

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

RECEIVED
Office of Oil and Gas

OCT 12 2017

WV Department of
Environmental Protection

API 47 - 095 - 02185 County Tyler District Meade
Quad Pennsboro 7.5' Pad Name Hartley East Pad Field/Pool Name -----
Farm name David M. Hartley Well Number Freeland Unit 1H
Operator (as registered with the OOG) Antero Resources Corporation
Address 1615 Wynkoop Street City Denver State CO Zip 80202

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 4357323m Easting 500599m
Landing Point of Curve Northing 4357286.269m Easting 499950.979m
Bottom Hole Northing 4358993m Easting 499265m

Elevation (ft) 1021' 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)

Air - Foam & 4% KCL

Mud - Polymer

Date permit issued 06/25/2014 Date drilling commenced 04/26/2015 Date drilling ceased 12/14/2015
Date completion activities began 10/17/2016 Date completion activities ceased 03/22/2017
Verbal plugging (Y/N) N/A 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 76', 135', 162' Open mine(s) (Y/N) depths No
Salt water depth(s) ft 846' Void(s) encountered (Y/N) depths No
Coal depth(s) ft 196', 1136', 1716' Cavern(s) encountered (Y/N) depths No
Is coal being mined in area (Y/N) No

APPROVED

NAME: See m
DATE: 10-25-17

Reviewed by: _____

11/10/2017

API 47-095 - 02185 Farm name David M. Hartley Well number Freeland Unit 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	24"	20"	40'	New	94#, K-55	N/A	Y
Surface	17-1/2"	13-3/8"	361'	New	48#, J-55	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2523'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	13106'	New	20#, P-110	N/A	Y
Tubing		2-3/8"	6787'		4.7#, N-80		
Packer type and depth set		N/A					

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	193 sx	15.6	1.18	228	0'	8 Hrs.
Surface	Class A	433 sx	15.6	1.17	507	0'	8 Hrs.
Coal							
Intermediate 1	Class A	988 sx	15.6	1.23	1215	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	869 sx (Lead) 1052 sx (Tail)	13.5 (Lead), 15.2 (Tail)	1.44 (Lead), 1.83 (Tail)	3177	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 13106' MD, 6233' TVD (BHL), 6261' (Deepest Point Drilled) Loggers TD (ft) 13056' MD
 Deepest formation penetrated Marcellus Plug back to (ft) N/A
 Plug back procedure N/A

Kick off depth (ft) 6209'

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

** This is a subsequent well. Antero only runs wireline logs on one well on a multi-well pad (Freeland Unit 2H API #47-095-02127). Please reference the wireline logs submitted with Form WR-35 for Freeland Unit 2H. A Cement Bond Log has been included with this submittal.

Well cored Yes No Conventional Sidewall Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING _____

Conductor - 0
 Surface - 1 above guide shoe, 1 above insert float, 1 every 4th joint to surface
 Intermediate - 1 above float joint, 1 above float collar, 1 every 4th joint to surface
 Production - 1 above float joint, 1 below float collar, 1 every 3rd joint to top of cement

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- 095 - 02185 Farm name David M. Hartley Well number Freeland Unit 1H

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
*PLEASE SEE ATTACHED EXHIBIT 1					

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
*PLEASE SEE ATTACHED EXHIBIT 2								

Please insert additional pages as applicable.

API 47- 095 - 02185 Farm name David M. Hartley Well number Freeland Unit 1H

<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>	
Marcellus	6219' (TOP) TVD	6654' (TOP) MD
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please insert additional pages as applicable.

GAS TEST Build up Drawdown Open Flow OIL TEST Flow Pump

SHUT-IN PRESSURE Surface 3000 psi Bottom Hole --- psi DURATION OF TEST --- hrs

OPEN FLOW Gas _____ mcfpd Oil _____ bpd NGL _____ bpd Water _____ bpd
GAS MEASURED BY Estimated Orifice Pilot

LITHOLOGY/ FORMATION	TOP		BOTTOM		DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H ₂ S, ETC)
	DEPTH IN FT NAME TVD	DEPTH IN FT TVD	DEPTH IN FT MD	DEPTH IN FT MD	

***PLEASE SEE ATTACHED EXHIBIT 3**

Please insert additional pages as applicable.

