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

Harold D. Ward, Cabinet Secretary
www.dep.wv.gov

Friday, February 25, 2022
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

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

Re: Permit Modification Approval for OLD CROW N-21HU
47-051-02335-00-00

Deep Well Modification to the Directional Plan, updated Casing and Mylar Plat.

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: OLD CROW N-21HU
Farm Name: DONNA VIVIAN YOHO (TOD) GARY LANCE YOH
U.S. WELL NUMBER: 47-051-02335-00-00
Horizontal 6A New Drill
Date Modification Issued: 02/25/2022

Promoting a healthy environment.

02/25/2022

west virginia department of environmental protection

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

Randall M. Albert, Chairman
dep.wv.gov

February 23, 2022

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

RE: Application for Deep Well Permit – API #47-051-02335 Modification

COMPANY: Tug Hill Operating, LLC

FARM: Donna Vivian Yoho (TOD) Gary Lance Yoho Old Crow N-21HU

COUNTY: Marshall DISTRICT: Franklin QUAD: Powhatan Point

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

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

1. Comments to Notice of Deviation filed? No.
2. Provided a certified copy of duly acknowledged and recorded consent and easement form from all surface owners? Yes
3. Provided a tabulation of all deep wells within one mile of the proposed location, including the API number of all deep wells: **yes
4. Provided a plat showing that the productive interval of the well meets the requirements of the Rules of the Commission W. Va. C.S.R. § 39-1-4.2.

**Corley N-9HU 47-051-01983; Corley N-10HU 47-051-01998; Bryan N-14HU 47-051-02031; Bryan N-12HU 47-051-02029; Bryan N-13HU 47-051-02030; Woodford 10HU 47-051-02152; MND 6 HHS 47-051-01732; MND 20AU 47-051-02011; MND 20 BU 47-051-02012; MND 20 CU 47-051-02013; MND 20 DU 47-051-02014; Old Crow N-19HU 47-051-02190; Old Crow N-17HU 47-051-02122; Old Crow N-18HU 47-051-02123; Old Crow N-20HU 47-051-02191; Old Crow N-21HU 47-051-02335; Pendleton N-9HU 47-051-02245; Michter N-8HU 47-051-02219; Michter N-9HU 47-051-02220; Van Winkle N-16HU 47-051-02349; Van Winkle N-17HU 47-051-02350

Sincerely,

Susan Rose

Susan Rose, Administrator

02/25/2022

WW-6B
(04/15)

MODIFICATION

API NO. 47- 051 - 02335
OPERATOR WELL NO. Old Crow N-21HU
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 7.5
Operator ID	County	District	Quadrangle

2) Operator's Well Number: Old Crow N-21HU Well Pad Name: Old Crow

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

4) Elevation, current ground: 1,265' Elevation, proposed post-construction: 1,265'

5) Well Type (a) Gas X Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow _____ Deep X
Horizontal X

6) Existing Pad: Yes or No Yes

MJK 2/16/2022

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Point Pleasant is the target formation at a depth of 11,353' - 11,470', thickness of 117' and anticipated pressure of approx. 7,500 psi.

8) Proposed Total Vertical Depth: 11,620'

9) Formation at Total Vertical Depth: Trenton

10) Proposed Total Measured Depth: 27,839'

11) Proposed Horizontal Leg Length: 13,934.34'

12) Approximate Fresh Water Strata Depths: 70; 919'

13) Method to Determine Fresh Water Depths: Based on the depth of Pittsburgh Coal seam, per WVGES mapping contours

14) Approximate Saltwater Depths: 1,353'

15) Approximate Coal Seam Depths: Sewickley Coal - 821' and Pittsburgh Coal - 913'

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

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

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

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(04/15)

API NO. 47- 051 - 02335
OPERATOR WELL NO. Old Crow N-21HU
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/Coal	20"	NEW	J55	106.5#	990'	990'	1,598FT^3(CTS)
Intermediate 1	13 3/8"	NEW	J55	54.5#	2,805'	2,805'	1,978FT^3(CTS)
Intermediate 2	9 5/8"	NEW	HPP110	47#	10,172'	10,172'	3,325FT^3(CTS)
Production	5 1/2"	NEW	P110	23#	27,839'	27,839'	FT^3(CTS)
Tubing	2 7/8"	NEW	P110	6.5#		11,263'	
Liners							

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TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	36"	1.0	2,333	1,866	CLASS A	1.2
Fresh Water	20"	26"	.5	2,410	1,928	SEE #24	1.2
Coal	13 3/8"	17 1/2"	.38	2,740	2,192	SEE #24	1.2
Intermediate	9 5/8"	12 1/4"	.472	10,730	6,968	SEE #24	1.33
Production	5 1/2"	8 1/2"	.415	16,510	13,208	SEE #24	1.17/1.19
Tubing	2 7/8"			14,530	11,624		
Liners							

PACKERS

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

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API NO. 47- 051 - 02335
OPERATOR WELL NO. Old Crow N-21HU
Well Pad Name: Old Crow

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

Drill through the Point Pleasant and TD Pilot Hole 150' into the Trenton. Log vertical section and run a solid cement plug back to proposed KOP(10,763'). 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 34,900,000 lb. proppant and 630,000 bbl 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 strings 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:

Sfc - Premium NE-1 + 2% CaCl; Int1 - Premium NE-1 + 1.5% CaCL + Flake; Int2 - Lead: Premium NE-1 + 5% BA-90 + .85% R-3 + 3% KCl + .75 gals/100sk FP-13L + 1% MPA-170 Tail: Premium NE-1 +.1% R-3 + 5% KCl + 1% CD-32 + .4% FL-52 +.2% ASA-301 + .6% Sodium Metasilicate; Kick Plug - Class H Cement + 1% CD-32 + .7% Sodium Metasilicate + .1% R-3 + .75 gal/100sk FP-13L; Prod - Lead: 50:50 (Poz:Class H) + .3% R-3 + .3% MPA-250 + .75 gal/100sk FP-13L Tail: 25:75 (Poz:Class H) + .3% R-3 + .3% MPA-250 + .375 gal/100sk FP-13L

25) Proposed borehole conditioning procedures:

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

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*Note: Attach additional sheets as needed.

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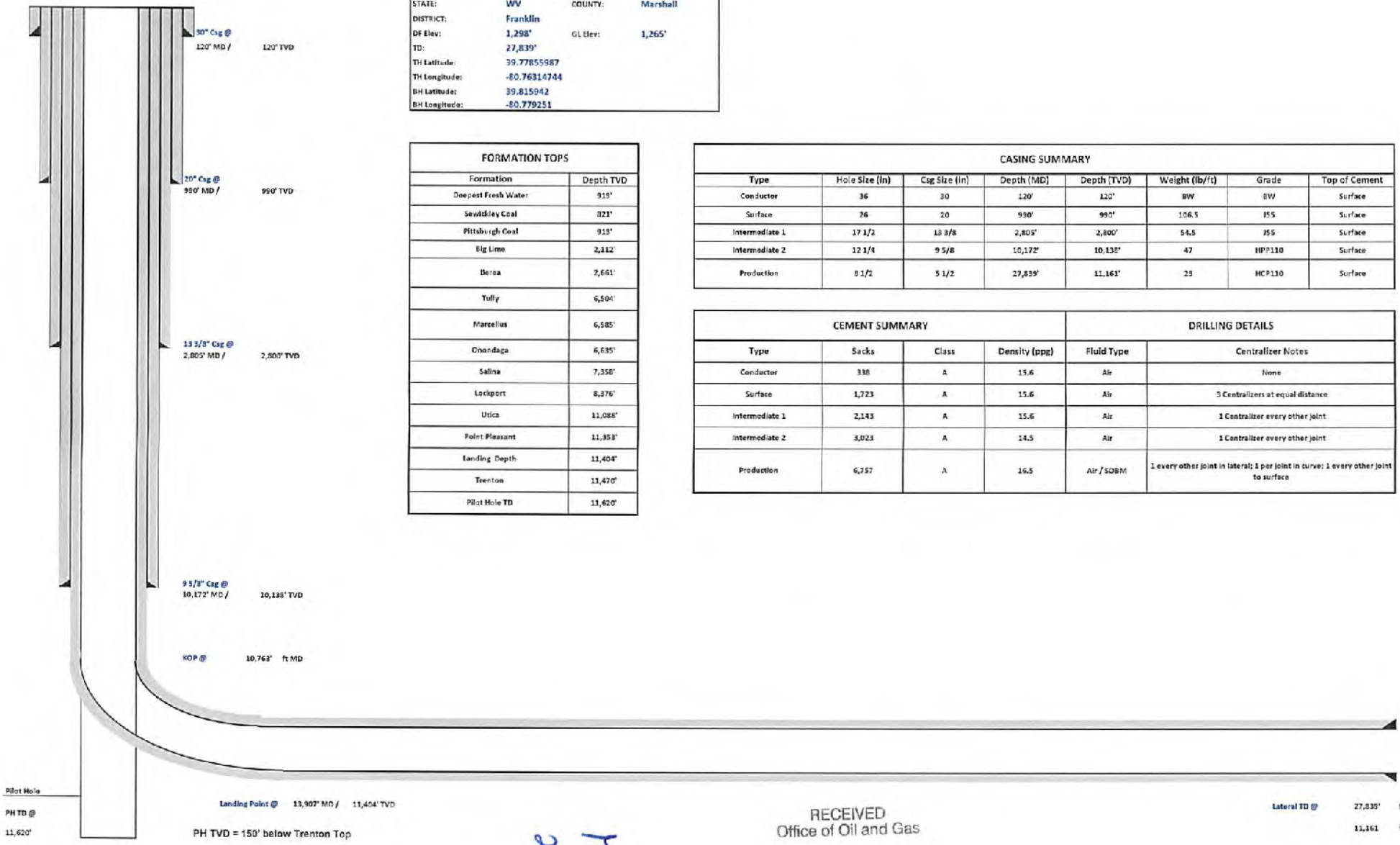
TUG HILL OPERATING

WELL NAME:	Old Crow N-21HU		
STATE:	WV	COUNTY:	Marshall
DISTRICT:	Franklin		
DF Elev:	1,298'	GL Elev:	1,265'
TD:	27,839'		
TH Latitude:	39.77855987		
TH Longitude:	-80.76314744		
BH Latitude:	39.815942		
BH Longitude:	-80.779251		



FORMATION TOPS	
Formation	Depth TVD
Deepest Fresh Water	919'
Sewickley Coal	821'
Pittsburgh Coal	919'
Big Lime	2,112'
Berea	2,661'
Tully	6,504'
Marcellus	6,585'
Onondaga	6,635'
Salina	7,358'
Lockport	8,376'
Utica	11,088'
Point Pleasant	11,353'
Landing Depth	11,404'
Trenton	11,470'
Pilot Hole TD	11,620'

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	26	20	990'	990'	106.5	J55	Surface
Intermediate 1	17 1/2	13 3/8	2,805'	2,800'	54.5	J55	Surface
Intermediate 2	12 1/4	9 5/8	10,172'	10,138'	47	HCP110	Surface
Production	8 1/2	5 1/2	27,839'	11,161'	23	HCP110	Surface

CEMENT SUMMARY				DRILLING DETAILS	
Type	Sacks	Class	Density (ppg)	Fluid Type	Centralizer Notes
Conductor	338	A	15.6	Air	None
Surface	1,723	A	15.6	Air	5 Centralizers at equal distance
Intermediate 1	2,143	A	15.6	Air	1 Centralizer every other joint
Intermediate 2	3,023	A	14.5	Air	1 Centralizer every other joint
Production	6,757	A	16.5	Air / SOBM	1 every other joint in lateral; 1 per joint in curve; 1 every other joint to surface

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TUG HILL OPERATING

Tug Hill Operating, LLC Casing and Cement Program

Old Crow N-21HU

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	20"	J55	26"	990'	CTS
Intermediate 1	13 3/8"	J55	17 1/2"	2,805'	CTS
Intermediate 2	9 5/8"	HPP110	12 1/4"	10,172'	CTS
Production	5 1/2"	HCP110	8 1/2"	27,839'	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 1:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.2
Intermediate 2:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 14.5 ppg, Y=1.35
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 16.5 ppg, Y = 1.03

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Well: Old Crow N-21 HU (slot V)
Site: Old Crow Pad
Project: Marshall County, West Virginia.
Design: rev4 bootleg
Rig: Nabors X14

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	6444.00	4.70	76.00	6422.98	70.07	438.29	0.00	0.00	-72.83	Survey @ 6444.00 MD 6422.98 TVD
2	6544.00	4.70	76.00	6522.64	72.05	446.24	0.00	0.00	-73.48	KOP Begin 2°/100' turn
3	6681.27	4.70	110.00	6659.48	71.49	456.98	2.00	106.95	-77.43	Begin 4.70° tangent
4	10135.41	4.70	110.00	10102.00	-25.31	722.94	0.00	0.00	-253.72	9 5/8" Csg 10135.41 MD 10102.00 TVD
5	10762.81	4.70	110.00	10727.29	-42.89	771.25	0.00	0.00	-285.74	Begin 8°/100' build/turn
6	11825.11	88.88	76.05	11394.00	96.86	1458.38	8.00	-34.09	-371.58	Begin 91.00° lateral
7	12212.11	88.88	76.05	11401.56	190.14	1833.90	0.00	0.00	-402.46	Begin 6.25°/100' turn
8	13906.82	91.00	330.00	11404.11	1536.49	2406.09	6.26	-89.26	692.28	Begin 91.00° lateral
9	27838.54	91.00	330.00	11161.00	13600.33	-4557.93	0.00	0.00	14343.76	PBHL/TD 27838.54 MD 11161.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL Old Crow N-21 HU r2	11161.00	13600.33	-4557.93	14459788.05	1702403.32	39.81594200	-80.77925100
- plan hits target center							
LP Old Crow N-21 HU r2	11404.00	1538.35	2406.25	14447726.08	1709367.50	39.78276681	-80.75456791
- plan misses target center by 1.08usft at 13908.35usft MD (11404.08 TVD, 1537.82 N, 2405.32 E)							

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

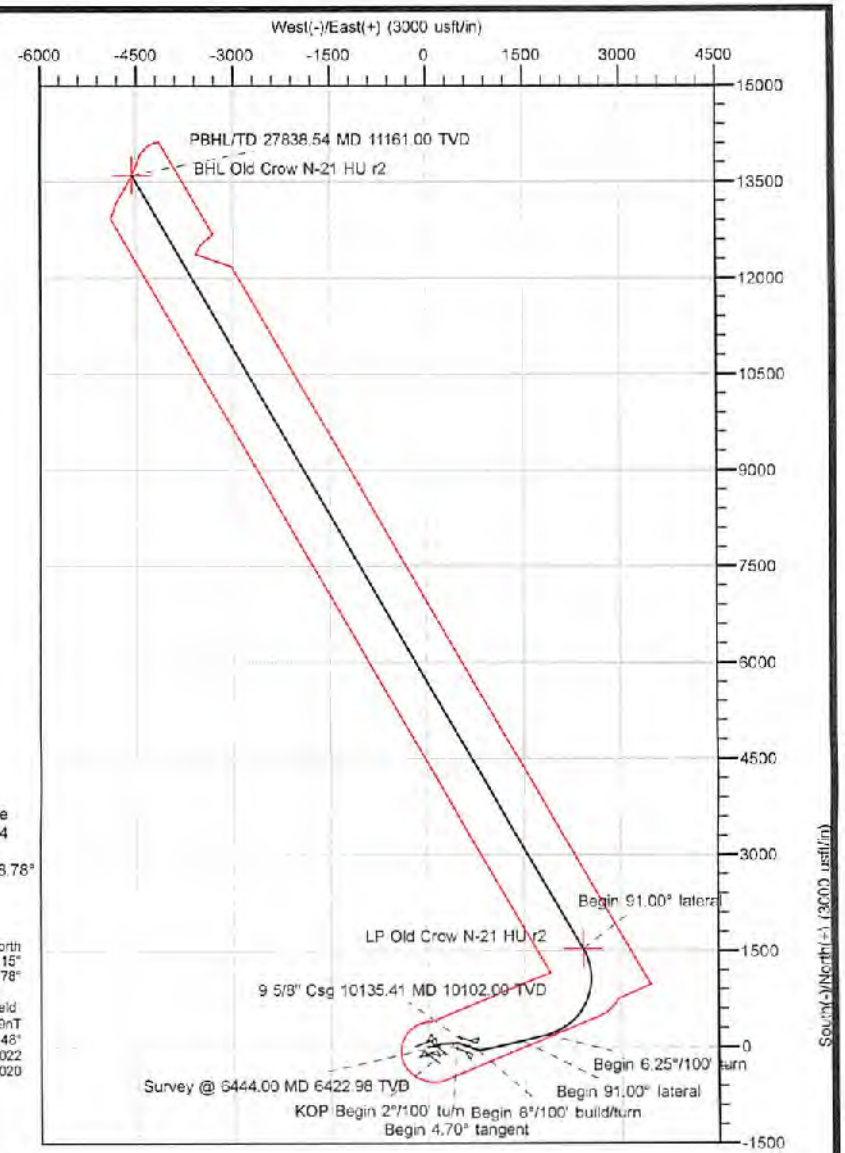
System Datum: Mean Sea Level
Depth Reference: RKB=1265+32.5 @ 1297.50usft (Nabors X14)

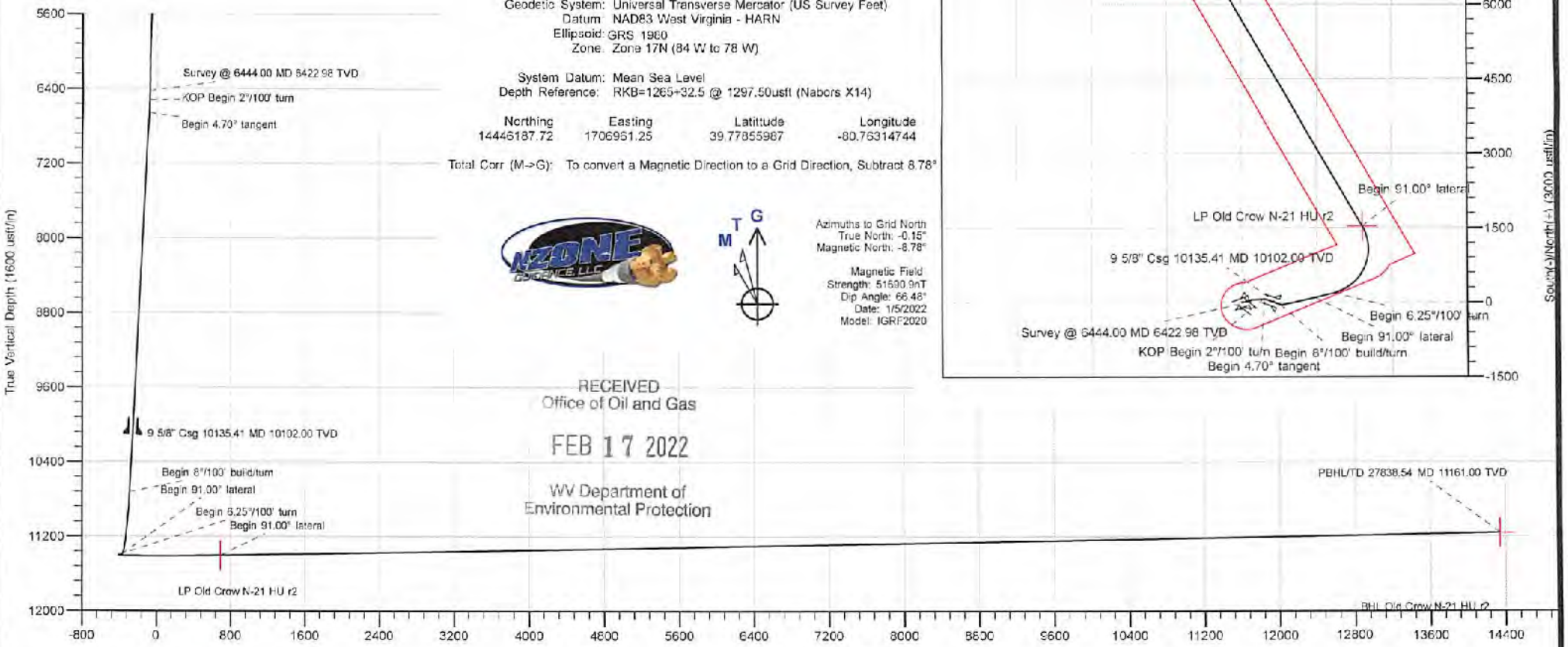
Northing	Easting	Latitude	Longitude
14446187.72	1706951.25	39.77855987	-80.76314744

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.78°

Azimuths to Grid North
True North: -0.15°
Magnetic North: -8.78°

Magnetic Field
Strength: 51690.9nT
Dip Angle: 66.48°
Date: 1/5/2022
Model: IGRF2020





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11:05, January 06 2022

TUG HILL OPERATING

Planning Report - Geographic

Database:	DB_Dec2220_v16	**Local Co-ordinate Reference:**	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	**TVD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	**MD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-21 HU (slot V)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

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 "		

Well Old Crow N-21 HU (slot V)

Well Position	**+N/-S**	0.00 usft	**Northing:**	14,446,187.73 usft	**Latitude:**	39.77855987
	+E/-W	0.00 usft	**Easting:**	1,706,961.25 usft	**Longitude:**	-80.76314744
Position Uncertainty		0.00 usft	**Wellhead Elevation:**	usft	**Ground Level:**	1,265.00 usft
Grid Convergence:						

Wellbore Original Hole

Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	IGRF2020	1/5/2022	-8.62	66.48	51,690.94218449

Design rev4 bootleg

Audit Notes:

Version:	**Phase:**	PLAN	**Tie On Depth:**	6,444.00

Vertical Section:	**Depth From (TVD) (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Direction (°)**
	0.00	0.00	0.00	341.47

Plan Survey Tool Program **Date**

	Depth From (usft)	**Depth To (usft)**	**Survey (Wellbore)**	**Tool Name**	**Remarks**
1	186.00	1,003.00	MWD surf (Original Hole)		
2	1,050.00	2,801.00	MWD int (Original Hole)		
3	2,863.00	6,444.00	MWD (Original Hole)		
4	6,444.00	27,838.52	rev4 bootleg (Original Hole)		

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Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

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
6,444.00	4.70	76.00	6,422.98	70.07	438.29	0.00	0.00	0.00	0.00	
6,544.00	4.70	76.00	6,522.64	72.05	446.24	0.00	0.00	0.00	0.00	
6,681.27	4.70	110.00	6,659.48	71.49	456.98	2.00	0.00	24.77	106.95	
10,135.41	4.70	110.00	10,102.00	-25.31	722.94	0.00	0.00	0.00	0.00	
10,762.81	4.70	110.00	10,727.29	-42.69	771.25	0.00	0.00	0.00	0.00	
11,825.11	88.88	76.05	11,394.00	96.86	1,458.38	8.00	7.92	-3.20	-34.09	
12,212.11	88.88	76.05	11,401.56	190.14	1,833.90	0.00	0.00	0.00	0.00	
13,906.82	91.00	330.00	11,404.11	1,536.49	2,406.09	6.26	0.13	-6.26	-89.28	
27,838.54	91.00	330.00	11,161.00	13,600.33	-4,557.93	0.00	0.00	0.00	0.00	BHL Old Crow N-21 H

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Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

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	14,446,187.73	1,706,961.25	39.77855987	-80.76314744
186.00	0.32	119.24	186.00	-0.25	0.45	14,446,187.47	1,706,961.70	39.77855917	-80.76314583
233.00	0.34	117.37	233.00	-0.38	0.69	14,446,187.34	1,706,961.94	39.77855882	-80.76314498
275.00	0.44	121.15	275.00	-0.52	0.94	14,446,187.20	1,706,962.19	39.77855843	-80.76314410
322.00	0.41	125.73	322.00	-0.71	1.23	14,446,187.01	1,706,962.48	39.77855790	-80.76314307
366.00	0.39	129.86	365.99	-0.90	1.47	14,446,186.82	1,706,962.72	39.77855738	-80.76314220
413.00	0.50	131.97	412.99	-1.14	1.75	14,446,186.58	1,706,963.00	39.77855672	-80.76314123
457.00	0.50	132.33	456.99	-1.40	2.03	14,446,186.33	1,706,963.28	39.77855601	-80.76314021
473.00	0.24	151.02	472.99	-1.48	2.10	14,446,186.25	1,706,963.35	39.77855580	-80.76313997
518.00	0.48	315.49	517.99	-1.42	2.02	14,446,186.30	1,706,963.26	39.77855595	-80.76314028
565.00	0.96	325.32	564.99	-0.96	1.65	14,446,186.77	1,706,962.90	39.77855722	-80.76314157
609.00	1.45	327.40	608.98	-0.19	1.14	14,446,187.54	1,706,962.39	39.77855935	-80.76314337
656.00	1.50	331.95	655.96	0.86	0.53	14,446,188.58	1,706,961.78	39.77856222	-80.76314553
699.00	1.61	333.79	698.95	1.90	0.00	14,446,189.62	1,706,961.25	39.77856508	-80.76314741
746.00	1.65	337.34	745.93	3.11	-0.55	14,446,190.84	1,706,960.70	39.77856842	-80.76314937
790.00	1.65	348.63	789.91	4.32	-0.92	14,446,192.04	1,706,960.33	39.77857174	-80.76315067
837.00	1.19	334.86	836.89	5.42	-1.26	14,446,193.15	1,706,959.99	39.77857477	-80.76315187
885.00	1.04	334.05	884.89	6.27	-1.66	14,446,193.99	1,706,959.59	39.77857709	-80.76315330
932.00	1.04	331.59	931.88	7.02	-2.05	14,446,194.75	1,706,959.20	39.77857918	-80.76315468
979.00	1.08	328.82	978.87	7.78	-2.48	14,446,195.50	1,706,958.76	39.77858125	-80.76315621
1,003.00	0.81	326.43	1,002.87	8.11	-2.69	14,446,195.84	1,706,958.55	39.77858217	-80.76315698
1,050.00	0.79	295.50	1,049.86	8.53	-3.17	14,446,196.26	1,706,958.08	39.77858332	-80.76315865
1,074.00	0.55	291.00	1,073.86	8.64	-3.43	14,446,196.37	1,706,957.82	39.77858363	-80.76315956
1,121.00	0.71	260.02	1,120.86	8.67	-3.93	14,446,196.40	1,706,957.32	39.77858372	-80.76316133
1,168.00	0.81	249.84	1,167.85	8.51	-4.52	14,446,196.23	1,706,956.73	39.77858327	-80.76316346
1,215.00	0.52	209.47	1,214.85	8.21	-4.94	14,446,195.93	1,706,956.31	39.77858245	-80.76316495
1,262.00	0.57	203.27	1,261.85	7.81	-5.14	14,446,195.53	1,706,956.11	39.77858135	-80.76316565
1,309.00	0.42	213.32	1,308.85	7.45	-5.32	14,446,195.17	1,706,955.92	39.77858036	-80.76316632
1,325.00	0.39	193.44	1,324.85	7.35	-5.37	14,446,195.07	1,706,955.88	39.77858009	-80.76316648
1,356.00	0.44	153.74	1,355.85	7.14	-5.34	14,446,194.86	1,706,955.91	39.77857951	-80.76316639
1,388.00	0.82	110.35	1,387.84	6.95	-5.07	14,446,194.67	1,706,956.18	39.77857899	-80.76316543
1,419.00	1.42	102.92	1,418.84	6.78	-4.49	14,446,194.51	1,706,956.76	39.77857853	-80.76316336
1,451.00	2.19	97.87	1,450.82	6.61	-3.50	14,446,194.34	1,706,957.75	39.77857805	-80.76315983
1,482.00	3.15	95.72	1,481.79	6.45	-2.06	14,446,194.17	1,706,959.19	39.77857759	-80.76315473
1,513.00	4.04	93.80	1,512.73	6.29	-0.13	14,446,194.01	1,706,961.12	39.77857714	-80.76314783
1,545.00	5.24	89.77	1,544.62	6.22	2.46	14,446,193.95	1,706,963.71	39.77857693	-80.76313863
1,576.00	5.69	90.41	1,575.48	6.21	5.41	14,446,193.94	1,706,966.66	39.77857690	-80.76312812
1,608.00	6.16	89.14	1,607.31	6.23	8.71	14,446,193.95	1,706,969.96	39.77857691	-80.76311636
1,639.00	6.31	84.74	1,638.13	6.41	12.07	14,446,194.14	1,706,973.32	39.77857739	-80.76310440
1,671.00	6.39	84.31	1,669.93	6.75	15.60	14,446,194.47	1,706,976.85	39.77857829	-80.76309186
1,702.00	6.54	79.78	1,700.73	7.23	19.05	14,446,194.96	1,706,980.30	39.77857959	-80.76307956
1,733.00	6.51	79.30	1,731.53	7.87	22.52	14,446,195.60	1,706,983.76	39.77858132	-80.76306723
1,764.00	6.55	76.35	1,762.33	8.62	25.96	14,446,196.34	1,706,987.21	39.77858334	-80.76305495
1,827.00	6.98	71.79	1,824.89	10.66	33.09	14,446,198.38	1,706,994.33	39.77858890	-80.76302958
1,874.00	7.17	68.95	1,871.54	12.60	38.53	14,446,200.33	1,706,999.78	39.77859420	-80.76301019
1,921.00	5.90	76.21	1,918.23	14.23	43.61	14,446,201.96	1,707,004.86	39.77859864	-80.76299208
2,015.00	5.43	80.80	2,011.77	16.09	52.69	14,446,203.82	1,707,013.94	39.77860368	-80.76295973
2,108.00	4.89	80.54	2,104.39	17.45	60.95	14,446,205.17	1,707,022.20	39.77860735	-80.76293034
2,203.00	5.11	71.50	2,199.03	19.46	68.95	14,446,207.18	1,707,030.20	39.77861280	-80.76290183
2,297.00	4.88	66.20	2,292.68	22.40	76.58	14,446,210.12	1,707,037.83	39.77862083	-80.76287465
2,391.00	4.08	70.57	2,386.39	25.12	83.39	14,446,212.85	1,707,044.64	39.77862826	-80.76285038
2,486.00	4.54	78.37	2,481.12	27.01	90.26	14,446,214.73	1,707,051.51	39.77863338	-80.76282591
2,580.00	5.08	77.16	2,574.79	28.88	97.97	14,446,216.41	1,707,059.21	39.77863793	-80.76279848
2,674.00	4.73	68.40	2,668.45	31.03	105.63	14,446,218.76	1,707,066.88	39.77864433	-80.76277119
2,768.00	4.90	68.84	2,762.12	33.91	112.97	14,446,221.63	1,707,074.22	39.77865217	-80.76274501

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WV Department of
Environmental Protection

Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
2,801.00	4.94	69.37	2,794.99	34.92	115.62	14,446,222.64	1,707,076.87	39.77865492	-80.76273559
2,863.00	5.04	69.47	2,856.76	36.81	120.67	14,446,224.54	1,707,081.92	39.77866009	-80.76271760
2,957.00	4.38	71.07	2,950.44	39.43	127.93	14,446,227.15	1,707,089.18	39.77866722	-80.76269173
3,052.00	3.98	78.57	3,045.19	41.26	134.59	14,446,228.98	1,707,095.84	39.77867219	-80.76266800
3,147.00	4.65	82.99	3,139.92	42.38	141.65	14,446,230.11	1,707,102.90	39.77867523	-80.76264288
3,241.00	5.33	82.62	3,233.56	43.41	149.76	14,446,231.13	1,707,111.01	39.77867799	-80.76261400
3,335.00	5.30	81.86	3,327.16	44.58	158.39	14,446,232.31	1,707,119.63	39.77868115	-80.76258328
3,429.00	5.50	80.60	3,420.74	45.93	167.13	14,446,233.66	1,707,128.38	39.77868480	-80.76255215
3,524.00	5.68	79.41	3,515.29	47.54	176.24	14,446,235.26	1,707,137.49	39.77868914	-80.76251970
3,618.00	5.55	78.90	3,608.84	49.27	185.27	14,446,236.99	1,707,146.52	39.77869383	-80.76248754
3,713.00	5.22	75.79	3,703.42	51.21	193.97	14,446,238.94	1,707,155.22	39.77869911	-80.76245656
3,808.00	4.64	73.16	3,798.07	53.39	201.84	14,446,241.11	1,707,163.09	39.77870502	-80.76242854
3,901.00	3.72	81.82	3,890.82	54.91	208.42	14,446,242.63	1,707,169.67	39.77870915	-80.76240508
3,996.00	3.31	93.17	3,985.64	55.19	214.21	14,446,242.92	1,707,175.46	39.77870989	-80.76238448
4,090.00	3.40	98.20	4,079.48	54.65	219.68	14,446,242.37	1,707,180.93	39.77870835	-80.76236502
4,186.00	3.47	96.95	4,175.31	53.89	225.38	14,446,241.61	1,707,186.63	39.77870623	-80.76234473
4,280.00	3.79	92.01	4,269.12	53.44	231.31	14,446,241.16	1,707,192.56	39.77870494	-80.76232363
4,374.00	5.15	89.39	4,362.83	53.37	238.64	14,446,241.10	1,707,199.86	39.77870471	-80.76229757
4,468.00	4.92	83.41	4,456.47	53.88	246.86	14,446,241.60	1,707,208.11	39.77870604	-80.76226829
4,562.00	4.86	82.39	4,550.13	54.87	254.81	14,446,242.59	1,707,216.06	39.77870870	-80.76223998
4,656.00	6.43	81.40	4,643.67	56.18	263.96	14,446,243.91	1,707,225.21	39.77871225	-80.76220740
4,750.00	6.89	78.87	4,737.03	58.06	274.70	14,446,245.78	1,707,235.95	39.77871732	-80.76216917
4,844.00	6.66	86.12	4,830.38	59.52	285.67	14,446,247.24	1,707,246.92	39.77872124	-80.76213010
4,938.00	6.73	93.13	4,923.74	59.58	296.61	14,446,247.31	1,707,257.86	39.77872135	-80.76209117
5,032.00	6.05	93.36	5,017.16	58.99	307.05	14,446,246.72	1,707,268.30	39.77871965	-80.76205400
5,126.00	5.25	86.57	5,110.70	58.96	316.29	14,446,246.69	1,707,277.54	39.77871949	-80.76202112
5,220.00	5.31	84.64	5,204.30	59.62	324.91	14,446,247.35	1,707,286.16	39.77872125	-80.76199042
5,314.00	5.43	81.51	5,297.89	60.69	333.64	14,446,248.41	1,707,294.89	39.77872410	-80.76195934
5,408.00	5.19	81.72	5,391.49	61.96	342.25	14,446,249.68	1,707,303.50	39.77872753	-80.76192869
5,502.00	5.39	83.78	5,485.08	63.05	350.85	14,446,250.77	1,707,312.09	39.77873046	-80.76189809
5,597.00	5.27	83.36	5,579.67	64.03	359.62	14,446,251.76	1,707,320.86	39.77873311	-80.76186687
5,691.00	5.24	86.15	5,673.28	64.82	368.19	14,446,252.55	1,707,329.43	39.77873521	-80.76183635
5,784.00	5.39	87.50	5,765.88	65.30	376.79	14,446,253.02	1,707,338.04	39.77873645	-80.76180573
5,879.00	5.51	86.66	5,860.45	65.76	385.80	14,446,253.48	1,707,347.05	39.77873765	-80.76177366
5,973.00	5.17	86.58	5,954.04	66.27	394.53	14,446,254.00	1,707,355.78	39.77873900	-80.76174257
6,067.00	5.78	86.92	6,047.61	66.78	403.48	14,446,254.51	1,707,364.73	39.77874033	-80.76171069
6,161.00	5.63	86.44	6,141.15	67.32	412.81	14,446,255.05	1,707,374.06	39.77874175	-80.76167749
6,256.00	5.35	88.88	6,235.71	67.70	421.89	14,446,255.42	1,707,383.14	39.77874271	-80.76164517
6,350.00	5.12	80.68	6,329.32	68.46	430.41	14,446,256.19	1,707,391.66	39.77874475	-80.76161483
6,444.00	4.70	76.00	6,422.98	70.07	438.29	14,446,257.80	1,707,399.54	39.77874912	-80.76158679
Survey @ 6444.00 MD 6422.98 TVD									
6,500.00	4.70	76.00	6,478.79	71.18	442.74	14,446,258.91	1,707,403.99	39.77875213	-80.76157093
6,544.00	4.70	76.00	6,522.64	72.05	446.24	14,446,259.78	1,707,407.49	39.77875450	-80.76155847
KOP Begin 2°/100' turn									
6,600.00	4.50	89.78	6,578.46	72.62	450.66	14,446,260.34	1,707,411.91	39.77875602	-80.76154272
6,681.27	4.70	110.00	6,659.48	71.49	456.98	14,446,259.22	1,707,418.23	39.77875288	-80.76152023
Begin 4.70° tangent									
6,700.00	4.70	110.00	6,678.14	70.97	458.42	14,446,258.69	1,707,419.67	39.77875143	-80.76151511
6,800.00	4.70	110.00	6,777.80	68.16	466.12	14,446,255.89	1,707,427.37	39.77874367	-80.76148773
6,900.00	4.70	110.00	6,877.47	65.36	473.82	14,446,253.09	1,707,435.07	39.77873592	-80.76146035
7,000.00	4.70	110.00	6,977.13	62.56	481.52	14,446,250.29	1,707,442.77	39.77872817	-80.76143297
7,100.00	4.70	110.00	7,076.80	59.76	489.22	14,446,247.48	1,707,450.47	39.77872041	-80.76140559
7,200.00	4.70	110.00	7,176.46	56.95	496.92	14,446,244.68	1,707,458.17	39.77871266	-80.76137821
7,300.00	4.70	110.00	7,276.12	54.15	504.62	14,446,241.88	1,707,465.87	39.77870491	-80.76135083

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WV Department of Environmental Protection

Database:	DB_Dec2220_v16	**Local Co-ordinate Reference:**	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	**TVD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	**MD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-21 HU (slot V)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
7,400.00	4.70	110.00	7,375.79	51.35	512.32	14,446,239.08	1,707,473.57	39.77869716	-80.76132346
7,500.00	4.70	110.00	7,475.45	48.55	520.02	14,446,236.27	1,707,481.27	39.77868940	-80.76129608
7,600.00	4.70	110.00	7,575.11	45.74	527.72	14,446,233.47	1,707,488.97	39.77868165	-80.76126870
7,700.00	4.70	110.00	7,674.78	42.94	535.42	14,446,230.67	1,707,496.67	39.77867390	-80.76124132
7,800.00	4.70	110.00	7,774.44	40.14	543.12	14,446,227.87	1,707,504.37	39.77866615	-80.76121394
7,900.00	4.70	110.00	7,874.11	37.34	550.82	14,446,225.06	1,707,512.07	39.77865839	-80.76118656
8,000.00	4.70	110.00	7,973.77	34.53	558.52	14,446,222.26	1,707,519.77	39.77865064	-80.76115918
8,100.00	4.70	110.00	8,073.43	31.73	566.22	14,446,219.46	1,707,527.47	39.77864289	-80.76113180
8,200.00	4.70	110.00	8,173.10	28.93	573.92	14,446,216.66	1,707,535.17	39.77863513	-80.76110442
8,300.00	4.70	110.00	8,272.76	26.13	581.62	14,446,213.85	1,707,542.87	39.77862738	-80.76107705
8,400.00	4.70	110.00	8,372.42	23.33	589.32	14,446,211.05	1,707,550.57	39.77861963	-80.76104967
8,500.00	4.70	110.00	8,472.09	20.52	597.02	14,446,208.25	1,707,558.27	39.77861188	-80.76102229
8,600.00	4.70	110.00	8,571.75	17.72	604.72	14,446,205.45	1,707,565.97	39.77860412	-80.76099491
8,700.00	4.70	110.00	8,671.42	14.92	612.42	14,446,202.64	1,707,573.67	39.77859637	-80.76096753
8,800.00	4.70	110.00	8,771.08	12.12	620.12	14,446,199.84	1,707,581.37	39.77858862	-80.76094015
8,900.00	4.70	110.00	8,870.74	9.31	627.82	14,446,197.04	1,707,589.07	39.77858087	-80.76091277
9,000.00	4.70	110.00	8,970.41	6.51	635.52	14,446,194.24	1,707,596.77	39.77857311	-80.76088539
9,100.00	4.70	110.00	9,070.07	3.71	643.22	14,446,191.43	1,707,604.47	39.77856536	-80.76085802
9,200.00	4.70	110.00	9,169.73	0.91	650.92	14,446,188.63	1,707,612.17	39.77855761	-80.76083064
9,300.00	4.70	110.00	9,269.40	-1.90	658.62	14,446,185.83	1,707,619.87	39.77854985	-80.76080326
9,400.00	4.70	110.00	9,369.06	-4.70	666.32	14,446,183.03	1,707,627.57	39.77854210	-80.76077588
9,500.00	4.70	110.00	9,468.73	-7.50	674.02	14,446,180.22	1,707,635.27	39.77853435	-80.76074850
9,600.00	4.70	110.00	9,568.39	-10.30	681.72	14,446,177.42	1,707,642.96	39.77852660	-80.76072112
9,700.00	4.70	110.00	9,668.05	-13.11	689.42	14,446,174.62	1,707,650.66	39.77851884	-80.76069374
9,800.00	4.70	110.00	9,767.72	-15.91	697.12	14,446,171.82	1,707,658.36	39.77851109	-80.76066637
9,900.00	4.70	110.00	9,867.38	-18.71	704.82	14,446,169.01	1,707,666.06	39.77850334	-80.76063899
10,000.00	4.70	110.00	9,967.04	-21.51	712.51	14,446,166.21	1,707,673.76	39.77849558	-80.76061161
10,100.00	4.70	110.00	10,066.71	-24.32	720.21	14,446,163.41	1,707,681.46	39.77848783	-80.76058423
10,135.41	4.70	110.00	10,102.00	-25.31	722.94	14,446,162.42	1,707,684.19	39.77848509	-80.76057453
9 5/8" Csg 10135.41 MD 10102.00 TVD									
10,200.00	4.70	110.00	10,166.37	-27.12	727.91	14,446,160.61	1,707,689.16	39.77848008	-80.76055685
10,300.00	4.70	110.00	10,266.04	-29.92	735.61	14,446,157.80	1,707,696.86	39.77847233	-80.76052947
10,400.00	4.70	110.00	10,365.70	-32.72	743.31	14,446,155.00	1,707,704.56	39.77846457	-80.76050209
10,500.00	4.70	110.00	10,465.36	-35.53	751.01	14,446,152.20	1,707,712.26	39.77845682	-80.76047471
10,600.00	4.70	110.00	10,565.03	-38.33	758.71	14,446,149.40	1,707,719.96	39.77844907	-80.76044734
10,700.00	4.70	110.00	10,664.69	-41.13	766.41	14,446,146.59	1,707,727.66	39.77844131	-80.76041996
10,762.81	4.70	110.00	10,727.29	-42.89	771.25	14,446,144.83	1,707,732.50	39.77843644	-80.76040276
Begin 8°/100' build/turn									
10,800.00	7.35	96.86	10,764.27	-43.70	775.04	14,446,144.03	1,707,736.29	39.77843420	-80.76038926
10,850.00	11.18	89.45	10,813.61	-44.03	783.07	14,446,143.69	1,707,744.32	39.77843322	-80.76036069
10,900.00	15.10	85.61	10,862.29	-43.51	794.42	14,446,144.21	1,707,755.67	39.77843457	-80.76032030
10,950.00	19.05	83.65	10,910.08	-42.13	809.03	14,446,145.59	1,707,770.28	39.77843825	-80.76026829
11,000.00	23.01	82.21	10,956.74	-39.91	826.83	14,446,147.82	1,707,788.07	39.77844424	-80.76020492
11,050.00	26.99	81.18	11,002.05	-36.84	847.73	14,446,150.89	1,707,808.98	39.77845250	-80.76013049
11,100.00	30.97	80.39	11,045.78	-32.95	871.63	14,446,154.77	1,707,832.88	39.77846301	-80.76004537
11,150.00	34.96	79.77	11,087.72	-28.26	898.43	14,446,159.47	1,707,859.67	39.77847570	-80.75994996
11,200.00	38.95	79.26	11,127.67	-22.78	927.97	14,446,164.94	1,707,889.22	39.77849052	-80.75984474
11,250.00	42.94	78.83	11,165.43	-16.55	960.13	14,446,171.17	1,707,921.38	39.77850739	-80.75973022
11,300.00	46.93	78.46	11,200.83	-9.60	994.75	14,446,178.13	1,707,955.99	39.77852623	-80.75960696
11,350.00	50.92	78.14	11,233.67	-1.95	1,031.65	14,446,185.77	1,707,992.89	39.77854695	-80.75947555
11,400.00	54.91	77.85	11,263.82	6.34	1,070.65	14,446,194.07	1,708,031.90	39.77856945	-80.75933663
11,450.00	58.91	77.59	11,291.11	15.25	1,111.58	14,446,202.98	1,708,072.82	39.77859362	-80.75919089
11,500.00	62.90	77.35	11,315.42	24.74	1,154.22	14,446,212.46	1,708,115.46	39.77861935	-80.75903903
11,550.00	66.90	77.12	11,336.62	34.74	1,198.37	14,446,222.47	1,708,159.61	39.77864649	-80.75888179

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TUG HILL OPERATING

Planning Report - Geographic

Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,600.00	70.89	76.91	11,354.63	45.22	1,243.81	14,446,232.94	1,708,205.06	39.77867493	-80.75871995
11,650.00	74.89	76.71	11,369.33	56.12	1,290.33	14,446,243.85	1,708,251.57	39.77870453	-80.75855428
11,700.00	78.88	76.52	11,380.68	67.39	1,337.69	14,446,255.12	1,708,298.94	39.77873514	-80.75838559
11,750.00	82.88	76.33	11,388.60	78.98	1,385.67	14,446,266.71	1,708,346.92	39.77876661	-80.75821471
11,800.00	86.87	76.14	11,393.07	90.83	1,434.03	14,446,278.55	1,708,395.28	39.77879878	-80.75804247
11,825.11	88.88	76.05	11,394.00	96.86	1,458.38	14,446,284.58	1,708,419.63	39.77881516	-80.75795573
Begin 91.00° lateral									
11,900.00	88.88	76.05	11,395.46	114.91	1,531.05	14,446,302.63	1,708,492.30	39.77886419	-80.75769690
12,000.00	88.88	76.05	11,397.41	139.01	1,628.08	14,446,326.74	1,708,589.33	39.77892967	-80.75735130
12,100.00	88.88	76.05	11,399.37	163.11	1,725.11	14,446,350.84	1,708,686.36	39.77899514	-80.75700571
12,200.00	88.88	76.05	11,401.32	187.22	1,822.15	14,446,374.94	1,708,783.40	39.77906061	-80.75666011
12,212.11	88.88	76.05	11,401.56	190.14	1,833.90	14,446,377.86	1,708,795.14	39.77906853	-80.75661826
Begin 6.25°/100' turn									
12,250.00	88.91	73.68	11,402.29	200.03	1,870.46	14,446,387.75	1,708,831.71	39.77909542	-80.75648801
12,300.00	88.95	70.55	11,403.22	215.38	1,918.03	14,446,403.10	1,708,879.28	39.77913723	-80.75631855
12,350.00	89.00	67.42	11,404.12	233.31	1,964.69	14,446,421.03	1,708,925.94	39.77918611	-80.75615229
12,400.00	89.05	64.29	11,404.97	253.75	2,010.31	14,446,441.48	1,708,971.56	39.77924192	-80.75598974
12,450.00	89.10	61.16	11,405.77	276.66	2,054.74	14,446,464.38	1,709,015.99	39.77930450	-80.75583138
12,500.00	89.16	58.03	11,406.53	301.96	2,097.85	14,446,489.68	1,709,059.10	39.77937365	-80.75567768
12,550.00	89.21	54.90	11,407.24	329.57	2,139.52	14,446,517.30	1,709,100.77	39.77944917	-80.75552910
12,600.00	89.27	51.77	11,407.90	359.42	2,179.62	14,446,547.14	1,709,140.87	39.77953084	-80.75538608
12,650.00	89.34	48.65	11,408.51	391.41	2,218.03	14,446,579.14	1,709,179.28	39.77961841	-80.75524904
12,700.00	89.40	45.52	11,409.06	425.45	2,254.64	14,446,613.18	1,709,215.89	39.77971163	-80.75511841
12,750.00	89.47	42.39	11,409.56	461.44	2,289.34	14,446,649.17	1,709,250.59	39.77981020	-80.75499456
12,800.00	89.53	39.26	11,409.99	499.27	2,322.02	14,446,687.00	1,709,283.27	39.77991385	-80.75487787
12,850.00	89.60	36.13	11,410.37	538.83	2,352.59	14,446,726.56	1,709,313.64	39.78002226	-80.75476868
12,900.00	89.67	33.00	11,410.69	580.00	2,380.95	14,446,767.72	1,709,342.20	39.78013510	-80.75466732
12,950.00	89.74	29.87	11,410.94	622.65	2,407.03	14,446,810.38	1,709,368.28	39.78025204	-80.75457409
13,000.00	89.81	26.75	11,411.14	666.67	2,430.74	14,446,854.39	1,709,391.99	39.78037274	-80.75448927
13,050.00	89.89	23.62	11,411.27	711.91	2,452.01	14,446,899.63	1,709,413.26	39.78049683	-80.75441311
13,100.00	89.96	20.49	11,411.33	756.24	2,470.78	14,446,945.97	1,709,432.03	39.78062394	-80.75434585
13,150.00	90.03	17.36	11,411.34	805.54	2,486.99	14,446,993.26	1,709,448.24	39.78075369	-80.75428767
13,200.00	90.10	14.23	11,411.28	853.64	2,500.60	14,447,041.37	1,709,461.85	39.78088570	-80.75423876
13,250.00	90.18	11.10	11,411.16	902.42	2,511.57	14,447,090.14	1,709,472.82	39.78101957	-80.75419926
13,300.00	90.25	7.98	11,410.97	951.72	2,519.85	14,447,139.45	1,709,481.10	39.78115490	-80.75416929
13,350.00	90.32	4.85	11,410.72	1,001.40	2,525.44	14,447,189.13	1,709,486.69	39.78129130	-80.75414893
13,400.00	90.39	1.72	11,410.41	1,051.31	2,528.30	14,447,239.04	1,709,489.55	39.78142834	-80.75413825
13,450.00	90.46	358.59	11,410.05	1,101.30	2,528.43	14,447,289.03	1,709,489.68	39.78156564	-80.75413728
13,500.00	90.53	355.46	11,409.62	1,151.23	2,525.84	14,447,338.95	1,709,487.09	39.78170276	-80.75414603
13,550.00	90.59	352.33	11,409.13	1,200.94	2,520.53	14,447,388.66	1,709,481.77	39.78183931	-80.75416446
13,600.00	90.66	349.20	11,408.58	1,250.28	2,512.51	14,447,438.01	1,709,473.76	39.78197489	-80.75419252
13,650.00	90.72	346.08	11,407.98	1,299.11	2,501.81	14,447,486.84	1,709,463.05	39.78210907	-80.75423013
13,700.00	90.78	342.95	11,407.33	1,347.29	2,488.46	14,447,535.01	1,709,449.71	39.78224147	-80.75427718
13,750.00	90.84	339.82	11,406.63	1,394.66	2,472.50	14,447,582.38	1,709,433.75	39.78237169	-80.75433352
13,800.00	90.89	336.69	11,405.87	1,441.09	2,453.98	14,447,628.81	1,709,415.23	39.78249934	-80.75439899
13,850.00	90.94	333.56	11,405.07	1,486.44	2,432.95	14,447,674.16	1,709,394.20	39.78262404	-80.75447340
13,900.00	90.99	330.43	11,404.23	1,530.57	2,409.48	14,447,718.30	1,709,370.73	39.78274542	-80.75455651
13,906.82	91.00	330.00	11,404.11	1,536.49	2,406.09	14,447,724.21	1,709,367.34	39.78276189	-80.75456851
Begin 91.00° lateral									
14,000.00	91.00	330.00	11,402.48	1,617.18	2,359.51	14,447,804.90	1,709,320.76	39.78298354	-80.75473351
14,100.00	91.00	330.00	11,400.74	1,703.77	2,309.53	14,447,891.50	1,709,270.78	39.78322182	-80.75491060
14,200.00	91.00	330.00	11,398.99	1,790.36	2,259.54	14,447,978.09	1,709,220.79	39.78346000	-80.75508768
14,300.00	91.00	330.00	11,397.25	1,876.95	2,209.55	14,448,064.68	1,709,170.80	39.78369818	-80.75526477
14,400.00	91.00	330.00	11,395.50	1,963.55	2,159.57	14,448,151.27	1,709,120.82	39.78393637	-80.75544186

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Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,500.00	91.00	330.00	11,393.76	2,050.14	2,109.58	14,448,237.87	1,709,070.83	39.78417455	-80.75561895
14,600.00	91.00	330.00	11,392.01	2,136.73	2,059.59	14,448,324.46	1,709,020.84	39.78441273	-80.75579604
14,700.00	91.00	330.00	11,390.27	2,223.33	2,009.61	14,448,411.05	1,708,970.85	39.78465091	-80.75597313
14,800.00	91.00	330.00	11,388.52	2,309.92	1,959.62	14,448,497.64	1,708,920.87	39.78488909	-80.75615022
14,900.00	91.00	330.00	11,386.78	2,396.51	1,909.63	14,448,584.24	1,708,870.88	39.78512727	-80.75632732
15,000.00	91.00	330.00	11,385.03	2,483.10	1,859.65	14,448,670.83	1,708,820.89	39.78536545	-80.75650441
15,100.00	91.00	330.00	11,383.29	2,569.70	1,809.66	14,448,757.42	1,708,770.91	39.78560363	-80.75668151
15,200.00	91.00	330.00	11,381.54	2,656.29	1,759.67	14,448,844.01	1,708,720.92	39.78584181	-80.75685861
15,300.00	91.00	330.00	11,379.80	2,742.88	1,709.69	14,448,930.61	1,708,670.93	39.78607999	-80.75703571
15,400.00	91.00	330.00	11,378.05	2,829.47	1,659.70	14,449,017.20	1,708,620.95	39.78631817	-80.75721281
15,500.00	91.00	330.00	11,376.31	2,916.07	1,609.71	14,449,103.79	1,708,570.96	39.78655635	-80.75738991
15,600.00	91.00	330.00	11,374.56	3,002.66	1,559.73	14,449,190.38	1,708,520.97	39.78679453	-80.75756701
15,700.00	91.00	330.00	11,372.82	3,089.25	1,509.74	14,449,276.98	1,708,470.99	39.78703270	-80.75774412
15,800.00	91.00	330.00	11,371.07	3,175.84	1,459.75	14,449,363.57	1,708,421.00	39.78727088	-80.75792122
15,900.00	91.00	330.00	11,369.33	3,262.44	1,409.76	14,449,450.16	1,708,371.01	39.78750906	-80.75809833
16,000.00	91.00	330.00	11,367.58	3,349.03	1,359.78	14,449,536.75	1,708,321.03	39.78774724	-80.75827544
16,100.00	91.00	330.00	11,365.84	3,435.62	1,309.79	14,449,623.35	1,708,271.04	39.78798541	-80.75845254
16,200.00	91.00	330.00	11,364.09	3,522.21	1,259.80	14,449,709.94	1,708,221.05	39.78822359	-80.75862965
16,300.00	91.00	330.00	11,362.35	3,608.81	1,209.82	14,449,796.53	1,708,171.07	39.78846177	-80.75880677
16,400.00	91.00	330.00	11,360.60	3,695.40	1,159.83	14,449,883.13	1,708,121.08	39.78869994	-80.75898388
16,500.00	91.00	330.00	11,358.86	3,781.99	1,109.84	14,449,969.72	1,708,071.09	39.78893812	-80.75916099
16,600.00	91.00	330.00	11,357.11	3,868.58	1,059.86	14,450,056.31	1,708,021.11	39.78917630	-80.75933811
16,700.00	91.00	330.00	11,355.37	3,955.18	1,009.87	14,450,142.90	1,707,971.12	39.78941447	-80.75951522
16,800.00	91.00	330.00	11,353.62	4,041.77	959.88	14,450,229.50	1,707,921.13	39.78965265	-80.75969234
16,900.00	91.00	330.00	11,351.88	4,128.36	909.90	14,450,316.09	1,707,871.15	39.78989082	-80.75986946
17,000.00	91.00	330.00	11,350.13	4,214.95	859.91	14,450,402.68	1,707,821.16	39.79012900	-80.76004658
17,100.00	91.00	330.00	11,348.39	4,301.55	809.92	14,450,489.27	1,707,771.17	39.79036717	-80.76022370
17,200.00	91.00	330.00	11,346.64	4,388.14	759.94	14,450,575.87	1,707,721.19	39.79060534	-80.76040082
17,300.00	91.00	330.00	11,344.90	4,474.73	709.95	14,450,662.46	1,707,671.20	39.79084352	-80.76057794
17,400.00	91.00	330.00	11,343.15	4,561.33	659.96	14,450,749.05	1,707,621.21	39.79108169	-80.76075507
17,500.00	91.00	330.00	11,341.41	4,647.92	609.98	14,450,835.64	1,707,571.22	39.79131987	-80.76093220
17,600.00	91.00	330.00	11,339.66	4,734.51	559.99	14,450,922.24	1,707,521.24	39.79155804	-80.76110932
17,700.00	91.00	330.00	11,337.92	4,821.10	510.00	14,451,008.83	1,707,471.25	39.79179621	-80.76128645
17,800.00	91.00	330.00	11,336.17	4,907.70	460.02	14,451,095.42	1,707,421.26	39.79203438	-80.76146358
17,900.00	91.00	330.00	11,334.43	4,994.29	410.03	14,451,182.01	1,707,371.28	39.79227256	-80.76164071
18,000.00	91.00	330.00	11,332.68	5,080.88	360.04	14,451,268.61	1,707,321.29	39.79251073	-80.76181784
18,100.00	91.00	330.00	11,330.94	5,167.47	310.06	14,451,355.20	1,707,271.30	39.79274890	-80.76199498
18,200.00	91.00	330.00	11,329.19	5,254.07	260.07	14,451,441.79	1,707,221.32	39.79298707	-80.76217211
18,300.00	91.00	330.00	11,327.45	5,340.66	210.08	14,451,528.38	1,707,171.33	39.79322524	-80.76234925
18,400.00	91.00	330.00	11,325.70	5,427.25	160.10	14,451,614.98	1,707,121.34	39.79346341	-80.76252638
18,500.00	91.00	330.00	11,323.96	5,513.84	110.11	14,451,701.57	1,707,071.36	39.79370158	-80.76270352
18,600.00	91.00	330.00	11,322.21	5,600.44	60.12	14,451,788.16	1,707,021.37	39.79393975	-80.76288066
18,700.00	91.00	330.00	11,320.47	5,687.03	10.13	14,451,874.75	1,706,971.38	39.79417792	-80.76305780
18,800.00	91.00	330.00	11,318.72	5,773.62	-39.85	14,451,961.35	1,706,921.40	39.79441609	-80.76323494
18,900.00	91.00	330.00	11,316.98	5,860.21	-89.84	14,452,047.94	1,706,871.41	39.79465426	-80.76341209
19,000.00	91.00	330.00	11,315.23	5,946.81	-139.83	14,452,134.53	1,706,821.42	39.79489243	-80.76358923
19,100.00	91.00	330.00	11,313.49	6,033.40	-189.81	14,452,221.13	1,706,771.44	39.79513060	-80.76376637
19,200.00	91.00	330.00	11,311.74	6,119.99	-239.80	14,452,307.72	1,706,721.45	39.79536877	-80.76394352
19,300.00	91.00	330.00	11,310.00	6,206.58	-289.79	14,452,394.31	1,706,671.46	39.79560694	-80.76412067
19,400.00	91.00	330.00	11,308.25	6,293.18	-339.77	14,452,480.90	1,706,621.48	39.79584510	-80.76429782
19,500.00	91.00	330.00	11,306.51	6,379.77	-389.76	14,452,567.50	1,706,571.49	39.79608327	-80.76447497
19,600.00	91.00	330.00	11,304.76	6,466.36	-439.75	14,452,654.09	1,706,521.50	39.79632144	-80.76465212
19,700.00	91.00	330.00	11,303.02	6,552.95	-489.73	14,452,740.68	1,706,471.52	39.79655961	-80.76482927
19,800.00	91.00	330.00	11,301.27	6,639.55	-539.72	14,452,827.27	1,706,421.53	39.79679777	-80.76500643
19,900.00	91.00	330.00	11,299.53	6,726.14	-589.71	14,452,913.87	1,706,371.54	39.79703594	-80.76518358

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WV Department of Environmental Protection

Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1285+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia	MD Reference:	RKB=1285+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 boolleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
20,000.00	91.00	330.00	11,297.78	6,812.73	-639.69	14,453,000.46	1,706,321.56	39.79727411	-80.76536074
20,100.00	91.00	330.00	11,296.04	6,899.33	-689.68	14,453,087.05	1,706,271.57	39.79751227	-80.76553790
20,200.00	91.00	330.00	11,294.29	6,985.92	-739.67	14,453,173.64	1,706,221.58	39.79775044	-80.76571506
20,300.00	91.00	330.00	11,292.55	7,072.51	-789.65	14,453,260.24	1,706,171.60	39.79798860	-80.76589221
20,400.00	91.00	330.00	11,290.80	7,159.10	-839.64	14,453,346.83	1,706,121.61	39.79822677	-80.76606938
20,500.00	91.00	330.00	11,289.06	7,245.70	-889.63	14,453,433.42	1,706,071.62	39.79846493	-80.76624654
20,600.00	91.00	330.00	11,287.31	7,332.29	-939.61	14,453,520.01	1,706,021.63	39.79870310	-80.76642370
20,700.00	91.00	330.00	11,285.57	7,418.88	-989.60	14,453,606.61	1,705,971.65	39.79894126	-80.76660087
20,800.00	91.00	330.00	11,283.82	7,505.47	-1,039.59	14,453,693.20	1,705,921.66	39.79917943	-80.76677803
20,900.00	91.00	330.00	11,282.08	7,592.07	-1,089.57	14,453,779.79	1,705,871.67	39.79941759	-80.76695520
21,000.00	91.00	330.00	11,280.33	7,678.66	-1,139.56	14,453,866.38	1,705,821.69	39.79965575	-80.76713237
21,100.00	91.00	330.00	11,278.59	7,765.25	-1,189.55	14,453,952.98	1,705,771.70	39.79989392	-80.76730954
21,200.00	91.00	330.00	11,276.84	7,851.84	-1,239.53	14,454,039.57	1,705,721.71	39.80013208	-80.76748671
21,300.00	91.00	330.00	11,275.10	7,938.44	-1,289.52	14,454,126.16	1,705,671.73	39.80037024	-80.76766388
21,400.00	91.00	330.00	11,273.35	8,025.03	-1,339.51	14,454,212.75	1,705,621.74	39.80060841	-80.76784105
21,500.00	91.00	330.00	11,271.61	8,111.62	-1,389.49	14,454,299.35	1,705,571.75	39.80084657	-80.76801823
21,600.00	91.00	330.00	11,269.86	8,198.21	-1,439.48	14,454,385.94	1,705,521.77	39.80108473	-80.76819541
21,700.00	91.00	330.00	11,268.12	8,284.81	-1,489.47	14,454,472.53	1,705,471.78	39.80132289	-80.76837258
21,800.00	91.00	330.00	11,266.37	8,371.40	-1,539.46	14,454,559.13	1,705,421.79	39.80156105	-80.76854976
21,900.00	91.00	330.00	11,264.63	8,457.99	-1,589.44	14,454,645.72	1,705,371.81	39.80179921	-80.76872694
22,000.00	91.00	330.00	11,262.88	8,544.58	-1,639.43	14,454,732.31	1,705,321.82	39.80203737	-80.76890412
22,100.00	91.00	330.00	11,261.14	8,631.18	-1,689.42	14,454,818.90	1,705,271.83	39.80227553	-80.76908130
22,200.00	91.00	330.00	11,259.39	8,717.77	-1,739.40	14,454,905.50	1,705,221.85	39.80251370	-80.76925849
22,300.00	91.00	330.00	11,257.65	8,804.36	-1,789.39	14,454,992.09	1,705,171.86	39.80275186	-80.76943567
22,400.00	91.00	330.00	11,255.90	8,890.95	-1,839.38	14,455,078.68	1,705,121.87	39.80299001	-80.76961286
22,500.00	91.00	330.00	11,254.16	8,977.55	-1,889.36	14,455,165.27	1,705,071.89	39.80322817	-80.76979004
22,600.00	91.00	330.00	11,252.41	9,064.14	-1,939.35	14,455,251.87	1,705,021.90	39.80346633	-80.76996723
22,700.00	91.00	330.00	11,250.67	9,150.73	-1,989.34	14,455,338.46	1,704,971.91	39.80370449	-80.77014442
22,800.00	91.00	330.00	11,248.92	9,237.33	-2,039.32	14,455,425.05	1,704,921.93	39.80394265	-80.77032161
22,900.00	91.00	330.00	11,247.18	9,323.92	-2,089.31	14,455,511.64	1,704,871.94	39.80418081	-80.77049880
23,000.00	91.00	330.00	11,245.43	9,410.51	-2,139.30	14,455,598.24	1,704,821.95	39.80441897	-80.77067600
23,100.00	91.00	330.00	11,243.69	9,497.10	-2,189.28	14,455,684.83	1,704,771.97	39.80465712	-80.77085319
23,200.00	91.00	330.00	11,241.94	9,583.70	-2,239.27	14,455,771.42	1,704,721.98	39.80489528	-80.77103039
23,300.00	91.00	330.00	11,240.20	9,670.29	-2,289.26	14,455,858.01	1,704,671.99	39.80513344	-80.77120758
23,400.00	91.00	330.00	11,238.45	9,756.88	-2,339.24	14,455,944.61	1,704,622.00	39.80537160	-80.77138478
23,500.00	91.00	330.00	11,236.71	9,843.47	-2,389.23	14,456,031.20	1,704,572.02	39.80560975	-80.77156198
23,600.00	91.00	330.00	11,234.96	9,930.07	-2,439.22	14,456,117.79	1,704,522.03	39.80584791	-80.77173918
23,700.00	91.00	330.00	11,233.22	10,016.66	-2,489.20	14,456,204.38	1,704,472.04	39.80608607	-80.77191638
23,800.00	91.00	330.00	11,231.47	10,103.25	-2,539.19	14,456,290.98	1,704,422.06	39.80632422	-80.77209358
23,900.00	91.00	330.00	11,229.73	10,189.84	-2,589.18	14,456,377.57	1,704,372.07	39.80656238	-80.77227079
24,000.00	91.00	330.00	11,227.98	10,276.44	-2,639.16	14,456,464.16	1,704,322.08	39.80680053	-80.77244799
24,100.00	91.00	330.00	11,226.24	10,363.03	-2,689.15	14,456,550.75	1,704,272.10	39.80703869	-80.77262520
24,200.00	91.00	330.00	11,224.49	10,449.62	-2,739.14	14,456,637.35	1,704,222.11	39.80727684	-80.77280241
24,300.00	91.00	330.00	11,222.75	10,536.21	-2,789.12	14,456,723.94	1,704,172.12	39.80751500	-80.77297961
24,400.00	91.00	330.00	11,221.00	10,622.81	-2,839.11	14,456,810.53	1,704,122.14	39.80775315	-80.77315682
24,500.00	91.00	330.00	11,219.26	10,709.40	-2,889.10	14,456,897.13	1,704,072.15	39.80799130	-80.77333404
24,600.00	91.00	330.00	11,217.51	10,795.99	-2,939.09	14,456,983.72	1,704,022.16	39.80822946	-80.77351125
24,700.00	91.00	330.00	11,215.77	10,882.58	-2,989.07	14,457,070.31	1,703,972.18	39.80846761	-80.77368846
24,800.00	91.00	330.00	11,214.02	10,969.18	-3,039.06	14,457,156.90	1,703,922.19	39.80870576	-80.77386568
24,900.00	91.00	330.00	11,212.28	11,055.77	-3,089.05	14,457,243.50	1,703,872.20	39.80894392	-80.77404289
25,000.00	91.00	330.00	11,210.53	11,142.36	-3,139.03	14,457,330.09	1,703,822.22	39.80918207	-80.77422011
25,100.00	91.00	330.00	11,208.79	11,228.95	-3,189.02	14,457,416.68	1,703,772.23	39.80942022	-80.77439733
25,200.00	91.00	330.00	11,207.04	11,315.55	-3,239.01	14,457,503.27	1,703,722.24	39.80965837	-80.77457455
25,300.00	91.00	330.00	11,205.30	11,402.14	-3,288.99	14,457,589.87	1,703,672.26	39.80989653	-80.77475177
25,400.00	91.00	330.00	11,203.55	11,488.73	-3,338.98	14,457,676.46	1,703,622.27	39.81013468	-80.77492899

