

#### 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-6H

47-033-05939-00-00

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,

Chief

James A. Martin

Operator's Well Number: NAYS 1209 N-6H

Farm Name: HG ENERGY II APPALACHIA, LLC

U.S. WELL NUMBER: 47-033-05939-00-00

Horizontal 6A New Drill Date Modification Issued: 04/01/2019

Promoting a healthy environment.

API NO. 47- 033 \_

05939

OPERATOR WELL NO. Nays 1209 N-6H
Well Pad Name: Nays 1209

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

1) Well Opera	ator: HG E	nergy II App	alachia, 🛔	494519932	Harrison	Union	West Milford 7.5'
2) Operator's	Well Numbe	er: Nays 120	9 N-6H	Operator ID	County ad Name: Nay	District	Quadrangle
				alachia Public Ro			n Rd/SLS 35
4) Elevation, c				vation, proposed			
5) Well Type	(a) Gas Other	Х		Uno			
	(b)If Gas	Shallow Horizontal	x	Deep			SOW
6) Existing Pac	d: Yes or No						2/7/2019
7) Proposed Ta Marcellus at	arget Format 6863'/6914'	tion(s), Depth and 51' in thic	(s), Anticir kness. Anti	nated Thickness icipated pressure	— and Expected I at 4314#.		1:12:1
8) Proposed To	otal Vertical	Depth: 690	0'				
9) Formation a	t Total Verti	ical Depth:	Marcellus				
(0) Proposed T	otal Measur	red Depth:	23,028'				
11) Proposed H	Horizontal Le	eg Length:	14757'				
2) Approxima	ite Fresh Wa	ter Strata De	pths:	135', 500'			
Method to     Approxima				earest offset we	il data		
5) Approxima			and the second				
				e, karst, other):	None		
7) Does Propo irectly overlying	sed well loc ng or adjace	ation contain nt to an activ	coal seams e mine?	Yes	No	×	
(a) If Yes, pro	vide Mine I	nfo: Name:					
		Depth:					
		Seam:				44	RECEIVED ce of Oil and Gas
		Owner					
						F	EB 1 2 2019

WV Department of Environmental Protection WW-6B (04/15)

API NO. 47		
<b>OPERATOR WELL</b>	NO.	Nays 1209 N-6H
Well Pad Name:	Nays	1209

### 18)

# CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	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"	ŅEW	J-55	40	2500'	2500'	40% excess yield Load/ 0% Excess Te
Production	5 1/2"	NEW	P-110	23	23028'		20% excess yield = 1,10, fall yield = 1.04
Tubing							
Liners							

50w 2/7/2019

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	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 Lead_40
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	20% excess yield = 1,13, tall yield 1,54 c
Tubing							
Liners							

# PACKERS

Kind:	
Sizes:	
Depths Set:	
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FEB 1 2 2019

WV Department of Environmental Protection

#### 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



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FEB 1 2 2019

WV Department of Environmental Protection

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 revisions.

