	39.78005046	-80.76176720	
3,099.99	34.76	34.37	2,938.49	598.70	409.45	14,446,778.58	1,707,379.78	39.78017948	-80.76165219	
3,199.99	34.76	34.37	3,020.64	645.76	441.63	14,446,825.65	1,707,411.96	39.78030850	-80.76153717	
3,299.99	34.76	34.37	3,102.79	692.83	473.82	14,446,872.72	1,707,444.15	39.78043753	-80.76142216	
3,399.99	34.76	34.37	3,184.94	739.90	506.01	14,446,919.78	1,707,476.34	39.78056655	-80.76130714	
3,499.99	34.76	34.37	3,267.09	786.96	538.20	14,446,966.85	1,707,508.53	39.78069557	-80.76119213	
3,599.99	34.76	34.37	3,349.24	834.03	570.39	14,447,013.92	1,707,540.72	39.78082459	-80.76107711	
3,699.99	34.76	34.37	3,431.39	881.09	602.57	14,447,060.98	1,707,572.90	39.78095361	-80.76096209	
3,799.99	34.76	34.37	3,513.54	928.16	634.76	14,447,108.05	1,707,605.09	39.78108263	-80.76084708	
3,899.99	34.76	34.37	3,595.69	975.23	666.95	14,447,155.11	1,707,637.28	39.78121165	-80.76073206	
3,999.99	34.76	34.37	3,677.84	1,022.29	699.14	14,447,202.18	1,707,669.47	39.78134067	-80.76061704	
4,099.99	34.76	34.37	3,759.99	1,069.36	731.33	14,447,249.25	1,707,701.66	39.78146969	-80.76050202	
4,199.99	34.76	34.37	3,842.14	1,116.43	763.51	14,447,296.31	1,707,733.84	39.78159871	-80.76038700	
4,299.99	34.76	34.37	3,924.29	1,163.49	795.70	14,447,343.38	1,707,766.03	39.78172773	-80.76027198	
4,399.99	34.76	34.37	4,006.44	1,210.56	827.89	14,447,390.45	1,707,798.22	39.78185675	-80.76015696	
4,499.99	34.76	34.37	4,088.59	1,257.62	860.08	14,447,437.51	1,707,830.41	39.78198577	-80.76004194	
4,599.99	34.76	34.37	4,170.74	1,304.69	892.27	14,447,484.58	1,707,862.60	39.78211479	-80.75992692	
4,699.99	34.76	34.37	4,252.89	1,351.76	924.45	14,447,531.65	1,707,894.78	39.78224381	-80.75981190	

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Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,799.99	34.76	34.37	4,335.04	1,398.82	956.64	14,447,578.71	1,707,926.97	39.78237283	-80.75969688	
4,899.99	34.76	34.37	4,417.19	1,445.89	988.83	14,447,625.78	1,707,959.16	39.78250185	-80.75958186	
4,999.99	34.76	34.37	4,499.34	1,492.96	1,021.02	14,447,672.84	1,707,991.35	39.78263087	-80.75946683	
5,099.99	34.76	34.37	4,581.49	1,540.02	1,053.21	14,447,719.91	1,708,023.54	39.78275989	-80.75935181	
5,199.99	34.76	34.37	4,663.64	1,587.09	1,085.39	14,447,766.98	1,708,055.72	39.78288891	-80.75923679	
5,299.99	34.76	34.37	4,745.79	1,634.15	1,117.58	14,447,814.04	1,708,087.91	39.78301793	-80.75912176	
5,399.99	34.76	34.37	4,827.94	1,681.22	1,149.77	14,447,861.11	1,708,120.10	39.78314695	-80.75900674	
5,499.99	34.76	34.37	4,910.09	1,728.29	1,181.96	14,447,908.18	1,708,152.29	39.78327597	-80.75889171	
5,599.99	34.76	34.37	4,992.24	1,775.35	1,214.15	14,447,955.24	1,708,184.48	39.78340499	-80.75877669	
5,699.99	34.76	34.37	5,074.39	1,822.42	1,246.33	14,448,002.31	1,708,216.66	39.78353400	-80.75866166	
5,799.99	34.76	34.37	5,156.54	1,869.49	1,278.52	14,448,049.37	1,708,248.85	39.78366302	-80.75854664	
5,899.99	34.76	34.37	5,238.69	1,916.55	1,310.71	14,448,096.44	1,708,281.04	39.78379204	-80.75843161	
5,999.99	34.76	34.37	5,320.84	1,963.62	1,342.90	14,448,143.51	1,708,313.23	39.78392106	-80.75831658	
6,099.99	34.76	34.37	5,402.99	2,010.68	1,375.09	14,448,190.57	1,708,345.42	39.78405008	-80.75820156	
6,199.99	34.76	34.37	5,485.14	2,057.75	1,407.27	14,448,237.64	1,708,377.60	39.78417910	-80.75808653	
6,299.99	34.76	34.37	5,567.29	2,104.82	1,439.46	14,448,284.71	1,708,409.79	39.78430811	-80.75797150	
6,399.99	34.76	34.37	5,649.45	2,151.88	1,471.65	14,448,331.77	1,708,441.98	39.78443713	-80.75785647	
6,499.99	34.76	34.37	5,731.60	2,198.95	1,503.84	14,448,378.84	1,708,474.17	39.78456615	-80.75774144	
6,599.99	34.76	34.37	5,813.75	2,246.02	1,536.03	14,448,425.90	1,708,506.36	39.78469517	-80.75762641	
6,699.99	34.76	34.37	5,895.90	2,293.08	1,568.21	14,448,472.97	1,708,538.54	39.78482418	-80.75751138	
6,799.99	34.76	34.37	5,978.05	2,340.15	1,600.40	14,448,520.04	1,708,570.73	39.78495320	-80.75739635	
6,899.99	34.76	34.37	6,060.20	2,387.22	1,632.59	14,448,567.10	1,708,602.92	39.78508222	-80.75728132	
6,999.99	34.76	34.37	6,142.35	2,434.28	1,664.78	14,448,614.17	1,708,635.11	39.78521124	-80.75716629	
7,099.99	34.76	34.37	6,224.50	2,481.35	1,696.97	14,448,661.24	1,708,667.30	39.78534025	-80.75705126	
7,101.22	34.76	34.37	6,225.51	2,481.93	1,697.36	14,448,661.82	1,708,667.69	39.78534185	-80.75704984	
Begin 10°/100' build/tum										
7,199.99	39.38	19.84	6,304.44	2,534.78	1,723.96	14,448,714.66	1,708,694.29	39.78548678	-80.75695467	
7,299.99	45.54	8.12	6,378.30	2,600.11	1,739.80	14,448,780.00	1,708,710.13	39.78566609	-80.75689763	
7,399.99	52.65	358.80	6,443.82	2,675.37	1,744.03	14,448,855.25	1,708,714.36	39.78587273	-80.75688187	
7,499.99	60.37	351.16	6,499.02	2,758.26	1,736.50	14,448,938.15	1,708,706.83	39.78610043	-80.75690787	
7,599.98	68.46	344.63	6,542.21	2,846.27	1,717.44	14,449,026.16	1,708,687.77	39.78634228	-80.75697485	
7,699.98	76.77	338.81	6,572.09	2,936.72	1,687.44	14,449,116.61	1,708,657.77	39.78659091	-80.75708076	
7,799.98	85.21	333.37	6,587.74	3,026.87	1,647.41	14,449,206.72	1,708,617.74	39.78683878	-80.75722240	
7,868.21	91.00	329.75	6,590.00	3,086.80	1,614.95	14,449,266.69	1,708,585.28	39.78700359	-80.75733737	
Begin 91.00° lateral section										
7,899.98	91.00	329.75	6,589.45	3,114.24	1,598.95	14,449,294.13	1,708,569.28	39.78707907	-80.75739407	
7,999.98	91.00	329.75	6,587.70	3,200.61	1,548.58	14,449,380.50	1,708,518.91	39.78731665	-80.75757254	
8,099.98	91.00	329.75	6,585.96	3,286.98	1,498.21	14,449,466.87	1,708,468.54	39.78755422	-80.75775100	
8,199.98	91.00	329.75	6,584.22	3,373.35	1,447.84	14,449,553.24	1,708,418.17	39.78779179	-80.75792947	
8,299.98	91.00	329.75	6,582.48	3,459.72	1,397.47	14,449,639.61	1,708,367.80	39.78802936	-80.75810794	
8,399.98	91.00	329.75	6,580.73	3,546.09	1,347.10	14,449,725.98	1,708,317.43	39.78826693	-80.75828642	
8,499.98	91.00	329.75	6,578.99	3,632.46	1,296.73	14,449,812.35	1,708,267.06	39.78850450	-80.75846489	
8,599.98	91.00	329.75	6,577.25	3,718.83	1,246.36	14,449,898.72	1,708,216.69	39.78874207	-80.75864336	
8,699.98	91.00	329.75	6,575.51	3,805.20	1,195.99	14,449,985.09	1,708,166.32	39.78897964	-80.75882184	
8,799.98	91.00	329.75	6,573.76	3,891.57	1,145.62	14,450,071.46	1,708,115.95	39.78921721	-80.75900032	
8,899.98	91.00	329.75	6,572.02	3,977.95	1,095.26	14,450,157.83	1,708,065.59	39.78945478	-80.75917879	
8,999.98	91.00	329.75	6,570.28	4,064.32	1,044.89	14,450,244.20	1,708,015.22	39.78969235	-80.75935727	
9,099.98	91.00	329.75	6,568.54	4,150.69	994.52	14,450,330.57	1,707,964.85	39.78992992	-80.75953575	
9,199.98	91.00	329.75	6,566.79	4,237.06	944.15	14,450,416.95	1,707,914.48	39.79016748	-80.75971423	
9,299.98	91.00	329.75	6,565.05	4,323.43	893.78	14,450,503.32	1,707,864.11	39.79040505	-80.75989272	
9,399.98	91.00	329.75	6,563.31	4,409.80	843.41	14,450,589.69	1,707,813.74	39.79064262	-80.76007120	
9,499.98	91.00	329.75	6,561.57	4,496.17	793.04	14,450,676.06	1,707,763.37	39.79088019	-80.76024969	
9,599.98	91.00	329.75	6,559.82	4,582.54	742.67	14,450,762.43	1,707,713.00	39.79111775	-80.76042817	
9,699.98	91.00	329.75	6,558.08	4,668.91	692.30	14,450,848.80	1,707,662.63	39.79135532	-80.76060666	

