

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

API 47-017-06573 County DODDRIDGE District WEST UNION  
Quad WEST UNION 7.5' Pad Name WEU6 Field/Pool Name \_\_\_\_\_  
Farm name FRANKLIN BUTLER & KEY OIL COMPANY Well Number 513344  
Operator (as registered with the OOG) EQT Production Company  
Address 625 Liberty Ave. EQT Plaza, Suite 1700 City Pittsburgh State PA Zip 15222

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey  
Top hole Northing 4,349,011 Easting 521,256  
Landing Point of Curve Northing 4,348,038 Easting 520,525  
Bottom Hole Northing 4,346,928 Easting 520,842

Elevation (ft) 1260 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)

Water base Mud 13.5 ppg barium sulfate, sodium chloride, xanthan gum, polyacrylamide, modified starch, sodium hydroxide, phosphonates and alkyl phosphates, glutaraldehyde solution, calcium hydroxide, partially hydrolyzed polyacrylamide/polyacrylate, potassium chloride, sodium carbonate, ground walnut shells, alcohol and modified fatty acid, ferrochrome lignosulfonate, calcium carbonate, fibrous cellulose

Date permit issued 10/21/2014 Date drilling commenced 10/28/2014 Date drilling ceased 01/23/2015  
Date completion activities began 4/27/2015 Date completion activities ceased 5/2/2015  
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

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Freshwater depth(s) ft 353', 465', 508', 967', 1031' Open mine(s) (Y/N) depths JUN 24 2015  
Salt water depth(s) ft NONE Void(s) encountered (Y/N) depths N  
Coal depth(s) ft 188' Cavern(s) encountered (Y/N) depths N  
Is coal being mined in area (Y/N) N

Reviewed by:

JP 5/24/15

10/23/2015

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Farm name FRANKLIN BUTLER & KEY OIL COMPANY

Well number 513344

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	24"	20"	40'	NEW	A-500 40LB/FT	NONE	Y
Surface	17.5"	13.375"	1131'	NEW	J-55 54.5LB/FT	281',494'	Y
Coal							
Intermediate 1	12.375"	9.625"	3104'	NEW	A-500 40LB/FT	1202',1498'	Y
Intermediate 2							
Intermediate 3							
Production	8.5"	5.5"	13,830'	NEW	P-110 20LB/FT	NONE	N
Tubing							
Packer type and depth set							

Comment Details \_\_\_\_\_

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	CLASS A	38	15.6	1.18	44.84	0	8
Surface	CLASS A	890	15.6	1.19	1059.1	0	8
Coal							
Intermediate 1	CLASS A	1128	15.6	1.18	1331.04	0	8
Intermediate 2							
Intermediate 3							
Production	CLASS A / CLASS H	1225/645	15.2/15.6	1.07/1.86	2510.45	4000'	72
Tubing							

Drillers TD (ft) 13,845 MD \_\_\_\_\_ Loggers TD (ft) N/A \_\_\_\_\_

Deepest formation penetrated Marcellus \_\_\_\_\_ Plug back to (ft) N/A \_\_\_\_\_

Plug back procedure N/A \_\_\_\_\_

Kick off depth (ft) 5,100' MD \_\_\_\_\_

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

Well cored  Yes    No    Conventional    Sidewall     
 Were cuttings collected  Yes    No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING \_\_\_\_\_

CONDUCTOR- NONE  
 SURFACE- JOINTS: 1,12,23  
 INTERMEDIATE- RAN AT LEAST EVERY 500 FEET  
 PRODUCTION- 226 Composite bodied centralizers on every joint from TD up to 4,000'

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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 \_\_\_\_\_





API 47- 017 - 06573 Farm name FRANKLIN BUTLER & KEY OIL COMPANY Well number 513344

Drilling Contractor Savanna Drilling  
Address 2204 Timberloch Place Suite 230 City Woodlands State TX Zip 77380

Logging Company HOSSCO SERVICES LLC  
Address 614 TROTTERS LANE City CHARLESTON State WV Zip 25312

Logging Company \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Cementing Company \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

