

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD: Artesia

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010**SUNDRY NOTICES AND REPORTS ON WELLS**
*Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.*5. Lease Serial No.
NMLC069464A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

8. Well Name and No.
ARCTURUS 18 FEDERAL 5H9. API Well No.
30-015-41802-00-X110. Field and Pool, or Exploratory
HACKBERRY11. County or Parish, and State
EDDY COUNTY, NM**SUBMIT IN TRIPLICATE - Other instructions on reverse side.**

1. Type of Well

☒ Oil Well ☐ Gas Well ☐ Other

2. Name of Operator

Contact: LINDA GOOD

DEVON ENERGY PRODUCTION CO EMail: linda.good@devn.com

3a. Address

333 WEST SHERIDAN AVE
OKLAHOMA CITY, OK 73102

3b. Phone No. (include area code)

Ph: 405.552.6558

4. Location of Well (Footage, Sec., T., R., M., or Survey Description)

Sec 18 T19S R31E NENE 845FNL 250FEL
32.665333 N Lat, 103.900879 W Lon**12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA**

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	Change to Original A
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	PD

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleat horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleat in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Devon Energy Production Company, L.P. respectfully requests to run a tapered production string of 7" x 5.5" casing to a total depth of 12,332 ft measured depth as long as hole conditions permits. If lost circulation is encountered we will stay as originally planned to run a 5-1/2" production longstring. Casing design requirements are below as well as the cement design for both the 7" x 5.5" tapered production string and the 5.5" production longstring. The updated directional well plan is also included.

NM OIL CONSERVATION
ARTESIA DISTRICT

OCT 20 2014

SEE ATTACHED FOR
CONDITIONS OF APPROVAL

Accepted for record

NMOC DTS 10-20-14

RECEIVED

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #270342 verified by the BLM Well Information System
For DEVON ENERGY PRODUCTION CO LP, sent to the Carlsbad
Committed to AFMSS for processing by JENNIFER MASON on 10/14/2014 (15JAM0018SE).

Name (Printed/Typed) LINDA GOOD

Title REGULATORY SPECIALIST

Signature (Electronic Submission)

Date 10/13/2014

APPROVED

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By

Title

OCT 14 2014

Date

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

Arcturus 18 Fed 5H – APD DRILLING PLAN CHANGE

AAA 10-10-2014: Change to 7" x 5.5" Combination Production String

Sundry Request:

Casing Program Changes: 7" x 5.5" Tapered Production String

Hole Size	Hole Interval	OD Csg	Casing Interval	Weight	Collar	Grade
8-3/4"	4000 - 7338	7"	0 - 7338	29#	BTC	P-110
8-3/4"	7338 - 12332	5-1/2"	7338 - 12332	17#	BTC	P-110

Original Option: 5.5 Production Longstring

Hole Size	Hole Interval	OD Csg	Casing Interval	Weight	Collar	Grade
8-3/4"	4000 - 12332	5-1/2"	0 - 12332	17#	BTC	P-110

Note: only new casing will be utilized

MAXIMUM LATERAL TVD **7,940**

Design Factors: 7" x 5.5" Tapered Production String

Casing Size	Collapse Design Factor	Burst Design Factor	Tension Design Factor
7" 29# P-110 BTC	2.48	3.27	3.12
5-1/2" 17# P-110 BTC	2.01	2.86	6.43

NOT A TRUE LONG STRING

Original Option: 5.5 Production Longstring

Casing Size	Collapse Design Factor	Burst Design Factor	Tension Design Factor
5-1/2" 17# P-110 BTC	2.00	2.84	2.60

Cementing Table:

String	Number of sx	Weight lbs/gal	Water Volume g/sx	Yield cf/sx	Stage; Lead/Tail	Slurry Description
5-1/2" Production 2-Stage Original Option	297	12.5	11.02	2.01	Stage 1 Lead	(35:65) Poz (Fly Ash):Premium Plus H Cement + 3% bwow Sodium Chloride + 0.125 lbs/sack Cello Flake + 0.7% bwoc FL-52 + 0.3% bwoc ASA-301 + 6% bwoc Bentonite + 105.6% Fresh Water
	1350	14.2	5.76	1.28	Stage 1 Tail	(50:50) Poz (Fly Ash):Class H + 5% bwow Sodium Chloride + 0.3% bwoc CD-32 + 0.5% bwoc FL-25 + 0.5% bwoc FL-52 + 0.3% bwoc Sodium Metasilicate + 57.2% Fresh Water
	DV Tool @ 5000 ft					
	145	11.4	17.69	2.88	Stage 2 Lead	Premium Plus C Cement + 1% bwoc R-3 + 0.125 lbs/sack Cello Flake + 0.3% bwoc FL-52 + 3% bwoc Sodium Metasilicate + 157% Fresh Water
	174	13.8	6.40	1.37	Stage 2 Tail	(60:40) Poz (Fly Ash):Premium Plus C Cement + 5% bwow Sodium Chloride + 0.125 lbs/sack Cello Flake + 0.5% bwoc BA-10A + 4% bwoc MPA-5 + 65.1% Fresh Water
7" x 5-1/2" Production Casing Single Stage	188	11.8	13.16	2.3	1 st Lead	(50:50) Poz (Fly Ash):Class H Cement + 0.5% bwoc FL-52 + 0.3% bwoc ASA-301 + 10% bwoc Bentonite + 0.35% bwoc R-21 + 130.7% Fresh Water
	177	12.5	11.01	2.01	2 nd Lead	(35:65) Poz (Fly Ash):Prem Plus H + 3% bwow Sodium Chloride + 0.125 lbs/sack Cello Flake + 0.7% bwoc FL-52A + 0.3% bwoc ASA-301 + 6% bwoc Bentonite + 0.2% bwoc R-3 + 105.5% Fresh Water
	1305	14.2	5.77	1.28	Tail	(50:50) Poz (Fly Ash):Prem Plus H + 5% bwow Sodium Chloride + 0.3% bwoc CD-32 + 0.5% bwoc FL-25 + 0.4% bwoc FL-52A + 0.5% bwoc Sodium Metasilicate + 57.3% Fresh Water

