

#### 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

Austin Caperton, Cabinet Secretary www.dep.wv.gov

# Monday, April 1, 2019 PERMIT MODIFICATION APPROVAL Horizontal 6A / New Drill

HG ENERGY II APPALACHIA, LLC 5260 DUPONT ROAD PARKERSBURG, WV 26101

Re: Permit Modification Approval for NAYS 1209 N-2H

47-033-05935-00-00

Extend intermediate string, 17.5", by 150' through storage field

#### HG ENERGY II APPALACHIA, LLC

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.

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Operator's Well Number: NAYS 1209 N-2H

Farm Name: HG ENERGY II APPALACHIA, LLC

James A. Martin

Chief

U.S. WELL NUMBER: 47-033-05935-00-00

Horizontal 6A New Drill

Date Modification Issued: 04/01/2019

Promoting a healthy environment.

API NO. 47-033 \_ 05935

OPERATOR WELL NO. Nays 1209 N-2H
Well Pad Name: Nays 1209

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

1) Well Operator: HG	Energy II App	alachia, 📙	494519932	Harrison	Union	West Milford 7.5'
			Operator ID	County	District	Quadrangle
2) Operator's Well Num	ber: Nays 120	9 N-2H	Well P	ad Name: Nay	s 1209	
3) Farm Name/Surface (	Owner: Nays/Ho	Energy II App	alachia Public Ro	oad Access: Ki	ncheloe Ru	n Rd/SLS 35
4) Elevation, current gro	und: 1002'	Ele	evation, propose	d post-construc	tion: 1007'	
5) Well Type (a) Gas Other	x		Un			
(b)If Gas		х	Deep			-17
OR'S BLW	Horizontal	X				5NW 2/7/2019
6) Existing Pad: Yes or 1		311315	- 1015 a p v P	-1		210,000
<ol> <li>Proposed Target Form Marcellus at 6863'/691</li> </ol>					Pressure(s):	
	a compression		licipated pressure	at 4314#.		
8) Proposed Total Vertic		0.00 N. F. W. C. C. C.				
<ol><li>Formation at Total Ve</li></ol>	rtical Depth:	Marcellus	1			
10) Proposed Total Meas	sured Depth:	20,911'				
11) Proposed Horizontal	Leg Length:	13,328'				
12) Approximate Fresh V	Vater Strata De	pths:	135', 500'			
13) Method to Determine	Fresh Water I	epths: N	earest offset we	ell data		
14) Approximate Saltwar	er Depths: No	ne noted i	n offsets			
15) Approximate Coal Se	eam Depths: 6	60' to 665				
16) Approximate Depth t	o Possible Voi	d (coal min	e, karst, other):	None		
17) Does Proposed well l directly overlying or adja			Yes	No	, <u>x</u>	
(a) If Yes, provide Mine	e Info: Name:					5.34.33
are now with a temperature	Depth				C	Office of Oil and Gas
	Seam:					FEB 1 2 2019
	Owner				Env	WV Department of

WW-6B (04/15)

API NO. 47			
OPERATOR WELI	LNO.	Nays 1209 N-2H	
Well Pad Name	Nays	1209	

18)

## CASING AND TUBING PROGRAM

ТҮРЕ	Size (in)	New or Used	<u>Grade</u>	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	30"	New	LS	157.5	100'	100'	Drilled In
Fresh Water	20"	NEW	J-55	94	600'	600'	40% excess, yield =1.20,CTS
Coal	13 3/8"	NEW	J-55	68	1735'	1735' √	40% excess yield = 1.20,CTS
Intermediate	9 5/8"	NEW	J-55	40	2500'	2500'	40% extense yield Lead/ 0% Excess Tell
Production	5 1/2"	NEW	P-110	23	20911'	20911'	20% excess yield = 1,19, toll yield = 1
Tubing							
Liners							

