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west virginia department of environmental protection

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

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://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 214  
47-091-01333-00-00

**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 214  
Farm Name: WILLIAMS, WILLIAM C.  
U.S. WELL NUMBER: 47-091-01333-00-00  
Horizontal 6A New Drill  
Date Modification Issued: June 25, 2018

Promoting a healthy environment.

06/29/2018



April 4, 2018

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

**RE: Williams Pad – Williams 214 API# 47-091-01333 – Modification due to spacing changes and extending lateral**

Dear Laura:

Enclosed please find the modification for the Williams 214 (API# 47-091-01333). 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 6,311.00'. We have obtained additional leasing for this site during this modification and request to extend the lateral 1,077.67' for a total of 7,388.67'. 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 cursive script that reads 'Kelly Davis'.

Kelly Davis  
Permitting Specialist  
304-517-8743 mobile  
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 214      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: 16,010.7'

11) Proposed Horizontal Leg Length: 7,388.67'

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**

<b>TYPE</b>	<u>Size (in)</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling (ft)</u>	<u>INTERVALS: Left in Well (ft)</u>	<u>CEMENT: Fill-up (Cu. Ft.)/CTS</u>
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#	16,011'	16,011'	TOC @ 1,450'
Tubing							
Liners							

*Ernest L. Ayers*  
4-4-18

<b>TYPE</b>	<u>Size (in)</u>	<u>Wellbore Diameter (in)</u>	<u>Wall Thickness (in)</u>	<u>Burst Pressure (psi)</u>	<u>Anticipated Max. Internal Pressure (psi)</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	24"	36"			0	Class A, 3% CaCl2	1.20
Fresh Water	13.375"	17.5"	0.38"	2730	900	Class A, 3% CaCl2	1.20
Coal							
Intermediate	9.625"	12.25"	0.395"	3950psi	1,500	Class A, 2% CaCl2	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		

**PACKERS**

Kind:			
Sizes:			
Depths Set:			

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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 26" 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:

26"- 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.

REC'D  
Office of Oil and Gas  
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24) Describe all cement additives associated with each cement type:

26" 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 weight to placement and possibly gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additive mentioned here, helps cement achieve 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.

\*Note: Attach additional sheets as needed.



Arsenal Resources  
Williams 214  
Casing Design  
Directional Plan # 3 QES

Other Names:	N/A
Surface Location:	TBD
Bottom Hole Location:	TBD
Total Depth:	16,011 MD (ft)
	7,826 TVD (ft)

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

Logs	Significant Formations (TVD)	Depth (ft) MD	Depth (ft) TVD	Hole Size	Casing and Cement	Mud	Directional & Surveys Drlg /Csg Point												
None	<b>Section 1</b>		80	24" 94# H-40 STC	Vertical														
None	<b>Section 2</b>		80	17 1/2" (PDC)	Floc Water														
Possible CBL after cement job		650	650	13 3/8" 54.6# J-55 STC	Vertical														
None	<b>Section 3</b>		650	12 1/4" (PDC)	Floc Water														
Possible CBL after cement job		1,600	1,600	9 5/8" 40# J-55 LTC	Vertical														
	<b>Section 4</b>		1,600			<table border="1"> <tr><td>Mud Data</td><td>From</td><td>To</td></tr> <tr><td>Floc Water</td><td>60</td><td>1900</td></tr> <tr><td>Floc Water</td><td>1600</td><td>7,622</td></tr> <tr><td>11.5- 12.0 ppg SOB</td><td>7,622</td><td>16,011</td></tr> </table>	Mud Data	From	To	Floc Water	60	1900	Floc Water	1600	7,622	11.5- 12.0 ppg SOB	7,622	16,011	
Mud Data	From	To																	
Floc Water	60	1900																	
Floc Water	1600	7,622																	
11.5- 12.0 ppg SOB	7,622	16,011																	
			1,059	Big Lime															
			4,459	1st Elk Siltstone															
			7,479	Tully Lime															
			7,775	Purcell (Limestone)															
			7,809	Lower Marcellus															
			16,011 MD 7,826 TVD																
				5 1/2" 20# P-110 VAR															

Cement: Class A 489 Sacks w/ 30% Excess  
TOC: Surface (top off if needed)  
All cement volumes are estimates

Cement: Class A 678 Sacks w/ 50% Excess  
TOC: Surface (top off if needed)  
All cement volumes are estimates

BH Data		
17-1/2" & 12 1/4" PDC	From	To
8- 3/4" (PDC)	1,600	8,622
6- 1/2" (PDC)	8,622	16,011

Directional Data See Directional Plan

Cement: Class A: 50/50 POZ  
1.2 fl3/sack +10% Exs in OH = 2794 sacks  
TOC : 1,450 ft  
All cement volumes are estimates

Revision 1 Note: Not drawn to scale Cement Outside Casing Seal Assembly in Annulus  
Date Last Revised: 27-Mar-18 Jarrett Toms

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06/29/2018

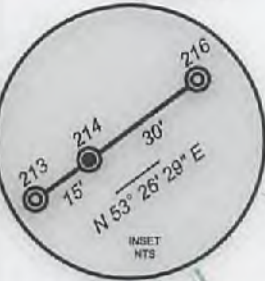
Latitude: 39°27'30" SURFACE HOLE 4135'

Latitude: 39°27'30" BOTTOM HOLE 6390'

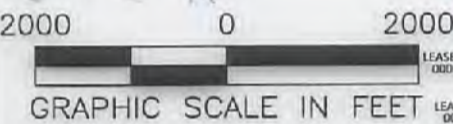
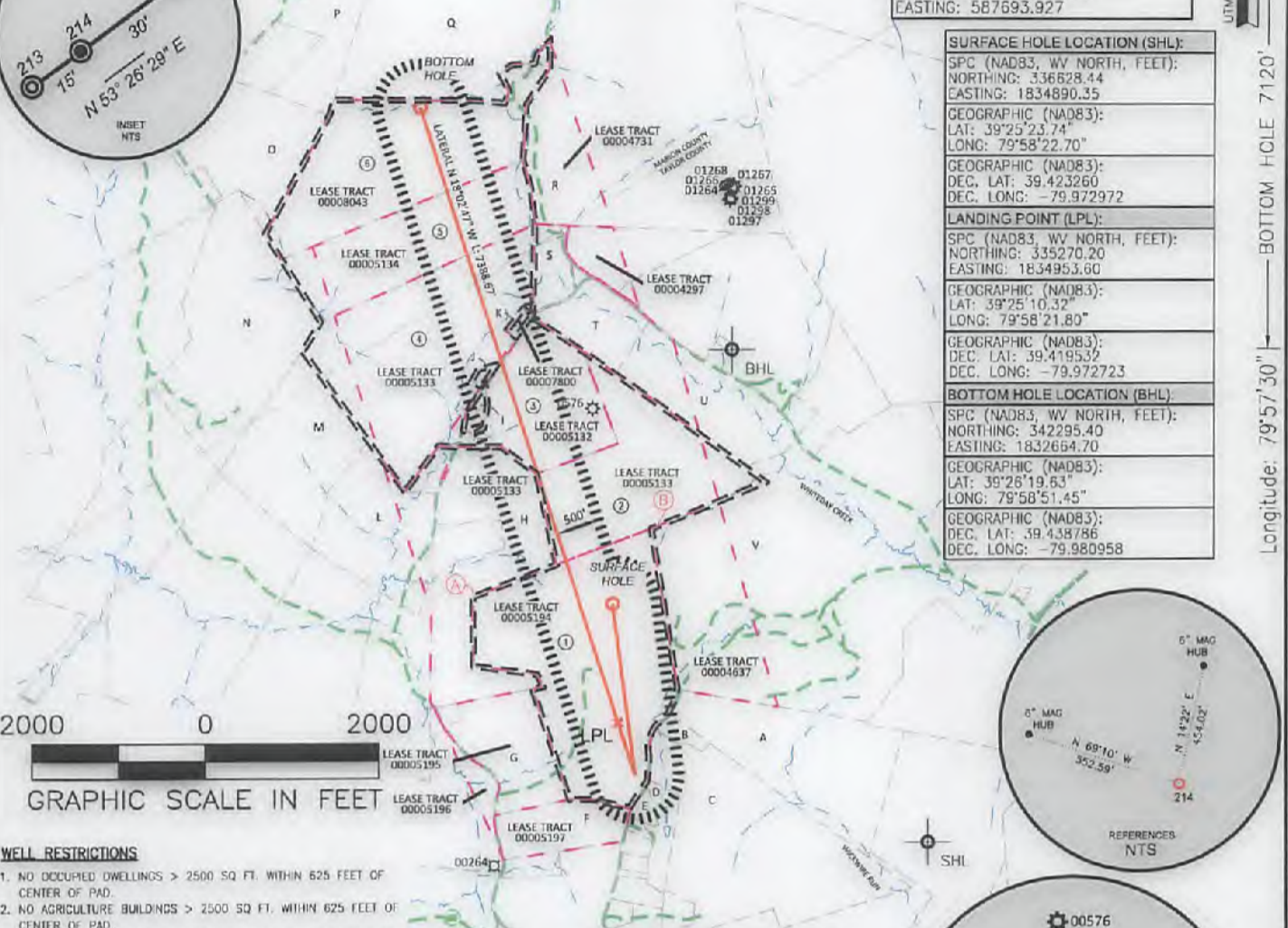
GRID NORTH  
UTM, NAD83 DATUM, ZONE 17, US FT



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



<b>SURFACE HOLE LOCATION (SHL):</b>
UTM (NAD83, ZONE 17, METERS):
NORTHING: 4364251.091
EASTING: 588400.794
<b>LANDING POINT (LPL):</b>
UTM (NAD83, ZONE 17, METERS):
NORTHING: 4363837.580
EASTING: 588426.956
<b>BOTTOM HOLE LOCATION (BHL):</b>
UTM (NAD83, ZONE 17, METERS):
NORTHING: 4365966.418
EASTING: 587693.927



**WELL RESTRICTIONS**

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

TAX MAP PARCEL SURVEYED LINE COORDINATES (UTM - NAD 83 - ZONE 17, U.S. FOOT)			
	NORTHING	EASTING	LONGITUDE
A	14318435.936	1928845.676	39.423462
B	14319262.042	1930917.956	39.425666

**NOTES ON SURVEY**

1. 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.
2. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARCELS SHOWN HEREON.
3. 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 SURVEY GRADE GPS ELEVATION: (NAVD 88, US FT)

COMPANY: **ARSENAL RESOURCES**

WILLIAMS  
OPERATOR'S WELL #: 214  
API WELL #: 47 091 01333 MOO  
STATE COUNTY PERMIT

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 TWD 16,010.7 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:	○ PROPOSED SURFACE HOLE / BOTTOM HOLE	— SURVEYED BOUNDARY	REVISIONS:	DATE: 04-04-2018
	⊙ EXISTING / PRODUCING WELLHEAD	— PROPOSED PATH		
LPL ⊙ LANDING POINT LOCATION	⊙ EXISTING WATER WELL	⊙ EXISTING SPRING		
				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	ALVIN L. & JUDY K. LIPSCOMB	06-02-10
3	ALVIN L. & JUDY K. LIPSCOMB	06-02-09
4	MARK D. & KAREN T. WOLF & SURV.	06-02-2.2
5	SAMMY R. & SARA L. JACOBS FAMILY TRUST, ET AL	19-26-12
6	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-11

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	LAWRENCE A. JR & SAMANTHA L. BALDWIN & SURV.	06-02-9.1
J	JEFFREY A. SHAFFER	6-2-2
K	CHARLES C. CATANIA	06-02-2.1
L	PAUL L. SICILIANO	06-07-7
M	CHARLES E. MCDONALD	06-02-1
N	CHARLES E. MCDONALD	19-26-06
O	THE JOHN M. CONNOLLY TRUST	19-26-7.8
P	DAVID L. SR & BONNIE SMITH	19-29-15
Q	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-09
R	ORTHODOX EDUCATIONAL SOCIETY	06-03-41
S	SAMMY R. & SARA L. JACOBS FAMILY TRUST & DANIEL & SONDRAL & SURV	06-02-03
T	ANTHONY T. DORSEY & LAURA J. TOBIN & SURV.	06-02-8.1
U	CHARLES E. MCDONALD	6-2-11
V	FIREMAN PAYTON TRUSTEE OF MELBA M. ZINN TRUST (HEIRS)	06-07-11

06/29/2018

REVISIONS:	COMPANY:			DATE: 04-04-2018
	OPERATOR'S			WILLIAMS
	WELL #:			214
	DISTRICT:	COUNTY:		STATE:
	FEETTERMAN DISTRICT	TAYLOR	WV	DRAWN BY: K.E.S.
				SCALE: N/A
				DRAWING NO: 154-452
				WELL LOCATION PLAT 2



**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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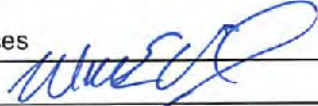
See Attached

**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

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

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**Attachment to WW-6A1, Williams (Puma 75) #214**

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, 4 [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 3 [Lease 00005132 (WVLO1000.000)]	Harry L. Summers and Nancy Laressa Summers, his wife	Pepper Resources, Inc.	12.50%	42/504	47
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 5 [Lease 00005134 (WVLO1002.000)]	Virginia G. Rowland, widow	Pepper Resources, Inc.	12.50%	878/609	42.75
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 6 [Lease 00008043]	William M. Compton, divorced	Mar Key LLC	15.00%	69/60	77.6

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M/V Department of Environmental Protection

## West Virginia Secretary of State — Online Data Services

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

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WV Department of Environmental Protection

<b>Authorized Shares</b>

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

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

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<b>Annual Reports</b>
<b>Date filed</b>

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 Keystone, PDC, and PDC Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

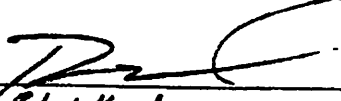
**MOUNTAINEER KEYSTONE LLC**

By:   
Name: *Robert Kovel*  
Title: *CEO*

**PDC MOUNTAINEER, LLC**

By:   
Name: *Robert Kovel*  
Title: *CEO*

**PDC MOUNTAINEER HOLDINGS, LLC**

By:   
Name: *Robert Kovel*  
Title: *CEO*

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People Powered. Asset Strong.