Drilling Contractor Precision Drilling Company, LP
Address 2640 Reach Road City Williamsport State PA Zip 17701

Logging Company Allied Horizontal Wireline Services
Address 381 Colonial Manor Rd. City North Huntingdon State PA Zip 15642

Cementing Company Allied Oil & Gas Services, LLC
Address 1036 East Main Street City Bridgeport State WV Zip 26330

Stimulating Company US Well Services
Address 533 Industrial Park Dr. City Jane Lew State WV Zip 26378

Please insert additional pages as applicable.

Completed by Samantha Klaas Telephone 303-357-6759
Signature  Title Permitting Agent Date 10/11/2017

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

API 47-095-02185 Farm Name David M. Hartley Well Number Freeland Unit 1H

EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	12/14/2016	12828	12997	60	Marcellus
2	12/14/2016	12627	12796	60	Marcellus
3	12/15/2016	12426	12595	60	Marcellus
4	12/15/2016	12225	12394	60	Marcellus
5	12/15/2016	12024	12193	60	Marcellus
6	12/15/2016	11823	11993	60	Marcellus
7	12/16/2016	11622	11792	60	Marcellus
8	12/16/2016	11421	11591	60	Marcellus
9	12/16/2016	11221	11390	60	Marcellus
10	12/16/2016	11020	11189	60	Marcellus
11	12/16/2016	10819	10988	60	Marcellus
12	12/17/2016	10618	10787	60	Marcellus
13	12/17/2016	10417	10586	60	Marcellus
14	12/17/2016	10216	10385	60	Marcellus
15	12/17/2016	10015	10185	60	Marcellus
16	12/17/2016	9814	9984	60	Marcellus
17	12/18/2016	9613	9783	60	Marcellus
18	12/18/2016	9413	9582	60	Marcellus
19	12/18/2016	9212	9381	60	Marcellus
20	12/18/2016	9011	9180	60	Marcellus
21	12/19/2016	8810	8979	60	Marcellus
22	12/19/2016	8609	8778	60	Marcellus
23	12/19/2016	8408	8577	60	Marcellus
24	12/19/2016	8207	8377	60	Marcellus
25	12/20/2016	8006	8176	60	Marcellus
26	12/20/2016	7805	7975	60	Marcellus
27	12/20/2016	7605	7774	60	Marcellus
28	12/20/2016	7404	7573	60	Marcellus
29	12/20/2016	7203	7372	60	Marcellus
30	12/20/2016	7002	7171	60	Marcellus
31	12/21/2016	6801	6970	60	Marcellus

API 47-095-02185 Farm Name David M. Hartley Well Number Freeland Unit 1H

EXHIBIT 2

Stage No.	Stimulations Date	Avg Pump Rate	Avg Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/ other (units)
1	12/14/2016	70.4	7005	5701	4685	309500	7154.0	N/A
2	12/14/2016	69.5	6680	6030	4506	308080	6899.0	N/A
3	12/15/2016	69.3	6749	5382	5264	308100	6895.0	N/A
4	12/15/2016	68.9	6786	54181	5003	308250	6890.0	N/A
5	12/15/2016	69.6	6733	5407	4796	309300	6978.0	N/A
6	12/15/2016	68.9	6776	5325	4084	304920	6858.0	N/A
7	12/16/2016	69.9	6725	5157	3984	309000	6846.0	N/A
8	12/16/2016	68.1	6665	5608	4957	309830	6741.0	N/A
9	12/16/2016	70.0	6785	5783	4424	308820	6731.0	N/A
10	12/16/2016	69.7	6901	6144	4882	308150	6739.0	N/A
11	12/16/2016	69.6	6757	5440	4138	310340	6731.0	N/A
12	12/17/2016	69.8	6615	5189	5035	308000	6719.0	N/A
13	12/17/2016	69.1	6847	5443	4005	309700	6983.0	N/A
14	12/17/2016	69.7	6616	5525	3351	308200	6707.0	N/A
15	12/17/2016	70.1	6565	5118	4295	308550	6655.0	N/A
16	12/17/2016	69.9	6488	5651	3455	306750	6692.0	N/A
17	12/18/2016	69.7	6401	5250	4685	306500	6678.0	N/A
18	12/18/2016	70.1	6425	5751	3766	308150	6667.0	N/A
19	12/18/2016	71.1	6781	5064	5085	297310	8386.0	N/A
20	12/18/2016	69.7	6482	5418	4714	308640	6628.0	N/A
21	12/19/2016	70.1	6361	5740	4224	304500	6625.0	N/A
22	12/19/2016	70.3	6800	4957	4102	308550	7672.0	N/A
23	12/19/2016	69.7	6394	5432	4900	309150	6617.0	N/A
24	12/19/2016	70.7	6488	5304	5336	308350	6599.0	N/A
25	12/20/2016	70.5	6294	5572	4027	309750	6601.0	N/A
26	12/20/2016	70.5	6402	5608	4463	308150	6585.0	N/A
27	12/20/2016	69.9	6259	5150	4728	308950	6569.0	N/A
28	12/20/2016	70.7	6140	5668	3587	309820	6540.0	N/A
29	12/20/2016	70.6	6179	6702	5168	309750	6566.0	N/A
30	12/20/2016	70.4	5946	6773	3991	309700	6573.0	N/A
31	12/21/2016	70.7	6010	5912	3866	310650	6556.0	N/A
	AVG=	69.9	6,550	7,141	4,436	9,553,410	211,080	TOTAL

EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Fresh Water	76'	N/A	76'	N/A
Fresh Water	135'	N/A	135'	N/A
Fresh Water	162'	N/A	162'	N/A
Shale/ Sandstone	est. 26	196	est. 26	196
Shale/ Trace Coal	est. 196	236	est. 196	236
Sandstone	est. 236	456	est. 236	456
Shale/ Limestone	est. 456	556	est. 456	556
Sandstone	est. 556	616	est. 556	616
Shale/ Trace Limestone	est. 616	776	est. 616	776
Siltstone	est. 776	801	est. 776	801
Shale/ Limestone	est. 801	956	est. 801	956
Sandstone	est. 956	1036	est. 956	1036
Shale/ Limestone	est. 1036	1136	est. 1036	1136
Shale/ Trace Coal	est. 1136	1176	est. 1136	1176
Sandstone/ Trace Coal	est. 1176	1236	est. 1176	1236
Shale/ Trace Limestone	est. 1236	1316	est. 1236	1316
Sandstone/ Shale	est. 1316	1416	est. 1316	1416
Sanstone/ Coal	est. 1416	1556	est. 1416	1556
Shale/ Trace Coal	est. 1556	1716	est. 1556	1716
Siltstone/ Trace Coal	est. 1716	1932	est. 1716	1932
Big Lime	1932	2807	1932	2888
Fifth Sandstone	2807	2921	2888	3137
Bayard	2921	3281	3137	3825
Speechley	3281	3363	3825	4119
Baltown	3363	3941	4119	4561
Bradford	3941	4234	4561	4957
Benson	4234	4598	4957	5240
Alexander	4598	4953	5240	5391
Elk	4953	5198	5391	5865
Rhinestreet	5198	6020	5865	6156
Sycamore	6020	6113	6156	6337
Middlesex	6113	6199	6337	6511
Burkett	6199	6212	6511	6571
Tully	6212	6219	6571	6654
Marcellus	6219	NA	6654	NA

*Please note Antero determines formation tops based on mud logs that are only run on one well on a multi-well pad. The measured depth (MD) data on subsequent wells may be slightly different due to the well's unique departure.

Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	12/14/2016
Job End Date:	12/21/2016
State:	West Virginia
County:	Tyler
API Number:	47-095-02185-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Freeland 1H
Latitude:	39.43195278
Longitude:	-80.99321111
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,260
Total Base Water Volume (gal):	9,125,072
Total Base Non Water Volume:	0



Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Service Abstract Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Water	Antero Resources	Carrier/Base Fluid	Water	7732-18-5	100.00000	88.58242	
Sand	J.S. Well Services, LLC	Proppant					
HCL Acid (12.6%-17.5%)	J.S. Well Services, LLC	Bulk Acid	Crystalline Silica, quartz	14808-60-7	100.00000	11.11997	
LGC-15	J.S. Well Services, LLC	Gelling Agents	Water Hydrogen Chloride	7732-18-5 7647-01-0	87.40000 17.50000	0.16104 0.03744	
WFRA-405	J.S. Well Services, LLC	Friction Reducer	Guar Gum Petroleum Distillates Suspending agent (solid) Surfactant	9000-30-0 84742-47-8 14808-60-7 88439-51-0	50.00000 60.00000 3.00000 3.00000	0.02524 0.02390 0.00386 0.00151	
			2-Propenoic acid, polymer with 2-propenamide Hydrated light distillate (petroleum)	29003-06-9 84742-47-8	30.00000 30.00000	0.01500 0.01208	

