



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

March 1, 2018
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

TUG HILL OPERATING, LLC
1320 SOUTH UNIVERSITY DRIVE, SUITE 500

FORT WORTH , TX 76107

Re: Permit Modification Approval for HEAVEN HILL 3-3HM
47-051-01963-00-00

Modified Bottom Hole Coordinates thereby Shortened Lateral

TUG HILL OPERATING, LLC

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

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

James A. Martin
Chief

Operator's Well Number: HEAVEN HILL 3-3HM
Farm Name: RICKY L. WHITLATCH
U.S. WELL NUMBER: 47-051-01963-00-00
Horizontal 6A / New Drill
Date Issued: March 1, 2018

Promoting a healthy environment.

03/02/2018

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

1) Well Operator: Tug Hill Operating, LLC 494510851 Marshall Meade Glen Easton 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Heaven Hill 3-3HM Well Pad Name: Heaven Hill 3

3) Farm Name/Surface Owner: Ricky L. Whitlatch Public Road Access: Yeater Land CR 21/11

4) Elevation, current ground: 1343' Elevation, proposed post-construction: 1326'

5) Well Type (a) Gas Oil Underground Storage

Other

(b) If Gas Shallow Deep

Horizontal

6) Existing Pad: Yes or No No

JW
2/5/18

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus is the target formation at a depth of 6724 - 6776' thickness of 52' and anticipated pressure of approx. 3800 psi

8) Proposed Total Vertical Depth: 6,876'

9) Formation at Total Vertical Depth: Onondaga

10) Proposed Total Measured Depth: 14,900'

11) Proposed Horizontal Leg Length: 7,451'

12) Approximate Fresh Water Strata Depths: 70', 1038'

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

14) Approximate Saltwater Depths: 2,167'

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15) Approximate Coal Seam Depths: Sewickly Coal - 946' and Pittsburgh Coal - 1031'

FEB 6 2018

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

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

(a) If Yes, provide Mine Info: Name: Marshall County Coal Co. / Marshall County Mine
Depth: 1031' TVD and 312' subsea level
Seam: Pittsburgh #8
Owner: Murray Energy / Consolidated Coal Co.

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'	338FT^3(CTS)
Fresh Water	13 3/8"	NEW	H40	48#	1,120'	1,120'	1142ft^3(CTS)
Coal	13 3/8"	NEW	H40	48#	1,130'	1,120'	1142ft^3(CTS)
Intermediate	9 5/8"	NEW	J55	36#	2,800'	2,800'	895ft^3(CTS)
Production	5 1/2"	NEW	P110	20#	14,900'	14,900'	3366ft^3(CTS)
Tubing	2 3/8"	NEW	N80	4.7#		7,314'	
Liners							

JW
2/5/18

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 1/2"	.33	1,730	1,384	SEE #24	1.2
Coal	13 3/8"	17 1/2"	.33	1,730	1,384	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 - 01963400

OPERATOR WELL NO. Heaven Hill 3-3HM

Well Pad Name: Heaven Hill 3

Handwritten signature and date: 2/5/18

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

Drill through the Marcellus and TD Pilot Hole 100' into the Onondaga. Log vertical section and run a solid cement plug back to proposed KOP. Drill curve and lateral per proposed well plan, run and cement production casing. Perform CBL from 60 deg to surface, make cleanout run, and stimulate.

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

Well to be completed with approximately 31,437,500 lb proppant and 486,047 bbl of water. Max rate = 80 bpm; max psi = 9,000#.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 18.43

22) Area to be disturbed for well pad only, less access road (acres): 7.15

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

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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

*Note: Attach additional sheets as needed.

51-01963
Mon



Tug Hill Operating, LLC Casing and Cement Program

Heaven Hill 3-3HM

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	13 3/8"	H40	17 1/2"	1,120'	CTS
Intermediate	9 5/8"	J55	12 1/4"	2,800'	CTS
Production	5 1/2"	P110	8 7/8 x 8 3/4"	14,900'	CTS

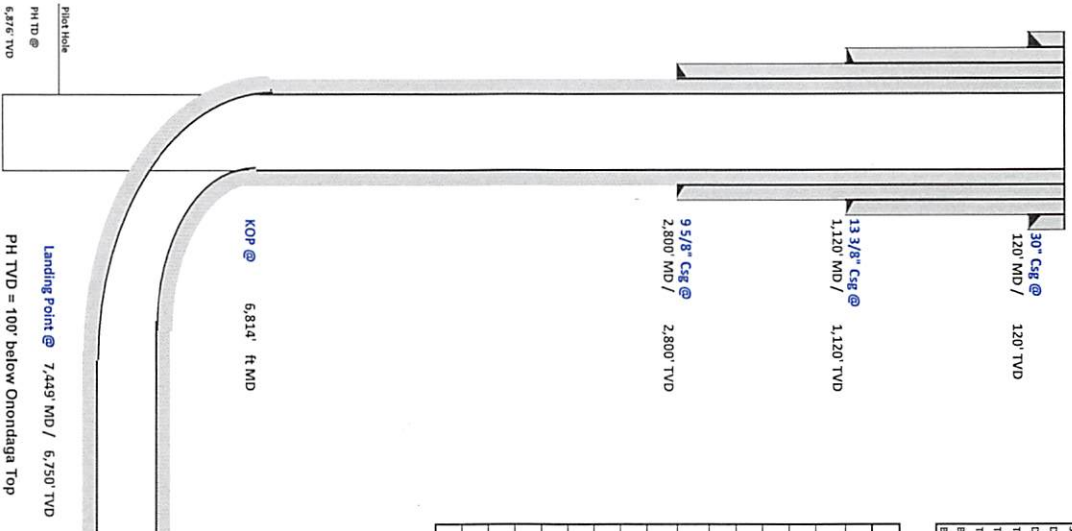
Cement Cement

- 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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51-01963
MWD



WELL NAME:	Heaven Hill 3-3HM	COUNTY:	Marshall
STATE:	West Virginia		
DISTRICT:	Merde	GL Elev:	1,326'
DR Elev:	1,326'		
TD:	14,900'		
TH Latitude:	39.80858447		
TH Longitude:	-80.69323444		
BH Latitude:	39.78501926		
BH Longitude:	-80.67910994		

FORMATION TOPS	Depth TVD
Formation	1038
Deepart Fresh Water	946
Swackley Coal	1031
Pittsburgh Coal	2060
Big Lime	2486
Well	2684
Berea	2946
Gordon	6068
Rhinestreet	6586
Genesey/Buckett	6617
Tully	6650
Hamilton	6724
Marcellus	6750
Landing Depth	6776
Onondaga	6876
Pilot Hole Depth	6876

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	1,120'	1,120'	48	H40	Surface
Intermediate 1	12 1/4	9 5/8	2,800'	2,800'	36	J55	Surface
Production	8 7/8 x 8 3/4	5 1/2	14,900'	6,880'	20	P110	Surface

CEMENT SUMMARY				DRILLING DETAILS	
Sacks	Class	Density	Fluid Type	Centralizer/Nozz	
338	A	15.6	Air	None	
1,142	A	15.6	Air	3 Centralizers at equal distance	
895	A	15	Air	1 Centralizer every other ft	
3,366	A	14.5	Air / SOBMI	1 every other joint in lateral; 1 per joint in curve; 1 every other ft to sfc	

Handwritten signature and date: JWS 2/5/18

Lateral TD @ 14,900' ft MD
6,880 ft TVD

SI-01963 Hwy

Well: Heaven Hill 3-3 HM
Site: Heaven Hill 3
Project: Marshall County, West Virginia
Design: rev4



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSEct	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1600.00	2.00	176.99	1699.98	-1.74	0.09	0.00	0.00	0.00	KOP Begin 2'100' build
3	1700.00	2.00	176.99	1699.98	-1.74	0.09	2.00	176.99	1.62	Begin 2'100' tangent
4	2900.75	2.00	176.99	2900.00	-43.59	2.29	0.00	0.00	40.47	Begin 2'100' build
5	4244.84	28.88	176.99	4183.72	-397.68	20.92	2.00	0.00	369.23	Begin 28.88' tangent
6	6813.77	28.88	176.99	6433.13	-1636.77	86.12	0.00	0.00	1519.66	Begin 10'100' build/turn
7	7449.14	89.00	150.00	6750.00	-2115.14	272.50	10.00	-30.45	2031.97	Begin 89.00' lateral section
8	14900.00	89.00	150.00	6860.00	-8566.79	3987.38	0.00	0.00	9453.51	PBHL/TD 14900.00 MD/6860.00 TVD

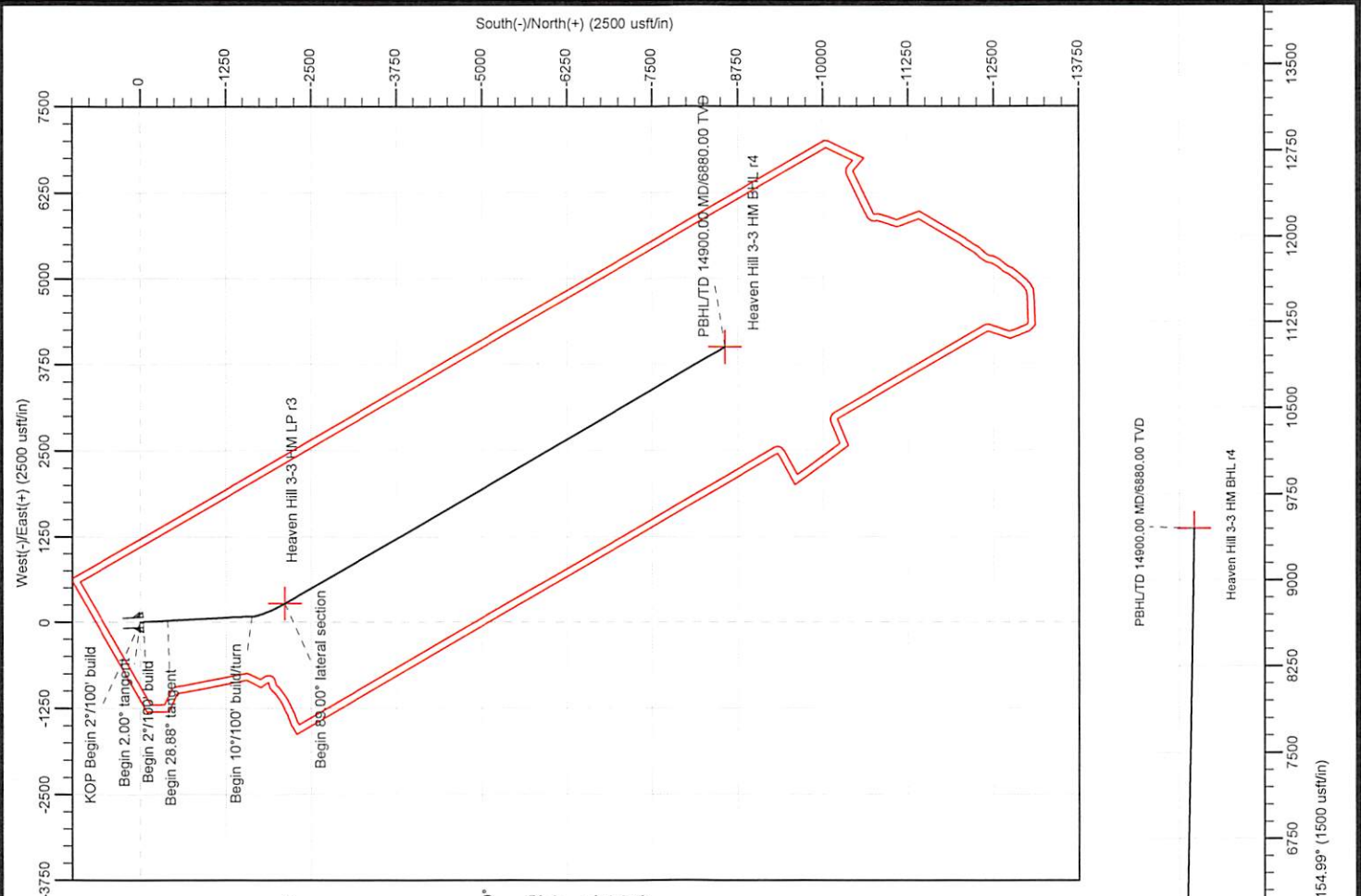
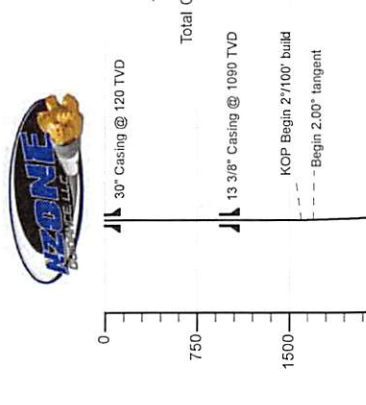
Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD83 West Virginia - HARR
 Ellipsoid: GRS 1990
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level
 Depth Reference: GL @ 1326.00usft