March 28, 2018

Mr. James Martin, Chief of Oil and Gas  
WV DEP  
601 57<sup>th</sup> 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 (ARSENAL RESOURCES) hydraulic fracturing in Taylor County, WV prior to hydraulic fracturing at the following ARSENAL RESOURCES wells on the Williams 214 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 7900' TVD) and existing conventional natural gas wells in partially-depleted, relatively high permeability reservoirs at depths shallower than the Marcellus.

ARSENAL RESOURCES has determined there are no existing active or inactive wells within the 500' offset of the Williams 214 wellbore.

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R E S O U R C E S

## **Arsenal Resources**

**Taylor County, West Virginia  
Williams PAD  
Williams #214**

**Wellbore #1  
Design #3**

## **QES Anticollision Report**

**14 February, 2018**

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06/29/2018

<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	Offset Datum

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

<b>Survey Tool Program</b>	Date 2/14/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
0.0	16,010.7	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
<b>Summary</b>						
Offset Well - Wellbore - Design						
Williams PAD						
Williams #213 - Wellbore #1 - Design #3	1,500.0	1,500.0	15.0	8.5	2.316	CC, ES, SF
Williams #216 - Wellbore #1 - Design #3	2,000.0	2,000.0	30.0	21.3	3.440	CC, ES
Williams #216 - Wellbore #1 - Design #3	2,100.0	2,100.0	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 +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	-8.9	-12.0	15.0				
100.0	100.0	100.0	100.0	0.1	0.1	-126.56	-8.9	-12.0	15.0	14.8	83.366		
200.0	200.0	200.0	200.0	0.3	0.3	-126.56	-8.9	-12.0	15.0	14.4	23.819		
300.0	300.0	300.0	300.0	0.5	0.5	-126.56	-8.9	-12.0	15.0	13.9	13.894		
400.0	400.0	400.0	400.0	0.8	0.8	-126.56	-8.9	-12.0	15.0	13.5	9.808		
500.0	500.0	500.0	500.0	1.0	1.0	-126.56	-8.9	-12.0	15.0	13.0	7.579		
600.0	600.0	600.0	600.0	1.2	1.2	-126.56	-8.9	-12.0	15.0	12.6	6.175		
700.0	700.0	700.0	700.0	1.4	1.4	-126.56	-8.9	-12.0	15.0	12.1	5.210		
800.0	800.0	800.0	800.0	1.7	1.7	-126.56	-8.9	-12.0	15.0	11.7	4.506		
900.0	900.0	900.0	900.0	1.9	1.9	-126.56	-8.9	-12.0	15.0	11.2	3.970		
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-126.56	-8.9	-12.0	15.0	10.8	3.547		
1,100.0	1,100.0	1,100.0	1,100.0	2.3	2.3	-126.56	-8.9	-12.0	15.0	10.3	3.206		
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	-126.56	-8.9	-12.0	15.0	9.9	2.925		
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	-126.56	-8.9	-12.0	15.0	9.4	2.689		
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	-126.56	-8.9	-12.0	15.0	9.0	2.489		
1,500.0	1,500.0	1,500.0	1,500.0	3.2	3.2	-126.56	-8.9	-12.0	15.0	8.5	2,316	CC, ES, SF	
1,600.0	1,600.0	1,599.5	1,599.5	3.5	3.4	-130.21	-10.6	-12.5	16.4	9.5	2.382		
1,700.0	1,700.0	1,698.8	1,698.7	3.7	3.6	-138.04	-15.5	-14.0	21.0	13.7	2.880		
1,800.0	1,800.0	1,797.7	1,797.1	3.9	3.8	-145.41	-23.8	-16.4	28.0	21.3	3.788		
1,900.0	1,900.0	1,895.8	1,894.5	4.1	4.0	-150.69	-35.1	-19.7	40.7	32.6	5.061		
2,000.0	2,000.0	1,993.0	1,990.6	4.4	4.2	-154.21	-49.5	-23.9	55.8	47.4	6.644		
2,100.0	2,100.0	2,089.4	2,085.2	4.6	4.5	31.53	-66.9	-29.0	72.9	64.2	8.348		
2,200.0	2,199.8	2,185.1	2,178.6	4.7	4.7	31.21	-87.2	-35.0	90.4	81.4	9.995		
2,300.0	2,299.5	2,280.2	2,270.6	4.9	5.1	31.65	-110.3	-41.7	108.3	98.9	11.560		

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

<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	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	
2,400.0	2,399.7	2,374.7	2,361.2	5.1	5.5	32.51	-136.1	-49.3	126.4	116.7	13.041		
2,500.0	2,497.5	2,468.6	2,450.2	5.3	5.9	33.61	-164.6	-57.7	144.9	134.8	14.435		
2,600.0	2,495.6	2,461.8	2,437.6	5.5	6.4	34.86	-195.6	-66.7	163.8	153.4	15.731		
2,700.0	2,493.1	2,454.3	2,423.3	5.8	7.0	36.19	-229.1	-76.6	183.1	172.2	16.917		
2,800.0	2,789.6	2,746.2	2,707.3	6.1	7.6	37.57	-265.0	-87.1	202.8	191.5	17.973		
2,900.0	2,885.3	2,837.4	2,789.4	6.5	8.2	38.96	-303.1	-98.3	223.0	211.2	18.880		
3,000.0	2,979.8	2,928.0	2,869.6	7.0	8.9	40.34	-343.4	-110.1	243.8	231.4	19.623		
3,100.0	3,073.2	3,020.1	2,949.8	7.4	9.7	41.75	-386.8	-122.8	264.9	251.8	20.109		
3,200.0	3,165.2	3,117.7	3,034.5	8.0	10.6	43.44	-433.4	-136.5	284.5	270.4	20.987		
3,300.0	3,255.8	3,215.6	3,119.4	8.6	11.5	45.36	-480.2	-150.1	302.0	286.7	19.740		
3,383.1	3,330.0	3,296.9	3,190.0	9.2	12.2	47.15	-519.0	-161.5	315.0	298.7	19.246		
3,400.0	3,345.0	3,313.5	3,204.3	9.3	12.4	47.56	-526.9	-163.8	317.6	301.0	19.126		
3,500.0	3,433.5	3,411.4	3,289.3	10.1	13.3	49.88	-573.7	-177.5	332.9	314.8	18.443		
3,600.0	3,522.1	3,509.4	3,374.3	10.9	14.2	51.99	-620.4	-191.3	348.7	329.1	17.817		
3,700.0	3,610.7	3,607.3	3,459.2	11.7	15.1	53.93	-667.2	-205.0	364.9	343.7	17.251		
3,800.0	3,699.2	3,705.3	3,544.2	12.5	16.1	55.70	-714.0	-218.7	381.5	358.7	16.742		
3,900.0	3,787.8	3,803.2	3,629.2	13.3	17.0	57.32	-760.7	-232.4	398.4	373.9	16.288		
4,000.0	3,876.4	3,901.2	3,714.1	14.1	17.9	58.81	-807.5	-248.1	415.6	389.4	15.863		
4,100.0	3,965.0	3,999.1	3,799.1	15.0	18.9	60.18	-854.3	-259.8	433.1	405.2	15.521		
4,200.0	4,053.5	4,097.1	3,884.1	15.8	19.8	61.44	-901.0	-273.5	450.7	421.1	15.199		
4,300.0	4,142.1	4,195.0	3,969.0	16.7	20.8	62.62	-947.8	-287.2	468.6	437.2	14.910		
4,400.0	4,230.7	4,293.0	4,054.0	17.5	21.7	63.70	-994.6	-300.9	486.7	453.5	14.651		
4,500.0	4,319.2	4,390.9	4,139.0	18.4	22.7	64.71	-1,041.3	-314.6	504.9	469.9	14.419		
4,600.0	4,407.8	4,488.9	4,223.9	19.2	23.7	65.64	-1,088.1	-328.3	523.3	486.4	14.209		
4,700.0	4,496.4	4,586.8	4,308.9	20.1	24.6	66.52	-1,134.9	-342.0	541.8	503.1	14.020		
4,800.0	4,584.9	4,684.8	4,393.9	21.0	25.6	67.34	-1,181.6	-355.7	560.4	519.9	13.848		
4,900.0	4,673.5	4,782.7	4,478.8	21.9	26.5	68.10	-1,228.4	-369.4	579.1	536.8	13.692		
5,000.0	4,762.1	4,880.7	4,563.8	22.8	27.5	68.82	-1,275.2	-383.1	597.9	553.7	13.550		
5,100.0	4,850.7	4,978.6	4,648.8	23.6	28.5	69.49	-1,321.9	-396.8	616.8	570.8	13.420		
5,200.0	4,939.2	5,076.6	4,733.7	24.5	29.4	70.12	-1,368.7	-410.5	635.7	587.9	13.301		
5,300.0	5,027.8	5,174.5	4,818.7	25.4	30.4	70.72	-1,415.5	-424.2	654.8	605.1	13.192		
5,400.0	5,116.4	5,272.5	4,903.7	26.3	31.4	71.28	-1,462.2	-438.0	673.9	622.4	13.091		
5,500.0	5,204.9	5,370.4	4,988.6	27.2	32.3	71.81	-1,509.0	-451.7	693.0	639.7	12.998		
5,600.0	5,293.5	5,468.4	5,073.6	28.1	33.3	72.32	-1,555.8	-465.4	712.2	657.1	12.912		
5,700.0	5,382.1	5,566.3	5,158.6	29.0	34.3	72.80	-1,602.5	-479.1	731.5	674.5	12.832		
5,800.0	5,470.6	5,664.3	5,243.5	29.9	35.2	73.25	-1,649.3	-492.8	750.8	691.9	12.758		
5,900.0	5,559.2	5,762.2	5,328.5	30.8	36.2	73.68	-1,696.1	-506.5	770.2	709.5	12.689		
6,000.0	5,647.8	5,860.2	5,413.4	31.7	37.2	74.09	-1,742.8	-520.2	789.5	727.0	12.624		
6,100.0	5,736.4	5,958.1	5,498.4	32.5	38.1	74.48	-1,789.6	-533.9	809.0	744.5	12.564		
6,200.0	5,824.9	6,056.1	5,583.4	33.4	39.1	74.85	-1,836.4	-547.6	828.4	762.2	12.508		
6,238.9	5,859.4	6,094.2	5,616.5	33.8	39.5	74.99	-1,854.6	-552.9	836.0	769.1	12.487		
6,300.0	5,913.8	6,154.0	5,668.3	34.3	40.1	75.40	-1,883.1	-561.3	848.1	780.1	12.476		
6,400.0	6,004.1	6,251.9	5,753.2	34.9	41.0	75.89	-1,929.8	-575.0	868.6	799.1	12.508		
6,500.0	6,095.8	6,368.3	5,855.2	35.4	41.9	76.22	-1,983.9	-590.8	889.0	818.0	12.533		
6,600.0	6,189.9	6,488.4	5,962.6	36.0	42.7	76.52	-2,035.4	-605.9	907.8	835.5	12.554		
6,700.0	6,283.2	6,609.5	6,073.1	36.5	43.5	76.79	-2,082.9	-619.9	925.1	851.5	12.569		
6,800.0	6,378.6	6,731.4	6,186.3	37.0	44.2	77.03	-2,126.2	-632.5	940.7	865.9	12.581		
6,900.0	6,475.0	6,854.2	6,302.2	37.4	44.8	77.24	-2,165.1	-643.9	954.6	878.8	12.588		
7,000.0	6,572.2	6,977.7	6,420.4	37.8	45.4	77.42	-2,199.3	-654.0	968.8	890.0	12.592		
7,100.0	6,670.2	7,101.8	6,540.6	38.1	45.9	77.57	-2,228.8	-662.6	977.2	899.6	12.593		
7,200.0	6,768.9	7,226.4	6,662.6	38.4	46.4	77.69	-2,253.3	-669.8	985.8	907.6	12.593		
7,300.0	6,868.0	7,351.5	6,786.0	38.7	46.7	77.79	-2,272.8	-675.5	992.7	913.8	12.590		