SI-1100	U.S. Well Services, LLC	Scale Inhibitor						
			Ethylene Glycol	107-21-1			40.00000	0.00759
			Copolymer of Maleic and Acrylic acid	52255-49-9			10.00000	0.00157
			Potassium salt of diethylene triamine penta (methylene phosphonic acid)	15827-60-8			3.00000	0.00054
			Phosphino carboxylic acid polymer	71050-62-9			3.00000	0.00052
			Hexamethylene tramine penta (methylene phosphonic acid)	34690-00-1			3.00000	0.00052
Bioclear 2000	U.S. Well Services, LLC	Anti-Bacterial Agent						
			2,2-dibromo-3-nitropropionamide	10222-01-2			20.00000	0.00425
AI-303	U.S. Well Services, LLC	Acid Corrosion Inhibitors	Detonized Water	7732-18-5			28.00000	0.00243
			Ethylene glycol	107-21-1			40.00000	0.00006
			Cinnamaldehyde	104-55-2			20.00000	0.00002
			Formic acid	64-18-6			20.00000	0.00002
			Butyl cellosolve	111-76-2			20.00000	0.00002
			Polyether	Proprietary			10.00000	0.00001
			Acetophenone, thiourea, formaldehyde polymer	68527-49-1			5.00000	0.00001

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)

LATITUDE 39°22'30"

9,863'

2,460' TO BOTTOM HOLE

LATITUDE 39°25'00"

3,538'

LONGITUDE 81°00'00"

LONGITUDE 80°57'30"