Northing 14457180.08 Easting 1726566.13 Longitude 39.80858427
 Latitude -80.69323444

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.89°

Magnetic Field
 Strength: 52225.1snT
 Dip Angle: 67.00°
 Date: 2/8/2017
 Model: IGRF2015



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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 (12/19/2016) 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

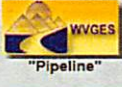
Permit well - Heaven Hill 3-3HM

Wells within 500' Buffer

Note: Well spots depicted on Area of Review map (page 3) are derived from State held coordinates. The spots may differ from those depicted on the Well Plat because the Plat locations represent actual field surveyed locations. Please refer to the Plat for surveyed well spots

Is this well "known or reasonably expected to penetrate a depth that could be within the range of Fracture propagation"? 1000' is max limit I would assign to wells that might be within in range of fracture propagation

API Number	Operator Name	Total Depth	Perforated Fms	Producing zones not perforated	Is this well "known or reasonably expected to penetrate a depth that could be within the range of Fracture propagation"? 1000' is max limit I would assign to wells that might be within in range of fracture propagation	Comments
4705101934	Tug Hill	6737' TVD planned	None	None	No, Permitted Marcellus well	Permitted Marcellus well. Not yet drilled
4705101962	Tug Hill	6737' TVD planned	None	None	No, Permitted Marcellus well	Permitted Marcellus well. Not yet drilled
4705101947	Tug Hill	6737' TVD planned	None	None	No, Permitted Marcellus well	Permitted Marcellus well. Not yet drilled
4705101948	Tug Hill	6737' TVD planned	None	None	No, Permitted Marcellus well	Permitted Marcellus well. Not yet drilled
4705170645	Unknown	Unknown	Unknown	Unknown	Unknown but unlikely, Probably an old shallow well	Old well, records are incomplete
4705100847	McElroy Coal Co.	Unknown	Unknown	Unknown	Unknown but unlikely, Appears to be an old, plugged well	Old well, records are incomplete, plug date 2/18/2000. A field survey was conducted to locate this well and no evidence of this well was found.
4705100855	Consolidation Coal Co.	Unknown	Unknown	Unknown	Unknown but unlikely, Appears to be an old, shallow well that has been plugged	Well was plugged 10/10/2000. A field survey was conducted to locate this well and it was found plugged at the location shown on the well plat.
4705100593	McElroy Coal Co.	2521	Gordon	Unknown	No. TVD depth of well is too shallow to be within Range of potential Fracture propagation from Marcellus wells	Plug date 2/20/2004. A field survey was conducted to locate this well and no evidence of this well was found.



[Table Descriptions](#)
[County Code Translations](#)
[Form Number/Revision Dates](#)
[Usage Notes](#)
[Contact Information](#)
[Disclaimer](#)
[WVGES Main](#)
[Pipeline Plus! New](#)

Select County: (051) Marshall Select datatypes: (Check All)

Enter Permit #: 70645

Location Production Plugging
 Owner/Completion Stratigraphy Sample
 Pay/Show Water Logs Stem Hole Log

Get Dots Reset

WV Geological & Economic Survey: Well: County = 51 Permit = 70645 Report Time: Thu

Location Information: [View Map](#)

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LON_DD	UTME	UTMN
4705170645	Marshall	70645	Meade	Glen Easton	Cameron	39.824235	-80.891104	420442.6	4409079.8

There is no Bottom Hole Location data for this well

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_V
4705170645	1/21		Unknown	Empty Map	E. J. Jones					Unknown	1276

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD
4705170645	1/21	1/21						unclassified	unclassified	not available	unknown	unknown		

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

There is no Sample data for this well

WVGES
"Pipeline"

Select County: (051) Marshall
Enter Permit #: 00847
Get Data Reset

Select datatypes: (Check All)
 Location Production Plugging
 Owner/Completion Stratigraphy Sample
 Pay/Show/Water Logs Btm Hole Loc

Table Descriptions
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WV Geological & Economic Survey. **Well: County = 51 Permit = 00847** Report Time: Thursday, June 08, 2011

Well Reassignment Information: Reassigned From
 OLD_COUNTY OLD_PERMIT NEW_COUNTY NEW_PERMIT
 51 70994 51 847

Location Information: [View Map](#)

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LONG_DD	UTME	UTMN
4705100847	Marshall	847	Meade	Glen Easton	Cameron	39.796014	-80.637344	520700.4	4405460.8

There is no Bottom Hole Location data for this well

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD
4705100847	2/18/2000		Plugging	Completed Larry J. Whetzel		m-09				McElroy Coal Company	
4705100847	-/-/-		unknown	Rusty Map E J Jones			1250			Manufacturers Light & Heat Co	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD
4705100847	2/18/2000	2/8/2000								not available	unknown	unknown
4705100847	-/-/-	-/-/-					unclassified	unclassified		not available	unknown	unknown

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

Plugging Information:

API	PLG_DT	DEPTH_PBT
4705100847	2/18/2000	0

There is no Sample data for this well

WVGES
"Pipeline"

Select County: (051) Marshall
Enter Permit #: 00593
Get Data Reset

Select datatypes: (Check All)
 Location Production Plugging
 Owner/Completion Stratigraphy Sample
 Pay/Show/Water Logs Btm Hole Loc

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WV Geological & Economic Survey. **Well: County = 51 Permit = 00593** Report Time: Thursday, June 03, 2011 1:37:32 PM

Location Information: [View Map](#)

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LONG_DD	UTME	UTMN
4705100593	Marshall	593	Meade	Glen Easton	Cameron	39.78933	-80.673127	527560.9	4404907.4

There is no Bottom Hole Location data for this well

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD
4705100593	11/3/2014		Original Log	Completed David Dowdell et al	1	1227				Manufacturers Light & Heat Co	
4705100593	2/20/2004		Plugging	Completed Harmon & Mary B Crow		M-78				McElroy Coal Company	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TR
4705100593	11/3/2014	-/-/-		Cameron-Danar	Greenland Gas Fm	Gordon	unclassified	unclassified	Gas	unknown	unknown	2521	
4705100593	2/20/2004	2/12/2004	700	Ground Level									

There is no Pay data for this well

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

Plugging Information:

API	PLG_DT	DEPTH_PBT
4705100593	2/20/2004	0

There is no Sample data for this well

WVGES
"Pipeline"

Select County: (051) Marshall
Enter Permit #: 00855
Get Data Reset

Select datatypes: (Check All)
 Location Production Plugging
 Owner/Completion Stratigraphy Sample
 Pay/Show/Water Logs Btm Hole Loc

Table Descriptions
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WV Geological & Economic Survey. **Well: County = 51 Permit = 00855**

Well Reassignment Information: Reassigned From
 OLD_COUNTY OLD_PERMIT NEW_COUNTY NEW_PERMIT
 51 70780 51 655

Location Information: [View Map](#)

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LONG_DD	UTME	UTMN
4705100855	Marshall	855	Meade	Glen Easton	Cameron	39.780479	-80.650762	527333.2	4404547.2

There is no Bottom Hole Location data for this well

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD	PROP_TR
4705100855	10/10/2000		Plugging	Completed K N & D R McCardie		M-08				Consolidation Coal Co		
4705100855	-/-/-		unknown	Rusty Map Samuel Rogg		571				Hope Natural Gas Company		

Completion Information:

API	CMP_DT	SPUD_DT	ELEV DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TR	NEW_FIG
4705100855	10/10/2000	9/14/2000	1259	Ground Level			unclassified	unclassified		not available	unknown	unknown		
4705100855	-/-/-	-/-/-								not available	unknown	unknown		

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Production Water data for this well