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

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<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	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	Offset	Semi Major Axis	Highside	Offset Wellbore	Distance	Separation	Warning						
Measured Depth (usft)	Vertical Depth (usft)	Reference	Offset	Toolface (°)	Between Centres (usft)	Factor	Between Ellipses (usft)						
Measured Depth (usft)	Vertical Depth (usft)	Reference	Offset	Toolface (°)	+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Separation Factor				
7,400.0	6,967.6	7,477.0	6,910.6	38.9	47.0	77.86	-2,287.2	-679.7	997.7	918.4	12.586		
7,600.0	7,067.4	7,602.7	7,035.9	39.0	47.2	77.91	-2,296.3	-682.4	1,000.9	921.3	12.578		
7,600.0	7,167.4	7,728.5	7,161.7	39.1	47.3	77.93	-2,300.1	-683.5	1,002.2	922.5	12.568		
7,622.0	7,189.4	7,756.2	7,189.4	39.1	47.4	-109.63	-2,300.2	-683.5	1,002.2	922.5	12.565		
7,650.0	7,217.4	7,785.5	7,218.5	39.2	47.4	-91.58	-2,299.6	-683.7	1,002.2	922.5	12.562		
7,700.0	7,267.2	7,837.7	7,270.7	39.1	47.4	-91.57	-2,295.3	-685.2	1,002.2	922.5	12.569		
7,750.0	7,316.5	7,890.0	7,322.2	39.1	47.3	-91.55	-2,288.9	-687.9	1,002.2	922.6	12.591		
7,800.0	7,365.1	7,942.2	7,372.7	38.9	47.2	-91.52	-2,274.6	-691.9	1,002.2	922.9	12.629		
7,850.0	7,412.5	7,994.3	7,422.0	38.8	47.0	-91.48	-2,258.4	-697.2	1,002.2	923.2	12.683		
7,900.0	7,458.6	8,046.4	7,469.5	38.5	46.8	-91.43	-2,238.4	-703.7	1,002.2	923.6	12.753		
7,950.0	7,503.0	8,098.4	7,515.3	38.3	46.6	-91.37	-2,214.9	-711.3	1,002.2	924.1	12.839		
8,000.0	7,545.5	8,150.3	7,558.8	38.0	46.2	-91.30	-2,187.9	-720.1	1,002.1	924.7	12.940		
8,050.0	7,585.8	8,202.0	7,599.7	37.6	45.9	-91.22	-2,157.8	-730.0	1,002.1	925.3	13.056		
8,100.0	7,623.7	8,253.7	7,637.8	37.2	45.5	-91.14	-2,124.6	-740.6	1,002.1	926.1	13.187		
8,150.0	7,658.9	8,305.2	7,672.8	36.8	45.1	-91.05	-2,088.7	-752.4	1,002.0	926.9	13.332		
8,200.0	7,691.2	8,356.6	7,704.7	36.3	44.7	-90.95	-2,050.4	-764.9	1,002.0	927.7	13.490		
8,250.0	7,720.4	8,407.8	7,733.0	35.9	44.3	-90.85	-2,009.9	-778.1	1,002.0	928.6	13.661		
8,300.0	7,746.3	8,458.9	7,757.8	35.4	43.8	-90.74	-1,967.4	-792.0	1,001.9	929.6	13.844		
8,350.0	7,768.8	8,509.8	7,778.9	34.9	43.3	-90.63	-1,923.4	-806.3	1,001.9	930.6	14.038		
8,400.0	7,787.7	8,560.6	7,796.2	34.3	42.8	-90.51	-1,878.0	-821.1	1,001.9	931.5	14.240		
8,450.0	7,802.9	8,611.2	7,809.6	33.8	42.3	-90.39	-1,831.6	-836.2	1,001.9	932.6	14.451		
8,500.0	7,814.3	8,661.6	7,819.0	33.3	41.9	-90.27	-1,784.6	-851.6	1,001.9	933.6	14.668		
8,550.0	7,821.9	8,711.8	7,824.5	32.8	41.4	-90.14	-1,737.1	-867.0	1,001.9	934.6	14.889		
8,600.0	7,825.6	8,761.9	7,826.0	32.3	40.9	-90.02	-1,689.5	-882.5	1,001.9	935.6	15.112		
8,614.7	7,826.0	8,776.6	7,826.0	32.2	40.8	-90.00	-1,675.6	-887.1	1,001.9	935.9	15.176		
8,622.0	7,826.0	8,783.9	7,826.0	32.1	40.7	-90.00	-1,668.6	-888.3	1,001.9	936.0	15.211		
8,700.0	7,826.0	8,861.9	7,826.0	31.3	40.0	-90.00	-1,594.4	-913.5	1,001.9	937.5	15.557		
8,800.0	7,826.0	8,961.9	7,826.0	30.5	39.1	-90.00	-1,499.4	-944.5	1,001.9	939.2	15.985		
8,900.0	7,826.0	9,061.9	7,826.0	29.7	38.3	-90.00	-1,404.3	-975.5	1,001.9	940.7	16.386		
9,000.0	7,826.0	9,161.9	7,826.0	29.0	37.6	-90.00	-1,309.2	-1,006.4	1,001.9	942.0	16.747		
9,100.0	7,826.0	9,261.9	7,826.0	28.5	36.8	-90.00	-1,214.1	-1,037.4	1,001.9	943.1	17.059		
9,200.0	7,826.0	9,361.9	7,826.0	28.0	36.1	-90.00	-1,119.0	-1,068.4	1,001.9	944.0	17.312		
9,300.0	7,826.0	9,461.9	7,826.0	27.7	35.5	-90.00	-1,024.0	-1,099.4	1,001.9	944.5	17.495		
9,400.0	7,826.0	9,561.9	7,826.0	27.5	34.9	-90.00	-928.9	-1,130.3	1,001.9	945.0	17.604		
9,500.0	7,826.0	9,661.9	7,826.0	27.4	34.3	-90.00	-833.8	-1,161.3	1,001.9	945.0	17.631		
9,600.0	7,826.0	9,761.9	7,826.0	27.5	33.8	-90.00	-738.7	-1,192.3	1,001.9	944.9	17.577		
9,700.0	7,826.0	9,861.9	7,826.0	27.7	33.3	-90.00	-643.6	-1,223.3	1,001.9	944.4	17.444		
9,800.0	7,826.0	9,961.9	7,826.0	28.0	32.8	-90.00	-548.6	-1,254.3	1,001.9	943.7	17.237		
9,900.0	7,826.0	10,061.9	7,826.0	28.5	32.4	-90.00	-453.5	-1,285.2	1,001.9	942.8	16.964		
10,000.0	7,826.0	10,161.9	7,826.0	29.1	32.0	-90.00	-358.4	-1,316.2	1,001.9	941.6	16.634		
10,100.0	7,826.0	10,261.9	7,826.0	29.9	31.6	-90.00	-263.3	-1,347.2	1,001.9	940.2	16.254		
10,200.0	7,826.0	10,361.9	7,826.0	30.7	31.6	-90.00	-169.2	-1,378.2	1,001.9	938.7	15.873		
10,300.0	7,826.0	10,461.9	7,826.0	31.7	32.8	-90.00	-73.2	-1,409.2	1,001.9	936.9	15.423		
10,400.0	7,826.0	10,561.9	7,826.0	32.7	34.0	-90.00	21.9	-1,440.1	1,001.9	934.9	14.969		
10,500.0	7,826.0	10,661.9	7,826.0	33.8	35.3	-90.00	117.0	-1,471.1	1,001.9	932.8	14.509		
10,600.0	7,826.0	10,761.9	7,826.0	35.0	36.6	-90.00	212.1	-1,502.1	1,001.9	930.6	14.049		
10,700.0	7,826.0	10,861.9	7,826.0	36.2	37.9	-90.00	307.2	-1,533.1	1,001.9	928.2	13.592		
10,800.0	7,826.0	10,961.9	7,826.0	37.5	39.2	-90.00	402.2	-1,564.0	1,001.9	925.6	13.143		
10,900.0	7,826.0	11,061.9	7,826.0	38.9	40.6	-90.00	497.3	-1,595.0	1,001.9	923.0	12.706		
11,000.0	7,826.0	11,161.9	7,826.0	40.3	42.1	-90.00	592.4	-1,626.0	1,001.9	920.3	12.283		
11,100.0	7,826.0	11,261.9	7,826.0	41.7	43.5	-90.00	687.5	-1,657.0	1,001.9	917.5	11.874		
11,200.0	7,826.0	11,361.9	7,826.0	43.2	45.0	-90.00	782.6	-1,688.0	1,001.9	914.6	11.481		