5000

ТҮРЕ	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	30"	.500				CTS
Fresh Water	20"	24"	.438	2110	1200	Type 1, Class A	30 % excess yield = 1.20, CTS
Coal	13 3/8"	17 1/2"	.480	3450 /		Type 1/Class A	40% excess yield = 1.20, CTS
Intermediate	9 5/8"	12 1/4"	.395	3950		Type 1/Class A	40% excess yield = 0% Excess Load, 40
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	20% excess yield = 1.19, tail yield 1.54.0
Tubing							
Liners							

### PACKERS

Kind:	
Sizes:	RECEIVED Office of Oil and Gas
Depths Set:	FEB 1 2 2019
	WV Department of Environmental Protection

API NO. 47	04/05/2019
OPERATOR WELL	NO. Nays 1209 N-2H
Well Pad Name: N	lays 1209

19)	Describ	e pr	opos	ed '	well	work,	including	the	drilling	and	plugging	back	of any	y pilo	t hole	):

Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6900 feet. Drill horizontal leg to estimated 13328 TMD, stimulate and be capable of producing from the Marcellus Formation. Should we encounter an unanticipated void in the coal, we will install a minimum of 20' of casing below the void but not more than 100' below the void, set a basket and grout to surface.

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

The stimulation will be completed with multiple stages divided over the lateral length of the well. Stage spacing is dependent upon engineering design. Slickwater fracturing technique will be utilized on each stage using sand, water, and chemicals. See attached list. Maximum pressure not to exceed 12,500 psi.

- 21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 16.148 acres
- 22) Area to be disturbed for well pad only, less access road (acres): 10.834 acres
- 23) Describe centralizer placement for each casing string:

No centralizers will be used with conductor casing.
Freshwater - contralized every 3 joints to surface.
Coal - Bow Spring on every joint
Intermediate - 8ww Spring on first 2 joints from the lop of the curve to surface.
Intermediate - 8ww Spring on first 2 joints from the lop of the curve to surface.
Production - Run 1 spiral centralizer every 5 joints from the lop of the curve to surface. Run 1 spiral centralizer every 3 joints from the 1st 5.5" long joint to the top of the curve

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

Conductor -NAC Casing to be defined in wf Qual Rolary Rig.
Fresh Water -156 pag PME-1 + 2.5% brone CCI\_40 ME Excess Yield = 1.20, CTS
Coal - Lead: 15.4 pag PME-1 + 2.5% brone CCI\_40 ME Excess / Tail: 15.8 pag PME-1 + 2.5% brone CCI\_40 ME Excess / Tail: 15.8 pag PME-1 + 2.5% brone CCI\_40 ME Excess / Tail: 15.9 pag PME-1 + 2.5% brone CCI\_40 ME Excess

25) Proposed borehole conditioning procedures:

Conductor - Ensure the hole is clean at TO.
Fresh Water - Once casing is at setting depth, circulate a minimum of one hole volume with Fresh Water pfor to pumping coment.
Coal - Once casing is at setting depth, Circulate and condition at TD. Circulate a minimum of one hole volume pfor to pumping coment.
Intermediate - Once casing is at setting depth, Circulate and condition mut at TD. Circulate an minimum of one hole volume pfor to pumping coment.

Intermediate - Once casing is at setting depth, Circulate and condition mut at TD. Circulate an minimum of one hole volume prior to pumping coment.

Forest-from - Once on hold-proTM with earlys - circulate and more above for late at 22 bottoms up or until returns and pump prossures indicate the hole is clean. Circulate a minimum of one hole volume prior to pumping comen.

RECEIVED Office of Oil and Gas

FEB 1 2 2019

WV Department of Environmental Protection

\*Note: Attach additional sheets as needed.

#### Diane White

From: James H Moore Iii < James.H.Moore.Iii@dominionenergy.com>

Sent: Wednesday, February 06, 2019 11:55 AM

To: Diane White; Ronald L. Walden

Cc: Josh Hinton

Subject: RE: Revisions to the Nays 1209 N Lateral Permits for the Dominion Energy Natural Gas

Storage Field

Diane,

DETI agrees/approves of HG Energy setting the 13-3/8" casing shoe 150' below the base of the Gantz Sand (Storage Zone) for the NAYS 1209 wells 1H,2H,3H,4H,5H,6H.

