



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street, S.E.
Charleston, WV 25304
(304) 926-0450
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary
www.dep.wv.gov

Monday, June 25, 2018
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

ARSENAL RESOURCES LLC
6031 WALLACE ROAD EXTENSION SUITE 603
WEXFORD, PA 15090

Re: Permit Modification Approval for WILLIAMS 216
47-091-01335-00-00

Lateral Extension

ARSENAL RESOURCES LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin
Chief

Operator's Well Number: WILLIAMS 216
Farm Name: WILLIAMS, WILLIAM C.
U.S. WELL NUMBER: 47-091-01335-00-00
Horizontal 6A New Drill
Date Modification Issued: June 25, 2018

A blue ink signature of James A. Martin, written in a cursive style, is placed over the signature block.

Promoting a healthy environment.

06/29/2018



April 4, 2018

WVDEP
Office of Oil and Gas
ATTN: Laura Adkins
601 57th Street SE
Charleston, WV 25304

RE: Williams Pad – Williams 216 API# 47-091-01335 – Modification due to spacing changes and extending lateral

Dear Laura:

Enclosed please find the modification for the Williams 216 (API# 47-091-01335). This permit is being modified due to adjusting the well bore spacing 1,000ft. The well head locations remained the same. This well was originally permitted to 6,309.00'. We have obtained additional leasing for this site during this modification and request a modification to extend the lateral 41.11' for a total of 6,350.11'. Included are the following:

- Plat
- WW-6B, Well Work Permit Application/Casing
- Well Bore Schematic
- WW-6A1, Lease Information
- Road Crossing Letter
- Site Safety Plan
- AOR

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Should you have any questions or need any additional information, please feel free to contact me by phone or email. Thank you!

Sincerely,

A handwritten signature in black ink that reads 'Kelly Davis'.

Kelly Davis
Permitting Specialist
304-517-8743
724-940-1218 office
kdavis@arsenalresources.com

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

1) Well Operator: Arsenal Resources 494519412 Taylor Fetterman Gladesville
Operator ID County District Quadrangle

2) Operator's Well Number: Williams 216 Well Pad Name: Williams

3) Farm Name/Surface Owner: William C. Williams Public Road Access: Whiteday Road

4) Elevation, current ground: 1804' Elevation, proposed post-construction: 1800'

5) Well Type (a) Gas Oil Underground Storage

Other

(b) If Gas Shallow Deep

Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Target Formation- Marcellus Shale, Top- 7,744.0ft, Bottom- 7,840.0ft, Anticipated Thickness- 96ft, Associated Pressure- 0.5 psi/ft

8) Proposed Total Vertical Depth: 7,826'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 14,800.3'

11) Proposed Horizontal Leg Length: 6,350.11'

12) Approximate Fresh Water Strata Depths: 245', 600'

13) Method to Determine Fresh Water Depths: Offsetting wells reported water depths (091-00264, 091-00576, 091-01265, 091-01267, 091-01269)

14) Approximate Saltwater Depths: 910'

15) Approximate Coal Seam Depths: Bakerstown - 115', Brush Creek - 216', Upper Freeport - 283', Lower Freeport - 330', Upper Kittanning - 405', Middle Kittanning - 455', Lower Kittanning - 487'

16) Approximate Depth to Possible Void (coal mine, karst, other): None known

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes No None known

(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

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18)

CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	24"	New	H-40	94#	80'	80'	CTS
Fresh Water	13.375"	New	J-55	54.5#	650'	650'	CTS
Coal							
Intermediate	9.625"	New	J-55	40#	1,600'	1,600'	CTS
Production	5.5	New	P-110	20#	14,800'	14,800'	TOC @ 1,450'
Tubing							
Liners							

Samuel J. Lopez
4-4-18

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	24"	36"			0	Class A, 3% CaCl ₂	1.20
Fresh Water	13.375"	17.5"	0.38"	2730	900	Class A, 3% CaCl ₂	1.20
Coal							
Intermediate	9.625"	12.25"	0.395"	3950psi	1,500	Class A, 2% CaCl ₂	1.29
Production	5.5"	8.5-8.75	0.361"	12,640psi	9500	Class A/50/50 Poz	1.29/1.34
Tubing					5000		
Liners					N/A		

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Kind:				WV Department of Environmental Protection
Sizes:				
Depths Set:				

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

The well will be started with a conductor rig drilling a 36" hole to Conductor programmed depth then running 24" casing and circulate cement back to surface. The conductor rig will move out and the drilling rig will move in and rig up. The drilling rig will then spud a 17 1/2" hole and drill to fresh water casing (Surface) to the programmed depth, Run 13- 3/8" casing and cement to surface. The rig will continue drilling a 12- 1/4" intermediate hole to the programmed depth, run 9- 5/8" casing and cement to surface. The rig will then continue to drill an 8- 3/4" hole to a designed KOP. We will then start drilling the curve and lateral section to the programmed total measured depth, run 5 1/2" casing and cement according to the program.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

The well will be completed using a plug and perforation method and stimulated with a slickwater and sand slurry. The anticipated maximum rate will be 90 bpm and the maximum pressure will be 9,500 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 26.19

22) Area to be disturbed for well pad only, less access road (acres): 6.71

23) Describe centralizer placement for each casing string:

24"- No centralizers 13 3/8" – one bow spring centralizer on every other joint 9 5/8" – one bow spring centralizer every third joint from TD to surface 5 1/2" – one semi rigid centralizer on every joint from TD of casing to end of curve. Then every other joint to KOP. Every third joint from KOP to 1,800'; there will be no centralizers from 1,800 to surface.

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

24" will be circulated to surface. The 13 3/8" casing will be cemented to surface with Class A cement and no greater than 3% CaCl (calcium chloride). The 9 5/8" casing will be cemented to surface with Class A cement, & no greater than 3% calcium chloride. The 5 1/2" production string will be cemented back to 1,450' (+/- 150' above the casing shoe for the 9 5/8") with Class A and 50/50 Poz cement retarded (to extend pumpability) cellophane flaked for fluid loss, Bentonite gel as an extender (increased pumpability and fluid loss), a defoaming agent to decrease cement foaming during mixing to insure the cement is of proper consistency for placement and possibly gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additive mentioned here). ~~Of note, each pipe will have a "right angle" set) during the plastic phase of the cement set-up.~~

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25) Proposed borehole conditioning procedures:

Top holes will be drilled with fresh water KOP. At KOP, the wellbore will be loaded with synthetic oil based mud, barite-weighted mud system with such properties as to build a filter-cake on the face of the bore-hole. This will provide lubricity as well as stabilizing the well bore. We will begin rotating the drill string and mud will be circulated upon reaching TD until no further cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will pull three stands of drill pipe, load the hole, pull three strands and load the hole. The weight indicator on the rig will be monitored for any occurrences of drag and if any are noticed, we will re-run the previous stand of pipe pulled across and circulate 2x bottoms up while watching shakers for signs of cuttings. Once at the base curve, the string will be continuously rotated while pumping 2x bottoms up. We will pull three stands and fill the hole until we reach the vertical section of the well.

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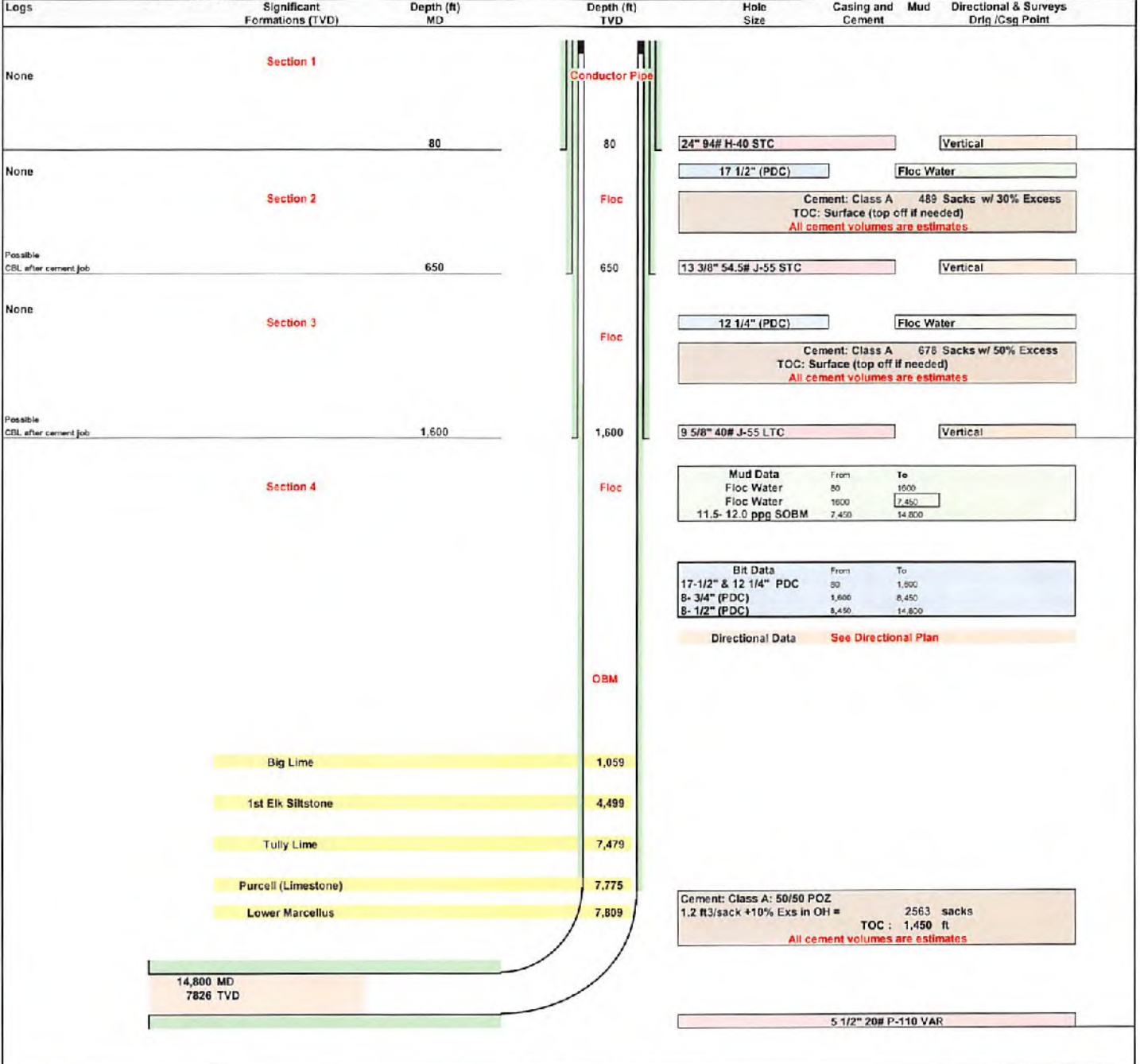
*Note: Attach additional sheets as needed.



Arsenal Resources
Williams 216
Casing Design
Directional Plan # 3 QES

Other Names:	N/A
Surface Location:	TBD
Bottom Hole Location:	TBD
Total Depth:	14,800 MD (ft) 7,826 TVD (ft)

County:	Taylor		
State:	West Virginia		
AFE #:	XX	API #:	XX
RKB:	27		
Ground Level:	1,800		



Revision 1
Note: Not drawn to scale
Cement Outside Casing Seal Assembly in Annulus
Office of Oil and Gas

Date Last Revised: 3-Apr-18
Jarrett Toms

APR 5 2018

WM Department of Environmental Protection

06/29/2018

Latitude: 39°27'30" SURFACE HOLE 4111'

Latitude: 39°27'30" BOTTOM HOLE 5345'



CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
600 MARKETPLACE AVENUE, SUITE 200
BRIDGEPORT, WV 26330
304-933-3119

SURFACE HOLE LOCATION (SHL):	
UTM (NAD83, ZONE 17, METERS):	
NORTHING: 4364256.658	
EASTING: 588408.046	
LANDING POINT (LPL):	
UTM (NAD83, ZONE 17, METERS):	
NORTHING: 4364151.719	
EASTING: 588641.950	
BOTTOM HOLE LOCATION (BHL):	
UTM (NAD83, ZONE 17, METERS):	
NORTHING: 4365981.333	
EASTING: 588011.987	

GRID NORTH
UTM, NAD83 DATUM, ZONE 17, US FT

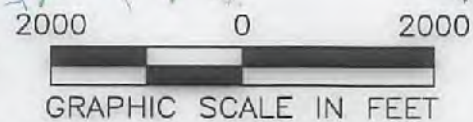


SURFACE HOLE LOCATION (SHL):	
SPC (NAD83, WV NORTH, FEET):	
NORTHING: 336646.31	
EASTING: 1834914.45	
GEOGRAPHIC (NAD83):	
LAT: 39°25'23.91"	
LONG: 79°58'22.39"	
GEOGRAPHIC (NAD83):	
DEC. LAT: 39.423309	
DEC. LONG: -79.972887	
LANDING POINT (LPL):	
SPC (NAD83, WV NORTH, FEET):	
NORTHING: 336289.20	
EASTING: 1835676.20	
GEOGRAPHIC (NAD83):	
LAT: 39°25'20.42"	
LONG: 79°58'12.66"	
GEOGRAPHIC (NAD83):	
DEC. LAT: 39.422340	
DEC. LONG: -79.970184	
BOTTOM HOLE LOCATION (BHL):	
SPC (NAD83, WV NORTH, FEET):	
NORTHING: 342326.96	
EASTING: 1833709.13	
GEOGRAPHIC (NAD83):	
LAT: 39°26'20.00"	
LONG: 79°58'38.14"	
GEOGRAPHIC (NAD83):	
DEC. LAT: 39.438888	
DEC. LONG: -79.972621	

TAX MAP PARCEL SURVEYED LINE COORDINATES (UTM - NAD 83 - ZONE 17, U.S. FOOT)			
NORTHING	EASTING	LATITUDE	LONGITUDE
A 14318435.936	1828845.676	39.423462	-79.978632
B 14319262.042	1930917.956	39.425666	-79.971262

- WELL RESTRICTIONS**
- NO OCCUPIED DWELLINGS > 2500 SQ FT. WITHIN 625 FEET OF CENTER OF PAD.
 - NO AGRICULTURE BUILDINGS > 2500 SQ FT. WITHIN 625 FEET OF CENTER OF PAD.
 - WATER WELLS OR DEVELOPED SPRINGS ARE WITHIN 969 FEET OF PROPOSED WELL.
 - PERENNIAL STREAMS, LAKES, PONDS, OR RESERVOIRS WITHIN 800 FEET OF THE LIMITS OF DISTURBANCE.
 - NO NATURALLY PRODUCING TROUT STREAM WITHIN 300 FEET OF LIMITS OF DISTURBANCE.
 - NO GROUND INTAKE OR PUBLIC WATER SUPPLY WITHIN 1000 FEET OF WELL PAD, LIMITS OF DISTURBANCE, E & S CONTROLS OR PUBLIC WATER SUPPLY.

- NOTES ON SURVEY**
- SURFACE AND ROYALTY OWNER INFORMATION AND THEIR BOUNDARIES SHOWN HEREON WERE PLOTTED FROM DEEDS AND/OR TAX PARCEL MAPS PROVIDED BY CLIENT AND/OR FIELD LOCATIONS.
 - THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARCELS SHOWN HEREON.
 - ALL INSETS ARE GRID NORTH UNLESS OTHERWISE DEPICTED.