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WV Department of
Environmental Protection

Database:	DB_Dec2220_v16	Local Co-ordinate Reference:	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	TVD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	MD Reference:	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	North Reference:	Grid
Well:	Old Crow N-21 HU (slot V)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
25,500.00	91.00	330.00	11,201.81	11,575.33	-3,388.97	14,457,763.05	1,703,572.28	39.81037283	-80.77510622
25,600.00	91.00	330.00	11,200.06	11,661.92	-3,438.95	14,457,849.64	1,703,522.30	39.81061098	-80.77528344
25,700.00	91.00	330.00	11,198.32	11,748.51	-3,488.94	14,457,936.24	1,703,472.31	39.81084913	-80.77546067
25,800.00	91.00	330.00	11,196.57	11,835.10	-3,538.93	14,458,022.83	1,703,422.32	39.81108728	-80.77563789
25,900.00	91.00	330.00	11,194.83	11,921.70	-3,588.91	14,458,109.42	1,703,372.34	39.81132543	-80.77581512
26,000.00	91.00	330.00	11,193.08	12,008.29	-3,638.90	14,458,196.01	1,703,322.35	39.81156358	-80.77599235
26,100.00	91.00	330.00	11,191.34	12,094.88	-3,688.89	14,458,282.61	1,703,272.36	39.81180173	-80.77616958
26,200.00	91.00	330.00	11,189.59	12,181.47	-3,738.87	14,458,369.20	1,703,222.38	39.81203988	-80.77634681
26,300.00	91.00	330.00	11,187.85	12,268.07	-3,788.86	14,458,455.79	1,703,172.39	39.81227803	-80.77652405
26,400.00	91.00	330.00	11,186.10	12,354.66	-3,838.85	14,458,542.38	1,703,122.40	39.81251618	-80.77670128
26,500.00	91.00	330.00	11,184.36	12,441.25	-3,888.83	14,458,628.98	1,703,072.41	39.81275432	-80.77687852
26,600.00	91.00	330.00	11,182.61	12,527.84	-3,938.82	14,458,715.57	1,703,022.43	39.81299247	-80.77705575
26,700.00	91.00	330.00	11,180.87	12,614.44	-3,988.81	14,458,802.16	1,702,972.44	39.81323062	-80.77723299
26,800.00	91.00	330.00	11,179.12	12,701.03	-4,038.79	14,458,888.75	1,702,922.45	39.81346877	-80.77741023
26,900.00	91.00	330.00	11,177.38	12,787.62	-4,088.78	14,458,975.35	1,702,872.47	39.81370691	-80.77758747
27,000.00	91.00	330.00	11,175.63	12,874.21	-4,138.77	14,459,061.94	1,702,822.48	39.81394506	-80.77776471
27,100.00	91.00	330.00	11,173.89	12,960.81	-4,188.75	14,459,148.53	1,702,772.49	39.81418321	-80.77794196
27,200.00	91.00	330.00	11,172.14	13,047.40	-4,238.74	14,459,235.13	1,702,722.51	39.81442135	-80.77811920
27,300.00	91.00	330.00	11,170.40	13,133.99	-4,288.73	14,459,321.72	1,702,672.52	39.81465950	-80.77829645
27,400.00	91.00	330.00	11,168.65	13,220.58	-4,338.71	14,459,408.31	1,702,622.53	39.81489765	-80.77847369
27,500.00	91.00	330.00	11,166.91	13,307.18	-4,388.70	14,459,494.90	1,702,572.55	39.81513579	-80.77865094
27,600.00	91.00	330.00	11,165.16	13,393.77	-4,438.69	14,459,581.50	1,702,522.56	39.81537394	-80.77882819
27,700.00	91.00	330.00	11,163.42	13,480.36	-4,488.68	14,459,668.09	1,702,472.57	39.81561208	-80.77900544
27,800.00	91.00	330.00	11,161.67	13,566.95	-4,538.66	14,459,754.68	1,702,422.59	39.81585023	-80.77918269
27,838.54	91.00	330.00	11,161.00	13,600.33	-4,557.93	14,459,788.05	1,702,403.32	39.81594200	-80.77925100

PBHL/TD 27838.54 MD 11161.00 TVD

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL Old Crow N-21 HU - plan hits target center - Point	0.00	0.00	11,161.00	13,600.33	-4,557.93	14,459,788.05	1,702,403.32	39.81594200	-80.77925100
LP Old Crow N-21 HU r2 - plan misses target center by 1.08usft at 13908.35usft MD (11404.08 TVD, 1537.82 N, 2405.32 E) - Point	0.00	0.00	11,404.00	1,538.35	2,406.25	14,447,726.08	1,709,367.50	39.78276681	-80.75456791

10,135.41	10,102.00	9 5/8"	9-5/8	12-1/4	

02/25/2022

Database:	DB_Dec2220_v16	**Local Co-ordinate Reference:**	Well Old Crow N-21 HU (slot V)
Company:	Tug Hill Operating LLC	**TVD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Project:	Marshall County, West Virginia.	**MD Reference:**	RKB=1265+32.5 @ 1297.50usft (Nabors X14)
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-21 HU (slot V)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev4 bootleg		

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
6,444.00	6,422.98	70.07	438.29	Survey @ 6444.00 MD 6422.98 TVD
6,544.00	6,522.64	72.05	446.24	KOP Begin 2°/100' turn
6,681.27	6,659.48	71.49	456.98	Begin 4.70° tangent
10,135.41	10,102.00	-25.31	722.94	9 5/8" Csg 10135.41 MD 10102.00 TVD
10,762.81	10,727.29	-42.89	771.25	Begin 8°/100' build/turn
11,825.11	11,394.00	96.86	1,458.38	Begin 91.00° lateral
12,212.11	11,401.56	190.14	1,833.90	Begin 6.25°/100' turn
13,906.82	11,404.11	1,536.49	2,406.09	Begin 91.00° lateral
27,838.54	11,161.00	13,600.33	-4,557.93	PBHL/TD 27838.54 MD 11161.00 TVD

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TUG HILL OPERATING

Well Site Safety Plan
Part A – Site Specific Data and Figures

Well Name: Old Crow N-21HU
Pad Name: Old Crow
County: Marshall

UTM (meters), NAD83, Zone 17
Northing: 4,403,206.82
Easting: 520,282.83

MJK 2/16/2022

KEY CONTACT FOR WELL SITE SAFETY PLAN DEVELOPMENT AND MAINTENANCE

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FEB 17 2022
WV Department of
Environmental Protection

Jerry V. DeRosa, Director EH&S Affairs
(724) 338-2029 (office)
(412) 736-5767 (cellular)

24-HOUR EMERGENCY PHONE NUMBER

(800) 921-9745

02/25/2022

FORM WW 6 – SHEET 1

OLD CROW N LEASE
UTICA UNIT - 484.05 AC±
WELL 21HU
TUG HILL OPERATING

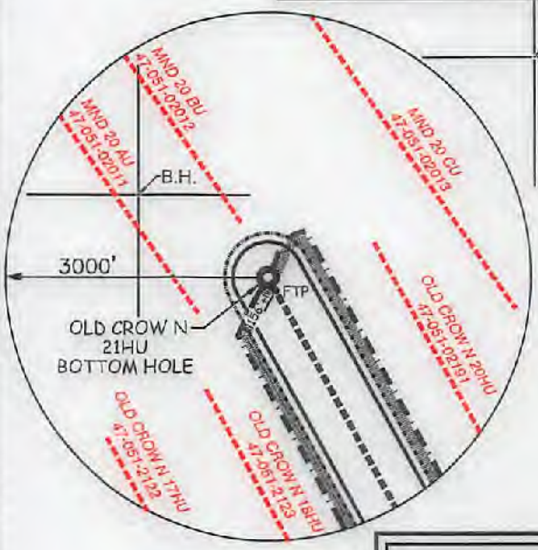
8,217' B.H. — 3,695' T.H.

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

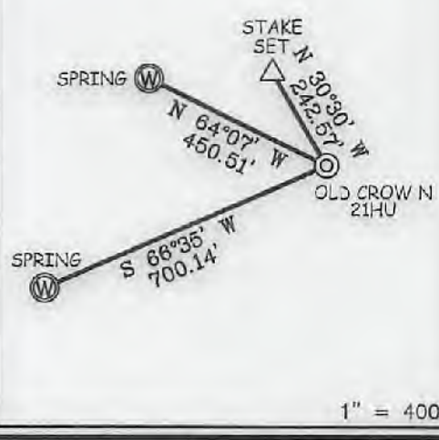
(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)		
NAD'83 S.P.C.(FT)	N. 468,186.86	E. 1,613,503.81
NAD'83 GEO.	LAT-(N) 39.778560	LONG-(W) 80.763147
NAD'83 UTM (M)	N. 4,403,206.82	E. 520,282.83
LANDING POINT/LTP		
NAD'83 S.P.C.(FT)	N. 469,663.5	E. 1,615,938.1
NAD'83 GEO.	LAT-(N) 39.782762	LONG-(W) 80.754569
NAD'83 UTM (M)	N. 4,403,675.1	E. 521,016.2
BOTTOM HOLE		
NAD'83 S.P.C.(FT)	N. 481,866.1	E. 1,609,172.2
NAD'83 GEO.	LAT-(N) 39.815942	LONG-(W) 80.779251
NAD'83 UTM (M)	N. 4,407,352.2	E. 518,893.6

T.H. LONGITUDE 80°45'00"
B.H. LONGITUDE 80°45'00"
4,775' T.H.
6,335' B.H.

MAP/PARCEL	ADJOINING SURFACE OWNER LIST	ACRES
5-9-4.3	HARRY E. JR. & MICHELA KARR	1.471
5-9-4.5	DYLAN AULENBACHER	0.991
5-9-4.7	FRANCIS D. BARR, ET UX	0.481
5-9-4.9	THOMAS MIDCAP, ET UX	0.375
5-9-4.11	GARY PORTER	1.00
5-9-4.12	SAMUEL L. & DEBRA N. CANTERBURY	0.650
5-9-4.13	SAMUEL LEE CANTERBURY, ET UX	0.9284
5-9-4.16	SAMUEL L. & DEBRA N. CANTERBURY	0.517
5-9-13	KAREN M. KAZEMKA (N.K.A. KAREN M. WILSON)	3.69
5-9-14	DENNIS P. CADMUS	136 POLES
5-9-15	DENNIS P. CADMUS	3.85
5-9-16	SHEENA ROSE	1.65
5-9-17	DENNIS P. CADMUS	28.063
5-9-28	WILLIAM N. & DELORES E. MCDONOUGH - LIFE	4.01
5-9-29	JAMES M. & ROBERTA L. STERN	3.1777
5-9-30	MATTHEW B. GRIFFITH	2.708
5-9-30.1	DAVID JR. & MELISSA LOVE	2.518
5-9-30.3	MATTHEW B. GRIFFITH	0.82
5-9-32	MILLARD JUNIOR BONNETTE, ET UX	2.321
5-9-32.3	RUBY M. HENRY ESTATE	0.552
5-9-32.4	DAVID D. & CHRISTINE S. DANIELS	1.025
5-9-32.5	GARNET D. MIDCAP	270'x390'
5-9-32.8	TIMOTHY Q. HOYT, ET UX	0.711
5-9-32.10	TIMOTHY Q. HOYT, ET UX	0.588
5-9-32.11	TIMOTHY Q. HOYT, ET UX	1.717
5-9-32.12	JOHN DRAKE ALBAUGH	1.09
5-9-33.1	KEITH D. & BEVERLY A. DANIELS	1.00
5-9-33.2	KEITH D. & BEVERLY A. DANIELS	1.534
5-9-33.4	DAVID D. & CHRISTINE S. DANIELS	1.025
5-9-36	FRANK T. & ANNA M. WALKER	1.55
5-9-37	FRANK T. & ANNA M. WALKER	10.857
5-9-38	SHIRLEY A. HILL ESTATE	3.331
5-9-38.10	ROBERT S. COWGILL	0.920
5-9-40	SHIRLEY A. HILL ESTATE	3.92
5-10-4.2	JACK E. RECTOR	2.887
5-10-4.3	ANTHONY A. & KAREN L. ANKROM	5.697
5-10-4.7	LINDA BECHTOLD, ET AL	2.110
5-10-4.8	SAMUEL FRANKLIN	1.8808
5-10-4.9	JAMES E. KAREN M. WILSON	0.8692
5-10-4.10	SHEENA ROSE	0.803
5-10-4.11	JASON E. BONNETTE	1.50
5-10-11	JOSEPH LEE CROW	LOT
5-10-19	BRADLEY L. & CONNIE L. HUBBARD	3.209
5-10-20	LOUIS AULENBAUCHER	3.554
5-10-21	LOUIS AULENBAUCHER	3.667



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 ARE 1"=2000'
3. PROPOSED LATERAL OR TOP HOLE OF PROPOSED OLD CROW N-21HU IS WITHIN 3000' OF THE TOP HOLES OR LATERALS OF EXISTING WELLS BRYAN N 13HU (47-051-02030), BRYAN N 14HU (47-051-02031), OLD CROW N-17HU (47-051-02122), OLD CROW N-18HU (47-051-02123), OLD CROW N-20HU (47-051-02191), MND20 AU (47-051-02011), MND20 BU (47-051-02012), MND20 CU (47-051-02013) & MND20 DU (47-051-02014).
4. THE ASSESSMENT OF THE 1/10 ACRE LOT, OWNED BY JASON J. STEED AND DESCRIBED AS THE SECOND PARCEL IN DEED BOOK 843 PAGE 319 AND CORRECTIVE DEED 843 PAGE 300, IS NOT CURRENTLY ACCOUNTED FOR WITHIN THE 135.61 ACRE ASSESSMENT OF SURFACE TAX MAP 5-9-13.2
5. THIS PLAT WAS CREATED FOR REVISED BOREHOLE PERMIT.
6. MINIMUM OFFSET SPACING REQUIREMENTS EXEMPTED BY WAIVER WITH THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS AND OFFSET LEASEHOLDER AGREEMENTS AS PROVIDED BY TUG HILL OPERATING.

SLS FROM THE GROUND UP
12 Vanhorn Drive | P.O. Box 150 | Glenville, WV 26351 | 304.462.5634
1412 Kanawha Boulevard, East | Charleston, WV 25301 | 304.346.3862
254 East Beckley Bypass | Beckley, WV 25801 | 304.255.5296
slswv.com

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

GREGORY A. SMITH LICENSED No. 677 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

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

DATE FEBRUARY 28, 20 20

REVISED AUGUST 3, 2020 & FEBRUARY 11, 2022

OPERATORS WELL NO. OLD CROW N-21HU

API WELL NO. 47 — 051 — 02335
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500

FILE NO. 8796P21HUR2.dwg
OLD CROW NORTH 21HU REV4

SCALE 1" = 2000'

HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK)

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

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___ IF "GAS" PRODUCTION X STORAGE ___ DEEP X SHALLOW ___

LOCATION:

ELEVATION 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 - SEE ADDITIONAL SHEETS ACREAGE ___

PROPOSED WORK: LEASE NO. SEE ADDITIONAL SHEETS

DRILL X CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION ___ PERFORATE NEW FORMATION ___ PLUG AND ABANDON ___ CLEAN OUT AND REPLUG ___ OTHER ___

PHYSICAL CHANGE IN WELL (SPECIFY) ___ TARGET FORMATION POINT PLEASANT

ESTIMATED DEPTH TVD: 11,620' / TMD: 27,839'

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

DESIGNATED AGENT DARREN BROWN
CT CORPORATION
ADDRESS 5098 WASHINGTON ST. W STE. 407
CHARLESTON, WV 25313-1561

COUNTY NAME

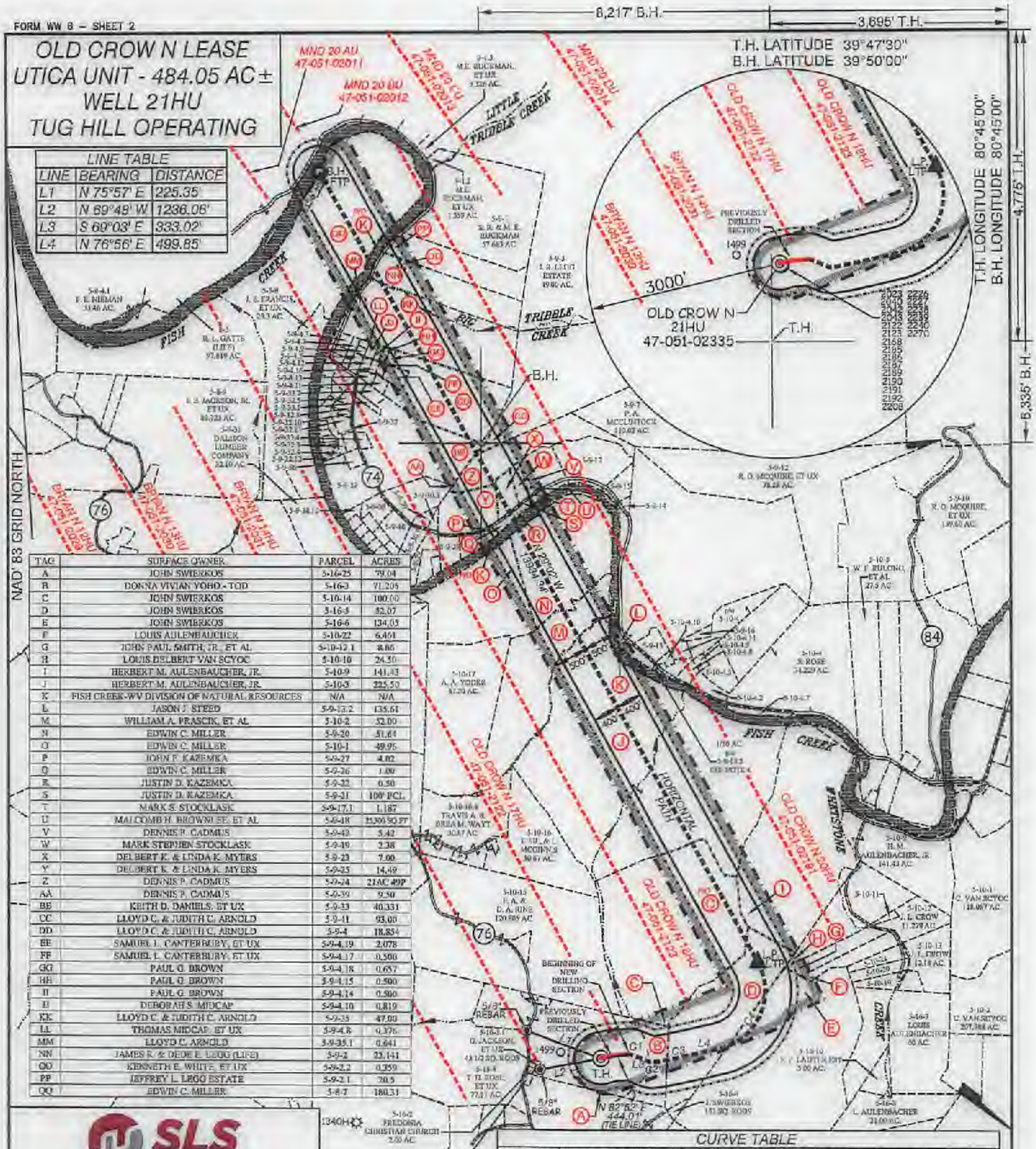
PERMIT

02/25/2022

FORM WW 6 – SHEET 2

OLD CROW N LEASE
UTICA UNIT - 484.05 AC±
WELL 21HU
TUG HILL OPERATING

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N 75°57' E	225.35'
L2	N 69°49' W	1236.06'
L3	S 69°03' E	333.02'
L4	N 76°56' E	499.85'



TAG	SURFACE OWNER	PARCEL	ACRES
A	JOHN SWIERKOS	5-16-25	79.04
B	DONNA VIVIAN YOHO - TOD	5-16-3	91.206
C	JOHN SWIERKOS	5-10-14	100.00
D	JOHN SWIERKOS	5-16-5	52.07
E	JOHN SWIERKOS	5-16-6	134.05
F	LOUIS AULENBAUCHER	5-10-22	6.461
G	JOHN PAUL SMITH, JR., ET AL	5-10-12.1	8.86
H	LOUIS DELBERT VAN SCYOC	5-10-10	24.30
I	HERBERT M. AULENBAUCHER, JR.	5-10-9	141.83
J	HERBERT M. AULENBAUCHER, JR.	5-10-3	225.50
K	FISH CREEK-WV DIVISION OF NATURAL RESOURCES	N/A	N/A
L	JASON J. STEED	5-9-13.2	135.61
M	WILLIAM A. PRASCIK, ET AL	5-10-2	52.00
N	EDWIN C. MILLER	5-9-20	51.64
O	EDWIN C. MILLER	5-10-1	49.95
P	JOHN F. KAZEMKA	5-9-27	4.02
Q	EDWIN C. MILLER	5-9-26	1.00
R	JUSTIN D. KAZEMKA	5-9-22	0.50
S	JUSTIN D. KAZEMKA	5-9-21	100' PCL
T	MARK S. STOCKLASK	5-9-17.1	1.187
U	MALCOMB H. BROWNLEE, ET AL	5-9-18	15,300.90 FT
V	DENNIS P. CADMUS	5-9-42	5.42
W	MARK STEPHEN STOCKLASK	5-9-19	2.38
X	DELBERT K. & LINDA K. MYERS	5-9-23	7.00
Y	DELBERT K. & LINDA K. MYERS	5-9-25	14.49
Z	DENNIS P. CADMUS	5-9-24	21AC 49P
AA	DENNIS P. CADMUS	5-9-39	9.50
BB	KEITH D. DANIELS, ET UX	5-9-33	40.331
CC	LLOYD C. & JUDITH C. ARNOLD	5-9-41	93.00
DD	LLOYD C. & JUDITH C. ARNOLD	5-9-4	18.854
EE	SAMUEL L. CANTERBURY, ET UX	5-9-4.19	2.078
FF	SAMUEL L. CANTERBURY, ET UX	5-9-4.17	0.500
GG	PAUL G. BROWN	5-9-4.18	0.657
HH	PAUL G. BROWN	5-9-4.15	0.500
II	PAUL G. BROWN	5-9-4.14	0.500
JJ	DEBORAH S. MIDCAP	5-9-4.10	0.819
KK	LLOYD C. & JUDITH C. ARNOLD	5-9-35	47.00
LL	THOMAS MIDCAP, ET UX	5-9-4.8	0.376
MM	LLOYD C. ARNOLD	5-9-35.1	0.641
NN	JAMES R. & DEDE E. LEGG (LIFE)	5-9-2	23.141
OO	KENNETH E. WHITE, ET UX	5-9-2.2	0.359
PP	JEFFREY L. LEGG ESTATE	5-9-2.1	20.5
QQ	EDWIN C. MILLER	5-8-7	180.31

CURVE TABLE				
CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	20.45'	35.34'	N 88°26' E	20.16'
C2	37.90'	150.34'	N 69°48' E	37.80'
C3	526.33'	9001.13'	N 78°40' E	526.26'
C4	1656.87'	916.51'	N 22°48' E	1440.29'

SLS
FROM THE GROUND UP
12 Vanhorn Drive | P.O. Box 150 | Glenville, WV 26351 | 304.462.5634
1412 Kanawha Boulevard, East | Charleston, WV 25301 | 304.346.3952
254 East Beckley Bypass | Beckley, WV 25801 | 304.255.5266
www.com

P.S. 677 Gregory A. Smith

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)

NAD'83 S.P.C (FT)	N. 468,186.86	E. 1,613,503.81
NAD'83 GEO.	LAT-(N) 39.778560	LONG-(W) 80.763147
NAD'83 UTM (M)	N. 4,403,206.82	E. 520,282.83
LANDING POINT/LTP		
NAD'83 S.P.C.(FT)	N. 469,893.5	E. 1,615,936.1
NAD'83 GEO.	LAT-(N) 39.782762	LONG-(W) 80.754569
NAD'83 UTM (M)	N. 4,403,675.1	E. 521,016.2
BOTTOM HOLE		
NAD'83 S.P.C.(FT)	N. 481,866.1	E. 1,609,172.2
NAD'83 GEO.	LAT-(N) 39.815942	LONG-(W) 80.779251
NAD'83 UTM (M)	N. 4,407,352.2	E. 518,893.6

GREGORY A. SMITH
LICENSED
No. 677
STATE OF
WEST VIRGINIA
PROFESSIONAL SURVEYOR

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

LEGEND

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

02/25/2022

COUNTY NAME

PERMIT

SCALE 1" = 2000' FILE NO. 8796P21HUR2.dwg
OLD CROW NORTH 21HU REV4
DATE FEBRUARY 28 , 20 20
REVISED AUGUST 3, 2020 & FEBRUARY 11, 2022
OPERATORS WELL NO. OLD CROW N-21HU
API WELL NO. 47 — 051 — 02335
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 DARREN BROWN
CT CORPORATION
ADDRESS 5098 WASHINGTON ST. W STE. 407
CHARLESTON, WV 25313-1561

FORM WW 6 – SHEET 3

OLD CROW N LEASE
UTICA UNIT - 484.05 AC±
WELL 21HU
TUG HILL OPERATING

SLS
FROM THE GROUND UP
12 Vanhorn Drive | P.O. Box 150 | Glenville, WV 26351 | 304.462.5634
1412 Kanawha Boulevard, East | Charleston, WV 25301 | 304.346.3952
254 East Beckley Bypass | Beckley, WV 25801 | 304.255.5296
slswv.com

No.	Lease ID	Tag	Parcel	Grantor, Lessor, Etc.	Deed Book/Page	
1	10*21468	A	5-16-25	JOHN A SWIERKOS	953	317
2	10*19340	B	5-16-3	DONNA V YOHO	665	407
3	10*14920	C	5-10-14	CHESTNUT HOLDINGS INC	836	119
4	10*14919	D	5-16-5	CHESTNUT HOLDINGS INC	836	117
5	10*21468	E	5-16-6	JOHN A SWIERKOS	953	317
6	10*18396	F	5-10-22	LOUIS AULENBACHER	932	468
7	10*21468	G	5-10-12.1	JOHN A SWIERKOS	953	317
8	10*21468	H	5-10-10	JOHN A SWIERKOS	953	317
9	10*19249	I	5-10-9	HERBERT M AULENBACHER	914	551
10	10*14918	J	5-10-3	CHESTNUT HOLDINGS INC	836	115
11	Q091960000	K	FISH CREEK	WEST VIRGINIA DIVISION OF NATURAL RESOURCES	865	558
12	10*47051.170.0	L	5-9-13.2	JASON J STEED	865	344
13	10*47051.260.0	M	5-10-2	WILLIAM A PRASCIK ET AL	879	302
14	10*47051.127.1	N	5-9-20	EDWIN C MILLER AND KIMBERLY ANN MILLER	885	61
15	10*18970	O	5-10-1	DONALD E BERISFORD	941	287
16	10*17512	P	5-9-27	BONNIE LOU POSTLEWAIT	917	68
17	10*17512	Q	5-9-26	BONNIE LOU POSTLEWAIT	917	68
18	10*17512	R	5-9-22	BONNIE LOU POSTLEWAIT	917	68
19	10*18796	S	5-9-21	DWG OIL & GAS ACQUISITIONS LLC	938	476
20	10*18796	T	5-9-17.1	DWG OIL & GAS ACQUISITIONS LLC	938	476
21	10*18796	U	5-9-18	DWG OIL & GAS ACQUISITIONS LLC	938	476
22	10*18796	V	5-9-42	DWG OIL & GAS ACQUISITIONS LLC	938	476
23	10*18796	W	5-9-19	DWG OIL & GAS ACQUISITIONS LLC	938	476
24	10*17512	X	5-9-23	BONNIE LOU POSTLEWAIT	917	68
25	10*17512	Y	5-9-25	BONNIE LOU POSTLEWAIT	917	68
26	CVX935271	Z	5-9-24	CHARLES W. MILLER	853	59
27	CVX935271	AA	5-9-39	CHARLES W. MILLER	853	59
28	10*27025	BB	5-9-33	STONE HILL MINERALS HOLDINGS LLC	1034	626
29	10*26046	CC	5-9-41	ARNOLD LLOYD C ET UX	915	628
30	CVX939752	DD	5-9-4	LLOYD C ARNOLD AND JUDITH C ARNOLD	915	582
31	CVX936589	EE	5-9-4.19	LLOYD C. ARNOLD AND JUDITH C ARNOLD	863	511
32	CVX936589	FF	5-9-4.17	LLOYD C. ARNOLD AND JUDITH C ARNOLD	863	511
33	CVX936589	GG	5-9-4.18	LLOYD C. ARNOLD AND JUDITH C ARNOLD	863	511
34	CVX936589	HH	5-9-4.15	LLOYD C. ARNOLD AND JUDITH C ARNOLD	863	511
35	CVX936589	II	5-9-4.14	LLOYD C. ARNOLD AND JUDITH C ARNOLD	863	511
36	CVX868468	JJ	5-9-4.10	DEBORAH S. MIDCAP	737	260
37	CVX935273	KK	5-9-35	PAUL PARSONS ET UX	853	430
38	CVX868588	LL	5-9-4.9	THOMAS E. MIDCAP FREDA M MIDCAP	738	482
39	CVX935271	MM	5-9-35.1	CHARLES W. MILLER	853	59
40	Q081124002	NN	5-9-2	JAMES REDMAN LEGG II ET AL	879	580
41	Q080154002	OO	5-9-2.2	KENNETH EUGENE WHITE AND LESLIE A WHITE	879	577
42	Q081123002	PP	5-9-2.1	JEFFREY L LEGG	879	575
43	10*21546	QQ	5-8-7	EDWIN C MILLER AND KIMBERLY ANN MILLER	957	257

FILE NO. 8796P21HUR2.dwg
OLD CROW NORTH 21HU REV4

DATE FEBRUARY 28, 20 20

REVISED AUGUST 3, 2020 & FEBRUARY 11, 2022

OPERATORS WELL NO. OLD CROW N-21HU

API WELL NO. 47 — 051 — 02335
STATE COUNTY PERMIT

GREGORY A. SMITH
LICENSED
No. 677
STATE OF
WEST VIRGINIA
PROFESSIONAL SURVEYOR

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

02/25/2022

COUNTY NAME

P.S. 677 Gregory A. Smith

PERMIT

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

DESIGNATED AGENT DARREN BROWN
CT CORPORATION
ADDRESS 5098 WASHINGTON ST. W STE. 407
CHARLESTON, WV 25313-1561

47-051-02335 MOD
Deep
Ck#054963
$2500.00
2/10/22

TUG HILL

UTICA MODIFICATION

February 16, 2022

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

VIA USPS

RE: Old Crow N-21HU Utica Permit Modification
Franklin District, Marshall County, WV

Dear Susan:

Enclosed you will find a permit modification for the Old Crow N-21HU (API # 47-051-02335). We are requesting a modification to change the directional plan of this well. Please find the following enclosed:

- Check in the amount of $2500.
- Updated WW-6B highlighted to reflect the changes caused by modifying the directional plan for this well.
- Updated Well Plat
- Updated Well Site Safety Plan

No changes were made to the unit for this well, so there are no updates to the WW-6A1 information or 500' offset lists. If you need any further information, please let me know. Thank you for your consideration to this request.

Sincerely,

Amy L. Morris

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

RECEIVED
Office of Oil and Gas
FEB 17 2022
WV Department of
Environmental Protection

Enclosures

02/25/2022

TUG HILL
OPERATING

Well Site Safety Plan
Part A – Site Specific Data and Figures

Well Name: Old Crow N-21HU
Pad Name: Old Crow
County: Marshall

UTM (meters), NAD83, Zone 17
Northing: 4,403,206.82
Easting: 520,282.83

MJK 2/16/2022

KEY CONTACT FOR WELL SITE SAFETY PLAN DEVELOPMENT AND MAINTENANCE

Jerry V. DeRosa, Director EH&S Affairs
(724) 338-2029 (office)
(412) 736-5767 (cellular)

24-HOUR EMERGENCY PHONE NUMBER

(800) 921-9745

02/25/2022

TABLE OF CONTENTS

SECTION **PAGE**

1.0 PART A SITE SPECIFIC DATA SECTION 1

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1.3 Distribution.....4

2.0 EMERGENCY CONTACTS 5

3.0 SITING EXHIBITS 5

4.0 WELL DEVELOPMENT AND EQUIPMENT LAYOUT FIGURES..... 5

5.0 CHEMICAL INVENTORY SAFETY DATA SHEETS 5

02/25/2022

1.0 PURPOSE

Pursuant to West Virginia legislative rule 35 CSR 8-5.7 – Rules Governing Horizontal Well Development, Tug Hill Operating LLC ("Tug Hill") has prepared this Well Site Safety Plan (WSSP) to address proper measures to be employed for the protection of persons on the well site, as well as the general public in the area surrounding the well site. This rule establishes the minimum requirements for WSSPs, which are to be prepared and submitted with each well work permit application and maintained in connection with each phase including Drilling, Completions, and Work-Over activities (referred to herein as "Operations").

Various additional federal and state environmental, safety and health regulations govern protection of life, property, and the environment in connection with oil and natural gas development. Other specific environmental and safety related contingency plans are, therefore, either incorporated herein or are referenced to meet these related requirements. These various components and other plans include:

- WV Well Site Safety Plan (WSSP)
- Emergency Response Plan (ERP)
- Incident Response and Notification Procedure
- Incident Command Structure (ICS) – pursuant to the federal National Incident Management System (NIMS)
- Hydrogen Sulfide (H2S) Contingency Plan
- Example Tug Hill Drilling and Completions Plans
- Example Production Facilities Design Plans

Once the site wells are flowing gas to sales gathering lines, it is referred to as being in the "Production" phase. During Production, gas flows to the sales lines and brine water and petroleum liquids (which will be referred to hereafter as "Condensate") are typically stored on location in aboveground storage tanks (ASTs). As such, once in Production, we also implement a Spill Prevention, Control, and Countermeasure Plan (SPCC) Plan and, in some instances depending upon location of the site and size of the tank(s), the added elements of a WV Department of Environmental Protection (WVDEP) Spill Prevention and Response Plan (SPRP).

These additional documents shall be referred to herein as "Companion Documents" to the WSSP and together, collectively, comprise the **Tug Hill Integrated Contingency Plan (ICP)**.

Also, incorporated by reference is the Tug Hill Contractor Expectations Manual (CEM) and the Tug Hill Master Containment Plan (MCP).

02/25/2022

Tug Hill has developed this WSSP and ICP binder of Companion Documents, to provide and confirm the procedures to be followed during emergencies, to facilitate the rapid deployment of resources, and to minimize impact and risk to the environment and personnel at the Tug Hill Well Pads.

Well Site Safety Plan Organization

Tug Hill has sought to follow the outline and sequence of the WVDEP guidance document on "Scope of Work for Site Safety Plans". Additional sections and attachments included in this WSSP and the ICP binder are provided to address other environmental, safety, and emergency response needs relevant to the various components of federal and state regulations and industry standard practices. The Tug Hill ERP draws upon the protocol established through Federal Emergency Management Agency (FEMA) National Incident Management System (NIMS). The NIMS is a systematic, proactive approach to guide departments and agencies of government, nongovernmental organizations, and the private sector, to work together seamlessly and manage incidents involving all threats and hazards, regardless of cause, size, location, or complexity, to reduce loss of life, property, and harm to the environment.

For ease of reference, therefore, the WSSP is separated into two parts:

PART A

- SITE-SPECIFIC DATA and information
- Siting Location Plans and Exhibits
- Well Development Figures
- Chemical Inventory Information

PART B

- Standard policies and procedures required under W.Va. Rule 35 CSR 8-5.7 which apply to all TUG HILL well pads in West Virginia.
- Standard Wellhead Assemblies Figures
- Emergency Response Procedures
- Hydrogen Sulfide planning

Part of ERP includes Emergency Response scenarios and the Incident Command System (ICS) – which is an organizational hierarchy and description of the division of responsibilities for large-scale, severe incidents such as a well control incident. As shown above, the ERP is provided in the **PART B – ATTACHMENTS** to the WSSP.

Because there is duplication of some topics under these different regulatorily required plans, we have sought to compile and condense those exhibits, figures and other items which would be most needed and accessed quickly by incident command in case of an emergency into a singular section that comprises **PART A - SITE-SPECIFIC DATA** section.

Where applicable, the reviewer of the WSSP is directed to find site plans, drawings, exhibits and tables, in the **PART A -- SITE-SPECIFIC DATA** tab.

Revisions

Revisions and updates to the WSSP relating to changes of Operational phases and/or personnel will occur in the **PART A - SITE-SPECIFIC DATA** section.

WSSP/ICP Record of Review & Revision Index

Date	Description of Changes	Reviewer/Revised by:

Distribution

WSSPs will be prepared and submitted to the WVDEP Office of Oil and Gas with the Well Work Permit application for review and approval. The WSSP, once approved, may only be modified upon approval by the WVDEP Office of Oil and Gas.

Copies of the WSSP will also be provided by Tug Hill to the County Office of the Emergency Management Agency (EMA) at least seven (7) days prior to the commencement of well work or site preparation work that involves any disturbance of land.

The WSSP and ICP binder of Companion Documents are to be maintained in the Company Man trailer on Drilling and Completions ("D&C Operations") pads. The **PART A -- SITE-SPECIFIC DATA** section of the WSSP (e.g., Emergency Contacts List, Site Layout, Emergency Evacuation, Helicopter Landing Zone, and Incident Response and Notification Procedure) are also to be kept in the Operations Pad Security Guard Shack for readily available access during a well control event. A hard copy of the WSSP will also be placed in the in the well pad site access road mailbox.

Once the well pad is converted to the Production phase, the ICP and engineer stamped SPCC/SPRP will be available to Operations personnel in the local Tug Hill Production field office and will also be available in the field electronically through the Tug Hill subscription database known as "EHS Insight".

All personnel working on location and managers making decisions about activities on-site, even if such manager does not visit the site, are to be cognizant of the contents of the WSSP and ICP Companion Documents.

DISTRIBUTION LIST

Recipients	Date
WVDEP Oil & Gas County Inspector Approval	
WVDEP Oil & Gas Division – Permit Application	
Marshall County Emergency Management Agency	
Drilling and Completions Person-in-Charge (PIC) Field Offices	
Tug Hill Pre-Spud Meeting - Drilling Person-in-Charge (PIC)	
Tug Hill Pre-Spud Meeting - Completions Person-in-Charge (PIC)	
Tug Hill Production Field Office	

2.0 EMERGENCY CONTACTS

- Incident Response and Notification Procedure
- Emergency Contacts List by Operational Phase

3.0 SITING EXHIBITS

Exhibit 1 – Directions to Well Site, Evacuation & Bonded Routes

Exhibit 2 – Topographic Maps – 1-mile Map, Resident Information and Area Schools
1500' Map, Resident Information and Area Schools

Exhibit 3 – Helicopter Landing Zone

Exhibit 4 – Plan View Map

Exhibit 5 – Zone of Critical Concern

4.0 WELL DEVELOPMENT AND EQUIPMENT LAYOUT FIGURES

Figure 1 – Collision Avoidance Well Bore Spider Plot

Figure 2 – Casing and Cementing

Figure 3 – Well Bore Layout Program

Figure 4 – Anticipated Rig Layout

Figure 5 – Anticipated Frac layout

Figure 6 – Planned Production Facilities

5.0 CHEMICAL INVENTORY SAFETY DATA SHEETS

- Chemical Inventory Table.
- SDS provided electronically. Hard Copies onsite
  - SDS- Drilling
  - SDS- completions
  - SDS- Production

Incident Response and Notification Procedure

INITIAL INCIDENT RESPONSE AND NOTIFICATION PROCEDURE
Tug Hill - Appalachia Based Operations

This procedure is designed for **INITIAL** internal reporting as a quick start guide to the Tug Hill WSSP/ERP/H_2S/SPCC/Stormwater Plans (which is part of the Tug Hill Integrated Contingency Plan or "ICP"). Please refer to the ICP for detailed instructions.

ALL incidents (e.g., near-miss, injuries, truck accidents, vandalism, acts of violence, pollution control malfunction), and spills/releases (e.g., gas leaks, fluid spills of chemicals, fuels, brine, & other hazardous materials used, stored, produced or transported) must be reported following the flow-chart below. Enter the event in EHS Insight First Report and follow-up with EHS Coordinator. Reporting to agencies will be performed by the Tug Hill Director of EH&S Affairs or a designee.

REPORT ALL INCIDENTS ASAP EVERY TIME

1. **UNCONTROLLED FIRE, EMERGENCY or SERIOUS INJURY ➡ CALL 911**
2. **Emergency Number: 1-800-921-9745 (for External Use)**
3. **ALL INCIDENTS: Follow Reporting Below (for Internal Use)**

Actions ⬇ **⬇ Reporting**

Observer of incident is to ***immediately*** contact **Tug Hill Company Man** or Tug Hill Person-in-Charge (PIC) and Contractor's Supervisor

For Spills, Stop and/or contain material and consult with EH&S

Take these containment and clean up actions only if they can be performed safely

Small, Minor to Moderate Spill Events

Clean-up with onsite personnel and equipment

EHS Coordinator is responsible for confirming clean-up is complete

Observer of incident is to ***immediately*** enter **First Report** into **EHS Insight** and call Tug Hill EHS Coordinator

Tug Hill EHS Coordinator to contact Tug Hill Operations Superintendent, Director or PIC to ensure collaboration

Larger, Major, More Serious/Significant and Crisis Spill Events

EH&S group to coordinate and manage clean-up and response actions using qualified response contractor pursuant to the Tug Hill ICP

Tug Hill EHS Coordinator to complete **EHS Insight Incident Submission** step and contact Tug Hill EHS Superintendent or Director

Tug Hill Director of EH&S to notify WVDEP via telephone **within 2 hours** of incident involving leak, spill or release of material

Tug Hill Director of EH&S to provide WVDEP with email followup **within 24 hours**

Tug Hill Operating EHS Contacts

Scott Watson: .281-684-3149(c)
swatson@tug-hillop.com

Josh Southern: 304-476-3079 (c)
jsouthern@tug-hillop.com

Noel Missig: 412-498-7322 (c)
nmissig@tug-hillop.com

Jeremy Barber: 412-877-5869 (c)
jbarber@tug-hillop.com

Doug Sykes: 304-815-3098 (c)
doug.sykes@gryphonesp.com

Tony Laquatra: 412-716-7396 (c)
alaquatra@gryphonesp.com

Cass Mattison: 832-262-1613 (c)
cassidy.mattison@gryphonESP.com

Night Coverage

Joey Guzzo: 910-712-3480 (c)
joseph.guzzo@gryphonesp.com

Randy Luna: 681-758-5428
randy.luna@gryphonESP.com

Tug Hill Director, EH&S Affairs

Jerry DeRosa: 412-736-5767
jderosa@tug-hillop.com

WVDEP Hotline (Reportable)
1-800-642-3074

WVDEP Inspectors

Gayne Knitowski – Marshall
304-546-8171

Bryan Harris – Wetzel
304-553-6087

Marshall Co. EMA 24 hr.
304-845-1920

Wetzel Co. EMA 24 hr.
304-455-6730

Continue attempting contacts until a person is reached.

Voicemail, texts, emails are NOT sufficient contact.

- ➡ Enter the **FIRST REPORT** into EHS Insight. EHS Coordinator will report to site & collect details for Report **SUBMISSION** and will support Operations management with response actions.
- ➡ For all events requiring Muster, activate and follow the **Tug Hill Well Site Safety Plan (WSSP).**

- ➡ **For Immediately Dangerous to Life or Health (IDLH)** conditions, off-site Muster, or when involving state or federal Emergency Response Agencies, activate and follow the **Tug Hill Emergency Response Plan (ERP) attached to the WSSP.**

All incidents are to be recorded in the EHS Insight database.

Incident Reporting is a several step process. The first two (2) steps combined comprise the initial reporting:

- Step 1: **First Alert/First Report** – All personnel have a responsibility to make the First Report ASAP and contact the on-duty EHS Coordinator.
- Step 2: **Submission step** – the EHS Coordinator will report to the site and gather incident details. Complete:
  - **ASAP:** (e.g., within time less than 2 hours)
  - **Routinely:** Before the end of the shift
  - **ALWAYS:** No later than within **24 hours** (unless approved by the EHS Superintendent or EHS Director).

Incident Severity Determination

- Incident severity will be determined pursuant to the **Incident Risk Matrix** in EHS Insight Step 2, Incident Details Submission. EHS Coordinators will enter the severity on the matrix when completing Step 2.
- High Severity Incidents, Hi-Potential Near Miss, and Reportable Injuries will typically require investigation.

Spill Response Guide for Contractor Selection

Pursuant CEM and the Tug Hill Incident Response and Notification Procedures, clean-up of reportable spills, especially larger, higher severity spill events, will be managed and coordinated by the EHS Department. When deemed necessary, the EHS Department will engage a professional environmental spill response Contractor to perform the response action. Approved spill response contractors shown on the Operations Emergency Contact List and found in the ICP and the SPCC Plan.

Reportable spills, and those considered larger and higher severity events are those that trigger a reporting requirement, and one of the following:

a) Spills off containment sufficient to have the potential in impact surface and/or groundwater (e.g. >1 bbl.).
b) The release of outside the confines of berms on the Operations pad and/or the permitted Limit of Disturbance.
c) The release will likely result in contaminated soils requiring excavation based upon state requirements.
d) The release that may result in a Notice of Violation (NOV) issued from the state or federal government.
e) The release is into a water body and/or in defined protect environ (e.g. Zone of Critical Concern or wetland).

Smaller spills may be cleaned-up by personnel on location if the spill is within certain specific parameters.

Under no circumstances, however, are spills of materials that constitute a "**hazardous waste"** to be cleaned-up by workers not trained in hazardous waste operations pursuant to OSHA regulation.

Contractors are to comply with all relevant and applicable regulations regarding spills and releases of pollutants and hazardous chemicals as defined by federal, state, and local laws and regulations. Contractors shall additionally adhere to any Tug Hill-issued policies and procedures pertaining to the work performed including, but not limited to the following:

- **Tug Hill Integrated Contingency Plan (ICP) binder contains the**
  - **Well Site Safety Plan (WSSP)** (Drilling and Completions Sites only)
  - **Emergency Response Plan (ERP)**
  - **Incident Command System (ICS)**
  - **Hydrogen Sulfide Contingency Plan**
  - **Spill Prevention and Countermeasure Plan (SPCC) / Spill Prevention and Response Plan (SPRP)**
- **Storm Water Management Plans and Groundwater Protection Plans (GPP)** (where applicable)
- **The Tug Hill Operating Contractor Expectation Manual (CEM)** (see the Incidents section).

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Emergency Contacts List by Operational Phase

TUG HILL OPERATING – DRILLING OPERATIONS EMERGENCY NUMBER 800-921-9745

OLD CROW – Key Personnel, Agency and Emergency Contact List

TUG HILL OPERATING REPRESENTATIVES

Contact	Name	Phone	Cell Phone	Email
SVP Operations	David Patterson	817-632-5240	620-304-1031	dpatterson@tug-hillop.com
VP Operations	Sean Gasser	817-632-5250	972-510-8438	sgasser@tug-hillop.com
Drilling & Completions Engineering	Rory Johnston	817-632-5200	432-664-4497	rjohnston@tug-hillop.com
Drilling Superintendent	Bill Smith		724-255-2308	bsmith@tug-hillop.com
Completions Superintendent	Jordan Buterbaugh	724-762-8271	724-762-8271	jbuterbaugh@tug-hillop.com
Rig Phone	Company Man		817-897-8270	naborsX08@tug-hillop.com
Director EH&S	Jerry DeRosa		412-736-5767	Jderosa@tug-hillop.com
EHS Superintendent	Scott Watson		281-684-3149	Swatson@tug-hillop.com
Sr. EHS Coord.	Josh Southern		304-476-3079	Jsouthern@tug-hillop.com
Sr. EHS Coord.	Noel Missig		412-498-7322	Nmissig@tug-hillop.com
EH&S Coord. (night shift)	Jeremy Barber		412-877-5869	jbarber@tug-hillop.com
Production Mgr.	Chad Grinnell		817-201-1566	cgrinnell@tug-hillop.com
Production	Steve Weigle	304-398-5710 h	682-404-6233	sweigle@tug-hillop.com
Production	Jeffery Walker		601-580-8821	jwalker@tug-hillop.com
Facilities	Rob Springer	724-749-8388	724 833-4328	rspringer@tug-hillop.com
Facilities	Terry Campbell		817-586-9374	tcampbell@tug-hillop.com
Construction	Geoff Radler		817-247-7233	gradler@tug-hillop.com
Construction	Chad Dunham		304-215-5405	cdunham@tug-hillop.com
Construction	Randy Sleeth		682-404-6266	rsleeth@tug-hillop.com
VP Geology	Jim Pancake	(724) 749-8388	(412) 463-9091	jpancake@tug-hillop.com
ALL INCIDENTS: SPILLS, NEAR MISS, ACCIDENTS, INJURIES, VIOLENCE		**TUG HILL INCIDENT RESPONSE AND NOTIFICATION PROCEDURE**		
TUG HILL 24 HOUR EMERGENCY		**800-921-9745**		**911**

TUG HILL OPERATING – DRILLING OPERATIONS EMERGENCY NUMBER 800-921-9745

OLD CROW – Key Personnel, Agency and Emergency Contact List

DRILLING RELATED CONTRACTOR INFORMATION

Contact	Company	Name	Cell Phone	Email
Nabors Drilling Superintendent	Nabors	Brent Kaschmitter	208-315-1027	brent.kaschmitter@nabors.com
Nabors HSE	Nabors	Todd Hinricksen	701-770-0157	todd.hinricksen@nabors.com
Nabors HSE	Nabors	Mardie Harrison	803-331-6122	mardie.harrison@nabors.com
Surface Casing	Miller Supply	Hal Payne	740-350-3688	hpayne@kenmillersupply.com
Intermediate Casing I	CTAP	Mike Booth	972-523-9822	mbooth@ctapllc.com
Intermediate Casing II	CTAP	Mike Booth	972-523-9822	mbooth@ctapllc.com
Trucking Casing	PANHANDLE TRUCKING	John Antonelli	304-989-4948	
Clean, Drift and Tally Crew	IOS	Michael Stewart	724-553-4212	mstewart@ibfoster.com
Casing Crew	KIMZEY CASING CREW	Jordan Beckner	724-747-0402	jbeckner@kimzeycasing.com
Casing Crew	WYOMING CASING CREW	Sam Lopez	330-415-8609	samlopez@wyomingcasing.com
Trucking	C & S Trucking	Jen McIntyre	724-809-0708	
DIRECTIONAL MWD	NZONE	Cole Patterson Luke Moodie	682-715-3624 512-672-9227	cpatterson@nzoneguidance.com lmoodie@nzoneguidance.com
Fresh Water Trucks	J&R	Dispatch	304-845-4974	
Fresh Water Trucks	Enlink	Dispatch	877-593-0821	
Dirty Water Trucks	LITMAN	Chris Lattea	304-455-2736, office 304-447-1567	
Gyro	Vaughn Energy Serv. (VES)	Joe Fenstermacher	304-704-8313	joe.fenstermacher@vessurvey.com
Solids Control/Hot Work	WHITE'S WELDING	Kyle Grubaugh	724-554-8981	kyle@whitesequipment.com
Cuttings	NOBLE ENVIRONMENTAL	Alex Sulkowski	412-979-5493	asulkowski@nobleenviro.com

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TUG HILL OPERATING – DRILLING OPERATIONS EMERGENCY NUMBER 800-921-9745

OLD CROW – Key Personnel, Agency and Emergency Contact List

Contact	Company	Name	Cell Phone	Email
Cement	Schlumberger	Patrick Crowder	318-560-8667	pcrowder@slb.com
Cement	Schlumberger	Patrick Crowder	318-560-8667	pcrowder@slb.com
Cement	Halliburton	Adam Ryan	832-794-2797	Adam.ryan@halliburton.com
Air Package	Air Drilling Assoc	Salty Cox	505-215-2331	ccox@airdrilling.com
Air Hammer	NUMA/Bill's Bits	Rich Walkos	412-582-5217	rwalkos@billsbitservice.com
Hotshot	WA STONEKING	Angie Stoneking	724-986-1735	angiestoneking@yahoo.com
Wellhead	Cactus	Troy Romero	504-908-9269	Troy.romero@cactuswellhead.com
Pipe Inspection & Machine Shop	Fairmont Tool	Connie Brown	cell#304-694-3644 Ofc # 304-363-8339	conniebrown@fairmonttool.com
Pipe Inspection, Hard Banding, ECT	IOS	Michael Stewart	724-553-4212	mstewart@ibfoster.com
Containment	New Pig	Drew Huff	(814) 505-3361	drewh@newpigenergy.com
Rig Mats	Strad	Steve Antoinette	(724) 802-5773	santoinette@stradinc.com
General Construction	Robey Construction	Mike Swiger	(304) 677-8062	rmikeswiger@gmail.com
Security / Traffic Control	EM1	Daniel Roberts	570-560-2561	droberts@em1services.com
Midstream Operations Mgr.	XcL Midstream	Paul Mickoloff	682-404-8816	pmickoloff@xclmidstream.com

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TUG HILL OPERATING – DRILLING OPERATIONS EMERGENCY NUMBER 800-921-9745

OLD CROW – Key Personnel, Agency and Emergency Contact List

CONTRACT EH&S REPRESENTATIVES

Contact	Name	Phone	Cell Phone	Email
EH&S Coordinator Gryphon Energy	Doug Sykes		304-815-3098	doug.sykes@gryphonesp.com
EH&S Coordinator Gryphon Energy	Anthony LaQuatra		412-716-7396	anthony.laquatra@gryphonesp.com
EH&S Coordinator Gryphon Energy	Joey Guzzo		910-712-3480	Joseph.guzzo@gryphonesp.com
EH&S Coordinator Gryphon Energy	Cass Mattison		832-262-1613	cassidy.mattison@gryphonESP.com
EH&S Coordinator Gryphon Energy	Randy Luna		681-758-5428	randy.luna@gryphonESP.com

EMERGENCY SPILL RESPONSE CONTRACTORS

In case of spill getting into stream or if spill emergency requires greater expertise, these contractors can respond to spill emergencies 24 hours a day.

Contact	Name	Phone	Cell Phone	Email
BBU Service of WV	Chip Hoover Tony Long	740-738-0314	304-549-9165 304-415-0881	choover@bbuservicesofwv.com tlong@bbuservicesofwv.com
IPC Services, LLC	Stephanie McKinney	724-831-7167	412-584-6961	stephanie.mckinney@insightpipe.com
Ryan Environmental	Jeremy Monday	800-649-5578 (24 Hr.) 304-842-5578 (ofc.)	304-629-6767	jeremy.monday@ryanenv.com
Robey excavating (Gen. Contractor)	Brian Robey Mike Swiger	304-783-4491 (ofc)	304-677-9141 304-677-8062	brian@robeyexcavating.com rmikeswiger@gmail.com
Gryphon/ESP Oilfield Services	Jason Anderson Chris Mitchell	855-479-7466 (24 Hr.)	903-316-7410 903-288-0648	jason.anderson@gryphonesp.com chris.mitchell@gryphonesp.com
EMS Onsite	Josh Baker Ryan Anderson	877-816-9111 24 hr.	614-800-5779 JB	jbaker@hepaco.com

TUG HILL OPERATING – DRILLING OPERATIONS
EMERGENCY NUMBER 800-921-9745
MICHTER – Key Personnel, Agency and Emergency Contact List

LOCAL AGENCY CONTACTS – WVDEP, COUNTY

Contact	Name	Phone	Cell Phone	Email
West Virginia One Call		811 800-245-4848		
WVDEP Spill Hotline		800-642-3074 (24 Hr)		
WVDEP Tank Div. Project Manager	Justin Tincher	304-368-2000	681-319-1856	Justin.m.tincher@wv.gov
WVDEP Inspector, Marshall County	Gayne Knitowski		304-546-8171	Gayne.j.knitowski@wv.gov
WVDEP Inspector, Wetzel County	Douglas Newlon		304-932-8049	douglas.c.newlon@wv.gov
WVDEP Inspector Supervisor	Douglas Newlon		304-932-8049	douglas.c.newlon@wv.gov
Marshall County Office of Emergency Mgmt.	Tom Hart, Director	**911** 304-843-1130 Ext 130 (TH)	304-650-3922 (TH Cell)	oem@marshallcountywv.org thart@marshallcountywv.org twhite@marshallcountywv.org tnovel@marshallcountywv.org
Marshall County Sheriff's Office	Kevin Cecil, Sheriff Bill Helms Chief Deputy Rick Mercer, Lt.	304-843-1500 (24 Hr.) Ext 220 (KC) Ext. 226 (WH) Ext. 285 (RM)	911	sheriff@mcsowv.org whelms@mcsowv.org rmercer@mcsowv.org
WVDOH	Corey Gast, Oil & Gas Administrator	304-843-4022		corey.m.gast@wv.gov
Marshall County Animal Control Office	Rosy Cozart	304-455-5348		wcasrosy@frontier.com

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INCIDENT COMMAND SYSTEM – STATE AND NATIONAL AGENCY CONTACTS

In the event of a large-scale incident with the potential to harm life or property in the surrounding community, in addition to the agencies listed above, notify the agency listed below:

Agency	Contact Person	Phone
West Virginia Division of Homeland Security and Emergency Management		304-558-5380 (24 Hr.)
WV State Police		304-746-2100
EPA National Response Center	Report Oil & Chemical Spills to Navigable Waters	800-424-8802 (24 Hr.)
Environmental Protection Agency (Region III)	Cosmo Servidio, Region 3 Administrator Linda Marzulli (24 hr.) Arlin Galarza-Hernandez (SPCC Coordinator)	304-234-0231 Wheeling WV Regional Offices 800-438-2474 Reg. 3 Ofc Philly 215-814-9016
OSHA Region 3 Charleston WV Office	Richard Mendelson Regional Administrator	304-347-5937 Report Fatalities within 24 hours **800-321-6742 (24 hr)**
US Coast Guard, Marine Safety Unit Barboursville, WV		304-733-0198 Ohio Valley Section 8 Office, Louisville, KY 502-779-5300

UNCONTROLLED WELL CONDITIONS

Wild Well Response Contractor	Address	Phone
Wild Well	380 Southpointe Blvd. Canonsburg, PA 15317	281-784-4700 (24 Hr.) 724-873-5081 Office

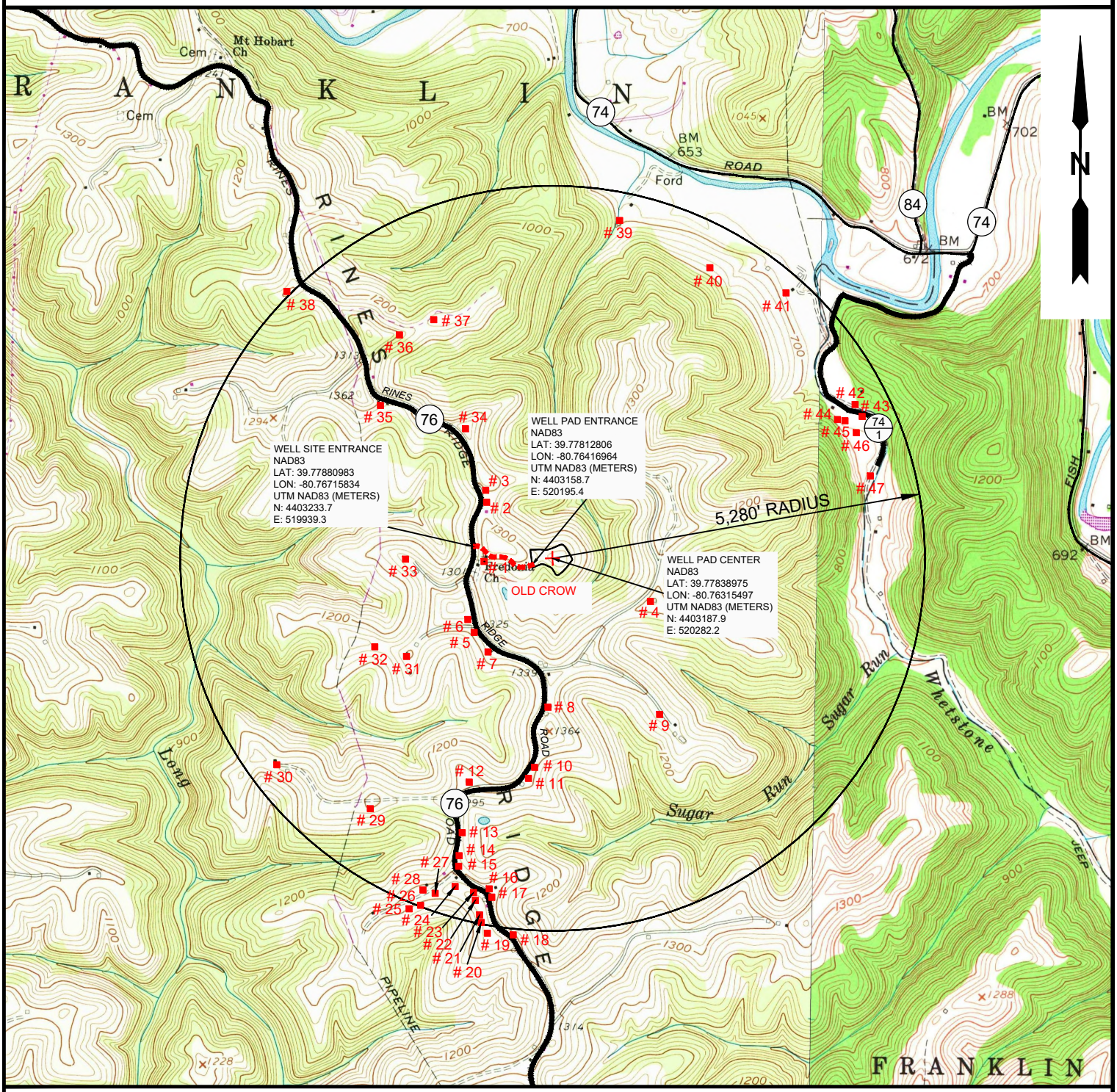
H2S EMERGENCY RESPONSE CONTRACTOR

Name & Title	Address	Contact
Jason Anderson **Chris Mitchell** **Gryphon/ESP Oilfield Services**	USA CORPORATE HEADQUARTERS 11300 Windfern Road Houston, TX 77064	855-479-7466 (24 Hr.) 903-316-7410 903-288-0648

Exhibit 1 – Directions to Well Site Evacuation & Bonded Routes

Exhibit 2 – Topo Maps
Resident Information and Schools

OLD CROW PAD



NOTE: THERE APPEARS TO BE FORTY-SIX (46) RESIDENCES AND ONE (1) BUSINESS/WELL PAD WITHIN 5,280'.