TOC for all Strings:

Production Cement @ 2470' (Cement top will tie-back 50' Capitan Formation at 2520')

Notes:

- Cement volumes Production based on at least 25% excess
- Actual cement volumes will be adjusted based on fluid caliper and caliper log data
- If lost circulation is encountered while drilling the production wellbore, the 5.5" original production longstring will be used with a DV tool installed a minimum of 50' below the previous casing shoe and of 200' above the current shoe. If the DV tool has to be moved, the cement volumes will be adjusted proportionately.



Arcturus 18 Federal 5H
Eddy Co, NM



Weatherford

Plan Data for Arcturus 18 Federal 5H

Plan Point Information:									
Dogleg Severity Unit: */100.00ft									
MD	Inc	Az	TVD	+N/-S	+E/-W	Northing	Easting	VSec	DLS
(USft)	(°)	(°)	(USft)	(USft)	(USft)	(USft)	(USft)	(USft)	(DLS)
0.00	0.00	0.00	0.00	0.00	0.00	606050.34	674416.70	0.00	0.00
4100.00	0.00	0.00	4100.00	0.00	0.00	606050.34	674416.70	0.00	0.00
4775.72	6.76	1.78	4774.15	39.78	1.24	606090.12	674417.94	-1.32	1.00
7388.89	6.76	1.78	7369.17	347.10	10.82	606397.44	674427.52	-11.54	0.00
8384.79	91.38	269.98	7948.00	415.33	-575.94	606465.67	673840.76	575.07	10.00
10591.82	91.38	269.98	7885.00	411.27	-2862.30	606461.61	671554.40	2861.43	0.00
10624.81	90.72	269.98	7884.40	411.21	-2895.29	606461.55	671521.41	2894.42	2.00
12332.12	90.72	269.98	7863.00	408.19	-4602.46	606458.53	669814.24	4601.59	0.00

Plan Data for Arcturus 18 Federal 5H

Slot: Arcturus 18 Federal 5H
Position:
Offset is from Site centre
Northing: 606050.34USft Latitude: 32°39'55.2"
+E/-W: 0.00USft Easting: 674416.70USft Longitude: -103°54'3.2"
Elevation Above VRD: 3437.00USft

Plan Data for Arcturus 18 Federal 5H

Target Set Information:
Name: Arcturus 18 Federal 5H
Position offsets from Slot centre
Name TVD +N/-S +E/-W Northing Easting Shape Comment
(USft) (USft) (USft) (USft) (USft)
LP Tgt 7948.00 415.33 -575.94 606465.67 673840.76 Cuboid
T1 7885.00 411.27 -2862.30 606461.61 671554.40 Cuboid
PBHL 5H 7863.00 408.19 -4602.46 606458.53 669814.24 Cuboid

Plan Data for Arcturus 18 Federal 5H

Well: Arcturus 18 Federal 5H
Type: Main-Well
File Number:
Plan Folder: P1 Plan: P1:V5
Vertical Section: Position offset of origin from Slot centre:
+N/-S: 0.00USft Azimuth: 269.88°
+E/-W: 0.00USft
Magnetic Parameters:
Model: Field Strength: Declination: Dip: Date:
BGM 48493(nT) 7.53° 60.45° 2014-10-15

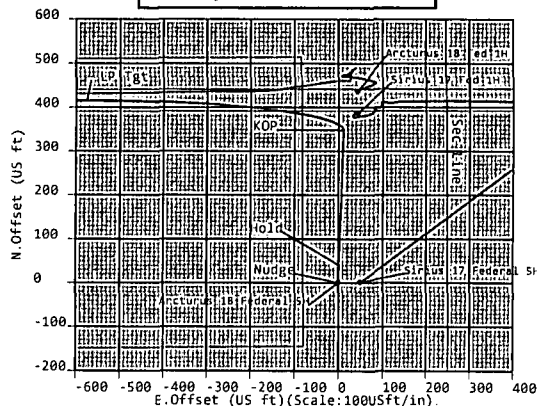
Arcturus 18 Federal 5H

Sirius 17 Fed 1H

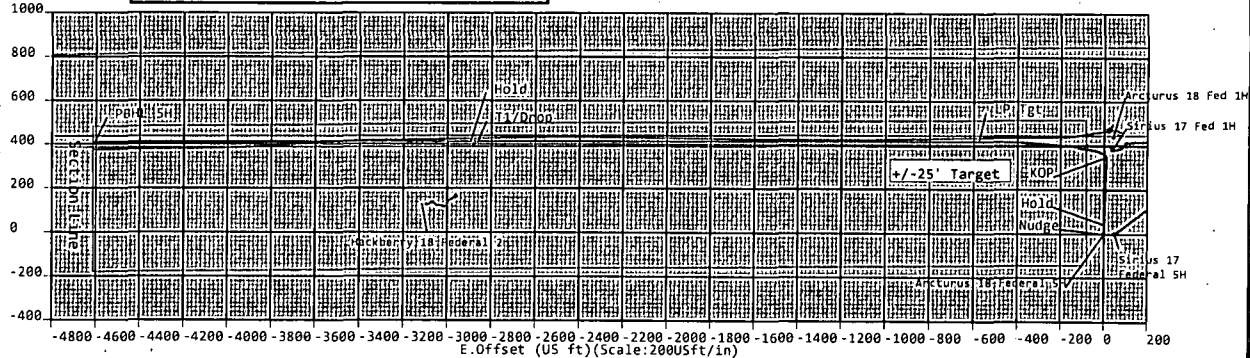
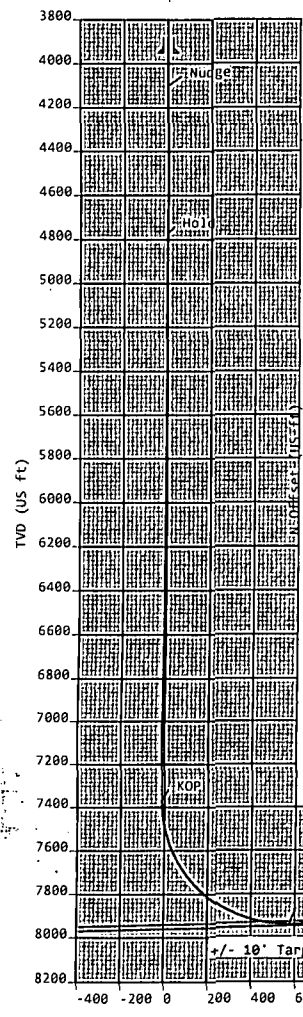
Arcturus 18 Fed 1H

