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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Wednesday, October 24, 2018  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for MASTER UNIT 1H  
47-085-10360-00-00

**Modified Lateral Length 10817'**

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

A blue ink signature of James A. Martin, written in a cursive style.

Operator's Well Number: MASTER UNIT 1H  
Farm Name: DANIEL M. HAYMOND IV, ET AL  
U.S. WELL NUMBER: 47-085-10360-00-00  
Horizontal 6A New Drill  
Date Modification Issued: October 24, 2018

Promoting a healthy environment.



July 20, 2018

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: Ms. Laura Adkins  
601 57<sup>th</sup> Street  
Charleston, WV 25304

Ms. Adkins:

Antero Resources Corporation (Antero) would like to submit the following permit modifications for nine approved wells on the Lettie Pad. We are requesting to change the bottom hole locations of the Hayes Unit 1H (API# 47-085-10365), Hayes Unit 2H (API# 47-085-10366), Master Unit 1H (API# 47-085-10360), Master Unit 2H (47-085-10322), Master Unit 3H (API# 47-085-10361), Leeroy Unit 2H (API# 47-085-10363), Leeroy Unit 3H (API# 47-085-10364), Christopher Unit 1H (API# 47-085-10357), and Christopher Unit 2H (API# 47-085-10358).

L

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised lateral length, Measured Depth and Production Casing/Cement program
- REVISED Form WW-6A1, which shows the new leases we will be drilling into
- REVISED Mylar Plats, 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 "Karin Cox", is written over a faint, illegible typed name.

Karin Cox  
Permitting Agent  
Antero Resources Corporation

Enclosures

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

1) Well Operator: Antero Resources Corporation 494507062 085 - Ritchie Clay Pennsboro 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Master Unit 1H Well Pad Name: Lettie Pad

3) Farm Name/Surface Owner: Daniel M. Haymond IV, et al Public Road Access: Stull Hill Rd.

4) Elevation, current ground: 970' Elevation, proposed post-construction: \_\_\_\_\_

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: 6800' TVD, Anticipated Thickness- 75 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 6800' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 18800' MD

11) Proposed Horizontal Leg Length: 10817'

12) Approximate Fresh Water Strata Depths: 408'

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

14) Approximate Saltwater Depths: 1760'

15) Approximate Coal Seam Depths: 622'

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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WW-6B  
(04/15)

Permit Modification - API# 47-085-10360 **MOD**  
 API NO. 47- 085 - 10360  
 OPERATOR WELL NO. Master Unit 1H  
 Well Pad Name: Lettie Pad

18) **CASING AND TUBING PROGRAM**

<b>TYPE</b>	<b>Size (in)</b>	<b>New or Used</b>	<b>Grade</b>	<b>Weight per ft. (lb/ft)</b>	<b>FOOTAGE: For Drilling (ft)</b>	<b>INTERVALS: Left in Well (ft)</b>	<b>CEMENT: Fill-up (Cu. Ft.)/CTS</b>
Conductor	20"	New	H-40	94#	80'	80'	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	460' *see #19	460' *see #19	CTS, 639 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	23#	18800'	18800'	4762 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

<b>TYPE</b>	<b>Size (in)</b>	<b>Wellbore Diameter (in)</b>	<b>Wall Thickness (in)</b>	<b>Burst Pressure (psi)</b>	<b>Anticipated Max. Internal Pressure (psi)</b>	<b>Cement Type</b>	<b>Cement Yield (cu. ft./k)</b>
Conductor	30"	24"	0.438"	1530	50	Class A	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730	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"	0.451"	14,530	2500	Lead-H/POZ & Tail - H	H/POZ~1.44 & H~1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

**PACKERS**

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

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WW-6B  
(10/14)

Permit Modification - API# 47-085-10360 **MOD**  
API NO. 47- 085 - 10360  
OPERATOR WELL NO. Master Unit 1H  
Well Pad Name: Lettie 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 fresh water 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."

Anticipated Max Pressure - 9300 lbs  
Anticipated Max Rate - 80 bpm

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 14.68 Acres

22) Area to be disturbed for well pad only, less access road (acres): 6.86 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 + 0.05% C-51  
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 spacer.  
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.

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\*Note: Attach additional sheets as needed.