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Formation Name	Final Top MD (ftGL) (ft)	Final Top TVD (ft)	Final Btm MD (ftGL) (ft)	Final Btm TVD (ft)
FRESH WATER ZONE	0	0	1,034	1,034
SAND / SHALE	0	0	191	191
COAL	191	191	194	194
SAND / SHALE	194	194	2,307	2,307
BEREA	2,307	2,307	2,575	2,575
GANTZ	2,575	2,575	2,665	2,665
50F	2,665	2,665	2,763	2,763
30F	2,763	2,763	2,830	2,830
GORDON	2,830	2,830	2,899	2,899
4TH	2,899	2,899	3,051	3,051
5TH	3,051	3,051	3,441	3,441
WARREN	3,441	3,441	3,507	3,507
SPEECHLEY	3,507	3,507	4,371	4,371
BRADFORD	4,371	4,371	4,659	4,659
RILEY	4,659	4,659	5,116	5,116
BENSON	5,116	5,116	5,362	5,359
ALEXANDER	5,362	5,359	6,484	5,910
RHINESTREET	6,484	5,910	8,133	6,484
SONYEA	8,133	6,484	8,573	6,630
MIDDLESEX	8,573	6,630	8,735	6,684
GENESEE	8,735	6,684	8,976	6,764
GENESEO	8,976	6,764	9,080	6,794
TULLY	9,080	6,794	9,200	6,820
HAMILTON	9,200	6,820	9,380	6,845
MARCELLUS	9,380	6,845	13,845	6,871

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**513344-47-017-06573-0000 - Perforations**

Stage Number	Perforation Date	Top Perf Depth (ftKB)	Bottom Perf Depth (ftKB)	Number of Shots	Formation
Initiation Sleeve	4/27/2015	13,804.00	13,807.00	10	MARCELLUS
1	4/27/2015	13,682.00	13,746.00	28	MARCELLUS
2	4/27/2015	13,504.00	13,626.00	42	MARCELLUS
3	4/27/2015	13,322.00	13,444.00	42	MARCELLUS
4	4/28/2015	13,142.00	13,265.00	42	MARCELLUS
5	4/28/2015	12,962.00	13,086.00	42	MARCELLUS
6	4/28/2015	12,782.00	12,906.00	42	MARCELLUS
7	4/28/2015	12,602.00	12,726.00	42	MARCELLUS
8	4/28/2015	12,422.00	12,546.00	42	MARCELLUS
9	4/29/2015	12,242.00	12,366.00	42	MARCELLUS
10	4/29/2015	12,062.00	12,188.00	42	MARCELLUS
11	4/29/2015	11,882.00	11,998.00	42	MARCELLUS
12	4/29/2015	11,702.00	11,826.00	42	MARCELLUS
13	4/30/2015	11,522.00	11,646.00	42	MARCELLUS
14	4/30/2015	11,342.00	11,466.00	42	MARCELLUS
15	4/30/2015	11,162.00	11,286.00	42	MARCELLUS
16	4/30/2015	10,982.00	11,106.00	42	MARCELLUS
17	4/30/2015	10,802.00	10,926.00	42	MARCELLUS
18	4/30/2015	10,622.00	10,746.00	42	MARCELLUS
19	5/1/2015	10,442.00	10,566.00	42	MARCELLUS
20	5/1/2015	10,262.00	10,386.00	42	MARCELLUS
21	5/1/2015	10,082.00	10,206.00	42	MARCELLUS
22	5/1/2015	9,902.00	10,026.00	42	MARCELLUS
23	5/1/2015	9,722.00	9,846.00	42	MARCELLUS
24	5/1/2015	9,542.00	9,666.00	42	MARCELLUS
25	5/2/2015	9,362.00	9,486.00	42	MARCELLUS
26	5/2/2015	9,182.00	9,306.00	42	MARCELLUS

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**513344- 47-017-06573-0000 - Stimulated Stages**

