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**west virginia** department of environmental protection

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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

March 28, 2014

**WELL WORK PERMIT**

**Horizontal 6A Well**

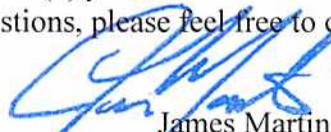
This permit, API Well Number: 47-103334, issued to MOUNTAINEER KEYSTONE, LLC, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, 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: EDGE 208  
Farm Name: EDGE, JOHN W.  
**API Well Number: 47-103334**  
**Permit Type: Horizontal 6A Well**  
Date Issued: 03/28/2014

**Promoting a healthy environment.**

## 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

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



Gene Smith, Assistant Chief  
 Office of Oil and Gas  
 601 57<sup>th</sup> Street SE  
 Charleston, WV 25304

Dear Assistant Chief:

Pursuant to your request, we submit the following letter regarding our pending well permit application for the proposed Marcellus Shale drilling location (Edge 201-208) in Barbour County, West Virginia. The proposed drilling location will be located approximately 1,500 feet from the Kasson Elementary School. We have spoken with Principal Jennifer Swift from Kasson Elementary School and would like to express our willingness to meet with officials from the Barbour County Board of Education prior to commencement of construction or operations on our proposed well pad. The purpose of this discussion would be to provide the Board of Education and school officials details of Mountaineer Keystone's current and proposed health, safety, environmental and operational policies and procedures.

Mountaineer Keystone has prepared the following supplemental safety procedures specifically for the proposed location near Kasson Elementary School:

- MK will inform all of its contractors, subcontractors and vendors that there are to be no commercial vehicles of three axles or more traveling to or from the MK well site on school district roadways during the busing curfew hours of 7:00AM-

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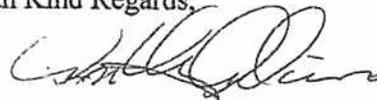
MAR 27 2014

8:30AM and 2:30PM-4:00PM while school is in session. The current school year ends June 11, 2014 and the 2014-2015 school calendar has not been finalized.

- MK will instruct its contractors, subcontractors and vendors that hazard flashers are to be utilized on all vehicles of three axles or more along SR92 at least one mile prior to approaching the school zone.
- MK will provide a flagman at the well site access road entrance along Campbell Dairy Road on days when school is in session during school operating hours.
- MK will provide a flagman along the access road to assist commercial vehicle traffic traveling the access road behind Kasson Elementary School.
- MK will utilize escort vehicles as required by the State of West Virginia.
- MK will install a guide rail on the downhill side of the access road along the expanse where it travels directly behind Kasson Elementary School.

Should you have any questions or concerns, please do not hesitate to contact me.

With Kind Regards,



Anthony Aulicino  
Director of Health, Safety and Environmental  
Mountaineer Keystone, LLC

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WW-6B  
(9/13)

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

1) Well Operator: Mountaineer Keystone, LLC 494501227 Barbour Cove Colebank, WV 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Edge 208 Well Pad Name: Edge 201-208

3) Farm Name/Surface Owner: John W. Edge Public Road Access: State Route 92

4) Elevation, current ground: 1854.0' Elevation, proposed post-construction: 1851.25'

5) Well Type (a) Gas  Oil  Underground Storage

Other

(b) If Gas Shallow  Deep

Horizontal

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):  
Marcellus Shale, ~8115 TVD, ~100', 0.50 psi

8) Proposed Total Vertical Depth: 8196'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 15644'

11) Proposed Horizontal Leg Length: 7576.6'

12) Approximate Fresh Water Strata Depths: ~480'

13) Method to Determine Fresh Water Depths: Offset drilled well records

14) Approximate Saltwater Depths: 800' - 1200'

15) Approximate Coal Seam Depths: 361', 461', 541', 586', 661', 741', 761'

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

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**

<b>TYPE</b>	<b>Size</b>	<b>New or Used</b>	<b>Grade</b>	<b>Weight per ft. (lb/ft)</b>	<b>FOOTAGE: For Drilling</b>	<b>INTERVALS: Left in Well</b>	<b>CEMENT: Fill-up (Cu. Ft.)</b>
Conductor	20"	New	H-40	94#	120'	120'	Grout
Fresh Water	13.375"	New	J-55	54.5#	600'	600'	CTS
Coal							
Intermediate	9.625"	New	J-55	36#	1600'	1600'	CTS
Production	5.5"	New	P-110	20#	15,644'	15,644'	TOC@1,400'
Tubing							
Liners							