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

TOPO SECTION:		OPERATOR:	
GLEN EASTON & 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.	8796	06/22/18	1" – 2000'

TUG HILL OPERATING

02/25/2022

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

Residences within 1 Mile

Pad: Old Crow
District: Franklin (Residence #'s 1-31, 33-46) (Business Location/Well Pad - #32)
State: WV

There appear to be forty-six (46) residences, one (1) business, no churches, no schools or no emergency facilities within 1 mile (5,280 feet) 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	**Residence 8** TM 16 Pcl. 25 John Swierkos Phone: 304-810-4092 **Physical Address:** 4510 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** 110 Rahm Dr. Proctor, WV 26055-9718	**Residence 9** TM 16 Pcl. 19 Bethany A. Redo & Robert W. Rahm Phone: None Found **Physical Address:** 379 Rahm Dr. Proctor, WV 26055 **Tax Address:** Same
Residence 10 TM 16 Pcl. 21	**Residence 11** TM 16 Pcl. 21	**Residence 12** TM 16 Pcl. 22.1

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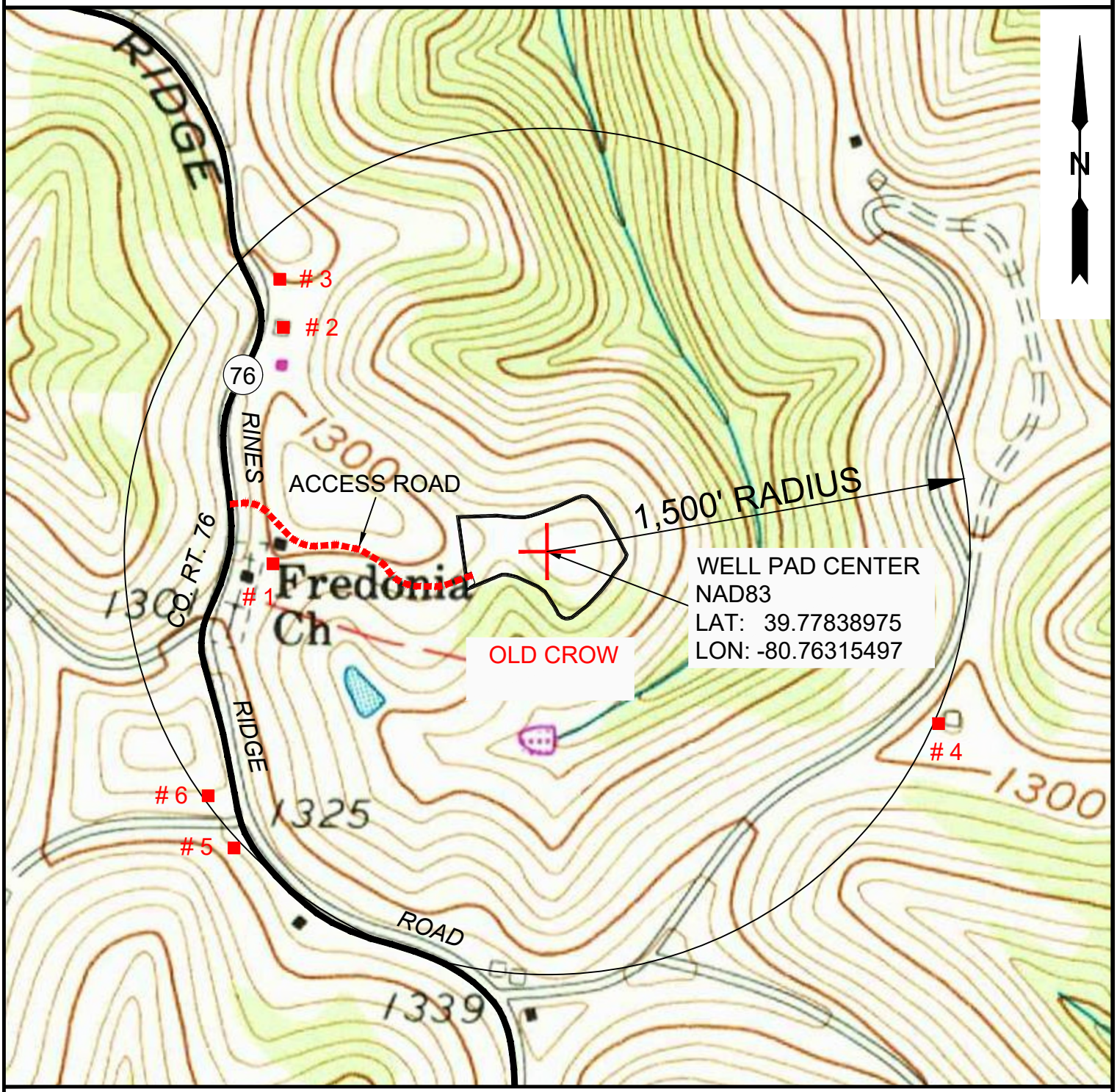
James M. Ruckman, Et Ux Phone: 304-845-8593 **Physical Address:** 4680 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	James M. Ruckman, Et Ux Phone: 304-845-8593 **Physical Address:** 4698 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	Heather A. Burgy Phone: None Found **Physical Address:** 4893 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 13 TM 18 Pcl. 55 William E. O'hara Phone: 304-455-6050 **Physical Address:** 5018 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 14** TM 18 Pcl. 28 Dotson G. Harrison, Et Ux Phone: 304-455-2143, 304-337-2783 **Physical Address:** 5036 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 15** TM 18 Pcl. 28.1 Carol Diane Helmick c/o Gary Litton Phone: 304-758-2564 (Rev. Address) **Physical Address:** 5116 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 16 TM 18 Pcl. 50 Steven G. Berisford Phone: 304-455-0378 **Physical Address:** 5214 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 17** TM 18 Pcl. 49 Tanner M. Butler Phone: None Found **Physical Address:** 5216 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 18** TM 18 Pcl. 37 John W. Wetzel Phone: None Found **Physical Address:** 5358 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 19 TM 18 Pcl. 45 Michael S. Fincham & Kezia M. Winters Phone: None Found **Physical Address:** 99 Patriot Dr. Proctor, WV 26055 **Tax Address:** Same	**Residence 20** TM 18 Pcl. 46 Dale W. & Patricia Gardner c/o Tracy Geho Phone: None Found **Physical Address:** 79 Patriot Dr. Proctor, WV 26055 **Tax Address:** Same	**Residence 21** TM 18 Pcl. 47 Robert Richard Pelley, II & Susan Lynn Briggs c/o Emmanuel N. Bouyiouclis Phone: None Found **Physical Address:** 65 Patriot Dr. Proctor, WV 26055 **Tax Address:** P.O. Box 714 Morgantown, WV 26507
Residence 22 TM 18 Pcl. 36 Ruth Mulligan Est. Phone: 304-455-3393 (Rev. Address) **Physical Address:** 49 Patriot Dr. Proctor, WV 26055 **Tax Address:** 5189 Rines Ridge Rd. Proctor, WV 26055	**Residence 23** TM 18 Pcl. 36 Ruth Mulligan Est. Phone: 304-455-3393 (Rev. Address) **Physical Address:** 5189 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 24** TM 18 Pcl. 15.2 Edward L. Burge Phone: 304-845-9379, 304-845-7331 **Physical Address:** 64 James Ln. Proctor, WV 26055 **Tax Address:** Same
Residence 25 TM 18 Pcl. 12	**Residence 26** TM 18 Pcl. 12	**Residence 27** TM 18 Pcl. 15.1

William L. Wayne, Et Ux Phone: 304-455-1534 **Physical Address:** 148 James Ln. Proctor, WV 26055 **Tax Address:** 1028 Campbell Ln. Proctor, WV 26055	William L. Wayne, Et Ux Phone: 304-455-1534 **Physical Address:** Unknown – Appears to be mobile home trailer **Tax Address:** 1028 Campbell Ln. Proctor, WV 26055	Jason Blair Phone: None Found **Physical Address:** 102 James Ln. Proctor, WV 26055 **Tax Address:** Same
Residence 28 TM 18 Pcl. 11 Benjamin Robinson Phone: None Found **Physical Address:** 97 James Ln. Proctor, WV 26055 **Tax Address:** Same	**Residence 29** TM 15 Pcl. 10 Mark Stanley Ruckman Phone: 304-845-0888, 304-845-6157 **Physical Address:** Unknown – New home location. **Tax Address:** 4919 Rines Ridge Rd. Proctor, WV 26055	**Residence 30** TM 15 Pcl. 10 Mark Stanley Ruckman Phone: 304-845-0888, 304-845-6157 **Physical Address:** 4919 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 31 TM 16 Pcl. 23 CNX Land Resources, Inc. Phone: 304-455-4943 (Rev. Address) **Physical Address:** 195 Isaiah Dr. Proctor, WV 26055 **Tax Address:** 1000 Consol Energy Dr. Cannonsburg, PA 15317	**Residence 32 (Business – Well Pad)** TM 15 Pcl. 9 CNX Land Resources, Inc. Phone: None Found (Rev. Address) **Physical Address:** 159 Isaiah Dr. Proctor, WV 26055 **Tax Address:** 1000 Consol Energy Dr. Cannonsburg, PA 15317	**Residence 33** TM 15 Pcl. 8 Terry D. Rose, Et Ux Phone: None Found **Physical Address:** 4069 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 34 TM 10 Pcl. 15.1 Donald T. Miller Phone: None Found **Physical Address:** 3628 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 35** TM 10 Pcl. 15 Paul Andrew & Debra A. Rine Phone: None Found **Physical Address:** 3437 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 36** TM 10 Pcl. 16.2 (Now p/o Pcl. 16.4) Melvin E. Jr., & Elizabeth Ferguson Phone: None Found **Physical Address:** 181 Corley Ln. Proctor, WV 26055 **Tax Address:** Same
Residence 37 TM 10 Pcl. 16.3 (Now p/o Pcl. 16) Timothy Sr., & Linda McGinnis Phone: None Found **Physical Address:** 251 Corley Ln. Proctor, WV 26055 **Tax Address:** Same	**Residence 38** TM 11 Pcl. 11.1 Nellie Marie & Robert W. Spencer Phone: None Found **Physical Address:** 3063 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 39** TM 10 Pcl. 3 Herbert M. Aulenbacher Jr. Phone: 304-843-4827 **Physical Address:** 844 Aulenbacher Ln. Proctor, WV 26055 **Tax Address:** Same
Residence 40 TM 10 Pcl. 3	**Residence 41** TM 10 Pcl. 9	**Residence 42** TM 10 Pcl. 11

Herbert M. Aulenbacher Jr. Phone: 304-843-4827 **Physical Address:** 746 Aulenbacher Ln. Proctor, WV 26055 **Tax Address:** 844 Aulenbacher Ln. Proctor, WV 26055	Herbert M. Aulenbacher Jr. Phone: 304-843-4827 **Physical Address:** 96 Aulenbacher Ln. Glen Easton, WV 26039 **Tax Address:** 844 Aulenbacher Ln. Proctor, WV 26055	Joseph Lee Crow Phone: 304-843-1226, 304-843-1824 **Physical Address:** 834 Whetstone Run Ln. Proctor, WV 26039 **Tax Address:** 1414 8th St. Moundsville, WV 26041
Residence 43 TM 10 Pcl. 12.1 John Paul Smith Jr., Et Al c/o William Lee Hubbard Phone: 304-233-6416 **Physical Address:** Unknown **Tax Address:** 50-6th Street Benwood, WV 26031	**Residence 44** TM 10 Pcl. 12.1 John Paul Smith Jr., Et Al c/o William Lee Hubbard Phone: 304-233-6416 **Physical Address:** Unknown – Appears to be mobile home trailer. **Tax Address:** 50-6th Street Benwood, WV 26031	**Residence 45** TM 10 Pcl. 12.1 John Paul Smith Jr., Et Al c/o William Lee Hubbard Phone: 304-233-6416 **Physical Address:** 61 Hubbard Ln. Glen Easton, WV 26039 **Tax Address:** 50-6th Street Benwood, WV 26031
Residence 46 TM 10 Pcl. 22 Louis Aulenbaucher Phone: None Found **Physical Address:** 76 Hubbard Ln. Glen Easton, WV 26039 **Tax Address:** 96 Hubbard Ln. Glen Easton, WV 26039	**Residence 47** TM 10 Pcl. 19 Bradley L. Connie L. Hubbard Phone: None Found **Physical Address:** 1033 Whetstone Run Ln. Proctor, WV 26055 **Tax Address:** RR 1 Box 47-B Glen Easton, WV 26039-9709	

OLD CROW PAD



NOTE: THERE APPEARS TO BE SIX (6) RESIDENCES WITHIN 1,500' ±.

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www.slssurveys.com

TOPO SECTION:		OPERATOR:	
GLEN EASTON & 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.	8796	06/22/18	1" – 500'

TUG HILL OPERATING

02/25/2022

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

Residences within 1500 Feet

Pad: Old Crow
District: Franklin (Residences 1-6)
State: WV

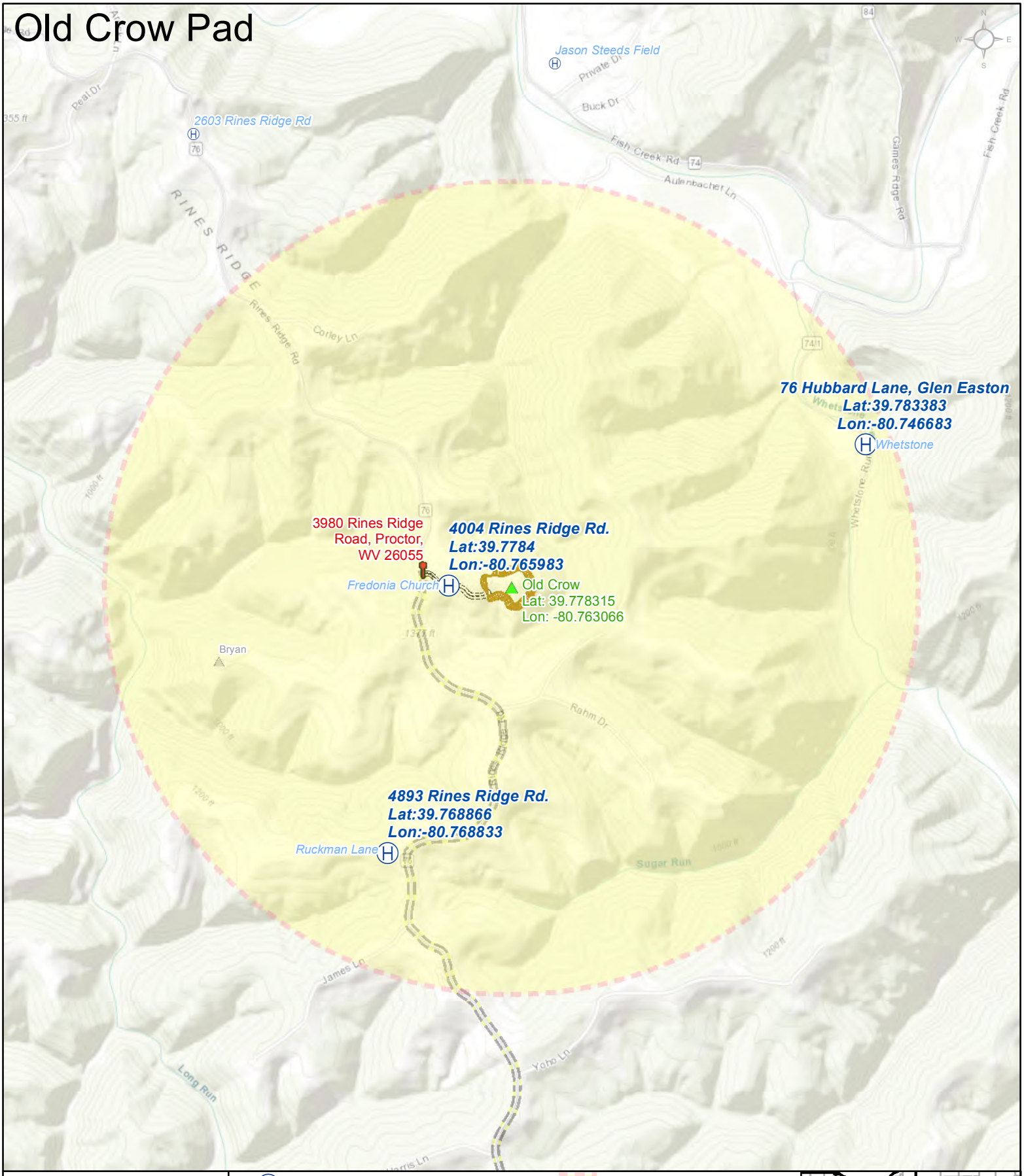
There are six (6) residence, no businesses, no churches, no schools or no emergency facilities within 1500 feet of the above referenced well location.

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

02/25/2022

Exhibit 3 – Helicopter Landing Zone

Old Crow Pad



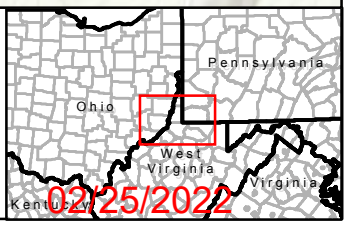
Nearby EMS LZ's

0 600 1,200 2,400 Feet

Coordinate System: NAD 1983 UTM Zone 17N - Units: Foot US

TUG HILL OPERATING

- EMS Landing Zones within 1 Mile
- Alternative EMS Landing Zones
- THQA Pad of Interest
- Other THQA Operated Pad
- Access Road Intersection
- 1 Mile Buffer Zone
- THQA Padsite Road
- Local Roads
- THQA Bonded Route



02/25/2022

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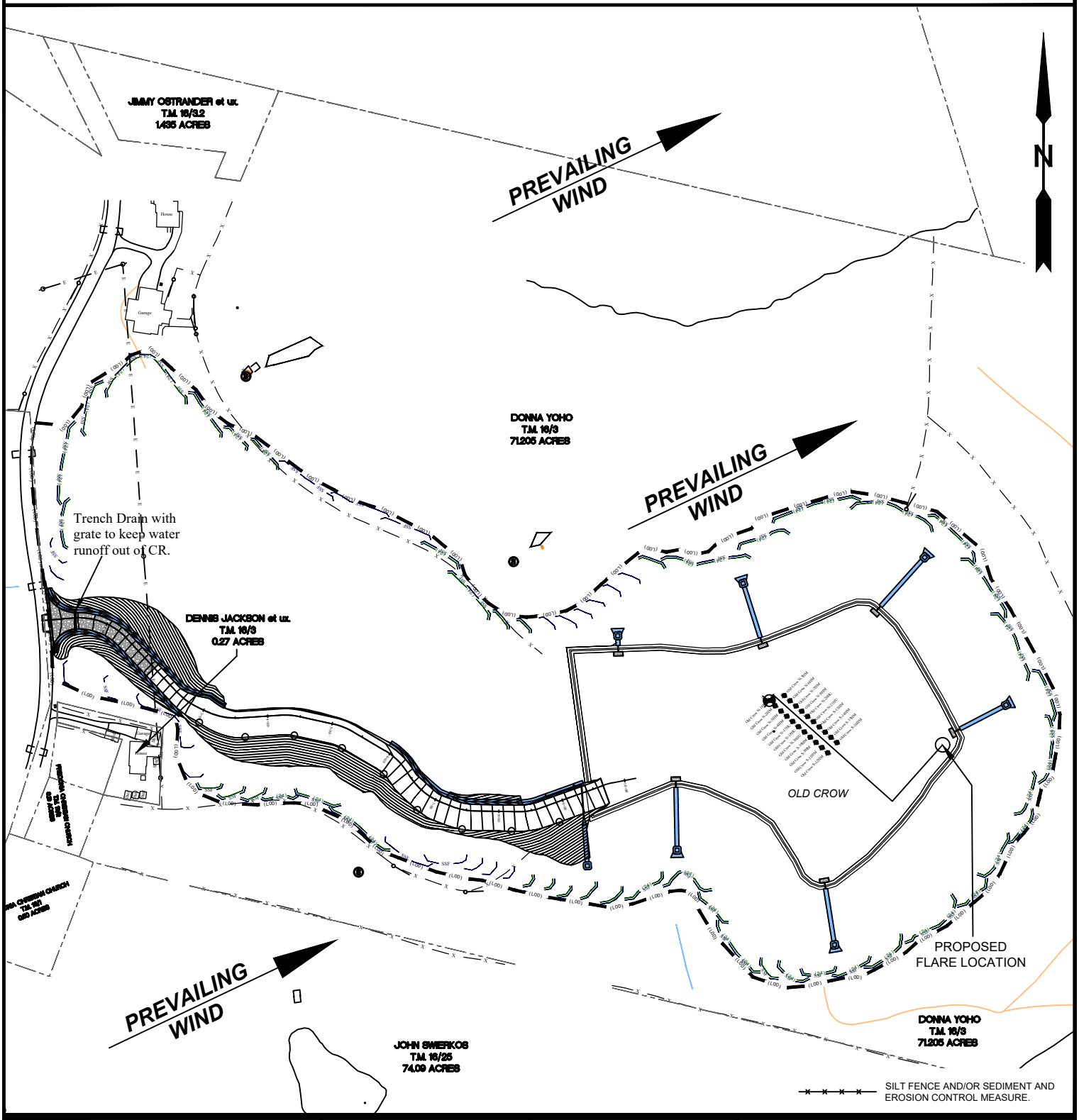
Map Created By: dcreighton on 8/25/2020

Exhibit 4 – Plan View

OLD CROW PAD



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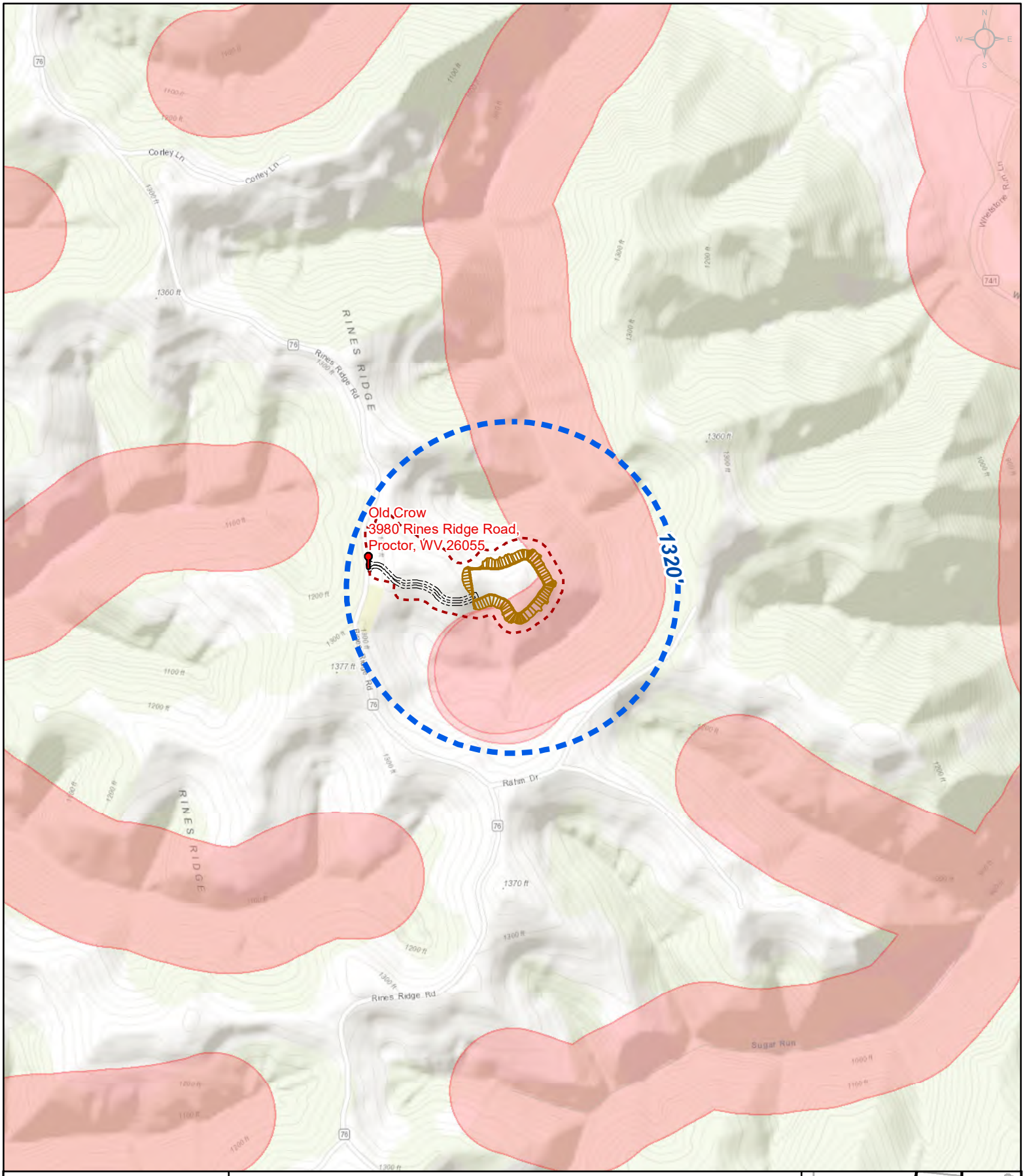
www.slssurveys.com

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

02/25/2022

Exhibit 5 – Zone of Critical Concern



CONFIDENTIAL

0 375 750 1,500 Feet

Coordinate System: NAD 1983 UTM Zone 17N - Units: Foot US

TUG HILL OPERATING

Access Road Intersection

Quarter Mile Radius

Limits of Disturbance

zcc

Pad Boundary

Padsite Road

02/25/2022

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Map Created By: dcreighton on 10/15/2021

Exhibit 6 – County List of Regional Resources

TUG HILL OPERATING – DRILLING OPERATIONS EMERGENCY NUMBER 800-921-9745

OLD CROW – Key Personnel, Agency and Emergency Contact List

MEDICAL SERVICES

Agency	Address	Phone
Reynolds Memorial Hospital	800 Wheeling Avenue Glen Dale (Moundsville), WV 26038	304-845-3211
Reynolds Rapid Care	215 North Lafayette Avenue Moundsville, WV 26041 Open Mon – Saturday • 9:00 AM – 7:00 PM Mon – Fri. • 8:00 AM – 4:00 PM Sat. & Sun.	(304) 843-3435
Wheeling Hospital	1 Medical Park, Wheeling, WV 26003	(304) 243-3000
Med Express New Martinsville	260 Russell Ave, New Martinsville, WV 26155 Open Mon – Saturday • 8:30 AM – 6:30 PM Mon – Fri. • 9:00 AM – 4:30 PM Saturday • Closed Sunday	304-398-4949
EZ CARE	260 Russell Avenue New Martinsville, WV 26155 • M-F 8:30 AM-7:00 PM • S 9:00 AM – 5:00 PM	304-398-4949
Wetzel County Hospital	2705 3E Benjamin Drive New Martinsville, WV 26155 • 2318 Whiteman Hill Road, New Martinsville, WV 26155 (North Entrance) • Head North on Whiteman Hill Rd. (Cty. Rt. 30) (2.3 mi.) • Slight Right onto Pike Street and then 1st Left on Central Street (300 ft.) • Turn Right onto WV-2 Energy Rd. (3.3 mi.) (Pass Pizza Hut on Left in 3.1 mi) • Turn Right on E Benjamin Drive (0.4 mi.)	304-455-8000

Figure 1 – Collision Avoidance

Well Bore Spider Plot

Well: Old Crow N-08 HM (slot D)
Site: Old Crow Pad
Project: Marshall County, West Virginia.
Design: rev6
Rig:

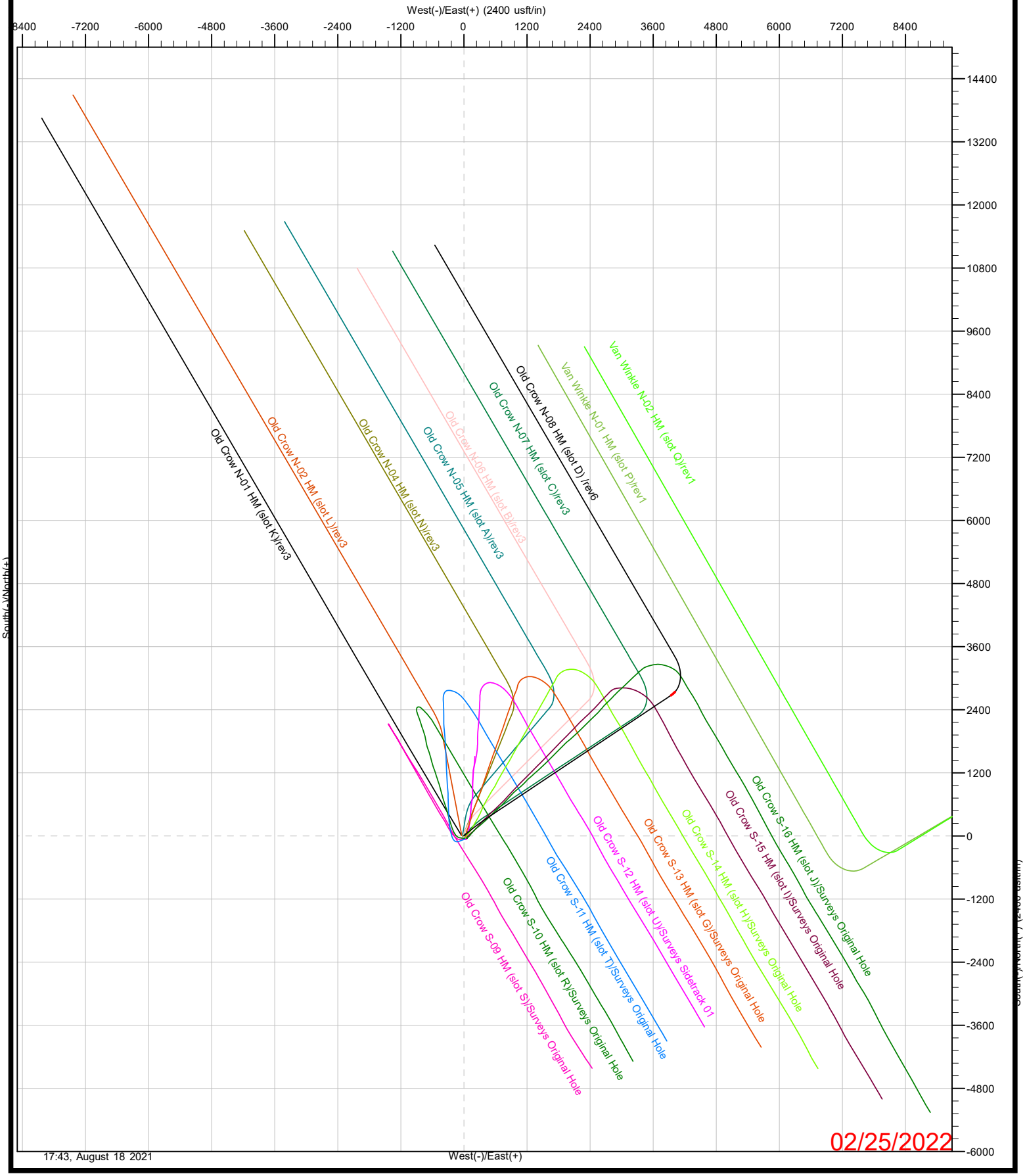


Figure 2 – Casing and Cementing

Tug Hill Operating, LLC Casing and Cement Program

Old Crow N-21HU

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	20"	J55	26"	990'	CTS
Intermediate 1	13 3/8"	J55	17 1/2"	2,805'	CTS
Intermediate 2	9 5/8"	HPP110	12 1/4"	10,172'	CTS
Production	5 1/2"	HCP110	8 1/2"	27,839'	CTS

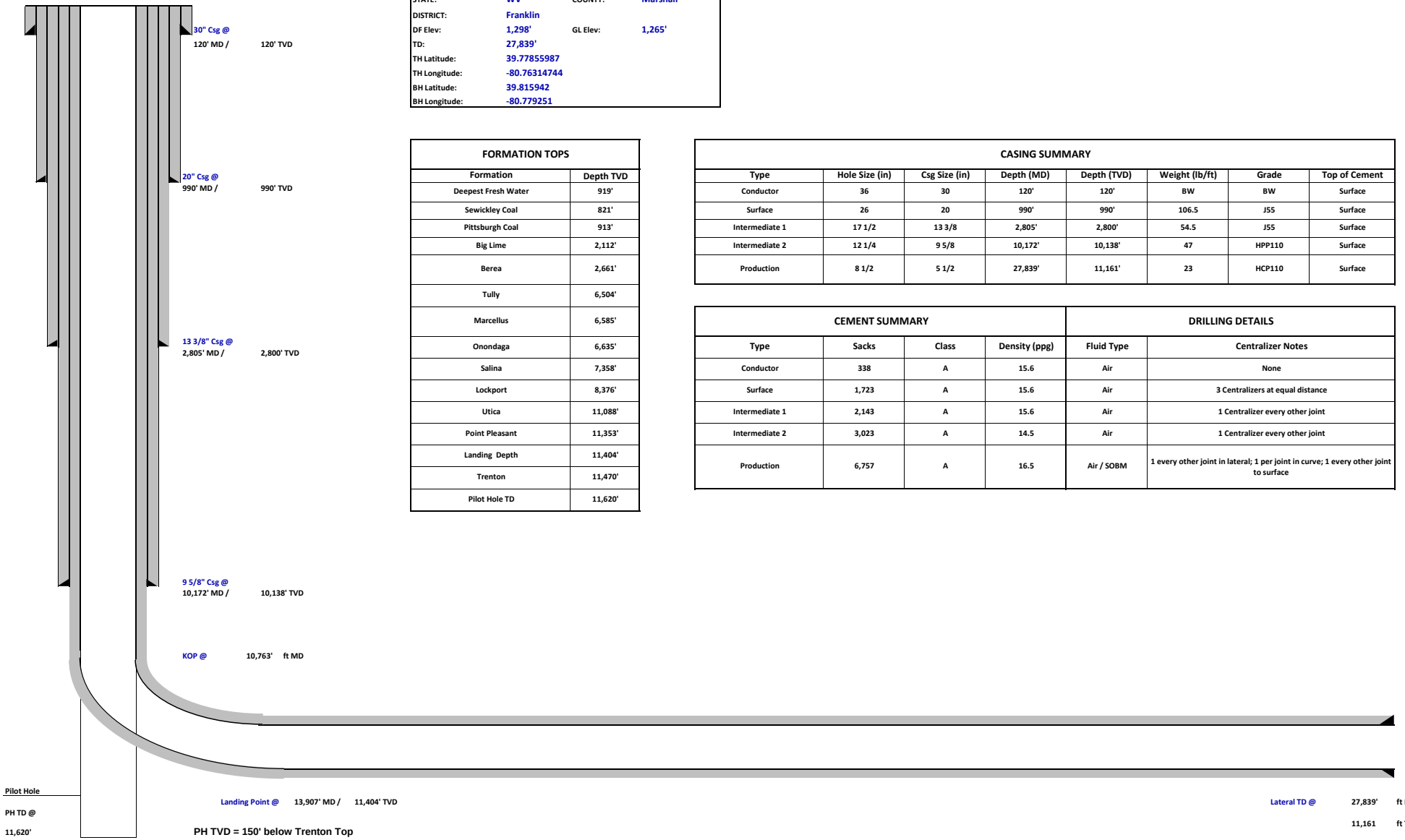
Cement

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 1:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.2
Intermediate 2:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 14.5 ppg, Y=1.35
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 16.5 ppg, Y = 1.03

02/25/2022

Figure 3 – Well Bore Layout Program

WELL NAME:	Old Crow N-21HU		
STATE:	WV	COUNTY:	Marshall
DISTRICT:	Franklin		
DF Elev:	1,298'	GL Elev:	1,265'
TD:	27,839'		
TH Latitude:	39.77855987		
TH Longitude:	-80.76314744		
BH Latitude:	39.815942		
BH Longitude:	-80.779251		



PH TVD = 150' below Trenton Top

FORMATION TOPS

Formation	Depth TVD
Deepest Fresh Water	919'
Sewickley Coal	821'
Pittsburgh Coal	913'
Big Lime	2,112'
Berea	2,661'
Tully	6,504'
Marcellus	6,585'
Onondaga	6,635'
Salina	7,358'
Lockport	8,376'
Utica	11,088'
Point Pleasant	11,353'
Landing Depth	11,404'
Trenton	11,470'
Pilot Hole TD	11,620'

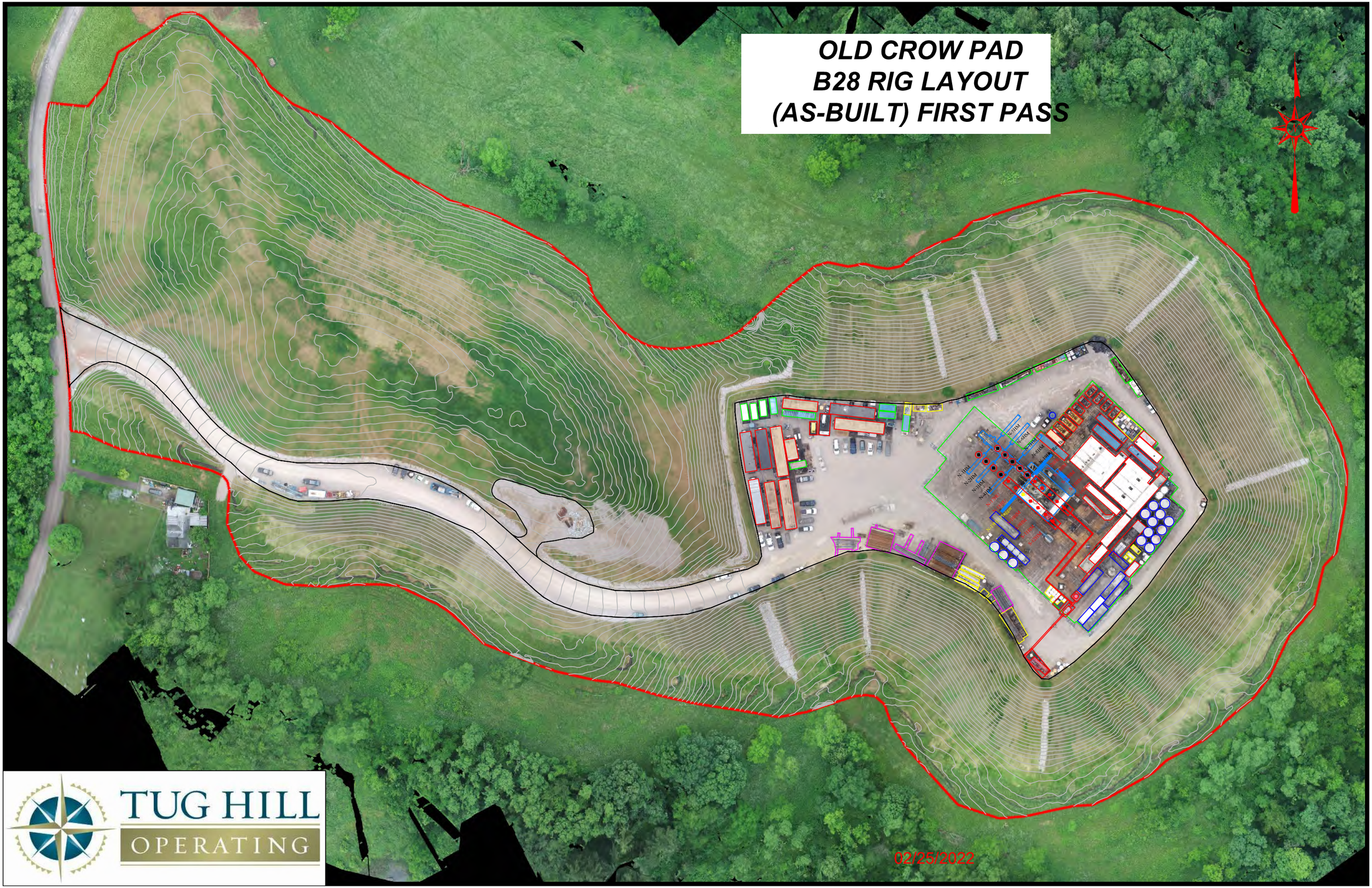
CASING SUMMARY

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	26	20	990'	990'	106.5	J55	Surface
Intermediate 1	17 1/2	13 3/8	2,805'	2,800'	54.5	J55	Surface
Intermediate 2	12 1/4	9 5/8	10,172'	10,138'	47	HPP110	Surface
Production	8 1/2	5 1/2	27,839'	11,161'	23	HCP110	Surface

CEMENT SUMMARY				DRILLING DETAILS	
Type	Sacks	Class	Density (ppg)	Fluid Type	Centralizer Notes
Conductor	338	A	15.6	Air	None
Surface	1,723	A	15.6	Air	3 Centralizers at equal distance
Intermediate 1	2,143	A	15.6	Air	1 Centralizer every other joint
Intermediate 2	3,023	A	14.5	Air	1 Centralizer every other joint
Production	6,757	A	16.5	Air / SOBM	1 every other joint in lateral; 1 per joint in curve; 1 every other joint to surface

Figure 4 – Anticipated Rig Layout

OLD CROW PAD
B28 RIG LAYOUT
(AS-BUILT) FIRST PASS



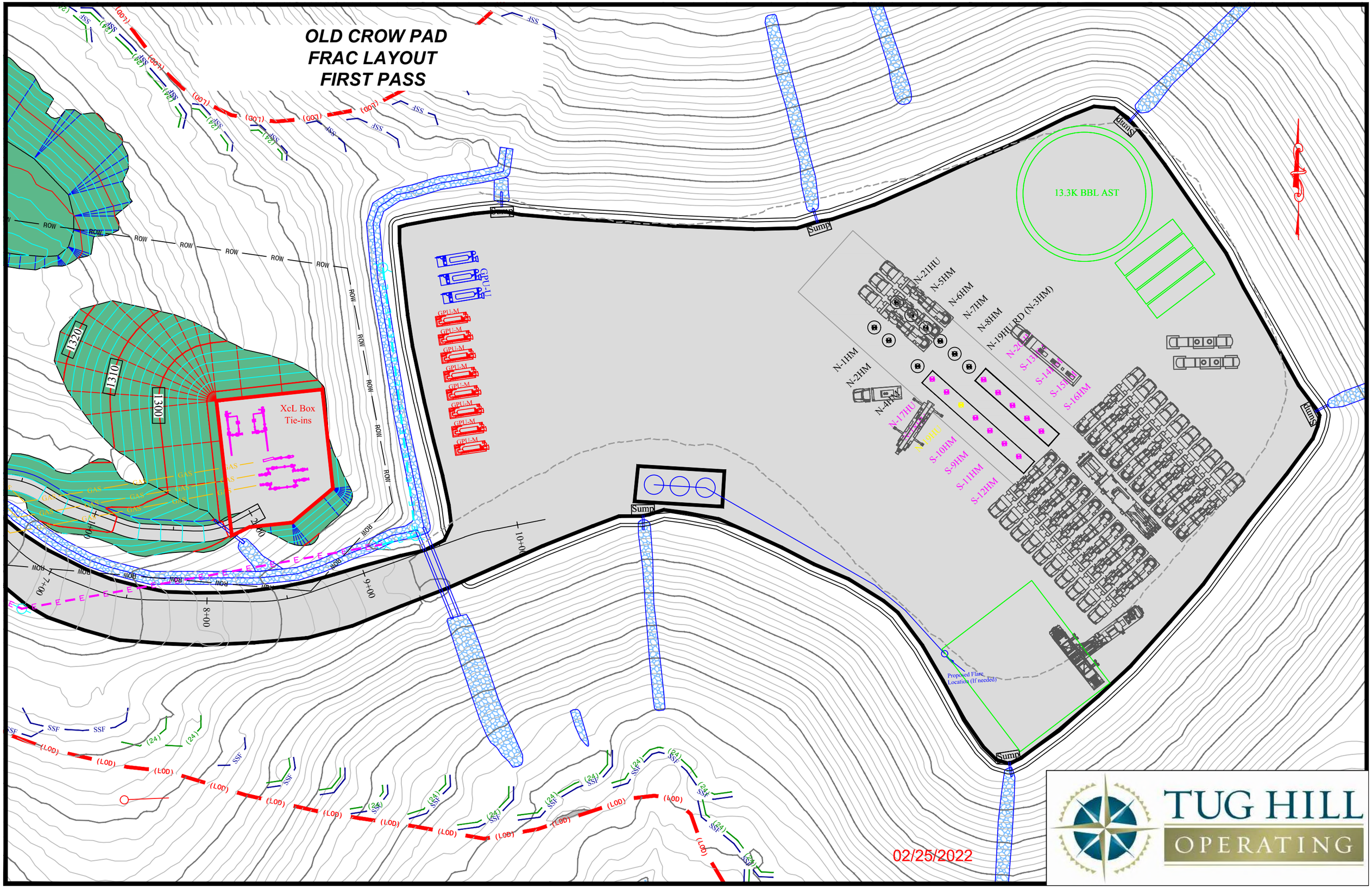
TUG HILL
OPERATING

OLD CROW
X14 RIG AS-BUILT LAYOUT
SECOND PASS

TUG HILL OPERATING

Figure 5 – Anticipated Frac layout

OLD CROW PAD
FRAC LAYOUT
FIRST PASS



OLD CROW PAD
FRAC LAYOUT
THIRD PASS

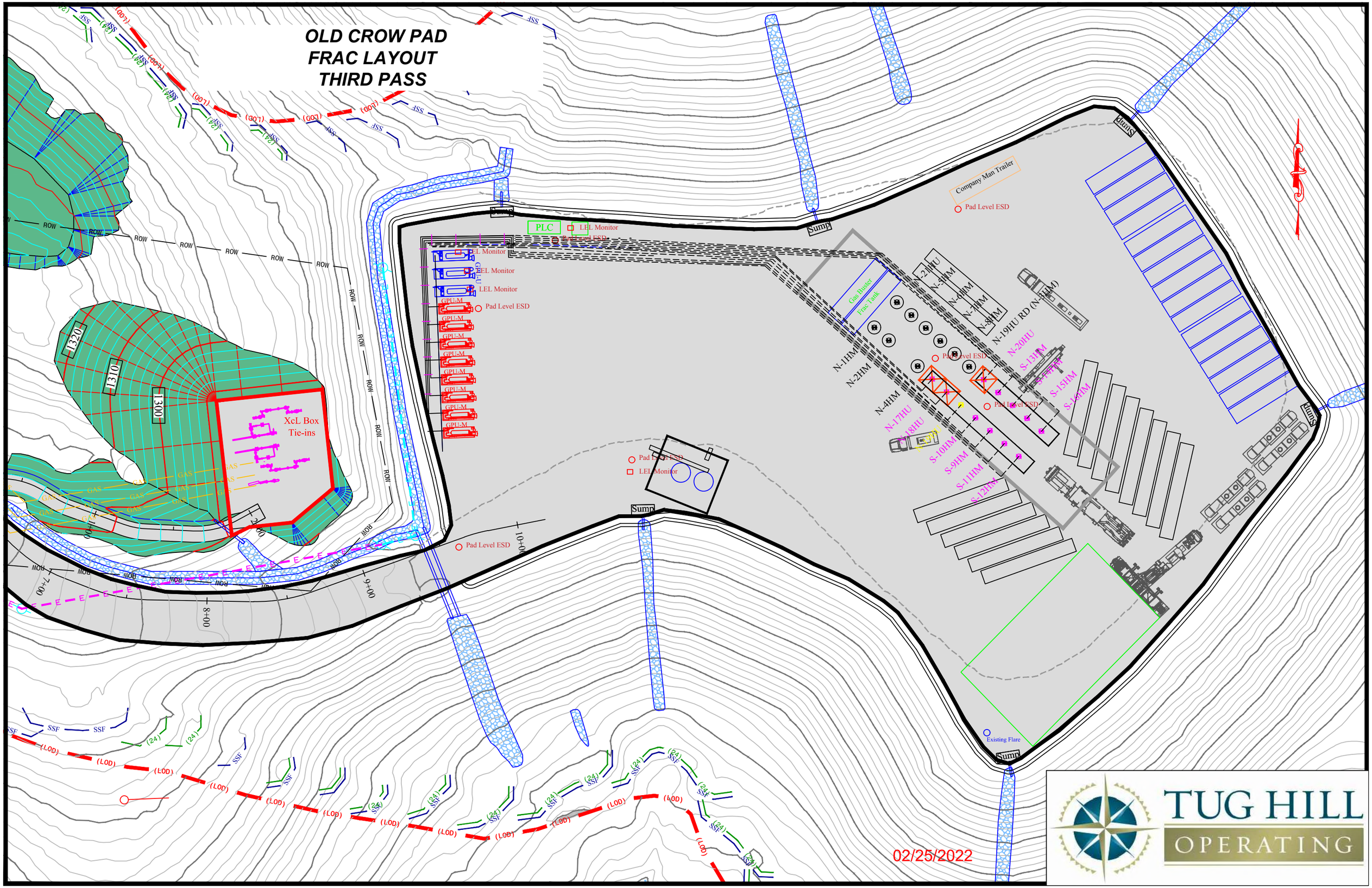
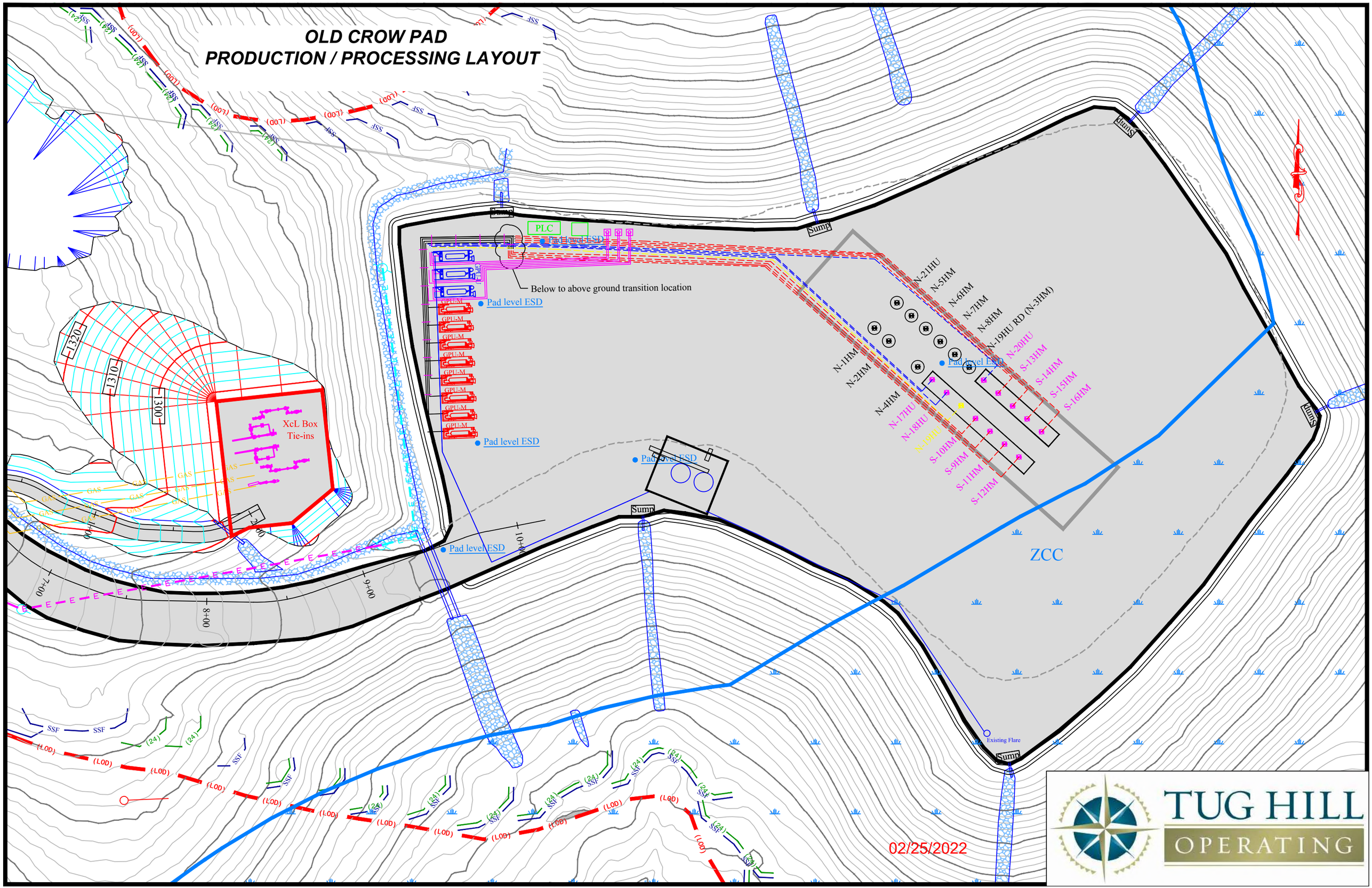


Figure 6 – Planned Production Facilities

OLD CROW PAD
PRODUCTION / PROCESSING LAYOUT



Tug Hill List of Chemicals by Formula Name and Maximum on Location
Updated March 2020

Construction Chemical	Max. on Location		Units
Diesel Fuel	500		gal.
Hydraulic Fluid	150		gal.
10w30 or 10w40 Oil	55		gal.
Grease	10		gal.

Drilling Chemicals	Max. on Location		Units
Paints	50		gal.
Spatz M-150	40		gal.
Krylon BBQ & Stove Paint *	12		pounds
Krylon OSHA Colors	36		pounds
Kem Kromik Metal Primer	10		gal.
Mineral Spirits	5		gal.
D322-Rigwash	100		gal.
2-26 Multi-Purpose Precision Lubricant	12		pounds
Ammonium Bisulfite	42		gal.
Calcium Chloride	2500		pounds
Chemplex 710 / Fumed Silica	280		gal.
Dow Corning 700 Industrial Grade	5		pounds
Formula 151	31.5		gal.
HRP	9		pounds
Mar-T126 / Tetrachloroisophthalonitrile	9		pounds
MC-122 / Methyl Alcohol	42		gal.
Marathon No. 2 Ultra Low Sulfur	30000		gal.
SPX 800 Series AW Hydraulic Oil	300		gal.
SXP Extended Life Coolant	300		gal.
SPX Gear Oil EP	300		gal.
Tekusolv II Red, MM	50		gal.
Citric Acid Anhydrous	1600		pounds
Synfloc-SC-Neutral	550		gal.
ABS 40 NE Base Oil	16800		gal.
ABS MUI	2200		gal.
AES Sperse	550		gal.
AES Vis III	6000		pounds
AES vis LS	6000		pounds
AES WA II	2200		gal.

02/25/2022

Drilling Chemicals	Max. on Location		Units
Barite	42000		pounds
CalCarb Mix	2500		pounds
BlueMax	550		gal.
CalciumChloride Powder	22400		pounds
GXM	2500		pounds
KCL	22400		pounds
Lime	20000		pounds
Nut Plug	5000		pounds
Pipelax	250		gal.
Sodium Chloride	10000		pounds
Silverseal	2500		pounds
Soda Ash	2500		pounds
WCI 1013	660		gal.
CJ020 Bentonite	500		pounds
CJ110 Calcium Chloride	2115		pounds
CJ600 - Super Flake	188		pounds
CJ910 Class A Cement	70500		pounds
Sugar / Sucrose	400		pounds
Dolomite Quick Lime / Calcium magnesium oxide	18		Tons

Completions Chemical	Max. on Location		Units
Citgo Aluminum Complex PL 000 Grease	**1980**		**gal.**
Final ChargeGlobal 50/50 Prediluted Antifreeze & coolant	**990**		**gal.**
Hyrochloric acid - <37%	**9000**		**pounds**
Mineral Oil	**990**		**gal.**
Mobil Delvac1300 Super 15W-40	**1650**		**gal.**
Mobilfluid 424	**1320**		**gal.**
Calcium Chloride	**2500**		**pounds**
StimSTREAM FR 9800	**4500**		**gal.**
Dynaseal	**275**		**gal.**
Zep Brake Flush 55GL	**5**		**gal.**
Zepreserve NC Aero DZ	**5**		**gal.**

Production Chemicals	Max. on Location		Units
SCW8234 Scale Inhibitor	300.0		gal.
Methanol	300		gal.

02/25/2022

Well Site Safety Plan
Part B – Policies and Procedures

Well Name: Old Crow N-21HU
Pad Name: Old Crow
County: Marshall

UTM (meters), NAD83, Zone 17
Northing: 4,403,206.82
Easting: 520,282.83

KEY CONTACT FOR WELL SITE SAFETY PLAN DEVELOPMENT AND MAINTENANCE

Jerry V. DeRosa, Director EH&S Affairs
(724) 338-2029 (office)
(412) 736-5767 (cellular)

24-HOUR EMERGENCY PHONE NUMBER

(800) 921-9745

02/25/2022

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WSSP PART B – ATTACHMENTS

Attachment 1 – Standard Wellhead Assemblies Figures

- Standard Marcellus Blow Out Preventor (BOP) Assembly
- Standard Marcellus Wellhead Assembly
- Standard Utica Frac Stack BOP Testing Procedure
- Standard Utica Wellhead Assembly

Attachment 2 – Emergency Response Plan

- Incident Response and Notification Procedure
- Incident Command Structure (ICS)
- Levels of Operational Emergencies & Initial Response Procedures
- Surface Emergency Scenarios
    - Blank Kill Sheet
    - Family Information Gathering Form
    - County Family Resource Guide
    - NIMS ICS Forms (select initial forms)

Attachment 3 – H2S Program & Forms

1.0 WELL SITE SAFETY PLAN ORGANIZATION

For ease of reference, therefore, the WSSP is separated into two parts:

PART A

- SITE-SPECIFIC DATA and information
- Emergency Contacts
- Siting Location Plans and Exhibits
- Well Development Figures
- Chemical Inventory Information

Part B

- Standard policies and procedures required under W.Va. Rule 35 CSR 8-5.7 which apply to all TUG HILL well pads in West Virginia.
- Standard Wellhead Assemblies Figures
- Emergency Response Procedures
- Hydrogen Sulfide planning

Part of ERP includes Emergency Response scenarios and the Incident Command System (ICS) – which is an organizational hierarchy and description of the division of responsibilities for large-scale, severe incidents such as a well control incident. As shown above, the ERP is provided in the **PART B– ATTACHMENTS** to the WSSP.

Because there is duplication of some topics under these different regulatorily required plans, we have sought to compile and condense those exhibits, figures and other items which would be most needed and accessed quickly by incident command in case of an emergency into a singular section that comprises **PART A - SITE-SPECIFIC DATA** section.

Where applicable, the reviewer of the WSSP is directed to find site plans, drawings, exhibits and tables, in the **PART A -- SITE-SPECIFIC DATA** tab.

2.0 CONTACTS, SCHEDULES, AND MEETINGS

2.1 Emergency Contact Information

The Tug Hill Emergency Contacts List presented within **PART A – SITE-SPECIFIC DATA** section of this WSSP. The list includes contact information for local emergency response, Tug Hill management personnel, and contractors currently operating at the well site. Contractors working on location will vary for Drilling versus Completions vs Production.

For reference, the Emergency Contacts List within **PART A – SITE-SPECIFIC DATA** section of this WSSP is comprised of those contractors being utilized by Tug Hill at the time of permit submittal. An updated Emergency Contact List will be issued and in the WSSP / ICP binder on location prior to the commencement of the Operational phase.

Schools, residences, and public facilities within a one (1) mile radius are shown in Siting Exhibits also in the **PART A – SITE-SPECIFIC DATA** section.

2.2 Incident and Emergency Notifications

Incident notifications commence by following the Tug Hill **Initial Incident Response and Notification Procedure**, which is provided in ERP in **PART B -- ATTACHMENTS** of this WSSP and in the ICP binder. Contractors and Employees alike are required to report all and every incident as soon as practicable.

Pursuant to the Tug Hill executive management EH&S policy directive, **all incidents** (e.g., safety or environmental related accidents and near miss events, equipment failure, vehicle accidents, injuries, illnesses, and/or spills, releases, or leaks involving loss of fuels, petroleum, chemical fluids, and other hazardous materials used, stored, produced, or transported on-site) must be reported immediately to the either Tug Hill Company Man/Completions Consultant or other Tug Hill Person-in-Charge (PIC), **AND** to the on-duty EHS Coordinator.

The observer of the condition or incident of concern continue attempting contacts until a person is reached. Voicemail, texts, emails are **NOT** sufficient contact.

The Tug Hill Company Man/Completions Consultant/PIC or EHS Coordinator will enter the FIRST ALERT REPORT into the Tug Hill EHS Insight database. The FIRST ALERT will automatically disseminate via email to the Tug Hill Operations Management team. The EHS Coordinator on-duty is to report to the scene and complete Incident SUBMISSION details in EHS Insight and will coordinate response actions in concert with the Company Man/PIC, EHS Director, and Tug Hill Operations management.

For all events requiring on-site Muster, response actions will be consistent with the "**Emergency Response Level**" of incident severity as defined in the ERP Emergency Response, Evacuation/Shut-down Plan attached to this WSSP and provided in the ICP binder. All Level 3 events will require moving all non-essential personnel to the secondary Muster point pursuant to the ERP. Typically, the secondary Muster point is located at the Guard Shack located along the

site access road. The location will be specified on in the Exhibits shown in **PART A -- SITE-SPECIFIC DATA.**

2.3 Emergency Response and Event Levels

For all Emergency Response Level 3 events (e.g., H_2S Emergencies, Well Control events, other conditions presenting an Immediately Danger to Life or Health [IDLH]) or when there is a need to activate state or federal Emergency Response Agencies (e.g., an uncontrolled fire, serious injury, or other emergency), the observer is to immediately call **911** to reach external emergency response services. County Dispatch will alert the appropriate emergency response agencies depending on the nature and extent of the emergency.

At the first notice of a detection of a well control issue, contact the Tug Hill Well Control Contractor identified in the Emergency Contact List. Every situation is unique, and steps may be taken to eliminate the issues at hand but when the ultimate well control situation occurs, there are procedures that will need to be followed to establish a well control intervention.

In all emergency incident situations, safety and preservation of life is paramount. Well site personnel shall not perform duties/functions for which they are not trained and appropriately qualified to perform and, therefore, shall not perform response efforts that may put themselves or others in a situation that threatens human health and safety. This may range from a well control event to a hazardous materials spill that would require hazardous waste clean-up.

Upon activation ERP for any Level 3 event, the Incident Command System will be employed pursuant to the ERP. Tug Hill Operations Management and/or EHS Director will make notifications to the WVDEP Department of Oil & Gas and the County EMA and the on-scene Incident Commander (e.g., Company Man/PIC) will work in concert with these agencies to establish Unified Incident Command (UIC).

3.0 SITE ACCESS, VISITOR MANAGEMENT, AND COMMUNICATION

3.1 Security and Site Access

Access and egress to the well pad is provided via a site access road. During the Drilling and Completions Operational phases of well development, Security Guard stations are typically located at the beginning or along the access road. The Security and Site Access is controlled pursuant to the **Tug Hill Site Security Standard Operating Procedure** (SOP).