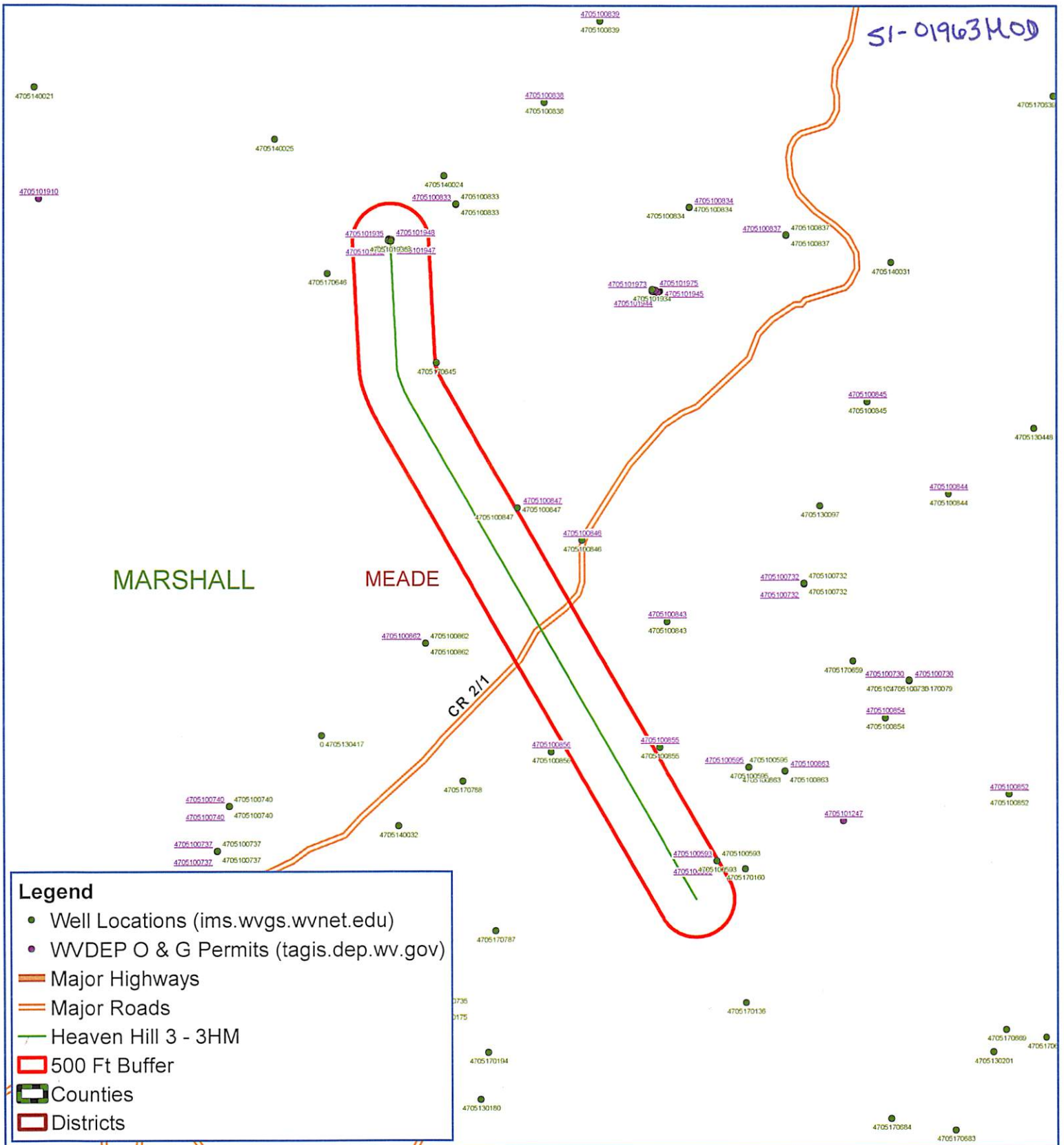
There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

Plugging Information:

API	PLG_DT	DEPTH_PBT
4705100855	10/10/2000	0

There is no Sample data for this well



Heaven Hill 3-3HM Meade District Marshall County, WV





Planning Report - Geographic

Database:	DB_Jul2216dt_v14	Local Co-ordinate Reference:	Well Heaven Hill 3-3 HM
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1326.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1326.00usft
Site:	Heaven Hill 3	North Reference:	Grid
Well:	Heaven Hill 3-3 HM	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4		

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	Heaven Hill 3				
Site Position:		Northing:	14,457,178.77 usft	Latitude:	39.80858060
From:	Lat/Long	Easting:	1,726,571.98 usft	Longitude:	-80.69321360
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.20 °

Well	Heaven Hill 3-3 HM					
Well Position	+N/-S	0.00 usft	Northing:	14,457,180.08 usft	Latitude:	39.80858427
	+E/-W	0.00 usft	Easting:	1,726,566.13 usft	Longitude:	-80.69323444
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	1,326.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	2/3/2017	-8.69	67.00	52,225.06818181

Design	rev4			
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	154.99

Plan Survey Tool Program	Date	2/2/2018			
Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks	
1	0.00	14,900.00 rev4 (Original Hole)	MWD MWD - Standard		

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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	0.00	
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,700.00	2.00	176.99	1,699.98	-1.74	0.09	2.00	2.00	0.00	176.99		
2,900.75	2.00	176.99	2,900.00	-43.59	2.29	0.00	0.00	0.00	0.00		
4,244.84	28.88	176.99	4,183.72	-397.68	20.92	2.00	2.00	0.00	0.00		
6,813.77	28.88	176.99	6,433.13	-1,636.77	86.12	0.00	0.00	0.00	0.00		
7,449.14	89.00	150.00	6,750.00	-2,115.14	272.50	10.00	9.46	-4.25	-30.45	Heaven Hill 3-3 HM L	
14,900.00	89.00	150.00	6,880.00	-8,566.79	3,997.38	0.00	0.00	0.00	0.00	Heaven Hill 3-3 HM B	

51-01963 Hwy



Planning Report - Geographic

Database: DB_Jul2216dt_v14
 Company: Tug Hill Operating LLC
 Project: Marshall County, West Virginia
 Site: Heaven Hill 3
 Well: Heaven Hill 3-3 HM
 Wellbore: Original Hole
 Design: rev4

Local Co-ordinate Reference: Well Heaven Hill 3-3 HM
 TVD Reference: GL @ 1326.00usft
 MD Reference: GL @ 1326.00usft
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature

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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	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
100.00	0.00	0.00	100.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
200.00	0.00	0.00	200.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
300.00	0.00	0.00	300.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
400.00	0.00	0.00	400.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
500.00	0.00	0.00	500.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
600.00	0.00	0.00	600.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
700.00	0.00	0.00	700.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
800.00	0.00	0.00	800.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
900.00	0.00	0.00	900.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,000.00	0.00	0.00	1,000.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,100.00	0.00	0.00	1,100.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,200.00	0.00	0.00	1,200.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,300.00	0.00	0.00	1,300.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,400.00	0.00	0.00	1,400.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,500.00	0.00	0.00	1,500.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
1,600.00	0.00	0.00	1,600.00	0.00	0.00	14,457,180.08	1,726,566.13	39.80858427	-80.69323444
KOP Begin 2°/100' build									
1,700.00	2.00	176.99	1,699.98	-1.74	0.09	14,457,178.34	1,726,566.22	39.80857949	-80.69323414
Begin 2.00° tangent									
1,800.00	2.00	176.99	1,799.92	-5.23	0.27	14,457,174.85	1,726,566.40	39.80856991	-80.69323353
1,900.00	2.00	176.99	1,899.86	-8.71	0.46	14,457,171.37	1,726,566.58	39.80856034	-80.69323292
2,000.00	2.00	176.99	1,999.80	-12.20	0.64	14,457,167.88	1,726,566.77	39.80855077	-80.69323231
2,100.00	2.00	176.99	2,099.74	-15.68	0.82	14,457,164.40	1,726,566.95	39.80854119	-80.69323170
2,200.00	2.00	176.99	2,199.68	-19.17	1.01	14,457,160.91	1,726,567.13	39.80853162	-80.69323109
2,300.00	2.00	176.99	2,299.61	-22.65	1.19	14,457,157.43	1,726,567.32	39.80852205	-80.69323048
2,400.00	2.00	176.99	2,399.55	-26.14	1.37	14,457,153.94	1,726,567.50	39.80851248	-80.69322987
2,500.00	2.00	176.99	2,499.49	-29.62	1.56	14,457,150.46	1,726,567.68	39.80850290	-80.69322926
2,600.00	2.00	176.99	2,599.43	-33.11	1.74	14,457,146.97	1,726,567.87	39.80849333	-80.69322865
2,700.00	2.00	176.99	2,699.37	-36.59	1.92	14,457,143.49	1,726,568.05	39.80848376	-80.69322804
2,800.00	2.00	176.99	2,799.31	-40.08	2.11	14,457,140.00	1,726,568.23	39.80847418	-80.69322743
2,900.00	2.00	176.99	2,899.25	-43.56	2.29	14,457,136.52	1,726,568.42	39.80846461	-80.69322682
2,900.75	2.00	176.99	2,900.00	-43.59	2.29	14,457,136.49	1,726,568.42	39.80846454	-80.69322681
Begin 2°/100' build									
3,000.00	3.98	176.99	2,999.11	-48.76	2.56	14,457,131.32	1,726,568.69	39.80845033	-80.69322590
3,100.00	5.98	176.99	3,098.72	-57.44	3.02	14,457,122.64	1,726,569.15	39.80842650	-80.69322439
3,200.00	7.98	176.99	3,197.98	-69.58	3.66	14,457,110.50	1,726,569.79	39.80839314	-80.69322226
3,300.00	9.98	176.99	3,296.75	-85.18	4.48	14,457,094.90	1,726,570.61	39.80835030	-80.69321953
3,400.00	11.98	176.99	3,394.91	-104.21	5.48	14,457,075.87	1,726,571.61	39.80829804	-80.69321620
3,500.00	13.98	176.99	3,492.35	-126.65	6.66	14,457,053.44	1,726,572.79	39.80823641	-80.69321227
3,600.00	15.98	176.99	3,588.94	-152.46	8.02	14,457,027.62	1,726,574.15	39.80816549	-80.69320774
3,700.00	17.98	176.99	3,684.57	-181.64	9.55	14,456,998.45	1,726,575.68	39.80808537	-80.69320263
3,800.00	19.98	176.99	3,779.13	-214.12	11.26	14,456,965.96	1,726,577.39	39.80799614	-80.69319694
3,900.00	21.98	176.99	3,872.49	-249.88	13.15	14,456,930.20	1,726,579.27	39.80789791	-80.69319068
4,000.00	23.98	176.99	3,964.55	-288.87	15.20	14,456,891.21	1,726,581.32	39.80779081	-80.69318385
4,100.00	25.98	176.99	4,055.19	-331.05	17.42	14,456,849.03	1,726,583.54	39.80767496	-80.69317646
4,200.00	27.98	176.99	4,144.29	-376.36	19.80	14,456,803.72	1,726,585.93	39.80755050	-80.69316853
4,244.84	28.88	176.99	4,183.72	-397.68	20.92	14,456,782.40	1,726,587.05	39.80749194	-80.69316479
4,244.85	28.88	176.99	4,183.73	-397.69	20.92	14,456,782.40	1,726,587.05	39.80749193	-80.69316479
Begin 28.88° tangent									
4,300.00	28.88	176.99	4,232.02	-424.29	22.32	14,456,755.79	1,726,588.45	39.80741886	-80.69316013
4,400.00	28.88	176.99	4,319.59	-472.52	24.86	14,456,707.56	1,726,590.99	39.80728638	-80.69315169
4,500.00	28.88	176.99	4,407.15	-520.76	27.40	14,456,659.33	1,726,593.52	39.80715389	-80.69314324
4,600.00	28.88	176.99	4,494.71	-568.99	29.94	14,456,611.09	1,726,596.06	39.80702141	-80.69313479



