

State of West Virginia
Department of Environmental Protection - Office of Oil and Gas
Well Operator's Report of Well Work

API 47-069-00236 County OHIO District LIBERTY
Quad BETHANY Pad Name THELMA HAYS OHI PAD Field/Pool Name PANHANDLE
Farm name SHARON L GARRISON (LIFE ESTATE), TIMOTHY R HAYS & THELMA C HAYS (REMAINDER) Well Number THELMA HAYS OHI 1H
Operator (as registered with the OOG) SWN PRODUCTION COMPANY, LLC
Address PO BOX 12359 City SPRING State TX Zip 77391-2359

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 4,444,654.884 Easting 537,964.694
Landing Point of Curve Northing 4,445,380.048 Easting 537,061.384
Bottom Hole Northing 4,447,149.440 Easting 536,494.104

Elevation (ft) 1244.1 GL Type of Well New Existing Type of Report Interim Final
Permit Type Deviated Horizontal Horizontal 6A Vertical Depth Type Deep Shallow
Type of Operation Convert Deepen Drill Plug Back Redrilling Rework Stimulate
Well Type Brine Disposal CBM Gas Oil Secondary Recovery Solution Mining Storage Other _____
Type of Completion Single Multiple Fluids Produced Brine Gas NGL Oil Other _____
Drilled with Cable Rotary

Drilling Media Surface hole Air Mud Fresh Water Intermediate hole Air Mud Fresh Water Brine
Production hole Air Mud Fresh Water Brine
Mud Type(s) and Additive(s)
SOBM

Office of Oil and Gas
JUN 21 2018
WV Department of Environmental Protection

Date permit issued 09/15/2017 Date drilling commenced 9/29/2017 Date drilling ceased 11/29/2017
Date completion activities began 03/23/2018 Date completion activities ceased 05/05/2018
Verbal plugging (Y/N) N Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 427' Open mine(s) (Y/N) depths N
Salt water depth(s) ft 750' Void(s) encountered (Y/N) depths N
Coal depth(s) ft 586' Cavern(s) encountered (Y/N) depths N
Is coal being mined in area (Y/N) N

Reviewed
[Signature] 8/30/18

Reviewed by:
[Signature] 8/30/18
09/07/2018

API 47- 069 - 00236 Farm name SHARON L GARRISON (LIFE ESTATE), TIMOTHY R HAYS & THELMA C HAYS Well number THELMA HAYS OHI 1H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/ N) * Provide details below*
Conductor	26	20	126'	NEW	J-55/106.50#		Y
Surface	17.5	13.375	649'	NEW	J-55/54.50#	570'	Y, 12 bbls
Coal	SEE SURFACE						
Intermediate 1	12.25	9.625	1872'	NEW	J-55/36#		Y, 28 bbls
Intermediate 2							
Intermediate 3							
Production	8.75/8.50	5.5	16063'	NEW	HCP-110/20#		Y
Tubing		2.375	6852'	NEW	P-110/4.70#		N
Packer type and depth set							

Comment Details _____

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	CLASS A	GROUT TO SURFACE				SURFACE	24
Surface	CLASS A	590	15.60	1.19	702.1	SURFACE	8
Coal	SEE SURFACE						
Intermediate 1	CLASS A	710	15.60	1.18	837.8	SURFACE	8
Intermediate 2							
Intermediate 3							
Production	CLASS A	2988	15.60	1.18	3525.84	SURFACE	24
Tubing							

Drillers TD (ft) 16083' Loggers TD (ft) 16083'
 Deepest formation penetrated MARCELLUS Plug back to (ft) N/A
 Plug back procedure N/A

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JUN 21 2018

Kick off depth (ft) 6008'

Check all wireline logs run caliper density deviated/directional induction
 neutron resistivity gamma ray temperature sonic

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Well cored Yes No Conventional Sidewall Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING _____

