WR-35
Rev. 8/23/13

Page ___ of ___

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

API 47 - 51 - 01617 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name
Farm name CNX Gas Company, LLC Well Number 6H
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 | 4400462.3 | Easting | 516419.7 |
| Landing Point of Curve | Northing | 4400657.0 | Easting | 516354.4 |
| Bottom Hole | Northing | 4401331.0 | Easting | 514718.1 |

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 12/12/2013 Date drilling ceased 7/30/2014
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 (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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WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01617 Farm name CNX Gas Company, LLC Well number 6H

| 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" | 1240' | New | H-40 / 48 #/ft | 80' | Yes |
| Intermediate 1 | 12.25" | 9.625" | 2665' | New | J-55 / 36 #/ft | 80' | Yes |
| Intermediate 2 | | | | | | | |
| Intermediate 3 | | | | | | | |
| Production | 8.875" & 8.5" | 5.5" | 12479' | New | P-110 / 20 #/ft | | Yes |
| Tubing | | 2.375" | 6589' | 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 | 942 | 15.6 | 1.21 | 1140 | Surface | 8 |
| Intermediate 1 | Class A | 870 | 15.6 | 1.19 | 1035 | Surface | 8 |
| Intermediate 2 | | | | | | | |
| Intermediate 3 | | | | | | | |
| Production | 50:50 Class A | 2663 | 14.5 | 1.21 | 3223 | Surface | 8 |
| Tubing | | | | | | | |

Drillers TD (ft) 12,484' Loggers TD (ft) N/A

Deepest formation penetrated Marcellus Plug back to (ft) N/A

Plug back procedure N/A

Kick off depth (ft) 6190'

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 - 216 Centralizers total - 1 centralizer every joint in the lateral and curve and 1 centralizer every other 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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WR-35
Rev. 8/23/13



API 47- 51 - 01617 Farm name CNX Gas Company, LLC Well number 6H

## PERFORATION RECORD

| Stage No. | Perforation date | Perforated from MD ft. | Perforated to MD ft. | Number of Perforations | Formation(s) |
|---|---|---|---|---|---|
| | | | | | SEE ATTACHED PERF INFO SHEET |
| | | | | | |
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Please insert additional pages as applicable.

## STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

| Stage No. | Stimulations Date | Ave Pump Rate (BPM) | Ave Treatment Pressure (PSI) | Max Breakdown Pressure (PSI) | ISIP (PSI) | Amount of Proppant (lbs) | Amount of Water (bbls) | Amount of Nitrogen/other (units) |
|---|---|---|---|---|---|---|---|---|
| | | | See Attached | | | | | |
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Please insert additional pages as applicable.

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WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01617 Farm name CNX Gas Company, LLC Well number 6H

| PRODUCING FORMATION(S) | DEPTHS | |
|---|---|---|
| Marcellus | 6,470' - 6,514' TVD | 6,664' - 12,485' MD |
| | | |
| | | |
| | | |

Please insert additional pages as applicable.

GAS TEST ☐ Build up ☐ Drawdown ☒ Open Flow OIL TEST ☒ Flow ☐ Pump

SHUT-IN PRESSURE Surface 1200 psi Bottom Hole 4025 psi DURATION OF TEST 253 hrs

| OPEN FLOW | Gas | Oil | NGL | Water | GAS MEASURED BY |
|---|---|---|---|---|---|
| | 2911 mcfpd | 266 bpd | bpd | 398 bpd | ☐ Estimated ☒ Orifice ☐ Pilot |

| LITHOLOGY/ FORMATION NAME | TOP DEPTH IN FT TVD | BOTTOM 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, $H_2S$, ETC) |
|---|---|---|---|---|---|
| | 0 | | 0 | | SEE ATTACHED |
| | | | | | |
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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.

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

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

51-01617

## Armstrong #6H Perforation Information

| Stage | Date | Perforated interval From ft | Perforated interval To ft | Number of Perfs | Formation |
|---|---|---|---|---|---|
| 1 | 9/22/2014 | 12373 | 12281 | 48 | Marcellus |
| 2 | 11/3/2014 | 12219 | 12091 | 36 | Marcellus |
| 3 | 11/4/2014 | 12046 | 11864 | 48 | Marcellus |
| 4 | 11/5/2014 | 11751 | 11606 | 48 | Marcellus |
| 5 | 11/6/2014 | 11558 | 11369 | 48 | Marcellus |
| 6 | 11/8/2014 | 11338 | 11160 | 48 | Marcellus |
| 7 | 11/9/2014 | 11106 | 10998 | 36 | Marcellus |
| 8 | 11/10/2014 | 10953 | 10782 | 48 | Marcellus |
| 9 | 11/11/2014 | 10742 | 10584 | 48 | Marcellus |
| 10 | 11/12/2014 | 10537 | 10409 | 48 | Marcellus |
| 11 | 11/13/2014 | 10359 | 10202 | 48 | Marcellus |
| 12 | 11/14/2014 | 10165 | 10027 | 48 | Marcellus |
| 13 | 11/15/2014 | 9986 | 9806 | 48 | Marcellus |
| 14 | 11/16/2014 | 9773 | 9601 | 48 | Marcellus |
| 15 | 11/17/2014 | 9551 | 9398 | 48 | Marcellus |
| 16 | 11/19/2014 | 9341 | 9201 | 48 | Marcellus |
| 17 | 11/20/2014 | 9140 | 9001 | 48 | Marcellus |
| 18 | 11/21/2014 | 8951 | 8833 | 36 | Marcellus |
| 19 | 11/22/2014 | 8718 | 8555 | 48 | Marcellus |
| 20 | 11/23/2014 | 8500 | 8342 | 48 | Marcellus |
| 21 | 11/23/2014 | 8239 | 8081 | 48 | Marcellus |
| 22 | **11/25/2014** | 8009 | 7783 | 60 | Marcellus |
| 23 | 11/25/2014 | 7738 | 7590 | 48 | Marcellus |
| 24 | 11/26/2014 | 7542 | 7386 | 48 | Marcellus |
| 25 | 11/26/2014 | 7317 | 7135 | 48 | Marcellus |
| 26 | 11/26/2014 | 7074 | 6911 | 48 | Marcellus |

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## Fluid & Sand Volume Summary - Armstrong #6H

| Stage | Stimulation Date | Avg Pump Rate (BPM) | Avg Pressure (PSI) | Max Break Pres. (PSI) | ISIP (PSI) | Sand Total (lbs) | Total Water (bbls) |
|---|---|---|---|---|---|---|---|
| 1 | 11/3/2014 | 74 | 6615 | n/a | 4295 | 129,513 | 4138 |
| 2 | 11/4/2014 | 78 | 6706 | 5026 | 4290 | 194,567 | 5885 |
| 3 | 11/5/2014 | 80 | 6468 | 5068 | 3667 | 260,165 | 6652 |
| 4 | 11/6/2014 | 80 | 6520 | 5168 | 4702 | 257,266 | 6497 |
| 5 | 11/7/2014 | 80 | 6840 | 5542 | 4817 | 256,943 | 5727 |
| 6 | 11/9/2014 | 80 | 6479 | 5228 | 4976 | 261,730 | 6486 |
| 7 | 11/10/2014 | 80 | 6623 | 5655 | 4857 | 255,790 | 6444 |
| 8 | 11/11/2014 | 81 | 6550 | 5274 | 4897 | 251,545 | 6352 |
| 9 | 11/12/2014 | 81 | 6752 | 5438 | 4788 | 263,436 | 6382 |
| 10 | 11/13/2014 | 81 | 6654 | 5438 | 5095 | 260,710 | 6361 |
| 11 | 11/14/2014 | 81 | 6669 | 5515 | 4977 | 258,972 | 6367 |
| 12 | 11/15/2014 | 81 | 6602 | 5448 | 4942 | 241,238 | 6361 |
| 13 | 11/16/2014 | 80 | 6498 | 5024 | 4952 | 255,706 | 6306 |
| 14 | 11/17/2014 | 82 | 6471 | 5523 | 4653 | 261,000 | 6334 |
| 15 | 11/19/2014 | 80 | 6320 | 5345 | 3352 | 250,672 | 6275 |
| 16 | 11/20/2014 | 80 | 6122 | 5077 | 4585 | 259,268 | 6284 |
| 17 | 11/21/2014 | 82 | 6313 | 5377 | 4905 | 259,697 | 6208 |
| 18 | 11/22/2014 | 81 | 6678 | 5290 | 4899 | 256,101 | 6045 |
| 19 | 11/23/2014 | 82 | 5936 | 5981 | 4588 | 258,166 | 6199 |
| 20 | 10/23/2014 | 81 | 5647 | 4920 | 4739 | 257,730 | 6025 |
| 21 | 11/25/2014 | 81 | 6265 | 5125 | 4740 | 257,896 | 5919 |
| 22 | 11/25/2014 | 80 | 5845 | 4920 | 5260 | 253,832 | 6023 |
| 23 | 11/26/2014 | 80 | 5920 | 4907 | 4943 | 255,824 | 6030 |
| 24 | 11/26/2014 | 81 | 5994 | 4813 | 5206 | 254,768 | 6023 |
| 25 | 11/27/2014 | 80 | 5818 | 4852 | 4894 | 252,634 | 4937 |
| 26 | 11/27/2014 | 80 | 5869 | 5001 | 5012 | 253415 | 5899 |

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51-01617

| 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 SANDSTC | 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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Welcome Tracy H., Operator - OpNo. G1410907 [ Log Out ]

**Hydraulic Fracturing** DISCLOSURE

FracFocus Chemical Disclosure Registry

Submission to FracFocus using Excel Spreadsheets has been turned off.

FIND A WELL BY STATE | ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

## Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

Preview Disclosure PDF | Validate Disclosure | Submit To FracFocus

## Hydraulic Fracturing Data

Edit

| Job Start Date | Job End Date | API Number | State & County |
|---|---|---|---|
| 11/3/2014 | 11/27/2014 | 47-051-01617-00-00 | West Virginia --- Marshall |

Well Name
ARMSTRONG 6H

| Longitude | Latitude | Datum | Federal/Tribal Well? |
|---|---|---|---|
| -80.82834 | 39.7617 | NAD27 | |

| True Vertical Depth (ft) | Total Water Vol (gal) | Total Non Water Vol | Total Mass (lbs) |
|---|---|---|---|
| 6490 | 6657294 | 0 | 62367452.6255 |

## 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% | 88.8692886% | | 55507185.9132 |
| Edit | Sand, White, 40/70 | Baker Hughes | Proppant | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | 6.19476% | | 3863515 |
| Edit | Sand, White, 30/50 | Baker Hughes | Proppant | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | 3.58253% | | 2234333 |
| Edit | HCl, 10.1 - 15% | Baker Hughes | Acidizing | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .595478% | SmartCare Product | 371385 |
| Edit | Sand, White, 100 mesh | Baker Hughes | Proppant | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .355485% | | 221707 |
| Edit | GW-3LDF | Baker Hughes | Gelling Agent | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .1221425% | SmartCare Product | 761771.2 |

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51-01617

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Edit | FRW-18 | Baker Hughes | Friction Reducer | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .088687% | SmartCare Product | 55311.88 |
| Edit | Alpha 1427 | Baker Hughes | Biocide | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0227001% | SmartCare Product | 14157.5 |
| Edit | Enzyme G-NE | Baker Hughes | Breaker | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .021243% | SmartCare Product | 13248.7642 |
| Edit | ScaleSorb 4, (50# bag) | Baker Hughes | Scale Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0080427% | SmartCare Product | 5016 |
| Edit | Ferrotrol 300L | Baker Hughes | Iron Control | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0040933% | SmartCare Product | 2552.86809 |
| Edit | Calcium Chloride | Baker Hughes | Salts | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0027065% | | 1688 |
| Edit | CI-14 | Baker Hughes | Corrosion Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0018832% | SmartCare Product | 1174.5 |

## Non-MSDS Chemical Ingredients

New Ingredients

| | Trade Name | Supplier | Purpose | Ingredients | CAS # | % High Additive | % HF Job | Comments | Ingredient Mass |
|---|---|---|---|---|---|---|---|---|---|
| Edit | Ingredients in Additive(s) (MSDS and non-MSDS) | Baker Hughes | See Trade Name(s) List | | | | | | |
| | | | | Crystalline Silica (Quartz) | 14808-60-7 | 100% | 10.1179479% | | 6319605.16 |
| | | | | Water | 7732-18-5 | 95% | .5766486% | | 360171.007035 |
| | | | | Hydrochloric Acid | 7647-01-0 | 15% | .0892092% | | 55719.495 |
| | | | | Mineral Oil | 8042-47-5 | 70% | .085374% | | 53324.04 |
| | | | | Guar Gum | 9000-30-0 | 60% | .0731777% | | 45706.32 |
| | | | | Paraffinic Petroleum Distillate | 64742-55-8 | 30% | .0365888% | | 22853.16 |
| | | | | Petroleum Distillates | 64742-47-8 | 30% | .0365888% | | 22853.16 |
| | | | | Poly (acrylamide-co-acrylic acid) partial sodium salt | 62649-23-4 | 30% | .026567% | | 16593.564 |
| | | | | Hydrotreated Light Distillate | 64742-47-8 | 30% | .026567% | | 16593.564 |
| | | | | Diatomaceous Earth, Calcined | 91053-39-3 | 100% | .0080308% | | 5016 |
| | | | | Glutaraldehyde | 111-30-8 | 30% | .0068% | | 4247.25 |
| | | | | Crystalline Silica: Quartz | 14808-60-7 | 5% | .0060981% | | 3808.86 |
| | | | | Isotridecanol, ethoxylated | 9043-30-5 | 5% | .0060981% | | 3808.86 |
| | | | | 1-butoxy-2- | 5131-66-8 | 5% | .0060981% | | 3808.86 |

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51-01617

| | | | | |
|---|---|---|---|---|
| Sodium Chloride | 7647-14-5 | 5% | .004563% | 2849.994 |
| Calcium Chloride | 10043-52-4 | 100% | .0027026% | 1688 |
| Ammonium Chloride | 12125-02-9 | 3% | .0026567% | 1659.3564 |
| Citric Acid | 77-92-9 | 60% | .0024523% | 1531.720854 |
| Didecyl Dimethyl Ammonium Chloride | 7173-51-5 | 10% | .0022667% | 1415.75 |
| Methanol | 67-56-1 | 100% | .0018804% | 1174.5 |
| Alcohols, C12-16, ethoxylated | 68551-12-2 | 2% | .0017711% | 1106.2376 |
| Oleamide DEA | 93-83-4 | 2% | .0017711% | 1106.2376 |
| Sodium Carboxymethyl inulin | 430439-54-6 | 15% | .0012046% | 752.4 |
| Sodium chloride | 7647-14-5 | 15% | .0012046% | 752.4 |
| Ethanol | 64-17-5 | 5% | .0011333% | 707.875 |
| Quaternary Ammonium Compound | 68424-85-1 | 5% | .0011333% | 707.875 |
| Hemicellulase Enzyme Concentrate | 9025-56-3 | 5% | .0010606% | 662.43821 |
| Polyoxyalkylenes | 68951-67-7 | 30% | .0005641% | 352.35 |
| Sorbitan Monooleate | 1338-43-8 | .5% | .0004428% | 276.5594 |
| Polyoxythylene Sorbitan Monooleate | 9005-65-6 | .5% | .0004428% | 276.5594 |
| Sodium diglycolate | 35249-69-5 | 5% | .0004015% | 250.8 |
| Sodium glycolate | 2836-32-0 | 5% | .0004015% | 250.8 |
| Fatty Acids | 61790-12-3 | 10% | .000188% | 117.45 |
| Potassium Chloride | 7447-40-7 | 5% | .0001351% | 84.4 |
| Modified Thiourea Polymer | 68527-49-1 | 7% | .0001316% | 82.215 |
| 2-butoxy-1-propanol | 15821-83-7 | .1% | .000122% | 76.1772 |
| Propargyl Alcohol | 107-19-7 | 5% | .000094% | 58.725 |
| Olefin | 64743-02-8 | 5% | .000094% | 58.725 |
| Crystalline Silica (Cristobaloite) | 14464-46-1 | 1% | .0000803% | 50.16 |
| Formaldehyde | 50-00-0 | 1% | .0000188% | 11.745 |

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Armstrong 6H 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 + .35% R-3 + .3% MPA-170

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# GASTAR EXPLORATION USA, INC.

Location: Marshall County, WV
Field: Marshall
Facility: Armstrong

Slot: Slot #6
Well: Armstrong 6H
Wellbore: Armstrong 6H (PWB)

BAKER HUGHES

51-01617

## Location Information

| Facility Name | | | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Armstrong | | | 1694263.000 | 14437151.000 | 39°45'13.773"N | 80°48'30.287"W |
| Slot | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
| Slot #6 | 32.01 | 24.01 | 1694287.000 | 14437183.000 | 39°45'14.089"N | 80°48'29.978"W |
| Nomac 323 (RT) to Mud line (At Slot: Slot #6) | | | | | 29.4ft | |
| Mean Sea Level to Mud line (At Slot: Slot #6) | | | | | -1278ft | |
| Nomac 323 (RT) to Mean Sea Level | | | | | 1307.4ft | |

| | |
|---|---|
| Plot reference wellpath is Armstrong 6H (PWP) Rev-C.0 | |
| True vertical depths are referenced to Nomac 323 (RT) | Grid System: NAD83 / UTM Zone 17 North, US feet |
| Measured depths are referenced to Nomac 323 (RT) | North Reference: Grid north |
| Nomac 323 (RT) to Mean Sea Level: 1307.4 feet | Scale: True distance |
| Mean Sea Level to Mud line (At Slot: Slot #6): -1278 feet | Depths are in feet |
| Coordinates are in feet referenced to Slot | Created by: frisjesl on 7/31/2014 |

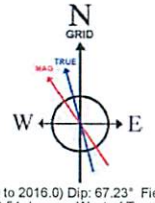
## Targets

| Name | MD (ft) | TVD (ft) | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| Armstrong 6H PBHL Rev-2 | 12485.77 | 6448.65 | 2853.14 | -5585.23 | 1688704.00 | 14440035.00 | 39°45'42.398"N | 80°49'41.420"W |
| Armstrong 6H PBHL Rev-1 | | 6468.00 | 2853.14 | -5585.23 | 1688704.00 | 14440035.00 | 39°45'42.398"N | 80°49'41.420"W |
| Armstrong 6H LP Rev-1 | 6913.79 | 6507.00 | 750.63 | -425.48 | 1693861.69 | 14437933.33 | 39°45'21.516"N | 80°48'35.406"W |

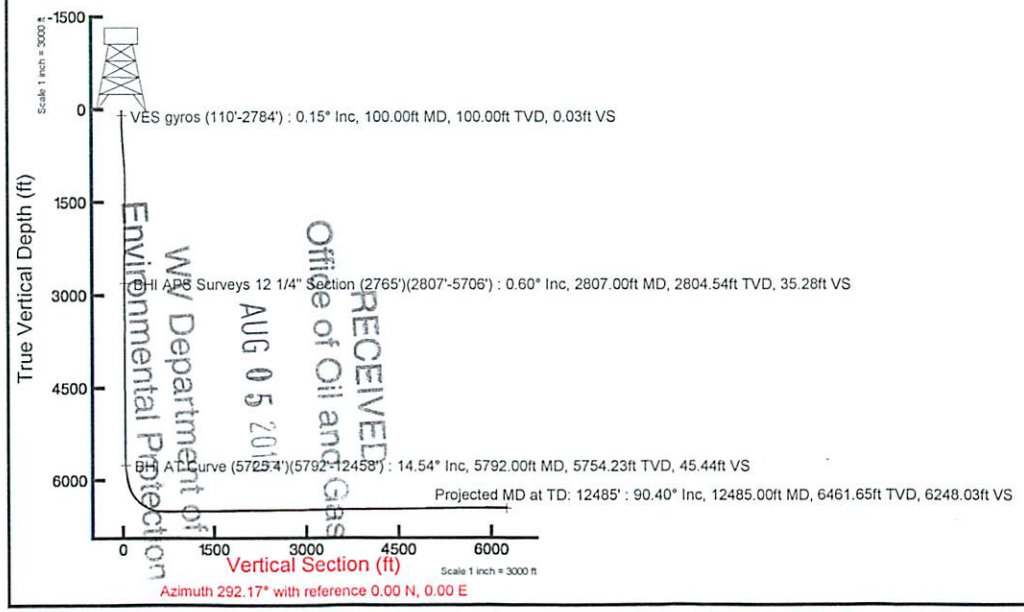
API: 47-051-01617-0000
Rig: Nomac 323
BHI Job #: 5847830
Duration: 07.23.2014 - 07.27.2014

## Well Profile Data

| Design Comment | MD (ft) | Inc (°) | Az (°) | TVD (ft) | Local N (ft) | Local E (ft) | DLS (°/100ft) | VS (ft) |
|---|---|---|---|---|---|---|---|---|
| Tie On | 5725.40 | 13.070 | 12.410 | 5689.55 | 347.80 | 95.56 | 0.00 | 42.75 |
| Projection | 5785.40 | 13.070 | 12.410 | 5748.00 | 361.05 | 98.47 | 0.00 | 45.05 |
| End of 3D Arc | 6080.03 | 16.372 | 337.740 | 6033.46 | 432.17 | 89.88 | 3.14 | 79.84 |
| LP | 6913.79 | 90.600 | 292.170 | 6507.00 | 750.63 | -425.48 | 9.50 | 677.28 |
| BHL | 12485.77 | 90.600 | 292.170 | 6448.65 | 2853.14 | -5585.23 | 0.00 | 6248.95 |




BGGM (1945.0 to 2016.0) Dip: 67.23° Field: 52484.9 nT
Magnetic North is 8.54 degrees West of True North (at 7/1/2014)
Grid North is 0.12 degrees East of True North
To correct azimuth from True to Grid subtract 0.12 degrees
To correct azimuth from Magnetic to Grid subtract 8.66 degrees

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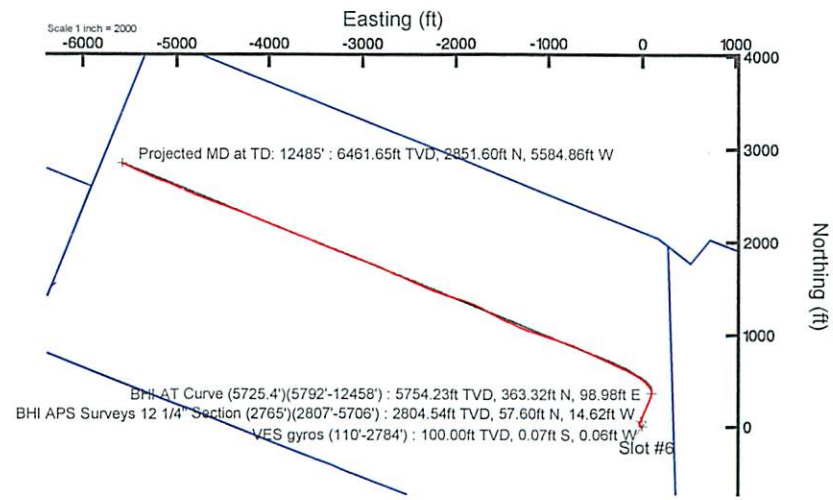

51-01617

| REFERENCE WELLPATH IDENTIFICATION | | | |
|---|---|---|---|
| Operator | GASTAR EXPLORATION INC. | Slot | Slot #6 |
| Area | Marshall County, WV | Well | Armstrong 6H |
| Field | Marshall | Wellbore | Armstrong 6H (AWB) |
| Facility | Armstrong | Wellpath | Armstrong 6H (AWP) Proj: 12,485' |
| | | Sidetrack | (none) |

**WELLPATH DATA † = interpolated/extrapolated station**

| | MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| † | 0.00 | 0.00 | 221.18 | 0.00 | 0.00 | 0.00 | 0.00 | 516419.7 | 4400462.3 | 39°45'14.089"N | 80°48'29.978"W | 0.00 | 0.00 | 0.00 |
| | 29.40 | 0.00 | 221.18 | 29.40 | 0.00 | 0.00 | 0.00 | 516419.7 | 4400462.3 | 39°45'14.089"N | 80°48'29.978"W | 0.00 | 0.00 | 0.00 |
| | 119.40 | 0.19 | 221.18 | 119.40 | 0.05 | -0.11 | -0.10 | 516419.7 | 4400462.1 | 39°45'14.088"N | 80°48'29.980"W | 0.15 | 221.18 | 0.21 |
| | 219.40 | 0.52 | 218.43 | 219.40 | 0.23 | -0.59 | -0.49 | 516419.6 | 4400462.0 | 39°45'14.083"N | 80°48'29.985"W | 0.77 | 219.56 | 0.33 |
| | 319.40 | 1.13 | 255.39 | 319.39 | 1.15 | -1.20 | -1.73 | 516419.2 | 4400461.8 | 39°45'14.077"N | 80°48'30.000"W | 2.10 | 235.26 | 0.78 |
| | 419.40 | 2.95 | 294.61 | 419.32 | 4.51 | -0.37 | -5.02 | 516418.2 | 4400462.1 | 39°45'14.085"N | 80°48'30.043"W | 5.03 | 265.74 | 2.19 |
| | 519.40 | 4.65 | 308.74 | 519.10 | 10.96 | 3.23 | -10.52 | 516416.5 | 4400463.2 | 39°45'14.121"N | 80°48'30.113"W | 11.01 | 287.09 | 1.93 |
| | 619.40 | 5.05 | 318.52 | 618.75 | 18.79 | 9.07 | -16.60 | 516414.7 | 4400464.9 | 39°45'14.179"N | 80°48'30.191"W | 18.91 | 298.65 | 0.92 |
| | 719.40 | 4.99 | 326.78 | 718.36 | 26.32 | 16.00 | -21.90 | 516413.0 | 4400467.1 | 39°45'14.248"N | 80°48'30.258"W | 27.12 | 306.16 | 0.72 |
| | 819.40 | 5.66 | 330.64 | 817.93 | 33.76 | 23.94 | -26.70 | 516411.6 | 4400469.5 | 39°45'14.326"N | 80°48'30.319"W | 35.86 | 311.89 | 0.76 |
| | 919.40 | 5.08 | 332.33 | 917.49 | 41.00 | 32.16 | -31.17 | 516410.2 | 4400472.0 | 39°45'14.407"N | 80°48'30.376"W | 44.79 | 315.90 | 0.60 |
| | 1019.40 | 2.77 | 341.72 | 1017.25 | 45.95 | 38.38 | -33.98 | 516409.4 | 4400473.9 | 39°45'14.469"N | 80°48'30.412"W | 51.26 | 318.47 | 2.39 |
| | 1119.40 | 1.80 | 1.82 | 1117.17 | 48.07 | 42.24 | -34.69 | 516409.1 | 4400475.0 | 39°45'14.507"N | 80°48'30.421"W | 54.66 | 320.60 | 1.24 |
| | 1219.40 | 1.06 | 46.70 | 1217.14 | 48.23 | 44.44 | -33.97 | 516409.4 | 4400475.7 | 39°45'14.529"N | 80°48'30.412"W | 55.94 | 322.61 | 1.29 |
| | 1319.40 | 1.22 | 41.20 | 1317.12 | 47.50 | 45.88 | -32.60 | 516409.8 | 4400476.2 | 39°45'14.543"N | 80°48'30.394"W | 56.28 | 324.61 | 0.19 |
| | 1419.40 | 1.19 | 43.93 | 1417.10 | 46.77 | 47.43 | -31.17 | 516410.2 | 4400476.6 | 39°45'14.558"N | 80°48'30.376"W | 56.76 | 326.68 | 0.06 |
| | 1519.40 | 1.00 | 56.49 | 1517.08 | 45.89 | 48.66 | -29.73 | 516410.7 | 4400477.0 | 39°45'14.570"N | 80°48'30.358"W | 57.02 | 328.58 | 0.31 |
| | 1619.40 | 0.99 | 58.32 | 1617.07 | 44.89 | 49.59 | -28.26 | 516411.1 | 4400477.3 | 39°45'14.580"N | 80°48'30.339"W | 57.08 | 330.32 | 0.03 |
| | 1719.40 | 1.19 | 66.28 | 1717.05 | 43.66 | 50.47 | -26.58 | 516411.6 | 4400477.6 | 39°45'14.588"N | 80°48'30.317"W | 57.04 | 332.23 | 0.25 |
| | 1819.40 | 0.89 | 66.85 | 1817.03 | 42.39 | 51.19 | -24.91 | 516412.1 | 4400477.8 | 39°45'14.595"N | 80°48'30.296"W | 56.93 | 334.05 | 0.30 |
| | 1919.40 | 0.88 | 86.91 | 1917.02 | 41.15 | 51.54 | -23.43 | 516412.6 | 4400477.9 | 39°45'14.599"N | 80°48'30.277"W | 56.61 | 335.55 | 0.31 |
| | 2019.40 | 0.78 | 90.95 | 2017.01 | 39.82 | 51.57 | -21.98 | 516413.0 | 4400477.9 | 39°45'14.599"N | 80°48'30.258"W | 56.06 | 336.91 | 0.12 |
| | 2119.40 | 0.89 | 82.50 | 2117.00 | 38.51 | 51.66 | -20.53 | 516413.5 | 4400477.9 | 39°45'14.600"N | 80°48'30.240"W | 55.59 | 338.32 | 0.16 |
| | 2219.40 | 0.82 | 64.07 | 2216.99 | 37.36 | 52.07 | -19.12 | 516413.9 | 4400478.0 | 39°45'14.604"N | 80°48'30.222"W | 55.47 | 339.84 | 0.28 |
| | 2319.40 | 0.85 | 61.00 | 2316.98 | 36.41 | 52.74 | -17.83 | 516414.3 | 4400478.2 | 39°45'14.611"N | 80°48'30.205"W | 55.67 | 341.32 | 0.05 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 2419.40 | 0.73 | 43.18 | 2416.97 | 35.72 | 53.57 | -16.74 | 516414.6 | 4400478.5 | 39°45'14.619"N | 80°48'30.191"W | 56.12 | 342.64 | 0.27 |
| 2519.40 | 0.72 | 32.77 | 2516.96 | 35.37 | 54.56 | -15.97 | 516414.8 | 4400478.8 | 39°45'14.628"N | 80°48'30.181"W | 56.85 | 343.69 | 0.13 |
| 2619.40 | 0.79 | 17.62 | 2616.95 | 35.31 | 55.74 | -15.42 | 516415.0 | 4400479.2 | 39°45'14.640"N | 80°48'30.174"W | 57.84 | 344.54 | 0.21 |
| 2719.40 | 0.54 | 24.98 | 2716.95 | 35.35 | 56.83 | -15.01 | 516415.1 | 4400479.5 | 39°45'14.651"N | 80°48'30.169"W | 58.78 | 345.20 | 0.26 |
| 2784.40 | 0.58 | 27.56 | 2781.94 | 35.30 | 57.40 | -14.73 | 516415.2 | 4400479.7 | 39°45'14.656"N | 80°48'30.165"W | 59.26 | 345.61 | 0.07 |
| 2826.40 | 0.61 | 24.52 | 2823.94 | 35.27 | 57.79 | -14.54 | 516415.3 | 4400479.8 | 39°45'14.660"N | 80°48'30.163"W | 59.59 | 345.88 | 0.10 |
| 2919.40 | 0.80 | 25.90 | 2916.93 | 35.21 | 58.82 | -14.05 | 516415.4 | 4400480.1 | 39°45'14.671"N | 80°48'30.157"W | 60.48 | 346.57 | 0.21 |
| 3014.40 | 0.94 | 31.81 | 3011.92 | 35.03 | 60.08 | -13.35 | 516415.6 | 4400480.5 | 39°45'14.683"N | 80°48'30.148"W | 61.55 | 347.47 | 0.17 |
| 3108.40 | 0.98 | 18.32 | 3105.91 | 34.96 | 61.50 | -12.69 | 516415.8 | 4400480.9 | 39°45'14.697"N | 80°48'30.139"W | 62.80 | 348.34 | 0.24 |
| 3203.40 | 0.98 | 13.78 | 3200.90 | 35.13 | 63.06 | -12.24 | 516416.0 | 4400481.4 | 39°45'14.712"N | 80°48'30.133"W | 64.24 | 349.02 | 0.08 |
| 3298.40 | 1.04 | 12.70 | 3295.88 | 35.39 | 64.69 | -11.86 | 516416.1 | 4400481.9 | 39°45'14.729"N | 80°48'30.128"W | 65.77 | 349.61 | 0.07 |
| 3392.40 | 1.69 | 1.68 | 3389.85 | 36.02 | 66.91 | -11.63 | 516416.2 | 4400482.6 | 39°45'14.750"N | 80°48'30.125"W | 67.91 | 350.14 | 0.74 |
| 3486.40 | 0.44 | 211.18 | 3483.84 | 36.56 | 67.99 | -11.78 | 516416.1 | 4400482.9 | 39°45'14.761"N | 80°48'30.127"W | 69.00 | 350.17 | 2.22 |
| 3580.40 | 1.80 | 182.03 | 3577.82 | 36.11 | 66.20 | -12.01 | 516416.1 | 4400482.4 | 39°45'14.743"N | 80°48'30.130"W | 67.28 | 349.71 | 1.52 |
| 3674.40 | 2.00 | 178.10 | 3671.77 | 34.93 | 63.09 | -12.01 | 516416.1 | 4400481.4 | 39°45'14.713"N | 80°48'30.130"W | 64.22 | 349.22 | 0.25 |
| 3766.40 | 0.33 | 150.44 | 3763.75 | 34.07 | 61.25 | -11.83 | 516416.1 | 4400480.8 | 39°45'14.695"N | 80°48'30.128"W | 62.38 | 349.07 | 1.86 |
| 3861.40 | 0.25 | 160.13 | 3858.75 | 33.71 | 60.82 | -11.62 | 516416.2 | 4400480.7 | 39°45'14.690"N | 80°48'30.125"W | 61.92 | 349.18 | 0.10 |
| 3955.40 | 0.34 | 149.78 | 3952.75 | 33.36 | 60.39 | -11.41 | 516416.2 | 4400480.6 | 39°45'14.686"N | 80°48'30.123"W | 61.45 | 349.30 | 0.11 |
| 4049.40 | 0.32 | 140.31 | 4046.75 | 32.90 | 59.94 | -11.11 | 516416.3 | 4400480.4 | 39°45'14.682"N | 80°48'30.119"W | 60.96 | 349.50 | 0.06 |
| 4144.40 | 0.80 | 24.80 | 4141.74 | 32.64 | 60.34 | -10.66 | 516416.5 | 4400480.6 | 39°45'14.685"N | 80°48'30.113"W | 61.27 | 349.98 | 1.03 |
| 4175.40 | 1.80 | 17.78 | 4172.73 | 32.67 | 61.00 | -10.42 | 516416.5 | 4400480.8 | 39°45'14.692"N | 80°48'30.110"W | 61.88 | 350.31 | 3.26 |
| 4207.40 | 2.47 | 20.77 | 4204.71 | 32.72 | 62.12 | -10.02 | 516416.7 | 4400481.1 | 39°45'14.703"N | 80°48'30.105"W | 62.93 | 350.84 | 2.12 |
| 4239.40 | 2.87 | 19.79 | 4236.68 | 32.77 | 63.52 | -9.50 | 516416.8 | 4400481.5 | 39°45'14.717"N | 80°48'30.098"W | 64.23 | 351.49 | 1.26 |
| 4270.40 | 3.79 | 21.95 | 4267.62 | 32.81 | 65.20 | -8.86 | 516417.0 | 4400482.0 | 39°45'14.734"N | 80°48'30.090"W | 65.80 | 352.26 | 2.99 |
| 4302.40 | 4.45 | 22.23 | 4299.54 | 32.81 | 67.33 | -7.99 | 516417.3 | 4400482.7 | 39°45'14.755"N | 80°48'30.079"W | 67.81 | 353.23 | 2.06 |
| 4334.40 | 5.59 | 20.36 | 4331.42 | 32.86 | 69.94 | -6.98 | 516417.6 | 4400483.5 | 39°45'14.780"N | 80°48'30.066"W | 70.29 | 354.30 | 3.60 |
| 4365.40 | 6.65 | 19.62 | 4362.24 | 32.99 | 73.05 | -5.85 | 516417.9 | 4400484.4 | 39°45'14.811"N | 80°48'30.051"W | 73.28 | 355.42 | 3.43 |
| 4397.40 | 7.82 | 17.34 | 4393.99 | 33.25 | 76.87 | -4.58 | 516418.3 | 4400485.6 | 39°45'14.849"N | 80°48'30.035"W | 77.01 | 356.59 | 3.76 |
| 4428.40 | 8.69 | 15.90 | 4424.66 | 33.69 | 81.14 | -3.31 | 516418.7 | 4400486.9 | 39°45'14.891"N | 80°48'30.018"W | 81.21 | 357.66 | 2.88 |
| 4460.40 | 9.12 | 14.16 | 4456.28 | 34.30 | 85.92 | -2.03 | 516419.1 | 4400488.4 | 39°45'14.938"N | 80°48'30.002"W | 85.95 | 358.65 | 1.59 |
| 4492.40 | 9.12 | 13.67 | 4487.87 | 35.03 | 90.85 | -0.81 | 516419.5 | 4400489.9 | 39°45'14.987"N | 80°48'29.986"W | 90.85 | 359.49 | 0.24 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 4523.40 | 10.12 | 13.45 | 4518.44 | 35.81 | 95.88 | 0.40 | 516419.8 | 4400491.4 | 39°45'15.037"N | 80°48'29.970"W | 95.88 | 0.24 | 3.23 |
| 4555.40 | 11.33 | 15.81 | 4549.88 | 36.58 | 101.64 | 1.91 | 516420.3 | 4400493.1 | 39°45'15.093"N | 80°48'29.951"W | 101.66 | 1.08 | 4.02 |
| 4587.40 | 11.65 | 16.27 | 4581.24 | 37.26 | 107.77 | 3.68 | 516420.8 | 4400495.0 | 39°45'15.154"N | 80°48'29.928"W | 107.83 | 1.95 | 1.04 |
| 4619.40 | 12.04 | 14.27 | 4612.56 | 38.05 | 114.10 | 5.40 | 516421.4 | 4400496.9 | 39°45'15.216"N | 80°48'29.906"W | 114.23 | 2.71 | 1.77 |
| 4682.40 | 13.27 | 18.89 | 4674.03 | 39.37 | 127.31 | 9.36 | 516422.6 | 4400501.0 | 39°45'15.347"N | 80°48'29.855"W | 127.66 | 4.21 | 2.53 |
| 4744.40 | 14.20 | 24.80 | 4734.26 | 39.43 | 140.95 | 14.86 | 516424.2 | 4400505.1 | 39°45'15.482"N | 80°48'29.784"W | 141.73 | 6.02 | 2.71 |
| 4807.40 | 14.25 | 23.87 | 4795.32 | 38.84 | 155.05 | 21.24 | 516426.2 | 4400509.4 | 39°45'15.621"N | 80°48'29.702"W | 156.50 | 7.80 | 0.37 |
| 4870.40 | 14.67 | 22.53 | 4856.33 | 38.56 | 169.51 | 27.43 | 516428.1 | 4400513.8 | 39°45'15.764"N | 80°48'29.622"W | 171.72 | 9.19 | 0.85 |
| 4933.40 | 14.28 | 25.46 | 4917.33 | 38.07 | 183.90 | 33.83 | 516430.0 | 4400518.2 | 39°45'15.906"N | 80°48'29.540"W | 186.98 | 10.42 | 1.32 |
| 4997.40 | 14.48 | 22.90 | 4979.32 | 37.51 | 198.40 | 40.34 | 516432.0 | 4400522.6 | 39°45'16.049"N | 80°48'29.456"W | 202.45 | 11.49 | 1.04 |
| 5059.40 | 12.38 | 23.47 | 5039.63 | 37.26 | 211.63 | 46.00 | 516433.7 | 4400526.7 | 39°45'16.179"N | 80°48'29.384"W | 216.58 | 12.26 | 3.39 |
| 5122.40 | 12.46 | 24.27 | 5101.15 | 36.86 | 224.02 | 51.48 | 516435.4 | 4400530.4 | 39°45'16.302"N | 80°48'29.313"W | 229.86 | 12.94 | 0.30 |
| 5186.40 | 12.25 | 23.72 | 5163.67 | 36.42 | 236.53 | 57.05 | 516437.1 | 4400534.2 | 39°45'16.425"N | 80°48'29.241"W | 243.32 | 13.56 | 0.38 |
| 5248.40 | 12.52 | 22.09 | 5224.23 | 36.26 | 248.78 | 62.22 | 516438.7 | 4400538.0 | 39°45'16.546"N | 80°48'29.175"W | 256.45 | 14.04 | 0.71 |
| 5311.40 | 13.31 | 19.78 | 5285.63 | 36.57 | 261.93 | 67.25 | 516440.2 | 4400542.0 | 39°45'16.676"N | 80°48'29.110"W | 270.43 | 14.40 | 1.50 |
| 5375.40 | 13.91 | 17.49 | 5347.84 | 37.50 | 276.20 | 72.05 | 516441.7 | 4400546.3 | 39°45'16.817"N | 80°48'29.048"W | 285.45 | 14.62 | 1.26 |
| 5437.40 | 13.23 | 21.04 | 5408.11 | 38.25 | 289.93 | 76.84 | 516443.1 | 4400550.5 | 39°45'16.953"N | 80°48'28.986"W | 299.94 | 14.84 | 1.73 |
| 5500.40 | 13.45 | 20.35 | 5469.41 | 38.63 | 303.53 | 81.98 | 516444.7 | 4400554.7 | 39°45'17.087"N | 80°48'28.920"W | 314.41 | 15.11 | 0.43 |
| 5564.40 | 11.97 | 20.71 | 5531.84 | 39.03 | 316.72 | 86.91 | 516446.2 | 4400558.7 | 39°45'17.217"N | 80°48'28.857"W | 328.43 | 15.35 | 2.32 |
| 5627.40 | 10.51 | 15.62 | 5593.63 | 39.85 | 328.37 | 90.77 | 516447.4 | 4400562.2 | 39°45'17.332"N | 80°48'28.807"W | 340.68 | 15.45 | 2.80 |
| 5725.40 | 13.07 | 12.41 | 5689.55 | 42.75 | 347.80 | 95.56 | 516448.8 | 4400568.1 | 39°45'17.524"N | 80°48'28.745"W | 360.69 | 15.36 | 2.70 |
| 5792.00 | 14.54 | 12.45 | 5754.23 | 45.44 | 363.32 | 98.98 | 516449.9 | 4400572.9 | 39°45'17.677"N | 80°48'28.701"W | 376.56 | 15.24 | 2.21 |
| 5858.00 | 14.78 | 357.03 | 5818.10 | 50.42 | 379.82 | 100.33 | 516450.3 | 4400577.9 | 39°45'17.840"N | 80°48'28.683"W | 392.85 | 14.80 | 5.91 |
| 5906.00 | 15.83 | 343.61 | 5864.41 | 57.10 | 392.22 | 98.16 | 516449.6 | 4400581.7 | 39°45'17.963"N | 80°48'28.711"W | 404.32 | 14.05 | 7.68 |
| 5955.00 | 15.61 | 332.98 | 5911.59 | 66.26 | 404.51 | 93.28 | 516448.1 | 4400585.4 | 39°45'18.085"N | 80°48'28.773"W | 415.12 | 12.99 | 5.89 |
| 6000.00 | 15.30 | 328.12 | 5954.97 | 75.65 | 414.94 | 87.40 | 516446.3 | 4400588.6 | 39°45'18.188"N | 80°48'28.848"W | 424.05 | 11.89 | 2.96 |
| 6095.00 | 15.87 | 325.41 | 6046.47 | 96.66 | 436.28 | 73.40 | 516442.1 | 4400595.1 | 39°45'18.399"N | 80°48'29.026"W | 442.41 | 9.55 | 0.97 |
| 6190.00 | 21.53 | 321.83 | 6136.43 | 122.69 | 460.70 | 55.24 | 516436.5 | 4400602.5 | 39°45'18.641"N | 80°48'29.258"W | 464.00 | 6.84 | 6.08 |
| 6285.00 | 31.33 | 314.52 | 6221.42 | 160.79 | 491.80 | 26.78 | 516427.9 | 4400612.0 | 39°45'18.949"N | 80°48'29.622"W | 492.53 | 3.12 | 10.85 |
| 6379.00 | 40.01 | 305.80 | 6297.76 | 212.89 | 526.71 | -15.26 | 516415.1 | 4400622.7 | 39°45'19.295"N | 80°48'30.159"W | 526.93 | 358.34 | 10.68 |
| 6474.00 | 50.71 | 301.17 | 6364.43 | 279.09 | 563.71 | -71.67 | 516397.9 | 4400633.9 | 39°45'19.661"N | 80°48'30.880"W | 568.25 | 352.76 | 11.78 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 6569.00 | 57.71 | 297.46 | 6419.96 | 355.49 | 601.31 | -138.85 | 516377.4 | 4400645.4 | 39°45'20.034"N | 80°48'31.740"W | 617.14 | 347.00 | 8.02 |
| 6664.00 | 68.50 | 296.33 | 6462.88 | 439.81 | 639.55 | -214.32 | 516354.4 | 4400657.0 | 39°45'20.414"N | 80°48'32.705"W | 674.50 | 341.47 | 11.41 |
| 6758.00 | 76.46 | 296.03 | 6491.15 | 529.16 | 679.06 | -294.70 | 516329.9 | 4400669.1 | 39°45'20.806"N | 80°48'33.733"W | 740.25 | 336.54 | 8.47 |
| 6852.00 | 82.69 | 295.24 | 6508.15 | 621.39 | 719.03 | -378.01 | 516304.5 | 4400681.3 | 39°45'21.203"N | 80°48'34.799"W | 812.34 | 332.27 | 6.68 |
| 6948.00 | 90.55 | 295.39 | 6513.81 | 717.00 | 759.97 | -464.57 | 516278.2 | 4400693.7 | 39°45'21.609"N | 80°48'35.906"W | 890.72 | 328.56 | 8.19 |
| 7043.00 | 90.55 | 295.40 | 6512.90 | 811.85 | 800.71 | -550.38 | 516252.0 | 4400706.1 | 39°45'22.014"N | 80°48'37.004"W | 971.63 | 325.50 | 0.01 |
| 7137.00 | 90.18 | 294.35 | 6512.30 | 905.74 | 840.25 | -635.66 | 516226.0 | 4400718.2 | 39°45'22.406"N | 80°48'38.094"W | 1053.61 | 322.89 | 1.18 |
| 7232.00 | 90.18 | 292.50 | 6512.00 | 1000.71 | 878.02 | -722.83 | 516199.5 | 4400729.7 | 39°45'22.781"N | 80°48'39.209"W | 1137.28 | 320.54 | 1.95 |
| 7327.00 | 90.12 | 289.00 | 6511.75 | 1095.67 | 911.67 | -811.65 | 516172.4 | 4400739.9 | 39°45'23.116"N | 80°48'40.346"W | 1220.62 | 318.32 | 3.68 |
| 7422.00 | 90.40 | 289.30 | 6511.32 | 1190.53 | 942.83 | -901.39 | 516145.1 | 4400749.4 | 39°45'23.426"N | 80°48'41.494"W | 1304.39 | 316.29 | 0.43 |
| 7517.00 | 90.37 | 287.78 | 6510.68 | 1285.34 | 973.04 | -991.46 | 516117.6 | 4400758.6 | 39°45'23.726"N | 80°48'42.646"W | 1389.17 | 314.46 | 1.60 |
| 7612.00 | 90.62 | 288.98 | 6509.86 | 1380.13 | 1002.99 | -1081.61 | 516090.2 | 4400767.8 | 39°45'24.024"N | 80°48'43.800"W | 1475.08 | 312.84 | 1.29 |
| 7707.00 | 90.55 | 287.74 | 6508.89 | 1474.91 | 1032.91 | -1171.76 | 516062.7 | 4400776.9 | 39°45'24.321"N | 80°48'44.954"W | 1562.03 | 311.40 | 1.31 |
| 7803.00 | 90.12 | 291.08 | 6508.33 | 1570.78 | 1064.81 | -1262.29 | 516035.1 | 4400786.6 | 39°45'24.639"N | 80°48'46.112"W | 1651.43 | 310.15 | 3.51 |
| 7898.00 | 90.12 | 294.34 | 6508.13 | 1665.77 | 1101.48 | -1349.92 | 516008.4 | 4400797.8 | 39°45'25.003"N | 80°48'47.233"W | 1742.28 | 309.21 | 3.43 |
| 7993.00 | 90.28 | 294.29 | 6507.80 | 1760.70 | 1140.60 | -1436.49 | 515982.0 | 4400809.7 | 39°45'25.391"N | 80°48'48.340"W | 1834.25 | 308.45 | 0.18 |
| 8088.00 | 90.22 | 295.94 | 6507.38 | 1855.57 | 1180.92 | -1522.50 | 515955.8 | 4400822.0 | 39°45'25.791"N | 80°48'49.441"W | 1926.81 | 307.80 | 1.74 |
| 8182.00 | 90.09 | 299.71 | 6507.13 | 1949.09 | 1224.79 | -1605.62 | 515930.5 | 4400835.3 | 39°45'26.227"N | 80°48'50.504"W | 2019.44 | 307.34 | 4.01 |
| 8277.00 | 90.61 | 298.68 | 6506.55 | 2043.38 | 1271.13 | -1688.55 | 515905.2 | 4400849.5 | 39°45'26.686"N | 80°48'51.564"W | 2113.52 | 306.97 | 1.21 |
| 8371.00 | 90.58 | 296.64 | 6505.57 | 2136.94 | 1314.76 | -1771.80 | 515879.9 | 4400862.8 | 39°45'27.119"N | 80°48'52.629"W | 2206.32 | 306.58 | 2.17 |
| 8466.00 | 90.55 | 290.54 | 6504.63 | 2231.86 | 1352.76 | -1858.81 | 515853.4 | 4400874.3 | 39°45'27.496"N | 80°48'53.742"W | 2298.94 | 306.05 | 6.42 |
| 8561.00 | 90.65 | 284.69 | 6503.64 | 2326.51 | 1381.49 | -1949.31 | 515825.8 | 4400883.1 | 39°45'27.782"N | 80°48'54.900"W | 2389.21 | 305.33 | 6.16 |
| 8655.00 | 90.49 | 287.35 | 6502.70 | 2419.96 | 1407.43 | -2039.65 | 515798.3 | 4400891.0 | 39°45'28.040"N | 80°48'56.056"W | 2478.11 | 304.61 | 2.83 |
| 8750.00 | 90.49 | 289.53 | 6501.89 | 2514.75 | 1437.48 | -2129.76 | 515770.8 | 4400900.1 | 39°45'28.339"N | 80°48'57.209"W | 2569.48 | 304.02 | 2.29 |
| 8845.00 | 90.58 | 289.59 | 6501.00 | 2609.64 | 1469.28 | -2219.28 | 515743.5 | 4400909.8 | 39°45'28.655"N | 80°48'58.355"W | 2661.57 | 303.51 | 0.11 |
| 8940.00 | 90.49 | 293.30 | 6500.12 | 2704.62 | 1504.01 | -2307.68 | 515716.6 | 4400920.4 | 39°45'29.000"N | 80°48'59.486"W | 2754.53 | 303.09 | 3.91 |
| 9035.00 | 90.55 | 294.08 | 6499.25 | 2799.58 | 1542.17 | -2394.67 | 515690.1 | 4400932.0 | 39°45'29.379"N | 80°49'00.599"W | 2848.29 | 302.78 | 0.82 |
| 9129.00 | 90.58 | 294.31 | 6498.33 | 2893.51 | 1580.70 | -2480.41 | 515664.0 | 4400943.8 | 39°45'29.762"N | 80°49'01.696"W | 2941.26 | 302.51 | 0.25 |
| 9224.00 | 90.83 | 293.38 | 6497.16 | 2988.47 | 1619.10 | -2567.29 | 515637.5 | 4400955.5 | 39°45'30.143"N | 80°49'02.807"W | 3035.21 | 302.24 | 1.01 |
| 9318.00 | 90.80 | 293.28 | 6495.82 | 3082.44 | 1656.32 | -2653.60 | 515611.2 | 4400966.8 | 39°45'30.513"N | 80°49'03.911"W | 3128.10 | 301.97 | 0.11 |
| 9413.00 | 90.86 | 294.97 | 6494.45 | 3177.37 | 1695.15 | -2740.29 | 515584.8 | 4400978.7 | 39°45'30.898"N | 80°49'05.020"W | 3222.22 | 301.74 | 1.78 |