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Planned Survey									WV Department of Environmental Protection	
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,700.00	28.88	176.99	4,582.27	-617.22	32.47	14,456,562.86	1,726,598.60	39.80688892	-80.69312634	
4,800.00	28.88	176.99	4,669.83	-665.46	35.01	14,456,514.63	1,726,601.14	39.80675643	-80.69311790	
4,900.00	28.88	176.99	4,757.39	-713.69	37.55	14,456,466.39	1,726,603.68	39.80662395	-80.69310945	
5,000.00	28.88	176.99	4,844.96	-761.92	40.09	14,456,418.16	1,726,606.21	39.80649146	-80.69310100	
5,100.00	28.88	176.99	4,932.52	-810.16	42.63	14,456,369.92	1,726,608.75	39.80635898	-80.69309255	
5,200.00	28.88	176.99	5,020.08	-858.39	45.16	14,456,321.69	1,726,611.29	39.80622649	-80.69308410	
5,300.00	28.88	176.99	5,107.64	-906.62	47.70	14,456,273.46	1,726,613.83	39.80609401	-80.69307566	
5,400.00	28.88	176.99	5,195.20	-954.86	50.24	14,456,225.22	1,726,616.37	39.80596152	-80.69306721	
5,500.00	28.88	176.99	5,282.77	-1,003.09	52.78	14,456,176.99	1,726,618.90	39.80582904	-80.69305876	
5,600.00	28.88	176.99	5,370.33	-1,051.33	55.31	14,456,128.76	1,726,621.44	39.80569655	-80.69305031	
5,700.00	28.88	176.99	5,457.89	-1,099.56	57.85	14,456,080.52	1,726,623.98	39.80556407	-80.69304187	
5,800.00	28.88	176.99	5,545.45	-1,147.79	60.39	14,456,032.29	1,726,626.52	39.80543158	-80.69303342	
5,900.00	28.88	176.99	5,633.01	-1,196.03	62.93	14,455,984.06	1,726,629.05	39.80529910	-80.69302497	
6,000.00	28.88	176.99	5,720.57	-1,244.26	65.47	14,455,935.82	1,726,631.59	39.80516661	-80.69301652	
6,100.00	28.88	176.99	5,808.14	-1,292.49	68.00	14,455,887.59	1,726,634.13	39.80503413	-80.69300808	
6,200.00	28.88	176.99	5,895.70	-1,340.73	70.54	14,455,839.36	1,726,636.67	39.80490164	-80.69299963	
6,300.00	28.88	176.99	5,983.26	-1,388.96	73.08	14,455,791.12	1,726,639.21	39.80476916	-80.69299118	
6,400.00	28.88	176.99	6,070.82	-1,437.19	75.62	14,455,742.89	1,726,641.74	39.80463667	-80.69298274	
6,500.00	28.88	176.99	6,158.38	-1,485.43	78.16	14,455,694.65	1,726,644.28	39.80450419	-80.69297429	
6,600.00	28.88	176.99	6,245.95	-1,533.66	80.69	14,455,646.42	1,726,646.82	39.80437170	-80.69296584	
6,700.00	28.88	176.99	6,333.51	-1,581.90	83.23	14,455,598.19	1,726,649.36	39.80423921	-80.69295739	
6,800.00	28.88	176.99	6,421.07	-1,630.13	85.77	14,455,549.95	1,726,651.90	39.80410673	-80.69294895	
6,813.77	28.88	176.99	6,433.13	-1,636.77	86.12	14,455,543.31	1,726,652.25	39.80408849	-80.69294778	
6,813.78	28.88	176.99	6,433.13	-1,636.77	86.12	14,455,543.31	1,726,652.25	39.80408848	-80.69294778	
Begin 10°/100' build/turn										
6,900.00	36.55	169.66	6,505.65	-1,682.92	91.83	14,455,497.17	1,726,657.96	39.80396171	-80.69292800	
7,000.00	45.83	163.95	6,580.85	-1,746.84	107.14	14,455,433.25	1,726,673.26	39.80378602	-80.69287429	
7,100.00	55.31	159.81	6,644.31	-1,820.07	131.30	14,455,360.01	1,726,697.43	39.80358467	-80.69278915	
7,200.00	64.90	156.54	6,694.10	-1,900.40	163.60	14,455,279.68	1,726,729.72	39.80336377	-80.69267514	
7,300.00	74.55	153.75	6,728.72	-1,985.37	203.04	14,455,194.71	1,726,769.17	39.80313003	-80.69253574	
7,400.00	84.24	151.21	6,747.10	-2,072.41	248.43	14,455,107.67	1,726,814.56	39.80289057	-80.69237519	
7,449.14	89.00	150.00	6,750.00	-2,115.14	272.50	14,455,064.94	1,726,838.63	39.80277301	-80.69229001	
Begin 89.00° lateral section										
7,449.14	89.00	150.00	6,750.00	-2,115.14	272.50	14,455,064.94	1,726,838.63	39.80277300	-80.69229000	
7,500.00	89.00	150.00	6,750.89	-2,159.18	297.93	14,455,020.90	1,726,864.06	39.80265183	-80.69220001	
7,600.00	89.00	150.00	6,752.63	-2,245.77	347.92	14,454,934.31	1,726,914.05	39.80241356	-80.69202308	
7,700.00	89.00	150.00	6,754.38	-2,332.36	397.91	14,454,847.72	1,726,964.04	39.80217529	-80.69184614	
7,800.00	89.00	150.00	6,756.12	-2,418.95	447.91	14,454,761.14	1,727,014.03	39.80193702	-80.69166921	
7,900.00	89.00	150.00	6,757.87	-2,505.54	497.90	14,454,674.55	1,727,064.03	39.80169875	-80.69149227	
8,000.00	89.00	150.00	6,759.61	-2,592.13	547.89	14,454,587.96	1,727,114.02	39.80146048	-80.69131534	
8,100.00	89.00	150.00	6,761.36	-2,678.71	597.88	14,454,501.37	1,727,164.01	39.80122221	-80.69113841	
8,200.00	89.00	150.00	6,763.10	-2,765.30	647.88	14,454,414.78	1,727,214.00	39.80098394	-80.69096148	
8,300.00	89.00	150.00	6,764.85	-2,851.89	697.87	14,454,328.19	1,727,264.00	39.80074567	-80.69078455	
8,400.00	89.00	150.00	6,766.59	-2,938.48	747.86	14,454,241.60	1,727,313.99	39.80050740	-80.69060762	
8,500.00	89.00	150.00	6,768.34	-3,025.07	797.85	14,454,155.01	1,727,363.98	39.80026913	-80.69043070	
8,600.00	89.00	150.00	6,770.08	-3,111.66	847.85	14,454,068.42	1,727,413.97	39.80003086	-80.69025377	
8,700.00	89.00	150.00	6,771.82	-3,198.25	897.84	14,453,981.83	1,727,463.97	39.79979259	-80.69007685	
8,800.00	89.00	150.00	6,773.57	-3,284.84	947.83	14,453,895.24	1,727,513.96	39.79955432	-80.68989992	
8,900.00	89.00	150.00	6,775.31	-3,371.43	997.82	14,453,808.65	1,727,563.95	39.79931605	-80.68972300	
9,000.00	89.00	150.00	6,777.06	-3,458.02	1,047.82	14,453,722.06	1,727,613.94	39.79907778	-80.68954608	
9,100.00	89.00	150.00	6,778.80	-3,544.61	1,097.81	14,453,635.47	1,727,663.94	39.79883951	-80.68936916	
9,200.00	89.00	150.00	6,780.55	-3,631.20	1,147.80	14,453,548.89	1,727,713.93	39.79860123	-80.68919224	
9,300.00	89.00	150.00	6,782.29	-3,717.79	1,197.79	14,453,462.30	1,727,763.92	39.79836296	-80.68901533	
9,400.00	89.00	150.00	6,784.04	-3,804.38	1,247.79	14,453,375.71	1,727,813.91	39.79812469	-80.68883841	