Thank You,

Diane



# 1209 N-6H Marcellus Shale Horizontal Harrison County, WV

		- 1							Harrison Co	ourity, eve				
						1209 N	1-6H SH	L	3	237394.8N 1732372	.24E			
ound Elevation	on		1007	L		1209	N-6H LF		2	38712.06N 173487	6.74E			
Azm		340.737°			1209 N-6H BHL				252642.42N 1730008.6E					
VELLBORE DIAGRA	AM.	HOLE	CASING	GEOLOGY	TOP	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS			
										- m				
	X	30"	30" 157.5# LS	Conductor	0	100	AIR	N/A, Casing to be drilled in w/ Dual Rotary Rig	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.5" wathickness			
			201			15.6 ppg PNE-1 + 3%		Once casing is at setting depth, circulate a minimum	Surface casing = 0.438" w					
	X	24 <sup>4</sup>	20" 94# J-55	Fresh Water	0	135	AIR	bwoc CaCl 40% Excess	Centralized every 3 joints to surface	of one hole volume with	thickness			
	x X			Fresh Water	0	600		Yield=1.20 / CTS		Fresh Water prior to pumping cement.	Burst=2110 psi			
				Kittaning Coal	660	665		Lead: 15.4 ppg PNE-1 +	Bow Spring on every	Once casing is at setting				
		47.00	13-3/8" 68#	Little/Big Lime	1126 / 1167	1151 / 1243		2,5% bwoc CaCl 40% Excess / Tail: 15.9	joint	depth, Circulate and condition at TD. Circulate a	Intermediate casing = 0.48			
	Х	17.5*	J-55 BTC	Injun / Gantz (Storage)	1243 / 1535	1349 / 1585	Salt Polymer	ppg PNE-1 + 2.5% bwoc	*will also be running ECP for isolating	minimum of one hole	wall thickness Burst=3450 psi			
	X			Intermediate 1	0	1735		CaCl zero% Excess, CTS	storage zone*	volume prior to pumping cement.	paret e ree par			
x x				Fifty / Thirty Foot	1650 / 1730	1697 / 1742		Lead: 15.4 ppg PNE-1 +		Once casing is at setting				
				Gordon Stray / Gordon	1785 / 1850	1850 / 1940	AIR / KCL	2.5% bwoc CaCl	Bow Spring on first 2	depth, Circulate and	Intermediate assiss - 0.00			
		12.25"	9-5/8" 40# J-55 BTC	5th Sand	2035	2070	Salt	40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc	joints then every third joint to 100' form	condition mud at TD. Circulate a minimum of one	Intermediate casing = 0.39 wall thickness			
x    x	X			Bayard Sand	2125	2160	Polymer	CaCl	surface	hole volume prior to	Burst=3950 psi			
				Intermediate 2	0.	2500		zero% Excess, CTS		pumping cement.				
x x	1			Speechley	2745	2763		1	Run 1 spiral centralizer					
		8.5" Vertical		Balltown	2965	3005	9.0ppg SOBM	<u>Lead</u> : 14.5 ppg POZ:PNE-1 + 0.3%	every 5 joints from the top of the curve to surface.					
		O.D. Vertices		Benson	4050	4083								
				West Falls	4620	5865		bwoc R3 + 1% bwoc						
				Rhinestreet	5865	6140		EC1 + 0.75 gal/sk FP13L + 0.3% bwoc		Once on bottom/TD with casing, circulate at max				
m I				Cashaqua	6140	6341		MPA170		allowable pump rate for at	Production casing = 0.418			
X S X	9		5-1/2" 23#	Middlesex	6341	6421	11.5ppg-	<u>Tail</u> : 14.8 ppg PNE-1 + 0.35% bwoc R3 + 0.75		least 2x bottoms up, or until returns and pump	wall thickness Burst=14520 psi			
WV Department of Environmental Protection	Office of Oil and	8.5" Curve	P-110 HC	West River	6421	6514	12.5ppg	gal/sk FP13L + 50%		pressures indicate the hole	Note:Actual centralizer			
nem L	30		CDC HTQ	Burkett	6514	6540	SOBM	bwoc ASCA1 + 0.5% bwoc MPA170	Run 1 spiral centralizer every 3 joints from the	is clean. Circulate a minimum of one hole	schedules may be change due to hole conditions			
art 60	) a			Tully Limestone	6540	6644		20% Excess	1st 5.5" long joint to the	volume prior to pumping	ado to fiolo ocitationo			
rot 20				Hamilton	6644	6863		Lead Yield=1.19 Tail Yield=1.94	top of the curve.	cement.	0.0			
ect of	Gas			Marcellus	6863	6914	11.5ppg-	CTS						
9n	co	co	co	60	8.5" Lateral	1	(Production)	23028	6900	12.5ppg SOBM				
X X	- 1	X		Onondaga 🔏	6914				λ					

Previous Permit

WW-6B (04/15) 4703304509/3099

API NO. 47OPERATOR WELL NO. Nays 1209 N-SH
Well Pad Name: Nays 1209

# DEPARTMENT OF ENVIRONMENTAL FROM DFFICE OF OIL AND GAS WELL WORK PERMIT APPLICATION

1) Well Operator: HG Energ	gy II Appalach	nia, 🛔 4945	19932	Harrison	Union	West Milford 7.5'
National Actions			rator ID	County	District	Quadrangle
2) Operator's Well Number:	Nays 1209 N-6	6H	_ Well Pa	ad Name: Nay	s 1209	
3) Farm Name/Surface Owne	r: Nays / HG Energ	y II Appalachia	Public Ro	ad Access: Ki	ncheloe Ru	n Rd/SLS 35
4) Elevation, current ground:	1002'	Elevation	n, proposed	d post-construc	tion: 1007'	
5) Well Type (a) Gas X Other	O	11	Un	derground Stor	age	
	hallow X		Deep			SDW
6) Existing Pad: Yes or No	11000 m					5PW 10/22/2018
7) Proposed Target Formation Marcellus at 6863'/6914' and	n(s), Depth(s),				Pressure(s):	
8) Proposed Total Vertical De	epth: 6900'					
9) Formation at Total Vertical	Depth: Marc	ellus				
10) Proposed Total Measured	Depth: 23,0	28'				
11) Proposed Horizontal Leg	Length: 1475	57'				
12) Approximate Fresh Water	Strata Depths:	135',	500'			
13) Method to Determine Free 14) Approximate Saltwater D		101	st offset w	ell data		
		727.7	.010			
15) Approximate Coal Seam				Albania		
16) Approximate Depth to Po	ssible Void (co	al mine, ka	rst, other):	None		
<ol> <li>Does Proposed well locat directly overlying or adjacent</li> </ol>			Yes	N	lo X	
(a) If Yes, provide Mine Inf	o: Name:				FEC	EIVED
(w) if 100, provide with in	Depth:				A 109 01 (	ਤੀ and Gas
	Seam:				NOV	₫ 2018
	Owner:				Wy Den:	rtment of
	A SALES			En	Vironnien	al Protection