JUL 23 2018

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE  
 Chapter 22, Article 6A, Section 5(a)(5)  
 IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<u>Irene Nutter Haymond Trust Lease</u>			
Irene Nutter Haymond	DC Petroleum, Inc.	1/8+	0257/0085
DC Petroleum, Inc.	Antero Resources Appalachian Corporation	Assignment	0257/0763
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>Gary R. Davis et ux Lease</u>			
Gary R Davis et ux	Antero Resources Appalachian Corporation	1/8	0263/0651
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>David L. Weekley Revocable Trust Lease</u>			
David L. Weekley Revocable Trust	Antero Resources Corporation	1/8+	0295/0030
<u>Cliff W. Perkins et ux Lease (3-3-6)</u>			
Cliff W. Perkins et ux	Antero Resources Corporation	1/8+	0266/0244
<u>Cliff. W. Perkins et ux Lease (3-1-p/o 5)</u>			
Cliff W. Perkins et ux	Antero Resources Corporation	1/8+	0266/0250

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WW-6A1  
(5/13)

Operator's Well No. Master Unit 1H

MOD

**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE  
Chapter 22, Article 6A, Section 5(a)(5)  
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

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Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
<u>Richard L. Barnard Lease</u>	Richard L. Barnard	Antero Resources Corporation	1/8+	0442/0079

\*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

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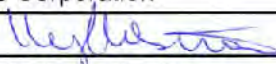
WV Department of  
Environmental Protection

**Acknowledgement of Possible Permitting/Approval  
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Antero Resources Corporation  
 By: Kevin Kilstrom   
 Its: Senior Vice President - Production

FORM WW-6A1  
EXHIBIT 1

47  
MOD 08510360

FILED

JUN 10 2013

Natalie E. Tennant  
Secretary of State  
1900 Kanawha Blvd E  
Bldg 1, Suite 157-K  
Charleston, WV 25305



Penney Barker, Manager  
Corporations Division  
Tel: (304)558-8000  
Fax: (304)558-8381  
Website: [www.wvsos.com](http://www.wvsos.com)  
E-mail: [business@wvsos.com](mailto:business@wvsos.com)

APPLICATION FOR  
AMENDED CERTIFICATE  
OF AUTHORITY

Office Hours: Monday - Friday  
8:30 a.m. - 5:00 p.m. ET

FILE ONE ORIGINAL  
(Two if you want a filed  
stamped copy returned to you)  
FEE: \$25.00

\*\*\*\* In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby \*\*\*\*  
applies for an Amended Certificate of Authority and submits the following statement:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation  
(Attach one Certified Copy of Name Change as filed in home State of Incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation  
(due to home state name not being available)
- Other amendments:  
(attach additional pages if necessary)
- Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)  
Alvyn A. Schopp (303) 367-7310  
Contact Name Phone Number
- Signature Information (See below \*Important Legal Notice Regarding Signature\*):  
Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person  
Signature: [Handwritten Signature] Date: June 10, 2013

**\*Important Legal Notice Regarding Signature:** Per West Virginia Code §31D-1-129, Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

JUL 23 2018





M&D

Master Unit 1H



Antero Resources Corporation

Master Unit 1H - AOR



REMARKS  
No Wells of Interest

April 10, 2018

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LATITUDE 39°22'30"

10,055'

LATITUDE 39°25'00"

2,705' TO BOTTOM HOLE

3,698'

8,850' TO BOTTOM HOLE

LONGITUDE 80°52'30"

LONGITUDE 80°55'00"



**Antero Resources Corporation**  
Well No. Master Unit 1H

**NOTES:**  
WELL 1H TOP HOLE INFORMATION:  
N: 318,126ft E: 1,601,200ft  
LAT: 39°21'53.45" LON: 80°54'38.03"  
BOTTOM HOLE INFORMATION:  
N: 328,219ft E: 1,596,929ft  
LAT: 39°23'32.53" LON: 80°55'34.46"  
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: 4,357,278m E: 507,719m  
BOTTOM HOLE INFORMATION:  
N: 4,360,331m E: 506,366m

**PAD LAYOUT**  
NOT TO SCALE

(NAD) 27 (UTM) ZONE 17 COORDS:  
WELL 1H TOP HOLE INFORMATION:  
N: 14,294,789ft E: 1,665,694ft  
POINT OF ENTRY INFORMATION:  
N: 14,294,629ft E: 1,664,912ft  
BOTTOM HOLE INFORMATION:  
N: 14,304,806ft E: 1,661,256ft