Office of Oil and Gas
 APR 11 2019
 WV Department of Environmental Protection



Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
9,799.98	91.00	329.75	6,556.34	4,755.28	641.93	14,450,935.17	1,707,612.26	39.79159289	-80.76078515	
9,899.98	91.00	329.75	6,554.60	4,841.65	591.57	14,451,021.54	1,707,561.90	39.79183045	-80.76096364	
9,999.98	91.00	329.75	6,552.85	4,928.02	541.20	14,451,107.91	1,707,511.53	39.79206802	-80.76114213	
10,099.98	91.00	329.75	6,551.11	5,014.39	490.83	14,451,194.28	1,707,461.16	39.79230559	-80.76132063	
10,199.98	91.00	329.75	6,549.37	5,100.76	440.46	14,451,280.65	1,707,410.79	39.79254315	-80.76149912	
10,299.98	91.00	329.75	6,547.63	5,187.13	390.09	14,451,367.02	1,707,360.42	39.79278072	-80.76167761	
10,399.98	91.00	329.75	6,545.88	5,273.50	339.72	14,451,453.39	1,707,310.05	39.79301828	-80.76185611	
10,499.98	91.00	329.75	6,544.14	5,359.88	289.35	14,451,539.76	1,707,259.68	39.79325585	-80.76203461	
10,599.98	91.00	329.75	6,542.40	5,446.25	238.98	14,451,626.13	1,707,209.31	39.79349341	-80.76221311	
10,699.98	91.00	329.75	6,540.66	5,532.62	188.61	14,451,712.50	1,707,158.94	39.79373097	-80.76239161	
10,799.98	91.00	329.75	6,538.91	5,618.99	138.24	14,451,798.88	1,707,108.57	39.79396854	-80.76257011	
10,899.98	91.00	329.75	6,537.17	5,705.36	87.87	14,451,885.25	1,707,058.20	39.79420610	-80.76274861	
10,999.98	91.00	329.75	6,535.43	5,791.73	37.51	14,451,971.62	1,707,007.84	39.79444367	-80.76292711	
11,099.98	91.00	329.75	6,533.69	5,878.10	-12.86	14,452,057.99	1,706,957.47	39.79468123	-80.76310562	
11,199.98	91.00	329.75	6,531.94	5,964.47	-63.23	14,452,144.36	1,706,907.10	39.79491879	-80.76328413	
11,299.98	91.00	329.75	6,530.20	6,050.84	-113.60	14,452,230.73	1,706,856.73	39.79515635	-80.76346263	
11,399.98	91.00	329.75	6,528.46	6,137.21	-163.97	14,452,317.10	1,706,806.36	39.79539392	-80.76364114	
11,499.98	91.00	329.75	6,526.72	6,223.58	-214.34	14,452,403.47	1,706,755.99	39.79563148	-80.76381965	
11,599.98	91.00	329.75	6,524.97	6,309.95	-264.71	14,452,489.84	1,706,705.62	39.79586904	-80.76399816	
11,699.98	91.00	329.75	6,523.23	6,396.32	-315.08	14,452,576.21	1,706,655.25	39.79610660	-80.76417668	
11,799.98	91.00	329.75	6,521.49	6,482.69	-365.45	14,452,662.58	1,706,604.88	39.79634416	-80.76435519	
11,899.98	91.00	329.75	6,519.75	6,569.06	-415.82	14,452,748.95	1,706,554.51	39.79658172	-80.76453370	
11,999.98	91.00	329.75	6,518.00	6,655.43	-466.19	14,452,835.32	1,706,504.15	39.79681928	-80.76471222	
12,099.98	91.00	329.75	6,516.26	6,741.80	-516.55	14,452,921.69	1,706,453.78	39.79705684	-80.76489074	
12,199.98	91.00	329.75	6,514.52	6,828.18	-566.92	14,453,008.06	1,706,403.41	39.79729440	-80.76506926	
12,299.98	91.00	329.75	6,512.78	6,914.55	-617.29	14,453,094.43	1,706,353.04	39.79753196	-80.76524778	
12,399.98	91.00	329.75	6,511.03	7,000.92	-667.66	14,453,180.80	1,706,302.67	39.79776952	-80.76542630	
12,499.98	91.00	329.75	6,509.29	7,087.29	-718.03	14,453,267.18	1,706,252.30	39.79800708	-80.76560482	
12,599.98	91.00	329.75	6,507.55	7,173.66	-768.40	14,453,353.55	1,706,201.93	39.79824464	-80.76578334	
12,699.97	91.00	329.75	6,505.81	7,260.03	-818.77	14,453,439.92	1,706,151.56	39.79848220	-80.76596187	
12,799.97	91.00	329.75	6,504.06	7,346.40	-869.14	14,453,526.29	1,706,101.19	39.79871976	-80.76614039	
12,899.97	91.00	329.75	6,502.32	7,432.77	-919.51	14,453,612.66	1,706,050.82	39.79895731	-80.76631892	
12,999.97	91.00	329.75	6,500.58	7,519.14	-969.88	14,453,699.03	1,706,000.45	39.79919487	-80.76649745	
13,099.97	91.00	329.75	6,498.84	7,605.51	-1,020.24	14,453,785.40	1,705,950.09	39.79943243	-80.76667598	
13,199.97	91.00	329.75	6,497.09	7,691.88	-1,070.61	14,453,871.77	1,705,899.72	39.79966999	-80.76685451	
13,299.97	91.00	329.75	6,495.35	7,778.25	-1,120.98	14,453,958.14	1,705,849.35	39.79990754	-80.76703304	
13,399.97	91.00	329.75	6,493.61	7,864.62	-1,171.35	14,454,044.51	1,705,798.98	39.80014510	-80.76721157	
13,499.97	91.00	329.75	6,491.87	7,950.99	-1,221.72	14,454,130.88	1,705,748.61	39.80038266	-80.76739011	
13,599.97	91.00	329.75	6,490.12	8,037.36	-1,272.09	14,454,217.25	1,705,698.24	39.80062021	-80.76756864	
13,699.97	91.00	329.75	6,488.38	8,123.73	-1,322.46	14,454,303.62	1,705,647.87	39.80085777	-80.76774718	
13,799.97	91.00	329.75	6,486.64	8,210.11	-1,372.83	14,454,389.99	1,705,597.50	39.80109532	-80.76792572	
13,899.97	91.00	329.75	6,484.90	8,296.48	-1,423.20	14,454,476.36	1,705,547.13	39.80133288	-80.76810426	
13,999.97	91.00	329.75	6,483.15	8,382.85	-1,473.57	14,454,562.73	1,705,496.76	39.80157043	-80.76828280	
14,099.97	91.00	329.75	6,481.41	8,469.22	-1,523.94	14,454,649.11	1,705,446.40	39.80180799	-80.76846134	
14,199.97	91.00	329.75	6,479.67	8,555.59	-1,574.30	14,454,735.48	1,705,396.03	39.80204554	-80.76863988	
14,299.97	91.00	329.75	6,477.93	8,641.96	-1,624.67	14,454,821.85	1,705,345.66	39.80228310	-80.76881843	
14,399.97	91.00	329.75	6,476.18	8,728.33	-1,675.04	14,454,908.22	1,705,295.29	39.80252065	-80.76899697	
14,499.97	91.00	329.75	6,474.44	8,814.70	-1,725.41	14,454,994.59	1,705,244.92	39.80275820	-80.76917552	
14,599.97	91.00	329.75	6,472.70	8,901.07	-1,775.78	14,455,080.96	1,705,194.55	39.80299576	-80.76935407	
14,699.97	91.00	329.75	6,470.96	8,987.44	-1,826.15	14,455,167.33	1,705,144.18	39.80323331	-80.76953262	
14,799.97	91.00	329.75	6,469.21	9,073.81	-1,876.52	14,455,253.70	1,705,093.81	39.80347087	-80.76971117	
14,899.97	91.00	329.75	6,467.47	9,160.18	-1,926.89	14,455,340.07	1,705,043.44	39.80370842	-80.76988972	
14,999.97	91.00	329.75	6,465.73	9,246.55	-1,977.26	14,455,426.44	1,704,993.07	39.80394597	-80.77006827	
15,099.97	91.00	329.75	6,463.99	9,332.92	-2,027.63	14,455,512.81	1,704,942.70	39.80418352	-80.77024682	
15,199.97	91.00	329.75	6,462.24	9,419.29	-2,077.99	14,455,599.18	1,704,892.34	39.80442107	-80.77042538	



Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
15,299.97	91.00	329.75	6,460.50	9,505.66	-2,128.36	14,455,685.55	1,704,841.97	39.80465862	-80.77060394	
15,399.97	91.00	329.75	6,458.76	9,592.03	-2,178.73	14,455,771.92	1,704,791.60	39.80489617	-80.77078249	
15,499.97	91.00	329.75	6,457.02	9,678.41	-2,229.10	14,455,858.29	1,704,741.23	39.80513372	-80.77096105	
15,599.97	91.00	329.75	6,455.27	9,764.78	-2,279.47	14,455,944.66	1,704,690.86	39.80537127	-80.77113961	
15,699.97	91.00	329.75	6,453.53	9,851.15	-2,329.84	14,456,031.04	1,704,640.49	39.80560882	-80.77131817	
15,799.97	91.00	329.75	6,451.79	9,937.52	-2,380.21	14,456,117.41	1,704,590.12	39.80584637	-80.77149674	
15,899.97	91.00	329.75	6,450.05	10,023.89	-2,430.58	14,456,203.78	1,704,539.75	39.80608392	-80.77167530	
15,999.97	91.00	329.75	6,448.30	10,110.26	-2,480.95	14,456,290.15	1,704,489.38	39.80632147	-80.77185387	
16,099.97	91.00	329.75	6,446.56	10,196.63	-2,531.32	14,456,376.52	1,704,439.01	39.80655902	-80.77203243	
16,199.97	91.00	329.75	6,444.82	10,283.00	-2,581.69	14,456,462.89	1,704,388.64	39.80679657	-80.77221100	
16,299.97	91.00	329.75	6,443.08	10,369.37	-2,632.05	14,456,549.26	1,704,338.28	39.80703412	-80.77238957	
16,399.97	91.00	329.75	6,441.33	10,455.74	-2,682.42	14,456,635.63	1,704,287.91	39.80727166	-80.77256814	
16,499.97	91.00	329.75	6,439.59	10,542.11	-2,732.79	14,456,722.00	1,704,237.54	39.80750921	-80.77274671	
16,599.97	91.00	329.75	6,437.85	10,628.48	-2,783.16	14,456,808.37	1,704,187.17	39.80774676	-80.77292528	
16,699.97	91.00	329.75	6,436.11	10,714.85	-2,833.53	14,456,894.74	1,704,136.80	39.80798431	-80.77310386	
16,799.97	91.00	329.75	6,434.36	10,801.22	-2,883.90	14,456,981.11	1,704,086.43	39.80822185	-80.77328243	
16,899.97	91.00	329.75	6,432.62	10,887.59	-2,934.27	14,457,067.48	1,704,036.06	39.80845940	-80.77346101	
16,999.97	91.00	329.75	6,430.88	10,973.96	-2,984.64	14,457,153.85	1,703,985.69	39.80869695	-80.77363958	
17,099.97	91.00	329.75	6,429.14	11,060.34	-3,035.01	14,457,240.22	1,703,935.32	39.80893449	-80.77381816	
17,199.97	91.00	329.75	6,427.39	11,146.71	-3,085.38	14,457,326.59	1,703,884.95	39.80917204	-80.77399674	
17,299.97	91.00	329.75	6,425.65	11,233.08	-3,135.75	14,457,412.96	1,703,834.59	39.80940959	-80.77417532	
17,399.97	91.00	329.75	6,423.91	11,319.45	-3,186.11	14,457,499.34	1,703,784.22	39.80964713	-80.77435390	
17,499.97	91.00	329.75	6,422.17	11,405.82	-3,236.48	14,457,585.71	1,703,733.85	39.80988468	-80.77453249	
17,599.97	91.00	329.75	6,420.42	11,492.19	-3,286.85	14,457,672.08	1,703,683.48	39.81012222	-80.77471107	
17,699.96	91.00	329.75	6,418.68	11,578.56	-3,337.22	14,457,758.45	1,703,633.11	39.81035976	-80.77488966	
17,796.46	91.00	329.75	6,417.00	11,661.90	-3,385.83	14,457,841.79	1,703,584.51	39.81058898	-80.77506199	
PBHL/TD 17796.46 MD 6417.00 TVD										
17,796.47	91.00	329.75	6,417.00	11,661.91	-3,385.83	14,457,841.80	1,703,584.50	39.81058900	-80.77506200	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
BHL Old Crow N-05 HM - hit/miss target - Shape - Point	0.00	0.00	6,417.00	11,661.91	-3,385.83	14,457,841.80	1,703,584.50	39.81058900	-80.77506200	
LP Old Crow N-05 HM 5 - plan hits target center - Point	0.00	0.00	6,590.00	3,086.80	1,614.95	14,449,266.68	1,708,585.28	39.78700359	-80.75733736	
LP Old Crow N-05 HM - plan misses target center by 43.19usft at 7893.40usft MD (6589.56 TVD, 3108.55 N, 1602.26 E) - Point	0.00	0.00	6,590.00	3,086.80	1,564.95	14,449,266.68	1,708,535.28	39.78700396	-80.75751535	

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Planning Report - Geographic

06/14/2019

Database:	DB_Aug0116_LT_v14	Local Co-ordinate Reference:	Well Old Crow N-05 HM (slot A)
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1265.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1265.00usft
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-05 HM (slot A)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
500.00	500.00	0.00	0.00	KOP Begin 1°/100' build
1,000.00	999.37	18.00	12.31	Begin 5.00° tangent
1,301.78	1,300.00	39.71	27.16	Begin 2°/100' build
2,790.00	2,683.83	452.79	309.67	Begin 34.76° tangent
7,101.22	6,225.51	2,481.93	1,697.36	Begin 10°/100' build/turn
7,868.21	6,590.00	3,086.80	1,614.95	Begin 91.00° lateral section
17,796.46	6,417.00	11,661.90	-3,385.83	PBHL/TD 17796.46 MD 6417.00 TVD

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WW-9
(4/16)

API Number 47 - 051 - 06/14/2019
Operator's Well No. Old Crow N-5HM

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

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Tug Hill Operating, LLC OP Code 494510851

Watershed (HUC 10) Fish Creek Quadrangle Powhatan Point 7.5'

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes No

Will a pit be used? Yes No

If so, please describe anticipated pit waste: AST Tanks with proper containment will be used for staging fresh water for frac and flow back water

Will a synthetic liner be used in the pit? Yes No If so, what ml.? AST Tanks will be used with proper contain

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection (UIC Permit Number UIC 2459, UIC 965, UIC 359, UIC 2D0732540, UIC 2D0732523)
- Reuse (at API Number _____)
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain _____)

Will closed loop system be used? If so, describe: Yes - For Vertical and Horizontal Drilling

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Air for vertical / Oil for Horizontal

-If oil based, what type? Synthetic, petroleum, etc. Synthetic Oil Base

Additives to be used in drilling medium? Barite for weight

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. All drill cuttings to be disposed of in a Landfill

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Wetzel County Sanitary Landfill (SWF-1021 / WV0109185) and Westmoreland Sanitary Landfill, LLC (SAN1405 / PA DEP ECH1386426)

Permittee shall provide written notice to the Office of Oil and Gas of any load of drill cuttings or associated waste rejected at any West Virginia solid waste facility. The notice shall be provided within 24 hours of rejection and the permittee shall also disclose where it was properly disposed.

