



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

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well - 1

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for MARKLE UNIT 2H
47-095-02350-00-00

Lateral Extension

ANTERO RESOURCES CORPORATION

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: MARKLE UNIT 2H
Farm Name: RITCHIE PETROLEUM INC.
U.S. WELL NUMBER: 47-095-02350-00-00
Horizontal 6A / Horizontal 6A Well - 1
Date Issued: 9/14/2016

Promoting a healthy environment.



June 8, 2016

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

West Virginia Department of Environmental Protection
Office of Oil and Gas
Attn: Mr. Taylor Brewer
601 57th Street
Charleston, WV 25304

Mr. Brewer:

Antero Resources Corporation (Antero) would like to submit the following permit modification for one approved well on the Terry Snider Pad. We are requesting to extend the horizontal lateral length which will change the bottom hole location of the Markle Unit 2H (API# 47-095-02350).

Please note:

- The Measured Depth has not changed; therefore, the Production Casing/Cement program on the revised Form WW-6B will remain the same.
- The revised lateral length and bottom hole location will not be drilling through any new leases; therefore, a revised Form WW-6A1 has not been included.

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised lateral length program
- REVISED Mylar Plat, which shows the new bottom hole location

If you have any questions please feel free to contact me at (303) 357-6820.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read "Natalie Komp", is written over the typed name.

Natalie Komp
Permitting Agent
Antero Resources Corporation

RECEIVED
Office of Oil and Gas

JUN 09 2016

Enclosures

WV Department of
Environmental Protection

WW-6B
(04/15)

API NO. 47- 095 - 02350
 OPERATOR WELL NO. Markle Unit 2H
 Well Pad Name: Existing Terry Snider Pad

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

1) Well Operator: Antero Resources Corp. 494507062 095 - Tyler Meade Pennsboro 7.5'
 Operator ID County District Quadrangle

2) Operator's Well Number: Markle Unit 2H Well Pad Name: Existing Terry Snider Pad

3) Farm Name/Surface Owner: Ritchie Petroleum, Inc. Public Road Access: CR 20

4) Elevation, current ground: 1147' Elevation, proposed post-construction: 1147'

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

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale: 6700' TVD, Anticipated Thickness 75 feet, Associated Pressure 2800#

4709502350 M&P

8) Proposed Total Vertical Depth: 6700'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 16,500'

11) Proposed Horizontal Leg Length: 9206'

12) Approximate Fresh Water Strata Depths: 124', 376'

13) Method to Determine Fresh Water Depths: Offset well records. Depths have been adjusted according to surface elevations.

14) Approximate Saltwater Depths: 1968'

15) Approximate Coal Seam Depths: None identified

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

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

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 Environmental Protection

WW-6B
(04/15)

PERMIT MODIFICATION API# 47-095-02350
 API NO. 47- 095 - 02350
 OPERATOR WELL NO. Markle Unit 2H
 Well Pad Name: Existing Terry Snider Pad

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	20"	New	H-40	94#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	430' *see #19	430'	CTS, 597 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2400'	2400'	CTS 977 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16500'	16500'	4160 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

47 0 9 5 0 2 3 5 0 MDY

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	20"	24"	0.438"	1530	50	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	1000	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A	1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12630	2500	Lead-HPOZ & Tail-H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11200			
Liners							

PACKERS

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

RECEIVED
Office of Oil and Gas

JUN 09 2016

WV Department of
Environmental Protection

WW-6B
(10/14)

API NO. 47- 095 - 02350

OPERATOR WELL NO. Markle Unit 2H

Well Pad Name: Existing Terry Snider Pad

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

Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale.

*Antero will be air drilling the fresh water string which makes it difficult to determine when freshwater is encountered, therefore we have built in a buffer for the casing setting depth which helps to ensure that all fresh water zones are covered.

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

Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."

Max Pressure - 9300 lbs

Max Rate - 80 bpm

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 38.07 acres with modification

22) Area to be disturbed for well pad only, less access road (acres): 6.64 existing acres

23) Describe centralizer placement for each casing string:

Conductor: no centralizers

Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface.

Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface.

Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.