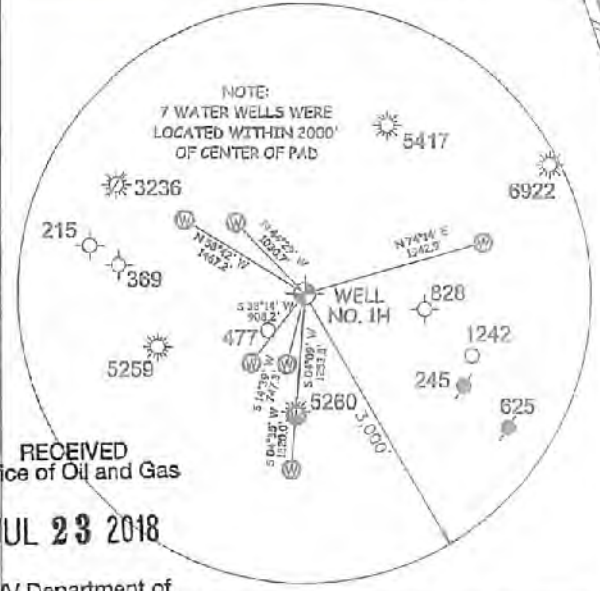
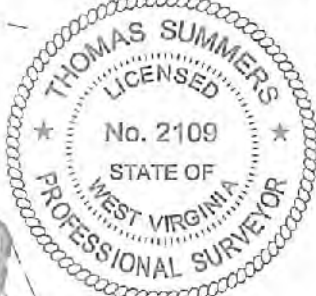
JOB # 17-015WA  
DRAWING # MASTER1HR  
SCALE 1" = 1000'  
MINIMUM DEGREE OF ACCURACY SUBMETER  
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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

OPERATOR'S WELL# MASTER UNIT #1H  
47 - 085 - 10360  
STATE COUNTY PERMIT

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

THOMAS SUMMERS P.S. 2109  
DATE 07/18/18



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WV 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

WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL  
(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X  
LOCATION: ELEVATION 970' - AS BUILT WATERSHED NORTH FORK HUGHES RIVER  
QUADRANGLE PENNSBORO 7.5 (TH) - MIDDLEBORNE 7.5 (RH) DISTRICT CLAY COUNTY RITCHIE  
SURFACE OWNER DANIEL M. HAYMOND IV ET AL ACREAGE 111.48 ACRES +/-  
OIL & GAS ROYALTY OWNER IRENE NUTTER HAYMOND TRUST; GARY R. DAVIS ET UX; LEASE ACREAGE 375 AC±; 10.25 AC±;  
DAVID L. WEEKLY REV. TRUST; CLIFF W. PERKINS ET UX; CLIFF W. PERKINS ET UX; RICHARD L. BARNARD 229 AC±; 26.16 AC±; 75.08 AC±; 284 AC±  
PROPOSED WORK: DRILL CONVERT DRILL DEEPER X 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 6,800' TVD 18,800' MD  
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM  
ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD  
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313

# LETTIE WELL PAD & WATER AS-BUILT EROSION CONTROL IMPROVEMENTS

## LOCATION COORDINATES:

ACCESS ROAD ENTRANCE  
LATITUDE: 39.365306 LONGITUDE: -80.912305 (NAD 83)  
N 4357319.87 E 507554.43 (UTM ZONE 17 METERS)

CENTER OF TANK  
LATITUDE: 39.365734 LONGITUDE: -80.912124 (NAD 83)  
N 4357367.42 E 507569.96 (UTM ZONE 17 METERS)

CENTROID OF PAD  
LATITUDE: 39.364936 LONGITUDE: -80.910350 (NAD 83)  
N 4357278.89 E 507722.90 (UTM ZONE 17 METERS)

## GENERAL DESCRIPTION:

THE ACCESS ROAD(S), WATER CONTAINMENT PAD, AND WELL PAD HAVE BEEN CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

## FLOODPLAIN NOTES:

THE SITE IS LOCATED WITHIN FEMA FLOOD ZONE "X" PER FEMA FLOOD MAP #54085C0125C.

