

State of West Virginia
Department of Environmental Protection - Office of Oil and Gas
Well Operator's Report of Well Work

API 47 - 51 - 01620 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name _____
Farm name CNX Gas Company, LLC Well Number 9H
Operator (as registered with the OOG) Gastar Exploration Inc.
Address 229 West Main Street Suite 301 City Clarksburg State WV Zip 26301

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 4400477.0 Easting 516430.7
Landing Point of Curve Northing 4401047.3 Easting 516304.3
Bottom Hole Northing 4401670.0 Easting 514853.9

Elevation (ft) 1278' GL Type of Well New Existing Type of Report Interim Final
Permit Type Deviated Horizontal Horizontal 6A Vertical Depth Type Deep Shallow
Type of Operation Convert Deepen Drill Plug Back Redrilling Rework Stimulate
Well Type Brine Disposal CBM Gas Oil Secondary Recovery Solution Mining Storage Other _____
Type of Completion Single Multiple Fluids Produced Brine Gas NGL Oil Other _____
Drilled with Cable Rotary

Drilling Media Surface hole Air Mud Fresh Water Intermediate hole Air Mud Fresh Water Brine
Production hole Air Mud Fresh Water Brine
Mud Type(s) and Additive(s)
Synthetic Oil Base Mud

Date permit issued April 15, 2013 Date drilling commenced 1/23/2014 Date drilling ceased 4/17/2014
Date completion activities began 9/8/2014 Date completion activities ceased 4/19/2015
Verbal plugging (Y/N) _____ Date permission granted _____ Granted by _____

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 55' Open mine(s) (Y/N) depths None
Salt water depth(s) ft 1664' Void(s) encountered (Y/N) depths None
Coal depth(s) ft 815'-825' & 1160'-1190' Cavern(s) encountered (Y/N) depths None
Is coal being mined in area (Y/N) No

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Reviewed by:
JR
10/16/2015

API 47-51 - 01620 Farm name CNX Gas Company, LLC Well number 9H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor							
Surface	30"	20"	118'	New	PE / 54.5 #/ft		Yes
Coal	17.5"	13.375"	1246'	New	H-40 / 48 #/ft	80'	Yes
Intermediate 1	12.25"	9.625"	2666'	New	J-55 / 36 #/ft	80'	Yes
Intermediate 2							
Intermediate 3							
Production	8.875" & 8.5"	5.5"	12405'	New	P-110 / 20 #/ft		No
Tubing		2.375"	6858'	New	N80/4.7#		
Packer type and depth set							

Comment Details Production Casing cement top at 1000' (1676' inside the intermediate casing).

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor							
Surface	Class A	295	15.6	1.21	357	Surface	12
Coal	Class A	945	15.6	1.2	1134	Surface	8
Intermediate 1	Class A	873	15.6	1.19	1039	Surface	8
Intermediate 2							
Intermediate 3							
Production	50:50 Class A	2845	14.5	1.21	3442	Surface	8
Tubing							

Drillers TD (ft) 12,282 Loggers TD (ft) N/A
 Deepest formation penetrated Marcellus Plug back to (ft) N/A
 Plug back procedure N/A

Kick off depth (ft) 6477'

Check all wireline logs run caliper density deviated/directional induction
 neutron resistivity gamma ray temperature sonic

Well cored Yes No Conventional Sidewall Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING _____

Surface/Coal Casing - 3 Centralizers at 300' spacing

Intermediate Casing - 7 Centralizers at 300' Spacing

Production Casing - 215 Centralizers total - 1 centralizer every joint in the lateral and curve and 1 centralizer every third joint in the vertical section

WAS WELL COMPLETED AS SHOT HOLE Yes No DETAILS _____

WAS WELL COMPLETED OPEN HOLE? Yes No DETAILS _____

WERE TRACERS USED Yes No TYPE OF TRACER(S) USED _____

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<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>
<u>Marcellus</u>	<u>6,470' - 6,504'</u> TVD <u>7,094' - 12,282'</u> MD
_____	_____
_____	_____
_____	_____

Please insert additional pages as applicable.