WW-6B (04/15) API NO. 47-OPERATOR WELL NO. Nays 1208 N-6H Well Pad Name: Nays 1209

# 18)

# **CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	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	54.5	1635'	1635'	40% excess yield = 1.20,CTS
Intermediate	9 5/8"	NEW	J-55	40	2500'	2500'	40% encess year Load 0% Encess Tal
Production	5 1/2"	NEW	P-110	23	23028'	23028'	20% corcess yield = 1.19, tail yield = 1.14
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"	.380	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% access yield = 0% Excess Lead 40
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	20% excess yield = 1.19, tell yield 1.94 (
Tubing		· ·			<u> </u>		<b></b>
Liners			<del></del>				

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# **PACKERS**

NOV 1 4 2018

Kind:		Eri	WV Department of with mental Protection
Sizes:			Teleption
Depths Set:			

WW-6B (10/14)

API NO. 47-\_\_\_\_OPERATOR WELL NO. Nays 1209 N-8H
Well Pad Name: Nays 1209

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

Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6900 feet. Drill horizontal leg to estimated 14757 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. Frostrivator - centralized every 3 joints to surface. Cost - Bow Soring on every lain!

Intermediate is the Spiring on the 12 joints then every third joint to 100' from surface.

Production - Run 1 spiral centralizer every 5 joints from the top of the curve to surface. Run 1 spiral centralizer every 3 joints from the 1st 8.5" tong joint to the top of the curve.

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

Conductor 4VA, Casing to be diffied in w/ Dust Rotary Rig.
Fresh Yester - 11.6 pag FWC-1 + 2% bence CaCl, 4V% Excess Yield = 1.20, CTS
Cod - Lass: 15 pag FWC-1 + 2.5% bence CaCl, 4V% Excess / Tat: 15.9 pag FWC-1 + 2.5% bence CaCl zero/k, Excess. CTS

Intermediate - Lassi 15.4 pg PPAC-1 \* 2.5% tomoc CDC4, 47% interest, Tax 15.4 pg PPAC-1 \* 2.5% tomoc CDC4, 47% interest, Tax 15.4 pg PPAC-1 \* 2.5% tomoc CDC4 \* 15% tomoc CDC4 \*

25) Proposed borehole conditioning procedures:

Office of Oil and Gas

Conditions's Entert on hold is death in 17 of Frish Water Open sainty is a setting depth, chroates a minimum of one hold volume with Fresh Water prior to pumping common.
Cost - Once casing is an esting depth, Conside and condition at TD. Consider a minimum of one hold volume prior to pumping common.
Intermediate - Once casing is an esting depth, Consider and condition and TD. Consider a minimum of one hold volume prior to pumping or intermediate - Once casing is at esting depth, depth, depth and TD. Consider a minimum of one hold volume note to pumping or intermediate - Once casing is at esting depth, depth, depth and TD. Consider a minimum of one hold volume note to pumping or intermediate - Once casing is at esting depth, depth depth and TD. Consider a minimum of one hold volume prior to pumping common.

NOV 1 4 2018

WV Department of Environmental Protection

\*Note: Attach additional sheets as needed.