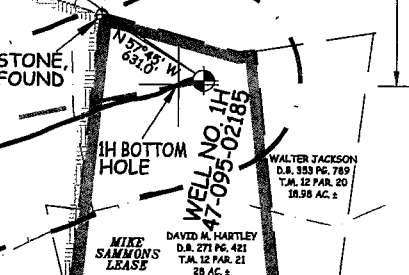
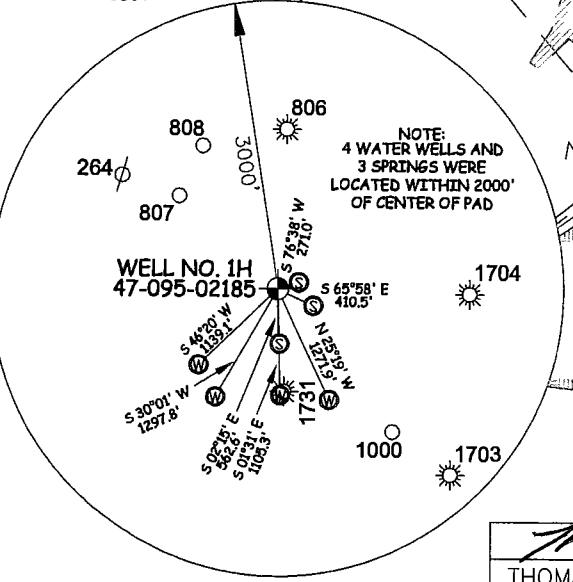
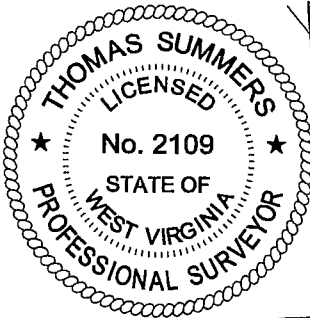
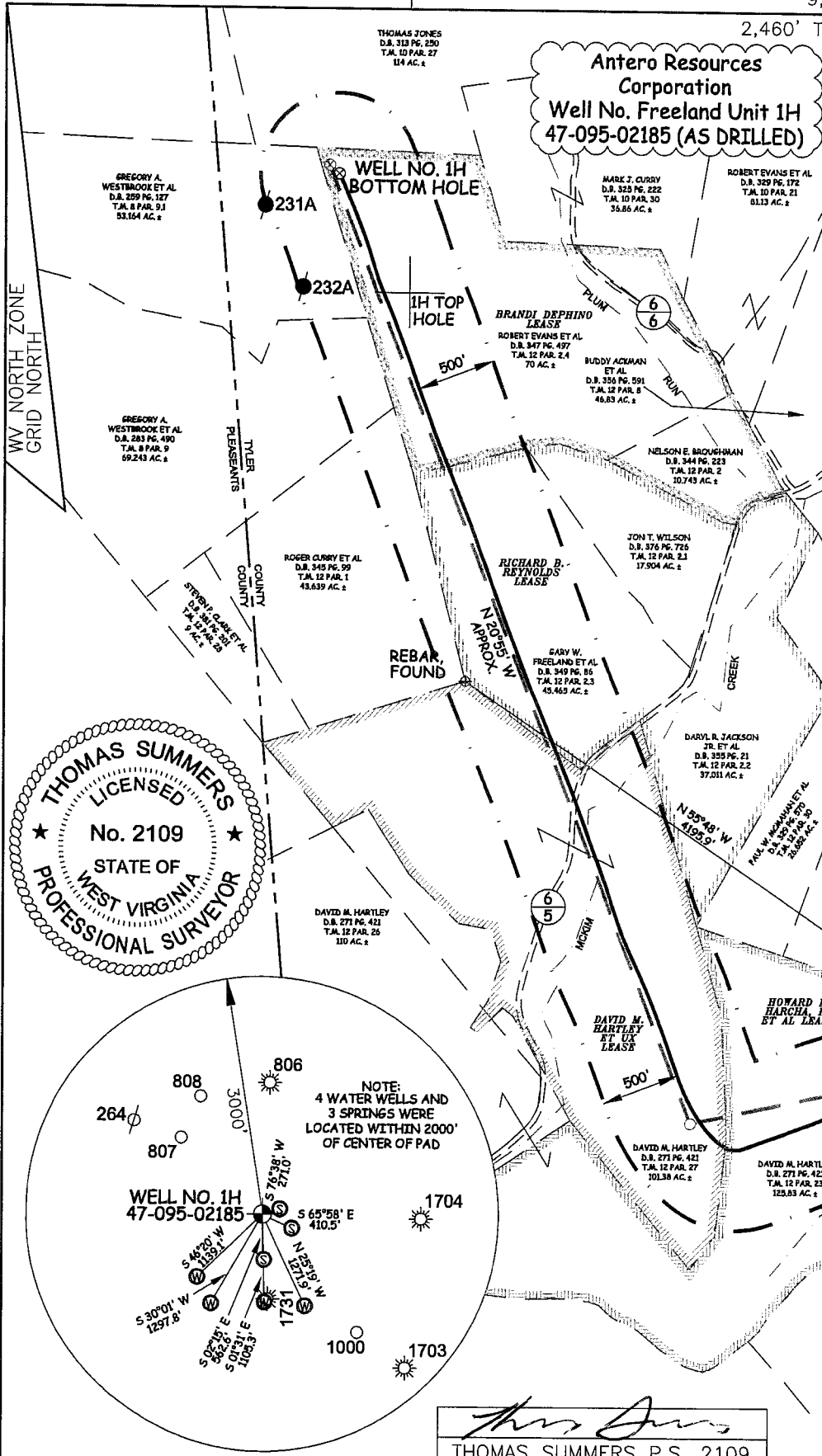
LONGITUDE 81°00'00"

Antero Resources Corporation
Well No. Freeland Unit 1H
47-095-02185 (AS DRILLED)

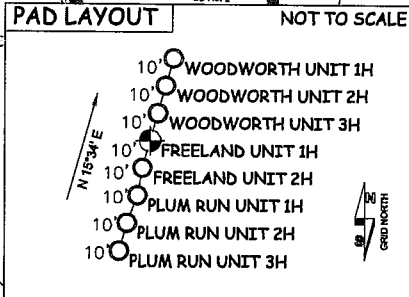
AS DRILLED DATA:
WELL 1H TOP HOLE INFORMATION:
N: 318,663ft E: 1,577,837ft
LAT: 39°21'55.03" LON: 80°59'35.58"
BOTTOM HOLE INFORMATION:
N: 324,218ft E: 1,573,552ft
LAT: 39°22'49.22" LON: 81°00'31.33"
WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