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature James Pancake

Company Official (Typed Name) James Pancake

Company Official Title Vice President - Geoscience

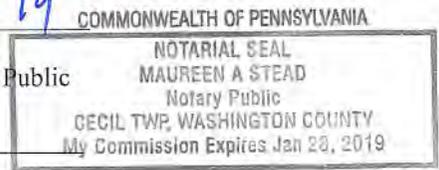
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Subscribed and sworn before me this 28 day of JANUARY, 20 19

Maureen A Stead

Notary Public

My commission expires 1/28/19



Tug Hill Operating, LLC

Proposed Revegetation Treatment: Acres Disturbed 19.18 Prevegetation pH 6.0

Lime 3 Tons/acre or to correct to pH 6.5

Fertilizer type 10-20-20

Fertilizer amount 500 lbs/acre

Mulch 2.5 Tons/acre

Seed Mixtures

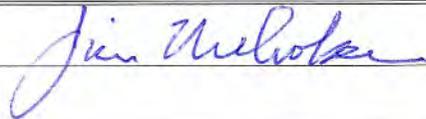
Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Ryegrass	40	Orchard Grass	12
Spring Oats	96	Ladino	3
		White Clover	2

Attach:

Maps(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided). If water from the pit will be land applied, include dimensions (L x W x D) of the pit, and dimensions (L x W), and area in acreage, of the land application area.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: _____



Comments: _____

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Title: Oil and Gas Inspector

Date: 1/23/19

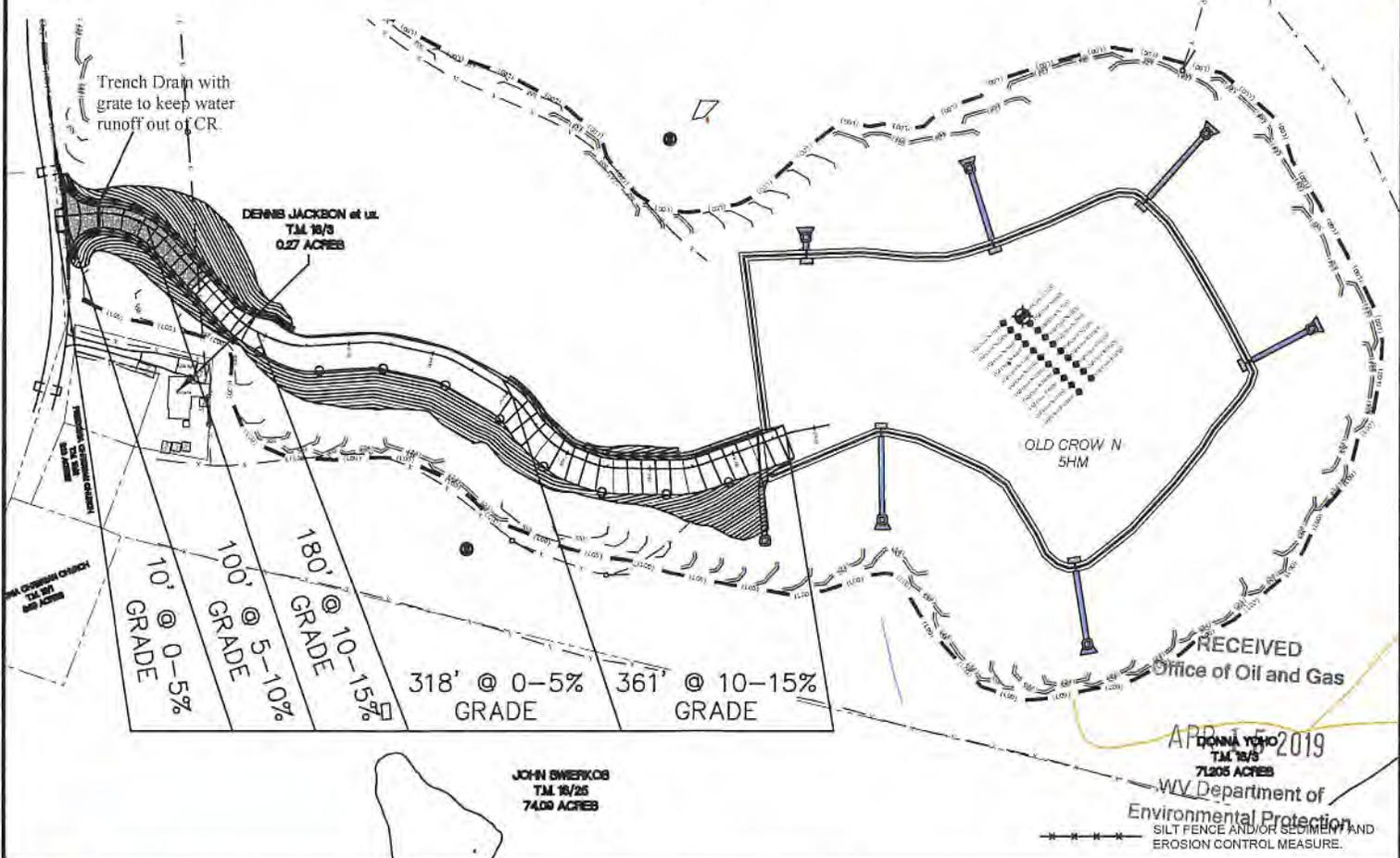
WV Department of
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Field Reviewed? Yes No

PROPOSED OLD CROW N - 5HM

NOTES:

1. Ⓞ - DENOTES INSTALL 18" PVC CULVERT AND APPLY APPROPRIATE SEDIMENT OUTLET CONTROL (RIP RAP SPLASH PAD)
2. DRAWING NOT TO SCALE
3. REFERENCE IS HEREBY MADE TO THE WV D.E.P. OFFICE OF OIL & GAS, "EROSION AND SEDIMENT CONTROL FIELD MANUAL" FOR REQUIREMENTS AND BMPs FOR AVERAGE FIELD CONDITIONS CONCERNING THE MAINTENANCE OF EXISTING ROADS AND THE CONSTRUCTION OF PROPOSED ROADS. FIELD CONDITIONS MAY REQUIRE VARIANCE FROM THESE GUIDELINES AND THE EARTHWORK CONTRACTOR IS RESPONSIBLE FOR NOTIFICATION TO THE INSPECTOR AND THE OPERATOR SHOULD THESE CONDITIONS OCCUR.
4. INSTALL CULVERTS AS SHOWN ON RECLAMATION PLAN OR AS FIELD CONDITIONS REQUIRE.
5. ENTRANCES ONTO PUBLIC ROADS SHALL BE CONSTRUCTED OR MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATIONS. ADDITIONAL PERMITS MAY BE REQUIRED.
6. TEMPORARILY SEED AND MULCH ALL SLOPS UPON CONSTRUCTION OF LOCATION.
7. ALL CUT AND FILL SLOPES ARE 2H : 1V SLOPE.
8. ALL TREES 6-INCHES AND ABOVE ARE TO BE CUT AND STACKED. BRUSH SLASHINGS ARE TO BE UTILIZED DOWN SLOPE OF SITE AND STRUCTURES TO ACT AS A CONTROL BARRIER IF AVAILABLE.
9. SEE OLD CROW N SITE PLAN PREPARED BY KELLEY SURVEYING, FOR COMPLETE CONSTRUCTION & EROSION AND SEDIMENT CONTROL DETAILS.



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Land & Energy Development
Solutions from the ground up.
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www.slsurveys.com

TOPO SECTION:		OPERATOR:	
POWHATAN POINT 7.5'		PREPARED FOR: TUG HILL OPERATING, LLC 380 SOUTHPOINTE BLVD SUITE 200 CANONSBURG, PA 15317	
COUNTY	DISTRICT		
MARSHALL	FRANKLIN		
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8769	06/22/18	NONE

**TUG HILL
OPERATING**



Well Site Safety Plan

Tug Hill Operating, LLC

JW
1/23/19

Well Name: Old Crow N-5HM

Pad Location: Old Crow Pad

Marshall County, West Virginia

UTM (meters), NAD83, Zone 17:

Northing: 4,403,204.44

Easting: 520,285.60

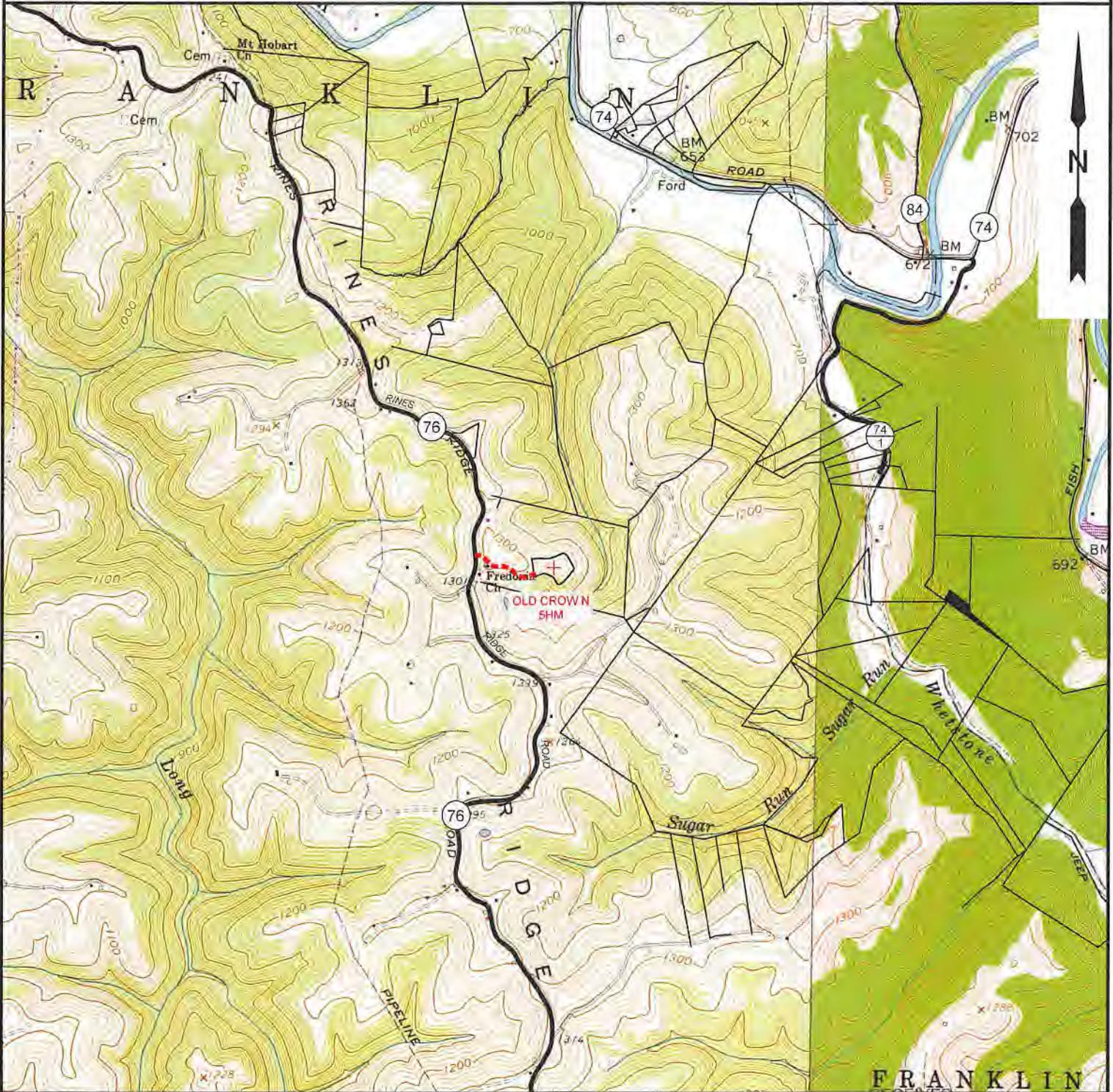
January 2019

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Environmental Protection

PROPOSED OLD CROWN - 5HM



NOTE: CLOSEST WATER PURVEYOR
GRANDVIEW - DOOLIN PUBLIC SERVICE DISTRICT
PROCTOR, WV

LAT: 39.7137712
LON: -80.8258327
LOCATED: S 37°39'00" W AT 29,404.13' FROM OLD CROWN N - 5HM SURFACE LOCATION

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TOPO SECTION:		OPERATOR:	
GLEN EASTON & POWHATAN POINT 7.5'		PREPARED FOR:	
COUNTY	DISTRICT	TUG HILL OPERATING, LLC	
MARSHALL	FRANKLIN	380 SOUTHPOINTE BLVD	
		SUITE 200	
		CANONSBURG, PA 15317	
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8796	06/22/18	1" = 2000'

WV Department of Environmental Protection
TUG HILL OPERATING

7,040' B.H.