Thanks,

Jamie.

Jamie Moore
Geologist II
Gas Storage Department
Dominion Energy Transmission, Inc.
925 White Oaks Boulevard
Bridgeport, WV 26330
Office-681-842-3372
Work Cell-304-859-1561
Personal Cell 540-641-4044



From: Diane White [mailto:dwhite@hgenergyllc.com]

Sent: Tuesday, February 05, 2019 4:32 PM

To: James H Moore Iii (GasInfrastructure - 2); Ronald L. Walden (GasInfrastructure - 2)

Cc: Josh Hinton

Subject: [External] Revisions to the Nays 1209 N Lateral Permits for the Dominion Energy Natural Gas Storage Field

Jamie and Ron,

Attached are the well schematics for the Nays 1209 N laterals. The revisions which will be requested are to allow for the 150 feet additional casing through the storage field as per your conversations with Josh Hinton.

If you can send back approval via email I'll include that with my request to the DEP for the permit revision Gas

Thank You, Diane

FEB 1 2 2019

WV Department of Environmental Protection



# 1209 N-2H Marcellus Shale Horizontal Harrison County WV

LS Conductor 0 100 Nim in w/ Dual Rotary Rig N/ TD. thickness thickness of the purple of the casing is at setting depth, circulate a minimum of one hole volume with Fresh Water prior to pumpling cement.  X 24" 94# J-55  Fresh Water 0 600  Kittaning Coal 660 665  Little/Big Lime 1126 / 1167 1151 / 1243  AIR / KCL 5/5 bxoc CaCl 4/5 Expess / Tail: 15,9 pag PNE-1 + 2.55 bxoc CaCl 4/5 Expess / Tail: 15,9 pag PNE-1 +								Harrison County, WV							
## WELLBORE DIAGRAM  ## HOLE CASING GEOLOGY TOP BASE MUD CEMENT CEMTRALIZERS CONDITIONING  ## CONDUCTOR OF TOP BASE MUD CEMENT CEMTRALIZERS  ## CONDITIONING COMMENTS  ## CONDUCTOR OF TOP BASE MUD CEMENT CEMTRALIZERS  ## CONDITIONING COMMENTS  ## CONDUCTOR OF TOP BASE MUD CEMENT CEMTRALIZERS  ## CONDITIONING COMMENTS  ## CONDUCTOR OF TOP BASE MUD CEMENT CEMENT CEMTRALIZERS  ## CONDUCTOR OF TOP BASE MUD CEMENT CEM							1209 N	I-2H SH	L	2	37364.97N 173237	3.55E			
Value   Casing   Geology   ToP   Base   MUD   Cement   Centralizers   Conditions   Comments	Fround Elev	ation		1007		11	1209	N-2H LI	0	-	237362.83N 173090	3.7E			
X   20   30" 157.5#   Conductor   0   10	Azm			341.49	3°		1209 N	I-2H BH	IC.	2	50001.47N 172667	3.04E			
17.5"   See   Se	WELLBORE DIA	GRAM	HOLE	CASING	GEOLOGY	TOP	BASE	MUD	MUD CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS			
17.5"   See   Se	(September 1	ocreronetes													
24*   20*   30   30   30   30   30   30   30		х	30"		Conductor	Ō	100	AIR		N/A		Conductor casing = 0.5" w thickness			
Name				20"					bwoc CaCl 40% Excess			Surface casing = 0.438" w			
Time		X	24"		Fresh Water	0	135	AIR				thickness			
17.5"   13-3/6*68#   Little/Big Lime   1126 / 1167   1151 / 1245   Mark / KCL   2.5% bwoc CaCL   2.5% bwoc	x	X			Fresh Water	0	600					Burst=2110 psi			
13-38° 888					Kittaning Coal	660	665			joint	Once casing is at setting				
17.5"   J-56 BTC   Intun / Gantz (Storage)   1243 / 1535   1349 / 1985   Polymer   Intermediate 1   0   1735   Thirty Foot   1650 / 1730   1697 / 1742   276% Excess CTS   2760   2760 / 276% Excess CTS   2760   2760 / 2760				13-3/8" 68#	Little/Big Lime	1126 / 1167	1151 / 1243	Salt			depth, Circulate and condition at TD. Circulate a minimum of one hole				
Strand	x	X	17.5"		Injun / Gantz (Storage)	1243 / 1535	1349 / 1585		ppg PNE-1 + 2.5% bwoc	*will also be running FCP for isolating					
12.25"   9-5/6" 40#   3-58 BTC   Shand   2035   2070   2560 by   2745   2763   2560 by   2745   2763   2560 by   2660 by   2745   2763   27					Intermediate 1	0	1735	, ayına							