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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

P.S. 991

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS

WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25034

MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SURVEY GRADE GPS (NAVD 88, US FT)

COMPANY: **ARSENAL RESOURCES**

WILLIAMS
OPERATOR'S WELL #: 216
API WELL #: 47 STATE 091 COUNTY PERMIT 01335100

WELL TYPE: OIL WASTE DISPOSAL PRODUCTION DEEP GAS LIQUID INJECTION STORAGE SHALLOW

WATERSHED: WHITEDAY CREEK ELEVATION: 1,804'

DISTRICT: FETTERMAN DISTRICT COUNTY: TAYLOR QUADRANGLE: GLADESVILLE

SURFACE OWNER: WILLIAM C. WILLIAMS ACREAGE: 107.25±

OIL & GAS ROYALTY OWNER: WILLIAM C. WILLIAMS ACREAGE: 107.25±

DRILL DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION

CONVERT PLUG & ABANDON CLEAN OUT & REPLUG OTHER CHANGE (SPECIFY)

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: 7,826 TVD 14,800.3 TMD

WELL OPERATOR: ARSENAL RESOURCES DESIGNATED AGENT: WILLIAM VEIGEL

ADDRESS: 6031 WALLACE RD, EXT. SUITE 300 ADDRESS: 65 PROFESSIONAL PLACE, SUITE 200

CITY: WEXFORD STATE: PA ZIP CODE: 15090 CITY: BRIDGEPORT STATE: WV ZIP CODE: 26330

LEGEND:	REVISIONS:	DATE: 04-04-2018
PROPOSED SURFACE HOLE / BOTTOM HOLE	PROPOSED PATH	DRAWN BY: K.E.S.
EXISTING / PRODUCING WELLHEAD	PENETRATED PARCEL	SCALE: 1" = 2000'
LPL * LANDING POINT LOCATION	LEASE BOUNDARY	DRAWING NO: 154-452
EXISTING WATER WELL	MAIN ROAD	WELL LOCATION PLAT
EXISTING SPRING	ADJOINER PROPERTY	
	WATER	
	SURVEYED CORNER	



CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
 600 MARKETPLACE AVENUE, SUITE 200
 BRIDGEPORT, WV 26330
 304-933-3119

WELL BORE TABLE FOR SURFACE OWNERS		
TRACT	SURFACE OWNER	TAX PARCEL
1	WILLIAM C. WILLIAMS	06-07-09
2	FIREMAN PAYTON TRUSTEE OF MELBA M. ZINN TRUST (HEIRS)	06-07-11
3	ALVIN L. & JUDY K. LIPSCOMB	06-02-10
4	ANTHONY T. DORSEY & LAURA J. TOBIN & SURV.	06-02-8.1
5	SAMMY R. & SARA L. JACOBS FAMILY TRUST & DANIEL & SONDR & SURV	06-02-03
6	WESLEY H. OR CAROLYN A. HAMILTON	06-02-08
7	ORTHODOX EDUCATIONAL SOCIETY	06-03-41
8	THE JOHN M. CONNOLLY TRUST, ET AL	06-26-11

ADJOINING OWNERS TABLE		
TRACT	SURFACE OWNER	TAX PARCEL
A	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-12
B	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-13
C	GLENNA LEE EVANS	06-07-14
D	MARGIE M. CURRY	06-07-14.9
E	MARGIE M. CURRY	06-07-14.7
F	MARY ANN & WILLIAM CHRISTOPHER WILLIAMS & SURV.	06-07-15
G	MARY ANN NUZUM	06-07-16
H	ALVIN L. & JUDY K. LIPSCOMB	06-07-08
I	ALVIN L. & JUDY K. LIPSCOMB	06-02-09
J	CHARLES C. GATANIA	06-02-2.1
K	MARK D. & KAREN T. WOLF & SURV.	06-02-2.2
L	SAMMY R. & SARA L. JACOBS FAMILY TRUST, ET AL	19-26-12
M	CHARLES E. MCDONALD	19-26-06
N	THE JOHN M. CONNOLLY TRUST	19-26-7.8
O	DAVID L. SR & BONNIE SMITH	19-29-15
P	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-10
Q	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-09
R	NATHAN S. STEVENS	19-26-8.4
S	DANIEL W. & SONDR & J. JACOBS	19-26-8.3
T	EVELYN J. MUSGROVE	19-28-01
U	CHRISTOPHER J. MORAN & CAROLINE E M ROBISON	19-28-3.1
V	MARK D. MORAN	19-28-03
W	VA E FLANNAGAN	19-27-08
X	WILLIAM R. BJORKMAN	19-27-07
Y	JAMES O. & JUDITH A. MORAN TRS MORAN LIVING TRUST	19-27-01
Z	BEVERLY D. HORNBECK TRUST	19-27-04
AA	CHARLES EDWARD & LAVERNE MACDONALD	6-03-20
BB	RUTH E. HAUGHT, ET AL	19-27-03
CC	RUTH E. PYSSELL	6-2-7
DD	CHARLES E. MCDONALD	6-2-6
EE	ROBERT W. & KIMBERLY J. BRYAN	6-2-5
FF	CHARLES E. MCDONALD	6-2-11
GG	WESLEY HAROLD HAMILTON & CAROLYN ANN BOWMAN	5-2-12
HH	BREWER VIRGINIA MORGAN	5-3-24
II	CAROL W. GALLAHER	5-3-26
JJ	BREWER VIRGINIA MORGAN	5-6-1

06/29/2018

REVISIONS:	COMPANY:			DATE: 04-04-2018
				DRAWN BY: K.E.S.
	OPERATOR'S	WILLIAMS		SCALE: N/A
	WELL #:	216		DRAWING NO: 154-452
	DISTRICT:	COUNTY:	STATE:	WELL LOCATION PLAT 2
	FETTERMAN DISTRICT	TAYLOR	WV	

**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
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See Attached

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

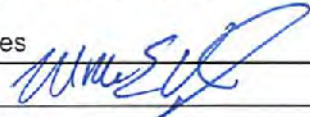
- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

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The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Arsenal Resources
 By: William Veigel 
 Its: Designated Agent

Attachment to WW-6A1, Williams (Puma 75) #216

Letter Designation/Number Designation on Plat	Grantor, Lessor, Assignor, etc.	Grantee, Lessee, Assignee, etc.	Royalty	Book/Page	Acreage
Tract 1 [Lease 00005194 (WVLO1054.000)]	William C. Williams, married, dealing in his sole and separate property	PDC Mountaineer, LLC	15.00%	64/659	107.25
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 2 [Lease 00004637 (WVLO0747.001)]	Melba M. Zinn Trust, a West Virginia testamentary trust of which Payton D. Fireman serves as sole Trustee, and John V. Zinn, II	PDC Mountaineer, LLC	16.00%	60/192	228.97
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 3 [Lease 00005133 (WVLO1001.000)]	William M. Compton and Doris L. Compton, his wife (3/4 interest); David S. Summers and Eunetta J. Summers, his wife (1/4 interest)	Pepper Resources, Inc.	12.50%	42/595	264.35
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667 34/575	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 4, 5, 6 [Lease 00004297 (WVLO0519.000)]	Union National Bank, Trustee - Truman E. Gore and C. Burke Morris	Pepper Resources, Inc.	12.50%	44/70	907
	Pepper Resources, Inc.	Petroleum Development Corporation		19/440 31/28	
	Petroleum Development Corporation	PDC Mountaineer, LLC		30/698	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 7 [Lease 00004731]	Orthodox Educational Society	PDC Mountaineer, LLC	16.00%	60/244 (Taylor) 1076/226 (Marion)	511
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 8 [Lease 00008043]	William M. Compton, divorced	Mar Key LLC	15.00%	69/60	77.6

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Business and Licensing

Online Data Services Help

Business Organization Detail

NOTICE: The West Virginia Secretary of State's Office makes every reasonable effort to ensure the accuracy of information. However, we make no representation or warranty as to the correctness or completeness of the information. If information is missing from this page, it is not in the The West Virginia Secretary of State's database.

MAR KEY LLC

Organization Information								
Org Type	Effective Date	Established Date	Filing Date	Charter	Class	Sec Type	Termination Date	Termination Reason
LLC Limited Liability Company	7/11/2011		7/11/2011	Domestic	Profit			

Organization Information			
Business Purpose	2111 - Mining, Quarrying, Oil & Gas Extraction - Oil and Gas Extraction - Crude Oil and Natural Gas Extraction		Capital Stock
Charter County		Control Number	99Q1F
Charter State	WV	Excess Acres	
At Will Term	A	Member Managed	MBR
At Will Term Years		Par Value	

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Authorized Shares

Addresses	
Type	Address
Designated Office Address	65 PROFESSIONAL PLACE SUITE 200 BRIDGEPORT, WV, 26330
Mailing Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Notice of Process Address	CORPORATION SERVICE COMPANY 209 WEST WASHINGTON STREET CHARLESTON, WV, 25302
Principal Office Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Type	Address

Officers	
Type	Name/Address
Member	ARSENAL RESOURCES ENERGY LLC 6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090
Organizer	PAUL M HERZING 560 EPSILON DR. PITTSBURGH, PA, 15238 USA
Type	Name/Address

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Annual Reports
Date filed

3/30/2017
6/20/2016
6/30/2015
4/28/2014
6/28/2013
5/8/2012
Date filed

For more information, please contact the Secretary of State's Office at 304-558-8000.

Tuesday, November 28, 2017 — 9:44 AM

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Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Arsenal Resources LLC, a West Virginia limited liability company ("Arsenal"), River Ridge Energy, LLC, a Delaware limited liability company ("River Ridge"), and River Ridge Energy, Holdings, LLC, a Delaware limited liability company ("River Ridge Holdings"), is effective as of March 1, 2017. (the "Effective Date") and sets forth the terms pursuant to which Arsenal will drill, complete and operate the Wells (as defined below) on behalf of River Ridge and River Ridge Holdings. Arsenal, River Ridge, and River Ridge Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

1. **Term:** This Agreement is effective from the Effective Date until terminated by Arsenal on the one hand or River Ridge and River Ridge Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** River Ridge and River Holdings authorize Arsenal to undertake and perform, on River Ridge and River Ridge Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by River Ridge or River Ridge Holdings. River Ridge, River Ridge Holdings and Arsenal are affiliates with a common parent. Arsenal was formed to operate oil and gas leasehold acreage held by River Ridge, River Ridge Holdings and certain other affiliates. Arsenal agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by River Ridge or River Ridge Holdings from time to time as directed by River Ridge or River Ridge Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]

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IN WITNESS WHEREOF, Arsenal, River Ridge, and River Ridge Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

ARSENAL RESOURCES LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE ENERGY, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE HOLDINGS, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

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Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Mountaineer Keystone LLC, a West Virginia limited liability company ("Mountaineer Keystone"), PDC Mountaineer, LLC, a Delaware limited liability company ("PDC"), and PDC Mountaineer Holdings, LLC, a Delaware limited liability company ("PDC Holdings"), is effective as of October 15, 2014. (the "Effective Date") and sets forth the terms pursuant to which Mountaineer Keystone will drill, complete and operate the Wells (as defined below) on behalf of PDC and PDC Holdings. Mountaineer Keystone, PDC, and PDC Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

1. **Term:** This Agreement is effective from the Effective Date until terminated by Mountaineer Keystone on the one hand or PDC and PDC Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** PDC and PDC Holdings authorize Mountaineer Keystone to undertake and perform, on PDC and PDC Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by PDC or PDC Holdings. PDC, PDC Holdings and Mountaineer Keystone are affiliates with a common parent. Mountaineer Keystone was formed to operate oil and gas leasehold acreage held by PDC, PDC Holdings and certain other affiliates. Mountaineer Keystone agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by PDC or PDC Holdings from time to time as directed by PDC or PDC Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]


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IN WITNESS WHEREOF, Mountaineer Kcystone, PDC, and PDC Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

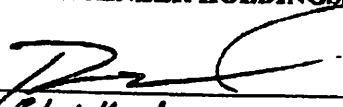
MOUNTAINEER KEYSTONE LLC

By: 
Name: *Robert Koel*
Title: *CEO*

PDC MOUNTAINEER, LLC

By: 
Name: *Robert Koel*
Title: *CEO*

PDC MOUNTAINEER HOLDINGS, LLC

By: 
Name: *Robert Koel*
Title: *CEO*

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People Powered. Asset Strong.

March 28, 2018

Mr. James Martin, Chief of Oil and Gas
WV DEP
601 57th Street, SE
Charleston, WV 25301

RE: Ownership of Roadways; Williams Pad

Mr. Martin:

In preparation of filing a permit application for the above referenced well, the Title Department of Arsenal Resources has conducted a thorough title examination in order to determine the ownership of the oil and gas underlying all roadways crossed by the proposed wells. The findings of the title examinations show that the roadways crossed by the proposed wells are right of ways, with the oil and gas being owned and covered by the leaseholds identified on the plat for the proposed wells.

If you have any questions, concerns or need further information, please do not hesitate to contact me at the address listed below.

Sincerely,

A handwritten signature in blue ink that reads 'Coty Brandon'.

Coty Brandon
Title Manager

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6031 Wallace Road Ext, Suite 300
Wexford, PA 15090
P: 724-940-1100
F: 800-428-0981
www.arsenalresources.com

06/29/2018



Purpose

The purpose of this pad-specific Hydraulic Fracturing Monitoring Plan is to identify and notify conventional well operators near Arsenal Resources hydraulic fracturing in Taylor County, WV prior to hydraulic fracturing at the following ARSENAL RESOURCES wells on the Williams 216 Pad.

Due to the apparent presence of unique geological conditions, the potential for communication between deep geologic zones exists in this area. This potential communication, via natural gas, water, or both, may occur between hydraulically fractured wells in the Marcellus formation (approximately 7,900' TVD) and existing conventional natural gas wells in the partially-depleted, relatively high permeability Huntersville Chert formation (approximately 8,150' TVD).

The plan is being implemented as an additional safety measure to be utilized in conjunction with best management practices and emergency action plans for this site. These additional measures include pre-notification of conventional well operators of the timing and location of the hydraulic fracturing, establishment of measures conventional well operators should implement, and assurance that the Division of Oil and Gas is notified of the timeline, as well as any issues that may arise during fracturing.

1. Communications with Conventional Operators.

ARSENAL RESOURCES, using available data (WV Geological Survey, WVDEP Website, and IHS data service), has identified all known conventional wells and well operators within 500 feet of this pad and the lateral sections. A map showing these wells along with a list of the wells and operators is included in Attachment A.

Upon approval of this plan, ARSENAL RESOURCES will notify these operators, via letter, of the hydraulic fracturing schedule for these wells. A copy of this letter is included in Attachment B.

The letter provides recommendations to these conventional operators to 1) increase their monitoring of their wells during that time period, 2) ensure that their well head equipment is sound, and 3) provide immediate notification to ARSENAL RESOURCES and the OOG in the event of any changes in their well conditions.