# 1209 N-6H Marcellus Shale Horizontal Harrison County, WV

		···					<u>-</u>	Harrison County, WV						
_							1209 i	V-6H SH	L		237394.8N 1732372	2.24E		
Ground	l Elev	ation		1007	•		1209 N-6H LP				238712.06N 1734876.74E			
ļ	∖zm			340.73	7°		1209 t	1-6H BH	L		252642.42N 1730008.6E			
WELLBO	RE DIAG	GRAM	HOLE	CASING	GEOLOGY	ТОР	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS		
			30"	30" 157.5# LS	Conductor	0	100	AIR	N/A, Casing to be drilled in w/ Dual Rotary Rig	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.5° w thickness		
				20"					15.6 ppg PNE-1 + 3% bwoc CaCl	Centralized every 3	Once casing is at setting depth, circulate a minimum	Surface casing = 0.438" w		
		X	24"	94# J-55	Fresh Water	0	135, 500	AIR	AIR 40% Excess	joints to surface	of one hole volume with Fresh Water prior to	thickness Burst=2110 psi		
X		X			Fresh Water	0	600		Yield=1.20 / CTS		pumping cement.	``		
							Kittaning Coal	660	665		Lead: 15.4 ppg PNE-1 +		Once casing is at setting	
				13-3/8" 68#	Little/Blg Lime	1126 / 1167	1151 / 1243		2.5% bwoc CaCl 40% Excess / Tail: 15:9		depth, Circulate and condition at TD. Circulate a	Intermediate casing = 0.480		
			17.5"	J-55 BTC	Injun / Gantz (Storage)	1 <b>243 /</b> 1535	1349 / 1585	Salt Polymer	ppg PNE-1 + 2.5% bwoc	joint	minimum of one hale	wall thickness Burst=3450 psi		
				Intermediate 1 (Shoc 50' below storage)	0	1635		CaCl zero% Excess. CTS		volume prior to pumping cement.	<u> </u>			
X		X			Fifty / Thirty Foot	1650 / 1730	1697 / 1742		   Lead: 15:4 ppg PNE-1 +		Once casing is at setting	Intermediate casing = 0.395°		
				9-5/8" 40#	Gordon Stray / Gordon	1785 / 1850	1850 / 1940	AIR / KCL -	2.5% bwoc CaCl 40% Excess / Tail: 15.9	Bow Spring on first 2 joints then every third	depth, Circulate and condition mud at TD.			
	100		12.25*	12.25* J-55 BTC	5th Sand	2035	2070	Salt Polymer	ppg PNE-1 + 2.5% bwoc		Circulate a minimum of one	wall thickness Burst≃3950 psi		
X		X			Bayard Sand	2125	2160	Polymer	CaCl zero% Excess. CTS		hole volume prior to pumping cement.	Ouist-3930 pai		
					Intermediate 2	0	2500				pumping centerit.			
		X				Speechley	2745	2763			Run 1 spiral centralizer			
		~	8.5" Vertical	.5" Vertical	Balltown	2965	3005	9.0ppg	Load: 14 Same	every 5 joints from the top of the curve to surface.				
•	A S. I. L				Велѕол	4050	4083	SOBM	<u>Lead</u> : 14.5 ppg POZ:PNE-1 + 0.3%					
	. T	<b>3</b>			West Falls	4620	5 <b>8</b> 65		bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk		Ones on bottom/Tri with			
- 100					Rhinestreet	5865	6140		FP13L + 0.3% bwoc		Once on bottom/TD with casing, circulate at max			
	New New			5-1/2"	Cashaqua	5140	6341		MPA170 Tail: 14.8 ppg PNE-1 +		allowable pump rate for at least 2x bottoms up, or until	Production casing = 0.41 wall thickness		
X		X.	5	23#	Middlesex	6341	6421	11,5ррд-	0.35% bwoc R3 + 0.75		returns and pump	Burst=14520 psi		
	1	X	8.5° Curve	P-110 HC CDC HTQ	West River	6421	6514	12.5ppg SOBM	gal/sk FP13L + 50% bwoc ASCA1 + 0.5%	Run 1 spiral centralizer	pressures indicate the hole is clean. Circulate a	Note:Actual centralizer schedules may be chang		
2000	3		כל	Cocina	Burkett	6514	6540	0000	bwoc MPA170	every 3 joints from the	minimum of one hole	due to hole conditions		
		2		•	Tully Limestone	6540	6644		20% Excess Lead Yield=1.19	1st 5.5" long joint to the top of the curve.	volume prior to pumping cement.			
. 3	•				Hamilton	6644	6863		Tail Yield=1.94	ioh oi tile caise.	cement.			
				Marcellus	6863	6914	11.5ppg-	стѕ						
	NAME OF THE PERSON OF THE PERS	8.5" Lateral		TMD / TVD (Production)	23028	6900	12.5ppg SOBM							
X	5	*	<u> </u>		Onondaga	6914	<u> </u>							
ZWS-MAN	8		A 00' TVD / 8271' MD			3.5" Hole - Cemente 5-1/2" 23# P-110 Ho	d Long String				57' ft Lateral	TD @ +/-8900' TVD +/-23028' MD		