12.25   9-5/8" 40#   3-5 BTC   5th Sand   2035   2070   2050   2070   2050   2070	x x	x			Fifty / Thirty Foot	1650 / 1730	1697 / 1742		Lead: 15.4 nng PNF-1 +		Once casing is at sotting				
12.25°   3-56° 40#   3-56 Bard   2035   2070   3-58 Bard   2035   2070   3-58 Bard   3-276 Bayard Sand   2125   2160					Gordon Stray / Gordon	1785 / 1850	1850 / 1940	AIR / KCI	2.5% bwoc CaCl		depth, Circulate and	Intermediate sector - 0.00			
Bayard Sand   2125   2180   Polymer   CaC    zero% Excess. CTS   Surface			12.25"	100 100 100 100 100 100 100 100 100 100	5th Sand	2035	2070					wall thickness			
Speechley   2745   2763   3005   30	x	X		7 11 11 1	Bayard Sand	2125	2160	Polymer	CaCl	The state of the s	hole volume prior to	Burst=3950 psi			
Balltown   2965   3005   9.0ppg   SOBM   Lead: 14.5 ppg   POZ:PNE-1+0.3%   bwoc R8+1%   bwoc R8+1%   bwoc R8+1%   bwoc R8+1%   bwoc R8+1%   bwoc R8+1%   bwoc R8+0.75   gal/sk FP13L + 50%   bwoc R8+0.75   gal/sk FP13L + 50%   bwoc R8+0.5%   bwoc R8+0.5%   bwoc R8+0.75   gal/sk FP13L + 50%   bwoc R8+0.5%					Intermediate 2	0	2500 ~		zero% Excess, CTS		pumping cement.				
Balltown   2965   3005   9.0ppg   SOBM   Benson   4050   4083   SOBM   Benson   4050   4083   SOBM   Benson   4050   4083   SOBM   Ead: 14.5 ppg   POZ:PNE-1 + 0.3%   bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk FP13L + 0.3%   bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk FP13L + 0.3%   bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk FP13L + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg POZ:PNE-1 + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg POZ:PNE-1 + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg POZ:PNE-1 + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg POZ:PNE-1 + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg POZ:PNE-1 + 0.3%   bwoc MPA170   Tail: 14.8 ppg PNE-1 + 0.35%   bwoc R3 + 0.75 gal/sk FP13L + 50%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%   bwoc MPA170   20% Excess   Lead (14.5 ppg PNE-1 + 0.3%	X	X	8.5" Vertical		Speechley	2745	2763	9.0ppg		every 5 joints from the top of the curve to					
Benson   4050   4083   SOBM   Control   Sobre   Sobr					Balltown	2965	3005								
West Falls					Benson	4050	4083	SOBM							
Cashaqua   6140   6341   6421   7   7   7   7   7   7   7   7   7					West Falls	4620	5865	10	bwoc R3 + 1% bwoc	Surface.					
TMD / TVD	5				Rhinestreet	5865	6140	-			The second secon				
TMD / TVD	vírc	T	Offi	F. 4 (0)	Cashaqua	6140	6341		MPA170		allowable pump rate for at	Production casing = 0.41			
TMD / TVD	X m	<b>8</b> B	G T		Middlesex	6341	6421	11.5ppg-							
TMD / TVD	ent	1	Curve Om		West River	6421	6514		1.0		pressures indicate the hole	Note:Actual centralizer			
TMD / TVD	a) P	2 2	a A	CDC HIQ	Burkett	6514	6540	SODIN				schedules may be change due to hole conditions			
TMD / TVD	rote	101	20		Tully Limestone	6540	6644			1st 5.5" long joint to the	volume prior to pumping				
TMD / TVD	9 of ection	aas		Hamilton	6644	6863		The state of the s	top of the curve.	cement.					
8.5" Lateral (Production) 20911 6900 12.5ppg SOBM  X X Onondaga 6914					6863	6914	11 5ppg-	CTS							
X X Onondaga 6914		8.5" Lateral	eral		20911	6900	12.5ppg								
	×	X			Onondaga	6914		CODIII							
LP @ 6900' TVD / 7583' 8.5" Hole - Cemented Long String		and the second second second	THE PARTY OF THE P	Contract of the Contract of th			401-101-101-101-101-101-1	CALAL STATE STATE STATE S	X	λ	<b>X</b>	<b>X</b>			