Sirius 17 Federal 5H

Hackberry 18 Federal 2



KB-3463
GL-3437



Sign Off: Russell Joyner

Arcturus 18 Federal 5H

Field: Eddy Co. NM (Nad 83 NME)

Map Units: US ft
Vertical Reference Datum (VRD): Mean Sea Level
Projected Coordinate System: NAD83 / New Mexico East (ftUS)

Site: Arcturus 18 Federal 5H

Company Name: Devon Energy
Units: US ft
TVD Reference:
Position:

Northing:	606050.34US ft	Latitude:	32° 39' 55.20"
Easting:	674416.70US ft	Longitude:	-103° 54' 3.16"

North Reference: Grid **Convergence Angle:** 0.23
Elevation above Mean Sea Level : 3437.00US ft
Comment :

Slot: Arcturus 18 Federal 5H

Position (Relative to Site centre)

+N/-S: 0.00US ft	Northing:	606050.34US ft	Latitude:	32° 39' 55.20"
+E/-W: 0.00US ft	Easting:	674416.70US ft	Longitude:	-103° 54' 3.16"

Elevation above Mean Sea Level : 3437.00US ft
Comment :

Well: Arcturus 18 Federal 5H

Type: Main well **Rig Height (Kelly Bushing):** 26.00US ft **Relative To Mean Sea Level:** 3463.00US ft
File Number:
Plan Folder: P1 **Plan:** P1:V5
Comment: Change LP TVD and add Mid Pt Tgt.
Closure Distance: 4620.53US ft **Closure Azimuth:** 275.068°
Comment:

Vertical Section:

Position of Origin (Relative to Slot centre) **+N/-S: 0.00US ft** **+E/-W: 0.00US ft**
Vertical Section Azimuth: 269.88°

Magnetic Parameters:

Model: BGGM **Field Strength:** 48493.5 nT **Declination:** 7.53° **Dip:** 60.45° **Date:** 15/Oct/2014 (dd/mm/yyyy)

3950	0	0	3950	0	0	0	0	0	0	0	9.5/B in
4100	0	0	4100	0	0	0	0	0	0	0	Nudge
4775.72	6.76	1.78	4774.15	39.78	1.24	-1.32	1	1	0	1.78	Hold
7388.89	6.76	1.78	7369.17	347.1	10.82	-11.54	0	0	0	0	KOP
8304.79	91.38	269.9	7940	415.33	575.94	575.07	10	9.24	-10.03	268.29	LP Tgt
10591.82	91.38	269.9	7885	411.27	-2862.3	2861.43	0	0	0	0	T1/Drop
10624.81	90.72	269.9	7884.4	411.21	-2895.29	2894.42	2	-2	0	179.97	Hold
12332.12	90.72	269.9	7863	408.19	-4602.46	4601.59	0	0	0	0	PBHL 5H

Interpolated Points: (Relative to Slot Centre, TVD Relative to Kelly Bushing)