<b>Stage Number</b>	<b>Stimulation Date</b>	<b>Ave Pump Rate (BPM)</b>	<b>Ave Treatment Pressure (PSI)</b>	<b>Max Breakdown Pressure (PSI)</b>	<b>ISIP (PSI)</b>	<b>Amount of Proppant (lbs)</b>	<b>Amount of Water (bbls)</b>	<b>Amount of Nitrogen/other (units)</b>
Initiation Sleeve	4/27/2015	5.20	8,210.00	9,153.00	4,740.00	0	625	0
1	4/27/2015	93.7	8,730	9,934	5,611	229,150	7,304	0
2	4/27/2015	95.6	8,144	8,342	4,199	300,420	8,163	0
3	4/27/2015	96.7	8,133	8,459	4,374	299,915	7,828	0
4	4/28/2015	95.3	8,203	8,588	5,059	299,390	10,015	0
5	4/28/2015	99.5	8,248	8,655	4,984	302,295	7,816	0
6	4/28/2015	100.1	8,271	8,520	4,724	299,670	7,999	0
7	4/28/2015	99.5	8,239	8,835	5,229	300,630	7,921	0
8	4/28/2015	89.4	8,309	8,846	4,680	319,270	13,085	0
9	4/29/2015	99.7	8,279	8,826	5,026	300,530	7,630	0
10	4/29/2015	90.0	8,290	9,180	4,614	302,310	8,592	0
11	4/29/2015	100.2	7,963	8,871	5,242	300,025	7,535	0
12	4/30/2015	100.2	7,935	8,634	4,694	301,685	7,525	0
13	4/30/2015	99.7	8,122	9,717	5,045	289,535	7,810	0
14	4/30/2015	97.9	8,244	8,920	5,314	290,890	7,445	0
15	4/30/2015	100.3	7,865	7,972	5,112	303,335	7,152	0
16	4/30/2015	100.2	7,976	8,381	4,996	301,260	7,481	0
17	4/30/2015	99.4	8,109	8,625	4,192	307,920	7,520	0
18	5/1/2015	100.0	7,909	8,724	4,756	305,150	7,075	0
19	5/1/2015	101.3	7,894	8,704	4,649	303,190	7,079	0
20	5/1/2015	99.7	7,776	8,058	4,680	297,899	7,393	0
21	5/1/2015	99.9	7,879	8,279	4,674	301,321	7,350	0
22	5/1/2015	100.2	7,838	8,523	4,301	302,180	6,967	0
23	5/1/2015	99.7	8,166	8,945	4,367	299,675	6,769	0
24	5/1/2015	99.4	7,862	9,175	3,927	281,735	6,671	0
25	5/2/2015	98.7	7,679	8,125	3,406	300,245	7,166	0
26	5/2/2015	99.9	7,190	7,990	3,385	300,725	7,273	0

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# Hydraulic Fracturing Fluid Product Component Information Disclosure

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Job Start Date:	4/27/2015
Job End Date:	5/2/2015
State:	West Virginia
County:	Doddridge
API Number:	47-017-06573-00-00
Operator Name:	EQT Production
Well Name and Number:	513344
Longitude:	-80.75369100
Latitude:	39.29012700
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	6,871
Total Base Water Volume (gal):	8,533,938
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
Water	Keane Group	Carrier/Base Fluid	Water	7732-18-5	100.00000	89.84883	None
Sand (Proppant)	Keane Group	Proppant	Silica Substrate	14808-60-7	100.00000	9.76556	None
MC MX 437-5	Multi-Chem	Calcium nitrate solution	Calcium nitrate	10124-37-5	60.00000	0.05695	None
Hydrochloric Acid (15%)	Keane Group	Acidizing	Hydrochloric Acid	7647-01-0	15.00000	0.02747	None
FFR 730	Keane Group	Friction reducer	Oxyalkylated alcohol A	Proprietary	5.00000	0.00395	None
Greenskeeper LF	Keane Group	Solvent	Distillates, Petroleum, Hydrotreated Light	64742-47-8	100.00000	0.00288	None
EC6330A	Keane Group	Scale Inhibitor	Sodium Phosphate, Tribasic	7601-54-9	5.00000	0.00124	None
AI 600	Keane Group	Corrosion Inhibitor	Ethylene Glycol	107-21-1	40.00000	0.00018	None
			N, N-Dimethylformamide	68-12-2	20.00000	0.00009	None

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			Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	15.00000	0.00007	None
			2-Butoxyethanol	111-76-2	15.00000	0.00007	None
			Cinnamialdehyde	104-55-2	15.00000	0.00007	None
			1-Decanol	112-30-1	5.00000	0.00002	None
			Poly (oxy-1,2-ethanediyl), alpha-(4-nonylphenyl)-omega-hydroxy- branched	127087-87-0	5.00000	0.00002	None
			Isopropyl alcohol	67-63-0	2.50000	0.00001	None
			Triethyl Phosphate	78-40-0	2.50000	0.00001	None
			1-Octanol	111-87-5	2.50000	0.00001	None
LEB-10X	Keane Group	Gel Breaker					
			Ethylene Glycol	107-21-1	30.00000	0.00011	None

**Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS.**

\* Total Water Volume sources may include fresh water, produced water, and/or recycled water  
 \*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

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)