Specifically, the letter recommends that conventional well operators conduct the following activities during and after fracturing operations:

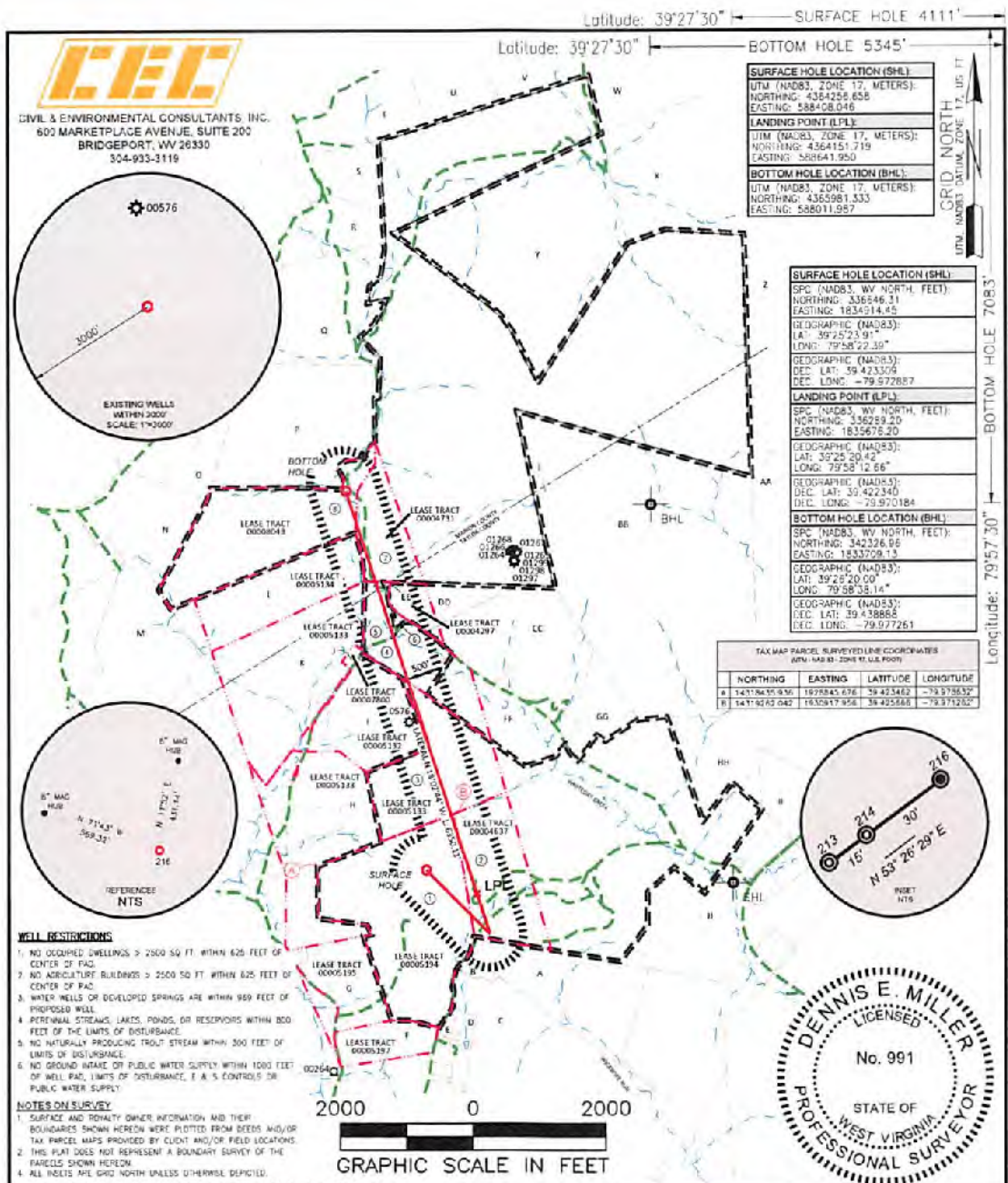
1. Inspect their surface equipment prior to fracturing to establish integrity and establish pre-frac well conditions.
2. Observe wells closely during and after fracturing and monitor for abnormal increases in water, gas or pressure.
3. Inspect or install master valves rated to 3,000 psi or other necessary equipment for wellhead integrity.
4. Notify the OOG and ARSENAL RESOURCES if any changes in water, gas production, pressure or other anomalies are identified.



2. Reporting

ARSENAL RESOURCES will provide information relating to the hydraulic fracturing schedule, communication with conventional operators, and ongoing monitoring of the work upon request of OOG or immediately after any event of any noted abnormalities.

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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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

P.S. 991

COMPANY: **ARSENAL RESOURCES**

WILLIAMS
 OPERATOR'S WELL #: 216
 API WELL #: 47 091
 STATE COUNTY PERMIT

WELL TYPE: OIL WASTE DISPOSAL PRODUCTION DEEP GAS LIQUID INJECTION STORAGE SHALLOW

WATERSHED: WHITEDAY CREEK
 DISTRICT: FETTERMAN DISTRICT COUNTY: TAYLOR
 SURFACE OWNER: WILLIAM C. WILLIAMS
 OIL & GAS ROYALTY OWNER: WILLIAM C. WILLIAMS

DRILL DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION

CONVERT PLUG & ABANDON CLEAN OUT & REPLUG OTHER CHANGE (SPECIFY)

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: 7,826 TO 14,800.3 TMD

WELL OPERATOR: ARSENAL RESOURCES
 ADDRESS: 6031 WALLACE RD, EXT. SUITE 300
 CITY: WEXFORD STATE: PA ZIP CODE: 15090

DESIGNATED AGENT: WILLIAM VEIGEL
 ADDRESS: 65 PROFESSIONAL PLACE, SUITE 200
 CITY: BRIDGEPORT STATE: WV ZIP CODE: 26330

LEGEND:
 ○ PROPOSED SURFACE HOLE / BOTTOM HOLE
 ⊗ EXISTING / PRODUCING WELLHEAD
 LPL LANDING POINT LOCATION
 ⊕ EXISTING WATER WELL
 ⊕ EXISTING SPRING

REVISIONS:
 DATE: 04-04-2018
 DRAWN BY: K.E.S.
 SCALE: 1" = 2000'
 DRAWING NO: 154-452
 WELL LOCATION PLAT



CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
 600 MARKETPLACE AVENUE, SUITE 200
 BRIDGEPORT, WV 26330
 304-933-3119

WELL BORE TABLE FOR SURFACE OWNERS		
TRACT	SURFACE OWNER	TAX PARCEL
1	WILLIAM C. WILLIAMS	06-07-09
2	FIREMAN PAYTON TRUSTEE OF MELBA M. ZINN TRUST (HEIRS)	06-07-11
3	ALVIN L. & JUDY K. LIPSCOMB	06-02-10
4	ANTHONY T. DORSEY & LAURA J. TOBIN & SURV.	06-02-8.1
5	SAMMY R. & SARA L. JACOBS FAMILY TRUST & DANIEL & SONORA & SURV	06-02-03
6	WESLEY H. DR CAROLYN A. HAMILTON	06-02-08
7	ORTHODOX EDUCATIONAL SOCIETY	06-03-41
8	THE JOHN M. CONNOLLY TRUST, ET AL	06-26-11

ADJOINING OWNERS TABLE		
TRACT	SURFACE OWNER	TAX PARCEL
A	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-12
B	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-13
C	GLENNA LEE EVANS	06-07-14
D	MARGIE M. CURRY	06-07-14.9
E	MARGIE M. CURRY	06-07-14.7
F	MARY ANN & WILLIAM CHRISTOPHER WILLIAMS & SURV	06-07-15
G	MARY ANN NUZUM	06-07-16
H	ALVIN L. & JUDY K. LIPSCOMB	06-07-08
I	ALVIN L. & JUDY K. LIPSCOMB	06-02-09
J	CHARLES C. CATANIA	06-02-2.1
K	MARK D. & KAREN T. WOLF & SURV.	06-02-2.2
L	SAMMY R. & SARA L. JACOBS FAMILY TRUST, ET AL	19-26-12
M	CHARLES E. MCDONALD	19-26-06
N	THE JOHN M. CONNOLLY TRUST	19-26-7.8
O	DAVID L. SR & BONNIE SMITH	19-29-15
P	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-10
Q	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-09
R	NATHAN S. STEVENS	19-26-8.4
S	DANIEL W. & SONORA J. JACOBS	19-26-8.3
T	EVELYN J. MUSGROVE	19-28-01
U	CHRISTOPHER J. MORAN & CAROLINE E M ROBSON	19-28-3.1
V	MARK D. MORAN	19-26-03
W	VA E FLANNAGAN	19-27-08
X	WILLIAM R. BJORKMAN	19-27-07
Y	JAMES O. & JUDITH A. MORAN TRS MORAN LIVING TRUST	19-27-01
Z	BEVERLY D. HORNBECK TRUST	19-27-04
AA	CHARLES EDWARD & LAVERNE MACDONALD	6-03-20
BB	RUTH E. HAUGHT, ET AL	19-27-03
CC	RUTH E. PYSSELL	6-2-7
DD	CHARLES E. MCDONALD	6-2-5
EE	ROBERT W. & KIMBERLY J. BRYAN	6-2-5
FF	CHARLES E. MCDONALD	6-2-11
GG	WESLEY HAROLD HAMILTON & CAROLYN ANN BOWMAN	6-2-12
HH	BREWER VIRGINIA MORGAN	6-3-24
II	CAROL W. GALLAHER	6-3-26
JJ	BREWER VIRGINIA MORGAN	6-6-1

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REVISIONS:	COMPANY:			DATE: 04-04-2018
				DRAWN BY: K.E.S.
	OPERATOR'S	WILLIAMS		SCALE: N/A
	WELL #:	216		DRAWING NO: 154-452
	DISTRICT:	COUNTY:	STATE:	WELL LOCATION PLAT 2
	FETTERMAN DISTRICT	TAYLOR	WV	

06/29/2018



Click or tap to enter a date.

Alliance Petroleum
Address
State

RE: Click or tap here to enter text.

Dear Sir/Madam,

Arsenal Resources has developed a Marcellus pad Williams 216, located in Taylor County, WV. As an owner or operator of conventional natural gas wells in this area, we are requesting your assistance in this matter.

Due to the apparent presence of unique geological conditions, the potential for communication between deep geologic zones exists in this area. This potential communication, via natural gas, water, or both, may occur between hydraulically fractured wells in the Marcellus formation (approximately 7,900' TVD) and existing conventional natural gas wells included in the attached well list for which you are believed to be the operator.

Arsenal Resources anticipates conducting hydraulic fracturing at the Williams 216 Pad during the Quarter of 2018. We have identified conventional natural gas wells operated by your company within 500' (lateral distance) of our newly planned wells. Plats for each well on this pad are attached.

We recommend that conventional well operators conduct the following activities before, during and after fracturing operations:

1. Inspect surface equipment, prior to fracturing, to establish integrity and establish well conditions.
2. Observe wells closely during and after fracturing and monitor for abnormal increases in water, gas, or pressure.
3. Inspect or install master valves rated to 3,000 psi or other necessary equipment for wellhead integrity.
4. Notify the OOG and Arsenal Resources if any changes in water, gas production, pressure or other anomalies are identified.

Please feel free to contact me at 724-940-1218 with any questions or comments. You may also contact the WV Office of Oil and Gas at 304-926-0440.

Sincerely,

Kelly Davis
Permitting Specialist

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"Attachment B"



ARSENAL
R E S O U R C E S

Arsenal Resources

**Taylor County, West Virginia
Williams PAD
Williams #216**

**Wellbore #1
Design #3**

QES Anticollision Report

29 March, 2018

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06/29/2018

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference	Design #3		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 10,000.0 us	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program	Date 3/29/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	14,800.3	Design #3 (Wellbore #1)	MWD default	MWD - Standard

Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Summary						
Offset Well - Wellbore - Design						
Williams PAD						
Williams #213 - Wellbore #1 - Design #3	1,500.0	1,500.0	45.0	38.5	6.951	CC, ES
Williams #213 - Wellbore #1 - Design #3	1,600.0	1,598.7	46.4	39.5	6.732	SF
Williams #214 - Wellbore #1 - Design #3	2,000.0	2,000.0	30.0	21.3	3.440	CC, ES
Williams #214 - Wellbore #1 - Design #3	2,100.0	2,099.5	30.9	21.7	3.379	SF

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3											Offset Site Error:	0.0 usft
Survey Program: 0-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	-126.56	-26.8	-36.1	45.0			
100.0	100.0	100.0	100.0	0.1	0.1	-126.56	-26.8	-36.1	45.0	44.8	250.219	
200.0	200.0	200.0	200.0	0.3	0.3	-126.56	-26.8	-36.1	45.0	44.4	71.491	
300.0	300.0	300.0	300.0	0.5	0.5	-126.56	-26.8	-36.1	45.0	43.9	41.703	
400.0	400.0	400.0	400.0	0.8	0.8	-126.56	-26.8	-36.1	45.0	43.5	29.438	
500.0	500.0	500.0	500.0	1.0	1.0	-126.56	-26.8	-36.1	45.0	43.0	22.747	
600.0	600.0	600.0	600.0	1.2	1.2	-126.56	-26.8	-36.1	45.0	42.6	18.535	
700.0	700.0	700.0	700.0	1.4	1.4	-126.56	-26.8	-36.1	45.0	42.1	15.639	
800.0	800.0	800.0	800.0	1.7	1.7	-126.56	-26.8	-36.1	45.0	41.7	13.525	
900.0	900.0	900.0	900.0	1.9	1.9	-126.56	-26.8	-36.1	45.0	41.2	11.915	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-126.56	-26.8	-36.1	45.0	40.8	10.649	
1,100.0	1,100.0	1,100.0	1,100.0	2.3	2.3	-126.56	-26.8	-36.1	45.0	40.3	9.624	
1,200.0	1,200.0	1,200.0	1,200.0	2.5	2.5	-126.56	-26.8	-36.1	45.0	39.9	8.780	
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	-126.56	-26.8	-36.1	45.0	39.4	8.072	
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	-126.56	-26.8	-36.1	45.0	39.0	7.469	
1,500.0	1,500.0	1,500.0	1,500.0	3.2	3.2	-126.56	-26.8	-36.1	45.0	38.5	6.951	CC, ES
1,600.0	1,600.0	1,598.7	1,598.7	3.5	3.4	-127.83	-28.4	-36.6	46.4	39.5	6.732	SF
1,700.0	1,700.0	1,697.2	1,697.1	3.7	3.6	-131.20	-33.3	-38.0	50.7	43.4	6.963	
1,800.0	1,800.0	1,795.2	1,794.7	3.9	3.8	-135.68	-41.4	-40.4	58.1	50.4	7.586	
1,900.0	1,900.0	1,892.6	1,891.3	4.1	4.0	-140.27	-52.6	-43.7	68.9	60.9	8.575	
2,000.0	2,000.0	1,989.0	1,986.6	4.4	4.2	-144.37	-66.8	-47.8	83.2	74.8	9.898	
2,100.0	2,100.0	2,084.3	2,080.3	4.6	4.4	-147.76	-83.8	-52.8	101.0	92.2	11.514	
2,200.0	2,200.0	2,178.4	2,172.0	4.8	4.7	-150.49	-103.5	-58.6	122.2	113.1	13.364	