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Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
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 #214	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: O-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		
11,300.0	7,826.0	11,461.9	7,826.0	44.7	46.5	-90.00	877.7	-1,718.9	1,001.9	911.6	11.105			
11,400.0	7,826.0	11,561.9	7,826.0	46.3	48.0	-90.00	972.7	-1,748.9	1,001.9	908.6	10.745			
11,500.0	7,826.0	11,661.9	7,826.0	47.8	49.6	-90.00	1,067.8	-1,780.9	1,001.9	905.5	10.401			
11,600.0	7,826.0	11,761.9	7,826.0	49.4	51.1	-90.00	1,162.9	-1,811.9	1,001.9	902.4	10.073			
11,700.0	7,826.0	11,861.9	7,826.0	51.0	52.7	-90.00	1,258.0	-1,842.9	1,001.9	899.2	9.761			
11,800.0	7,826.0	11,961.9	7,826.0	52.7	54.3	-90.00	1,353.1	-1,873.8	1,001.9	896.0	9.464			
11,900.0	7,826.0	12,061.9	7,826.0	54.3	55.9	-90.00	1,448.1	-1,904.8	1,001.9	892.7	9.181			
12,000.0	7,826.0	12,161.9	7,826.0	56.0	57.6	-90.00	1,543.2	-1,935.8	1,001.9	889.4	8.911			
12,100.0	7,826.0	12,261.9	7,826.0	57.7	59.2	-90.00	1,638.3	-1,966.8	1,001.9	886.1	8.654			
12,200.0	7,826.0	12,361.9	7,826.0	59.4	60.9	-90.00	1,733.4	-1,997.8	1,001.9	882.7	8.410			
12,300.0	7,826.0	12,461.9	7,826.0	61.1	62.5	-90.00	1,828.5	-2,028.7	1,001.9	879.3	8.177			
12,400.0	7,826.0	12,561.9	7,826.0	62.8	64.2	-90.00	1,923.5	-2,059.7	1,001.9	875.9	7.955			
12,500.0	7,826.0	12,661.9	7,826.0	64.5	65.9	-90.00	2,018.6	-2,090.7	1,001.9	872.5	7.743			
12,600.0	7,826.0	12,761.9	7,826.0	66.3	67.6	-90.00	2,113.7	-2,121.7	1,001.9	869.0	7.541			
12,700.0	7,826.0	12,861.9	7,826.0	68.0	69.4	-90.00	2,208.8	-2,152.6	1,001.9	865.5	7.349			
12,800.0	7,826.0	12,961.9	7,826.0	69.8	71.1	-90.00	2,303.9	-2,183.6	1,001.9	862.0	7.164			
12,900.0	7,826.0	13,061.9	7,826.0	71.6	72.8	-90.00	2,398.9	-2,214.6	1,001.9	858.5	6.989			
13,000.0	7,826.0	13,161.9	7,826.0	73.3	74.5	-90.00	2,494.0	-2,245.6	1,001.9	855.0	6.820			
13,100.0	7,826.0	13,261.9	7,826.0	75.1	76.3	-90.00	2,589.1	-2,276.6	1,001.9	851.4	6.659			
13,200.0	7,826.0	13,361.9	7,826.0	76.9	78.1	-90.00	2,684.2	-2,307.5	1,001.9	847.9	6.505			
13,300.0	7,826.0	13,461.9	7,826.0	78.7	79.8	-90.00	2,779.3	-2,338.5	1,001.9	844.3	6.358			
13,400.0	7,826.0	13,561.9	7,826.0	80.5	81.6	-90.00	2,874.3	-2,369.5	1,001.9	840.7	6.215			
13,500.0	7,826.0	13,661.9	7,826.0	82.3	83.4	-90.00	2,969.4	-2,400.5	1,001.9	837.1	6.080			
13,600.0	7,826.0	13,761.9	7,826.0	84.1	85.1	-90.00	3,064.5	-2,431.5	1,001.9	833.5	5.950			
13,700.0	7,826.0	13,861.9	7,826.0	85.9	86.9	-90.00	3,159.6	-2,462.4	1,001.9	829.9	5.824			
13,800.0	7,826.0	13,961.9	7,826.0	87.8	88.7	-90.00	3,254.7	-2,493.4	1,001.9	826.2	5.704			
13,900.0	7,826.0	14,061.9	7,826.0	89.6	90.5	-90.00	3,349.7	-2,524.4	1,001.9	822.6	5.588			
14,000.0	7,826.0	14,161.9	7,826.0	91.4	92.3	-90.00	3,444.8	-2,555.4	1,001.9	818.9	5.477			
14,100.0	7,826.0	14,261.9	7,826.0	93.2	94.1	-90.00	3,539.9	-2,586.3	1,001.9	815.3	5.370			
14,200.0	7,826.0	14,361.9	7,826.0	95.1	95.9	-90.00	3,635.0	-2,617.3	1,001.9	811.6	5.266			
14,300.0	7,826.0	14,461.9	7,826.0	96.9	97.7	-90.00	3,730.1	-2,648.3	1,001.9	808.0	5.167			
14,400.0	7,826.0	14,561.9	7,826.0	98.8	99.5	-90.00	3,825.1	-2,679.3	1,001.9	804.3	5.071			
14,500.0	7,826.0	14,661.9	7,826.0	100.6	101.4	-90.00	3,920.2	-2,710.3	1,001.9	800.6	4.978			
14,600.0	7,826.0	14,761.9	7,826.0	102.4	103.2	-90.00	4,015.3	-2,741.2	1,001.9	796.9	4.888			
14,700.0	7,826.0	14,861.9	7,826.0	104.3	105.0	-90.00	4,110.4	-2,772.2	1,001.9	793.2	4.802			
14,800.0	7,826.0	14,961.9	7,826.0	106.1	106.8	-90.00	4,205.5	-2,803.2	1,001.9	789.5	4.718			
14,900.0	7,826.0	15,061.9	7,826.0	108.0	108.7	-90.00	4,300.6	-2,834.2	1,001.9	785.8	4.637			
15,000.0	7,826.0	15,161.9	7,826.0	109.9	110.5	-90.00	4,395.6	-2,865.2	1,001.9	782.1	4.559			
15,100.0	7,826.0	15,261.9	7,826.0	111.7	112.3	-90.00	4,490.7	-2,896.1	1,001.9	778.4	4.483			
15,200.0	7,826.0	15,361.9	7,826.0	113.6	114.2	-90.00	4,585.8	-2,927.1	1,001.9	774.7	4.410			
15,300.0	7,826.0	15,461.9	7,826.0	115.4	116.0	-90.00	4,680.9	-2,958.1	1,001.9	771.0	4.339			
15,400.0	7,826.0	15,561.9	7,826.0	117.3	117.8	-90.00	4,776.0	-2,989.1	1,001.9	767.3	4.270			
15,500.0	7,826.0	15,661.9	7,826.0	119.2	119.7	-90.00	4,871.0	-3,020.1	1,001.9	763.6	4.203			
15,600.0	7,826.0	15,761.9	7,826.0	121.0	121.5	-90.00	4,966.1	-3,051.0	1,001.9	759.8	4.139			
15,700.0	7,826.0	15,861.9	7,826.0	122.9	123.4	-90.00	5,061.2	-3,082.0	1,001.9	756.1	4.076			
15,800.0	7,826.0	15,961.9	7,826.0	124.8	125.2	-90.00	5,156.3	-3,113.0	1,001.9	752.3	4.015			
15,900.0	7,826.0	16,061.9	7,826.0	126.6	127.1	-90.00	5,251.4	-3,144.0	1,001.9	748.6	3.956			
16,000.0	7,826.0	16,161.9	7,826.0	128.5	128.9	-90.00	5,346.4	-3,174.9	1,001.9	744.8	3.898			
16,010.7	7,826.0	16,172.6	7,826.0	128.7	129.1	-90.00	5,356.6	-3,178.3	1,001.9	744.5	3.892			

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<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Williams PAD- Williams #216 - 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 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	53.44	17.9	24.1	30.0				
100.0	100.0	100.0	100.0	0.1	0.1	53.44	17.9	24.1	30.0	29.8	166.854		
200.0	200.0	200.0	200.0	0.3	0.3	53.44	17.9	24.1	30.0	29.4	47.872		
300.0	300.0	300.0	300.0	0.5	0.5	53.44	17.9	24.1	30.0	28.9	27.809		
400.0	400.0	400.0	400.0	0.8	0.8	53.44	17.9	24.1	30.0	28.5	19.530		
500.0	500.0	500.0	500.0	1.0	1.0	53.44	17.9	24.1	30.0	28.0	15.169		
600.0	600.0	600.0	600.0	1.2	1.2	53.44	17.9	24.1	30.0	27.6	12.360		
700.0	700.0	700.0	700.0	1.4	1.4	53.44	17.9	24.1	30.0	27.1	10.428		
800.0	800.0	800.0	800.0	1.7	1.7	53.44	17.9	24.1	30.0	26.7	9.019		
900.0	900.0	900.0	900.0	1.9	1.9	53.44	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	53.44	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	53.44	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	53.44	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	53.44	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	53.44	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	53.44	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	53.44	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	53.44	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	53.44	17.9	24.1	30.0	22.2	3.836		
1,900.0	1,900.0	1,900.0	1,900.0	4.1	4.1	53.44	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	53.44	17.9	24.1	30.0	21.3	3.440	CC, ES	
2,100.0	2,100.0	2,100.0	2,100.0	4.6	4.6	-121.82	17.9	24.1	30.9	21.7	3.379	SF	
2,200.0	2,199.8	2,199.8	2,199.8	4.7	4.8	-129.29	17.9	24.1	33.9	24.4	3.559		
2,300.0	2,299.5	2,299.5	2,299.5	4.9	5.0	-138.89	17.9	24.1	40.0	30.1	4.030		
2,400.0	2,398.7	2,398.7	2,398.7	5.1	5.3	-148.01	17.9	24.1	49.9	39.5	4.824		
2,500.0	2,497.5	2,497.5	2,497.5	5.3	5.5	-155.35	17.9	24.1	63.7	53.0	5.927		
2,600.0	2,595.6	2,597.1	2,597.1	5.5	5.7	-158.91	16.7	25.3	80.6	69.5	7.233		
2,700.0	2,693.1	2,697.1	2,697.0	5.8	5.9	-161.81	13.1	28.9	99.1	87.6	8.601		
2,800.0	2,789.6	2,797.3	2,796.9	6.1	6.0	-162.20	7.0	35.0	118.9	107.0	9.984		
2,900.0	2,885.3	2,897.7	2,896.4	6.5	6.2	-161.69	-1.6	43.5	146.1	127.7	11.361		
3,000.0	2,979.8	2,998.1	2,995.6	7.0	6.5	-160.63	-12.7	54.6	162.5	149.7	12.718		
3,100.0	3,073.2	3,098.5	3,094.2	7.4	6.7	-159.23	-26.3	68.1	186.2	173.0	14.035		
3,200.0	3,165.2	3,198.9	3,192.0	8.0	7.0	-157.63	-42.2	84.0	211.4	197.6	15.294		
3,300.0	3,255.8	3,299.2	3,288.9	8.6	7.3	-155.92	-60.6	102.3	238.0	223.6	16.471		
3,383.1	3,330.0	3,362.4	3,368.5	9.2	7.6	-154.44	-77.6	119.3	261.3	246.3	17.370		
3,400.0	3,345.0	3,399.3	3,384.6	9.3	7.7	-154.17	-81.3	122.9	266.1	251.0	17.543		
3,500.0	3,433.5	3,499.7	3,479.5	10.1	8.1	-152.42	-104.4	146.0	293.8	277.8	18.367		
3,600.0	3,522.1	3,600.4	3,573.5	10.9	8.6	-150.39	-130.0	171.4	320.3	303.3	18.890		
3,700.0	3,610.7	3,701.2	3,666.3	11.7	9.1	-148.13	-157.9	199.3	345.7	327.6	19.147		
3,800.0	3,699.2	3,799.4	3,755.5	12.5	9.7	-145.79	-187.1	228.3	370.4	351.1	19.208		
3,900.0	3,787.8	3,895.3	3,842.4	13.3	10.3	-143.74	-215.8	256.9	395.6	374.9	19.197		
4,000.0	3,876.4	3,991.1	3,929.2	14.1	11.0	-141.93	-244.5	285.5	421.0	399.0	19.162		
4,100.0	3,965.0	4,087.0	4,015.1	15.0	11.7	-140.33	-273.2	314.1	449.9	423.5	19.112		
4,200.0	4,053.5	4,182.9	4,103.0	15.8	12.4	-138.90	-301.9	342.7	473.1	448.2	19.054		
4,300.0	4,142.1	4,278.7	4,189.9	16.7	13.1	-137.62	-330.6	371.3	499.5	473.2	18.990		
4,400.0	4,230.7	4,374.6	4,276.8	17.5	13.8	-136.47	-359.3	399.9	528.1	498.3	18.925		
4,500.0	4,319.2	4,470.5	4,363.7	18.4	14.5	-135.42	-388.0	428.5	552.9	523.6	18.861		
4,600.0	4,407.8	4,566.4	4,456.6	19.2	15.3	-134.48	-416.7	457.1	579.9	549.0	18.798		
4,700.0	4,496.4	4,662.2	4,537.4	20.1	16.0	-133.61	-445.4	485.7	607.0	574.6	18.737		
4,800.0	4,584.9	4,758.1	4,624.3	21.0	16.8	-132.82	-474.1	514.3	634.2	600.2	18.679		
4,900.0	4,673.5	4,854.0	4,711.2	21.9	17.6	-132.10	-502.8	542.9	661.5	626.0	18.624		
5,000.0	4,762.1	4,949.8	4,798.1	22.8	18.3	-131.43	-531.5	571.5	688.9	651.6	18.572		