## MISS UTILITY STATEMENT:

ANTERO RESOURCES CORPORATION HAS NOTIFIED MISS UTILITY OF WEST VIRGINIA FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1419246636. IN ADDITION, MISS UTILITY WAS CONTACTED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION FOR THIS PROJECT.

## ENTRANCE PERMIT:

ANTERO RESOURCES CORPORATION HAS OBTAINED AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

## ENVIRONMENTAL NOTES:

STREAM AND WETLAND DELINEATIONS WERE PERFORMED IN MAY 2014, JULY 2014, & OCTOBER 2016 BY K.C. HARVEY ENVIRONMENTAL, LLC TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE OCTOBER 21, 2016 DESIGN OVERVIEW MAP WAS PREPARED BY K.C. HARVEY ENVIRONMENTAL, LLC AND SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE MAP DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP.

## GEOTECHNICAL NOTES:

A SUBSURFACE INVESTIGATION OF THE SITE WAS PERFORMED BY PENNSYLVANIA SOIL & ROCK, INC. BETWEEN FEBRUARY 11, 2016 & FEBRUARY 25, 2016. THE REPORT PREPARED BY PENNSYLVANIA SOIL & ROCK, INC. DATED MARCH 27, 2015 REVISED JANUARY 31, 2017, REFLECTS THE RESULTS OF THE SUBSURFACE INVESTIGATION. THE INFORMATION AND RECOMMENDATIONS CONTAINED IN THIS REPORT WERE USED IN THE PREPARATION OF THESE PLANS. PLEASE REFER TO THE SUBSURFACE INVESTIGATION REPORT BY PENNSYLVANIA SOIL & ROCK, INC. FOR ADDITIONAL INFORMATION, AS NEEDED.

## PROJECT CONTACTS:

### OPERATOR:

ANTERO RESOURCES CORPORATION  
535 WHITE OAKS BLVD.  
BRIDGEPORT, WY 26330  
PHONE: (304) 842-4100  
FAX: (304) 842-4102

ELI WAGONER - ENVIRONMENTAL ENGINEER  
OFFICE: (304) 842-4068 CELL: (304) 476-9770

JON MCEVERS - OPERATIONS SUPERINTENDENT  
OFFICE: (303) 357-8799 CELL: (303) 806-2423

AARON KUNZLER - CONSTRUCTION SUPERVISOR  
CELL: (405) 227-8344

ROBERT B. WIRKS - FIELD ENGINEER  
OFFICE: (304) 842-4100 CELL: (304) 627-7405

CHARLES E. COMPTON, III - SURVEYING COORDINATOR  
CELL: (304) 719-6449

RICHARD LYLES - LAND AGENT  
CELL: (770) 378-6833

### ENGINEER/SURVEYOR:

NAVITUS ENGINEERING, INC.  
CYRUS S. KUMP, PE - PROJECT MANAGER/ENGINEER  
OFFICE: (888) 562-4185 CELL: (540) 686-6747

### ENVIRONMENTAL:

KC HARVEY ENVIRONMENTAL, LLC  
SHANNON THOMPSON - STAFF SCIENTIST  
OFFICE: (740) 373-1970 CELL: (970) 396-8250

### GEOTECHNICAL:

PENNSYLVANIA SOIL & ROCK, INC.  
CHRISTOPHER W. SAMIOS - PROJECT ENGINEER  
OFFICE: (412) 372-4000 CELL: (412) 589-0662

## RESTRICTIONS NOTES:

1. THERE ARE NO LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE WELL PAD AND LOD. THERE ARE WETLANDS & PERENNIAL STREAMS ADJACENT TO THE STAGING AREA & WATER CONTAINMENT PAD THAT HAS REMAINED UNDISTURBED.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE WELL PAD AND LOD.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE WELL PAD AND LOD.
4. THERE ARE NO APPARENT EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE WELL(S) BEING DRILLED.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.

## REPRODUCTION NOTE

THESE PLANS WERE CREATED TO BE PLOTTED ON 22"x34" (ANSI D) PAPER. HALF SCALE DRAWINGS ARE ON 11"x17" (ANSI B) PAPER.