MD (US ft)	Incl (°)	AI (°)	TVD (US ft)	N Offset (US ft)	E Offset (US ft)	VS (US ft)	DLS (°/100 US ft)	Northing (US ft)	Easting (US ft)	Comment
4100	0	0	4100	0	0	0	0	606050.34	674416.7	Nudge
4200	1	1.78	4199.99	0.87	0.03	-0.03	1	606051.21	674416.73	
4300	2	1.78	4299.96	3.49	0.11	-0.12	1	606053.83	674416.81	
4400	3	1.78	4399.86	7.85	0.24	-0.26	1	606058.19	674416.94	
4500	4	1.78	4499.68	13.95	0.43	-0.46	1	606064.29	674417.13	
4600	5	1.78	4599.37	21.79	0.68	-0.72	1	606072.13	674417.38	
4700	6	1.78	4698.9	31.37	0.98	-1.04	1	606081.71	674417.68	
4775.72	6.76	1.78	4774.15	39.78	1.24	-1.32	1	606090.12	674417.94	Hold
4800	6.76	1.78	4798.27	42.64	1.33	-1.42	0	606092.98	674418.03	
4900	6.76	1.78	4897.57	54.4	1.7	-1.81	0	606104.74	674418.4	
5000	6.76	1.78	4996.88	66.16	2.06	-2.2	0	606116.5	674418.76	
5100	6.76	1.78	5096.18	77.92	2.43	-2.59	0	606128.26	674419.13	
5200	6.76	1.78	5195.49	89.68	2.79	-2.98	0	606140.02	674419.49	
5300	6.76	1.78	5294.79	101.44	3.16	-3.37	0	606151.78	674419.86	
5400	6.76	1.78	5394.1	113.2	3.53	-3.76	0	606163.54	674420.23	
5500	6.76	1.78	5493.4	124.96	3.89	-4.16	0	606175.3	674420.59	
5600	6.76	1.78	5592.71	136.72	4.26	-4.55	0	606187.06	674420.96	
5700	6.76	1.78	5692.01	148.48	4.63	-4.94	0	606198.82	674421.33	
5800	6.76	1.78	5791.32	160.24	4.99	-5.33	0	606210.58	674421.69	
5900	6.76	1.78	5890.63	172	5.36	-5.72	0	606222.34	674422.06	
6000	6.76	1.78	5989.93	183.76	5.73	-6.11	0	606234.1	674422.43	
6100	6.76	1.78	6089.24	195.52	6.09	-6.5	0	606245.86	674422.79	
6200	6.76	1.78	6188.54	207.28	6.46	-6.89	0	606257.62	674423.16	
6300	6.76	1.78	6287.85	219.04	6.83	-7.28	0	606269.38	674423.53	
6400	6.76	1.78	6387.15	230.8	7.19	-7.68	0	606281.14	674423.89	
6500	6.76	1.78	6486.46	242.56	7.56	-8.07	0	606292.9	674424.26	
6600	6.76	1.78	6585.76	254.32	7.93	-8.46	0	606304.66	674424.63	
6700	6.76	1.78	6685.07	266.08	8.29	-8.85	0	606316.42	674424.99	
6800	6.76	1.78	6784.37	277.84	8.66	-9.24	0	606328.18	674425.36	
6900	6.76	1.78	6883.68	289.6	9.02	-9.63	0	606339.94	674425.72	
7000	6.76	1.78	6982.98	301.36	9.39	-10.02	0	606351.7	674426.09	
7100	6.76	1.78	7082.29	313.12	9.76	-10.41	0	606363.46	674426.46	

7200	6.76	1.78	7181.6	324.88	10.12	-10.8	0	606375.22	674426.82	
7300	6.76	1.78	7280.9	336.64	10.49	-11.2	0	606386.98	674427.19	
7388.89	6.76	1.78	7369.17	347.1	10.82	-11.54	0	606397.44	674427.52	KOP
7400	6.81	352.38	7380.21	348.4	10.75	-11.48	10	606398.74	674427.45	
7500	12.81	301.46	7478.86	360.1	0.48	-1.24	10	606410.44	674417.18	
7600	21.93	287.17	7574.24	371.42	26.88	26.1	10	606421.76	674389.82	
7700	31.57	281.18	7663.45	382.04	-70.51	69.71	10	606432.38	674346.19	
7800	41.37	277.79	7743.78	391.61	129.07	128.25	10	606441.95	674287.63	
7900	51.23	275.52	7812.79	399.86	200.79	199.96	10	606450.2	674215.91	
8000	61.13	273.81	7868.39	406.53	283.5	282.64	10	606456.87	674133.2	
8100	71.05	272.39	7908.87	411.43	374.66	373.8	10	606461.77	674042.04	
8200	80.97	271.14	7933.02	414.39	471.53	470.66	10	606464.73	673945.17	
8300	90.9	269.95	7940.1	415.34	571.15	570.28	10	606465.68	673845.55	
8304.79	91.38	269.9	7940	415.33	575.94	575.07	10	606465.67	673840.76	LP Tgt
8400	91.38	269.9	7937.71	415.16	671.12	670.25	0	606465.5	673745.58	
8500	91.38	269.9	7935.31	414.98	771.09	770.22	0	606465.32	673645.61	
8600	91.38	269.9	7932.9	414.81	871.06	870.19	0	606465.15	673545.64	
8700	91.38	269.9	7930.5	414.63	971.03	970.16	0	606464.97	673445.67	
8800	91.38	269.9	7928.09	414.45	1071	1070.13	0	606464.79	673345.7	
8900	91.38	269.9	7925.69	414.27	1170.97	1170.1	0	606464.61	673245.73	
9000	91.38	269.9	7923.28	414.1	1270.94	1270.07	0	606464.44	673145.76	
9100	91.38	269.9	7920.88	413.92	1370.91	1370.04	0	606464.26	673045.79	
9200	91.38	269.9	7918.47	413.74	1470.89	1470.02	0	606464.08	672945.81	
9300	91.38	269.9	7916.07	413.56	1570.86	1569.99	0	606463.9	672845.84	
9400	91.38	269.9	7913.66	413.39	1670.83	1669.96	0	606463.73	672745.87	
9500	91.38	269.9	7911.26	413.21	1770.8	1769.93	0	606463.55	672645.9	
9600	91.38	269.9	7908.85	413.03	1870.77	1869.9	0	606463.37	672545.93	
9700	91.38	269.9	7906.45	412.85	1970.74	1969.87	0	606463.19	672445.96	
9800	91.38	269.9	7904.04	412.68	2070.71	2069.84	0	606463.02	672345.99	
9900	91.38	269.9	7901.64	412.5	2170.68	2169.81	0	606462.84	672246.02	
10000	91.38	269.9	7899.23	412.32	2270.65	2269.78	0	606462.66	672146.05	
10100	91.38	269.9	7896.83	412.14	2370.62	2369.76	0	606462.48	672046.08	
10200	91.38	269.9	7894.42	411.97	2470.59	2469.73	0	606462.31	671946.11	
10300	91.38	269.9	7892.02	411.79	2570.57	2569.7	0	606462.13	671846.13	
10400	91.38	269.9	7889.61	411.61	2670.54	2669.67	0	606461.95	671746.16	
10500	91.38	269.9	7887.21	411.43	2770.51	2769.64	0	606461.77	671646.19	
10591.82	91.38	269.9	7885	411.27	2862.3	2861.43	0	606461.61	671554.4	T1/Drop
10600	91.21	269.9	7884.82	411.26	2870.48	2869.61	2	606461.6	671546.22	
10624.81	90.72	269.9	7884.4	411.21	2895.29	2894.42	2	606461.55	671521.41	Hold
10700	90.72	269.9	7883.46	411.08	2970.47	2969.6	0	606461.42	671446.23	
10800	90.72	269.9	7882.2	410.9	3070.46	3069.59	0	606461.24	671346.24	
10900	90.72	269.9	7880.95	410.72	3170.45	3169.59	0	606461.06	671246.25	
11000	90.72	269.9	7879.7	410.55	3270.44	3269.58	0	606460.89	671146.26	
11100	90.72	269.9	7878.44	410.37	3370.44	3369.57	0	606460.71	671046.26	