<b>TYPE</b>	<b>Size</b>	<b>Wellbore Diameter</b>	<b>Wall Thickness</b>	<b>Burst Pressure</b>	<b>Cement Type</b>	<b>Cement Yield (cu. ft./k)</b>
Conductor	20"	20"	0.417"	1530	Grout	Grout
Fresh Water	13.375"	17.5"	0.38"	2730	Type 1-2% Cacl + 0.75 EC-1	1.24
Coal						
Intermediate	9.625"	12.25"	0.352"	3520	Type 1-2% Cacl + 0.75 EC-1	1.27
Production	5.5"	7.875"	0.361"	14360	50/50 - Type 1	1.19
Tubing						
Liners						

**PACKERS**

Kind:	n/a			
Sizes:	n/a			
Depths Set:	n/a			

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Environmental Protection  
Page 2 of 3

WW-6B  
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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#	120'	120'	421 <i>Grout</i>
Fresh Water	13.375"	New	J-55	54.5#	600'	600'	492 <i>CTS</i>
Coal							
Intermediate	9.625"	New	J-55	36#	1600'	1600'	503 <i>CTS</i>
Production	5.5"	New	P-110	20#	<i>15,644</i>	<i>15,644</i>	<i>700 @ 1400'</i>
Tubing							
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	20"	0.417"	1530	<i>GROUT</i> <del>None</del>	<i>GROUT</i> None
Fresh Water	13.375"	17.5"	0.38"	2730	Type 1-2% Cacl + 0.75 EC-1	1.24
Coal						
Intermediate	9.625"	12.25"	0.352"	3520	Type 1-2% Cacl + 0.75 EC-1	1.27
Production	5.5"	7.875"	0.361"	14360	50/50 - Type 1	1.19
Tubing						
Liners						

*B.O.A.  
11-5-13*

PACKERS

Kind:	n/a			
Sizes:	n/a			
Depths Set:	n/a			

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

Hydraulic Stimulation

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

Perform a multi-stage plug and perf slickwater hydraulic stimulation utilizing approximately 7,500 bbls of water and 400,000 lbs of sand per stage.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 10.6

22) Area to be disturbed for well pad only, less access road (acres): 4.66

23) Describe centralizer placement for each casing string:

\*See attached sheet

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

\*See attached sheet

25) Proposed borehole conditioning procedures:

\*See attached sheet

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\*Note: Attach additional sheets as needed.

# Mountaineer Keystone LLC



## WW-6B Edge 201 – 208

### 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 every third joint from TD to surface
- 5 1/2" – one semi-rigid centralizer on every other joint from TD of casing to end of curve. Then every other joint to KOP.
- Every third joint from KOP to 1,400 TOC will be 1,400'; there will be no centralizers from 1/400' to surface.

### Cement Additives

- 20" is drive pipe.
- 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 retarder (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 salt-water based, or 50 BM barite-weighted mud system with such properties as 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 circuated upon reaching TD until no furhter cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will put three strands of drill pipe, load the hole, pull three strands and load the hole. The weight indicator on the rig will be monitored for any occurences of drag and if any are noticed, we will re-run the previous strand 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 rotoated while pumping 2X bottoms up. We will pull three strands and fill the hole until we reach the vertical setion of the well.