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Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
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Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Reference (usft)	Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Centre +E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
2,300.0	2,300.0	2,270.9	2,261.7	5.0	5.1	-152.62	-125.7	-65.1	146.7	137.2	15.474			
2,400.0	2,400.0	2,361.9	2,348.9	5.3	5.4	-154.30	-150.3	-72.3	174.4	164.6	17.750			
2,500.0	2,500.0	2,451.1	2,433.7	5.5	5.8	-155.63	-178.9	-80.1	205.2	195.1	20.189			
2,600.0	2,600.0	2,538.7	2,516.0	5.7	6.3	67.93	-205.5	-88.5	238.4	227.9	22.752			
2,700.0	2,699.8	2,624.8	2,596.1	5.9	6.8	67.33	-236.0	-97.4	273.2	262.4	25.357			
2,800.0	2,799.5	2,709.4	2,673.8	6.1	7.3	67.19	-268.1	-106.9	309.5	298.4	27.934			
2,900.0	2,898.7	2,792.4	2,749.0	6.2	7.9	67.36	-301.8	-116.7	347.3	335.9	30.454			
3,000.0	2,997.5	2,873.7	2,821.7	6.5	8.5	67.71	-336.9	-127.0	386.6	374.8	32.882			
3,100.0	3,095.6	2,953.4	2,891.8	6.7	9.2	68.16	-373.1	-137.6	427.4	415.2	35.189			
3,200.0	3,193.1	3,037.7	2,965.1	7.0	9.9	68.79	-413.1	-149.4	469.4	456.7	37.035			
3,300.0	3,289.6	3,127.7	3,043.1	7.3	10.7	69.65	-456.1	-161.9	510.8	497.5	38.231			
3,400.0	3,385.3	3,217.6	3,121.2	7.7	11.5	70.63	-499.0	-174.5	551.8	537.5	39.027			
3,500.0	3,479.8	3,307.4	3,199.1	8.1	12.3	71.70	-541.9	-187.1	591.9	576.9	39.452			
3,600.0	3,573.2	3,397.0	3,276.8	8.6	13.2	72.85	-584.6	-199.6	631.7	615.7	39.546			
3,700.0	3,665.2	3,486.2	3,354.1	9.1	14.0	74.06	-627.2	-212.1	671.3	654.2	39.355			
3,750.2	3,710.9	3,530.8	3,392.8	9.4	14.4	74.68	-648.5	-218.4	691.1	673.4	39.169			
3,800.0	3,756.0	3,575.0	3,431.2	9.7	14.8	75.69	-669.6	-224.5	710.8	692.6	38.956			
3,900.0	3,846.7	3,663.7	3,508.1	10.4	15.7	77.56	-712.0	-236.9	751.0	731.5	38.414			
4,000.0	3,937.3	3,752.5	3,585.1	11.1	16.5	79.25	-754.4	-249.4	791.9	771.0	37.889			
4,100.0	4,027.9	3,841.2	3,662.1	11.8	17.4	80.78	-796.7	-261.8	833.3	811.0	37.398			
4,200.0	4,118.6	3,929.9	3,739.1	12.5	18.2	82.18	-839.1	-274.2	875.2	851.5	36.944			
4,300.0	4,209.2	4,018.7	3,816.0	13.2	19.1	83.45	-881.5	-286.6	917.4	892.3	36.527			
4,400.0	4,299.8	4,107.4	3,893.0	14.0	19.9	84.61	-923.8	-299.0	960.1	933.5	36.147			
4,500.0	4,390.4	4,196.1	3,970.0	14.8	20.8	85.68	-965.2	-311.4	1,003.0	975.0	35.800			
4,600.0	4,481.0	4,284.9	4,047.0	15.5	21.7	86.66	-1,008.6	-323.9	1,046.2	1,016.7	35.483			
4,700.0	4,571.7	4,373.6	4,123.9	16.3	22.5	87.57	-1,050.9	-336.3	1,089.7	1,058.7	35.196			
4,800.0	4,662.3	4,462.3	4,200.9	17.1	23.4	88.40	-1,093.3	-348.7	1,133.3	1,100.9	34.934			
4,900.0	4,752.9	4,551.1	4,277.9	17.9	24.3	89.18	-1,135.7	-361.1	1,177.2	1,143.2	34.695			
5,000.0	4,843.6	4,639.8	4,354.8	18.7	25.1	89.90	-1,178.0	-373.5	1,221.2	1,185.8	34.476			
5,100.0	4,934.2	4,728.5	4,431.8	19.6	26.0	90.58	-1,220.4	-385.9	1,265.3	1,228.4	34.277			
5,200.0	5,024.8	4,817.3	4,508.8	20.4	26.9	91.21	-1,262.8	-398.4	1,309.6	1,271.2	34.094			
5,300.0	5,115.4	4,906.0	4,585.8	21.2	27.7	91.80	-1,305.1	-410.8	1,354.1	1,314.1	33.926			
5,400.0	5,206.1	4,994.8	4,662.7	22.0	28.6	92.35	-1,347.5	-423.2	1,398.6	1,357.2	33.772			
5,500.0	5,296.7	5,083.5	4,739.7	22.9	29.5	92.87	-1,389.9	-435.6	1,443.2	1,400.3	33.630			
5,600.0	5,387.3	5,172.2	4,816.7	23.7	30.4	93.35	-1,432.2	-448.0	1,487.9	1,443.5	33.499			
5,694.0	5,472.5	5,255.6	4,898.0	24.5	31.2	93.79	-1,472.0	-459.7	1,530.0	1,484.2	33.385			
5,700.0	5,478.0	5,261.0	4,893.7	24.5	31.2	93.87	-1,474.6	-460.4	1,532.7	1,486.8	33.381			
5,800.0	5,569.4	5,350.0	4,970.9	25.1	32.1	95.23	-1,517.1	-472.9	1,577.5	1,530.2	33.417			
5,900.0	5,662.2	5,439.4	5,048.4	25.7	33.0	96.42	-1,559.8	-485.4	1,621.9	1,573.5	33.494			
6,000.0	5,756.2	5,529.1	5,128.3	26.3	33.9	97.45	-1,602.6	-498.0	1,668.1	1,616.5	33.610			
6,100.0	5,851.4	5,619.0	5,204.2	26.8	34.8	98.34	-1,645.5	-510.5	1,709.8	1,659.2	33.763			
6,200.0	5,947.5	5,709.0	5,282.3	27.2	35.7	99.10	-1,688.5	-523.1	1,753.1	1,701.5	33.952			
6,300.0	6,044.6	5,798.9	5,360.3	27.6	36.6	99.72	-1,731.5	-535.7	1,795.9	1,743.4	34.178			
6,400.0	6,142.5	5,888.7	5,438.2	28.0	37.4	100.24	-1,774.3	-548.3	1,838.3	1,784.9	34.440			
6,500.0	6,241.0	5,978.3	5,515.9	28.3	38.3	100.64	-1,817.1	-560.8	1,880.1	1,826.0	34.741			
6,600.0	6,340.0	6,067.5	5,593.3	28.6	39.2	100.95	-1,859.7	-573.3	1,921.6	1,866.8	35.082			
6,700.0	6,439.5	6,156.2	5,670.3	28.8	40.1	101.18	-1,902.1	-585.7	1,962.6	1,907.3	35.465			
6,800.0	6,539.3	6,244.4	5,746.8	29.0	41.0	101.32	-1,944.1	-598.0	2,003.3	1,947.5	35.892			
6,900.0	6,639.2	6,330.9	5,824.4	29.2	42.0	100.98	-2,007.1	-615.5	2,042.1	1,985.4	35.991			
6,944.2	6,683.4	6,516.2	5,887.8	29.2	42.9	-124.69	-2,064.6	-633.3	2,057.7	1,999.8	35.623			
7,000.0	6,739.2	6,638.9	6,100.1	29.3	43.7	-125.59	-2,111.6	-647.1	2,075.7	2,017.0	35.325			
7,100.0	6,839.2	6,859.6	6,319.8	29.4	44.9	-126.96	-2,187.5	-669.4	2,103.6	2,043.5	34.999			

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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
7,200.0	6,939.2	7,112.8	6,551.3	29.5	46.0	-128.01	-2,249.0	-687.4	2,125.2	2,063.9	34.708		
7,300.0	7,039.2	7,365.8	6,800.1	29.6	46.8	-128.72	-2,292.6	-700.2	2,139.9	2,077.9	34.510		
7,400.0	7,139.2	8,892.3	7,826.0	29.7	39.7	-108.05	-1,583.4	-947.0	2,119.0	2,062.6	37.511		
7,450.2	7,189.4	8,892.3	7,826.0	29.7	39.7	-108.05	-1,583.4	-947.0	2,103.2	2,046.3	38.960		
7,500.0	7,239.2	8,894.2	7,826.0	29.8	39.7	-91.31	-1,581.5	-947.6	2,088.7	2,031.3	36.387		
7,550.0	7,288.8	8,900.1	7,826.0	29.8	39.7	-92.40	-1,576.0	-949.4	2,075.3	2,017.5	35.912		
7,600.0	7,337.8	8,909.8	7,826.0	29.7	39.6	-93.25	-1,566.7	-952.5	2,063.2	2,005.1	35.531		
7,650.0	7,385.9	8,923.4	7,826.0	29.6	39.5	-93.88	-1,553.8	-956.6	2,052.3	1,994.1	35.244		
7,700.0	7,432.8	8,940.7	7,926.0	29.5	39.3	-94.29	-1,537.4	-962.0	2,042.8	1,984.5	35.049		
7,750.0	7,478.2	8,961.6	7,826.0	29.3	39.1	-94.50	-1,517.5	-968.5	2,034.5	1,976.3	34.943		
7,800.0	7,521.9	8,986.0	7,826.0	29.1	38.9	-94.53	-1,494.3	-976.0	2,027.5	1,969.5	34.920		
7,850.0	7,563.4	9,013.8	7,826.0	28.8	38.7	-94.40	-1,467.9	-984.6	2,021.7	1,963.9	34.968		
7,900.0	7,602.7	9,044.7	7,826.0	28.6	38.5	-94.14	-1,438.5	-994.2	2,017.0	1,959.5	35.080		
7,950.0	7,639.4	9,078.6	7,826.0	28.3	38.2	-93.77	-1,406.2	-1,004.7	2,013.2	1,956.1	35.258		
8,000.0	7,673.4	9,115.3	7,826.0	28.0	37.9	-93.31	-1,371.3	-1,016.1	2,010.4	1,953.7	35.485		
8,050.0	7,704.3	9,154.6	7,826.0	27.6	37.6	-92.81	-1,334.0	-1,028.3	2,008.3	1,952.1	35.749		
8,100.0	7,732.1	9,196.1	7,826.0	27.3	37.3	-92.29	-1,294.5	-1,041.1	2,006.8	1,951.1	36.055		
8,150.0	7,756.5	9,239.7	7,826.0	27.0	37.0	-91.77	-1,253.1	-1,054.6	2,005.8	1,950.6	36.368		
8,200.0	7,777.5	9,285.1	7,826.0	26.6	36.7	-91.28	-1,209.9	-1,068.7	2,005.2	1,950.5	36.704		
8,250.0	7,794.8	9,332.0	7,826.0	26.3	36.3	-90.85	-1,165.3	-1,083.2	2,004.8	1,950.7	37.031		
8,300.0	7,808.4	9,380.1	7,826.0	25.9	36.0	-90.49	-1,119.6	-1,098.1	2,004.7	1,951.0	37.356		
8,350.0	7,818.1	9,429.1	7,826.0	25.6	35.7	-90.22	-1,073.0	-1,113.3	2,004.6	1,951.4	37.657		
8,400.0	7,824.0	9,478.8	7,826.0	25.3	35.4	-90.06	-1,025.8	-1,126.7	2,004.6	1,951.8	37.938		
8,418.4	7,825.2	9,497.2	7,826.0	25.2	35.3	-90.02	-1,008.3	-1,134.4	2,004.6	1,951.9	38.015		
8,450.2	7,826.0	9,528.9	7,826.0	25.0	35.1	-90.00	-978.1	-1,144.2	2,004.6	1,952.1	38.183		
8,500.0	7,826.0	9,578.7	7,826.0	24.7	34.8	-90.00	-930.7	-1,159.7	2,004.6	1,952.4	38.369		
8,600.0	7,826.0	9,678.7	7,826.0	24.2	34.2	-90.00	-835.6	-1,190.6	2,004.6	1,952.7	38.646		
8,700.0	7,826.0	9,778.7	7,826.0	23.8	33.7	-90.00	-740.5	-1,221.6	2,004.6	1,952.8	38.888		
8,800.0	7,826.0	9,878.7	7,826.0	23.5	33.2	-90.00	-645.5	-1,252.6	2,004.6	1,952.8	38.514		
8,900.0	7,826.0	9,978.7	7,826.0	23.4	32.8	-90.00	-550.4	-1,283.6	2,004.6	1,952.0	38.132		
9,000.0	7,826.0	10,078.7	7,826.0	23.4	32.4	-90.00	-455.3	-1,314.6	2,004.6	1,951.2	37.559		
9,100.0	7,826.0	10,178.7	7,826.0	23.7	32.0	-90.00	-360.2	-1,345.5	2,004.6	1,950.2	36.820		
9,200.0	7,826.0	10,278.7	7,826.0	24.2	31.6	-90.00	-265.2	-1,376.5	2,004.6	1,948.8	35.940		
9,300.0	7,826.0	10,378.7	7,826.0	24.9	31.8	-90.00	-170.1	-1,407.5	2,004.6	1,947.4	35.027		
9,400.0	7,826.0	10,478.7	7,826.0	25.8	33.0	-90.00	-75.0	-1,438.5	2,004.6	1,945.6	33.945		
9,500.0	7,826.0	10,578.7	7,826.0	26.9	34.2	-90.00	20.1	-1,469.5	2,004.6	1,943.6	32.850		
9,600.0	7,826.0	10,678.7	7,826.0	28.1	35.5	-90.00	115.2	-1,500.4	2,004.6	1,941.5	31.738		
9,700.0	7,826.0	10,778.7	7,826.0	29.3	36.8	-90.00	210.2	-1,531.4	2,004.6	1,939.2	30.625		
9,800.0	7,826.0	10,878.7	7,826.0	30.6	38.1	-90.00	305.3	-1,562.4	2,004.6	1,936.7	29.525		
9,900.0	7,826.0	10,978.7	7,826.0	32.0	39.5	-90.00	400.4	-1,593.4	2,004.6	1,934.2	28.453		
10,000.0	7,826.0	11,078.7	7,826.0	33.4	40.9	-90.00	495.5	-1,624.3	2,004.6	1,931.5	27.412		
10,100.0	7,826.0	11,178.7	7,826.0	34.9	42.3	-90.00	590.6	-1,655.3	2,004.6	1,928.7	26.410		
10,200.0	7,826.0	11,278.7	7,826.0	36.4	43.7	-90.00	685.6	-1,686.3	2,004.6	1,925.9	25.449		
10,300.0	7,826.0	11,378.7	7,826.0	37.9	45.2	-90.00	780.7	-1,717.3	2,004.6	1,922.9	24.532		
10,400.0	7,826.0	11,478.7	7,826.0	39.5	46.7	-90.00	875.8	-1,748.3	2,004.6	1,919.9	23.659		
10,500.0	7,826.0	11,578.7	7,826.0	41.1	48.3	-90.00	970.9	-1,779.2	2,004.6	1,916.8	22.829		
10,600.0	7,826.0	11,678.7	7,826.0	42.7	49.8	-90.00	1,066.0	-1,810.2	2,004.6	1,913.7	22.041		
10,700.0	7,826.0	11,778.7	7,826.0	44.4	51.4	-90.00	1,161.0	-1,841.2	2,004.6	1,910.5	21.294		
10,800.0	7,826.0	11,878.7	7,826.0	46.0	53.0	-90.00	1,256.1	-1,872.2	2,004.6	1,907.3	20.586		
10,900.0	7,826.0	11,978.7	7,826.0	47.7	54.6	-90.00	1,351.2	-1,903.2	2,004.6	1,904.0	19.916		
11,000.0	7,826.0	12,078.7	7,826.0	49.4	56.2	-90.00	1,446.3	-1,934.1	2,004.6	1,900.7	19.280		
11,100.0	7,826.0	12,178.7	7,826.0	51.1	57.8	-90.00	1,541.4	-1,965.1	2,004.6	1,897.3	18.678		

