

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

API 47-051-01614 County MARSHALL District FRANKLIN  
Quad POWHATAN POINT 7.5' Pad Name ARMSTRONG Field/Pool Name \_\_\_\_\_  
Farm name CNX GAS COMPANY, LLC Well Number ARMSTRONG NO. 2H  
Operator (as registered with the OOG) GASTAR EXPLORATION USA, INC.  
Address 229 W MAIN STREET - STE 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 4,400,442.73 Easting 516,405.24  
Landing Point of Curve Northing \_\_\_\_\_ Easting \_\_\_\_\_  
Bottom Hole Northing 4,400,233.95 Easting 516,346.35

Elevation (ft) 1279' 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 N/A  
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) \_\_\_\_\_

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Date permit issued 4/15/2013 Date drilling commenced 08/26/2013 Date drilling ceased 10/27/2013  
Date completion activities began N/A Date completion activities ceased \_\_\_\_\_  
Verbal plugging (Y/N) 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 N  
Salt water depth(s) ft 1,664' Void(s) encountered (Y/N) depths N  
Coal depth(s) ft 815'-825' & 1,160'-1,190' Cavern(s) encountered (Y/N) depths N  
Is coal being mined in area (Y/N) N

Approved: Justin Anderson 9/20/17 Reviewed by: [Signature]

API 47-051 - 01614 Farm name CNX GAS COMPANY, LLC Well number ARMSTRONG NO. 2H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade w/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor	30"	20"	118'	New	PE / 54.5 #/ft		YES
Surface	17-1/2"	13-3/8"	1,201'	New	H-40 / 48 #/ft	83'	YES
Coal	17-1/2"	13-3/8"	1,201'	New	H-40 / 48 #/ft	83'	YES
Intermediate 1	12-1/4"	9-5/8"	2,621'	New	J-55 / 36 #/ft	80'	YES
Intermediate 2							
Intermediate 3							
Production	8-7/8" & 8-3/4"	N/A	5,652'	N/A	N/A	N/A	N/A
Tubing							
Packer type and depth set		N/A					

Comment Details \*SEE ATTACHED SUMMARY

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	CLASS "A"	292	15.6	1.21	353	SURFACE	12
Surface	CLASS "A"	950	15.6	1.21	1149	SURFACE	8
Coal	CLASS "A"	950	15.6	1.21	1149	SURFACE	8
Intermediate 1	CLASS "A"	908	15.6	1.19	1081	SURFACE	8
Intermediate 2							
Intermediate 3							
Production							
Tubing							

Drillers TD (ft) 5,543' Loggers TD (ft) N/A  
 Deepest formation penetrated Alexander Formation Plug back to (ft) N/A  
 Plug back procedure N/A

Kick off depth (ft) N/A

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

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WAS WELL COMPLETED AS SHOT HOLE  Yes  No DETAILS N/A

WAS WELL COMPLETED OPEN HOLE?  Yes  No DETAILS N/A

WERE TRACERS USED  Yes  No TYPE OF TRACER(S) USED N/A





## Armstrong 2H Cement Additives

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

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

Intermediate: Class A + 1% EC-1 + ¼ per sack flake + .5% SMS + .55% BA-10A

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## **Armstrong 2H Drilling & Casing Summary**

The Armstrong 2H well was initially drilled to a depth of 118 feet utilizing a 30 inch bit. 20 inch conductor pipe was installed and cemented to surface. The well was then drilled to 1271' MD utilizing a 17 ½" bit. 13 3/8" casing was installed to 1201' MD and cemented to surface. The well was then drilled to 2689' MD utilizing a 12 ¼" bit. 9 5/8" casing was then installed to 2687' MD and cemented to surface. The well was then drilled to a total depth of 5652' MD utilizing a 8 7/8" bit. The well was subsequently filled with 9.4 lb/gal brine water and capped to await additional drilling.