24) Describe all cement additives associated with each cement type:

Conductor: no additives, Class A cement.

Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake.

Intermediate: Class A Cement with 1/4 lb of flake, 5 gallons of clay treat.

Production: Lead cement - 50/50 Class H/Poz + 1/5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.5% C51.

Production: Tail cement - Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20

25) Proposed borehole conditioning procedures:

Conductor: blowhole clean with air, run casing, 10 bbls fresh water.

Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water space out.

Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing,

circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.

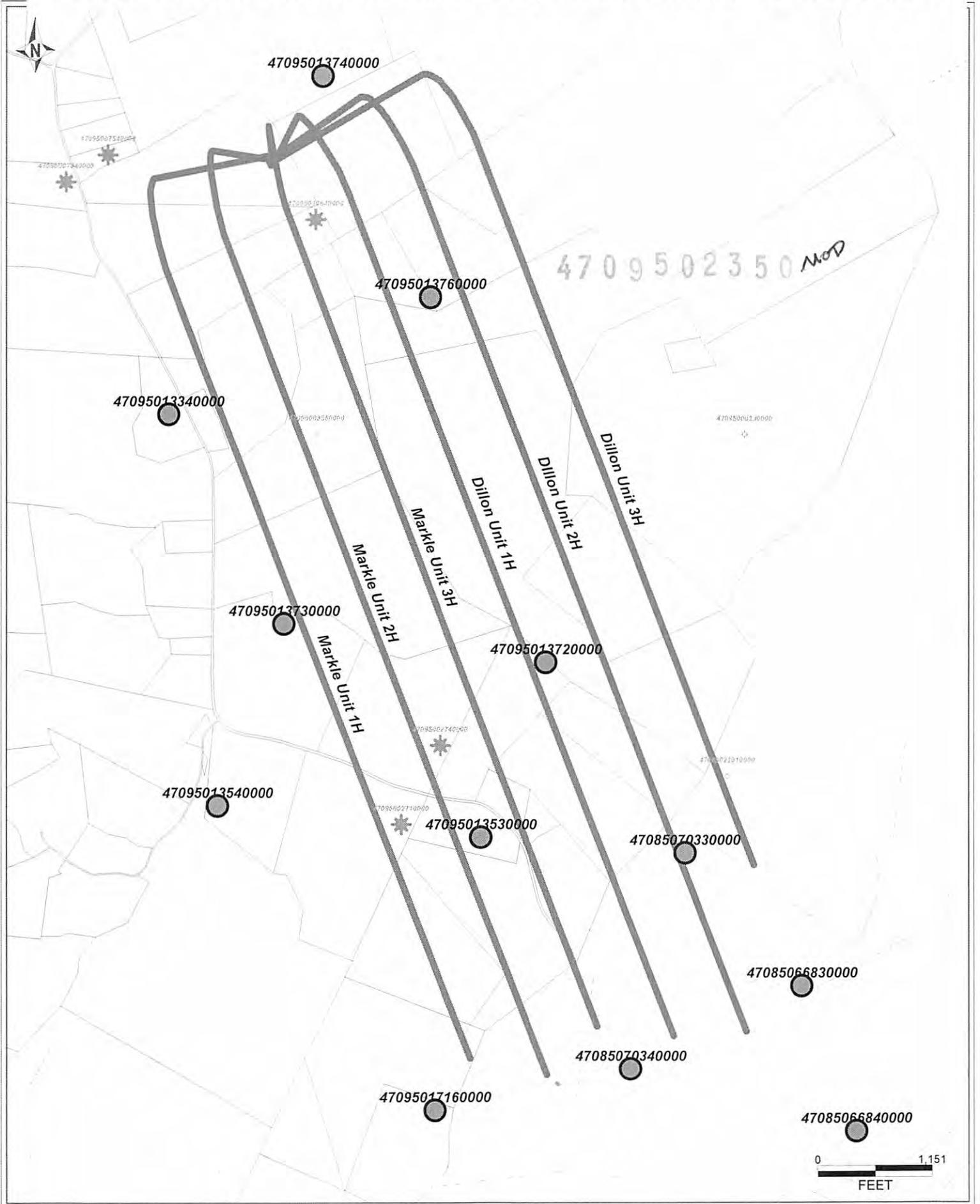
Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

47 0 0 5 0 2 3 5 0

RECEIVED
Office of Oil and Gas
JUN 09 2010
WV Dept of Environmental Protection

*Note: Attach additional sheets as needed.