SURFACE: 7 CENTRALIZERS - EVERY THIRD JOINT OF CASING
 INTERMEDIATE: 24 CENTRALIZERS - EVERY THIRD JOINT OF CASING
 PRODUCTION: 181 CENTRALIZERS - EVERY THIRD JOINT FROM SURFACE TO TOP OF CURVE, THEN EVERY JOINT UNTIL TD

WAS WELL COMPLETED AS SHOT HOLE Yes No DETAILS _____

WAS WELL COMPLETED OPEN HOLE? Yes No DETAILS _____

WERE TRACERS USED Yes No TYPE OF TRACER(S) USED _____

**THELMA HAYS OHI 1H
ATTACHMENT 1
PERF REPORT**

STAGE NUM	Perf Date	Perf Top MD	Perf Bottom MD	# SHOTS PER STG
1	1/28/2018	15,843	15,953	42
2	3/22/2018	15,700	15,799	42
3	3/23/2018	15,560	15,667	42
4	3/23/2018	15,420	15,527	42
5	3/24/2018	15,280	15,387	42
6	3/24/2018	15,140	15,247	42
7	3/25/2018	15,000	15,107	42
8	3/26/2018	14,860	14,967	42
9	3/27/2018	14,720	14,827	42
10	3/28/2018	14,582	14,685	42
11	3/28/2018	14,440	14,547	42
12	3/29/2018	14,300	14,407	42
13	3/30/2018	14,160	14,267	42
14	3/30/2018	14,020	14,127	42
15	3/31/2018	13,880	13,991	42
16	3/31/2018	13,740	13,847	42
17	4/1/2018	13,600	13,707	42
18	4/1/2018	13,460	13,567	42
19	4/2/2018	13,320	13,427	42
20	4/2/2018	13,180	13,287	42
21	4/3/2018	13,040	13,147	42
22	4/5/2018	12,900	13,007	42
23	4/5/2018	12,760	12,867	42
24	4/6/2018	12,620	12,727	42
25	4/6/2018	12,480	12,587	42
26	4/7/2018	12,340	12,447	42
27	4/7/2018	12,200	12,307	30
28	4/8/2018	12,060	12,167	42
29	4/8/2018	11,920	12,027	42
30	4/9/2018	11,780	11,887	42
31	4/9/2018	11,640	11,747	42
32	4/9/2018	11,500	11,607	42
33	4/10/2018	11,360	11,467	42
34	4/10/2018	11,220	11,327	42
35	4/11/2018	11,080	11,187	42
36	4/11/2018	10,940	11,047	42
37	4/11/2018	10,800	10,907	42
38	4/12/2018	10,660	10,767	42
39	4/12/2018	10,520	10,627	42
40	4/13/2018	10,380	10,482	42
41	4/13/2018	10,240	10,347	42
42	4/14/2018	10,100	10,207	42

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Department of Environmental Protection

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ATTACHMENT 1
PERF REPORT**

STAGE NUM	Perf Date	Perf Top MD	Perf Bottom MD	# SHOTS PER STG
43	4/14/2018	9,960	10,067	42
44	4/14/2018	9,820	9,927	42
45	4/15/2018	9,680	9,787	42
46	4/15/2018	9,540	9,647	42
47	4/17/2018	9,400	9,507	42
48	4/17/2018	9,260	9,367	42
49	4/17/2018	9,120	9,227	42
50	4/18/2018	8,980	9,087	42
51	4/18/2018	8,840	8,947	42
52	4/19/2018	8,700	8,807	42
53	4/19/2018	8,559	8,667	42
54	4/19/2018	8,420	8,527	42
55	4/20/2018	8,280	8,387	42
56	4/21/2018	8,140	8,247	42
57	4/21/2018	8,000	8,099	42
58	4/21/2018	7,860	7,967	42
59	4/22/2018	7,720	7,827	42
60	4/22/2018	7,580	7,687	42
61	4/22/2018	7,440	7,547	42
62	4/23/2018	7,300	7,407	42
63	4/23/2018	7,160	7,272	42
64	4/24/2018	7,020	7,127	42
65	4/25/2018	6,880	6,987	42