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



Anticollision Report



Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
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 #214	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 #216 - 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	
5,100.0	4,850.7	5,045.7	4,885.0	23.6	19.1	-130.81	-560.2	600.1	716.4	677.7	18.522		
5,200.0	4,939.2	5,141.6	4,971.9	24.5	19.9	-130.24	-588.9	628.7	744.0	703.7	18.476		
5,300.0	5,027.8	5,237.4	5,058.7	25.4	20.7	-129.71	-617.6	657.3	771.6	729.7	18.433		
5,400.0	5,116.4	5,333.3	5,145.6	26.3	21.5	-129.22	-646.3	685.9	799.3	755.8	18.392		
5,500.0	5,204.9	5,429.2	5,232.5	27.2	22.3	-128.76	-675.0	714.5	827.0	781.9	18.354		
5,600.0	5,293.5	5,525.1	5,319.4	28.1	23.1	-128.32	-703.8	743.1	854.8	808.1	18.318		
5,700.0	5,382.1	5,620.9	5,406.3	29.0	23.9	-127.92	-732.5	771.7	882.6	834.3	18.284		
5,800.0	5,470.6	5,718.4	5,492.8	29.9	24.6	-127.55	-761.0	800.2	910.5	860.6	18.271		
5,900.0	5,559.2	5,810.6	5,579.2	30.8	25.2	-127.34	-787.7	826.8	938.5	887.3	18.341		
6,000.0	5,647.8	5,904.8	5,666.7	31.7	25.7	-127.34	-812.4	851.4	966.7	914.3	18.440		
6,100.0	5,736.4	5,998.8	5,755.1	32.5	26.2	-127.52	-835.0	873.9	995.1	941.5	18.569		
6,200.0	5,824.9	6,092.5	5,844.2	33.4	26.7	-127.87	-855.5	894.3	1,023.6	969.0	18.729		
6,238.9	5,859.4	6,128.8	5,878.9	33.8	26.8	-128.06	-862.9	901.7	1,034.8	979.8	18.900		
6,300.0	5,913.8	6,185.7	5,933.7	34.3	27.2	-128.62	-873.8	912.6	1,052.1	996.5	18.930		
6,400.0	6,004.1	6,278.9	6,024.1	34.9	27.5	-129.54	-890.1	928.8	1,078.9	1,022.6	19.164		
6,500.0	6,095.8	6,372.3	6,115.3	35.4	27.9	-130.41	-904.2	942.9	1,103.9	1,047.0	19.386		
6,600.0	6,188.9	6,465.7	6,207.2	36.0	28.2	-131.26	-916.3	954.9	1,127.1	1,068.5	19.597		
6,700.0	6,283.2	6,559.2	6,299.5	36.5	28.5	-132.07	-926.2	964.8	1,148.4	1,090.4	19.800		
6,800.0	6,378.6	6,652.5	6,392.2	37.0	28.7	-132.85	-934.0	972.6	1,167.8	1,109.4	19.996		
6,900.0	6,475.0	6,745.8	6,485.2	37.4	28.9	-133.62	-939.7	978.2	1,185.4	1,126.6	20.186		
7,000.0	6,572.2	6,838.9	6,578.1	37.8	29.1	-134.37	-943.2	981.7	1,201.1	1,142.1	20.371		
7,100.0	6,670.2	6,931.8	6,671.0	38.1	29.2	-135.11	-944.5	983.0	1,214.9	1,155.8	20.551		
7,200.0	6,768.9	7,029.7	6,768.9	38.4	29.3	-135.80	-944.5	983.0	1,226.6	1,167.4	20.705		
7,300.0	6,868.0	7,128.8	6,868.0	38.7	29.4	-136.35	-944.5	983.0	1,236.0	1,176.6	20.811		
7,400.0	6,967.6	7,228.4	6,967.6	38.9	29.5	-136.75	-944.5	983.0	1,242.9	1,183.4	20.870		
7,500.0	7,067.4	7,328.2	7,067.4	39.0	29.6	-137.00	-944.5	983.0	1,247.3	1,187.6	20.981		
7,600.0	7,167.4	7,428.2	7,167.4	39.1	29.7	-137.10	-944.5	983.0	1,249.1	1,189.2	20.844		
7,622.0	7,189.4	7,450.2	7,189.4	39.1	29.7	35.34	-944.5	983.0	1,249.2	1,189.2	20.829		
7,650.0	7,217.4	7,450.2	7,189.4	39.2	29.7	53.39	-944.5	983.0	1,249.1	1,189.2	20.850		
7,700.0	7,267.2	7,486.1	7,225.3	39.1	29.8	53.54	-943.6	982.7	1,247.7	1,187.7	20.820		
7,750.0	7,316.5	7,500.0	7,239.2	39.1	29.8	53.77	-942.7	982.4	1,246.1	1,185.3	20.814		
7,800.0	7,365.1	7,532.1	7,271.1	38.9	29.8	54.10	-939.5	981.4	1,241.3	1,181.5	20.771		
7,850.0	7,412.5	7,550.0	7,288.8	38.8	29.8	54.68	-937.1	980.6	1,236.2	1,176.6	20.737		
7,900.0	7,458.6	7,578.1	7,316.4	38.5	29.7	55.36	-932.4	979.1	1,230.0	1,170.5	20.679		
7,950.0	7,503.0	7,600.0	7,337.8	38.3	29.7	56.13	-927.8	977.5	1,222.7	1,163.4	20.616		
8,000.0	7,545.5	7,623.9	7,361.0	38.0	29.7	57.05	-922.1	975.8	1,214.3	1,155.2	20.541		
8,050.0	7,585.8	7,650.0	7,385.9	37.6	29.6	58.13	-915.0	973.4	1,205.0	1,146.0	20.448		
8,100.0	7,623.7	7,669.5	7,404.4	37.2	29.5	59.25	-909.0	971.5	1,194.6	1,136.0	20.355		
8,150.0	7,658.9	7,700.0	7,432.8	36.8	29.5	60.69	-898.5	968.1	1,183.5	1,125.1	20.233		
8,200.0	7,691.2	7,714.8	7,446.5	36.3	29.4	61.96	-893.0	966.3	1,171.6	1,113.4	20.120		
8,250.0	7,720.4	7,737.3	7,466.9	35.9	29.3	63.49	-884.0	963.3	1,159.1	1,101.1	19.985		
8,300.0	7,746.3	7,750.0	7,478.2	35.4	29.3	64.88	-878.6	961.6	1,146.1	1,088.4	19.853		
8,350.0	7,768.8	7,782.1	7,506.4	34.9	29.2	66.88	-864.1	956.9	1,132.7	1,075.1	19.687		
8,400.0	7,787.7	7,800.0	7,521.9	34.3	29.1	68.59	-855.4	954.0	1,119.0	1,061.7	19.529		
8,450.0	7,802.9	7,826.2	7,543.9	33.8	28.9	70.62	-842.0	949.6	1,105.3	1,048.2	19.362		
8,500.0	7,814.3	7,850.0	7,563.4	33.3	28.9	72.65	-829.0	945.4	1,091.5	1,034.8	19.193		
8,550.0	7,821.9	7,869.6	7,579.2	32.8	28.7	74.58	-817.8	941.8	1,078.3	1,021.5	19.032		
8,600.0	7,825.6	7,900.0	7,602.7	32.3	28.6	76.94	-799.6	935.8	1,065.4	1,009.0	18.875		
8,622.0	7,826.0	7,900.0	7,602.7	32.1	28.6	77.45	-799.6	935.8	1,059.9	1,003.5	18.810		
8,700.0	7,826.0	7,935.3	7,628.9	31.3	28.4	78.88	-777.1	928.5	1,042.5	986.5	18.638		
8,800.0	7,826.0	7,966.9	7,664.8	30.5	28.0	80.87	-741.8	917.0	1,025.7	970.4	18.564		
8,900.0	7,826.0	8,050.0	7,704.3	29.7	27.6	83.08	-695.2	901.8	1,014.3	959.9	18.633		

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<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Williams PAD - Williams #216 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default:												Offset Well Error:	0.0 usft
Reference	Offset	Semi Major Axis		Highside Toolface	Offset Wellbore Centre		Distance		Separation Factor	Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)		Reference (usft)	Offset (usft)	+N-S (usft)	+E-W (usft)			Between Centres (usft)	Between Ellipses (usft)	
9,000.0	7,826.0	8,117.2	7,740.9	29.0	27.2	85.15	-641.6	884.3	1,007.5	954.0	18.934		
9,100.0	7,826.0	8,197.3	7,776.4	28.5	26.6	87.17	-573.4	862.1	1,004.2	951.7	19.136		
9,200.0	7,826.0	8,266.8	7,805.2	28.0	26.0	88.81	-492.9	835.9	1,003.0	951.5	19.478		
9,300.0	7,826.0	8,363.4	7,822.5	27.7	25.4	89.80	-402.6	806.5	1,002.7	952.1	19.795		
9,341.8	7,826.0	8,425.0	7,825.5	27.6	25.2	89.97	-363.2	793.7	1,002.7	952.3	19.901		
9,400.0	7,826.0	8,483.1	7,826.0	27.5	24.8	90.00	-307.9	775.6	1,002.7	952.7	20.034		
9,500.0	7,826.0	8,583.1	7,826.0	27.4	24.3	90.00	-212.8	744.7	1,002.7	953.0	20.160		
9,600.0	7,826.0	8,683.1	7,826.0	27.5	23.9	90.00	-117.7	713.7	1,002.7	953.0	20.171		
9,700.0	7,826.0	8,783.1	7,826.0	27.7	23.6	90.00	-22.7	682.7	1,002.7	952.7	20.061		
9,800.0	7,826.0	8,883.1	7,826.0	28.0	23.4	90.00	72.4	651.7	1,002.7	952.2	19.837		
9,900.0	7,826.0	8,983.1	7,826.0	28.5	23.4	90.00	167.5	620.8	1,002.7	951.3	19.510		
10,000.0	7,826.0	9,083.1	7,826.0	29.1	23.6	90.00	262.6	589.8	1,002.7	950.2	19.095		
10,100.0	7,826.0	9,183.1	7,826.0	29.9	24.1	90.00	357.7	558.8	1,002.7	948.9	18.608		
10,200.0	7,826.0	9,283.1	7,826.0	30.7	24.8	90.00	452.7	527.8	1,002.7	947.2	18.070		
10,300.0	7,826.0	9,383.1	7,826.0	31.7	25.7	90.00	547.8	496.8	1,002.7	945.4	17.495		
10,400.0	7,826.0	9,483.1	7,826.0	32.7	26.7	90.00	642.9	465.9	1,002.7	943.4	16.901		
10,500.0	7,826.0	9,583.1	7,826.0	33.8	27.9	90.00	738.0	434.9	1,002.7	941.2	16.299		
10,600.0	7,826.0	9,683.1	7,826.0	35.0	29.1	90.00	833.1	403.9	1,002.8	939.9	15.700		
10,700.0	7,826.0	9,783.1	7,826.0	36.2	30.4	90.00	928.2	372.9	1,002.8	936.4	15.111		
10,800.0	7,826.0	9,883.1	7,826.0	37.6	31.7	90.00	1,023.2	342.0	1,002.8	933.8	14.539		
10,900.0	7,826.0	9,983.1	7,826.0	38.9	33.2	90.00	1,118.3	311.0	1,002.8	931.1	13.988		
11,000.0	7,826.0	10,083.1	7,826.0	40.3	34.6	90.00	1,213.4	280.0	1,002.8	928.2	13.457		
11,100.0	7,826.0	10,183.1	7,826.0	41.7	36.1	90.00	1,308.5	249.0	1,002.8	925.3	12.951		
11,200.0	7,826.0	10,283.1	7,826.0	43.2	37.7	90.00	1,403.6	218.1	1,002.8	922.3	12.470		
11,300.0	7,826.0	10,383.1	7,826.0	44.7	39.2	90.00	1,498.6	187.1	1,002.8	919.3	12.013		
11,400.0	7,826.0	10,483.1	7,826.0	46.3	40.8	90.00	1,593.7	156.1	1,002.8	916.2	11.581		
11,500.0	7,826.0	10,583.1	7,826.0	47.8	42.4	90.00	1,688.8	125.1	1,002.8	913.0	11.171		
11,600.0	7,826.0	10,683.1	7,826.0	49.4	44.1	90.00	1,783.9	94.1	1,002.8	909.8	10.784		
11,700.0	7,826.0	10,783.1	7,826.0	51.0	45.7	90.00	1,879.0	63.2	1,002.8	906.5	10.417		
11,800.0	7,826.0	10,883.1	7,826.0	52.7	47.4	90.00	1,974.0	32.2	1,002.8	903.2	10.071		
11,900.0	7,826.0	10,983.1	7,826.0	54.3	49.1	90.00	2,069.1	1.2	1,002.8	899.9	9.744		
12,000.0	7,826.0	11,083.1	7,826.0	56.0	50.8	90.00	2,164.2	-29.8	1,002.8	896.5	9.434		
12,100.0	7,826.0	11,183.1	7,826.0	57.7	52.6	90.00	2,259.3	-60.7	1,002.8	893.1	9.141		
12,200.0	7,826.0	11,283.1	7,826.0	59.4	54.3	90.00	2,354.4	-91.7	1,002.8	889.6	8.863		
12,300.0	7,826.0	11,383.1	7,826.0	61.1	56.0	90.00	2,449.5	-122.7	1,002.8	886.2	8.600		
12,400.0	7,826.0	11,483.1	7,826.0	62.8	57.8	90.00	2,544.5	-153.7	1,002.8	882.7	8.351		
12,500.0	7,826.0	11,583.1	7,826.0	64.5	59.6	90.00	2,639.6	-184.6	1,002.8	879.2	8.114		
12,600.0	7,826.0	11,683.1	7,826.0	66.3	61.3	90.00	2,734.7	-215.6	1,002.8	875.7	7.889		
12,700.0	7,826.0	11,783.1	7,826.0	68.0	63.1	90.00	2,829.8	-246.6	1,002.8	872.1	7.675		
12,800.0	7,826.0	11,883.1	7,826.0	69.8	64.9	90.00	2,924.9	-277.6	1,002.8	868.6	7.472		
12,900.0	7,826.0	11,983.1	7,826.0	71.6	66.7	90.00	3,019.9	-308.6	1,002.8	865.0	7.278		
13,000.0	7,826.0	12,083.1	7,826.0	73.3	68.5	90.00	3,115.0	-339.5	1,002.8	861.4	7.093		
13,100.0	7,826.0	12,183.1	7,826.0	75.1	70.3	90.00	3,210.1	-370.5	1,002.8	857.8	6.917		
13,200.0	7,826.0	12,283.1	7,826.0	76.9	72.1	90.00	3,305.2	-401.5	1,002.8	854.2	6.749		
13,300.0	7,826.0	12,383.1	7,826.0	78.7	74.0	90.00	3,400.3	-432.5	1,002.8	850.6	6.589		
13,400.0	7,826.0	12,483.1	7,826.0	80.5	75.8	90.00	3,495.3	-463.4	1,002.8	847.0	6.435		
13,500.0	7,826.0	12,583.1	7,826.0	82.3	77.6	90.00	3,590.4	-494.4	1,002.8	843.3	6.288		
13,600.0	7,826.0	12,683.1	7,826.0	84.1	79.5	90.00	3,685.5	-525.4	1,002.8	839.7	6.147		
13,700.0	7,826.0	12,783.1	7,826.0	85.9	81.3	90.00	3,780.6	-556.4	1,002.8	836.0	6.013		
13,800.0	7,826.0	12,883.1	7,826.0	87.8	83.1	90.00	3,875.7	-587.3	1,002.8	832.4	5.883		
13,900.0	7,826.0	12,983.1	7,826.0	89.6	85.0	90.00	3,970.8	-618.3	1,002.8	828.7	5.759		
14,000.0	7,826.0	13,083.1	7,826.0	91.4	86.8	90.00	4,065.8	-649.3	1,002.8	825.0	5.640		