MARKLE-DILLON UNIT (TERRY SNIDER PAD) - AREA OF REVIEW 35-8-5.11 PAGE1



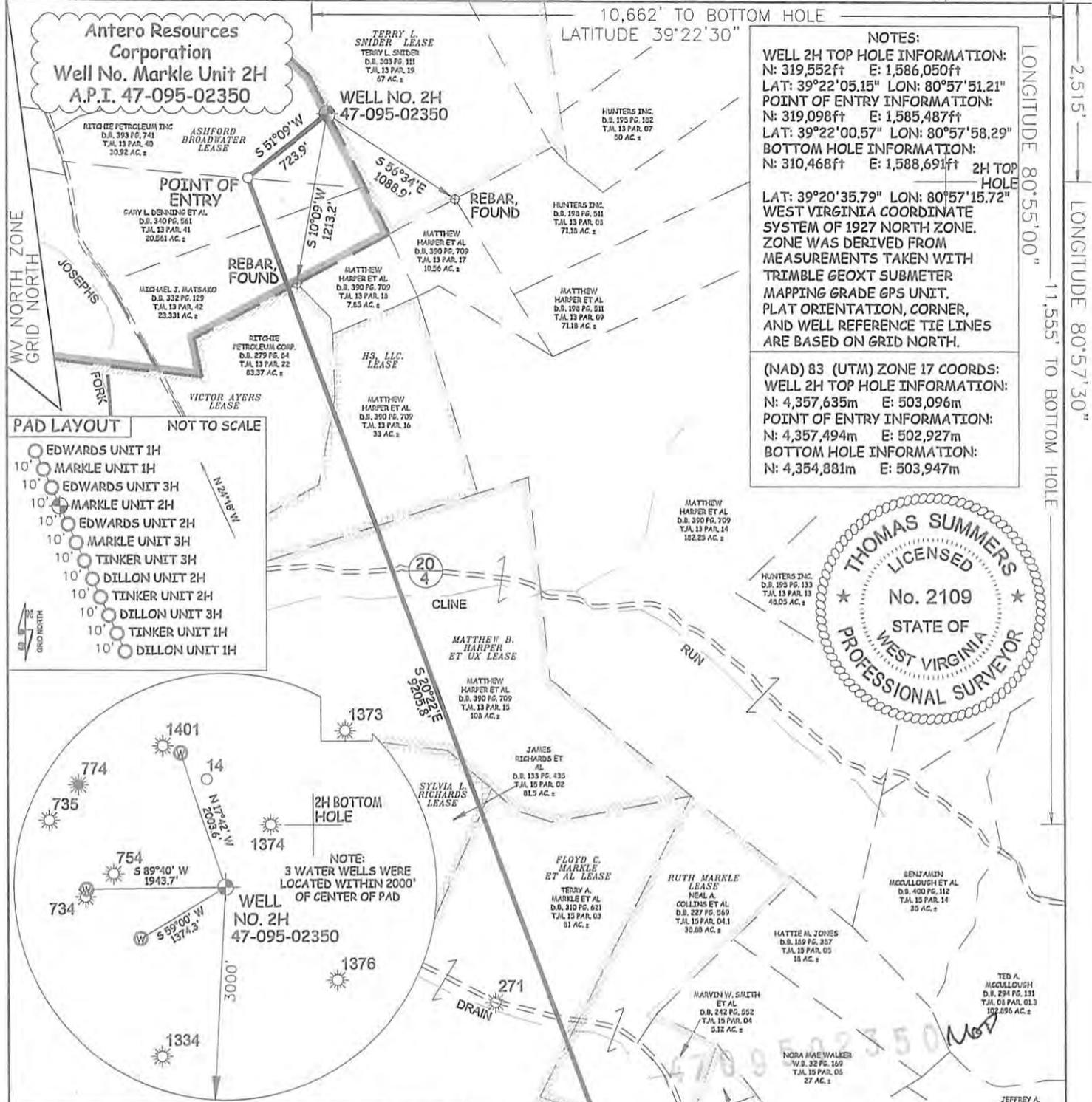
MARKLE-DILLON UNIT (TERRY SNIDER PAD) - AREA OF REVIEW 35-8-5.11 PAGE 2

UWI (APINum)	Well Name	Well Num	Operator	Hist Oper	TD	ELEV_GR	TD (SSTVD)	Perforated Interval (shallowest, Deepest)	Perforated Formations	Producible Formation(s) not perf'd
47085066840000	DOTY CONRAD P ET AL	J-801	ALLIANCE PETR CORP	J & J ENTERPRISES	5999	944	-5055	4,443' - 5,785'	Riley, Rhinestreet	Big Lime, Big Injun, Benson
47085070330000	EDWARDS B THOMAS	WK-349	ALLIANCE PETR CORP	KEPCO INCORPORATED	5998	1192	-4806	4,713' - 5,984'	Big Injun, Rhinestreet	Big Lime, Riley, Benson
47085066830000	DOTY CONRAD P ET AL	J-802	ALLIANCE PETR CORP	J & J ENTERPRISES	5979	1026	-4953	2,033' - 5,857'	Big Injun, Rhinestreet	Big Lime, Riley, Benson
47085070340000	EDWARDS B THOMAS	WK-348	ALLIANCE PETR CORP	KEPCO INCORPORATED	5955	991	-4964	4,521' - 5,799'	Riley, Rhinestreet	Big Lime, Big Injun, Benson
47095013760000	MCCULLOUGH HAROLD & WILMA	1	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	5214	1121	-4093	5,010' - 5,018'	Benson	Big Lime, Big Injun, Riley
47095017160000	COX BILLY J & MARGARET K	1	ALLIANCE PETR CORP	OHIO L & M	5194	1166	-4028	2,064' - 5,030'	Big Lime, Benson	Big Injun, Riley
47095013720000	COLLINS NEAL	2	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	5181	1166	-3995	2,182' - 5,050'	Big Injun, Benson	Big Lime, Riley