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**THELMA HAYS OHI 1H
ATTACHMENT 2
STIM REPORT**

STAGE NUM	Stim Date	Ave Pump Rate (BPM)	Ave Treatment	Max Breakdown	ISIP (PSI)	Amount of Proppant (lbs)	Amount of water bbls	Amount of nitrogen/othe
1	3/21/2018	80	8,346	8,748	3,776	458,420	8,916	
2	3/22/2018	83	8,795	9,006	4,451	504,260	8,113	
3	3/23/2018	85	7,980	8,451	4,597	507,820	7,707	
4	3/24/2018	83	8,095	8,713	4,915	506,780	7,247	
5	3/24/2018	88	7,995	8,402	4,375	511,180	7,952	
6	3/25/2018	87	7,971	8,520	4,422	514,960	7,472	
7	3/25/2018	86	7,937	8,584	4,356	491,180	6,324	
8	3/26/2018	83	8,080	8,708	4,484	504,180	6,603	
9	3/27/2018	86	7,996	8,480	4,440	494,520	6,339	
10	3/28/2018	93	8,427	8,691	4,406	493,620	6,606	
11	3/29/2018	89	7,810	8,665	4,466	500,820	6,420	
12	3/29/2018	87	7,777	8,664	4,384	510,940	7,530	
13	3/30/2018	87	7,889	8,672	4,481	501,800	6,425	
14	3/30/2018	92	8,038	8,408	4,454	499,260	6,340	
15	3/31/2018	94	7,969	8,619	4,599	499,020	6,387	
16	4/1/2018	95	7,922	8,223	4,488	498,880	6,094	
17	4/1/2018	86	7,619	8,655	4,397	506,340	6,374	
18	4/1/2018	95	7,802	8,370	4,343	508,600	5,871	
19	4/2/2018	93	8,154	8,599	4,456	511,840	5,871	
20	4/3/2018	84	7,779	8,742	4,647	495,320	5,722	
21	4/4/2018	93	7,781	8,643	4,492	513,460	10,251	
22	4/5/2018	89	7,835	8,694	4,526	500,640	7,475	
23	4/6/2018	96	8,029	8,329	4,589	496,620	6,987	
24	4/6/2018	94	7,808	8,669	4,911	502,840	7,612	
25	4/6/2018	98	8,004	8,528	4,374	505,460	6,015	
26	4/7/2018	93	7,858	8,954	4,555	505,000	5,787	
27	4/8/2018	99	8,037	8,678	4,754	505,360	5,723	
28	4/8/2018	97	7,777	8,362	4,868	508,100	5,995	
29	4/8/2018	100	7,948	8,255	4,300	506,660	5,673	
30	4/9/2018	98	7,933	8,640	4,150	507,740	6,019	
31	4/9/2018	99	7,917	8,298	5,278	499,110	5,547	
32	4/10/2018	94	7,566	7,955	4,384	508,020	5,616	
33	4/10/2018	92	7,639	8,466	4,553	516,720	5,998	
34	4/10/2018	98	8,039	8,527	4,616	505,980	5,736	
35	4/11/2018	92	7,719	8,414	4,726	504,020	5,696	
36	4/11/2018	100	8,040	8,632	4,226	510,720	5,526	
37	4/12/2018	97	7,699	8,194	4,592	509,900	5,499	
38	4/12/2018	100	7,409	8,028	4,419	501,020	6,443	
39	4/13/2018	100	7,374	8,343	4,473	504,280	5,580	
40	4/13/2018	101	7,300	8,083	4,474	494,910	5,831	
41	4/14/2018	96	7,320	8,206	4,896	507,360	6,392	
42	4/14/2018	95	7,257	7,812	4,502	492,740	5,846	
43	4/14/2018	94	7,271	7,808	4,500	491,840	5,489	
44	4/14/2018	95	7,006	8,765	4,627	508,660	5,373	
45	4/15/2018	93	7,339	7,872	4,886	509,640	5,377	
46	4/16/2018	100	7,480	7,880	4,346	511,600	5,388	
47	4/17/2018	99	7,456	8,425	4,799	508,600	5,394	
48	4/17/2018	100	7,813	8,308	4,717	511,560	5,371	
49	4/18/2018	100	7,400	7,748	4,481	509,760	5,476	
50	4/18/2018	99	7,241	7,606	4,454	508,160	5,540	
51	4/19/2018	98	7,219	7,749	4,722	515,100	5,494	
52	4/19/2018	98	7,346	7,865	4,751	513,000	5,561	
53	4/19/2018	97	7,302	7,781	4,473	510,840	5,510	