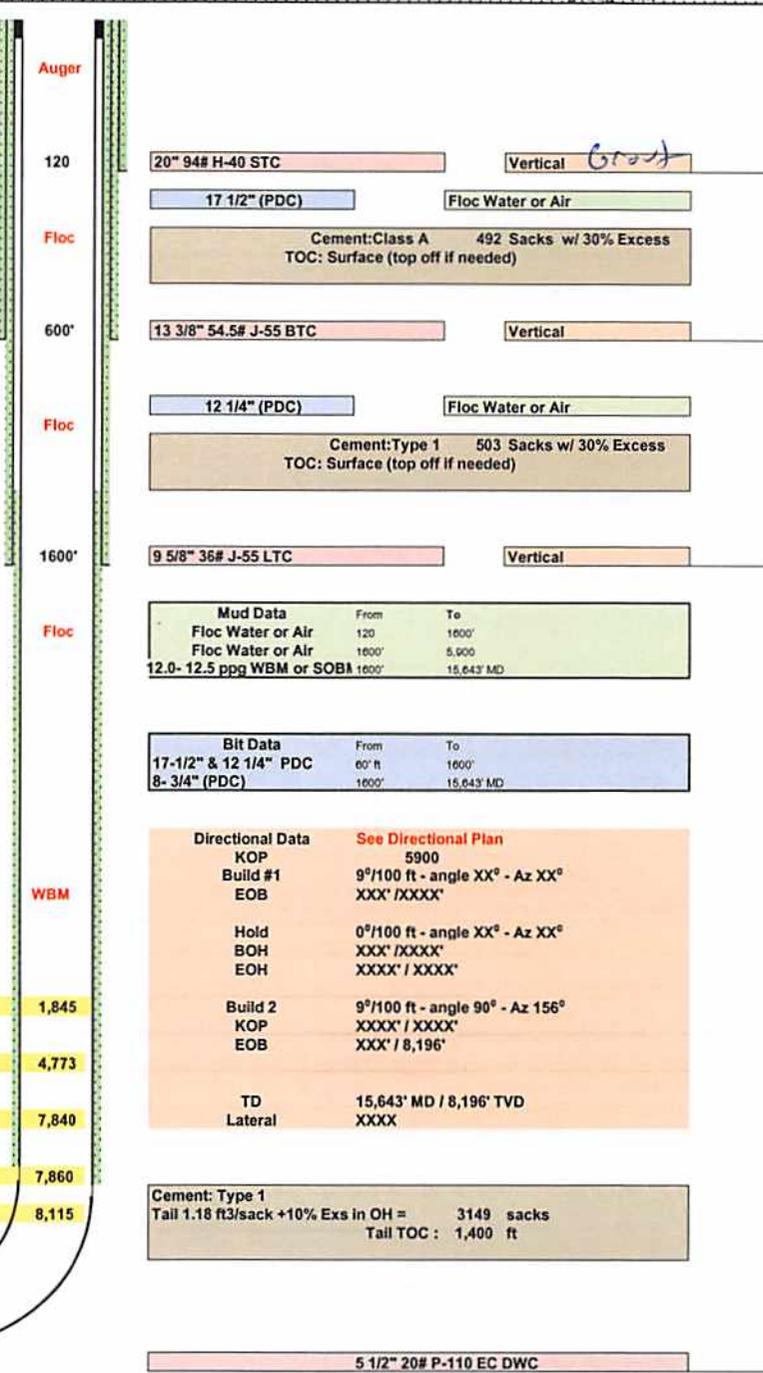
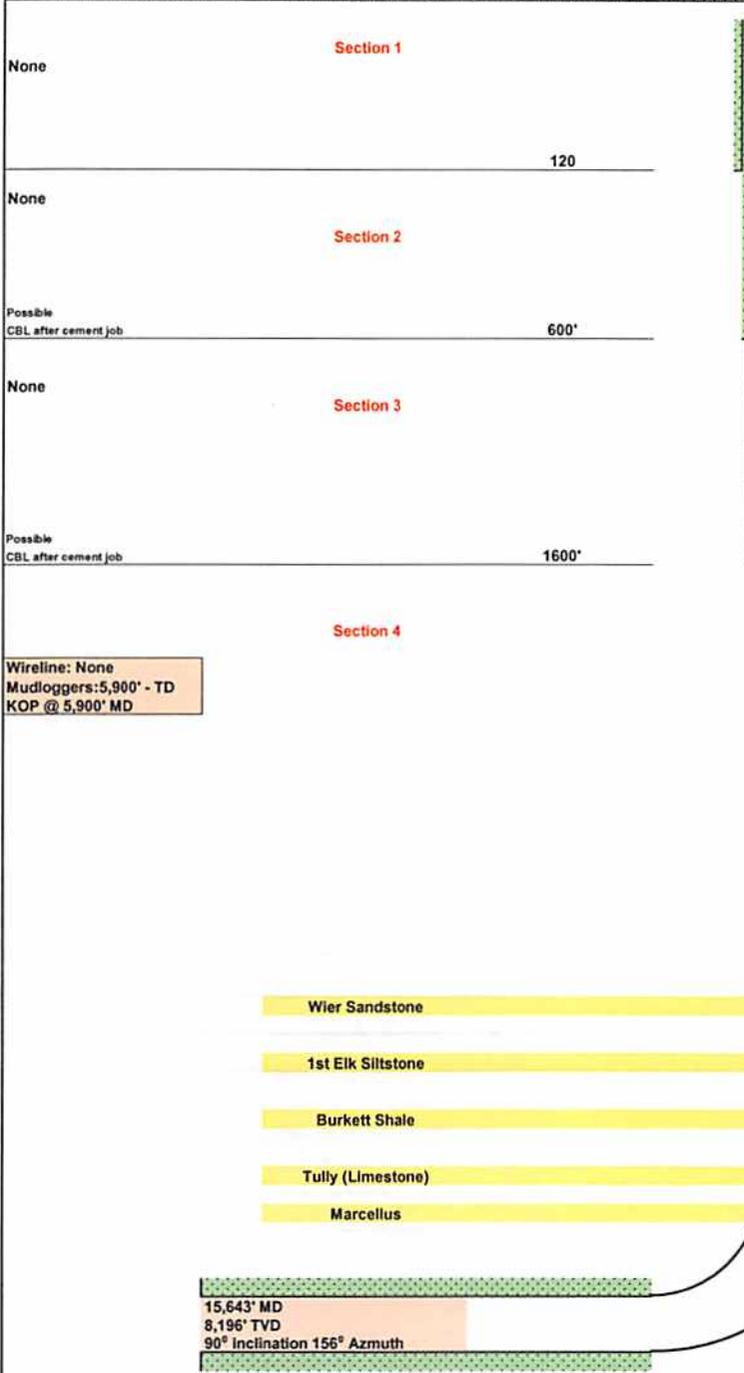
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and Safety  
6/8/2014