3,686' T.H.

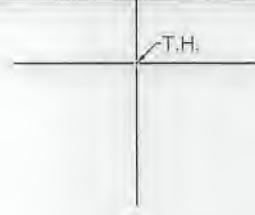
**OLD CROW N LEASE
WELL 5HM
TUG HILL OPERATING**

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

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)
 NAD'83 S.P.C.(FT) N. 468,178.88 E. 1,613,512.76
 NAD'83 GEO. LAT-(N) 39.778538 LONG-(W) 80.763115
 NAD'83 UTM (M) N. 4,403,204.44 E. 520,285.60
LANDING POINT
 NAD'83 S.P.C.(FT) N. 471,239.3 E. 1,615,179.6
 NAD'83 GEO. LAT-(N) 39.787004 LONG-(W) 80.757337
 NAD'83 UTM (M) N. 4,404,145.3 E. 520,777.8
BOTTOM HOLE
 NAD'83 S.P.C.(FT) N. 479,899.6 E. 1,610,306.6
 NAD'83 GEO. LAT-(N) 39.810589 LONG-(W) 80.775062
 NAD'83 UTM (M) N. 4,406,759.0 E. 519,253.6

T.H. LONGITUDE 80°45'00"
B.H. LONGITUDE 80°45'00"

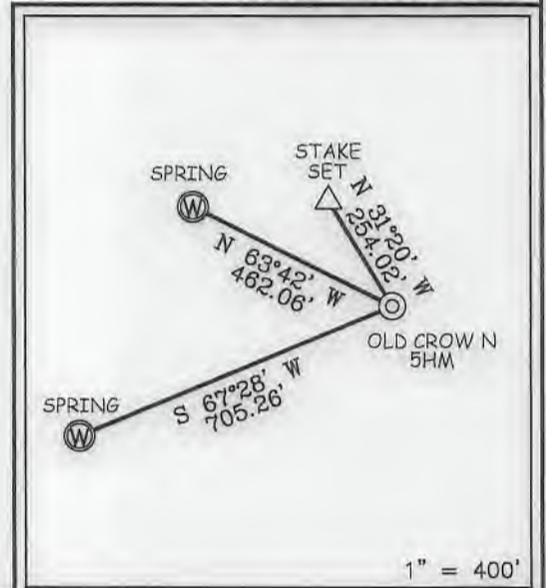
MAP/PARCEL	ADJOINING SURFACE OWNER LIST	ACRES
5-9-4.3	HARRY E. KARR, JR., ET UX	1.471
5-9-4.7	FRANCIS D. BARR, ET UX	0.481
5-9-4.8	THOMAS MIDCAP, ET UX	0.376
5-9-4.10	DEBORAH S. MIDCAP	0.819
5-9-4.11	GARY PORTER	1.00
5-9-4.14	PAUL G. BROWN	0.500
5-9-4.15	PAUL G. BROWN	0.500
5-9-4.18	PAUL G. BROWN	0.657
5-9-4.19	SAMUEL L. CANTERBURY, ET UX	2.078
5-9-13.1	DENNIS P. CADMUS	5.42
5-9-19	MARK STEPHEN STOCKLASK	2.38
5-9-21	ALBERT F. KAZEMKA	PARCEL 100'
5-9-25	DELBERT K. & LINDA K. MYERS	14.49
5-9-26	EDWIN C. MILLER	1.00
5-9-32	SANDRA J. BONNETTE	2.321
5-9-32.5	GARNET D. MIDCAP	PCL 270 x 390
5-9-32.3	TIMMOTHY Q. HOYT, ET UX	0.711
5-9-32.9	LIONEL E. HENRY SR., ET AL	1.269
5-9-32.10	TIMMOTHY Q. HOYT, ET UX	0.588
5-9-32.11	TIMMOTHY Q. HOYT, ET UX	1.717
5-9-33.1	KEITH D. & BEVERLY A. DANIELS	1.00
5-9-33.2	KEITH D. DANIELS, ET UX	1.334
5-9-33.4	DAVID D. & CHRISTINE S. DANIELS	1.025
5-9-36	FRANK T. & ANNA M. WALKER	PARCEL
5-9-37	FRANK T. & ANNA M. WALKER	10.857
5-9-38	SHIRLEY A. HILL EST.	3.331



NOTES ON SURVEY

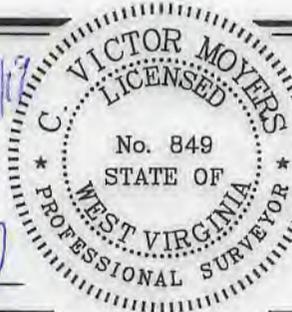
1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. OR DWELLINGS WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.
2. WELL SPOT CIRCLE & TOPO MARK SCALE ARE 1"=2000'

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 JUNE 22, 20 18
 REVISED JANUARY 17, 20 19
 OPERATORS WELL NO. OLD CROW N-5HM
 API WELL NO. 47 - 51 - 02208
 STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 8796P5HMR.dwg
OLD CROW NORTH 5HM REV1
 HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 2000'

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

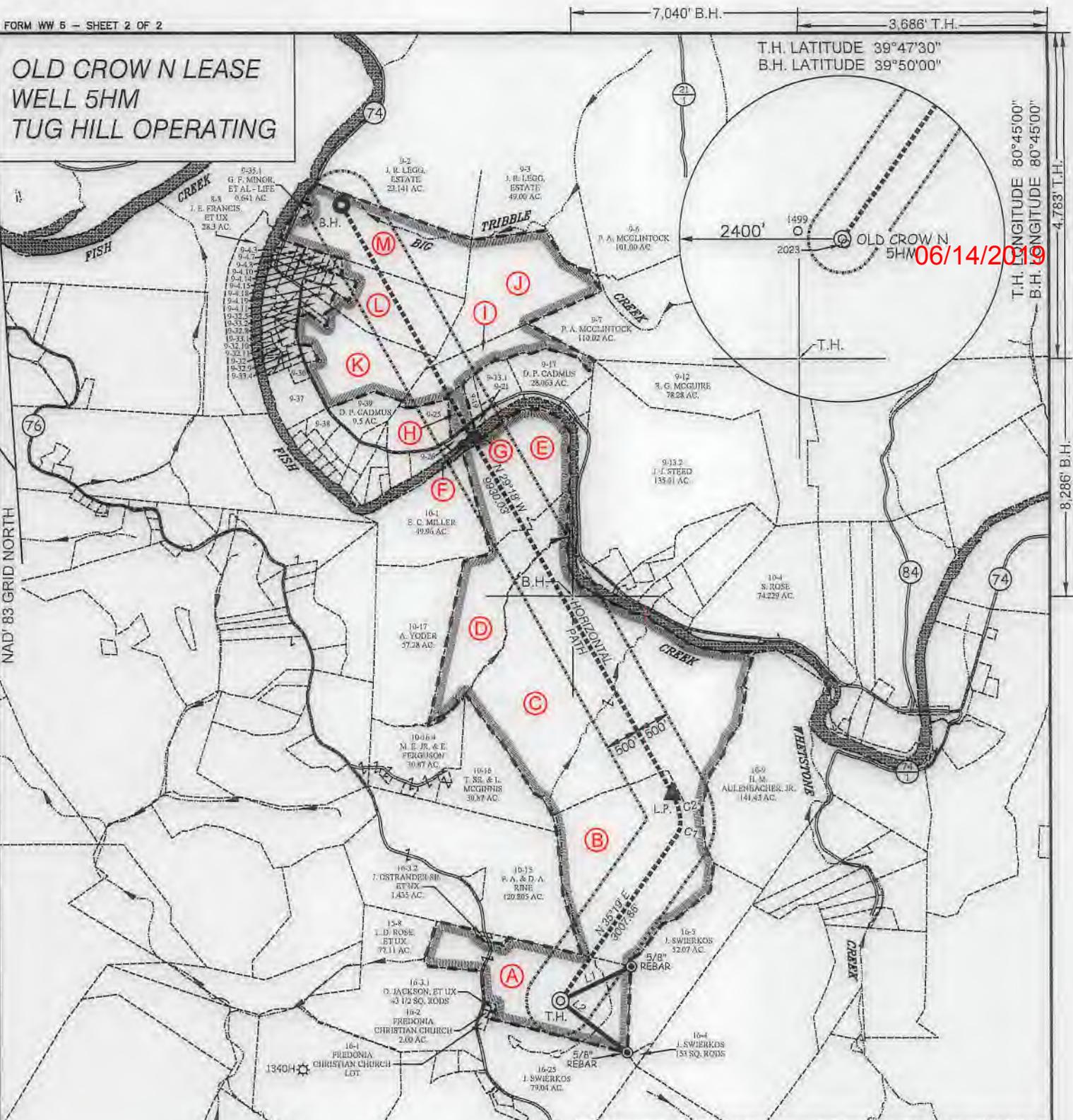
WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION STORAGE DEEP SHALLOW
 LOCATION: GROUND = 1,286.20' ELEVATION PROPOSED = 1,264.99' WATERSHED TRIBUTARY OF FISH CREEK (HUC-10)
 DISTRICT FRANKLIN COUNTY MARSHALL QUADRANGLE POWHATAN POINT 7.5'
 SURFACE OWNER DONNA VIVIAN YOHO (TOD) GARY LANCE YOHO ACREAGE 71.205±
 ROYALTY OWNER DONNA VIVIAN YOHO, ET AL ACREAGE 71.205±
 PROPOSED WORK: 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 MARCELLUS
 ESTIMATED DEPTH TVD: 6,701' / TMD: 17,796'

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

COUNTY NAME PERMIT

**OLD CROW N LEASE
WELL 5HM
TUG HILL OPERATING**

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



CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	182.71'	317.16'	N 15°52' E	180.20'
C2	454.80'	881.01'	N 15°41' W	449.77'

TAG	SURFACE OWNER	PARCEL	ACRES
A	DONNA VIVIAN YOHO (TOD) GARY LANCE YOHO	5-16-3	71.205
B	JOHN SWIERKOS	5-10-14	100.00
C	HERBERT M. AULENBACHER, JR.	5-10-3	225.50
D	WILLIAM A. PRASCIK, ET AL	5-10-2	52.00
E	EDWIN C. MILLER	5-9-20	51.64
F	STATE OF WEST VIRGINIA (FISH CREEK)	N/A	N/A
G	ALBERT F. KAZEMKA	5-9-22	0.5
H	DELBERT K. & LINDA K. MYERS	5-9-23	7.00
I	DENNIS P. CADMUS	5-9-24	21 AC 49 P
J	LLOYD C. & JUDITH C. ARNOLD	5-9-41	93.00
K	KEITH D. DANIELS, ET UX	5-9-33	40.331
L	LLOYD C. & JUDITH C. ARNOLD	5-9-4	18.854
M	LLOYD C. & JUDITH C. ARNOLD	5-9-35	47.00

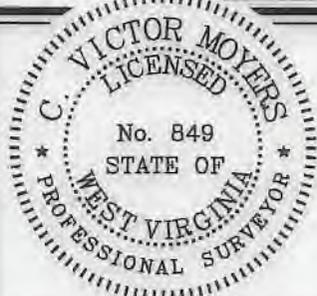
SLS
Land & Energy Development
Solutions from the ground up.
P.O. Box 150 • 12 Vanhorn Drive • Glenville, WV 26351 • (304) 462-5634
www.slsurveys.com

LINE	BEARING	DISTANCE
L1	N 64°29' E	1164.44'
L2	S 52°46' E	1239.99'

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)
 NAD'83 S.P.C.(FT) N. 468,178.88 E. 1,613,512.78
 NAD'83 GEO. LAT-(N) 39.778538 LONG-(W) 80.763115
 NAD'83 UTM (M) N. 4,403,204.44 E. 520,285.60

LANDING POINT
 NAD'83 S.P.C.(FT) N. 471,239.3 E. 1,615,179.6
 NAD'83 GEO. LAT-(N) 39.787004 LONG-(W) 80.757337
 NAD'83 UTM (M) N. 4,404,145.3 E. 520,777.8