This Site Security SOP requires the presence of security on location during Drilling and Completions activities, and for significant operations during which there are simultaneous operations "SIMOPS" involving multiple contractors onsite and/or which may be working in the hot work zone while wells are in Production.

A copy Incident Response and Notification Procedure and **PART A – SITE-SPECIFIC DATA** section of this WSSP with site layout and location figures and Emergency Contact List is to be maintained in the Security Guard Shack.

3.2 Accounting for Personnel

The Security Guard Contractor is shown in the Emergency Contact list provided in **PART A - SITE-SPECIFIC DATA** section of this WSSP. Security Guards are required to ask questions of workers entering the location and screen visitors and vendors. Security Guards also keep a running log of personnel on location.

All parties entering or leaving the site (e.g., visitors, Tug Hill personnel, and contractors) are required to sign in and sign out when entering or leaving the worksite during drilling, completion, and work-over activities. All visitors are required to have pre-approval from the Company Man/PIC to enter the location and are directed to report directly to the Company Man or Completions Consultant office. Visitors may not travel within the site unapproved.

This sign-in sheets maintained by Security will be used for account for visitors and personnel in the event of a well site emergency or significant incident. This log will be maintained for the duration of operations by contracted gate guards or the Tug Hill On-Site Supervisor or their designee.

For production facilities where there is no Security Guard and employees or service company individuals may be performing work alone, the employee is to maintain periodic contact with their supervisors or peers and make them aware of their location and routes and any changes to those routes that may occur.

3.3 Communications On-site

As always, communications are the key to a safe and successful worksite. Communications starts with site induction and CEM Safety Orientation. During site orientation, the muster locations, evacuation routes and alarm sounds shall be communicated. Additionally, daily safety meetings are held at the commencement of each work shift so that workers on location understand the planned activities and hazards anticipated. See Section 4.2 below regarding Safety Meetings.

Need of communications equipment is dictated by the activities and project's needs. Two-way radios are typically used on Drilling and Completions sites where well work is underway. On large and multi-disciplinary SIMOPS worksites, hand-held two-way radios will be issued to ensure crews working on the pad will have adequate means of communication in the event of emergency.

To address emergency situations, the drilling rig and completions site is equipped and alarm, horn, or siren. Additionally, gas monitoring systems on location are equipped with an audible and visual siren and flashing light to alert workers on location that a hazardous atmosphere condition has been detected.

For transportation with trucking, Tug Hill D&C Operations and Production Department employee vehicles are equipped with cellular telephones, cell phone boosters, and Citizen Band (CB) radios. Security Guards on each D&C Operations pads are equipped with cellular telephones and CB radios. CB radio signs are posted along Tug Hill Bonded Routes and the CB channel number designated for the well pad is included in the Pre-Spud and Pre-Frac hand-outs provided to Contractors and workers.

3.4 Communication with Outside Media

There will be no non-participants and outsiders other than emergency services allowed on the well pad during an emergency, and no statements will be issued to the media or other interested parties except by designated Tug Hill management.

Any media statements will be provided the Tug Hill Public Information Officer pursuant to the ERP. Tug Hill field workers and Contractor personnel are directed to be courteous to media representatives and direct them to the designated company spokesperson.

4.0 SITE SAFETY

4.1 Safety Orientation and Expectations for Workers and Contractors

All Contractors are required to participate in the Tug Hill Contractor Safety Management Program (CSMP) and either have a Master Services Agreement (MSA) by and between Tug Hill or be subcontracted directly with a primary Contractor who is bound by the MSA. Under the terms and conditions of the MSA, the Contractor is required to acknowledge receipt and abide by Contractor Expectation Manual (CEM). The CEM outlines Tug Hill safety and environmental performance expectations.

Upon first reporting to service for Tug Hill, all workers are required to participate in CEM Safety Orientation prior to be permitted to work on a Tug Hill location. During CEM Orientation, workers are informed of stop work authority, safe work practice expectations, requirements for Permits-to-Work (PTW), spill containment requirements, incident notification procedures, and emergency response procedures. Site specific information such as pad layout and muster points will be reviewed during the CEM Orientation. Workers who have not had CEM Orientation or SIMOPS Induction must report to the PIC or the EHS Coordinator.

4.2 Safety Meetings

Safety meetings are typically held on-site at the following frequency:

1. Prior to commencement of Drilling and/or Completions Operations (Pre-Spud; required)
2. Pre-shift for Day and Night shifts
3. During new or changing Operations (e.g., casing runs, cement jobs, wellhead work)
4. Weekly
5. Pre-Workover
6. Post-Accident / High Potential Near Miss
7. As deemed necessary by the PIC based upon operational conditions
8. Prior to drilling into potentially high-pressure zones
9. Prior to SIMOPS

At a minimum, safety meetings will be held on a weekly basis, prior to drilling, prior to the start of subsequent Operational phases (e.g., handover from Drilling to Completions). Personnel involved in ongoing operations (Tug Hill staff, key contractors, safety personnel, on-site support staff, etc.) shall be included in the safety meetings.

The District WVDEP Office of Oil & Gas County Inspector shall be notified at least 48 hours prior to the Pre-Spud, Pre-Stim, and Pre-Workover safety meetings so that they or their designated representative may attend the meeting if desired.

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Typically, the Tug-Hill Company Man/Completions Consultant/PIC will conduct the on-site safety meetings in conjunction with the Tug Hill EHS Coordinators and Contractor Supervisors. On-site workers and visitors are required to participate. A record of personnel and others attending the safety meetings will be recorded on the Safety Meeting Sign-In Sheet. Once completed, the forms will be maintained onsite or in the Tug Hill archived files.

4.3 SIMOPS Induction Meetings

When SIMOPS involving Drilling, Completions, or Work-Over Operations are planned simultaneous with Production, a site specific SIMOPS Plan will be developed to ensure mitigation of hazards associated with concurrent Operations. Each Contractor and its respective workers will attend an initial SIMOPS Induction Safety Orientation regarding the activities and procedures outlined in the SIMOPS Plan. This is in addition to or combined with standard CEM Safety Orientation provided by the EHS Coordinators.

During the Induction, the Tug Hill SIMOPS agenda topics shall be review and hazard identification, risk mitigation procedures, reporting, management of change, and emergency response procedures outlined in the ICP, ERP, and WSSP. Specific factors relevant to the activities and areas in which the Contractor's personnel are working will be reviewed.

4.4 SIMOPS Meetings

STANDARD SIMOPS MEETING SCHEDULE

Activity	Attendees/Time	Brief Agenda	Lead by
Pre-Work SIMOPS Meeting	All Key SIMOPS Mgmt. and Personnel	SIMOPS Pre-Work Meeting Agenda	SIMOPS PIC, Activity Supervisor, and EHS
Site Induction	All Workers New to Site -- Upon site entry EHS	General Rules. Emergency Procedures and Hazards Management; PTW; Buffer & Exclusion Zones; Communications; CEM Safety Orientation	Pad Owner/PIC/Activity Supervisor and/or EHS
Daily Site Safety meeting	Activity workforce Daily or as required. EHS (as available)	Day's activities, Incident Reports, Hazards Reported, Inspection Results; Other Current Issues;	PIC and/or Activity Supervisor
Operations Calls	Project supervisors, all projects, and EHS	Coordination of projects planned and activities of the day; Identify conflicts Permit requirements/EHS issues traffic movements, traffic community issues	Operations Manager; PIC
Weekly SIMOPS or at PIC Discretion for MOC	PIC, Site Supervisors, and EHS (as available)	3 to 4 day look ahead at planned activities, potential conflicts, shared services, permit requirements	PIC

Additionally, the SIMOPS Plan and Hazard Risk Mitigation actions shall be communicated to new contractors during on-boarding prior to working on the location.

The daily Safety Meeting is mandatory participation for all SIMOPS parties and site supervisors. Instances When an "all-hands" Safety Stand-down is required:

1. After a Muster Event or ESD (other than sensor malfunction)
2. Any Level 2 or 3 major, or severe incident events (after any major event (e.g., serious OSHA "Recordable" Injury, serious Reportable Spill requiring remedial action, or serious "High Potential" Near Miss, acts of violence or terrorism)
3. Stop Work Orders because of safety concern being identified on location
4. Activation of the ERP or Incident Command System for any reason
5. Any instance at the discretion of the Company Man, PIC, or Tug Hill and/or XcL Management

4.5 Management of Change – Extra Emphasis on SIMOPS

Management of Change (MOC) is critical to proper communications and to mitigate risks on the well pad. The PIC, Company Men and the Managers or Supervisors of the Operational teams are all equally responsible to ensure that MOC practices are followed.

Especially during SIMOPS, utilization of hand over notes and checklist between groups and Operational departments, work scope confirmations, and safety review meetings, are critical during instances involving any significant change in equipment, operations plans and schedules that differ from what was previously approved and communicated, and significant personnel changes.

The SIMOPS Plan shall be reviewed and approved prior to the commencement of SIMOPS. This Plan is to be distributed to the Safety or Operations Manager/Supervisor for each Contractor and Operational Division working on the location. Others who are in a decision-making capacity who may never visit the field Operations should be considered as well.

4.6 Personal Protective Equipment (PPE)

Workers on Operation and Production well pads must be outfitted with the appropriate level of protection as defined by OSHA 29 CFR 1910.132, Personal Protective Equipment.

A summary of PPE requirements is shown below. The full list of PPE requirements and expectations are listed in the Tug Hill Contractor Expectation Manual.

Additional PPE may be assigned dependent on the site conditions and shall be required at the discretion of the EH&S Coordinator and the Tug Hill Company Man. Additional PPE requirements will be communicated to all personnel, if required, during the Pre-Spud, Pre-Frac, and daily safety meetings.

Note: This list is not intended to be exhaustive nor representative of all PPE requirements to remain in compliance with all applicable federal, state, and local laws and regulations and/or industry standard or "best management" practices.

4.6.1 Basic PPE is required to be worn in the following circumstances:

a. When working on equipment at any Tug Hill Operations site where well work has commenced and at all Production pad where there is a presence of flammable gas and/or liquids. Basic PPE is also required on Construction sites.

b. When using hand or powered tools and operating mobile equipment.

c. Exceptions include office areas, parking areas, inside trucks and cars.

4.6.2 Basic PPE

All forms of PPE must meet the appropriate ANSI, ASTM and NFPA specification. Basic PPE on all Tug Hill sites and Operational areas includes:

a. Long pants

b. Shirt with sleeves

c. Hard-toed boots (steel or composite)

d. Safety glasses with permanent side shields

e. Hard hats

4.6.3 Head Protection

a. Hard hats that meet the requirements as defined in the most recent version of ANSI Z89.1 must be worn.

4.6.4 Eye Protection

a. All eye protection equipment (i.e., safety glasses/ goggles) must meet the current specification contained in the most recent version of ANSI Standard Z87.1 and be properly equipped with side shields.

b. Safety glasses/goggles must be inspected prior to use for cracked or damaged lenses, missing or damaged side shields, or other impairments.

c. There is no single type of eye protection that will offer protection from all hazards. Many Operations require a special type or a combination of types. Examples include, but are not limited to, the following:
   i. Welding hood or goggles for welding and burning Operations
   ii. Face shields for grinding
   iii. Face shields or goggles for chemical splash
   iv. When welding or burning, eye protection must be equipped with filter lenses which have a shade number appropriate for the work being performed for protection from potentially injurious light radiation
   v. Shaded lenses are only to be used during daylight hours

d. Workers who wear prescription lenses while engaged in Operations that involve eye hazards are to wear eye protection that incorporates the prescription in its design or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

4.6.5 Foot Protection

a. Hard-toed boots must meet the requirements as defined in the most recent version of ASTM F2413.

b. Additional foot protection, such as metatarsal guards, may be necessary when performing certain tasks, such as operating a jackhammer. Foot protectors must also meet the most recent version of ASTM F2413.

4.6.6 Hearing Protection and Conservation Programs

a. All Tug Hill employees and Contractors are required to wear hearing protection when noise exposure equals or exceeds those set forth by Table G-16 of OSHA 29 CFR 1910.95 (a - b).

b. Hearing protection must reduce the noise exposure to decibel below 90 dBa.

4.6.7 Face Protection

a. All face protection shall comply with the most recent version of ANSI Z87.1.

b. Face protection shall be worn in addition to approved safety glasses or goggles when the work activity includes one or more of the following hazards:
   i. Handling metal or other materials that can whip or spring, striking the face;
   ii. Exposure to flame, sparks, or radiant heat;
   iii. Exposure to chemical splash, drips, or spray;
   iv. Pressure spraying or cleaning;
   v. Grinding, chipping, or cutting Operations that cause flying sparks, chips, or particles; and/or

vi. Exposure to potential electrical arc flash.

4.6.8 Hand Protection

All personnel shall wear hand protection, commensurate with the hazards associated with the task. Selection of the appropriate hand protection will be determined by the chemical and physical nature of the materials handled. Basic tasks that require the use of gloves include, but are not limited to, the following:

a. Welding, cutting, burning.
b. Handling sharp edged steel and cables.
c. Working with corrosive or caustic chemicals.
d. Cold or hot temperature extremes.
e. Exposure to chemical splash, drips, or spray.
f. Pressure spraying or cleaning.

4.6.9 Flame Resistant (FR) Clothing

FR clothing shall be worn at all times by all Tug Hill employees and Contractor personnel while working on Tug Hill sites when:

a. Drilling has commenced and/or a well is installed (regardless of whether it is completed).
b. Where equipment and/or facilities contain or otherwise have the potential to convey natural gas or condensate.

FR clothing shall consist of FR-rated pants and long-sleeve shirt or coveralls conforming to NFPA 2112 and 2113 for Flash Fire protective clothing (the garment tag must read "NFPA 2112/HRC 2 for Flash Fire") with the exception of HRC1 rated raincoats worn over HRC 2 rated shirts and pants. NFPA 70E Arc Flash clothing is heavier and is not required on Tug Hill sites unless performing electrical work triggering NFPA 70E requirements.

The sleeves and shirt shall be buttoned, or coveralls zipped up when FR clothing is required to be worn and must be the outer most layer of clothing.

Reflective, high visibility safety vests are required on construction sites and pipeline projects where excavators, cranes, and heavy mobile equipment is being used. A high visibility safety vest worn in areas within 100 feet of where equipment may contain gas, these must be FR-rated fabric as well.

FR clothing heavily stained with oils and petroleum are not acceptable and can be rejected at the discretion of the Tug Hill EHS Coordinator or other Tug Hill representative. Workers are reminded that they should follow care instructions when laundering FR-rated fabrics as the fire-resistant qualities can be lost with improper washing.

Clothing made of synthetic materials, such as polyester, has been shown to contribute to the severity of burns received from fires, because it melts and sticks to the skin. Synthetic materials are prohibited on locations in Production or where there is equipment with the potential of containing gas. Underclothing made of certain natural fabrics, such as 100% cotton, can provide additional burn protection in flash fires.

4.6.10 Respiratory Protection

a. Respiratory protection must be worn when working in potentially harmful environments due to displaced oxygen, the presence of harmful or toxic gases, or while performing Operations that generate dusts, fibers or fumes that are above the applicable OSHA Permissible Exposure Limits (PELs).

b. When the use of respirator protection is required, the Contractor shall establish and implement a respirator protection program in accordance with OSHA 29 CFR 1910.134 Respiratory Protection. The Contractor shall ensure that the program includes:

   i. Medical evaluation on personnel required to wear a respirator;

   ii. Procedures for the proper selection of a respirator, annual fit testing;

   iii. Training in the proper use, and care of the respirator; and

   iv. Head and facial hair limitations.

c. Contractors are to enforce a "no facial hair" policy for workers who may be required to wear respiratory protection equipment. Pursuant to OSHA regulations 1910.134(g)(1)(i) and (g)(1)(i)(A) facial hair may not come between the sealing surface of the facepiece and the face.

4.7 Atmospheric Testing/Monitoring (LEL, H2S, CO and O2 Meters)

Note: All monitoring equipment must be functional, maintained, and calibrated per manufacturer specifications. Workers must wear personal monitors in strategic body placement per NIOSH, API, OSHA and manufacturer's specifications and guidelines. (see Gas Meter Alarm Cards attached to this CEM)

4.7.1 LEL Meters and 4-Gas Monitors

Unless site-wide or area radius Lower Explosive Limit (LEL) monitoring is being performed using stationary monitors, during the circumstances listed below, **LEL meters shall be worn by all personnel working within 40 feet** of wells, pipelines, separators, or other equipment that contains or has the potential to contain natural gas and/or condensate:

a. Where there is active construction or Operations involving mobile equipment (e.g., cranes, excavators, forklifts/telehandlers, skid steers, truck loading/unloading, rig moves, etc.).

b. **During SIMOPS** situations such as drilling, completions, or workover Operations on well pads that are actively flowing gas.

c. During any instance that meets the requirements for a Hot Work Permit.

d. During flowback Operations.

Workers may opt to wear 4-Gas monitors when merely an LEL monitor is required. Tug Hill employees are outfitted with 4-Gas monitors. Four Gas Meters (H_2S, CO_2, LEL, and O_2) are required by all personnel entering a an H2S Operations Pad or when entering Confined Space or otherwise directly involved in performance of Operations requiring a Confined Space Entry Permit.

When stationary LEL monitoring devices have been installed and/or other risk mitigation measures have been implemented, the Contractor may request approval from the Tug Hill PIC, Company Man, or EHS Coordinator to reduce the requirement for personal LEL meters to only those workers whose duties involve working within API defined Hazard Class 1 Division 1 or Division 2 areas.

4.7.2 H2S Meters

H_2S meters are required under the same circumstances as above if and when Operations involve working in regions or on well pads involving wells that penetrate a known hydrogen sulfide (H_2S) containing formation or one containing H_2S gas in concentrations greater than 10 parts per million (ppm) in the atmosphere.

Personnel shall be properly protected from the effects of H_2S and shall receive proper training in the hazards of H_2S and in the protective measures required.

The Tug Hill H_2S Contingency Plan with appropriate operating and emergency procedures in included in the WSSP and ICP binder. When personal H_2S monitors are required, a properly calibrated and functional monitor must be worn in the breathing zone (9” – 12” sphere– chest to forehead / forward the shoulders). (see Hydrogen Sulfide Danger Action Levels are attached to the H_2S Contingency Plan).

5.0 EXHIBITS REQUIRED IN THE WSSP

Maps and figures of the location and access road, nearby dwellings, etc. as required in the WSSP by W.Va. 35 CSR 8-5.7 are presented in the **PART A – SITE-SPECIFIC DATA** section of this WSSP, and in the ICP.

5.1 Driving Directions to Site

Driving directions, the County EMA-assigned 911 street address, and the coordinates for the well pad and access road entrance are provided as a packet of **Siting Exhibits** in **PART A – SITE-SPECIFIC DATA** section of this WSSP.

Additionally, Tug Hill issues a **Vehicle Operations Contractor Expectation** policy to all Contractors working on the location during the Pre-Spud and/or Pre-Stim meetings. The Vehicle Expectations also specify the hours of the bus curfews, provides maps of the approved bonded routes trucks may travel to access the location, and other rules regarding vehicle operations, especially those if trucks. The bonded route and evacuation route is shown on Exhibit 1.

Contractors are fully responsible for enforcing a **Zero Tolerance** policy regarding Vehicle Expectations with their personnel and the sub-contractors under their direction.

5.2 Site Location Maps

The following maps and figures are provided as a packet of **Siting Exhibits** in **PART A – SITE-SPECIFIC DATA** section of this WSSP.

5.2.1 Topographic Map – Resident Information

1-Mile and 1500 Safety Buffer Map, depicts the site location, site entrance, and location of the access road with UTM NAD 83 coordinates. See Exhibit 2.

A table of resident locations and businesses within a one-mile radius of the well pad is shown. Contact information for residences and businesses identified in this area are provided on List of Commercial and Residential Receptors. Helicopter landing zone is shown in Exhibit 3.

5.2.2 Plan View Map

General Site Plan and Vicinity Plan illustrating of site features, flare lines, and access roads are provided in the **PART A – SITE-SPECIFIC DATA** section of this WSSP. See Exhibit 4.

5.2.3 Well Development and Equipment Layouts

The layout of the drilling rig, completions spread, and production equipment figures are also provided in **PART A – SITE-SPECIFIC DATA** section. Adjustments to the exact layout of the drilling rig and completions spread will be made as needed at the time of moving on and rigging up.

Drawings of the final layout our included in Pre-Spud and Pre-Stim packages provided to Contractors at the pre-work safety meetings, to which the WVDEP Oil & Gas Inspector is invited.

Copies of the Pre-Spud and Pre-Stim documents are sent out electronically and will also be provided in **WSSP PART A - SITE-SPECIFIC DATA** of the ICP binder maintained in the Company Man/Completions Consultant office on location.

5.3 Emergency Response and Evacuation plans

5.3.1 Introduction to the Emergency Response Plan (ERP)

The ERP is a stand-alone document attached to the WSSP.

Included in the ERP is a discussion of the NIMS Incident Command System (ICS), the procedures to be followed in the event of specific types of emergencies, including fire/explosion, power loss, natural disasters, well control, and spill/fluid release, as well as action lists for "Emergency Levels" (1, 2, and 3) based upon the degree of risk presented by the circumstances, procedures for evacuation, and NIMS forms.

5.3.2 Identification of Emergency Levels

Incidents are reported pursuant to the Tug Hill Incident Response and Notification Procedure and are classified in the EHS Insight Incident Reporting Module. Incident Classification is based upon Incident Severity and nature of Consequences (e.g., People, Asset Environment, and Reputational/Community impact).

Actual Severity (AP)

Consequence	People	Environment	Asset	Reputation	
1	No injury or health effect	No effect, integral or primary equipment containment effective	No damage	No impact to landowner; No report to Agency; no reputation impact expected	☐ Low
2	Slight injury (First Aid) or health effect; OR agitated outside 3rd party; no threats; no medical treatment	No effect, <1 bbl. brine or petroleum in 2nd Containment; <5 gal. brine or petroleum or <1 gal. other haz. sub. to soils; no water impact or air impact offsite	Only minor or limited equipment or facilities damage <$10,000	Limited concern; local resident aware but no concerns; No Agency involvement	☑ Low
3	Minor injury or health effect w/ medical aid (Recordable); DART but not LTI; Stop Work; General threats from landowner or 3rd party	Slight/minor effect; gas or fluid release limited to pad but clean-up by hands onsite; Soils only; No offsite water impact or air impact offsite; Agency report not required	Minor asset/equip damage $10 - $50K; possible limited impact to Ops or Production <24 hours; possible minor vandalism	Moderate concern; local resident concerns or impact to landowner; Land Dept. engagement; Regulator involvement but no media or public attention	☐ Medium
4	Severe injury (LTI) or multiple minor injuries; Short-term health impact w/ hospitalization; Off site Muster event; Violent threats but no weapon observed	Reportable release/spill to air/water/soils but not outsite Lease LOD/ROW; Impacted soils & impact onsite water/groundwater; engaged spill Contractor; Agency report is required	Moderate damage; Production loss 1-5 days; Damage >$50K - $1MM; Moderate vandalism/theft; pot. "materially slg." insurance claim	Company-wide attention; multiple contractor; On social media; Brief local media attention; Minor/admin. Agency action	☐ Medium
5	Singular party potential fatality, serious injury/disability (OSHA Reportable); or Incident involves violent threat of injury or terrorism but not action. Weapon(s) observed. Evacuation	Sig. release w/ offsite impacts to air/water/soils or wetland; product in a stream; Impact reversible w/ site Inv.; Muster/evacuation; Contractor clean-up; Agency report req.; NOV	Major damage; Production loss 1-3 Weeks; Damage >$1MM - <$3MM; Substantial vandalism/theft	Moderate local media coverage & brief regional attention; Social media coverage; adjacent resident evac.; Agency action & fines; slg. landowner relations impact	☐ High
6	Singular party potential fatality, serious injury/disability (OSHA Reportable); or Incident involves violent threat of injury or terrorism but not action. Weapon(s) observed. Evacuation	Permanent imacts to water/groundwater or sensitive environ; Gas release causes regional evac.; Extensive impact & long-term monitoring/clean-up, NOVs, penalties or pot. Litigation	Serious Damage; Production Outage 1 Month or more; Production loss >$3MM; Terrorism Attack/attempt; Impact downstream stakeholders	In the news regional/national media; Unified Incident Command; Multiple Agencies; regional evac.; significant NOVs & fines >$1MM; pot. litigation; possible loss of permits	☐ High

Detailed examples of the three emergency level definitions are provided in the ERP. The following is a truncated listing of the definitions.

<u>Level 1 events</u> ("Green"; Consequence Levels 1-2 in EHS Insight Incident Reporting Module) involve situations that are either common to routine operations or do not pose significant risk to personnel. In most instances, Level 1 events can be resolved using standard operating/drilling procedures, commonly available equipment, personnel, and techniques.

<u>Level 2 events</u> ("Yellow"; Consequence Levels 3-4 in EHS Insight Incident Reporting Module) involve circumstances that are not commonly encountered during routine operations and pose the potential for significant risk to onsite personnel, equipment and/or the environment. A Level 2 event may require specialized well control personnel, equipment and/or techniques in order to be safely resolved.

IF IT IS DETERMINED THAT UNCONTROLLED LOSS OF CONTAINMENT OF GAS HAS OCCURED PROCEED TO LEVEL 3 INCIDENT.

<u>Level 3 events</u> ("Red"; Consequence Levels 5-6 or "RED" in EHS Insight Incident Reporting Module) present serious and immediate risks to personnel, assets, the surrounding community, and environment onsite and likely offsite as well. These situations require the immediate application of specialized techniques and well-developed safety assessment and hazard mitigation programs.

Examples of Level 3 events include, but are not limited to, the following scenarios:

1. Surface blowout (drill-pipe, BOP, production tree, broach, etc. with or without fire)
2. Underground blowout with insufficient casing set so that the well cannot be brought under control by pumping heavy mud simultaneously down the drill-string and annulus using rig pumps.

3. Surface pressure beyond the pressure rating of equipment (including tubulars)
4. Other situations that constitute a clear and present danger to personnel, environment or equipment that cannot be resolved via conventional means
5. IDLH Situation; Violent Unauthorized Persons on Location; Any Imminent Uncontrolled Threat to Location and Operations (including severe weather)
6. Uncontrollable release of gas! (>50% LEL in ambient air)

Level 3 events will warrant the immediate activation of the ERP, mobilization of well control specialists/engineers and other specialist personnel and equipment. Tug Hill Operations Management will contact its well control contractor immediately upon the determination of a Level 3 incident. Requested well control information will be gathered and provided to the well control contractor along with any other pertinent and/or related information.

5.3.3 Initial Response Actions

Initial response actions are those taken by personnel immediately upon becoming aware of an emergency incident. Timely reporting and implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation. Pursuant to the Incident Response and Report Procedure, all events are to be reported ASAP once the observe is safe to do so.

It is important to note that these actions are intended only as guidelines. The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note that without exception, personnel and public safety is first priority.

The person functioning as Incident Commander during the initial response period has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.

The **Initial Response Actions Acting Supervisor** should at a minimum:

- Personnel will be accounted for and moved to a safe upwind location
- Medical attention will be provided for any injured personnel
- Activate the appropriate alarms and operations shutdowns as necessary
- Further notifications by Tug Hill incident command structure (ICS) team
- Notification to local/state/federal authorities (See Emergency Notification List)
- The well site will be secured
- Activate response resources
- Information gathering and assessment of the situation will be initiated
- Monitor and manage the emergency situation
- Assist responding agencies as necessary

5.4 Incident Command

Once the ERP has been activated and evacuation of the location is deemed necessary, Incident Command will be established, and Tug Hill contract Well Control specialists will be consulted and/or activated as appropriate.

The highest-ranking competent person on location will assume the role of Incident Commander until they are relieved. In some cases, that person may be a contractor or service company representative who will begin managing the incident until a Tug-Hill representative relieves them. If a company employee is on site at the time of an accident, that person shall act as Incident Commander unless otherwise instructed.

All individuals remaining behind to shut down critical systems or utilities must be capable of recognizing when to abandon the operation or task and evacuate themselves. The systems to be shut down will be dependent on the operations being performed and will be decided upon after notification of an emergency evacuation by the PIC or the designated Incident Commander.

If the situation is of immediate danger to life and health, Unfired Command/Incident Command ("UIC") will be established pursuant the Incident Command System (ICS) in the ERP.

The person functioning as Incident Commander during the initial response period has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.

See the ERP attached to this WSSP for more detailed emergency response procedures.

5.5 On-site Muster Points for Workers

Muster Points have been established as personnel gathering points in a Level 2 or 3 emergency. Once at the muster point, accounting for all employees following an evacuation is critical.

The Primary Muster Point is typically at the edge of pad where the access road meets the entrance of the pad.

The Secondary Muster Point is used for more serious events requiring clearing personnel from the pad. This is typically established at the Security Guard Shack along the access road or at the point of the access road/municipal road junction.

Muster points are shown on the General Site Plan and Vicinity Plan and Evacuation Route, which are located in the **PART A – SITE-SPECIFIC DATA** section of this WSSP and the ICP binder. This information will be communicated during the Pre-Spud or Pre-Frac Meeting and during the required CEM Safety Orientation – which is provided to each person working on location at their first time of arrival to the worksite and/or when changes to muster point locations are made.

5.6 Establishment of Protection Zones and Evacuations

Most situations can be managed; however, a well control event at a Level 3 will cause the well site to be the evacuated. As stated initially, all evacuations require that personnel proceed to the muster point to be accounted for.

UIC will assess and determine if evacuation is desired and the size of protective zone for local residents. In the absence of UIC, the On-Scene Incident Commander, or his designee, shall determine protective zones to limit the risk of exposure to workers, local responders, and residents surrounding the work area.

The Safety Zone Map and Parcel Owners listed is provided in the **SITE-SPECIFIC DATA** section of the WSSP and ICP binder for each location.

Life safety impacts to the environment, and property conservation are priorities. The Emergency Protection Zones based on the following information on the scene:

- Magnitude of the incident
- Wind Direction
- MSDS of applicable materials
- Current and forecasted weather conditions
- Topography and land conditions
- Other influences specific to the incident

If the agency directs, on-site Tug Hill personnel and Contractors will be engaged to notify all local potentially impacted residents of the incident by dispatching workers to each potentially affected residence. If the public emergency responder does not direct this notification to be made by the Operator, then the public response agency will be responsible for this notification.

Tug Hill commits it full cooperation and assistance in making notifications to residents and assisting to maintain the designated protective zone. Tug Hill resources include the workers onsite and other Operations personnel, as well as our Incident Command Structure, EHS Department personnel and contractors, and the Tug Hill Land Department Land Agents.

Once established, these zones will be maintained until a determination is made by the Emergency Coordinator to alter or discontinue them. Tug Hill will contact local residents and will post personnel on all roads within the zone to prevent entrance to the area until an all clear has been issued. The initial contact will be conducted by telephone and, for those that cannot be reached, a drive by will be initiated.

5.7 Assisting Others in Evacuations

All personnel performing work shall be fit for duty. In the event of an emergency evacuation, all hazardous areas are to be avoided and any injured individual requiring assistance must be

assisted provided that the assist does not place those assisting in immediate danger to health or life.

If an injured individual requires assistance to evacuate that would place the rescuer in immediate danger to health and life, personnel should first evacuate themselves as necessary, assess the situation, don any necessary protective equipment, and provide rescue if the are trained and capable.

6.0 WELL WORK PLAN

The following Well Work Plan will be reviewed with Tug Hill staff, contractors, and support staff prior to beginning work at the Well Pad. Any required changes will be inserted in PART B to this WSSP.

6.1 Plan Assimilation and Dissemination

Pursuant to Section 1.2 – Distribution of this WSSP, a copy of this Plan will be made available in the following locations:

- In an on-site mailbox and/or with the Security Guard controlling access
- On-site, in the drilling, completion, or workover office
- WVDEP Office of Oil and Gas
- Marshall County Office of Emergency Response
- Local Tug Hill Office

Tug Hill, or their designee, shall be responsible for providing a copy of this WSSP to the Marshall County EMA within at least 7 days prior to land disturbance or well work. A representative of the Marshall County OER will be asked to sign a receipt documenting that they have received a copy of the plan.

6.2 Drilling

1. The anticipated drilling procedure to be followed for each well is presented below:
2. Ensure that appropriate signage listing Emergency Contact info, the well name and API for all wells to be drilled is in place at the entrance to location.
3. Install primary and secondary containment as required
4. Conduct Pre-Job Safety Meeting pursuant Section 3.0 of this WSSP
5. Review and confirm well slot and directional plan prior to spud
6. Take surveys and monitor anti-collision throughout the operations
7. Notify DEP 24 hours before Spud
8. Move-in, Rig-Up (MIRU) drilling rig
9. Drill surface hole to TD
    a. Surface section is to be drilled only with freshwater and benign soap
    b. At TD, notify DEP of upcoming casing & cement run
10. Run surface casing
11. Set depth minimum 50’ below deepest fresh water

12. Set depth maximum 150’ below deepest fresh water
13. Cement surface casing
    a. Circulate cement to surface
    b. WOC minimum of 8 hrs per state regulations
14. Drill first intermediate hole to TD
    a. At TD, notify DEP of upcoming casing & cement run
15. Cement intermediate casing
    a. Circulate cement to surface
    b. WOC minimum of 8 hrs per state regulations
16. NU 13 5/8” 10M BOP & rotating head (Bttm to Top below)
    a. Cameron U-Type Variable Ram 13 5/8” 10M
    b. Mud Cross (Left to Right)
        i. 2 1/16” 10M Check
        ii. 2 1/16” 10M Manual Gate
        iii. 2 1/16” 10M Manual Gate
        iv. 2 1/16” 10M Manual DSA
        v. 13 5/8” 10M Spool
        vi. 4 1/16” 10M Manual Gate
        vii. 4 1/16” 10M HCR
    c. Cameron U-type Blind Ram 13 5/8” 10M
    d. Cameron U-type Pipe Ram 13 5/8” 10M
    e. Cameron 13 5/8” 5Mx10M Annular
    f. 5M Rotating Head
17. Test BOPE Stack (15 min low / 15 min high)
    a. Run test plug & land in lower bowl
    b. Test annular to 250 psi low / 3,500 psi high
    c. Test rams to 250 psi low / 8,000 psi high
    d. Test choke & kill lines & valves to 250 psi low / 8,000 psi high
    e. Test choke manifold to 250 psi low / 8,000 psi high
    f. Retrieve test plug
    g. Keep the original BOPE test charts on the rig (to be signed & dated by Well Site Supervisor)
        i. 80% of 13 3/8” MU Torque
18. For Utica wells, drill second intermediate hole to TD
    a. At TD, notify DEP of upcoming casing & cement run
19. Cement second intermediate casing
    a. Circulate cement to surface
20. WOC minimum of 8 hrs per state regulations

20. Test BOPE Stack (15 min low / 15 min high)

21. Drill curve and lateral to TD per directional plan
    a. At TD, notify DEP of upcoming casing & cement run

   b. Circulate and condition hole

22. Run production casing with redundant toe sleeves
23. Cement production casing
24. ND BOP, NU and Test B section
25. Install dry hole flange and prepare to RDMO

6.3 Stimulation

1. Install primary and secondary containment as required
2. Notify DEP 24 hours before start of operations
3. Hold PJSM
4. MIRU e-line
5. RIH with gauge ring & junk basket
6. RIH with CBL
7. Pressure test casing and open toe sleeves
8. NU 7-1/16" frac stack
9. Torque stack flanges and pressure test stack per manufacturer specifications
10. MIRU pressure pumping services, wireline, pressure control equipment, water transfer, and water tanks
11. Equipment in containment as required
12. Pressure test all surface iron
13. Frac well per design
14. Pump down wireline and set frac plug/perforate per design
15. After the completion of final stage, set (2) kill plugs
16. After the completion of all wells on pad, RDMO associated frac operations equipment
17. ND frac stack leaving master valves in preparation for cleanout operations

6.4 Cleanout

1. Install primary and secondary containment as required
2. Notify DEP 24 hours before start of operations
3. Hold PJSM
4. MIRU standalone snubbing unit, BOP stack, mud pumps, and flowback equipment.

5. NU BOPs on top of master valve as follows (bottom-top)
    a. 7-1/16” 10M Primary SG BOP
    b. 7-1/16” 10M Flow Cross
    c. 7-1/16” 10M Primary DG BOP
    d. 7-1/16” 10M Primary DG BOP
    e. 7-1/16” 10M Primary SG BOP
    f. 7-1/16” 15M x 7-1/16” 10M XO Spool
    g. 7-1/16” 15M Stripping BOP
    h. 7-1/16” 15M Bleed Off/EQ Working Spool
    i. 7-1/16” 15M Stripping BOP
    j. 7-1/16” 5M Working Annular
6. Pressure test BOPs per manufacturer specifications
7. Pressure test all surface iron
8. PU bit and motor
9. TIH and drill out kill plugs and all frac plugs
10. Land production tubing and BPV/hanger in wellhead
11. RDMO standalone snubbing unit, BOP stack, and all associated equipment
12. ND master valves and NU production tree
13. Torque all flanges to manufacturer specifications
14. Perform low/high shell pressure test on tree after installation. Tests must be charted and recorded.
15. Lubricate out BPV
16. Prep to bring well online

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7.0 CHEMICAL INVENTORY AND SAFETY DATA SHEETS (SDS)

7.1 Safety Data Sheets (SDS):

Community Right-to-Know ("Tier II") reporting of chemicals and flammable materials on location is necessary so first responders, such as fire departments and emergency response personnel, know in advance what hazardous materials are on location. This is determined by the Contractor submitting a list of hazardous materials they will have on location, the anticipated quantities, and the Safety Data Sheets (SDS) for each chemical on location. Maintaining these records on location and submittal of notices to the county and state agencies is required by laws and regulations.

Contractors are to submit to Tug Hill a copy of **all SDS sheets** for chemicals to be brought onsite along with quantity estimations (average and maximum at any one time). Any changes to the chemical list should be reported to the Tug Hill EHS Coordinators immediately. Please submit this information to the Tug Hill EHS Coordinators, Company Man, or Tug Hill Representative ASAP with, if applicable, locations shown on the pad layout drawings (showing rig, chemical storage, and tanks).

SDSs for all materials and chemicals on-site will provided in **PART A – SITE-SPECIFIC DATA** section of this WSSP, and in the ICP. of the submitted copy of this plan and in the SDS section of the ICP.

7.2 Mud Information

Mud information for wells addressed by this section of the WSSP is presented below along with the SDS section of the ICP, as well as an inventory of on-site mud mixing chemicals.

Mud Usage	
Mix Mud Amount	2000 - 3500 bbls
Mud Weights	8.5 – 14 ppg

There will be one induction style mud hopper on location for mixing the fluid. Below table contains the inventory of on-site materials for mixing mud.

8.0 SPILLS AND RELEASES

8.1 Chemical Management Policy

Contractors and Tug Hill employees are to comply with all relevant and applicable regulations regarding spills and releases of pollutants and hazardous chemicals as defined by federal, state, and local laws and regulations. Contractors bringing chemicals to location are required to provide the SDS to the EHS Coordinator or the PIC. Those Contractors using and storing bulk quantities of hazardous substances and petroleum products are required to implement an SPCC plan for the materials under their control.

Contractors shall additionally adhere to any Tug Hill-issued policies and procedures pertaining to the work performed by Contractors including, but not limited to:

- the Tug Hill Incident Response and Notification Procedure;
- the Emergency Response Procedure
- Production and other sites where applicable, the Tug Hill SPCC Plan for chemical and petroleum storage on the location.
- Additional state specific spill response procedures and guidelines may apply.

8.2 Chemical Storage and Containment

To prevent any releases of chemicals or tainted fluids from impacting the soils, surface water or groundwater during drilling, hydraulic fracturing, and flowback operations, as well as any Operational activities generating fluids or involving fuel or hazardous chemical storage, Tug Hill has developed a Master Containment Plan (MCP) for implementation of temporary secondary containment practices.

The MCP outlines the SOPs for work areas to be underlain with an impermeable liner (referred to as “master containment”, “secondary containment”, or “tertiary containment”). These temporary containments are inspected weekly by Tug Hill EHS Coordinators pursuant to WVDEP regulation and Corrective Actions/Preventative Actions (CAPAs) orders are issued in the EHS Insight management system as needed to ensure containment integrity. Operational crews are trained on performing small project patch and repair and third-party contractors are activated to the field to rectify more significant modifications and repairs.

On Production pads, bulk above ground storage (ASTs) containing brine water and/or condensate produced by the wells are required to be situated within a permanent secondary containment to ensure that, in the event of a leak or spill, pollutants to not impact the surface or groundwater. The tank containment is inspected monthly pursuant to state and federal regulations. Inspections are recorded in EHS Insight and CAPAs are issued as needed to ensure regulatory compliance and to mitigate risk. Management of bulk storage secondary containment is described in the Tug Hill SPCC Plan, which is required by the USEPA and WVDEP regulations.

8.3 Spill Response Procedures

8.3.1 Small, Minor to Moderate Spill Events

Smaller and minor spill events that can be safety cleaned-up with onsite personnel and equipment may be managed by the Contractor with the consent of the Company Man or Tug Hill Representative **AND** the Tug Hill EH&S Department. When the clean-up work is performed by a Contractor which is not specified in the Tug Hill ICP, all such clean-up actions will be supervised and performed to the satisfaction of the EHS Coordinator and/or the Tug Hill Director of EH&S Affairs.

8.3.2 Larger, Major, More Serious/Significant and Crisis Spill Events

Larger, Major, More Serious/Significant and Crisis Spill Events generally include those spills that trigger a reporting requirement, and:

a. will likely require a site investigation and remediation;

b. will likely result in a Notice of Violation (NOV); and/or

c. likely require a Root Cause Assessment (RCA). More significant spill events will be managed and coordinated by the EHS Department and clean-up action will be performed by a professional environmental spill response Contractor.

Response Contractors are in the Emergency Contact List shown in the Tug Hill WSSP and ICP binder .

The Tug Hill Director, EH&S Affairs and the EHS Coordinators, will manage clean-up activities of all Level 3 (e.g., major and severe release events per classification) pursuant this **Tug Hill Incident Response and Notification Procedure**. Smaller spills may be cleaned-up by personnel on location if the spill is within certain specific parameters.

Under no circumstances are spills of materials that constitute a **hazardous waste** to be cleaned-up by workers not trained in hazardous waste operations pursuant to OSHA regulation.

8.4 Spill Reporting

As applicable, pursuant to WVDEP spill and release reporting requirements, releases of petroleum and hazardous substances will be reported to the WVDEP Emergency Spill Reporting line. This determination will be made by the Tug Hill Director of EH&S Affairs and/or other company management representative.

In accordance with 40 CFR 302.6, those spill or release events involving a regulatory-defined reportable quantity (RQ) and/or releases to waters of the state will also trigger reporting to the **National Response Center** (**NRC**) **at 1-800-424-8802**.

9.0 BLOW-OUT PREVENTER (BOP) AND WELL CONTROL

9.1 BOP Equipment

The following is a list of BOP equipment with types, sizes, and ratings to be utilized and available during the drill, completion, and work-over of the well.

5M System**

- Annular preventer
- Pipe ram, blind ram, and if conditions warrant as specified by the authorized officer, another pipe ram shall also be required.
- A second pipe ram preventer shall be used with a tapered drill string.
- Drilling spool or blow out preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter).
- 3-inch diameter choke line.
- Kill line (2 inch minimum).
- 2 chokes with 1 remotely controlled rig floor.
- 2 kill line valves and a check valve (2 inch minimum).
- Upper kelly cock valve with handle available.
- When the expected pressures approach working pressure of the system, 1 remote kill line tested to stack pressure (which shall run to the outer edge of the substructure and be unobstructed).
- Lower kelly cock valve with handle available.
- Safety valve(s) and subs to fit all drill string connections in use.
- All BOP equipment connections subject to well pressure shall be flanged, welded, or clamped.
- Fill-up line above the uppermost preventer.

If repair or replacement of the BOP equipment is required after testing, this work shall be performed prior to drilling out the casing shoe.

When the BOP equipment cannot function to secure the hole, the hole shall be secured using cement, retrievable packer, or a bridge plug packer, bridge plug, or other acceptable approved method to assure safe well conditions.

9.1.1 Minimum Standards for Choke Manifold Equipment

- Choke lines shall be straight lines unless turns use tee blocks or are targeted with running tees and are anchored to prevent whip and reduce vibration.

- Choke manifold equipment configuration shall be functionally equivalent to the appropriate pressure ratings. The actual configuration of the chokes may vary.

All valves (except chokes) in the kill line choke manifold, and choke line shall be a type that does not restrict the flow (full opening) and that allows a straight through flow.

Pressure gauges in the well control system shall be a type designed for drilling fluid service.

**These are typical design features for 5M systems; however, the actual field equipment may vary.

9.1.2 Minimum Standards for Choke Manifold Equipment

1. Choke lines shall be straight lines unless turns use tee blocks or are targeted with running tees and are anchored to prevent whip and reduce vibration.
2. Choke manifold equipment configuration shall be functionally equivalent to the appropriate pressure ratings. The actual configuration of the chokes may vary.

All valves (except chokes) in the kill line choke manifold, and choke line shall be a type that does not restrict the flow (full opening) and that allows a straight through flow.

Pressure gauges in the well control system shall be a type designed for drilling fluid service.

**These are typical design features for 5M systems; however, the actual field equipment may vary.

5M and higher system accumulator shall have sufficient capacity to open the hydraulically controlled gate valve (if so equipped) and close all rams plus the annular preventer (for 3 ram systems add a 50 percent safety factor to compensate for any fluid loss in the control system for preventers) and retain a minimum pressure of 200 psi above pre-charge on the closing manifold without use of the closing unit pumps. The fluid reservoir capacity shall be double the usable fluid volume of the accumulator system capacity and the fluid level of the reservoir shall be maintained at the manufacturer's recommendations. Two independent sources of power shall be available for powering the closing unit pumps. Sufficient nitrogen bottles are suitable as a backup power source only and shall be recharged when the pressure falls below manufacturer's specifications.

9.1.3 Accumulator Pre-charge Pressure Test

This test shall be conducted prior to connecting the closing unit to the BOP stack and at least once every six (6) months. The accumulator pressure shall be corrected if the measured pre-charge pressure is found to be above or below the maximum or minimum limit specified below (only nitrogen gas may be used to pre-charge):

Accumulator Working Pressure Rating	Minimum Acceptable Operating Pressure	Desired Pre-chargePressure	Maximum AcceptablePre-charge Pressure	Minimum Acceptable Pre-chargePressure
1,500 psi	1,500 psi	750 psi	800 psi	700 psi
2,000 psi	2,000 psi	1,000 psi	1,100 psi	900 psi
3,000 psi	3,000 psi	1,000 psi	1,100 psi	900 psi

9.1.4 Power Availability

Power for the closing unit pumps shall be available to the unit at all times so that the pumps shall automatically start when the closing valve manifold pressure has decreased to the pre-set level.

9.1.5 Accumulator Pump Capacity

Each BOP closing unit shall be equipped with sufficient number and sizes of pumps so that, with the accumulator system isolated from service, the pump shall be capable of opening the hydraulically operated gate valve (if equipped), plus closing the annual preventer on the smallest size drill pipe to be used within 2 minutes and obtain a minimum of 200 psi above specified accumulator pre-charge pressure.

9.1.6 Locking Devices

A manual locking device (i.e., hand wheels) or automatic locking devices shall be installed on all systems of 2M or greater. A valve shall be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve shall be maintained in the open position and shall be closed when the power source for the accumulator system is inoperative.

9.1.7 Remote Controls

Remote controls shall be readily accessible to the driller. Remote controls for all 3M or greater systems shall be capable of closing all preventers. Remote controls for 5M or greater systems shall be capable of both opening and closing all preventers. Master controls shall be at the accumulator and shall be capable of opening and closing all preventers and the choke line valve (if equipped). No remote control for a 2M system is required.

9.2 Procedure and Schedule for Testing BOP Equipment

9.2.1 Well Control Equipment Testing

1) The procedure and schedule for testing the BOP stack as follows:
   a. for the bottom and horizontal wellbore drilling phase,
   b. the BOP equipment shall be function tested upon initial installation,

c. weekly, and after each bit trip unless otherwise authorized by the Office as part of a well work permit.

d. It shall be pressure tested upon initial installation and every twenty-one (21) days thereafter.

e. All pressure tests shall be performed for thirty (15) minutes.

f. Annular preventers should be tested to seventy percent (70%) of the rated capacity and ram preventers should be tested to eighty percent (80%) of the rated capacity.

2) Valves shall be tested from working pressure side during BOP equipment tests with all downstream valves open.
3) When testing the kill line valve(s), the check valve shall be held open, or the ball removed.
4) Annular preventers shall be functionally operated at least weekly.
5) Pipe and blind rams shall be activated each trip; however, this function need not be performed more than once a day.
6) A BOP equipment pit level drill (exercise) shall be conducted weekly for each drilling crew.
7) Pressure tests shall apply to all related well control equipment.
8) All the above-described tests and/or drill shall be recorded in the drilling log.
9) For intermediate wellbore drilling phase, the BOP equipment will be pressure and function tested upon initial installation.

9.2.2 Criteria for Testing

1) This test procedure must be followed at all times.
2) The operator's representative, the rig manager, and the driller must be present during the entire testing process. Any other personnel must be approved by the rig manager before assisting in any BOP testing operation.
3) If any test fails, the rig manager is to inform the operator's representative and the drilling contractor's superintendent.
4) An acceptable low-pressure test shall be achieved before attempting a high-pressure test.
5) Pressure testing acceptance requirements:
    a. All BOPs, with an ID of 18-3/4" or less, are required to close within 30 seconds.
    b. Pressure tests shall be in 5- and 5-minute durations.
        i. A low pressure (250 psi) test for 5 min will be allowed no greater than a 15 psi drop during the duration of the test.
        ii. A high pressure (8,000 psi) test for 15 min will be allowed no greater than a 100 psi drop during the entire test.
6) The annular will be tested to 70% of its rated working pressure.
7) A copy of the final test reports will be provided to the operator's representative.

8) The rig must maintain a copy of the final BOP test reports on the workstation in the rig manager's office and a printed copy in the well folder.
9) Note that adjustable chokes (manual and remotely operated) are not required to be full sealing devises; therefore, are not required to be pressure tested (API STD 53 6.5.5.5). Adjustable chokes shall be function tested.

9.2.3 Pre-Test Preparation

1) Complete approved JSA prior to beginning any work.
2) Ensure that BOP is properly sized for the tubing and wellhead and that it is installed correctly.
3) Verify that the appropriate packer is on location and readily available.
4) Verify that the test unit has been inspected and is in the proper condition to perform pressure testing.
5) Verify that fresh water or fresh water/glycol mixture tote is on location with the proper fill volume needed to perform pressure testing.
6) Verify that a buffer zone has been established, all personnel have been cleared from the test area.

9.2.4 Pre-Test Set-up

1) Circulate fresh water through the entire well control system. Drilling mud has more compressibility than water and can lead to pressure drops during testing.
2) Remove the wellhead bushing.
3) Pick up Designated 5" or 4" test joint with pre torqued cross over.
4) Attach pup joint to the joint of 5" drill pipe that will be used for testing. Torque connection appropriately per thread type recommended specifications.
5) Open the 2" casing valve (open to atmosphere) under the test plug to prevent any case for trapping pressure. Monitor this valve while open but maintain a buffer zone while any equipment is exposed to pressure.
6) Screw the joint of drill pipe into the wellhead test plug (operator supplied equipment). Ensure that the test plug is appropriate to the wellhead's size and profile, then land the plug into the wellhead. Mark a reference line on test joint to help count thread rounds when backing out/spinning in of test plug. Secure the test plug into the wellhead as appropriate to the application. *NOTE: Securely screw the joint of drill pipe into the test plug, but DO NOT torque this connection as you will have to back out of the test plug at a later time to test the blind rams.
7) Verify that the gauge block on the choke manifold assembly has at least one union open to atmosphere.

8) Fill the Bop with fresh water or glycol/freshwater mixture until Bop is full.

9.2.5 Testing Procedure

1) BOP testing will be performed in the following test sequence:

- **Test #1:** Make up 5" drill pipe to test sub, screw into test plug and set in stack.
  Equipment being tested – Annular.
  Equipment to close - HCR, outside kill, annular, lwcv
  Equipment to open-
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 3,500 psi for 15 minutes. Ensure test chart has tracked properly before decreasing pressure. Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve.**

- **Test # 2:**
  Equipment being tested - Upper pipe rams, HCR, outside kill, lwcv
  Equipment to close - Upper pipe rams
  Equipment to open - Annular
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes. Check super choke gauges once again. Ensure test chart has tracked properly before decreasing pressure. Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

- **Test # 3:**
  Equipment being tested - Upper pipe rams, manual 4" HCR, inside kill, ibop **Equipment to close** - manual 4" hcr, inside kill, ibop
  Equipment to open - hcr, outside kill, lwcv
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes. Check super choke gauges once again. Ensure test chart has tracked properly before decreasing pressure. Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

- **Test #4**
  Equipment being tested - lower pipe rams
  Equipment to close - Lower pipe rams, lwcv
  Equipment to open - Upper pipe rams, ibop
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes. Check super choke gauges once again. Ensure test chart has tracked properly before decreasing pressure. Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

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- **Test #5:** Put check valve guts back in it.
  Equipment being tested - Blinds, and check valve
  Equipment to close - Blinds after pipe has been removed from stack.
  Equipment to open - 4" manual choke, inside kill, lower pipe rams
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes Ensure test chart has tracked properly before decreasing pressure... Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

2) Accumulator Test

- **Test# 5:** Turn off all accumulator pumps. Record the initial accumulator, manifold, and annular pressures. Time and record the closing time of the BOPs and the HCR (must be less than 30 seconds). Open the HCR. Close annular and lower pipe/VBR rams. Open the lower pipe/VBR rams. Observe final pressure after 5 minutes and verify that it has stayed above 1,500 psi. Turn on one accumulator pump and record the time for a 200 psi increase, then turn on the second pump and keep time going until full pressure shutdown. Open preventers.

3) Offline Chokehouse

OFFLINE TEST ON CHOKEHOUSE Close - 4" manual choke on stack. Fill choke with test fluid to get air out valves. 14 and 11 open while bleed air out, fluid will go in at valve 3. Remove blind flange from below #3 valve and remove one 1502 flange from top of #3 valve. Place 1502 flange below #3 valve for test 1. Once done with first test put back in original position for last 3 tests. Screw dart to top of pump through sub and tiw to bottom of pump through sub. Use second test port to test this while doing Test #1 offline

- **TEST#1 OFFLINE CHOKEHOUSE.**
  Equipment being tested - Valves 12, 15, 9, 3, tiw, dart
  Equipment to close - Valves 12, 15, 9, 3, tiw, dart
  Equipment to open - Open all other valves on choke manifold at this time
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes Ensure test chart has tracked properly before bleeding off Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

- **TEST#2 OFFLINE CHOKEHOUSE.**
  Equipment being tested - 11, 14, 8
  Equipment to close - 11, 14, 8
  Equipment to open - 12, 15, 9

Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes Ensure test chart has tracked properly before bleeding off Document test results. Release pressure from the system.
Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve.

- **TEST#3 OFFLINE CHOKEHOUSE.**
  Equipment being tested - 5, 7
  Equipment to close - 5, 7
  Equipment to open - 10, 13
  Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes Ensure test chart has tracked properly before bleeding off Document test results. Release pressure from the system. **Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve**.

- **TEST#4 OFFLINE MUDLINE.**
  Equipment being tested - MUDLINE, kill line
  Equipment to close - LWCV, Outside kill line valve
  Equipment to open -

  Remove guts from check valve and shut outside kill line valve. Attach 1502 test port to standpipe above 4" standpipe valve. Fill mudline with fluid using mud pump. Once full shut down pumps and isolate mud pumps from the mud line. Pressure up and test to 250 psi for 15 minutes. Ensure test chart has tracked properly before increasing pressure. Document test results. Increase pressure to 8,000 psi for 15 minutes Ensure test chart has tracked properly before bleeding off Document test results. Release pressure from the system.

  Note: Do not exceed 7.5 ft pounds of torque in the closed position for the dump valve.

ACCUMULATOR FUNCTION TEST

TO CHECK THE USABLE FLUID STORED IN THE NITROGEN BOTTLES ON THE ACCUMULATOR (O.S.O. #2 section III.A.2c.i. or ii or iii)

1. Make sure all rams and annular are open and if applicable HCR is closed.
2. Ensure accumulator is pumped up to working pressure! (Shut off all pumps)
3. Open HCR valve. (if applicable)
4. Close annular.
5. Close **ALL** pipe rams.
6. Open one set of the pipe rams to simulate closing the blind ram.
7. If you have a 3-ram stack, open the annular to achieve the 50+/- % safety factor for 5M and greater systems.

8. Accumulator pressure should be 200psi over desired pre-charged pressure. (Accumulator working pressure (1000 + 200 = 1200 psi))
9. Record the remaining pressure _____psi.

If annular is closed, open it at this time and close HCR.

TO CHECK THE PRECHARGE ON BOTTLES OR SPHERICAL (O.S.O. #2, section III.A.2.d.)

1. With power to pumps shut off, open bleed line to the tank.
2. Watch and record where the pressure drops, **(accumulator psi).**
3. Record the pressure drop _____psi.

If pressure drops below **MINIMUM (MIN)** pre-charge, 900psi, each bottle shall be independently checked with a gauge.

TO CHECK THE CAPACITY OF THE ACCUMULATOR PUMPS (O.S.O. #2, section III.A.2.f)

Shut the accumulator bottles or spherical, (isolate them from the pumps & manifold) open the bleed off valve to the tank, (manifold psi should go th 0psi) close the bleed valve.

1. Open the HCR valve, (if applicable).
2. Close annular.
3. With the **PUMPS** only, time how long it takes to regain manifold pressure to 200psi over desired pre-charge pressure! = 1200 psi.

Record elapsed time _____. (2minutes or less)

9.3 BOP Installation Schedule

The BOP will be installed after running surface casing as well as after running intermediate casing. BOP equipment shall be installed on the innermost string of casing after the surface casing.

9.4 Well Control Training

All Tug-Hill Company Men are required to hold International Association of Drilling Contractors (IADC) well control certification relevant to the Operational phase underway. A well control certified Company Man/Completions Consultant shall be the PIC present during the Drilling and Completions operations. Training certificates are to be submitted to Tug Hill EHS Department. The list of well control certified personnel will be maintained in EHS Insight for record keeping and access as needed.

9.5 Drilling Records

The Tug Hill On-Site Supervisor will maintain detailed records of significant drilling events such as lost circulation, hydrogen sulfide gas, fluid entry, kicks, and abnormal pressures, which will be reported to the DEP as per the requirements of the WSSP regulations.

This WSSP requires the Tug Hill On-Site Supervisor to notify the district oil and gas inspector or the designated Office of Oil and Gas representative in the event of the presence of H_2S gas at a

concentration of ten parts per million (10 ppm), any blow-out, Loss of circulation, Flaring or a significant kick.

9.6 Schematic and Description of the Rig Layout and Wellhead Assembly

Over the life of a well, the wellhead system may be exposed to many different load conditions. During the well design process, wellhead fatigue risks are assessed based on operational and environmental conditions which are anticipated during both the construction and long-term production phases. A schematic of the proposed drilling rig and diagram of the wellhead assembly are provided in Well Development figures in **PART A – SITE-SPECIFIC DATA** section of this WSSP, and in the ICP.

9.7 Kill Procedures

In the event of a well control situation:

1) Driller is to secure the well and notify company man / on-site drilling consultant
2) On-site consultant will direct all operations on the pad and the appropriate well control procedures will be followed
3) On-site consultant will contact Tug Hill V.P of Operations
4) V.P. of Operations will notify the appropriate personnel within Tug Hill and disseminate information internally.

Should gas be encountered when drilling on air:

1) PU off bottom
2) Divert through choke/flare
3) If gas/flare dies off, gas was drilled
4) If gas continues, load hole and swap to fluid

BOP Testing Schedule:

1) Test BOPE Stack per Prog
2) Upon initial installation
3) Every 21 days (minimum)
4) After any BOP equipment maintenance or repair
5) Pipe rams shall be function tested daily and blinds should be function tested every trip

BOP / Choke Drill Schedule:

1) Choke drill should be performed after each BOP test (minimum)
2) Break circulation and pump through choke every trip
3) Standard drilling configuration calls for manual choke line to be open, HCR to be closed, and manifold chokes to be closed.

Background Gas:

1) When gas is observed while drilling, watch for pit gains, change in cuttings (popping shale), and PVT changes as an indication that gas influx has occurred.
    a. Do not assume that all gas is background gas.

2) Drilled gas is expected but all steps must be taken to ensure that the handling of this gas is never treated with complacency.
3) Target MW for the Utica is .5 over gradient

Once a kick is detected, a prompt shut in of the well is essential. The exact shut-in method will be dictated by the operation being performed at the time of the kick, available equipment, as well as other extenuating circumstances. The types of kill operations listed below may be performed to bring the well back under control, and are methods recognized by the IADC.

Kill Procedures:

- Drillers Method
- Wait and Weight Method
- Circulate and Weight Method
- Concurrent Method
- Reverse Circulation Method
- Dynamic Kill Method
- Bullheading Method
- Volumetric Method

The Blank Well Kill Sheet is provided as an attachment to the ERP attached hereto as Attachment 2. The Blank Well Kill Sheet contains a calculation guide used to determine the correct kill procedure.

10.0 HYDROGEN SULFIDE (H_2S)

10.1 H_2S Program

The **Tug Hill H_2S Contingency Plan** is included in **PART B – ATTACHMENTS** to this WSSP and included in the ICP binder. The H_2S Drilling Contingency Plan describes the training, equipment, and procedures to be employed in the event that H2S is encountered during drilling operations.

The overriding purpose of this plan is to ensure the safety of all on-site personnel as well as those residents in close proximity. Hazards associated with the possibility of encounters with H_2S and the warning signs of H_2S exposure will be covered.

Not all situations can be foreseen, however, nor can detailed instructions be provided for every situation that might be encountered. The guidelines set forth in the **H_2S Contingency Plan** should be considered as a minimum set of requirements for preparing for and dealing with H_2S exposure at a Tug Hill site.

This **H_2S Contingency Plan** is a Companion Document to the Tug Hill WSSP and ICP, as well as the Hydrogen Sulfide section of the Tug Hill Operating Contractor Expectation Manual (CEM). Contractors may have additional requirements and are expected to comply with their established corporate policies in addition to the Tug Hill H_2S Contingency Plan and the Contractor Expectation Manual (CEM).

Pursuant to WVDEP requirements, the attached Tug Hill H_2S Contingency Plan addresses:

- H_2S Hazard Conditions and Exposure
- Hazard Determination and Training
- Detection and Monitoring Sensors, Alarms and Breathing Apparatus Equipment
- Operating Conditions and Responsibilities
- H_2S Response and Notifications
- Establishment of Zones of Protection
- List of Personal Protective Equipment on location and the quantities of each
- Special concerns

Included in the **SITE-SPECIFIC DATA** section of this WSSP and in the ICP binder are:

- The Figures detailing evacuation routes, safety briefing areas, prevailing wind direction.
- A plat locating the Tug Hill facility and the location of private dwellings, residential areas and public facilities within the potential area of exposure.
- List of **EMERGENCY CONTACTS**

10.2 Tug Hill H2S Policy

The guidelines and requirements stipulated in the H_2S Contingency Plan are to be implemented (e.g., H_2S detection equipment, training materials, warning signs, etc.) on any well pad where Operations have encountered or are projected to encounter H_2S based upon advisement of the Tug Hill Geosciences Department and/or previously observed conditions.

The Tug Hill H_2S Policy is to consider every encounter with H_2S as potentially lethal until proven otherwise. Operations conducted at Tug Hill locations where work area atmospheric concentrations of H_2S (known or suspected) could exceed 10 PPM are to be conducted in compliance with applicable governmental regulations and in accordance with industry recommended practices.

Upon encountering H_2S, Tug Hill employees or contractors(s) will determine the concentration of H_2S and report this information to Tug Hill Operations Management and the EH&S Department for further evaluation.

When appropriate, Tug Hill will implement the response procedures outlined in the **Tug Hill H_2S Contingency Plan**, which will provide for safe rig operation/shutdown, respiratory protection, and/or evacuation, if warranted. The site will be secured, and only trained emergency response personnel will be permitted to enter the site.

If H_2S is detected and confirmed at sustained elevated concentrations, Tug Hill will notify via telephone the local Office of Oil & Gas Chief, the County Oil & Gas Inspector, and the County EMA. Contacts are in the EMERGENCY CONTACTS LIST Section of this WSSP and the ICP.

10.3 H_2S EXPECTATIONS

Currently there is no expectation of encountering hydrogen sulfide gas in the Marshall or Wetzel County region of West Virginia. Analysis of gas produced in the area has revealed no significant findings of hydrogen sulfide. Tug Hill conducts continuous H_2S monitoring on all drilling pads. Since 2017 to date of issuance of this WSSP, Tug Hill has not encountered H_2S at noteworthy or actionable concentrations.