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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Reference (usft)	Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
11,200.0	7,826.0	12,278.7	7,826.0	52.8	59.5	-90.00	1,636.4	-1,966.1	2,004.6	1,893.9	18.107		
11,300.0	7,826.0	12,378.7	7,826.0	54.6	61.2	-90.00	1,731.5	-2,027.1	2,004.6	1,890.5	17.566		
11,400.0	7,826.0	12,478.7	7,826.0	56.3	62.8	-90.00	1,826.6	-2,058.1	2,004.7	1,887.1	17.052		
11,500.0	7,826.0	12,578.7	7,826.0	58.1	64.5	-90.00	1,921.7	-2,089.0	2,004.7	1,883.6	16.565		
11,600.0	7,826.0	12,678.7	7,826.0	59.9	66.2	-90.00	2,016.8	-2,120.0	2,004.7	1,880.2	16.101		
11,700.0	7,826.0	12,778.7	7,826.0	61.6	67.9	-90.00	2,111.9	-2,151.0	2,004.7	1,876.6	15.660		
11,800.0	7,826.0	12,878.7	7,826.0	63.4	69.6	-90.00	2,206.9	-2,182.0	2,004.7	1,873.1	15.241		
11,900.0	7,826.0	12,978.7	7,826.0	65.2	71.4	-90.00	2,302.0	-2,212.9	2,004.7	1,869.6	14.842		
12,000.0	7,826.0	13,078.7	7,826.0	67.0	73.1	-90.00	2,397.1	-2,243.9	2,004.7	1,866.0	14.461		
12,100.0	7,826.0	13,178.7	7,826.0	68.8	74.8	-90.00	2,492.2	-2,274.9	2,004.7	1,862.5	14.098		
12,200.0	7,826.0	13,278.7	7,826.0	70.6	76.5	-90.00	2,587.3	-2,305.9	2,004.7	1,858.9	13.751		
12,300.0	7,826.0	13,378.7	7,826.0	72.4	78.3	-90.00	2,682.3	-2,336.9	2,004.7	1,855.3	13.420		
12,400.0	7,826.0	13,478.7	7,826.0	74.3	80.1	-90.00	2,777.4	-2,367.8	2,004.7	1,851.7	13.104		
12,500.0	7,826.0	13,578.7	7,826.0	76.1	81.9	-90.00	2,872.5	-2,398.8	2,004.7	1,848.1	12.801		
12,600.0	7,826.0	13,678.7	7,826.0	77.9	83.7	-90.00	2,967.6	-2,429.8	2,004.7	1,844.4	12.511		
12,700.0	7,826.0	13,778.7	7,826.0	79.8	85.4	-90.00	3,062.7	-2,460.8	2,004.7	1,840.8	12.234		
12,800.0	7,826.0	13,878.7	7,826.0	81.6	87.2	-90.00	3,157.7	-2,491.8	2,004.7	1,837.2	11.967		
12,900.0	7,826.0	13,978.7	7,826.0	83.4	89.0	-90.00	3,252.8	-2,522.7	2,004.7	1,833.5	11.712		
13,000.0	7,826.0	14,078.7	7,826.0	85.3	90.8	-90.00	3,347.9	-2,553.7	2,004.7	1,829.9	11.466		
13,100.0	7,826.0	14,178.7	7,826.0	87.1	92.6	-90.00	3,443.0	-2,584.7	2,004.7	1,826.2	11.231		
13,200.0	7,826.0	14,278.7	7,826.0	89.0	94.4	-90.00	3,538.1	-2,615.7	2,004.7	1,822.5	11.004		
13,300.0	7,826.0	14,378.7	7,826.0	90.8	96.2	-90.00	3,633.1	-2,646.6	2,004.7	1,818.8	10.786		
13,400.0	7,826.0	14,478.7	7,826.0	92.7	98.0	-90.00	3,728.2	-2,677.6	2,004.7	1,815.1	10.576		
13,500.0	7,826.0	14,578.7	7,826.0	94.5	99.8	-90.00	3,823.3	-2,708.6	2,004.7	1,811.4	10.374		
13,600.0	7,826.0	14,678.7	7,826.0	96.4	101.7	-90.00	3,918.4	-2,739.6	2,004.7	1,807.7	10.179		
13,700.0	7,826.0	14,778.7	7,826.0	98.3	103.5	-90.00	4,013.5	-2,770.6	2,004.7	1,804.0	9.991		
13,800.0	7,826.0	14,878.7	7,826.0	100.1	105.3	-90.00	4,108.5	-2,801.5	2,004.7	1,800.3	9.810		
13,900.0	7,826.0	14,978.7	7,826.0	102.0	107.1	-90.00	4,203.6	-2,832.5	2,004.7	1,796.6	9.634		
14,000.0	7,826.0	15,078.7	7,826.0	103.9	109.0	-90.00	4,298.7	-2,863.5	2,004.7	1,792.9	9.465		
14,100.0	7,826.0	15,178.7	7,826.0	105.7	110.8	-90.00	4,393.8	-2,894.5	2,004.7	1,789.2	9.302		
14,200.0	7,826.0	15,278.7	7,826.0	107.6	112.6	-90.00	4,488.9	-2,925.5	2,004.7	1,785.5	9.144		
14,300.0	7,826.0	15,378.7	7,826.0	109.5	114.5	-90.00	4,583.9	-2,956.4	2,004.7	1,781.7	8.991		
14,400.0	7,826.0	15,478.7	7,826.0	111.4	116.3	-90.00	4,679.0	-2,987.4	2,004.7	1,778.0	8.843		
14,500.0	7,826.0	15,578.7	7,826.0	113.2	118.2	-90.00	4,774.1	-3,018.4	2,004.7	1,774.3	8.699		
14,600.0	7,826.0	15,678.7	7,826.0	115.1	120.0	-90.00	4,869.2	-3,049.4	2,004.7	1,770.5	8.560		
14,700.0	7,826.0	15,778.7	7,826.0	117.0	121.8	-90.00	4,964.3	-3,080.4	2,004.7	1,766.8	8.425		
14,798.5	7,826.0	15,877.2	7,826.0	118.8	123.7	-90.00	5,059.9	-3,110.9	2,004.7	1,763.1	8.297		
14,800.3	7,826.0	15,879.1	7,826.0	118.9	123.7	-90.00	5,059.7	-3,111.4	2,004.7	1,763.0	8.294		

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Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #214 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	-126.56	-17.9	-24.1	30.0				
100.0	100.0	100.0	100.0	0.1	0.1	-126.56	-17.9	-24.1	30.0	29.8	166.854		
200.0	200.0	200.0	200.0	0.3	0.3	-126.56	-17.9	-24.1	30.0	29.4	47.672		
300.0	300.0	300.0	300.0	0.5	0.5	-126.56	-17.9	-24.1	30.0	28.9	27.809		
400.0	400.0	400.0	400.0	0.8	0.8	-126.56	-17.9	-24.1	30.0	28.5	19.630		
500.0	500.0	500.0	500.0	1.0	1.0	-126.56	-17.9	-24.1	30.0	28.0	15.169		
600.0	600.0	600.0	600.0	1.2	1.2	-126.56	-17.9	-24.1	30.0	27.6	12.360		
700.0	700.0	700.0	700.0	1.4	1.4	-126.56	-17.9	-24.1	30.0	27.1	10.428		
800.0	800.0	800.0	800.0	1.7	1.7	-126.56	-17.9	-24.1	30.0	26.7	9.019		
900.0	900.0	900.0	900.0	1.9	1.9	-126.56	-17.9	-24.1	30.0	26.2	7.945		
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-126.56	-17.9	-24.1	30.0	25.8	7.100		
1,100.0	1,100.0	1,100.0	1,100.0	2.3	2.3	-126.56	-17.9	-24.1	30.0	25.3	6.417		
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	-126.56	-17.9	-24.1	30.0	24.9	5.855		
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	-126.56	-17.9	-24.1	30.0	24.4	5.382		
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	-126.56	-17.9	-24.1	30.0	24.0	4.981		
1,500.0	1,500.0	1,500.0	1,500.0	3.2	3.2	-126.56	-17.9	-24.1	30.0	23.5	4.635		
1,600.0	1,600.0	1,600.0	1,600.0	3.5	3.5	-126.56	-17.9	-24.1	30.0	23.1	4.334		
1,700.0	1,700.0	1,700.0	1,700.0	3.7	3.7	-126.56	-17.9	-24.1	30.0	22.6	4.070		
1,800.0	1,800.0	1,800.0	1,800.0	3.9	3.9	-126.56	-17.9	-24.1	30.0	22.2	3.835		
1,900.0	1,900.0	1,900.0	1,900.0	4.1	4.1	-126.56	-17.9	-24.1	30.0	21.7	3.627		
2,000.0	2,000.0	2,000.0	2,000.0	4.4	4.4	-126.56	-17.9	-24.1	30.0	21.3	3,440 CC, ES		
2,100.0	2,100.0	2,099.5	2,099.4	4.6	4.6	-129.36	-19.6	-23.9	30.9	21.7	3,379 SF		
2,200.0	2,200.0	2,198.7	2,198.5	4.8	4.7	-136.80	-24.7	-23.2	33.9	24.4	3,560		
2,300.0	2,300.0	2,297.4	2,296.9	5.0	4.9	-146.35	-33.2	-22.1	40.0	30.1	4,034		
2,400.0	2,400.0	2,395.4	2,394.2	5.3	5.1	-155.43	-44.9	-20.5	49.7	39.4	4,837		
2,500.0	2,500.0	2,492.6	2,490.1	5.5	5.3	-162.75	-59.7	-18.5	63.3	52.7	5,958		
2,600.0	2,600.0	2,588.8	2,584.7	5.7	5.5	57.41	-77.6	-16.2	79.8	68.9	7,291		
2,700.0	2,699.8	2,684.3	2,677.8	5.9	5.8	55.29	-98.5	-13.4	97.9	86.6	8,696		
2,800.0	2,799.5	2,779.1	2,769.5	6.1	6.1	54.62	-122.2	-10.3	117.0	105.5	10,124		
2,900.0	2,898.7	2,873.0	2,859.6	6.2	6.4	54.79	-148.7	-6.7	137.3	125.5	11,555		
3,000.0	2,897.5	2,866.1	2,847.9	6.5	6.8	55.48	-177.8	-2.9	158.7	146.5	12,973		
3,100.0	3,055.6	3,058.3	3,034.4	6.7	7.2	56.42	-209.5	1.3	181.2	168.6	14,359		
3,200.0	3,193.1	3,149.6	3,119.0	7.0	7.7	57.54	-243.5	5.8	204.9	191.8	15,690		
3,300.0	3,289.5	3,240.0	3,201.6	7.3	8.3	58.74	-279.8	10.6	229.8	216.2	16,941		
3,400.0	3,385.3	3,329.4	3,282.2	7.7	8.9	59.96	-318.2	15.7	255.8	241.7	18,088		
3,500.0	3,479.8	3,420.8	3,363.4	8.1	9.5	61.25	-359.8	21.3	283.0	268.1	19,009		
3,600.0	3,573.2	3,516.7	3,448.3	8.6	10.2	62.84	-404.0	27.1	309.3	293.4	19,517		
3,700.0	3,665.2	3,612.7	3,533.3	9.1	11.0	64.67	-448.1	33.0	334.5	317.5	19,742		
3,750.2	3,710.9	3,660.8	3,576.0	9.4	11.3	65.67	-470.3	35.9	346.8	329.2	19,763		
3,800.0	3,756.0	3,708.5	3,618.2	9.7	11.7	66.87	-492.2	38.8	358.9	340.8	19,753		
3,900.0	3,846.7	3,804.4	3,703.1	10.4	12.5	69.05	-536.4	44.7	383.8	364.3	19,675		
4,000.0	3,937.3	3,900.3	3,786.1	11.1	13.3	70.95	-580.5	50.5	409.1	388.2	19,575		
4,100.0	4,027.9	3,956.2	3,873.0	11.8	14.1	72.66	-624.6	56.4	434.8	412.5	19,469		
4,200.0	4,118.5	4,082.0	3,957.9	12.5	14.9	74.16	-668.7	62.2	460.9	437.1	19,361		
4,300.0	4,209.2	4,187.9	4,042.8	13.2	15.7	75.51	-712.9	68.1	487.2	461.9	19,255		
4,400.0	4,299.8	4,283.8	4,127.7	14.0	16.5	76.72	-757.0	73.9	513.7	486.9	19,156		
4,500.0	4,390.4	4,379.6	4,212.6	14.8	17.3	77.81	-801.1	79.8	540.4	512.1	19,061		
4,600.0	4,481.0	4,475.5	4,297.5	15.5	18.2	78.80	-845.2	85.6	567.3	537.4	18,972		
4,700.0	4,571.7	4,571.4	4,382.4	16.3	19.0	79.70	-889.3	91.5	594.4	562.9	18,889		
4,800.0	4,662.3	4,667.2	4,467.4	17.1	19.8	80.52	-933.5	97.4	621.5	588.5	18,812		
4,900.0	4,752.9	4,763.1	4,552.3	17.9	20.7	81.28	-977.6	103.2	648.8	614.2	18,741		
5,000.0	4,843.6	4,859.0	4,637.2	18.7	21.5	81.97	-1,021.7	109.1	676.2	640.0	18,675		

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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #214 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,100.0	4,934.2	4,954.9	4,722.1	19.6	22.4	82.61	-1,055.8	114.9	703.6	665.8	18.614		
5,200.0	5,024.8	5,050.7	4,807.0	20.4	23.2	83.20	-1,109.9	120.8	731.2	691.8	18.557		
5,300.0	5,115.4	5,146.6	4,891.9	21.2	24.0	83.75	-1,154.1	125.6	758.8	717.8	18.504		
5,400.0	5,205.1	5,242.5	4,976.8	22.0	24.9	84.26	-1,198.2	132.6	786.4	743.8	18.456		
5,500.0	5,296.7	5,338.3	5,061.7	22.9	25.7	84.74	-1,242.3	138.3	814.1	769.9	18.410		
5,600.0	5,387.3	5,434.2	5,146.7	23.7	26.6	85.18	-1,286.4	144.2	841.9	795.0	18.368		
5,694.0	5,472.5	5,524.3	5,226.5	24.5	27.4	85.58	-1,327.9	149.7	868.0	820.7	18.331		
5,700.0	5,478.0	5,530.1	5,231.6	24.5	27.5	85.64	-1,330.6	150.0	869.7	822.2	18.331		
5,800.0	5,569.4	5,626.0	5,316.5	25.1	28.3	86.48	-1,374.7	155.9	897.7	848.8	18.388		
5,900.0	5,662.2	5,721.9	5,401.5	25.7	29.2	87.09	-1,418.9	161.7	925.8	875.7	18.479		
6,000.0	5,756.2	5,817.8	5,486.4	26.3	30.0	87.48	-1,463.0	167.6	954.2	902.9	18.504		
6,100.0	5,851.4	5,913.4	5,571.1	26.8	30.9	87.68	-1,507.0	173.4	982.7	930.4	18.763		
6,200.0	5,947.5	6,008.7	5,655.5	27.2	31.7	87.70	-1,550.8	179.2	1,011.5	958.1	18.955		
6,300.0	6,044.6	6,103.5	5,739.5	27.6	32.6	87.56	-1,594.5	185.0	1,040.5	985.2	19.184		
6,400.0	6,142.5	6,197.8	5,823.0	28.0	33.4	87.29	-1,637.9	190.8	1,069.8	1,014.8	19.452		
6,500.0	6,241.0	6,309.0	5,921.9	28.3	34.3	86.72	-1,688.3	197.5	1,099.2	1,043.3	19.682		
6,600.0	6,340.0	6,436.1	6,037.1	28.6	35.1	85.99	-1,741.5	204.5	1,126.6	1,069.9	19.881		
6,700.0	6,439.5	6,566.0	6,157.2	28.8	35.8	85.23	-1,790.6	211.1	1,151.7	1,094.3	20.068		
6,800.0	6,539.3	6,698.7	6,282.0	29.0	36.5	84.45	-1,835.2	217.0	1,174.4	1,116.4	20.247		
6,900.0	6,639.2	6,834.0	6,411.2	29.2	37.1	83.64	-1,874.6	222.2	1,194.6	1,136.1	20.424		
6,944.2	6,683.4	6,894.6	6,469.7	29.2	37.4	-141.63	-1,890.3	224.3	1,202.7	1,144.0	20.500		
7,000.0	6,739.2	6,971.9	6,544.9	29.3	37.7	-142.26	-1,908.6	225.7	1,212.1	1,153.2	20.591		
7,100.0	6,839.2	7,112.9	6,682.9	29.4	38.2	-143.21	-1,936.7	230.4	1,226.5	1,167.3	20.717		
7,200.0	6,939.2	7,256.4	6,824.8	29.5	38.6	-143.92	-1,958.3	233.3	1,237.5	1,178.0	20.803		
7,300.0	7,039.2	7,401.8	6,969.4	29.6	38.9	-144.39	-1,973.0	235.2	1,245.0	1,185.2	20.845		
7,400.0	7,139.2	7,530.4	7,126.0	29.7	31.1	-108.05	-1,273.0	5.6	1,215.4	1,166.3	24.758		
7,450.2	7,189.4	7,730.4	7,262.0	29.7	31.1	-108.05	-1,273.0	5.6	1,187.7	1,137.6	23.696		
7,500.0	7,239.2	7,832.4	7,326.0	29.8	31.1	-92.62	-1,271.2	5.0	1,181.8	1,110.7	22.732		
7,550.0	7,288.8	7,938.2	7,382.0	29.8	31.0	-94.78	-1,285.6	3.1	1,137.6	1,085.5	21.873		
7,600.0	7,337.8	8,048.0	7,426.0	29.7	30.9	-96.48	-1,256.3	0.1	1,115.2	1,062.4	21.124		
7,650.0	7,385.9	8,151.5	7,482.0	29.6	30.8	-97.72	-1,243.5	-4.1	1,095.0	1,041.6	20.486		
7,700.0	7,432.8	8,278.8	7,526.0	29.5	30.7	-98.53	-1,227.0	-9.4	1,077.0	1,023.1	19.956		
7,750.0	7,478.2	8,399.7	7,582.0	29.3	30.5	-98.94	-1,207.1	-15.9	1,081.3	1,007.0	19.533		
7,800.0	7,521.9	8,524.1	7,626.0	29.1	30.3	-99.00	-1,183.9	-23.5	1,047.8	993.3	19.203		
7,850.0	7,563.4	8,651.9	7,682.0	28.8	30.1	-98.75	-1,157.5	-32.1	1,036.5	981.9	18.968		
7,900.0	7,602.7	8,782.8	7,726.0	28.6	29.8	-98.23	-1,128.1	-41.6	1,027.3	972.7	18.823		
7,950.0	7,639.4	8,916.7	7,782.0	28.3	29.6	-97.49	-1,095.9	-52.2	1,019.9	955.5	18.752		
8,000.0	7,673.4	9,053.4	7,826.0	28.0	29.3	-96.60	-1,061.0	-63.5	1,014.3	940.2	18.748		
8,050.0	7,704.3	9,192.7	7,882.0	27.6	29.1	-95.51	-1,023.7	-75.7	1,010.1	956.4	18.806		
8,100.0	7,732.1	9,334.2	7,926.0	27.3	28.8	-94.57	-984.1	-88.6	1,007.1	953.8	18.902		
8,150.0	7,756.5	9,477.9	7,982.0	27.0	28.6	-93.53	-942.7	-102.1	1,005.1	952.3	19.036		
8,200.0	7,777.5	9,623.2	8,026.0	26.6	28.4	-92.56	-899.5	-116.1	1,003.9	951.6	19.195		
8,250.0	7,794.8	9,770.1	8,082.0	26.3	28.1	-91.70	-854.9	-130.7	1,003.2	951.4	19.362		
8,300.0	7,808.4	9,918.2	8,126.0	25.9	27.9	-90.98	-809.2	-145.6	1,002.9	951.5	19.533		
8,350.0	7,818.1	10,067.3	8,182.0	25.6	27.8	-90.44	-762.6	-160.7	1,002.8	951.8	19.693		
8,400.0	7,824.0	10,216.9	8,226.0	25.3	27.6	-90.11	-715.4	-175.1	1,002.7	952.2	19.840		
8,425.0	7,825.5	10,341.8	8,262.0	25.2	27.6	-90.03	-691.7	-183.8	1,002.7	952.3	19.901		
8,450.2	7,826.0	10,467.0	8,262.0	25.0	27.5	-90.00	-657.7	-191.6	1,002.7	952.5	19.962		
8,500.0	7,826.0	10,592.9	8,262.0	24.7	27.4	-90.00	-620.4	-207.1	1,002.7	952.7	20.062		
8,600.0	7,826.0	10,718.9	8,262.0	24.2	27.4	-90.00	-525.3	-238.1	1,002.7	953.0	20.171		
8,700.0	7,826.0	10,844.9	8,262.0	23.8	27.5	-90.00	-430.2	-269.0	1,002.7	953.0	20.161		
8,800.0	7,826.0	10,970.9	8,262.0	23.5	27.7	-90.00	-335.1	-300.0	1,002.7	952.7	20.032		

