

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

API 47 - 51 - 01618 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name _____
Farm name CNX Gas Company, LLC Well Number 7H
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 4400467.2 Easting 516423.4
Landing Point of Curve Northing 4400772.6 Easting 516360.8
Bottom Hole Northing 4401443.8 Easting 514763.1

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 1/3/2014 Date drilling ceased 8/8/2014
Date completion activities began 9/10/2014 Date completion activities ceased 4/20/2015
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 depths None
Coal depth(s) ft 815'-825' & 1160'-1190' Cavern(s) encountered depths None
Is coal being mined in area (Y/N) No

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Reviewed by:
SK
10/16/2015

API 47-51 - 01618 Farm name CNX Gas Company, LLC Well number 7H

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"	1224'	New	H-40 / 48 #/ft	80'	Yes
Intermediate 1	12.25"	9.625"	2672'	New	J-55 / 36 #/ft	80'	Yes
Intermediate 2							
Intermediate 3							
Production	8.875" & 8.5"	5.5"	12419'	New	P-110 / 20 #/ft		Yes
Tubing		2.375"	6672'	New	N80/4.7#		
Packer type and depth set							

Comment Details _____

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	930	15.6	1.2	1116	Surface	8
Intermediate 1	Class A	854	15.6	1.19	1016	Surface	8
Intermediate 2							
Intermediate 3							
Production	50:50 Class A	2795	14.5	1.21	3382	Surface	8
Tubing							

Drillers TD (ft) 12,459' Loggers TD (ft) N/A
 Deepest formation penetrated Marcellus Plug back to (ft) N/A
 Plug back procedure N/A

Kick off depth (ft) 5998'

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 - 202 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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Armstrong #7H 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	9/18/2014	12314	12222	48	Marcellus
2	11/3/2014	12153	11986	48	Marcellus
3	11/4/2014	11925	11769	48	Marcellus
4	11/5/2014	11713	11546	48	Marcellus
5	11/6/2014	11493	11326	48	Marcellus
6	11/8/2014	11273	11106	48	Marcellus
7	11/9/2014	11057	10887	48	Marcellus
8	11/10/2014	10833	10666	48	Marcellus
9	11/11/2014	10613	10446	48	Marcellus
10	11/12/2014	10393	10226	48	Marcellus
11	11/13/2014	10175	10006	48	Marcellus
12	11/14/2014	9953	9783	48	Marcellus
13	11/15/2014	9733	9566	48	Marcellus
14	11/16/2014	9513	9346	48	Marcellus
15	11/17/2014	9293	9126	48	Marcellus
16	11/19/2014	9071	8901	48	Marcellus
17	11/20/2014	8853	8686	48	Marcellus
18	11/21/2014	8590	8456	48	Marcellus
19	11/22/2014	8400	8145	48	Marcellus
20	11/23/2014	8106	7911	48	Marcellus
21	11/23/2014	7850	7667	48	Marcellus
22	11/25/2014	7615	7414	48	Marcellus
23	11/26/2014	7364	7263	36	Marcellus
24	11/27/2014	7214	7034	48	Marcellus

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Fluid & Sand Volume Summary - Armstrong #7H

<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	11/3/2014	82	6766	n/a	4761	151,639	4159
2	11/4/2014	81	6520	5065	3962	256,561	6603
3	11/5/2014	81	6395	4859	4222	256,415	6499
4	11/6/2014	81	6244	4813	4137	256,931	6474
5	11/8/2014	80	6374	4992	4669	258,914	6456
6	11/9/2014	80	6497	5045	4579	255,851	6401
7	11/10/2014	76	6191	5341	4629	221,401	6004
8	11/11/2014	81	6572	5372	4429	258,033	6344
9	11/12/2014	80	6676	5458	4665	261,234	6207
10	11/13/2014	81	6450	5248	4453	261,234	6376
11	11/14/2014	80	6789	5812	4575	233,014	7677
12	11/15/2014	81	6540	5485	5059	249,873	6268
13	11/16/2014	82	6598	5507	4643	254,119	6320
14	11/17/2014	82	6243	5199	4805	235,022	6325
15	11/19/2014	82	6600	5515	4867	244,266	6245
16	11/20/2014	82	6143	7135	4458	268,012	6299
17	11/21/2014	82	6338	5168	4805	254,812	6209
18	11/22/2014	80	6213	5105	4804	255,203	6009
19	11/23/2014	83	5964	5290	4679	258,166	5998
20	10/24/2014	78	5709	7195	4403	254,084	6102
21	11/25/2014	80	6028	5032	4633	255,999	6031
22	11/26/2014	80	5702	6457	4541	255,653	5995
23	11/26/2014	80	5920	4907	4943	255,824	6030
24	11/27/2014	80	6097	5227	4902	274,170	6010