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Other Names:	Edge Well
Surface Location:	See Direction Plan
Bottom Hole Location:	See Direction Plan
Total Depth:	15,643' MD / 8,196' TVD

County:	Barbour
State:	West Virginia
AFE #:	API #:
RKB:	24
Ground Level:	1,851

Logs	Significant Formations (TVD)	Depth (ft) MD	Depth (ft) TVD	Hole Size	Casing and Cement	Mud	Directional & Surveys Drlg / Csg Point
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Revision 1  
Date Last Revised: 30-Sep-13  
Ross Schweitzer  
Note: Not drawn to scale  
Cement Outside Casing Seal Assembly in Annulus

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WW-9  
(9/13)

001 03334

API Number 47 - \_\_\_\_\_ - \_\_\_\_\_  
Operator's Well No. Edge 201 - 208

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) Raccoon Creek Quadrangle Colebank, WV 7.5'

Elevation 1854.0' County Barbour District Cove

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:

- Land Application
- Underground Injection ( UIC Permit Number \_\_\_\_\_ )
- Reuse (at API Number \_\_\_\_\_ )
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain Cuttings hauled off to Meadowfill Landfill)

Will closed loop system be used? If so, describe: yes

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. freshwater - vertical, oil - horizontal

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

Additives to be used in drilling medium? n/a

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) \_\_\_\_\_

-Landfill or offsite name/permit number? Meadowfill Landfill / 101215WV

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.

Company Official Signature [Signature]

Company Official (Typed Name) Nathan Skeen

Company Official Title Designated Agent

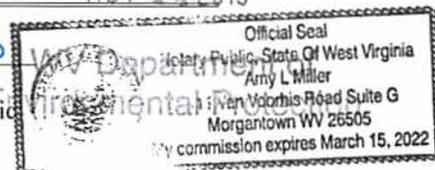
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Subscribed and sworn before me this 9th day of November, 20 13

[Signature]

Notary Public



My commission expires 3-15-2022

Form WW-9

Operator's Well No. Edge 201 - 208

Mountaineer Keystone, LLC

Proposed Revegetation Treatment: Acres Disturbed 4.40 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: *Debra O'Hara*

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Title: *Oil & Gas Inspector* Date: *11-5-13*

Field Reviewed?  Yes  No

Edge 201 - 208  
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



Delivery Acknowledgement for  
Site Specific  
Safety and Environmental Plan  
For  
Edge Pad 201-208  
Barbour County, WV  
Date Prepared: 10/22/2013