51.01617

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 9507.00 | 90.80 | 291.81 | 6493.08 | 3271.32 | 1732.45 | -2826.54 | 515558.5 | 4400990.0 | 39°45'31.268"N | 80°49'06.124"W | 3315.23 | 301.51 | 3.36 |
| 9602.00 | 91.38 | 291.12 | 6491.28 | 3366.30 | 1767.21 | -2914.94 | 515531.6 | 4401000.6 | 39°45'31.614"N | 80°49'07.255"W | 3408.80 | 301.23 | 0.95 |
| 9698.00 | 91.26 | 291.03 | 6489.06 | 3462.26 | 1801.72 | -3004.49 | 515504.3 | 4401011.1 | 39°45'31.957"N | 80°49'08.401"W | 3503.31 | 300.95 | 0.16 |
| 9792.00 | 90.46 | 290.06 | 6487.65 | 3556.21 | 1834.71 | -3092.50 | 515477.5 | 4401021.2 | 39°45'32.284"N | 80°49'09.527"W | 3595.79 | 300.68 | 1.34 |
| 9887.00 | 90.68 | 294.24 | 6486.71 | 3651.18 | 1870.51 | -3180.47 | 515450.7 | 4401032.1 | 39°45'32.640"N | 80°49'10.652"W | 3689.74 | 300.46 | 4.41 |
| 9982.00 | 90.61 | 291.59 | 6485.64 | 3746.16 | 1907.50 | -3267.96 | 515424.0 | 4401043.4 | 39°45'33.007"N | 80°49'11.771"W | 3783.93 | 300.27 | 2.79 |
| 10078.00 | 90.59 | 291.46 | 6484.63 | 3842.15 | 1942.72 | -3357.26 | 515396.8 | 4401054.1 | 39°45'33.357"N | 80°49'12.914"W | 3878.83 | 300.06 | 0.14 |
| 10171.00 | 90.61 | 292.48 | 6483.66 | 3935.14 | 1977.51 | -3443.50 | 515370.6 | 4401064.7 | 39°45'33.703"N | 80°49'14.017"W | 3970.92 | 299.87 | 1.10 |
| 10264.00 | 90.58 | 293.77 | 6482.69 | 4028.12 | 2014.03 | -3529.02 | 515344.5 | 4401075.8 | 39°45'34.065"N | 80°49'15.111"W | 4063.29 | 299.71 | 1.39 |
| 10359.00 | 90.65 | 292.03 | 6481.67 | 4123.10 | 2051.00 | -3616.52 | 515317.8 | 4401087.1 | 39°45'34.432"N | 80°49'16.231"W | 4157.62 | 299.56 | 1.83 |
| 10453.00 | 90.55 | 291.28 | 6480.69 | 4217.09 | 2085.68 | -3703.88 | 515291.2 | 4401097.6 | 39°45'34.777"N | 80°49'17.349"W | 4250.74 | 299.38 | 0.80 |
| 10548.00 | 90.55 | 293.80 | 6479.78 | 4312.08 | 2122.09 | -3791.62 | 515264.5 | 4401108.7 | 39°45'35.138"N | 80°49'18.471"W | 4345.07 | 299.24 | 2.65 |
| 10643.00 | 90.49 | 292.43 | 6478.91 | 4407.06 | 2159.38 | -3878.98 | 515237.9 | 4401120.1 | 39°45'35.509"N | 80°49'19.589"W | 4439.53 | 299.10 | 1.44 |
| 10739.00 | 90.74 | 290.66 | 6477.88 | 4503.04 | 2194.64 | -3968.27 | 515210.7 | 4401130.8 | 39°45'35.859"N | 80°49'20.731"W | 4534.71 | 298.95 | 1.86 |
| 10834.00 | 91.26 | 292.51 | 6476.23 | 4598.02 | 2229.58 | -4056.59 | 515183.8 | 4401141.5 | 39°45'36.206"N | 80°49'21.861"W | 4628.92 | 298.79 | 2.02 |
| 10928.00 | 91.26 | 292.24 | 6474.16 | 4692.00 | 2265.35 | -4143.49 | 515157.3 | 4401152.4 | 39°45'36.561"N | 80°49'22.973"W | 4722.32 | 298.67 | 0.29 |
| 11023.00 | 90.68 | 292.11 | 6472.55 | 4786.98 | 2301.20 | -4231.45 | 515130.5 | 4401163.3 | 39°45'36.917"N | 80°49'24.099"W | 4816.71 | 298.54 | 0.63 |
| 11118.00 | 90.65 | 291.11 | 6471.45 | 4881.97 | 2336.19 | -4319.76 | 515103.6 | 4401174.0 | 39°45'37.264"N | 80°49'25.229"W | 4911.02 | 298.41 | 1.05 |
| 11213.00 | 90.62 | 289.83 | 6470.40 | 4976.92 | 2369.41 | -4408.76 | 515076.5 | 4401184.1 | 39°45'37.595"N | 80°49'26.367"W | 5005.12 | 298.26 | 1.35 |
| 11307.00 | 90.65 | 289.59 | 6469.35 | 5070.83 | 2401.11 | -4497.25 | 515049.5 | 4401193.7 | 39°45'37.910"N | 80°49'27.500"W | 5098.09 | 298.10 | 0.26 |
| 11402.00 | 90.71 | 289.44 | 6468.23 | 5165.72 | 2432.84 | -4586.78 | 515022.2 | 4401203.4 | 39°45'38.225"N | 80°49'28.645"W | 5192.04 | 297.94 | 0.17 |
| 11497.00 | 90.68 | 290.90 | 6467.07 | 5260.65 | 2465.59 | -4675.95 | 514995.0 | 4401213.4 | 39°45'38.550"N | 80°49'29.786"W | 5286.17 | 297.80 | 1.54 |
| 11590.00 | 90.71 | 291.31 | 6465.95 | 5353.63 | 2499.08 | -4762.70 | 514968.6 | 4401223.6 | 39°45'38.883"N | 80°49'30.896"W | 5378.54 | 297.69 | 0.44 |
| 11685.00 | 90.71 | 293.40 | 6464.77 | 5448.62 | 2535.21 | -4850.55 | 514941.8 | 4401234.6 | 39°45'39.242"N | 80°49'32.020"W | 5473.13 | 297.59 | 2.20 |
| 11780.00 | 90.71 | 293.85 | 6463.59 | 5543.58 | 2573.27 | -4937.58 | 514915.3 | 4401246.2 | 39°45'39.620"N | 80°49'33.134"W | 5567.90 | 297.53 | 0.47 |
| 11875.00 | 90.62 | 294.28 | 6462.49 | 5638.52 | 2612.01 | -5024.32 | 514888.9 | 4401258.0 | 39°45'40.004"N | 80°49'34.244"W | 5662.72 | 297.47 | 0.46 |
| 11971.00 | 90.46 | 289.74 | 6461.58 | 5734.49 | 2647.98 | -5113.30 | 514861.8 | 4401269.0 | 39°45'40.361"N | 80°49'35.382"W | 5758.26 | 297.38 | 4.73 |
| 12066.00 | 89.85 | 289.73 | 6461.33 | 5829.40 | 2680.06 | -5202.71 | 514834.6 | 4401278.7 | 39°45'40.680"N | 80°49'36.526"W | 5852.43 | 297.25 | 0.64 |
| 12161.00 | 89.97 | 294.37 | 6461.48 | 5924.38 | 2715.71 | -5290.74 | 514807.7 | 4401289.6 | 39°45'41.034"N | 80°49'37.653"W | 5947.02 | 297.17 | 4.89 |
| 12256.00 | 89.82 | 294.40 | 6461.65 | 6019.31 | 2754.93 | -5377.27 | 514781.4 | 4401301.5 | 39°45'41.423"N | 80°49'38.760"W | 6041.91 | 297.13 | 0.16 |
| 12350.00 | 89.72 | 295.63 | 6462.03 | 6113.19 | 2794.68 | -5462.45 | 514755.4 | 4401313.7 | 39°45'41.818"N | 80°49'39.849"W | 6135.84 | 297.10 | 1.31 |

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AUG 05 2015
WV Department of
Environmental Protection

| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 12445.00 | 90.40 | 294.57 | 6461.93 | 6208.06 | 2834.98 | -5548.47 | 514729.2 | 4401325.9 | 39°45'42.218"N | 80°49'40.950"W | 6230.78 | 297.07 | 1.33 |
| 12458.00 | 90.40 | 294.55 | 6461.84 | 6221.05 | 2840.38 | -5560.30 | 514725.6 | 4401327.6 | 39°45'42.271"N | 80°49'41.101"W | 6243.77 | 297.06 | 0.15 |
| 12485.00 | 90.40 | 294.55 | 6461.65 | 6248.03 | 2851.60 | -5584.86 | 514718.1 | 4401331.0 | 39°45'42.382"N | 80°49'41.415"W | 6270.74 | 297.05 | 0.00 |

51-01617

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AUG 05 2015
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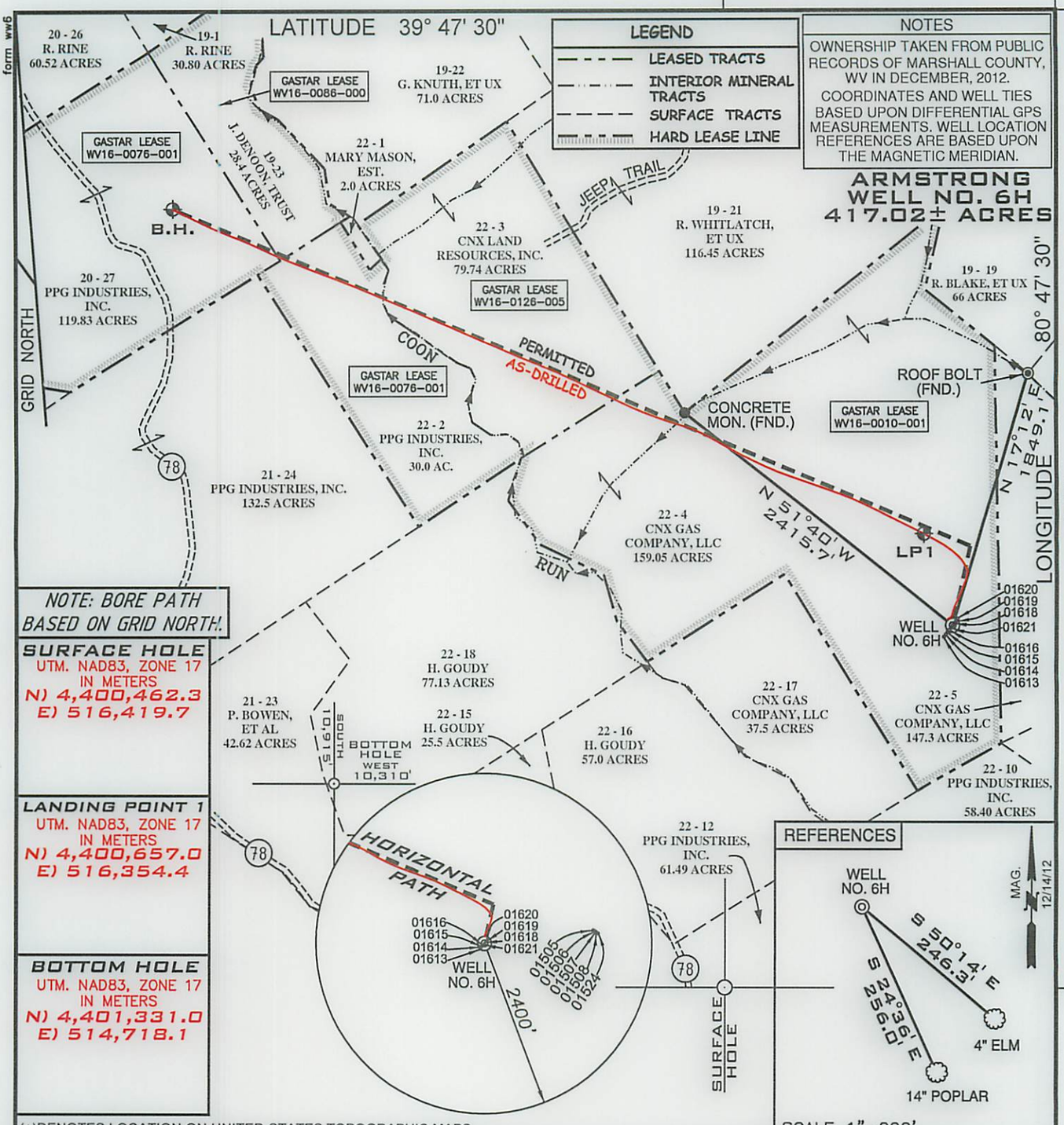
Environmental Protection

form ww6




(+)DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

FILE NUMBER W0120316 (WB1-56)

DRAWING NUMBER ARMSTRONG_WP_6H-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

RECEIVED Office of Oil and Gas AUG 05 2015

Jonathan N. White LICENSED NO. 2122 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

STATE OF WEST VIRGINIA MONTANI SEMPER LIBERI

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

WV Department of Environmental Protection

DATE: JULY 27, 2015

OPERATORS WELL NO. ARMSTRONG NO. 6H AS-DRILLED

API WELL NO. 47 - 051 - 01617 (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 WV16-0010-001, 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 417.02

PROPOSED WORK: DRILL ___ CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE ___ PLUG OFF OLD FORMATION ___

PERFORATE NEW FORMATION ___ OTHER PHYSICAL CHANGE (SPECIFY) ___

PLUG & ABANDON ___ CLEAN OUT & REPLUG ___

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD:6514' TMD:12,485'

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

COUNTY NAME PERMIT

WR-35
Rev. 8/23/13

Page ___ of ___

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 (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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WR-35
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Page ___ of ___

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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WR-35
Rev. 8/23/13



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

## PERFORATION RECORD

| Stage No. | Perforation date | Perforated from MD ft. | Perforated to MD ft. | Number of Perforations | Formation(s) |
|---|---|---|---|---|---|
| | | | | | SEE ATTACHED PERF INFO SHEET |
| | | | | | |
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Please insert additional pages as applicable.

## STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

| Stage No. | Stimulations Date | Ave Pump Rate (BPM) | Ave Treatment Pressure (PSI) | Max Breakdown Pressure (PSI) | ISIP (PSI) | Amount of Proppant (lbs) | Amount of Water (bbls) | Amount of Nitrogen/other (units) |
|---|---|---|---|---|---|---|---|---|
| | | | See Attached | | | | | |
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Please insert additional pages as applicable.

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WR-35
Rev. 8/23/13

Page ___ of ___

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

| PRODUCING FORMATION(S) | DEPTHS | |
|---|---|---|
| Marcellus | 6,470' - 6,512' TVD | 6,757' - 12,459' MD |
| | | |
| | | |
| | | |

Please insert additional pages as applicable.

GAS TEST ☐ Build up ☐ Drawdown ☒ Open Flow OIL TEST ☒ Flow ☐ Pump

SHUT-IN PRESSURE Surface 950 psi Bottom Hole 3774 psi DURATION OF TEST 253 hrs

| OPEN FLOW | Gas | Oil | NGL | Water | GAS MEASURED BY |
|---|---|---|---|---|---|
| | 2443 mcfpd | 160 bpd | ___ bpd | 449 bpd | ☐ Estimated ☒ Orifice ☐ Pilot |

| LITHOLOGY/ FORMATION NAME | TOP DEPTH IN FT TVD | BOTTOM 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, $H_2S$, ETC) |
|---|---|---|---|---|---|
| | 0 | | 0 | | SEE ATTACHED |
| | | | | | |
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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.

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

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

51-01618

**Armstrong #7H Perforation Information**

| Stage | Date | Perforated interval From ft | Perforated interval To ft | Number of Perfs | Formation |
|---|---|---|---|---|---|
| 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

| Stage | Stimulation Date | Avg Pump Rate (BPM) | Avg Pressure (PSI) | Max Break Pres. (PSI) | ISIP (PSI) | Sand Total (lbs) | Total Water (bbls) |
|---|---|---|---|---|---|---|---|
| 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 SANDSTC | 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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Welcome Tracy H., Operator - OpNo. G1410907 [ Log Out ]

# Hydraulic Fracturing
DISCLOSURE

FracFocus
Chemical Disclosure Registry

Please use the FracFocus XML submission process or create disclosures online.

FIND A WELL BY STATE | ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

## Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

Preview Disclosure PDF | Validate Disclosure | Submit To FracFocus

## Hydraulic Fracturing Data

Edit

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

Well Name
ARMSTRONG 7H

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

| True Vertical Depth (ft) | Total Water Vol (gal) | Total Non Water Vol | Total Mass (lbs) |
|---|---|---|---|
| 6490 | 5829978 | 0 | 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% | | 197579 |
| Edit | GW-3LDF | Baker Hughes | Gelling Agent | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .1263969% | SmartCare Product | 69516.48 |
| Edit | FRW-18 | Baker Hughes | Friction Reducer | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .1059221% | SmartCare Product | 58255.6 |

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|---|---|---|---|---|---|---|---|---|---|
| Edit | Alpha 1427 | Baker Hughes | Biocide | | | | | | |
| 51-01618 | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0284462% | SmartCare Product | 15645 |
| Edit | Enzyme G-NE | Baker Hughes | Breaker | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0216485% | SmartCare Product | 11906.3784 |
| Edit | ScaleSorb 4, (50# bag) | Baker Hughes | Scale Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .008393% | SmartCare Product | 4616 |
| Edit | Ferrotrol 300L | Baker Hughes | Iron Control | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0051001% | SmartCare Product | 2805.00321 |
| Edit | Calcium Chloride | Baker Hughes | Salts | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0032501% | | 1787.5 |
| 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

New Ingredients

| | Trade Name | Supplier | Purpose | Ingredients | CAS # | % High Additive | % HF Job | Comments | Ingredient Mass |
|---|---|---|---|---|---|---|---|---|---|
| Edit | Ingredients 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% | | 1165.112 |

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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 |
| Polyoxythylene 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 (Cristobaloite) | 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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# GASTAR EXPLORATION USA, INC.

Location: Marshall County, WV
Field: Marshall
Facility: Armstrong

Slot: Slot #7
Well: Armstrong 7H
Wellbore: Armstrong 7H (PWB)

BAKER HUGHES

51-01618

## Location Information

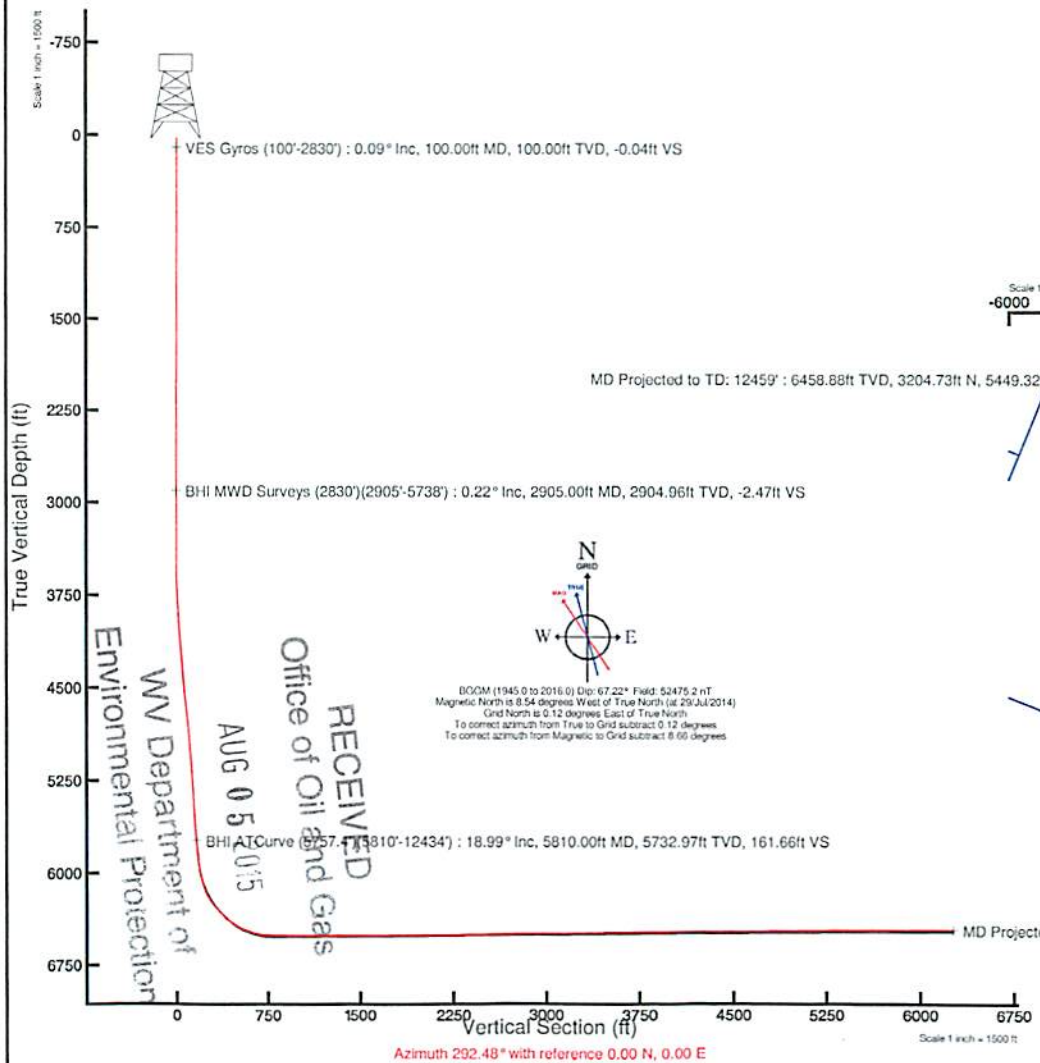
| Facility Name | | | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Armstrong | | | 1694263.000 | 14437151.000 | 39°45'13.773"N | 80°48'30.287"W |
| Slot | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
| Slot #7 | 49.02 | 36.01 | 1694299.000 | 14437200.000 | 39°45'14.257"N | 80°48'29.824"W |
| Nomac 323 (RT) to Mud line (At Slot: Slot #7) | | | | | 29.4ft | |
| Mean Sea Level to Mud line (At Slot: Slot #7) | | | | | -1278ft | |
| Nomac 323 (RT) to Mean Sea Level | | | | | 1307.4ft | |

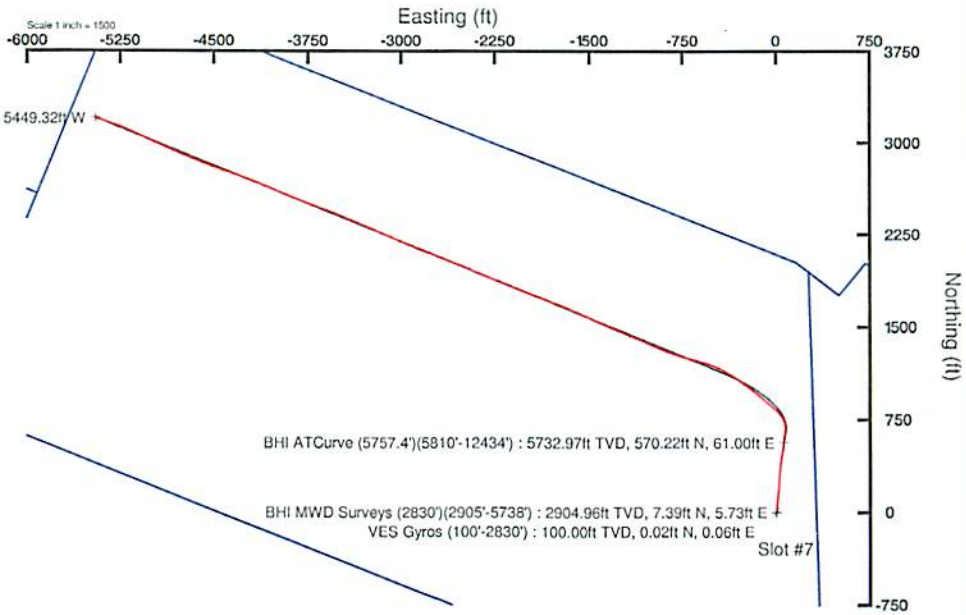
| | |
|---|---|
| Plot reference wellpath is Armstrong 7H (PWP) Rev-B.0 | |
| True vertical depths are referenced to Nomac 323 (RT) | Grid System: NAD83 / UTM Zone 17 North, US feet |
| Measured depths are referenced to Nomac 323 (RT) | North Reference: Grid north |
| Nomac 323 (RT) to Mean Sea Level: 1307.4 feet | Scale: True distance |
| Mean Sea Level to Mud line (At Slot: Slot #7): -1278 feet | Depths are in feet |
| Coordinates are in feet referenced to Slot | Created by: kroschr on 07/Aug/2014 |

## Well Data

| Slot | Well | Wellbore | Wellpath |
|---|---|---|---|
| Slot #7 | Armstrong 7H | Armstrong 7H (AWB) | Armstrong 7H (AWP) Proj:12459' |
| Slot #7 | Armstrong 7H | Armstrong 7H (PWB) | Armstrong 7H (PWP) Rev-B.0 |

API: 47-051-01618-0000
Rig: Nomac 323
BHI Job #: 5847862
Duration: 08/01/2014-08/04/2014




Azimuth 292.48° with reference 0.00 N, 0.00 E

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| REFERENCE WELLPATH IDENTIFICATION | | | |
|---|---|---|---|
| Operator | GASTAR EXPLORATION INC. | Slot | Slot #7 |
| Area | Marshall County, WV | Well | Armstrong 7H |
| Field | Marshall | Wellbore | Armstrong 7H (AWB) |
| Facility | Armstrong | Wellpath | Armstrong 7H (AWP) Proj: 12,459' |
| | | Sidetrack | (none) |