47095013530000	COLLINS NEAL	1	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	5132	942	-4190	4,808 - 4,818'	Benson	Big Lime, Big Injun, Riley
47095013730000	RICHARDS SYLVIA	2	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	5062	1010	-4052	4,874' - 4,881'	Benson	Big Lime, Big Injun, Riley
47095013340000	AYRES VICTOR	3845	CONSOL GAS COMPANY	CNG DEVELOPMENT CO	5045	826	-4219	4,712' - 4,718'	Benson	Big Lime, Big Injun, Riley
47095013740000	HILL PALMER	1	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	5035	895	-4140	4,790' - 4,800'	Benson	Big Lime, Big Injun, Riley
47095013540000	RICHARDS SYLVIA	1	CONSOL GAS COMPANY	CHESTERFIELD EN CORP	4987	950	-4037	4,812' - 4,820'	Benson	Big Lime, Big Injun, Riley
47095007540000	DILLON CLINTON & VIRGINIA	5	DUPKE ROGER C OIL CO	SECURITY G&O INC	3491	905	-2586		N/A	N/A
47095007340000	DILLON CLINTON S & VIRGINIA H	1	DUPKE ROGER C OIL CO	SECURITY G&O INC	3359	805	-2554		N/A	N/A
47085022910000	BLANCE STEWART	1	SULLIE OIL COMPANY	SULLIE OIL COMPANY	2400	1148	-1252		N/A	N/A
47095000230000	E A HILL	1	UNKNOWN	UNKNOWN	2289	1150	-1139		N/A	N/A
47095002740000	FLOYD C MARKLE	2	MCCULLOUGH WELL SRVC	SULLIE OIL COMPANY	2130	1038	-1092		N/A	N/A
47095003550000	DONSEL (SP DONZEL) ANKROM	1	UNKNOWN	UNKNOWN	1992	916	-1076		N/A	N/A
47095002710000	FLOYD C MARKLE	1	MCCULLOUGH WELL SRVC	SULLIE OIL COMPANY	1977	888	-1089		N/A	N/A