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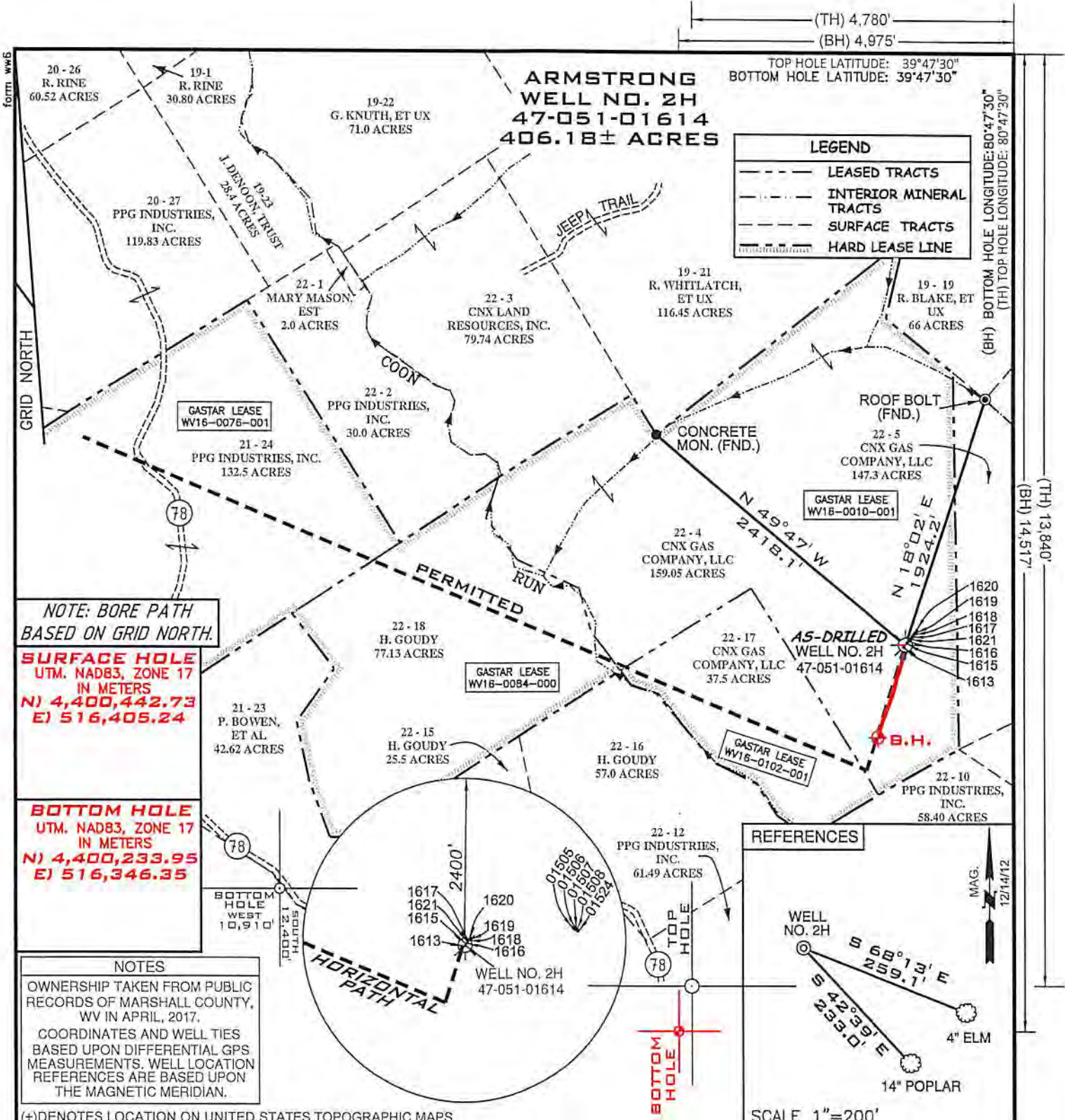
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LITHOLOGY/FORMATION	TOP DEPTH IN FT TVD	DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL , GAS, H <sub>2</sub> S, ETC)
Undifferentiated Fm	0	810	0	810	Interbedded sandstone, siltstone, limestone and shale
Sewickley Coal	810	814	810	814	Coal
Undifferentiated Fm	814	908	814	908	Interbedded sandstone, siltstone, limestone and shale
Pittsburgh Coal	908	913	908	913	Coal
Undifferentiated Fm	913	1456	913	1456	Interbedded sandstone, siltstone, limestone and shale
Salt Sand	1456	1486	1456	1486	Sandstone
Undifferentiated Fm	1486	1990	1486	1992	Interbedded sandstone, siltstone and shale
Maxton Sandstone	1990	2025	1992	2027	Sandstone
Undifferentiated Fm	2025	2087	2027	2089	Interbedded sandstone, siltstone and shale
Big Lime	2087	2154	2089	2156	Limestone
Big Injun	2154	2238	2156	2240	Sandstone
Undifferentiated Fm	2238	2441	2240	2443	Interbedded sandstone, siltstone and shale
Weir Sandstone	2441	2486	2443	2488	Sandstone
Undifferentiated Fm	2486	2629	2488	2631	Interbedded sandstone, siltstone and shale
Berea Sandstone	2629	2634	2631	2636	Sandstone
Undifferentiated Fm	2634	2969	2636	2971	Interbedded sandstone, siltstone and shale
Gordon Sandstone	2969	2979	2971	2981	Sandstone
Undifferentiated Fm	2979	3025	2981	3027	Interbedded sandstone, siltstone and shale
Fifty Foot Sandstone	3025	3045	3027	3047	Sandstone
Undifferentiated Fm	3045	3580	3047	3589	Interbedded sandstone, siltstone and shale
Speechley Sandstone	3580	3630	3589	3639	Sandstone
Undifferentiated Fm	3630	4964	3639	5047	Interbedded sandstone, siltstone and shale
Benson Sandstone	4964	4994	5047	5077	Sandstone
Undifferentiated Fm	4994	5324	5077	5425	Interbedded sandstone, siltstone and shale
Alexander Fm	5324	5542	5425	5652	Siltstone