**WELLPATH DATA † = interpolated/extrapolated station**

| | MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| † | 0.00 | 0.00 | 71.76 | 0.00 | 0.00 | 0.00 | 0.00 | 516423.4 | 4400467.2 | 39°45'14.257"N | 80°48'29.824"W | 0.00 | 0.00 | 0.00 |
| | 29.40 | 0.00 | 71.76 | 29.40 | 0.00 | 0.00 | 0.00 | 516423.4 | 4400467.2 | 39°45'14.257"N | 80°48'29.824"W | 0.00 | 0.00 | 0.00 |
| | 119.40 | 0.12 | 71.76 | 119.40 | -0.07 | 0.03 | 0.09 | 516423.4 | 4400467.4 | 39°45'14.257"N | 80°48'29.823"W | 0.09 | 71.76 | 0.13 |
| | 219.40 | 0.27 | 338.06 | 219.40 | 0.01 | 0.28 | 0.10 | 516423.4 | 4400467.4 | 39°45'14.260"N | 80°48'29.823"W | 0.30 | 19.77 | 0.30 |
| | 319.40 | 0.27 | 345.35 | 319.40 | 0.32 | 0.73 | -0.05 | 516423.4 | 4400467.6 | 39°45'14.264"N | 80°48'29.825"W | 0.73 | 356.33 | 0.03 |
| | 419.40 | 0.32 | 358.69 | 419.40 | 0.58 | 1.23 | -0.11 | 516423.3 | 4400467.7 | 39°45'14.269"N | 80°48'29.826"W | 1.24 | 354.79 | 0.08 |
| | 519.40 | 0.39 | 21.27 | 519.40 | 0.70 | 1.83 | 0.00 | 516423.4 | 4400467.9 | 39°45'14.275"N | 80°48'29.824"W | 1.83 | 0.14 | 0.16 |
| | 619.40 | 0.35 | 25.30 | 619.39 | 0.69 | 2.42 | 0.26 | 516423.4 | 4400468.1 | 39°45'14.281"N | 80°48'29.821"W | 2.44 | 6.09 | 0.05 |
| | 719.40 | 0.26 | 19.43 | 719.39 | 0.69 | 2.91 | 0.46 | 516423.5 | 4400468.2 | 39°45'14.286"N | 80°48'29.818"W | 2.95 | 9.05 | 0.10 |
| | 819.40 | 0.34 | 38.10 | 819.39 | 0.62 | 3.36 | 0.72 | 516423.6 | 4400468.4 | 39°45'14.290"N | 80°48'29.815"W | 3.44 | 12.14 | 0.13 |
| | 919.40 | 0.41 | 31.52 | 919.39 | 0.48 | 3.90 | 1.09 | 516423.7 | 4400468.6 | 39°45'14.295"N | 80°48'29.810"W | 4.05 | 15.66 | 0.08 |
| | 1019.40 | 0.42 | 50.33 | 1019.39 | 0.25 | 4.44 | 1.56 | 516423.8 | 4400468.7 | 39°45'14.301"N | 80°48'29.804"W | 4.71 | 19.39 | 0.14 |
| | 1119.40 | 0.36 | 34.59 | 1119.38 | 0.02 | 4.93 | 2.02 | 516424.0 | 4400468.9 | 39°45'14.305"N | 80°48'29.798"W | 5.33 | 22.30 | 0.12 |
| | 1219.40 | 0.27 | 7.17 | 1219.38 | 0.01 | 5.42 | 2.23 | 516424.0 | 4400469.0 | 39°45'14.310"N | 80°48'29.795"W | 5.86 | 22.35 | 0.17 |
| | 1319.40 | 0.28 | 346.33 | 1319.38 | 0.22 | 5.90 | 2.20 | 516424.0 | 4400469.2 | 39°45'14.315"N | 80°48'29.796"W | 6.29 | 20.48 | 0.10 |
| | 1419.40 | 0.30 | 336.57 | 1419.38 | 0.55 | 6.37 | 2.04 | 516424.0 | 4400469.3 | 39°45'14.320"N | 80°48'29.798"W | 6.69 | 17.75 | 0.05 |
| | 1519.40 | 0.24 | 324.56 | 1519.38 | 0.92 | 6.78 | 1.81 | 516423.9 | 4400469.4 | 39°45'14.324"N | 80°48'29.801"W | 7.02 | 14.98 | 0.08 |
| | 1619.40 | 0.02 | 221.29 | 1619.38 | 1.10 | 6.94 | 1.68 | 516423.9 | 4400469.5 | 39°45'14.325"N | 80°48'29.802"W | 7.14 | 13.62 | 0.25 |
| | 1719.40 | 0.29 | 140.25 | 1719.38 | 0.88 | 6.73 | 1.83 | 516423.9 | 4400469.4 | 39°45'14.323"N | 80°48'29.800"W | 6.98 | 15.22 | 0.29 |
| | 1819.40 | 0.46 | 141.95 | 1819.38 | 0.31 | 6.22 | 2.24 | 516424.1 | 4400469.3 | 39°45'14.318"N | 80°48'29.795"W | 6.61 | 19.81 | 0.17 |
| | 1919.40 | 0.32 | 122.37 | 1919.37 | -0.32 | 5.76 | 2.72 | 516424.2 | 4400469.1 | 39°45'14.314"N | 80°48'29.789"W | 6.37 | 25.33 | 0.19 |
| | 2019.40 | 0.43 | 91.06 | 2019.37 | -0.94 | 5.60 | 3.34 | 516424.4 | 4400469.1 | 39°45'14.312"N | 80°48'29.781"W | 6.52 | 30.78 | 0.23 |
| | 2119.40 | 0.13 | 76.87 | 2119.37 | -1.38 | 5.62 | 3.82 | 516424.5 | 4400469.1 | 39°45'14.312"N | 80°48'29.775"W | 6.80 | 34.22 | 0.31 |
| | 2219.40 | 0.35 | 59.19 | 2219.37 | -1.66 | 5.80 | 4.19 | 516424.6 | 4400469.1 | 39°45'14.314"N | 80°48'29.770"W | 7.16 | 35.86 | 0.23 |
| | 2319.40 | 0.23 | 50.43 | 2319.37 | -1.93 | 6.09 | 4.61 | 516424.8 | 4400469.2 | 39°45'14.317"N | 80°48'29.765"W | 7.64 | 37.15 | 0.13 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 2419.40 | 0.36 | 47.49 | 2419.37 | -2.16 | 6.43 | 5.00 | 516424.9 | 4400469.3 | 39°45'14.320"N | 80°48'29.760"W | 8.14 | 37.87 | 0.13 |
| 2519.40 | 0.19 | 50.34 | 2519.37 | -2.37 | 6.74 | 5.36 | 516425.0 | 4400469.4 | 39°45'14.323"N | 80°48'29.755"W | 8.61 | 38.46 | 0.17 |
| 2619.40 | 0.04 | 48.22 | 2619.36 | -2.46 | 6.87 | 5.51 | 516425.0 | 4400469.5 | 39°45'14.325"N | 80°48'29.753"W | 8.81 | 38.72 | 0.15 |
| 2719.40 | 0.14 | 41.70 | 2719.36 | -2.52 | 6.99 | 5.62 | 516425.1 | 4400469.5 | 39°45'14.326"N | 80°48'29.752"W | 8.97 | 38.80 | 0.10 |
| 2819.40 | 0.07 | 14.52 | 2819.36 | -2.55 | 7.14 | 5.71 | 516425.1 | 4400469.5 | 39°45'14.327"N | 80°48'29.751"W | 9.14 | 38.68 | 0.08 |
| 2849.40 | 0.17 | 6.24 | 2849.36 | -2.54 | 7.20 | 5.72 | 516425.1 | 4400469.6 | 39°45'14.328"N | 80°48'29.751"W | 9.20 | 38.48 | 0.34 |
| 2924.40 | 0.24 | 359.35 | 2924.36 | -2.44 | 7.47 | 5.73 | 516425.1 | 4400469.6 | 39°45'14.330"N | 80°48'29.750"W | 9.42 | 37.52 | 0.10 |
| 3018.40 | 0.27 | 48.29 | 3018.36 | -2.46 | 7.81 | 5.90 | 516425.2 | 4400469.7 | 39°45'14.334"N | 80°48'29.748"W | 9.79 | 37.05 | 0.23 |
| 3113.40 | 0.27 | 33.30 | 3113.36 | -2.60 | 8.15 | 6.19 | 516425.3 | 4400469.8 | 39°45'14.337"N | 80°48'29.745"W | 10.23 | 37.21 | 0.07 |
| 3207.40 | 0.21 | 21.54 | 3207.36 | -2.64 | 8.49 | 6.37 | 516425.3 | 4400469.9 | 39°45'14.341"N | 80°48'29.742"W | 10.62 | 36.88 | 0.08 |
| 3301.40 | 0.38 | 33.29 | 3301.36 | -2.70 | 8.91 | 6.61 | 516425.4 | 4400470.1 | 39°45'14.345"N | 80°48'29.739"W | 11.10 | 36.54 | 0.19 |
| 3396.40 | 0.08 | 298.81 | 3396.36 | -2.69 | 9.21 | 6.72 | 516425.4 | 4400470.2 | 39°45'14.348"N | 80°48'29.738"W | 11.40 | 36.12 | 0.42 |
| 3428.40 | 0.36 | 43.07 | 3428.36 | -2.70 | 9.29 | 6.77 | 516425.4 | 4400470.2 | 39°45'14.348"N | 80°48'29.737"W | 11.50 | 36.07 | 1.21 |
| 3460.40 | 0.29 | 48.37 | 3460.36 | -2.77 | 9.42 | 6.90 | 516425.5 | 4400470.2 | 39°45'14.350"N | 80°48'29.736"W | 11.68 | 36.22 | 0.24 |
| 3490.40 | 0.40 | 34.47 | 3490.36 | -2.83 | 9.56 | 7.02 | 516425.5 | 4400470.3 | 39°45'14.351"N | 80°48'29.734"W | 11.86 | 36.28 | 0.46 |
| 3522.40 | 0.86 | 14.12 | 3522.36 | -2.82 | 9.88 | 7.14 | 516425.5 | 4400470.4 | 39°45'14.354"N | 80°48'29.732"W | 12.19 | 35.84 | 1.58 |
| 3553.40 | 1.75 | 1.34 | 3553.35 | -2.61 | 10.58 | 7.20 | 516425.6 | 4400470.6 | 39°45'14.361"N | 80°48'29.732"W | 12.80 | 34.25 | 3.00 |
| 3585.40 | 2.73 | 357.43 | 3585.32 | -2.11 | 11.83 | 7.18 | 516425.6 | 4400471.0 | 39°45'14.374"N | 80°48'29.732"W | 13.84 | 31.26 | 3.10 |
| 3615.40 | 3.86 | 358.03 | 3615.27 | -1.39 | 13.55 | 7.12 | 516425.5 | 4400471.5 | 39°45'14.391"N | 80°48'29.733"W | 15.31 | 27.70 | 3.77 |
| 3646.40 | 4.75 | 357.04 | 3646.19 | -0.41 | 15.88 | 7.01 | 516425.5 | 4400472.2 | 39°45'14.414"N | 80°48'29.734"W | 17.36 | 23.83 | 2.88 |
| 3676.40 | 5.58 | 358.64 | 3676.06 | 0.71 | 18.58 | 6.91 | 516425.5 | 4400473.0 | 39°45'14.440"N | 80°48'29.735"W | 19.82 | 20.42 | 2.81 |
| 3708.40 | 5.92 | 359.46 | 3707.90 | 1.99 | 21.78 | 6.86 | 516425.5 | 4400474.0 | 39°45'14.472"N | 80°48'29.736"W | 22.84 | 17.49 | 1.09 |
| 3740.40 | 6.49 | 0.56 | 3739.71 | 3.31 | 25.24 | 6.86 | 516425.5 | 4400475.1 | 39°45'14.506"N | 80°48'29.736"W | 26.16 | 15.21 | 1.82 |
| 3772.40 | 7.23 | 2.15 | 3771.49 | 4.68 | 29.06 | 6.96 | 516425.5 | 4400476.2 | 39°45'14.544"N | 80°48'29.734"W | 29.88 | 13.46 | 2.39 |
| 3803.40 | 7.97 | 0.69 | 3802.21 | 6.16 | 33.16 | 7.06 | 516425.5 | 4400477.5 | 39°45'14.584"N | 80°48'29.733"W | 33.90 | 12.01 | 2.47 |
| 3834.40 | 8.51 | 0.17 | 3832.89 | 7.83 | 37.60 | 7.09 | 516425.5 | 4400478.8 | 39°45'14.628"N | 80°48'29.732"W | 38.27 | 10.68 | 1.76 |
| 3866.40 | 9.57 | 1.35 | 3864.49 | 9.69 | 42.63 | 7.16 | 516425.6 | 4400480.3 | 39°45'14.678"N | 80°48'29.731"W | 43.23 | 9.53 | 3.36 |
| 3897.40 | 10.17 | 1.29 | 3895.04 | 11.60 | 47.94 | 7.28 | 516425.6 | 4400482.0 | 39°45'14.730"N | 80°48'29.730"W | 48.49 | 8.64 | 1.94 |
| 3929.40 | 10.88 | 4.12 | 3926.50 | 13.58 | 53.78 | 7.56 | 516425.7 | 4400483.7 | 39°45'14.788"N | 80°48'29.726"W | 54.31 | 8.00 | 2.74 |
| 3960.40 | 11.64 | 5.66 | 3956.90 | 15.40 | 59.81 | 8.08 | 516425.8 | 4400485.6 | 39°45'14.848"N | 80°48'29.719"W | 60.35 | 7.69 | 2.64 |
| 3992.40 | 12.27 | 5.73 | 3988.21 | 17.32 | 66.41 | 8.74 | 516426.0 | 4400487.6 | 39°45'14.913"N | 80°48'29.710"W | 66.98 | 7.50 | 1.97 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 4055.40 | 13.89 | 4.62 | 4049.57 | 21.57 | 80.61 | 10.02 | 516426.4 | 4400491.9 | 39°45'15.053"N | 80°48'29.694"W | 81.23 | 7.08 | 2.60 |
| 4118.40 | 15.73 | 4.21 | 4110.47 | 26.56 | 96.66 | 11.25 | 516426.8 | 4400496.8 | 39°45'15.212"N | 80°48'29.677"W | 97.31 | 6.64 | 2.93 |
| 4182.40 | 15.84 | 3.53 | 4172.06 | 32.12 | 114.03 | 12.43 | 516427.2 | 4400502.1 | 39°45'15.383"N | 80°48'29.662"W | 114.71 | 6.22 | 0.34 |
| 4245.40 | 15.14 | 3.16 | 4232.77 | 37.63 | 130.83 | 13.41 | 516427.5 | 4400507.2 | 39°45'15.549"N | 80°48'29.649"W | 131.51 | 5.85 | 1.12 |
| 4309.40 | 15.56 | 5.55 | 4294.49 | 42.90 | 147.72 | 14.70 | 516427.8 | 4400512.4 | 39°45'15.716"N | 80°48'29.632"W | 148.45 | 5.68 | 1.19 |
| 4373.40 | 15.72 | 8.40 | 4356.12 | 47.51 | 164.84 | 16.80 | 516428.5 | 4400517.6 | 39°45'15.885"N | 80°48'29.605"W | 165.69 | 5.82 | 1.23 |
| 4436.40 | 15.78 | 6.49 | 4416.76 | 51.94 | 181.79 | 19.01 | 516429.2 | 4400522.7 | 39°45'16.053"N | 80°48'29.576"W | 182.78 | 5.97 | 0.83 |
| 4499.40 | 15.17 | 3.73 | 4477.47 | 56.95 | 198.53 | 20.52 | 516429.6 | 4400527.8 | 39°45'16.218"N | 80°48'29.556"W | 199.59 | 5.90 | 1.52 |
| 4561.40 | 16.77 | 3.72 | 4537.08 | 62.44 | 215.55 | 21.62 | 516430.0 | 4400533.0 | 39°45'16.387"N | 80°48'29.541"W | 216.63 | 5.73 | 2.58 |
| 4624.40 | 19.20 | 3.35 | 4596.99 | 68.76 | 234.96 | 22.82 | 516430.3 | 4400538.9 | 39°45'16.578"N | 80°48'29.525"W | 236.07 | 5.55 | 3.86 |
| 4687.40 | 19.16 | 1.67 | 4656.50 | 75.82 | 255.64 | 23.73 | 516430.6 | 4400545.3 | 39°45'16.783"N | 80°48'29.513"W | 256.74 | 5.30 | 0.88 |
| 4750.40 | 18.66 | 2.15 | 4716.10 | 83.00 | 276.05 | 24.41 | 516430.8 | 4400551.5 | 39°45'16.984"N | 80°48'29.504"W | 277.12 | 5.05 | 0.83 |
| 4812.40 | 18.45 | 6.33 | 4774.88 | 89.17 | 295.71 | 25.86 | 516431.2 | 4400557.5 | 39°45'17.179"N | 80°48'29.485"W | 296.84 | 5.00 | 2.17 |
| 4876.40 | 18.32 | 7.26 | 4835.61 | 94.63 | 315.75 | 28.25 | 516432.0 | 4400563.6 | 39°45'17.377"N | 80°48'29.454"W | 317.01 | 5.11 | 0.50 |
| 4939.40 | 16.47 | 6.16 | 4895.73 | 99.74 | 334.46 | 30.46 | 516432.6 | 4400569.3 | 39°45'17.561"N | 80°48'29.425"W | 335.84 | 5.20 | 2.98 |
| 5002.40 | 15.39 | 4.44 | 4956.31 | 104.84 | 351.67 | 32.06 | 516433.1 | 4400574.5 | 39°45'17.732"N | 80°48'29.404"W | 353.13 | 5.21 | 1.87 |
| 5065.40 | 15.69 | 3.72 | 5017.00 | 110.17 | 368.50 | 33.26 | 516433.5 | 4400579.6 | 39°45'17.898"N | 80°48'29.388"W | 370.00 | 5.16 | 0.57 |
| 5128.40 | 16.83 | 8.09 | 5077.49 | 115.17 | 386.04 | 35.10 | 516434.1 | 4400585.0 | 39°45'18.071"N | 80°48'29.364"W | 387.63 | 5.20 | 2.65 |
| 5191.40 | 17.43 | 7.04 | 5137.69 | 119.95 | 404.43 | 37.54 | 516434.8 | 4400590.6 | 39°45'18.253"N | 80°48'29.332"W | 406.17 | 5.30 | 1.07 |
| 5255.40 | 16.33 | 7.41 | 5198.93 | 124.84 | 422.87 | 39.87 | 516435.5 | 4400596.2 | 39°45'18.435"N | 80°48'29.302"W | 424.74 | 5.39 | 1.73 |
| 5317.40 | 15.47 | 8.38 | 5258.56 | 129.12 | 439.69 | 42.20 | 516436.2 | 4400601.3 | 39°45'18.601"N | 80°48'29.272"W | 441.71 | 5.48 | 1.45 |
| 5380.40 | 15.46 | 11.15 | 5319.28 | 132.82 | 456.24 | 45.05 | 516437.1 | 4400606.4 | 39°45'18.765"N | 80°48'29.235"W | 458.46 | 5.64 | 1.17 |
| 5442.40 | 14.70 | 10.99 | 5379.14 | 136.01 | 472.07 | 48.15 | 516438.0 | 4400611.2 | 39°45'18.921"N | 80°48'29.195"W | 474.52 | 5.82 | 1.23 |
| 5506.40 | 13.65 | 9.09 | 5441.20 | 139.38 | 487.50 | 50.89 | 516438.9 | 4400615.9 | 39°45'19.074"N | 80°48'29.159"W | 490.15 | 5.96 | 1.79 |
| 5568.40 | 13.67 | 7.56 | 5501.44 | 142.96 | 501.99 | 53.01 | 516439.5 | 4400620.3 | 39°45'19.217"N | 80°48'29.132"W | 504.78 | 6.03 | 0.58 |
| 5631.40 | 15.46 | 7.68 | 5562.41 | 147.02 | 517.69 | 55.11 | 516440.2 | 4400625.1 | 39°45'19.372"N | 80°48'29.104"W | 520.61 | 6.08 | 2.84 |
| 5694.40 | 16.35 | 7.26 | 5623.00 | 151.49 | 534.81 | 57.35 | 516440.8 | 4400630.3 | 39°45'19.541"N | 80°48'29.075"W | 537.87 | 6.12 | 1.42 |
| 5757.40 | 18.33 | 5.71 | 5683.14 | 156.68 | 553.46 | 59.46 | 516441.5 | 4400636.0 | 39°45'19.725"N | 80°48'29.048"W | 556.65 | 6.13 | 3.23 |
| 5810.00 | 18.99 | 4.83 | 5732.97 | 161.66 | 570.22 | 61.00 | 516442.0 | 4400641.1 | 39°45'19.891"N | 80°48'29.027"W | 573.47 | 6.11 | 1.36 |
| 5904.00 | 22.16 | 5.27 | 5820.96 | 171.55 | 603.12 | 63.92 | 516442.8 | 4400651.1 | 39°45'20.216"N | 80°48'28.989"W | 606.50 | 6.05 | 3.38 |
| 5998.00 | 28.12 | 9.00 | 5906.03 | 181.96 | 642.69 | 69.02 | 516444.4 | 4400663.2 | 39°45'20.607"N | 80°48'28.923"W | 646.39 | 6.13 | 6.56 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 6044.00 | 27.94 | 6.53 | 5946.63 | 187.45 | 664.11 | 71.94 | 516445.3 | 4400669.7 | 39°45'20.818"N | 80°48'28.885"W | 667.99 | 6.18 | 2.55 |
| 6094.00 | 27.40 | 357.92 | 5990.93 | 195.46 | 687.25 | 72.86 | 516445.6 | 4400676.8 | 39°45'21.047"N | 80°48'28.872"W | 691.10 | 6.05 | 8.06 |
| 6188.00 | 22.33 | 346.89 | 6076.24 | 214.86 | 726.31 | 68.02 | 516444.1 | 4400688.7 | 39°45'21.433"N | 80°48'28.933"W | 729.48 | 5.35 | 7.29 |
| 6283.00 | 30.57 | 331.20 | 6161.32 | 244.30 | 765.17 | 52.24 | 516439.3 | 4400700.5 | 39°45'21.818"N | 80°48'29.134"W | 766.95 | 3.91 | 11.31 |
| 6378.00 | 39.96 | 317.44 | 6238.92 | 290.99 | 808.97 | 19.84 | 516429.4 | 4400713.8 | 39°45'22.251"N | 80°48'29.548"W | 809.22 | 1.41 | 12.90 |
| 6473.00 | 45.48 | 311.22 | 6308.72 | 350.79 | 853.82 | -26.32 | 516415.3 | 4400727.5 | 39°45'22.695"N | 80°48'30.138"W | 854.22 | 358.23 | 7.31 |
| 6568.00 | 49.45 | 310.14 | 6372.93 | 417.28 | 899.42 | -79.41 | 516399.2 | 4400741.4 | 39°45'23.147"N | 80°48'30.816"W | 902.92 | 354.95 | 4.26 |
| 6662.00 | 59.58 | 309.61 | 6427.43 | 490.23 | 948.41 | -138.09 | 516381.3 | 4400756.3 | 39°45'23.633"N | 80°48'31.566"W | 958.41 | 351.72 | 10.79 |
| 6757.00 | 69.80 | 307.39 | 6467.99 | 572.68 | 1001.74 | -205.25 | 516360.8 | 4400772.6 | 39°45'24.161"N | 80°48'32.425"W | 1022.55 | 348.42 | 10.96 |
| 6851.00 | 77.40 | 305.04 | 6494.52 | 660.21 | 1054.95 | -277.97 | 516338.7 | 4400788.8 | 39°45'24.688"N | 80°48'33.354"W | 1090.95 | 345.24 | 8.43 |
| 6946.00 | 86.86 | 302.35 | 6507.51 | 752.41 | 1107.07 | -356.18 | 516314.8 | 4400804.7 | 39°45'25.205"N | 80°48'34.354"W | 1162.95 | 342.17 | 10.34 |
| 7041.00 | 89.26 | 297.96 | 6510.73 | 846.48 | 1154.75 | -438.25 | 516289.8 | 4400819.2 | 39°45'25.678"N | 80°48'35.404"W | 1235.11 | 339.22 | 5.26 |
| 7135.00 | 89.88 | 289.43 | 6511.44 | 940.37 | 1192.48 | -524.24 | 516263.6 | 4400830.7 | 39°45'26.053"N | 80°48'36.504"W | 1302.63 | 336.27 | 9.10 |
| 7230.00 | 89.82 | 283.59 | 6511.69 | 1034.81 | 1219.47 | -615.29 | 516235.9 | 4400838.9 | 39°45'26.321"N | 80°48'37.669"W | 1365.90 | 333.23 | 6.15 |
| 7326.00 | 89.85 | 286.08 | 6511.96 | 1129.95 | 1244.05 | -708.08 | 516207.6 | 4400846.4 | 39°45'26.566"N | 80°48'38.857"W | 1431.44 | 330.35 | 2.59 |
| 7421.00 | 90.37 | 289.02 | 6511.78 | 1224.59 | 1272.69 | -798.65 | 516180.0 | 4400855.1 | 39°45'26.851"N | 80°48'40.015"W | 1502.52 | 327.89 | 3.14 |
| 7516.00 | 90.31 | 291.49 | 6511.22 | 1319.51 | 1305.58 | -887.77 | 516152.9 | 4400865.1 | 39°45'27.178"N | 80°48'41.156"W | 1578.81 | 325.79 | 2.60 |
| 7611.00 | 90.40 | 294.63 | 6510.63 | 1414.49 | 1342.78 | -975.16 | 516126.3 | 4400876.5 | 39°45'27.548"N | 80°48'42.274"W | 1659.52 | 324.01 | 3.31 |
| 7706.00 | 90.34 | 293.88 | 6510.02 | 1509.44 | 1381.81 | -1061.77 | 516099.9 | 4400888.4 | 39°45'27.935"N | 80°48'43.382"W | 1742.63 | 322.46 | 0.79 |
| 7802.00 | 90.34 | 292.79 | 6509.45 | 1605.43 | 1419.83 | -1149.92 | 516073.0 | 4400900.0 | 39°45'28.313"N | 80°48'44.509"W | 1827.08 | 321.00 | 1.14 |
| 7897.00 | 90.34 | 292.94 | 6508.88 | 1700.42 | 1456.74 | -1237.45 | 516046.3 | 4400911.2 | 39°45'28.679"N | 80°48'45.629"W | 1911.38 | 319.65 | 0.16 |
| 7992.00 | 90.37 | 293.01 | 6508.29 | 1795.42 | 1493.82 | -1324.91 | 516019.7 | 4400922.5 | 39°45'29.047"N | 80°48'46.748"W | 1996.72 | 318.43 | 0.08 |
| 8087.00 | 90.37 | 294.79 | 6507.68 | 1890.38 | 1532.31 | -1411.76 | 515993.2 | 4400934.2 | 39°45'29.430"N | 80°48'47.859"W | 2083.52 | 317.35 | 1.87 |
| 8181.00 | 90.43 | 295.23 | 6507.02 | 1984.29 | 1572.05 | -1496.95 | 515967.3 | 4400946.3 | 39°45'29.824"N | 80°48'48.949"W | 2170.76 | 316.40 | 0.47 |
| 8276.00 | 90.61 | 294.02 | 6506.16 | 2079.22 | 1611.63 | -1583.30 | 515941.0 | 4400958.4 | 39°45'30.217"N | 80°48'50.053"W | 2259.25 | 315.51 | 1.29 |
| 8370.00 | 90.62 | 292.62 | 6505.15 | 2173.20 | 1648.84 | -1669.62 | 515914.7 | 4400969.7 | 39°45'30.587"N | 80°48'51.158"W | 2346.55 | 314.64 | 1.49 |
| 8465.00 | 90.65 | 291.56 | 6504.10 | 2268.19 | 1684.56 | -1757.64 | 515887.9 | 4400980.6 | 39°45'30.941"N | 80°48'52.284"W | 2434.55 | 313.78 | 1.12 |
| 8559.00 | 90.65 | 291.23 | 6503.03 | 2362.17 | 1718.85 | -1845.15 | 515861.2 | 4400991.1 | 39°45'31.282"N | 80°48'53.404"W | 2521.71 | 312.97 | 0.35 |
| 8654.00 | 90.59 | 290.88 | 6502.00 | 2457.13 | 1752.98 | -1933.80 | 515834.2 | 4401001.5 | 39°45'31.621"N | 80°48'54.538"W | 2610.08 | 312.19 | 0.37 |
| 8749.00 | 90.65 | 291.46 | 6500.98 | 2552.10 | 1787.29 | -2022.39 | 515807.2 | 4401011.9 | 39°45'31.962"N | 80°48'55.671"W | 2698.97 | 311.47 | 0.61 |
| 8844.00 | 90.68 | 292.28 | 6499.87 | 2647.09 | 1822.67 | -2110.54 | 515780.3 | 4401022.7 | 39°45'32.313"N | 80°48'56.799"W | 2788.64 | 310.81 | 0.86 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 8938.00 | 90.68 | 293.34 | 6498.76 | 2741.08 | 1859.11 | -2197.18 | 515753.9 | 4401033.8 | 39°45'32.675"N | 80°48'57.907"W | 2878.18 | 310.24 | 1.13 |
| 9033.00 | 90.71 | 293.46 | 6497.61 | 2836.06 | 1896.84 | -2284.36 | 515727.4 | 4401045.3 | 39°45'33.050"N | 80°48'59.023"W | 2969.23 | 309.71 | 0.13 |
| 9128.00 | 90.80 | 293.16 | 6496.35 | 2931.04 | 1934.42 | -2371.60 | 515700.8 | 4401056.7 | 39°45'33.423"N | 80°49'00.139"W | 3060.47 | 309.20 | 0.33 |
| 9222.00 | 90.95 | 293.19 | 6494.92 | 3025.02 | 1971.41 | -2458.01 | 515674.5 | 4401068.0 | 39°45'33.790"N | 80°49'01.244"W | 3150.92 | 308.73 | 0.16 |
| 9317.00 | 91.23 | 291.65 | 6493.11 | 3120.00 | 2007.64 | -2545.81 | 515647.7 | 4401079.0 | 39°45'34.150"N | 80°49'02.368"W | 3242.18 | 308.26 | 1.65 |
| 9411.00 | 91.26 | 292.04 | 6491.07 | 3213.97 | 2042.61 | -2633.04 | 515621.1 | 4401089.7 | 39°45'34.498"N | 80°49'03.484"W | 3332.44 | 307.80 | 0.42 |
| 9506.00 | 91.23 | 291.82 | 6489.01 | 3308.95 | 2078.08 | -2721.14 | 515594.3 | 4401100.5 | 39°45'34.850"N | 80°49'04.611"W | 3423.89 | 307.37 | 0.23 |
| 9601.00 | 91.05 | 291.56 | 6487.12 | 3403.92 | 2113.18 | -2809.40 | 515567.4 | 4401111.2 | 39°45'35.199"N | 80°49'05.740"W | 3515.43 | 306.95 | 0.33 |
| 9696.00 | 90.74 | 292.38 | 6485.63 | 3498.90 | 2148.72 | -2897.49 | 515540.6 | 4401122.0 | 39°45'35.552"N | 80°49'06.867"W | 3607.28 | 306.56 | 0.92 |
| 9791.00 | 90.61 | 293.43 | 6484.51 | 3593.89 | 2185.69 | -2984.99 | 515513.9 | 4401133.3 | 39°45'35.919"N | 80°49'07.987"W | 3699.65 | 306.21 | 1.11 |
| 9886.00 | 90.43 | 293.99 | 6483.65 | 3688.87 | 2223.89 | -3071.97 | 515487.4 | 4401144.9 | 39°45'36.298"N | 80°49'09.099"W | 3792.45 | 305.90 | 0.62 |
| 9981.00 | 90.40 | 293.41 | 6482.96 | 3783.84 | 2262.07 | -3158.95 | 515460.9 | 4401156.6 | 39°45'36.677"N | 80°49'10.212"W | 3885.35 | 305.61 | 0.61 |
| 10077.00 | 90.46 | 292.98 | 6482.24 | 3879.83 | 2299.88 | -3247.19 | 515434.0 | 4401168.1 | 39°45'37.052"N | 80°49'11.341"W | 3979.16 | 305.31 | 0.45 |
| 10170.00 | 90.55 | 293.65 | 6481.42 | 3972.82 | 2336.69 | -3332.59 | 515408.0 | 4401179.3 | 39°45'37.418"N | 80°49'12.434"W | 4070.17 | 305.04 | 0.73 |
| 10263.00 | 90.62 | 293.14 | 6480.47 | 4065.80 | 2373.61 | -3417.94 | 515382.0 | 4401190.6 | 39°45'37.785"N | 80°49'13.526"W | 4161.29 | 304.78 | 0.55 |
| 10358.00 | 90.52 | 292.48 | 6479.53 | 4160.79 | 2410.44 | -3505.51 | 515355.3 | 4401201.8 | 39°45'38.150"N | 80°49'14.646"W | 4254.27 | 304.51 | 0.70 |
| 10452.00 | 90.55 | 291.33 | 6478.65 | 4254.78 | 2445.51 | -3592.72 | 515328.7 | 4401212.5 | 39°45'38.498"N | 80°49'15.762"W | 4346.05 | 304.24 | 1.22 |
| 10547.00 | 90.52 | 290.18 | 6477.76 | 4349.73 | 2479.17 | -3681.55 | 515301.7 | 4401222.7 | 39°45'38.833"N | 80°49'16.899"W | 4438.48 | 303.96 | 1.21 |
| 10642.00 | 90.92 | 291.01 | 6476.57 | 4444.67 | 2512.59 | -3770.47 | 515274.6 | 4401232.9 | 39°45'39.165"N | 80°49'18.036"W | 4530.95 | 303.68 | 0.97 |
| 10738.00 | 90.83 | 291.65 | 6475.10 | 4540.64 | 2547.50 | -3859.88 | 515247.3 | 4401243.5 | 39°45'39.512"N | 80°49'19.180"W | 4624.76 | 303.43 | 0.67 |
| 10833.00 | 90.95 | 293.32 | 6473.63 | 4635.63 | 2583.83 | -3947.64 | 515220.6 | 4401254.6 | 39°45'39.872"N | 80°49'20.303"W | 4718.06 | 303.21 | 1.76 |
| 10927.00 | 90.92 | 293.02 | 6472.09 | 4729.61 | 2620.81 | -4034.05 | 515194.3 | 4401265.9 | 39°45'40.240"N | 80°49'21.409"W | 4810.63 | 303.01 | 0.32 |
| 11022.00 | 90.65 | 293.71 | 6470.79 | 4824.59 | 2658.48 | -4121.25 | 515167.7 | 4401277.3 | 39°45'40.614"N | 80°49'22.524"W | 4904.31 | 302.83 | 0.78 |
| 11117.00 | 90.59 | 292.65 | 6469.76 | 4919.57 | 2695.87 | -4208.58 | 515141.1 | 4401288.7 | 39°45'40.985"N | 80°49'23.642"W | 4997.98 | 302.64 | 1.12 |
| 11212.00 | 90.55 | 290.36 | 6468.82 | 5014.55 | 2730.69 | -4296.95 | 515114.2 | 4401299.3 | 39°45'41.331"N | 80°49'24.772"W | 5091.22 | 302.44 | 2.41 |
| 11306.00 | 90.62 | 289.09 | 6467.86 | 5108.43 | 2762.41 | -4385.43 | 515087.2 | 4401309.0 | 39°45'41.646"N | 80°49'25.905"W | 5182.95 | 302.21 | 1.35 |
| 11401.00 | 90.58 | 289.95 | 6466.86 | 5203.30 | 2794.15 | -4474.96 | 515059.9 | 4401318.7 | 39°45'41.961"N | 80°49'27.050"W | 5275.66 | 301.98 | 0.91 |
| 11496.00 | 90.74 | 291.80 | 6465.77 | 5298.25 | 2828.00 | -4563.72 | 515032.9 | 4401329.0 | 39°45'42.298"N | 80°49'28.186"W | 5368.90 | 301.79 | 1.95 |
| 11589.00 | 90.40 | 291.71 | 6464.84 | 5391.24 | 2862.47 | -4650.09 | 515006.6 | 4401339.5 | 39°45'42.640"N | 80°49'29.291"W | 5460.50 | 301.62 | 0.38 |
| 11684.00 | 90.40 | 292.77 | 6464.18 | 5486.24 | 2898.43 | -4738.02 | 514979.8 | 4401350.5 | 39°45'42.997"N | 80°49'30.416"W | 5554.25 | 301.46 | 1.12 |
| 11779.00 | 90.43 | 294.89 | 6463.49 | 5581.20 | 2936.80 | -4824.91 | 514953.3 | 4401362.1 | 39°45'43.378"N | 80°49'31.528"W | 5648.42 | 301.33 | 2.23 |

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51-01618

| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 11874.00 | 90.49 | 294.61 | 6462.73 | 5676.13 | 2976.58 | -4911.18 | 514927.0 | 4401374.3 | 39°45'43.773"N | 80°49'32.632"W | 5742.80 | 301.22 | 0.30 |
| 11970.00 | 90.31 | 295.37 | 6462.06 | 5772.03 | 3017.13 | -4998.19 | 514900.5 | 4401386.6 | 39°45'44.175"N | 80°49'33.745"W | 5838.24 | 301.12 | 0.81 |
| 12065.00 | 90.28 | 295.30 | 6461.57 | 5866.91 | 3057.78 | -5084.06 | 514874.4 | 4401399.0 | 39°45'44.578"N | 80°49'34.843"W | 5932.76 | 301.03 | 0.08 |
| 12160.00 | 90.37 | 294.41 | 6461.03 | 5961.83 | 3097.71 | -5170.25 | 514848.1 | 4401411.2 | 39°45'44.975"N | 80°49'35.946"W | 6027.22 | 300.93 | 0.94 |
| 12255.00 | 90.37 | 291.67 | 6460.42 | 6056.81 | 3134.89 | -5257.67 | 514821.5 | 4401422.5 | 39°45'45.344"N | 80°49'37.065"W | 6121.32 | 300.81 | 2.88 |
| 12349.00 | 90.49 | 289.20 | 6459.71 | 6150.74 | 3167.70 | -5345.74 | 514794.6 | 4401432.5 | 39°45'45.670"N | 80°49'38.192"W | 6213.80 | 300.65 | 2.63 |
| 12434.00 | 90.40 | 289.97 | 6459.05 | 6235.63 | 3196.19 | -5425.82 | 514770.2 | 4401441.2 | 39°45'45.953"N | 80°49'39.216"W | 6297.24 | 300.50 | 0.91 |
| 12459.00 | 90.40 | 289.97 | 6458.88 | 6260.60 | 3204.73 | -5449.32 | 514763.1 | 4401443.8 | 39°45'46.038"N | 80°49'39.517"W | 6321.82 | 300.46 | 0.00 |

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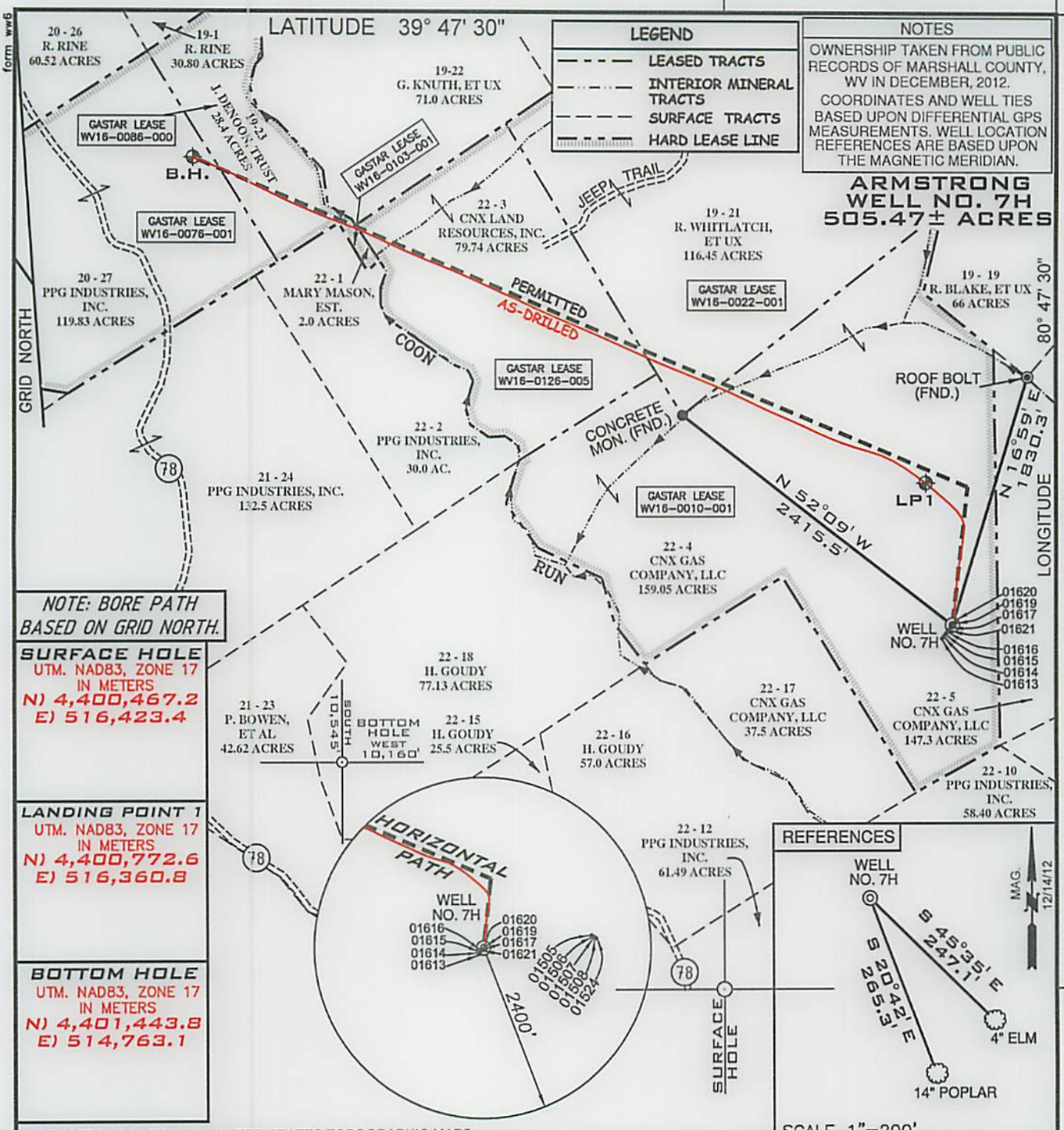
form ww6




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

Jonathan N. White LICENSED NO. 2122 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

STATE OF WEST VIRGINIA MONTAIN SEMPER LIBERI

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 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, WV16-0103-001, WV16-0022-001, WV16-0010-001, WV16-0076-001, WV16-0126-005

COUNTY NAME

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) ___
PLUG & ABANDON ___ CLEAN OUT & REPLUG ___

PERMIT

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

WR-35
Rev. 8/23/13

Page ___ of ___

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

API 47 - 51 - 01619 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name
Farm name CNX Gas Company, LLC Well Number 8H
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 | 4400472.1 | Easting | 516427.0 |
| Landing Point of Curve | Northing | 4400912.3 | Easting | 516341.5 |
| Bottom Hole | Northing | 4401558.0 | Easting | 514809.1 |

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 1/13/2014 Date drilling ceased 4/26/2014
Date completion activities began 9/9/2014 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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Environmental Protection

Reviewed by:

WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01619 Farm name CNX Gas Company, LLC Well number 8H

| 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" | 1234' | New | H-40 / 48 #/ft | 80' | Yes |
| Intermediate 1 | 12.25" | 9.625" | 2676' | 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" | 6751' | 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 | 940 | 15.6 | 1.2 | 1128 | Surface | 8 |
| Intermediate 1 | Class A | 874 | 15.6 | 1.19 | 1040 | Surface | 8 |
| Intermediate 2 | | | | | | | |
| Intermediate 3 | | | | | | | |
| Production | 50:50 Class A | 2466 | 14.5 | 1.21 | 2984 | Surface | 8 |
| Tubing | | | | | | | |

Drillers TD (ft) 12,420' Loggers TD (ft) N/A
Deepest formation penetrated Marcellus Plug back to (ft) N/A
Plug back procedure N/A

Kick off depth (ft) 6097'

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 - 199 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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WR-35
Rev. 8/23/13



API 47- 51 - 01619 Farm name CNX Gas Company, LLC Well number 8H

## PERFORATION RECORD

| Stage No. | Perforation date | Perforated from MD ft. | Perforated to MD ft. | Number of Perforations | Formation(s) |
|---|---|---|---|---|---|
| | | | | | SEE ATTACHED PERF INFO SHEET |
| | | | | | |
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Please insert additional pages as applicable.

## STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

| Stage No. | Stimulations Date | Ave Pump Rate (BPM) | Ave Treatment Pressure (PSI) | Max Breakdown Pressure (PSI) | ISIP (PSI) | Amount of Proppant (lbs) | Amount of Water (bbls) | Amount of Nitrogen/other (units) |
|---|---|---|---|---|---|---|---|---|
| | | | See Attached | | | | | |
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Please insert additional pages as applicable.

WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01619 Farm name CNX Gas Company, LLC Well number 8H

| PRODUCING FORMATION(S) | DEPTHS | |
|---|---|---|
| Marcellus | 6,470' - 6,511' TVD | 6,952' - 12,420' MD |
| | | |
| | | |
| | | |

Please insert additional pages as applicable.

GAS TEST ☐ Build up ☐ Drawdown ☒ Open Flow OIL TEST ☒ Flow ☐ Pump

SHUT-IN PRESSURE Surface 1250 psi Bottom Hole 4073 psi DURATION OF TEST 253 hrs

| OPEN FLOW | Gas | Oil | NGL | Water | GAS MEASURED BY |
|---|---|---|---|---|---|
| | 3875 mcfpd | 359 bpd | ___ bpd | 530 bpd | ☐ Estimated ☒ Orifice ☐ Pilot |

| LITHOLOGY/ FORMATION NAME | TOP DEPTH IN FT TVD | BOTTOM 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, $H_2S$, ETC) |
|---|---|---|---|---|---|
| | 0 | | 0 | | SEE ATTACHED |
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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.

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

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

51-01619

## Armstrong #8H Perforation Information

| Stage | Date | Perforated interval From ft | Perforated interval To ft | Number of Perfs | Formation |
|---|---|---|---|---|---|
| 1 | 9/23/2014 | 12252 | 12160 | 48 | Marcellus |
| 2 | 11/4/2014 | 12027 | 11860 | 48 | Marcellus |
| 3 | 11/5/2014 | 11804 | 11635 | 48 | Marcellus |
| 4 | 11/6/2014 | 11587 | 11420 | 48 | Marcellus |
| 5 | 11/8/2014 | 11367 | 11200 | 48 | Marcellus |
| 6 | 11/9/2014 | 11119 | 10998 | 36 | Marcellus |
| 7 | 11/10/2014 | 10929 | 10719 | 48 | Marcellus |
| 8 | 11/11/2014 | 10649 | 10441 | 48 | Marcellus |
| 9 | 11/12/2014 | 10370 | 10177 | 48 | Marcellus |
| 10 | 11/13/2014 | 10112 | 9912 | 48 | Marcellus |
| 11 | 11/14/2014 | 9854 | 9178 | 48 | Marcellus |
| 12 | 11/15/2014 | 9675 | 9530 | 48 | Marcellus |
| 13 | 11/16/2014 | 9483 | 9366 | 48 | Marcellus |
| 14 | 11/17/2014 | 9311 | 9150 | 48 | Marcellus |
| 15 | 11/18/2014 | 9089 | 8963 | 36 | Marcellus |
| 16 | 11/19/2014 | 8898 | 8799 | 36 | Marcellus |
| 17 | 11/20/2014 | 8766 | 8588 | 48 | Marcellus |
| 18 | 11/21/2014 | 8542 | 8373 | 48 | Marcellus |
| 19 | 11/22/2014 | 8333 | 8160 | 48 | Marcellus |
| 20 | 11/23/2014 | 8109 | 7999 | 48 | Marcellus |
| 21 | 11/23/2014 | 7961 | 7834 | 36 | Marcellus |
| 22 | **11/25/2014** | 7789 | 7631 | 48 | Marcellus |
| 23 | 11/26/2014 | 7553 | 7332 | 36 | Marcellus |
| 24 | 11/27/2014 | 7286 | 7185 | 36 | Marcellus |

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## Fluid & Sand Volume Summary - Armstrong #8H

| Stage | Stimulation Date | Avg Pump Rate (BPM) | Avg Pressure (PSI) | Max Break Pres. (PSI) | ISIP (PSI) | Sand Total (lbs) | Total Water (bbls) |
|---|---|---|---|---|---|---|---|
| 1 | 11/4/2014 | 80 | 6547 | n/a | 4255 | 134,742 | 4060 |
| 2 | 11/5/2014 | 81 | 6237 | 4645 | 4127 | 257,970 | 6589 |
| 3 | 11/6/2014 | 80 | 6361 | 5007 | 4455 | 259,435 | 6531 |
| 4 | 11/7/2014 | 81 | 6477 | 5176 | 4655 | 256,082 | 6444 |
| 5 | 11/9/2014 | 80 | 6224 | 4684 | 4132 | 257,050 | 6500 |
| 6 | 11/10/2014 | 80 | 6161 | 5130 | 4714 | 257,314 | 6415 |
| 7 | 11/11/2014 | 79 | 6348 | 5131 | 4414 | 252,545 | 6314 |
| 8 | 11/12/2014 | 81 | 6397 | 4958 | 4153 | 254,933 | 6286 |
| 9 | 11/13/2014 | 81 | 6123 | 4879 | 4000 | 259,175 | 6292 |
| 10 | 11/15/2014 | 81 | 6267 | 4857 | 3866 | 260,296 | 6263 |
| 11 | 11/15/2014 | 81 | 6316 | 4881 | 4467 | 263,159 | 6249 |
| 12 | 11/16/2014 | 82 | 6396 | 6711 | 4625 | 260,549 | 6112 |
| 13 | 11/17/2014 | 79 | 6546 | 5516 | 4352 | 264,395 | 6542 |
| 14 | 11/18/2014 | 82 | 6379 | 5877 | 4684 | 226,404 | 6099 |
| 15 | 11/19/2014 | 82 | 6629 | 6842 | 4689 | 276,629 | 6260 |
| 16 | 11/20/2014 | 82 | 6289 | 5085 | 4230 | 254,141 | 6202 |
| 17 | 11/21/2014 | 84 | 6143 | 4825 | 4523 | 260,115 | 6189 |
| 18 | 11/22/2014 | 82 | 6009 | 4754 | 4730 | 255,206 | 5960 |
| 19 | 11/23/2014 | 82 | 6072 | 4648 | 4299 | 256,066 | 5981 |
| 20 | 11/24/2014 | 83 | 6143 | 4834 | 4531 | 256,588 | 6059 |
| 21 | 11/25/2014 | 80 | 6313 | 4858 | 4826 | 255,436 | 6039 |
| 22 | 11/26/2014 | 80 | 5931 | 4789 | 4722 | 256,597 | 6020 |
| 23 | 11/27/2014 | 80 | 5883 | 4627 | 4762 | 256,273 | 5964 |
| 24 | 11/27/2014 | 80 | 6362 | 4627 | 4669 | 253,059 | 5890 |

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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 SANDSTC | 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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Welcome Tracy H., Operator - OpNo. G1410907 [ Log Out ]

# Hydraulic Fracturing
DISCLOSURE

FracFocus
Chemical Disclosure Registry

Submission to FracFocus using Excel Spreadsheets has been turned off.

FIND A WELL BY STATE | ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

## Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

Preview Disclosure PDF | Validate Disclosure | Submit To FracFocus

## Hydraulic Fracturing Data

Edit

| Job Start Date | Job End Date | API Number | State & County |
|---|---|---|---|
| 11/4/2014 | 11/28/2014 | 47-051-01619-00-00 | West Virginia --- Marshall |

Well Name
ARMSTRONG 8H

| Longitude | Latitude | Datum | Federal/Tribal Well? |
|---|---|---|---|
| -80.82727 | 39.76373 | NAD27 | |

| True Vertical Depth (ft) | Total Water Vol (gal) | Total Non Water Vol | Total Mass (lbs) |
|---|---|---|---|
| 6491 | 16188900 | 0 | 141418575.7675 |

## 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% | 95.3910686% | | 134979810.42 |
| Edit Sand, White, 40/70 | Baker Hughes | Proppant | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | 2.56198% | | 3623120 |
| Edit Sand, White, 30/50 | Baker Hughes | Proppant | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | 1.49277% | | 2111056 |
| Edit HCl, 10.1 - 15% | Baker Hughes | Acidizing | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .237325% | SmartCare Product | 335622 |
| Edit Sand, White, 100 mesh | Baker Hughes | Proppant | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .15242% | | 215551 |
| Edit GW-3LDF | Baker Hughes | Gelling Agent | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0485677% | SmartCare Product | 68683.89 |
| Edit FRW-18 | Baker Hughes | Friction Reducer | | | | | | |
| | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0349677% | SmartCare Product | 49450.96 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Edit | Alpha 1427 | Baker Hughes | Biocide | | | | | |
| 51.01619 | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .009151% | SmartCare Product | 12941.25 |
| Edit | Enzyme G-NE | Baker Hughes | Breaker | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0087965% | SmartCare Product | 12439.9976 |
| Edit | ScaleSorb 4, (50# bag) | Baker Hughes | Scale Inhibitor | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0033291% | SmartCare Product | 4708 |
| Edit | Ferrotrol 300L | Baker Hughes | Iron Control | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0016492% | SmartCare Product | 2332.24986 |
| Edit | Calcium Chloride | Baker Hughes | Salts | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0012636% | | 1787 |
| Edit | CI-14 | Baker Hughes | Corrosion Inhibitor | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0007587% | SmartCare Product | 1073 |

## Non-MSDS Chemical Ingredients

New Ingredients

| | Trade Name | Supplier | Purpose | Ingredients | CAS # | % High Additive | % HF Job | Comments | Ingredient Mass |
|---|---|---|---|---|---|---|---|---|---|
| Edit | Ingredients in Additive(s) (MSDS and non-MSDS) | Baker Hughes | See Trade Name(s) List | | | | | | |
| | | | | Crystalline Silica (Quartz) | 14808-60-7 | 100% | 4.2047422% | | 5949774.08 |
| | | | | Water | 7732-18-5 | 95% | .2302581% | | 325818.68665 |
| | | | | Hydrochloric Acid | 7647-01-0 | 15% | .0355855% | | 50354.03 |
| | | | | Mineral Oil | 8042-47-5 | 70% | .0339775% | | 48078.723 |
| | | | | Guar Gum | 9000-30-0 | 60% | .0291236% | | 41210.334 |
| | | | | Paraffinic Petroleum Distillate | 64742-55-8 | 30% | .0145618% | | 20605.167 |
| | | | | Petroleum Distillates | 64742-47-8 | 30% | .0145618% | | 20605.167 |
| | | | | Hydrotreated Light Distillate | 64742-47-8 | 30% | .0104842% | | 14835.288 |
| | | | | Poly (acrylamide-co-acrylic acid) partial sodium salt | 62649-23-4 | 30% | .0104842% | | 14835.288 |
| | | | | Diatomaceous Earth, Calcined | 91053-39-3 | 100% | .0033272% | | 4708 |
| | | | | Glutaraldehyde | 111-30-8 | 30% | .0027437% | | 3882.375 |
| | | | | Crystalline Silica: Quartz | 14808-60-7 | 5% | .002427% | | 3434.1945 |
| | | | | 1-butoxy-2-propanol | 5131-66-8 | 5% | .002427% | | 3434.1945 |
| | | | | Isotridecanol, ethoxylated | 9043-30-5 | 5% | .002427% | | 3434.1945 |
| | | | | Sodium Chloride | 7647-14-5 | 5% | .0018105% | | 2561.898 |
| | | | | Calcium Chloride | 10043-52-4 | 100% | .0012629% | | 1787 |
| | | | | Ammonium Chloride | 12125-02-9 | 3% | .0010484% | | 1483.5288 |
| | | | | Citric Acid | 77-92-9 | 60% | .0009889% | | 1399.349916 |
| | | | | Didecyl Dimethyl Ammonium Chloride | 7173-51-5 | 10% | .0009146% | | 1294.125 |
| | | | | Methanol | 67-56-1 | 100% | .0007583% | | 1073 |
| | | | | Oleamide DEA | 93-83-4 | 2% | .0006989% | | 989.0192 |

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51-01619

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|---|---|---|---|---|
| Alcohols, C12-16, ethoxylated | 68551-12-2 | 2% | .0006989% | 989.0192 |
| Sodium Carboxymethyl inulin | 430439-54-6 | 15% | .0004991% | 706.2 |
| Sodium chloride | 7647-14-5 | 15% | .0004991% | 706.2 |
| Ethanol | 64-17-5 | 5% | .0004573% | 647.0625 |
| Quaternary Ammonium Compound | 68424-85-1 | 5% | .0004573% | 647.0625 |
| Hemicellulase Enzyme Concentrate | 9025-56-3 | 5% | .0004396% | 621.99988 |
| Polyoxyalkylenes | 68951-67-7 | 30% | .0002275% | 321.9 |
| Polyoxythylene Sorbitan Monooleate | 9005-65-6 | .5% | .0001747% | 247.2548 |
| Sorbitan Monooleate | 1338-43-8 | .5% | .0001747% | 247.2548 |
| Sodium glycolate | 2836-32-0 | 5% | .0001664% | 235.4 |
| Sodium diglycolate | 35249-69-5 | 5% | .0001664% | 235.4 |
| Fatty Acids | 61790-12-3 | 10% | .0000758% | 107.3 |
| Potassium Chloride | 7447-40-7 | 5% | .0000631% | 89.35 |
| Modified Thiourea Polymer | 68527-49-1 | 7% | .0000531% | 75.11 |
| 2-butoxy-1-propanol | 15821-83-7 | .1% | .0000485% | 68.68389 |
| Propargyl Alcohol | 107-19-7 | 5% | .0000379% | 53.65 |
| Olefin | 64743-02-8 | 5% | .0000379% | 53.65 |
| Crystalline Silica (Cristobaloite) | 14464-46-1 | 1% | .0000333% | 47.08 |
| Formaldehyde | 50-00-0 | 1% | .0000076% | 10.73 |

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Armstrong 8H 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 + .35% R-3 + .3% MPA-170

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# GASTAR EXPLORATION USA, INC.

Location: Marshall County, WV
Field: Marshall
Facility: Armstrong

Slot: Slot #8
Well: Armstrong 8H
Wellbore: Armstrong 8H (PWB)

BAKER HUGHES

51-01619

## Location Information

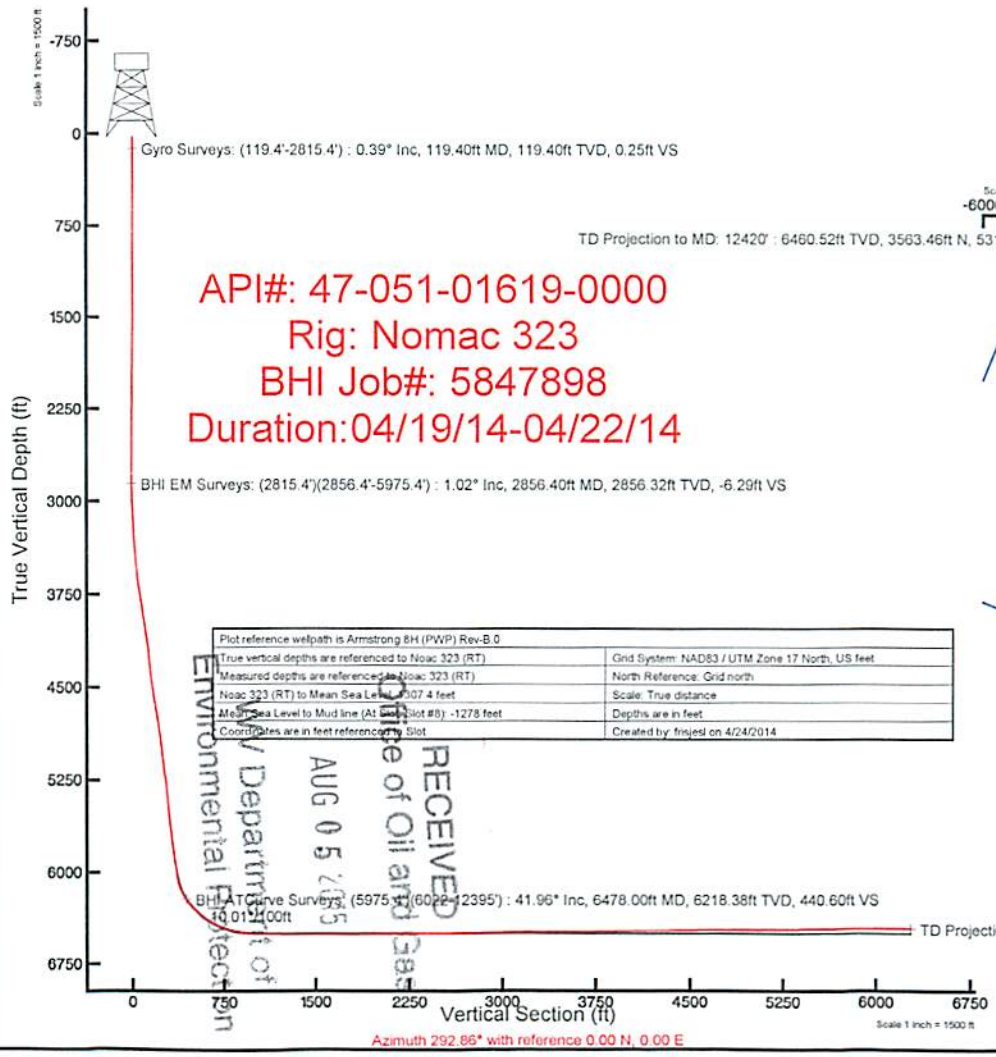
| Facility Name | | | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Armstrong | | | 1694263.000 | 14437151.000 | 39°45'13.773"N | 80°48'30.287"W |
| Slot | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
| Slot #8 | 65.03 | 48.02 | 1694311.000 | 14437216.000 | 39°45'14.415"N | 80°48'29.670"W |
| Noac 323 (RT) to Mud line (At Slot: Slot #8) | | | | | 29.4ft | |
| Mean Sea Level to Mud line (At Slot: Slot #8) | | | | | -1278ft | |
| Noac 323 (RT) to Mean Sea Level | | | | | 1307.4ft | |

## Well Profile Data

| Design Comment | MD (ft) | Inc (°) | Az (°) | TVD (ft) | Local N (ft) | Local E (ft) | DLS (°/100ft) | VS (ft) |
|---|---|---|---|---|---|---|---|---|
| Tie On | 5975.00 | 21.597 | 3.854 | 5798.02 | 1003.20 | 63.64 | 0.00 | 331.08 |
| Proj | 6030.00 | 21.597 | 3.854 | 5849.16 | 1023.40 | 65.00 | 0.00 | 337.67 |
| End of 3D Arc | 6258.36 | 28.000 | 358.000 | 6056.39 | 1119.01 | 65.96 | 3.00 | 373.94 |
| End of 3D Arc | 7013.54 | 83.581 | 286.796 | 6497.96 | 1454.75 | -363.62 | 10.01 | 900.21 |
| Landing Pt. | 7103.53 | 90.000 | 293.127 | 6503.00 | 1485.41 | -447.98 | 10.01 | 980.85 |
| BHL | 12391.63 | 90.000 | 293.127 | 6503.00 | 3562.42 | -5311.12 | 0.00 | 6277.90 |

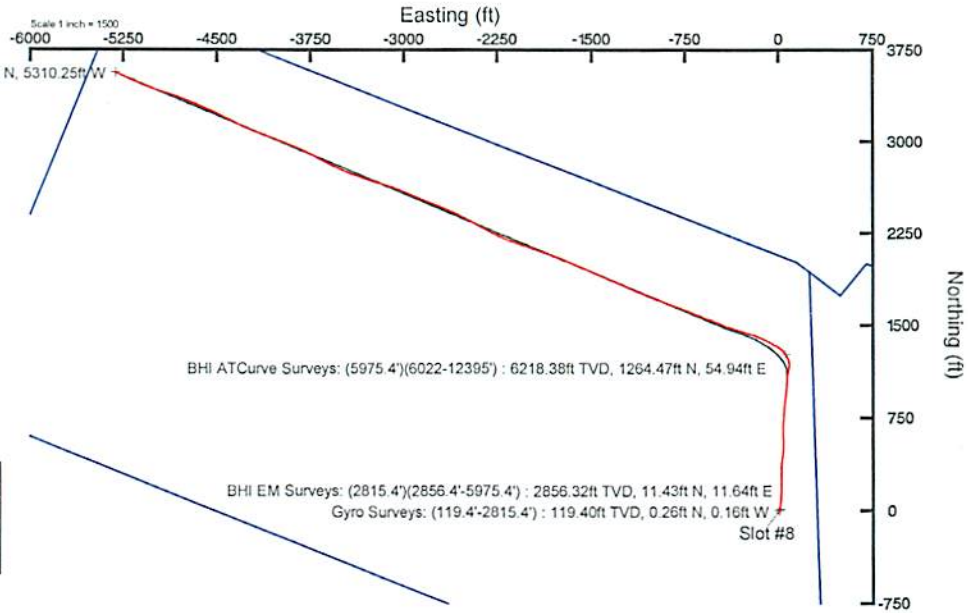
## Targets

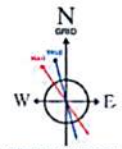
| Name | MD (ft) | TVD (ft) | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| Armstrong 8H PBHL Rev-1 | | 6468.00 | 3562.42 | -5311.12 | 1689002.00 | 14440777.00 | 39°45'49.728"N | 80°49'37.584"W |
| Armstrong 8H LP Rev-1 | 7103.53 | 6503.00 | 1485.41 | -447.98 | 1693863.20 | 14438700.82 | 39°45'29.104"N | 80°48'35.365"W |
| Armstrong 8H PBHL Rev-2 | 12391.63 | 6503.00 | 3562.42 | -5311.12 | 1689002.00 | 14440777.00 | 39°45'49.728"N | 80°49'37.584"W |




API#: 47-051-01619-0000
Rig: Nomac 323
BHI Job#: 5847898
Duration:04/19/14-04/22/14

| Plot reference wellpath is Armstrong 8H (PWP) Rev-B.0 | |
|---|---|
| True vertical depths are referenced to Noac 323 (RT) | Grid System: NAD83 / UTM Zone 17 North, US feet |
| Measured depths are referenced to Noac 323 (RT) | North Reference: Grid north |
| Noac 323 (RT) to Mean Sea Level: 1307.4 feet | Scale: True distance |
| Mean Sea Level to Mud line (At Slot: Slot #8): -1278 feet | Depths are in feet |
| Coordinates are in feet referenced to Slot | Created by: frisjesl on 4/24/2014 |




User specified Dip: 67.22° Field: 52741 nT
Magnetic North is 7.54 degrees West of True North (at 4/14/2014)
Grid North is 0.12 degrees East of True North
To correct azimuth from True to Grid subtract 0.12 degrees
To correct azimuth from Magnetic to Grid subtract 7.66 degrees

Azimuth 292.86° with reference 0.00 N, 0.00 E

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| REFERENCE WELLPATH IDENTIFICATION | | | |
|---|---|---|---|
| Operator | GASTAR EXPLORATION INC. | Slot | Slot #8 |
| Area | Marshall County, WV | Well | Armstrong 8H |
| Field | Marshall | Wellbore | Armstrong 8H (AWB) |
| Facility | Armstrong | Wellpath | Armstrong 8H (AWP) Proj: 12,420' |
| | | Sidetrack | (none) |

**WELLPATH DATA † = interpolated/extrapolated station**

| | MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| † | 0.00 | 0.00 | 328.49 | 0.00 | 0.00 | 0.00 | 0.00 | 516427.0 | 4400472.1 | 39°45'14.415"N | 80°48'29.670"W | 0.00 | 0.00 | 0.00 |
| | 29.40 | 0.00 | 328.49 | 29.40 | 0.00 | 0.00 | 0.00 | 516427.0 | 4400472.1 | 39°45'14.415"N | 80°48'29.670"W | 0.00 | 0.00 | 0.00 |
| | 119.40 | 0.39 | 328.49 | 119.40 | 0.25 | 0.26 | -0.16 | 516427.0 | 4400472.3 | 39°45'14.417"N | 80°48'29.672"W | 0.31 | 328.49 | 0.43 |
| | 219.40 | 0.48 | 336.51 | 219.40 | 0.83 | 0.94 | -0.50 | 516426.9 | 4400472.5 | 39°45'14.424"N | 80°48'29.676"W | 1.06 | 331.64 | 0.11 |
| | 319.40 | 0.40 | 352.15 | 319.39 | 1.31 | 1.67 | -0.72 | 516426.8 | 4400472.7 | 39°45'14.431"N | 80°48'29.679"W | 1.81 | 336.63 | 0.14 |
| | 419.40 | 0.53 | 18.78 | 419.39 | 1.52 | 2.45 | -0.62 | 516426.8 | 4400473.0 | 39°45'14.439"N | 80°48'29.678"W | 2.53 | 345.83 | 0.25 |
| | 519.40 | 0.35 | 40.01 | 519.39 | 1.46 | 3.12 | -0.27 | 516426.9 | 4400473.2 | 39°45'14.446"N | 80°48'29.673"W | 3.13 | 355.00 | 0.24 |
| | 619.40 | 0.34 | 39.97 | 619.39 | 1.29 | 3.58 | 0.11 | 516427.1 | 4400473.3 | 39°45'14.450"N | 80°48'29.668"W | 3.58 | 1.82 | 0.01 |
| | 719.40 | 0.31 | 54.47 | 719.38 | 1.06 | 3.97 | 0.52 | 516427.2 | 4400473.4 | 39°45'14.454"N | 80°48'29.663"W | 4.00 | 7.53 | 0.09 |
| | 819.40 | 0.11 | 49.75 | 819.38 | 0.87 | 4.19 | 0.82 | 516427.3 | 4400473.5 | 39°45'14.456"N | 80°48'29.659"W | 4.27 | 11.06 | 0.20 |
| | 919.40 | 0.36 | 37.63 | 919.38 | 0.75 | 4.50 | 1.08 | 516427.4 | 4400473.6 | 39°45'14.459"N | 80°48'29.656"W | 4.63 | 13.54 | 0.25 |
| | 1019.40 | 0.23 | 23.75 | 1019.38 | 0.67 | 4.93 | 1.36 | 516427.4 | 4400473.7 | 39°45'14.463"N | 80°48'29.652"W | 5.11 | 15.38 | 0.15 |
| | 1119.40 | 0.44 | 55.15 | 1119.38 | 0.46 | 5.33 | 1.75 | 516427.6 | 4400473.9 | 39°45'14.467"N | 80°48'29.647"W | 5.61 | 18.19 | 0.27 |
| | 1219.40 | 0.31 | 20.59 | 1219.38 | 0.26 | 5.81 | 2.16 | 516427.7 | 4400474.0 | 39°45'14.472"N | 80°48'29.642"W | 6.19 | 20.43 | 0.26 |
| | 1319.40 | 0.43 | 27.42 | 1319.38 | 0.24 | 6.39 | 2.43 | 516427.8 | 4400474.2 | 39°45'14.478"N | 80°48'29.639"W | 6.84 | 20.82 | 0.13 |
| | 1419.40 | 0.50 | 45.57 | 1419.37 | 0.05 | 7.03 | 2.91 | 516427.9 | 4400474.4 | 39°45'14.484"N | 80°48'29.632"W | 7.61 | 22.52 | 0.16 |
| | 1519.40 | 0.58 | 47.58 | 1519.37 | -0.33 | 7.68 | 3.60 | 516428.1 | 4400474.6 | 39°45'14.490"N | 80°48'29.624"W | 8.48 | 25.12 | 0.08 |
| | 1619.40 | 0.60 | 65.85 | 1619.36 | -0.90 | 8.23 | 4.45 | 516428.4 | 4400474.7 | 39°45'14.496"N | 80°48'29.613"W | 9.36 | 28.40 | 0.19 |
| | 1719.40 | 0.55 | 77.34 | 1719.36 | -1.65 | 8.55 | 5.40 | 516428.7 | 4400474.8 | 39°45'14.499"N | 80°48'29.601"W | 10.11 | 32.26 | 0.13 |
| | 1819.40 | 0.46 | 75.82 | 1819.35 | -2.36 | 8.76 | 6.25 | 516428.9 | 4400474.9 | 39°45'14.501"N | 80°48'29.590"W | 10.76 | 35.54 | 0.09 |
| | 1919.40 | 0.67 | 93.47 | 1919.35 | -3.23 | 8.82 | 7.23 | 516429.2 | 4400474.9 | 39°45'14.502"N | 80°48'29.577"W | 11.40 | 39.34 | 0.27 |
| | 2019.40 | 0.69 | 79.58 | 2019.34 | -4.29 | 8.89 | 8.40 | 516429.6 | 4400474.9 | 39°45'14.502"N | 80°48'29.562"W | 12.23 | 43.38 | 0.17 |
| | 2119.40 | 0.66 | 65.01 | 2119.33 | -5.18 | 9.24 | 9.52 | 516429.9 | 4400475.1 | 39°45'14.506"N | 80°48'29.548"W | 13.27 | 45.83 | 0.17 |
| | 2219.40 | 0.44 | 55.76 | 2219.33 | -5.77 | 9.70 | 10.36 | 516430.2 | 4400475.2 | 39°45'14.510"N | 80°48'29.537"W | 14.19 | 46.87 | 0.24 |
| | 2319.40 | 0.36 | 76.58 | 2319.33 | -6.24 | 9.99 | 10.98 | 516430.4 | 4400475.3 | 39°45'14.513"N | 80°48'29.529"W | 14.85 | 47.70 | 0.16 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 2419.40 | 0.02 | 60.74 | 2419.33 | -6.50 | 10.07 | 11.30 | 516430.5 | 4400475.3 | 39°45'14.514"N | 80°48'29.525"W | 15.14 | 48.28 | 0.34 |
| 2519.40 | 0.22 | 66.54 | 2519.33 | -6.64 | 10.16 | 11.49 | 516430.5 | 4400475.3 | 39°45'14.515"N | 80°48'29.523"W | 15.34 | 48.52 | 0.20 |
| 2619.40 | 0.29 | 22.20 | 2619.33 | -6.77 | 10.47 | 11.76 | 516430.6 | 4400475.4 | 39°45'14.518"N | 80°48'29.519"W | 15.75 | 48.33 | 0.20 |
| 2719.40 | 0.12 | 339.74 | 2719.33 | -6.70 | 10.80 | 11.82 | 516430.6 | 4400475.5 | 39°45'14.521"N | 80°48'29.518"W | 16.01 | 47.58 | 0.22 |
| 2815.40 | 0.23 | 310.07 | 2815.32 | -6.45 | 11.02 | 11.64 | 516430.6 | 4400475.6 | 39°45'14.523"N | 80°48'29.521"W | 16.03 | 46.57 | 0.14 |
| 2856.40 | 1.02 | 10.07 | 2856.32 | -6.29 | 11.43 | 11.64 | 516430.6 | 4400475.7 | 39°45'14.527"N | 80°48'29.521"W | 16.32 | 45.52 | 2.26 |
| 2887.40 | 2.35 | 5.59 | 2887.31 | -6.04 | 12.34 | 11.75 | 516430.6 | 4400476.0 | 39°45'14.536"N | 80°48'29.519"W | 17.04 | 43.61 | 4.31 |
| 2919.40 | 3.60 | 8.65 | 2919.26 | -5.59 | 13.98 | 11.97 | 516430.7 | 4400476.5 | 39°45'14.553"N | 80°48'29.516"W | 18.40 | 40.56 | 3.94 |
| 2950.40 | 4.77 | 7.87 | 2950.18 | -5.02 | 16.22 | 12.29 | 516430.8 | 4400477.2 | 39°45'14.575"N | 80°48'29.512"W | 20.35 | 37.15 | 3.78 |
| 2982.40 | 5.50 | 6.11 | 2982.05 | -4.24 | 19.07 | 12.63 | 516430.9 | 4400478.0 | 39°45'14.603"N | 80°48'29.508"W | 22.87 | 33.53 | 2.33 |
| 3013.40 | 6.34 | 1.63 | 3012.89 | -3.19 | 22.25 | 12.84 | 516430.9 | 4400479.0 | 39°45'14.634"N | 80°48'29.505"W | 25.69 | 29.99 | 3.09 |
| 3045.40 | 6.62 | 0.78 | 3044.68 | -1.86 | 25.86 | 12.92 | 516431.0 | 4400480.1 | 39°45'14.670"N | 80°48'29.504"W | 28.91 | 26.54 | 0.92 |
| 3076.40 | 7.31 | 359.75 | 3075.45 | -0.41 | 29.62 | 12.93 | 516431.0 | 4400481.3 | 39°45'14.707"N | 80°48'29.504"W | 32.32 | 23.59 | 2.26 |
| 3108.40 | 7.44 | 359.55 | 3107.19 | 1.21 | 33.73 | 12.91 | 516431.0 | 4400482.5 | 39°45'14.748"N | 80°48'29.504"W | 36.12 | 20.94 | 0.41 |
| 3139.40 | 7.44 | 0.29 | 3137.93 | 2.77 | 37.74 | 12.90 | 516431.0 | 4400483.7 | 39°45'14.787"N | 80°48'29.504"W | 39.89 | 18.87 | 0.31 |
| 3170.40 | 8.06 | 2.78 | 3168.64 | 4.29 | 41.92 | 13.02 | 516431.0 | 4400485.0 | 39°45'14.829"N | 80°48'29.502"W | 43.90 | 17.25 | 2.27 |
| 3202.40 | 8.66 | 5.37 | 3200.30 | 5.78 | 46.56 | 13.35 | 516431.1 | 4400486.4 | 39°45'14.875"N | 80°48'29.498"W | 48.44 | 16.00 | 2.21 |
| 3234.40 | 9.47 | 5.60 | 3231.90 | 7.29 | 51.58 | 13.83 | 516431.2 | 4400488.0 | 39°45'14.924"N | 80°48'29.491"W | 53.40 | 15.01 | 2.53 |
| 3266.40 | 10.96 | 5.78 | 3263.40 | 8.96 | 57.23 | 14.40 | 516431.4 | 4400489.7 | 39°45'14.980"N | 80°48'29.484"W | 59.01 | 14.12 | 4.66 |
| 3298.40 | 11.91 | 6.18 | 3294.76 | 10.81 | 63.54 | 15.06 | 516431.6 | 4400491.6 | 39°45'15.042"N | 80°48'29.475"W | 65.30 | 13.33 | 2.98 |
| 3330.40 | 13.07 | 5.79 | 3326.00 | 12.82 | 70.42 | 15.78 | 516431.8 | 4400493.7 | 39°45'15.110"N | 80°48'29.466"W | 72.17 | 12.63 | 3.63 |
| 3362.40 | 13.91 | 4.93 | 3357.12 | 15.06 | 77.85 | 16.48 | 516432.0 | 4400496.0 | 39°45'15.184"N | 80°48'29.457"W | 79.58 | 11.95 | 2.70 |
| 3394.40 | 14.89 | 4.86 | 3388.11 | 17.52 | 85.78 | 17.15 | 516432.3 | 4400498.4 | 39°45'15.262"N | 80°48'29.448"W | 87.48 | 11.31 | 3.06 |
| 3426.40 | 15.63 | 3.69 | 3418.99 | 20.20 | 94.18 | 17.78 | 516432.4 | 4400500.9 | 39°45'15.345"N | 80°48'29.440"W | 95.84 | 10.69 | 2.50 |
| 3458.40 | 15.98 | 2.23 | 3449.78 | 23.17 | 102.88 | 18.23 | 516432.6 | 4400503.6 | 39°45'15.431"N | 80°48'29.434"W | 104.48 | 10.05 | 1.66 |
| 3489.40 | 16.99 | 2.55 | 3479.50 | 26.25 | 111.67 | 18.60 | 516432.7 | 4400506.3 | 39°45'15.518"N | 80°48'29.429"W | 113.21 | 9.46 | 3.27 |
| 3521.40 | 17.96 | 3.74 | 3510.02 | 29.48 | 121.27 | 19.13 | 516432.9 | 4400509.2 | 39°45'15.613"N | 80°48'29.422"W | 122.76 | 8.96 | 3.23 |
| 3551.40 | 19.11 | 4.19 | 3538.47 | 32.57 | 130.78 | 19.79 | 516433.1 | 4400512.1 | 39°45'15.707"N | 80°48'29.413"W | 132.27 | 8.60 | 3.86 |
| 3614.40 | 20.76 | 3.52 | 3597.69 | 39.57 | 152.21 | 21.23 | 516433.5 | 4400518.6 | 39°45'15.918"N | 80°48'29.394"W | 153.68 | 7.94 | 2.64 |
| 3677.40 | 20.17 | 0.98 | 3656.72 | 47.32 | 174.21 | 22.10 | 516433.8 | 4400525.3 | 39°45'16.136"N | 80°48'29.382"W | 175.61 | 7.23 | 1.69 |
| 3740.40 | 20.49 | 359.56 | 3715.79 | 55.73 | 196.10 | 22.20 | 516433.8 | 4400532.0 | 39°45'16.352"N | 80°48'29.380"W | 197.35 | 6.46 | 0.93 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 3804.40 | 22.08 | 358.66 | 3775.42 | 65.09 | 219.33 | 21.83 | 516433.7 | 4400539.1 | 39°45'16.582"N | 80°48'29.384"W | 220.41 | 5.68 | 2.54 |
| 3867.40 | 22.50 | 1.77 | 3833.72 | 74.28 | 243.22 | 21.93 | 516433.7 | 4400546.3 | 39°45'16.818"N | 80°48'29.383"W | 244.20 | 5.15 | 1.99 |
| 3930.40 | 21.91 | 0.57 | 3892.05 | 83.08 | 267.02 | 22.42 | 516433.9 | 4400553.6 | 39°45'17.053"N | 80°48'29.376"W | 267.96 | 4.80 | 1.18 |
| 3993.40 | 21.19 | 359.64 | 3950.64 | 92.02 | 290.16 | 22.46 | 516433.9 | 4400560.6 | 39°45'17.282"N | 80°48'29.374"W | 291.03 | 4.43 | 1.26 |
| 4054.40 | 22.01 | 0.92 | 4007.36 | 100.64 | 312.61 | 22.58 | 516433.9 | 4400567.5 | 39°45'17.504"N | 80°48'29.372"W | 313.43 | 4.13 | 1.55 |
| 4116.40 | 21.36 | 358.88 | 4064.97 | 109.57 | 335.52 | 22.54 | 516433.9 | 4400574.5 | 39°45'17.730"N | 80°48'29.372"W | 336.27 | 3.84 | 1.61 |
| 4179.40 | 21.92 | 1.34 | 4123.53 | 118.55 | 358.75 | 22.59 | 516433.9 | 4400581.5 | 39°45'17.960"N | 80°48'29.371"W | 359.46 | 3.60 | 1.69 |
| 4241.40 | 21.71 | 5.73 | 4181.10 | 126.17 | 381.73 | 24.01 | 516434.3 | 4400588.5 | 39°45'18.187"N | 80°48'29.352"W | 382.48 | 3.60 | 2.65 |
| 4305.40 | 21.08 | 8.88 | 4240.69 | 132.44 | 404.88 | 26.97 | 516435.2 | 4400595.6 | 39°45'18.415"N | 80°48'29.314"W | 405.77 | 3.81 | 2.05 |
| 4367.40 | 21.56 | 9.70 | 4298.44 | 137.73 | 427.12 | 30.61 | 516436.4 | 4400602.4 | 39°45'18.635"N | 80°48'29.266"W | 428.22 | 4.10 | 0.91 |
| 4429.40 | 23.77 | 7.17 | 4355.65 | 143.70 | 450.75 | 34.09 | 516437.4 | 4400609.6 | 39°45'18.869"N | 80°48'29.221"W | 452.04 | 4.33 | 3.90 |
| 4492.40 | 23.37 | 4.54 | 4413.40 | 151.06 | 475.81 | 36.66 | 516438.2 | 4400617.2 | 39°45'19.116"N | 80°48'29.188"W | 477.22 | 4.41 | 1.79 |
| 4555.40 | 22.87 | 2.52 | 4471.34 | 159.24 | 500.49 | 38.19 | 516438.7 | 4400624.7 | 39°45'19.360"N | 80°48'29.167"W | 501.95 | 4.36 | 1.49 |
| 4618.40 | 22.19 | 1.09 | 4529.53 | 167.91 | 524.62 | 38.95 | 516438.9 | 4400632.1 | 39°45'19.599"N | 80°48'29.157"W | 526.06 | 4.25 | 1.39 |
| 4682.40 | 22.17 | 359.53 | 4588.80 | 177.18 | 548.78 | 39.08 | 516438.9 | 4400639.4 | 39°45'19.837"N | 80°48'29.154"W | 550.17 | 4.07 | 0.92 |
| 4745.40 | 22.30 | 358.05 | 4647.11 | 186.90 | 572.61 | 38.58 | 516438.8 | 4400646.7 | 39°45'20.073"N | 80°48'29.160"W | 573.91 | 3.85 | 0.91 |
| 4808.40 | 20.27 | 356.55 | 4705.81 | 196.75 | 595.45 | 37.52 | 516438.5 | 4400653.7 | 39°45'20.299"N | 80°48'29.173"W | 596.63 | 3.61 | 3.34 |
| 4871.40 | 19.15 | 356.01 | 4765.12 | 206.26 | 616.65 | 36.14 | 516438.0 | 4400660.1 | 39°45'20.508"N | 80°48'29.190"W | 617.71 | 3.35 | 1.80 |
| 4934.40 | 19.92 | 2.10 | 4824.50 | 214.73 | 637.69 | 35.81 | 516437.9 | 4400666.5 | 39°45'20.716"N | 80°48'29.194"W | 638.69 | 3.21 | 3.45 |
| 4998.40 | 20.25 | 1.75 | 4884.61 | 222.58 | 659.66 | 36.55 | 516438.2 | 4400673.2 | 39°45'20.933"N | 80°48'29.184"W | 660.67 | 3.17 | 0.55 |
| 5061.40 | 20.09 | 0.11 | 4943.74 | 230.69 | 681.37 | 36.91 | 516438.3 | 4400679.8 | 39°45'21.148"N | 80°48'29.179"W | 682.37 | 3.10 | 0.93 |
| 5124.40 | 18.72 | 2.97 | 5003.17 | 238.32 | 702.29 | 37.45 | 516438.4 | 4400686.2 | 39°45'21.354"N | 80°48'29.171"W | 703.29 | 3.05 | 2.65 |
| 5188.40 | 19.89 | 4.52 | 5063.57 | 245.24 | 723.40 | 38.84 | 516438.9 | 4400692.6 | 39°45'21.563"N | 80°48'29.153"W | 724.44 | 3.07 | 2.00 |
| 5251.40 | 22.10 | 6.54 | 5122.38 | 251.94 | 745.86 | 41.03 | 516439.5 | 4400699.5 | 39°45'21.785"N | 80°48'29.124"W | 746.99 | 3.15 | 3.69 |
| 5314.40 | 22.67 | 4.00 | 5180.63 | 259.20 | 769.75 | 43.23 | 516440.2 | 4400706.8 | 39°45'22.021"N | 80°48'29.095"W | 770.96 | 3.22 | 1.78 |
| 5377.40 | 22.97 | 2.00 | 5238.70 | 267.50 | 794.14 | 44.51 | 516440.6 | 4400714.2 | 39°45'22.262"N | 80°48'29.078"W | 795.39 | 3.21 | 1.32 |
| 5440.40 | 20.68 | 3.27 | 5297.19 | 275.61 | 817.54 | 45.57 | 516440.9 | 4400721.3 | 39°45'22.493"N | 80°48'29.064"W | 818.81 | 3.19 | 3.71 |
| 5503.40 | 18.93 | 6.61 | 5356.46 | 282.20 | 838.80 | 47.38 | 516441.5 | 4400727.8 | 39°45'22.703"N | 80°48'29.040"W | 840.14 | 3.23 | 3.31 |
| 5566.40 | 18.87 | 6.46 | 5416.06 | 287.93 | 859.07 | 49.70 | 516442.2 | 4400734.0 | 39°45'22.904"N | 80°48'29.010"W | 860.51 | 3.31 | 0.12 |
| 5629.40 | 19.01 | 5.23 | 5475.65 | 293.92 | 879.41 | 51.79 | 516442.8 | 4400740.2 | 39°45'23.105"N | 80°48'28.983"W | 880.94 | 3.37 | 0.67 |
| 5692.40 | 19.57 | 5.97 | 5535.11 | 300.09 | 900.13 | 53.82 | 516443.4 | 4400746.5 | 39°45'23.309"N | 80°48'28.956"W | 901.73 | 3.42 | 0.97 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 5754.40 | 20.67 | 5.49 | 5593.33 | 306.37 | 921.35 | 55.95 | 516444.1 | 4400753.0 | 39°45'23.519"N | 80°48'28.928"W | 923.04 | 3.48 | 1.79 |
| 5818.40 | 22.06 | 5.29 | 5652.93 | 313.37 | 944.56 | 58.13 | 516444.7 | 4400760.0 | 39°45'23.748"N | 80°48'28.900"W | 946.35 | 3.52 | 2.17 |
| 5881.40 | 22.80 | 6.60 | 5711.16 | 320.36 | 968.47 | 60.63 | 516445.5 | 4400767.3 | 39°45'23.984"N | 80°48'28.867"W | 970.36 | 3.58 | 1.42 |
| 5944.40 | 21.34 | 4.15 | 5769.55 | 327.46 | 992.03 | 62.86 | 516446.2 | 4400774.5 | 39°45'24.217"N | 80°48'28.838"W | 994.02 | 3.63 | 2.74 |
| 5975.40 | 21.60 | 3.85 | 5798.40 | 331.13 | 1003.34 | 63.65 | 516446.4 | 4400777.9 | 39°45'24.329"N | 80°48'28.827"W | 1005.36 | 3.63 | 0.91 |
| 6022.00 | 22.00 | 2.43 | 5841.66 | 336.97 | 1020.62 | 64.60 | 516446.7 | 4400783.2 | 39°45'24.500"N | 80°48'28.815"W | 1022.67 | 3.62 | 1.42 |
| 6097.00 | 24.27 | 0.24 | 5910.63 | 347.80 | 1050.08 | 65.26 | 516446.9 | 4400792.2 | 39°45'24.791"N | 80°48'28.806"W | 1052.10 | 3.56 | 3.24 |
| 6145.00 | 27.44 | 3.73 | 5953.82 | 355.22 | 1070.98 | 66.02 | 516447.1 | 4400798.5 | 39°45'24.998"N | 80°48'28.795"W | 1073.02 | 3.53 | 7.32 |
| 6192.00 | 31.22 | 10.37 | 5994.80 | 361.41 | 1093.79 | 68.92 | 516448.0 | 4400805.5 | 39°45'25.223"N | 80°48'28.758"W | 1095.96 | 3.61 | 10.60 |
| 6240.00 | 36.13 | 13.32 | 6034.74 | 366.45 | 1119.81 | 74.42 | 516449.7 | 4400813.4 | 39°45'25.480"N | 80°48'28.686"W | 1122.28 | 3.80 | 10.78 |
| 6287.00 | 40.80 | 10.27 | 6071.53 | 372.10 | 1148.42 | 80.36 | 516451.5 | 4400822.1 | 39°45'25.763"N | 80°48'28.610"W | 1151.23 | 4.00 | 10.72 |
| 6335.00 | 40.07 | 359.45 | 6108.11 | 381.66 | 1179.34 | 83.01 | 516452.3 | 4400831.6 | 39°45'26.068"N | 80°48'28.575"W | 1182.26 | 4.03 | 14.69 |
| 6386.00 | 38.34 | 346.70 | 6147.69 | 397.55 | 1211.20 | 79.20 | 516451.2 | 4400841.3 | 39°45'26.383"N | 80°48'28.623"W | 1213.79 | 3.74 | 16.14 |
| 6430.00 | 39.50 | 335.65 | 6181.97 | 415.89 | 1237.27 | 70.28 | 516448.4 | 4400849.2 | 39°45'26.641"N | 80°48'28.736"W | 1239.26 | 3.25 | 15.98 |
| 6478.00 | 41.96 | 325.75 | 6218.38 | 440.60 | 1264.47 | 54.94 | 516443.8 | 4400857.5 | 39°45'26.910"N | 80°48'28.932"W | 1265.66 | 2.49 | 14.39 |
| 6527.00 | 42.52 | 315.93 | 6254.69 | 469.62 | 1289.94 | 34.18 | 516437.4 | 4400865.3 | 39°45'27.162"N | 80°48'29.197"W | 1290.39 | 1.52 | 13.51 |
| 6573.00 | 44.15 | 308.11 | 6288.18 | 499.40 | 1311.01 | 10.74 | 516430.3 | 4400871.7 | 39°45'27.371"N | 80°48'29.496"W | 1311.05 | 0.47 | 12.19 |
| 6620.00 | 47.27 | 302.43 | 6321.00 | 532.24 | 1330.38 | -16.72 | 516421.9 | 4400877.6 | 39°45'27.563"N | 80°48'29.848"W | 1330.49 | 359.28 | 10.90 |
| 6668.00 | 50.75 | 299.65 | 6352.49 | 568.09 | 1349.04 | -47.77 | 516412.5 | 4400883.3 | 39°45'27.748"N | 80°48'30.245"W | 1349.88 | 357.97 | 8.46 |
| 6715.00 | 54.89 | 297.61 | 6380.89 | 605.34 | 1366.96 | -80.64 | 516402.5 | 4400888.7 | 39°45'27.926"N | 80°48'30.665"W | 1369.34 | 356.62 | 9.46 |
| 6762.00 | 59.52 | 295.25 | 6406.34 | 644.76 | 1384.52 | -116.01 | 516391.7 | 4400894.1 | 39°45'28.100"N | 80°48'31.117"W | 1389.37 | 355.21 | 10.72 |
| 6810.00 | 63.86 | 293.60 | 6429.10 | 686.99 | 1401.98 | -154.48 | 516380.0 | 4400899.4 | 39°45'28.273"N | 80°48'31.610"W | 1410.46 | 353.71 | 9.53 |
| 6857.00 | 67.28 | 289.71 | 6448.54 | 729.75 | 1417.74 | -194.24 | 516367.8 | 4400904.2 | 39°45'28.430"N | 80°48'32.118"W | 1430.99 | 352.20 | 10.47 |
| 6904.00 | 72.46 | 286.31 | 6464.71 | 773.70 | 1431.36 | -236.20 | 516355.1 | 4400908.3 | 39°45'28.565"N | 80°48'32.655"W | 1450.72 | 350.63 | 12.94 |
| 6952.00 | 77.12 | 286.22 | 6477.30 | 819.70 | 1444.33 | -280.65 | 516341.5 | 4400912.3 | 39°45'28.694"N | 80°48'33.224"W | 1471.34 | 349.00 | 9.71 |
| 6999.00 | 79.10 | 287.65 | 6486.99 | 865.44 | 1457.73 | -324.64 | 516328.1 | 4400916.4 | 39°45'28.828"N | 80°48'33.787"W | 1493.44 | 347.45 | 5.16 |
| 7047.00 | 81.44 | 289.02 | 6495.10 | 912.60 | 1472.61 | -369.55 | 516314.4 | 4400920.9 | 39°45'28.976"N | 80°48'34.361"W | 1518.27 | 345.91 | 5.63 |
| 7094.00 | 82.31 | 290.90 | 6501.74 | 959.07 | 1488.49 | -413.28 | 516301.1 | 4400925.8 | 39°45'29.134"N | 80°48'34.921"W | 1544.80 | 344.48 | 4.37 |
| 7142.00 | 84.98 | 291.41 | 6507.05 | 1006.75 | 1505.71 | -457.76 | 516287.6 | 4400931.0 | 39°45'29.305"N | 80°48'35.490"W | 1573.75 | 343.09 | 5.66 |
| 7189.00 | 89.97 | 292.01 | 6509.12 | 1053.68 | 1523.07 | -501.37 | 516274.3 | 4400936.3 | 39°45'29.477"N | 80°48'36.048"W | 1603.47 | 341.78 | 10.69 |
| 7237.00 | 89.97 | 291.02 | 6509.15 | 1101.66 | 1540.67 | -546.03 | 516260.7 | 4400941.6 | 39°45'29.652"N | 80°48'36.619"W | 1634.57 | 340.49 | 2.06 |