API - reasonably expected to penetrate a depth that could be within range of fracture propagation
 API - not reasonably expected to penetrate a depth that could be within range of fracture propagation; therefore no additional details (perforated formation and producing zones) are required as outlined in 35CSR8-5.12
 **All reported data is correct to the best of our knowledge with the resources available

4709502350 N/A

LATITUDE 39°22'30" 1,665'



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 PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WILLOW LAND SURVEYING PLLC
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

JOB # 16-008WA
DRAWING # MARKLE2HR3
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS

DATE 06/02/16
OPERATOR'S WELL# MARKLE UNIT #2H

WELL NO. 2H BOTTOM HOLE
N 67°04' 249.0' W
W 1,665.0' S
STAKE/ NAIL, SET
1" = 400'

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL 47 - 095 - 02350
(IF "GAS") PRODUCTION STORAGE DEEP SHALLOW STATE COUNTY PERMIT
LOCATION: ELEVATION 1,171' ORIGINAL - 1,147' AS-BUILT WATERSHED OUTLET MIDDLE ISLAND CREEK
QUADRANGLE PENNSBORO 7.5' DISTRICT MEADE COUNTY TYLER
SURFACE OWNER RITCHIE PETROLEUM INC. ACREAGE 30.92 ACRES +/-
OIL & GAS ROYALTY OWNER ASHFORD BROADWATER; TERRY L. SNIDER; VICTOR AYERS; H3, LLC; LEASE ACREAGE 503.712 ACRES+; 67 ACRES+; 97 ACRES+; 33 ACRES+;
MATTHEW B. HARPER ET UX; SYLVIA L. RICHARDS; FLOYD C. MARKLE ET AL.; RUTH MARKLE; HATTIE JONES; THE WINSTON FAMILY TRUST 100 ACRES+; 81.5 ACRES+; 81 ACRES+; 44 ACRES+; 43.57 ACRES+; 21 ACRES+
PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) MOD BHL PLUG & ABANDON WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,700' TVD 16,500' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313

LATITUDE 39°22'30" 1,665'