81-01963.M00



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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,500.00	89.00	150.00	6,785.78	-3,890.96	1,297.78	14,453,289.12	1,727,863.91	39.79788642	-80.68866150
9,600.00	89.00	150.00	6,787.53	-3,977.55	1,347.77	14,453,202.53	1,727,913.90	39.79764814	-80.68848459
9,700.00	89.00	150.00	6,789.27	-4,064.14	1,397.76	14,453,115.94	1,727,963.89	39.79740987	-80.68830767
9,800.00	89.00	150.00	6,791.02	-4,150.73	1,447.76	14,453,029.35	1,728,013.88	39.79717159	-80.68813076
9,900.00	89.00	150.00	6,792.76	-4,237.32	1,497.75	14,452,942.76	1,728,063.88	39.79693332	-80.68795385
10,000.00	89.00	150.00	6,794.51	-4,323.91	1,547.74	14,452,856.17	1,728,113.87	39.79669505	-80.68777695
10,100.00	89.00	150.00	6,796.25	-4,410.50	1,597.73	14,452,769.58	1,728,163.86	39.79645677	-80.68760004
10,200.00	89.00	150.00	6,798.00	-4,497.09	1,647.73	14,452,682.99	1,728,213.85	39.79621850	-80.68742313
10,300.00	89.00	150.00	6,799.74	-4,583.68	1,697.72	14,452,596.40	1,728,263.85	39.79598022	-80.68724623
10,400.00	89.00	150.00	6,801.49	-4,670.27	1,747.71	14,452,509.81	1,728,313.84	39.79574195	-80.68706932
10,500.00	89.00	150.00	6,803.23	-4,756.86	1,797.70	14,452,423.22	1,728,363.83	39.79550367	-80.68689242
10,600.00	89.00	150.00	6,804.98	-4,843.45	1,847.70	14,452,336.64	1,728,413.82	39.79526539	-80.68671552
10,700.00	89.00	150.00	6,806.72	-4,930.04	1,897.69	14,452,250.05	1,728,463.82	39.79502712	-80.68653862
10,800.00	89.00	150.00	6,808.46	-5,016.63	1,947.68	14,452,163.46	1,728,513.81	39.79478884	-80.68636172
10,900.00	89.00	150.00	6,810.21	-5,103.21	1,997.67	14,452,076.87	1,728,563.80	39.79455056	-80.68618483
11,000.00	89.00	150.00	6,811.95	-5,189.80	2,047.67	14,451,990.28	1,728,613.79	39.79431229	-80.68600793
11,100.00	89.00	150.00	6,813.70	-5,276.39	2,097.66	14,451,903.69	1,728,663.79	39.79407401	-80.68583104
11,200.00	89.00	150.00	6,815.44	-5,362.98	2,147.65	14,451,817.10	1,728,713.78	39.79383573	-80.68565414
11,300.00	89.00	150.00	6,817.19	-5,449.57	2,197.64	14,451,730.51	1,728,763.77	39.79359745	-80.68547725
11,400.00	89.00	150.00	6,818.93	-5,536.16	2,247.64	14,451,643.92	1,728,813.76	39.79335917	-80.68530036
11,500.00	89.00	150.00	6,820.68	-5,622.75	2,297.63	14,451,557.33	1,728,863.76	39.79312090	-80.68512347
11,600.00	89.00	150.00	6,822.42	-5,709.34	2,347.62	14,451,470.74	1,728,913.75	39.79288262	-80.68494658
11,700.00	89.00	150.00	6,824.17	-5,795.93	2,397.61	14,451,384.15	1,728,963.74	39.79264434	-80.68476969
11,800.00	89.00	150.00	6,825.91	-5,882.52	2,447.61	14,451,297.56	1,729,013.73	39.79240606	-80.68459281
11,900.00	89.00	150.00	6,827.66	-5,969.11	2,497.60	14,451,210.97	1,729,063.73	39.79216778	-80.68441592
12,000.00	89.00	150.00	6,829.40	-6,055.70	2,547.59	14,451,124.39	1,729,113.72	39.79192950	-80.68423904
12,100.00	89.00	150.00	6,831.15	-6,142.29	2,597.58	14,451,037.80	1,729,163.71	39.79169122	-80.68406215
12,200.00	89.00	150.00	6,832.89	-6,228.88	2,647.58	14,450,951.21	1,729,213.70	39.79145294	-80.68388527
12,300.00	89.00	150.00	6,834.64	-6,315.47	2,697.57	14,450,864.62	1,729,263.70	39.79121466	-80.68370839
12,400.00	89.00	150.00	6,836.38	-6,402.05	2,747.56	14,450,778.03	1,729,313.69	39.79097638	-80.68353151
12,500.00	89.00	150.00	6,838.13	-6,488.64	2,797.55	14,450,691.44	1,729,363.68	39.79073809	-80.68335464
12,600.00	89.00	150.00	6,839.87	-6,575.23	2,847.55	14,450,604.85	1,729,413.67	39.79049981	-80.68317776
12,700.00	89.00	150.00	6,841.62	-6,661.82	2,897.54	14,450,518.26	1,729,463.67	39.79026153	-80.68300088
12,800.00	89.00	150.00	6,843.36	-6,748.41	2,947.53	14,450,431.67	1,729,513.66	39.79002325	-80.68282401
12,900.00	89.00	150.00	6,845.10	-6,835.00	2,997.52	14,450,345.08	1,729,563.65	39.78978497	-80.68264714
13,000.00	89.00	150.00	6,846.85	-6,921.59	3,047.52	14,450,258.49	1,729,613.64	39.78954668	-80.68247027
13,100.00	89.00	150.00	6,848.59	-7,008.18	3,097.51	14,450,171.90	1,729,663.64	39.78930840	-80.68229340
13,200.00	89.00	150.00	6,850.34	-7,094.77	3,147.50	14,450,085.31	1,729,713.63	39.78907012	-80.68211653
13,300.00	89.00	150.00	6,852.08	-7,181.36	3,197.49	14,449,998.72	1,729,763.62	39.78883183	-80.68193966
13,400.00	89.00	150.00	6,853.83	-7,267.95	3,247.49	14,449,912.14	1,729,813.61	39.78859355	-80.68176279
13,500.00	89.00	150.00	6,855.57	-7,354.54	3,297.48	14,449,825.55	1,729,863.61	39.78835527	-80.68158593
13,600.00	89.00	150.00	6,857.32	-7,441.13	3,347.47	14,449,738.96	1,729,913.60	39.78811698	-80.68140906
13,700.00	89.00	150.00	6,859.06	-7,527.72	3,397.46	14,449,652.37	1,729,963.59	39.78787870	-80.68123220
13,800.00	89.00	150.00	6,860.81	-7,614.30	3,447.46	14,449,565.78	1,730,013.58	39.78764041	-80.68105534
13,900.00	89.00	150.00	6,862.55	-7,700.89	3,497.45	14,449,479.19	1,730,063.58	39.78740213	-80.68087848
14,000.00	89.00	150.00	6,864.30	-7,787.48	3,547.44	14,449,392.60	1,730,113.57	39.78716384	-80.68070162
14,100.00	89.00	150.00	6,866.04	-7,874.07	3,597.43	14,449,306.01	1,730,163.56	39.78692555	-80.68052476
14,200.00	89.00	150.00	6,867.79	-7,960.66	3,647.43	14,449,219.42	1,730,213.55	39.78668727	-80.68034790
14,300.00	89.00	150.00	6,869.53	-8,047.25	3,697.42	14,449,132.83	1,730,263.55	39.78644898	-80.68017105
14,400.00	89.00	150.00	6,871.28	-8,133.84	3,747.41	14,449,046.24	1,730,313.54	39.78621070	-80.67999419
14,500.00	89.00	150.00	6,873.02	-8,220.43	3,797.40	14,448,959.65	1,730,363.53	39.78597241	-80.67981734
14,600.00	89.00	150.00	6,874.77	-8,307.02	3,847.40	14,448,873.06	1,730,413.52	39.78573412	-80.67964048
14,700.00	89.00	150.00	6,876.51	-8,393.61	3,897.39	14,448,786.47	1,730,463.52	39.78549583	-80.67946363
14,800.00	89.00	150.00	6,878.26	-8,480.20	3,947.38	14,448,699.89	1,730,513.51	39.78525755	-80.67928678

51-01963 MSB



Planning Report - Geographic

Database:	DB_Jul2216dt_v14	Local Co-ordinate Reference:	Well Heaven Hill 3-3 HM
Company:	Tug Hill Operating LLC	TVD Reference:	GL @ 1326.00usft
Project:	Marshall County, West Virginia	MD Reference:	GL @ 1326.00usft
Site:	Heaven Hill 3	North Reference:	Grid
Well:	Heaven Hill 3-3 HM	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,900.00	89.00	150.00	6,880.00	-8,566.79	3,997.37	14,448,613.30	1,730,563.50	39.78501926	-80.67910994
PBHL/TD 14900.00 MD/6880.00 TVD									

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Heaven Hill 3-3 HM LP r - hit/miss target center - Point	0.00	0.01	6,750.00	-2,115.14	272.50	14,455,064.94	1,726,838.63	39.80277300	-80.69229000
Heaven Hill 3-3 HM BHL - plan hits target center - Point	0.00	0.01	6,880.00	-8,566.79	3,997.38	14,448,613.29	1,730,563.50	39.78501925	-80.67910993

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
120.00	120.00	30" Casing @ 120 TVD	30	36	
1,090.00	1,090.00	13 3/8" Casing @ 1090 TVD	13-3/8	17	
2,800.69	2,800.00	9 5/8" Casing @ 2800 TVD	9-5/8	12-1/4	

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
1,600.00	1,600.00	0.00	0.00	KOP Begin 2°/100' build
1,700.00	1,699.98	-1.74	0.09	Begin 2.00° tangent
2,900.75	2,900.00	-43.59	2.29	Begin 2°/100' build
4,244.85	4,183.73	-397.69	20.92	Begin 28.88° tangent
6,813.78	6,433.13	-1,636.77	86.12	Begin 10°/100' build/turn
7,449.14	6,750.00	-2,115.14	272.50	Begin 89.00° lateral section
14,900.00	6,880.00	-8,566.79	3,997.37	PBHL/TD 14900.00 MD/6880.00 TVD

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03/02/2018



Well Site Safety Plan

Tug Hill Operating, LLC

Jan
2/5/18

Well Name: Heaven Hill 3-3HM

Pad Location: Heaven Hill 3

Marshall County, West Virginia

UTM (meters), NAD83, Zone 17:
Northing-4,406,557.30
Easting -526,258.41

February 2018
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**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 sheets

**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

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

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

WW-6A1 Supplement

Operator's Well No. Heaven Hill 3 - 3HM

SI-0963MOD

LEASE Name or No	Tag	Parcel	Grantor, Lessor, etc.	Grantee, Lessee, etc	Royalty	Dead Book/Page	Assignment	Assignment	Assignment
10*15557	A	9-7-30	RICKY L WHITLATCH ET AL	CHEVRON USA INC	1/8+	780	N/A	N/A	Chevron to Tug Hill: 36/148
10*15557	B	9-7-21	RICKY L WHITLATCH ET AL	CHEVRON USA INC	1/8+	780	N/A	N/A	Chevron to Tug Hill: 36/148
10*16289	C	9-7-20	BRENDA HINERMAN WILLIAMSON AND BRIAN K WILLIAMSON	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16051	C	9-7-20	DONNA JEAN SNIDER AND DAVID SNIDER	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16412	C	9-7-20	ELIZABETH ANN BLAZER AND PAUL R BLAZER	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16053	C	9-7-20	GARY D HINERMAN AND JUDY ANN HINERMAN	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*15720	C	9-7-20	KAREN L GREATHOUSE AND FLOYD GREATHOUSE	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*15667	C	9-7-20	KEVIN E MCGILTON ET UX	CHEVRON USA INC	1/8+	850	N/A	N/A	Chevron to Tug Hill: 36/148
10*15698	C	9-7-20	ROBERT A EDGE AND SHERRIE N EDGE	TH EXPLORATION LLC	1/8+	900	N/A	N/A	N/A
10*16413	C	9-7-20	RONALD H EDGE JR	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16028	C	9-7-20	ROSEMARY PARKINS AND STEPHEN PARKINS	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16020	C	9-7-20	SHARON HINERMAN MAY & DANIEL G MAY	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*15721	C	9-7-20	TINA L EDGE MONTI AND THOMAS MONTI	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.22	D	9-11-7	BEVERLY J HOPSON	TH EXPLORATION LLC	1/8+	913	N/A	N/A	N/A
10*47051.256.1	D	9-11-7	BRENDA J WHETZEL	TH EXPLORATION LLC	1/8+	881	N/A	N/A	N/A
10*15746	D	9-11-7	BRUCE D SCHURR	TH EXPLORATION LLC	1/8+	921	N/A	N/A	N/A
10*16247	D	9-11-7	CAROL RIGGLE PARSLEY AND JAMES DENNIS PARSLEY	TH EXPLORATION LLC	1/8+	925	N/A	N/A	N/A
10*47051.256.24	D	9-11-7	CATHERINE BONAR PETTIT BILLIE	TH EXPLORATION LLC	1/8+	904	N/A	N/A	N/A
10*47051.256.16	D	9-11-7	CHARLOTTE B HUMMELL	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.15	D	9-11-7	CHARLOTTE J BONAR YOHO	TH EXPLORATION LLC	1/8+	904	N/A	N/A	N/A
10*17506	D	9-11-7	CHASKIA F HARRIS AND JAMES M HARRIS	TH EXPLORATION LLC	1/8+	919	N/A	N/A	N/A
10*17507	D	9-11-7	DEZRAY METCALF	TH EXPLORATION LLC	1/8+	919	N/A	N/A	N/A
10*17415	D	9-11-7	DILLON PITSENBARGER	TH EXPLORATION LLC	1/8+	919	N/A	N/A	N/A
10*16115	D	9-11-7	EARL W HARRIS	TH EXPLORATION LLC	1/8+	925	N/A	N/A	N/A
10*47051.256.10	D	9-11-7	GRACE LAURA BONAR	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.14	D	9-11-7	HUGH R BUZZARD	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.21	D	9-11-7	JACK L MASON AND JEAN M MASON	TH EXPLORATION LLC	1/8+	904	N/A	N/A	N/A
10*47051.256.20	D	9-11-7	JEFFREY THOMAS PYLES AND TERESA A PYLES	TH EXPLORATION LLC	1/8+	907	N/A	N/A	N/A
10*47051.256.11	D	9-11-7	JOHN L MASON	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.18	D	9-11-7	JOHN WILLIAM BONAR AND SHIRLEY BONAR	TH EXPLORATION LLC	1/8+	913	N/A	N/A	N/A
10*47051.256.7	D	9-11-7	MARILYN SUE BUMER	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.17	D	9-11-7	MAXINE G JOHNSON	TH EXPLORATION LLC	1/8+	904	N/A	N/A	N/A
10*47051.256.19	D	9-11-7	MICHAEL DAVID PYLES AND CYNTHIA A PYLES	TH EXPLORATION LLC	1/8+	907	N/A	N/A	N/A
10*47051.256.8	D	9-11-7	PAMELA ANN MASON	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.23	D	9-11-7	ROBERT L BONAR	TH EXPLORATION LLC	1/8+	913	N/A	N/A	N/A
10*47051.256.12	D	9-11-7	STEVEN A BOHRER	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16021	D	9-11-7	TOMMY BONAR AND TANYA S BONAR	TH EXPLORATION LLC	1/8+	925	N/A	N/A	N/A
10*47051.256.9	D	9-11-7	WANDA MASON SUNSHINE	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.256.13	D	9-11-7	WILLIAM W CRAIG AND GLENDA L CRAIG	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16238	E	9-12-27	SUSAN MARIE JOHNSON AKA SUSAN MARIE HUBER	TH EXPLORATION LLC	1/8+	924	N/A	N/A	N/A
10*47051.309.1	E	9-12-27	LESLIE E QUIGLEY	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*47051.309.2	E	9-12-27	LEWIS M QUIGLEY AND MAXINE V QUIGLEY	TH EXPLORATION LLC	1/8+	907	N/A	N/A	N/A
10*47051.309.3	E	9-12-27	GERALD W QUIGLEY AND VICKI L QUIGLEY	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*15606	F	9-12-2	CHK-MAC LLC	CHESAPEAKE APPALACHIA LLC	1/8+	798	N/A	N/A	Chesapeake to Chevron: 30/461
10*47051.309.3	F	9-12-2	GERALD W QUIGLEY AND VICKI L QUIGLEY	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A
10*16932	F	9-12-2	HAYMAKER PROPERTIES LP	CHEVRON U.S.A. INC.	1/8+	902	N/A	N/A	Chevron to Tug Hill: 37/437
10*47051.309.1	F	9-12-2	LESLIE E QUIGLEY	TH EXPLORATION LLC	1/8+	905	N/A	N/A	N/A