GAS TEST Build up Drawdown Open Flow OIL TEST Flow Pump

SHUT-IN PRESSURE Surface 1500 psi Bottom Hole 4320 psi DURATION OF TEST 72 hrs

OPEN FLOW Gas 3072 mcfpd Oil 107 bpd NGL _____ bpd Water 684 bpd GAS MEASURED BY Estimated Orifice Pilot

LITHOLOGY/ FORMATION	TOP	BOTTOM	TOP	BOTTOM	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H ₂ S, ETC)
	DEPTH IN FT NAME TVD	DEPTH IN FT TVD	DEPTH IN FT MD	DEPTH IN FT MD	
	<u>0</u>		<u>0</u>		<u>SEE ATTACHED</u>

Please insert additional pages as applicable.

Drilling Contractor Nomac Drilling
Address 171 Locust Ave. City Mt. Morris State PA Zip 15349

Logging Company Baker Hughes
Address 370 Westec Drive City Mt. Pleasant State PA Zip 15666

Cementing Company Baker Hughes
Address 837 Philippi Pike City Clarksburg State WV Zip 26301

Stimulating Company Baker Hughes
Address 837 Philippi Pike City Clarksburg State WV Zip 26301

Please insert additional pages as applicable.

Completed by Thomas Rowan Telephone 304-622-4796
Signature [Signature] Title Drilling and Completions Engineer Date 7-31-15 AUG 05 2015

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Armstrong #9H Perforation Information

<u>Stage</u>	<u>Date</u>	<u>Perforated interval</u>		<u>Number of Perfs</u>	<u>Formation</u>
		<u>From</u> ft	<u>To</u> ft		
1	9/23/2014	12101	12009	48	Marcellus
2	11/4/2014	11831	11603	60	Marcellus
3	11/5/2014	11549	11380	60	Marcellus
4	11/6/2014	11335	11169	48	Marcellus
5	11/8/2014	11104	10945	48	Marcellus
6	11/9/2014	10875	10690	48	Marcellus
7	11/10/2014	10614	10391	60	Marcellus
8	11/11/2014	10328	10113	60	Marcellus
9	11/12/2014	10057	9889	48	Marcellus
10	11/13/2014	9808	9566	60	Marcellus
11	11/14/2014	9514	9349	48	Marcellus
12	11/15/2014	9101	9287	60	Marcellus
13	11/16/2014	9029	8868	48	Marcellus
14	11/17/2014	8574	8790	48	Marcellus
15	11/18/2014	8515	8266	60	Marcellus
16	11/19/2014	8138	7977	60	Marcellus
17	11/20/2014	7928	7637	60	Marcellus
18	11/21/2014	7568	7393	48	Marcellus

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Fluid & Sand Volume Summary - Armstrong #9H

<u>Stage</u>	<u>Stimulation Date</u>	<u>Avg Pump Rate (BPM)</u>	<u>Avg Pressure (PSI)</u>	<u>Max Break Pres. (PSI)</u>	<u>ISIP (PSI)</u>	<u>Sand Total (lbs)</u>	<u>Total Water (bbls)</u>
1	11/4/2014	81	6381	n/a	3985	135,544	3939
2	11/5/2014	81	5964	4949	4080	257,450	6442
3	11/6/2014	80	6676	5131	3897	260,337	6531
4	11/8/2014	81	6334	5430	4394	256,030	6394
5	11/9/2014	80	6325	5383	4241	257,146	6426
6	11/10/2014	81	6350	5418	4370	254,092	6372
7	11/11/2014	78	5928	4859	3688	252,556	6374
8	11/12/2014	81	6134	4968	4058	248,593	6199
9	11/13/2014	81	6285	5021	3900	250,798	6205
10	11/14/2014	81	6005	4886	3530	257,903	6208
11	11/15/2014	82	6213	7911	3624	243,049	6143
12	11/16/2014	80	5893	4730	3835	259,756	6202
13	11/17/2014	80	6391	4622	3683	282,570	6496
14	11/18/2014	83	6094	5011	4147	269,182	6388
15	11/19/2014	84	6333	4997	0	258,219	6516
16	11/20/2014	82	5772	4646	4350	261,704	6110
17	11/21/2014	83	5622	4585	4232	260,470	6190
18	11/22/2014	83	6010	5166	4280	259,114	5965