See the attached **Tug Hill H_2S Contingency Plan** in **PART B – ATTACHMENTS** to this WSSP for further detail.

11.0 WELL FLARING

11.1 Flaring

Well flaring occurs during drilling and testing of gas wells. This practice is used to determine the types of fluids the well can produce, the pressure and flow rates of gas, and other characteristics of the underground reservoir. The pressure, flow, and composition of the gas will be determined before it can be safely handled by the pipelines and processing plants. Also, additional flaring during under balanced drilling operations is performed to manage gas that comes to the surface. This process can speed up drilling and help to reduce potential damage to the producing formation by the drilling fluids. Prior to commencement of flaring operations, Tug Hill on site supervisor will contact the WVDEP Office of Oil and Gas inspector and County EMA.

The flare duration should not exceed the maximum time requirements required to complete drilling operations.

In **PART A – SITE-SPECIFIC DATA** section of this WSSP of the ICP binder is a plan view depicting the proposed flare and flare line location. Prevailing wind direction is also shown.

11.2 Flaring Activities

11.2.1 Size, Construction and Length of Flare Line

The flare line will be a 4” diameter steel line that extends 100 ft. (or, if not possible, to the edge of pad) from the nearest wellhead. The line will be anchored to the surface of the ground by cross pinning itin place using metal stakes at multiple points along the line.

11.2.2 Flare Lighting System

The system for lighting the flare will be an automatic flare igniter using Shore power and/or a solar collection panel and battery charging system. A secondary igniter will be installed as a backup in the event flaring is required or needed. The onsite Drilling Supervisor shall notify the local fire department prior to lighting the flare or as soon as possible thereafter.

11.2.3 Flare Safe Distance

The flare line discharge will be located no less than 100 ft. from the nearest wellhead (or, if not possible, to the edge of pad) and shall be positioned downwind of the drilling rig and trailers in terms of the prevailing wind direction. The flare system shall have an effective method for ignition. Flammable material beyond the end of the flare will be cleared to a minimum distance of fifty (50) feet.

12.0 COLLISION AVOIDANCE

12.1 Surveys

Collision avoidance is managed by utilizing gyro tools, downhole steering tools (MWD/EM), and anti-collision software by engineers. Every well planned to be drilled has a surface plot diagram, 2-D plot diagram, and a pad plot diagram prepared. (Plots attached under "Collision Avoidance Diagrams") North seeking gyro tools, MWD/EM tools, and anti-collision processes are utilized to mitigate the risk of downhole collisions.

Anti-collision processes include confirmation of gyro accuracy, evaluation of anti-collision software (Compass, Longbow, or equivalent program), and 2-D/3-D model plotting. It is Tug Hill's standard operating procedure (SOP) for the on-site supervisor of Tug-Hill and the directional drilling company supervisor to confirm the orientation of the directional tools and ensure that the tools are orientated consistent with the directional motor's high side. When anti-collision is a risk and directional assemblies are required to navigate utilizing a gyro tool, it is Tug Hill's SOP to use the Gyro company's muleshoe to ensure the accuracy of the gyro seat in the muleshoe. In addition, when using this muleshoe, it is Tug Hill's SOP to have the Tug Hill's on-site supervisor, directional drilling company supervisor, and gyro company supervisor confirm the alignment and orientation of the tool and ensure that the tools are orientated consistent with the directional motor's high side. This ensures the azimuthal direction is correct when steering the well.

Each well will have directional surveys recorded for the entirety of the wellbore. These surveys will be monitored in real-time and used in conjunction with anti-collision software to ensure that all anti-collision risks are effectively mitigated. At the end of each hole, the third-party directional company will certify that the surveys taken are true and accurate. If multiple surface holes are to be drilled on the same pad, or if the active well is planned within 300 ft. of an existing wellbore, survey frequency over the at-risk interval will be increased and surveys will be recorded at a minimum of 30 ft. intervals or until risk of collision is mitigated.

If, at any time an active wellbore comes within 14 ft. or a SF <2 (Level 3) from an existing wellbore, survey frequency will be increased and actively monitored until the wells are clear of potential collision. If spatial separation of less than 5 ft. or SF <1.1 (Level 1) are encountered, an email notification will be sent by the Tug Hill to the WVDEP County OOG Inspector.

In the event that a wellbore collision cannot be avoided, Tug Hill will properly secure each well and evaluate the most prudent plan forward while communicating plans to the WVDEP County OOG Inspector via phone and email.

12.2 Vertical Section:

- Each hole is drilled to KOP by either the top-hole rig or bottom hole rig. While drilling, directional surveys are taken at the appropriate intervals to ensure that the appropriate SFs and separation distances are maintained. A SF of 1.5 or greater will be obtained as early in the directional plan as is practical and maintained for the duration of the vertical.

- A combination of MWD and gyro surveys are used to determine the wellbore's position.
- Due to wellhead spacing on the surface, anti-collision risks are elevated and require constant monitoring. In order to mitigate this risk, nudges or tangents are drilled in order to maintain the appropriate spatial separation and SFs.

12.3 Curve Section:

- Each hole is drilled from KOP to the landing point by the bottom hole rig. While drilling, directional surveys are taken at the appropriate intervals to ensure that the appropriate SFs and separation distances are maintained.
- MWD surveys are generally used to determine the wellbore's position as the curve is drilled.
- Anti-collision risks decrease in this section, but directional surveys are taken at a high frequency to ensure that the well is drilled in accordance with the prescribed directional plan.

12.4 Horizontal Section:

- Each hole is drilled from the landing point to TD by the bottom hole rig. While drilling, directional surveys are taken at the appropriate intervals to ensure that the appropriate SFs and separation distances are maintained.
- MWD surveys are generally used to determine the wellbore's position as the lateral is drilled.
- Anti-collision risks are minimal or eliminated in this section, and directional surveys are taken to ensure that the well is drilled in accordance with the permitted well path.

Both the onsite supervisor and the drilling engineer for the active well will be responsible for actively monitoring anti-collision risks and communicating any necessary updates to the appropriate state inspector.

See **PART A – SITE-SPECIFIC DATA** section of this WSSP of the ICP binder for attached Spider Map with site specific details and information pertaining to collision avoidance.

13.0 ADDITIONAL REQUIREMENTS

13.1 Geologic Prognosis

A list of anticipated freshwater, saltwater, oil and gas, hydrogen sulfide, thief zones, and high pressure and high-volume zones, including their expected depth are provided the Well Development permit application form WW- 6B.

Estimated Formation Tops (From DF Elevation)				
Formation	**Top TVD ft**	**Top Subsea ft**	**Lithology**	**Comments**
Sewickley Coal	**325**	**445**	**Coal**	Sewickley Coal
Pittsburgh Coal	**407**	**363**	**Coal**	Pittsburgh Coal
Deepest Fresh Water	413	357		
Fresh Water Casing Point	**480**			
Potential Red Rock interval	414	356	**Red shale**	Unstable red shale from base of Pittsburgh Coal to top of the Maxton
Maxton	1458	-688	Sandstone	
Big Lime	1637	-932	Limestone	Possible gas/oil show, historical producer in area
Big Injun	1702	-932	Sandstone	*possible water, Offset Producer
Weir	1922	-1152	Sandstone	
Berea	2124	-1354	Sandstone	Possible gas/oil show, historical producer in area
Intermediate Casing Point 1	**2200**			
Gordon	2385	-1615	Sandstone	Offset Producer
Fifty Foot	2468	-1698	Sandstone	Possible gas/oil show, historical producer in area
Speechley	3054	-2284	Sandstone	Possible gas/oil show, historical producer in area
Benson	4500	-3730	Sandstone	Possible gas/oil show, historical producer in area
Alexander	4917	-4147	Siltstone	
Rhinestreet	5546	-4776	Black shale	
Middlesex	6016	-5246	Black shale	Possible Gas Shows
Geneseo/Burkett	6085	-5315	Black shale	Possible Gas Shows
Tully	6118	-5348	Limestone	
Hamilton	6151	-5381	Gray shale	
Marcellus	6218	-5448	Black shale	Gas Show
Onondaga	6268	-5498	Limestone	Very hard, resistant chert beds
Oriskany	6501	-5731	Sandstone	
Helderberg	6625	-5855	Limestone	Hard resistant Limestone
Salina	6979	-6209	Shale/LS/Salt/Anhydrite	Potential fluid reactive and washout zones
Salina Salt A	7200	-6430	Salt	
Salina Salt B	7787	-7017	Salt	
Lockport	8105	-7335	Dolomite	
Rose Hill	8478	-7708	Shale	Red Shale, unstable, interbedded lithology
Packer Shell	8756	-7986	Limestone	Interbedded Limestone, Sandstone and Shale
Clinton/Tuscarora	8976	-8206	Sandstone	Very hard, resistant sandstone
Juniata/Queenston	9082	-8312	Red Shale	Gray to Red Shale
Reedsville	9873	-9103	Gray Shale	
Intermediate Casing Point 2	**10000**			
Utica	10864	-10094	Black Shale	
Point Pleasant	11097	-10327	Shale/Limestone	Gas Show
Target Top	**11137**	**-10367**		
Lateral Landing Point	**11147**	**-10377**		11146.99' TVD @ 91° inclination
Target Base	**11157**	**-10387**		
Lexington	11186	-10416	Limestone	
Trenton	11216	-10446	Limestone	
Pilot Hole TD	**11366**			Assumes 150' of rathole based on Trenton top

13.2 Casing and Cementing Program

In developing the Casing and Cementing Program, designers must consider the presence of hydrocarbon-bearing intervals and any depleted or flow zones requiring isolation. Additional casing strings may be required to isolate highly pressure-depleted zones with associated low fracture gradients.

Typically, if no trouble zones exist within a drilling interval, casing is set when the mud density required to safely manage the formation pressure approaches the fracture gradient of the weakest exposed formation (normally at the previous casing shoe). Casing may also be set based on geologic considerations.

The Casing and Cementing Program proposed by Tug Hill in Form WW-6B outlines the detailed casing and cementing requirements, which meets the standards of the American Petroleum Institute (API). The proposed plan employs a minimum of three (3) strings of casing which are of sufficient weight, quantity, and quality for the anticipated conditions to be encountered.

The proposed wellbore diagram is provided in **PART A – SITE-SPECIFIC DATA** section of this WSSP of the ICP binder.

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	20"	J55	26"	1,070'	CTS
Intermediate 1	13 3/8"	J55	17 1/2"	2,850'	CTS
Intermediate 2	9 5/8"	HPP110	12 1/4"	11,070'	CTS
Production	5 1/2"	HCP110	8 1/2"	25,606'	CTS

Cement

Surface:	Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Surface Cement mixed at 15.6 ppg, Y=1.2
Intermediate 1:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.2
Intermediate 2:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.99
Production:	50:50 Poz: Premium NE-1 + .1% bwoc ASA-301 + 60lb/sk ASCA-1 + .35% bwoc BA-10A + .25% bwoc MPA-170, 44 lb sack + .5% bwoc R-3 + .75 gals/100sk FP-13L – Production Cement mixed at 15.2ppg, Y = 1.18

ATTACHMENTS

INITIAL INCIDENT RESPONSE AND NOTIFICATION PROCEDURE
Tug Hill - Appalachia Based Operations

This procedure is designed for **INITIAL** internal reporting as a quick start guide to the Tug Hill WSSP/ERP/H_2S/ SPCC/Stormwater Plans (which is part of the Tug Hill Integrated Contingency Plan or "ICP"). Please refer to the ICP for detailed instructions.

ALL incidents (e.g., near-miss, injuries, truck accidents, vandalism, acts of violence, pollution control malfunction, and spills/releases (e.g., gas leaks, fluid spills of: chemicals, fuels, brine, & other hazardous materials used, stored, produced or transported) must be reported following the flow-chart below. Enter the event in EHS Insight First Report and follow-up with EHS Coordinator. Reporting to agencies will be performed by the Tug Hill Director of EH&S Affairs or a designee.

REPORT ALL INCIDENTS ASAP EVERY TIME

1. **UNCONTROLLED FIRE, EMERGENCY or SERIOUS INJURY ➡ CALL 911**
2. **Emergency Number: 1-800-921-9745 (for External Use)**
3. **ALL INCIDENTS: Follow Reporting Below (for Internal Use)**

Actions ⬇ **⬇ Reporting**

Observer of incident is to ***immediately*** contact **Tug Hill Company Man** or Tug Hill Person-in-Charge (PIC) and Contractor's Supervisor

For Spills, Stop and/or contain material and consult with EH&S

Take these containment and clean up actions only if they can be performed safely

Small, Minor to Moderate Spill Events

Clean-up with onsite personnel and equipment

EHS Coordinator is responsible for confirming clean-up is complete

Observer of incident is to ***immediately*** enter **First Report** into **EHS Insight** and call Tug Hill EHS Coordinator

Tug Hill EHS Coordinator to contact Tug Hill Operations Superintendent, Director or PIC to ensure collaboration

Larger, Major, More Serious/Significant and Crisis Spill Events

EH&S group to coordinate and manage clean-up and response actions using qualified response contractor pursuant to the Tug Hill ICP

Tug Hill EHS Coordinator to complete **EHS Insight Incident Submission** step and contact Tug Hill EHS Superintendent

Tug Hill Director of EH&S to notify WVDEP via telephone **within 2 hours** of incident involving leak, spill or release of material

Tug Hill Director of EH&S to provide WVDEP with email followup **within 24 hours**

Tug Hill Operating EHS Contacts
Ken Sentgeorge, Supt. 724-487-0639 (c)
ksentgeorge@tug-hillop.com

THO EHS Coordinator Contacts
Josh Southern: 304-476-3079 (c)
jsouthern@tug-hillop.com
Noel Missig: 412-498-7322 (c)
nmissig@tug-hillop.com
Jeremy Barber: 412-877-5869 (c)
jbarber@tug-hillop.com

Doug Sykes: 304-815-3098 (c)
doug.sykes@gryphonesp.com
Joey Guzzo: 910-712-3480 (c)
joseph.guzzo@gryphonesp.com
Tony Laquatra: 412-716-7396 (c)
alaquatra@gryphonesp.com

Tug Hill Director, EH&S Affairs
Jerry DeRosa: 412-736-5767
jderosa@tug-hillop.com

WVDEP Hotline (Reportable)
1-800-642-3074

WVDEP Inspectors
Barry Stollings – Marshall
304-552-4194
Bryan Harris – Wetzel
(304) 553-6087

Marshall Co. EMA 24 hr.
(304) 845-1920
Wetzel Co. EMA 24 hr.
(304) 455-6730

Continue attempting contacts until a person is reached. Voicemail, texts, emails are NOT sufficient contact.

➡ Enter the FIRST REPORT into EHS Insight. EHS Coordinator will report to site & collect details for the Incident Report SUBMISSION and will coordinate response actions in concert with Operations management.

➡ For all events requiring Muster, activate and follow the **Tug Hill Well Site Safety Plan (WSSP).**

➡ **For Immediately Dangerous to Life or Health (IDLH)** conditions, off-site Muster, or when involving state or federal Emergency Response Agencies, activate and follow the **Tug Hill Emergency Response Plan (ERP) attached to the WSSP.**

All incidents are to be recorded in the EHS Insight database.

Incident Reporting is a several step process. The first two (2) steps combined comprise the initial reporting:

- Step 1: **First Alert/First Report** – All personnel have a responsibility to make the First Report ASAP and contact the on-duty EHS Coordinator.
- Step 2: **Submission step** – the EHS Coordinator will report to the site and gather incident details. Complete:
  - **ASAP:** (e.g., within time less than 2 hours)
  - **Routinely:** Before the end of the shift
  - **ALWAYS:** No later than within **24 hours** (unless approved by the EHS Superintendent or EHS Director).

Incident Severity Determination

- Incident severity will be determined pursuant to the **Incident Risk Matrix** in EHS Insight Step 2, Incident Details Submission. EHS Coordinators will enter the severity on the matrix when completing Step 2.
- High Severity Incidents, Hi-Potential Near Miss, and Reportable Injuries will typically require investigation.

Spill Response Guide for Contractor Selection

Pursuant CEM and the Tug Hill Incident Response and Notification Procedures, clean-up of reportable spills, especially larger, higher severity spill events, will be managed and coordinated by the EHS Department. When deemed necessary, the EHS Department will engage a professional environmental spill response Contractor to perform the response action. Approved spill response contractors shown on the Operations Emergency Contact List and found in the ICP and the SPCC Plan.

Reportable spills, and those considered larger and higher severity events are those that trigger a reporting requirement, and one of the following:

a) Spills off containment sufficient to have the potential in impact surface and/or groundwater (e.g. >1 bbl.).
b) The release of outside the confines of berms on the Operations pad and/or the permitted Limit of Disturbance.
c) The release will likely result in contaminated soils requiring excavation based upon state requirements.
d) The release that may result in a Notice of Violation (NOV) issued from the state or federal government.
e) The release is into a water body and/or in defined protect environ (e.g. Zone of Critical Concern or wetland).

Smaller spills may be cleaned-up by personnel on location if the spill is within certain specific parameters.

Under no circumstances, however, are spills of materials that constitute a "**hazardous waste"** to be cleaned-up by workers not trained in hazardous waste operations pursuant to OSHA regulation.

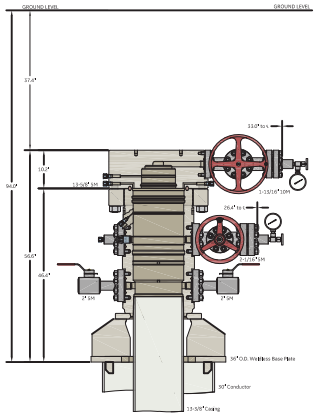
Contractors are to comply with all relevant and applicable regulations regarding spills and releases of pollutants and hazardous chemicals as defined by federal, state, and local laws and regulations. Contractors shall additionally adhere to any Tug Hill-issued policies and procedures pertaining to the work performed including, but not limited to the following:

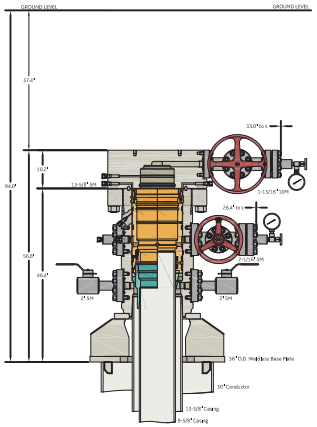
- **Tug Hill Integrated Contingency Plan (ICP) binder contains the**
  - **Well Site Safety Plan (WSSP)** (Drilling and Completions Sites only)
  - **Emergency Response Plan (ERP)**
  - **Incident Command System (ICS)**
  - **Hydrogen Sulfide Contingency Plan**
  - **Spill Prevention and Countermeasure Plan (SPCC) / Spill Prevention and Response Plan (SPRP)**
- **Storm Water Management Plans and Groundwater Protection Plans (GPP)** (where applicable)
- **The Tug Hill Operating Contractor Expectation Manual (CEM)** (see the Incidents section).

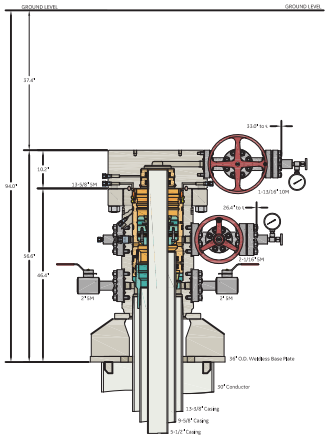
Attachment 1

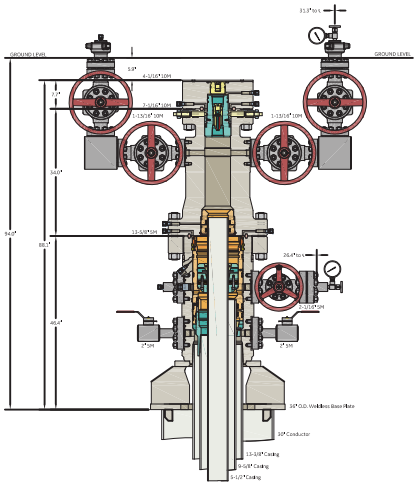
Standard Wellhead Assemblies Figures

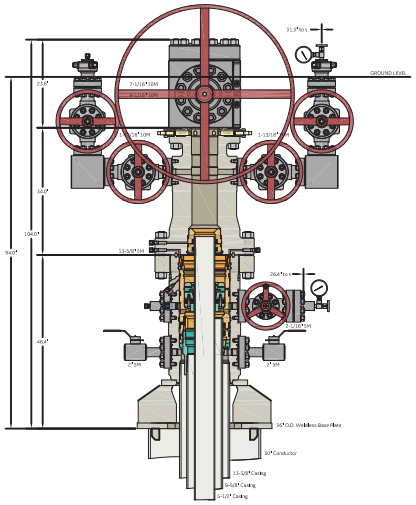
- Standard Marcellus Blow Out Preventor (BOP) Assembly
- Standard Marcellus Wellhead Assembly
- Standard Utica Frac Stack BOP Testing Procedure
- Standard Utica Wellhead Assembly

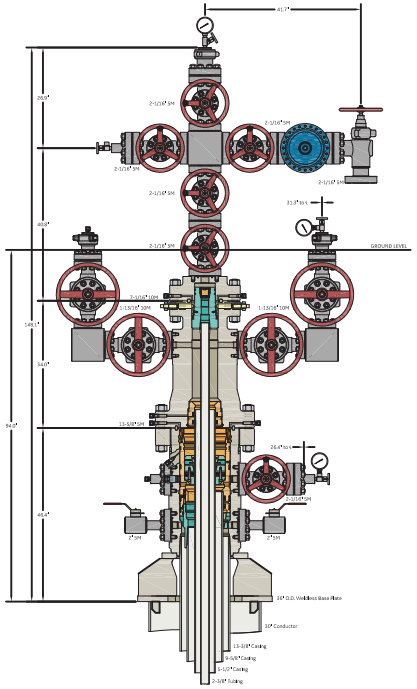












02/25/2022

Baker Hughes

Pressure Control

DRILLING TO PRODUCTION

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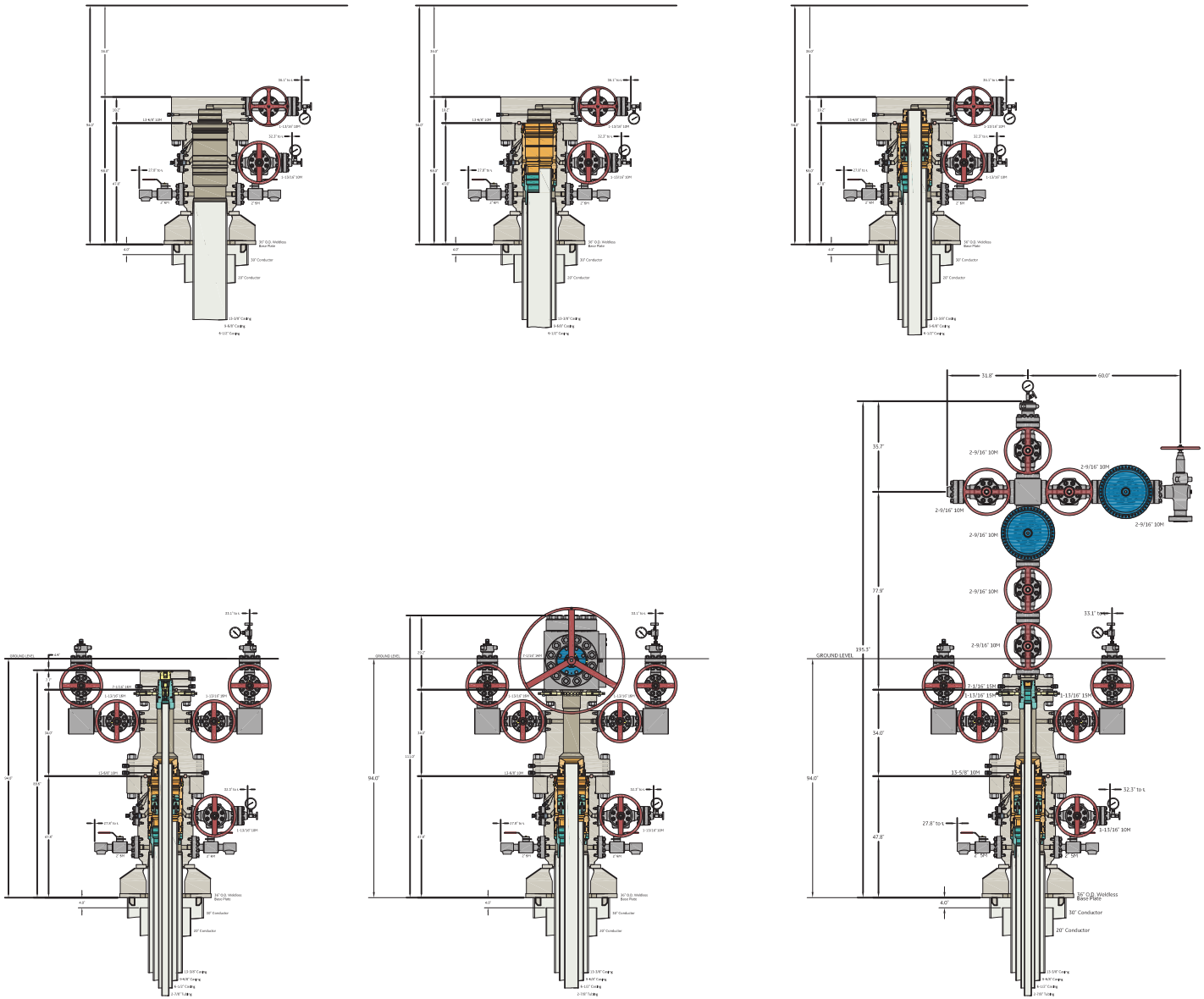
APPROVED BY:		DATE:	12FEB20

MARCELLUS



Pressure Control

DRILLING TO PRODUCTION

Baker Hughes

02/25/2022

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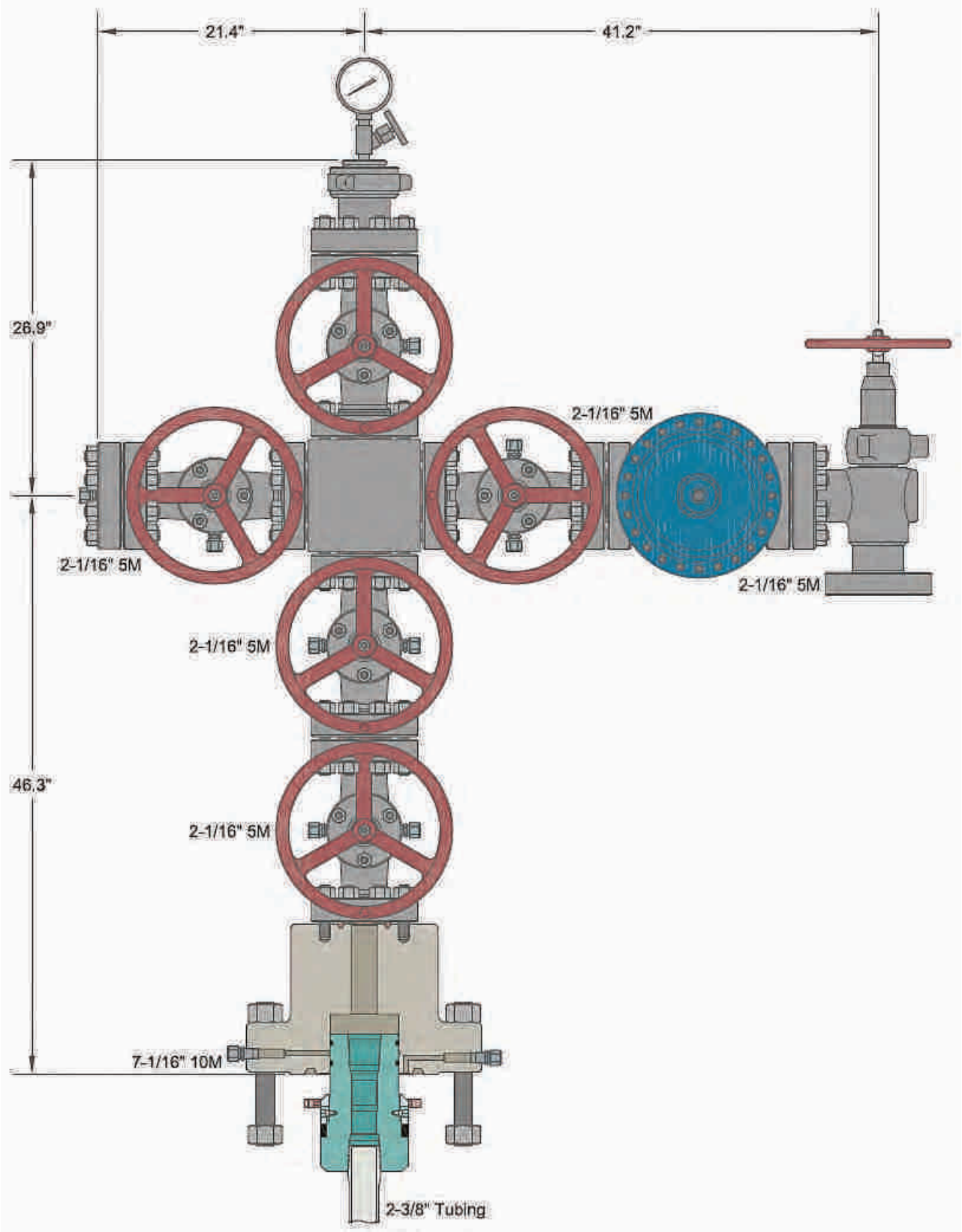
APPROVED BY:		DATE:	12FEB20

UTICA

MARCELLUS – POST COMPLETION



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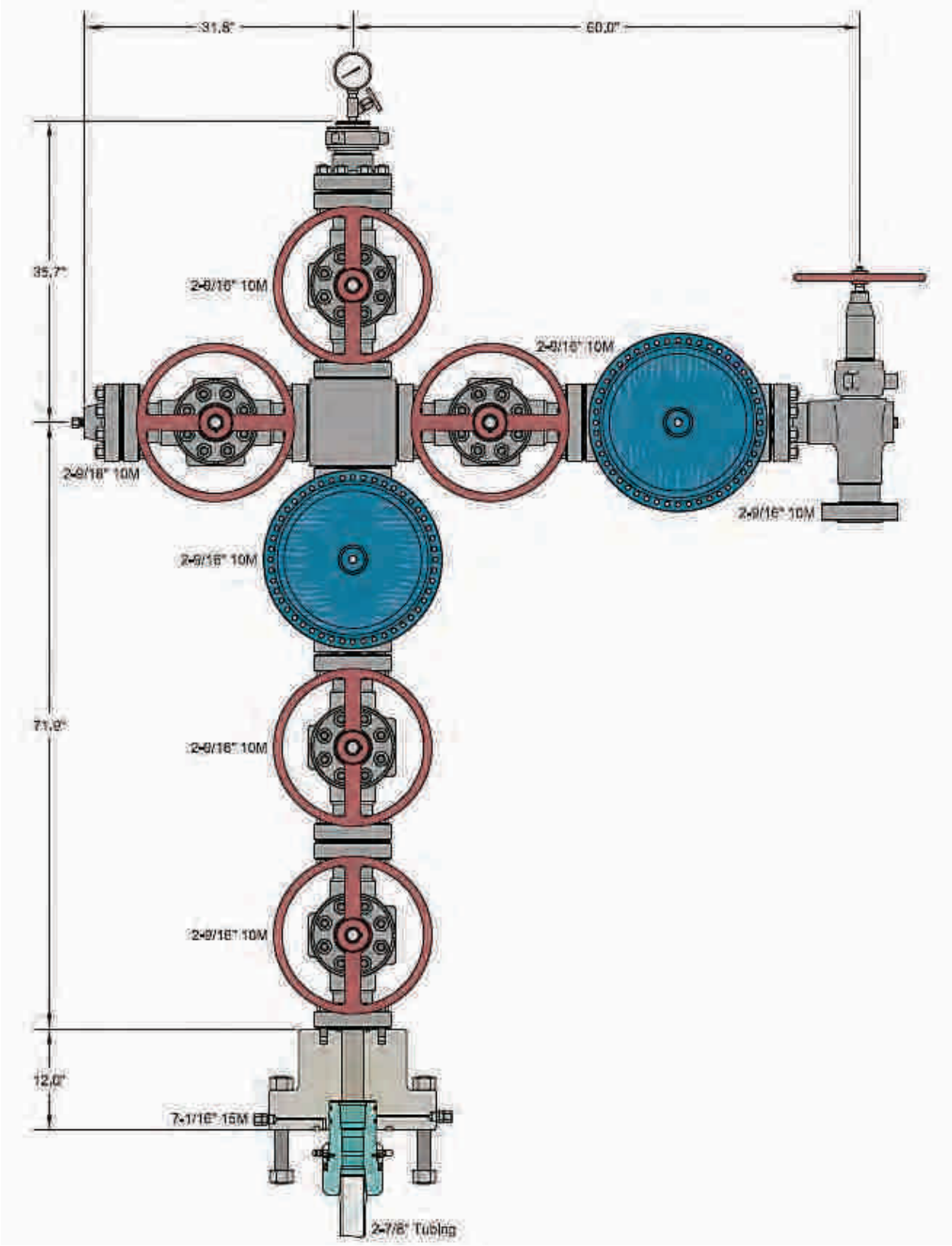

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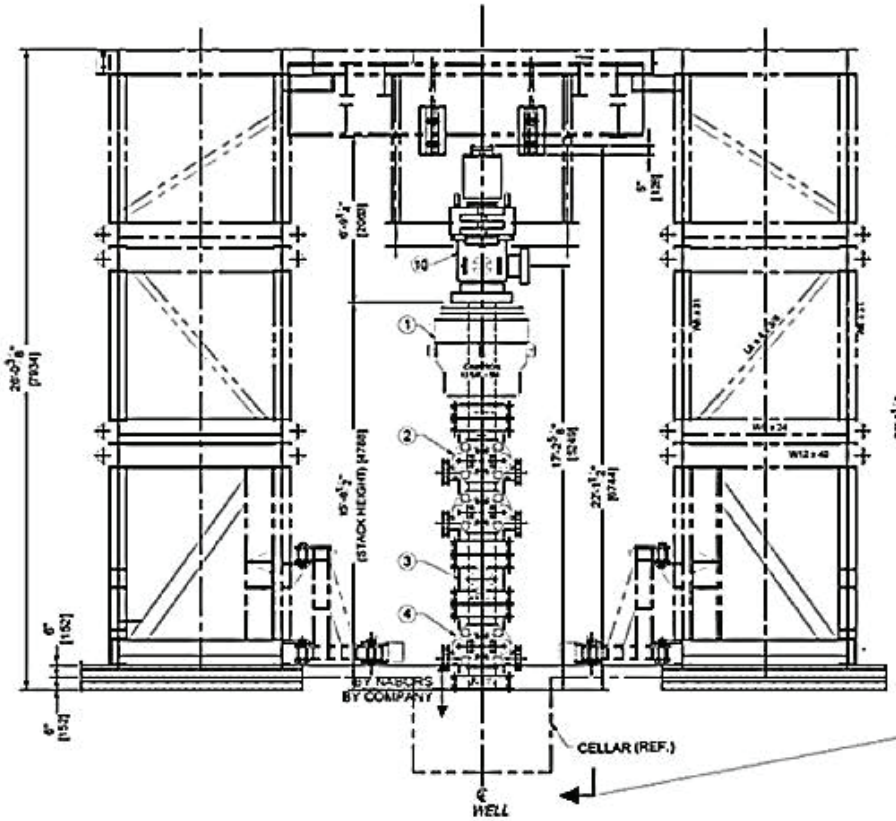
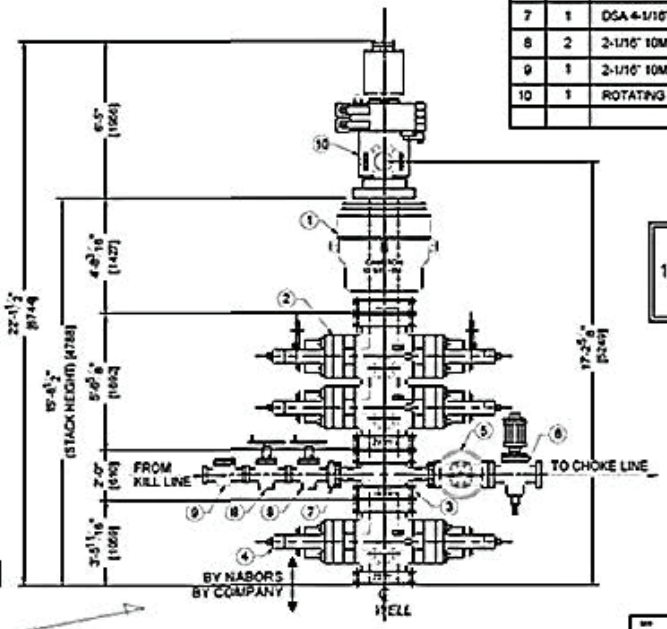
BILL OF MATERIALS		
NO	QTY	DESCRIPTION
1	1	CAMERON ANNULAR, 13-5/8", 5M WP TOP CONNECTION STUDDED 13-5/8" 5M BOTTOM CONNECTION FLANGED 13-5/8" 10M
2	1	CAMERON "U" DOUBLE RAM, 13-5/8, 10M WP
3	1	DRILLING SPOOL, 13-5/8" 10M, 24" Lg w/ (2) 4-1/16", 10 M FLANGED SIDE OUTLETS
4	1	CAMERON "U" SINGLE RAM, 13-5/8, 10M WP
5	1	4-1/16" 10M MANUAL GATE VALVE
6	1	4-1/16" 10M HCR VALVE
7	1	DSA 4-1/16" 10M 2-1/16" 10M
8	2	2-1/16" 10M MANUAL GATE VALVE
9	1	2-1/16" 10M CHECK VALVE
10	1	ROTATING HEAD (MAKE AND MODEL TO BE CONFIRMED)



13 5/8" - 10M B.O.P. STACK with 5M ANNULAR
V-DOOR SIDE ELEVATION VIEW



13 5/8" - 10M B.O.P. STACK LAYOUT

OPTION-1
13 5/8" - 10M B.O.P. STACK
with 5M ANNULAR

PRELIMINARY
FOR INFORMATION
ONLY

THIS DRAWING IS REFERENCE TO
ENG. REQUEST TICKET NO. F1772104

NABORS PACE® B28
13 5/8" - 10M B.O.P. STACK with 5M ANNULAR
TUG HILL

THIS DRAWING IS SHOWN TRUE SCALE ONLY WHEN PRINTED ON THIS SIZE PAPER

REV	DESCRIPTION	DATE	BY	APP
A	ISSUED FOR REVIEW	06-DEC-16	JR	*

NABORS

B

NTS

15890-0-01

02/25/2022

Frac Stack Schematic

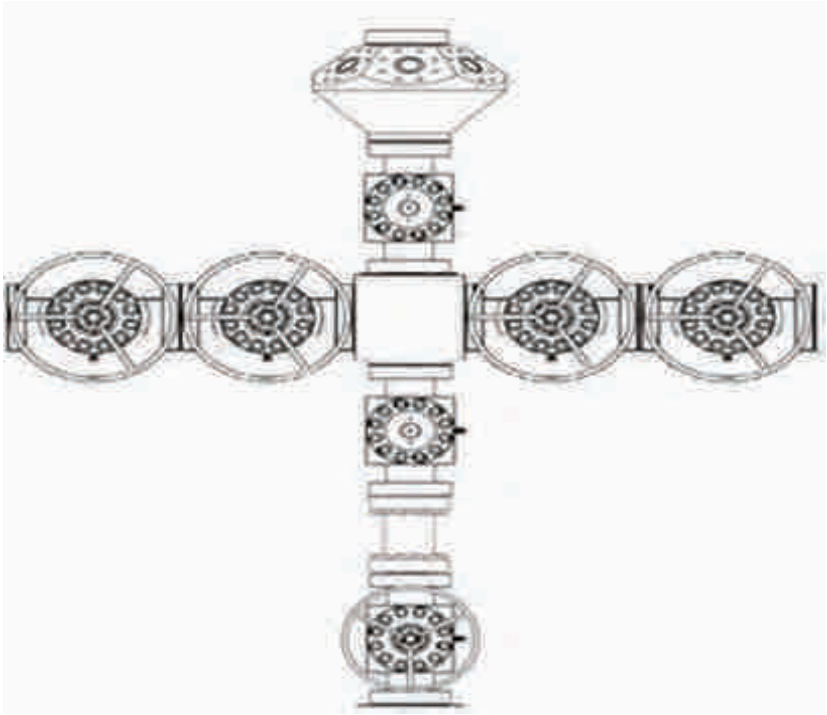
1) Dress wellhead in preparation for frac.

2) Grade location and install containment. Check 9-5/8" x 5-1/2" annulus psi & note on first report. Plumb line from annulus valve and install pressure gauge.

3) Bleed off any pressure and remove 7-1/16" 15K psi night cap. RU 7 1/16" 15K frac stack as follows (top to bottom):

- 4 x 4" goathead
- 7 1/16" 15K Hydraulic
- 7 1/16" 15K x (2x4 1/16" 15K) x (2x4 1/16 " 15K)flow cross double valved and capped
- 7 1/16" 15K Hydraulic (working)
- 7 1/16" 15K Manual
- 13 5/8" 10K x 7 1/16" 15K wellhead

SUBJECT TO CHANGE. VERIFY CONFIGURATION WITH SUPERINTENDENT



4) Torque frac stack flanges to spec. Digitally record torque valves for all flanges. PIC to verify that all flanges are torqued to the correct values prior to starting any pumping operations.

5) Test frac stack to 15,000 psi per mfg spec. Once positive pressure test has been achieved, cycle lower master valve closed checking for leakes and to ensure that valve will operate under pressure. Record full open/close turns in daily report. Return valve to opened state and continue testing remainder of frac stack per mfg spec (see attached).

6) MIRU pressure pumping services with pressure monitoring/recording. Close upper 7-1/16" valve and pressure test iron ande PSV to 15,000 psi. Bleed off pressure and fully open 7-1/16" valve.

Attachment 2

Emergency Response Plan

- Incident Response and Notification Procedure
- Incident Command Structure (ICS)
- Incident Severity Assessment & Emergency Levels
- Incident Action Planning Process
- Site Access, Visitor Management, and Communication
- Evacuation
- Emergency Response by Scenario
- Attachments
    - U.S. DOT Emergency Response Guidebook Guides
    - Blank Kill Sheet
    - Family Information Gathering Form
    - Marshall County Family Resource Guide
    - NIMS ICS Forms (select initial forms)

Emergency Response Plan

OWNER/OPERATOR

Tug Hill Operating, LLC

380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

KEY CONTACT FOR EMERGENCY RESPONSE PLAN DEVELOPMENT AND MAINTENANCE

Jerry V. DeRosa, Director EH&S Affairs
(724) 338-2029 (office)
(412) 736-5767 (cellular)

24-HOUR EMERGENCY PHONE NUMBER
(800) 921-9745

Updated: May 06, 2021

EMERGENCY RESPONSE PLAN
Tug Hill Operating, LLC

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ATTACHMENTS

1. **U.S. DOT Emergency Response Guidebook Guides**
2. **Blank Kill Sheet**
3. **Family Information Gathering Form**
4. **Marshall County Family Resource Guide**
5. **NIMS Incident Command System (ICS) Forms**

1.0 EMERGENCY RESPONSE PLAN

1.1 Purpose

The purpose of this Emergency Response Plan (ERP) is to provide the procedures to be followed to facilitate the rapid deployment of resources during an emergency condition at the Tug Hill Operating ("Tug Hill") well pad development site. The primary objectives are to minimize risk and potential for negative impacts to the surrounding community, environment, and personnel working onsite. This ERP and the defined emergency levels and corresponding response actions apply to all stages of development, from construction through plugging and abandonment.

This ERP will be a stand-alone "Companion Document" to the Tug Hill Well Site Safety Plans (WSSP) to provide the guidelines and protocols to following during emergency conditions. This ERP is intended to be activated and utilized during incidents that may cause materially significant severe consequences to equipment, personnel, community, and/or the environment, as well as instances which require involvement, coordination, and resources of local, county, regional, state, and/or federal agencies.

This ERP is specifically designed to address the requirements of the West Virginia Department of Environmental Protection (WV DEP) Office of Oil and Gas legislative rule 35 CSR 8, as well as OSHA CFR 1910.38 (Emergency Action Plans, Fire Prevention Plans, and Exit Routes).

Additionally, the Tug Hill ERP draws upon the protocol established through Federal Emergency Management Agency (FEMA) National Incident Management System (NIMS). The NIMS is a systematic, proactive approach to guide departments and agencies of government, nongovernmental organizations, and the private sector, to work together seamlessly and manage incidents involving all threats and hazards, regardless of cause, size, location, or complexity, to reduce loss of life, property, and harm to the environment.

1.2 ERP Organization

This ERP will be found in each WSSP as **WSSP PART A – Attachment 2.** Site specific documents and figures pertaining to the design and layout of the well pad are provided in **WSSP PART B - SITE-SPECIFIC DATA Section.** These and other Companion Documents governing environmental, health and safety practices and Standard Operating Procedures (SOPs) relevant to the well site development comprise the Integrated Contingency Plan (ICP) binder prepared for each site.

Part of the ERP includes Emergency Response scenarios and the Incident Command System (ICS) – which is an organizational hierarchy and description of the division of responsibilities for large-scale, severe incidents such as a well control incident. The ERP also provides the procedures to be followed in the event of specific types of emergencies, including fire/explosion, power loss, natural disasters, well control, and spill/fluid release, as well as action lists for "Emergency Levels" (1, 2, and 3) based upon the degree of risk presented by the circumstances, procedures for evacuation, and the NIMS ICS forms.

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1.3 Distribution

The ERP will be distributed with the WSSP for each Well Work Permit Application. Copies of the WSSP will also be provided by Tug Hill to the County Office of the Emergency Management Agency (EMA) prior to the commencement of well work or site preparation work that involves any disturbance of land.

The WSSP and ICP binder of Companion Documents are to be maintained in the Company Man trailer on Drilling and Completions ("D&C Operations") pads. The **PART B -- SITE-SPECIFIC DATA** section of the WSSP (e.g., Emergency Contacts List, Site Layout, Emergency Evacuation, Helicopter Landing Zone, and Incident Response and Notification Procedure) are also to be kept in the Operations Pad Security Guard Shack for readily available access during a well control event. A hard copy of the WSSP will also be placed in the in the well pad site access road mailbox. All personnel working on location and managers making decisions about activities on-site, even if such manager does not visit the site, are to be cognizant of the contents of the WSSP and ICP Companion Documents.

1.4 Revisions

Revisions and updates to the WSSP relating to changes of Operational phases and/or personnel will occur in the **PART B - SITE-SPECIFIC DATA** section. Revisions to this the ERP include:

ERP Record of Review & Revision Index

Date	Description of Changes	Reviewer / Revised by:

02/25/2022

2.0 GAS WELL DEVELOPMENT PHASES

The general phases of gas well development, hazards and anticipated number of persons on-site during each phase, are discussed below.

2.1 Development Phases, Equipment and Personnel

Personnel and equipment on-site during each of the above phases are summarized below:

Natural Gas Development Operational Phase Description Table			
Phase	**Personnel headcount (approx.)**	**Equipment**	**Description of Activity**
Construction	8-12	Logging, Excavators and other heavy machinery, Cranes, dump trucks, auger/conductor rig.	Build location to code, install cellars and conductor casing
Drilling **Rig Move**	25-35 30-40	Drilling Rig, temporary living quarters with septic, generators, light-plants, compressors, diesel fuel storage, drill cutting waste boxes, cuttings excavator, various ancillary equipment.	Spud and drill horizontal well. Capture drill cuttings and mud.
Completions	30-40	High Pressure pump tractor trailers, blending equipment, water and sand storage, high weight sand fork-lift, mobile office, cased hole wireline unit, crane, and various ancillary equipment.	Perforate and Frac horizontal well. Large quantity of acids on-site; friction reducer and other chemicals, fuels are utilized.
Drill Out	20-25	Coil Tubing unit, Snubbing Unit, Crane, high pressure pump, water storage & various ancillary equipment	Drill out Frac plugs and clean well up for flowback operations
Flow back	10-15	Water storage, high pressure flowback iron, sand traps	Flow back water and sand for final well clean-up
Production Normal Ops **Production Repairs**	1-2 4-6	Wellheads, and production facilities	Production

02/25/2022

3.0 ERP TRAINING AND REVIEW

Communication of the emergency response and notification procedures encompassed in detail in the WSSP, and ERP are communicated to Tug Hill employees and contractors at various points in the well development process. See the Site Safety Section of the WSSP for a full discussion of all safety orientation and meetings.

All Contractors are required to participate in the Tug Hill Contractor Safety Management Program (CSMP) and either have a Master Services Agreement (MSA) by and between Tug Hill or be subcontracted directly with a primary Contractor who is bound by the MSA. Under the terms and conditions of the MSA, the Contractor is required to acknowledge receipt and abide by Contractor Expectation Manual (CEM). The CEM outlines Tug Hill safety and environmental performance expectations.

Upon first reporting to service for Tug Hill, all workers are required to participate in CEM Safety Orientation prior to be permitted to work on a Tug Hill location. During CEM Orientation, workers are informed of stop work authority, safe work practice expectations, requirements for Permits-to-Work (PTW), spill containment requirements, incident notification procedures, and emergency response and notification procedures. Site specific information such as pad layout and muster points will be reviewed during the CEM Orientation. Workers who have not had CEM Orientation must report to the Person-in-Charge (PIC) or the EHS Coordinator.

All Company Men who will serve as the Tug Hill contracted Company Man/PIC on the well pad are required to go through EHS Onboarding upon initially reporting to duty. All Tug Hill field Operations employees likewise receive EHS Onboarding. During the EHS Onboarding, the contents of the WSSP and Companion Documents including, but not limited to, the ERP, are reviewed. Tug Hill employees are to annually review the WSSP and ICP binder and/or participate in training. The WSSP and ERP are also reviewed with supervisors of all contractors during Pre-Spud and Pre-Frac meetings that are held for each well site Drilling & Completions (D&C) Operations.

Visitors should also be informed when on-site on ERP basics including how to contact the EHS Coordinator or Company Man/PIC and of muster points and evacuation routes.

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4.0 INCIDENT SEVERITY ASSESSMENT

4.1 Identification of Emergency Levels

Incidents are reported pursuant to the Tug Hill Incident Response and Notification Procedure and are classified in the EHS Insight Incident Reporting Module. Incident Classification is based upon Incident Severity and nature of Consequences (e.g., People, Asset Environment, and Reputational/Community impact).

Severity				
	People / Health	**Environment**	**Asset**	**Community**
1	No injury	No effect	No damage	No impact
2	1st Aid only	In containment	Minor; <$10,000	Limited/Minor concern
3	Minor injury but medical aid (OSHA Recordable), not Lost Time Incident	Slight/minor effect; Outside containment but on well pad. Minor soil clean-up. No off-site or water impact	Limited Asset damage ($10K - $50K); Impact to Ops <24 hrs. or less lost Production; possible vandalism	Moderate concern; Local resident impact; Land Dept. involvement; no media
4	Serious injury, LTI or hospitalization; OSHA Recordable; potential Off-Site Muster	Reportable release but inside the LOD/ROW; impact to soil and water; potentially Materially Significant" clean-up required; agency NOV unlikely	Moderate damage; Production loss 1-5 days; potentially "Materially Significant" Asset damage = $100K - $1MM	Significant local community disruption; multi. Contractor response action; Media attention; Social Media visibility; Limited local Govt./Agency action or involvement
5	Severe injury potentially leading to fatality or disability; OSHR Reportable; Evacuation required; violent threat of injury or act of terrorism	Sig. release w/ off-site & serious impact to air/water/soils or sensitive environ (wetland); Agency Reportable and likely NOV; protracted clean-up >$100,000	Major damage; Production loss est. between 1 – 3 wks.; Asset damage >$1MM - <$3MM; substantial vandalism/theft	Local resident evacuation; Moderate local or regional media coverage; substantial social media; Agency NOV and penalties likely; potential legal action
6	One or more fatalities; or multi. severe OSHA Reportable injuries; acts of violence w/ severe injury; act of terrorism committed	permanent impacts to water/groundwater or sensitive environ; gas release causing regional evacuation; extensive long-term env. Monitoring/clean-up; NOVs/penalties & pot. Legal actions	Severe damage; Production outage 1 month or more; Losses >$3MM; terrorism attack; impact to Midstream or other 3rd party assets	IN the regional or national news; Unified Incident Command w/ multi. Agency response; regional evacuation; sig. NOVs/penalties pot. >$1MM; pot. Litigation; possible loss of permits

This ERP addresses actions to be taken specifically during Level 2 and Level 3 events. In all emergency incident situations, safety and preservation of life is paramount. Well site personnel shall not perform duties/functions for which they are not trained and appropriately qualified to

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perform and, therefore, shall not perform response efforts that may put themselves or others in a situation that threatens human health and safety. This may range from a well control event to a hazardous materials spill that would require hazardous waste clean-up.

Upon activation ERP for any Level 3 event, the Incident Command System will be employed pursuant to the ERP.

Level 1 events ("Green"; Consequence Levels 1-2 in EHS Insight Incident Reporting Module) involve situations that are either common to routine operations or do not pose significant risk to personnel. In most instances, Level 1 events can be resolved using standard operating/drilling procedures, commonly available equipment, personnel, and techniques.

Level 2 events ("Yellow"; Consequence Levels 3-4 in EHS Insight Incident Reporting Module) involve circumstances that are not commonly encountered during routine operations and pose the potential for significant risk to onsite personnel, equipment and/or the environment. A Level 2 event may require specialized well control personnel, equipment and/or techniques in order to be safely resolved.

IF IT IS DETERMINED THAT UNCONTROLLED LOSS OF CONTAINMENT OF GAS HAS OCCURED PROCEED TO LEVEL 3 INCIDENT.

Level 3 events ("Red"; Consequence Levels 5-6 or "RED" in EHS Insight Incident Reporting Module) present serious and immediate risks to personnel, assets, the surrounding community, and environment onsite and likely offsite as well. These situations require the immediate application of specialized techniques and well-developed safety assessment and hazard mitigation programs.

Examples of Level 3 events are provided in Section 11 of this ERP.

Level 3 events will warrant the immediate activation of the ERP, likely mobilization of well control specialists/engineers and other specialist personnel and equipment. Tug Hill Operations Management will contact and consult with well control contractor immediately upon the determination of a Level 3 incident. Requested well control information will be gathered and provided to the well control contractor along with any other pertinent and/or related information.

A complete list of Key Personnel, Agency and Emergency Contacts, and Evacuation Routes are included in the **WSSP PART B – SITE-SPECIFIC DATA** section in this ICP binder.

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5.0 INCIDENT COMMAND

The Incident Command System (ICS) is a standardized approach to the command, control, and coordination of on-scene incident management that provides a common hierarchy within which personnel from multiple organizations can be effective. ICS specifies an organizational structure for incident management that integrates and coordinates a combination of procedures, personnel, equipment, facilities, and communications. Using ICS for every incident helps hone and maintain skills needed to coordinate efforts effectively. ICS applies across disciplines and enables incident managers from different organizations to work together seamlessly. This system includes five major functional areas, staffed as needed, for a given incident:

1. **Incident Command**
2. **Operations**
3. **Planning**
4. **Logistics**
5. **Finance/Administration**

In an incident command organization, the command staff typically includes an Operations Coordinator, Public Information Coordinator, and the Emergency EHS&S Coordinator who report directly to the IC/UIC. The Incident Command team will report up to the Executive Management Team. Additional positions may be required, depending on the nature, scope, complexity, and location(s) of the incident(s) or according to specific requirements established by the IC/UIC.

Once the ERP has been activated and evacuation of the location is deemed necessary, Incident Command will be established, and Tug Hill contract Well Control specialists will be consulted and/or activated as appropriate.

The highest-ranking competent person on location will assume the role of On-scene Incident Commander until they are relieved. In some cases, that person may be a contractor or service company representative who will begin managing the incident until a Tug-Hill representative relieves them. If a company employee is on site at the time of an accident, that person shall act as Incident Commander unless otherwise instructed.

All individuals remaining behind to shut down critical systems or utilities must be capable of recognizing when to abandon the operation or task and evacuate themselves. The systems to be shut down will be dependent on the operations being performed and will be decided upon after notification of an emergency evacuation by the PIC or the designated Incident Commander.

If the situation is of immediate danger to life and health, Unified Command/Incident Command ("UIC") will be established pursuant the Incident Command System (ICS) in the ERP.

The person functioning as Incident Commander during the initial response period has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.

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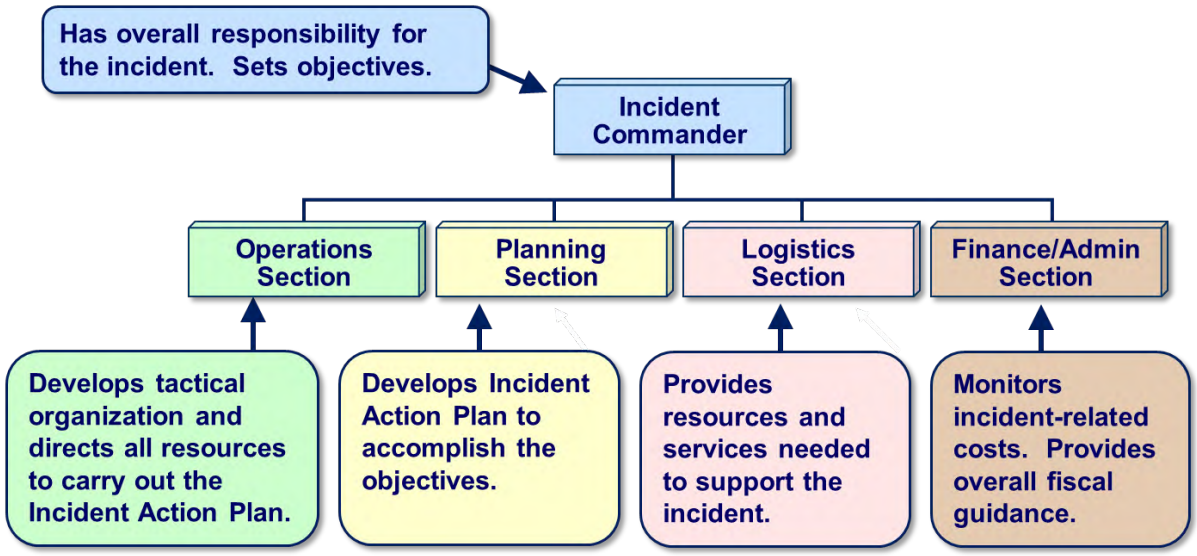
The Vice President of Operations and/or Emergency EHS&S Coordinator will establish a team of personnel who are responsible for immediately responding to the emergency and who will be cognizant of physical or process changes at the site that would require a response procedure to be modified.

5.1 Overall Organizational Functions

ICS was designed by identifying the primary activities or functions necessary to effectively respond to incidents. As incidents became more complex, difficult, and expensive, the need for an organizational manager became more evident. Thus, in ICS, and especially in larger incidents, the Incident Commander manages the organization and not the incident.

In addition to the Command function, other desired functions and activities are to:

- Delegate authority and provide a separate organizational level within the ICS structure with sole responsibility for the tactical direction and control of resources.
- Provide logistical support to the incident organization.
- Provide planning services for both current and future activities.
- Provide cost assessment, time recording, and procurement control necessary to support the incident and the managing of claims.
- Promptly and effectively interact with the media, and provide informational services for the incident, involved agencies, and the public.
- Provide a safe operating environment within all parts of the incident organization.
- Ensure that assisting and cooperating agencies' needs are met, and to see that they are used in an effective manner.



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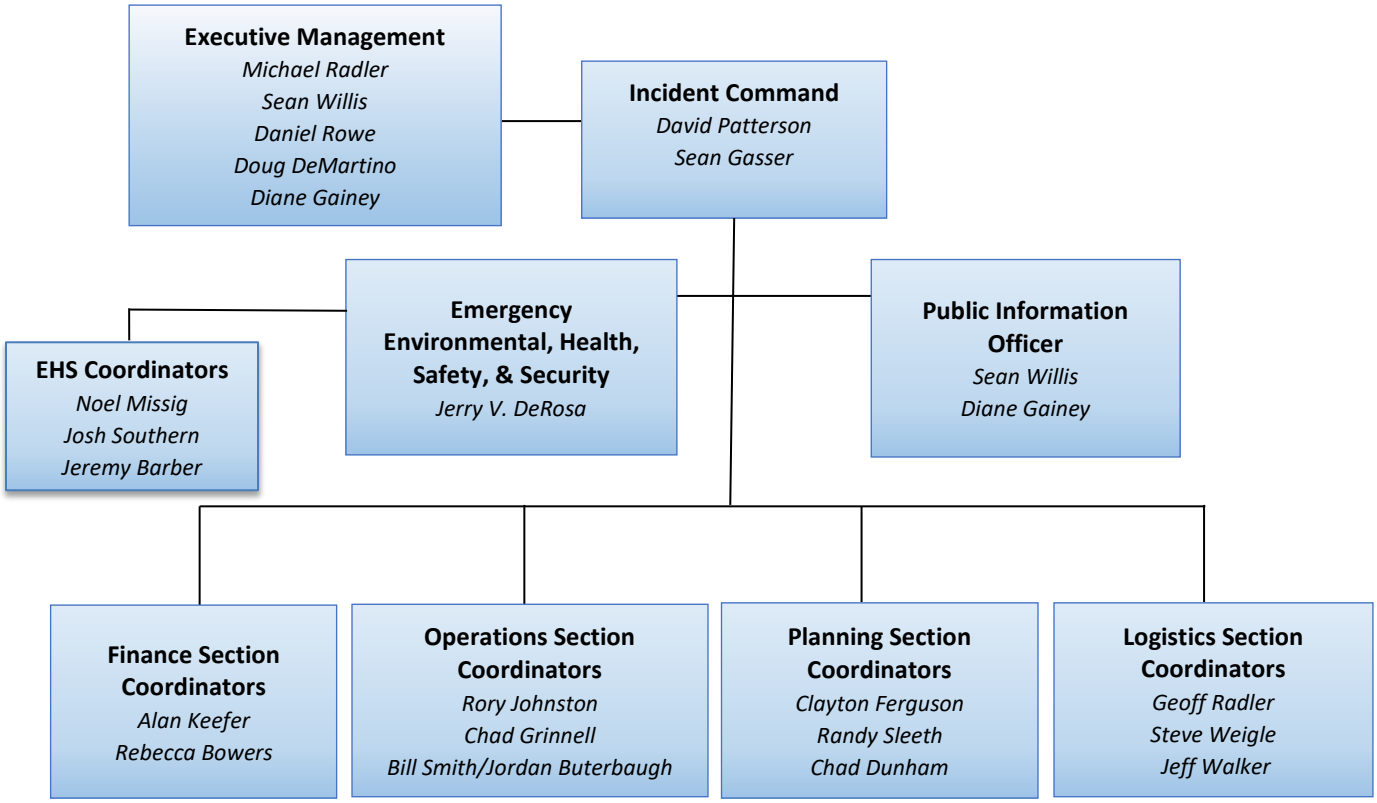
Tug Hill Operating
Incident Command Structure



5.2 Incident Commander/Unified commander (IC/UIC)

Once the ERP has been activated and evacuation of the location is deemed necessary, Incident Command will be established. The highest-ranking competent person on location will assume the role of On-scene Incident Commander (IC) until they are relieved. In some cases, that person may be a contractor or service company representative who will begin managing the incident until a Tug-Hill representative relieves them. If a company employee is on site at the time of an accident, that person shall act as Incident Commander unless otherwise instructed.

The IC is responsible for overall onsite and field management of the emergency and will be responsible for determining when to upgrade the level of emergency response.

Overall management includes Executive Management Team, the IC, and Command Staff. The IC is responsible for overall onsite and field management of the emergency and will be responsible for determining when to upgrade the level of emergency response. Additionally, Tug Hill maintains a contractual relationship with Well Control specialists and these parties will be consulted and/or activated as appropriate.

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The IC and Command Staff are typically located at the Incident Command Post (ICP) or at the emergency location, as appropriate, and a remote Command Center for the Public Information Office and agency meetings.

All individuals remaining behind to shut down critical systems or utilities must be capable of recognizing when to abandon the operation or task and evacuate themselves. The systems to be shut down will be dependent on the operations being performed and will be decided upon after notification of an emergency evacuation by the PIC or the designated IC.

The primary function of the IC may be conducted as a Single Incident Commander when there is no jurisdictional or functional agency overlap, or a Unified Command (UIC) where multijurisdictional or multiagency jurisdiction exists. The roles, division of responsibilities, and employment of UIC will be discussed further in the section below.