Previous Permit

WW-6B (04/15) 4703305935 04/05/2019

API NO. 47-\_\_\_\_OPERATOR WELL NO. Nays 1209 N-2H
Well Pad Name: Nays 1209

# DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS WELL WORK PERMIT APPLICATION

1) Well Opera	tor: HG Energ	y II Appa	lachia,	4945	19932	Harrison	Union	West Milford 7.5'
4 1.62 1.22				Oper	ator ID	County	District	Quadrangle
2) Operator's	Well Number: 1	lays 1209	9 N-2H		Well Pa	ad Name: Nay	rs 1209	7 Y Y
3) Farm Name	e/Surface Owner	Nays/HG	Energy II Appa	alachia	Public Ro	ad Access: Ki	ncheloe Ru	n Rd/SLS 35
4) Elevation, o	current ground:	1002'	Ele	vation	, proposed	l post-construc	tion: 1007'	
5) Well Type	(a) Gas x Other		Oil		Und	derground Stor	rage	
	(b)If Gas Si	nallow	x		Deep			1.000
	Н	orizontal	x					50W 10/22/2018
<ol><li>Existing Pa</li></ol>	d: Yes or No N	0				Lange Co.		10/22/2010
	arget Formation t 6863'/6914' and						Pressure(s):	
3) Proposed T	otal Vertical De	pth: 690	0'					
9) Formation a	at Total Vertical	Depth:	Marcellus					
10) Proposed	Total Measured	Depth:	20,911'					
11) Proposed	Horizontal Leg I	ength:	13,328'					
12) Approxim	ate Fresh Water	Strata De	pths:	135',	500'			
13) Method to	Determine Fres	h Water D	epths: N	leares	t offset w	ell data		
	ate Saltwater De			in offse	ets			
15) Approxim	ate Coal Seam I	Depths: 6	60' to 665					
16) Approxim	ate Depth to Pos	sible Voi	d (coal mir	ne, kar	st, other):	None		
	oosed well locati ving or adjacent				es	1	10 X	
(.) TCX		XI				RECE		
(a) If Yes, pi	rovide Mine Info			-		Office of O	l and Gas	
		Depth			_	NOV 1	4 2018	
		Seam:					W. 1	
		Owne	r;			WV Depa	rtment of	
					E	nvironment	al Fretecti	OH

WW-6B (04/15)

API	NO. 4/		
	<b>OPERATOR WELL</b>	NO.	Nays 1209 N-2H
	Well Pad Name:	Nays '	1209

18)

### **CASING AND TUBING PROGRAM**

ТҮРЕ	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
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Coal	13 3/8"	NEW	J-55	54.5	1635'	1635'	40% excess yield = 1.20,CT8
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Tubing							
Liners							