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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #214 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
8,900.0	7,826.0	9,816.9	7,826.0	23.4	28.1	-90.00	-240.0	-331.0	1,002.7	952.1	19.790		
9,000.0	7,826.0	9,916.9	7,826.0	23.4	28.6	-90.00	-145.0	-362.0	1,002.7	951.2	19.447		
9,100.0	7,826.0	10,016.9	7,826.0	23.7	29.2	-90.00	-49.9	-393.0	1,002.7	950.0	19.018		
9,200.0	7,826.0	10,116.9	7,826.0	24.2	30.0	-90.00	45.2	-423.9	1,002.7	948.6	18.521		
9,300.0	7,826.0	10,216.9	7,826.0	24.9	30.9	-90.00	140.3	-454.9	1,002.7	947.0	17.975		
9,400.0	7,826.0	10,316.9	7,826.0	25.8	31.8	-90.00	235.4	-485.9	1,002.7	945.1	17.397		
9,500.0	7,826.0	10,416.9	7,826.0	26.9	32.9	-90.00	330.4	-516.9	1,002.7	943.1	16.800		
9,600.0	7,826.0	10,516.9	7,826.0	28.1	34.0	-90.00	425.5	-547.9	1,002.7	940.8	16.198		
9,700.0	7,826.0	10,616.9	7,826.0	29.3	35.2	-90.00	520.6	-578.8	1,002.8	938.5	15.600		
9,800.0	7,826.0	10,716.9	7,826.0	30.6	36.4	-90.00	615.7	-609.8	1,002.8	936.0	15.013		
9,900.0	7,826.0	10,816.9	7,826.0	32.0	37.8	-90.00	710.8	-640.8	1,002.8	933.3	14.444		
10,000.0	7,826.0	10,916.9	7,826.0	33.4	39.1	-90.00	805.8	-671.8	1,002.8	930.6	13.895		
10,100.0	7,826.0	11,016.9	7,826.0	34.9	40.5	-90.00	900.9	-702.7	1,002.8	927.8	13.370		
10,200.0	7,826.0	11,116.9	7,826.0	36.4	42.0	-90.00	996.0	-733.7	1,002.8	924.8	12.868		
10,300.0	7,826.0	11,216.9	7,826.0	37.9	43.5	-90.00	1,091.1	-764.7	1,002.8	921.8	12.391		
10,400.0	7,826.0	11,316.9	7,826.0	39.5	45.0	-90.00	1,186.2	-795.7	1,002.8	918.8	11.939		
10,500.0	7,826.0	11,416.9	7,826.0	41.1	46.5	-90.00	1,281.3	-826.7	1,002.8	915.6	11.510		
10,600.0	7,826.0	11,516.9	7,826.0	42.7	48.1	-90.00	1,376.3	-857.6	1,002.8	912.5	11.104		
10,700.0	7,826.0	11,616.9	7,826.0	44.4	49.7	-90.00	1,471.4	-888.6	1,002.8	909.2	10.720		
10,800.0	7,826.0	11,716.9	7,826.0	46.0	51.3	-90.00	1,566.5	-919.6	1,002.8	906.0	10.358		
10,900.0	7,826.0	11,816.9	7,826.0	47.7	52.9	-90.00	1,661.6	-950.6	1,002.8	902.6	10.015		
11,000.0	7,826.0	11,916.9	7,826.0	49.4	54.6	-90.00	1,756.7	-981.6	1,002.8	899.3	9.690		
11,100.0	7,826.0	12,016.9	7,826.0	51.1	56.3	-90.00	1,851.7	-1,012.5	1,002.8	896.9	9.383		
11,200.0	7,826.0	12,116.9	7,826.0	52.8	57.9	-90.00	1,946.8	-1,043.5	1,002.8	892.5	9.093		
11,300.0	7,826.0	12,216.9	7,826.0	54.6	59.6	-90.00	2,041.9	-1,074.5	1,002.8	889.1	8.818		
11,400.0	7,826.0	12,316.9	7,826.0	56.3	61.4	-90.00	2,137.0	-1,105.5	1,002.8	885.6	8.557		
11,500.0	7,826.0	12,416.9	7,826.0	58.1	63.1	-90.00	2,232.1	-1,136.4	1,002.8	882.1	8.310		
11,600.0	7,826.0	12,516.9	7,826.0	59.9	64.8	-90.00	2,327.1	-1,167.4	1,002.8	878.6	8.075		
11,700.0	7,826.0	12,616.9	7,826.0	61.6	66.6	-90.00	2,422.2	-1,198.4	1,002.8	875.1	7.852		
11,800.0	7,826.0	12,716.9	7,826.0	63.4	68.3	-90.00	2,517.3	-1,229.4	1,002.8	871.5	7.640		
11,900.0	7,826.0	12,816.9	7,826.0	65.2	70.1	-90.00	2,612.4	-1,260.4	1,002.8	868.0	7.438		
12,000.0	7,826.0	12,916.9	7,826.0	67.0	71.9	-90.00	2,707.5	-1,291.3	1,002.8	864.4	7.246		
12,100.0	7,826.0	13,016.9	7,826.0	68.8	73.6	-90.00	2,802.5	-1,322.3	1,002.8	860.8	7.063		
12,200.0	7,826.0	13,116.9	7,826.0	70.6	75.4	-90.00	2,897.6	-1,353.3	1,002.8	857.2	6.888		
12,300.0	7,826.0	13,216.9	7,826.0	72.4	77.2	-90.00	2,992.7	-1,384.3	1,002.8	853.6	6.722		
12,400.0	7,826.0	13,316.9	7,826.0	74.3	79.0	-90.00	3,087.8	-1,415.3	1,002.8	850.0	6.562		
12,500.0	7,826.0	13,416.9	7,826.0	76.1	80.8	-90.00	3,182.9	-1,446.2	1,002.8	846.4	6.410		
12,600.0	7,826.0	13,516.9	7,826.0	77.9	82.6	-90.00	3,277.9	-1,477.2	1,002.8	842.7	6.264		
12,700.0	7,826.0	13,616.9	7,826.0	79.8	84.4	-90.00	3,373.0	-1,508.2	1,002.8	839.1	6.124		
12,800.0	7,826.0	13,716.9	7,826.0	81.6	86.2	-90.00	3,468.1	-1,539.2	1,002.8	835.4	5.990		
12,900.0	7,826.0	13,816.9	7,826.0	83.4	88.1	-90.00	3,563.2	-1,570.2	1,002.8	831.7	5.862		
13,000.0	7,826.0	13,916.9	7,826.0	85.3	89.9	-90.00	3,658.3	-1,601.1	1,002.8	828.1	5.739		
13,100.0	7,826.0	14,016.9	7,826.0	87.1	91.7	-90.00	3,753.3	-1,632.1	1,002.8	824.4	5.620		
13,200.0	7,826.0	14,116.9	7,826.0	89.0	93.5	-90.00	3,848.4	-1,663.1	1,002.8	820.7	5.507		
13,300.0	7,826.0	14,216.9	7,826.0	90.8	95.4	-90.00	3,943.5	-1,694.1	1,002.8	817.0	5.397		
13,400.0	7,826.0	14,316.9	7,826.0	92.7	97.2	-90.00	4,038.6	-1,725.0	1,002.8	813.3	5.292		
13,500.0	7,826.0	14,416.9	7,826.0	94.5	99.1	-90.00	4,133.7	-1,756.0	1,002.8	809.6	5.190		
13,600.0	7,826.0	14,516.9	7,826.0	96.4	100.9	-90.00	4,228.7	-1,787.0	1,002.8	805.9	5.092		
13,700.0	7,826.0	14,616.9	7,826.0	98.3	102.8	-90.00	4,323.8	-1,818.0	1,002.8	802.2	4.998		
13,800.0	7,826.0	14,716.9	7,826.0	100.1	104.6	-90.00	4,418.9	-1,849.0	1,002.8	798.5	4.907		
13,900.0	7,826.0	14,816.9	7,826.0	102.0	106.5	-90.00	4,514.0	-1,879.9	1,002.8	794.8	4.819		
14,000.0	7,826.0	14,916.9	7,826.0	103.9	108.3	-90.00	4,609.1	-1,910.9	1,002.8	791.0	4.735		

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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

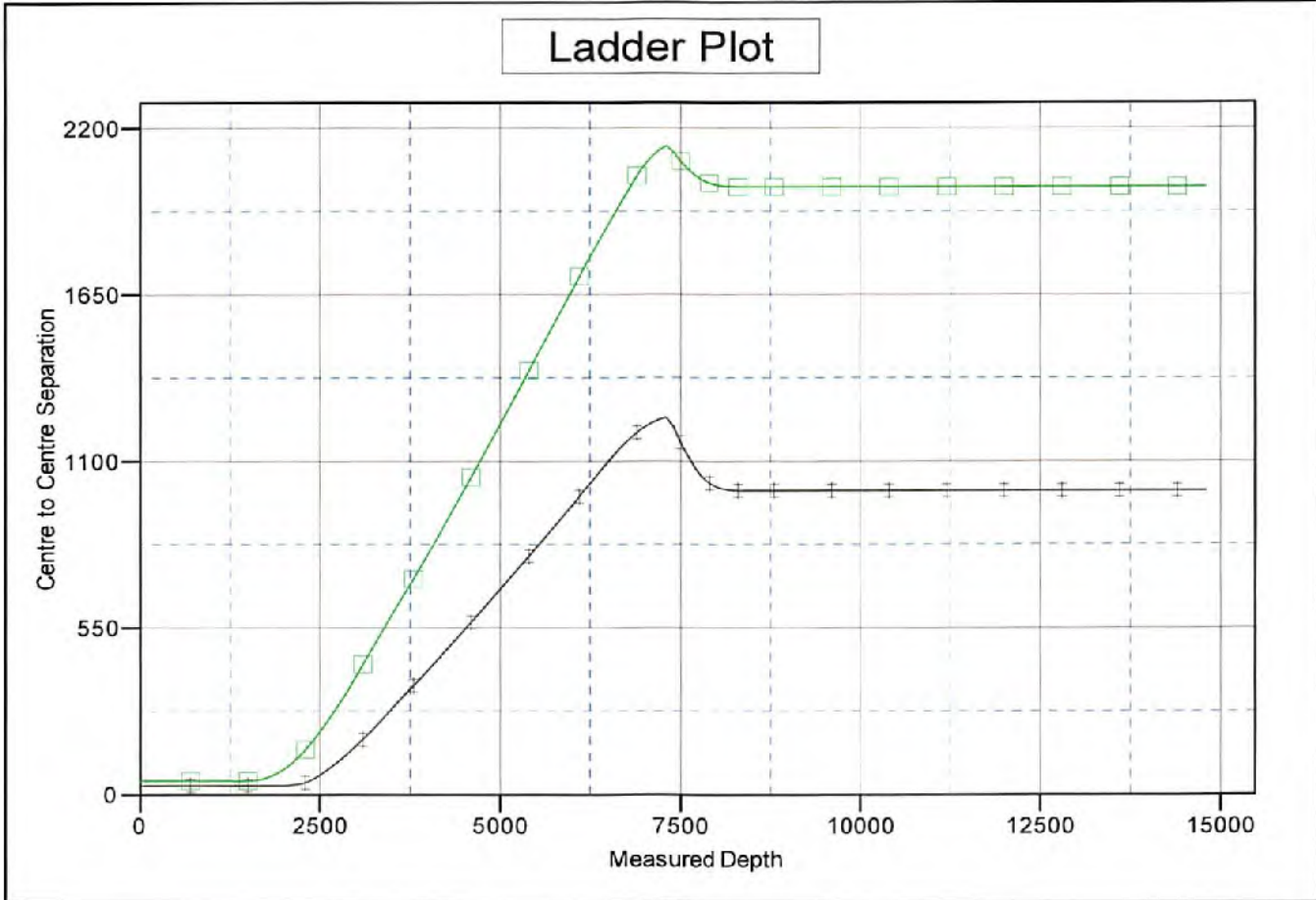
Offset Design Williams PAD - Williams #214 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Reference (usft)	Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
14,100.0	7,826.0	15,016.9	7,826.0	105.7	110.2	-90.00	4,704.2	-1,941.9	1,002.8	787.3	4.653		
14,200.0	7,826.0	15,116.9	7,826.0	107.6	112.0	-90.00	4,799.2	-1,972.9	1,002.8	783.6	4.573		
14,300.0	7,826.0	15,216.9	7,826.0	109.6	113.9	-90.00	4,894.3	-2,003.9	1,002.8	779.8	4.497		
14,400.0	7,826.0	15,316.9	7,826.0	111.4	115.7	-90.00	4,989.4	-2,034.8	1,002.8	776.1	4.423		
14,600.0	7,826.0	15,416.9	7,826.0	113.2	117.6	-90.00	5,084.5	-2,065.8	1,002.8	772.3	4.351		
14,600.0	7,826.0	15,516.9	7,826.0	115.1	119.5	-90.00	5,179.6	-2,096.8	1,002.8	768.6	4.281		
14,700.0	7,826.0	15,616.9	7,826.0	117.0	121.3	-90.00	5,274.6	-2,127.8	1,002.8	764.9	4.214		
14,798.5	7,826.0	15,715.4	7,826.0	118.8	123.2	-90.00	5,368.3	-2,158.3	1,002.9	761.2	4.149		
14,800.3	7,826.0	15,717.2	7,826.0	118.9	123.2	-90.00	5,370.0	-2,159.8	1,002.8	761.1	4.148		

