west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
(304) 926-0450
(304) 926-0452 fax

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

August 21, 2014

WELL WORK PERMIT

Horizontal 6A Well

This permit, API Well Number: 47-7700617, issued to MOUNTAINEER KEYSTONE, LLC, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.

James Martin
Chief

Operator's Well No: HAMILTON 213
Farm Name: HAMILTON, TERRY D. & BETTY
API Well Number: 47-7700617
Permit Type: Horizontal 6A Well
Date Issued: 08/21/2014

Promoting a healthy environment.

API Number: 4707700617

PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.

2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.

3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.

4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.

5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.

6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.

7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.

8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov within 30 days of commencement of drilling.

4707700617

WW-6B
(9/13)

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

		77	06	347
1) Well Operator: Mountaineer Keystone, LLC	494501227	Preston	Reno	Fellowsville 7.5'
	Operator ID	County	District	Quadrangle

2) Operator's Well Number: Hamilton 213 Well Pad Name: Hamilton 211-215

3) Farm Name/Surface Owner: Terry D. and Betty Hamilton Public Road Access: Rt. 92

4) Elevation, current ground: 1566.82' Elevation, proposed post-construction: 1562'

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

6) Existing Pad: Yes or No No

3/25/14

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus Shale, 7962' (TVD Heel) - 8101' (TVD Toe), 100 ft., 0.5 psi/ft.

8) Proposed Total Vertical Depth: 8101'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 17274'

11) Proposed Horizontal Leg Length: 9684'

12) Approximate Fresh Water Strata Depths: surface to 800'

13) Method to Determine Fresh Water Depths: Offsetting wells reported water depths (077-00434, 077-00505, 077-00424, 077-00384, 077-00398)

14) Approximate Saltwater Depths: 1000 - 1800'

15) Approximate Coal Seam Depths: Bakerstown - 190', Brush Creek - 290', Upper Freeport - 350', Lower Freeport - 400', Upper Kittanning - 510', Middle Kittanning - 550', Lower Kittanning - 580'

16) Approximate Depth to Possible Void (coal mine, karst, other): none known

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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18) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	20"	New	H-40	94#	100'	100'	Grout
Fresh Water	13.375"	New	J-55	54.5#	900'	900'	CTS
Coal							
Intermediate	9.625"	New	J-55	36#	1900'	1900'	CTS
Production	5.5"	New	P-110	20#	17,154'	17,154'	TOC@1,700'
Tubing							
Liners							

3/25/14

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	30"	0.417"	1530	None	None
Fresh Water	13.375"	17.5"	0.38"	2730	Class A & 1.5% CaCl	1.18
Coal						
Intermediate	9.625"	12.25"	0.352"	3520	Type 1 & 1.5% CaCl	1.2
Production	5.5"	7.875"	0.361"	14360	50/50 - Type 1	1.2
Tubing						
Liners						

PACKERS

Kind:			
Sizes:			
Depths Set:			

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

The well will be started with a conductor rig drilling a 30" hole to Conductor programmed depth then running 20" casing and grout cement back to surface. The conductor rig will move out and the drilling rig will move in and rig up. The drilling rig will then spud a 17 ½" hole and drill to fresh water casing (Surface) to the programmed depth, Run 13- 3/8" casing and cement to surface. The rig will continue drilling a 12- ¼" intermediate hole to the programmed depth, run 9- 5/8" casing and cement to surface. The rig with then continue to drill a 8- ¾" hole vertically to a programmed depth, run wireline logs and then plug back the well with the programmed cement to a designed KOP. We will then start drilling the curve and lateral section to the programmed total measured depth, run 5 ½" casing and cement according to the program.

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

The well will be completed using a plug and perforation method and stimulated with a slickwater and sand slurry. The anticipated maximum rate will be 90 bpm and the maximum pressure will be 9,500 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 6.91 acres

22) Area to be disturbed for well pad only, less access road (acres): 4.12 acres

23) Describe centralizer placement for each casing string:

20" - No centralizers
13 3/8" - one bow spring centralizer on every other joint
9 5/8" - one bow spring centralizer on every third joint from TD to surface
5 1/2" - one semi-rigid centralizer on every joint from TD of casing to end of curve. Then every other joint to KOP. Every third joint from KOP to 1,700'; there will be no centralizers from 1700' to surface.