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

<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	Offset Datum

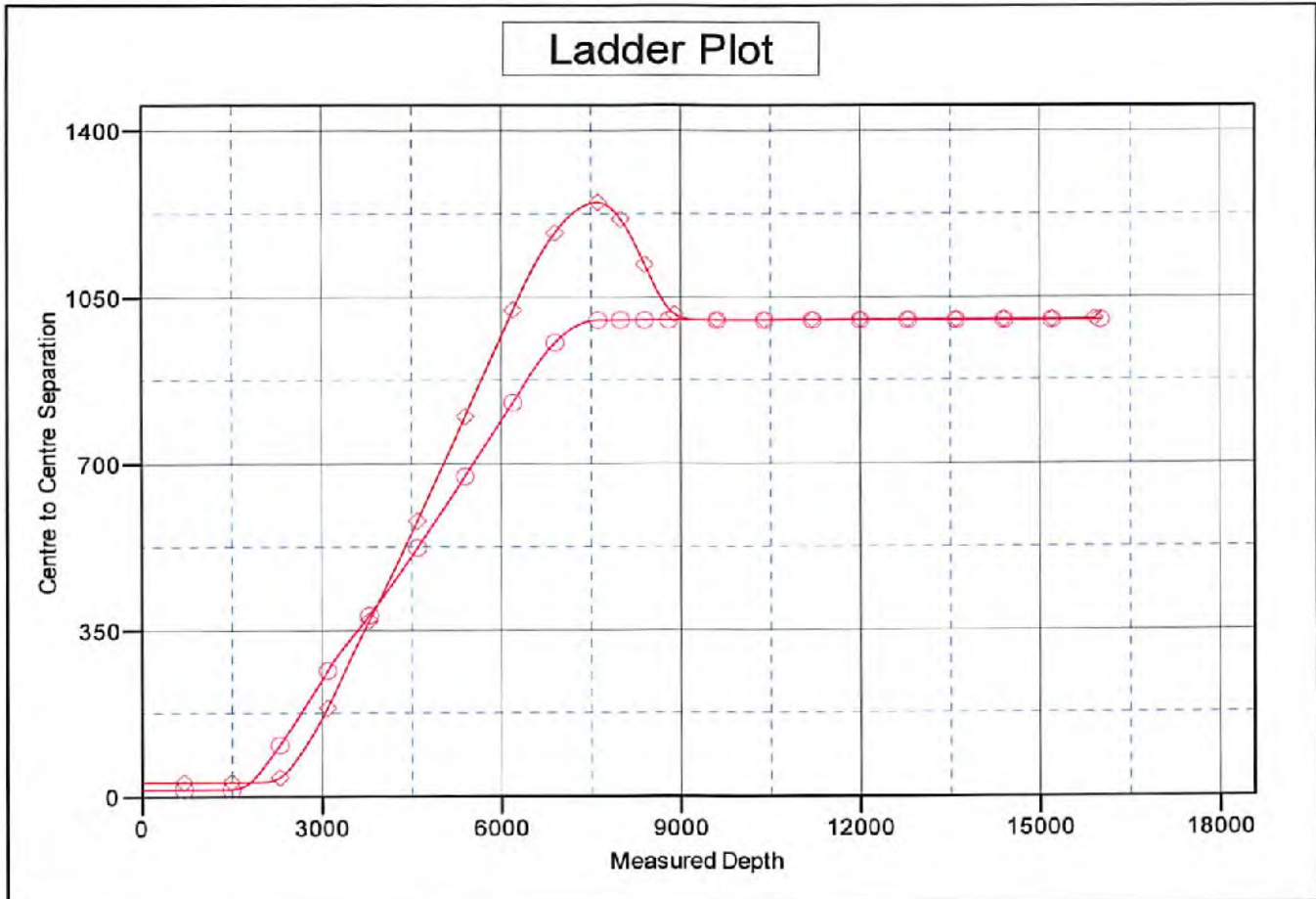
Offset Design Williams PAD - Williams #216 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
14,100.0	7,826.0	13,183.1	7,826.0	93.2	88.7	90.00	4,180.9	-680.3	1,002.8	821.3	5.525		
14,200.0	7,826.0	13,283.1	7,826.0	95.1	90.5	90.00	4,256.0	-711.3	1,002.8	817.6	5.415		
14,300.0	7,826.0	13,383.1	7,826.0	96.9	92.4	90.00	4,351.1	-742.2	1,002.8	813.9	5.309		
14,400.0	7,826.0	13,483.1	7,826.0	98.8	94.2	90.00	4,446.2	-773.2	1,002.8	810.2	5.207		
14,500.0	7,826.0	13,583.1	7,826.0	100.6	96.1	90.00	4,541.2	-804.2	1,002.8	806.5	5.109		
14,600.0	7,826.0	13,683.1	7,826.0	102.4	98.0	90.00	4,636.3	-835.2	1,002.8	802.8	5.014		
14,700.0	7,826.0	13,783.1	7,826.0	104.3	99.8	90.00	4,731.4	-866.1	1,002.8	799.1	4.922		
14,800.0	7,826.0	13,883.1	7,826.0	106.1	101.7	90.00	4,826.5	-897.1	1,002.8	795.4	4.834		
14,900.0	7,826.0	13,983.1	7,826.0	108.0	103.6	90.00	4,921.6	-928.1	1,002.8	791.7	4.749		
15,000.0	7,826.0	14,083.1	7,826.0	109.9	105.4	90.00	5,016.6	-959.1	1,002.8	787.9	4.666		
15,100.0	7,826.0	14,183.1	7,826.0	111.7	107.3	90.00	5,111.7	-990.0	1,002.8	784.2	4.587		
15,200.0	7,826.0	14,283.1	7,826.0	113.6	109.2	90.00	5,206.8	-1,021.0	1,002.8	780.5	4.510		
15,300.0	7,826.0	14,383.1	7,826.0	115.4	111.0	90.00	5,301.9	-1,052.0	1,002.8	776.7	4.435		
15,400.0	7,826.0	14,483.1	7,826.0	117.3	112.9	90.00	5,397.0	-1,083.0	1,002.8	773.0	4.363		
15,500.0	7,826.0	14,583.1	7,826.0	119.2	114.8	90.00	5,492.1	-1,114.0	1,002.8	769.2	4.293		
15,600.0	7,826.0	14,683.1	7,826.0	121.0	116.7	90.00	5,587.1	-1,144.9	1,002.8	765.5	4.225		
15,700.0	7,826.0	14,783.1	7,826.0	122.9	118.6	90.00	5,682.2	-1,175.9	1,002.9	761.7	4.159		
15,800.0	7,826.0	14,883.1	7,826.0	124.8	120.4	90.00	5,777.3	-1,206.9	1,002.9	758.0	4.095		
15,839.5	7,826.0	14,922.6	7,826.0	125.5	121.2	90.00	5,814.9	-1,219.1	1,002.8	756.5	4.071		
15,900.0	7,826.0	14,922.6	7,826.0	126.6	121.2	90.00	5,814.9	-1,219.1	1,004.6	757.4	4.063		
16,000.0	7,826.0	14,922.6	7,826.0	128.5	121.2	90.00	5,814.9	-1,219.1	1,015.6	768.8	4.115		
16,010.7	7,826.0	14,922.6	7,826.0	128.7	121.2	90.00	5,814.9	-1,219.1	1,017.3	770.7	4.125		

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<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	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 #214  
 Coordinate System is US State Plane 1983, West Virginia Northern Zone  
 Grid Convergence at Surface is: -0.30°



**LEGEND**

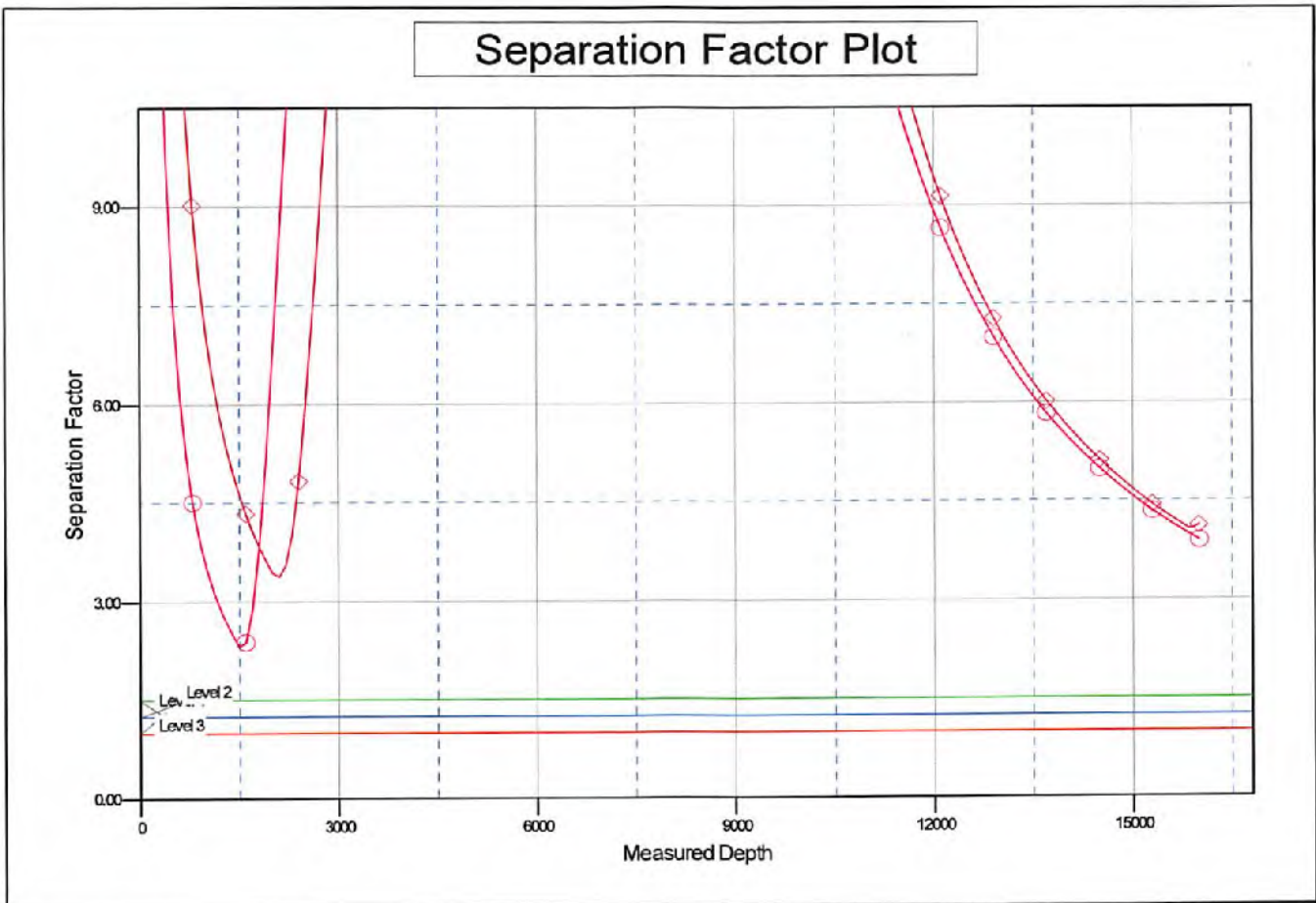
—○— Williams #213, Wellbore #1, Design #3 V0    
 —◇— Williams #216, Wellbore #1, Design #3 V0