(NAD) 83 (UTM) ZONE 17 COORDS:
WELL 1H TOP HOLE INFORMATION:
N: 4,357,323m E: 500,599m
BOTTOM HOLE INFORMATION:
N: 4,358,993m E: 499,265m

NOTE
1. NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY HUSBANDRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD.
2. TOP HOLE DATA SHOWN HEREON WAS PROVIDED BY ALLEGHENY SURVEYS, INC.
3. AS DRILLED DATA WAS PROVIDED BY ANTERO RESOURCES CORPORATION.
4. WLS IS NOT CERTIFYING THE DATA AND INFORMATION PROVIDED LISTED IN NOTES 2 AND 3, ONLY THE RELATIONSHIP TO THE DATA AND INFORMATION PROVIDED TO THE LEASE BOUNDARIES.
5. WLS IS BY NO MEANS RESPONSIBLE FOR ANY ERRORS OR INACCURACIES WITH THE DATA AND INFORMATION THAT HAS BEEN PROVIDED.



THOMAS SUMMERS P.S. 2109



JOB # 13-042WA
DRAWING # FREELAND1HADR
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
STATE OF WEST VIRGINIA

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 RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.
STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WILLOW LAND SURVEYING PLLC

LEGEND
DATE 07/20/17



11/10/2017

LATITUDE 39°22'30"

9,863'

2,460' TO BOTTOM HOLE

LATITUDE 39°25'00"

LONGITUDE 81°00'00"

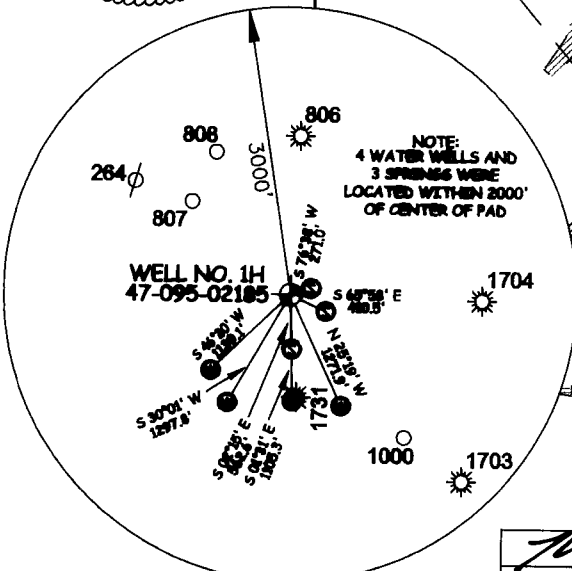
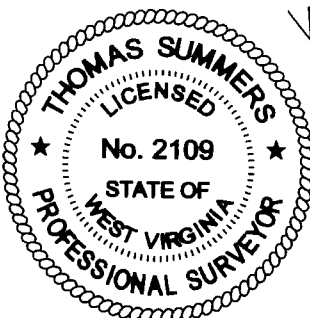
LONGITUDE 80°57'30"

Antero Resources Corporation
Well No. Freeland Unit 1H
47-095-02185 (AS DRILLED)

AS DRILLED DATA:
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5. WLS IS BY NO MEANS RESPONSIBLE FOR ANY ERRORS OR INACCURACIES WITH THE DATA AND INFORMATION THAT HAS BEEN PROVIDED.

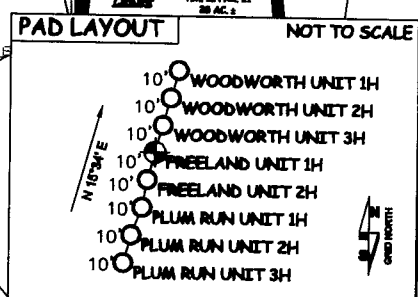


THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



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

WILLOW LAND SURVEYING PLLC



- LEGEND
- Surface Owner Boundary Lines +/-
 - - - Interior Surface Tracts +/-
 - X Existing Fence
 - Found monument, as noted
 - ⊗ Proposed Well Path
 - ⊙ As Drilled Well Path

DATE 07/20/17

11/10/2017

JOB # 13-042WA
DRAWING # FREELAND1HADR
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
STATE OF WEST VIRGINIA