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10*47051.309.2	F	9-12-2	LEWIS M QUIGLEY AND MAXINE V QUIGLEY	TH EXPLORATION LLC	1/8+	907	217	N/A	N/A
10*16238	F	9-12-2	SUSAN MARIE JOHNSON AKA SUSAN MARIE HUBER	TH EXPLORATION LLC	1/8+	924	614	N/A	N/A
10*15559	G	9-11-11	KENNETH M MCCARDLE ET UX REV LT	CHEVRON USA INC	1/8+	816	499	N/A	N/A
10*16244	H	9-12-1.1	EMILY ANN NICIFOROS	TH EXPLORATION LLC	1/8+	924	617	N/A	N/A
10*16149	H	9-12-1.1	THOMAS MICHAEL WALLACE	TH EXPLORATION LLC	1/8+	924	610	N/A	N/A
10*47051.333.1	H	9-12-1.1	THOMAS S RIGGS III	TH EXPLORATION LLC	1/8+	904	556	N/A	N/A
10*47051.333.2	H	9-12-1.1	WILLIAM MARTIN RIGGS ANGELA RAE MOORE	TH EXPLORATION LLC	1/8+	907	220	N/A	N/A
10*16244	I	9-12-1	EMILY ANN NICIFOROS	TH EXPLORATION LLC	1/8+	924	617	N/A	N/A
10*16149	I	9-12-1	THOMAS MICHAEL WALLACE	TH EXPLORATION LLC	1/8+	924	610	N/A	N/A
10*47051.333.1	I	9-12-1	THOMAS S RIGGS III	TH EXPLORATION LLC	1/8+	904	556	N/A	N/A
10*47051.333.2	I	9-12-1	WILLIAM MARTIN RIGGS ANGELA RAE MOORE	TH EXPLORATION LLC	1/8+	907	220	N/A	N/A
10*16244	J	9-12-31	EMILY ANN NICIFOROS	TH EXPLORATION LLC	1/8+	924	617	N/A	N/A
10*17555	K	9-14-18	AARON AND JANA K PARRY	TH EXPLORATION LLC	1/8+	924	113	N/A	N/A
10*17452	K	9-14-18	ALAN H & MARY K DEGARMO	TH EXPLORATION, LLC	1/8+	924	164	N/A	N/A
10*17139	K	9-14-18	ALICE G WEINER AND GERALD S WEINER	TH EXPLORATION LLC	1/8+	915	131	N/A	N/A
10*16183	K	9-14-18	ALLEN R L DAVIS AND DIANA LEE PATTERSON	TH EXPLORATION LLC	1/8+	906	285	N/A	N/A
10*17436	K	9-14-18	ANDREW M HOOVER AND DINAH R HOOVER	TH EXPLORATION LLC	1/8+	924	156	N/A	N/A
10*16239	K	9-14-18	ANGELA L OLDFIELD AND KENNETH W OLDFIELD	TH EXPLORATION LLC	1/8+	906	287	N/A	N/A
10*17880	K	9-14-18	ANNA M WRIGHT	TH EXPLORATION, LLC	1/8+	924	586	N/A	N/A
10*16443	K	9-14-18	BARBARA BROWN CHAMBERS	TH EXPLORATION LLC	1/8+	924	621	N/A	N/A
10*16018	K	9-14-18	BARBARA MCFADDEN ALBRIGHT	TH EXPLORATION LLC	1/8+	906	262	N/A	N/A
10*17708	K	9-14-18	BETTY LOU NOBLE	TH EXPLORATION LLC	1/8+	923	127	N/A	N/A
10*17612	K	9-14-18	BEVERLY A LEDBETTER	TH EXPLORATION, LLC	1/8+	923	480	N/A	N/A
10*16240	K	9-14-18	BONNIE SUE PATTERSON SWISHER	TH EXPLORATION LLC	1/8+	906	289	N/A	N/A
10*17830	K	9-14-18	BRIAN AND MELINDA MASTERS	TH EXPLORATION LLC	1/8+	925	319	N/A	N/A
10*16031	K	9-14-18	CARL J CHMIELEWSKI AND KATHLEEN A CHMIELEWSKI	TH EXPLORATION LLC	1/8+	906	266	N/A	N/A
10*17613	K	9-14-18	CARLTON DOBBS JR AND MIKHAIL PROKOPENKO	TH EXPLORATION LLC	1/8+	924	120	N/A	N/A
10*16444	K	9-14-18	CATHERINE ELLEN CHAMBERS	TH EXPLORATION LLC	1/8+	924	623	N/A	N/A
10*16083	K	9-14-18	CECIL HARRY LILLY, III AND PAMELA KAY KNIGHT LILLY	TH EXPLORATION LLC	1/8+	912	47	N/A	N/A
10*17771	K	9-14-18	CHARLES AND LISA WARRICK	TH EXPLORATION, LLC	1/8+	923	477	N/A	N/A
10*16535	K	9-14-18	CHARLES E CARSON AND MARY KAY CARSON	TH EXPLORATION LLC	1/8+	906	420	N/A	N/A
10*17396	K	9-14-18	CHRISTINE L KIDD	TH EXPLORATION LLC	1/8+	924	158	N/A	N/A
10*16486	K	9-14-18	DAVID ALAN WILKINSON AND PATRICIA LYNN WILKINSON	TH EXPLORATION LLC	1/8+	924	180	N/A	N/A
10*17614	K	9-14-18	DAVID DOBBS	TH EXPLORATION, LLC	1/8+	923	489	N/A	N/A
10*17528	K	9-14-18	DEAN E GARRISON	TH EXPLORATION LLC	1/8+	923	535	N/A	N/A
10*17487	K	9-14-18	DEBORAH R MOKOSH	TH EXPLORATION LLC	1/8+	924	166	N/A	N/A
10*17711	K	9-14-18	DEBRA A WENNEMAN AND KURT J WENNEMAN	TH EXPLORATION LLC	1/8+	923	520	N/A	N/A
10*16995	K	9-14-18	DIANE ELSIE RAMSEY	TH EXPLORATION LLC	1/8+	924	146	N/A	N/A
10*17579	K	9-14-18	DON COFFIELD & GLENDA DOBBS	TH EXPLORATION, LLC	1/8+	923	525	N/A	N/A
10*17563	K	9-14-18	DONALD L WOOD	TH EXPLORATION LLC	1/8+	923	523	N/A	N/A
10*16953	K	9-14-18	DONALD T AND JEAN K HOGAN	TH EXPLORATION LLC	1/8+	924	140	N/A	N/A
10*16582	K	9-14-18	DORA BROCK BRAMMER	TH EXPLORATION LLC	1/8+	907	429	N/A	N/A
10*16445	K	9-14-18	DOUGLAS C AND GWENDLYN D LEWTON	TH EXPLORATION LLC	1/8+	925	123	N/A	N/A
10*16511	K	9-14-18	DOUGLAS R BOWEN	TH EXPLORATION LLC	1/8+	906	475	N/A	N/A
10*17766	K	9-14-18	EDWARD S & NANCY A ROSENTHAL	TH EXPLORATION, LLC	1/8+	923	495	N/A	N/A
10*16131	K	9-14-18	ERIC S DOBBS	TH EXPLORATION LLC	1/8+	902	68	N/A	N/A
10*16835	K	9-14-18	ERNEST CARL AUGUSTINE JR	TH EXPLORATION LLC	1/8+	924	188	N/A	N/A
10*16182	K	9-14-18	FIRST CHRISTIAN CHURCH OF MOUNDSVILLE BY ROGER FRANCIS AND ROBERT ALBERT TRUSTEES	TH EXPLORATION LLC	1/8+	906	283	N/A	N/A