The IC is technically not a part of either the General or Command Staff. The Incident Commander is responsible for:

- Having clear authority and knowing Tug Hill policy.
- Ensuring incident safety.
- Establishing an Incident Command Post.
- Setting priorities and determining incident objectives and strategies to be followed
- Establishing the ICS organization needed to manage the incident.
- Approving the Incident Action Plan.
- Coordinating Command and General Staff activities.
- Approving resource requests and use of volunteers and auxiliary personnel.
- Ensuring after-action reports are completed.
- Authorizing information release to the media.
- Ordering demobilization as needed.

Additional Command Staff positions may also be necessary, depending on the nature and location(s) of the incident or specific requirements established by the IC/UIC.

5.3 Public Information Coordinator

To ensure consistent communications which are accurate and controlled, it is essential that personnel understand that interaction with the public and media is to go through the Public Information Coordinator. Any other interaction or communication with the public or media is strictly prohibited and a direct violation of this document.

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The Public Information Coordinator may also perform a key public information-monitoring role. Whether the command structure is single or unified, only one Public Information Coordinator should be designated per incident. Assistants may be assigned from other involved agencies, departments, or organizations.

The Public Information Coordinator is responsible for interfacing with the public, media, and/or with other agencies with incident-related information requirements. The Public Information Coordinator will gather, verify, coordinate, and disseminate information on the incident's cause, size, and current situation; resources committed; and other matters of general interest for both internal and external audiences.

Specific functions of the Public Information Coordinator include, but are not limited to:

- Determine, according to direction from the IC, any limits on informationrelease.
- Develop accurate, accessible, and timely information for use in press/mediabriefings.
- Obtain IC's approval of news releases.
- Conduct periodic media briefings.
- Arrange for tours and other interviews or briefings that may be required.
- Monitor and forward media information that may be useful to incidentplanning.
- Maintain current information, summaries, and/or displays on the incident.
- Make information about the incident available to incident personnel.
- Participate in planning meetings.

Members of the media must be treated with respect and fairness. At the approval of the Executive Management team, a nearby hotel with the ability to supply the following accommodations shall be used for all press releases:

- Sheltered environment with heating/air conditioning.
- An appropriately sized meeting space with seating, tables and water.
- Audio-Visual Equipment including a podium.
- Dependable Wi-Fi connection.

The IC/UIC must approve the release of incident-related information and any meetings or communication with the public or media. In large-scale incidents or where multiple command posts are established, the Public Information Coordinator should participate in or lead the Joint Information Center in order to ensure consistency in the provision of information to the public.

5.4 Environmental, Health, Safety & Security Coordinator

The Environmental, Health, Safety & Security (EHS&S) Coordinator has immediate authority to stop and/or prevent unsafe acts during incident operations. This will include working closely with the Incident Command team member to ensure all onsite equipment and operational matters are considered.

General duties of the Emergency EHS&S Coordinator include:

- Ensuring employees and contractors at the site have been given orientation on response procedures and are advised of evacuation routes, muster points, the locations of fire extinguishers and first aid supplies.
- The Emergency EHS&S Coordinator will ensure that new employees and contractors are given EHS Onboarding to review the WSSP and ERP.
- Assigning an employee or specialized crisis management contractor to notify emergency response personnel (such as an ambulance, the fire department, or the police) and/or to alert other employees of impending danger or necessary evacuation.

The EHS&S Coordinator will monitor incident operations and advise the IC/UIC on matters relating to operational safety, including the health and safety of emergency responder personnel. The ultimate responsibility for the safe conduct of incident management operations rests with the IC/UIC and supervisors at each level of incident management. This will include working closely with the Incident Command team member to ensure all onsite equipment and operational matters are considered.

The EHS&S Coordinator is responsible to the IC/UIC for the systems and procedures necessary to ensure ongoing assessment of hazardous environments, coordination of multi-agency safety efforts, and implementation of measures to promote emergency responder safety as well as the general safety of incident operations.

It is important to note that the agencies, organizations, operational team members, or jurisdictions that contribute to joint safety management efforts do not lose their individual identities or responsibility for their own programs, policies, and personnel. Rather, each contributes to the overall effort to protect responder personnel involved in incident operations.

The Emergency EHS&S Coordinator or designated alternative may respond to an imminent or actual emergency in the following manner:

- Ensure all impacted employees and contractors are given emergency care or the proper emergency care.
- Identify the character, source, amount, and area affected by the situation.
- Assess the danger and risk to employees, the public, and the environment.
- Take reasonable steps to prevent the emergency situation from occurring, re-occurring, or spreading to other areas where materials are stored. This may involve containing

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and collecting the released material and removing or isolating the storage vessels or containers. With regards to managing onsite equipment, this will require close coordination with the Incident Command team member(s).

- Continue monitoring the equipment for leaks, pressure build-up, etc.
- Coordinate the disposal of waste materials, contaminated soil, used sorbent material, etc.
- Ensure that incompatible wastes are kept separate.
- Clean or decontaminate equipment used for clean-up.

Emergency EHS&S Coordinator notification responsibilities during an emergency are listed below:

- Ensure that government and emergency agencies are notified as required.
- Inform local emergency responders of the evacuation status of the site.
- Establish a secure and confidential perimeter around the impacted area. Ensure all personnel and vehicle entry/exit is monitored and recorded.
- Ensure any unauthorized personnel are removed or not granted entry to the impacted area. Media and/or local residents shall not be granted access to the impacted area unless authorized by Public Relations. To achieve this goal, it may require security contractors to be stationed at or near the impacted area.
- Informing local emergency responders of hazards associated with field operations including drilling or completions procedures, equipment / rigging, and/or chemicals used when the event occurs in the field.
- Informing local emergency responders of equipment that may still be running or in operation at the site.

In the event of a spill or release at the site, the Emergency EHS&S Coordinator will mobilize to the site to coordinate activities or will send a designee. The Emergency EHS&S Coordinator or his designee will plan for the disposal of recovered spill material, impacted water, soil, or absorbents. This will include working closely with the Incident Command team member to ensure all onsite equipment and operational matters are considered.

Upon completion of the cleanup and restoration, the Emergency EHS&S Coordinator will prepare a Remediation Completion Report, which will be reviewed and approved by Executive Management. Also, a complete log of events and activities during and after the spill will be kept, and photographs if possible, for legal purposes and critical review of events at a later date. Specific emergency and spill response and hazardous materials management procedures are included in the **ERP** and the **SPCC PLAN** which are included in the ICP binder.

5.5 Operations Section Coordinator

The Operations Section Coordinator is responsible for managing all tactical operations at an incident. The need to expand the Operations Section is generally dictated by the number of tactical resources involved and is influenced by span of control considerations.

Major responsibilities of the Operations Section Chief are to:

- Assure safety of tactical operations.
- Manage tactical operations.
- Develop the operations portion of the IAP.
- Supervise execution of operations portions of the IAP.
- Request additional resources to support tactical operations.
- Approve release of resources from active operational assignments.
- Make or approve expedient changes to the IAP.
- Maintain close contact with IC, subordinate Operations personnel, and other agencies involved in the incident.

The Operations Coordinator reports to the IC/UIC for the direct management of incident-related tactical activities. The Operations Coordinator is responsible for activities focused on reducing the immediate hazard, saving lives and property, establishing situational control, and restoring normal operations.

The Operations Coordinator will establish tactics for the assigned operational period. Safety of tactical operations personnel is the highest priority and the first objective. Personnel in the ICS organization shall support the Operations Coordinator to succeed in this objective.

An Operations Coordinator should be designated for each operational period and the responsibilities that are assigned during that operational period.

5.6 Planning Section Coordinator

The Planning Section (Planning Coordinator) will collect, evaluate, and disseminate incident situation information and intelligence to the IC/UIC and incident management personnel. The Planning Coordinator will then prepare status reports, display situation information, maintain the status of resources assigned to the incident, and prepare documents based on Operations Section input and guidance from the IC/UIC.

The Planning Section is comprised of five primary units, as well as a number of technical specialists to assist in evaluating the situation, developing planning options, and forecasting requirements for additional resources.

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Within Planning, the following primary units fulfill functional requirements:

- **Resources Unit**: Responsible to evaluate resources needed and currently committed to the incident, the effects additional responding resources will have on the incident and anticipated resources needed.
- **Situation Unit**: Responsible for the collection, organization, and analysis of incident status information and for the analysis of the situation as it progresses.
- **Documentation Unit**: Responsible for collecting, recording, and safeguarding documents relevant to the incident.
- **Technical Specialist(s)**: Personnel with special skills that can be used anywhere within the organization.
- **Demobilization Unit**: Responsible for ensuring orderly, safe, and efficient demobilization of incident resources.

Planning is normally responsible for gathering and disseminating information and intelligence critical to the incident unless the IC/UIC places this function elsewhere. The Planning Section is also responsible for assembling the Incident Action Plan (IAP). The IAP will include the overall incident objectives and strategies established by the IC/UIC.

5.7 Logistics Section Coordinator

The Logistics Section (Logistics Coordinator) is responsible for service support requirements needed to facilitate effective and efficient incident management, including ordering resources from off-incident locations.

The Logistics Coordinator will also provide facilities, transportation, supplies, equipment maintenance and fuel, food services, communications and information technology support, and emergency responder medical services. Within the Logistics Section, six primary Units fulfill functional requirements:

- **Supply Unit:** Orders, receives, stores, and processes incident related resources, personnel, and supplies.
- **Ground Support Unit**: Provides ground transportation during an incident. In conjunction with providing transportation, the unit is also responsible for maintaining and supplying vehicles, keeping usage records, and developing incident traffic plans.
- **Facilities Unit**: Sets up, maintains, and demobilizes facilities used in support of incident operations. The unit also provides facility maintenance required to support incident operations.
- **Food Unit**: Determines food and water requirements, plans menus, orders food, provides cooking facilities, cooks, serves, maintains food service areas, and manages food concerns.

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- **Communications Unit**: Organizes effective communications planning as well as acquiring, setting up, maintaining, and accounting for communications equipment.
- **Medical Unit**: Responsible for the effective and efficient provision of medical services to incident personnel.

5.8 Finance Section Coordinator

The Finance Section (Finance Coordinator) will be established when the incident management activities require on-scene or incident-specific finance and other administrative support services. Some of the functions that fall within the scope of the Finance Section are recording personnel time, maintaining vendor contracts, administering compensation and claims, invoice coding for EH&S response costs, and conducting an overall cost analysis for the incident. If a separate Section is established, close coordination with Planning and Logistics is also essential so that operational records can be reconciled with financial documents. Expedited payment of invoices may be required by contractors who are unable to front-load the cost of intensified services during an emergency operation.

Finance is a critical part of the ICS in large, complex incidents involving significant funding originating from multiple sources. In addition to monitoring multiple sources of funds, the Finance Section must track and report to the IC/UIC the accrued cost as the incident progresses. This allows the IC/UIC to forecast the need for additional funds before operations are negatively affected. When such a Section is established, the depicted units may be staffed as required.

Within the Finance Section, primary functional requirements include:

- Manage all financial aspects of an incident.
- Responsible for tracking costs, analyzing cost data, making estimates, and recommending cost saving measures.
- Ensure that all financial obligation documents initiated at the incident are properly prepared and completed. For example:
- Vendor contracts.
- Recording time for incident personnel and hired equipment.
- Coding of invoices and costs, including the proper approval routing.
- Ensure compensation and claims functions are being addressed relative to the incident.
- Responsible for financial concerns resulting from property damage, injuries, or fatalities at the incident.
- Maintain daily contact with Tug Hill management on finance matters.

6.0 UNIFIED COMMAND

Unified Command improves unity of effort for incidents involving multiple agency response (e.g., the County Emergency Management Agency, the WVDEP, local Fire Departments, and potentially other agencies such as the U.S. Coast Guard and U.S. Environmental Protection Agency). The use of Unified Command enables jurisdictions and those with authority or functional responsibility for the incident (called members of the Unified Command) to jointly manage and direct incident activities through the establishment of a common set of incident objectives, strategies, and a single IAP. However, each participating partner maintains authority, responsibility, and accountability for its personnel and other resources, and each member of Unified Command is responsible for keeping other members of Unified Command informed.

6.1 Responsibilities of the Incident Commander and Unified command

Whether using a single Incident Commander or a Unified Command, the command function:

- Establishes a single ICP for the incident.
- Establishes consolidated incident objectives, priorities, and strategic guidance, and updating them every operational period.
- Selects a single Section Chief for each position on the General Staff needed based on current incident priorities.
- Establishes a single system for ordering resources.
- Approves a consolidated IAP for each operational period.
- Establishes procedures for joint decision making and documentation.
- Captures lessons learned and best practices.

6.2 Advantages of Using Unified Command

The advantages of using Unified Command include:

- A single set of objectives is developed for the entire incident.
- A collective approach is used to develop strategies to achieve incident objectives.
- Information flow and coordination is improved between all jurisdictions and agencies involved in the incident.
- All agencies with responsibility for the incident have an understanding of joint priorities and restrictions.
- No agency's legal authorities will be compromised or neglected.
- The combined efforts of all agencies are optimized as they perform their respective assignments under a single Incident Action Plan

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7.0 INCIDENT ACTION PLANNING PROCESS

The incident action planning process and IAPs are central to managing incidents. The incident action planning process helps synchronize operations and ensure that they support incident objectives. Incident action planning is more than producing an IAP and completing forms—it provides a consistent rhythm and structure to incident management.

Personnel managing the incident develop an IAP for each operational period. A concise IAP template is essential to guide the initial incident management decision process and the continuing collective planning activities. The IAP is the vehicle by which leaders on an incident communicate their expectations and provide clear guidance to those managing the incident.

7.1 The IAP Objectives:

- Informs incident personnel of the incident objectives for the operational period, the specific resources that will be applied, actions taken during the operational period to achieve the objectives, and other operational information (e.g., weather, constraints, limitations, etc.).
- Informs the IC/UIC, Command Staff, and various Emergency Response partners regarding the objectives and operational activities planned for the coming operational period.
- Identifies work assignments and provides a roadmap of operations during the operational period to help individuals understand how their efforts affect the success of the operation.
- Shows how specific supervisory personnel and various operational elements fit into the organization.
- Often provides a schedule of the key meetings and briefings during the operational period.

The IAP provides clear direction and includes a comprehensive listing of the tactics, resources, and support needed to accomplish the objectives. The various steps in the process, executed in sequence, help ensure a comprehensive IAP. These steps support the accomplishment of objectives within a specified time.

The development of IAPs is a cyclical process, and personnel repeat the planning steps every operational period. The Operational Period Planning Cycle (Planning P) is a graphic depiction of this cycle. Personnel develop the IAP using the best information available at the time of the Planning Meeting. Personnel should not delay planning meetings in anticipation of future information.

In the Planning P, the leg of the “P” describes the initial stages of an incident, when personnel work to gain awareness of the situation and establish the organization for incident management.

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During the initial stage of incident management, the Incident Commander typically develops a simple plan and communicates the plan through concise oral briefings. In the beginning of an incident, the situation can be chaotic and situational awareness hard to obtain, so the Incident Commander often develops this initial plan very quickly and with incomplete situation information. As the incident management effort evolves, additional lead time, staff, information systems, and technologies enable more detailed planning and cataloging of events and lessons learned. The steps of the planning process are essentially the same for the first responders on scene determining initial tactics and for personnel developing formal written IAPs.

Incident personnel perform the steps in the leg of the "P" only one time. Once they are accomplished, incident management shifts into a cycle of planning and operations, informed by ongoing situational awareness and repeated each operational period.

The following are brief descriptions of the meetings and briefings that are repeated each operational cycle until the conclusion of the incident or event.

- **Objectives Development/Update:** The IC/UIC establishes the incident objectives for the initial operational period. After the initial operational period, the IC/UIC reviews the incident objectives and may validate them, modify them, or develop new objectives.
- **Strategy Meeting/Command and General Staff Meeting:** After developing or revising the incident objectives, the IC/UIC typically meets with the Command and General Staff, and sometimes others, to discuss the incident objectives and provide direction.
- **Preparing for the Tactics Meeting:** Once the approach to achieving or working toward achieving the incident objectives is determined, the Operations Section Chief and staff prepare for the Tactics Meeting by developing tactics and determining the resources that will be applied during the operational period.
- **Tactics Meeting**: In the Tactics Meeting, key players review the proposed tactics developed by the Operations Section and conduct planning for resource assignments. The OPS Section Chief leads the Tactics Meeting, and key participants include the LOG Section Chief, Safety Officer, a Planning representative and other invitees.
- **Preparing for the Planning Meeting:** Following the Tactics Meeting, staff collaborate to identify support needs and assign specific resources to accomplish the plan.
- **Planning Meeting:** The Planning Meeting serves as a final review and approval of operational plans and resource assignments developed during and after the Tactics Meeting. At the end of the Planning Meeting, Command and General Staff confirm that they can support the plan.
- **IAP Preparation and Approval:** Based on concurrence from all elements at the end of the Planning Meeting, the Incident Commander or Unified Command approves the plan.
- **Operational Period Briefing:** Each operational period starts with an Operational Period Briefing. Incident supervisory and tactical personnel receive the IAP during the briefing. Members of the Command and General Staff present the incident objectives, review the current situation, and share information related to communications or safety.

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Following the Briefing, supervisors brief their assigned personnel on their respective assignments.

Operational Period Planning Cycle (Planning P)

8.0 ICS FORMS

Attached to this ERP are select ICS forms for the purposes of initiating gathering critical information at the onset of the incident.

In the event of an Emergency, the following ICS Forms are to be employed. Strict adherence to this requirement shall be enforced by the IC/UIC.

Form	Component
ICS 201	**Incident Briefing**
ICS 202	**Incident Objectives**
ICS 204	**Assignment List**
ICS 205 A	**Communications List**
ICS 206	**Medical Plan**
ICS 208 HM	**Site Safety and Control Plan**
ICS 214	**Activity Log**
ICS 215 A	**Incident Action Plan Safety Analysis**
Other ICS Forms are available but are not attached to this ERP. https://training.fema.gov/icsresource/icsforms.aspx	

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9.0 SITE ACCESS, VISITOR MANAGEMENT, AND COMMUNICATION

9.1 Security and Site Access

Access and egress to the well pad is provided via a site access road. During the Drilling and Completions Operational phases of well development, Security Guard stations are typically located at the beginning or along the access road. The Security and Site Access is controlled pursuant to the **Tug Hill Site Security Standard Operating Procedure** (SOP).

During Level 2 and Level 3 events, access to the well pad will be strictly prohibited except for response contractors, first responders and agency representatives. All persons provided access will be approved by the IC/UIC prior to proceeding beyond the Security Guard checkpoint.

9.2 Accounting for Personnel

There are always at least two muster points for a well development pad; the Primary Muster Point at or near the access road entrance to the pad, and the Secondary Muster Point along the access road to the pad.

Security Guards also keep a running log of personnel on location. This sign-in sheets maintained by Security will be used for account for visitors and personnel in the event of a well site emergency or significant incident. This log will be maintained for the duration of operations by contracted gate guards or the Tug Hill Company Man/PIC or On-Scene IC or their designee.

For production facilities, a Security Guard checkpoint will be established as needed during Level 2 events and will be mandatory during ALL Level 3 events.

9.3 Communications On-site

Alarm systems and communications are reviewed with Tug Hill employees and contractors during operational activities. Contractors working on the Well Pad Site who employ their own distinctive means of identifying and communicating operational alarm signals are required to inform the Emergency EHS&S Coordinator and/or Tug Hill Company Man prior to beginning operations.

To address Level 2 and Level 3 emergency situations, the drilling rig and completions site is equipped and alarm, horn, or siren. Additionally, gas monitoring systems on location are equipped with an audible and visual siren and flashing light to alert workers on location that a hazardous atmosphere condition has been detected.

During completions operations, Tug Hill employees and contractors will use radio and cellular communications to communicate what is happening on-site. Everyone on-site is to be informed as soon as practicable.

For transportation with trucking, Tug Hill D&C Operations and Production Department employee vehicles are equipped with cellular telephones, cell phone boosters, and Citizen Band (CB) radios.

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Security Guards on each D&C Operations pads are equipped with cellular telephones and CB radios. CB radio signs are posted along Tug Hill Bonded Routes and the CB channel number designated for the well pad is included in the Pre-Spud and Pre-Frac hand-outs provided to Contractors and workers.

9.4 Communication with Outside Media

There will be no non-participants and outsiders other than emergency services allowed on the well pad during an emergency, and no statements will be issued to the media or other interested parties except by designated Tug Hill Public Information Coordinator or Tug Hill Executive Management.

Any media statements provided the Tug Hill Public Information Officer must be approved by the IC/UIC and the Executive Management Team.

Tug Hill field workers and Contractor personnel are directed to be courteous to media representatives and direct them to the designated company spokesperson. Contractors are to follow the guidelines for media and resident inquiries are provided in the CEM.

These CEM Media Relations Guidelines are as follows:

Workers may occasionally encounter members of the news media. Your role in this situation is to help reporters get in touch with Tug Hill Public Information Coordinator and, unless expressly approved in writing by Tug Hill, **CONTRACTORS ARE NOT to serve as a Tug Hill spokesperson**.

Any worker approached by the media or public (on site or by phone) under circumstances when you absolutely cannot defer them to the Tug Hill Public Information Coordinator or the Tug Hill Director of EH&S Affairs, follow these guidelines below:

- **IN EVERY RESPONSE, DO THE FOLLOWING**:

  - Politely gather the reporter(s) name and contact information.
  - Explain that someone from Tug Hill will contact them by saying the following:

    "I can help you best by putting you in touch with the Tug Hill Public Information Coordinator or Tug Hill Director of EH&S Affairs."
  - Politely keep reporter(s) in designated muster area or site guard shack for safety reasons.
  - Gather reporter(s) name, news organization, phone number and inquire about deadline; then immediately provide this information to Public Information Coordinator, IC/UIC or a Tug Hill Manager or the Director of EH&S Affairs.

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- Do not make any statements on behalf of Tug Hill but, in any comments even between co-workers, ABSOLUTELY avoid any speculation and negative terminology (i.e., explosion, blowout, dangerous).
- If an incident or emergency is ongoing, indicate that Tug Hill policies and procedures that dictate the response, communication, and incident command during such situations and these procedures are being followed.
- Any additional information will be provided by the Public Information Coordinator or other Executive Management.

10.0 EVACUATION

10.1 Initial Response Actions

Initial response actions are those taken by personnel immediately upon becoming aware of an emergency incident. Pursuant to the Incident Response and Report Procedure, all events are to be reported ASAP once the observe is safe to do so. Timely reporting and implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

It is important to note that these actions are intended only as guidelines. The appropriate response to a particular incident may vary depending on the nature and severity of the incident and on other factors that are not readily addressed. Note that without exception, personnel and public safety is first priority.

The person functioning as PIC/On-scene IC during the initial response period has the authority to take the steps necessary to control the situation and must not be constrained by these general guidelines.

The **Initial Response Actions Acting Supervisor** should at a minimum:

- Personnel will be accounted for and moved to a safe upwind location.
- Medical attention will be provided for any injured personnel.
- Activate the appropriate alarms and operations shutdowns as necessary.
- Further notifications by Tug Hill incident command structure (ICS) team.
- Notification to local/state/federal authorities (See Emergency Notification List)
- The well site will be secured.
- Activate response resources.
- Information gathering and assessment of the situation will be initiated.
- Monitor and manage the emergency situation.
- Assist responding agencies as necessary.

10.2 Evacuation

All Level 3 events will require moving all non-essential personnel to the secondary Muster point pursuant to the ERP. Typically, the secondary Muster point is located at the Guard Shack located along the site access road. The location will be specified on in the **Exhibits 1-5** shown in **PART B – SITE-SPECIFIC DATA** section of the WSSP.

If an evacuation of the Well Pad Site is required, the following steps will be taken:

- **CALL 911**
- The EHS Coordinator, Tug Hill Company Man, or designated worker will notify other personnel via cellular phone, radio, or other means of communication.

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- Tug Hill employees, contractors and visitors will leave their respective areas immediately and move towards the Muster Area (or other safe location if designated Muster Area is not safe).
- In the event of a chemical release or heavy smoke during an emergency, Tug Hill employees, contractors, and visitors will evacuate the area by going crosswind and upwind of the direction of the windsock (or other wind indicator) to a safe location (free of vapors). A windsock or other wind indicator will be installed at the Well Pad Site.
- Upon evacuation, Tug Hill employees, contractors, and visitors will meet in the designated Muster Area. Muster points are shown on the General Site Plan and Vicinity Plan and Evacuation Route, which are located in the **WSSP PART B - SITE-SPECIFIC DATA** of the ICP binder. This information will be communicated to those working on location at their time of arrival to the worksite and when changes to muster point locations are made.
- The Operations PIC, on-duty EHS Coordinator, or other individual designated by On-scene IC will require a head count of employees, contractors, and visitors to ensure that everyone has been safely evacuated.
- Employees are not permitted to return to their respective work areas until the "All Clear" signal has been given by the Emergency EHS&S Coordinator or their designee or the local emergency responders.
- Site Supervisors should be aware and assist employees, contractors and or visitors with mobility impairments.

10.3 Establishment of Protection Zones and Evacuations

A Level 3 event typically requires that the well site to be the evacuated. Establishment of Protective Zones will initially occur on the incident site to be protective of workers. Protective Zones should follow the prescribed distances in the U.S. Department of Transportation Emergency Response Guidebook (ERG).

Initial loss of containment of gas requires an initial minimum safe distance of 330 ft. and large spill of flammable petroleum liquids (e.g., condensate) of 150 ft.

UIC will assess and determine if local resident evacuation is required and the size of protective zone. In the absence of UIC, the On-Scene Incident Commander, or his designee, shall determine protective zones to limit the risk of exposure to workers, local responders, and residents surrounding the work area.

The Safety Zone Map and Parcel Owners listed is provided in **Exhibit 2, WSSP PART B – SITE-SPECIFIC DATA** section of the WSSP and ICP binder for each location.

Life safety impacts to the environment, and property conservation are priorities. The Emergency Protection Zones based on the following information on the scene:

- Magnitude of the incident
- Wind Direction
- SDS of applicable materials
- Current and forecasted weather conditions
- Topography and land conditions
- Other influences specific to the incident

If the agency directs, on-site Tug Hill personnel and Contractors will be engaged to notify all local potentially impacted residents of the incident by dispatching workers to each potentially affected residence. If the public emergency responder does not direct this notification to be made by the Operator, then the public response agency will be responsible for this notification.

Local Residents and other Emergency Contacts are shown in **Exhibit 2, PART B – SITE SPECIFIC DATA** section of the WSSP.

Tug Hill commits it full cooperation and assistance in making notifications to residents and assisting to maintain the designated protective zone. Tug Hill resources include the workers onsite and other Operations personnel, as well as our Incident Command Structure, EHS Department personnel and contractors, and the Tug Hill Land Department Land Agents.

Once established, these zones will be maintained until a determination is made by the IC/UIC to alter or discontinue them. Tug Hill will contact local residents and will post personnel on all roads within the zone to prevent entrance to the area until an all clear has been issued. The initial contact will be conducted by telephone and, for those that cannot be reached, a drive by will be initiated.

10.4 Resident and Animal Evacuation

In the event that emergency conditions require the evacuation of local residents in the vicinity of the well pad, the EH&S Director or designee will contact the County Office of Emergency Management (OEM). The County OEM will provide support for notification and evacuation of residents, coordinate with the West Virginia State Police and other local agencies to provide logistical support and traffic control.

In an evacuation situation, Tug Hill personnel may be the first contact with local residents. Under these circumstances, an Evacuation Notice will be provided by the County OEM shall be used to aid in providing information to residents.

Certain evacuees may require special services or accommodations to address physical disabilities, prescriptions, multiple dependents, or services for pets. The Family Information and

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Requirement Questionnaire in the appended to this ERP may be used by aid staff to determine special needs of evacuees and their dependents.

Should livestock require relocation, the County Animal Control Office will aid in locating shelter, food, and care for displaced animals. See the County Animal Control Office listed in the Marshall County Family Resource Guide attached hereto.

10.5 Evacuation Routes

Evacuation routes have been established and are designated in **Exhibits 1-5, PART B – SITE-SPECIFIC DATA** section of the WSSP and ICP binder for each location. The primary evacuation route should be utilized unless wind direction or other condition makes this route unfavorable or unusable. One or more secondary evacuation routes have been identified for use in the event that the primary evacuation route is blocked or otherwise unsafe. These routes will be communicated prior to start of operations at the Well Pad Site. Tug Hill employees, contractors, and visitors will be made aware of these evacuation procedures.

10.6 Isolation of the Emergency Hazard Area

If an evacuation is ordered by the UIC, roadblocks will be established to isolate the Emergency Hazard Area. Roadblocks may be relocated based on monitoring data. Roadblocks will set up and manned to restrict non-essential personnel from entering the Emergency Hazard Area. Additional personnel may be called out from a safety company if required. The roadblock personnel should be equipped with a radio or mobile telephone, reflective clothing, road barriers, copy of the evacuation route map and local road map, flashlights and, if appropriate, air monitors and respiratory protection. Local and /or state police may assume traffic control.

Local residents must be notified of the situation and advised of any evacuation order. Consideration must be given to notifying transients (i.e., hunters, trappers, recreational users, non-resident landowners, etc.) of hazards and evacuation.

- Request of early evacuation of special needs residents.
- Identify an evacuation center for the public.
- Determine the locations of appropriate and relevant air monitoring based upon the nature of the incident.
- Evacuation of the public should begin downwind of the release.
- Local landowners shall be contacted by phone, using a scripted statement, and leaving notices on vacant homes and vehicles.
- Large industrial operations and public facilities may also require notification and/or evacuation.

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10.7 No-Fly Zone

In well control events, it may be necessary to establish a No-Fly Zone over the Hazard Response Zone (HRZ). The determination to establish a NO-Fly Zone should be made by UIC.

The IC should consider notifying the 911 center of the potential hazard to air traffic. Pilots should be notified of restrictions in the airspace through local channels.

It is also important to control the use of drones in a flammable atmosphere.

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EMERGENCY RESPONSE BY SCENARIO

11.0 EMERGENCY RESPONSE BY SCENARIO

The following sections are intended to provide guidance on initial response actions to manage site conditions and account for personnel working on the well pad based upon the incident scenario. This information is general guidance and intended to list initial response actions. The needs of each response will be dictated by the circumstances of the event and initial response actions specified by the PIC/On-scene IC at the time of the event.

Company Men and other Operational PICs are to be familiar with the response guides and follow this ERP unless site specific conditions that affect environmental, health and safety require deviation from the guidelines provided.

Tab 1 – FIRE AND/OR EXPLOSION

Tab 2 – WELL CONTROL – Events by Incident Level

Tab 3 – HYDROGEN SULFIDE (H_2S) AND COMBUSTIBLE GASES

Tab 4 – MEDICAL EMERGENCIES/INJURY REPORTING

Tab 5 – NATURAL DISASTERS

Tab 6 – SPILL OR FLUID RELEASE

Tab 7 – PERSONAL THREATS AND WORKPLACE VIOLENCE

Tab 8 – BOMB THREATS

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FIRE AND/OR EXPLOSION

11.1 FIRE AND/OR EXPLOSION

This is a summary of the reactions and responses required when there is a fire and/or explosion on an active well site. This could be one or more of the following emergencies:

- Explosive atmospheres and gas release without fire
- Actual explosions
- Fires on the rig
- Fires off the rig (structural)
- Vehicle or equipment fires
- Other fires

11.1.1 Hazard Analysis

A possibility of exposure to natural gas, H2S, combustible products, flying debris, extreme heat, oxygen depleted atmospheres, and the potential for fire and/or explosions.

11.1.2 Personal Protective Equipment

As required for specific tasks. Required equipment may include firefighting equipment such as extinguishers, clothing, and respiratory protection. Only trained personnel should engage in these activities. The fire can be extinguished by Operations personnel using fire extinguishers located on-site only if it is safe to do so and if the fire is limited in scope and size; otherwise, the fire will be managed by the local township fire department.

11.1.3 Response Actions

Upon witnessing a fire:

- Shout "FIRE" to alert others in the immediate area.
- Eliminate possible sources of ignition immediately.
    - Sparks
    - Combustion engines
    - Electric motors or tools not rated for hydrocarbon atmospheres.
    - Electronic equipment such as radios, phones and flashlights not rated for intrinsic safety.

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11.1.4 Early-Stage Incipient Fires

- For early stage "Incipient" fires, the fire can be extinguished by Operations personnel using fire extinguishers located on-site only if it is safe to do so and if the fire is limited in scope and size; otherwise, the fire will be managed by the local township fire department.
- Portable Fire Extinguisher Use – Use the PASS Acronym for extinguisher use:
  - Pull the pin.
  - Aim the Nozzle at the base (bottom) of the fire.
  - Squeeze the Handle or trigger.
  - Sweep the nozzle back and forth quickly at the base of the fire.
- NEVER fully extinguish a fuel fed fire!

11.1.5 Beyond Incipient Fires – Growth and Fully Developed Stage

For fires that are in the "Growth" or "Fully Developed" stage, or burning persistently:

- Signal the evacuation alarm/notification system and **call 911 ASAP.**
- If safe to do so:
  - shut down critical ongoing equipment/processes/operations, including motorized traffic and spark-producing equipment in the area.
  - Isolate utilities, if possible, to the affected area(s).
  - Isolate, if possible, the source of the leak(s).
  - Remove injured persons to the Muster Area.
- Fire Extinguisher Use for Escape
  - Portable fire extinguishers may be used to develop and/or maintain an escape route.
  - When necessary, multiple portable fire extinguishers may be used to develop and/or maintain an escape route.
- Immediately evacuate the area and report to the pre-designated Muster Area for a head count. Account for wind direction and exposure to smoke.
- **Call 911 ASAP** (as soon as safe to do so) to activate emergency first responders and arrange for emergency transportation/medical attention.
- Follow Tug Hill Incident Response and Notification Procedure discussed above.
- Account for all personnel and evacuate the affected area immediately.
- Evacuate all personnel from IDLH atmospheres.

  Initial loss of containment of gas requires an initial minimum safe distance of 330 ft. and large spill of flammable petroleum liquids (e.g., condensate) of 150 ft.
- Never enter an area alone, develop and maintain a buddy system and maintain communications with the Emergency Coordinator at all times.

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- Always back away from a fire and monitor its progress. Never put the fire between you and an exit or path of egress.
- Be alert for falling/flying debris and seek refuge.
- Follow other emergency action plans as needed to respond to any issues that occur as a result of the fire.
- Secure all equipment in such a manner so as not to create a hazard to the emergency first responders.
- Maintain a safe distance away from the fire and monitor growth.
- Shield personnel from a possible explosion/blast by seeking refuge behind a solid object.
- If trained, monitor the atmosphere with detecting equipment and avoid areas >20% LEL.
- Monitor weather conditions and wind directions.
- Initiate the Incident Command System, if necessary.
- Follow Evacuation procedures in this ERP and the WSSP.

11.1.6 Additional Evacuation Considerations

Follow Evacuation procedures outlined in Section 10.0 in this ERP and the WSSP.

Proceed to the pre-determined primary Muster Point or as directed by the PIC/On-scene IC. The route taken will be determined by the site condition and the prevailing wind. Seek the safest and quickest path to the Muster Point.

Evacuated employees will be immediately accounted for by the Emergency Coordinator, team leader, or somebody assigned by Tug Hill supervision to do so. Anyone unaccounted for at the re-location point will have their names given to the On-scene IC.

The EHS Coordinator or other person designated by the On-scene IC will be responsible for accountability must immediately convey this information. The On-scene IC shall then notify the appropriate resources to search for those unaccounted personnel.

Evacuation of the well pad to the secondary Muster Point is required Level 3 Emergencies involving uncontrolled fires, release of gas or condensate, and/or when there is a potential for explosion or exposure to hazardous atmospheric conditions that present risk to life or health. In such conditions, the PIC/On-Scene IC or EHS Coordinator will call of all personnel to proceed to the pre-determined Secondary Muster Point as per the same directions above.

At the Muster Point, account for personnel. Immediately convey those unaccounted for to the EHS Coordinator or On-scene IC.

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11.1.7 Following the Incident

An "All-Clear" signal is given by the On-scene IC/UIC including the fire department when fire and/or hazards have been extinguished and personnel are no longer in danger.
Only after the All-Clear determination can the well pad/site be entered by Tug Hill employees, contractors and visitors.

- Be alert for weakened floors, stairways and structures.
- Fire extinguishers used in the emergency must be re-inspected by a third-party contractor before they may be returned to service.
- Inspect and re-commission all equipment and facilities on location for possible damage caused by heat and/or energy releases before returning to Operations.

Tug Hill EH&S Director will complete an incident investigation at the conclusion of the event and will be responsible for follow-up with governmental agencies as required.

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WELL CONTROL – Events by Incident Level

11.2 WELL CONTROL

11.2.1 Level 1 Well Events

Level 1 events involve situations that are either common to routine operations or do not pose significant risk to personnel. In most instances, Level 1 events can be resolved using standard operating/drilling procedures, commonly available equipment, personnel and techniques.

Level 1 examples are included here because they pose the potential for escalation into a Level 2 or 3 event. Level 1 events might include, but are not limited to, the following scenarios:

a) Well "kicks" (influxes) of manageable volume and intensity (usually < 1 ppg) that are not complicated by mitigating circumstances.

b) Mild to moderate loss of circulation

c) Loss of production tubing integrity resulting in sustained pressure on production casing < 50% of casing burst rating. Loss of tubing integrity includes failure of wellhead seals and downhole equipment.

d) Loss of production casing integrity resulting in sustained pressure on intermediate casing < 25% of casing.

e) Burst rating. Loss of casing integrity includes failure of wellhead seals.

f) Pressure release valve trip or other malfunction of Completions, Workover equipment, or facilities.

g) Minor surface leaks at wellhead, flowlines, or production equipment that can be isolated via remote means or accessed and isolated manually without significant risk to personnel. Ambient gas **<20% LEL**.

h) Minor Recordable Injury, moderate Environmental Release, serious Near-Miss Incident

i) DURING CONFINED SPACE WORK, EVACUATE SPACE AT >10% LEL.

11.2.2 Level 1 Response

Level 1 events will be corrected through the use of standard industry operating/drilling procedures. No specialized equipment or personnel will be required unless the Level 1 event escalates.

1. Drilling Company Man, Completions Site Manager, Production Operator or other Person-in-Charge (PIC) evaluate situation, determine best course of action.

2. Follow Tug Hill Incident Response and Notification Procedure. Company Man/PIC/Site Manager to notify Tug Hill Operations Management and Safety Department. Issue Incident First Alert in EHS Insight. EHS Coordinator to report to the scene and complete Incident Submission in EHS Insight.

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3. Follow Well Control Protocol.

11.2.3 Level 1 Well Control Considerations

- Weighting materials and mud chemicals will be evaluated for kick circulation (consider using driller's method if materials are low or if suspected swabbed kick).
- Monitor surface equipment during kick circulation in order to quickly identify any leaks.
- Monitor pressure on outer casing string during kick circulation in order to quickly identify pressure communication between the strings of pipe.
- Be prepared to immediately close pipe ram if annular begins to leak.
- If productive zones are exposed, monitor well closely for signs of flow during circulation losses.
- Closely monitor outer casing strings if sustained pressure results from tubing or downhole equipment failures.
- Small surface leaks that can be isolated will be isolated remotely if possible. Adequate safety precautions will be in place before approaching even small surface leaks in pressurized equipment and lines.

11.2.4 Resuming Work

To resume operations, approval must be granted by the PIC. If this is a site with simultaneous operations ("SIMOPS"), as specified in Roles and Responsibilities section of SIMOPS Plan.

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11.2.5 Level 2 Well Control Incident

11.2.6 Definition

Level 2 events involve circumstances that are not commonly encountered during routine drilling operations and pose the potential for significant risk to personnel, equipment and/or the environment. A Level 2 event may require specialized well control personnel, equipment and/or techniques in order to be safely resolved.

Examples of Level 2 events include, but are not limited to, the following scenarios:

a) Well kicks complicated by influx size or intensity (under-balance), pipe off bottom, plugged tubing/ drill-string, washout, plugged choke, etc.

b) Severe loss of circulation

c) Loss of production tubing integrity resulting in sustained pressure on production casing >50% of casing burst rating. Loss of tubing integrity includes failure of wellhead seals and downhole equipment.

d) Loss of production casing integrity resulting in sustained pressure on intermediate casing >25% of casing burst rating. Loss of casing integrity includes failure of wellhead seals.

e) Loss of protective casing integrity resulting in sustained pressure on surface casing (any pressure).

f) Wash-out of equipment causing non-well control incident.

g) Activation of pressure relief valve, over-pressurization of a tank.

h) Surface leaks that cannot be easily or safely isolated.

i) Leak on equipment causing **>20% but <50% LEL** alarm triggered; any Medium Risk gas detection per LEL Card.

j) Severe Injury meeting definition of "OSHA Reportable" and requiring medivac or ambulatory services, or third-party threats or acts of terroristic violence.

k) DURING CONFINED SPACE WORK, EVACUATE SPACE AT >25 - <50% LEL.

IF IT IS DETERMINED THAT UNCONTROLLED LOSS OF CONTAINMENT OF GAS HAS OCCURED PROCEED TO LEVEL 3 INCIDENT.

11.2.7 Level 2 Response

Certain Level 2 events can be dealt with according to established procedures; others require special consideration be given to personnel safety while implementing these procedures as well as specialized techniques. If warranted, the Tug Hill ICP/ERP will be activated for Level 2 events and the appropriate Operations Management and EHS personnel will mobilize to the company office and well site. The Tug Hill response team will remain in engaged until the situation is resolved or downgraded to a Level

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1 event. Specific procedures will be incident circumstance dependent. Basic procedures are outlined below.

Tug Hill Operations Management may opt to advise their contract well control specialists/engineers at the onset of a Level 2 event. As needed, Tug Hill Operations Management will consult with the well control specialists/engineers for advice on safe handling of the situation.

If deemed necessary, arrangements for the mobilization of well control specialists/engineers will be decided upon to ensure the most expedient mobilization route until the Level 2 event is resolved or downgraded to Level 1.

If mobilization of well control specialists/engineers is not deemed necessary, Tug Hill will communicate with the well control contractor's office as deemed appropriate.

11.2.8 Level 2 – If Operations Shut-down is required:

If Drilling, Procedure

1. Driller pick up off bottom, space out and prepare to shut in well.
2. Activate ESD on producing wells.
3. Driller sound alarm. Continual rig horn blast.
4. Drilling Site Manager establish communication with Completion or Production Supervisor.
5. Drilling Site Manager muster non-essential personnel at muster point. Account for all personnel.
6. Drilling Site Manager & HSE Supervisor investigate and evaluate situation, determine best course of action.

Follow Tug Hill Incident Response and Notification Procedure. Drilling Site Manager notify Drilling, Completions, and Production Coordinator and Safety Department. EHS Coordinator issues Incident First Alert in EHS Insight.

If Completion, Procedure

1. Completions Site Manager shut down completion operation.
2. Activate ESD on producing wells.
3. Completions Site Manager establish communication with Operational Supervisors.
4. Completions Site Manager muster non-essential personnel at muster point. Account for all personnel
5. Completions Site Manager investigate, evaluate situation, determine best response.
6. Follow Tug Hill Incident Response and Notification Procedure. Completions Site Manager notify Drilling, Completions, and Production Coordinator and Safety Department. EHS Coordinator issues Incident First Alert in EHS Insight.

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If Frac Plug DO, Procedure

1. Driller shut in well.
2. Activate ESD on producing wells.
3. Driller sound alarm. Continual workover rig horn blast.
4. Production Operator establishes communication with Completion or Drilling Supervisor.
5. Production Operator muster non-essential personnel at muster point.
6. Production Operator investigate then evaluate situation, determine best course of action.
7. Follow Tug Hill Incident Response and Notification Procedure. Company Man/PIC/Site Manager to notify Tug Hill Operations Management and Safety Department. Issue Incident First Alert in EHS Insight. EHS Coordinator to report to the scene and complete Incident Submission in EHS Insight.

11.2.9 Level 2 Drilling Considerations

1. Weighting materials and mud chemicals will be evaluated for kick circulation (consider using driller's method if material supplies are low or if suspected swab kick).
2. Monitor surface equipment during kick circulation in order to quickly identify any leaks.
3. Monitor pressure on outer casing during kick circulation to quickly identify pressure communication.
4. Be prepared to immediately close pipe ram if annular begins to leak.
5. If productive zones are exposed, monitor well closely for signs of flow during circulation losses.
6. If the thrust created by the current or anticipated surface pressure acting on the cross-sectional area of the pipe approaches or exceeds an amount equal to the buoyed weight of the pipe string, the pipe will be secured at the surface. This may require the use of conventional equipment such as drill pipe clamps, chains and/or cables.
7. The situation may eventually require the use of slip rams and other measures. The well control specialists/ engineers may be consulted and mobilized if such a situation develops.
8. Monitor mud/gas separator equipment for signs of overload while circulating large gas influxes.
9. Consider mobilizing additional liquid mud and loss circulation material (LCM) if conventional lost circulation techniques are ineffective.
10. Consider the possibility of stripping/snubbing of slick bottom hole assembly (BHA) versus perforating or severing drill collars to accommodate high concentration LCM placement and/or barite pills, gunk pills, etc.

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11. Evaluate the possibility of casing failure due to wear as a cause of lost circulation. Note that this could quickly become a Level 3 event if an influx is taken.
12. Consider using temperature log to determine exact point(s) of losses (ambient temperature fluid pumped from the surface will enhance identification)
13. Prepare to deal with gas migration while preparing to strip pipe to bottom (water-based mud systems)
14. Annular BOP failure can be expected while stripping if closing pressure is not reduced. Consult with BOP manufacturer for recommended procedures and practices for stripping.
15. Improper bleed-off during pipe stripping can lead to underground blowouts or additional influxes. Review procedures carefully before attempting to strip pipe to bottom. Allowances must be made for gas migration and influx elongation due to pipe entry in water-based systems.
16. If no pressure increases or a transient pressure fluctuation is observed while lowering pipe (stripping), an underground flow may be in progress. If this is confirmed, a Level 3 event will be declared.
17. If surface pressures are too high for safe stripping operations (including situations where the pipe is "light"), an off-bottom kill will be considered using volumetric and circulation techniques (i.e., volumetric control until influx is above bit then constant bottom hole pressure circulation)

11.2.10 Resuming Work

To resume operations, approval must be granted by Tug Hill Operations Management. Additionally, if SIMOPS situation, as specified in Roles and Responsibilities section of SIMOPS Plan.

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11.2.11 Level 3 Well Control Events

Level 3 events present serious and immediate risks to personnel, the environment and assets. These situations require the immediate application of specialized techniques and well-developed safety assessment and hazard mitigation programs.

Examples of Level 3 events include, but are not limited to, the following scenarios:

a) Surface blowout (drill-pipe, BOP, production tree, broach, etc. with or without fire).

b) Underground blowout with insufficient casing set so that the well cannot be brought under control by pumping heavy mud simultaneously down the drill-string and annulus using rig pumps.

c) Surface pressure beyond the pressure rating of equipment (including tubulars).

d) Other situations that constitute a clear and present danger to personnel, environment or equipment that cannot be resolved via conventional means.

e) IDLH Situation; Violent Unauthorized Persons on Location; Any Imminent Uncontrolled Threat to Location and Operations (including severe weather).

f) **Uncontrollable release of gas! (>50% LEL in ambient air)**

In the case of the loss of well control of a gas well, actions should be implemented to protect human life and control the incident as rapidly as possible.

The Well Pad Sites utilizes blowout prevention (BOP) assemblies and well control systems on each well to assure the safety of Tug Hill employees, contractors, and visitors working on there well sites. These systems are described in the WSSP PART A and associated Attachments.

Level 3 events will warrant the immediate activation of the emergency response plan, mobilization of well control specialists/engineers from Wild Well Control, Inc. and other specialist personnel and equipment. Tug Hill Operations Management will contact well control specialists/engineers immediately upon the determination of a Level 3 incident. Requested well control information will be gathered and provided to Wild Well Control along with any other pertinent and/or related information.

The activities defined in the intervention action plan section of this emergency response plan will be initiated immediately. These include, but are not limited to:

- Personnel will be accounted for and moved to a safe upwind location.
- Medical attention will be provided for any injured personnel.
- The well site will be secured.
- Further notifications by Tug Hill incident command structure (ICS) team.
- Notification to local/state/federal authorities.
- Information gathering and assessment of the situation will be initiated.

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11.2.12 Complete or partial rig evacuation is likely under most Level 3 events.

Re-manning of the rig will be attempted only under the direction of on-site well control specialists/engineers.

If the arrival of the well control specialists/engineers is delayed, such action(s) will be discussed in detail and agreed upon with the well control specialists/engineers before being attempted by the Tug Hill COO, Vice President Operations, and EHS Director.

The first task will be to determine the critical aspects of the situation, perform a hazard analysis and establish safe working principles for the intervention (i.e., hot zones, safe areas, access control and accounting, emergency evacuation plans, etc.).

A minimum number of personnel will enter the location.

A well site command center will be designated in a safe area, and all operations will be directed from it. Restrictions will be placed on personnel movement between command post and the rest of the location; personnel accounting procedures will be established to monitor the personnel on location at all times.

Rig evacuation and shutdown will render critical equipment unusable. A plan will need to be developed to identify components that will be required for intervention purposes and to provide sufficient power.

The equipment that may be needed during such an event includes, but is not limited to:

- Draw-works
- Top drive
- Mud pumps
- BOP hoists
- Air/hydraulic winches Hydraulic chokes
- BOP accumulator charge pumps
- Iron roughneck

11.2.13 Level 3 Immediate Field Response Actions

While intervention activities will be dictated by an event's severity and magnitude, the immediate response will be consistent and uniform for any event. This action plan does not intend to replace sound logic or engineering judgment — it is a guideline only.

Well control emergencies require common sense and professional judgment on the part of all personnel involved in the intervention.

1. Evacuate all rig personnel

- Sound Alarms and/or otherwise notify persons on-site to evacuate the area and re-assemble at the pre-determined Secondary Muster Area(s).
- Evacuate rig and move personnel to designated safe area.
- Account for all on-site personnel.
- DO NOT re-enter area until authorized.
- Secure Location.

2. Emergency Shut-down

- Perform Emergency Stop Work and Emergency Shut-Down of equipment and any producing wells on location.
- All fired (or non-intrinsically safe) equipment will be shut down as per established Drilling rig, Completions, Work-Over rig, Flowback contractor guidelines and procedures.
- BOP equipment will be engaged by authorized personnel during the evacuation.
- **NOTE! THE ABOVE ACTIONS WILL ONLY BE UNDERTAKEN IF THEY DO NOT INVOLVE RISK TO THE SAFETY OF PERSONNEL.**

3. Establish Hot Zone, Warm Zone, and Safe Zone

Hot Zone: Based on various criteria, the area immediately around the wellhead is designated the hot zone. Access to the hot zone is strictly limited to well control personnel. Based on wind and other conditions, the hot zone may change throughout the course of the event. The boundaries will be closely monitored, and changes made accordingly. The safe zone is located away from the well and has minimal impact from the blowout.

Safe Zone: The command center will be located within the safe zone. The safe zone will have two means of ingress and egress.

Warm Zone: Between the hot zone and the safe zone is the warm zone. Access to the warm zone will be monitored and restricted to essential support personnel only.

Secure the location and perimeter to prevent area population, news media, etc. from accessing the well site area. Seek assistance from the local police/sheriff agency.

4. Initiate fire watch

Identify any engines that may have been left running. Identify any other possible ignition sources.

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5. Implement Tug Hill ICP, including Incident Command System and Emergency Response Plan

- Follow Tug Hill Incident Response and Notification Procedure.
- Company Man/PIC/Site Manager to notify Tug Hill Operations Management and Safety Department. Issue Incident First Alert in EHS Insight.
- EHS Coordinator to report to the scene and complete Incident Submission in EHS Insight.
- The On-Scene IC with contact the designated Incident Command structure to activate Well Control Specialist Contractor(s). See the Emergency Contact List in **PART B – SITE SPECIFIC DATA** section of the WSSP in this binder.
- Once the Incident Commander is on-site, discussions will begin with the Public Information Officer to address issues with the media.

6. Identify hazardous materials on-site

Identify the material and location on the well site of any hazardous material. Present information to the well control specialists upon their arrival at the well site.

7. Monitor well conditions

Appoint a rig crew member to observe the well from a safe location outside the hot zone and record all changes in the flow at the wellhead. Recorded changes will include changes in flow, noise, etc. The collected information will be important to the well control specialists/engineers in completing their investigation and analysis of the situation.

8. Implement pollution abatement measures

Working in the safe zone only, use heavy equipment to establish the safe drainage and storage of well flow away from the wellhead area.

Prevent any well flow runoff from entering any public ditch, drainage, culvert or septic system, streams, waterways, roadways, etc.

A fluid containment plan will be discussed with the well control specialists/ engineers and implemented as quickly as possible.

11.2.14 Initial Level 3 evaluation and information gathering

- Utilize **ICS Forms** attached to the ERP to gather information needed by Well Control Specialists.
- Certain information is crucial in developing an effective intervention plan and immediate response. This duty will fall upon Tug Hill 's personnel at the rig. The following information will be gathered and documented so that it can be passed on to well control specialists.

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- Forms from the federal NIMS emergency response program and/or well control forms as provided by the Tug Hill contract well control specialists/ engineers for the collection of this information.
    a) Operation at the time of the incident
    b) Last observed pressures
    c) Present configuration of the well bore – casing, drill pipe, drill collars, packers, depths, geology, fluids, etc. at the time of the incident.
    d) BOP equipment in use at the time of the incident – position of all rams, subsea BOP pod status, and top drive safety valves, etc.
    e) Last known status of wellhead or BOP components – open, closed, locked, damaged, etc.
    f) Rig equipment shutdown level initiated, well control actions implemented.
    g) Estimate of flow rates and flow characteristics (gas and water)
    h) Extent of damage sustained by the rig.
    i) Size and location of any boil at the surface.
    j) Other information as dictated by the situation.

The information from the initial evaluation will be conveyed to Tug Hill contract well control specialists/ engineers for planning purposes and will be included in the permanent records.

In the initial stages, the information will be used to determine the feasibility of a quick resolution (i.e., pumping kill fluids, bridging agents, etc.) if it exists.

If possible, this will be done before the situation deteriorates, eliminating this type of intervention.

11.2.15 On-Scene Incident Commander Checklist

- Develop solutions to problems that addresses the following areas of concern:
    - Protection of people
    - Protection of surrounding residents
    - Protection of the environment
    - Protection of Assets
    - Control the Source

- Identify Tasks and Assign Tasks Leaders
- Brief each Task Leader on:
    - Nature and location of task and its relationship to strategy
    - Safety considerations
    - Communication procedures, including chain-of-command

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- Provide Logistics Officer information on un-met resource needs
- Receive safety status reports from Site Safety Officer

11.2.16 Communications

- Work direct reports (e.g., Task Leaders) to establish and maintain tactical network and tactical network communications protocol:
  - Who talks to whom
  - About what
  - When and how
- Work with Deputy On-Scene Commander to establish and maintain command network and command network communications protocol:
  - Who talks to whom
  - About what
  - When and how
- Designate Aide(s) for compiling field and/or setting up and maintaining communication equipment, and/or for providing assistance on technical matters. Answer questions raised by Aide(s) responsible for compiling field reports.
- Provide the IC with field reports approximately 30-45 minutes before IMT assessment meetings; ensure reports provide current information on location of incident facilities, including:
  - Tactical Command Post
  - Logistics
  - Decontamination Stations
  - First Aid Stations
  - Security check points
  - Nature, location and characteristics of spilled/emitted material(s)
  - On-Scene weather
  - Tactical response organization down to task level
  - Strategy
  - Nature and status of tasks broken down by Branch and/or Division
  - "Assigned" resources broken down by logistics
  - Progress being made
  - Problems encountered
  - Needs

11.2.17 Immediate Response Actions – Office

Upon notification from the field, the Incident Commander (the person designated to manage well control emergencies) shall review the information and, if deemed necessary, enact the Tug Hill ICP/ERP which activates the Tug Hill Incident Command team.

An Executive Management Team Command Center will be designated within the Tug Hill offices, if possible, and the designated Command Staff and operations staff shall meet to review the current situation and initiate the various assigned tasks and duties.

The Tug Hill IC or Executive Management will immediately contact the Tug Hill well control contractor to discuss the incident and possible mobilization of well control personnel and equipment.

Discussion with well control specialists regarding the initial mobilization of equipment and personnel will be done at this time. A list of all equipment and services ordered will be noted. Information regarding the location, route details, trucking or flying time and a full manifest, etc. will need to be gathered and properly documented.

11.2.18 Environmental Considerations

- Once the emergency is under control, the Emergency EHS&S Coordinator will contact safety and environmental consultants to assess damage and mitigate further damage from occurring. These consultants should be in direct contact with the Incident Commander and other appropriate persons within the Incident Command System.
- Ensure notification requirements are being met by the Emergency EHS&S Coordinator or Public Information Officer to applicable Federal, State, and local regulatory agencies. This will include OSHA, the U.S. EPA Emergency Response Center, and U.S. Coast Guard, if necessary.
- The Emergency EHS&S Coordinator, with the help of safety and environmental consultants, will document the scene and determine root cause of the incident.
- Tug Hill, with the help of safety and environmental consultants, will gather information and prepare responds to the applicable Federal, State, and local regulatory agencies inquires.

HYDROGEN SULFIDE (H_2S) AND COMBUSTIBLE GASES

11.3 HYDROGEN SULFIDE (H_2S) AND COMBUSTIBLE GASES

The **Tug Hill H_2S Contingency Plan** is included in **PART A – ATTACHMENTS** to this WSSP and included in the ICP binder. The H_2S Drilling Contingency Plan describes the training, equipment, and procedures to be employed in the event that H2S is encountered during drilling operations.

The **H_2S Contingency Plan** is a Companion Document to the Tug Hill WSSP and ICP, as well as the Hydrogen Sulfide section of the Tug Hill Operating Contractor Expectation Manual (CEM). The **H_2S Contingency Plan** has been prepared in accordance with regulatory agency requirements and best industry practices and takes precedence over the ERP.

A summary of action levels and associated responses for H_2S is provided below. The locations of H_2S monitoring stations and emergency equipment are provided in the **WELL SITE SAFETY PLAN PART B** of this ICP binder.

11.3.1 Initial Emergency Response

If elevated concentrations of H_2S or combustible gas are detected by either fixed area monitors or on a personal 4-gas monitor, the Company Man/PIC and/or Rig or Frac Manager is to be notified immediately.

Gas	Tug Hill Procedural Risk Actions
Medium Risk	
O_2 >23.5%	Extremely Flammable. No Hot Work. Control and Evacuate
H_2S >10 ppm	Stop Work & attempt to identify source
H_2S >15 ppm	Evacuate after 5 min. if H_2S remains >15 ppm and uncontrollable
LEL > 10%	No Hot Work; Implement intrinsically safe work environment. Notify EHS
LEL > 20%	Stop Work. Shut-in or ESD the wells or equipment. Muster until conc. drops
CO > 100 ppm	Stop Work. Shut-in or ESD the wells or equipment. Muster until conc. drops
High Risk	
O_2 <18.5%	**Evacuate to Muster Point. Go to high ground this upwind & watch for wind direction changes. Notify site management and EHS Coordinator. No Re-Entry without approval.** **Note: IDLH: H_2S = 100 ppm; CO = 1,200 ppm**
O_2 >24.5%	
H_2S >25 ppm	
LEL >50%	
CO >200 ppm	

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Based upon the concentrations detected, area alarm stations will flash either yellow for CAUTION or red EVACUATION or the audible alarm is sounded during an active operation (such as drilling or completions).

Unexpected H_2S or Combustible Gas Release

Regardless of the source, the emergency alarm will be audible should be detectable by all personnel on location. All personnel are advised to following these initial guidelines:

- DO NOT PANIC! Identify your best route of escape.
- If available, put on a 5-minute escape unit or Breathing Apparatus, Supplied Air Respirator; (hold your breath while evacuating if supplied air breathing equipment such as 5-minute escape units are not available).
- Rapidly evacuate the area and move upwind or cross wind if possible and evacuate anyone who may be affected by the gas to a safe area.
- Put on air breathing equipment before helping anyone overcome by H_2S.
- Assemble at Primary Muster Point or alternate upwind Muster Point and wait to receive instructions.
- Drilling/coring operations remain suspended until the source of H_2S is located and the atmospheric level falls to a level <10 ppm.
- All personnel remaining in the potential danger area are required to wear appropriate respirator protection and have appropriate requisite training and medical clearance to work in hazardous atmospheres while wearing a supplied air respirator.

11.3.2 Muster Points

- The Primary Muster Point is located either at the Company Man Trailer or entrance of the pad where the access road meets the pad opening. The Guard Shack on the Access Road to the Pad is the Secondary Muster Point.
- Be cognizant of the wind direction. If the wind direction is towards the Primary Muster location and you are on the upwind side of the H_2S release, use the 5-minute escape pack or SCBA to proceed to the Muster location.
- If you DO NOT have access to an escape pack or SCBA, do your best to communicate to someone who has a radio or to your supervisor of your location and evacuate the pad in the upwind direction.
- Muster Areas will be monitored throughout the response. All personnel not assigned emergency duties will proceed to the Secondary Muster Point or Safe Zone. Personnel must avoid entering areas designated as potential Danger Zone areas as they proceed to the safe-briefing areas.

- Muster personnel and confirm that all personnel are accounted for based upon Pad sign-in sheet and other records of personnel on location.

11.3.3 Incident Reporting and Activation of the H_2S Contingency Plan

- If dangerous levels of H_2S are detected, report the incident as soon as it is safe to do so, pursuant the Tug Hill Incident Response and Notification Procedure and implement the procedures described in the H_2S Contingency Plan.
- After initial assessment of the situation, if H_2S gas is detected and confirmed at sustained concentrations above 10 ppm, the Tug Hill Operations management or the Director EH&S Affairs will notify the County EMA and the WVDEP Inspector. If the Director of EH&S Affairs cannot be reached, the EHS Coordinator or the Company Man will make the notification as soon as practicable.
- If the situation is of immediate danger to life and health, Unfired Command/Incident Command ("UIC") will be established pursuant the Incident Command System (ICS) in the ERP.
- UIC will assess and determine if evacuation is desired and the size of protective zone for local residents (e.g., 1,500 feet from center of pad – See Well Siting Exhibits 1-5 in **WSSP PART B – SITE-SPECIFIC DATA** in this ICP binder.

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MEDICAL EMERGENCIES/INJURY REPORTING

11.4 MEDICAL EMERGENCIES/INJURY REPORTING

This is a summary of the reactions and responses required when there is an illness or injury of personnel on an active well site. This could be one or more of the following emergencies:

- General Illness
- General Injury
- Vehicle collisions with injuries
- Operational accidents
- Fall injury
- Exposures to chemicals or environments

11.4.1 Personal Protective Equipment

Universal Precautions include, but are not limited to, one or more of the following: Glasses or face-shield, gown, medical gloves, and facemask.

11.4.2 Hazard Analysis

A possibility of exposure to bloodborne pathogens and infectious disease is possible when aiding those who are ill or injured. Proper precautions, training, and equipment shall be used to protect the worker(s) from exposure.

11.4.3 Scene Safety

Scene Safety is the ultimate goal of all personnel responding to an ill or injured person. If the scene is not safe, steps should be immediately taken to make it safe before placing additional persons' safety at risk. Responding personnel should initiate the necessary steps to provide for the safety of all personnel. This may include shutting down equipment in the immediate area and securing it in such a manner so as not to create additional hazards.

11.4.4 General Illness and Injuries

- Make notifications pursuant the Tug Hill Incident Response and Notification Procedure.
- Conduct a quick initial assessment of the injured personnel and determine the need for off-site emergency first responders and the method(s) of evacuating.

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- Treat the ill personnel based upon reported illness and on level of training of attending personnel.
- Transport the person off-site to see a medical professional if there is uncertainty of condition and perceived potential for condition to worsen.

11.4.5 Serious, Critical-Situation Injuries Requiring Immediate Medical Attention

- **CALL 911** to activate first responders. Remember to stay on the line until help arrives, if possible.
- Conduct a quick initial assessment of the injured personnel and determine the need for off-site emergency first responders and the method(s) of evacuating.
- Provide first aid and/or CPR to the injured worker as needed.
- Do not move a person who has suffered serious head, neck or back injury, or who has been injured by caught-between, struck-by incidents, energy releases, of vehicle/equipment accidents, unless safety considerations necessitate movement or transportation to a safer location.
- If bleeding is excessive or life threatening apply continues pressure and/or tourniquet to slow or stop bleeding
- Someone must meet the emergency responders at the access road to the well site. If you are providing first aid to the injured person, send someone to the end of the lease road to meet the emergency responders.
- In the event of a medical emergency requiring helicopter evacuation, an emergency helicopter landing zone must be marked, and all safety precautions must be followed.
- See the Helicopter Landing Zone figure in **Exhibit 3, WSSP PART B – SITE-SPECIFIC DATA** in this ICP binder.
- When help arrives, allow responding units to take control of situation.