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51-01619

| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 7332.00 | 89.69 | 291.79 | 6509.43 | 1196.63 | 1575.34 | -634.47 | 516233.7 | 4400952.2 | 39°45'29.997"N | 80°48'37.751"W | 1698.31 | 338.06 | 0.86 |
| 7427.00 | 89.72 | 291.44 | 6509.92 | 1291.61 | 1610.34 | -722.79 | 516206.8 | 4400962.9 | 39°45'30.344"N | 80°48'38.881"W | 1765.11 | 335.83 | 0.37 |
| 7521.00 | 89.72 | 291.31 | 6510.38 | 1385.57 | 1644.60 | -810.32 | 516180.1 | 4400973.3 | 39°45'30.685"N | 80°48'40.001"W | 1833.39 | 333.77 | 0.14 |
| 7615.00 | 89.63 | 290.84 | 6510.91 | 1479.53 | 1678.40 | -898.03 | 516153.4 | 4400983.6 | 39°45'31.021"N | 80°48'41.123"W | 1903.55 | 331.85 | 0.51 |
| 7710.00 | 90.31 | 291.45 | 6510.96 | 1574.48 | 1712.67 | -986.64 | 516126.4 | 4400994.1 | 39°45'31.361"N | 80°48'42.257"W | 1976.53 | 330.06 | 0.96 |
| 7805.00 | 90.25 | 293.03 | 6510.50 | 1669.47 | 1748.62 | -1074.57 | 516099.6 | 4401005.0 | 39°45'31.718"N | 80°48'43.381"W | 2052.41 | 328.43 | 1.66 |
| 7900.00 | 90.22 | 293.77 | 6510.11 | 1764.47 | 1786.35 | -1161.75 | 516073.1 | 4401016.5 | 39°45'32.093"N | 80°48'44.497"W | 2130.90 | 326.96 | 0.78 |
| 7994.00 | 90.55 | 293.67 | 6509.48 | 1858.45 | 1824.16 | -1247.81 | 516046.8 | 4401028.0 | 39°45'32.468"N | 80°48'45.598"W | 2210.11 | 325.63 | 0.37 |
| 8089.00 | 90.55 | 292.99 | 6508.57 | 1953.45 | 1861.78 | -1335.04 | 516020.3 | 4401039.5 | 39°45'32.842"N | 80°48'46.714"W | 2290.97 | 324.36 | 0.72 |
| 8184.00 | 90.58 | 293.45 | 6507.63 | 2048.44 | 1899.24 | -1422.34 | 515993.7 | 4401050.9 | 39°45'33.214"N | 80°48'47.831"W | 2372.79 | 323.17 | 0.49 |
| 8279.00 | 90.65 | 294.02 | 6506.61 | 2143.42 | 1937.47 | -1509.30 | 515967.2 | 4401062.5 | 39°45'33.594"N | 80°48'48.943"W | 2455.97 | 322.08 | 0.60 |
| 8374.00 | 90.68 | 293.81 | 6505.51 | 2238.40 | 1975.98 | -1596.13 | 515940.7 | 4401074.3 | 39°45'33.976"N | 80°48'50.054"W | 2540.11 | 321.07 | 0.22 |
| 8469.00 | 90.58 | 293.91 | 6504.46 | 2333.38 | 2014.41 | -1683.01 | 515914.2 | 4401086.0 | 39°45'34.358"N | 80°48'51.165"W | 2624.95 | 320.12 | 0.15 |
| 8566.00 | 90.52 | 291.27 | 6503.53 | 2430.36 | 2051.66 | -1772.56 | 515887.0 | 4401097.3 | 39°45'34.728"N | 80°48'52.311"W | 2711.32 | 319.17 | 2.72 |
| 8658.00 | 90.62 | 290.52 | 6502.62 | 2522.31 | 2084.47 | -1858.50 | 515860.8 | 4401107.3 | 39°45'35.054"N | 80°48'53.411"W | 2792.68 | 318.28 | 0.82 |
| 8753.00 | 90.58 | 290.15 | 6501.62 | 2617.21 | 2117.49 | -1947.57 | 515833.6 | 4401117.4 | 39°45'35.382"N | 80°48'54.550"W | 2876.94 | 317.39 | 0.39 |
| 8851.00 | 90.62 | 288.54 | 6500.59 | 2715.02 | 2149.95 | -2040.03 | 515805.5 | 4401127.3 | 39°45'35.704"N | 80°48'55.733"W | 2963.78 | 316.50 | 1.64 |
| 8946.00 | 90.55 | 290.44 | 6499.62 | 2809.84 | 2181.64 | -2129.58 | 515778.2 | 4401136.9 | 39°45'36.019"N | 80°48'56.879"W | 3048.71 | 315.69 | 2.00 |
| 9042.00 | 90.65 | 294.66 | 6498.62 | 2905.81 | 2218.44 | -2218.22 | 515751.2 | 4401148.2 | 39°45'36.385"N | 80°48'58.013"W | 3137.19 | 315.00 | 4.40 |
| 9136.00 | 91.11 | 298.10 | 6497.17 | 2999.61 | 2260.20 | -2302.41 | 515725.5 | 4401160.9 | 39°45'36.799"N | 80°48'59.090"W | 3226.39 | 314.47 | 3.69 |
| 9231.00 | 90.89 | 299.69 | 6495.52 | 3094.07 | 2306.09 | -2385.56 | 515700.2 | 4401174.9 | 39°45'37.255"N | 80°49'00.154"W | 3317.98 | 314.03 | 1.69 |
| 9326.00 | 90.62 | 299.09 | 6494.26 | 3188.44 | 2352.71 | -2468.33 | 515675.0 | 4401189.1 | 39°45'37.717"N | 80°49'01.212"W | 3409.97 | 313.63 | 0.69 |
| 9421.00 | 90.92 | 296.56 | 6492.99 | 3283.07 | 2397.05 | -2552.33 | 515649.4 | 4401202.6 | 39°45'38.157"N | 80°49'02.287"W | 3501.46 | 313.20 | 2.68 |
| 9513.00 | 90.68 | 294.73 | 6491.70 | 3374.95 | 2436.86 | -2635.26 | 515624.1 | 4401214.7 | 39°45'38.552"N | 80°49'03.348"W | 3589.27 | 312.76 | 2.01 |
| 9608.00 | 90.89 | 292.30 | 6490.40 | 3469.92 | 2474.76 | -2722.35 | 515597.6 | 4401226.2 | 39°45'38.928"N | 80°49'04.462"W | 3679.08 | 312.27 | 2.57 |
| 9703.00 | 90.65 | 291.19 | 6489.12 | 3564.90 | 2509.95 | -2810.58 | 515570.7 | 4401237.0 | 39°45'39.278"N | 80°49'05.591"W | 3768.18 | 311.77 | 1.20 |
| 9798.00 | 90.68 | 293.33 | 6488.02 | 3659.88 | 2545.93 | -2898.49 | 515543.9 | 4401247.9 | 39°45'39.635"N | 80°49'06.716"W | 3857.85 | 311.30 | 2.25 |
| 9893.00 | 90.68 | 293.72 | 6486.89 | 3754.87 | 2583.85 | -2985.59 | 515517.4 | 4401259.5 | 39°45'40.012"N | 80°49'07.830"W | 3948.42 | 310.87 | 0.41 |
| 9988.00 | 90.74 | 289.34 | 6485.72 | 3849.81 | 2618.70 | -3073.93 | 515490.5 | 4401270.1 | 39°45'40.358"N | 80°49'08.960"W | 4038.15 | 310.43 | 4.61 |
| 10084.00 | 91.26 | 286.43 | 6484.04 | 3945.42 | 2648.17 | -3165.27 | 515462.6 | 4401279.1 | 39°45'40.651"N | 80°49'10.129"W | 4126.95 | 309.92 | 3.08 |
| 10179.00 | 91.23 | 287.47 | 6481.98 | 4039.89 | 2675.86 | -3256.12 | 515435.0 | 4401287.5 | 39°45'40.926"N | 80°49'11.292"W | 4214.56 | 309.41 | 1.09 |

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2015

51-016/9

| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 10274.00 | 91.11 | 290.03 | 6480.04 | 4134.62 | 2706.39 | -3346.05 | 515407.6 | 4401296.8 | 39°45'41.230"N | 80°49'12.443"W | 4303.56 | 308.97 | 2.70 |
| 10368.00 | 90.77 | 291.62 | 6478.49 | 4228.55 | 2739.80 | -3433.90 | 515380.8 | 4401307.0 | 39°45'41.562"N | 80°49'13.567"W | 4392.97 | 308.59 | 1.73 |
| 10462.00 | 90.65 | 294.20 | 6477.33 | 4322.53 | 2776.39 | -3520.47 | 515354.4 | 4401318.1 | 39°45'41.925"N | 80°49'14.674"W | 4483.53 | 308.26 | 2.75 |
| 10557.00 | 90.65 | 297.78 | 6476.25 | 4417.37 | 2818.01 | -3605.84 | 515328.4 | 4401330.8 | 39°45'42.338"N | 80°49'15.766"W | 4576.38 | 308.01 | 3.77 |
| 10652.00 | 90.74 | 299.81 | 6475.10 | 4511.85 | 2863.76 | -3689.08 | 515303.0 | 4401344.8 | 39°45'42.792"N | 80°49'16.831"W | 4670.17 | 307.82 | 2.14 |
| 10747.00 | 90.52 | 297.29 | 6474.05 | 4606.37 | 2909.16 | -3772.52 | 515277.6 | 4401358.6 | 39°45'43.242"N | 80°49'17.898"W | 4763.94 | 307.64 | 2.66 |
| 10842.00 | 90.46 | 293.13 | 6473.24 | 4701.26 | 2949.61 | -3858.45 | 515251.4 | 4401370.9 | 39°45'43.644"N | 80°49'18.998"W | 4856.73 | 307.40 | 4.38 |
| 10937.00 | 90.55 | 291.21 | 6472.40 | 4796.25 | 2985.46 | -3946.42 | 515224.6 | 4401381.8 | 39°45'44.000"N | 80°49'20.123"W | 4948.45 | 307.11 | 2.02 |
| 11032.00 | 90.46 | 291.49 | 6471.57 | 4891.21 | 3020.05 | -4034.89 | 515197.7 | 4401392.4 | 39°45'44.343"N | 80°49'21.255"W | 5039.95 | 306.81 | 0.31 |
| 11128.00 | 90.58 | 290.67 | 6470.70 | 4987.16 | 3054.57 | -4124.47 | 515170.4 | 4401402.9 | 39°45'44.686"N | 80°49'22.401"W | 5132.41 | 306.52 | 0.86 |
| 11223.00 | 90.74 | 292.59 | 6469.60 | 5082.13 | 3089.59 | -4212.77 | 515143.5 | 4401413.6 | 39°45'45.034"N | 80°49'23.531"W | 5224.26 | 306.26 | 2.03 |
| 11318.00 | 90.52 | 296.35 | 6468.56 | 5177.07 | 3128.93 | -4299.21 | 515117.1 | 4401425.6 | 39°45'45.424"N | 80°49'24.637"W | 5317.27 | 306.05 | 3.96 |
| 11412.00 | 90.37 | 296.96 | 6467.83 | 5270.86 | 3171.10 | -4383.22 | 515091.6 | 4401438.4 | 39°45'45.843"N | 80°49'25.712"W | 5410.03 | 305.88 | 0.67 |
| 11507.00 | 90.49 | 297.49 | 6467.11 | 5365.58 | 3214.56 | -4467.69 | 515065.8 | 4401451.6 | 39°45'46.274"N | 80°49'26.793"W | 5503.97 | 305.74 | 0.57 |
| 11602.00 | 90.46 | 294.49 | 6466.33 | 5460.42 | 3256.18 | -4553.07 | 515039.8 | 4401464.3 | 39°45'46.687"N | 80°49'27.885"W | 5597.60 | 305.57 | 3.16 |
| 11696.00 | 90.43 | 295.00 | 6465.60 | 5554.37 | 3295.53 | -4638.44 | 515013.8 | 4401476.3 | 39°45'47.077"N | 80°49'28.977"W | 5689.96 | 305.39 | 0.54 |
| 11792.00 | 90.49 | 291.94 | 6464.82 | 5650.35 | 3333.75 | -4726.48 | 514987.0 | 4401488.0 | 39°45'47.457"N | 80°49'30.103"W | 5783.90 | 305.20 | 3.19 |
| 11887.00 | 90.77 | 289.89 | 6463.78 | 5745.28 | 3367.66 | -4815.21 | 514959.9 | 4401498.3 | 39°45'47.794"N | 80°49'31.239"W | 5876.00 | 304.97 | 2.18 |
| 11981.00 | 90.40 | 287.05 | 6462.82 | 5838.99 | 3397.44 | -4904.36 | 514932.8 | 4401507.4 | 39°45'48.090"N | 80°49'32.380"W | 5966.18 | 304.71 | 3.05 |
| 12074.00 | 90.31 | 289.63 | 6462.24 | 5931.69 | 3426.70 | -4992.62 | 514905.9 | 4401516.3 | 39°45'48.381"N | 80°49'33.509"W | 6055.46 | 304.46 | 2.78 |
| 12169.00 | 90.37 | 291.85 | 6461.68 | 6026.62 | 3460.34 | -5081.46 | 514878.8 | 4401526.5 | 39°45'48.715"N | 80°49'34.646"W | 6147.78 | 304.25 | 2.34 |
| 12264.00 | 90.18 | 294.52 | 6461.22 | 6121.61 | 3497.73 | -5168.78 | 514852.2 | 4401537.9 | 39°45'49.086"N | 80°49'35.763"W | 6241.03 | 304.09 | 2.82 |
| 12359.00 | 90.37 | 295.22 | 6460.77 | 6216.55 | 3537.69 | -5254.97 | 514825.9 | 4401550.1 | 39°45'49.482"N | 80°49'36.866"W | 6334.82 | 303.95 | 0.76 |
| 12395.00 | 90.18 | 294.90 | 6460.59 | 6252.52 | 3552.94 | -5287.58 | 514816.0 | 4401554.7 | 39°45'49.634"N | 80°49'37.283"W | 6370.39 | 303.90 | 1.03 |
| 12420.00 | 90.18 | 294.90 | 6460.52 | 6277.51 | 3563.46 | -5310.25 | 514809.1 | 4401558.0 | 39°45'49.738"N | 80°49'37.573"W | 6395.08 | 303.86 | 0.00 |

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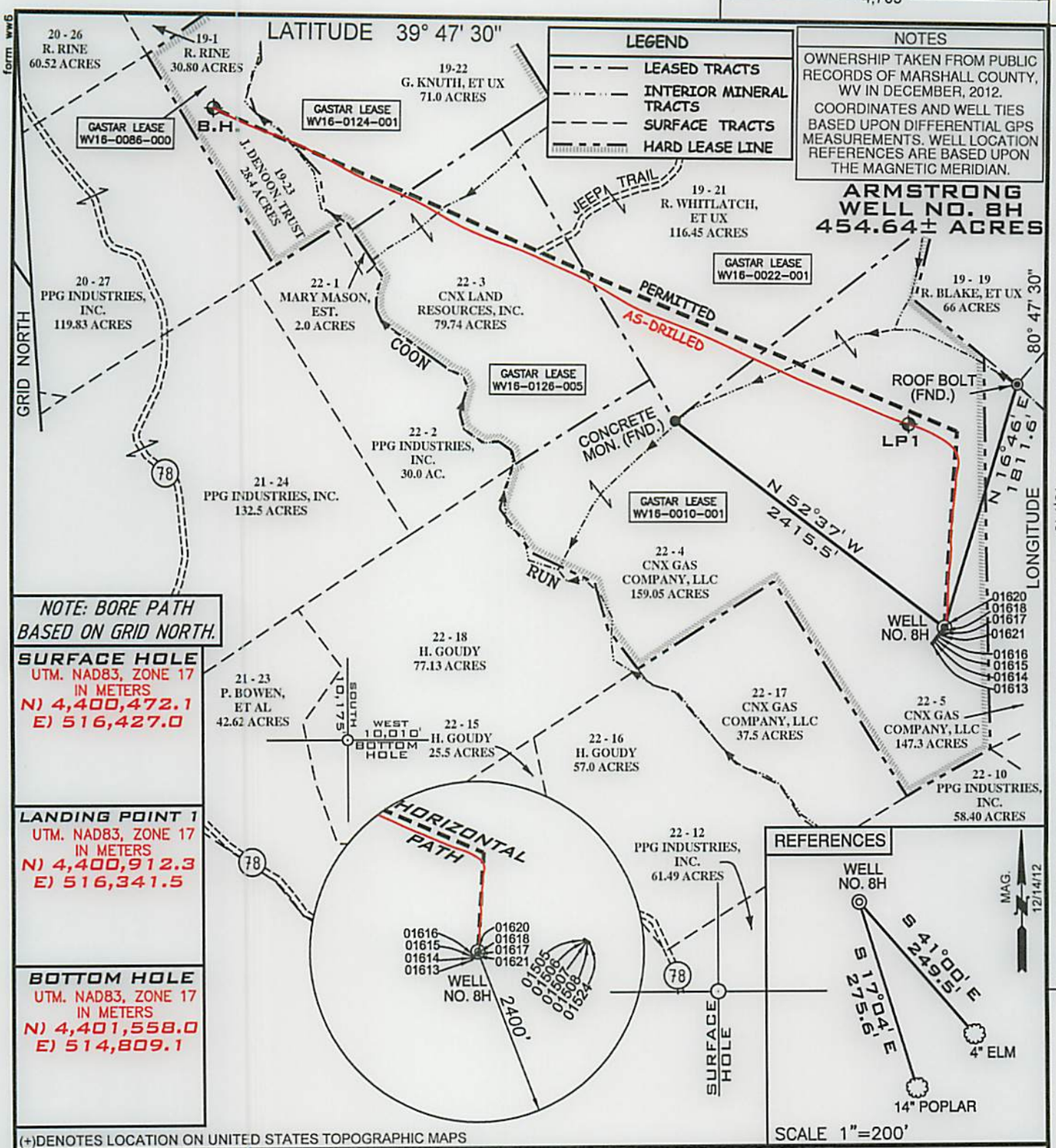
form ww6




(+)DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

FILE NUMBER W0120316 (WB1-56)

DRAWING NUMBER ARMSTRONG_WP_8H-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

Jonathan N. White LICENSED NO. 2122 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

STATE OF WEST VIRGINIA MONTAM SEMPER LIBER

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

DATE: JULY 27, 2012

OPERATORS WELL NO. ARMSTRONG NO. 8H AS-DRILLED

API WELL NO. 47 — 051 — 01619
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) ___
PLUG & ABANDON ___ CLEAN OUT & REPLUG ___

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD:6511' TMD:12,420'

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

COUNTY NAME PERMIT

WR-35
Rev. 8/23/13

Page ___ of ___

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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Page ___ of ___

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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WR-35
Rev. 8/23/13



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

## PERFORATION RECORD

| Stage No. | Perforation date | Perforated from MD ft. | Perforated to MD ft. | Number of Perforations | Formation(s) |
|---|---|---|---|---|---|
| | | | | | SEE ATTACHED PERF INFO SHEET |
| | | | | | |
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Please insert additional pages as applicable.

## STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

| Stage No. | Stimulations Date | Ave Pump Rate (BPM) | Ave Treatment Pressure (PSI) | Max Breakdown Pressure (PSI) | ISIP (PSI) | Amount of Proppant (lbs) | Amount of Water (bbls) | Amount of Nitrogen/other (units) |
|---|---|---|---|---|---|---|---|---|
| | | | See Attached | | | | | |
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Please insert additional pages as applicable.

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WR-35
Rev. 8/23/13

Page ___ of ___

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

| PRODUCING FORMATION(S) | DEPTHS | |
|---|---|---|
| Marcellus | 6,470' - 6,504' TVD | 7,094' - 12,282' 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 | Oil | NGL | Water | GAS MEASURED BY |
|---|---|---|---|---|---|
| | 3072 mcfpd | 107 bpd | ___ bpd | 684 bpd | ☐ Estimated ☒ Orifice ☐ Pilot |

| LITHOLOGY/ FORMATION NAME | TOP DEPTH IN FT TVD | BOTTOM 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, $H_2S$, ETC) |
|---|---|---|---|---|---|
| | 0 | | 0 | | SEE ATTACHED |
| | | | | | |
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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.

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

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

51-01620

**Armstrong #9H Perforation Information**

| Stage | Date | Perforated interval From ft | Perforated interval To ft | Number of Perfs | Formation |
|---|---|---|---|---|---|
| 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

| Stage | Stimulation Date | Avg Pump Rate (BPM) | Avg Pressure (PSI) | Max Break Pres. (PSI) | ISIP (PSI) | Sand Total (lbs) | Total Water (bbls) |
|---|---|---|---|---|---|---|---|
| 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 SANDSTC | 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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Welcome Tracy H., Operator - OpNo. G1410907 [ Log Out ]

**Hydraulic Fracturing** DISCLOSURE

FracFocus Chemical Disclosure Registry

Please use the FracFocus XML submission process or create disclosures online.

FIND A WELL BY STATE | ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

## Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

Preview Disclosure PDF | Validate Disclosure | Submit To FracFocus

## Hydraulic Fracturing Data

Edit

| Job Start Date | Job End Date | API Number | State & County |
|---|---|---|---|
| 11/4/2014 | 11/22/2014 | 47-051-01620-00-00 | West Virginia --- Marshall |

Well Name
ARMSTRONG 9H

| Longitude | Latitude | Datum | Federal/Tribal Well? |
|---|---|---|---|
| -80.82674 | 39.76474 | NAD27 | |

| True Vertical Depth (ft) | Total Water Vol (gal) | Total Non Water Vol | Total Mass (lbs) |
|---|---|---|---|
| 6491 | 4669224 | 0 | 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% | | 161290 |
| 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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|---|---|---|---|---|---|---|---|---|---|
| Edit | Enzyme G-NE | Baker Hughes | Breaker | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0208705% | SmartCare Product | 9129.891 |
| Edit | Alpha 1427 | Baker Hughes | Biocide | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0205222% | SmartCare Product | 8977.5 |
| Edit | ScaleSorb 4, (50# bag) | Baker Hughes | Scale Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0082294% | SmartCare Product | 3600 |
| Edit | Calcium Chloride | Baker Hughes | Salts | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0050005% | | 2187.5 |
| Edit | Ferrotrol 300L | Baker Hughes | Iron Control | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0039625% | SmartCare Product | 1733.42895 |
| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 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% | | 2187.5 |
| | | | | Sodium Chloride | 7647-14-5 | 5% | .0044741% | | 1960.029 |
| | | | | Ammonium Chloride | 12125-02-9 | 3% | .0025347% | | 1110.3924 |
| | | | | 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 |
| Polyoxythylene 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 (Cristobaloite) | 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 + ¼ # per sack flake

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

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

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# GASTAR EXPLORATION USA, INC.