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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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Hydraulic Fracturing Data

[Edit](#)

Job Start Date: 11/3/2014 Job End Date: 11/28/2014 API Number: 47-051-01618-00-00 State & County: West Virginia --- Marshall

Well Name: ARMSTRONG 7H

Longitude: -80.82781 Latitude: 39.76271 Datum: NAD27 Federal/Tribal Well?:

True Vertical Depth (ft): 6490 Total Water Vol (gal): 5829978 Total Non Water Vol: 0 Total Mass (lbs): 54998530.86



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%	88.2457413%		48609190.5684
Edit Sand, White, 40/70	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	6.47761%		3562591
Edit Sand, White, 30/50	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	3.73451%		2053931
Edit HCl, 10.1 - 15%	Baker Hughes	Acidizing	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.74444%	SmartCare Product	409431.33
Edit Sand, White, 100 mesh	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.359244%		582997.8
Edit GW-3LDF	Baker Hughes	Gelling Agent	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.1263969%	SmartCare Product	582997.8
Edit FRW-18	Baker Hughes	Friction Reducer	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.1059221%	SmartCare Product	582997.8

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<input type="button" value="Edit"/>	Alpha 1427	Baker Hughes	Biocide	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0284462%	SmartCare Product	15645	
51-01618										
<input type="button" value="Edit"/>	Enzyme G-NE	Baker Hughes	Breaker	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0216485%	SmartCare Product	11906.3784	
<input type="button" value="Edit"/>	ScaleSorb 4, (50# bag)	Baker Hughes	Scale Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.008393%	SmartCare Product	4616	
<input type="button" value="Edit"/>	Ferrotrol 300L	Baker Hughes	Iron Control	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0051001%	SmartCare Product	2805.00321	
<input type="button" value="Edit"/>	Calcium Chloride	Baker Hughes	Salts	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0032501%		1787.5	
<input type="button" value="Edit"/>	CI-14	Baker Hughes	Corrosion Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0023201%	SmartCare Product	1276	

Non-MSDS Chemical Ingredients

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
<input type="button" value="Edit"/>	Ingrédients in Additive(s) (MSDS and non-MSDS)	Baker Hughes	See Trade Name(s) List					
			Crystalline Silica (Quartz)	14808-60-7	100%	10.5550765%		5814147.16
			Water	7732-18-5	95%	.7142418%		393432.191585
			Hydrochloric Acid	7647-01-0	15%	.1115162%		61427.4595
			Mineral Oil	8042-47-5	70%	.0883408%		48661.536
			Guar Gum	9000-30-0	60%	.0757207%		41709.888
			Petroleum Distillates	64742-47-8	30%	.0378603%		20854.944
			Paraffinic Petroleum Distillate	64742-55-8	30%	.0378603%		20854.944
			Poly (acrylamide-co-acrylic acid) partial sodium salt	62649-23-4	30%	.0317274%		17476.68
			Hydrotreated Light Distillate	64742-47-8	30%	.0317274%		17476.68
			Glutaraldehyde	111-30-8	30%	.0085206%		4693.5
			Diatomaceous Earth, Calcined	91053-39-3	100%	.0083799%		4616
			Crystalline Silica: Quartz	14808-60-7	5%	.0063101%		3475.824
			Isotridecanol, ethoxylated	9043-30-5	5%	.0063101%		3475.824
			1-butoxy-2-propanol	5131-66-8	5%	.0063101%		3475.824
			Sodium Chloride	7647-14-5	5%	.0054502%		3002.155
			Calcium Chloride	10043-52-4	100%	.0032451%		1787.5
			Ammonium Chloride	12125-02-9	3%	.0031727%		1747.668
			Citric Acid	77-92-9	60%	.0030553%		1683.001926
			Didecyl Dimethyl Ammonium Chloride	7173-51-5	10%	.0028402%		1564.5
			Methanol	67-56-1	100%	.0023165%		1276
			Oleamide DEA	93-83-4	2%	.0021152%		185.112