11.4.6 Vehicle Collisions with Injury

In addition to the above guidelines for Serious, Critical Situation Injuries (shown above), consider the following guidelines:

- DO NOT move persons with severe neck, head, or back trauma unless there is an imminent threat to life by remaining in-place.
- If a life safety threat exists, then the person should be removed from the area regardless of their injuries.
- If the person is trapped in the vehicle, notify outside emergency first responders of the situation.
- Treat the injured personnel based on level of training.
- Make notifications pursuant the Tug Hill Incident Response and Notification Procedure.

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- Drive the damaged vehicle to another location on site if the vehicle is blocking access to the site or movement on the site. The vehicle should only be driven if it is safe to do so. A vehicle should be considered capable of being normally and safely driven if it does not require towing and can be operated under its own power, in its customary manner without further damage or hazard to itself, other traffic elements, or the site.
- Call a tow truck if the vehicle may not be driven to another location.
- Use available equipment appropriately to push or pull the damaged vehicle out of the way if it creates an unsafe condition (e.g., blocking access to the site by emergency vehicles). This should only be done if the time to move the damaged vehicle is less than the time for a tow to arrive, the front loader is capable of moving the vehicle, and the damaged vehicle does not contain a hazardous, flammable or combustible cargo.
- A recovery service or heavy machinery should be summoned if large parts are spilled from the vehicle.
- Remove, secure, repair damaged site equipment.

11.4.7 Operational Accidents

In addition to the above guidelines for Serious, Critical Situation Injuries (shown above), consider the following guidelines:

- Secure all equipment in such a manner so as not to create a hazard to the emergency first responders.
- If a life safety threat exists, then the person should be removed from the area regardless of any injuries sustained.
- If the person is trapped, notify outside emergency first responders of the situation.
- Treat the injured personnel based on level of training.
- Make notifications pursuant the Tug Hill Incident Response and Notification Procedure.
- Shut down and then Secure Equipment in affected area using standard emergency shut-down procedures.
- Shut down any other equipment in the immediate affected area at the direction of the PIC/On-Scene IC using standard emergency shut-down procedures.
- Remove, secure, and repair damaged site equipment.

11.4.8 Fall Emergencies

In addition to the above guidelines for Serious, Critical Situation Injuries (shown above), consider the following guidelines:

- Conduct a quick initial assessment of the injured personnel and determine the need for off-site emergency first responders and the method(s) of evacuating.
- If self-rescue is possible, provide aid to the victim with ladders, vehicles or other means of removal.
- If the person is removed, conduct a secondary assessment and determine the extent of injuries and need for off-site emergency first responders.
- Note: Moving the person quickly into a horizontal position is likely to cause a large volume of deoxygenated blood to move to the heart, if the worker had been suspended for an extended period. The heart may be unable to cope with the abrupt increase in blood flow, causing cardiac arrest. Some authorities recommend that the person be transported with the upper body raised.
- If the person is trapped, notify outside emergency first responders of the situation.
- If the trapped person is conscious, have him/her:
    - Pump his/her legs to increase circulation.
    - Use a rope ladder or harness steps to relieve stress to legs.
- Notify outside emergency first responders if needed.
- Treat the injured personnel based on level of training.
- Transport the person, if necessary, according to the Transportation Procedure below.
- If rescue services are on-site:
    - Trained personnel should respond.
    - Gather needed equipment.
    - Attempt to safely remove the victim from suspension.
    - Evacuate the victim to the ground.
- Make notifications pursuant the Tug Hill Incident Response and Notification Procedure.
- Shut down any other equipment in the immediate affected area at the direction of the Emergency Coordinator using Emergency Shut-down Procedures.
- Secure all equipment in such a manner so as not to create a hazard to the emergency first responders.
- Assist emergency first responders as required.

11.4.9 Exposures to chemicals or environments

In addition to the above guidelines for Serious, Critical Situation Injuries (shown above), consider the following guidelines:

- Conduct a quick initial assessment of the injured personnel and determine the need for off-site emergency first responders and the method(s) of evacuating.
- If safe to do so, remove the victim from the environment and move him/her into a safedry place.
- If personnel are covered in chemical products, remove contaminated clothing, and decontaminate them by putting them in the shower or rinsing with large amounts of water.
- Refer to the product SDS for further information and treatment instructions.
- If the injured party is demonstrating unusual behavior or alter consciousness or has suffered chemical burns, **CALL 911** to activate emergency first responders if needed.
- Treat the injured personnel based on your level of training or those around you.
- Make notifications pursuant the Tug Hill Incident Response and Notification Procedure.

11.4.10 Transportation

Transportation of seriously ill or severely injured personnel may be transported in accordance with the following:

1. By Ambulance – The first choice should always be to have seriously ill or severely injured personnel transported to the nearest hospital or medical facility by Ambulance. The Company Man/PIC, On-Scene IC, or EHS Coordinator will notify the emergency services/ambulance dispatcher.
2. By persons trained in First Aid/CPR - The injured personnel may be transported to the nearest hospital or medical facility by persons trained in First Aid/CPR.
3. By Other Worker – Only those injured personnel with no life-threatening injuries may be transported to receive medical attention by a co-worker or person designated by the On-Scene IC, Company Man/PIC, or EHS Coordinator.

   Note: Injured personnel should not drive themselves to medical care.

11.4.11 Additional Evacuation Considerations

Follow Evacuation procedures outlined in Section 10.0 in this ERP and the WSSP.

Evacuation of the well pad to the secondary Muster Point is required Level 3 Emergencies involving uncontrolled fires, release of gas or condensate, and/or when there is a potential for explosion or exposure to hazardous atmospheric conditions that present risk to life or health. In

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such conditions, the PIC/On-Scene IC or EHS Coordinator will call of all personnel to proceed to the pre-determined Secondary Muster Point as per the same directions above.

At the Muster Point, account for personnel. Immediately convey those unaccounted for to the EHS Coordinator or On-scene IC.

11.4.12 Reporting

ALL Level 3 ("Red"; Consequence Levels 5-6 or "RED" in EHS Insight Incident Reporting Module): The Emergency EHS&S Coordinator, Vice President of Operations, and/or Executive Management must be notified immediately if there are multiple injuries that occur from the same incident or if there is a fatality.

11.4.13 Following the Incident

- If a critical injury or fatality occurs, the Tug Hill Public Information Coordinator or other designate will inform family of injury or death.
- The completed Incident Investigation Form will be retained in the Tug Hill EHS Insight Incident Module.
- The Tug Hill EH&S Director/Emergency EHS&S Coordinator will implement a root cause investigation.

Tug Hill EH&S Director will complete an incident investigation at the conclusion of the event and will be responsible for follow-up with governmental agencies as required.

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Process damage from NATURAL DISASTERS

11.5 NATURAL DISASTERS

This is a summary of the responses required when there is a disruption or upset in the on-site utilities or processes as a result of Natural Disasters. This could occur from one or more of the following:

- Utility Loss of Power
- Outside Emergency impacting the site
- Weather Emergencies
- Mechanical Failure or defect
- System Failure or defect

11.5.1 Hazard Analysis:

A possibility of exposure to conditions, inclement weather, stored energy, faulty equipment, unexpected hazards introduced to the site, and other hazards generated by the loss of production on the worksite.

In case of a natural disaster, be prepared to shut-down Operations or shut-in the wells and move to the safest area, away from falling objects or equipment, then notify the EHS Coordinator.

Listen to weather reports. The National Weather Service will broadcast several types of messages to notify specific locations or general areas of impending or actual severe weather.

11.5.2 Floods and Mudslides

A large downpour or several continuous days of rain can cause flooding in low-lying areas and have the potential to cause mudslides. If flooding or mudslides are encountered on-site, along lease roads, or along public roads accessing the site, follow the Tug Hill Incident Response and Notification Procedure and take action to vacate the location safely.

- Monitor streams and drainage channels. Use a fixed point to record fluid levels over time.
- Do not leave loose equipment around the site; especially that which can float.
- Be prepared to remove computers and sensitive electronics.
- Avoid flood waters and electrical equipment that may be tied to electrical lines laying in water.

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- If evacuation is required, shut-down all machinery and electrical energized equipment. Take laptop computers, extra clothes, supplies, food, water, communication equipment and critically important documents.
- Avoid driving or walking through water of undetermined depth. They may be deeper than you perceive, and roads can be washed out, especially when near topographical drop-offs.

11.5.3 Lightning

Thunderstorms often generate lightning that can harm personnel and/or damage buildings and Operational rigs, Production facilities and equipment. Stay inside structures or a vehicle until the storm ends and avoid using phones and electronic devices if you are outside.

When lightning is estimated to be within 3 miles and travelling in the direction of the work site, the Company Man/PIC has the discretion to stop work if an imminent threat is apparent.

- Seek shelter indoors, in a vehicle, or crouch down (not lying) in a low place.
- Avoid water, single tall objects, and anything metal.
- Groups of people exposed and in the open should spread out.
- Turn-off electronics and sensitive electronic equipment.
- Avoid the use of plumbing.

Work may not resume until the imminent danger of lightning strikes has passed based upon weather alerts.

11.5.4 Tornados

Severe Weather/TORNADO WATCH means meteorological conditions are favorable for severe weather and the formation of tornadoes. Severe Weather/TORNADO WARNING means severe weather and tornado has actually been sighted.

Tornadoes generally occur near the trailing edge of a thunderstorm. Monitor weather conditions and forecasts for the area.

Indicators that a tornado is possible:

- Large Hail
- A large dark, low-lying cloud (particularly if rotating)
- Loud roar, similar to a freight train
- Dark and discolored clouds

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When under a Severe Weather/TORNADO WARNING in the immediate vicinity of the well pad:

- Cease operations if a tornado is sighted or if weather forecasts indicate that a tornado is heading toward the site.
- Secure outdoor objects that could blow away and cause damage.
- Move into a low-lying area or available storm shelter or take cover near objects that are low and securely anchored to the ground, such as culverts or low retaining walls.
- Take cover in a nearby ditch or depression. Wear your hard hat and cover your neck with your hands. Wear your gloves.

Note: A vehicle, trailer or mobile home is not acceptable cover. No personnel should take cover in the drilling rig or site trailers. An interior room of a structure is an acceptable shelter area.

- Monitor the movement of the tornado and confirm is has travelled out of the area.
- Notify the Emergency EHS&S Coordinator and the EHS Coordinator.
- Do not leave protective cover or resume operations until the Tornado Warning has been lifted for the area.

11.5.5 Earthquakes

Earthquakes occur without warning. Some earthquakes are instantaneous tremors and others are significant sustained events followed by aftershocks. Individuals should take emergency action immediately and additional actions will be implemented after the earthquake stops.

If outdoors:

- If you can, move away from on-site structures, equipment, and utility wires.
- Once in the open, drop, cover, and hold on until the shaking stops.

If in a moving vehicle:

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped.
- Avoid roads with sharp topographical drop-offs and routes that might have been damaged by the earthquake.

Be prepared for aftershocks. Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the earthquake. Follow the same procedures as for earthquakes.

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11.5.6 Post-Earthquake Procedures:

Subsequent to an earthquake event, components of the facility will require inspection, testing, gas monitoring, and documented re-commissioning. Inspection and re-commissioning shall include, at a minimum:

- Determining integrity of BOPs, ESDs, and Production equipment.
- Monitoring of flanges, valves, and fittings using leak detection meters or infrared cameras.
- Pressure testing flowlines and production equipment.
- Testing completions related piping, connections, and other equipment.
- Check storage tanks containing fuel, Condensate, NGLs, chemicals, and Produced Water.

Inspections are to achieve final approval from the manager of Drilling and Completions or Production before resuming operations. See also local and state codes and standards.

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Level 3 SPILL OR FLUID RELEASE events

11.6 LEVEL 3 SPILL OR FLUID RELEASE EVENTS

The purpose of the procedures described below is to provide the guidance to facilitate the rapid deployment of resources during severe spill Level 3 events ("Red"; Consequence Levels 5-6 or "RED" in EHS Insight Incident Reporting Module) that present serious and immediate risks to personnel, assets, the surrounding community, and environment onsite and likely offsite as well. These situations require the immediate application of specialized techniques and well-developed safety assessment and hazard mitigation programs.

Each employee at the Tug Hill well pads is required to be familiar with the response procedures and their responsibilities related to this Plan.

11.6.1 Description

This is a summary of the reactions and responses required when there is a hazardous substance and environmental emergency on an active well site. This could be an uncontrolled release of one or more of the following emergencies:

- Fuels, Condensate, or Oil Spill
- Acids or other chemicals defined as a "Hazardous Substance"
- Other chemicals having a regulatory-defined reportable quantity (RQ)

11.6.2 Hazard Analysis

A possibility of exposure to chemicals or fluids possessing physical or chemical properties that are hazardous, toxic, or present risk to human health or aquatic life. Refer to DOT Emergency Response Guidebook or SDS for specific hazards and precautions.

11.6.3 Personal Protective Equipment

As required for specific tasks. Required equipment may include chemical protective clothing and respiratory protection. Only trained personnel should engage in these activities.

Under no circumstances are spills of materials that constitute a **hazardous waste** to be cleaned-up by workers not trained in hazardous waste operations pursuant to OSHA regulation.

11.6.4 Initial Spill-Related Emergency Response Actions

- Notify personnel in the immediate area that a spill has occurred.
- Issue Stop Work and, if necessary, cease Operations.

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- Evacuate employees from the area and restrict entry into the area.
- Implement the Tug Hill Incident Response and Notification Procedure.
- In the event of an emergency caused by flooding, tornado, extreme snow, or acts of terrorism, remember these four simple guidelines:
    - Protect yourself.
    - Protect others.
    - Protect property.
    - Protect the Environment.
    - Make notifications as listed above.
- Never touch or smell any spilled material.
- Stay upwind of unknown spilled material and do not approach closer than necessary.
- Note any other chemicals stored in the immediate vicinity of the release (e.g., oxidizers and reactive chemicals), as other products may adversely react with the spilled material.
- If it safe to do so:
    - Attempt to define the area of the facility affected by the spill.
    - Contain the leak and/or spill with absorbent material, diking material, or soil, if necessary, providing containment can be done safely.
    - Identify and then stop the source of the spill.
- If there is any danger of a spill of any kind eventually reaching soils or surface waters, the following actions are to be taken immediately:
    - Deploy absorbents or spill sock/booms to control the migration.
    - Use earth moving equipment to create a earthen berm downgradient of the spill to prevent impact to a stream or waterbody or sensitive environ.
    - Assist with moving equipment to facilitate the cleanup contractors.
- Limit access to the site to persons involved in the emergency response.

11.6.5 Spill Countermeasures

Tug Hill has established agreements with response contractors (Contact numbers are provided in the **Emergency Contact List, WSSP PART B – SITE SPECIFIC DATA** section of this ICP binder).

Upon assessment of the spill incident, the Emergency EHS&S Coordinator or another member of the IC structure may activate one or more of the contractors to contain and/or remove the contaminated soil if it is determined that the response cannot be handled in-house.

The Tug Hill Director, EH&S Affairs and the EHS Coordinators, will manage clean-up activities of all Level 3 (e.g., major and severe release events per classification).

If a Tug Hill Production Well Pad, following the Countermeasures and other procedural; requirements of the SPCC Plan for the site.

11.6.6 Off-Site Spills and Releases

Limiting off-site impacts to land of third parties and waterways are initial objectives. If the spill site is within or threatens to impact a waterway, rapid response is critical to prevent negative impact to water supplies.

For off-site spills or releases of chemicals or waste along public roadways:

- Follow the response and notification procedure which is appropriate for the severity of the incident. Refer to the Incident Response and Notification Procedure.
- If safe to do so and properly trained, attempt to stop and/or contain the release, and prevent the released material from entering sewers, ditches, or surface water.
- If there is an imminent risk of fire, explosion, or a condition that is immediately dangerous to life or health (IDLH), call 911 immediately.

The Director of EHS Affairs or Tug Hill management will determine whether Tug Hill will defer the remedial response to the contractor or lead the response actions. The EHS Coordinator will initiate contact with the West Virginia Department of Environmental Protection (WVDEP) and the local municipality or County EMA, notify a Tug Hill-approved remediation contractor, and arrange for traffic control to divert traffic around the incident location.

11.6.7 Restoration

Restoration of remediated areas located on the well pad will be performed by or at the direction of Tug Hill EH&S Director. Affected areas located within the limits of disturbance of the well pad or access road will be restored to as close to original condition as possible by Tug Hill -approved contractors under the direction of Tug Hill Operations or Director of EHS Affairs.

Restoration of off-site property and public roadways will be performed by the contractor involved in the incident, or Tug Hill -approved contractors in conjunction with stipulations of regulatory authorities (e.g., WVDEP, WVDOH, U.S. Coast Guard, and/or local agencies).

11.6.8 Agency Reporting

As applicable, pursuant to WVDEP spill and release reporting requirements, releases of petroleum and hazardous substances will be reported to the WVDEP Emergency Spill Reporting line. This determination will be made by the Tug Hill Director of EH&S Affairs and/or other company management representative.

In the event of a major chemical release, the County Office of Emergency Management (OEM) will be notified by the Director of EHS Affairs or the 911 dispatcher. If required, notification or

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evacuation of local residents will be coordinated with the County OEM, following the Evacuation Procedures described in this ERP.

In accordance with 40 CFR 302.6, those spill or release events involving a regulatory-defined reportable quantity (RQ) and/or releases to waters of the state will also trigger reporting to the **National Response Center** (**NRC**) **at 1-800-424-8802**.

11.6.9 Recordkeeping

The EHS Coordinator and contractors involved in the remediation and restoration will maintain a record of activities, contacts and quantities of labor hours and materials associated with the response. The records will be submitted to Tug Hill Director of EH&S Affairs.

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PERSONAL THREATS AND WORKPLACE VIOLENCE

11.7 PERSONAL THREATS AND WORKPLACE VIOLENCE

No one can predict human behavior and there is no "specific profile" of a potentially dangerous individual(s); however, indicators of increased risk of violent behavior have been identified by the Federal Bureau of Investigation's (FBI) National Center for the Analysis of Violent Crime, Profiling, and Behavioral Assessment Unit in its analysis of past incidents of workplace violence.

These are some of the indicators of hostility:

- Direct or veiled threats of harm.
- Intimidating, belligerent, harassing, bullying, or other inappropriate and aggressive behavior.
- Numerous conflicts with supervisors and other employees.
- Bringing a weapon to the workplace, brandishing a weapon in the workplace, making inappropriate references to guns, or fascination with weapons.
- Statements showing fascination with incidents of workplace violence, statements indicating approval of the use of violence to resolve a problem or statements indicating identification with perpetrators of workplace homicides.
- Statements indicating desperation (over family, financial and other personal problems) to the point of contemplating suicide.
- Drug and/or alcohol abuse.
- Extreme changes in behaviors.

Each of these behaviors could be a clear sign that something is wrong. **None should be ignored.** By identifying the problem and dealing with it appropriately, Tug Hill employees, contractors, and visitors may be able to prevent violence from happening.

Some behaviors require immediate police or security involvement; others constitute actionable misconduct and require disciplinary action. **In either case, CALL 9-1-1; contact your supervisor or the Emergency EHS&S Coordinator immediately if you feel threatened by another employee(s), visitor(s) or intruder(s).**

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BOMB THREATS

11.8 BOMB THREATS

In the event someone is alerted to or notified of a potential bomb threat:

- **CALL 911** and follow the Tug Hill Incident Response and Notification Procedure.
- Help personnel **REMAIN CALM** and stay together.
- Do not evacuate the buildings or well pad sites unless instructed to do so by Police or emergency management personnel in charge.
- As soon as possible, notify the EHS Coordinator and the Emergency EHS&S Coordinator. The EHS Coordinator will initiate the Incident Notification procedure.
- The PIC or Director, EH&S Affairs, will notify the Tug Hill Executive Management Team ASAP.

11.8.1 Bomb Threat Event Details

If the threat is received in person or on the phone, the person should note the following information, if provided:

1. When is the suspected item going to explode?
2. Where is it right now?
3. What does it look like?
4. What kind of suspected item is it?
5. What will cause it to explode?
6. Did you place the suspected item?
7. Why?
8. What is your name?
9. What is your address?
10. What is your phone number?

NOTE: DO NOT hang up your phone (a trace may be possible).

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11.8.2 Bomb Threat Specifics

The receiver of the threat should note as many details as possible:

- Make notes of the exact words of the caller.
- Time of call.
- Background noises (e.g., street noises, bells, whistles, horns, banging, engines or motors running, voices, music, machinery, echoing)
- Description of caller's voice, does it sound familiar?
- Did the caller appear to be familiar with the site or facility?
- Description of caller's language skills (well spoken, educated, foul, irrational, incoherent, accent and/or taped).

11.8.3 Suspicious Items Encountered

Precautions:

- Do not disturb or touch a suspect item.
- Notify Tug Hill employees, contractors, and visitors, immediately.
- Do not use radios in close proximately to suspected bombs.
- If a suspected threat letter is opened, do not let anyone else touch the letter or envelope; place it in a bag, larger envelope, between clean pieces of paper, etc. and turn over to law enforcement for fingerprints and other tests.

11.8.4 Person Who Received the Call or Threat

- Document your Name, Phone, and Address, Employer
- Document where the call or threat was received or observed. If received by phone, specify the phone number and owner of the phone.
- Make notes to best of recollection of all details.
- Use complete sentences and full names.
- Provide additional comments such intuition and perceptions, but do not speculate nor use inflammatory terms.

Attachments

U.S. DOT Emergency Response Guidebook

Guide 115 – Gases Flammable

Guide 130 – Flammable Liquids

GUIDE 115 Gases - Flammable (Including Refrigerated Liquids)

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **EXTREMELY FLAMMABLE.**
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966), Methane (UN1971) and Hydrogen and Methane mixture, compressed (UN2034) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY

- **CALL 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.).

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing provides thermal protection **but only limited chemical protection**.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area for at least 100 meters (330 feet) in all directions.

Large Spill

- Consider initial downwind evacuation for at least 800 meters (1/2 mile).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- In fires involving Liquefied Petroleum Gases (LPG) (UN1075), Butane (UN1011), Butylene (UN1012), Isobutylene (UN1055), Propylene (UN1077), Isobutane (UN1969), and Propane (UN1978), also refer to BLEVE – SAFETY PRECAUTIONS (Page 366).

In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the ERAP Program Section (page 390).

EMERGENCY RESPONSE

FIRE

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Hydrogen and Methane mixture, compressed (UN2034) will burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)

Small Fire

- Dry chemical or CO_2.

Large Fire

- Water spray or fog.
- If it can be done safely, move undamaged containers away from the area around the fire.

CAUTION: For **LNG - Liquefied natural gas (UN1972)** pool fires, DO NOT USE water. Use dry chemical or high-expansion foam.

Fire Involving Tanks

- Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.

CAUTION: For **LNG - Liquefied natural gas (UN1972)**, DO NOT apply water, regular or alcohol-resistant foam directly on spill. Use a high-expansion foam if available to reduce vapors.

- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

- Call 911 or emergency medical service.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air if it can be done safely.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.

GUIDE 130 Flammable Liquids (Water-Immiscible/Noxious)

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.**
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along the ground and collect in low or confined areas (sewers, basements, tanks, etc.).
- Vapor explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a **(P)** may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids will float on water.

HEALTH

- May cause toxic effects if inhaled or absorbed through skin.
- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or asphyxiation.
- Runoff from fire control or dilution water may cause environmental contamination.

PUBLIC SAFETY

- **CALL 911. Then call emergency response telephone number on shipping paper.** If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Ventilate closed spaces before entering, but only if properly trained and equipped.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing provides thermal protection **but only limited chemical protection**.

EVACUATION

Immediate precautionary measure

- Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

Large Spill

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.

Small Fire

- Dry chemical, CO_2, water spray or regular foam.

Large Fire

- Water spray, fog or regular foam.
- Avoid aiming straight or solid streams directly onto the product.
- If it can be done safely, move undamaged containers away from the area around the fire.

Fire Involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapor-suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean, non-sparking tools to collect absorbed material.

Large Spill

- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor, but may not prevent ignition in closed spaces.

FIRST AID

- Call 911 or emergency medical service.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air if it can be done safely.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.

Blank IADC Well Control and Kill Sheet

IADC WellCAP Well Control Worksheet
Surface Stack - Wait and Weight Method

IADC

Well Name: _____ **Completed By:** _____ **Date:** ____ / ____ / ____

PRE-RECORDED INFORMATION

TRUE PUMP OUTPUT: _____ (m³/Stk @ 100%) x _____ (% Efficiency) = _____ (TPO (m³/Stk))

Surface Line: _____ (m³) Surface Line Capacity ÷ _____ True Pump Output (m³/Stk) = _____ Strokes to Pump

DRILL STRING CAPACITY:

Drill Pipe #1: _____ Size (mm) _____ Weight (kg/m) _____ m³/m x _____ Length (m) = _____ m³ DP

Drill Pipe #2: _____ Size (mm) _____ Weight (kg/m) _____ m³/m x _____ Length (m) = _____ m³ DP

HWDP: _____ Size (mm) _____ Weight (kg/m) _____ m³/m x _____ Length (m) = _____ m³ HWDP

Drill Collars #1: _____ Size (mm) _____ Weight (kg/m) _____ m³/m x _____ Length (m) = _____ m³ DC

Drill Collars #2: _____ Size (mm) _____ Weight (kg/m) _____ m³/m x _____ Length (m) = _____ m³ DC

_____ Total Drill String Capacity (m³)

STROKES FROM SURFACE TO BIT:

_____ Total Drill String Capacity (m³) ÷ _____ True Pump Output (m³/Stk) = _____ Strokes, Surface to Bit

ANNULAR CAPACITY:

Between CSG and DP: _____ m³/m x _____ m = _____ m³

Between Liner #1 and DP: _____ m³/m x _____ m = _____ m³

Between Liner #2 and DP: _____ m³/m x _____ m = _____ m³

Between OH and DP/HWDP: _____ m³/m x _____ m = _____ m³

Between OH and DC: _____ m³/m x _____ m = _____ m³

STROKES FROM BIT TO SHOE:

_____ Open Hole Annular Vol. (m³) ÷ _____ True Pump Output (m³/Stk) = _____ Strokes, Bit to Shoe

STROKES FROM BIT TO SURFACE:

_____ Total Annular Volume (m³) ÷ _____ True Pump Output (m³/Stk) = _____ Strokes, Bit to Surface

TOTAL STROKES FROM SURFACE TO SURFACE:

_____ Strokes, Surface to Bit + _____ Strokes, Bit to Surface = _____ Strokes, Surface to Surface

MAXIMUM ALLOWABLE FLUID DENSITY (kg/m³)

[_____ Surface LOT Pressure (kPa) ÷ (_____ Shoe TVD (m) x 0.00981)] + _____ LOT Fluid Density (kg/m³) = _____ kg/m³ MAX. ALLOWABLE FLUID DENSITY

MAXIMUM ALLOWABLE ANNULAR SURFACE PRESSURE (MAASP) (kPa)

(_____ Max. Allowable Fluid Density (kg/m³) - _____ Current Fluid Density (kg/m³)) x 0.00981 x _____ Shoe TVD (m) = _____ kPa MAX. ALLOWABLE ANNULAR SURFACE PRESSURE

CURRENT WELL DATA

PRESENT MUD WEIGHT: _____ kg/m³

SLOW CIRCULATION RATE (SCR):

SCR taken @ _____ (m)

	Stks/min	Pressure(kPa)	m³/min	Pressure(kPa)
Pump #1				
Pump #2				
Pump #3				

CASING DATA:

CASING _____ size, _____ ID, _____ weight

SHOE DEPTH @ MD / TVD _____ / _____ m

SHOE TEST DATA:

_____ Depth #1 _____ (kPa) @ Test MW of _____ (kg/m³)

_____ Depth #2 _____ (kPa) @ Test MW of _____ (kg/m³)

_____ Depth #3 _____ (kPa) @ Test MW of _____ (kg/m³)

LINER #1 _____ size, _____ ID, _____ weight

LINER #2 _____ size, _____ ID, _____ weight

LINER #1 TOP DEPTH _____ m

LINER #2 TOP DEPTH _____ m

LINER #1 SHOE DEPTH _____ m

LINER #2 SHOE DEPTH _____ m

TVD CASING or LINER _____ m

HOLE DATA:

TOTAL DEPTH (MD) _____ m

TOTAL DEPTH (TVD) _____ m

BIT DEPTH @ MD / TVD _____ / _____ m

BIT SIZE _____ inches

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KICK DATA

SIDPP: _____ kPa **SICP:** _____ kPa **PIT GAIN:** _____ m³ **Time of Incident:** ____ : ____

CALCULATIONS

KILL FLUID DENSITY (kg/m³)

[_____ ÷ (_____ X 0.00981)] + _____ = _____ kg/m³ KILL FLUID DENSITY

SIDPP (kPa) TVD (m) Current Fluid Density (Kg/m³)

INITIAL CIRCULATING PRESSURE (ICP)

_____ + _____ = _____ kPa INITIAL CIRCULATING PRESSURE

SIDPP (kPa) Pump Pressure (kPa) @ SCR of _____SPM

FINAL CIRCULATING PRESSURE (FCP)

_____ X _____ ÷ _____ = _____ kPa FINAL CIRCULATING PRESSURE

Pump Pressure (kPa) @ SCR of _____SPM Kill Mud Weight (kg/m³) Present Mud Weight (kg/m³)

PRESSURE CHART

Stroke or Volume	Theoretical Drill Pipe Pressure	Actual Drill Pipe Pressure	Actual Casing Pressure	Actual Pit Volume Deviation
SURFACE 0	ICP			
BIT	FCP			

_____ ÷ 10 = _____ _____ - _____ ÷ 10 = _____

Strokes Surface to Bit Strokes per Step Initial Circulation Pressure Final Circulation Pressure PSI per Step

BIT	FCP			
SURFACE				

_____ ÷ 10 = _____

Strokes Bit to Surface Strokes per Step

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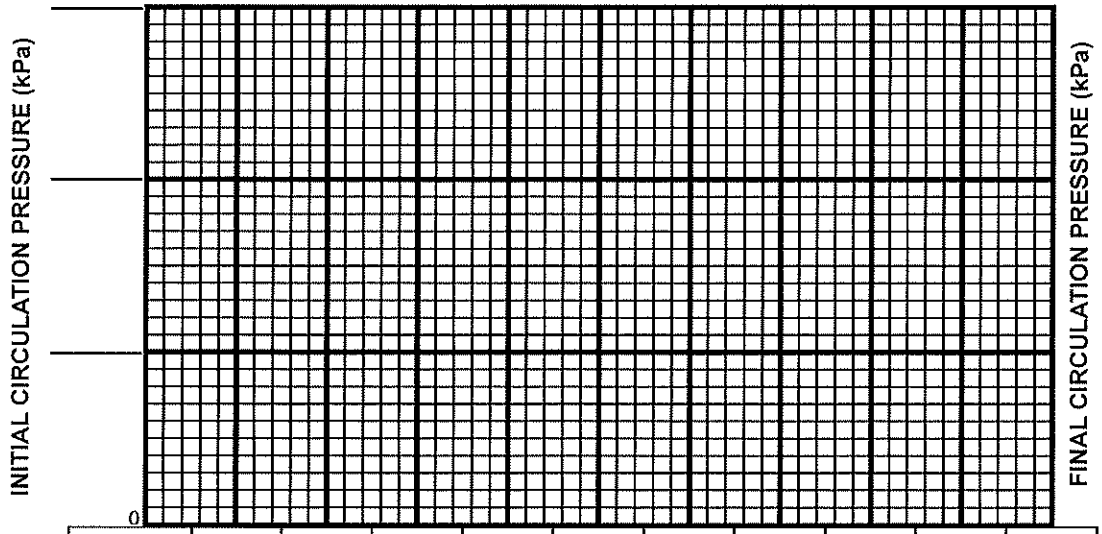
GRAPHIC ANALYSIS



Stroke										
Pressure										
Time										

1. Pressure Gradient (kPa/m) = Fluid Density (kg/m³) x 0.00981

2. Hydrostatic Pressure (kPa) = Fluid Density (kg/m³) x 0.00981 x TVD (m)

3. Capacity (m³/m) = Inside Diameter^2 (mm) ÷ 1273

4. Annular Capacity (m³/m) = (Inside Diameter of Casing^2 (mm) or Hole Diameter^2(mm) - Outside Diameter of Pipe^2 (mm)) ÷ 1273

5. Pipe Displacement (m³/m) = (Outside Diameter of pipe^2 (mm) - Inside Diameter of pipe^2 (mm)) ÷ 1273

6. Maximum Allowable Fluid Density (kg/m³) = $\frac{\text{Surface LOT Pressure (kPa)}}{\text{Shoe TVD (m)} \times 0.00981}$ + LOT Fluid Density (kg/m³)

7. MAASP (kPa) = [Maximum Allowable Fluid Density (kg/m³) - Current Fluid Density (kg/m³)] x 0.00981 x Shoe TVD (m)

8. Pressure Drop per Metre Tripping Dry Pipe (kPa/m) = $\frac{\text{Drilling Fluid Density (kg/m}^3\text{)} \times 0.00981 \times \text{Metal Displacement (m}^3\text{/m)}}{\text{Riser/Casing Capacity (m}^3\text{/m)} - \text{Metal Displacement (m}^3\text{/m)}}$

9. Pressure Drop per Metre Tripping Wet Pipe (kPa/m) = $\frac{\text{Drilling Fluid Density (kg/m}^3\text{)} \times 0.00981 \times \text{Closed End Displacement (m}^3\text{/m)}}{\text{Riser/Casing Capacity (m}^3\text{/m)} - \text{Closed End Displacement (m}^3\text{/m)}}$

10. Formation Pressure (kPa) = Hydrostatic Pressure Mud in Hole (kPa) + SIDPP (kPa)

11. Equivalent Circulating Density (kg/m³) = $\frac{\text{Annular Pressure Loss (kPa)}}{\text{TVD (m)} \times 0.00981}$ + Fluid Density (kg/m³)

12. Kg of Barite Needed to Weight-Up Mud = $\frac{\text{m}^3\text{ of Mud in System} \times 4250 \times (\text{KMW} - \text{OMW})}{(4250 - \text{KMW})}$

13. Volume Increase from Adding Barite (m³) = $\frac{\text{Kg of Barite Needed to Weight-Up Mud}}{4250}$

14. Estimated New Pump Pressure at New Pump Rate (kPa) = Old Pump Pressure (kPa) x $\left[\frac{\text{New Pump Rate (SPM)}}{\text{Old Pump Rate (SPM)}}\right]^2$

15. Estimated New Pump Pressure with New Mud Weight (kPa) = Old Pump Pressure (kPa) x $\frac{\text{New Mud Weight (kg/m}^3\text{)}}{\text{Old Mud Weight (kg/m}^3\text{)}}$

DISCLAIMER: This Well Control Worksheet is intended solely for the use of the IADC and IADC accredited schools and organizations engaging in the teaching of the IADC WellCAP Well Control classes. The IADC, its employees or others acting on its behalf, makes no warranties or guarantees expressed, implied or statutory, as to any matter whatsoever, with respect to the use of this Well Control Worksheet.

02/25/2022

Family Information Gathering Form

TUG HILL OPERATING

FAMILY INFORMATION AND REQUIREMENTS QUESTIONNAIRE

Meeting Place	Phone / Email:	Date / Time:
Meeting Place	Phone / Email:	Date / Time:
Meeting Place	Phone / Email:	Date / Time:

Family Members Names:	Phone / Email:	Daytime Location	Evening Location	Special Needs Info:
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

TUG HILL OPERATING

Pets and Livestock Survey				
Animal Type	**Pet Name if any**	**Number of Livestock**	**Location**	**Comments**

Comments / Notes:

Marshall County Family Resource Guide

Clothing Assistance:

Blue & Gold Christian Center Thrift Store	304-686-2210
Gabriel Project (Child, Maternity)	304-639-5039
House of the Carpenter (M-Fri. 8-4)	304-233-4640
Shepherd's Pantry (Weds. 9-11:30)	304-221-9510
Salvation Army	304-845-0510
St. Vincent de Paul Thrift Store	304-232-4230
YWCA Women's Boutique	304-232-0511
Wellspring Pregnancy Center	304-810-0292

Food Distribution:

Blue and Gold Christian Center	304-686-2210
Calvary United Methodist Church	304-845-2732
Cameron Baptist Church	304-686-3301
Catholic Charities Neighborhood Center	304-232-7157
Family Services, Senior Division x204	304-233-2350
Feeding Body & Soul Community Kitchen Simpson UMC (M-Sat.)	304-780-7266
First Church of God – McMechen	304-232-0388
Glen Dale United Methodist Church	304-845-1140
Marshall Co. WIC (Women Infant & Children)	304-845-7426
Mount Olivet United Methodist Church	304-242-3162
Temple Baptist Church	304-280-6630
Salvation Army – Marshall County	304-845-0510
Shepherd's Pantry (Weds. Only)	304-221-9510

Emergency Shelter or Housing Needs:

Benwood-McMechen Housing Authority	304-233-0830
Blue & Gold Christian Center (Cameron)	304-686-2210
Change, Inc. Weatherization	304-845-8269
Greater Wheeling Coalition for the Homeless	304-232-6105
Habitat for Humanity	304-233-0887
Helping Heroes – Veterans	304-810-4291
Hill View Apartments	304-843-2271
Moundsville Housing Authority	304-845-3141
Northwood Homeless Shelter	304-233-3502
Salvation Army	304-845-0510
USDA Rural Development	304-238-5651
Washington Lands Ltd	304-845-6485
Wesley Park (Senior Housing)	304-845-9701
Woodland Knolls Apartments	304-843-1575
WV DHHR	304-843-4120
YWCA	304-232-0511

Youth Shelters, Residential Programs, Foster Home Programs, Intensive Home-based Services:

Children's Home of Wheeling	304-233-2367
Children's Home Society of WV	304-218-2893
Crittenton Services – Wellspring Family Services	304-242-7060
National Youth Advocate Program-WV	304-243-1865
St. John's Home for Children	304-242-5633
Youth Services System	304-233-9627

Victim Assistance Services:

CASA for Children	304-233-0333
Harmony House Child Advocacy Center	304-230-2205
Sexual Assault Help Center	304-234-1783
YWCA Family Violence Prevention Program	304-232-2748

Transportation Services:

Dan Van (Veterans transp. VA hospital)	412-439-0209
Faith in Action Caregivers	304-243-5420
Family Services	304-233-2350
Hometown Transportation	304-845-6070
Marshall County Senior Center	304-845-8200
National Church Residence Transportation	740-425-9001
Non-Emergency Medical Transportation	844-549-8353
OVRTA	304-232-2190
Wheeling Hospital (Benwood City Limits)	304-243-7123

Specialized Trainings & Employment Services:

Adult Education Center	304-845-7890
WorkForce West Virginia Career Center	304-232-6280
WorkForce WV Job Service & Unemployment	304-238-1035
WV DHHR	304-843-4120
WV Division of Rehabilitation Services	304-238-1092
WV Northern Community College	304-233-5900
WVU Extension	304-843-1170

Legal Services:

Drug Court	304-551-2986
Fair Housing Law Center	877-725-4472
Family Court	304-455-0903
Legal Aid of WV	304-232-1260
Marshall County Public Defender	304-843-4074
Marshall County Prosecuting Attorney	304-845-3580

After-school Program/ Literacy Assistance:

Blue & Gold Christian Center-Kidz Kamp	304-686-2210
YSS Community Cares at McNinch	304-233-9627

Prenatal, Infant & Child Services:

Gabriel Project	304-639-5039
Marshall County FRN Parents As Teachers	304-845-3300
Northern Panhandle Parents As Teachers	304-810-4522
Right from the Start	304-845-7726
Wellspring Pregnancy Center	304-810-0292

City Buildings:

Benwood City Building	304-232-4320
Cameron City Building	304-686-2366
Glen Dale City Building	304-845-5511
Marshall County Courthouse	304-845-1220
Moundsville City Building	304-845-6300
McMechen City Building	304-232-3140

To Report Child Abuse please call Centralized Intake 1-800-352-6513

Like us or follow us!

This directory is for informational purposes only. Information provided is believed to be accurate at the time of printing. Any exclusions are purely accidental and do not reflect disapproval. The Marshall County FRN is funded in part by the West Virginia Department of Health & Human Resources. 2020

marshall county frn

Resource Guide

Working together to make Marshall County a better place to live and work.

1501 Second Street
Moundsville, WV 26041
304-845-3300

www.marshallcountyfrn.com

Emergency Services:

American Red Cross	304-232-0711
Cameron Police Department	304-686-2213
Center for Missing and Exploited Children	800-843-5678
Emergency Management Office: (24hr.843-1500)	304-843-1130
Flood Plain Management Office	304-845-0482
Marshall County Fire, Police & Sheriff	911
Marshall Co. Sheriff's Dept. Crime Line	304-843-5422
McMechen Police Department	304-232-3140
Moundsville Police Department	304-845-1611
National Suicide Prevention Life Line	800-273-8255
Northwood Crisis Unit	304-234-3583
Poison Control Center	800-222-1222
Project Safe Childhood (internet safety)	304-234-0100
Safe Schools Helpline	866-723-3982
Veterans Crisis Hotline (text 838255)	800-273-8255
WV DHHR	304-843-4120
YWCA Family Violence Prevention	304-232-2748
WV State Police-Marshall Co. Detachment	304-843-4100

Hospitals:

Reynolds Memorial Hospital	304-845-3211
Reynolds Rapid Care – Benwood	304-221-3014
Reynolds Rapid Care – Moundsville	304-843-3435
MedExpress	304-843-5381
Wheeling Hospital	304-243-3000

Schools:

Cameron Elementary	304-686-3305
Cameron High School	304-686-3336
Center McMechen Elementary	304-232-6530
Central Elementary	304-843-4425
Gateway Achievement Center	304-843-4526
Glen Dale Elementary	304-843-4427
Hilltop Elementary	304-232-8640
John Marshall High School	304-843-4444
Marshall County Board of Education	304-843-4400
Marshall Co. School Delays/Closing	304-843-4424
McNinch Primary	304-843-4431
Moundsville Middle School	304-843-4440
Our Lady of Peace	304-242-1383
Sand Hill Elementary	304-547-5041
Sherrard Middle School	304-233-3331
Washington Lands Elementary	304-843-4420

Utility Assistance:

Catholic Charities Neighborhood Center	304-232-7157
Change, Inc.	304-845-8269
House of the Carpenter	304-233-4640
Information Helpline	304-233-6300
Salvation Army	304-845-0510
St. Vincent de Paul	304-232-4230
WV DHHR	304-843-4120

Utilities:

American Electric Power	800-852-6942
Benwood Municipal Water Works	304-232-4320
Cameron Water Department	304-686-2366
Comcast	800-934-6489
Frontier Phone Services	800-921-8101
Glen Dale Water Works	304-845-4740
Moundsville Water Department	304-845-0380
Mountaineer Gas	800-834-2070
Verizon Phone Service	800-837-4966

Information & Referral Services:

Altenheim Resource & Referral Services	304-243-0996
Change Inc.	304-845-8269
Child Care Resource Center	304-232-1603
Gabriel Project of WV	304-639-5039
Helping Heroes – Veterans	304-810-4291
Information Helpline	304-233-6300
Marshall County Family Resource Center	304-845-3300
Marshall County Family Resource Network	304-845-3300
NAMI	304-238-8277
WV 211 Information & Referral	211

Adult /Senior Services:

AARP WV	866-227-7458
Cameron Senior Center	304-686-2119
Cameron Nursing & Rehab	304-686-3318
Coordinated Council for Independent Living	304-843-2306
Family Services of the Upper Ohio Valley	304-233-2350
Marshall Co. Senior Center/Services	304-845-8200
Mound View Care Center	304-843-1035
Social Security Administration	800-772-1213
WVU Extension	304-843-1170

Programs for Children, Youth & Adults with Special Needs & their Families:

Adena Industries (Northwood)	304-843-1111
Augusta Levy Learning Center	304-242-6722
Autism Speaks/ Autism Response Team	888-288-4762
Easter Seals Rehabilitation Services	304-242-1390
Parent Educator Resource Center	304-843-4457
Marshall Co. Special Needs Preschool (Ext. 356)	304-843-4400
MDA Program	614-841-1014
REM Community Options	304-233-3474
Russell Nesbitt	304-232-0233
Seeing Hand Association	304-232-4810
Special Needs & Autism Parent Support (SNAPS)	304-232-5600
WATCH	304-232-1750
WV Birth to Three	304-214-5775
WV Children with Special Health Care Needs	304-232-4411
WV Division of Rehabilitation Services	304-238-1092
WVU Ctr. For Excellence in Disabilities	888-829-9426

Early Childhood Child Care/Early Education:

Glen Dale UM Child Development Center	304-845-1450
Higher Hills Children's Center	304-905-9541
Hunny Pot Child Care Center	304-233-9744
Moundsville Baptist Church Pre-School	304-845-5316
Northern Panhandle Head Start	304-233-3290

Health Programs:

Adolescent Health Initiative Program	304-845-3300
Adolescent Pregnancy Prevention	800-642-8522
AIDS Task Force	304-232-6822
American Lung Association of WV	304-342-6600
Cameron Community Health Center	304-686-3376
Cancer Resource Center at RMH	304-780-9864
Children's Health Insurance Program	877-982-2447
Dental Hygiene Program of WLU	304-336-8030
Family Medical Care (Change, Inc.)	304-748-2828
Lions Club (Glasses/Eye Exams)	304-559-7917
Marshall County Health Department	304-845-7840
Marshall County WIC	304-845-7426
Mountain Health Trust	800-449-8466
Osiris Shrine Temple	304-242-2911
Valley Hospice	304-242-1977
Wheeling Health Right	304-233-9323
WV Division of Rehabilitation Services	304-238-1092
WV DHHR	304-843-4120
WV Breast & Cervical Cancer Program	800-642-8522
WVU Center for Excellence in Disabilities	800-829-9426

Addiction Counseling/ Drug & Alcohol Support Services:

Al-Anon	888-490-1970
Alcoholics Anonymous (AA)	800-333-5051
BreakThru (withdrawal services)	304-221-4528
Gambler's Anonymous	800-426-2537
HealthWays – Miracles Happen	304-242-0217
Help 4WV	844-435-7498
Mothers Against Drunk Driving	800-438-6233
Narcotics Anonymous	800-251-2426
Northwood Health Systems	304-234-7777
Ohio Valley Recovery Unity Center	304-232-3888
Wellspring Family Services	304-242-7060
WV Tobacco Quitline	800-966-8784
Youth Services System, Adolescent IOP	304-233-9627
YWCA Wind Program (ext. 42 or 45)	304-232-0511

Counseling Services:

Apprisen – Bankruptcy Counseling	800-355-2227
Crittenton – Wellspring Family Services	304-242-7060
Fox Run	800-245-2131
Harmony House Child Advocacy Center	304-230-2205
Northwood Health Systems	304-845-3000
Park Valley Behavioral Health Care	304-218-2023
YWCA Family Violence Prevention Program	304-232-2748
WV Saves	304-234-9221

Youth Programs:

Boy Scouts of America	304-277-2660
4-H Extension Services	304-843-1170
The Sanford Center	304-281-4550
WVU Extension	304-843-1170
YMCA	304-242-8086

NIMS ICS Forms

National Incident Management System Incident Command System

September 2010

FEMA

ICS Forms

02/25/2022

NATIONAL INCIDENT MANAGEMENT SYSTEM
INCIDENT COMMAND SYSTEM

ICS FORMS BOOKLET
FEMA 502-2

September 2010

02/25/2022

INTRODUCTION TO ICS FORMS

The National Incident Management System (NIMS) Incident Command System (ICS) Forms Booklet, FEMA 502-2, is designed to assist emergency response personnel in the use of ICS and corresponding documentation during incident operations. This booklet is a companion document to the NIMS ICS Field Operations Guide (FOG), FEMA 502-1, which provides general guidance to emergency responders on implementing ICS. This booklet is meant to complement existing incident management programs and does not replace relevant emergency operations plans, laws, and ordinances. These forms are designed for use within the Incident Command System, and are not targeted for use in Area Command or in multiagency coordination systems.

These forms are intended for use as tools for the creation of Incident Action Plans (IAPs), for other incident management activities, and for support and documentation of ICS activities. Personnel using the forms should have a basic understanding of NIMS, including ICS, through training and/or experience to ensure they can effectively use and understand these forms. These ICS Forms represent an all-hazards approach and update to previously used ICS Forms. While the layout and specific blocks may have been updated, the functionality of the forms remains the same. It is recommended that all users familiarize themselves with the updated forms and instructions.

A general description of each ICS Form's purpose, suggested preparation, and distribution are included immediately after the form, including block-by-block completion instructions to ensure maximum clarity on specifics, or for those personnel who may be unfamiliar with the forms.

The ICS organizational charts contained in these forms are examples of how an ICS organization is typically developed for incident response. However, the flexibility and scalability of ICS allow modifications, as needed, based on experience and particular incident requirements.

These forms are designed to include the essential data elements for the ICS process they address. The use of these standardized ICS Forms is encouraged to promote consistency in the management and documentation of incidents in the spirit of NIMS, and to facilitate effective use of mutual aid. In many cases, additional pages can be added to the existing ICS Forms when needed, and several forms are set up with this specific provision. The section after the ICS Forms List provides details on adding appendixes or fields to the forms for jurisdiction- or discipline-specific needs.

It may be appropriate to compile and maintain other NIMS-related forms with these ICS Forms, such as resource management and/or ordering forms that are used to support incidents. Examples of these include the following Emergency Management Assistance Compact (EMAC) forms: REQ-A (Interstate Mutual Aid Request), Reimbursement Form R-1 (Interstate Reimbursement Form), and Reimbursement Form R-2 (Intrastate Reimbursement Form).

ICS FORMS LIST

This table lists all of the ICS Forms included in this publication.

Notes:

- In the following table, the ICS Forms identified with an asterisk (*) are typically included in an IAP.
- Forms identified with two asterisks (**) are additional forms that could be used in the IAP.
- The other ICS Forms are used in the ICS process for incident management activities, but are not typically included in the IAP.
- The date and time entered in the form blocks should be determined by the Incident Command or Unified Command. Local time is typically used.

ICS Form #:	Form Title:	Typically Prepared by:
ICS 201	**Incident Briefing**	Initial Incident Commander
***ICS 202**	**Incident Objectives**	Planning Section Chief
***ICS 203**	**Organization Assignment List**	Resources Unit Leader
***ICS 204**	**Assignment List**	Resources Unit Leader and Operations Section Chief
***ICS 205**	**Incident Radio Communications Plan**	Communications Unit Leader
****ICS 205A**	**Communications List**	Communications Unit Leader
***ICS 206**	**Medical Plan**	Medical Unit Leader (reviewed by Safety Officer)
ICS 207	**Incident Organization Chart** *(wall-mount size, optional 8½" x 14")*	Resources Unit Leader
****ICS 208**	**Safety Message/Plan**	Safety Officer
ICS 209	**Incident Status Summary**	Situation Unit Leader
ICS 210	**Resource Status Change**	Communications Unit Leader
ICS 211	**Incident Check-In List** *(optional 8½" x 14" and 11" x 17")*	Resources Unit/Check-In Recorder
ICS 213	**General Message** *(3-part form)*	Any Message Originator
ICS 214	**Activity Log** *(optional 2-sided form)*	All Sections and Units
ICS 215	**Operational Planning Worksheet** *(optional 8½" x 14" and 11" x 17")*	Operations Section Chief
ICS 215A	**Incident Action Plan Safety Analysis**	Safety Officer
ICS 218	**Support Vehicle/Equipment Inventory** *(optional 8½" x 14" and 11" x 17")*	Ground Support Unit
ICS 219-1 to ICS 219-8, ICS 219-10 ***(Cards)***	**Resource Status Card (T-Card)** *(may be printed on cardstock)*	Resources Unit
ICS 220	**Air Operations Summary Worksheet**	Operations Section Chief or Air Branch Director
ICS 221	**Demobilization Check-Out**	Demobilization Unit Leader
ICS 225	**Incident Personnel Performance Rating**	Supervisor at the incident

ICS FORM ADAPTION, EXTENSION, AND APPENDIXES

The ICS Forms in this booklet are designed to serve all-hazards, cross-discipline needs for incident management across the Nation. These forms include the essential data elements for the ICS process they address, and create a foundation within ICS for complex incident management activities. However, the flexibility and scalability of NIMS should allow for needs outside this foundation, so the following are possible mechanisms to add to, extend, or adapt ICS Forms when needed.

Because the goal of NIMS is to have a consistent nationwide approach to incident management, jurisdictions and disciplines are encouraged to use the ICS Forms as they are presented here – unless these forms do not meet an organization's particular incident management needs for some unique reason. If changes are needed, the focus on essential information elements should remain, and as such the spirit and intent of particular fields or "information elements" on the ICS Forms should remain intact to maintain consistency if the forms are altered. Modifications should be clearly indicated as deviations from or additions to the ICS Forms. The following approaches may be used to meet any unique needs.

ICS Form Adaptation

When agencies and organizations require specialized forms or information for particular kinds of incidents, events, or disciplines, it may be beneficial to utilize the essential data elements from a particular ICS Form to create a more localized or field-specific form. When this occurs, organizations are encouraged to use the relevant essential data elements and ICS Form number, but to clarify that the altered form is a specific organizational adaptation of the form. For example, an altered form should clearly indicate in the title that it has been changed to meet a specific need, such as "ICS 215A, Hazard Risk Analysis Worksheet, Adapted for Story County Hazmat Program."

Extending ICS Form Fields

Particular fields on an ICS Form may need to include further breakouts or additional related elements. If such additions are needed, the form itself should be clearly labeled as an adapted form (see above), and the additional sub-field numbers should be clearly labeled as unique to the adapted form. Letters or other indicators may be used to label the new sub-fields (if the block does not already include sub-fields).

Examples of possible field additions are shown below for the ICS 209:

- Block 2: Incident Number.
  - Block 2A (adapted): Full agency accounting cost charge number for primary authority having jurisdiction.
- Block 29: Primary Materials or Hazards Involved (hazardous chemicals, fuel types, infectious agents, radiation, etc.).
  - Block 29A (adapted): Indicate specific wildland fire fuel model number.

Creating ICS Form Appendixes

Certain ICS Forms may require appendixes to include additional information elements needed by a particular jurisdiction or discipline. When an appendix is needed for a given form, it is expected that the jurisdiction or discipline will determine standardized fields for such an appendix and make the form available as needed.

Any ICS Form appendixes should be clearly labeled with the form name and an indicator that it is a discipline- or jurisdiction-specific appendix. Appendix field numbering should begin following the last identified block in the corresponding ICS Form.

INCIDENT BRIEFING (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated: Date: Time:

4. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, impacted and threatened areas, overflight results, trajectories, impacted shorelines, or other graphics depicting situational status and resource assignment)**:**

5. Situation Summary and Health and Safety Briefing (for briefings or transfer of command)**:** Recognize potential incident Health and Safety Hazards and develop necessary measures (remove hazard, provide personal protective equipment, warn people of the hazard) to protect responders from those hazards.

6. Prepared by: Name: _____ Position/Title: _____ Signature: _____

 Date/Time: _____

02/25/2022

INCIDENT BRIEFING (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated: Date: Time:

7. Current and Planned Objectives:

8. Current and Planned Actions, Strategies, and Tactics:

Time:	Actions:

6. Prepared by: Name: _____ Position/Title: _____ Signature: _____

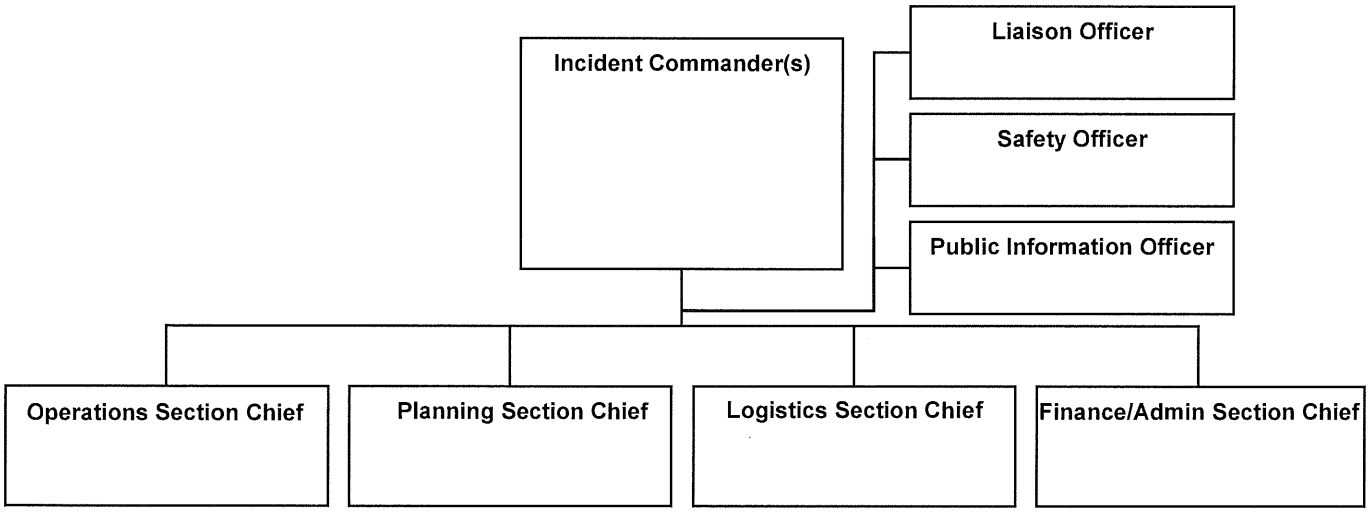
ICS 201, Page 2 Date/Time: _____

02/25/2022

INCIDENT BRIEFING (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated: Date: Time:

9. Current Organization (fill in additional organization as appropriate):



6. Prepared by: Name: _____ Position/Title: _____ Signature: _____

ICS 201, Page 3 Date/Time: _____

02/25/2022

INCIDENT BRIEFING (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated: Date: Time:

10. Resource Summary:

Resource	Resource Identifier	Date/Time Ordered	ETA	Arrived	Notes (location/assignment/status)
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	
				☐	

6. Prepared by: Name: _____ Position/Title: _____ Signature: _____

ICS 201, Page 4 Date/Time: _____

02/25/2022

ICS 201
Incident Briefing

Purpose. The Incident Briefing (ICS 201) provides the Incident Commander (and the Command and General Staffs) with basic information regarding the incident situation and the resources allocated to the incident. In addition to a briefing document, the ICS 201 also serves as an initial action worksheet. It serves as a permanent record of the initial response to the incident.

Preparation. The briefing form is prepared by the Incident Commander for presentation to the incoming Incident Commander along with a more detailed oral briefing.

Distribution. Ideally, the ICS 201 is duplicated and distributed before the initial briefing of the Command and General Staffs or other responders as appropriate. The "Map/Sketch" and "Current and Planned Actions, Strategies, and Tactics" sections (pages 1–2) of the briefing form are given to the Situation Unit, while the "Current Organization" and "Resource Summary" sections (pages 3–4) are given to the Resources Unit.

Notes:

- The ICS 201 can serve as part of the initial Incident Action Plan (IAP).
- If additional pages are needed for any form page, use a blank ICS 201 and repaginate as needed.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Incident Number**	Enter the number assigned to the incident.
3	**Date/Time Initiated** • Date, Time	Enter date initiated (month/day/year) and time initiated (using the 24-hour clock).
4	**Map/Sketch** (include sketch, showing the total area of operations, the incident site/area, impacted and threatened areas, overflight results, trajectories, impacted shorelines, or other graphics depicting situational status and resource assignment)	Show perimeter and other graphics depicting situational status, resource assignments, incident facilities, and other special information on a map/sketch or with attached maps. Utilize commonly accepted ICS map symbology. If specific geospatial reference points are needed about the incident's location or area outside the ICS organization at the incident, that information should be submitted on the Incident Status Summary (ICS 209). North should be at the top of page unless noted otherwise.
5	**Situation Summary and Health and Safety Briefing** (for briefings or transfer of command): Recognize potential incident Health and Safety Hazards and develop necessary measures (remove hazard, provide personal protective equipment, warn people of the hazard) to protect responders from those hazards.	Self-explanatory.
6	**Prepared by** • Name • Position/Title • Signature • Date/Time	Enter the name, ICS position/title, and signature of the person preparing the form. Enter date (month/day/year) and time prepared (24-hour clock).
7	**Current and Planned Objectives**	Enter the objectives used on the incident and note any specific problem areas.

Block Number	Block Title	Instructions
8	**Current and Planned Actions, Strategies, and Tactics** • Time • Actions	Enter the current and planned actions, strategies, and tactics and time they may or did occur to attain the objectives. If additional pages are needed, use a blank sheet or another ICS 201 (Page 2), and adjust page numbers accordingly.
9	**Current Organization** (fill in additional organization as appropriate) • Incident Commander(s) • Liaison Officer • Safety Officer • Public Information Officer • Planning Section Chief • Operations Section Chief • Finance/Administration Section Chief • Logistics Section Chief	• Enter on the organization chart the names of the individuals assigned to each position. • Modify the chart as necessary, and add any lines/spaces needed for Command Staff Assistants, Agency Representatives, and the organization of each of the General Staff Sections. • If Unified Command is being used, split the Incident Commander box. • Indicate agency for each of the Incident Commanders listed if Unified Command is being used.
10	**Resource Summary**	Enter the following information about the resources allocated to the incident. If additional pages are needed, use a blank sheet or another ICS 201 (Page 4), and adjust page numbers accordingly.
	• Resource	Enter the number and appropriate category, kind, or type of resource ordered.
	• Resource Identifier	Enter the relevant agency designator and/or resource designator (if any).
	• Date/Time Ordered	Enter the date (month/day/year) and time (24-hour clock) the resource was ordered.
	• ETA	Enter the estimated time of arrival (ETA) to the incident (use 24-hour clock).
	• Arrived	Enter an "X" or a checkmark upon arrival to the incident.
	• Notes (location/ assignment/status)	Enter notes such as the assigned location of the resource and/or the actual assignment and status.

INCIDENT OBJECTIVES (ICS 202)

1. Incident Name:	2. Operational Period: Date From: Date To: Time From: Time To:

3. Objective(s):

4. Operational Period Command Emphasis:

General Situational Awareness

5. Site Safety Plan Required? Yes ☐ No ☐

Approved Site Safety Plan(s) Located at:

6. Incident Action Plan (the items checked below are included in this Incident Action Plan):

☐ ICS 203	☐ ICS 207	Other Attachments:
☐ ICS 204	☐ ICS 208	☐ _____
☐ ICS 205	☐ Map/Chart	☐ _____
☐ ICS 205A	☐ Weather Forecast/Tides/Currents	☐ _____
☐ ICS 206		☐ _____

7. Prepared by: Name: _____ Position/Title: _____ Signature: _____

8. Approved by Incident Commander: Name: _____ Signature: _____

ICS 202	IAP Page _____	Date/Time: _____

02/25/2022

ICS 202
Incident Objectives

Purpose. The Incident Objectives (ICS 202) describes the basic incident strategy, incident objectives, command emphasis/priorities, and safety considerations for use during the next operational period.

Preparation. The ICS 202 is completed by the Planning Section following each Command and General Staff meeting conducted to prepare the Incident Action Plan (IAP). In case of a Unified Command, one Incident Commander (IC) may approve the ICS 202. If additional IC signatures are used, attach a blank page.

Distribution. The ICS 202 may be reproduced with the IAP and may be part of the IAP and given to all supervisory personnel at the Section, Branch, Division/Group, and Unit levels. All completed original forms must be given to the Documentation Unit.

Notes:

- The ICS 202 is part of the IAP and can be used as the opening or cover page.
- If additional pages are needed, use a blank ICS 202 and repaginate as needed.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident. If needed, an incident number can be added.
2	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (using the 24-hour clock) and end date and time for the operational period to which the form applies.
3	**Objective(s)**	Enter clear, concise statements of the objectives for managing the response. Ideally, these objectives will be listed in priority order. These objectives are for the incident response for this operational period as well as for the duration of the incident. Include alternative and/or specific tactical objectives as applicable. Objectives should follow the SMART model or a similar approach: **S**pecific – Is the wording precise and unambiguous? **M**easurable – How will achievements be measured? **A**ction-oriented – Is an action verb used to describe expected accomplishments? **R**ealistic – Is the outcome achievable with given available resources? **T**ime-sensitive – What is the timeframe?
4	**Operational Period Command Emphasis**	Enter command emphasis for the operational period, which may include tactical priorities or a general weather forecast for the operational period. It may be a sequence of events or order of events to address. This is not a narrative on the objectives, but a discussion about where to place emphasis if there are needs to prioritize based on the Incident Commander's or Unified Command's direction. Examples: Be aware of falling debris, secondary explosions, etc.
	General Situational Awareness	General situational awareness may include a weather forecast, incident conditions, and/or a general safety message. If a safety message is included here, it should be reviewed by the Safety Officer to ensure it is in alignment with the Safety Message/Plan (ICS 208).
5	**Site Safety Plan Required?** Yes ☐ No ☐	Safety Officer should check whether or not a site safety plan is required for this incident.
	Approved Site Safety Plan(s) Located At	Enter the location of the approved Site Safety Plan(s).