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Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 1820.0usft
 Offset Depths are relative to Offset Datum
 Central Meridian is 79° 30' 0.000 W

Coordinates are relative to: Williams #216
 Coordinate System is US State Plane 1983, West Virginia Northern Zone
 Grid Convergence at Surface is: -0.30°



LEGEND

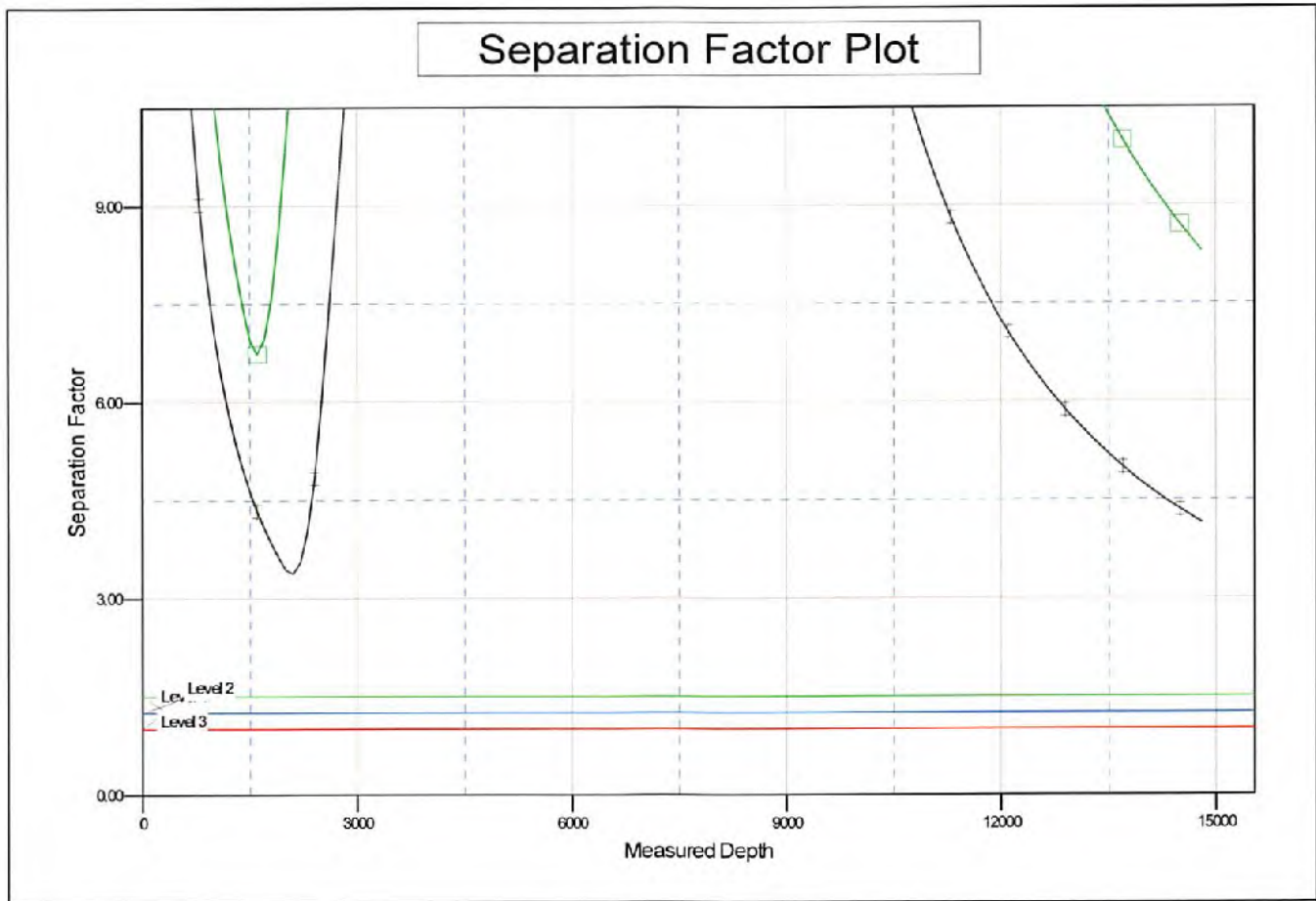
— Williams #214, Wellbore #1, Design #3 V0
 — Williams #213, Wellbore #1, Design #3 V0

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Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #216
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 1820.0usft
 Offset Depths are relative to Offset Datum
 Central Meridian is 79° 30' 0.000 W

Coordinates are relative to: Williams #216
 Coordinate System is US State Plane 1983, West Virginia Northern Zone
 Grid Convergence at Surface is: -0.30°



LEGEND

- Williams #214, Wellbore #1, Design #3 V0
- Williams #213, Wellbore #1, Design #3 V0

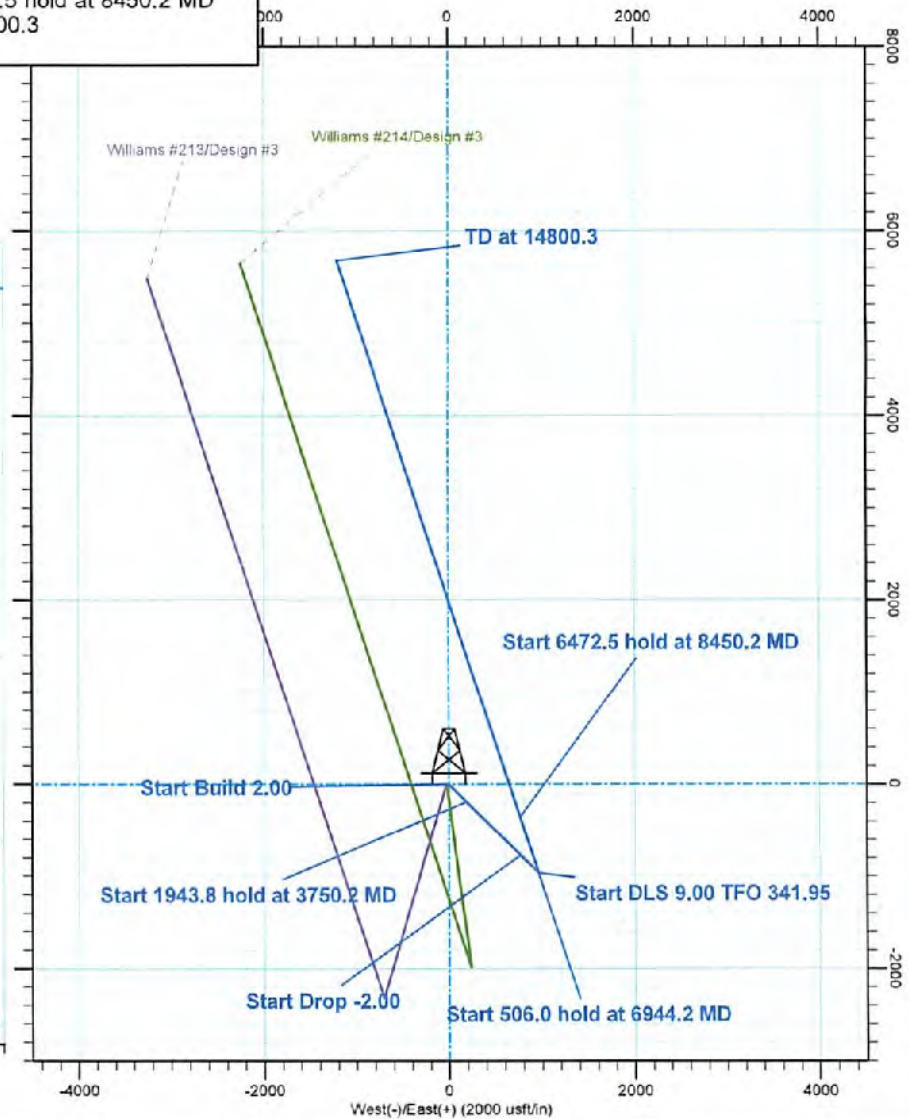
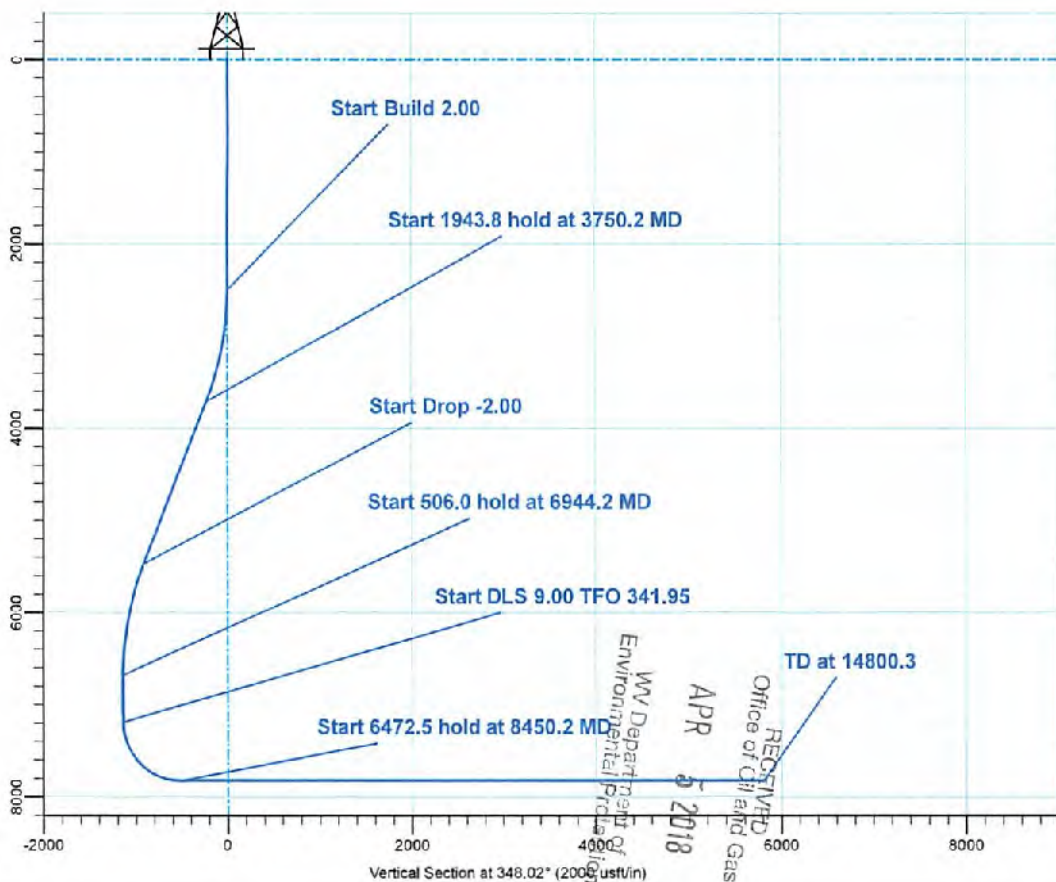
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Arsenal Resources
 Taylor County, West Virginia
 Williams PAD
 Williams #216
 Design #3

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
2500.0	0.00	0.00	2500.0	0.0	0.0	0.0	0.0	Start Build 2.00
3750.2	25.00	135.10	3710.9	-190.2	189.5	-225.4	268.5	Start 1943.8 hold at 3750.2 MD
5694.0	25.00	135.10	5472.5	-772.2	769.4	-915.1	1090.1	Start Drop -2.00
6944.2	0.00	360.00	6683.4	-962.4	959.0	-1140.5	1358.6	Start 506.0 hold at 6944.2 MD
7450.2	0.00	0.00	7189.4	-962.4	959.0	-1140.5	1358.6	Start DLS 9.00 TFO 341.95
8450.2	90.00	341.95	7826.0	-357.1	761.8	-507.4	1995.2	Start 6472.5 hold at 8450.2 MD
14800.3	90.00	341.95	7826.0	5680.7	-1205.3	5807.1	8345.3	TD at 14800.3





ARSENAL
R E S O U R C E S

Arsenal Resources

Taylor County, West Virginia

Williams PAD

Williams #216

Wellbore #1

Plan: Design #3

QES Well Planning Report

29 March, 2018

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06/29/2018

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Project	Taylor County, West Virginia		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	West Virginia Northern Zone		

Site	Williams PAD				
Site Position:		Northing:	336,619.51 usft	Latitude:	39° 25' 23.647 N
From:	Map	Easting:	1,834,878.31 usft	Longitude:	79° 58' 22.853 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.30 °

Well	Williams #216					
Well Position	+N/-S	26.8 usft	Northing:	336,646.31 usft	Latitude:	39° 25' 23.914 N
	+E/-W	36.1 usft	Easting:	1,834,914.45 usft	Longitude:	79° 58' 22.394 W
Position Uncertainty	0.0 usft		Wellhead Elevation:	0.0 usft	Ground Level:	1,800.0 usft

Wellbore	Wellbore #1				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/21/2016	-9.12	66.64	52,046.43881153

Design	Design #3				
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Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.0	

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	348.02

Plan Sections										
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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,750.2	25.00	135.10	3,710.9	-190.2	189.5	2.00	2.00	0.00	135.10	
5,694.0	25.00	135.10	5,472.5	-772.2	769.4	0.00	0.00	0.00	0.00	
6,944.2	0.00	360.00	6,683.4	-962.4	958.9	2.00	-2.00	0.00	180.00	
7,450.2	0.00	360.00	7,189.4	-962.4	958.9	0.00	0.00	0.00	0.00	0.00 VP Williams #216 C
8,450.2	90.00	341.95	7,826.0	-357.1	761.7	9.00	9.00	-1.80	341.95	LP Williams #216 D
14,800.3	90.00	341.95	7,826.0	5,680.7	-1,205.3	0.00	0.00	0.00	0.00	PBH Williams #216