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

*See attached sheet

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25) Proposed borehole conditioning procedures:

*See attached sheet

*Note: Attach additional sheets as needed.

Mountaineer Keystone LLC

Hamilton 213

Cement Additives

- 20" is auger drilled and cemented back to surface.
- The 13-3/8" casing will be cemented to surface with Class A cement and no greater than 3% CaCl (Calcium Chloride).
- The 9-5/8" casing will be cemented to surface with Type 1 cement and no greater than 3% calcium choride.
- The 5-1/2" production string will be cemented back to 1750' (+/- 200' above the casing shoe for the 9-5/8") with Type 1 or Class A cement retarter (to extend pumpability) cellophane flaked for fluid loss, Bentonite gel as an extender (increased pumpability and fluid loss), a defoaming agent to decrease cement foaming during mixing to insure the cement is of proper weight to placement and possibly a gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additives mentioned here, helps cement achieve a "right-angle" set) during the plastic phase of the cement set-up.

Proposed Borehole Conditioning Procedures:

- Top holes will be drilled on fluid to KOP. At KOP, the wellbore will be loaded with water based mud, barite-weighted mud system with such properties to build a filter-cake on the face to the bore-hole. This will provide lubricity as well as stabilizing the well bore. We will begin rotating the drill string and mud will be circulated upon reaching TD until no further cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will pull three stands of drill pipe, load the hole, pull three stands and load the hole. The weight indiciatror on the rig will be monitored for any occurrences of drag and if any are noticed, we will re-run the previous stand of pipe pulled across and circulate 2X bottoms up while watching the shakers for signs of cuttings. Once at the base of the curve, the string will be continuously rotated while pumping 2X bottoms up. We will pull three stands and fill the hole until we reach the vertical section of the well.

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Mountaineer Keystone LLC

Mountaineer Keystone
Hamilton #213
Casing Design
Directional Plan #1 (Phoenix)

Other Names:	Hamilton Well	County:	Preston
Surface Location:	See Direction Plan	State:	West Virginia
Bottom Hole Location:	See Direction Plan	AFE #:	API #:
		RKB:	24
Total Depth:	17,274' MD / 8,101' TVD	Ground Level:	1,562

Logs	Significant Formations (TVD)	Depth (ft) MD	Depth (ft) TVD	Hole Size	Casing and Cement	Mud	Directional & Surveys Drlg /Csg Point
None	Section 1		Grout				
		100	100	20" 94# H-40 STC			Vertical
None	Section 2		Floc	17 1/2" (PDC)		Floc Water	
				Cement:Class A 492 Sacks w/ 30% Excess TOC: Surface (top off if needed)			
Possible CBL after cement job		900	900	13 3/8" 54.5# J-55 BTC			Vertical
None	Section 3		Floc	12 1/4" (PDC)		Floc Water	
				Cement:Type 1 599 Sacks w/ 30% Excess TOC: Surface (top off if needed)			
Possible CBL after cement job		1900'	1900'	9 5/8" 36# J-55 LTC			Vertical
	Section 4		Floc				
			SOBM				
	Wier Sandstone		1,647				
	1st Elk Siltstone		4,602				
	Burkett Shale		7,567				
	Tully (Limestone)		7,587				
	Marcellus		7,872				

Wireline: None
Mudloggers:7,000' - TD
KOP @ 7,000' MD

Mud Data	From	To
Floc Water	100	1900'
Floc Water	1900'	7,000
12.5-13.0 ppg WBM or SOBM	1900'	17,274

Bit Data	From	To
17-1/2" & 12 1/4" PDC	60' ft	1900'
8- 3/4" (PDC)	1900'	17,274

Directional Data	See Directional Plan
KOP	7000
Build #1	9°/100 ft - angle XX° - Az XX°
EOB	XXX' /XXXX'
Hold	0°/100 ft - angle XX° - Az XX°
BOH	XXX' /XXXX'
EOH	XXXX' / XXXX'
Build 2	9°/100 ft - angle 89.1° - Az 335°
KOP	XXXX' / XXXX'
EOB	XXX' / 8,196'
TD	17,274' MD / 8,101' TVD
Lateral	XXXX