Location: Marshall County, WV
Field: Marshall
Facility: Armstrong

Slot: Slot #9
Well: Armstrong 9H
Wellbore: Armstrong 9H (PWB)

51-01620

## Location Information

| Facility Name | | | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Armstrong | | | 1694263.000 | 14437151.000 | 39°45'13.773"N | 80°48'30.287"W |
| Slot | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
| Slot #9 | 81.03 | 60.02 | 1694323.000 | 14437232.000 | 39°45'14.573"N | 80°48'29.516"W |
| Nomac 323 (RT) to Mud line (At Slot: Slot #9) | | | | | 29.4ft | |
| Mean Sea Level to Mud line (At Slot: Slot #9) | | | | | -1278ft | |
| Nomac 323 (RT) to Mean Sea Level | | | | | 1307.4ft | |

## Targets

| Name | MD (ft) | TVD (ft) | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| Armstrong 9H PBHL Rev-1 | 12286.04 | 6438.95 | 3917.56 | -5174.06 | 1689151.00 | 14441148.00 | 39°45'53.393"N | 80°49'35.666"W |
| Armstrong 9H PBHL Plat | | 6470.40 | 3917.56 | -5174.06 | 1689151.00 | 14441148.00 | 39°45'53.393"N | 80°49'35.666"W |
| Armstrong 9H LP Rev-1 | | 6470.84 | 1922.94 | -537.26 | 1693785.95 | 14439154.17 | 39°45'33.588"N | 80°48'36.343"W |
| Armstrong 9H LP Rev-2 | 7238.23 | 6483.00 | 1922.94 | -537.26 | 1693785.95 | 14439154.17 | 39°45'33.588"N | 80°48'36.343"W |
| Armstrong Lim | | 6489.40 | 1820.73 | 40.02 | 1694303.00 | 14439052.00 | 39°45'32.585"N | 80°48'28.954"W |

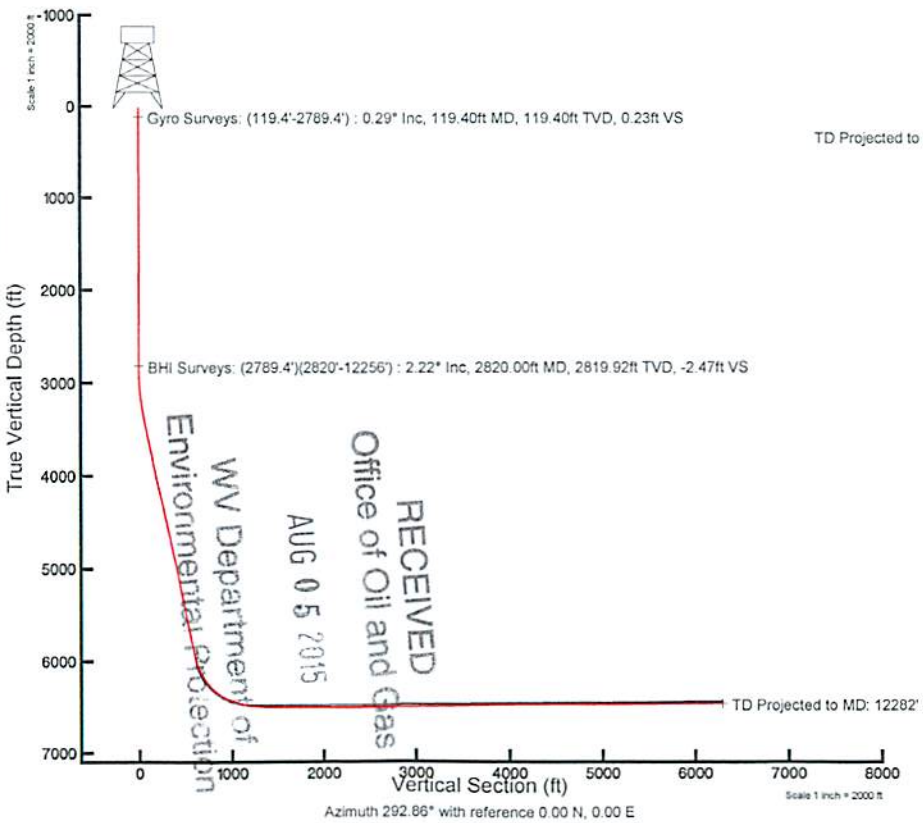
Plot reference wellpath is Armstrong 9H (PWP) Rev-E.0

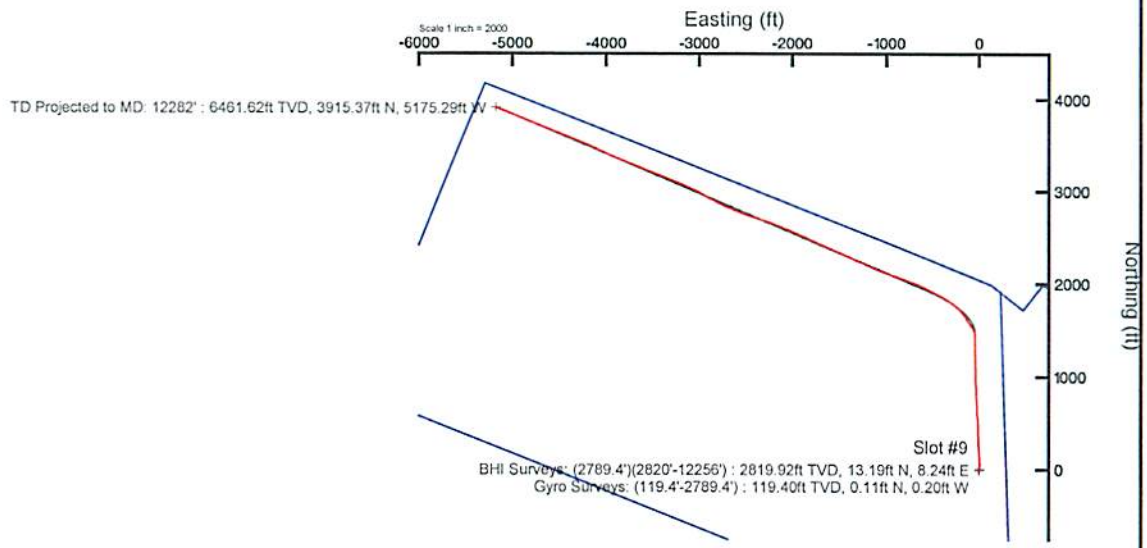
| | |
|---|---|
| True vertical depths are referenced to Nomac 323 (RT) | Grid System: NAD83 / UTM Zone 17 North, US feet |
| Measured depths are referenced to Nomac 323 (RT) | North Reference: Grid north |
| Nomac 323 (RT) to Mean Sea Level: 1307.4 feet | Scale: True distance |
| Mean Sea Level to Mud line (At Slot: Slot #9): -1278 feet | Depths are in feet |
| Coordinates are in feet referenced to Slot | Created by: frisjesl on 4/14/2014 |

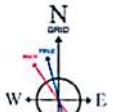
## Well Profile Data

| Design Comment | MD (ft) | Inc (°) | Az (°) | TVD (ft) | Local N (ft) | Local E (ft) | DLS (°/100ft) | VS (ft) |
|---|---|---|---|---|---|---|---|---|
| Tie On | 6171.40 | 27.700 | 358.820 | 5856.75 | 1393.04 | -40.60 | 0.56 | 578.58 |
| Proj | 6243.40 | 27.700 | 358.820 | 5920.50 | 1426.50 | -41.28 | 0.00 | 592.21 |
| End of Tangent | 6363.40 | 27.700 | 358.820 | 6026.75 | 1482.27 | -42.43 | 0.00 | 614.93 |
| End of 3D Arc | 7226.31 | 90.188 | 292.222 | 6483.07 | 1918.33 | -526.27 | 9.22 | 1230.16 |
| LP | 7238.23 | 90.500 | 293.276 | 6483.00 | 1922.94 | -537.26 | 9.22 | 1242.09 |
| BHL | 12286.04 | 90.500 | 293.276 | 6438.95 | 3917.56 | -5174.06 | 0.00 | 6289.57 |

API#: 47-051-01620-0000
Rig: Nomac 323
BHI Job#: 5847930
Duration: 04/08/14-04/12/14




BGGM (1945.0 to 2015.0) Dip: 67.22° Field: 52509.6 nT
Magnetic North is 8.59 degrees West of True North (at 4/2/2014)
Grid North is 0.12 degrees East of True North
To correct azimuth from True to Grid subtract 0.12 degrees
To correct azimuth from Magnetic to Grid subtract 8.71 degrees

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WV Department of
Environmental Protection

51-01626

| REFERENCE WELLPATH IDENTIFICATION | | | |
|---|---|---|---|
| Operator | GASTAR EXPLORATION INC. | Slot | Slot #9 |
| Area | Marshall County, WV | Well | Armstrong 9H |
| Field | Marshall | Wellbore | Armstrong 9H (AWB) |
| Facility | Armstrong | Wellpath | Armstrong 9H (AWP) Proj: 12,282' |
| | | Sidetrack | (none) |

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**WELLPATH DATA † = interpolated/extrapolated station**

| | MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| † | 0.00 | 0.00 | 299.41 | 0.00 | 0.00 | 0.00 | 0.00 | 516430.7 | 4400477.0 | 39°45'14.573"N | 80°48'29.516"W | 0.00 | 0.00 | 0.00 |
| | 29.40 | 0.00 | 299.41 | 29.40 | 0.00 | 0.00 | 0.00 | 516430.7 | 4400477.0 | 39°45'14.573"N | 80°48'29.516"W | 0.00 | 0.00 | 0.00 |
| | 119.40 | 0.29 | 299.41 | 119.40 | 0.23 | 0.11 | -0.20 | 516430.6 | 4400477.1 | 39°45'14.574"N | 80°48'29.518"W | 0.23 | 299.41 | 0.32 |
| | 219.40 | 0.32 | 350.56 | 219.40 | 0.63 | 0.51 | -0.46 | 516430.5 | 4400477.3 | 39°45'14.578"N | 80°48'29.522"W | 0.69 | 317.75 | 0.26 |
| | 319.40 | 0.74 | 8.33 | 319.39 | 0.94 | 1.43 | -0.42 | 516430.6 | 4400477.6 | 39°45'14.587"N | 80°48'29.521"W | 1.49 | 343.70 | 0.45 |
| | 419.40 | 0.70 | 6.42 | 419.39 | 1.27 | 2.67 | -0.26 | 516430.6 | 4400477.9 | 39°45'14.599"N | 80°48'29.519"W | 2.68 | 354.55 | 0.05 |
| | 519.40 | 0.43 | 16.13 | 519.38 | 1.49 | 3.64 | -0.08 | 516430.7 | 4400478.2 | 39°45'14.609"N | 80°48'29.517"W | 3.64 | 358.70 | 0.29 |
| | 619.40 | 0.42 | 19.79 | 619.38 | 1.55 | 4.34 | 0.15 | 516430.7 | 4400478.4 | 39°45'14.616"N | 80°48'29.514"W | 4.35 | 1.92 | 0.03 |
| | 719.40 | 0.50 | 357.11 | 719.38 | 1.76 | 5.13 | 0.25 | 516430.8 | 4400478.7 | 39°45'14.623"N | 80°48'29.512"W | 5.13 | 2.77 | 0.20 |
| | 819.40 | 0.48 | 342.19 | 819.37 | 2.23 | 5.96 | 0.10 | 516430.7 | 4400478.9 | 39°45'14.632"N | 80°48'29.514"W | 5.96 | 0.94 | 0.13 |
| | 919.40 | 0.27 | 337.25 | 919.37 | 2.67 | 6.58 | -0.12 | 516430.6 | 4400479.1 | 39°45'14.638"N | 80°48'29.517"W | 6.58 | 358.94 | 0.21 |
| | 1019.40 | 0.25 | 334.15 | 1019.37 | 3.00 | 6.99 | -0.31 | 516430.6 | 4400479.2 | 39°45'14.642"N | 80°48'29.520"W | 7.00 | 357.48 | 0.02 |
| | 1119.40 | 0.44 | 13.59 | 1119.37 | 3.22 | 7.56 | -0.31 | 516430.6 | 4400479.4 | 39°45'14.647"N | 80°48'29.520"W | 7.57 | 357.63 | 0.29 |
| | 1219.40 | 0.16 | 16.12 | 1219.37 | 3.30 | 8.07 | -0.18 | 516430.6 | 4400479.6 | 39°45'14.652"N | 80°48'29.518"W | 8.07 | 358.70 | 0.28 |
| | 1319.40 | 0.32 | 17.38 | 1319.36 | 3.35 | 8.47 | -0.06 | 516430.7 | 4400479.7 | 39°45'14.656"N | 80°48'29.516"W | 8.47 | 359.59 | 0.16 |
| | 1419.40 | 0.66 | 25.35 | 1419.36 | 3.35 | 9.25 | 0.27 | 516430.8 | 4400479.9 | 39°45'14.664"N | 80°48'29.512"W | 9.26 | 1.66 | 0.35 |
| | 1519.40 | 0.52 | 36.67 | 1519.36 | 3.21 | 10.14 | 0.79 | 516430.9 | 4400480.2 | 39°45'14.673"N | 80°48'29.505"W | 10.17 | 4.43 | 0.18 |
| | 1619.40 | 0.34 | 64.08 | 1619.35 | 2.91 | 10.63 | 1.32 | 516431.1 | 4400480.4 | 39°45'14.678"N | 80°48'29.499"W | 10.71 | 7.10 | 0.27 |
| | 1719.40 | 0.36 | 81.59 | 1719.35 | 2.45 | 10.81 | 1.90 | 516431.3 | 4400480.4 | 39°45'14.679"N | 80°48'29.491"W | 10.97 | 9.98 | 0.11 |
| | 1819.40 | 0.41 | 80.51 | 1819.35 | 1.88 | 10.91 | 2.57 | 516431.5 | 4400480.4 | 39°45'14.680"N | 80°48'29.483"W | 11.21 | 13.23 | 0.05 |
| | 1919.40 | 0.76 | 93.91 | 1919.34 | 0.95 | 10.93 | 3.58 | 516431.8 | 4400480.4 | 39°45'14.681"N | 80°48'29.470"W | 11.50 | 18.14 | 0.37 |
| | 2019.40 | 0.68 | 99.95 | 2019.34 | -0.26 | 10.78 | 4.83 | 516432.2 | 4400480.4 | 39°45'14.679"N | 80°48'29.454"W | 11.81 | 24.12 | 0.11 |
| | 2119.40 | 0.23 | 50.71 | 2119.33 | -0.93 | 10.80 | 5.57 | 516432.4 | 4400480.4 | 39°45'14.679"N | 80°48'29.444"W | 12.15 | 27.26 | 0.56 |
| | 2219.40 | 0.20 | 49.70 | 2219.33 | -1.10 | 11.04 | 5.85 | 516432.5 | 4400480.5 | 39°45'14.682"N | 80°48'29.441"W | 12.50 | 27.93 | 0.03 |
| | 2319.40 | 0.29 | 55.40 | 2319.33 | -1.32 | 11.30 | 6.20 | 516432.6 | 4400480.6 | 39°45'14.684"N | 80°48'29.436"W | 12.89 | 28.74 | 0.09 |

51.01620

| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 2419.40 | 0.40 | 43.92 | 2419.33 | -1.58 | 11.70 | 6.65 | 516432.7 | 4400480.7 | 39°45'14.688"N | 80°48'29.430"W | 13.45 | 29.61 | 0.13 |
| 2519.40 | 0.14 | 46.48 | 2519.33 | -1.76 | 12.03 | 6.98 | 516432.8 | 4400480.8 | 39°45'14.691"N | 80°48'29.426"W | 13.91 | 30.11 | 0.26 |
| 2619.40 | 0.22 | 49.53 | 2619.33 | -1.89 | 12.24 | 7.21 | 516432.9 | 4400480.8 | 39°45'14.693"N | 80°48'29.423"W | 14.21 | 30.51 | 0.08 |
| 2719.40 | 0.34 | 63.75 | 2719.33 | -2.17 | 12.50 | 7.62 | 516433.0 | 4400480.9 | 39°45'14.696"N | 80°48'29.418"W | 14.64 | 31.39 | 0.14 |
| 2789.40 | 0.38 | 87.18 | 2789.32 | -2.52 | 12.60 | 8.04 | 516433.1 | 4400481.0 | 39°45'14.697"N | 80°48'29.413"W | 14.95 | 32.55 | 0.22 |
| 2820.40 | 2.25 | 8.93 | 2820.32 | -2.46 | 13.20 | 8.24 | 516433.2 | 4400481.1 | 39°45'14.703"N | 80°48'29.410"W | 15.56 | 31.96 | 7.11 |
| 2852.40 | 3.88 | 10.88 | 2852.27 | -2.09 | 14.89 | 8.54 | 516433.3 | 4400481.7 | 39°45'14.720"N | 80°48'29.406"W | 17.16 | 29.84 | 5.10 |
| 2883.40 | 5.30 | 8.95 | 2883.17 | -1.52 | 17.33 | 8.96 | 516433.4 | 4400482.4 | 39°45'14.744"N | 80°48'29.401"W | 19.51 | 27.34 | 4.61 |
| 2915.40 | 6.83 | 10.54 | 2914.99 | -0.76 | 20.66 | 9.54 | 516433.6 | 4400483.4 | 39°45'14.777"N | 80°48'29.393"W | 22.76 | 24.78 | 4.81 |
| 2947.40 | 8.44 | 8.52 | 2946.70 | 0.22 | 24.86 | 10.24 | 516433.8 | 4400484.7 | 39°45'14.818"N | 80°48'29.384"W | 26.88 | 22.38 | 5.10 |
| 2978.40 | 10.12 | 7.33 | 2977.30 | 1.52 | 29.81 | 10.92 | 516434.0 | 4400486.2 | 39°45'14.867"N | 80°48'29.375"W | 31.75 | 20.12 | 5.45 |
| 3010.40 | 11.69 | 5.00 | 3008.72 | 3.26 | 35.83 | 11.56 | 516434.2 | 4400488.0 | 39°45'14.926"N | 80°48'29.367"W | 37.65 | 17.89 | 5.09 |
| 3042.40 | 12.55 | 3.82 | 3040.01 | 5.39 | 42.53 | 12.08 | 516434.4 | 4400490.1 | 39°45'14.993"N | 80°48'29.360"W | 44.21 | 15.85 | 2.80 |
| 3073.40 | 13.30 | 0.76 | 3070.22 | 7.83 | 49.45 | 12.35 | 516434.4 | 4400492.2 | 39°45'15.061"N | 80°48'29.356"W | 50.97 | 14.02 | 3.27 |
| 3104.40 | 14.29 | 359.53 | 3100.33 | 10.69 | 56.84 | 12.36 | 516434.5 | 4400494.4 | 39°45'15.134"N | 80°48'29.356"W | 58.17 | 12.27 | 3.33 |
| 3136.40 | 15.18 | 357.42 | 3131.27 | 14.05 | 64.98 | 12.14 | 516434.4 | 4400496.9 | 39°45'15.215"N | 80°48'29.359"W | 66.10 | 10.59 | 3.25 |
| 3168.40 | 16.04 | 356.47 | 3162.09 | 17.82 | 73.58 | 11.68 | 516434.2 | 4400499.5 | 39°45'15.300"N | 80°48'29.364"W | 74.50 | 9.02 | 2.80 |
| 3200.40 | 17.08 | 356.85 | 3192.76 | 21.84 | 82.68 | 11.15 | 516434.1 | 4400502.3 | 39°45'15.390"N | 80°48'29.371"W | 83.43 | 7.68 | 3.27 |
| 3231.40 | 18.13 | 357.48 | 3222.31 | 25.91 | 92.05 | 10.69 | 516433.9 | 4400505.2 | 39°45'15.482"N | 80°48'29.376"W | 92.66 | 6.62 | 3.44 |
| 3262.40 | 19.18 | 357.24 | 3251.68 | 30.18 | 101.95 | 10.23 | 516433.8 | 4400508.2 | 39°45'15.580"N | 80°48'29.382"W | 102.46 | 5.73 | 3.40 |
| 3294.40 | 20.13 | 356.79 | 3281.82 | 34.87 | 112.70 | 9.67 | 516433.6 | 4400511.5 | 39°45'15.686"N | 80°48'29.389"W | 113.11 | 4.90 | 3.01 |
| 3325.40 | 21.37 | 356.81 | 3310.81 | 39.70 | 123.67 | 9.06 | 516433.4 | 4400514.8 | 39°45'15.795"N | 80°48'29.396"W | 124.00 | 4.19 | 4.00 |
| 3357.40 | 22.61 | 357.35 | 3340.48 | 44.91 | 135.63 | 8.45 | 516433.3 | 4400518.4 | 39°45'15.913"N | 80°48'29.404"W | 135.89 | 3.56 | 3.93 |
| 3388.40 | 23.87 | 357.23 | 3368.96 | 50.19 | 147.85 | 7.87 | 516433.1 | 4400522.2 | 39°45'16.034"N | 80°48'29.411"W | 148.06 | 3.05 | 4.07 |
| 3419.40 | 24.61 | 357.41 | 3397.23 | 55.67 | 160.56 | 7.27 | 516432.9 | 4400526.0 | 39°45'16.159"N | 80°48'29.418"W | 160.73 | 2.59 | 2.40 |
| 3451.40 | 25.16 | 357.45 | 3426.26 | 61.45 | 174.02 | 6.67 | 516432.7 | 4400530.1 | 39°45'16.292"N | 80°48'29.426"W | 174.14 | 2.20 | 1.72 |
| 3482.40 | 24.91 | 357.35 | 3454.35 | 67.09 | 187.12 | 6.08 | 516432.5 | 4400534.1 | 39°45'16.422"N | 80°48'29.433"W | 187.22 | 1.86 | 0.82 |
| 3513.40 | 24.91 | 356.70 | 3482.46 | 72.78 | 200.16 | 5.40 | 516432.3 | 4400538.1 | 39°45'16.551"N | 80°48'29.441"W | 200.23 | 1.55 | 0.88 |
| 3544.40 | 24.05 | 356.31 | 3510.67 | 78.49 | 212.98 | 4.62 | 516432.1 | 4400542.0 | 39°45'16.677"N | 80°48'29.451"W | 213.03 | 1.24 | 2.82 |
| 3608.40 | 25.86 | 356.09 | 3568.70 | 90.60 | 239.92 | 2.82 | 516431.5 | 4400550.2 | 39°45'16.944"N | 80°48'29.473"W | 239.94 | 0.68 | 2.83 |
| 3671.40 | 26.65 | 357.19 | 3625.20 | 102.91 | 267.74 | 1.20 | 516431.0 | 4400558.7 | 39°45'17.219"N | 80°48'29.493"W | 267.74 | 0.26 | 1.47 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 3734.40 | 27.36 | 359.57 | 3681.33 | 114.76 | 296.33 | 0.39 | 516430.8 | 4400567.4 | 39°45'17.501"N | 80°48'29.503"W | 296.33 | 0.08 | 2.05 |
| 3798.40 | 26.27 | 357.73 | 3738.45 | 126.59 | 325.19 | -0.28 | 516430.6 | 4400576.2 | 39°45'17.786"N | 80°48'29.510"W | 325.19 | 359.95 | 2.14 |
| 3861.40 | 25.51 | 356.68 | 3795.12 | 138.49 | 352.67 | -1.62 | 516430.2 | 4400584.6 | 39°45'18.058"N | 80°48'29.527"W | 352.67 | 359.74 | 1.41 |
| 3924.40 | 26.66 | 0.36 | 3851.71 | 149.89 | 380.35 | -2.31 | 516430.0 | 4400593.0 | 39°45'18.332"N | 80°48'29.535"W | 380.35 | 359.65 | 3.15 |
| 3987.40 | 26.24 | 359.08 | 3908.12 | 160.91 | 408.41 | -2.45 | 516429.9 | 4400601.5 | 39°45'18.609"N | 80°48'29.536"W | 408.41 | 359.66 | 1.12 |
| 4051.40 | 27.86 | 359.03 | 3965.11 | 172.66 | 437.51 | -2.93 | 516429.8 | 4400610.4 | 39°45'18.896"N | 80°48'29.541"W | 437.52 | 359.62 | 2.53 |
| 4114.40 | 26.74 | 357.51 | 4021.10 | 184.68 | 466.38 | -3.79 | 516429.5 | 4400619.2 | 39°45'19.182"N | 80°48'29.552"W | 466.40 | 359.53 | 2.09 |
| 4177.40 | 26.04 | 356.22 | 4077.53 | 196.95 | 494.34 | -5.32 | 516429.1 | 4400627.7 | 39°45'19.458"N | 80°48'29.570"W | 494.37 | 359.38 | 1.44 |
| 4241.40 | 27.84 | 356.83 | 4134.58 | 209.80 | 523.28 | -7.07 | 516428.5 | 4400636.6 | 39°45'19.744"N | 80°48'29.592"W | 523.33 | 359.23 | 2.85 |
| 4304.40 | 26.75 | 354.12 | 4190.57 | 223.08 | 552.08 | -9.34 | 516427.8 | 4400645.3 | 39°45'20.029"N | 80°48'29.620"W | 552.16 | 359.03 | 2.62 |
| 4367.40 | 25.64 | 351.67 | 4247.10 | 236.95 | 579.67 | -12.77 | 516426.8 | 4400653.7 | 39°45'20.302"N | 80°48'29.663"W | 579.81 | 358.74 | 2.46 |
| 4430.40 | 26.46 | 355.11 | 4303.70 | 250.55 | 607.14 | -15.94 | 516425.8 | 4400662.1 | 39°45'20.573"N | 80°48'29.703"W | 607.35 | 358.50 | 2.73 |
| 4494.40 | 27.39 | 358.46 | 4360.77 | 263.27 | 636.07 | -17.55 | 516425.3 | 4400670.9 | 39°45'20.859"N | 80°48'29.723"W | 636.31 | 358.42 | 2.78 |
| 4557.40 | 28.11 | 0.66 | 4416.52 | 274.87 | 665.40 | -17.77 | 516425.3 | 4400679.8 | 39°45'21.149"N | 80°48'29.725"W | 665.63 | 358.47 | 1.99 |
| 4618.40 | 27.09 | 358.15 | 4470.58 | 286.10 | 693.65 | -18.05 | 516425.2 | 4400688.5 | 39°45'21.428"N | 80°48'29.728"W | 693.88 | 358.51 | 2.54 |
| 4681.40 | 26.56 | 356.55 | 4526.80 | 298.34 | 722.05 | -19.36 | 516424.8 | 4400697.1 | 39°45'21.709"N | 80°48'29.744"W | 722.31 | 358.46 | 1.42 |
| 4744.40 | 26.02 | 354.00 | 4583.29 | 311.25 | 749.85 | -21.65 | 516424.1 | 4400705.6 | 39°45'21.984"N | 80°48'29.773"W | 750.16 | 358.35 | 1.99 |
| 4807.40 | 26.05 | 355.59 | 4639.90 | 324.26 | 777.39 | -24.16 | 516423.3 | 4400714.0 | 39°45'22.256"N | 80°48'29.804"W | 777.76 | 358.22 | 1.11 |
| 4870.40 | 26.74 | 357.92 | 4696.33 | 336.58 | 805.34 | -25.74 | 516422.8 | 4400722.5 | 39°45'22.532"N | 80°48'29.823"W | 805.75 | 358.17 | 1.98 |
| 4933.40 | 27.80 | 359.94 | 4752.33 | 348.28 | 834.20 | -26.27 | 516422.7 | 4400731.3 | 39°45'22.817"N | 80°48'29.829"W | 834.61 | 358.20 | 2.23 |
| 4997.40 | 27.32 | 358.17 | 4809.07 | 360.22 | 863.80 | -26.75 | 516422.5 | 4400740.3 | 39°45'23.110"N | 80°48'29.835"W | 864.22 | 358.23 | 1.48 |
| 5060.40 | 26.93 | 355.94 | 4865.14 | 372.72 | 892.49 | -28.23 | 516422.1 | 4400749.0 | 39°45'23.393"N | 80°48'29.853"W | 892.93 | 358.19 | 1.73 |
| 5123.40 | 26.42 | 354.07 | 4921.44 | 385.93 | 920.66 | -30.68 | 516421.3 | 4400757.6 | 39°45'23.672"N | 80°48'29.883"W | 921.17 | 358.09 | 1.56 |
| 5185.40 | 27.44 | 356.98 | 4976.71 | 398.81 | 948.64 | -32.86 | 516420.7 | 4400766.1 | 39°45'23.949"N | 80°48'29.911"W | 949.21 | 358.02 | 2.69 |
| 5249.40 | 27.02 | 359.93 | 5033.62 | 410.91 | 977.91 | -33.66 | 516420.4 | 4400775.1 | 39°45'24.238"N | 80°48'29.920"W | 978.49 | 358.03 | 2.21 |
| 5312.40 | 27.18 | 358.76 | 5089.71 | 422.36 | 1006.61 | -33.99 | 516420.3 | 4400783.8 | 39°45'24.521"N | 80°48'29.923"W | 1007.18 | 358.07 | 0.88 |
| 5374.40 | 27.27 | 357.99 | 5144.84 | 434.12 | 1034.96 | -34.79 | 516420.1 | 4400792.4 | 39°45'24.802"N | 80°48'29.933"W | 1035.54 | 358.08 | 0.59 |
| 5436.40 | 26.79 | 0.69 | 5200.07 | 445.36 | 1063.13 | -35.12 | 516420.0 | 4400801.0 | 39°45'25.080"N | 80°48'29.936"W | 1063.71 | 358.11 | 2.12 |
| 5498.40 | 26.58 | 359.71 | 5255.47 | 456.09 | 1090.97 | -35.02 | 516420.0 | 4400809.5 | 39°45'25.355"N | 80°48'29.934"W | 1091.53 | 358.16 | 0.79 |
| 5561.40 | 26.59 | 357.95 | 5311.81 | 467.57 | 1119.15 | -35.60 | 516419.8 | 4400818.1 | 39°45'25.634"N | 80°48'29.941"W | 1119.72 | 358.18 | 1.25 |
| 5624.40 | 26.53 | 356.32 | 5368.16 | 479.80 | 1147.28 | -37.00 | 516419.4 | 4400826.7 | 39°45'25.912"N | 80°48'29.958"W | 1147.88 | 358.15 | 1.16 |

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51-01620

**WELLPATH DATA † = interpolated/extrapolated station**

| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5687.40 | 26.10 | 359.95 | 5424.63 | 491.48 | 1175.19 | -37.92 | 516419.1 | 4400835.2 | 39°45'26.187"N | 80°48'29.969"W | 1175.80 | 358.15 | 2.64 |
| 5750.40 | 25.64 | 359.36 | 5481.32 | 502.31 | 1202.67 | -38.08 | 516419.1 | 4400843.5 | 39°45'26.459"N | 80°48'29.970"W | 1203.28 | 358.19 | 0.84 |
| 5813.40 | 25.21 | 358.21 | 5538.22 | 513.34 | 1229.71 | -38.66 | 516418.9 | 4400851.8 | 39°45'26.726"N | 80°48'29.977"W | 1230.32 | 358.20 | 1.04 |
| 5877.40 | 26.60 | 359.18 | 5595.79 | 524.78 | 1257.67 | -39.29 | 516418.7 | 4400860.3 | 39°45'27.003"N | 80°48'29.984"W | 1258.28 | 358.21 | 2.27 |
| 5939.40 | 26.64 | 359.38 | 5651.21 | 535.89 | 1285.44 | -39.64 | 516418.6 | 4400868.8 | 39°45'27.277"N | 80°48'29.988"W | 1286.05 | 358.23 | 0.16 |
| 5970.40 | 27.58 | 359.46 | 5678.81 | 541.51 | 1299.57 | -39.78 | 516418.6 | 4400873.1 | 39°45'27.417"N | 80°48'29.990"W | 1300.18 | 358.25 | 3.03 |
| 6033.40 | 27.54 | 359.86 | 5734.66 | 552.99 | 1328.72 | -39.95 | 516418.5 | 4400881.9 | 39°45'27.705"N | 80°48'29.991"W | 1329.32 | 358.28 | 0.30 |
| 6097.40 | 27.94 | 359.55 | 5791.30 | 564.71 | 1358.51 | -40.11 | 516418.5 | 4400891.0 | 39°45'27.999"N | 80°48'29.992"W | 1359.10 | 358.31 | 0.66 |
| 6171.40 | 27.70 | 358.82 | 5856.75 | 578.58 | 1393.04 | -40.60 | 516418.3 | 4400901.5 | 39°45'28.340"N | 80°48'29.997"W | 1393.63 | 358.33 | 0.56 |
| 6239.00 | 27.55 | 358.54 | 5916.64 | 591.41 | 1424.37 | -41.32 | 516418.1 | 4400911.1 | 39°45'28.650"N | 80°48'30.006"W | 1424.97 | 358.34 | 0.29 |
| 6287.00 | 28.53 | 358.48 | 5959.01 | 600.72 | 1446.93 | -41.90 | 516417.9 | 4400918.0 | 39°45'28.873"N | 80°48'30.013"W | 1447.54 | 358.34 | 2.04 |
| 6334.00 | 29.31 | 352.52 | 6000.16 | 611.16 | 1469.56 | -43.70 | 516417.4 | 4400924.9 | 39°45'29.097"N | 80°48'30.035"W | 1470.21 | 358.30 | 6.35 |
| 6382.00 | 29.35 | 342.99 | 6042.03 | 624.65 | 1492.47 | -48.67 | 516415.9 | 4400931.8 | 39°45'29.323"N | 80°48'30.098"W | 1493.27 | 358.13 | 9.72 |
| 6429.00 | 28.84 | 332.05 | 6083.13 | 640.83 | 1513.52 | -57.36 | 516413.2 | 4400938.3 | 39°45'29.531"N | 80°48'30.209"W | 1514.60 | 357.83 | 11.36 |
| 6477.00 | 30.24 | 325.00 | 6124.90 | 660.04 | 1533.65 | -69.73 | 516409.4 | 4400944.4 | 39°45'29.731"N | 80°48'30.367"W | 1535.23 | 357.40 | 7.80 |
| 6525.00 | 34.92 | 325.18 | 6165.33 | 681.90 | 1554.84 | -84.51 | 516404.9 | 4400950.8 | 39°45'29.940"N | 80°48'30.555"W | 1557.14 | 356.89 | 9.75 |
| 6572.00 | 37.50 | 325.46 | 6203.25 | 705.32 | 1577.67 | -100.31 | 516400.1 | 4400957.8 | 39°45'30.166"N | 80°48'30.757"W | 1580.86 | 356.36 | 5.50 |
| 6620.00 | 40.91 | 324.29 | 6240.44 | 731.05 | 1602.48 | -117.77 | 516394.8 | 4400965.4 | 39°45'30.412"N | 80°48'30.980"W | 1606.80 | 355.80 | 7.27 |
| 6667.00 | 45.94 | 326.85 | 6274.57 | 758.20 | 1629.13 | -136.00 | 516389.2 | 4400973.5 | 39°45'30.676"N | 80°48'31.213"W | 1634.80 | 355.23 | 11.34 |
| 6716.00 | 50.25 | 327.19 | 6307.29 | 788.37 | 1659.72 | -155.84 | 516383.2 | 4400982.8 | 39°45'30.978"N | 80°48'31.466"W | 1667.02 | 354.64 | 8.81 |
| 6762.00 | 54.74 | 322.99 | 6335.29 | 819.24 | 1689.60 | -176.75 | 516376.8 | 4400991.9 | 39°45'31.274"N | 80°48'31.733"W | 1698.82 | 354.03 | 12.15 |
| 6808.00 | 56.71 | 316.00 | 6361.22 | 853.20 | 1718.45 | -201.43 | 516369.3 | 4401000.7 | 39°45'31.560"N | 80°48'32.048"W | 1730.22 | 353.32 | 13.26 |
| 6856.00 | 60.49 | 310.43 | 6386.24 | 891.59 | 1746.46 | -231.29 | 516360.2 | 4401009.2 | 39°45'31.837"N | 80°48'32.430"W | 1761.71 | 352.46 | 12.65 |
| 6904.00 | 66.35 | 308.36 | 6407.71 | 932.73 | 1773.67 | -264.46 | 516350.1 | 4401017.5 | 39°45'32.107"N | 80°48'32.854"W | 1793.28 | 351.52 | 12.80 |
| 6951.00 | 70.29 | 306.41 | 6425.07 | 975.00 | 1800.18 | -299.16 | 516339.5 | 4401025.6 | 39°45'32.370"N | 80°48'33.297"W | 1824.86 | 350.57 | 9.23 |
| 6998.00 | 71.49 | 302.74 | 6440.46 | 1018.47 | 1825.37 | -335.72 | 516328.4 | 4401033.3 | 39°45'32.619"N | 80°48'33.765"W | 1855.98 | 349.58 | 7.81 |
| 7046.00 | 71.76 | 300.13 | 6455.60 | 1063.51 | 1849.12 | -374.59 | 516316.6 | 4401040.5 | 39°45'32.855"N | 80°48'34.262"W | 1886.68 | 348.55 | 5.19 |
| 7094.00 | 75.19 | 297.91 | 6469.25 | 1109.26 | 1871.43 | -414.82 | 516304.3 | 4401047.3 | 39°45'33.076"N | 80°48'34.776"W | 1916.86 | 347.50 | 8.41 |
| 7141.00 | 77.75 | 297.00 | 6480.24 | 1154.80 | 1892.50 | -455.37 | 516291.9 | 4401053.7 | 39°45'33.285"N | 80°48'35.295"W | 1946.51 | 346.47 | 5.76 |
| 7190.00 | 83.65 | 298.06 | 6488.16 | 1202.97 | 1914.84 | -498.23 | 516278.9 | 4401060.5 | 39°45'33.507"N | 80°48'35.843"W | 1978.60 | 345.42 | 12.23 |
| 7236.00 | 85.66 | 297.99 | 6492.44 | 1248.59 | 1936.36 | -538.65 | 516266.6 | 4401067.1 | 39°45'33.720"N | 80°48'36.360"W | 2009.89 | 344.46 | 4.37 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 7284.00 | 84.48 | 295.47 | 6496.57 | 1296.29 | 1957.87 | -581.36 | 516253.6 | 4401073.6 | 39°45'33.934"N | 80°48'36.906"W | 2042.36 | 343.46 | 5.78 |
| 7331.00 | 85.63 | 293.69 | 6500.62 | 1343.10 | 1977.34 | -623.94 | 516240.6 | 4401079.6 | 39°45'34.127"N | 80°48'37.451"W | 2073.45 | 342.49 | 4.50 |
| 7395.00 | 89.94 | 293.41 | 6503.09 | 1407.03 | 2002.89 | -682.55 | 516222.7 | 4401087.4 | 39°45'34.381"N | 80°48'38.201"W | 2116.00 | 341.18 | 6.75 |
| 7427.00 | 89.85 | 292.74 | 6503.15 | 1439.03 | 2015.43 | -711.99 | 516213.8 | 4401091.2 | 39°45'34.506"N | 80°48'38.578"W | 2137.50 | 340.54 | 2.11 |
| 7521.00 | 89.88 | 289.31 | 6503.37 | 1532.96 | 2049.15 | -799.72 | 516187.0 | 4401101.4 | 39°45'34.841"N | 80°48'39.700"W | 2199.68 | 338.68 | 3.65 |
| 7615.00 | 89.94 | 288.41 | 6503.52 | 1626.73 | 2079.54 | -888.67 | 516159.9 | 4401110.7 | 39°45'35.143"N | 80°48'40.838"W | 2261.46 | 336.86 | 0.96 |
| 7710.00 | 89.88 | 289.50 | 6503.67 | 1721.51 | 2110.40 | -978.52 | 516132.5 | 4401120.1 | 39°45'35.450"N | 80°48'41.988"W | 2326.21 | 335.12 | 1.15 |
| 7805.00 | 89.91 | 291.90 | 6503.84 | 1816.44 | 2143.97 | -1067.38 | 516105.5 | 4401130.3 | 39°45'35.783"N | 80°48'43.125"W | 2394.98 | 333.53 | 2.53 |
| 7899.00 | 89.91 | 294.20 | 6503.99 | 1910.43 | 2180.77 | -1153.87 | 516079.1 | 4401141.6 | 39°45'36.149"N | 80°48'44.231"W | 2467.22 | 332.12 | 2.45 |
| 7994.00 | 89.88 | 294.10 | 6504.17 | 2005.41 | 2219.64 | -1240.56 | 516052.7 | 4401153.4 | 39°45'36.535"N | 80°48'45.340"W | 2542.79 | 330.80 | 0.11 |
| 8089.00 | 89.91 | 294.60 | 6504.34 | 2100.37 | 2258.81 | -1327.10 | 516026.3 | 4401165.3 | 39°45'36.924"N | 80°48'46.447"W | 2619.82 | 329.57 | 0.53 |
| 8184.00 | 90.43 | 295.81 | 6504.06 | 2195.29 | 2299.27 | -1413.06 | 516000.2 | 4401177.7 | 39°45'37.325"N | 80°48'47.547"W | 2698.77 | 328.43 | 1.39 |
| 8279.00 | 90.40 | 294.61 | 6503.37 | 2290.21 | 2339.73 | -1499.01 | 515974.0 | 4401190.0 | 39°45'37.727"N | 80°48'48.646"W | 2778.73 | 327.35 | 1.26 |
| 8375.00 | 90.40 | 293.33 | 6502.70 | 2386.19 | 2378.73 | -1586.72 | 515947.2 | 4401201.9 | 39°45'38.114"N | 80°48'49.769"W | 2859.38 | 326.30 | 1.33 |
| 8471.00 | 90.46 | 293.92 | 6501.98 | 2482.17 | 2417.20 | -1674.67 | 515920.4 | 4401213.6 | 39°45'38.496"N | 80°48'50.894"W | 2940.64 | 325.29 | 0.62 |
| 8565.00 | 90.40 | 295.61 | 6501.27 | 2576.12 | 2456.57 | -1760.02 | 515894.4 | 4401225.6 | 39°45'38.887"N | 80°48'51.986"W | 3021.99 | 324.38 | 1.80 |
| 8660.00 | 90.46 | 295.03 | 6500.56 | 2671.03 | 2497.20 | -1845.89 | 515868.3 | 4401238.0 | 39°45'39.290"N | 80°48'53.084"W | 3105.37 | 323.53 | 0.61 |
| 8756.00 | 90.74 | 294.07 | 6499.56 | 2766.98 | 2537.08 | -1933.21 | 515841.7 | 4401250.1 | 39°45'39.686"N | 80°48'54.201"W | 3189.69 | 322.69 | 1.04 |
| 8850.00 | 90.74 | 293.05 | 6498.34 | 2860.96 | 2574.65 | -2019.37 | 515815.4 | 4401261.6 | 39°45'40.059"N | 80°48'55.303"W | 3272.11 | 321.89 | 1.09 |
| 8946.00 | 90.89 | 292.32 | 6496.98 | 2956.95 | 2611.67 | -2107.93 | 515788.4 | 4401272.8 | 39°45'40.427"N | 80°48'56.436"W | 3356.22 | 321.09 | 0.78 |
| 9041.00 | 90.99 | 290.79 | 6495.42 | 3051.91 | 2646.57 | -2196.27 | 515761.5 | 4401283.5 | 39°45'40.773"N | 80°48'57.567"W | 3439.18 | 320.31 | 1.61 |
| 9136.00 | 90.89 | 288.45 | 6493.86 | 3146.74 | 2678.46 | -2285.74 | 515734.3 | 4401293.2 | 39°45'41.090"N | 80°48'58.712"W | 3521.19 | 319.52 | 2.47 |
| 9231.00 | 90.86 | 287.50 | 6492.41 | 3241.38 | 2707.78 | -2376.09 | 515706.7 | 4401302.1 | 39°45'41.382"N | 80°48'59.868"W | 3602.48 | 318.73 | 1.00 |
| 9326.00 | 91.20 | 289.40 | 6490.70 | 3336.08 | 2737.83 | -2466.19 | 515679.3 | 4401311.3 | 39°45'41.681"N | 80°49'01.021"W | 3684.81 | 317.99 | 2.03 |
| 9420.00 | 91.17 | 291.72 | 6488.76 | 3429.98 | 2770.84 | -2554.17 | 515652.5 | 4401321.3 | 39°45'42.009"N | 80°49'02.147"W | 3768.47 | 317.33 | 2.47 |
| 9513.00 | 91.17 | 293.07 | 6486.86 | 3522.95 | 2806.26 | -2640.14 | 515626.3 | 4401332.1 | 39°45'42.361"N | 80°49'03.246"W | 3852.98 | 316.75 | 1.45 |
| 9608.00 | 90.89 | 294.99 | 6485.15 | 3617.91 | 2844.94 | -2726.89 | 515599.9 | 4401343.9 | 39°45'42.745"N | 80°49'04.356"W | 3940.76 | 316.21 | 2.04 |
| 9702.00 | 90.92 | 297.82 | 6483.66 | 3711.71 | 2886.73 | -2811.06 | 515574.2 | 4401356.6 | 39°45'43.159"N | 80°49'05.433"W | 4029.30 | 315.76 | 3.01 |
| 9797.00 | 90.86 | 299.91 | 6482.19 | 3806.18 | 2932.58 | -2894.25 | 515548.9 | 4401370.6 | 39°45'43.614"N | 80°49'06.497"W | 4120.28 | 315.38 | 2.20 |
| 9892.00 | 90.68 | 298.30 | 6480.91 | 3900.60 | 2978.79 | -2977.24 | 515523.6 | 4401384.7 | 39°45'44.072"N | 80°49'07.559"W | 4211.55 | 315.02 | 1.71 |
| 9988.00 | 90.58 | 295.73 | 6479.86 | 3996.33 | 3022.39 | -3062.75 | 515497.5 | 4401398.0 | 39°45'44.505"N | 80°49'08.653"W | 4302.94 | 314.62 | 2.68 |