THESE PLANS WERE CREATED FOR COLOR PLOTTING AND ANY REPRODUCTIONS IN GRAY SCALE OR COLOR MAY RESULT IN A LOSS OF INFORMATION AND SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

CLAY DISTRICT, RITCHIE COUNTY  
CABIN RUN-NORTH FORK HUGHES

USGS 7.5 PENNSBORO



2000 0  
SCALE: 1" = 2000'

## WEST VIRGINIA COUNTY MAP



(NOT TO SCALE)

## AS-BUILT CERTIFICATIONS:

THE DRAWINGS, CONSTRUCTION NOTES, AND REFERENCE DIAGRAMS ATTACHED HERETO HAVE BEEN PREPARED IN ACCORDANCE WITH THE WEST VIRGINIA CODE OF STATE RULES, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS CRS 35-8.

Mod

# WATER CONTAINMENT PAD & SEDIMENT CONTROL PLAN

RECEIVED  
Office of Oil and Gas

JUL 23 2018

WV Department of  
Environmental Protection

**SHEET INDEX:**

- 1 - COVER SHEET
- 2 - LEGEND
- 3 - OVERALL PLAN SHEET INDEX
- 4 - ACCESS ROAD, WELL PAD, & WATER CONTAINMENT PAD AS-BUILT PLAN
- 5 - ACCESS ROAD AS-BUILT PROFILE, WELL PAD, WATER CONTAINMENT PAD, & STOCKPILE AS-BUILT SECTIONS

CLAY COUNTY, WEST VIRGINIA  
SOUTH RIVER WATERSHED  
QUAD MAP



WEST VIRGINIA STATE PLANE COORDINATE SYSTEM  
NORTH ZONE, NAD 83  
ELEVATION BASED ON NAVD83  
ESTABLISHED BY SURVEY, GRADE GPS & DPUS  
POST-PROCESSING

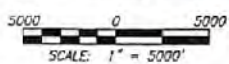
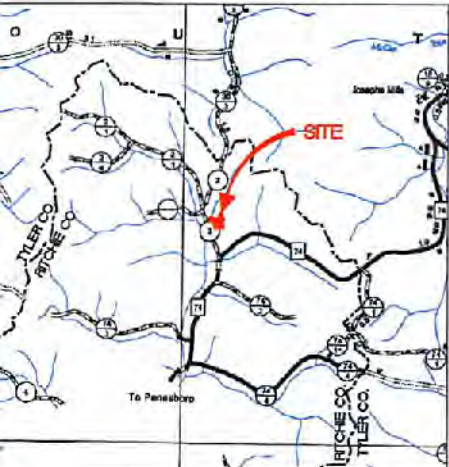
LETTIE LIMITS OF DISTURBANCE AREA (AC)	
<b>Total Site</b>	
Access Road "A" (554')	1.94
Access Road "B" (37')	0.05
Staging Area	1.14
Well Pad	8.86
Water Containment Pad	1.47
Excess/Topsoil Material Stockpiles	3.22
<b>Total Affected Area</b>	<b>14.68</b>
<b>Total Wooded Acres Disturbed</b>	<b>12.34</b>
<b>Impacts to Christopher K. Haymond TM 4-09</b>	
Access Road "A" (487')	1.70
Access Road "B" (24')	0.02
Staging Area	1.14
Well Pad	6.86
Water Containment Pad	0.76
Excess/Topsoil Material Stockpiles	3.22
<b>Total Affected Area</b>	<b>13.70</b>
<b>Total Wooded Acres Disturbed</b>	<b>12.25</b>
<b>Impacts to Michael D Hammett TM 4-13</b>	
Access Road "A" (67')	0.24
Access Road "B" (13')	0.03
Water Containment Pad	0.71
<b>Total Affected Area</b>	<b>0.98</b>
<b>Total Wooded Acres Disturbed</b>	<b>0.09</b>