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Formations	Armstrong TOP TVD	Armstrong BASE TVD	Top MD	Base MD
SHALE AND SANDSTONE	0	815	0	815
SEWICKLEY COAL	815	825	815	825
SHALE	825	1160	825	1160
PITTSBURGE COAL	1160	1190	1160	1190
SHALE AND SANDSTONE	1190	1664	1190	1664
3RD SALT SAND	1664	1720	1664	1720
SHALE	1720	1820	1720	1820
MAXTON	1820	1894	1820	1894
SHALE	1894	1914	1894	1914
BIG LIME	1914	2001	1914	2001
BIG INJUN	2001	2251	2001	2251
WEIR SILTSTONE	2251	2524	2251	2524
BEREA SILTSTONE	2524	2724	2524	2724
SAND AND SHALE	2724	2730	2724	2730
GORDON	2730	2787	2730	2787
SILTSTONE AND SANDSTONE	2787	3400	2787	3400
BRAILLER	3400	5280	3400	5325
PIPE CREEK SHALE	5280	5480	5325	5526
SHALE	5480	5905	5526	5958
RHINESTREET	5905	6175	5958	6243
CASHAQUA	6175	6311	6243	6414
MIDDLESEX	6311	6330	6414	6442
WEST RIVER	6330	6389	6442	6538
GENESEO	6389	6416	6538	6588
TULLY LIMESTONE	6416	6452	6588	6666
HAMILTON	6452	6470	6666	6721
MARCELLUS	6470	na	6721	na
ONONDOGA	na	na	na	na

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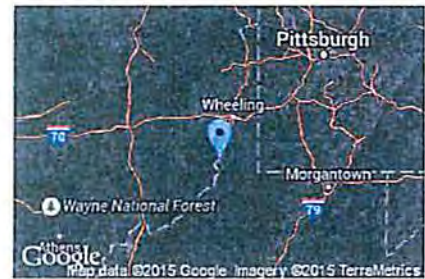
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Hydraulic Fracturing Data

[Edit](#)

Job Start Date 11/4/2014	Job End Date 11/22/2014	API Number 47-051-01620-00-00	State & County West Virginia --- Marshall
Well Name ARMSTRONG 9H			
Longitude -80.82674	Latitude 39.76474	Datum NAD27	Federal/Tribal Well?
True Vertical Depth (ft) 6491	Total Water Vol (gal) 4669224	Total Non Water Vol 0	Total Mass (lbs) 43745408.0971



MSDS Chemical Ingredients

[New Additive](#) [Select Additive](#) [Add Additive](#)

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
Edit Water	Operator	Carrier	Water	7732-18-5	100%	88.8664278%		38931055.8672
Edit Sand, White, 40/70	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	6.2915%		2752243
Edit Sand, White, 30/50	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	3.51244%		1536535
Edit HCl, 10.1 - 15%	Baker Hughes	Acidizing	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.568075%	SmartCare Product	248507
Edit Sand, White, 100 mesh	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.368701%		61290
Edit GW-3LDF	Baker Hughes	Gelling Agent	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.119643%	SmartCare Product	52338.33
Edit FRW-18	Baker Hughes	Friction Reducer	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0846102%	SmartCare Product	37013.08

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SmartCare Product

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<input type="button" value="Edit"/>	Enzyme G-NE	Baker Hughes	Breaker	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0208705%	SmartCare Product	9129.891
<input type="button" value="Edit"/>	Alpha 1427	Baker Hughes	Biocide	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0205222%	SmartCare Product	8977.5
<input type="button" value="Edit"/>	ScaleSorb 4, (50# bag)	Baker Hughes	Scale Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0082294%	SmartCare Product	3600
<input type="button" value="Edit"/>	Calcium Chloride	Baker Hughes	Salts	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0050005%		2187.5
<input type="button" value="Edit"/>	Ferrotrol 300L	Baker Hughes	Iron Control	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0039625%	SmartCare Product	1733.42895
<input type="button" value="Edit"/>	CI-14	Baker Hughes	Corrosion Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.001823%	SmartCare Product	797.5