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| WELLPATH DATA † = interpolated/extrapolated station | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 10083.00 | 90.55 | 294.27 | 6478.92 | 4091.26 | 3062.53 | -3148.85 | 515471.3 | 4401410.2 | 39°45'44.903"N | 80°49'09.754"W | 4392.53 | 314.20 | 1.54 |
| 10178.00 | 90.62 | 292.21 | 6477.95 | 4186.25 | 3100.01 | -3236.13 | 515444.7 | 4401421.6 | 39°45'45.276"N | 80°49'10.871"W | 4481.36 | 313.77 | 2.17 |
| 10272.00 | 90.49 | 292.36 | 6477.04 | 4280.24 | 3135.66 | -3323.10 | 515418.2 | 4401432.5 | 39°45'45.630"N | 80°49'11.983"W | 4568.96 | 313.34 | 0.21 |
| 10367.00 | 90.58 | 291.72 | 6476.15 | 4375.22 | 3171.31 | -3411.16 | 515391.4 | 4401443.3 | 39°45'45.984"N | 80°49'13.110"W | 4657.59 | 312.91 | 0.68 |
| 10461.00 | 90.52 | 291.84 | 6475.25 | 4469.20 | 3206.18 | -3498.44 | 515364.8 | 4401454.0 | 39°45'46.330"N | 80°49'14.227"W | 4745.39 | 312.50 | 0.14 |
| 10557.00 | 90.28 | 292.05 | 6474.58 | 4565.19 | 3242.06 | -3587.48 | 515337.7 | 4401464.9 | 39°45'46.686"N | 80°49'15.366"W | 4835.39 | 312.11 | 0.33 |
| 10652.00 | 90.37 | 293.03 | 6474.04 | 4660.18 | 3278.47 | -3675.22 | 515310.9 | 4401476.0 | 39°45'47.048"N | 80°49'16.489"W | 4925.00 | 311.73 | 1.04 |
| 10748.00 | 90.28 | 292.25 | 6473.50 | 4756.18 | 3315.43 | -3763.82 | 515283.9 | 4401487.3 | 39°45'47.415"N | 80°49'17.622"W | 5015.82 | 311.38 | 0.82 |
| 10843.00 | 90.31 | 292.10 | 6473.01 | 4851.17 | 3351.28 | -3851.80 | 515257.1 | 4401498.2 | 39°45'47.771"N | 80°49'18.748"W | 5105.63 | 311.03 | 0.16 |
| 10938.00 | 90.25 | 292.68 | 6472.54 | 4946.17 | 3387.47 | -3939.63 | 515230.4 | 4401509.2 | 39°45'48.130"N | 80°49'19.872"W | 5195.73 | 310.69 | 0.61 |
| 11033.00 | 90.34 | 295.73 | 6472.05 | 5041.13 | 3426.41 | -4026.27 | 515204.0 | 4401521.1 | 39°45'48.517"N | 80°49'20.980"W | 5286.89 | 310.40 | 3.21 |
| 11128.00 | 90.71 | 295.63 | 6471.18 | 5136.01 | 3467.58 | -4111.88 | 515177.9 | 4401533.6 | 39°45'48.925"N | 80°49'22.076"W | 5378.82 | 310.14 | 0.40 |
| 11222.00 | 90.65 | 294.05 | 6470.07 | 5229.94 | 3507.06 | -4197.18 | 515151.9 | 4401545.6 | 39°45'49.317"N | 80°49'23.167"W | 5469.53 | 309.88 | 1.68 |
| 11317.00 | 90.71 | 293.40 | 6468.94 | 5324.93 | 3545.28 | -4284.14 | 515125.4 | 4401557.3 | 39°45'49.697"N | 80°49'24.280"W | 5560.84 | 309.61 | 0.69 |
| 11411.00 | 90.62 | 291.79 | 6467.85 | 5418.92 | 3581.40 | -4370.92 | 515099.0 | 4401568.3 | 39°45'50.055"N | 80°49'25.390"W | 5650.78 | 309.33 | 1.72 |
| 11506.00 | 90.74 | 292.21 | 6466.72 | 5513.90 | 3616.98 | -4458.99 | 515072.1 | 4401579.1 | 39°45'50.409"N | 80°49'26.517"W | 5741.53 | 309.05 | 0.46 |
| 11601.00 | 90.62 | 292.09 | 6465.59 | 5608.88 | 3652.80 | -4546.98 | 515045.3 | 4401590.0 | 39°45'50.764"N | 80°49'27.643"W | 5832.49 | 308.78 | 0.18 |
| 11696.00 | 90.28 | 292.33 | 6464.85 | 5703.88 | 3688.71 | -4634.93 | 515018.5 | 4401601.0 | 39°45'51.121"N | 80°49'28.768"W | 5923.60 | 308.52 | 0.44 |
| 11792.00 | 90.22 | 292.12 | 6464.43 | 5799.87 | 3725.02 | -4723.79 | 514991.4 | 4401612.0 | 39°45'51.481"N | 80°49'29.905"W | 6015.81 | 308.26 | 0.23 |
| 11886.00 | 90.25 | 292.56 | 6464.04 | 5893.86 | 3760.75 | -4810.74 | 514965.0 | 4401622.9 | 39°45'51.836"N | 80°49'31.018"W | 6106.26 | 308.02 | 0.47 |
| 11981.00 | 90.31 | 293.18 | 6463.58 | 5988.86 | 3797.67 | -4898.27 | 514938.3 | 4401634.2 | 39°45'52.203"N | 80°49'32.138"W | 6198.01 | 307.79 | 0.66 |
| 12076.00 | 90.25 | 293.05 | 6463.11 | 6083.86 | 3834.96 | -4985.64 | 514911.7 | 4401645.5 | 39°45'52.573"N | 80°49'33.256"W | 6289.95 | 307.57 | 0.15 |
| 12171.00 | 90.28 | 292.99 | 6462.67 | 6178.86 | 3872.11 | -5073.07 | 514885.0 | 4401656.9 | 39°45'52.942"N | 80°49'34.374"W | 6381.95 | 307.35 | 0.07 |
| 12256.00 | 90.71 | 292.91 | 6461.94 | 6263.86 | 3905.25 | -5151.34 | 514861.2 | 4401667.0 | 39°45'53.271"N | 80°49'35.376"W | 6464.31 | 307.17 | 0.51 |
| 12282.00 | 90.71 | 292.91 | 6461.62 | 6289.85 | 3915.37 | -5175.29 | 514853.9 | 4401670.0 | 39°45'53.371"N | 80°49'35.682"W | 6489.51 | 307.11 | 0.00 |

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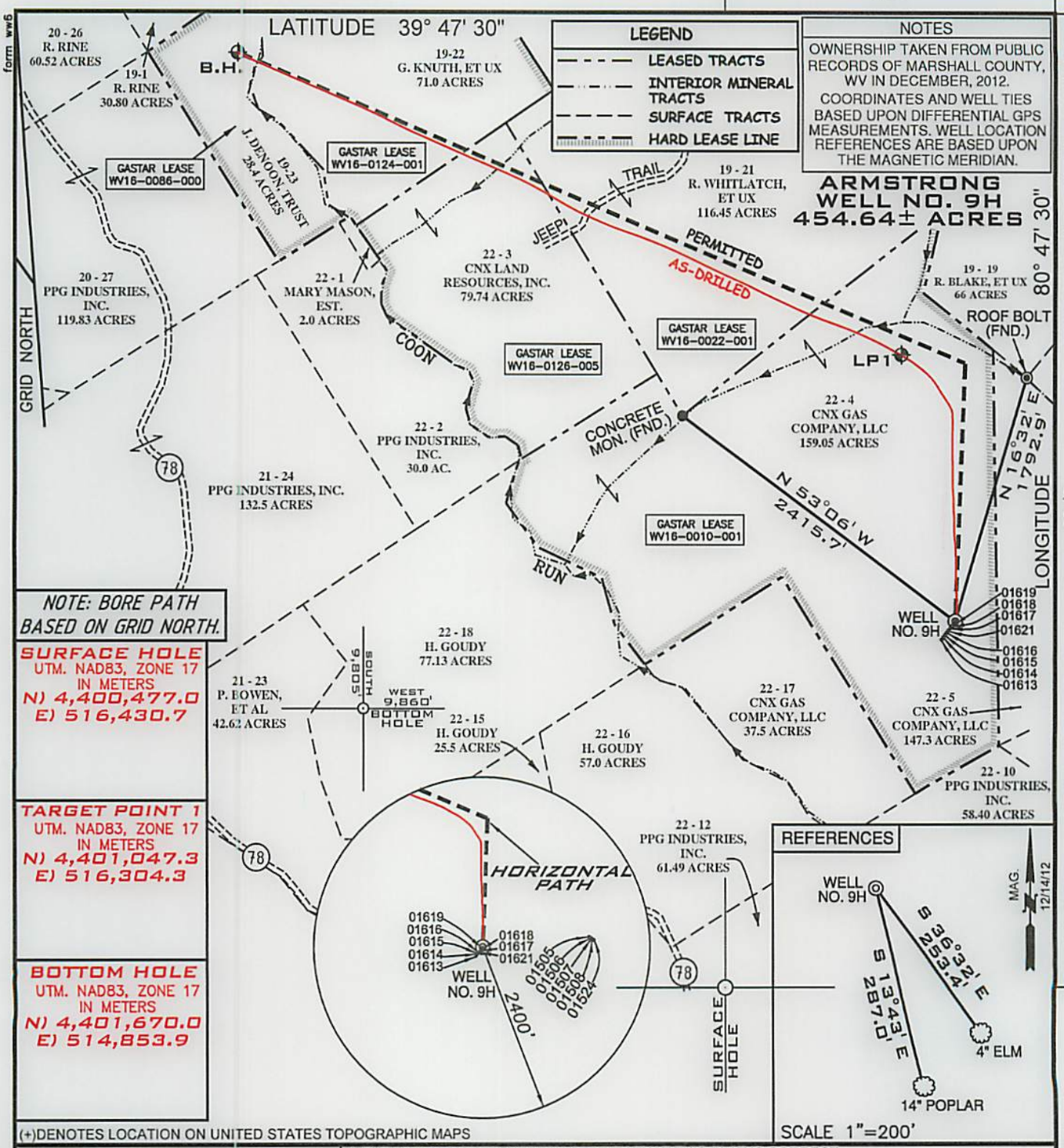
form ww6




NOTE: BORE PATH BASED ON GRID NORTH.

**SURFACE HOLE**
UTM. NAD83, ZONE 17
IN METERS
N) 4,400,477.0
E) 516,430.7

**TARGET POINT 1**
UTM. NAD83, ZONE 17
IN METERS
N) 4,401,047.3
E) 516,304.3

**BOTTOM HOLE**
UTM. NAD83, ZONE 17
IN METERS
N) 4,401,670.0
E) 514,853.9

(+)DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

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. 2122 Jonathan N. White

Jonathan N. White LICENSED NO. 2122 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

STATE OF WEST VIRGINIA MONTAIN SEMPER LIBER

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) ___
___ PLUG & ABANDON ___ CLEAN OUT & REPLUG ___

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

COUNTY NAME PERMIT

WR-35
Rev. 8/23/13

Page ___ of ___

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

API 47 - 51 - 01621 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name
Farm name CNX Gas Company, LLC Well Number 5H
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 4400457.4 | Easting 516416.1 |
| Landing Point of Curve | Northing 4400547.9 | Easting 516320.0 |
| Bottom Hole | Northing 4401216.2 | Easting 514671.4 |

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 12/1/2013 Date drilling ceased 7/22/2014
Date completion activities began 9/11/2014 Date completion activities ceased 4/21/2015
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

WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01621 Farm name CNX Gas Company, LLC Well number 5H

| 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" | 1252' | New | H-40 / 48 #/ft | 80' | Yes |
| Intermediate 1 | 12.25" | 9.625" | 2671' | New | J-55 / 36 #/ft | 80' | Yes |
| Intermediate 2 | | | | | | | |
| Intermediate 3 | | | | | | | |
| Production | 8.875" & 8.5" | 5.5" | 12446' | New | P-110 / 20 #/ft | | Yes |
| Tubing | | 2.375" | 6578' | 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 | 934 | 15.6 | 1.21 | 1130 | Surface | 8 |
| Intermediate 1 | Class A | 855 | 15.6 | 1.19 | 1022 | Surface | 8 |
| Intermediate 2 | | | | | | | |
| Intermediate 3 | | | | | | | |
| Production | 50:50 Class A | 2821 | 14.5 | 1.21 | 3413 | Surface | 8 |
| Tubing | | | | | | | |

Drillers TD (ft) 12,512' Loggers TD (ft) N/A
Deepest formation penetrated Marcellus Plug back to (ft) N/A
Plug back procedure N/A

Kick off depth (ft) 5736'

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 - 216 Centralizers total - 1 centralizer every joint in the lateral and curve and 1 centralizer every other 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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WR-35
Rev. 8/23/13



API 47- 51 - 01621 Farm name CNX Gas Company, LLC Well number 5H

## PERFORATION RECORD

| Stage No. | Perforation date | Perforated from MD ft. | Perforated to MD ft. | Number of Perforations | Formation(s) |
|---|---|---|---|---|---|
| | | | | | SEE ATTACHED PERF INFO SHEET |
| | | | | | |
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Please insert additional pages as applicable.

## STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

| Stage No. | Stimulations Date | Ave Pump Rate (BPM) | Ave Treatment Pressure (PSI) | Max Breakdown Pressure (PSI) | ISIP (PSI) | Amount of Proppant (lbs) | Amount of Water (bbls) | Amount of Nitrogen/other (units) |
|---|---|---|---|---|---|---|---|---|
| | | | See Attached | | | | | |
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Please insert additional pages as applicable.

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WR-35
Rev. 8/23/13

Page ___ of ___

API 47- 51 - 01621 Farm name CNX Gas Company, LLC Well number 5H

| PRODUCING FORMATION(S) | DEPTHS | |
|---|---|---|
| Marcellus | 6,470' - 6,514' TVD | 6,665' - 12,512' MD |
| | | |
| | | |
| | | |

Please insert additional pages as applicable.

GAS TEST ☐ Build up ☐ Drawdown ☒ Open Flow OIL TEST ☒ Flow ☐ Pump

SHUT-IN PRESSURE Surface 1525 psi Bottom Hole 4349 psi DURATION OF TEST 206 hrs

| OPEN FLOW | Gas | Oil | NGL | Water | GAS MEASURED BY |
|---|---|---|---|---|---|
| | 2701 mcfpd | 272 bpd | ___ bpd | 581 bpd | ☐ Estimated ☒ Orifice ☐ Pilot |

| LITHOLOGY/ FORMATION NAME | TOP DEPTH IN FT TVD | BOTTOM 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, $H_2S$, ETC) |
|---|---|---|---|---|---|
| | 0 | | 0 | | SEE ATTACHED |
| | | | | | |
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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.

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

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

5L.01621

## Armstrong 5H Perforation Information

| Stage | Date | Perforated interval From ft | Perforated interval To ft | Number of Perfs | Formation |
|---|---|---|---|---|---|
| 1 | 9/16/2014 | 12331 | 12248 | 48 | Marcellus |
| 2 | 9/28/2014 | 12069 | 11835 | 48 | Marcellus |
| 3 | 9/29/2014 | 11757.5 | 11604 | 48 | Marcellus |
| 4 | 9/30/2014 | 11527 | 11444.5 | 36 | Marcellus |
| 5 | 10/3/2014 | 11395 | 11255.5 | 48 | Marcellus |
| 6 | 10/4/2014 | 11187 | 11020 | 48 | Marcellus |
| 7 | 10/5/2014 | 10954.5 | 10828 | 48 | Marcellus |
| 8 | 10/5/2014 | 10774 | 10644 | 48 | Marcellus |
| 9 | 10/5/2014 | 10601 | 10357 | 48 | Marcellus |
| 10 | 10/5/2014 | 10279.5 | 10087 | 48 | Marcellus |
| 11 | 10/6/2014 | 10048 | 9971 | 36 | Marcellus |
| 12 | 10/6/2014 | 9899 | 9742 | 48 | Marcellus |
| 13 | 10/6/2014 | 9639 | 9496 | 48 | Marcellus |
| 14 | 10/7/2014 | 9437 | 9262.5 | 48 | Marcellus |
| 15 | 10/9/2014 | 9207 | 9055 | 48 | Marcellus |
| 16 | 10/9/2014 | 8992 | 8819.5 | 48 | Marcellus |
| 17 | 10/10/2014 | 8729 | 8564 | 48 | Marcellus |
| 18 | 10/11/2014 | 8524 | 8284 | 48 | Marcellus |
| 19 | 10/12/2014 | 8237 | 8093 | 36 | Marcellus |
| 20 | 10/13/2014 | 8037 | 7851.5 | 48 | Marcellus |
| 21 | 10/14/2014 | 7800 | 7611 | 48 | Marcellus |
| 22 | **10/15/2014** | 7550 | 7393 | 48 | Marcellus |
| 23 | 10/16/2014 | 7320 | 7172.5 | 48 | Marcellus |
| 24 | 10/17/2014 | 7138 | 7004 | 48 | Marcellus |
| 25 | 10/18/2014 | 6910 | 6811.5 | 36 | Marcellus |

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**Fluid & Sand Volume Summary - Armstrong #5H**

| Stage | Stimulation Date | Avg Pump Rate (BPM) | Avg Pressure (PSI) | Max Break Pres. (PSI) | ISIP (PSI) | Sand Total (lbs) | Total Water (bbls) |
|---|---|---|---|---|---|---|---|
| 1 | 9/27/2014 | 75 | 6106 | 4534 | 4276 | 86,090 | 2907 |
| 2 | 9/28/2014 | 78 | 5942 | 4405 | 3755 | 245,294 | 6173 |
| 3 | 9/29/2014 | 77 | 6097 | 4790 | 4242 | 259,713 | 6205 |
| 4 | 9/30/2014 | 78 | 6608 | 5318 | 4030 | 256,585 | 6200 |
| 5 | 10/3/2014 | 78 | 6225 | 5111 | 4308 | 269,564 | 6907 |
| 6 | 10/4/2014 | 78 | 6084 | 4715 | 4429 | 263,444 | 6481 |
| 7 | 10/5/2014 | 78 | 6080 | 4550 | 3723 | 217,303 | 6098 |
| 8 | 10/5/2014 | 78 | 6089 | 4676 | 4150 | 253,914 | 6279 |
| 9 | 10/5/2014 | 79 | 6025 | 4775 | 3757 | 252,603 | 6325 |
| 10 | 10/6/2015 | 79 | 5987 | 4770 | 4279 | 253,990 | 6325 |
| 11 | 10/6/2014 | 79 | 6347 | 5197 | 4178 | 252,897 | 6260 |
| 12 | 10/6/2014 | 79 | 6010 | 4676 | 4134 | 250,401 | 6127 |
| 13 | 10/7/2014 | 79 | 5920 | 5103 | 3733 | 252,858 | 6375 |
| 14 | 10/7/2014 | 77 | 5801 | 4552 | 3761 | 154,409 | 4978 |
| 15 | 10/9/2014 | 76 | 6039 | 6750 | 3969 | 133,024 | 4615 |
| 16 | 10/10/2014 | 77 | 5763 | 4432 | 3754 | 148,291 | 6082 |
| 17 | 10/10/2014 | 82 | 5614 | 4959 | 3644 | 155,690 | 6089 |
| 18 | 10/12/2014 | 78 | 5370 | 4259 | 3532 | 145,075 | 6099 |
| 19 | 10/13/2014 | 81 | 6154 | 4886 | 4166 | 212,012 | 5990 |
| 20 | 10/14/2014 | 83 | 5672 | 4434 | 4150 | 214,595 | 8607 |
| 21 | 10/15/2014 | 83 | 5646 | 4580 | 4056 | 214,901 | 8509 |
| 22 | 10/16/2014 | 82 | 5363 | 4577 | 3928 | 215,678 | 8486 |
| 23 | 10/17/2014 | 81 | 6346 | 4336 | 3437 | 218,192 | 9208 |
| 24 | 10/18/2014 | 80 | 5508 | 4643 | 4079 | 221,760 | 8543 |
| 25 | 10/19/2014 | 80 | 5859 | 5025 | 3731 | 220,245 | 8533 |

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51.01621

| 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 SANDSTC | 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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Welcome Tracy H., Operator - OpNo. G1410907 [ Log Out ]

**Hydraulic Fracturing** DISCLOSURE

FracFocus Chemical Disclosure Registry

Submission to FracFocus using Excel Spreadsheets has been turned off.

FIND A WELL BY STATE | ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

## Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

Preview Disclosure PDF | Validate Disclosure | Submit To FracFocus

## Hydraulic Fracturing Data

Edit

| Job Start Date | Job End Date | API Number | State & County |
|---|---|---|---|
| 9/27/2014 | 10/20/2014 | 47-051-01621-00-00 | West Virginia --- Marshall |

Well Name
ARMSTRONG 5H

| Longitude | Latitude | Datum | Federal/Tribal Well? |
|---|---|---|---|
| -80.82887 | 39.76067 | NAD27 | ☐ |

| True Vertical Depth (ft) | Total Water Vol (gal) | Total Non Water Vol | Total Mass (lbs) |
|---|---|---|---|
| 6490 | 16256410.8 | 0 | 141080548.461 |

## 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% | 96.0385773% | | 135542701.96824 |
| Edit Sand, White, 40/70 | Baker Hughes | Proppant | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | 2.7008% | | 3810313 |
| Edit Sand, White, 30/50 | Baker Hughes | Proppant | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .8595% | | 1212597 |
| Edit HCl, 10.1 - 15% | Baker Hughes | Acidizing | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .271374% | SmartCare Product | 382856.67 |
| Edit FRW-18 | Baker Hughes | Friction Reducer | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0372759% | SmartCare Product | 52589.16 |
| Edit GW-3LDF | Baker Hughes | Gelling Agent | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0283476% | SmartCare Product | 39993.03 |
| Edit Alpha 1427 | Baker Hughes | Biocide | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0092225% | SmartCare Product | 13011.25 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Edit | FlexSand MSE, 20/40 mesh | Baker Hughes | Proppant | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0070881% | | 10000 |
| Edit | Enzyme G-NE | Baker Hughes | Breaker | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0058036% | SmartCare Product | 8187.7196 |
| Edit | ScaleSorb 4, (50# bag) | Baker Hughes | Scale Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0028714% | SmartCare Product | 4051 |
| Edit | Ferrotrol 300L | Baker Hughes | Iron Control | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0018691% | SmartCare Product | 2636.91313 |
| Edit | CI-14 | Baker Hughes | Corrosion Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0008582% | SmartCare Product | 1210.75 |
| Edit | ScaleSorb 7 (50 lb) | Baker Hughes | Scale Inhibitor | | | | | | |
| | | | | MSDS and Non-MSDS Ingredients Listed Below | N/A | 0% | .0002835% | | 400 |

## Non-MSDS Chemical Ingredients

New Ingredients

| | Trade Name | Supplier | Purpose | Ingredients | CAS # | % High Additive | % HF Job | Comments | Ingredient Mass |
|---|---|---|---|---|---|---|---|---|---|
| Edit | Ingredients in Additive(s) (MSDS and non-MSDS) | Baker Hughes | See Trade Name(s) List | | | | | | |
| | | | | Crystalline Silica (Quartz) | 14808-60-7 | 100% | 3.5590069% | | 5022954.51 |
| | | | | Water | 7732-18-5 | 95% | .2574862% | | 363399.481185 |
| | | | | Hydrochloric Acid | 7647-01-0 | 15% | .0406995% | | 57440.608 |
| | | | | Mineral Oil | 8042-47-5 | 70% | .0198359% | | 27995.121 |
| | | | | Guar Gum | 9000-30-0 | 60% | .0170022% | | 23995.818 |
| | | | | Hydrotreated Light Distillate | 64742-47-8 | 30% | .0111786% | | 15776.748 |
| | | | | Poly (acrylamide-co-acrylic acid) partial sodium salt | 62649-23-4 | 30% | .0111786% | | 15776.748 |
| | | | | Petroleum Distillates | 64742-47-8 | 30% | .0085011% | | 11997.909 |
| | | | | Paraffinic Petroleum Distillate | 64742-55-8 | 30% | .0085011% | | 11997.909 |
| | | | | Walnut Shells | 84012-43-1 | 90% | .0063769% | | 9000 |
| | | | | Diatomaceous Earth, Calcined | 91053-39-3 | 100% | .0031537% | | 4451 |
| | | | | Glutaraldehyde | 111-30-8 | 30% | .0027657% | | 3903.375 |
| | | | | Sodium Chloride | 7647-14-5 | 10% | .0018914% | | 2669.458 |
| | | | | Crystalline Silica: Quartz | 14808-60-7 | 5% | .0014169% | | 1999.6515 |
| | | | | Isotridecanol, ethoxylated | 9043-30-5 | 5% | .0014169% | | 1999.6515 |
| | | | | 1-butoxy-2-propanol | 5131-66-8 | 5% | .0014169% | | 1999.6515 |
| | | | | Citric Acid | 77-92-9 | 60% | .001121% | | 1582.147878 |
| | | | | Ammonium Chloride | 12125-02-9 | 3% | .0011179% | | 1577.6748 |
| | | | | Didecyl Dimethyl Ammonium Chloride | 7173-51-5 | 10% | .0009219% | | 1301.125 |
| | | | | Methanol | 67-56-1 | 100% | .0008579% | | 1210.75 |

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| | | | | |
|---|---|---|---|---|
| Alcohols, C12-16, ethoxylated | 68551-12-2 | 2% | .0007452% | 1051.7832 |
| Oleamide DEA | 93-83-4 | 2% | .0007452% | 1051.7832 |
| Cured Resin | 25085-99-8 | 10% | .0007085% | 1000 |
| Quaternary Ammonium Compound | 68424-85-1 | 5% | .000461% | 650.5625 |
| Ethanol | 64-17-5 | 5% | .000461% | 650.5625 |
| Sodium chloride | 7647-14-5 | 15% | .0004305% | 607.65 |
| Sodium Carboxymethyl inulin | 430439-54-6 | 15% | .0004305% | 607.65 |
| Hemicellulase Enzyme Concentrate | 9025-56-3 | 5% | .0002901% | 409.38598 |
| Polyoxyalkylenes | 68951-67-7 | 30% | .0002574% | 363.225 |
| Sorbitan Monooleate | 1338-43-8 | .5% | .0001863% | 262.9458 |
| Polyoxythylene Sorbitan Monooleate | 9005-65-6 | .5% | .0001863% | 262.9458 |
| Sodium diglycolate | 35249-69-5 | 5% | .0001435% | 202.55 |
| Sodium glycolate | 2836-32-0 | 5% | .0001435% | 202.55 |
| Fatty Acids | 61790-12-3 | 10% | .0000858% | 121.075 |
| Organo Phosphorus Salt | Trade Secret , disc. | 30% | .000085% | 120 |
| Modified Thiourea Polymer | 68527-49-1 | 7% | .0000601% | 84.7525 |
| Propargyl Alcohol | 107-19-7 | 5% | .0000429% | 60.5375 |
| Olefin | 64743-02-8 | 5% | .0000429% | 60.5375 |
| Crystalline Silica (Cristobaloite) | 14464-46-1 | 1% | .0000287% | 40.51 |
| 2-butoxy-1-propanol | 15821-83-7 | .1% | .0000283% | 39.99303 |
| Formaldehyde | 50-00-0 | 1% | .0000086% | 12.1075 |
| Sodium Bisulfate | 7631-90-5 | 1% | .0000028% | 4 |
| Sodium Sulfonate | 870-72-4 | .5% | .0000014% | 2 |

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Armstrong 5H Cement and additives

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

Coal: Class A + 2% CaCl + ¼ # per sack flake

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

Production: 50:50 Class A + 3 lbs/sk BA-90 + .35% R-3 + .3% MPA-170

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# GASTAR EXPLORATION USA, INC.

Location: Marshall County, WV
Field: Marshall
Facility: Armstrong

Slot: Slot #5
Well: Armstrong 5H
Wellbore: Armstrong 5H (PWB)

BAKER HUGHES

51-01621

## Location Information

| Facility Name | | | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Armstrong | | | 1694263.000 | 14437151.000 | 39°45'13.773"N | 80°48'30.287"W |
| Slot | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
| Slot #5 | 16.01 | 12.00 | 1694275.000 | 14437167.000 | 39°45'13.931"N | 80°48'30.132"W |
| Nomac 323 (RT) to Mud line (At Slot: Slot #5) | | | | | 29.4ft | |
| Mean Sea Level to Mud line (At Slot: Slot #5) | | | | | -1278ft | |
| Nomac 323 (RT) to Mean Sea Level | | | | | 1307.4ft | |

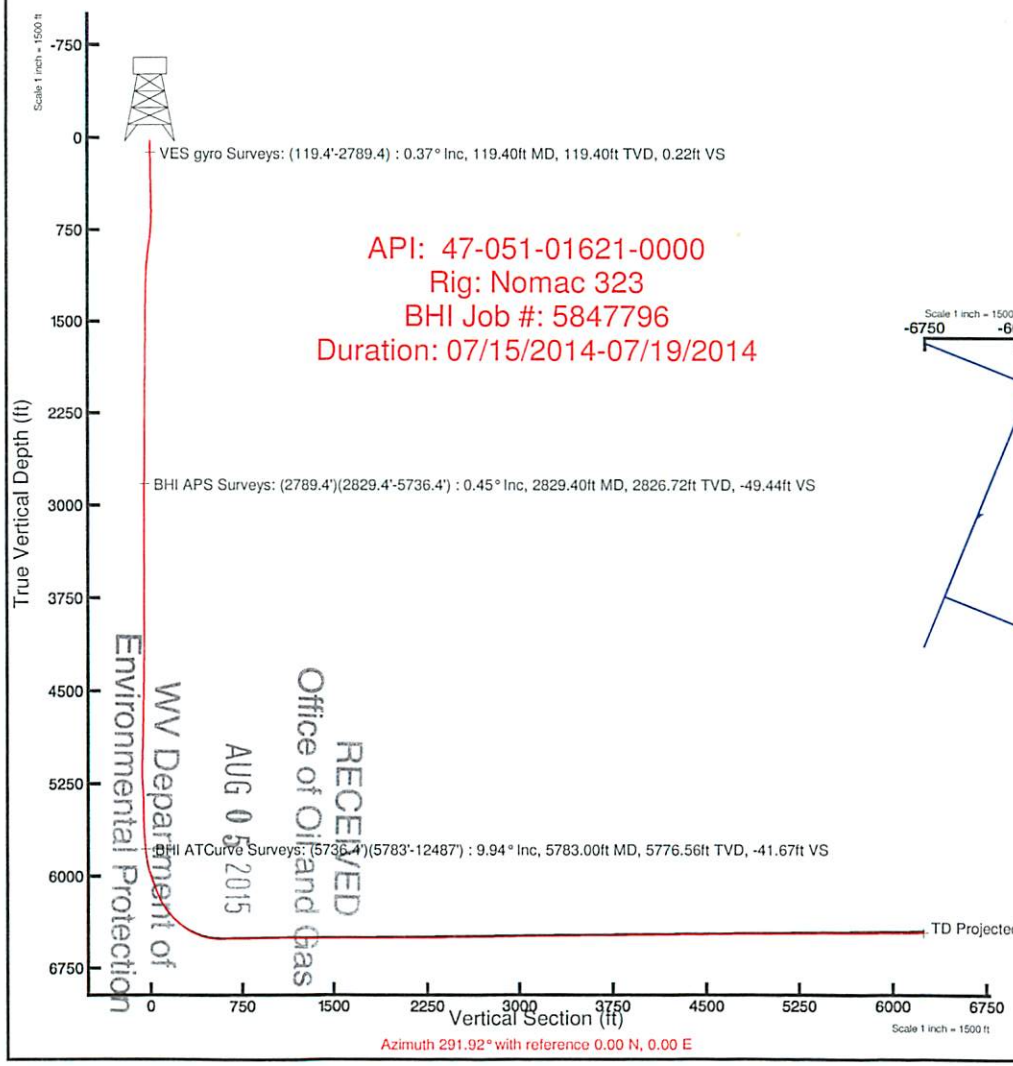
## Well Profile Data

| Design Comment | MD (ft) | Inc (°) | Az (°) | TVD (ft) | Local N (ft) | Local E (ft) | DLS (°/100ft) | VS (ft) |
|---|---|---|---|---|---|---|---|---|
| Tie On | 5736.40 | 8.830 | 345.930 | 5730.58 | 62.91 | 74.99 | 2.67 | -46.08 |
| End of Tangent | 5828.40 | 8.830 | 345.930 | 5821.49 | 76.61 | 71.56 | 0.00 | -37.79 |
| End of 3D Arc | 5995.59 | 21.294 | 309.805 | 5982.91 | 108.67 | 44.96 | 9.00 | -1.14 |
| End of Tangent | 6158.62 | 21.294 | 309.805 | 6134.81 | 146.57 | -0.52 | 0.00 | 55.20 |
| LP | 6862.39 | 90.600 | 291.920 | 6507.00 | 391.31 | -468.01 | 10.00 | 598.91 |
| BHL | 12505.94 | 90.600 | 291.920 | 6447.90 | 2498.00 | -5723.28 | 0.00 | 6242.05 |

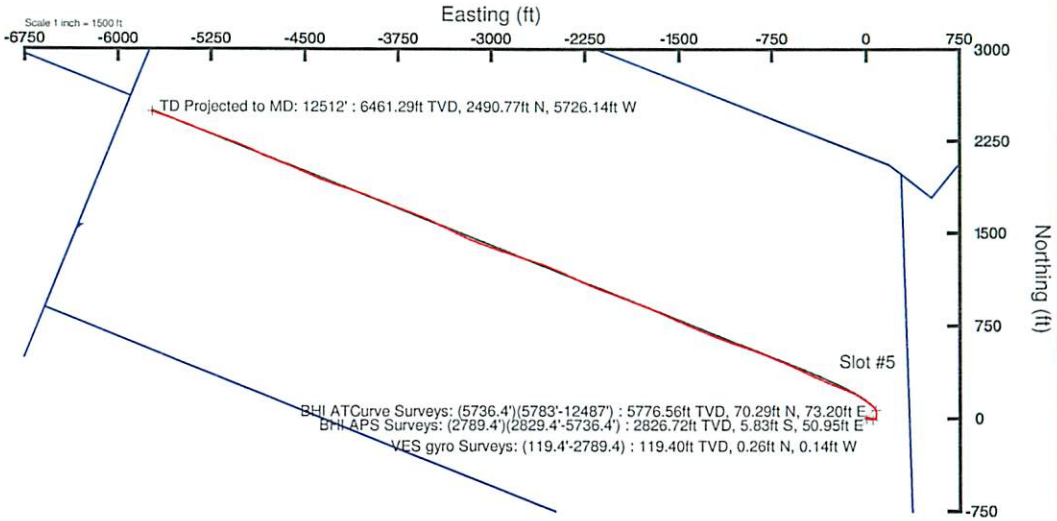
## Targets

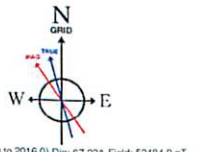
| Name | MD (ft) | TVD (ft) | Local N (ft) | Local E (ft) | Grid East (US ft) | Grid North (US ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| Armstrong 5H PBHL Rev-2 | 12505.94 | 6447.90 | 2498.00 | -5723.28 | 1688554.00 | 14439664.00 | 39°45'38.733"N | 80°49'43.351"W |
| Armstrong 5H PBHL Rev- | | 6487.40 | 2498.00 | -5723.28 | 1688554.00 | 14439664.00 | 39°45'38.733"N | 80°49'43.351"W |
| Armstrong 5H LP: Rev-1 | 6862.39 | 6507.00 | 391.31 | -468.01 | 1693787.18 | 14437558.15 | 39°45'17.808"N | 80°48'36.370"W |

| | |
|---|---|
| Plot reference wellpath is Armstrong 5H PWP Rev-D.0 | |
| True vertical depths are referenced to Nomac 323 (RT) | Grid System: NAD83 / UTM Zone 17 North, US feet |
| Measured depths are referenced to Nomac 323 (RT) | North Reference: Grid north |
| Nomac 323 (RT) to Mean Sea Level: 1307.4 feet | Scale: True distance |
| Mean Sea Level to Mud line (At Slot: Slot #5): -1278 feet | Depths are in feet |
| Coordinates are in feet referenced to Slot | Created by: frisjesl on 7/21/2014 |




API: 47-051-01621-0000
Rig: Nomac 323
BHI Job #: 5847796
Duration: 07/15/2014-07/19/2014




BGGM (1945.0 to 2016.0) Dip: 67.23° Field: 52484.9 nT
Magnetic North is 8.54 degrees West of True North (at 7/1/2014)
Grid North is 0.12 degrees East of True North
To correct azimuth from True to Grid subtract 0.12 degrees
To correct azimuth from Magnetic to Grid subtract 8.66 degrees

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| REFERENCE WELLPATH IDENTIFICATION | | | |
|---|---|---|---|
| Operator | GASTAR EXPLORATION INC. | Slot | Slot #5 |
| Area | Marshall County, WV | Well | Armstrong 5H |
| Field | Marshall | Wellbore | Armstrong 5H (AWB) |
| Facility | Armstrong | Wellpath | Armstrong 5H (AWP) Proj: 12,512' |
| | | Sidetrack | (none) |