Proposed Well Name	WV North NAD 27	WV North NAD 83	UTM (METERS) Zone 17	NAD 83 Lat & Long
Leeroy Unit 1H	N 318128.36 E 1601170.59	N 318152.77 E 1569729.51	N 4357278.66 E 507709.97	LAT 39-21-53.7503 LONG -80-54-37.8009
Leeroy Unit 2H	N 318127.46 E 1601160.65	N 318161.85 E 1569739.47	N 4357278.44 E 507713.01	LAT 39-21-53.7510 LONG -80-54-37.5740
Leeroy Unit 3H	N 318126.56 E 1601190.61	N 318190.08 E 1569749.43	N 4357278.22 E 507716.05	LAT 39-21-53.7437 LONG -80-54-37.5470
Master Unit 1H	N 318125.67 E 1601200.47	N 318190.08 E 1569759.39	N 4357278.00 E 507719.05	LAT 39-21-53.7364 LONG -80-54-37.4200
Master Unit 2H	N 318124.77 E 1601210.43	N 318159.19 E 1569769.35	N 4357277.78 E 507722.13	LAT 39-21-53.7291 LONG -80-54-37.2930
Master Unit 3H	N 318123.88 E 1601220.39	N 318158.29 E 1569779.31	N 4357277.55 E 507725.17	LAT 39-21-53.7218 LONG -80-54-37.1660
Hayes Unit 1H	N 318122.98 E 1601230.35	N 318157.40 E 1569789.27	N 4357277.33 E 507728.21	LAT 39-21-53.7145 LONG -80-54-37.0390
Hayes Unit 2H	N 318122.09 E 1601240.31	N 318156.50 E 1569799.23	N 4357277.11 E 507731.24	LAT 39-21-53.7072 LONG -80-54-36.9121
Christopher Unit 1H	N 318121.19 E 1601250.27	N 318155.61 E 1569809.19	N 4357276.89 E 507734.28	LAT 39-21-53.6999 LONG -80-54-36.7851
Christopher Unit 2H	N 318120.29 E 1601260.23	N 318154.71 E 1569819.15	N 4357276.67 E 507737.32	LAT 39-21-53.6926 LONG -80-54-36.6581
Christopher Unit 3H	N 318119.40 E 1601270.19	N 318153.82 E 1569829.11	N 4357276.44 E 507740.36	LAT 39-21-53.6852 LONG -80-54-36.5311
Well Pad Elevation	970.0			

**NOTES:**

1. ALL BMP'S MUST REMAIN IN PLACE AND FUNCTIONAL UNTIL ALL AREAS WITHIN THE LIMIT OF DISTURBANCE ARE COMPLETE AND PERMANENTLY STABILIZED. MAINTENANCE MUST INCLUDE INSPECTION OF ALL EROSION AND SEDIMENT CONTROLS AFTER EACH RUNOFF EVENT IN EXCESS OF 0.5" AND ON A BIWEEKLY BASIS.
2. THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL STABILIZATION MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. FINAL STABILIZATION MEANS THAT ALL SOIL-DISTURBING ACTIVITIES ARE COMPLETED, AND THAT EITHER A PERMANENT VEGETATIVE COVER WITH A DENSITY OF 70% OR GREATER HAS BEEN ESTABLISHED OR THAT THE SURFACE HAS BEEN STABILIZED BY HARD COVER SUCH AS PAVEMENT OR BUILDINGS. IT SHOULD BE NOTED THAT THE 70% REQUIREMENT REFERS TO THE TOTAL AREA VEGETATED AND NOT JUST A PERCENT OF THE SITE.
3. ALL PERMANENT SEDIMENT CONTROL MEASURES CAN BE REMOVED AFTER THE SITE IS PERMANENTLY STABILIZED AND APPROVAL IS RECEIVED FROM THE WDPEP.
4. ANY AREAS DISTURBED BY REMOVAL OF CONTROLS SHALL BE REPAIRED, STABILIZED, AND PERMANENTLY SEEDED.
5. THE AS-BUILT INFORMATION SHOWN HEREON REFLECTS FIELD DATA COLLECTED RELATING TO THE FINAL GRADING OF THE DISTURBED AREA AS OF MARCH 15, 2018. NAVITUS ENGINEERING IS NOT RESPONSIBLE FOR ANY CHANGES MADE TO THE SITE AFTER THE ABOVE MENTIONED DATES.
6. THE EXISTING CONTAINMENT BERM AROUND THE WELL PAD SHALL BE REPAIRED AS NECESSARY TO ENSURE 100% CONTAINMENT OF ALL FLUIDS PRIOR TO DRILLING OPERATIONS.
7. THE EXISTING EGREGESSES TO THE WELL PAD SHALL HAVE THE MOUNTABLE BERMS REPAIRED AS NECESSARY TO ENSURE 100% CONTAINMENT OF ALL FLUIDS PRIOR TO DRILLING OPERATIONS.