BOTTOM HOLE
 NAD'83 S.P.C.(FT) N. 479,899.6 E. 1,610,321.1
 NAD'83 GEO. LAT-(N) 39.810589 LONG-(W) 80.775062
 NAD'83 UTM (M) N. 4,406,759.0 E. 519,253.6



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

P.S. 849 *C. Victor Moyers*

LEGEND

- LEASE LINE
- SURFACE LINE
- WELL LATERAL
- OFFSET LINE
- TIE LINE
- CREEK
- ROAD
- COUNTY ROUTE
- PROPOSED WELL
- EXISTING WELL
- PERMITTED WELL
- TAX MAP-PARCEL
- SURFACE OWNER (SEE TABLE)
- LEASE # (SEE WW-6A1)

SCALE 1" = 2000' FILE NO. 8796P5HMR.dwg
 OLD CROW NORTH 5HM REV1
 DATE JUNE 22 20 18
 REVISED JANUARY 17 20 19
 OPERATORS WELL NO. OLD CROW N-5HM
 API WELL NO. 47-051-02208
 NO. STATE COUNTY PERMIT

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

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

COUNTY NAME PERMIT

WW-6A1
(5/13)

Operator's Well No. Old Crow N-5HM

**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
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*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. Miller *Amy Miller*

Its: Permitting Specialist - Appalachia Region

Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	
10*19340	5-16-3	A	DONNA V YOHO	GASTAR EXPLORATION USA INC	1/8+	665 407	N/A	Gastar Exploration USA Inc to Atinum Marcellus I LLC: 23/353	Gastar Exploration USA Inc & Atinum Marcellus I LLC to AB Resources LLC: 23/617	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/317	Chief E&D LLC, Chief O&G LLC, Radler 2000 LP, & Enerplus Resources USA Corp to Chevron USA Inc: 25/1 & 25/105	AB Resources LLC to Chevron USA Inc: 756/397	Chevron USA Inc to TH Exploration LLC: 40/57
10*19673	5-10-14	B	CHESTNUT HOLDINGS INC	TH EXPLORATION LLC	1/8+	949 313	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19673	5-10-3	C	CHESTNUT HOLDINGS INC	TH EXPLORATION LLC	1/8+	949 313	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	D	WILLIAM A PRASCIK	TH EXPLORATION LLC	1/8+	936 547	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	D	LORI J PRASCIK	TH EXPLORATION LLC	1/8+	936 551	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	D	FRANCIS C PRASCIK	TH EXPLORATION LLC	1/8+	943 535	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	D	CATHERINE A PRASCIK	TH EXPLORATION LLC	1/8+	936 549	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.1	5-9-20	E	EDWIN C MILLER AND KIMBERLY ANN MILLER	TH EXPLORATION LLC	1/8+	885 61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Q091960000	FISH CREEK	F	WEST VIRGINIA DIVISION OF NATURAL RESOURCES	NOBLE ENERGY	1/8+	865 558	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286 - Attached
10*22547	5-9-22	G	LAWRENCE EDWARD MURPHY AND JOAN MARIE MURPHY	TH EXPLORATION LLC	1/8+	966 628	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17916	5-9-22	G	MARY E BISHOP	TH EXPLORATION LLC	1/8+	927 167	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18270	5-9-22	G	GERALD L BISHOP III	TH EXPLORATION LLC	1/8+	943 10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19572	5-9-22	G	DOUGLAS R BISHOP	TH EXPLORATION LLC	1/8+	943 12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21478	5-9-22	G	CHILDRENS HOME SOCIETY OF WEST VIRGINIA	TH EXPLORATION LLC	1/8+	960 173	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18796	5-9-22	G	DWG OIL & GAS ACQUISITIONS LLC	TH EXPLORATION LLC	1/8+	938 476	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19107	5-9-22	G	ALBERT F KAZEMKA	CHEVRON USA INC	1/8+	853 73	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*22606	5-9-22	G	ROBERT B MURPHY AND LINDA MURPHY	TH EXPLORATION LLC	1/8+	966 469	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22636	5-9-22	G	CHANDA MURPHY AND DANIEL WILSON	TH EXPLORATION LLC	1/8+	968 226	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17512	5-9-22	G	BONNIE LOU POSTLEWAIT	TH EXPLORATION LLC	1/8+	917 68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17530	5-9-22	G	WOODROW N WARD AND HILDA A WARD	TH EXPLORATION LLC	1/8+	916 208	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22044	5-9-22	G	MICHAEL A BISHOP	TH EXPLORATION LLC	1/8+	960 421	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22296	5-9-22	G	NOAH BAKER AND ALISA BAKER	TH EXPLORATION LLC	1/8+	962 200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22407	5-9-22	G	BRADLEY MURPHY	TH EXPLORATION LLC	1/8+	962 575	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22430	5-9-22	G	DEBORAH VANVRANKEN	TH EXPLORATION LLC	1/8+	964 510	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22492	5-9-22	G	FAITH MARIE FREESTONE AND ERIC FREESTONE	TH EXPLORATION LLC	1/8+	972 50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23508	5-9-22	G	MICHAEL A MURPHY	TH EXPLORATION LLC	1/8+	1009 98	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24985	5-9-22	G	JONATHAN BAKER	TH EXPLORATION LLC	1/8+	1027 558	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21937	5-9-22	G	WHEELING SOCIETY FOR CRIPPLED CHILDREN	TH EXPLORATION LLC	1/8+	960 33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22326	5-9-22	G	RACHEL SONDA AND SCOTT SONDA	TH EXPLORATION LLC	1/8+	962 532	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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 WV Department of
 Environmental Protection
 APR 15 2019
 Oil and Gas

WW-6A1 Supplement

Operator's Well No. Old Crow N - 5HM

Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
10*23035	5-9-22	G	DEAN S CARR	TH EXPLORATION LLC	1/8+	977 364	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24888	5-9-22	G	ARTHUR LEE MILLER ET AL	TH EXPLORATION LLC	1/8+	1027 187	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Q090332002	5-9-22	G	LORETTA JEAN RIGGLE ET VIR	NOBLE ENERGY INC	1/8+	860 538	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/172	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332003	5-9-22	G	PATTY BERISFORD ET VIR	NOBLE ENERGY INC	1/8+	860 555	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/313	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332007	5-9-22	G	ROBERT RANDOLPH WOODBURN ET UX	NOBLE ENERGY INC	1/8+	860 568	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/313	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*25642	5-9-22	G	SANDRA PARDINI AKA KATHERINE S PARDINI AND ALLAN F PARDINI	TH EXPLORATION LLC	1/8+	1031 540	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17600	5-9-22	G	CARLA JO ALLEN AND KENNETH ALLEN	TH EXPLORATION LLC	1/8+	916 129	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18796	5-9-23	H	DWG OIL & GAS ACQUISITIONS LLC	TH EXPLORATION LLC	1/8+	938 476	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19572	5-9-23	H	DOUGLAS R BISHOP	TH EXPLORATION LLC	1/8+	943 12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23508	5-9-23	H	MICHAEL A MURPHY	TH EXPLORATION LLC	1/8+	1009 98	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17512	5-9-23	H	BONNIE LOU POSTLEWAIT	TH EXPLORATION LLC	1/8+	917 68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17530	5-9-23	H	WOODROW N WARD AND HILDA A WARD	TH EXPLORATION LLC	1/8+	916 208	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17916	5-9-23	H	MARY E BISHOP	TH EXPLORATION LLC	1/8+	927 167	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18270	5-9-23	H	GERALD L BISHOP III	TH EXPLORATION LLC	1/8+	943 10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21478	5-9-23	H	CHILDRENS HOME SOCIETY OF WEST VIRGINIA	TH EXPLORATION LLC	1/8+	960 173	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22547	5-9-23	H	LAWRENCE EDWARD MURPHY AND JOAN MARIE MURPHY	TH EXPLORATION LLC	1/8+	966 628	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22606	5-9-23	H	ROBERT B MURPHY AND LINDA MURPHY	TH EXPLORATION LLC	1/8+	966 469	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22636	5-9-23	H	CHANDA MURPHY AND DANIEL WILSON	TH EXPLORATION LLC	1/8+	968 226	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22044	5-9-23	H	MICHAEL A BISHOP	TH EXPLORATION LLC	1/8+	960 421	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22296	5-9-23	H	NOAH BAKER AND ALISA BAKER	TH EXPLORATION LLC	1/8+	962 200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22407	5-9-23	H	BRADLEY MURPHY	TH EXPLORATION LLC	1/8+	962 575	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22430	5-9-23	H	DEBORAH VANVRANKEN	TH EXPLORATION LLC	1/8+	964 510	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22492	5-9-23	H	FAITH MARIE FREESTONE AND ERIC FREESTONE	TH EXPLORATION LLC	1/8+	972 50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*25250	5-9-23	H	THE ESTATE OF DELBERT K MYERS JR BY LINDA KAY MYERS ACTING AS EXECUTRIX, AND LINDA KAY MYERS, A WIDOW	TH EXPLORATION LLC	1/8+	1030 118	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24985	5-9-23	H	JONATHAN BAKER	TH EXPLORATION LLC	1/8+	1027 558	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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 Office of Oil and Gas
 APR 15 2019
 WV Department of Environmental Protection

Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	
10*23035	5-9-23	H	DEAN S CARR	TH EXPLORATION LLC	1/8+	977	364	N/A	N/A	N/A	N/A	N/A	N/A	
10*21937	5-9-23	H	WHEELING SOCIETY FOR CRIPPLED CHILDREN	TH EXPLORATION LLC	1/8+	960	33	N/A	N/A	N/A	N/A	N/A	N/A	
10*22326	5-9-23	H	RACHEL SONDA AND SCOTT SONDA	TH EXPLORATION LLC	1/8+	962	532	N/A	N/A	N/A	N/A	N/A	N/A	
10*24888	5-9-23	H	ARTHUR LEE MILLER ET AL	TH EXPLORATION LLC	1/8+	1027	187	N/A	N/A	N/A	N/A	N/A	N/A	
Q090332002	5-9-23	H	LORETTA JEAN RIGGLE ET VIR	NOBLE ENERGY INC	1/8+	860	538	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/172	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332003	5-9-23	H	PATTY BERISFORD ET VIR	NOBLE ENERGY INC	1/8+	860	555	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/313	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332007	5-9-23	H	ROBERT RANDOLPH WOODBURN ET UX	NOBLE ENERGY INC	1/8+	860	568	N/A	N/A	N/A	Noble Energy Inc to CNX Gas Company: 35/313	CNX Gas Company to Noble Energy Inc: 37/169	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*25642	5-9-23	H	SANDRA PARDINI AKA KATHERINE S PARDINI AND ALLAN F PARDINI	TH EXPLORATION LLC	1/8+	1031	540	N/A	N/A	N/A	N/A	N/A	N/A	
10*17600	5-9-23	H	CARLA JO ALLEN AND KENNETH ALLEN	TH EXPLORATION LLC	1/8+	916	129	N/A	N/A	N/A	N/A	N/A	N/A	
CVX866958	5-9-24	I	ANITA L. SLOUGH ET AL	AB RESOURCES LLC	1/8+	696	7	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX866959	5-9-24	I	PAUL SCHEIBELHOOD ET AL	AB RESOURCES LLC	1/8+	695	629	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
CVX935271	5-9-24	I	CHARLES W. MILLER	CHEVRON USA INC	1/8+	853	59	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935273	5-9-24	I	PAUL PARSONS ET UX	CHEVRON USA INC	1/8+	853	430	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935276	5-9-24	I	SHARON LYN RUSSELL	CHEVRON USA INC	1/8+	853	422	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935969	5-9-24	I	TIMOTHY HUFF ET UX	CHEVRON USA INC	1/8+	864	47	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936053	5-9-24	I	LLOYD C. ARNOLD ET UX	CHEVRON USA INC	1/8+	864	39	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936054	5-9-24	I	MARY JO CRONIN	CHEVRON USA INC	1/8+	864	43	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936058	5-9-24	I	RICHARD KURPIL ET UX	CHEVRON USA INC	1/8+	863	594	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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CVX936061	5-9-24	I	CLARA MAE CLIFTON	CHEVRON USA INC	1/8+	853	426	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936062	5-9-24	I	GEORGE EDWARDS ET UX	CHEVRON USA INC	1/8+	853	418	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936112	5-9-24	I	DONNA FAE KYLE	CHEVRON USA INC	1/8+	853	449	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936113	5-9-24	I	JUDITH MAY CONNER	CHEVRON USA INC	1/8+	853	445	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*26046	5-9-41	J	LLOYD C ARNOLD ET UX	CHEVRON USA INC	1/8+	915	628	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 43/95
PENDING	5-9-33	K	STONE HILL MINERALS HOLDINGS LLC	TH EXPLORATION LLC	1/8+	1034	626	N/A	N/A	N/A	N/A	N/A	N/A
CVX939752	5-9-4	L	LLOYD C ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	915	582	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX866958	5-9-35	M	ANITA L. SLOUGH ET AL	AB RESOURCES LLC	1/8+	696	7	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155 Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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4705102208

WW-6A1 Supplement

Operator's Well No. Old Crow N - 5HM

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CVX866959	5-9-35	M	PAUL SCHEIBELHOOD ET AL	AB RESOURCES LLC	1/8+	695	629	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
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Environmental Protection

1000 E. 10th St.

Office of Oil and Gas

AFFIDAVIT

STATE OF TEXAS §
 § SS
COUNTY OF TARRANT §

On this 18th day of October, 2016, before me, the undersigned authority, personally appeared David D. Kalish ("Affiant") who being first duly sworn under oath, deposes and saith:

1. TH Exploration, LLC, TH Exploration II, LLC and TH Exploration III, LLC are wholly owned subsidiaries of THQ Appalachia I, LLC.
2. Tug Hill Operating, LLC provides oil and gas operations services to THQ Appalachia I, LLC under an Operating Services Agreement dated July 23, 2014.
3. David D. Kalish, the Affiant, is the Vice President of Tug Hill Operating, LLC, THQ Appalachia I, LLC, TH Exploration, LLC, TH Exploration II, LLC and TH Exploration III, LLC, and;
3. Tug Hill Operating, LLC is authorized to operate and maintain the assets owned by THQ Appalachia I, LLC, including, as referenced above, TH Exploration, LLC, TH Exploration II, LLC, and TH Exploration III, LLC, including oil and gas leases, wells, pipelines, surface facilities, and other all other assets that support the business of THQ Appalachia I, LLC, and;
4. Specifically, Tug Hill Operating, LLC is authorized to submit and obtain well work permits and carry out all activities pursuant to such work permits for assets owned by TH Exploration, LLC, TH Exploration II, LLC, TH Exploration III, LLC.