Cement: Type 1
Tail 1.18 ft3/sack +10% Exs in OH = 3443 sacks
Tail TOC : 1,700 ft
Pilot hole plug back 2,500' 870 sacks

17,274 MD
8101' TVD
89.1 inclination 335° Azmuth

5 1/2" 20# P-110 EC DWC

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Revision 1

Note: Not drawn to scale

Cement Outside Casing
Seal Assembly in Annulus

Date Last Revised: 19-Dec-13
Ross Schweitzer

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WW-9
(9/13)

API Number 47 - _____ - _____
Operator's Well No. Hamilton 213

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Mountaineer Keystone, LLC OP Code 494501227

Watershed (HUC 10) Little Sandy Creek Quadrangle Fellowsville 7.5'

Elevation 1562' County Preston District Reno

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes ☐ No ☑

Will a pit be used? Yes ☐ No ☑

If so, please describe anticipated pit waste: _____

Will a synthetic liner be used in the pit? Yes ☐ No ☐ If so, what ml.? _____

Proposed Disposal Method For Treated Pit Wastes:

3/25/14

_____ Land Application
_____ Underground Injection (UIC Permit Number _____)
_____ Reuse (at API Number _____)
_____ Off Site Disposal (Supply form WW-9 for disposal location)
_____ Other (Explain _____

Will closed loop system be used? If so, describe: Yes. It will contain all of the drilling medium and drill cuttings to be taken to landfill.

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Vert: Freshwater, Horiz: water based mud

-If oil based, what type? Synthetic, petroleum, etc. _____

Additives to be used in drilling medium? Sodium Chloride, Xanthan Gum, PAC R/SL, Caustic Soda, Soda Ash, Barite, Defoamer

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Landfill

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) If wet cutting, sawdust will be used.

-Landfill or offsite name/permit number? Tucker County Landfill, Davis, WV

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

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Company Official Signature _____

Company Official (Typed Name) Nathan Skeen

Company Official Title Designated Agent

Subscribed and sworn before me this 25th day of March, 20 14

Amy L Miller Notary Public

Official Seal
Notary Public, State Of West Virginia
Amy L Miller
1111 Van Voorhis Road Suite G
Morgantown WV 26505
My commission expires March 15, 2022

My commission expires 3-15-2022

4707700617

Form WW-9

Operator's Well No. Hamilton 213

Mountaineer Keystone, LLC

Proposed Revegetation Treatment: Acres Disturbed 4.12 Prevegetation pH 6.5

Lime 2 Tons/acre or to correct to pH 7.0

Fertilizer type 10-20-20

Fertilizer amount 500 lbs/acre

Mulch hay or straw at 2 Tons/acre

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
*See attached sheet			

Attach:
Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [signature]

Comments: Seed & mulch ASAP.

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Title: Oil & Gas Inspector Date: 3/25/14

Field Reviewed? (✓) Yes ( ) No

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Hamilton 213
Seed Mixtures

Area I

Seed Type	lbs/acre
Annual Ryegrass	40
Spring Oats	96
Rye Grain	140
Annual Ryegrass	26
Spring Oats	64

Area II

Seed Type	lbs/acre
Tall Fescue	40
Ladino Clover	5
Tall Fescue	30
Birdsfoot Trefoil	10
Tall Fescue	30
Crownvetch	10
Orchardgrass	12
Birdsfoot Trefoil	10
Orchardgrass	12
Ladino	3
Kentucky Bluegrass	20
Redtop	5
White Clover	2
Kentucky Bluegrass	20
Redshirt	5
Birdsfoot Trefoil	10

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Mountaineer Keystone

Site Specific
Safety and Environmental Plan
For

Hamilton 211-215
Preston County, WV
Date Prepared3/19/2014

Mounatineer Keystone	WV Oil and Gas Inspector
Title	Oil & Gas Inspector
Date	3/25/14