Non-MSDS Chemical Ingredients

New Ingredients

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
<input type="button" value="Edit"/> Ingredients in Additive(s) (MSDS and non-MSDS)	Baker Hughes	See Trade Name(s) List	Crystalline Silica (Quartz)	14808-60-7	100%	10.1580817%		4450104
			Water	7732-18-5	95%	.5500547%		240970.767925
			Hydrochloric Acid	7647-01-0	15%	.0851068%		37284.025
			Mineral Oil	8042-47-5	70%	.0836295%		36636.831
			Guar Gum	9000-30-0	60%	.0716824%		31402.998
			Paraffinic Petroleum Distillate	64742-55-8	30%	.0358412%		15701.499
			Petroleum Distillates	64742-47-8	30%	.0358412%		15701.499
			Poly (acrylamide-co-acrylic acid) partial sodium salt	62649-23-4	30%	.0253465%		11103.924
			Hydrotreated Light Distillate	64742-47-8	30%	.0253465%		11103.924
			Diatomaceous Earth, Calcined	91053-39-3	100%	.0082176%		3600
			Glutaraldehyde	111-30-8	30%	.0061478%		2693.25
			Crystalline Silica: Quartz	14808-60-7	5%	.0059735%		2616.9165
			1-butoxy-2-propanol	5131-66-8	5%	.0059735%		2616.9165
			Isotridecanol, ethoxylated	9043-30-5	5%	.0059735%		2616.9165
			Calcium Chloride	10043-52-4	100%	.0049933%		187.5
			Sodium Chloride	7647-14-5	5%	.0044741%		1960.029
			Ammonium Chloride	12125-02-9	3%	.0025347%		115.39245
Citric Acid	77-92-9	60%	.0023741%		1040.05737			
Didecyl Dimethyl Ammonium Chloride	7173-51-5	10%	.0020493%		897.75			
Methanol	67-56-1	100%	.0018204%		797.5			
Oleamide DEA	93-83-4	2%	.0016898%		740.2616			

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Alcohols, C12-16, ethoxylated	68551-12-2	2%	.0016898%	740.2616
Sodium Carboxymethyl inulin	430439-54-6	15%	.0012326%	540
Sodium chloride	7647-14-5	15%	.0012326%	540
Hemicellulase Enzyme Concentrate	9025-56-3	5%	.001042%	456.49455
Quaternary Ammonium Compound	68424-85-1	5%	.0010246%	448.875
Ethanol	64-17-5	5%	.0010246%	448.875
Polyoxyalkylenes	68951-67-7	30%	.0005461%	239.25
Sorbitan Monooleate	1338-43-8	.5%	.0004224%	185.0654
Polyoxyethylene Sorbitan Monooleate	9005-65-6	.5%	.0004224%	185.0654
Sodium diglycolate	35249-69-5	5%	.0004109%	180
Sodium glycolate	2836-32-0	5%	.0004109%	180
Potassium Chloride	7447-40-7	5%	.0002497%	109.375
Fatty Acids	61790-12-3	10%	.000182%	79.75
Modified Thiourea Polymer	68527-49-1	7%	.0001274%	55.825
2-butoxy-1-propanol	15821-83-7	.1%	.0001195%	52.33833
Olefin	64743-02-8	5%	.000091%	39.875
Propargyl Alcohol	107-19-7	5%	.000091%	39.875
Crystalline Silica (Cristobalite)	14464-46-1	1%	.0000822%	36
Formaldehyde	50-00-0	1%	.0000182%	7.975

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Armstrong 9H Cement and additives