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ATTACHMENT 2
STIM REPORT

STAGE NUM	Stim Date	Ave Pump Rate (BPM)	Ave Treatment	Max Breakdown	ISIP (PSI)	Amount of Proppant (lbs)	Amount of water bbls	Amount of nitrogen/othe
54	4/20/2018	90	6,738	7,682	4,258	496,300	5,279	
55	4/20/2018	94	7,133	7,689	4,553	486,400	5,191	
56	4/21/2018	98	6,987	7,357	4,417	499,300	5,586	
57	4/21/2018	99	7,134	7,664	4,327	507,260	5,506	
58	4/21/2018	99	7,454	8,712	4,425	461,320	5,070	
59	4/22/2018	99	7,350	7,900	4,692	507,020	5,420	
60	4/22/2018	99	6,879	8,167	4,209	503,820	5,644	
61	4/23/2018	98	7,246	8,471	4,465	505,020	5,242	
62	4/23/2018	97	7,099	9,037	5,035	504,460	5,558	
63	4/24/2018	100	6,604	7,392	4,277	508,000	5,047	
64	4/24/2018	100	6,359	7,232	4,275	505,240	5,417	
65	4/25/2018	100	6,640	8,279	4,240	501,260	4,990	

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ATTACHMENT 3

47069002360000

THELMA HAYS OHI 1H

Well Name:

LITHOLOGY/FORMATION	TOP DEPTH, MD (FT)	TOP DEPTH, TVD (FT)	BOTTOM DEPTH, MD (FT)	BOTTOM DEPTH, TVD (FT)	QUANTITY AND TYPE OF FLUID
Base of Fresh Water	0.00	0.00	427.00	427.00	
Top of Salt Water	750.00	750.00	NA	NA	
Pittsburgh Coal	586.00	586.00	593.00	593.00	
Pottsville (ss)	734.00	734.00	845.00	845.00	
Mauch Chunk (shale)	846.00	846.00	1620.00	1620.00	
Raven Cliff (ss)	1152.00	1152.00	1313.00	1313.00	
Maxton (ss)	1463.00	1463.00	1620.00	1620.00	
Greenbriar (ls)	1620.00	1620.00	1782.00	1782.00	
Big Injun (ss)	2332.00	2322.00	2479.00	2467.00	
Berea (siltstone)	2393.00	2382.00	2308.00	2299.00	
Rhinstreet (shale)	6066.00	5812.00	6282.00	6006.00	
Cashagua (shale)	6298.00	6020.00	6370.00	6079.00	
Middlesex (shale)	6370.00	6079.00	6475.00	6155.00	
Burket (shale)	6475.00	6155.00	6500.00	6171.00	
Tully (ls)	6500.00	6171.00	6567.00	6212.00	
Mahantango (shale)	6567.00	6212.00	6902.00	6336.00	
Marcellus (shale)	6902.00	6336.00	NA	NA	GAS