11200	90.72	269.9	7877.19	410.19	3470.43	3469.56	0	606460.53	670946.27
11300	90.72	269.9	7875.94	410.02	3570.42	3569.55	0	606460.36	670846.28
11400	90.72	269.9	7874.68	409.84	3670.41	3669.55	0	606460.18	670746.29
11500	90.72	269.9	7873.43	409.66	3770.4	3769.54	0	606460	670646.3
11600	90.72	269.9	7872.18	409.49	3870.4	3869.53	0	606459.83	670546.3
11700	90.72	269.9	7870.92	409.31	3970.39	3969.52	0	606459.65	670446.31
11800	90.72	269.9	7869.67	409.13	4070.38	4069.52	0	606459.47	670346.32
11900	90.72	269.9	7868.42	408.95	4170.37	4169.51	0	606459.29	670246.33
12000	90.72	269.9	7867.16	408.78	4270.36	4269.5	0	606459.12	670146.34
12100	90.72	269.9	7865.91	408.6	4370.35	4369.49	0	606458.94	670046.34
12200	90.72	269.9	7864.66	408.42	4470.35	4469.48	0	606458.76	669946.35
12300	90.72	269.9	7863.4	408.25	4570.34	4569.48	0	606458.59	669846.36
12332.12	90.72	269.9	7863	408.19	4602.46	4601.59	0	606458.53	669814.24 . PBHL 5H

Formation Points: (Relative to Slot Centre, TVD Relative to Kelly Bushing)

MD (US ft)	Incl (°)	Alt (°)	TVD (US ft)	N Offset (US ft)	E Offset (US ft)	Northing (US ft)	Easting (US ft)	Name	Comment
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Weatherford International Limited

50.7.5.9: 25 September 2014, 14:32:02 UTC

5D Plan Report**Devon Energy****Field Name:** *Eddy Co, NM (Nad 83 NME)***Site Name:** *Arcturus 18 Federal 5H***Well Name:** *Arcturus 18 Federal 5H***Plan:** *P1:V5*

25 September 2014

**Weatherford®**

Arcturus 18 Federal 5H

Field Name	Map Units : US ft Company Name : Devon Energy Vertical Reference Datum (VRD) : Mean Sea Level Projected Coordinate System : NAD83 / New Mexico East (ftUS) Comment :									
Eddy Co, NM (Nad 83 NME)										
Site Name	Units : US ft	North Reference : Grid	Convergence Angle : 0.23							
Arcturus 18 Federal 5H	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">Position</td> <td style="width: 40%;">Northing : 606050.34 US ft</td> <td style="width: 40%;">Latitude : 32° 39' 55.20"</td> </tr> <tr> <td></td> <td>Easting : 674416.70 US ft</td> <td>Longitude : 103° 54' 3.16"</td> </tr> </table>			Position	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"		Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"	
	Position	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"							
		Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"							
Elevation above Mean Sea Level: 3437.00 US ft Comment :										
Slot Name	Position (Offsets relative to Site Centre) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">+N / -S : 0.00 US ft</td> <td style="width: 40%;">Northing : 606050.34 US ft</td> <td style="width: 40%;">Latitude : 32° 39' 55.20"</td> </tr> <tr> <td>+E / -W : 0.00 US ft</td> <td>Easting : 674416.70 US ft</td> <td>Longitude : 103° 54' 3.16"</td> </tr> </table>			+N / -S : 0.00 US ft	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"	+E / -W : 0.00 US ft	Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"	
+N / -S : 0.00 US ft	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"								
+E / -W : 0.00 US ft	Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"								
Arcturus 18 Federal 5H	Slot TVD Reference : Ground Elevation Elevation above Mean Sea Level : 3437.00 US ft Comment :									
Well Name	Type : Main well	UWI :	Plan : P1:V5							
Arcturus 18 Federal 5H	Rig Height <i>Kelly Bushing</i> : 26.00 US ft Comment : Relative to Mean Sea Level: 3463.00 US ft									
	Closure Distance : 4620.53 US ft Closure Azimuth : 275.068°									
	Vertical Section (Position of Origin Relative to Slot) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">+N / -S : 0.00 US ft</td> <td style="width: 33%;">+E / -W : 0.00 US ft</td> <td style="width: 33%;">Az : 269.88°</td> </tr> </table>			+N / -S : 0.00 US ft	+E / -W : 0.00 US ft	Az : 269.88°				
	+N / -S : 0.00 US ft	+E / -W : 0.00 US ft	Az : 269.88°							
	Magnetic Parameters <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Model : BGGM</td> <td style="width: 25%;">Field Strength :</td> <td style="width: 25%;">Dec : 7.53°</td> <td style="width: 25%;">Dip : 60.45°</td> </tr> <tr> <td></td> <td>48493.5nT</td> <td></td> <td>Date : 15/Oct/2014</td> </tr> </table>			Model : BGGM	Field Strength :	Dec : 7.53°	Dip : 60.45°		48493.5nT	
Model : BGGM	Field Strength :	Dec : 7.53°	Dip : 60.45°							
	48493.5nT		Date : 15/Oct/2014							