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Alcohols, C12-16, ethoxylated	68551-12-2	2%	.0021152%	1165.112
Quaternary Ammonium Compound	68424-85-1	5%	.0014201%	782.25
Ethanol	64-17-5	5%	.0014201%	782.25
Sodium chloride	7647-14-5	15%	.001257%	692.4
Sodium Carboxymethyl inulin	430439-54-6	15%	.001257%	692.4
Hemicellulase Enzyme Concentrate	9025-56-3	5%	.0010807%	595.31892
Polyoxyalkylenes	68951-67-7	30%	.0006949%	382.8
Polyoxyethylene Sorbitan Monooleate	9005-65-6	.5%	.0005288%	291.278
Sorbitan Monooleate	1338-43-8	.5%	.0005288%	291.278
Sodium glycolate	2836-32-0	5%	.000419%	230.8
Sodium diglycolate	35249-69-5	5%	.000419%	230.8
Fatty Acids	61790-12-3	10%	.0002316%	127.6
Potassium Chloride	7447-40-7	5%	.0001623%	89.375
Modified Thiourea Polymer	68527-49-1	7%	.0001622%	89.32
2-butoxy-1-propanol	15821-83-7	.1%	.0001262%	69.51648
Olefin	64743-02-8	5%	.0001158%	63.8
Propargyl Alcohol	107-19-7	5%	.0001158%	63.8
Crystalline Silica (Cristobalite)	14464-46-1	1%	.0000838%	46.16
Formaldehyde	50-00-0	1%	.0000232%	12.76

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Armstrong 7H Cement and additives

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

Coal: Class A + 3% CaCl + ¼ # per sack flake

Intermediate: Class A + 1% EC-1 + .5% SMS + .55% BA-10A

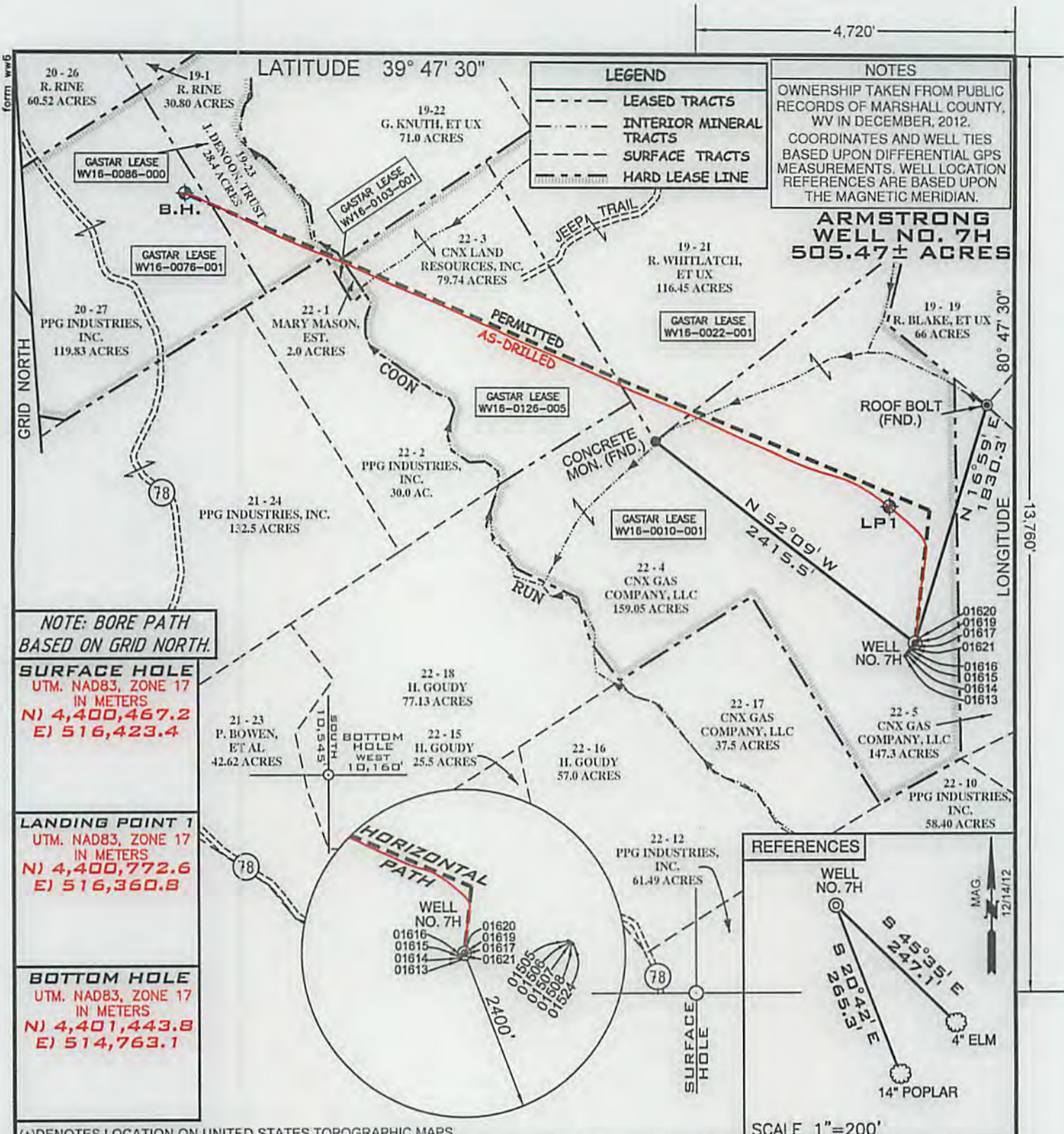
Production: 50:50 Class A + 3 lbs/sk BA-90 + .3% MPA-170