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Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	3/21/2018
Job End Date:	4/25/2018
State:	West Virginia
County:	Ohio
API Number:	47-069-00236-00-00
Operator Name:	Southwestern Energy
Well Name and Number:	Thelma Hays OHI 1H
Latitude:	40.15138469
Longitude:	-80.55425354
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,351
Total Base Water Volume (gal):	16,496,654
Total Base Non Water Volume:	0



Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Fresh Water	Operator	Base Fluid					
			RECEIVED Office of Oil and Gas JUN 21 2018 WV Department of Environmental Protection Water	7732-18-5	100.00000	79.85732	Density = 8.340
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	1.02828	

				Hydrotreated light petroleum distillate	64742-47-8	30.00000	0.02535	
				Polyacrylate	Proprietary	30.00000	0.02535	
				Methanol	67-56-1	60.00000	0.01424	
				Fatty acid ester	Proprietary	5.00000	0.00845	
				Benzyl-(C12-C16 Alkyl)-Dimethyl-Ammonium Chloride	68424-85-1	30.00000	0.00712	
				Ammonium chloride	12125-02-9	5.00000	0.00422	
				Sodium chloride	7647-14-5	5.00000	0.00422	
				Ethoxylated fatty acid	Proprietary	5.00000	0.00422	
				Glutaraldehyde	111-30-8	10.00000	0.00237	
				Ethylene Glycol	107-21-1	30.00000	0.00104	
				Amine Triphosphate	Proprietary	30.00000	0.00104	Denise Tuck, Halliburton, 3000 N. Sam Houston Pkwy E., Houston, TX 77032, 281-871-6226
				Sodium Phosphate	7632-05-5	30.00000	0.00104	
				Non-hazardous food substance	Proprietary	100.00000	0.00075	

* Total Water Volume sources may include various types of water including fresh water, produced water, and recycled water

** Information is based on the maximum potential for concentration and thus the total may be over 100%

*** If you are calculating a percentage of total ingredients do not add the water volume below the green line to the water volume above the green line

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided.

Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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Environmental Protection

09/07/2018

Latitude: 40°12'30"

8,356' BHL

3,573' SHL

THRASHER

THE THRASHER GROUP, INC.
600 WHITE OAKS BLVD.
BRIDGEPORT, WV 26330
PHONE 304-624-4108

- NOTES ON SURVEY**
- COORDINATES SYSTEM IS UTM, NAD 83 DATUM, ZONE 17, U.S. FOOT AND WELL COORDINATES ESTABLISHED USING SURVEY GRADE GPS.
 - SURFACE AND ROYALTY OWNER INFORMATION AND THEIR BOUNDARIES SHOWN HEREON WERE PLOTTED FROM DEEDS AND/OR TAX PARCEL MAPS PROVIDED BY CLIENT AND FIELD LOCATIONS.
 - THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARCELS SHOWN HEREON.
 - NO DWELLINGS AND BUILDINGS WITHIN 625 FEET OF PROPOSED OF CENTER OF PAD.
 - NO WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF PROPOSED WELL.
 - NO PERENNIAL STREAMS, LAKES, PONDS, RESERVOIRS OR WETLANDS WITHIN 100 FEET OF THE LIMITS OF DISTURBANCE.
 - NO NATURALLY PRODUCING TROUT STREAM WITHIN 300 FEET OF LIMITS OF DISTURBANCE.