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10*16017	K	9-14-18	FLOYD A MCFADDEN	TH EXPLORATION LLC	1/8+	906	260	N/A	N/A
10*15730	K	9-14-18	FRANCES V CARPENTER	TH EXPLORATION LLC	1/8+	906	256	N/A	N/A
10*16442	K	9-14-18	FRED T AND JERRY L CHAMBERS	TH EXPLORATION LLC	1/8+	924	174	N/A	N/A
10*17448	K	9-14-18	FREDERICK L HERVEY AND CATHY J HERVEY	TH EXPLORATION LLC	1/8+	924	162	N/A	N/A
10*16948	K	9-14-18	FREDERICK M LEWTON	TH EXPLORATION LLC	1/8+	924	136	N/A	N/A
10*17209	K	9-14-18	GAYLE S SHANNON	TH EXPLORATION LLC	1/8+	924	168	N/A	N/A
10*16441	K	9-14-18	GEORGE FRANKLIN AND NANCY ANN REED	TH EXPLORATION LLC	1/8+	924	619	N/A	N/A
10*17515	K	9-14-18	GLADYS E DOBBS	TH EXPLORATION LLC	1/8+	923	541	N/A	N/A
10*17769	K	9-14-18	GLADYS FRAZIER KING	TH EXPLORATION, LLC	1/8+	923	492	N/A	N/A
10*17504	K	9-14-18	GREGG ALAN MILLER AND BETH ANN MILLER	TH EXPLORATION LLC	1/8+	924	118	N/A	N/A
10*17675	K	9-14-18	GREGORY D & CAROLYN J WIBLE	TH EXPLORATION, LLC	1/8+	923	507	N/A	N/A
10*16580	K	9-14-18	HAROLD C MCFADDEN	TH EXPLORATION LLC	1/8+	907	480	N/A	N/A
10*17289	K	9-14-18	HAROLD R HUNT JR AND ELIZABETH A HUNT	TH EXPLORATION LLC	1/8+	924	170	N/A	N/A
10*17879	K	9-14-18	HARRY R WRIGHT JR	TH EXPLORATION, LLC	1/8+	924	588	N/A	N/A
10*16581	K	9-14-18	HELEN L SCHILLING	TH EXPLORATION LLC	1/8+	907	489	N/A	N/A
10*17674	K	9-14-18	HOWARD L & BETH E WOOD	TH EXPLORATION, LLC	1/8+	923	505	N/A	N/A
10*16540	K	9-14-18	JAMES A WINTER AND CONNIE G WINTER	TH EXPLORATION LLC	1/8+	924	184	N/A	N/A
10*17676	K	9-14-18	JAMES C & DEIDRE G DORIA	TH EXPLORATION, LLC	1/8+	923	513	N/A	N/A
10*47051.325.4	K	9-14-18	JAMES H WHITE AND RITA FRANKS WHITE	TH EXPLORATION LLC	1/8+	906	230	N/A	N/A
10*17731	K	9-14-18	JAMES J MCGHEE AND JEANNINE CHAMBERS MCGHEE	TH EXPLORATION LLC	1/8+	914	519	N/A	N/A
10*17671	K	9-14-18	JAMES L STOUT	TH EXPLORATION LLC	1/8+	923	484	N/A	N/A
10*16882	K	9-14-18	JAMES LEROY AND DARLENE DOBBS OWENS	TH EXPLORATION LLC	1/8+	924	190	N/A	N/A
10*16569	K	9-14-18	JANICE C BAILE	TH EXPLORATION LLC	1/8+	907	425	N/A	N/A
10*17503	K	9-14-18	JANICE L KUHN	TH EXPLORATION LLC	1/8+	924	122	N/A	N/A
10*16950	K	9-14-18	JAY E AND CECILIA E LEWTON	TH EXPLORATION LLC	1/8+	924	134	N/A	N/A
10*16532	K	9-14-18	JEAN ANN MCFADDEN	TH EXPLORATION LLC	1/8+	906	459	N/A	N/A
10*16285	K	9-14-18	JOHN A SHUTZ AND CYNTHIA J SHUTZ	TH EXPLORATION LLC	1/8+	906	291	N/A	N/A
10*16483	K	9-14-18	JOHN C AND BARBARA H WINTER	TH EXPLORATION LLC	1/8+	924	178	N/A	N/A
10*16966	K	9-14-18	JOHN GILLETTE AND BARBARA GILLETTE	TH EXPLORATION LLC	1/8+	913	377	N/A	N/A
10*17885	K	9-14-18	JOHN RUSSELL BECKER	TH EXPLORATION, LLC	1/8+	924	540	N/A	N/A
10*17582	K	9-14-18	JOHN THOMAS ERAZMUS AND JEAN R ERAZMUS	TH EXPLORATION LLC	1/8+	924	124	N/A	N/A
10*16030	K	9-14-18	JOSEPH F CHMIELEWSKI AND SANDRA CHMIELEWSKI	TH EXPLORATION LLC	1/8+	906	264	N/A	N/A
10*47051.325.1	K	9-14-18	JUDITH A LEWANDOSKY AND ALAN E LEWANDOSKY	TH EXPLORATION LLC	1/8+	906	225	N/A	N/A
10*16993	K	9-14-18	JULIA HOOVER	TH EXPLORATION LLC	1/8+	924	150	N/A	N/A
10*17517	K	9-14-18	JULIO ENRIQUE & DEBRA K TORRES	TH EXPLORATION, LLC	1/8+	923	537	N/A	N/A
10*16085	K	9-14-18	KATHARYN ANNETTE LILLY LAING AND FREDDIE JOE LAING	TH EXPLORATION LLC	1/8+	912	43	N/A	N/A
10*16086	K	9-14-18	KATHARYN DAY LILLY	TH EXPLORATION LLC	1/8+	906	272	N/A	N/A
10*16531	K	9-14-18	KATHY DOBBS WELLS	TH EXPLORATION LLC	1/8+	906	472	N/A	N/A
10*17668	K	9-14-18	KENNETH R DOBBS	TH EXPLORATION, LLC	1/8+	923	503	N/A	N/A
10*16537	K	9-14-18	KIM D BOWEN AND MADONNA M BOWEN	TH EXPLORATION LLC	1/8+	907	415	N/A	N/A
10*15752	K	9-14-18	KIM O CHAMBERS AND DEBRA CHAMBERS	TH EXPLORATION LLC	1/8+	906	258	N/A	N/A
10*16180	K	9-14-18	LARRY L CHAMBERS	TH EXPLORATION LLC	1/8+	906	280	N/A	N/A
10*17131	K	9-14-18	LAURA E TOTTEN AND LONNIE R TOTTEN	TH EXPLORATION LLC	1/8+	924	154	N/A	N/A
10*16726	K	9-14-18	LESLEY K WHITE	TH EXPLORATION LLC	1/8+	924	182	N/A	N/A
10*16576	K	9-14-18	LINDA A MINER AND MICHAEL W MINER	TH EXPLORATION LLC	1/8+	907	484	N/A	N/A
10*16992	K	9-14-18	LINDA C ABRAHAM	TH EXPLORATION LLC	1/8+	924	148	N/A	N/A
10*17520	K	9-14-18	LUCY P SULLIVAN	TH EXPLORATION LLC	1/8+	923	533	N/A	N/A
10*17559	K	9-14-18	MARVIN JERRY BLAKE AND LINDA D BLAKE	TH EXPLORATION LLC	1/8+	923	528	N/A	N/A

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10*16087	K	9-14-18	MARY PENELOPE LILLY MURPHY	TH EXPLORATION LLC	1/8+	912	41	N/A	N/A
10*17516	K	9-14-18	MARY V DOBBS	TH EXPLORATION LLC	1/8+	923	539	N/A	N/A
10*17505	K	9-14-18	MICHAEL R & LEANNE DOBBS	TH EXPLORATION, LLC	1/8+	924	116	N/A	N/A
10*47051.325.3	K	9-14-18	NICHOLAS D PAVLIK AND GLORIA K PAVLIK	TH EXPLORATION LLC	1/8+	906	228	N/A	N/A
10*16181	K	9-14-18	NORMA CHRISTINE WHIPP AND GERALD WAYNE BLACK	TH EXPLORATION LLC	1/8+	906	281	N/A	N/A
10*16144	K	9-14-18	PATTIE S MADRID	TH EXPLORATION LLC	1/8+	906	278	N/A	N/A
10*17580	K	9-14-18	PAUL CRAIG CUNNINGHAM	TH EXPLORATION LLC	1/8+	923	530	N/A	N/A
10*17615	K	9-14-18	PAULA JO WRIGHT	TH EXPLORATION, LLC	1/8+	923	482	N/A	N/A
10*17581	K	9-14-18	PAULA WEIRES	TH EXPLORATION LLC	1/8+	923	486	N/A	N/A
10*47051.325.8	K	9-14-18	RICK PAVLIK	TH EXPLORATION LLC	1/8+	906	239	N/A	N/A
10*16570	K	9-14-18	ROBERT D BOWEN AND MARCIA M R BOWEN	TH EXPLORATION LLC	1/8+	907	420	N/A	N/A
10*17878	K	9-14-18	ROBERT E & SARAH M ROUSH	TH EXPLORATION, LLC	1/8+	924	590	N/A	N/A
10*17413	K	9-14-18	ROBERT M CHAMBERS AND CHARLOTTE A CHAMBERS	TH EXPLORATION LLC	1/8+	924	160	N/A	N/A
10*17129	K	9-14-18	ROBERTA JANE PARKINSON	TH EXPLORATION LLC	1/8+	924	142	N/A	N/A
10*17700	K	9-14-18	ROGER L & MARILYN L GARRISON	TH EXPLORATION, LLC	1/8+	923	472	N/A	N/A
10*17616	K	9-14-18	RONALD & ELIZABETH DOBBS	TH EXPLORATION, LLC	1/8+	924	107	N/A	N/A
10*15477	K	9-14-18	RONALD A WYCINSKI	TH EXPLORATION LLC	1/8+	906	241	N/A	N/A
10*16680	K	9-14-18	RONALD J AND JENNIFER CHAMBERS FICCA	TH EXPLORATION LLC	1/8+	924	186	N/A	N/A
10*16990	K	9-14-18	ROSEMARY H BEAVERS	TH EXPLORATION LLC	1/8+	924	152	N/A	N/A
10*17664	K	9-14-18	RUDOLPH H PARSONS	TH EXPLORATION, LLC	1/8+	923	511	N/A	N/A
10*16952	K	9-14-18	RUSSELL D HERVEY	TH EXPLORATION LLC	1/8+	924	132	N/A	N/A
10*47051.325.5	K	9-14-18	SAMUEL ALAN MCCORD AND WINIFRED A MCKEE	TH EXPLORATION LLC	1/8+	906	232	N/A	N/A
10*16733	K	9-14-18	SARAH L BISHOP	TH EXPLORATION LLC	1/8+	924	172	N/A	N/A
10*47051.325.7	K	9-14-18	SHERON JONES	TH EXPLORATION LLC	1/8+	906	237	N/A	N/A
10*16533	K	9-14-18	SHIRLEY ANN DOBBS	TH EXPLORATION LLC	1/8+	906	469	N/A	N/A
10*17703	K	9-14-18	SHIRLEY N COX	TH EXPLORATION, LLC	1/8+	923	498	N/A	N/A
10*16949	K	9-14-18	STEVEN R AND BRIANNE L LUTT	TH EXPLORATION LLC	1/8+	924	138	N/A	N/A
10*17701	K	9-14-18	SUE ANN WORD	TH EXPLORATION, LLC	1/8+	923	470	N/A	N/A
10*17702	K	9-14-18	TAMMY BETH RAMSEY	TH EXPLORATION, LLC	1/8+	925	500	N/A	N/A
10*16967	K	9-14-18	TARA JEANNE MINOR AND JENNIFER A KNAPP	TH EXPLORATION LLC	1/8+	914	612	N/A	N/A
10*16534	K	9-14-18	TERRY LEE LASAVAGE	TH EXPLORATION LLC	1/8+	906	443	N/A	N/A
10*17667	K	9-14-18	THOMAS BRIAN WARRICK	TH EXPLORATION, LLC	1/8+	923	509	N/A	N/A
10*47051.325.6	K	9-14-18	THOMAS O MCCORD	TH EXPLORATION LLC	1/8+	906	235	N/A	N/A
10*47051.325.2	K	9-14-18	TIMMY LEE STOUT AND DOROTHY MARIE STOUT	TH EXPLORATION LLC	1/8+	906	222	N/A	N/A
10*17560	K	9-14-18	TREVOR HOOKS	TH EXPLORATION LLC	1/8+	924	110	N/A	N/A
10*17134	K	9-14-18	UNITED CHRISTIAN MISSIONARY SOCIETY	TH EXPLORATION LLC	1/8+	924	144	N/A	N/A
10*17617	K	9-14-18	UNITED DISCIPLES OF CHRIST CHURCH	TH EXPLORATION LLC	1/8+	924	129	N/A	N/A
10*17881	K	9-14-18	WAYLON L & ANGELA J MURPHEE	TH EXPLORATION, LLC	1/8+	924	555	N/A	N/A
10*16490	K	9-14-18	WILLIAM H AND MERRY C COTTON	TH EXPLORATION, LLC	1/8+	924	176	N/A	N/A
10*17767	K	9-14-18	WILLIAM K & LINDA J MERRITT	TH EXPLORATION, LLC	1/8+	923	474	N/A	N/A
10*16965	K	9-14-18	WILLIAM L WRIGHT AND CAROLINA WRIGHT	TH EXPLORATION LLC	1/8+	914	524	N/A	N/A