Target Set

Name : Arcturus 18 Federal 5H **Number of Targets :** 3

Comment :

Target Name:	Position (Relative to Slot centre) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">+N / -S : 415.33 US ft</td> <td style="width: 40%;">Northing : 606465.67 US ft</td> <td style="width: 40%;">Latitude : 32° 39' 59.33"</td> </tr> <tr> <td>+E / -W : -575.94 US ft</td> <td>Easting : 673840.76 US ft</td> <td>Longitude : 103° 54' 9.88"</td> </tr> </table>			+N / -S : 415.33 US ft	Northing : 606465.67 US ft	Latitude : 32° 39' 59.33"	+E / -W : -575.94 US ft	Easting : 673840.76 US ft	Longitude : 103° 54' 9.88"
+N / -S : 415.33 US ft	Northing : 606465.67 US ft	Latitude : 32° 39' 59.33"							
+E / -W : -575.94 US ft	Easting : 673840.76 US ft	Longitude : 103° 54' 9.88"							
LPTgt									
Shape:	TVD (Kelly Bushing) : 7940.00 US ft								
Cuboid									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Orientation Azimuth : 269.90°</td> <td style="width: 33%;">Inclination : 1.38°</td> <td style="width: 33%;"></td> </tr> <tr> <td>Dimensions Length : 4620.00 US ft</td> <td>Breadth : 50.00 US ft</td> <td>Height : 20.00 US ft</td> </tr> </table>				Orientation Azimuth : 269.90°	Inclination : 1.38°		Dimensions Length : 4620.00 US ft	Breadth : 50.00 US ft	Height : 20.00 US ft
Orientation Azimuth : 269.90°	Inclination : 1.38°								
Dimensions Length : 4620.00 US ft	Breadth : 50.00 US ft	Height : 20.00 US ft							

5D Plan Report

Target Name: T1	Position (Relative to Slot centre)		
	+N / -S : 411.27 US ft	Northing : 606461.61 US ft	Latitude : 32°39'59.38"
	+E / -W : -2862.30 US ft	Easting : 671554.40 US ft	Longitude : -103°54'36.63"
Shape: Cuboid	TVD (Kelly Bushing) : 7885.00 US ft		
	Orientation Azimuth : 0.00°	Inclination : 0.00°	
	Dimensions Length : 20.00 US ft	Breadth : 20.00 US ft	Height : 20.00 US ft

Target Name: PBHL 5H	Position (Relative to Slot centre)		
	+N / -S : 408.19 US ft	Northing : 606458.53 US ft	Latitude : 32°39'59.42"
	+E / -W : -4602.46 US ft	Easting : 669814.24 US ft	Longitude : -103°54'56.99"
Shape: Cuboid	TVD (Kelly Bushing) : 7863.00 US ft		
	Orientation Azimuth : 269.90°	Inclination : 0.72°	
	Dimensions Length : 3444.00 US ft	Breadth : 50.00 US ft	Height : 20.00 US ft

Casing Points (Relative to Slot centre, TVD relative to Kelly Bushing)									
MD (US ft)	Inc (°)	Az (°)	TVD (US ft)	N.Offset (US ft)	E.Offset (US ft)	Northing (US ft)	Easting (US ft)	Name	
3950.00	0.00	0.00	3950.00	0.00	0.00	606050.34	674416.70	9 5/8 in	

Well path created using minimum curvature.

Salient Points (Relative to Slot centre, TVD relative to Kelly Bushing)											
MD (US ft)	Inc (°)	Az (°)	TVD (US ft)	N.Offset (US ft)	E.Offset (US ft)	VS (US ft)	DLS (°/100 US ft)	B.Rate (°/100 US ft)	T.Rate (°/100 US ft)	Face (°)	Comment
0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	0.00	0.00	
3950.00	0.00	0.00	3950.00	0.00	0.00	-0.00	0.00	0.00	0.00	0.00	9 5/8 in
4100.00	0.00	0.00	4100.00	0.00	0.00	-0.00	0.00	0.00	0.00	0.00	Nudge
4775.72	6.76	1.78	4774.15	39.78	1.24	-1.32	1.00	1.00	0.00	1.78	Hold
7388.89	6.76	1.78	7369.17	347.10	10.82	-11.54	0.00	0.00	0.00	0.00	KOP
8304.79	91.38	269.90	7940.00	415.33	-575.94	575.07	10.00	9.24	-10.03	268.29	LP Tgt
10591.82	91.38	269.90	7885.00	411.27	-2862.30	2861.43	0.00	0.00	0.00	0.00	T1/Drop
10624.81	90.72	269.90	7884.40	411.21	-2895.29	2894.42	2.00	-2.00	0.00	179.97	Hold
12332.12	90.72	269.90	7863.00	408.19	-4602.46	4601.59	0.00	0.00	0.00	0.00	PBHL 5H