FURTHER, AFFIANT SAITH NOT.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this 18th day of October, 2016.

David D. Kalish
Affiant: David D. Kalish

JURAT

Jan Pest
MARSHALL County 03:44:28 PM
Instrument No 1416299
Date Recorded 10/19/2016
Document Type HIS
Pages Recorded 1
Book-Page 28-62
Recording Fee \$5.00
Additional \$5.00

STATE OF TEXAS §
 § SS
COUNTY OF TARRANT §

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Sworn and subscribed to (or affirmed) before me on this, the 18th day of October, 2016, by David D. Kalish

APR 15 2019

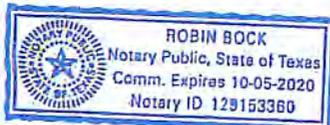
IN WITNESS WHEREOF, I hereunto set my hand and official seal.

WV Department of
Environmental Protection

My Commission Expires: 10-05-2020

Signature/Notary Public: Robin Bock

Name/Notary Public (Print): Robin Bock



MEMORANDUM OF OPERATING AGREEMENT AND FINANCING STATEMENT

This Memorandum of Operating Agreement and Financing Statement (hereinafter referred to as "Memorandum") is executed to be effective concurrently with that certain Operating Agreement (the "Operating Agreement") by and between TH Exploration, LLC, as Operator, and HG Energy II Appalachia, LLC and TH Exploration II, LLC, as Non-Operators, covering, among other things, the development and production of crude oil, natural gas and associated substances from the leases (hereinafter called the "Contract Area") described on Exhibit "A-1" and Exhibit "A-2" attached hereto and owned by Operator and Non-Operator in the respective percentages of shares indicated on Exhibit "A" to the Operating Agreement.

The Operating Agreement contains an Accounting Procedure, along with provisions giving the parties hereto mutual liens and security interests where one or more parties hereto are or may become Debtors to one or more other parties hereto. This Memorandum incorporates by reference all of the terms and conditions of the Operating Agreement, including but not limited to the lien and security interest provisions.

The purpose of this Memorandum is to place third parties on notice of the Operating Agreement, and to secure and perfect the mutual liens and security interests of the parties hereto.

The Operating Agreement specifically provides and the parties do hereby confirm and agree that:

1. The Operator shall conduct and direct and have full control of all operations on the Contract Area as permitted and required by, and within the limits of, the Operating Agreement.
2. The liability of the parties under the Operating Agreement shall be several, not joint or collective. Each party shall be responsible only for its obligations and shall be liable only for its proportionate share of costs.
3. Each Non-Operator grants to Operator a lien upon its oil and gas rights, oil and gas leases and mineral interests in the Contract Area, and a security interest in its share of oil and/or gas when extracted and its interest in all fixtures, inventory, personal property and equipment located on or used on the Contract Area and in all its contract rights and receivables related thereto and arising therefrom to secure payment of its present and future share of costs and expenses, together with interest thereon at the rate provided in the Accounting Procedure referred to above. To the extent that Operator has a security interest under the Uniform Commercial Code ("Code") of the state or states in which the Contract Area is located, Operator without prejudice and in addition to all other legal, equitable and contractual remedies which are expressly reserved, shall be entitled to exercise the rights and remedies of a secured party under the Code. The bringing of a suit and the obtaining of judgment by Operator for the secured indebtedness shall not be deemed an election of remedies or otherwise affect the rights or security interests for the payment thereof.
4. The Operator grants to Non-Operator a lien and security interest equivalent to that granted to Operator as described in Paragraph 3 above, to secure payment by Operator of its own share of costs and expenses when due.

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April 9, 2019

WV Department of Environmental Protection
Office of Oil & Gas
601 57th Street, SE
Charleston, WV 25304
Attention: Laura Adkins

RE: Old Crow N-5HM

Subject: Road Crossing Letter

Dear Laura:

Tug Hill Operating, LLC will not be drilling, extracting or producing any minerals under any WV County or State Routes in the area reflected on the Old Crow N-5HM well plat.

If your office has any questions or concerns regarding the contents of this letter, please do not hesitate to contact me directly at 304-376-0111, or by email at amiller@tug-hillop.com.

Sincerely,

A handwritten signature in blue ink that reads "Amy L. Miller".

Amy L. Miller
Permitting Specialist – Appalachia Region

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WV Department of
Environmental Protection

**STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE CERTIFICATION**

Date of Notice Certification: 04/10/2019

API No. 47- 051
Operator's Well No. Old Crow N-5HM
Well Pad Name: Old Crow

Notice has been given:

Pursuant to the provisions in West Virginia Code § 22-6A, the Operator has provided the required parties with the Notice Forms listed below for the tract of land as follows:

State:	<u>West Virginia</u>	UTM NAD 83 Easting:	<u>520,285.60</u>
County:	<u>Marshall</u>	Northing:	<u>4,403,204.44</u>
District:	<u>Franklin</u>	Public Road Access:	<u>Rines Ridge Road (CR 76)</u>
Quadrangle:	<u>Powhatan Point 7.5</u>	Generally used farm name:	<u>Donna YoHo</u>
Watershed:	<u>Fish Creek (HUC 10)</u>		

Pursuant to West Virginia Code § 22-6A-7(b), every permit application filed under this section shall be on a form as may be prescribed by the secretary, shall be verified and shall contain the following information: (14) A certification from the operator that (i) it has provided the owners of the surface described in subdivisions (1), (2) and (4), subsection (b), section ten of this article, the information required by subsections (b) and (c), section sixteen of this article; (ii) that the requirement was deemed satisfied as a result of giving the surface owner notice of entry to survey pursuant to subsection (a), section ten of this article six-a; or (iii) the notice requirements of subsection (b), section sixteen of this article were waived in writing by the surface owner; and Pursuant to West Virginia Code § 22-6A-11(b), the applicant shall tender proof of and certify to the secretary that the notice requirements of section ten of this article have been completed by the applicant.

<p>Pursuant to West Virginia Code § 22-6A, the Operator has attached proof to this Notice Certification that the Operator has properly served the required parties with the following:</p> <p>*PLEASE CHECK ALL THAT APPLY</p> <p><input type="checkbox"/> 1. NOTICE OF SEISMIC ACTIVITY or <input checked="" type="checkbox"/> NOTICE NOT REQUIRED BECAUSE NO SEISMIC ACTIVITY WAS CONDUCTED</p> <p><input checked="" type="checkbox"/> 2. NOTICE OF ENTRY FOR PLAT SURVEY or <input type="checkbox"/> NO PLAT SURVEY WAS CONDUCTED</p> <p><input type="checkbox"/> 3. NOTICE OF INTENT TO DRILL or <input checked="" type="checkbox"/> NOTICE NOT REQUIRED BECAUSE NOTICE OF ENTRY FOR PLAT SURVEY WAS CONDUCTED or</p> <p style="padding-left: 100px;"><input type="checkbox"/> WRITTEN WAIVER BY SURFACE OWNER (PLEASE ATTACH)</p> <p><input checked="" type="checkbox"/> 4. NOTICE OF PLANNED OPERATION</p> <p><input checked="" type="checkbox"/> 5. PUBLIC NOTICE</p> <p><input checked="" type="checkbox"/> 6. NOTICE OF APPLICATION</p>	<p>OOG OFFICE USE ONLY</p> <p><input type="checkbox"/> RECEIVED/ NOT REQUIRED</p> <p><input type="checkbox"/> RECEIVED</p> <p><input type="checkbox"/> RECEIVED/ NOT REQUIRED</p> <p><input type="checkbox"/> RECEIVED</p> <p><input type="checkbox"/> RECEIVED</p> <p><input type="checkbox"/> RECEIVED</p>
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Required Attachments:

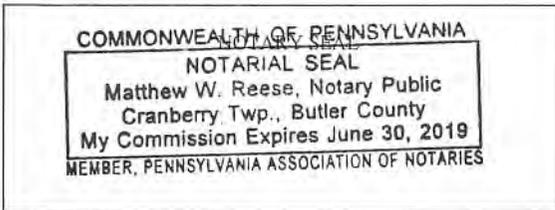
The Operator shall attach to this Notice Certification Form all Notice Forms and Certifications of Notice that have been provided to the required parties and/or any associated written waivers. For the Public Notice, the operator shall attach a copy of the Class II Legal Advertisement with publication date verification or the associated Affidavit of Publication. The attached Notice Forms and Certifications of Notice shall serve as proof that the required parties have been noticed as required under West Virginia Code § 22-6A. Pursuant to West Virginia Code § 22-6A-11(b), the Certification of Notice to the person may be made by affidavit of personal service, the return receipt card or other postal receipt for certified mailing.

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Certification of Notice is hereby given:

THEREFORE, I Amy L. Miller, have read and understand the notice requirements within West Virginia Code § 22-6A. I certify that as required under West Virginia Code § 22-6A, I have served the attached copies of the Notice Forms, identified above, to the required parties through personal service, by registered mail or by any method of delivery that requires a receipt or signature confirmation. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Notice Certification and all attachments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator:	<u>Tug Hill Operating, LLC</u>	Address:	<u>380 Southpointe Boulevard, Plaza II, Suite 200</u>
By:	Amy L. Miller <u><i>Amy Miller</i></u>		<u>Canonsburg, PA 15317</u>
Its:	<u>Permitting Specialist - Appalachia Region</u>	Facsimile:	<u>724-338-2030</u>
Telephone:	<u>724-749-8388</u>	Email:	<u>amiller@tug-hilltop.com</u>



Subscribed and sworn before me this 10 day of April 2019.
Matthew W. Reese Notary Public
 My Commission Expires 6-30-2019

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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WW-6A
(9-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF APPLICATION

Notice Time Requirement: notice shall be provided no later than the filing date of permit application.