Surface: Class A + 3% CaCl + 1/4 # per sack Flake

Coal: Class A + 3% CaCl + 1/4 # per sack flake

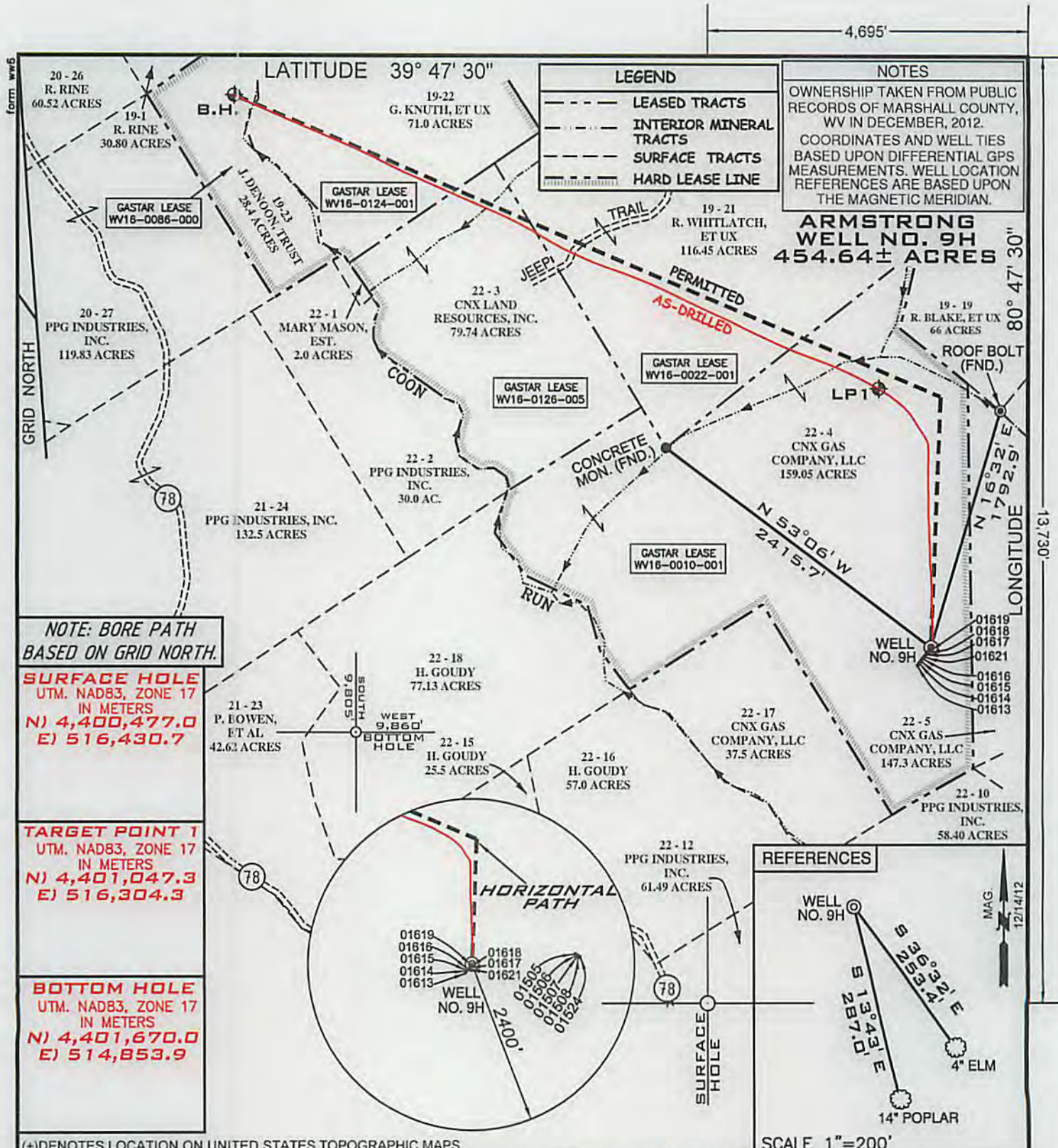
Intermediate: Class A + 1% EC-1 + .5% SMS + .55% BA-10A + 1/4 # per sack flake

Production: 50:50 Class A + 3 lbs/sk BA-90 + .25% R-3 + .3% MPA-170

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FILE NUMBER W0120316 (WB1-56)
 DRAWING NUMBER ARMSTRONG_WP_9H-WR35
 SCALE 1" = 1000'
 MINIMUM DEGREE OF ACCURACY 1/200
 PROVEN SOURCE OF ELEVATION SUBMETER MAPPING
GRADE GPS

I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION

P.S. Jonathan N. White
 2122



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

DATE: JULY 27, 2015

OPERATORS WELL NO. ARMSTRONG NO. 9H AS-DRILLED

API WELL NO. 47-051-01620

STATE COUNTY PERMIT

WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL
 (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X

LOCATION ELEVATION 1278' WATERSHED TRIBUTARY OF COON RUN

DISTRICT FRANKLIN COUNTY MARSHALL

QUADRANGLE POWHATAN POINT 7.5' LEASE NUMBER WV16-0086-000, WV16-0124-001, WV16-0010-001, WV16-0022-001, WV16-0126-005

SURFACE OWNER CNX GAS COMPANY, LLC ACREAGE 159.05

OIL & GAS ROYALTY OWNER CNX GAS COMPANY, LLC LEASE ACREAGE 454.64

PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION
 PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE (SPECIFY)

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD:6504' TMD:12,282'

WELL OPERATOR GASTAR EXPLORATION INC.

DESIGNATED AGENT MICHAEL McCOWN

ADDRESS 229 W MAIN STREET, SUITE 301 CLARKSBURG WV, 26301

ADDRESS 229 W MAIN STREET, SUITE 301 CLARKSBURG WV, 26301

10/16/2015

COUNTY NAME
 PERMIT