Interpolated Points (Relative to Slot centre, TVD relative to Kelly Bushing)											
MD (US ft)	Inc (°)	Az (°)	TVD (US ft)	N.Offset (US ft)	E.Offset (US ft)	VS (US ft)	DLS (°/100 US ft)	Northing (US ft)	Easting (US ft)	Comment	
4100.00	0.00	0.00	4100.00	0.00	0.00	-0.00	0.00	606050.34	674416.70	Nudge	
4200.00	1.00	1.78	4199.99	0.87	0.03	-0.03	1.00	606051.21	674416.73		
4300.00	2.00	1.78	4299.96	3.49	0.11	-0.12	1.00	606053.83	674416.81		
4400.00	3.00	1.78	4399.86	7.85	0.24	-0.26	1.00	606058.19	674416.94		
4500.00	4.00	1.78	4499.68	13.95	0.43	-0.46	1.00	606064.29	674417.13		
4600.00	5.00	1.78	4599.37	21.79	0.68	-0.72	1.00	606072.13	674417.38		
4700.00	6.00	1.78	4698.90	31.37	0.98	-1.04	1.00	606081.71	674417.68		
4775.72	6.76	1.78	4774.15	39.78	1.24	-1.32	1.00	606090.12	674417.94	Hold	
4800.00	6.76	1.78	4798.27	42.64	1.33	-1.42	0.00	606092.98	674418.03		
4900.00	6.76	1.78	4897.57	54.40	1.70	-1.81	0.00	606104.74	674418.40		
5000.00	6.76	1.78	4996.88	66.16	2.06	-2.20	0.00	606116.50	674418.76		
5100.00	6.76	1.78	5096.18	77.92	2.43	-2.59	0.00	606128.26	674419.13		
5200.00	6.76	1.78	5195.49	89.68	2.79	-2.98	0.00	606140.02	674419.49		
5300.00	6.76	1.78	5294.79	101.44	3.16	-3.37	0.00	606151.78	674419.86		
5400.00	6.76	1.78	5394.10	113.20	3.53	-3.76	0.00	606163.54	674420.23		
5500.00	6.76	1.78	5493.40	124.96	3.89	-4.16	0.00	606175.30	674420.59		

5D Plan Report

Interpolated Points (Relative to Slot centre, TVD relative to Kelly Bushing)										
MD (US ft)	Incl (°)	Az (°)	TVD (US ft)	N Offset (US ft)	E Offset (US ft)	VS (US ft)	D/S (%/100 US ft)	Northing (US ft)	Eastings (US ft)	Comment
5600.00	6.76	1.78	5592.71	136.72	4.26	-4.55	0.00	606187.06	674420.96	
5700.00	6.76	1.78	5692.01	148.48	4.63	-4.94	0.00	606198.82	674421.33	
5800.00	6.76	1.78	5791.32	160.24	4.99	-5.33	0.00	606210.58	674421.69	
5900.00	6.76	1.78	5890.63	172.00	5.36	-5.72	0.00	606222.34	674422.06	
6000.00	6.76	1.78	5989.93	183.76	5.73	-6.11	0.00	606234.10	674422.43	
6100.00	6.76	1.78	6089.24	195.52	6.09	-6.50	0.00	606245.86	674422.79	
6200.00	6.76	1.78	6188.54	207.28	6.46	-6.89	0.00	606257.62	674423.16	
6300.00	6.76	1.78	6287.85	219.04	6.83	-7.28	0.00	606269.38	674423.53	
6400.00	6.76	1.78	6387.15	230.80	7.19	-7.68	0.00	606281.14	674423.89	
6500.00	6.76	1.78	6486.46	242.56	7.56	-8.07	0.00	606292.90	674424.26	
6600.00	6.76	1.78	6585.76	254.32	7.93	-8.46	0.00	606304.66	674424.63	
6700.00	6.76	1.78	6685.07	266.08	8.29	-8.85	0.00	606316.42	674424.99	
6800.00	6.76	1.78	6784.37	277.84	8.66	-9.24	0.00	606328.18	674425.36	
6900.00	6.76	1.78	6883.68	289.60	9.02	-9.63	0.00	606339.94	674425.72	
7000.00	6.76	1.78	6982.98	301.36	9.39	-10.02	0.00	606351.70	674426.09	
7100.00	6.76	1.78	7082.29	313.12	9.76	-10.41	0.00	606363.46	674426.46	
7200.00	6.76	1.78	7181.60	324.88	10.12	-10.80	0.00	606375.22	674426.82	
7300.00	6.76	1.78	7280.90	336.64	10.49	-11.20	0.00	606386.98	674427.19	
7388.89	6.76	1.78	7369.17	347.10	10.82	-11.54	0.00	606397.74	674427.52	KOP
7400.00	6.81	352.38	7380.21	348.40	10.75	-11.48	10.00	606398.88	674427.45	
7500.00	12.81	301.46	7478.86	360.10	0.48	-1.24	10.00	606410.44	674417.18	
7600.00	21.93	287.17	7574.24	371.42	-26.88	26.10	10.00	606421.76	674389.82	
7700.00	31.57	281.18	7663.45	382.04	-70.51	69.71	10.00	606432.38	674346.19	
7800.00	41.37	277.79	7743.78	391.61	-129.07	128.25	10.00	606441.95	674287.63	
7900.00	51.23	275.52	7812.79	399.86	-200.79	199.96	10.00	606450.20	674215.91	
8000.00	61.13	273.81	7868.39	406.53	-283.50	282.64	10.00	606456.87	674133.20	
8100.00	71.05	272.39	7908.87	411.43	-374.66	373.80	10.00	606461.77	674042.04	
8200.00	80.97	271.14	7933.02	414.39	-471.53	470.66	10.00	606464.73	673945.17	
8300.00	90.90	269.95	7940.10	415.34	-571.15	570.28	10.00	606465.68	673845.55	
8304.79	91.38	269.90	7940.00	415.33	-575.94	575.07	10.00	606465.67	673840.76	LP Tgt
8400.00	91.38	269.90	7937.71	415.16	-671.12	670.25	0.00	606465.50	673745.58	
8500.00	91.38	269.90	7935.31	414.98	-771.09	770.22	0.00	606465.32	673645.61	
8600.00	91.38	269.90	7932.90	414.81	-871.06	870.19	0.00	606465.15	673545.64	
8700.00	91.38	269.90	7930.50	414.63	-971.03	970.16	0.00	606464.97	673445.67	
8800.00	91.38	269.90	7928.09	414.45	-1071.00	1070.13	0.00	606464.79	673345.70	
8900.00	91.38	269.90	7925.69	414.27	-1170.97	1170.10	0.00	606464.61	673245.73	
9000.00	91.38	269.90	7923.28	414.10	-1270.94	1270.07	0.00	606464.44	673145.76	
9100.00	91.38	269.90	7920.88	413.92	-1370.91	1370.04	0.00	606464.26	673045.79	
9200.00	91.38	269.90	7918.47	413.74	-1470.89	1470.02	0.00	606464.08	672945.81	
9300.00	91.38	269.90	7916.07	413.56	-1570.86	1569.99	0.00	606463.90	672845.84	
9400.00	91.38	269.90	7913.66	413.39	-1670.83	1669.96	0.00	606463.73	672745.87	
9500.00	91.38	269.90	7911.26	413.21	-1770.80	1769.93	0.00	606463.55	672645.90	
9600.00	91.38	269.90	7908.85	413.03	-1870.77	1869.90	0.00	606463.37	672545.93	
9700.00	91.38	269.90	7906.45	412.85	-1970.74	1969.87	0.00	606463.19	672445.96	
9800.00	91.38	269.90	7904.04	412.68	-2070.71	2069.84	0.00	606463.02	672345.99	
9900.00	91.38	269.90	7901.64	412.50	-2170.68	2169.81	0.00	606462.84	672246.02	
10000.00	91.38	269.90	7899.23	412.32	-2270.65	2269.78	0.00	606462.66	672146.05	
10100.00	91.38	269.90	7896.83	412.14	-2370.62	2369.76	0.00	606462.48	672046.08	
10200.00	91.38	269.90	7894.42	411.97	-2470.59	2469.73	0.00	606462.31	671946.11	
10300.00	91.38	269.90	7892.02	411.79	-2570.57	2569.70	0.00	606462.13	671846.13	
10400.00	91.38	269.90	7889.61	411.61	-2670.54	2669.67	0.00	606461.95	671746.16	
10500.00	91.38	269.90	7887.21	411.43	-2770.51	2769.64	0.00	606461.77	671646.19	
10591.82	91.38	269.90	7885.00	411.27	-2862.30	2861.43	0.00	606461.61	671554.40	T1/Drop
10600.00	91.21	269.90	7884.82	411.26	-2870.48	2869.61	2.00	606461.60	671546.22	
10624.81	90.72	269.90	7884.40	411.21	-2895.29	2894.42	2.00	606461.55	671521.41	Hold
10700.00	90.72	269.90	7883.46	411.08	-2970.47	2969.60	0.00	606461.42	671446.23	
10800.00	90.72	269.90	7882.20	410.90	-3070.46	3069.59	0.00	606461.24	671346.24	
10900.00	90.72	269.90	7880.95	410.72	-3170.45	3169.59	0.00	606461.06	671246.25	
11000.00	90.72	269.90	7879.70	410.55	-3270.44	3269.58	0.00	606460.89	671146.26	