10,662' TO BOTTOM HOLE

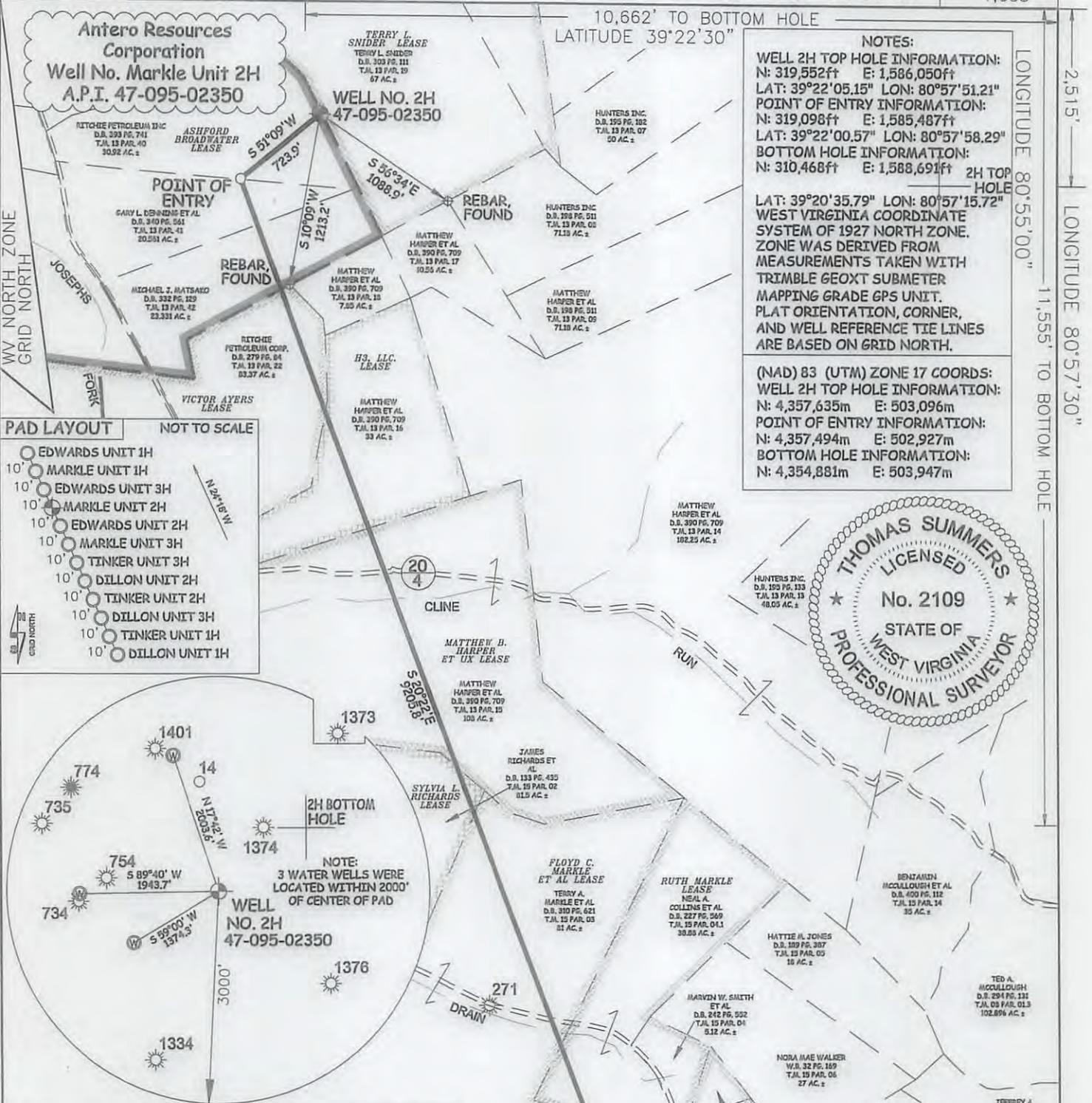
LATITUDE 39°22'30"

LONGITUDE 80°55'00"

2,515'

LONGITUDE 80°57'30"

11,555' TO BOTTOM HOLE



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 PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



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

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220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

JOB # 16-008WA
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SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS

LEGEND

- Surface Owner Boundary Lines +/-
- Interior Surface Tracts +/-
- Existing Fence
- Found monument, as noted

THOMAS SUMMERS P.S. 2109
DATE 06/02/16
OPERATOR'S WELL# MARKLE UNIT #2H

REFERENCES

STAKE/ NAIL, SET WELL NO. 2H
N 61°04' W 249.0'
W 1°00' E 5.9402'

STAKE/ NAIL, SET
1" = 400'

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.

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL 47 - 095 - 02350
(IF "GAS") PRODUCTION STORAGE DEEP SHALLOW X STATE COUNTY PERMIT
LOCATION: ELEVATION 1,171' ORIGINAL - 1,147' AS-BUILT WATERSHED OUTLET MIDDLE ISLAND CREEK
QUADRANGLE PENNSBORO 7.5' DISTRICT MEADE COUNTY TYLER
SURFACE OWNER RITCHIE PETROLEUM INC. ACREAGE 30.92 ACRES +/-
OIL & GAS ROYALTY OWNER ASHFORD BROADWATER; TERRY L. SNIDER; VICTOR AYERS; H3, LLC.; LEASE ACREAGE 503.712 ACRES+; 67 ACRES+; 97 ACRES+; 33 AC+;
MATTHEW B. HARPER ET UX; SYLVIA L. RICHARDS; FLOYD C. MARKLE ET AL; RUTH MARKLE; HATTIE JONES; THE WINSTON FAMILY TRUST 108 ACRES+; 81.5 ACRES+; 81 ACRES+; 44 ACRES+; 43.57 ACRES+; 21 ACRES+
PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL
(SPECIFY) MOD BHL PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,700' TVD 16,500' MD
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DENVER, CO 80202 CHARLESTON, WV 25313