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Office of Oil and Gas

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WV Department of Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	0.00
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	0.00
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	0.00
2,300.0	0.00	0.00	2,300.0	0.0	0.0	0.0	0.00	0.00	0.00
2,400.0	0.00	0.00	2,400.0	0.0	0.0	0.0	0.00	0.00	0.00
Start Build 2.00									
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.0	0.00	0.00	0.00
2,600.0	2.00	135.10	2,600.0	-1.2	1.2	-1.5	2.00	2.00	0.00
2,700.0	4.00	135.10	2,699.8	-4.9	4.9	-5.9	2.00	2.00	0.00
2,800.0	6.00	135.10	2,799.5	-11.1	11.1	-13.2	2.00	2.00	0.00
2,900.0	8.00	135.10	2,898.7	-19.7	19.7	-23.4	2.00	2.00	0.00
3,000.0	10.00	135.10	2,997.5	-30.8	30.7	-36.5	2.00	2.00	0.00
3,100.0	12.00	135.10	3,095.6	-44.3	44.2	-52.6	2.00	2.00	0.00
3,200.0	14.00	135.10	3,193.1	-60.3	60.1	-71.4	2.00	2.00	0.00
3,300.0	16.00	135.10	3,289.6	-78.6	78.3	-93.2	2.00	2.00	0.00
3,400.0	18.00	135.10	3,385.3	-99.3	99.0	-117.7	2.00	2.00	0.00
3,500.0	20.00	135.10	3,479.8	-122.4	121.9	-145.0	2.00	2.00	0.00
3,600.0	22.00	135.10	3,573.2	-147.8	147.2	-175.1	2.00	2.00	0.00
3,700.0	24.00	135.10	3,665.2	-175.4	174.8	-207.9	2.00	2.00	0.00
Start 1943.8 hold at 3750.2 MD									
3,750.2	25.00	135.10	3,710.9	-190.2	189.5	-225.4	2.00	2.00	0.00
3,800.0	25.00	135.10	3,756.0	-205.1	204.4	-243.1	0.00	0.00	0.00
3,900.0	25.00	135.10	3,846.7	-235.0	234.2	-278.5	0.00	0.00	0.00
4,000.0	25.00	135.10	3,937.3	-265.0	264.0	-314.0	0.00	0.00	0.00
4,100.0	25.00	135.10	4,027.9	-294.9	293.9	-349.5	0.00	0.00	0.00
4,200.0	25.00	135.10	4,118.5	-324.9	323.7	-385.0	0.00	0.00	0.00
4,300.0	25.00	135.10	4,209.2	-354.8	353.5	-420.5	0.00	0.00	0.00
4,400.0	25.00	135.10	4,299.8	-384.8	383.4	-455.0	0.00	0.00	0.00
4,500.0	25.00	135.10	4,390.4	-414.7	413.2	-491.4	0.00	0.00	0.00
4,600.0	25.00	135.10	4,481.0	-444.6	443.0	-526.9	0.00	0.00	0.00
4,700.0	25.00	135.10	4,571.7	-474.6	472.9	-562.4	0.00	0.00	0.00
4,800.0	25.00	135.10	4,662.3	-504.5	502.7	-597.9	0.00	0.00	0.00
4,900.0	25.00	135.10	4,752.9	-534.5	532.6	-633.4	0.00	0.00	0.00
5,000.0	25.00	135.10	4,843.6	-564.4	562.4	-668.8	0.00	0.00	0.00

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APR 5 2018

WV Department of Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
5,100.0	25.00	135.10	4,934.2	-594.4	592.2	-704.3	0.00	0.00	0.00	
5,200.0	25.00	135.10	5,024.8	-624.3	622.1	-739.8	0.00	0.00	0.00	
5,300.0	25.00	135.10	5,115.4	-654.2	651.9	-775.3	0.00	0.00	0.00	
5,400.0	25.00	135.10	5,206.1	-684.2	681.7	-810.8	0.00	0.00	0.00	
5,500.0	25.00	135.10	5,296.7	-714.1	711.6	-846.3	0.00	0.00	0.00	
5,600.0	25.00	135.10	5,387.3	-744.1	741.4	-881.7	0.00	0.00	0.00	
Start Drop -2.00										
5,694.0	25.00	135.10	5,472.5	-772.2	769.4	-915.1	0.00	0.00	0.00	
5,700.0	24.88	135.10	5,478.0	-774.0	771.2	-917.2	2.00	-2.00	0.00	
5,800.0	22.88	135.10	5,569.4	-802.7	799.8	-951.2	2.00	-2.00	0.00	
5,900.0	20.88	135.10	5,662.2	-829.1	826.1	-982.5	2.00	-2.00	0.00	
6,000.0	18.88	135.10	5,756.2	-853.2	850.1	-1,011.0	2.00	-2.00	0.00	
6,100.0	16.88	135.10	5,851.4	-874.9	871.8	-1,036.8	2.00	-2.00	0.00	
6,200.0	14.88	135.10	5,947.5	-894.3	891.1	-1,059.8	2.00	-2.00	0.00	
6,300.0	12.88	135.10	6,044.6	-911.3	908.0	-1,079.9	2.00	-2.00	0.00	
6,400.0	10.88	135.10	6,142.5	-925.9	922.6	-1,097.2	2.00	-2.00	0.00	
6,500.0	8.88	135.10	6,241.0	-938.1	934.7	-1,111.6	2.00	-2.00	0.00	
6,600.0	6.88	135.10	6,340.0	-947.8	944.4	-1,123.1	2.00	-2.00	0.00	
6,700.0	4.88	135.10	6,439.5	-955.0	951.6	-1,131.8	2.00	-2.00	0.00	
6,800.0	2.88	135.10	6,539.3	-959.8	956.4	-1,137.4	2.00	-2.00	0.00	
6,900.0	0.88	135.10	6,639.2	-962.2	958.7	-1,140.2	2.00	-2.00	0.00	
Start 506.0 hold at 6944.2 MD										
6,944.2	0.00	360.00	6,683.4	-962.4	958.9	-1,140.5	2.00	-2.00	0.00	
7,000.0	0.00	0.00	6,739.2	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
7,100.0	0.00	0.00	6,839.2	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
7,200.0	0.00	0.00	6,939.2	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
7,300.0	0.00	0.00	7,039.2	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
7,400.0	0.00	0.00	7,139.2	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
Start DLS 9.00 TFO 341.95										
7,450.2	0.00	0.00	7,189.4	-962.4	958.9	-1,140.5	0.00	0.00	0.00	
7,500.0	4.48	341.95	7,239.2	-960.5	958.3	-1,138.5	9.00	9.00	0.00	
7,550.0	8.98	341.95	7,288.8	-955.0	956.5	-1,132.7	9.00	9.00	0.00	
7,600.0	13.48	341.95	7,337.8	-945.7	953.5	-1,123.0	9.00	9.00	0.00	
7,650.0	17.98	341.95	7,385.9	-932.8	949.3	-1,109.6	9.00	9.00	0.00	
7,700.0	22.48	341.95	7,432.8	-916.4	944.0	-1,092.4	9.00	9.00	0.00	
7,750.0	26.98	341.95	7,478.2	-896.5	937.5	-1,071.6	9.00	9.00	0.00	
7,800.0	31.48	341.95	7,521.9	-873.3	929.9	-1,047.3	9.00	9.00	0.00	
7,850.0	35.98	341.95	7,563.4	-846.9	921.3	-1,019.7	9.00	9.00	0.00	
7,900.0	40.48	341.95	7,602.7	-817.5	911.7	-988.9	9.00	9.00	0.00	
7,950.0	44.98	341.95	7,639.4	-785.2	901.2	-955.2	9.00	9.00	0.00	
8,000.0	49.48	341.95	7,673.4	-750.3	889.9	-918.7	9.00	9.00	0.00	
8,050.0	53.98	341.95	7,704.3	-713.0	877.7	-879.7	9.00	9.00	0.00	
8,100.0	58.48	341.95	7,732.1	-673.5	864.8	-838.4	9.00	9.00	0.00	
8,150.0	62.98	341.95	7,756.5	-632.1	851.3	-795.0	9.00	9.00	0.00	
8,200.0	67.48	341.95	7,777.5	-588.9	837.3	-749.9	9.00	9.00	0.00	
8,250.0	71.98	341.95	7,794.8	-544.3	822.7	-703.2	9.00	9.00	0.00	
8,300.0	76.48	341.95	7,808.4	-498.6	807.8	-655.4	9.00	9.00	0.00	
8,350.0	80.99	341.95	7,818.1	-452.0	792.7	-606.6	9.00	9.00	0.00	
8,400.0	85.49	341.95	7,824.0	-404.8	777.3	-557.3	9.00	9.00	0.00	
Start 6472.5 hold at 8450.2 MD										
8,450.2	90.00	341.95	7,826.0	-357.1	761.7	-507.4	9.00	9.00	0.00	
8,500.0	90.00	341.95	7,826.0	-309.7	746.3	-457.9	0.00	0.00	0.00	
8,600.0	90.00	341.95	7,826.0	-214.6	715.3	-358.4	0.00	0.00	0.00	

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Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
8,700.0	90.00	341.95	7,826.0	-119.6	684.4	-259.0	0.00	0.00	0.00
8,800.0	90.00	341.95	7,826.0	-24.5	653.4	-159.6	0.00	0.00	0.00
8,900.0	90.00	341.95	7,826.0	70.6	622.4	-60.1	0.00	0.00	0.00
9,000.0	90.00	341.95	7,826.0	165.7	591.4	39.3	0.00	0.00	0.00
9,100.0	90.00	341.95	7,826.0	260.8	560.5	138.8	0.00	0.00	0.00
9,200.0	90.00	341.95	7,826.0	355.8	529.5	238.2	0.00	0.00	0.00
9,300.0	90.00	341.95	7,826.0	450.9	498.5	337.6	0.00	0.00	0.00
9,400.0	90.00	341.95	7,826.0	546.0	467.5	437.1	0.00	0.00	0.00
9,500.0	90.00	341.95	7,826.0	641.1	436.5	536.5	0.00	0.00	0.00
9,600.0	90.00	341.95	7,826.0	736.2	405.6	636.0	0.00	0.00	0.00
9,700.0	90.00	341.95	7,826.0	831.2	374.6	735.4	0.00	0.00	0.00
9,800.0	90.00	341.95	7,826.0	926.3	343.6	834.8	0.00	0.00	0.00
9,900.0	90.00	341.95	7,826.0	1,021.4	312.6	934.3	0.00	0.00	0.00
10,000.0	90.00	341.95	7,826.0	1,116.5	281.7	1,033.7	0.00	0.00	0.00
10,100.0	90.00	341.95	7,826.0	1,211.6	250.7	1,133.2	0.00	0.00	0.00
10,200.0	90.00	341.95	7,826.0	1,306.7	219.7	1,232.6	0.00	0.00	0.00
10,300.0	90.00	341.95	7,826.0	1,401.7	188.7	1,332.0	0.00	0.00	0.00
10,400.0	90.00	341.95	7,826.0	1,496.8	157.8	1,431.5	0.00	0.00	0.00
10,500.0	90.00	341.95	7,826.0	1,591.9	126.8	1,530.9	0.00	0.00	0.00
10,600.0	90.00	341.95	7,826.0	1,687.0	95.8	1,630.4	0.00	0.00	0.00
10,700.0	90.00	341.95	7,826.0	1,782.1	64.8	1,729.8	0.00	0.00	0.00
10,800.0	90.00	341.95	7,826.0	1,877.1	33.8	1,829.2	0.00	0.00	0.00
10,900.0	90.00	341.95	7,826.0	1,972.2	2.9	1,928.7	0.00	0.00	0.00
11,000.0	90.00	341.95	7,826.0	2,067.3	-28.1	2,028.1	0.00	0.00	0.00
11,100.0	90.00	341.95	7,826.0	2,162.4	-59.1	2,127.6	0.00	0.00	0.00
11,200.0	90.00	341.95	7,826.0	2,257.5	-90.1	2,227.0	0.00	0.00	0.00
11,300.0	90.00	341.95	7,826.0	2,352.5	-121.0	2,326.4	0.00	0.00	0.00
11,400.0	90.00	341.95	7,826.0	2,447.6	-152.0	2,425.9	0.00	0.00	0.00
11,500.0	90.00	341.95	7,826.0	2,542.7	-183.0	2,525.3	0.00	0.00	0.00
11,600.0	90.00	341.95	7,826.0	2,637.8	-214.0	2,624.8	0.00	0.00	0.00
11,700.0	90.00	341.95	7,826.0	2,732.9	-244.9	2,724.2	0.00	0.00	0.00
11,800.0	90.00	341.95	7,826.0	2,828.0	-275.9	2,823.6	0.00	0.00	0.00
11,900.0	90.00	341.95	7,826.0	2,923.0	-306.9	2,923.1	0.00	0.00	0.00
12,000.0	90.00	341.95	7,826.0	3,018.1	-337.9	3,022.5	0.00	0.00	0.00
12,100.0	90.00	341.95	7,826.0	3,113.2	-368.9	3,122.0	0.00	0.00	0.00
12,200.0	90.00	341.95	7,826.0	3,208.3	-399.8	3,221.4	0.00	0.00	0.00
12,300.0	90.00	341.95	7,826.0	3,303.4	-430.8	3,320.8	0.00	0.00	0.00
12,400.0	90.00	341.95	7,826.0	3,398.4	-461.8	3,420.3	0.00	0.00	0.00
12,500.0	90.00	341.95	7,826.0	3,493.5	-492.8	3,519.7	0.00	0.00	0.00
12,600.0	90.00	341.95	7,826.0	3,588.6	-523.7	3,619.2	0.00	0.00	0.00
12,700.0	90.00	341.95	7,826.0	3,683.7	-554.7	3,718.6	0.00	0.00	0.00
12,800.0	90.00	341.95	7,826.0	3,778.8	-585.7	3,818.0	0.00	0.00	0.00
12,900.0	90.00	341.95	7,826.0	3,873.8	-616.7	3,917.5	0.00	0.00	0.00
13,000.0	90.00	341.95	7,826.0	3,968.9	-647.6	4,016.9	0.00	0.00	0.00
13,100.0	90.00	341.95	7,826.0	4,064.0	-678.6	4,116.4	0.00	0.00	0.00
13,200.0	90.00	341.95	7,826.0	4,159.1	-709.6	4,215.8	0.00	0.00	0.00
13,300.0	90.00	341.95	7,826.0	4,254.2	-740.6	4,315.2	0.00	0.00	0.00
13,400.0	90.00	341.95	7,826.0	4,349.3	-771.6	4,414.7	0.00	0.00	0.00
13,500.0	90.00	341.95	7,826.0	4,444.3	-802.5	4,514.1	0.00	0.00	0.00
13,600.0	90.00	341.95	7,826.0	4,539.4	-833.5	4,613.6	0.00	0.00	0.00
13,700.0	90.00	341.95	7,826.0	4,634.5	-864.5	4,713.0	0.00	0.00	0.00
13,800.0	90.00	341.95	7,826.0	4,729.6	-895.5	4,812.4	0.00	0.00	0.00
13,900.0	90.00	341.95	7,826.0	4,824.7	-926.4	4,911.9	0.00	0.00	0.00
14,000.0	90.00	341.95	7,826.0	4,919.7	-957.4	5,011.3	0.00	0.00	0.00

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Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #216
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #216	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,100.0	90.00	341.95	7,826.0	5,014.8	-988.4	5,110.8	0.00	0.00	0.00
14,200.0	90.00	341.95	7,826.0	5,109.9	-1,019.4	5,210.2	0.00	0.00	0.00
14,300.0	90.00	341.95	7,826.0	5,205.0	-1,050.3	5,309.6	0.00	0.00	0.00
14,400.0	90.00	341.95	7,826.0	5,300.1	-1,081.3	5,409.1	0.00	0.00	0.00
14,500.0	90.00	341.95	7,826.0	5,395.1	-1,112.3	5,508.5	0.00	0.00	0.00
14,600.0	90.00	341.95	7,826.0	5,490.2	-1,143.3	5,608.0	0.00	0.00	0.00
14,700.0	90.00	341.95	7,826.0	5,585.3	-1,174.3	5,707.4	0.00	0.00	0.00
TD at 14800.3									
14,800.3	90.00	341.95	7,826.0	5,680.7	-1,205.3	5,807.1	0.00	0.00	0.00

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
VP Williams #216 D#1 - hit/miss target - Shape - Point	0.00	360.00	7,189.4	-962.4	958.9	335,683.91	1,835,873.40	39° 25' 14.452 N	79° 58' 10.109 W
PBHL Williams #216 - plan hits target center - Point	0.00	360.00	7,826.0	5,680.7	-1,205.3	342,327.00	1,833,709.10	39° 26' 19.997 N	79° 58' 38.139 W
LP Williams #216 D#2 - plan hits target center - Point	0.00	360.00	7,826.0	-357.1	761.7	336,289.20	1,835,676.20	39° 25' 20.424 N	79° 58' 12.662 W

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
2,500.0	2,500.0	0.0	0.0	Start Build 2.00
3,750.2	3,710.9	-190.2	189.5	Start 1943.8 hold at 3750.2 MD
5,694.0	5,472.5	-772.2	769.4	Start Drop -2.00
6,944.2	6,683.4	-962.4	958.9	Start 506.0 hold at 6944.2 MD
7,450.2	7,189.4	-962.4	958.9	Start DLS 9.00 TFO 341.95
8,450.2	7,826.0	-357.1	761.7	Start 6472.5 hold at 8450.2 MD
14,800.3	7,826.0	5,680.7	-1,205.3	TD at 14800.3

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