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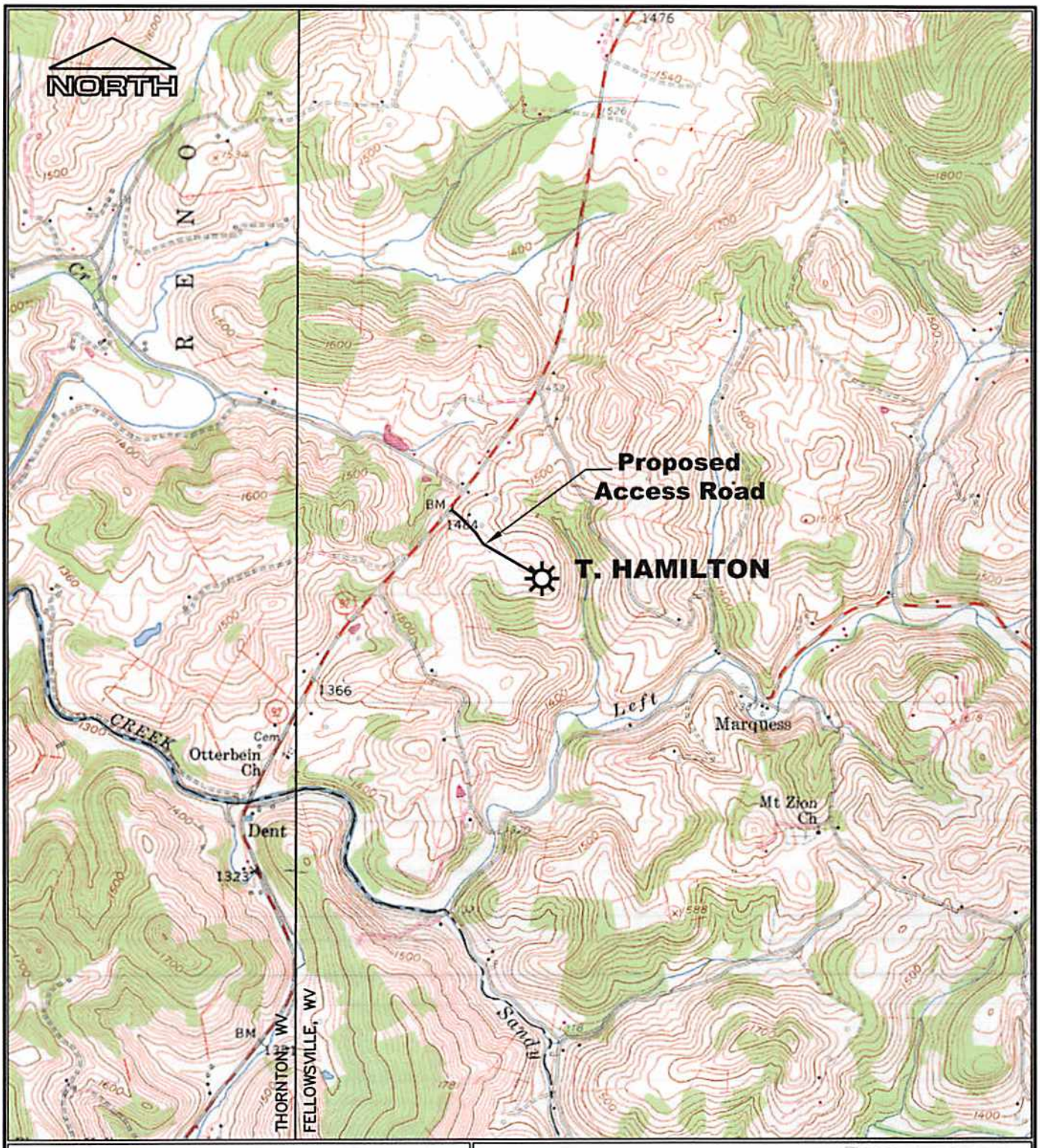

2000' 1000' 0 2000'

SCALE : 1" = 2000'

REFERENCE

U.S.G.S TOPOGRAPHIC MAPS 7.5'
FELLOWSVILLE, WV. 1958 (P.R. 1976)
THORNTON, WV. 1958 (P.R. 1976)

13-284-Hamilton Location Exhibit

MOUNTAINEER KEYSTONE, LLC

PROPOSED T. HAMILTON WELL LOCATION MAP

Drawn by	RLR	2/14	Scale: AS SHOWN
Engineer	DDT	2/14	
Checked by	RVS	2/14	
		Date	1 of 1

Prepared by MSES consultants, inc.