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<b>Company:</b>	Arsenal Resources	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Project:</b>	Taylor County, West Virginia	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Reference Site:</b>	Williams PAD	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site Error:</b>	0.0 usft	<b>North Reference:</b>	Grid
<b>Reference Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 usft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db
<b>Reference Design:</b>	Design #3	<b>Offset TVD Reference:</b>	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 #214  
 Coordinate System is US State Plane 1983, West Virginia Northern Zone  
 Grid Convergence at Surface is: -0.30°



**LEGEND**

○ Williams #213, Wellbore #1, Design #3 V0    
 ◇ Williams #216, Wellbore #1, Design #3 V0

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R E S O U R C E S

## **Arsenal Resources**

**Taylor County, West Virginia**

**Williams PAD**

**Williams #214**

**Wellbore #1**

**Plan: Design #3**

## **QES Well Planning Report**

**14 February, 2018**

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06/29/2018

<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Company:</b>	Arsenal Resources	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Project:</b>	Taylor County, West Virginia	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site:</b>	Williams PAD	<b>North Reference:</b>	Grid
<b>Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Design #3		

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

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

<b>Well</b>	Williams #214					
<b>Well Position</b>	<b>+N/-S</b>	8.9 usft	<b>Northing:</b>	336,628.44 usft	<b>Latitude:</b>	39° 25' 23.736 N
	<b>+E/-W</b>	12.0 usft	<b>Easting:</b>	1,834,890.35 usft	<b>Longitude:</b>	79° 58' 22.700 W
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft	<b>Ground Level:</b>	1,800.0 usft

<b>Wellbore</b>	Wellbore #1				
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<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	3/21/2016	-9.12	66.64	52,046.42382418

<b>Design</b>	Design #3				
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<b>Audit Notes:</b>					
<b>Version:</b>	<b>Phase:</b>	PLAN	<b>Tie On Depth:</b>	0.0	
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	338.56	

Plan Sections										
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	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,383.1	27.66	172.44	3,330.0	-324.6	43.1	2.00	2.00	0.00	172.44	
6,238.9	27.66	172.44	5,859.4	-1,638.9	217.4	0.00	0.00	0.00	0.00	
7,622.0	0.00	360.00	7,189.4	-1,963.5	260.5	2.00	-2.00	0.00	180.00	VP Williams #214 C
8,622.0	90.00	341.95	7,826.0	-1,358.2	63.2	9.00	9.00	-1.80	341.95	LP Williams #214 D
16,010.7	90.00	341.95	7,826.0	5,667.0	-2,225.6	0.00	0.00	0.00	0.00	PBHL Williams #21

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<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Company:</b>	Arsenal Resources	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Project:</b>	Taylor County, West Virginia	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site:</b>	Williams PAD	<b>North Reference:</b>	Grid
<b>Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	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
<b>Start Build 2.00</b>									
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	2.00	172.44	2,100.0	-1.7	0.2	-1.7	2.00	2.00	0.00
2,200.0	4.00	172.44	2,199.8	-6.9	0.9	-6.8	2.00	2.00	0.00
2,300.0	6.00	172.44	2,299.5	-15.6	2.1	-15.2	2.00	2.00	0.00
2,400.0	8.00	172.44	2,398.7	-27.6	3.7	-27.1	2.00	2.00	0.00
2,500.0	10.00	172.44	2,497.5	-43.1	5.7	-42.3	2.00	2.00	0.00
2,600.0	12.00	172.44	2,595.6	-62.1	8.2	-60.8	2.00	2.00	0.00
2,700.0	14.00	172.44	2,693.1	-84.4	11.2	-82.6	2.00	2.00	0.00
2,800.0	16.00	172.44	2,789.6	-110.0	14.6	-107.7	2.00	2.00	0.00
2,900.0	18.00	172.44	2,885.3	-139.0	18.4	-136.1	2.00	2.00	0.00
3,000.0	20.00	172.44	2,979.8	-171.3	22.7	-167.7	2.00	2.00	0.00
3,100.0	22.00	172.44	3,073.2	-206.8	27.4	-202.5	2.00	2.00	0.00
3,200.0	24.00	172.44	3,165.2	-245.5	32.6	-240.4	2.00	2.00	0.00
3,300.0	26.00	172.44	3,255.8	-287.4	38.1	-281.5	2.00	2.00	0.00
<b>Start 2855.8 hold at 3383.1 MD</b>									
3,383.1	27.66	172.44	3,330.0	-324.6	43.1	-317.9	2.00	2.00	0.00
3,400.0	27.66	172.44	3,345.0	-332.4	44.1	-325.5	0.00	0.00	0.00
3,500.0	27.66	172.44	3,433.5	-378.4	50.2	-370.6	0.00	0.00	0.00
3,600.0	27.66	172.44	3,522.1	-424.4	56.3	-415.6	0.00	0.00	0.00
3,700.0	27.66	172.44	3,610.7	-470.4	62.4	-460.7	0.00	0.00	0.00
3,800.0	27.66	172.44	3,699.2	-516.5	68.5	-505.8	0.00	0.00	0.00
3,900.0	27.66	172.44	3,787.8	-562.5	74.6	-550.8	0.00	0.00	0.00
4,000.0	27.66	172.44	3,876.4	-608.5	80.7	-595.9	0.00	0.00	0.00
4,100.0	27.66	172.44	3,965.0	-654.5	86.8	-641.0	0.00	0.00	0.00
4,200.0	27.66	172.44	4,053.5	-700.6	92.9	-686.0	0.00	0.00	0.00
4,300.0	27.66	172.44	4,142.1	-746.6	99.0	-731.1	0.00	0.00	0.00
4,400.0	27.66	172.44	4,230.7	-792.6	105.1	-776.2	0.00	0.00	0.00
4,500.0	27.66	172.44	4,319.2	-838.6	111.2	-821.2	0.00	0.00	0.00
4,600.0	27.66	172.44	4,407.8	-884.6	117.3	-866.3	0.00	0.00	0.00
4,700.0	27.66	172.44	4,496.4	-930.7	123.5	-911.4	0.00	0.00	0.00
4,800.0	27.66	172.44	4,584.9	-976.7	129.6	-956.5	0.00	0.00	0.00
4,900.0	27.66	172.44	4,673.5	-1,022.7	135.7	-1,001.5	0.00	0.00	0.00
5,000.0	27.66	172.44	4,762.1	-1,068.7	141.8	-1,046.6	0.00	0.00	0.00

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<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Company:</b>	Arsenal Resources	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Project:</b>	Taylor County, West Virginia	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site:</b>	Williams PAD	<b>North Reference:</b>	Grid
<b>Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	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	27.66	172.44	4,850.7	-1,114.8	147.9	-1,091.7	0.00	0.00	0.00
5,200.0	27.66	172.44	4,939.2	-1,160.8	154.0	-1,136.7	0.00	0.00	0.00
5,300.0	27.66	172.44	5,027.8	-1,206.8	160.1	-1,181.8	0.00	0.00	0.00
5,400.0	27.66	172.44	5,116.4	-1,252.8	166.2	-1,226.9	0.00	0.00	0.00
5,500.0	27.66	172.44	5,204.9	-1,298.8	172.3	-1,271.9	0.00	0.00	0.00
5,600.0	27.66	172.44	5,293.5	-1,344.9	178.4	-1,317.0	0.00	0.00	0.00
5,700.0	27.66	172.44	5,382.1	-1,390.9	184.5	-1,362.1	0.00	0.00	0.00
5,800.0	27.66	172.44	5,470.6	-1,436.9	190.6	-1,407.1	0.00	0.00	0.00
5,900.0	27.66	172.44	5,559.2	-1,482.9	196.7	-1,452.2	0.00	0.00	0.00
6,000.0	27.66	172.44	5,647.8	-1,529.0	202.8	-1,497.3	0.00	0.00	0.00
6,100.0	27.66	172.44	5,736.4	-1,575.0	208.9	-1,542.3	0.00	0.00	0.00
6,200.0	27.66	172.44	5,824.9	-1,621.0	215.0	-1,587.4	0.00	0.00	0.00
<b>Start Drop -2.00</b>									
6,238.9	27.66	172.44	5,859.4	-1,638.9	217.4	-1,605.0	0.00	0.00	0.00
6,300.0	26.44	172.44	5,913.8	-1,666.5	221.1	-1,631.9	2.00	-2.00	0.00
6,400.0	24.44	172.44	6,004.1	-1,709.0	226.7	-1,673.6	2.00	-2.00	0.00
6,500.0	22.44	172.44	6,095.8	-1,748.5	231.9	-1,712.2	2.00	-2.00	0.00
6,600.0	20.44	172.44	6,188.9	-1,784.7	236.7	-1,747.7	2.00	-2.00	0.00
6,700.0	18.44	172.44	6,283.2	-1,817.7	241.1	-1,780.0	2.00	-2.00	0.00
6,800.0	16.44	172.44	6,378.6	-1,847.4	245.1	-1,809.1	2.00	-2.00	0.00
6,900.0	14.44	172.44	6,475.0	-1,873.8	248.6	-1,835.0	2.00	-2.00	0.00
7,000.0	12.44	172.44	6,572.2	-1,896.8	251.6	-1,857.5	2.00	-2.00	0.00
7,100.0	10.44	172.44	6,670.2	-1,916.5	254.2	-1,876.8	2.00	-2.00	0.00
7,200.0	8.44	172.44	6,768.9	-1,932.8	256.4	-1,892.7	2.00	-2.00	0.00
7,300.0	6.44	172.44	6,868.0	-1,945.6	258.1	-1,905.3	2.00	-2.00	0.00
7,400.0	4.44	172.44	6,967.6	-1,955.0	259.3	-1,914.5	2.00	-2.00	0.00
7,500.0	2.44	172.44	7,067.4	-1,960.9	260.1	-1,920.3	2.00	-2.00	0.00
7,600.0	0.44	172.44	7,167.4	-1,963.4	260.4	-1,922.8	2.00	-2.00	0.00
<b>Start DLS 9.00 TFO 341.95</b>									
7,822.0	0.00	360.00	7,189.4	-1,963.5	260.5	-1,922.8	2.00	-2.00	0.00
7,850.0	2.52	341.95	7,217.4	-1,962.9	260.3	-1,922.2	9.00	9.00	0.00
7,700.0	7.02	341.95	7,267.2	-1,959.0	259.0	-1,918.1	9.00	9.00	0.00
7,750.0	11.52	341.95	7,316.5	-1,951.3	256.5	-1,910.0	9.00	9.00	0.00
7,800.0	16.02	341.95	7,365.1	-1,940.0	252.8	-1,898.2	9.00	9.00	0.00
7,850.0	20.52	341.95	7,412.5	-1,925.1	248.0	-1,882.5	9.00	9.00	0.00
7,900.0	25.02	341.95	7,458.6	-1,906.7	242.0	-1,863.2	9.00	9.00	0.00
7,950.0	29.52	341.95	7,503.0	-1,885.0	234.9	-1,840.4	9.00	9.00	0.00
8,000.0	34.02	341.95	7,545.5	-1,859.9	226.7	-1,814.1	9.00	9.00	0.00
8,050.0	38.52	341.95	7,585.8	-1,831.8	217.5	-1,784.6	9.00	9.00	0.00
8,100.0	43.02	341.95	7,623.7	-1,800.8	207.4	-1,752.0	9.00	9.00	0.00
8,150.0	47.52	341.95	7,658.9	-1,767.0	196.4	-1,716.5	9.00	9.00	0.00
8,200.0	52.02	341.95	7,691.2	-1,730.7	184.6	-1,678.4	9.00	9.00	0.00
8,250.0	56.52	341.95	7,720.4	-1,692.2	172.0	-1,637.9	9.00	9.00	0.00
8,300.0	61.02	341.95	7,746.3	-1,651.5	158.8	-1,595.3	9.00	9.00	0.00
8,350.0	65.52	341.95	7,768.8	-1,609.1	145.0	-1,550.7	9.00	9.00	0.00
8,400.0	70.02	341.95	7,787.7	-1,565.1	130.6	-1,504.5	9.00	9.00	0.00
8,450.0	74.52	341.95	7,802.9	-1,519.8	115.9	-1,457.0	9.00	9.00	0.00
8,500.0	79.02	341.95	7,814.3	-1,473.5	100.8	-1,408.4	9.00	9.00	0.00
8,550.0	83.52	341.95	7,821.9	-1,426.6	85.5	-1,359.1	9.00	9.00	0.00
8,600.0	88.02	341.95	7,825.6	-1,379.2	70.1	-1,309.3	9.00	9.00	0.00
<b>Start 7388.7 hold at 8622.0 MD</b>									
8,622.0	90.00	341.95	7,826.0	-1,358.2	63.2	-1,287.4	9.00	9.00	0.00
8,700.0	90.00	341.95	7,826.0	-1,284.1	39.1	-1,209.5	0.00	0.00	0.00