SDW 2018

TYPE	Size (in)	Wellbore Diameter (in)	<u>Wall</u> <u>Thickness</u> <u>(in)</u>	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	<u>Cement</u> <u>Yield</u> (cu. ft./k)
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Fresh Water	20"	24"	.438	2110	1200	Type 1, Class A	30 % excess yield = 1.20, CTS
Coal	13 3/8"	17 1/2"	.380 <sub>1</sub>	2730 、		Type 1/Class A	40% excess yield = 1.20, CTS
Intermediate	9 5/8"	12 1/4"	.395	3950		Type 1/Class A	40% coccas yield = 0% Excess Load, 40
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	20% excess yield = 1.19, tail yield 1.94.0
Tubing							
Liners							

### **PACKERS**

Kind:			
Sizes:		RECEIVED	
Depths Set:		Office of Oil and	Gas

NOV 1 4 2018

WV Department of Environmental Protection

API NO. 47	_
OPERATOR WELL NO. Nays 1209 N-2H	_
Well Pad Name: Nays 1209	

19	Describe 1	proposed	l well w	ork, inch	uding the	drilling an	d plugging	back of an	y pilot hole:

Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6900 feet. Drill horizontal leg to estimated 13328 TMD, stimulate and be capable of producing from the Marcellus Formation. Should we encounter an unanticipated void in the coal, we will install a minimum of 20' of casing below the void but not more than 100' below the void, set a basket and grout to surface.

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

The stimulation will be completed with multiple stages divided over the lateral length of the well. Stage spacing is dependent upon engineering design. Slickwater fracturing technique will be utilized on each stage using sand, water, and chemicals. See attached list. Maximum pressure not to exceed 12,500 psi.

- 21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 16.148 acres
- 22) Area to be disturbed for well pad only, less access road (acres): 10.834 acres
- 23) Describe centralizer placement for each casing string:

No centralizers will be used with conductor easing.
Freshwater - consulted every 3 joints to surface.
Coal-Bow Spring on every joint
Intermediate - Bow Spring on their 12 joints then every that joint to 100' from au
Intermediate - Bow Spring on their 12 joints then every that joint to 100' from su
Intermediate - Bow Spring on their 12 joints then every that joint to 100' from su
Intermediate - Bow Spring on their 12 joints then every that joint to 100' from su

The spring of the spring o

Production - Run 1 spiral controllers every 5 joints from the top of the curve to surface. Run 1 spiral controllers every 3 joints from the 1st 5.5' long joint to the top of the curve.

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

Conductor—VAP, Cashing to be diffed in will Dust Robby Rig.

Finally Water -16.6 ppg PMCE-1 = 9.00 k Excess Visid = 1.20, CTS

Coal - Load: 15.4 ppg PMCE-1 = 2.5% towor CoCL, 40% Excess Visid = 1.20, CTS

Coal - Load: 15.4 ppg PMCE-1 = 2.5% towor CoCL, 40% Excess / Tait: 15.9 ppg PMCE-1 = 2.5% towor CoCL, 200% Excess, CTS

cintermodular - Lead: 15.4 ppg PMCE-1 = 2.5% towor CoCL, 40% Excess, Tait: 15.9 ppg PMCE-1 = 2.5% towor CoCL, 200% Excess / Ta

25) Proposed borehole conditioning procedures:

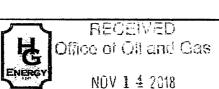
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WV Department of Environmental Protection

<sup>\*</sup>Note: Attach additional sheets as needed.