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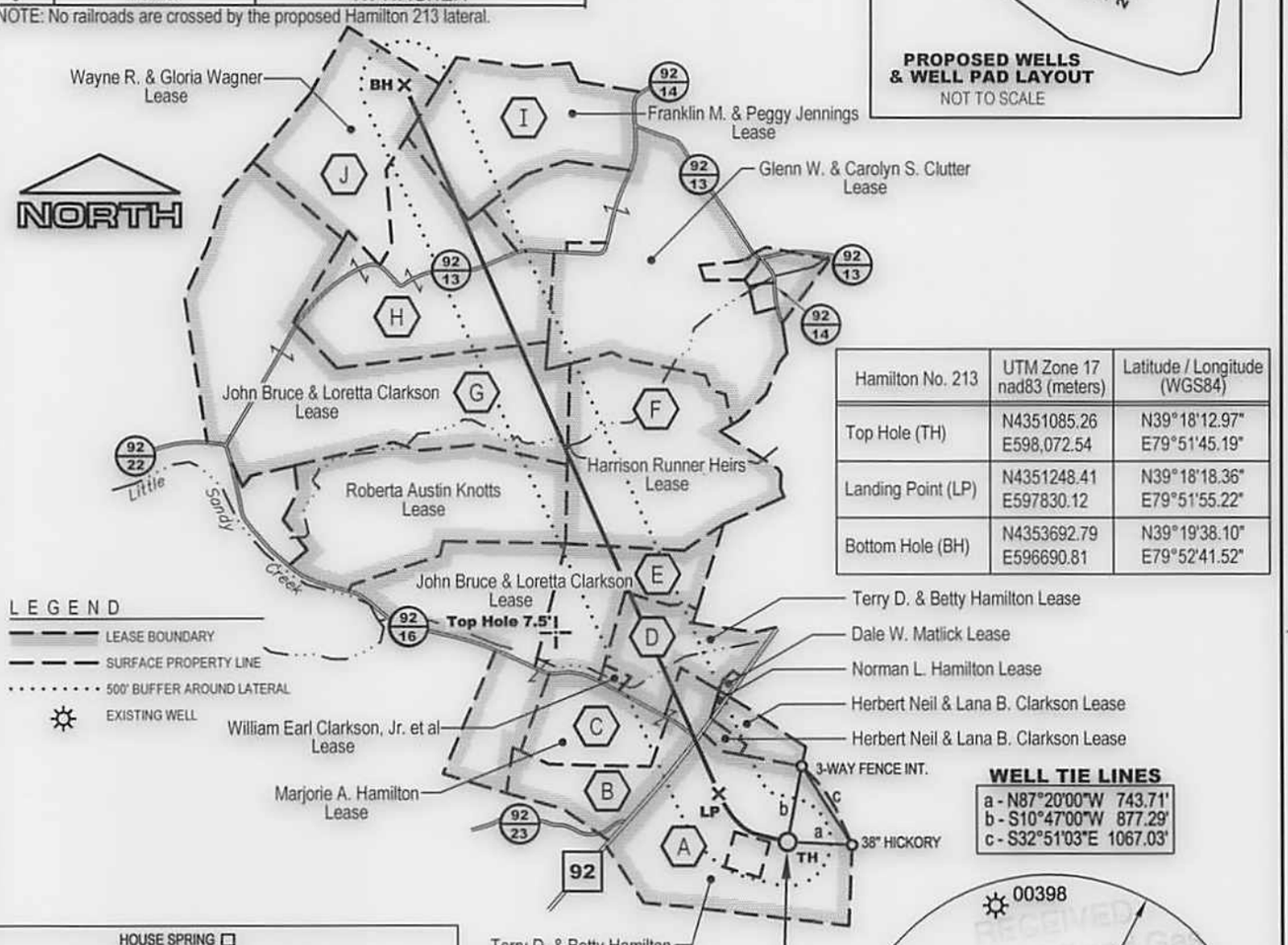
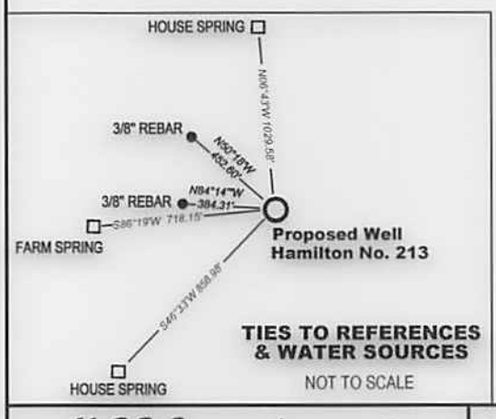
	Tax Map / Parcel	Surface Owner
A	23 / 1	T. & B. HAMILTON
B	22 / 13	HAMILTON FAMILY TRUST
C	15 / 23	HAMILTON FAMILY TRUST
D	16 / 35	T. & B. HAMILTON
E	15 / 21	J. & L. CLARKSON
F	15 / 14	H. RUNNER HEIRS
G	15 / 6	J. & L. CLARKSON
H	15 / 7	W. & G. WAGNER
I	15 / 4	F. & P. JENNINGS
J	15 / 3	W. WAGNER