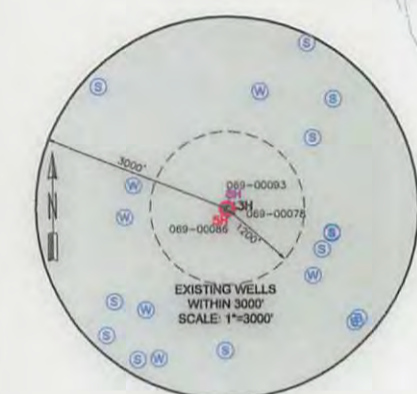
TRACT	ADJOINER	TAX PARCEL
A	JOHN P MINGA	03-15-3.1
B	GEORGE W GROVE Jr.	03-15-5.1
C	JOSEPH P TAGGART	03-15-5.3
D	NANCY L WILLIAMS	03-15-5.4
E	E L MONROE	03-15-7
F	GENE MONROE	03-15-7.3
G	GEORGE W GROVE Jr.	03-15-7.1
H	GENE & S MONROE	03-15-7.4
I	CHARLES W GROUNDS	03-15-4

GRID NORTH
UTM, NAD83 DATUM, ZONE 17, US FT

GRID NORTH
UTM, NAD83 DATUM, ZONE 17, US FT

Longitude: 80°32'30"

20,757' SHL



SURFACE HOLE LOCATION (SHL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,444,654.884 EASTING: 537,964.694	SURFACE HOLE LOCATION (SHL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,444,654.884 EASTING: 537,964.694
LANDING POINT LOCATION (LPL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,444,562.911 EASTING: 537,429.232	LANDING POINT LOCATION (LPL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,445,380.048 EASTING: 537,061.384
TURNING POINT LOCATION (TPL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,446,023.930 EASTING: 536,788.715	TURNING POINT LOCATION (TPL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,446,031.041 EASTING: 536,788.499
BOTTOM HOLE LOCATION (BHL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,447,154.908 EASTING: 536,491.068	BOTTOM HOLE LOCATION (BHL): UTM (NAD83, ZONE 17, METERS): NORTHING: 4,447,149.440 EASTING: 536,494.104

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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

P.S. 2270

MSW 1/8/18



GRAPHIC SCALE IN FEET

COMPANY:

SWN

SWN

Production Company, LLC

Production Company™



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

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25034

MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SURVEY GRADE GPS (NAVD 88, US FT)

OPERATOR'S WELL #: THELMA HAYS OHI 1H

API WELL #: 47 STATE 069 COUNTY PERMIT 00236

WELL TYPE: OIL WASTE DISPOSAL PRODUCTION DEEP GAS LIQUID INJECTION STORAGE SHALLOW

WATERSHED: BUFFALO CREEK ELEVATION: 1244.1'

DISTRICT: LIBERTY COUNTY: OHIO

SURFACE OWNER: SHARON L GARRISON(LIFE ESTATE),TIMOTHY R HAYS AND THELMA C HAYS(REMAINDER) ACREAGE: ± 102.00

OIL & GAS ROYALTY OWNER: TIMOTHY R HAYS, THELMA C HAYS AND SHARON L GARRISON ACREAGE: ±102.00

DRILL DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION

CONVERT PLUG & ABANDON CLEAN OUT & REPLUG OTHER CHANGE (SPECIFY) AS-DRILLED

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: 6,351' 09/07/2018

WELL OPERATOR: SWN PRODUCTION COMPANY, LLC
ADDRESS: P.O. BOX 1300
CITY: JANE LEW STATE: WV ZIP CODE: 26378

DESIGNATED AGENT: DEE SOUTHALL
ADDRESS: P.O. BOX 1300
CITY: JANE LEW STATE: WV ZIP CODE: 26378

LEGEND:

- PROPOSED SURFACE HOLE / BOTTOM HOLE
- ☼ EXISTING / PRODUCING WELLHEAD
- LPL* LANDING POINT LOCATION
- W EXISTING WATER WELL
- S EXISTING SPRING
- SURVEYED BOUNDARY
- DRILLING UNIT
- == LEASE BOUNDARY
- PROPOSED PATH
- AS-DRILLED PATH
- TPL* TURNING POINT LOCATION

REVISIONS:

DATE: 01-08-2018

DRAWN BY: R. DOERR

SCALE: 1" = 2000'

DRAWING NO: 050-5660

WELL LOCATION PLAT