Date of Notice: 3/10/2019 Date Permit Application Filed: 3/20/2019

Notice of:

- PERMIT FOR ANY WELL WORK
- CERTIFICATE OF APPROVAL FOR THE CONSTRUCTION OF AN IMPOUNDMENT OR PIT

Delivery method pursuant to West Virginia Code § 22-6A-10(b)

- PERSONAL SERVICE
- REGISTERED MAIL
- METHOD OF DELIVERY THAT REQUIRES A RECEIPT OR SIGNATURE CONFIRMATION

Pursuant to W. Va. Code § 22-6A-10(b) no later than the filing date of the application, the applicant for a permit for any well work or for a certificate of approval for the construction of an impoundment or pit as required by this article shall deliver, by personal service or by registered mail or by any method of delivery that requires a receipt or signature confirmation, copies of the application, the erosion and sediment control plan required by section seven of this article, and the well plat to each of the following persons: (1) The owners of record of the surface of the tract on which the well is or is proposed to be located; (2) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for roads or other land disturbance as described in the erosion and sediment control plan submitted pursuant to subsection (c), section seven of this article; (3) The coal owner, operator or lessee, in the event the tract of land on which the well proposed to be drilled is located [sic] is known to be underlain by one or more coal seams; (4) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for the placement, construction, enlargement, alteration, repair, removal or abandonment of any impoundment or pit as described in section nine of this article; (5) Any surface owner or water purveyor who is known to the applicant to have a water well, spring or water supply source located within one thousand five hundred feet of the center of the well pad which is used to provide water for consumption by humans or domestic animals; and (6) The operator of any natural gas storage field within which the proposed well work activity is to take place. (c)(1) If more than three tenants in common or other co-owners of interests described in subsection (b) of this section hold interests in the lands, the applicant may serve the documents required upon the person described in the records of the sheriff required to be maintained pursuant to section eight, article one, chapter eleven-a of this code. (2) Notwithstanding any provision of this article to the contrary, notice to a lien holder is not notice to a landowner, unless the lien holder is the landowner. W. Va. Code R. § 35-8-5.7.a requires, in part, that the operator shall also provide the Well Site Safety Plan ("WSSP") to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

Application Notice WSSP Notice E&S Plan Notice Well Plat Notice is hereby provided to:

SURFACE OWNER(s)
 Name: Donna Yoho
 Address: 3682 Rines Ridge Road
Proctor, WV 26055
 Name: _____
 Address: _____

COAL OWNER OR LESSEE
 Name: Consol Energy, Inc. Leatherwood, Inc. Attn: Casey Saunders
 Address: 1000 CONSOL Energy DRive
Canonsburg, PA 15317

COAL OPERATOR
 Name: _____
 Address: _____

SURFACE OWNER(s) (Road and/or Other Disturbance)
 Name: _____
 Address: _____
 Name: _____
 Address: _____

SURFACE OWNER OF WATER WELL AND/OR WATER PURVEYOR(s)
 Name: *See attached list
 Address: _____

SURFACE OWNER(s) (Impoundments or Pits)
 Name: _____
 Address: _____

OPERATOR OF ANY NATURAL GAS STORAGE FIELD
 Name: _____
 Address: _____

*Please attach additional forms if necessary

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WW-6A
(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

Notice is hereby given:

Pursuant to West Virginia Code § 22-6A-10(b), notice is hereby given that the undersigned well operator has applied for a permit for well work or for a certificate of approval for the construction of an impoundment or pit.

This Notice Shall Include:

Pursuant to W. Va. Code § 22-6A-10(b), this notice shall include: (1) copies of the application; (2) the erosion and sediment control plan required by section seven of this article; and (3) the well plat.

Pursuant to W. Va. Code § 22-6A-10(f), this notice shall include: (1) a statement of the time limits for filing written comments; (2) who may file written comments; (3) the name and address of the secretary for the purpose of filing the comments and obtaining additional information; and (4) a statement that the persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

Pursuant to W. Va. Code R. § 35-8-5.7.a, the operator shall provide the Well Site Safety Plan to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

Pursuant to W. Va. Code R. § 35-8-15.2.c, this notice shall: (1) contain a statement of the surface owner's and water purveyor's right to request sampling and analysis; (2) advise the surface owner and water purveyor of the rebuttable presumption for contamination or deprivation of a fresh water source or supply; advise the surface owner and water purveyor that refusal to allow the operator to conduct a pre-drilling water well test constitutes a method to rebut the presumption of liability; (3) advise the surface owner and water purveyor of his or her independent right to sample and analyze any water supply at his or her own expense; advise the surface owner and water purveyor whether or not the operator will utilize an independent laboratory to analyze any sample; and (4) advise the surface owner and or water purveyor that he or she can obtain from the Chief a list of water testing laboratories in the subject area capable of and qualified to test water supplies in accordance with standard acceptable methods.

Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Well Location Restrictions

Pursuant to W. Va. Code § 22-6A-12, Wells may not be drilled within two hundred fifty feet measured horizontally from any existing water well or developed spring used for human or domestic animal consumption. The center of well pads may not be located within six hundred twenty-five feet of an occupied dwelling structure, or a building two thousand five hundred square feet or larger used to house or shelter dairy cattle or poultry husbandry. This limitation is applicable to those wells, developed springs, dwellings or agricultural buildings that existed on the date a notice to the surface owner of planned entry for surveying or staking as provided in section ten of this article or a notice of intent to drill a horizontal well as provided in subsection (b), section sixteen of this article was provided, whichever occurs first, and to any dwelling under construction prior to that date. This limitation may be waived by written consent of the surface owner transmitted to the department and recorded in the real property records maintained by the clerk of the county commission for the county in which such property is located. Furthermore, the well operator may be granted a variance by the secretary from these distance restrictions upon submission of a plan which identifies the sufficient measures, facilities or practices to be employed during well site construction, drilling and operations. The variance, if granted, shall include terms and conditions the department requires to ensure the safety and protection of affected persons and property. The terms and conditions may include insurance, bonding and indemnification, as well as technical requirements. (b) No well pad may be prepared or well drilled within one hundred feet measured horizontally from any perennial stream, natural or artificial lake, pond or reservoir, or a wetland, or within three hundred feet of a naturally reproducing trout stream. No well pad may be located within one thousand feet of a surface or ground water intake of a public water supply. The distance from the public water supply as identified by the department shall be measured as follows: (1) For a surface water intake on a lake or reservoir, the distance shall be measured from the boundary of the lake or reservoir. (2) For a surface water intake on a flowing stream, the distance shall be measured from a semicircular radius extending upstream of the surface water intake. (3) For a groundwater source, the distance shall be measured from the wellhead or spring. The department may, in its discretion, waive these distance restrictions upon submission of a plan identifying sufficient measures, facilities or practices to be employed during well site construction, drilling and operations to protect the waters of the state. A waiver, if granted, shall impose any permit conditions as the secretary considers necessary. (c) Notwithstanding the foregoing provisions of this section, nothing contained in this section prevents an operator from conducting the activities permitted or authorized by a Clean Water Act Section 404 permit or other approval from the United States Army Corps of Engineers within any waters of the state or within the restricted areas referenced in this section. (d) The well location restrictions set forth in this section shall not apply to any well on a multiple well pad if at least one of the wells was permitted prior to the effective date of this article. (e) The secretary shall, by December 31, 2012, report to the Legislature on the noise, light, dust and volatile organic compounds generated by the drilling of horizontal wells as they relate to the well location restrictions regarding occupied dwelling structures pursuant to this section. Upon a finding, if any, by the secretary that the well location restrictions regarding occupied dwelling structures are inadequate or otherwise require alteration to address the items

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API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

examined in the study required by this subsection, the secretary shall have the authority to propose for promulgation legislative rules establishing guidelines and procedures regarding reasonable levels of noise, light, dust and volatile organic compounds relating to drilling horizontal wells, including reasonable means of mitigating such factors, if necessary.

Water Well Testing:

Pursuant to West Virginia Code § 22-6A-10(d), notification shall be made, with respect to surface landowners identified in subsection (b) or water purveyors identified in subdivision (5), subsection (b) of this section, of the opportunity for testing their water well. The operator shall provide an analysis to such surface landowner or water purveyor at their request.

Water Testing Laboratories:

Pursuant to West Virginia Code § 22-6A-10(i), persons entitled to notice pursuant to subsection (b) of this section may contact the department to ascertain the names and locations of water testing laboratories in the subject area capable and qualified to test water supplies in accordance with standard accepted methods. In compiling that list of names the department shall consult with the state Bureau for Public Health and local health departments. A surface owner and water purveyor has an independent right to sample and analyze any water supply at his or her own expense. The laboratory utilized by the operator shall be approved by the agency as being certified and capable of performing sample analyses in accordance with this section.

Rebuttable Presumption for Contamination or Deprivation of a Fresh Water Source or Supply:

W. Va. Code § 22-6A-18 requires that (b) unless rebutted by one of the defenses established in subsection (c) of this section, in any action for contamination or deprivation of a fresh water source or supply within one thousand five hundred feet of the center of the well pad for horizontal well, there is a rebuttable presumption that the drilling and the oil or gas well or either was the proximate cause of the contamination or deprivation of the fresh water source or supply. (c) In order to rebut the presumption of liability established in subsection (b) of this section, the operator must prove by a preponderance of the evidence one of the following defenses: (1) The pollution existed prior to the drilling or alteration activity as determined by a predrilling or prealteration water well test. (2) The landowner or water purveyor refused to allow the operator access to the property to conduct a predrilling or prealteration water well test. (3) The water supply is not within one thousand five hundred feet of the well. (4) The pollution occurred more than six months after completion of drilling or alteration activities. (5) The pollution occurred as the result of some cause other than the drilling or alteration activity. (d) Any operator electing to preserve its defenses under subdivision (1), subsection (c) of this section shall retain the services of an independent certified laboratory to conduct the predrilling or prealteration water well test. A copy of the results of the test shall be submitted to the department and the surface owner or water purveyor in a manner prescribed by the secretary. (e) Any operator shall replace the water supply of an owner of interest in real property who obtains all or part of that owner's supply of water for domestic, agricultural, industrial or other legitimate use from an underground or surface source with a comparable water supply where the secretary determines that the water supply has been affected by contamination, diminution or interruption proximately caused by the oil or gas operation, unless waived in writing by that owner. (f) The secretary may order the operator conducting the oil or gas operation to: (1) Provide an emergency drinking water supply within twenty-four hours; (2) Provide temporary water supply within seventy-two hours; (3) Within thirty days begin activities to establish a permanent water supply or submit a proposal to the secretary outlining the measures and timetables to be used in establishing a permanent supply. The total time in providing a permanent water supply may not exceed two years. If the operator demonstrates that providing a permanent replacement water supply cannot be completed within two years, the secretary may extend the time frame on case-by-case basis; and (4) Pay all reasonable costs incurred by the real property owner in securing a water supply. (g) A person as described in subsection (b) of this section aggrieved under the provisions of subsections (b), (e) or (f) of this section may seek relief in court... (i) Notwithstanding the denial of the operator of responsibility for the damage to the real property owner's water supply or the status of any appeal on determination of liability for the damage to the real property owner's water supply, the operator may not discontinue providing the required water service until authorized to do so by the secretary or a court of competent jurisdiction.

Written Comment:

Pursuant to West Virginia Code § 22-6A-11(a), all persons described in subsection (b), section ten of this article may file written comments with the secretary as to the location or construction of the applicant's proposed well work within thirty days after the application is filed with the secretary. All persons described in West Virginia Code § 22-6A-10(b) may file written comments as to the location or construction of the applicant's proposed well work to the Secretary at:

Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0450

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Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water. **NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.**

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(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

Time Limits and Methods for Filing Comments.

The law requires these materials to be served on or before the date the operator files its Application. You have **THIRTY (30) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

Pursuant to West Virginia Code § 22-6A-11(c)(2), Any objections of the affected coal operators and coal seam owners and lessees shall be addressed through the processes and procedures that exist under sections fifteen, seventeen and forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article. The written comments filed by the parties entitled to notice under subdivisions (1), (2), (4), (5) and (6), subsection (b), section ten of this article shall be considered by the secretary in the permit issuance process, but the parties are not entitled to participate in the processes and proceedings that exist under sections fifteen, seventeen or forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article.

Comment Requirements

Your comments must be in writing and include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

Disclaimer: All comments received will be placed on our web site <http://www.dep.wv.gov/oil-and-gas/Horizontal-Permits/Pages/default.aspx> and the applicant will automatically be forwarded an email notice that such comments have been submitted. The applicant will be expected to provide a response to comments submitted by any surface owner, water purveyor or natural gas storage operator noticed within the application.

Permit Denial or Condition

The Chief has the power to deny or condition a well work permit. Pursuant to West Virginia Code § 22-6A-8(d), the permit may not be issued or be conditioned, including conditions with respect to the location of the well and access roads prior to issuance if the director determines that:

- (1) The proposed well work will constitute a hazard to the safety of persons;
- (2) The plan for soil erosion and sediment control is not adequate or effective;
- (3) Damage would occur to publicly owned lands or resources; or
- (4) The proposed well work fails to protect fresh water sources or supplies.

A permit may also be denied under West Virginia Code § 22-6A-7(k), the secretary shall deny the issuance of a permit if the secretary determines that the applicant has committed a substantial violation of a previously issued permit for a horizontal well, including the applicable erosion and sediment control plan associated with the previously issued permit, or a substantial violation of one or more of the rules promulgated under this article, and in each instance has failed to abate or seek review of the violation within the time prescribed by the secretary pursuant to the provisions of subdivisions (1) and (2), subsection (a), section five of this article and the rules promulgated hereunder, which time may not be unreasonable.