**WELLPATH DATA † = interpolated/extrapolated station**

| | MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| † | 0.00 | 0.00 | 331.39 | 0.00 | 0.00 | 0.00 | 0.00 | 516416.1 | 4400457.4 | 39°45'13.931"N | 80°48'30.132"W | 0.00 | 0.00 | 0.00 |
| | 29.40 | 0.00 | 331.39 | 29.40 | 0.00 | 0.00 | 0.00 | 516416.1 | 4400457.4 | 39°45'13.931"N | 80°48'30.132"W | 0.00 | 0.00 | 0.00 |
| | 119.40 | 0.37 | 331.39 | 119.40 | 0.22 | 0.26 | -0.14 | 516416.0 | 4400457.4 | 39°45'13.934"N | 80°48'30.134"W | 0.29 | 331.39 | 0.41 |
| | 219.40 | 0.68 | 296.29 | 219.40 | 1.07 | 0.80 | -0.83 | 516415.8 | 4400457.5 | 39°45'13.939"N | 80°48'30.143"W | 1.15 | 314.14 | 0.43 |
| | 319.40 | 1.28 | 320.99 | 319.38 | 2.63 | 1.93 | -2.06 | 516415.4 | 4400457.9 | 39°45'13.950"N | 80°48'30.159"W | 2.82 | 313.15 | 0.72 |
| | 419.40 | 1.73 | 310.70 | 419.35 | 5.04 | 3.78 | -3.91 | 516414.9 | 4400458.5 | 39°45'13.968"N | 80°48'30.182"W | 5.44 | 314.08 | 0.52 |
| | 519.40 | 1.77 | 347.89 | 519.30 | 7.33 | 6.28 | -5.38 | 516414.4 | 4400459.2 | 39°45'13.993"N | 80°48'30.201"W | 8.27 | 319.43 | 1.12 |
| | 619.40 | 2.21 | 28.28 | 619.25 | 7.98 | 9.49 | -4.79 | 516414.6 | 4400460.2 | 39°45'14.025"N | 80°48'30.193"W | 10.63 | 333.22 | 1.43 |
| | 719.40 | 4.22 | 73.87 | 719.10 | 4.87 | 12.21 | -0.34 | 516415.9 | 4400461.0 | 39°45'14.052"N | 80°48'30.136"W | 12.21 | 358.41 | 3.10 |
| | 819.40 | 7.62 | 90.18 | 818.56 | -4.19 | 13.21 | 9.83 | 516419.0 | 4400461.3 | 39°45'14.061"N | 80°48'30.006"W | 16.47 | 36.66 | 3.76 |
| | 919.40 | 7.07 | 101.03 | 917.74 | -16.39 | 12.01 | 22.50 | 516422.9 | 4400461.0 | 39°45'14.049"N | 80°48'29.844"W | 25.51 | 61.91 | 1.49 |
| | 1019.40 | 5.43 | 110.94 | 1017.15 | -27.17 | 9.14 | 32.96 | 516426.1 | 4400460.1 | 39°45'14.021"N | 80°48'29.710"W | 34.21 | 74.50 | 1.96 |
| | 1119.40 | 2.90 | 128.57 | 1116.88 | -34.32 | 5.87 | 39.36 | 516428.0 | 4400459.1 | 39°45'13.988"N | 80°48'29.628"W | 39.80 | 81.51 | 2.81 |
| | 1219.40 | 1.40 | 147.58 | 1216.81 | -37.74 | 3.27 | 41.99 | 516428.8 | 4400458.3 | 39°45'13.962"N | 80°48'29.595"W | 42.12 | 85.55 | 1.64 |
| | 1319.40 | 0.70 | 156.96 | 1316.79 | -39.16 | 1.67 | 42.89 | 516429.1 | 4400457.8 | 39°45'13.947"N | 80°48'29.583"W | 42.92 | 87.77 | 0.72 |
| | 1419.40 | 0.55 | 160.93 | 1416.78 | -39.91 | 0.66 | 43.28 | 516429.2 | 4400457.5 | 39°45'13.937"N | 80°48'29.578"W | 43.29 | 89.13 | 0.16 |
| | 1519.40 | 0.68 | 165.20 | 1516.78 | -40.58 | -0.37 | 43.59 | 516429.3 | 4400457.2 | 39°45'13.926"N | 80°48'29.574"W | 43.59 | 90.49 | 0.14 |
| | 1619.40 | 0.74 | 155.15 | 1616.77 | -41.40 | -1.53 | 44.01 | 516429.5 | 4400456.8 | 39°45'13.915"N | 80°48'29.569"W | 44.04 | 91.99 | 0.14 |
| | 1719.40 | 0.73 | 158.58 | 1716.76 | -42.31 | -2.71 | 44.52 | 516429.6 | 4400456.5 | 39°45'13.903"N | 80°48'29.562"W | 44.60 | 93.48 | 0.05 |
| | 1819.40 | 0.76 | 169.90 | 1816.75 | -43.10 | -3.96 | 44.87 | 516429.7 | 4400456.1 | 39°45'13.891"N | 80°48'29.558"W | 45.04 | 95.04 | 0.15 |
| | 1919.40 | 0.70 | 157.15 | 1916.74 | -43.88 | -5.17 | 45.22 | 516429.8 | 4400455.7 | 39°45'13.879"N | 80°48'29.554"W | 45.52 | 96.52 | 0.17 |
| | 2019.40 | 0.65 | 143.21 | 2016.74 | -44.80 | -6.19 | 45.80 | 516430.0 | 4400455.4 | 39°45'13.869"N | 80°48'29.546"W | 46.21 | 97.70 | 0.17 |
| | 2119.40 | 0.46 | 113.69 | 2116.73 | -45.68 | -6.80 | 46.50 | 516430.2 | 4400455.2 | 39°45'13.863"N | 80°48'29.537"W | 47.00 | 98.32 | 0.34 |
| | 2219.40 | 0.39 | 110.54 | 2216.73 | -46.42 | -7.09 | 47.19 | 516430.4 | 4400455.1 | 39°45'13.860"N | 80°48'29.528"W | 47.72 | 98.54 | 0.07 |
| | 2319.40 | 0.40 | 84.72 | 2316.73 | -47.07 | -7.17 | 47.86 | 516430.6 | 4400455.1 | 39°45'13.859"N | 80°48'29.520"W | 48.39 | 98.52 | 0.18 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 2419.40 | 0.39 | 78.20 | 2416.73 | -47.67 | -7.07 | 48.54 | 516430.8 | 4400455.1 | 39°45'13.860"N | 80°48'29.511"W | 49.05 | 98.29 | 0.05 |
| 2519.40 | 0.57 | 71.83 | 2516.72 | -48.33 | -6.85 | 49.34 | 516431.1 | 4400455.2 | 39°45'13.862"N | 80°48'29.501"W | 49.82 | 97.90 | 0.19 |
| 2619.40 | 0.18 | 50.72 | 2616.72 | -48.79 | -6.59 | 49.94 | 516431.3 | 4400455.3 | 39°45'13.865"N | 80°48'29.493"W | 50.37 | 97.52 | 0.41 |
| 2719.40 | 0.30 | 51.29 | 2716.72 | -48.99 | -6.33 | 50.26 | 516431.4 | 4400455.4 | 39°45'13.867"N | 80°48'29.489"W | 50.66 | 97.18 | 0.12 |
| 2789.40 | 0.53 | 53.74 | 2786.72 | -49.25 | -6.02 | 50.67 | 516431.5 | 4400455.5 | 39°45'13.870"N | 80°48'29.484"W | 51.02 | 96.78 | 0.33 |
| 2829.40 | 0.45 | 58.48 | 2826.72 | -49.44 | -5.83 | 50.95 | 516431.6 | 4400455.5 | 39°45'13.872"N | 80°48'29.480"W | 51.28 | 96.53 | 0.22 |
| 2861.40 | 0.44 | 78.74 | 2858.71 | -49.62 | -5.74 | 51.18 | 516431.6 | 4400455.6 | 39°45'13.873"N | 80°48'29.477"W | 51.50 | 96.40 | 0.49 |
| 2924.40 | 0.40 | 92.29 | 2921.71 | -50.03 | -5.70 | 51.64 | 516431.8 | 4400455.6 | 39°45'13.874"N | 80°48'29.471"W | 51.95 | 96.30 | 0.17 |
| 2986.40 | 0.34 | 126.08 | 2983.71 | -50.41 | -5.82 | 52.00 | 516431.9 | 4400455.5 | 39°45'13.872"N | 80°48'29.467"W | 52.33 | 96.39 | 0.36 |
| 3049.40 | 0.44 | 113.90 | 3046.71 | -50.84 | -6.03 | 52.37 | 516432.0 | 4400455.5 | 39°45'13.870"N | 80°48'29.462"W | 52.72 | 96.57 | 0.21 |
| 3111.40 | 0.08 | 181.00 | 3108.71 | -51.09 | -6.17 | 52.59 | 516432.1 | 4400455.4 | 39°45'13.869"N | 80°48'29.459"W | 52.95 | 96.69 | 0.67 |
| 3173.40 | 0.10 | 162.44 | 3170.71 | -51.14 | -6.26 | 52.61 | 516432.1 | 4400455.4 | 39°45'13.868"N | 80°48'29.459"W | 52.98 | 96.79 | 0.06 |
| 3267.40 | 0.31 | 150.85 | 3264.71 | -51.39 | -6.56 | 52.75 | 516432.1 | 4400455.3 | 39°45'13.865"N | 80°48'29.457"W | 53.16 | 97.09 | 0.23 |
| 3362.40 | 0.05 | 332.66 | 3359.71 | -51.56 | -6.75 | 52.86 | 516432.2 | 4400455.2 | 39°45'13.863"N | 80°48'29.456"W | 53.29 | 97.28 | 0.38 |
| 3457.40 | 0.45 | 294.07 | 3454.71 | -51.15 | -6.56 | 52.50 | 516432.0 | 4400455.3 | 39°45'13.865"N | 80°48'29.460"W | 52.91 | 97.12 | 0.43 |
| 3552.40 | 0.27 | 277.09 | 3549.71 | -50.56 | -6.38 | 51.94 | 516431.9 | 4400455.4 | 39°45'13.867"N | 80°48'29.468"W | 52.33 | 97.01 | 0.22 |
| 3646.40 | 0.24 | 275.39 | 3643.70 | -50.16 | -6.34 | 51.52 | 516431.8 | 4400455.4 | 39°45'13.867"N | 80°48'29.473"W | 51.91 | 97.01 | 0.03 |
| 3741.40 | 0.37 | 348.91 | 3738.70 | -49.80 | -6.02 | 51.26 | 516431.7 | 4400455.5 | 39°45'13.870"N | 80°48'29.476"W | 51.62 | 96.69 | 0.40 |
| 3836.40 | 0.27 | 53.14 | 3833.70 | -49.75 | -5.58 | 51.38 | 516431.7 | 4400455.6 | 39°45'13.875"N | 80°48'29.475"W | 51.69 | 96.20 | 0.37 |
| 3931.40 | 0.51 | 29.67 | 3928.70 | -49.93 | -5.08 | 51.77 | 516431.8 | 4400455.8 | 39°45'13.880"N | 80°48'29.470"W | 52.02 | 95.60 | 0.30 |
| 4025.40 | 0.39 | 55.65 | 4022.70 | -50.16 | -4.53 | 52.24 | 516432.0 | 4400455.9 | 39°45'13.885"N | 80°48'29.464"W | 52.44 | 94.96 | 0.25 |
| 4120.40 | 0.71 | 68.85 | 4117.69 | -50.77 | -4.14 | 53.06 | 516432.2 | 4400456.0 | 39°45'13.889"N | 80°48'29.453"W | 53.22 | 94.46 | 0.36 |
| 4215.40 | 0.69 | 52.15 | 4212.69 | -51.49 | -3.58 | 54.06 | 516432.5 | 4400456.2 | 39°45'13.895"N | 80°48'29.440"W | 54.18 | 93.79 | 0.22 |
| 4309.40 | 1.09 | 70.61 | 4306.67 | -52.44 | -2.93 | 55.35 | 516432.9 | 4400456.4 | 39°45'13.901"N | 80°48'29.424"W | 55.43 | 93.03 | 0.52 |
| 4404.40 | 1.06 | 72.81 | 4401.66 | -53.80 | -2.37 | 57.04 | 516433.4 | 4400456.6 | 39°45'13.906"N | 80°48'29.402"W | 57.09 | 92.38 | 0.05 |
| 4498.40 | 1.68 | 61.90 | 4495.63 | -55.36 | -1.47 | 59.09 | 516434.1 | 4400456.9 | 39°45'13.915"N | 80°48'29.376"W | 59.11 | 91.42 | 0.71 |
| 4593.40 | 1.78 | 55.63 | 4590.59 | -57.08 | 0.02 | 61.54 | 516434.8 | 4400457.3 | 39°45'13.930"N | 80°48'29.345"W | 61.54 | 89.98 | 0.23 |
| 4688.40 | 2.11 | 40.50 | 4685.53 | -58.45 | 2.18 | 63.89 | 516435.5 | 4400458.0 | 39°45'13.951"N | 80°48'29.314"W | 63.93 | 88.04 | 0.64 |
| 4783.40 | 2.70 | 43.34 | 4780.45 | -59.83 | 5.14 | 66.56 | 516436.3 | 4400458.9 | 39°45'13.980"N | 80°48'29.280"W | 66.76 | 85.58 | 0.63 |
| 4876.40 | 2.42 | 61.97 | 4873.36 | -61.89 | 7.66 | 69.80 | 516437.3 | 4400459.6 | 39°45'14.005"N | 80°48'29.239"W | 70.22 | 83.74 | 0.94 |
| 4970.40 | 1.61 | 84.78 | 4967.30 | -64.34 | 8.71 | 72.86 | 516438.3 | 4400460.0 | 39°45'14.016"N | 80°48'29.199"W | 73.38 | 83.18 | 1.20 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 5032.40 | 2.02 | 69.57 | 5029.27 | -65.93 | 9.17 | 74.76 | 516438.8 | 4400460.1 | 39°45'14.020"N | 80°48'29.175"W | 75.32 | 83.01 | 1.01 |
| 5063.40 | 2.15 | 69.40 | 5060.25 | -66.76 | 9.57 | 75.81 | 516439.2 | 4400460.2 | 39°45'14.024"N | 80°48'29.161"W | 76.41 | 82.81 | 0.42 |
| 5094.40 | 2.22 | 65.85 | 5091.23 | -67.60 | 10.02 | 76.90 | 516439.5 | 4400460.4 | 39°45'14.028"N | 80°48'29.147"W | 77.55 | 82.58 | 0.49 |
| 5125.40 | 1.78 | 50.44 | 5122.21 | -68.25 | 10.57 | 77.82 | 516439.8 | 4400460.5 | 39°45'14.034"N | 80°48'29.136"W | 78.54 | 82.27 | 2.23 |
| 5156.40 | 2.29 | 13.11 | 5153.19 | -68.39 | 11.48 | 78.33 | 516439.9 | 4400460.8 | 39°45'14.043"N | 80°48'29.129"W | 79.17 | 81.66 | 4.48 |
| 5187.40 | 3.10 | 349.86 | 5184.16 | -67.85 | 12.91 | 78.33 | 516439.9 | 4400461.2 | 39°45'14.057"N | 80°48'29.129"W | 79.38 | 80.64 | 4.34 |
| 5219.40 | 4.35 | 339.74 | 5216.09 | -66.57 | 14.90 | 77.75 | 516439.7 | 4400461.8 | 39°45'14.077"N | 80°48'29.136"W | 79.17 | 79.15 | 4.40 |
| 5251.40 | 5.30 | 337.84 | 5247.97 | -64.73 | 17.41 | 76.78 | 516439.4 | 4400462.6 | 39°45'14.101"N | 80°48'29.149"W | 78.73 | 77.23 | 3.01 |
| 5282.40 | 5.27 | 340.44 | 5278.84 | -62.79 | 20.07 | 75.76 | 516439.1 | 4400463.4 | 39°45'14.128"N | 80°48'29.162"W | 78.37 | 75.16 | 0.78 |
| 5314.40 | 6.01 | 352.50 | 5310.69 | -60.99 | 23.12 | 75.05 | 516438.9 | 4400464.3 | 39°45'14.158"N | 80°48'29.171"W | 78.53 | 72.88 | 4.35 |
| 5346.40 | 6.32 | 3.85 | 5342.50 | -59.62 | 26.54 | 74.95 | 516438.9 | 4400465.4 | 39°45'14.192"N | 80°48'29.172"W | 79.51 | 70.50 | 3.92 |
| 5378.40 | 6.28 | 9.59 | 5374.31 | -58.70 | 30.02 | 75.36 | 516439.0 | 4400466.5 | 39°45'14.226"N | 80°48'29.167"W | 81.12 | 68.28 | 1.97 |
| 5409.40 | 5.94 | 16.27 | 5405.14 | -58.18 | 33.23 | 76.09 | 516439.2 | 4400467.4 | 39°45'14.258"N | 80°48'29.157"W | 83.03 | 66.41 | 2.54 |
| 5440.40 | 5.06 | 18.48 | 5435.99 | -57.94 | 36.07 | 76.97 | 516439.5 | 4400468.3 | 39°45'14.286"N | 80°48'29.146"W | 85.00 | 64.89 | 2.92 |
| 5472.40 | 3.94 | 19.25 | 5467.89 | -57.81 | 38.44 | 77.78 | 516439.8 | 4400469.0 | 39°45'14.309"N | 80°48'29.135"W | 86.77 | 63.70 | 3.51 |
| 5504.40 | 3.20 | 13.50 | 5499.83 | -57.63 | 40.35 | 78.35 | 516439.9 | 4400469.6 | 39°45'14.328"N | 80°48'29.128"W | 88.13 | 62.75 | 2.57 |
| 5536.40 | 3.59 | 5.79 | 5531.77 | -57.22 | 42.22 | 78.66 | 516440.0 | 4400470.2 | 39°45'14.347"N | 80°48'29.124"W | 89.28 | 61.78 | 1.87 |
| 5566.40 | 4.16 | 357.04 | 5561.71 | -56.50 | 44.24 | 78.70 | 516440.0 | 4400470.8 | 39°45'14.367"N | 80°48'29.124"W | 90.28 | 60.66 | 2.73 |
| 5597.40 | 4.58 | 350.39 | 5592.62 | -55.38 | 46.58 | 78.44 | 516440.0 | 4400471.5 | 39°45'14.390"N | 80°48'29.127"W | 91.23 | 59.30 | 2.12 |
| 5629.40 | 5.87 | 350.60 | 5624.48 | -53.86 | 49.45 | 77.96 | 516439.8 | 4400472.4 | 39°45'14.418"N | 80°48'29.133"W | 92.32 | 57.61 | 4.03 |
| 5660.40 | 6.83 | 348.30 | 5655.29 | -52.01 | 52.82 | 77.32 | 516439.6 | 4400473.4 | 39°45'14.451"N | 80°48'29.141"W | 93.65 | 55.66 | 3.20 |
| 5736.40 | 8.83 | 345.93 | 5730.58 | -46.08 | 62.91 | 74.99 | 516438.9 | 4400476.5 | 39°45'14.551"N | 80°48'29.171"W | 97.88 | 50.01 | 2.67 |
| 5783.00 | 9.94 | 346.76 | 5776.56 | -41.67 | 70.29 | 73.20 | 516438.4 | 4400478.7 | 39°45'14.624"N | 80°48'29.193"W | 101.48 | 46.16 | 2.40 |
| 5813.00 | 10.44 | 343.08 | 5806.08 | -38.47 | 75.41 | 71.82 | 516437.9 | 4400480.3 | 39°45'14.675"N | 80°48'29.211"W | 104.14 | 43.60 | 2.74 |
| 5859.00 | 11.22 | 327.79 | 5851.27 | -32.23 | 83.19 | 68.22 | 516436.8 | 4400482.7 | 39°45'14.752"N | 80°48'29.257"W | 107.58 | 39.35 | 6.45 |
| 5907.00 | 12.48 | 316.90 | 5898.25 | -23.74 | 90.93 | 62.18 | 516435.0 | 4400485.0 | 39°45'14.828"N | 80°48'29.334"W | 110.16 | 34.37 | 5.34 |
| 5954.00 | 14.93 | 314.06 | 5943.91 | -13.53 | 98.85 | 54.36 | 516432.6 | 4400487.4 | 39°45'14.907"N | 80°48'29.434"W | 112.81 | 28.81 | 5.40 |
| 6001.00 | 19.67 | 312.28 | 5988.77 | -0.50 | 108.39 | 44.15 | 516429.5 | 4400490.3 | 39°45'15.001"N | 80°48'29.564"W | 117.03 | 22.16 | 10.15 |
| 6096.00 | 22.28 | 306.57 | 6077.48 | 31.92 | 129.88 | 17.85 | 516421.5 | 4400496.9 | 39°45'15.214"N | 80°48'29.900"W | 131.10 | 7.83 | 3.49 |
| 6144.00 | 22.54 | 305.12 | 6121.86 | 49.69 | 140.59 | 3.02 | 516417.0 | 4400500.1 | 39°45'15.320"N | 80°48'30.090"W | 140.62 | 1.23 | 1.27 |
| 6191.00 | 24.96 | 305.73 | 6164.87 | 68.09 | 151.57 | -12.40 | 516412.3 | 4400503.5 | 39°45'15.429"N | 80°48'30.287"W | 152.07 | 355.32 | 5.18 |

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## WELLPATH DATA † = interpolated/extrapolated station

| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6238.00 | 29.12 | 305.62 | 6206.73 | 88.84 | 164.02 | -29.76 | 516407.0 | 4400507.3 | 39°45'15.553"N | 80°48'30.509"W | 166.70 | 349.72 | 8.85 |
| 6286.00 | 34.40 | 303.13 | 6247.53 | 113.50 | 178.25 | -50.62 | 516400.6 | 4400511.6 | 39°45'15.694"N | 80°48'30.776"W | 185.30 | 344.15 | 11.33 |
| 6332.00 | 38.91 | 299.47 | 6284.42 | 140.59 | 192.47 | -74.10 | 516393.5 | 4400515.9 | 39°45'15.835"N | 80°48'31.076"W | 206.24 | 338.94 | 10.89 |
| 6381.00 | 42.46 | 296.24 | 6321.58 | 172.35 | 207.35 | -102.34 | 516384.9 | 4400520.5 | 39°45'15.982"N | 80°48'31.437"W | 231.23 | 333.73 | 8.42 |
| 6426.00 | 46.18 | 294.26 | 6353.77 | 203.73 | 220.75 | -130.78 | 516376.2 | 4400524.6 | 39°45'16.115"N | 80°48'31.801"W | 256.58 | 329.36 | 8.82 |
| 6475.00 | 50.01 | 291.94 | 6386.49 | 240.18 | 235.03 | -164.32 | 516366.0 | 4400528.9 | 39°45'16.257"N | 80°48'32.230"W | 286.77 | 325.04 | 8.57 |
| 6521.00 | 54.34 | 291.91 | 6414.70 | 276.50 | 248.59 | -198.02 | 516355.7 | 4400533.0 | 39°45'16.392"N | 80°48'32.661"W | 317.82 | 321.46 | 9.41 |
| 6571.00 | 59.97 | 292.05 | 6441.80 | 318.49 | 264.31 | -236.96 | 516343.9 | 4400537.8 | 39°45'16.548"N | 80°48'33.159"W | 354.98 | 318.12 | 11.26 |
| 6617.00 | 65.53 | 292.98 | 6462.86 | 359.37 | 279.97 | -274.71 | 516332.4 | 4400542.6 | 39°45'16.704"N | 80°48'33.642"W | 392.24 | 315.54 | 12.22 |
| 6665.00 | 68.46 | 292.89 | 6481.62 | 403.54 | 297.19 | -315.40 | 516320.0 | 4400547.9 | 39°45'16.875"N | 80°48'34.163"W | 433.36 | 313.30 | 6.11 |
| 6711.00 | 74.35 | 293.59 | 6496.28 | 447.11 | 314.39 | -355.44 | 516307.8 | 4400553.1 | 39°45'17.045"N | 80°48'34.675"W | 474.53 | 311.49 | 12.89 |
| 6759.00 | 80.17 | 294.21 | 6506.86 | 493.88 | 333.35 | -398.23 | 516294.7 | 4400558.9 | 39°45'17.234"N | 80°48'35.222"W | 519.33 | 309.93 | 12.19 |
| 6853.00 | 90.71 | 295.55 | 6514.32 | 587.32 | 372.72 | -483.11 | 516268.9 | 4400570.9 | 39°45'17.625"N | 80°48'36.308"W | 610.17 | 307.65 | 11.30 |
| 6949.00 | 90.89 | 295.78 | 6512.98 | 683.11 | 414.30 | -569.63 | 516242.5 | 4400583.5 | 39°45'18.037"N | 80°48'37.415"W | 704.35 | 306.03 | 0.30 |
| 7044.00 | 90.58 | 293.03 | 6511.76 | 778.00 | 453.54 | -656.12 | 516216.1 | 4400595.5 | 39°45'18.427"N | 80°48'38.521"W | 797.62 | 304.65 | 2.91 |
| 7138.00 | 90.58 | 293.41 | 6510.81 | 871.97 | 490.60 | -742.50 | 516189.8 | 4400606.8 | 39°45'18.795"N | 80°48'39.626"W | 889.94 | 303.45 | 0.40 |
| 7233.00 | 90.58 | 291.29 | 6509.85 | 966.96 | 526.72 | -830.36 | 516163.1 | 4400617.8 | 39°45'19.154"N | 80°48'40.750"W | 983.33 | 302.39 | 2.23 |
| 7328.00 | 90.55 | 289.32 | 6508.91 | 1061.91 | 559.68 | -919.45 | 516135.9 | 4400627.8 | 39°45'19.481"N | 80°48'41.890"W | 1076.40 | 301.33 | 2.07 |
| 7424.00 | 90.28 | 289.09 | 6508.22 | 1157.80 | 591.26 | -1010.10 | 516108.3 | 4400637.4 | 39°45'19.795"N | 80°48'43.050"W | 1170.42 | 300.34 | 0.37 |
| 7519.00 | 89.91 | 289.36 | 6508.06 | 1252.70 | 622.54 | -1099.80 | 516081.0 | 4400647.0 | 39°45'20.106"N | 80°48'44.197"W | 1263.77 | 299.51 | 0.48 |
| 7614.00 | 89.94 | 291.35 | 6508.18 | 1347.66 | 655.59 | -1188.87 | 516053.8 | 4400657.0 | 39°45'20.435"N | 80°48'45.337"W | 1357.64 | 298.87 | 2.09 |
| 7709.00 | 90.55 | 292.93 | 6507.78 | 1442.65 | 691.39 | -1276.86 | 516027.0 | 4400668.0 | 39°45'20.790"N | 80°48'46.462"W | 1452.03 | 298.44 | 1.78 |
| 7805.00 | 90.68 | 293.14 | 6506.75 | 1538.63 | 728.95 | -1365.20 | 516000.1 | 4400679.4 | 39°45'21.164"N | 80°48'47.593"W | 1547.62 | 298.10 | 0.26 |
| 7900.00 | 90.55 | 293.42 | 6505.73 | 1633.59 | 766.49 | -1452.46 | 515973.5 | 4400690.8 | 39°45'21.536"N | 80°48'48.709"W | 1642.30 | 297.82 | 0.32 |
| 7995.00 | 90.22 | 294.78 | 6505.09 | 1728.52 | 805.28 | -1539.17 | 515947.1 | 4400702.7 | 39°45'21.921"N | 80°48'49.818"W | 1737.10 | 297.62 | 1.47 |
| 8090.00 | 90.25 | 294.80 | 6504.70 | 1823.40 | 845.12 | -1625.42 | 515920.8 | 4400714.8 | 39°45'22.317"N | 80°48'50.921"W | 1831.99 | 297.47 | 0.04 |
| 8184.00 | 90.28 | 292.45 | 6504.26 | 1917.35 | 882.78 | -1711.53 | 515894.6 | 4400726.3 | 39°45'22.691"N | 80°48'52.023"W | 1925.79 | 297.28 | 2.50 |
| 8279.00 | 90.22 | 290.47 | 6503.85 | 2012.34 | 917.54 | -1799.94 | 515867.6 | 4400736.9 | 39°45'23.036"N | 80°48'53.154"W | 2020.31 | 297.01 | 2.09 |
| 8373.00 | 90.25 | 291.97 | 6503.46 | 2106.33 | 951.56 | -1887.56 | 515841.0 | 4400747.2 | 39°45'23.374"N | 80°48'54.275"W | 2113.85 | 296.75 | 1.60 |
| 8468.00 | 90.28 | 290.91 | 6503.02 | 2201.33 | 986.28 | -1975.99 | 515814.0 | 4400757.8 | 39°45'23.719"N | 80°48'55.406"W | 2208.46 | 296.53 | 1.12 |
| 8562.00 | 90.25 | 291.45 | 6502.59 | 2295.32 | 1020.25 | -2063.64 | 515787.3 | 4400768.2 | 39°45'24.057"N | 80°48'56.528"W | 2302.06 | 296.31 | 0.58 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 8657.00 | 90.68 | 291.83 | 6501.82 | 2390.31 | 1055.28 | -2151.94 | 515760.4 | 4400778.8 | 39°45'24.405"N | 80°48'57.658"W | 2396.76 | 296.12 | 0.60 |
| 8752.00 | 90.62 | 293.85 | 6500.74 | 2485.29 | 1092.15 | -2239.48 | 515733.7 | 4400790.1 | 39°45'24.771"N | 80°48'58.778"W | 2491.60 | 296.00 | 2.13 |
| 8847.00 | 90.83 | 294.99 | 6499.54 | 2580.19 | 1131.42 | -2325.97 | 515707.4 | 4400802.0 | 39°45'25.161"N | 80°48'59.884"W | 2586.55 | 295.94 | 1.22 |
| 8941.00 | 90.83 | 295.58 | 6498.18 | 2674.02 | 1171.56 | -2410.96 | 515681.5 | 4400814.3 | 39°45'25.559"N | 80°49'00.971"W | 2680.54 | 295.92 | 0.63 |
| 9036.00 | 90.83 | 292.00 | 6496.80 | 2768.94 | 1209.88 | -2497.86 | 515655.0 | 4400825.9 | 39°45'25.939"N | 80°49'02.083"W | 2775.45 | 295.84 | 3.77 |
| 9131.00 | 90.80 | 290.22 | 6495.45 | 2863.92 | 1244.09 | -2586.47 | 515628.0 | 4400836.4 | 39°45'26.279"N | 80°49'03.217"W | 2870.12 | 295.69 | 1.87 |
| 9225.00 | 90.77 | 288.36 | 6494.16 | 2957.81 | 1275.14 | -2675.18 | 515601.0 | 4400845.8 | 39°45'26.588"N | 80°49'04.352"W | 2963.54 | 295.49 | 1.98 |
| 9320.00 | 90.89 | 287.84 | 6492.79 | 3052.59 | 1304.65 | -2765.47 | 515573.5 | 4400854.8 | 39°45'26.881"N | 80°49'05.507"W | 3057.77 | 295.26 | 0.56 |
| 9414.00 | 90.80 | 288.52 | 6491.40 | 3146.37 | 1333.97 | -2854.77 | 515546.3 | 4400863.7 | 39°45'27.173"N | 80°49'06.650"W | 3151.06 | 295.05 | 0.73 |
| 9509.00 | 90.80 | 288.98 | 6490.07 | 3241.22 | 1364.50 | -2944.72 | 515518.9 | 4400873.0 | 39°45'27.477"N | 80°49'07.801"W | 3245.50 | 294.86 | 0.48 |
| 9604.00 | 90.89 | 290.81 | 6488.67 | 3336.15 | 1396.83 | -3034.04 | 515491.6 | 4400882.9 | 39°45'27.798"N | 80°49'08.943"W | 3340.14 | 294.72 | 1.93 |
| 9699.00 | 90.83 | 291.43 | 6487.25 | 3431.13 | 1431.05 | -3122.64 | 515464.6 | 4400893.3 | 39°45'28.138"N | 80°49'10.077"W | 3434.94 | 294.62 | 0.66 |
| 9794.00 | 90.77 | 294.77 | 6485.92 | 3526.08 | 1468.32 | -3210.01 | 515438.0 | 4400904.7 | 39°45'28.508"N | 80°49'11.195"W | 3529.89 | 294.58 | 3.52 |
| 9888.00 | 90.86 | 296.48 | 6484.58 | 3619.87 | 1508.97 | -3294.75 | 515412.2 | 4400917.1 | 39°45'28.911"N | 80°49'12.279"W | 3623.86 | 294.61 | 1.82 |
| 9983.00 | 90.68 | 296.90 | 6483.31 | 3714.54 | 1551.63 | -3379.62 | 515386.4 | 4400930.1 | 39°45'29.335"N | 80°49'13.364"W | 3718.79 | 294.66 | 0.48 |
| 10079.00 | 90.74 | 294.83 | 6482.12 | 3810.30 | 1593.51 | -3465.99 | 515360.0 | 4400942.8 | 39°45'29.750"N | 80°49'14.469"W | 3814.76 | 294.69 | 2.16 |
| 10172.00 | 90.65 | 293.07 | 6480.99 | 3903.23 | 1631.25 | -3550.97 | 515334.1 | 4400954.3 | 39°45'30.125"N | 80°49'15.557"W | 3907.74 | 294.67 | 1.89 |
| 10265.00 | 90.65 | 290.01 | 6479.93 | 3996.21 | 1665.39 | -3637.46 | 515307.8 | 4400964.7 | 39°45'30.464"N | 80°49'16.663"W | 4000.58 | 294.60 | 3.29 |
| 10360.00 | 90.55 | 290.59 | 6478.94 | 4091.16 | 1698.35 | -3726.56 | 515280.6 | 4400974.8 | 39°45'30.791"N | 80°49'17.803"W | 4095.32 | 294.50 | 0.62 |
| 10454.00 | 90.65 | 292.47 | 6477.95 | 4185.15 | 1732.84 | -3813.99 | 515254.0 | 4400985.3 | 39°45'31.134"N | 80°49'18.922"W | 4189.18 | 294.43 | 2.00 |
| 10549.00 | 90.80 | 291.66 | 6476.75 | 4280.14 | 1768.53 | -3902.02 | 515227.2 | 4400996.1 | 39°45'31.488"N | 80°49'20.048"W | 4284.10 | 294.38 | 0.87 |
| 10644.00 | 90.65 | 291.82 | 6475.55 | 4375.14 | 1803.71 | -3990.26 | 515200.3 | 4401006.9 | 39°45'31.838"N | 80°49'21.177"W | 4378.99 | 294.32 | 0.23 |
| 10740.00 | 90.71 | 289.11 | 6474.41 | 4471.09 | 1837.27 | -4080.19 | 515172.9 | 4401017.1 | 39°45'32.171"N | 80°49'22.328"W | 4474.76 | 294.24 | 2.82 |
| 10835.00 | 90.71 | 288.60 | 6473.23 | 4565.95 | 1867.97 | -4170.08 | 515145.5 | 4401026.4 | 39°45'32.476"N | 80°49'23.478"W | 4569.34 | 294.13 | 0.54 |
| 10930.00 | 90.62 | 288.91 | 6472.13 | 4660.79 | 1898.51 | -4260.03 | 515118.1 | 4401035.7 | 39°45'32.780"N | 80°49'24.629"W | 4663.93 | 294.02 | 0.34 |
| 11025.00 | 90.68 | 291.46 | 6471.05 | 4755.74 | 1931.29 | -4349.18 | 515090.9 | 4401045.7 | 39°45'33.106"N | 80°49'25.770"W | 4758.71 | 293.94 | 2.68 |
| 11120.00 | 90.34 | 294.63 | 6470.21 | 4850.70 | 1968.47 | -4436.59 | 515064.3 | 4401057.1 | 39°45'33.475"N | 80°49'26.888"W | 4853.68 | 293.93 | 3.36 |
| 11215.00 | 90.40 | 294.15 | 6469.59 | 4945.61 | 2007.70 | -4523.11 | 515038.0 | 4401069.0 | 39°45'33.864"N | 80°49'27.995"W | 4948.67 | 293.94 | 0.51 |
| 11309.00 | 90.40 | 292.69 | 6468.94 | 5039.57 | 2045.06 | -4609.36 | 515011.7 | 4401080.4 | 39°45'34.235"N | 80°49'29.098"W | 5042.66 | 293.93 | 1.55 |
| 11404.00 | 90.37 | 291.45 | 6468.30 | 5134.57 | 2080.75 | -4697.39 | 514984.9 | 4401091.3 | 39°45'34.589"N | 80°49'30.225"W | 5137.61 | 293.89 | 1.31 |
| 11499.00 | 90.43 | 292.37 | 6467.63 | 5229.57 | 2116.20 | -4785.53 | 514958.0 | 4401102.1 | 39°45'34.942"N | 80°49'31.352"W | 5232.55 | 293.86 | 0.97 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD [ft] | Inclination [°] | Azimuth [°] | TVD [ft] | Vert Sect [ft] | North [ft] | East [ft] | Grid East [M] | Grid North [M] | Latitude | Longitude | Closure Dist [ft] | Closure Dir [°] | DLS [°/100ft] |
| 11592.00 | 90.43 | 295.94 | 6466.94 | 5322.48 | 2154.25 | -4870.37 | 514932.2 | 4401113.7 | 39°45'35.319"N | 80°49'32.438"W | 5325.53 | 293.86 | 3.84 |
| 11687.00 | 90.43 | 295.05 | 6466.22 | 5417.29 | 2195.14 | -4956.12 | 514906.0 | 4401126.1 | 39°45'35.725"N | 80°49'33.535"W | 5420.49 | 293.89 | 0.94 |
| 11782.00 | 90.40 | 290.42 | 6465.53 | 5512.25 | 2231.84 | -5043.71 | 514879.3 | 4401137.3 | 39°45'36.089"N | 80°49'34.655"W | 5515.44 | 293.87 | 4.87 |
| 11877.00 | 90.18 | 291.09 | 6465.05 | 5607.23 | 2265.51 | -5132.54 | 514852.3 | 4401147.6 | 39°45'36.424"N | 80°49'35.792"W | 5610.30 | 293.82 | 0.74 |
| 11973.00 | 90.22 | 290.50 | 6464.72 | 5703.21 | 2299.59 | -5222.29 | 514824.9 | 4401157.9 | 39°45'36.762"N | 80°49'36.940"W | 5706.17 | 293.77 | 0.62 |
| 12068.00 | 90.15 | 291.38 | 6464.41 | 5798.20 | 2333.54 | -5311.01 | 514797.9 | 4401168.3 | 39°45'37.099"N | 80°49'38.076"W | 5801.06 | 293.72 | 0.93 |
| 12163.00 | 90.46 | 292.47 | 6463.91 | 5893.19 | 2369.01 | -5399.14 | 514771.0 | 4401179.1 | 39°45'37.452"N | 80°49'39.203"W | 5896.01 | 293.69 | 1.19 |
| 12257.00 | 90.40 | 291.38 | 6463.20 | 5987.19 | 2404.11 | -5486.34 | 514744.5 | 4401189.8 | 39°45'37.800"N | 80°49'40.319"W | 5989.96 | 293.66 | 1.16 |
| 12352.00 | 90.46 | 289.58 | 6462.49 | 6082.15 | 2437.35 | -5575.32 | 514717.4 | 4401199.9 | 39°45'38.130"N | 80°49'41.458"W | 6084.81 | 293.61 | 1.90 |
| 12447.00 | 90.43 | 289.29 | 6461.75 | 6177.06 | 2468.96 | -5664.91 | 514690.1 | 4401209.5 | 39°45'38.444"N | 80°49'42.604"W | 6179.56 | 293.55 | 0.31 |
| 12487.00 | 90.40 | 289.75 | 6461.46 | 6217.02 | 2482.32 | -5702.61 | 514678.6 | 4401213.6 | 39°45'38.577"N | 80°49'43.086"W | 6219.46 | 293.52 | 1.15 |
| 12512.00 | 90.40 | 289.75 | 6461.29 | 6242.01 | 2490.77 | -5726.14 | 514671.4 | 4401216.2 | 39°45'38.661"N | 80°49'43.388"W | 6244.40 | 293.51 | 0.00 |

51-01621

RECEIVED
Office of Oil and Gas
AUG 05 2015
WV Department of
Environmental Protection

form ww6

4,740'

13,795'

LATITUDE 39° 47' 30"

LONGITUDE 80° 47' 30"

GRID NORTH

**LEGEND**

- LEASED TRACTS
- INTERIOR MINERAL TRACTS
- SURFACE TRACTS
- HARD LEASE LINE

**NOTES**

OWNERSHIP TAKEN FROM PUBLIC RECORDS OF MARSHALL COUNTY, WV IN DECEMBER, 2012.
COORDINATES AND WELL TIES BASED UPON DIFFERENTIAL GPS MEASUREMENTS. WELL LOCATION REFERENCES ARE BASED UPON THE MAGNETIC MERIDIAN.

**ARMSTRONG WELL NO. 5H**
**521.12± ACRES**

20 - 26 R. RINE 60.52 ACRES
19-1 R. RINE 30.80 ACRES
19-22 G. KNUTH, ET UX 71.0 ACRES
GASTAR LEASE WV16-0076-001
19-23 J. DENOON, TRUST 28.4 ACRES
20 - 27 PPG INDUSTRIES, INC. 119.83 ACRES
JEEP TRAIL
19 - 21 R. WHITLATCH, ET UX 116.45 ACRES
19 - 19 R. BLAKE, ET UX 66 ACRES
B.H.
22 - 1 MARY MASON, EST. 2.0 ACRES
22 - 3 CNX LAND RESOURCES, INC. 79.74 ACRES
PERMITTED
AS-DRILLED
COON
GASTAR LEASE WV16-0126-005
GASTAR LEASE WV16-0076-001
ROOF BOLT (FND.)
CONCRETE MON. (FND.)
22 - 5 CNX GAS COMPANY, LLC 147.3 ACRES
GASTAR LEASE WV16-0076-001
22 - 2 PPG INDUSTRIES, INC. 30.0 AC.
N 51°12' W 2416.1'
N 17°25' E 1867.8'
GASTAR LEASE WV16-0010-001
78
21 - 24 PPG INDUSTRIES, INC. 132.5 ACRES
22 - 4 CNX GAS COMPANY, LLC 159.05 ACRES
RUN
LP1
01620
01619
01618
01617
WELL NO. 5H
01616
01615
01614
01613

NOTE: BORE PATH BASED ON GRID NORTH.

**SURFACE HOLE**
UTM. NAD83, ZONE 17
IN METERS
N) 4,400,457.4
E) 516,416.1

**LANDING POINT 1**
UTM. NAD83, ZONE 17
IN METERS
N) 4,400,547.9
E) 516,320.0

**BOTTOM HOLE**
UTM. NAD83, ZONE 17
IN METERS
N) 4,401,216.2
E) 514,671.4

22 - 18 H. GOUDY 77.13 ACRES
21 - 23 P. BOWEN, ET AL 42.62 ACRES
22 - 15 H. GOUDY 25.5 ACRES
22 - 16 H. GOUDY 57.0 ACRES
22 - 17 CNX GAS COMPANY, LLC 37.5 ACRES
22 - 10 PPG INDUSTRIES, INC. 58.40 ACRES
BOTTOM HOLE WEST 10,460'
SOUTH 11,290'
78
HORIZONTAL PATH
WELL NO. 5H
01616
01615
01614
01613
01620
01619
01618
01617
01505
01506
01507
01508
01524
2400'
22 - 12 PPG INDUSTRIES, INC. 61.49 ACRES
78
SURFACE HOLE

**REFERENCES**

WELL NO. 5H
S 54°52' E 247.2'
S 28°46' E 248.1'
4" ELM
14" POPLAR
MAG. 12/14/12

(+)DENOTES LOCATION ON UNITED STATES TOPOGRAPHIC MAPS

SCALE 1"=200'

FILE NUMBER W0120316 (WB1-56)
DRAWING NUMBER ARMSTRONG_WP_5H-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

Jonathan N. White LICENSED NO. 2122 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

STATE OF WEST VIRGINIA MONTANI SEMPER LIBERI

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

DATE: JULY 27, 2015
OPERATORS WELL NO. ARMSTRONG NO. 5H AS-DRILLED
API WELL NO. 47 - 051 - 01621 (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 WV16-0010-001, 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 521.12
PROPOSED WORK: DRILL ___ CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE ___ PLUG OFF OLD FORMATION ___
PERFORATE NEW FORMATION ___ OTHER PHYSICAL CHANGE (SPECIFY) ___
PLUG & ABANDON ___ CLEAN OUT & REPLUG ___

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD: 6514' TMD:12,512'

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

COUNTY NAME PERMIT