Mounatineer Keystone

Director of HSE

Title

Date

11/5/2013

WV Oil and Gas Inspector

Title

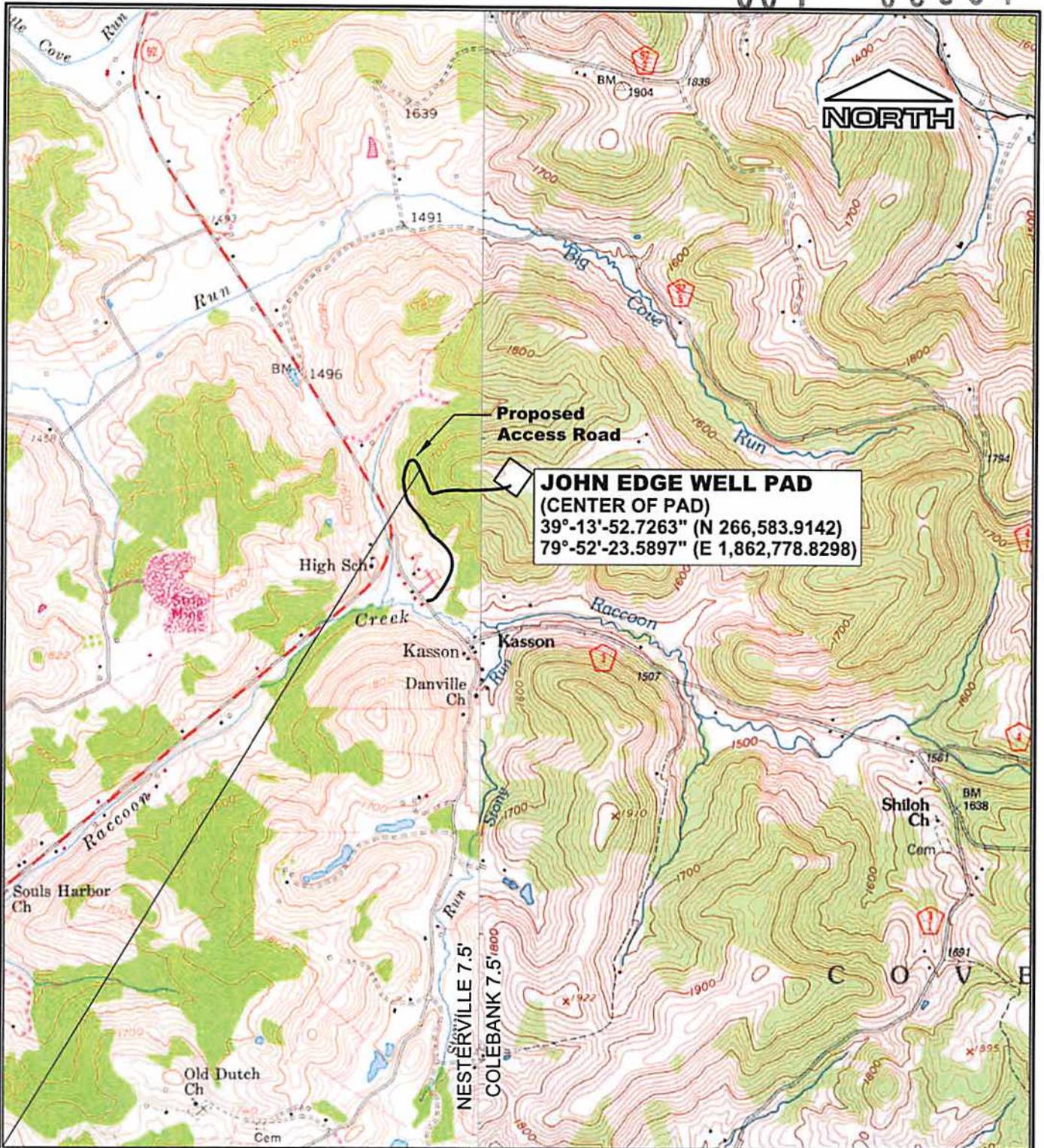
Date

3-5-14

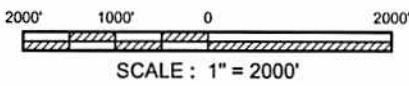
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**JOHN EDGE WELL PAD**  
 (CENTER OF PAD)  
 39°-13'-52.7263" (N 266,583.9142)  
 79°-52'-23.5897" (E 1,862,778.8298)