MD

### 1209 N-2H Marcellus Shale Horizontal Harrison County, WV

+/-20911' MD

		<b></b>	110 4 1 2 10	110		<u> </u>		Harrison C	ounty, wv	
			4. 55. 5. 5.		1209	N-2H SI	iL .	<u> </u>	237364.97N 173237	3.55E
Ground Elevation 1007% Departure			CHEOL	1209	N-2H L	Р	237362.83N 1730903.7E			
Azm		347.4930 nmental .7			1209 N-2H BHL				250001.47N 172667	3.04E
WELLBORE DIAGRAM	HOLE	CASING	GEOLOGY	ТОР	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS
Zirskiski minikende										
×	30"	30" 157.5# LS	Conductor	0	100	AIR	N/A, Casing to be drilled in w/ Dual Rofary Rig	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.5" wal
		20"				AIR	15.6 ppg PNE-1 + 3% bwoc CaCl 40% Excess	Centralized every 3	Once casing is at setting depth, circulate a minimum	Surface casing = 0.438" wall
XIII	24"	94# J-55	Fresh Water	0	135, 500			joints to surface	of one hale volume with Fresh Water prior to	thickness Burst=2110 psi
X			Fresh Water	0	600		Yield=1.20 / CTS		pumping cement.	333, 2110 ps
			Kittaning Coal	660	665		Lead: 15.4 ppg PNE-1+ 2.5% bwoc CaCl 40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc CaCl zero% Excess. CTS	Bow Spring on every joint	Once casing is at setting	Intermediate casing = 0.480" wall thickness Burst=3450 psi
		13-3/8" 68#	Little/Big Lime	1126 / 1167	1151 / 1243				depth, Circulate and condition at TD. Circulate a minimum of one hole volume prior to pumping cement.	
	17.5"	J-55 BTC	Injun / Gantz (Storage)	1243 / 1535	1349 / 1585	Salt Polymer				
			Intermediate 1 (Shoe 50' below storage)	O	1635					
X X		9-5/8" 40# J-55 BTC	Fifty / Thirty Foot	1650 / 1730	1697 / 1742	⊣	Lead: 15.4 ppg PNE-1 + 2.5% bwoc CaCl 40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc CaCl zero% Excess. CTS	Bow Spring on first 2 joints then every third joint to 100' form surface	Once casing is at setting depth, Circulate and condition mud at TD. Circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.395" wall thickness Burst=3950 psi
			Gordon Stray / Gordon	1785 / 1850	1850 / 1940					
X	12,25"		5th Sand	2035	2070					
			Bayard Sand	2125	2160					
			Intermediate 2	0	2500					
× ×		5-1/2* 23#	Speechley	2745	2763	9.0ppg SOBM	Lead: 14.5 ppg POZ:PNE-1 + 0.3% bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk FP13L + 0.3% bwoc MPA170 Taii: 14.8 ppg PNE-1 + 0.35% bwoc R3 + 0.75 gal/sk FP13L + 50% bwoc ASCA1 + 0.5% bwoc ASCA1 + 0.5% bwoc MPA170 20% Excess Lead Yield=1.19 Tail Yield=1.94 CTS	Run 1 spiral centralizer every 5 joints from the top of the curve to surface.	Once on bottom/TD with casing, circulate at max allowable pump rate for at least 2x bottoms up, or until returns and pump pressures indicate the hole is clean. Circulate a minimum of one hole volume prior to pumping cement.	Burst=14520 psi
	8.5" Vertical		Bailtown	2965	3005					
	a.s ventcal		Benson	4050	4083					
			West Falls	4620	5865					
			Rhinestreet	5865	6140	11.5ppg- 12.5ppg SOBM		Run 1 spiral centralizer every 3 joints from the 1st 5.5" long joint to the top of the curve.		
			Cashaqua	6140	6341					
ž ž			Middlesex	6341	6421					
	8.5" Curve		West River	6421	6514					
			Burkett	6514	6540					
			Tully Limestone	6540	6644					
			Hamilton	6644	6863					
	8,5" Lateral	al	Marcellus	6863	6914	11.5ppg- 12.5ppg SOBM				
			TMD / TVD (Production)	20911	6900					
			Onondaga	6914						
	Accessor	37.00		<b>X</b> 1000000000000000000000000000000000000		X	<b>A</b>	<b>X</b> 200 (100 (100 (100 (100 (100 (100 (100		
LP@690	00' TVD / 7583' MD		ŧ	8.5" Hole - Cemented		}		+/-133	28' ft Lateral	TD @ +/-6900' TVD

5-1/2" 23# P-110 HC CDC HTQ