WVDOH COUNTY ROAD MAP



MISS Utility of West Virginia  
1-800-245-4848  
West Virginia State Law  
(Section XIV: Chapter 24-C)  
Requires that you call two  
business days before you dig in  
the state of West Virginia.  
**IT'S THE LAW!!**



Telephone: (888) 952-4195 | www.NavitusEng.com

DATE	REVISION



THIS DOCUMENT  
WAS PREPARED FOR:  
ANTERO RESOURCES  
CORPORATION

COVER SHEET  
**LETTIE**  
WELL PAD & WATER CONTAINMENT PAD  
CLAY DISTRICT  
RITCHIE COUNTY, WEST VIRGINIA



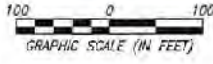
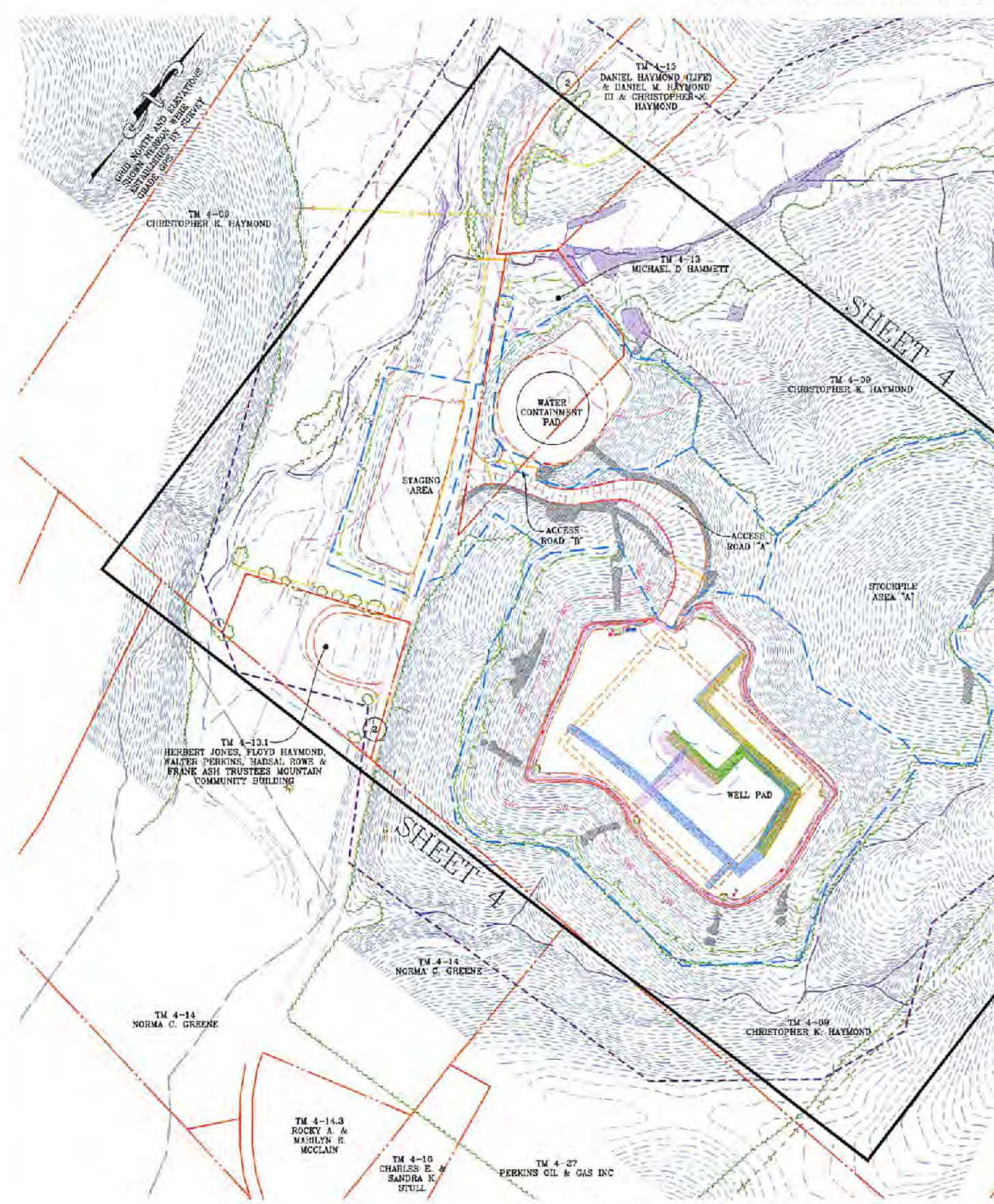
DATE: 03/26/2018  
SCALE: AS SHOWN  
SHEET 1 OF 5