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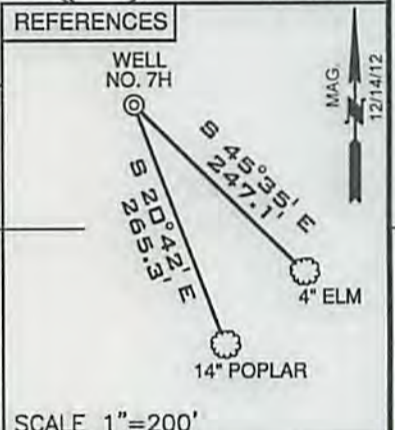


NOTE: BORE PATH BASED ON GRID NORTH.

SURFACE HOLE
UTM. NAD83, ZONE 17
IN METERS
N) 4,400,467.2
E) 516,423.4

LANDING POINT 1
UTM. NAD83, ZONE 17
IN METERS
N) 4,400,772.6
E) 516,360.8

BOTTOM HOLE
UTM. NAD83, ZONE 17
IN METERS
N) 4,401,443.8
E) 514,763.1



(+) DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

FILE NUMBER W0120316 (WB1-56)

DRAWING NUMBER ARMSTRONG_WP_7H-WR35

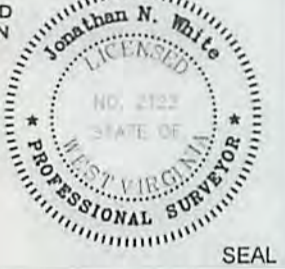
SCALE 1" = 1000'

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. 2122 *Jonathan N. White*



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

DATE: JULY 27, 2015

OPERATORS WELL NO. ARMSTRONG NO. 7H AS-DRILLED

API WELL NO. 47-051-01618

STATE WV COUNTY MARSHALL PERMIT

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

LOCATION ELEVATION 1278' WATERSHED TRIBUTARY OF COON RUN

DISTRICT FRANKLIN COUNTY MARSHALL

QUADRANGLE PCWHATAN POINT 7.5' LEASE NUMBER WV16-0086-000, WV16-0103-001, WV16-0022-001, WV16-0010-001, WV16-0076-001, WV16-0126-005

SURFACE OWNER CNX GAS COMPANY, LLC ACREAGE 159.05

OIL & GAS ROYALTY OWNER CNX GAS COMPANY, LLC LEASE ACREAGE 505.47

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:6512' TMD:12,459'

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