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<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Company:</b>	Arsenal Resources	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Project:</b>	Taylor County, West Virginia	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site:</b>	Williams PAD	<b>North Reference:</b>	Grid
<b>Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	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)	
8,800.0	90.00	341.95	7,826.0	-1,189.0	8.1	-1,109.7	0.00	0.00	0.00	
8,900.0	90.00	341.95	7,826.0	-1,093.9	-22.9	-1,009.8	0.00	0.00	0.00	
9,000.0	90.00	341.95	7,826.0	-998.8	-53.8	-910.0	0.00	0.00	0.00	
9,100.0	90.00	341.95	7,826.0	-903.8	-84.8	-810.2	0.00	0.00	0.00	
9,200.0	90.00	341.95	7,826.0	-808.7	-115.8	-710.4	0.00	0.00	0.00	
9,300.0	90.00	341.95	7,826.0	-713.6	-146.8	-610.5	0.00	0.00	0.00	
9,400.0	90.00	341.95	7,826.0	-618.5	-177.8	-510.7	0.00	0.00	0.00	
9,500.0	90.00	341.95	7,826.0	-523.4	-208.7	-410.9	0.00	0.00	0.00	
9,600.0	90.00	341.95	7,826.0	-428.4	-239.7	-311.1	0.00	0.00	0.00	
9,700.0	90.00	341.95	7,826.0	-333.3	-270.7	-211.2	0.00	0.00	0.00	
9,800.0	90.00	341.95	7,826.0	-238.2	-301.7	-111.4	0.00	0.00	0.00	
9,900.0	90.00	341.95	7,826.0	-143.1	-332.7	-11.6	0.00	0.00	0.00	
10,000.0	90.00	341.95	7,826.0	-48.0	-363.6	88.2	0.00	0.00	0.00	
10,100.0	90.00	341.95	7,826.0	47.0	-394.6	188.0	0.00	0.00	0.00	
10,200.0	90.00	341.95	7,826.0	142.1	-425.6	287.9	0.00	0.00	0.00	
10,300.0	90.00	341.95	7,826.0	237.2	-456.6	387.7	0.00	0.00	0.00	
10,400.0	90.00	341.95	7,826.0	332.3	-487.6	487.5	0.00	0.00	0.00	
10,500.0	90.00	341.95	7,826.0	427.4	-518.5	587.3	0.00	0.00	0.00	
10,600.0	90.00	341.95	7,826.0	522.5	-549.5	687.2	0.00	0.00	0.00	
10,700.0	90.00	341.95	7,826.0	617.5	-580.5	787.0	0.00	0.00	0.00	
10,800.0	90.00	341.95	7,826.0	712.6	-611.5	886.8	0.00	0.00	0.00	
10,900.0	90.00	341.95	7,826.0	807.7	-642.4	986.6	0.00	0.00	0.00	
11,000.0	90.00	341.95	7,826.0	902.8	-673.4	1,086.5	0.00	0.00	0.00	
11,100.0	90.00	341.95	7,826.0	997.9	-704.4	1,186.3	0.00	0.00	0.00	
11,200.0	90.00	341.95	7,826.0	1,092.9	-735.4	1,286.1	0.00	0.00	0.00	
11,300.0	90.00	341.95	7,826.0	1,188.0	-766.4	1,385.9	0.00	0.00	0.00	
11,400.0	90.00	341.95	7,826.0	1,283.1	-797.3	1,485.8	0.00	0.00	0.00	
11,500.0	90.00	341.95	7,826.0	1,378.2	-828.3	1,585.6	0.00	0.00	0.00	
11,600.0	90.00	341.95	7,826.0	1,473.3	-859.3	1,685.4	0.00	0.00	0.00	
11,700.0	90.00	341.95	7,826.0	1,568.3	-890.3	1,785.2	0.00	0.00	0.00	
11,800.0	90.00	341.95	7,826.0	1,663.4	-921.3	1,885.1	0.00	0.00	0.00	
11,900.0	90.00	341.95	7,826.0	1,758.5	-952.2	1,984.9	0.00	0.00	0.00	
12,000.0	90.00	341.95	7,826.0	1,853.6	-983.2	2,084.7	0.00	0.00	0.00	
12,100.0	90.00	341.95	7,826.0	1,948.7	-1,014.2	2,184.5	0.00	0.00	0.00	
12,200.0	90.00	341.95	7,826.0	2,043.7	-1,045.2	2,284.4	0.00	0.00	0.00	
12,300.0	90.00	341.95	7,826.0	2,138.8	-1,076.1	2,384.2	0.00	0.00	0.00	
12,400.0	90.00	341.95	7,826.0	2,233.9	-1,107.1	2,484.0	0.00	0.00	0.00	
12,500.0	90.00	341.95	7,826.0	2,329.0	-1,138.1	2,583.8	0.00	0.00	0.00	
12,600.0	90.00	341.95	7,826.0	2,424.1	-1,169.1	2,683.7	0.00	0.00	0.00	
12,700.0	90.00	341.95	7,826.0	2,519.1	-1,200.1	2,783.5	0.00	0.00	0.00	
12,800.0	90.00	341.95	7,826.0	2,614.2	-1,231.0	2,883.3	0.00	0.00	0.00	
12,900.0	90.00	341.95	7,826.0	2,709.3	-1,262.0	2,983.1	0.00	0.00	0.00	
13,000.0	90.00	341.95	7,826.0	2,804.4	-1,293.0	3,083.0	0.00	0.00	0.00	
13,100.0	90.00	341.95	7,826.0	2,899.5	-1,324.0	3,182.8	0.00	0.00	0.00	
13,200.0	90.00	341.95	7,826.0	2,994.5	-1,355.0	3,282.6	0.00	0.00	0.00	
13,300.0	90.00	341.95	7,826.0	3,089.6	-1,385.9	3,382.4	0.00	0.00	0.00	
13,400.0	90.00	341.95	7,826.0	3,184.7	-1,416.9	3,482.3	0.00	0.00	0.00	
13,500.0	90.00	341.95	7,826.0	3,279.8	-1,447.9	3,582.1	0.00	0.00	0.00	
13,600.0	90.00	341.95	7,826.0	3,374.9	-1,478.9	3,681.9	0.00	0.00	0.00	
13,700.0	90.00	341.95	7,826.0	3,470.0	-1,509.9	3,781.7	0.00	0.00	0.00	
13,800.0	90.00	341.95	7,826.0	3,565.0	-1,540.8	3,881.6	0.00	0.00	0.00	
13,900.0	90.00	341.95	7,826.0	3,660.1	-1,571.8	3,981.4	0.00	0.00	0.00	
14,000.0	90.00	341.95	7,826.0	3,755.2	-1,602.8	4,081.2	0.00	0.00	0.00	
14,100.0	90.00	341.95	7,826.0	3,850.3	-1,633.8	4,181.0	0.00	0.00	0.00	

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<b>Database:</b>	EDM 5000.1 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Williams #214
<b>Company:</b>	Arsenal Resources	<b>TVD Reference:</b>	WELL @ 1820.0usft
<b>Project:</b>	Taylor County, West Virginia	<b>MD Reference:</b>	WELL @ 1820.0usft
<b>Site:</b>	Williams PAD	<b>North Reference:</b>	Grid
<b>Well:</b>	Williams #214	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	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)
14,200.0	90.00	341.95	7,826.0	3,945.4	-1,664.7	4,280.9	0.00	0.00	0.00
14,300.0	90.00	341.95	7,826.0	4,040.4	-1,695.7	4,380.7	0.00	0.00	0.00
14,400.0	90.00	341.95	7,826.0	4,135.5	-1,726.7	4,480.5	0.00	0.00	0.00
14,500.0	90.00	341.95	7,826.0	4,230.6	-1,757.7	4,580.3	0.00	0.00	0.00
14,600.0	90.00	341.95	7,826.0	4,325.7	-1,788.7	4,680.1	0.00	0.00	0.00
14,700.0	90.00	341.95	7,826.0	4,420.8	-1,819.6	4,780.0	0.00	0.00	0.00
14,800.0	90.00	341.95	7,826.0	4,515.8	-1,850.6	4,879.8	0.00	0.00	0.00
14,900.0	90.00	341.95	7,826.0	4,610.9	-1,881.6	4,979.6	0.00	0.00	0.00
15,000.0	90.00	341.95	7,826.0	4,706.0	-1,912.6	5,079.4	0.00	0.00	0.00
15,100.0	90.00	341.95	7,826.0	4,801.1	-1,943.6	5,179.3	0.00	0.00	0.00
15,200.0	90.00	341.95	7,826.0	4,896.2	-1,974.5	5,279.1	0.00	0.00	0.00
15,300.0	90.00	341.95	7,826.0	4,991.2	-2,005.5	5,378.9	0.00	0.00	0.00
15,400.0	90.00	341.95	7,826.0	5,086.3	-2,036.5	5,478.7	0.00	0.00	0.00
15,500.0	90.00	341.95	7,826.0	5,181.4	-2,067.5	5,578.6	0.00	0.00	0.00
15,600.0	90.00	341.95	7,826.0	5,276.5	-2,098.4	5,678.4	0.00	0.00	0.00
15,700.0	90.00	341.95	7,826.0	5,371.6	-2,129.4	5,778.2	0.00	0.00	0.00
15,800.0	90.00	341.95	7,826.0	5,466.6	-2,160.4	5,878.0	0.00	0.00	0.00
15,900.0	90.00	341.95	7,826.0	5,561.7	-2,191.4	5,977.9	0.00	0.00	0.00
16,000.0	90.00	341.95	7,826.0	5,656.8	-2,222.4	6,077.7	0.00	0.00	0.00
<b>TD at 16010.7</b>									
16,010.7	90.00	341.95	7,826.0	5,667.0	-2,225.6	6,088.3	0.00	0.00	0.00

**Design Targets**

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
VP Williams #214 D#1 - hit/miss target - Shape - Point	0.00	360.00	7,189.4	-1,963.5	260.5	334,664.92	1,835,150.81	39° 25' 4.343 N	79° 58' 19.249 W
LP Williams #214 D#2 - plan hits target center - Point	0.00	360.00	7,826.0	-1,358.2	63.2	335,270.20	1,834,953.60	39° 25' 10.315 N	79° 58' 21.803 W
PBHL Williams #214 - plan hits target center - Point	0.00	360.00	7,826.0	5,667.0	-2,225.6	342,295.40	1,832,664.70	39° 26' 19.630 N	79° 58' 51.449 W

**Plan Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,000.0	2,000.0	0.0	0.0	Start Build 2.00
3,383.1	3,330.0	-324.6	43.1	Start 2855.8 hold at 3383.1 MD
6,238.9	5,859.4	-1,638.9	217.4	Start Drop -2.00
7,622.0	7,189.4	-1,963.5	260.5	Start DLS 9.00 TFO 341.95
8,622.0	7,826.0	-1,358.2	63.2	Start 7388.7 hold at 8622.0 MD
16,010.7	7,826.0	5,667.0	-2,225.6	TD at 16010.7

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 Williams PAD  
 Williams #214  
 Design #3

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
2000.0	0.00	0.00	2000.0	0.0	0.0	0.0	0.0	Start Build 2.00
3383.1	27.66	172.44	3330.0	-324.6	43.1	-317.9	327.4	Start 2855.8 hold at 3383.1 MD
6238.9	27.66	172.44	5859.4	-1638.9	217.4	-1605.0	1653.3	Start Drop -2.00
7622.0	0.00	360.00	7189.4	-1963.5	260.5	-1922.8	1980.7	Start DLS 9.00 TFO 341.95
8622.0	90.00	341.95	7826.0	-1358.2	63.3	-1287.4	2617.3	Start 7388.7 hold at 8622.0 MD
16010.7	90.00	341.95	7826.0	5667.0	-2225.6	6088.3	10006.0	TD at 16010.7