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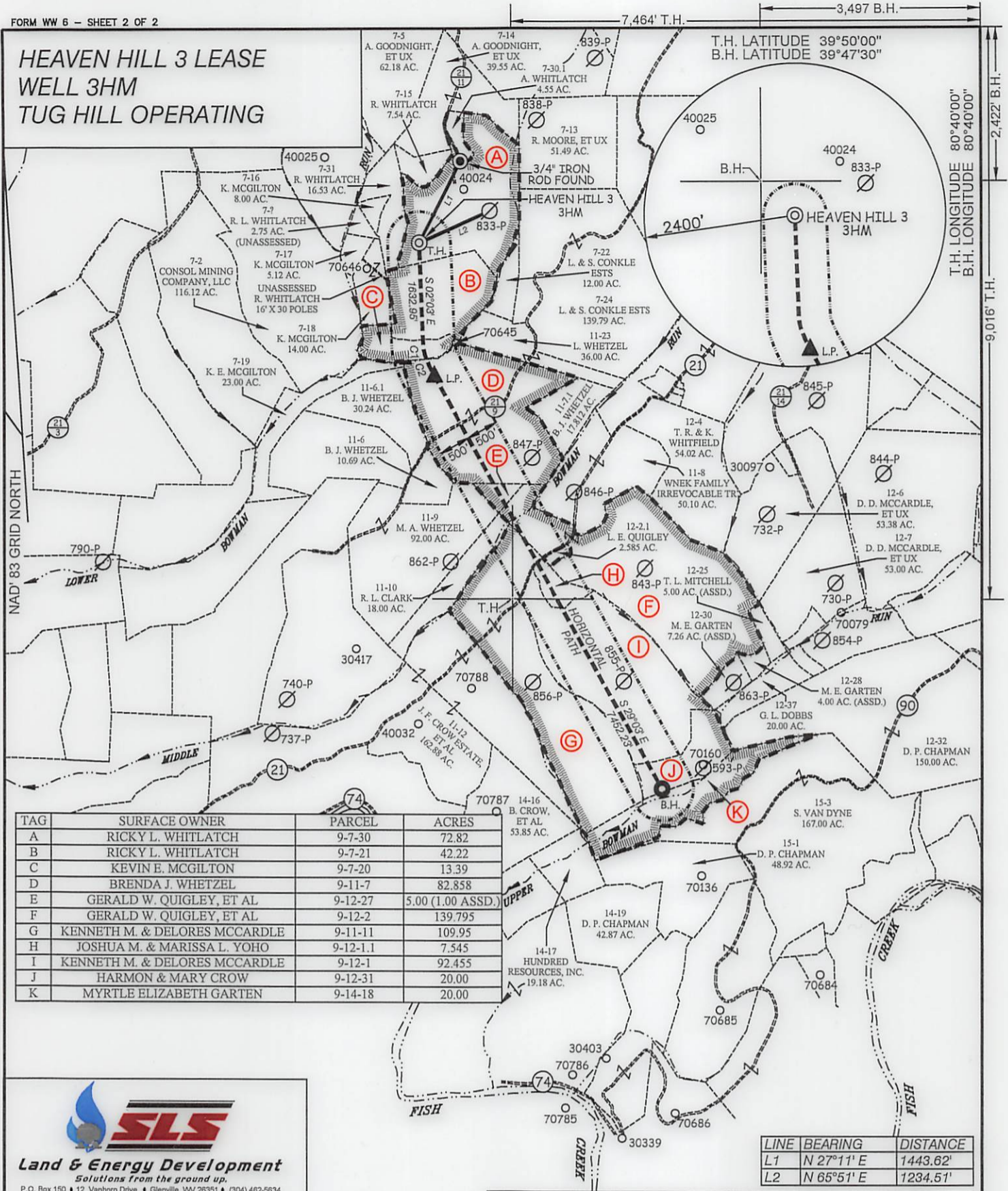
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**HEAVEN HILL 3 LEASE
WELL 3HM
TUG HILL OPERATING**



TAG	SURFACE OWNER	PARCEL	ACRES
A	RICKY L. WHITLATCH	9-7-30	72.82
B	RICKY L. WHITLATCH	9-7-21	42.22
C	KEVIN E. MCGILTON	9-7-20	13.39
D	BRENDA J. WHETZEL	9-11-7	82.858
E	GERALD W. QUIGLEY, ET AL	9-12-27	5.00 (1.00 ASSD.)
F	GERALD W. QUIGLEY, ET AL	9-12-2	139.795
G	KENNETH M. & DELORES MCCARDLE	9-11-11	109.95
H	JOSHUA M. & MARISSA L. YOHO	9-12-1.1	7.545
I	KENNETH M. & DELORES MCCARDLE	9-12-1	92.455
J	HARMON & MARY CROW	9-12-31	20.00
K	MYRTLE ELIZABETH GARTEN	9-14-18	20.00

LINE	BEARING	DISTANCE
L1	N 27°11' E	1443.62'
L2	N 65°51' E	1234.51'

CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	156.18'	602.02'	S 11°03' E	155.75'
C2	367.46'	1906.01'	S 23°56' E	366.89'

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OFFICE OF OIL AND GAS



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

LEGEND

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

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)
 NAD'83 S.P.C.(FT) N. 478,853.76 E. 1,633,296.29
 NAD'83 GEO. LAT.-(N) 39.808584 LONG.-(W) 80.693234
 NAD'83 UTM (M) N. 4,406,557.30 E. 526,258.41
LANDING POINT
 NAD'83 S.P.C.(FT) N. 476,733.6 E. 1,633,533.5
 NAD'83 GEO. LAT.-(N) 39.802773 LONG.-(W) 80.692290
 NAD'83 UTM (M) N. 4,405,912.6 E. 526,341.5
BOTTOM HOLE
 NAD'83 S.P.C.(FT) N. 470,218.5 E. 1,637,151.3
 NAD'83 GEO. LAT.-(N) 39.785019 LONG.-(W) 80.679110
 NAD'83 UTM (M) N. 4,403,946.1 E. 527,476.8

SCALE 1" = 2000' FILE NO. 8654P3HMR.dwg
 DATE JUNE 30, 20 17
 REVISED FEBRUARY 2, 20 18
 OPERATORS WELL NO. HEAVEN HILL 3-3HM
 API WELL NO. 47 — 051 — 01963
 NO. STATE COUNTY PERMIT

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

03/02/2018

COUNTY NAME PERMIT

7,464' T.H.

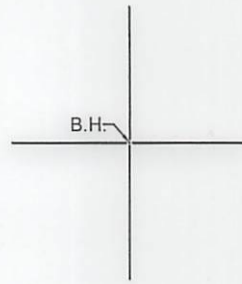
3,497 B.H.

**HEAVEN HILL 3 LEASE
WELL 3HM
TUG HILL OPERATING**

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

T.H. LONGITUDE 80°40'00"
B.H. LONGITUDE 80°40'00"

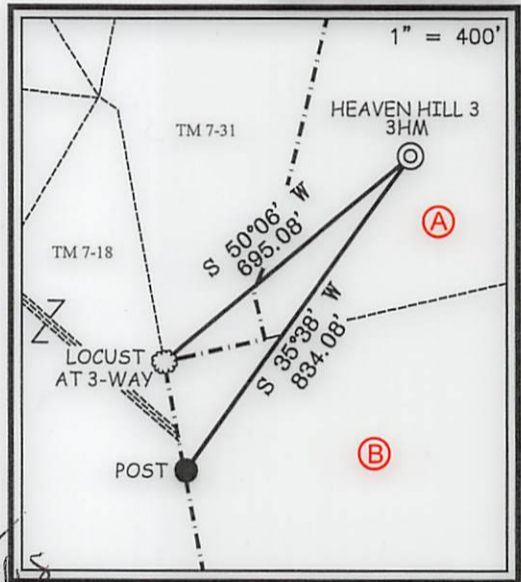
9,016' T.H.



(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)		
NAD'83 S.P.C.(FT)	N. 478,853.76	E. 1,633,296.29
NAD'83 GEO.	LAT-(N) 39.808584	LONG-(W) 80.693234
NAD'83 UTM (M)	N. 4,406,557.30	E. 526,258.41
LANDING POINT		
NAD'83 S.P.C.(FT)	N. 476,733.6	E. 1,633,533.5
NAD'83 GEO.	LAT-(N) 39.802773	LONG-(W) 80.692290
NAD'83 UTM (M)	N. 4,405,912.6	E. 526,341.5
BOTTOM HOLE		
NAD'83 S.P.C.(FT)	N. 470,218.5	E. 1,637,151.3
NAD'83 GEO.	LAT-(N) 39.785019	LONG-(W) 80.679110
NAD'83 UTM (M)	N. 4,403,946.1	E. 527,476.8



REFERENCES



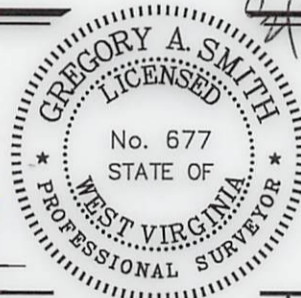
NOTES ON SURVEY

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 IS 1"=2000'



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. 677 *Gregory A. Smith*



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.
 DATE JUNE 30, 20 17
 REVISED FEBRUARY 2, 20 18
 OPERATORS WELL NO. HEAVEN HILL 3-3HM
 API WELL NO. 47-051-01963 *MOD*
 STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 8654P3HMR.dwg
 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 = 1,343.0' ELEVATION PROPOSED = 1,326.35' WATERSHED LOWER BOWMAN RUN OF FISH CREEK (HUC 10) DISTRICT MEADE COUNTY MARSHALL QUADRANGLE GLEN EASTON 7.5'

SURFACE OWNER RICKY L. WHITLATCH ACREAGE 72.82±
 ROYALTY OWNER RICKY L. WHITLATCH, ET AL - SEE WW-6A1 ACREAGE 72.82±

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: 6,876' / TMD: 14,900'

WELL OPERATOR TUG HILL OPERATING, LLC DESIGNATED AGENT DIANNA STAMPER
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 FORT WORTH, TX 76107 CHARLESTON, WV 25313

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