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NOTE: BORE PATH BASED ON GRID NORTH.

**SURFACE HOLE**  
UTM. NAD83, ZONE 17  
IN METERS  
N) 4,400,442.73  
E) 516,405.24

**BOTTOM HOLE**  
UTM. NAD83, ZONE 17  
IN METERS  
N) 4,400,233.95  
E) 516,346.35

**NOTES**

OWNERSHIP TAKEN FROM PUBLIC RECORDS OF MARSHALL COUNTY, WV IN APRIL, 2017.

COORDINATES AND WELL TIES BASED UPON DIFFERENTIAL GPS MEASUREMENTS. WELL LOCATION REFERENCES ARE BASED UPON THE MAGNETIC MERIDIAN.

(+) DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

FILE NUMBER	W0120316 (WB1-56)
DRAWING NUMBER	ARMSTRONG_WP_2H_AD
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*



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

WV Department of Environmental Protection  
DATE: APRIL 18, 2017

OPERATORS WELL NO. ARMSTRONG NO. 2H AS-DRILLED  
API WELL NO. 47-051-01614

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

LOCATION ELEVATION 1279' WATERSHED \_\_\_\_\_ TRIBUTARY OF COON RUN

DISTRICT FRANKLIN COUNTY MARSHALL

QUADRANGLE POWHATAN POINT 7.5' LEASE NUMBER WV16-0102-001  
WV16-0010-001, WV16-0076-001, WV16-0084-000

SURFACE OWNER CNX GAS COMPANY, LLC ACREAGE 159.05

OIL & GAS ROYALTY OWNER CNX GAS COMPANY, LLC LEASE ACREAGE 406.18

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

TARGET FORMATION ALEXANDER ESTIMATED DEPTH TVD: 5,543' TMD: 5,652'

WELL OPERATOR GASTAR EXPLORATION USA, 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

COUNTY NAME  
PERMIT