Pursuant to West Virginia Code § 22-6A-10(g), any person entitled to submit written comments to the secretary pursuant to subsection (a), section eleven of this article, shall also be entitled to receive from the secretary a copy of the permit as issued or a copy of the order modifying or denying the permit if the person requests receipt of them as a part of the written comments submitted concerning the permit application. Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

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(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-5HM
Well Pad Name: Old Crow

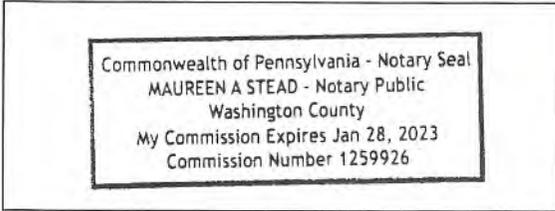
Notice is hereby given by:

Well Operator: Tug Hill Operating, LLC
Telephone: 724-749-8388
Email: amiller@tug-hilltop.com *amiller*

Address: 380 Southpointe Boulevard, Plaza II, Suite 200
Canonsburg, PA 15317
Facsimile: 724-338-2030

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.



Subscribed and sworn before me this 11 day of MARCH, 2019.
Maureen A Stead Notary Public
My Commission Expires 1/28/23

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Exhibit WW-6A

Tug Hill Operating, LLC
 380 Southpointe Blvd, Suite 200
 Cannonsburg, PA 15137

Residences within Two-Thousand Feet (2,000')

Well: Old Crow N – 5HM
 District: Franklin (Residence #'s 1-7)
 State: WV

There are seven (7) residences, no businesses, no churches, no schools or no emergency facilities within two-thousand feet (2,000') of the above referenced well location.

Residence 1 TM 16 Pcl. 3.1 Dennis Jackson, Et Ux Phone: 304-843-1762 Physical Address: 4004 Rines Ridge Rd. Proctor, WV 26055 Tax Address: P.O. Box 109 Woodsfield, OH 43793	Residence 2 TM 16 Pcl. 3 Donna Vivian Yoho - TOD Phone: 304-845-5590 (Rev. Address) Physical Address: 3862 Rines Ridge Rd. Proctor, WV 26055 Tax Address: Same	Residence 3 TM 16 Pcl. 3.2 Jimmy Ostrander, Sr., Et Ux Phone: 304-845-5599, 304-845-5590 Physical Address: 3810 Rines Ridge Rd. Proctor, WV 26055 Tax Address: Same
Residence 4 TM 16 Pcl. 6 John Swierkos Phone: 304-810-4092 Physical Address: 110 Rahm Dr. Proctor, WV 26055 Tax Address: Same	Residence 5 TM 16 Pcl. 23.3 Greg & Christina Riddle Phone: 304-843-0173 Physical Address: 4205 Rines Ridge Rd. Proctor, WV 26055 Tax Address: Same	Residence 6 TM 16 Pcl. 23.1 Ray E. Minor, Et Ux Phone: 304-843-1713 Physical Address: 4193 Rines Ridge Rd. Proctor, WV 26055 Tax Address: Same
Residence 7 TM 16 Pcl. 24 Alan M. Beyser, Et Ux Phone: 304-810-0617 Physical Address: 4271 Rines Ridge Rd. Proctor, WV 26055 Tax Address: Same		

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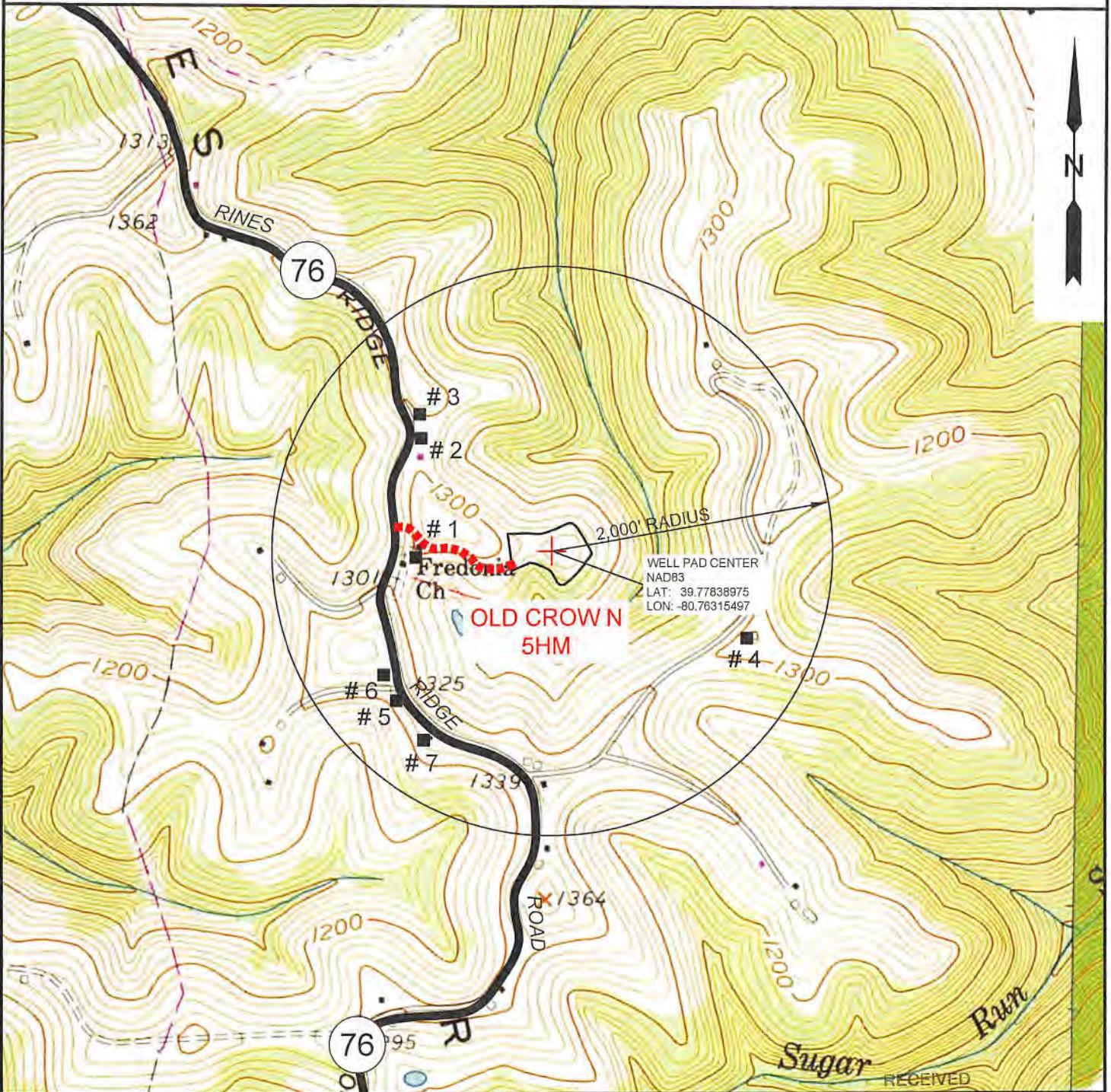
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WW-6A

PROPOSED OLD CROW N - 5HM

SUPPLEMENT PG. 1B



NOTE: THERE APPEARS TO BE SEVEN (7) POSSIBLE WATER SOURCES WITHIN 2,000'.

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P.O. Box 150 • 12 Vanhorn Drive • Glenville, WV 26351 • (304) 482-5634
www.slssurveys.com

TOPO SECTION:		OPERATOR:	
GLEN EASTON & POWHATAN POINT 7.5'		PREPARED FOR:	
COUNTY	DISTRICT	TUG HILL OPERATING, LLC	
MARSHALL	FRANKLIN	380 SOUTHPOINTE BLVD	
		SUITE 200	
		CANONSBURG, PA 15317	
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8796	06/22/18	1" = 1000'

WV Department of Environmental Protection
TUG HILL OPERATING

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF ENTRY FOR PLAT SURVEY

Notice Time Requirement: Notice shall be provided at least SEVEN (7) days but no more than FORTY-FIVE (45) days prior to entry

Date of Notice: 11/16/2017 **Date of Planned Entry:** 11/24/2017

Delivery method pursuant to West Virginia Code § 22-6A-10a

- PERSONAL SERVICE
- REGISTERED MAIL
- METHOD OF DELIVERY THAT REQUIRES A RECEIPT OR SIGNATURE CONFIRMATION

Pursuant to West Virginia Code § 22-6A-10(a), Prior to filing a permit application, the operator shall provide notice of planned entry on to the surface tract to conduct any plat surveys required pursuant to this article. Such notice shall be provided at least seven days but no more than forty-five days prior to such entry to: (1) The surface owner of such tract; (2) to any owner or lessee of coal seams beneath such tract that has filed a declaration pursuant to section thirty-six, article six, chapter twenty-two of this code; and (3) any owner of minerals underlying such tract in the county tax records. The notice shall include a statement that copies of the state Erosion and Sediment Control Manual and the statutes and rules related to oil and gas exploration and production may be obtained from the Secretary, which statement shall include contact information, including the address for a web page on the Secretary's web site, to enable the surface owner to obtain copies from the secretary.

Notice is hereby provided to:

SURFACE OWNER(s)

Name: Donna Vivian Yoho (Well Pad and Access Road)
Address: 3862 Rines Ridge Road
Proctor, WV 26055

Name: _____
Address: _____

Name: _____
Address: _____

COAL OWNER OR LESSEE

Name: Donna Vivian Yoho
Address: 3862 Rines Ridge Road
Proctor, WV 26055

MINERAL OWNER(s)

Name: Donna Vivian Yoho
Address: 3862 Rines Ridge Road
Proctor, WV 26055

*please attach additional forms if necessary

Notice is hereby given:

Pursuant to West Virginia Code § 22-6A-10(a), notice is hereby given that the undersigned well operator is planning entry to conduct a plat survey on the tract of land as follows:

State: West Virginia
County: Marshall
District: Franklin
Quadrangle: Powhatan Point 7.5'

Approx. Latitude & Longitude: 39.7784004; -80.7631353
Public Road Access: Rines Ridge Road (County Route 76)
Watershed: Fish Creek (HUC-10)
Generally used farm name: Donna Vivian Yoho

Copies of the state Erosion and Sediment Control Manual and the statutes and rules related to oil and gas exploration and production may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450). Copies of such documents or additional information related to horizontal drilling may be obtained from the Secretary by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Notice is hereby given by:

Well Operator: Tug Hill Operating, LLC
Telephone: 724-749-8388
Email: amiller@tug-hillop.com

Address: 380 Southpointe Boulevard, Plaza II, Suite 200
Canonsburg, PA 15317
Facsimile: 724-338-2030

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505Thomas J. Smith, P. E.
Secretary of Transportation/
Commissioner of Highways

March 2, 2018

Jill M. Newman
Deputy CommissionerJames A. Martin, Chief
Office of Oil and Gas
Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304Subject: DOH Permit for the Old Crow Pad, Marshall County
Old Crow N-5HM Well site

Dear Mr. Martin,

This well site will be accessed from a DOH permit #06-2018-0130 which has been issued to Tug Hill Operating, LLC for access to the State Road for a well site located off of Marshall County Route 76 SLS.

The operator has signed a STATEWIDE OIL AND GAS ROAD MAINTENANCE BONDING AGREEMENT and provided the required Bond. This operator is currently in compliance with the DOH OIL AND GAS POLICY dated January 3, 2012.

Very Truly Yours,

Handwritten signature of Gary K. Clayton in blue ink.

Gary K. Clayton, P.E.
Regional Maintenance Engineer
Central Office O&G CoordinatorCc: Jonathan White
Tug Hill Operating, LLC
CH, OM, D-6
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PLANNED ADDITIVES TO BE USED IN FRACTURING OR STIMULATION

Well No. Old Crow N-5HM

PRODUCT NAME:	CHEMICAL DESCRIPTION:	PRODUCT USE:	HAZARDOUS COMPONENT:
GBW-20C	Hemicellulase Breaker	Breaker - Water	None
ALPHA 1427		Biocide	Glutaraldehyde – CAS#000111-30-8 Quaternary ammonium chloride CAS# 007173-51-5 Alky dimethyl benzyl ammonium Chloride (C12-16) – CAS#068424-85-1 Ethanol – CAS# 000064-17-5 Water – CAS# 007732-18-5
FRAC SAND	Silica Sand (various Mesh sizes)	Proppant	Crystalline silica (quartz) CAS# 14808-60-7
S-8C, Sand	Silica Sand (100 mesh)	Sand	Silica – CAS# 14808-60-7
GW-3LDF		Gellant - Water	Petroleum Distillate Blend – Proprietary, (Not Associated with Diesel Fuel) Guar gum – CAS# 009000-30-0
FRW-18		Friction Reducer	Hydrotreated light distillate CAS# 064742-47-8
Scaletrol		Scale Inhibitor	Ethylene glycol – CAS# 000107-21-1 Diethylene glycol – CAS# 000111-46-6

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