Block Number	Block Title	Instructions
6	**Incident Action Plan** (the items checked below are included in this Incident Action Plan): ☐ ICS 203 ☐ ICS 204 ☐ ICS 205 ☐ ICS 205A ☐ ICS 206 ☐ ICS 207 ☐ ICS 208 ☐ Map/Chart ☐ Weather Forecast/ Tides/Currents Other Attachments:	Check appropriate forms and list other relevant documents that are included in the IAP. ☐ ICS 203 – Organization Assignment List ☐ ICS 204 – Assignment List ☐ ICS 205 – Incident Radio Communications Plan ☐ ICS 205A – Communications List ☐ ICS 206 – Medical Plan ☐ ICS 207 – Incident Organization Chart ☐ ICS 208 – Safety Message/Plan
7	**Prepared by** • Name • Position/Title • Signature	Enter the name, ICS position, and signature of the person preparing the form. Enter date (month/day/year) and time prepared (24-hour clock).
8	**Approved by Incident Commander** • Name • Signature • Date/Time	In the case of a Unified Command, one IC may approve the ICS 202. If additional IC signatures are used, attach a blank page.

ASSIGNMENT LIST (ICS 204)

1. Incident Name:	2. Operational Period: Date From: Date To: Time From: Time To:	3. Branch: Division: Group: Staging Area:

4. Operations Personnel: Name Contact Number(s)

Operations Section Chief: _____

Branch Director: _____

Division/Group Supervisor: _____

5. Resources Assigned:

Resource Identifier	Leader	# of Persons	Contact (e.g., phone, pager, radio frequency, etc.)	Reporting Location, Special Equipment and Supplies, Remarks, Notes, Information

6. Work Assignments:

7. Special Instructions:

8. Communications (radio and/or phone contact numbers needed for this assignment):

Name/Function	Primary Contact: indicate cell, pager, or radio (frequency/system/channel)
/	
/	
/	
/	

9. Prepared by: Name: _____ Position/Title: _____ Signature: _____

ICS 204	IAP Page _____	Date/Time: _____

02/25/2022

ICS 204
Assignment List

Purpose. The Assignment List(s) (ICS 204) informs Division and Group supervisors of incident assignments. Once the Command and General Staffs agree to the assignments, the assignment information is given to the appropriate Divisions and Groups.

Preparation. The ICS 204 is normally prepared by the Resources Unit, using guidance from the Incident Objectives (ICS 202), Operational Planning Worksheet (ICS 215), and the Operations Section Chief. It must be approved by the Incident Commander, but may be reviewed and initialed by the Planning Section Chief and Operations Section Chief as well.

Distribution. The ICS 204 is duplicated and attached to the ICS 202 and given to all recipients as part of the Incident Action Plan (IAP). In some cases, assignments may be communicated via radio/telephone/fax. All completed original forms must be given to the Documentation Unit.

Notes:

- The ICS 204 details assignments at Division and Group levels and is part of the IAP.
- Multiple pages/copies can be used if needed.
- If additional pages are needed, use a blank ICS 204 and repaginate as needed.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (using the 24-hour clock) and end date and time for the operational period to which the form applies.
3	**Branch** **Division** **Group** **Staging Area**	This block is for use in a large IAP for reference only. Write the alphanumeric abbreviation for the Branch, Division, Group, and Staging Area (e.g., "Branch 1," "Division D," "Group 1A") in large letters for easy referencing.
4	**Operations Personnel** • Name, Contact Number(s) – Operations Section Chief – Branch Director – Division/Group Supervisor	Enter the name and contact numbers of the Operations Section Chief, applicable Branch Director(s), and Division/Group Supervisor(s).
5	**Resources Assigned**	Enter the following information about the resources assigned to the Division or Group for this period:
	• Resource Identifier	The identifier is a unique way to identify a resource (e.g., ENG-13, IA-SCC-413). If the resource has been ordered but no identification has been received, use TBD (to be determined).
	• Leader	Enter resource leader's name.
	• # of Persons	Enter total number of persons for the resource assigned, including the leader.
	• Contact (e.g., phone, pager, radio frequency, etc.)	Enter primary means of contacting the leader or contact person (e.g., radio, phone, pager, etc.). Be sure to include the area code when listing a phone number.
5 (continued)	• Reporting Location, Special Equipment and Supplies, Remarks, Notes, Information	Provide special notes or directions specific to this resource. If required, add notes to indicate: (1) specific location/time where the resource should report or be dropped off/picked up; (2) special equipment and supplies that will be used or needed; (3) whether or not the resource received briefings; (4) transportation needs; or (5) other information.

Block Number	Block Title	Instructions
6	**Work Assignments**	Provide a statement of the tactical objectives to be achieved within the operational period by personnel assigned to this Division or Group.
7	**Special Instructions**	Enter a statement noting any safety problems, specific precautions to be exercised, dropoff or pickup points, or other important information.
8	**Communications** (radio and/or phone contact numbers needed for this assignment) • Name/Function • Primary Contact: indicate cell, pager, or radio (frequency/system/channel)	Enter specific communications information (including emergency numbers) for this Branch/Division/Group. If radios are being used, enter function (command, tactical, support, etc.), frequency, system, and channel from the Incident Radio Communications Plan (ICS 205). Phone and pager numbers should include the area code and any satellite phone specifics. In light of potential IAP distribution, use sensitivity when including cell phone number. Add a secondary contact (phone number or radio) if needed.
9	**Prepared by** • Name • Position/Title • Signature • Date/Time	Enter the name, ICS position, and signature of the person preparing the form. Enter date (month/day/year) and time prepared (24-hour clock).

COMMUNICATIONS LIST (ICS 205A)

1. Incident Name:	2. Operational Period: Date From: Time From:	Date To: Time To:

3. Basic Local Communications Information:

Incident Assigned Position	Name (Alphabetized)	Method(s) of Contact (phone, pager, cell, etc.)

ICS 205A
Communications List

Purpose. The Communications List (ICS 205A) records methods of contact for incident personnel. While the Incident Radio Communications Plan (ICS 205) is used to provide information on all radio frequencies down to the Division/Group level, the ICS 205A indicates all methods of contact for personnel assigned to the incident (radio frequencies, phone numbers, pager numbers, etc.), and functions as an incident directory.

Preparation. The ICS 205A can be filled out during check-in and is maintained and distributed by Communications Unit personnel. This form should be updated each operational period.

Distribution. The ICS 205A is distributed within the ICS organization by the Communications Unit, and posted as necessary. All completed original forms must be given to the Documentation Unit. If this form contains sensitive information such as cell phone numbers, it should be clearly marked in the header that it contains sensitive information and is not for public release.

Notes:

- The ICS 205A is an optional part of the Incident Action Plan (IAP).
- This optional form is used in conjunction with the ICS 205.
- If additional pages are needed, use a blank ICS 205A and repaginate as needed.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (using the 24-hour clock) and end date and time for the operational period to which the form applies.
3	**Basic Local Communications Information**	Enter the communications methods assigned and used for personnel by their assigned ICS position.
	• Incident Assigned Position	Enter the ICS organizational assignment.
	• Name	Enter the name of the assigned person.
	• Method(s) of Contact (phone, pager, cell, etc.)	For each assignment, enter the radio frequency and contact number(s) to include area code, etc. If applicable, include the vehicle license or ID number assigned to the vehicle for the incident (e.g., HAZMAT 1, etc.).
4	**Prepared by** • Name • Position/Title • Signature • Date/Time	Enter the name, ICS position, and signature of the person preparing the form. Enter date (month/day/year) and time prepared (24-hour clock).

MEDICAL PLAN (ICS 206)

1. Incident Name:	2. Operational Period: Date From: Time From: Date To: Time To:

3. Medical Aid Stations:

Name	Location	Contact Number(s)/Frequency	Paramedics on Site?
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

4. Transportation (indicate air or ground)**:**

Ambulance Service	Location	Contact Number(s)/Frequency	Level of Service
			☐ ALS ☐ BLS
			☐ ALS ☐ BLS
			☐ ALS ☐ BLS
			☐ ALS ☐ BLS

5. Hospitals:

Hospital Name	Address, Latitude & Longitude if Helipad	Contact Number(s)/ Frequency	Travel Time		Trauma Center	Burn Center	Helipad
			Air	Ground			
					☐ Yes Level:_____	☐ Yes ☐ No	☐ Yes ☐ No
					☐ Yes Level:_____	☐ Yes ☐ No	☐ Yes ☐ No
					☐ Yes Level:_____	☐ Yes ☐ No	☐ Yes ☐ No
					☐ Yes Level:_____	☐ Yes ☐ No	☐ Yes ☐ No
					☐ Yes Level:_____	☐ Yes ☐ No	☐ Yes ☐ No

6. Special Medical Emergency Procedures:

☐ Check box if aviation assets are utilized for rescue. If assets are used, coordinate with Air Operations.

7. Prepared by (Medical Unit Leader)**:** Name: _____ Signature: _____

8. Approved by (Safety Officer)**:** Name: _____ Signature: _____

ICS 206	IAP Page _____	Date/Time: _____

ICS 206
Medical Plan

Purpose. The Medical Plan (ICS 206) provides information on incident medical aid stations, transportation services, hospitals, and medical emergency procedures.

Preparation. The ICS 206 is prepared by the Medical Unit Leader and reviewed by the Safety Officer to ensure ICS coordination. If aviation assets are utilized for rescue, coordinate with Air Operations.

Distribution. The ICS 206 is duplicated and attached to the Incident Objectives (ICS 202) and given to all recipients as part of the Incident Action Plan (IAP). Information from the plan pertaining to incident medical aid stations and medical emergency procedures may be noted on the Assignment List (ICS 204). All completed original forms must be given to the Documentation Unit.

Notes:

- The ICS 206 serves as part of the IAP.
- This form can include multiple pages.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (using the 24-hour clock) and end date and time for the operational period to which the form applies.
3	**Medical Aid Stations**	Enter the following information on the incident medical aid station(s):
	• Name	Enter name of the medical aid station.
	• Location	Enter the location of the medical aid station (e.g., Staging Area, Camp Ground).
	• Contact Number(s)/Frequency	Enter the contact number(s) and frequency for the medical aid station(s).
	• Paramedics on Site? ☐ Yes ☐ No	Indicate (yes or no) if paramedics are at the site indicated.
4	**Transportation** (indicate air or ground)	Enter the following information for ambulance services available to the incident:
	• Ambulance Service	Enter name of ambulance service.
	• Location	Enter the location of the ambulance service.
	• Contact Number(s)/Frequency	Enter the contact number(s) and frequency for the ambulance service.
	• Level of Service ☐ ALS ☐ BLS	Indicate the level of service available for each ambulance, either ALS (Advanced Life Support) or BLS (Basic Life Support).

Block Number	Block Title	Instructions
5	**Hospitals**	Enter the following information for hospital(s) that could serve this incident:
	• Hospital Name	Enter hospital name and identify any predesignated medivac aircraft by name a frequency.
	• Address, Latitude & Longitude if Helipad	Enter the physical address of the hospital and the latitude and longitude if the hospital has a helipad.
	• Contact Number(s)/ Frequency	Enter the contact number(s) and/or communications frequency(s) for the hospital.
	• Travel Time • Air • Ground	Enter the travel time by air and ground from the incident to the hospital.
	• Trauma Center ☐ Yes Level:_____	Indicate yes and the trauma level if the hospital has a trauma center.
	• Burn Center ☐ Yes ☐ No	Indicate (yes or no) if the hospital has a burn center.
	• Helipad ☐ Yes ☐ No	Indicate (yes or no) if the hospital has a helipad. Latitude and Longitude data format need to compliment Medical Evacuation Helicopters and Medical Air Resources
6	**Special Medical Emergency Procedures**	Note any special emergency instructions for use by incident personnel, including (1) who should be contacted, (2) how should they be contacted; and (3) who manages an incident within an incident due to a rescue, accident, etc. Include procedures for how to report medical emergencies.
	☐ Check box if aviation assets are utilized for rescue. If assets are used, coordinate with Air Operations.	Self explanatory. Incident assigned aviation assets should be included in ICS 220.
7	**Prepared by** (Medical Unit Leader) • Name • Signature	Enter the name and signature of the person preparing the form, typically the Medical Unit Leader. Enter date (month/day/year) and time prepared (24-hour clock).
8	**Approved by** (Safety Officer) • Name • Signature • Date/Time	Enter the name of the person who approved the plan, typically the Safety Officer. Enter date (month/day/year) and time reviewed (24-hour clock).

SITE SAFETY AND CONTROL PLAN ICS 208 HM	1. Incident Name:	2. Date Prepared:	3. Operational Period: Time:

Section I. Site Information

4. Incident Location:

Section II. Organization

5. Incident Commander:	6. HM Group Supervisor:	7. Tech. Specialist - HM Reference:
8. Safety Officer:	9. Entry Leader:	10. Site Access Control Leader:
11. Asst. Safety Officer - HM:	12. Decontamination Leader:	13. Safe Refuge Area Mgr:
14. Environmental Health:	15.	16.

17. Entry Team: (Buddy System) Name:	PPE Level	18. Decontamination Element: Name:	PPE Level
Entry 1		Decon 1	
Entry 2		Decon 2	
Entry 3		Decon 3	
Entry 4		Decon 4	

Section III. Hazard/Risk Analysis

19. Material:	Container type	Qty.	Phys. State	pH	IDLH	F.P.	I.T.	V.P.	V.D.	S.G.	LEL	UEL

Comment:

Section IV. Hazard Monitoring

20. LEL Instrument(s):	21. O_2 Instrument(s):
22. Toxicity/PPM Instrument(s):	23. Radiological Instrument(s):

Comment:

Section V. Decontamination Procedures

24. Standard Decontamination Procedures: YES: ☐ NO: ☐

Comment:

Section VI. Site Communications

25. Command Frequency:	26. Tactical Frequency:	27. Entry Frequency:

Section VII. Medical Assistance

28. Medical Monitoring: YES: ☐ NO: ☐ 29. Medical Treatment and Transport In-place: YES: ☐ NO: ☐

Comment:

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Section VIII. Site Map

30. Site Map:

Weather ☐ Command Post ☐ Zones ☐ Assembly Areas ☐ Escape Routes ☐ Other ☐

Section IX. Entry Objectives

31. Entry Objectives:

Section X. SOP S and Safe Work Practices

32. Modifications to Documented SOP s or Work Practices: YES: ☐ NO: ☐

Comment:

Section XI. Emergency Procedures

33. Emergency Procedures:

Section XII. Safety Briefing

34. Asst. Safety Officer - HM Signature: Safety Briefing Completed (Time):

35. HM Group Supervisor Signature:

36. Incident Commander Signature:

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INSTRUCTIONS FOR COMPLETING THE SITE SAFETY AND CONTROL PLAN
ICS 208 HM

A Site Safety and Control Plan must be completed by the Hazardous Materials Group Supervisor and reviewed by all within the Hazardous Materials Group prior to operations commencing within the Exclusion Zone.

Item Number	Item Title	Instructions
1.	Incident Name/Number	Print name and/or incident number.
2.	Date and Time	Enter date and time prepared.
3.	Operational Period	Enter the time interval for which the form applies.
4.	Incident Location	Enter the address and or map coordinates of the incident.
5 - 16.	Organization	Enter names of all individuals assigned to ICS positions. (Entries 5 & 8 mandatory). Use Boxes 15 and 16 for other functions: i.e. Medical Monitoring.
17 - 18.	Entry Team/Decon Element	Enter names and level of PPE of Entry & Decon personnel. (Entries 1 - 4 mandatory buddy system and back-up.)
19.	Material	Enter names and pertinent information of all known chemical products. Enter UNK if material is not known. Include any which apply to chemical properties. (Definitions: ph = Potential for Hydrogen (Corrosivity), IDLH = Immediately Dangerous to Life and Health, F.P. = Flash Point, I.T. = Ignition Temperature, V.P. = Vapor Pressure, V.D. = Vapor Density, S.G. = Specific Gravity, LEL = Lower Explosive Limit, UEL = Upper Explosive Limit)
20 - 23.	Hazard Monitoring	List the instruments which will be used to monitor for chemical.
24.	Decontamination Procedures	Check NO if modifications are made to standard decontamination procedures and make appropriate Comments including type of solutions.
25 - 27.	Site Communications	Enter the radio frequency(ies) which apply.
28 - 29.	Medical Assistance	Enter comments if NO is checked.
30.	Site Map	Sketch or attach a site map which defines all locations and layouts of operational zones. (Check boxes are mandatory to be identified.)
31.	Entry Objectives	List all objectives to be performed by the Entry Team in the Exclusion Zone and any parameters which will alter or stop entry operations.
32 - 33.	SOP s, Safe Work Practices, and Emergency Procedures	List in Comments if any modifications to SOP s and any emergency procedures which will be affected if an emergency occurs while personnel are within the Exclusion Zone.
34 - 36.	Safety Briefing	Have the appropriate individual place their signature in the box once the Site Safety and Control Plan is reviewed. Note the time in box 34 when the safety briefing has been completed.

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ACTIVITY LOG (ICS 214)

1. Incident Name:	2. Operational Period: Date From: Date To: Time From: Time To:

7. Activity Log (continuation):

Date/Time	Notable Activities

ICS 214
Activity Log

Purpose. The Activity Log (ICS 214) records details of notable activities at any ICS level, including single resources, equipment, Task Forces, etc. These logs provide basic incident activity documentation, and a reference for any after-action report.

Preparation. An ICS 214 can be initiated and maintained by personnel in various ICS positions as it is needed or appropriate. Personnel should document how relevant incident activities are occurring and progressing, or any notable events or communications.

Distribution. Completed ICS 214s are submitted to supervisors, who forward them to the Documentation Unit. All completed original forms must be given to the Documentation Unit, which maintains a file of all ICS 214s. It is recommended that individuals retain a copy for their own records.

Notes:

- The ICS 214 can be printed as a two-sided form.
- Use additional copies as continuation sheets as needed, and indicate pagination as used.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (using the 24-hour clock) and end date and time for the operational period to which the form applies.
3	**Name**	Enter the title of the organizational unit or resource designator (e.g., Facilities Unit, Safety Officer, Strike Team).
4	**ICS Position**	Enter the name and ICS position of the individual in charge of the Unit.
5	**Home Agency** (and Unit)	Enter the home agency of the individual completing the ICS 214. Enter a unit designator if utilized by the jurisdiction or discipline.
6	**Resources Assigned**	Enter the following information for resources assigned:
	• Name	Use this section to enter the resource's name. For all individuals, use at least the first initial and last name. Cell phone number for the individual can be added as an option.
	• ICS Position	Use this section to enter the resource's ICS position (e.g., Finance Section Chief).
	• Home Agency (and Unit)	Use this section to enter the resource's home agency and/or unit (e.g., Des Moines Public Works Department, Water Management Unit).
7	**Activity Log** • Date/Time • Notable Activities	• Enter the time (24-hour clock) and briefly describe individual notable activities. Note the date as well if the operational period covers more than one day. • Activities described may include notable occurrences or events such as task assignments, task completions, injuries, difficulties encountered, etc. • This block can also be used to track personal work habits by adding columns such as "Action Required," "Delegated To," "Status," etc.
8	**Prepared by** • Name • Position/Title • Signature • Date/Time	Enter the name, ICS position/title, and signature of the person preparing the form. Enter date (month/day/year) and time prepared (24-hour clock).

INCIDENT ACTION PLAN SAFETY ANALYSIS (ICS 215A)

1. Incident Name:	2. Incident Number:

3. Date/Time Prepared:	4. Operational Period: Date From:	Date To:
Date: Time:	Time From:	Time To:

5. Incident Area	6. Hazards/Risks	7. Mitigations

8. Prepared by (Safety Officer): Name: _____ Signature: _____

Prepared by (Operations Section Chief): Name: _____ Signature: _____

ICS 215A Date/Time: _____

02/25/2022

ICS 215A
Incident Action Plan Safety Analysis

Purpose. The purpose of the Incident Action Plan Safety Analysis (ICS 215A) is to aid the Safety Officer in completing an operational risk assessment to prioritize hazards, safety, and health issues, and to develop appropriate controls. This worksheet addresses communications challenges between planning and operations, and is best utilized in the planning phase and for Operations Section briefings.

Preparation. The ICS 215A is typically prepared by the Safety Officer during the incident action planning cycle. When the Operations Section Chief is preparing for the tactics meeting, the Safety Officer collaborates with the Operations Section Chief to complete the Incident Action Plan Safety Analysis. This worksheet is closely linked to the Operational Planning Worksheet (ICS 215). Incident areas or regions are listed along with associated hazards and risks. For those assignments involving risks and hazards, mitigations or controls should be developed to safeguard responders, and appropriate incident personnel should be briefed on the hazards, mitigations, and related measures. Use additional sheets as needed.

Distribution. When the safety analysis is completed, the form is distributed to the Resources Unit to help prepare the Operations Section briefing. All completed original forms must be given to the Documentation Unit.

Notes:

- This worksheet can be made into a wall mount, and can be part of the IAP.
- If additional pages are needed, use a blank ICS 215A and repaginate as needed.

Block Number	Block Title	Instructions
1	**Incident Name**	Enter the name assigned to the incident.
2	**Incident Number**	Enter the number assigned to the incident.
3	**Date/Time Prepared**	Enter date (month/day/year) and time (using the 24-hour clock) prepared.
4	**Operational Period** • Date and Time From • Date and Time To	Enter the start date (month/day/year) and time (24-hour clock) and end date and time for the operational period to which the form applies.
5	**Incident Area**	Enter the incident areas where personnel or resources are likely to encounter risks. This may be specified as a Branch, Division, or Group.
6	**Hazards/Risks**	List the types of hazards and/or risks likely to be encountered by personnel or resources at the incident area relevant to the work assignment.
7	**Mitigations**	List actions taken to reduce risk for each hazard indicated (e.g., specify personal protective equipment or use of a buddy system or escape routes).
8	**Prepared by** (Safety Officer and Operations Section Chief) • Name • Signature • Date/Time	Enter the name of both the Safety Officer and the Operations Section Chief, who should collaborate on form preparation. Enter date (month/day/year) and time (24-hour clock) reviewed.

Attachment 3

H2S Program & Forms

West Virginia Field Operations

Hydrogen Sulfide (H_2S) Contingency Plan

OWNER/OPERATOR

Tug Hill Operating, LLC

380 Southpointe Blvd., Suite 200
Canonsburg, PA 15317

KEY CONTACT FOR H_2S DRILLING CONTINGENCY PLAN DEVELOPMENT AND MAINTENANCE

Jerry V. DeRosa, Director EH&S Affairs
(724) 338-2029 (office)
(412) 736-5767 (cellular)

24-HOUR EMERGENCY PHONE NUMBER

(800) 921-9745

Update Version
April 2021

H_2S DRILLING CONTINGENCY PLAN
Tug Hill Operating, LLC
West Virginia Operations

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H_2S DRILLING CONTINGENCY PLAN
Tug Hill Operating, LLC
West Virginia Operations

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TUG HILL – MULTI-GAS METER ALARM CARD

1.0 INTRODUCTION

1.1 PURPOSE

This Hydrogen Sulfide (H_2S) Contingency Plan (Contingency Plan) is intended to guides personnel in recognizing, preparing, and responding to potentially dangerous H_2S situations during exploration and production operations at Tug Hill Operating (THQA) facilities. The overriding purpose of this plan is to ensure the safety of all on-site personnel as well as those residents in close proximity. Hazards associated with the possibility of encounters with H_2S and the warning signs of H_2S exposure will be covered.

Not all situations can be foreseen, however, nor can detailed instructions be provided for every situation that might be encountered. The guidelines set forth in this document should be considered as a minimum set of requirements for preparing for and dealing with H_2S exposure at a THQA site.

This Contingency Plan is a companion document to and incorporates by reference the Tug Hill Well Site Safety Plan (WSSP) and Integrated Contingency Plan (ICP), as well as the Hydrogen Sulfide section of the Tug Hill Operating Contractor Expectation Manual. Contractors may have additional requirements and are expected to comply with their established corporate policies in addition to THQA's Contingency Plan and the Contractor Expectation Manual (CEM). Personnel should consult the onsite Environmental, Health & Safety (EHS) Coordinator or "Safety Representative" for instruction and guidance on specific situations.

In addition, these guidelines can be used with other heavier-than-air toxic gases, provided that the proper gas detector systems have been installed and calibrated for the specific gas.

1.2 H_2S EXPECTATIONS

Currently there is no expectation of encountering hydrogen sulfide gas in the Marshall or Wetzel County region of West Virginia. Analysis of gas produced in the area has revealed no significant findings of hydrogen sulfide. THQA conducts continuous H_2S monitoring on all drilling pads. Since 2017 to date of issuance of this WSSP, THQA has not encountered H_2S at noteworthy or actionable concentrations.

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2.0 H_2S POLICY

The guidelines and requirements stipulated in this H_2S Contingency Plan are to be implemented (e.g., H_2S detection equipment, training materials, warning signs, etc.) on any well pad where Operations have encountered or are projected to encounter H_2S based upon advisement of the THQA Geosciences Department and/or previously observed conditions.

The THQA H_2S Policy is to consider every encounter with H_2S as potentially lethal until proven otherwise. Operations conducted at THQA locations where work area atmospheric concentrations of H_2S (known or suspected) could exceed 10 PPM are to be conducted in compliance with applicable governmental regulations and in accordance with industry recommended practices.

Upon encountering H_2S, THQA employees or contractors(s) will determine the concentration of H_2S and report this information to THQA Operations Management and the EH&S Department for further evaluation.

3.0 HYDROGEN SULFIED CONTINGENCY PLAN ADMINISTRATION

3.1 SCOPE

The H_2S Contingency Plan provides guidelines for:

- Training
- H_2S Hazard Conditions and Exposure
- Hazard Determination
- Sensors, Alarms and Breathing Apparatus Equipment
- Operating Conditions and Responsibilities
- H_2S Response
- Special concerns

H_2S safety equipment as described herein will be made available when working in a known or suspected H_2S bearing zone. During such instances, the THQA Company Man/Person-in-Charge (PIC) and/or EHS Coordinator will review training records and verify that each employee and contractor has completed required H_2S training.

Included in the Well Site Safety Plan and the **SITE-SPECIFIC DATA** section in the ICP binder are:

- The Figures detailing evacuation routes, safety briefing areas, prevailing wind direction.
- A plat locating the THQA facility and the location of private dwellings, residential areas and public facilities within the potential area of exposure.
- List of **EMERGENCY CONTACTS**

3.2 DISTRIBUTION

A copy will also be provided to the County Office of Emergency Management (OEM) and the West Virginia Department of Environmental Protection (WVDEP) as part of the WSSP submittal.

A hard copy of this Contingency Plan will be kept in the ICP binder onsite.

An electronic copy of this Contingency Plan will be kept on file with the Director of EH&S Affairs for review upon request.

3.3 PERIODIC REVIEW AND UPDATES

The H_2S Contingency Plan will be reviewed as needed. Updates will be implemented and redistributed by the Director of EHS Affairs.

4.0 TRAINING

All THQA personnel and contractors who may be onsite during drilling, completions, and production Operations will be trained at an H_2S awareness level to be familiar with the properties and hazards associated with H_2S. THQA provides awareness-level H_2S training for its employees and this training expectation is communicated to contractors as part of the Contractor Safety Management Program (CSMP) at the time of engagement. Contractors are responsible for training their employees prior to assignment and meet the same objectives consistent with this Plan.

If H_2S has been determined present or projected to be encountered, H_2S safety training certification will be required for all personnel onsite. Only those personnel who have been properly trained and certified in the hazards of H_2S will be allowed on location during Operations when such an H_2S risk is present. In such cases, Contractors are to submit records of training for their workers and all workers would be required to present their training certification card or documentation prior working on-site. These records will be kept onsite with the Company Man.

When warranted, THQA will arrange for on-site certification training to the fulfill the requirement of this policy. The training will be completed prior to spudding the well or commencing with completions Operations. H_2S safety training certification records are kept for all who attend and the Company Man or EHS Coordinator will issue the worker a yellow H_2S hardhat stickers as visual confirmation for those who have received training.

If H_2S has been determined present or projected to be encountered, an H_2S safety briefing prior to start of each shift or tower and hazards and currently readings of H_2S will be documented on the pre-job safety meeting and JSA.

4.1 TRAINING OBJECTIVES

When greater than awareness-level training and certification requirements are implemented, training objectives for workers and supervisory personnel will include:

- Understand the purpose and the function of the H_2S Contingency Plan
- Understand the H_2S related roles and responsibilities of personnel on-site
- Understand the hazards, properties, characteristics, symptoms, and toxicity of exposure to H_2S, as well as associated safety precautions
- Know the potential sources of H_2S on-site and testing/monitoring procedures
- Know the location, use and care of:
    - Windsocks and wind indicators
    - Mechanical blowers
    - Respiratory protection equipment
    - Fixed and portable H_2S detection equipment
    - Fixed and portable LEL gas detection equipment
    - Resuscitation equipment and first aid supplies

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  - Portable fire extinguishers
  - Emergency alarm system

- Know the meaning of H_2S warning signs and alarms
- Know emergency rescue and first aid/CPR procedures

4.2 FREQUENCY

Initial Training – Employees and contractors shall be initially trained to ensure familiarity with the H_2S Program prior to working in a H_2S environment. Training is to be provided to employees whose work responsibilities involve operations where atmospheric concentrations of H_2S could exceed 10 PPM.

Retraining – Employees and contractors shall receive retraining whenever:

- Activities that impose hazards for which an employee has not been previously trained;
- The THQA H_2S Program, the Contingency Plan, regulatory requirements change; or
- Retraining shall also be conducted whenever there are inadequacies in an employee's knowledge or deviations from the H_2S Program are observed. The retraining shall re-establish employee proficiency and shall introduce new or revised methods and procedures as necessary.

Refresher Training - Employees shall receive annual refresher training in the H_2S Program in accordance with their assigned responsibilities. Contractors are responsible for training their employees prior to assignment and meet the same objectives consistent with this Plan.

Verification – THQA will verify that the training outlined in the H_2S Program has been accomplished. The verification will contain the employee's name and signature, the signature of the trainer, the dates of training and documentation of the employee's understanding of the material.

4.2 TRAINING IDENTIFICATION

In addition to training documentation on file, once the employee or contractor has completed or shown proof of training, a yellow H_2S hardhat sticker is to be placed on the individual's hardhat. Workers are expected to have training certification card available indicating that they have completed training.

4.3 H_2S SAFETY DRILLS

If H_2S has been determined present or projected to be encountered, the Company Man/PIC will periodically perform safety drills to test equipment, personnel, and overall responsiveness at the location.

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5.0 H_2S HAZARD EXPOSURE AND DETERMINATIONS

H2S or sour gas is often found in oil and gas formations. It is a colorless gas that is highly toxic and extremely flammable. It is heavier than air and may travel along the ground or accumulate in low-lying areas. At low concentrations, it smells like "rotten eggs," but at higher concentrations it does not have a noticeable odor. At higher concentrations it can quickly – almost immediately – overcome unprotected workers, including rescue workers. This swift unconsciousness is often referred to as "knockdown."

5.1 EXPOSURE TO H_2S BY INHALATION

Exposure by breathing (inhalation of) H_2S is a primary concern when H_2S is present. H_2S fires and explosions occur at much higher concentrations than exposure limits (i.e., death can result from H_2S inhalation exposures of 700-1000 ppm, while fire and explosion hazards are at levels above 40,000 ppm).

H_2S accompanies the release of any oil or gas from a well system where H_2S exists. H_2S gas causes a wide range of health effects depending on how much H_2S is inhaled, and for how long. Exposure to high concentrations can quickly lead to incapacitation and death. The NIOSH IDLH (Immediately Dangerous to Life and Health) limit is only 100 parts per million (ppm).

Heallth effects of H_2S exposure are listed by concernation in Table 4 attached to this Plan. The OSHA permissible exposure limit (PEL) to H2S for general industry is 20 ppm, which is not to be exceeded at any time during an 8-hour shift, except that an exposure of 50 ppm H_2S is allowed for up to 10 minutes per 8-hour period as long as no other measurable exposure occurs during that 8-hour time period (see 29 CFR 1910.1000, Table Z-2). Health effects begin with prolonged exposures as low as 2 to 5 ppm – potentially resulting in nausea, tearing of the eyes, headaches, and loss of sleep. Generally, industry practice uses 10 ppm as an alarm set point to warn workers of the hazard, and to evacuate the area, and the NIOSH Recommended Exposure Limit is 10 ppm.

H_2S sometimes can be detectable by its characteristic odor; however, the sense of smell cannot be relied upon to provide a warning of higher concentrations of the gas (i.e., greater than 100 ppm) because H_2S rapidly eliminates the sense of smell (due to paralysis of the olfactory nerve). Longer exposures to lower concentrations also have a similar desensitizing effect on the sense of smell. Never rely on sense of smell for the presence of H_2S.

5.2 COMMON H_2S SOURCES

The most common H_2S sources during drilling activity are in the mud handling, rig floor, pits or during connection operations.

- Gases diffusing from recovered drilling samples taken.
- Gases that are "swabbed" up the drill string when a core, down-hole tool, or logging tool is recovered and escape when the drill string is opened at the rig floor.
- Gases that escape from down-hole or logging tools when opened in the laboratory after use.

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- Gases displaced when the inner core barrel is washed out.
- Decomposition of recovered H_2S clathrates.
- Well blowout that releases gases up through the drill string or into the surrounding waters.
- Gases diffusing through the drilling fluids, on rig floor, pits, and other mud handling or transferring system.

In all these cases (except for clathrates and blowout situations), the source of H_2S is small in volume or must pass through a small opening first (i.e., the open end of the drill string) before reaching a work area.

5.3 H_2S HAZARD DETERMINATION

There are five H_2S hazard conditions, excluding "normal operations" (see that attached **Table T1**).

The H_2S hazard condition sign is set by the Company Man/PIC based on the concentration of H_2S (in parts per million or "ppm") in air, the type of H_2S source, the location of the detector (open air or confined space), and the relative distance of the detector from the H_2S source.

To determine the H_2S hazard action level **see "Table T1".** It is important to remember the following facts:

- H_2S concentrations will diminish with distance from the source.
- Moving air will greatly reduce the concentration of H2S with distance from the source.
- Moving air can direct H_2S away from the sensor.
- H_2S is denser than air and will accumulate in unventilated rooms or in low lying areas, (e.g., in the well cellar, pits, between tanks; and ditches or valleys).

The following examples demonstrate why it is important to understand where and how H_2S was detected before assigning a hazard classification.

- H_2S has been swabbed up the drill pipe and released onto the drill floor when the pipe was opened to retrieve a core barrel.
- A fixed detector, mounted 10 ft away and downwind from the open drill pipe, measures an H_2S level of 4 ppm (no alarm).
- On the core-receiving station, or at gassing point of drill pipe, H_2S measures 100 ppm using a portable detector with the sampling tube.

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6.0 H_2S DETECTORS AND ALARMS

Table T2 is an example of typical sensor and alarm locations on a drilling pad. At the time of Operations, the Company Man/PIC and EHS Coordinator will identify site-specific locations based upon actual layout and prevailing wind direction. This table is provided for guidance *only* and may be modified by the Company Man and the on-site EHS Coordinator or as the situation and experience with the local H_2S environment dictates.

6.1 FIXED-AREA DETECTION STATIONS

Fixed-area detection stations are mounted around the well site **(see "Table T2")** where H_2S sources are present or in areas where H_2S may accumulate. One H_2S and one Lower Explosive Limit (LEL) sensor is attached to each detection station. The stations are mounted in open areas and continuously monitor for H_2S and combustible gases in the work area atmosphere.

Alarm control panels are mounted in strategic locations to provide the workers, Company Man/PIC, and Rig or Frac Manager immediate notification of a hazardous conditions. Examples of areas to position control panels may include at or near the doghouse/rig floor and the Company Man trailer/Primary Muster location.

All fixed H_2S sensors are set to detect a minimum of 10 ppm. Warning lights and siren units should be installed on the rig floor and the working pits. If H_2S is present at concentrations at or above 10 ppm, a local audible and visual alarm will sound. At the same time, an audible and visual alarm will be triggered on the central alarm panel.

For detailed operating instructions and specifications, see the manufacturer's operator manual.

6.2 PERSONAL DETECTORS

H_2S monitors (personal, portable or fixed) are to be utilized in THQA drilling, completion, well servicing, workover, and production operations where atmospheric concentrations of H_2S could exceed 10 PPM.

Supervisors are responsible for assuring that H_2S monitoring equipment is available to protect employees involved in H_2S operations. The EHS Coordinator is responsible for recommending appropriate H_2S monitoring equipment to be utilized in THQA operations.

THQA employees and contractor workers are responsible for utilizing H_2S monitoring equipment provided in accordance with the Contractor Expectations Manual and H_2S Program requirements and training received.

THQA will issue H_2S monitors to its personnel working on location. Contractors are responsible to provide their own workers with monitors. If THQA assigns a monitor to workers of Contractors, the Contractor is responsible to ensure that the workers wears, utilizes and returns the monitors in proper worker condition. **<u>H_2S Monitor is to be worn in the breathing zone (NOT on your boot or hard hat).</u>**

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EHS Coordinator, Company Man, Rig Manager, and Tool Pusher will be issued 4-gas monitors that can detect H_2S as well as CO, O2, and LEL .

Attached to the Contingency Plan is the **Tug Hill – Multi-Gas Meter Alarm Card** providing ready reference gas concentration risk levels and appropriate response actions by the wearer of the gas monitor. These Multi-Gas Meter Alarm Cards are issued at the time of CEM Safety Orientation and/or on-site H_2S awareness training.

Personal monitors are designed to alert the wearer when the H_2S concentration level reaches 10 PPM or greater. If your monitor alarms, notify the Rig Manager or Tool Pusher, who will notify the Company Man and EHS Coordinator immediately.

THQA employees and contractors assigned H_2S personal monitors must:

1. Wear personal monitors on the collar area outside of all clothing for the complete workday at THQA locations where atmospheric concentrations of H_2S could exceed 10 PPM.
2. Check personal monitors daily or before each use to ensure that they are operating properly in accordance with the monitor manufacturer's recommendations. Monitors that do not perform properly in this "go/no-go" check are to be removed from service and repaired.
3. Calibrate personal monitors in accordance with monitor manufacturer's recommendations and procedures utilizing approved calibration kit.
4. Report any perceived malfunctions of the monitor and perform routine maintenance on personal monitors in accordance with monitor manufacturer's recommendations and procedures. All repairs are to be performed only by the manufacturer or an authorized distributor technician.
5. Store monitors in a clean dry place. Personal and portable monitors are to be carried in the interior of vehicles and not in toolboxes. Monitors are not to be left in direct sunlight or in extremes of heat or cold. Necessary precautions are to be taken with all types of monitors to ensure that the sensor head is protected, does not become clogged with dust or dirt and that it does not become saturated with water or petroleum products.
6. Not place monitors in high H_2S concentration or high humidity untreated gas lines, sample ports or in the vapor space above tanks to check the alarm on the equipment. Such practice can cause irreparable damage to the monitor sensor. Use calibration gas to "bump" test a monitor.
7. Questions concerning personal monitor selection, operation, calibration, maintenance or repairs are to be directed to the EHS Coordinator.

Continuous reading portable monitors are to be used to:

1. To survey suspect areas
2. To find sources of leaks

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3. When lines, valves or vessels are opened
4. For confined space entry activities including maintenance and inspection

6.3 CONFINED SPACE

Confined spaces in field areas may include enclosures, oil and condensate tanks, gun barrels, heaters, separators, treaters, well cellars, excavated areas around flow lines (bell holes), open pits, and open produced water storage tanks.

Portable monitors are to be used in the following manner:

1. Prior to initiating work, the portable monitor is to be used to thoroughly check the complete work area.
2. Monitors are to be used with a probe so entry into the suspect area can be limited. The emphasis on monitoring must be on low lying areas where H_2S is prone to concentrate.
3. If the suspect area must be entered to perform the initial check, then respiratory protection must be worn.
4. Once the initial check of the area has been completed, the portable monitor is to be placed in the immediate work area and used for the duration of the work task.
5. If the work task requires workers to be more dispersed, then additional portable monitors are to be utilized.
6. H_2S can become isolated to small areas and the gas has been known to increase from a low concentration to a hazardous level within several feet.

When H_2S levels are above 10 ppm, use a detector...don't assume! Always use a portable H_2S detector to monitor H_2S levels in a confined space. Low oxygen levels can be just as lethal as H_2S. In some cases, it is necessary to use both types of meters. H_2S levels may be safe at the entrance to a confined area but can change quickly to lethal levels, depending on the source. H_2S is denser than air and will settle into low areas. Do not enter a confined space without using a SCBA to rescue someone who has passed out.

For additional information, see the Confined Space Entry Program.

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7.0 RESPIRATORY PROTECTION

Respiratory protection equipment is to be provided for employees where atmospheric concentrations of H_2S could exceed 10 PPM.

Local Supervisors are responsible for assuring that respiratory protection equipment is available for routine and emergency use to protect employees involved in H_2S operations. Respiratory protection equipment is to be readily available to employees.

The EHS Coordinator is responsible for recommending appropriate respiratory protection to be used in THQA operations involving H_2S and for conducting or coordinating respiratory protection training for employees.

Employees required to use respiratory protection equipment on a routine or emergency basis are to receive medical clearance and annual training to ensure the proper and safe use of such equipment. Additional information may be found in the Respiratory Protection Program.

7.1 RESPIRATOR SPECIFICATION REQUIREMENTS

Only National Institute for Occupational Safety and Health/Mine Safety Health Administration (NIOSH/MSHA) approved positive pressure self-contained breathing apparatus (SCBA) or positive pressure airline units with an emergency egress bottle with an air supply of at least five (5) minutes duration are to be provided and used. Canister-type gas masks or any other type of air purifying respirators shall not be used in H_2S environments.

Breathing air in SCBAs and airline respirators shall meet the specifications for Grade D breathing air. Suppliers of compressed breathing air must furnish written documentation that air meets Grade D specification. A copy of this documentation must be kept on file at each location where breathing air is used.

7.2 RESPIRATOR MEDICAL CLEARANCE REQUIREMENTS

Employees must be physically able to utilize a SCBA or airline unit if they are to be assigned to a work location involving H_2S operations. Employees who may be required to wear respiratory protection equipment on a routine or emergency basis will undergo a medical status evaluation. A THQA authorized physician shall determine if an employee is approved to wear a respirator.

7.3 RESPIRATOR TRAINING REQUIREMENTS

Employees expected to wear respirators for routine or emergency use are to receive annual training to ensure the proper and safe use of respirators.

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7.4 RESPIRATOR USE REQUIREMENTS

Suspected Exposure - Respiratory protection use is mandatory where atmospheric concentrations of H_2S could exceed 10 PPM or where the concentration is unknown. Work tasks that may expose employees to unknown or suspected H_2S atmospheres of 10 PPM or more include:

- For confined space work when the atmospheric concentration of H_2S has not yet been determined and entry is required to perform the initial check.
- During emergency rescue where there is the slightest chance that the victim has been overcome by H_2S.
- When checking known or suspected leaks at THQA operated locations, facilities and pipelines involved in H_2S service.
- When it is necessary to evacuate the work environment due to a sudden release of H_2S.
- When conducting initial H_2S surveys when concentrations are unknown.

When atmospheric concentration of H_2S exceeds 100 PPM (IDLH), the use of a standby person is required. Tank gauging and other operations requiring open thief hatches on tanks require a standby person when the concentration of H_2S is 100 PPM or greater measured level with the thief hatch. The standby person is required at all times, including call outs, and must have positive pressure SCBA immediately available.

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8.0 OPERATING CONTROLS WHEN H_2S IS SUSPECTED

8.1 SITE ACCESS CONTROL

During operations where the potential for H_2S is suspected, access will be limited by the security guard positioned at the site entrance. Only those with the previously described H_2S training will be allowed unattended entry.

Those individuals who have not been trained may be escorted by a trained individual at the discretion of the company man or EHS Coordinator.

8.2 RESPONSE EQUIPMENT

The following section details H_2S safety equipment to be utilized at THQA drilling operations where atmospheric concentrations of H_2S could exceed 10 ppm. Equipment is located and actively maintained onsite during operations where an H_2S encounter is suspected. All personnel who may be expected to use this equipment must be "fit for duty". An authorized THQA representative will have the final authority to make the determination. Both portable and stationary equipment will be in use.

- Safety trailer with breathing air cascade and manifold system (Minimum 10 - 300 ft^3 cylinders/4 manifolds)
- Airline (NIOSH approved airline hose/sufficient footage for location setup and complement of personnel)
- Air-supplied airline respirators with emergency escape bottles (Minimum 8 NIOSH approved units)
- SCBA respirators (Minimum 5 NIOSH approved units with 30-minute air supply)
- Portable H_2S monitor
- "H_2S Warning" sign (Minimum 2)
- "H_2S Condition" sign (Minimum 2)
- "Safety Briefing Area" sign (Minimum 2)
- Windsock (Minimum 2) and/or Streamers
- Sample gas (sufficient quantity for daily testing of sensors)
- First aid kit
- Resuscitator/spare cylinder
- Hand portable fire extinguisher (Minimum 20# ABC)
- Full-body harnesses/lifelines (Minimum 2)
- Portable combustible gas detector

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8.3 OPERATIONS

During normal drilling operations, H_2S is typically first detected by odor (<1 ppm). When an H_2S odor is detected, the company man should be notified immediately. After consultation with the operations manager, Director EH&S Affairs, and all personnel have been made aware, the manager determines whether or not an H_2S hazard conditions exists.

During an H_2S hazard condition of ALERT (Light is Yellow) or higher, all drilling operations are suspended until the pre-site H_2S preparations are completed, monitoring, including H_2S safety training, which can be given to each shift before they start work.

In addition, the company man can permit drilling operations to resume while fixed-station detectors are being installed, provided portable detectors are available for monitoring and H_2S levels do not exceed 10 ppm when measured at the drill string or core.

8.4 GENERAL SAFETY PRACTICES FOR POTENTIAL H_2S

- At a minimum, a fixed detector must be installed on the rig floor and in several points of the mud handling system.
- Use fans to ventilate work areas. Fans can keep the H_2S concentration low enough so that SCBAs are not required
- Always use the buddy system when working in potentially hazardous areas
- Always check PPE at the beginning of the work shift. Never assume that someone has left it in working order
- Do not let materials pile up around fixed H_2S sensors
- While cleaning/steaming rig area, Do Not Steam Clean Sensors

8.5 POTENTIAL H_2S POTENTIAL BLOWOUT

Although unlikely, a set of circumstances could occur that would cause an H_2S discharge gas up through the drill string. The first sign that this situation is occurring would be backflow when the drill string is opened.

Although considered unlikely in the THQA operating area in West Virginia, this drill string H_2S observation represents a potential to escalate into an H_2S blowout. There are many situations other than a blowout that can cause backflow, but while drilling in an environment where H_2S is present the following steps should be taken if backflow is detected unless otherwise instructed by the installation manager:

- The drill string is reconnected as quickly as possible.
- The safety technician checks atmosphere for H_2S.
- The safety technician notifies the driller, and manager will take charge of the situation.
- Safety technicians await instructions from the manager.

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The toxic hazards associated with H_2S exposure are serious at well sites. Maintain strict diligence to prevent and control exposure. Post warning signs indicating the hazards associated with the release of H_2S at any well site that has H_2S present in the system at high concentrations.

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9.0 H_2S HAZARD ROLES AND RESPONSIBILITIES

Each person on location has a responsibility to work safely and make known any unsafe or hazard work condition; this includes hazards related to H2S exposure.

9.1.1 Tug Hill Company Man/PIC

- Understands the H_2S guidelines and policies set forth in this document and ensures that all personnel observe the same;
- Informs the Tool-Pusher, Driller, EHS Coordinator, and additional personnel of the current H_2S hazard condition;
- Responsible to restrict entry to pad in a Level III or Level IV Alarm condition; and
- May modify the policies in this document to fit the safety requirements of the situation.

9.1.2 Driller and Tool Pusher or Frac Supervisor

- Assists the Company Man in enforcing the policies set forth in this document;
- Ensures all Rig Personnel have training;
- Collaborates with EHS Coordinator and Company Man to conduct drills;
- Assigns an individual to monitor H_2S levels on the core-receiving platform, drilling platform or in the core laboratory facility;
- Communications Alarm conditions and keeps staff informed of the H_2S hazard situation;
- Keeps management informed of H_2S hazard situation; and
- Is qualified to assist in all emergency procedures.

9.1.3 EHS Coordinator

- Knows and executes the H_2S monitoring policies/guidelines set forth in this document;
- Monitors H_2S detection system for functionality and coordinates repairs with contractor;
- Ensures that safety equipment supplied by 3rd party contractor is in good working order;
- Completes head count and accounts for personnel on location during muster events;
- Coordinates with Company Man and Driller to facility drills;
- Communicates with Tug Hill EH&S Director and WVDEP for reporting;

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- Keeps the on-site manager, tool-pusher, driller, and all on-site personnel, advised of the H_2S situation in their work area, and provide guidance in the evacuation/rescue procedures;
- Ensures all personnel on location have had required H_2S training;
- Ensures personal monitors/meters on location are accounted and calibrated;
- Serves as Safety Representative on location in the event of an incident; and
- Conducts Incident Reporting and Investigation.

9.1.4 <u>All Personnel</u>

All personnel working in the designated hazardous areas (rig floor, core-receiving platform) must:

- Be familiar with the procedures outlined in this document;
- Complete an H_2S safety training course;
- Be responsible for their PPE including proper storage and accessibility;
- Responsible for your personal monitor condition and calibration;
- Be familiar with the location of all safety equipment in your respective work areas and be able to use it upon notice;
- Stay informed of the current H_2S hazard condition; and
- Follow instructions set forth in this document or as provided by your supervisor.

9.2 THIRD-PARTY H2S MONITORING COMPANY

If conditions warrant, THQA may engage a 3rd party H_2S monitoring and response Contractor to provide a 2-man crew during 24/7 operations, and a single man crew when daylight-hour operations only are being conducted. When operations are underway that require the use of respirators, this 3rd party monitoring company will be acting as H_2S Safety Advisors and Emergency Response and will have the full authority of the on-site THQA Representative.

Respirators, sensors, alarms and personal H_2S monitors will be periodically checked, calibrated, and recharged by the H_2S monitoring contractor.

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10.0 RESPONSE TO HAZARDOUS CONCENTRATIONS

10.1 INITIAL RESPONSE TO H_2S EMERGENCY CONDITION

Unexpected H_2S Release

Regardless of the source, the emergency alarm will be audible and/or visual and will be detectable by all personnel on location. All personnel are advised to following these initial guidelines:

- DO NOT PANIC! Identify your best route of escape.
- If available, put on a 5-minute escape unit or Breathing Apparatus, Supplied Air Respirator; (hold your breath while evacuating if supplied air breathing equipment such as 5-minute escape units are not available).
- Rapidly evacuate the area containing the H_2S and move upwind or cross wind if possible and evacuate anyone who may be affected by the gas to a safe area.
- Put on air breathing equipment before helping anyone overcome by H_2S.
- Assemble at Primary Muster Point or alternate upwind Muster Point and wait to receive instructions.
- Drilling/coring operations remain suspended until the source of H_2S is located and the atmospheric level falls to a level <10 ppm.
- The buddy system is utilized for all personnel remaining in the potential danger area.

10.2 PROCEED TO THE PRIMARY OR SECONDARY MUSTER POINT

The Primary Muster Point is located at the Company Man Trailer. The Guard Shack on the Access Road to the Pad is the Secondary Muster Point.

Be cognizant of the wind direction. If the wind direction is towards the Primary Muster location and you are on the upwind side of the H_2S release, use the 5-minute escape pack or SCBA to proceed to the Muster location. If you DO NOT have access to an escape pack or SCBA, do your best to communicate to someone who has a radio or to your supervisor of your location and evacuate the pad in the upwind direction.

Muster Areas will be monitored throughout the response. All personnel not assigned emergency duties will proceed to the safe-briefing area. Personnel must avoid entering areas designated as potential H_2S danger areas as they proceed to the safe-briefing areas.

10.3 INCIDENT REPORTING AND ACTIVATION OF THE ERP

If dangerous levels of H_2S are detected, report the incident as soon as it is safe to do so, pursuant the Tug Hill **Incident Response and Notification Procedure** and implement the procedures described in this H_2S Contingency Plan and the Tug Hill ERP, which are provided in this WSSP and

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ICP binder. This plan specifies the roles and responsibilities of on-site personnel in case of emergency and addresses emergency notification of potentially affected residents and public emergency response personnel.

After initial assessment of the situation, if H_2S gas is detected and confirmed at sustained concentrations above 10 ppm, the Tug Hill Operations management or the Director EH&S Affairs will notify the County EMA and the WVDEP Inspector. If the Director of EH&S Affairs cannot be reached, the EHS Coordinator or the Company Man will make the notification as soon as practicable.

If the situation is of immediate danger to life and health, Unfired Command/Incident Command ("UIC") will be established pursuant the Incident Command System (ICS) in the ERP.

UIC will assess and determine if evacuation is desired and the size of protective zone for local residents (e.g., 1,500 feet from center of pad – See Well Siting Exhibits in the WSSP).

If the agency directs, on-site Tug Hill personnel and Contractors will be engaged to notify all local potentially impacted residents of the incident by dispatching workers to each potentially affected residence. If the public emergency responder does not direct this notification to be made by the Operator, then the public response agency will be responsible for this notification.

Tug Hill commits it full cooperation and assistance in making notifications to residents and assisting to maintain the designated protective zone. Tug Hill resources include the workers onsite and other Operations personnel, as well as our Incident Command Structure, EHS Department personnel and contractors, and the Tug Hill Land Department Land Agents.

10.4 PROTECTION ZONES

In cooperation with the UIC, the On-Scene Incident Commander, or his designee, shall determine protective zones to limit the risk of exposure to workers, local responders, and residents surrounding the work area.

The Safety Zone Map and Parcel Owners listed is provided in the **SITE-SPECIFIC DATA** section of the WSSP and ICP binder for each location.

Life safety impacts to the environment, and property conservation are priorities. The Emergency Protection Zones based on the following information on the scene:

- Magnitude of the incident
- Wind Direction
- MSDS of applicable materials
- Current and forecasted weather conditions
- Topography and land conditions
- Other influences specific to the incident

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Once established, these zones will be maintained until a determination is made by the Emergency Coordinator to alter or discontinue them. Tug Hill will contact local residents and will post personnel on all roads within the zone to prevent entrance to the area until an all clear has been issued. The initial contact will be conducted by telephone and, for those that cannot be reached, a drive by will be initiated.

10.5 FIRST AID

If a person is overcome by H_2S gas, immediate first aid treatment is vital. Degree of H_2S poisoning and probability of respiratory failure will vary depending on the concentration of H_2S gas, the duration of exposure, and the physiological and psychological condition of the individual.

The primary objective is managing first aid treatment of H_2S exposure is to provide the person with fresh breathing air (oxygen), free of gas contamination.

The following steps are a basic guideline to follow in managing first aid treatment for a person overcome by H_2S gas:

1. Once in a fresh breathing air area, provide mouth-to-mouth artificial respiration or mechanical oxygen resuscitation (only if properly trained). NOTE: Oxygen applied to a greasy face will burn where it is greasy.
2. Provide CPR (Cardiopulmonary Resuscitation) only if required and properly trained.
3. Once revived, treat for shock and do not leave unattended.
4. Transport to professional medical care at once. Although the person may seem to have recovered, do not rely on their sense or appearance – all victims of H_2S gas poisoning shall receive professional care as soon as possible. It is important for persons working around H_2S gas areas to have proper training (American Red Cross courses or American Heart Association courses or Medic First Aid) in mouth-to-mouth artificial respiration and CPR.

10.6 RESCUE

All emergency rescue attempts must be performed by personal trained and qualified personnel. Rescue attempts in an H_2S gas release area requires the rescuer to don a positive pressure type SCBA or airline units with emergency egress bottle. Do not attempt rescue without the proper respiratory protection or the rescuer may become a victim.

1. Notify emergency response services and your supervisor.
2. Put on a SCBA before proceeding to assist anyone affected by the gas. Check pressure and don emergency respiratory protection equipment, making certain of a good seal on the face piece.
3. Put on a rescue harness with a minimum of 50 ft. of rescue line and obtain standby assistance before entering the area if the person is in a high-concentration area.

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4. Remove the individual from the suspected area to a safe location upwind and away from the source of H_2S emissions.
5. Once removed from the area, open the individual's airway, check for breathing. Begin mouth-to-mouth artificial respiration if the individual is not breathing.
6. Check for pulse. Initiate CPR if circulation has stopped.
7. Treat for shock.
8. If emergency medical personnel cannot be summoned to the scene quickly, the individual should be taken to the nearest hospital.
9. Continue mouth-to-mouth artificial respiration or CPR during transport. Once started, CPR should be continued until the individual recovers or until turned over to emergency service personnel.

All individuals reacting to H_2S exposure, which includes showing signs of severe persistent irritation, faintness, sluggishness, eye pain, convulsions, nausea, vomiting, confusion or unconsciousness, are to receive medical attention and remain under observation until released by a physician.

10.7 POST-INCIDENT FOLLOW-UP AND DOCUMENTATION

After the well and site are secured and it is safe to access the area, post-incident investigation of the conditions and circumstances leading up and during the incident is required. The time, date, weather conditions, Operational details, geologic formation, pressures recorded, personnel sign-in sheets, and information and logs regarding where, when and how the H_2S release occurred are to be preserved and provided to the EHS Department. Logs of landowner and agency communications will also be required.

Personal medical information regarding injured parties is to be kept confidential and handled in a discrete and confidential manner and shared solely with the EHS Director and/or human resources of the employer.

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Tables

Table T1

Hydrogen Sulfide Operating Conditions Hazard Action Levels

H_2S condition	Conc. ppm	Level Risk	Action
	Open air		
Normal operations	No H_2S potential	None/NA	None
Watch/Green	Potential H_2S Odor	None/NA	Monitor/Be Alert
Alert/Yellow	1–10 ppm	Low	Report Use Caution Inform All Personnel Continuously Monitor for changes
Danger/Red	>10 ppm to 15 ppm	Low - Moderate	At 10 PPM company man will instruct the rig to pull up, start circulating and prepare to shut-in. Report to Company Man and EHS Coordinator Pair Up / Buddy System Check Wind Direction Notify All Personnel Muster at Primary or Upwind Muster Pt. Check Head Count and Names EHS and Company Man Check Sensors Functions Monitor for Changes in Concentration EHS to Notify WVDEP Inspector
Danger/Red	15-25 ppm	Moderate OSHA STEL (15 min) is 20 ppm	**ALL ABOVE ACTIONS PLUS:** Don 5 Minute Escape Pack Shut the Air/Mud Pumps Shut-in the Well Evacuate Rig Establish Red Zone
Elevated Emergency	>25 ppm	Extreme Danger	Evacuate all personnel to Primary Muster if concentration at Primary Muster Area is <10 ppm Evacuate to Off-Site Muster at Security Shack if sustained conc. is >25 ppm at Primary Muster Initiate Emergency Procedures Guard to STOP all access SCBA or Supplied Air Required to Enter Red Zone If concentrations off pad >100 ppm, work with County OEM (EMA?)/ EMA to notify residents within 3,000 ft.

Table T2

Locations of Sensors, Alarms and Breathing Apparatus Equipment

Sensor Locations **LEL and H_2S Sensors are at Each Location**	**Sensor #** **(To be shown on Site Plan)**	**Visible Flash or Audible Siren**
Rig Floor – Back of Draw-works	LEL – T-# H_2S – T-#	**Both**
Well Cellar/BOP – LEL and H_2S on opposing I-Beams	LEL – T-# H_2S – T-#	**Both**
Shaker – (Prevailing Downwind Side)	LEL – T-# H_2S – T-#	**Both**
Backyard Near Mud Mix-off Half-Round (Downwind)	LEL – T-# H_2S – T-#	**Both**
Other?	LEL – T-# H_2S – T-#	
Other?	LEL – T-# H_2S – T-#	
Other?	LEL – T-# H_2S – T-#	
Other?	LEL – T-# H_2S – T-#	
Location of Self-Contained Breathing Apparatus (SCBA)	**Escape Packs**	**SCBA**
2 SCBA at Primary Muster Point		**X**
2 SCBA at Secondary Muster		**X**
5-Minute Escape Packs		
Excavator – 1 Pack	**X**	
Shaker Catwalk – 2 Packs – One at Each End	**X**	
Rig Dog House – 2 Packs	**X**	
Rig Floor – 2 at Each Stairway – On-side and Off-side	**X**	
Hopper House – 1 Pack	**X**	

Table T3

Breathing Apparatus Required before Opening Drill String

H_2S hazard condition	Pit/Mud (handling area)	Rig floor crew	Driller (driller's shack)
Watch	None	None	No
Alert	In ready state	In ready state	In ready state
Danger	Yes	Yes	Yes
Emergency	Yes	Yes	Yes

Table T4

Health Effects of H_2S Exposure

Concentration of H_2S			Effect
(%)	(ppm)	(g/100 ft^3)	
0.001	10	0.65	Obvious and unpleasant odor; safe for 8 hr
0.002	20	1.3	Safe for 4 hr exposure
0.01	100	6.48	Kills sense of smell in 3–15 min; may sting eyes and throat
0.02	200	12.96	Kills sense of smell; stings eyes and throat
0.05	500	32.96	Dizziness; breathing ceases in minutes; need prompt artificial respiration
0.07	700	45.26	Unconscious quickly; death will result if not rescued promptly
0.1	1000	64.8	Unconscious immediately, followed by death within minutes

Tug Hill – Multi-Gas Meter Alarm Card

Tug Hill – Multi-Gas Meter Alarms				
Sensors	Low Alarm	High Alarm	No Entry (Note: No Alarm)	Reference
O_2	< 19.5 %	> 23.5 %	< 18.5 % > 24.5 %	Fresh Air 20.9%
H_2S	> 10 ppm	> 15 ppm	> 25 ppm	OSHA PEL 10 ppm[1]
LEL	> 10 %	> 20 %	> 50 %	
CO	> 35 ppm	> 100 ppm	> 200ppm	OSHA PEL 50 ppm[1]
Low Risk	Medium Risk		High Risk	
[1]OSHA PEL Based on 8-Hour TWA				

Tug Hill – Procedural Risk Actions	
Low Risk Actions	Notify Operator & Crew, Identify Source & Attempt to Control
CO > 35 ppm	When elevated CO is encountered, Continuously Monitor
H2S/LEL > 1 ppm	When H2S is encountered at this level, Continuously Monitor
Medium Risk Actions	Notify Operator & Crew, Identify Source & Attempt to Control, Prepare to evacuate.
O2 > 23.5%	Extremely Flammable Atmosphere, No Hot Work, Control or Evacuate
H2S > 10 ppm	Stop Work & Continue to Identify Source
H2S > 15 ppm	Evacuate After 5 Min if H2S Remains > 15 ppm & Uncontrollable
LEL > 10%	No Hot Work, Implement Intrinsically Safe Environment
LEL > 20%	Stop Work
CO > 100 ppm	Stop Work
High Risk Actions	Evacuate Immediately
O2 < 18.5% or O2 > 24.5% H2S > 25 ppm LEL > 50% CO > 200 ppm	Evacuate to muster point. Go to high ground that is upwind & watch for wind direction changes. Notify Management. No Re-entry. *Note IDLH: H2S – 100 ppm; CO – 1200 ppm*
Confined Space	If Confined Space, Evacuate for Any Alarm; High or Low

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Stansberry, Wade A <wade.a.stansberry@wv.gov>

Deep Modification H6A Horizontal Well Work Permit API: 47-051-02335)

1 message

Stansberry, Wade A <wade.a.stansberry@wv.gov> Fri, Feb 25, 2022 at 9:30 AM
To: Amy Morris <amorris@tug-hillop.com>, Eric Buzzard <ebuzzard@marshallcountywv.org>, "Gayne J. Knitowski" <gayne.j.knitowski@wv.gov>

I have attached a copy of the newly issued well permit number. This will serve as your copy.

47-051-02335 - OLD CROW N-21HU

If you have any questions, then please contact us here at the Office of Oil and Gas.

Thank you,

Wade A. Stansberry
Environmental Resource Specialist 3
West Virginia Department of Environmental Protection
Office of Oil & Gas
601 57th St. SE
Charleston, WV 25304
(304) 926-0499 ext. 41115
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2 attachments

47-051-02335 - Copy.pdf
2679K

51-02335 SSP signed.pdf
18728K

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