# LEGEND

LEGEND		
EX. INDEX CONTOUR & CONTOUR LABEL		PR. INDEX CONTOUR
EX. INTERMEDIATE CONTOUR		PR. INTERMEDIATE
EX. PROPERTY LINE		PR. INTERMEDIATE
EX. TOP OF BERM		PR. INDEX ROAD
EX. ROAD EDGE OF GRAVEL/DIRT		PR. INTERMEDIATE
EX. ROAD EDGE OF PAVEMENT		PR. PADS/STOCK
EX. ROAD CENTERLINE		PERMITTED LIMIT
EX. GUARDRAIL		MODIFICATION LIM
EX. BRIDGE		PR. ROAD/IMPOU
EX. DITCHLINE/DRAINAGE FEATURE		PR. ROAD CENTE
EX. RIP-RAP		PR. GUARDRAIL
EX. CULVERT		PR. ROCK CONST
EX. TREELINE		PR. AIR BRIDGE
EX. BUILDING		PR. CULVERT
EX. MISCELLANEOUS FEATURE		PR. DITCH
EX. 100 YR FEMA FLOODPLAIN		PR. RIP-RAP TR
EX. DELINEATED STREAM		PR. OUTLET PRO
EX. DELINEATED WETLAND/POND		PR. DIVERSION
100' WETLAND/STREAM BUFFER		PR. ROCK LEVEL
STREAM/WETLAND DELINEATION STUDY AREA		PR. COMPOST FI
EX. FENCELINE		PR. SUPER SILT
EX. GATE		PR. WELL HEAD
EX. PERIMETER SAFETY FENCE		PR. PAD DEWATE
EX. ACCESS GATE WITH EMERGENCY LIFELINE		PR. TOP OF PAD
EX. WELL HEAD ON DESIGNED PAD		PR. 220' X 320'
EX. GAS WELL		PR. SPOT SHOT
EX. PIPELINE		PR. PERMETER
EX. PIPELINE R/W		PR. ACCESS GAT
EX. PIPELINE METER		PR. PIPELINE
EX. PIPELINE VALVE		PR. PIPELINE R/
EX. PIT		PR. OVERHEAD U
EX. OVERHEAD UTILITY		PR. POWER POLE
EX. POWER POLE/GUY WIRE		PR. OVERHEAD U
EX. UNDERGROUND ELECTRIC		PR. WATERLINE
EX. UNDERGROUND TELEPHONE		BORING LOCATIO
EX. UNDERGROUND FIBER OPTIC		X-SECTION/PROF
EX. UTILITY R/W		X-SECTION/PROF
EX. WATERLINE		X-SECTION/PROF
EX. WATER WELL/EX. SPRING		X-SECTION/PROF
EX. COMPOST SOCK		X-SECTION/PROF
EX. SUPER SILT FENCE		X-SECTION/PROF
EX. SILT FENCE		MATCHLINE
APPROX. LOCATION OF SLIDE AREA		EX. METER
APPROX. LOCATION OF BORROW/ SPOIL AREA		EX. TANK
PR. TOE BENCH		EX. COMBUSTOR
EX. APPROX. SURFACE & SUB-SURFACE ELECTRIC LINE AREA		EX. GPU
EX. APPROX. SURFACE & SUB-SURFACE DUMP LINE AREA		EX. SEPARATOR
EX. APPROX. SURFACE & SUB-SURFACE WELL LINE AREA		EX. VRT
EX. APPROX. SURFACE & SUB-SURFACE SALES LINE AREA		EX. KNOCK-OUT



# OVERALL PLAN SH











# ACCESS ROAD AS-BUILT PROFILE CONTAINMENT PAD, & STOCKP