**REFERENCE**  
 U.S.G.S TOPOGRAPHIC MAPS 7.5'  
 COLEBANK, WV 1995  
 NESTERVILLE, W.V. 1958, P.I. 1976

**MOUNTAINEER KEYSTONE, LLC**

**PROPOSED JOHN EDGE WELL PAD LOCATION MAP**

Drawn by	RLR	11/13
Engineer	DDT	11/13
Checked by	RVS	11/13
		Date

Scale: AS SHOWN

Prepared by *MSES consultants, inc.*

**FIGURE 1**

John Edge No. 208	UTM Zone 17 nad83 (meters)	WV North State Plane nad83 (feet)	Latitude / Longitude (WGS84)
Top Hole (TH)	N4343074.41 E597277.68	N266660.43 E1862862.11	N39°13'53.4860" E79°52'22.5354"
Landing Point (LP)	N4343042.40 E597935.71	N266518.56 E1865019.46	N39°13'52.1714" E79°51'55.1109"
Bottom Hole (BH)	N4341295.22 E598748.70	N260741.49 E1867591.94	N39°12'55.1733" E79°51'22.1272"

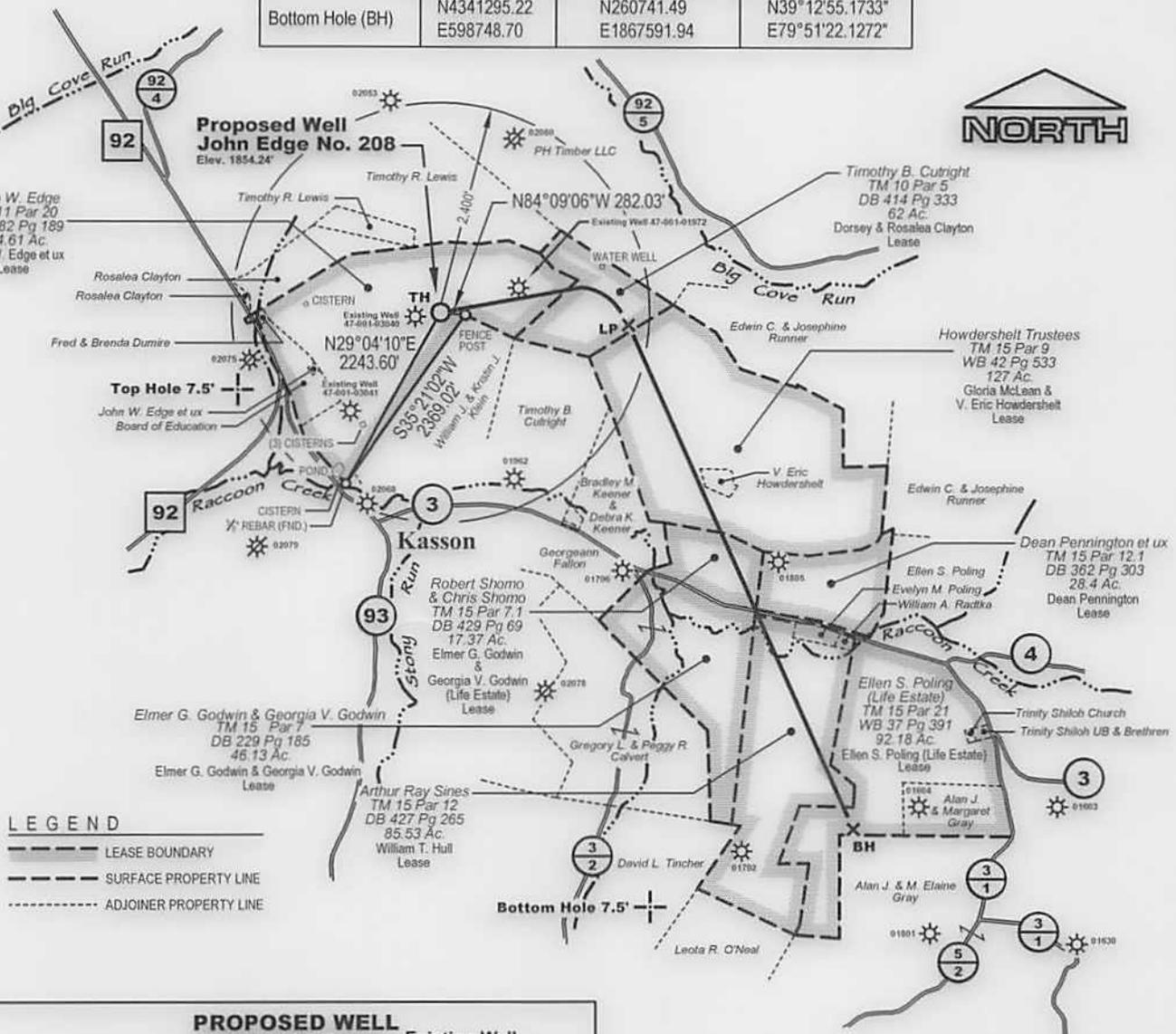
LATITUDE 39°15'00"