NOTE: No railroads are crossed by the proposed Hamilton 213 lateral.



Hamilton No. 213	UTM Zone 17 nad83 (meters)	Latitude / Longitude (WGS84)
Top Hole (TH)	N4351085.26 E598,072.54	N39°18'12.97" E79°51'45.19"
Landing Point (LP)	N4351248.41 E597830.12	N39°18'18.36" E79°51'55.22"
Bottom Hole (BH)	N4353692.79 E596690.81	N39°19'38.10" E79°52'41.52"



MSES consultants, inc.
P. O. Drawer 190, Clarksburg, WV 26302-0190
(304) 624-9700

FILE NO. 13-284-Hamilton#213 Well Plat
SCALE 1" = 2000' DRAWN BY RLR
MIN. DEGREE OF ACCURACY 1 in 200
PROVEN SOURCE OF ELEVATION: GPS (SURVEY GRADE)

I, the undersigned, hereby certify that this plat is correct to the best of my knowledge and belief and that it shows all information required by law and the rules issued and prescribed by the department of environmental protection.

(SIGNED) _____ R.P.E. _____ P.S. 2029

DANIEL T. TREMBLY LICENSED No.2029 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

WVDEP
OFFICE OF OIL & GAS
601 57th STREET
CHARLESTON, WV 25304

DATE MARCH 7 20 14
OPERATOR'S WELL NO. HAMILTON NO. 213

47 077 00617 H6A
STATE COUNTY PERMIT NO.
API WELL NO.

WELL TYPE : OIL ☐ GAS ☒ LIQUID INJECTION ☐ WASTE DISPOSAL ☐
IF "GAS", PRODUCTION ☒ STORAGE ☐ DEEP ☐ SHALLOW ☒

LOCATION : ELEVATION 1566.58' WATERSHED LITTLE SANDY CREEK
DISTRICT RENO COUNTY PRESTON QUADRANGLE FELLOWSVILLE, W V 7.5'
SURFACE OWNER TERRY D. & BETTY HAMILTON NEAREST TOWN DENT
OIL & GAS ROYALTY OWNER T.&B. Hamilton, J.B.&L. Clarkson, H. Runner Heirs c/o E.C. Runner, W.R.&G. Wagner, F.M.&P. Jennings ACREAGE 95.06 LEASE ACREAGE 99.06

PROPOSED WORK : DRILL ☒ CONVERT ☐ DRILL DEEPER ☐ REDRILL ☐ FRACTURE OR STIMULATE ☒
PLUG OFF OLD FORMATION ☐ PERFORATE NEW FORMATION ☐ CLEAN OUT AND REPLUG ☐
OTHER PHYSICAL CHANGE IN WELL (SPECIFY) _____ PLUG AND ABANDON ☐

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD 8,101.0' MD 17,274.4'

WELL OPERATOR MOUNTAINEER KEYSTONE LLC DESIGNATED AGENT NATHAN SKEEN
ADDRESS 1111 VAN VOORHIS ROAD, SUITE G ADDRESS 1111 VAN VOORHIS ROAD, SUITE G
MORGANTOWN, WV 26505 MORGANTOWN, WV 26505

FORM WW-6

COUNTY 077

PERMIT NO.

RECEIVED Office of Oil and Gas APR 1 0 2014 WV Department of Environmental Protection