LONGITUDE 79°50'00"

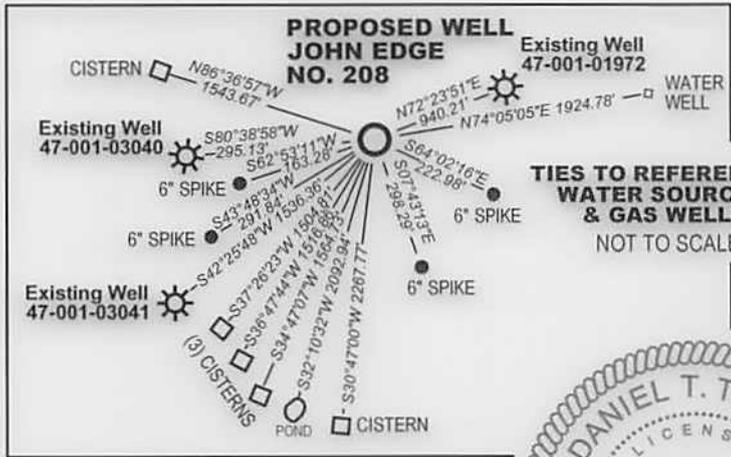
TH 11,240'

BH 6,511'

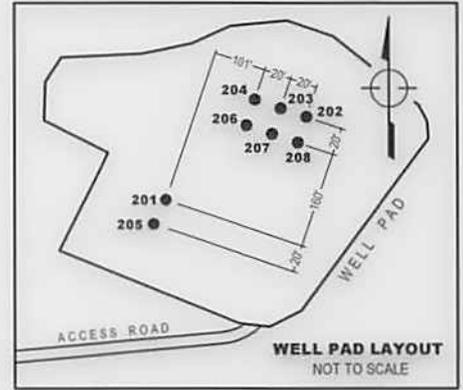
BH 12,604'



**LEGEND**  
 --- LEASE BOUNDARY  
 --- SURFACE PROPERTY LINE  
 - - - ADJOINER PROPERTY LINE



**TIES TO REFERENCES, WATER SOURCES, & GAS WELLS**  
 NOT TO SCALE



**MSES consultants, inc.**  
 P. O. Drawer 190, Clarksburg, WV 27301-0190  
 (304) 624-9700  
 FILE NO. 13-284-Edge#208 Well Plat  
 SCALE 1" = 2000' DRAWN BY SARC  
 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

STATE OF WEST VIRGINIA  
 DEPARTMENT OF MINES  
 OIL AND GAS DIVISION  
 DATE JANUARY 27 20 14  
 OPERATOR'S WELL NO. JOHN EDGE NO. 208



**47 001 03334H6A**  
 STATE COUNTY PERMIT NO.  
 API WELL NO.

COUNTY 001

PERMIT NO.

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

LOCATION: ELEVATION 1854.24' WATERSHED RACCOON CREEK QUADRANGLE COLEBANK, W.V.7.5'  
 DISTRICT COVE COUNTY BARBOUR NEAREST TOWN KASSON

SURFACE OWNER JOHN W. EDGE ACREAGE 104.61  
 OIL & GAS ROYALTY OWNER JOHN W. EDGE ET UX LEASE NO. LEASE ACREAGE 104.61

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 8,196' TVD 15,644' MD

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 IV-6