5D Plan Report

Interpolated Points (Relative to Slot centre, TVD relative to Kelly Bushing)										
MD (US-ft)	Incl (°)	AZ (°)	TVD (US-ft)	N. Offset (US-ft)	E. Offset (US-ft)	VS (US-ft)	DLS (%/100 US-ft)	Northing (US-ft)	Easting (US-ft)	Comment
11100.00	90.72	269.90	7878.44	410.37	-3370.44	3369.57	0.00	606460.71	671046.26	
11200.00	90.72	269.90	7877.19	410.19	-3470.43	3469.56	0.00	606460.53	670946.27	
11300.00	90.72	269.90	7875.94	410.02	-3570.42	3569.55	0.00	606460.36	670846.28	
11400.00	90.72	269.90	7874.68	409.84	-3670.41	3669.55	0.00	606460.18	670746.29	
11500.00	90.72	269.90	7873.43	409.66	-3770.40	3769.54	0.00	606460.00	670646.30	
11600.00	90.72	269.90	7872.18	409.49	-3870.40	3869.53	0.00	606459.83	670546.30	
11700.00	90.72	269.90	7870.92	409.31	-3970.39	3969.52	0.00	606459.65	670446.31	
11800.00	90.72	269.90	7869.67	409.13	-4070.38	4069.52	0.00	606459.47	670346.32	
11900.00	90.72	269.90	7868.42	408.95	-4170.37	4169.51	0.00	606459.29	670246.33	
12000.00	90.72	269.90	7867.16	408.78	-4270.36	4269.50	0.00	606459.12	670146.34	
12100.00	90.72	269.90	7865.91	408.60	-4370.36	4369.49	0.00	606458.94	670046.34	
12200.00	90.72	269.90	7864.66	408.42	-4470.35	4469.48	0.00	606458.76	669946.35	
12300.00	90.72	269.90	7863.40	408.25	-4570.34	4569.48	0.00	606458.59	669846.36	
12332.12	90.72	269.90	7863.00	408.19	-4602.46	4601.59	0.00	606458.53	669814.24	PBHL 5H

5D Anti-Collision Report**Devon Energy****Field Name:** *Eddy Co, NM (Nad 83 NME)***Site Name:** *Arcturus 18 Federal 5H***Well Name:** *Arcturus 18 Federal 5H*

25 September 2014

**Weatherford®**



Weatherford

Arcturus 18 Federal 5H

Field Name Eddy Co, NM (Nad 83 NME)	Map Units : US ft		Company Name : Devon Energy	
	Vertical Reference Datum (VRD) : Mean Sea Level			
	Projected Coordinate System : NAD83 / New Mexico East (ftUS)			
Comment :				
Site Name Arcturus 18 Federal 5H	Units : US ft	North Reference : Grid	Convergence Angle : 0.23	
	Position	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"	
	Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"		
Elevation above Mean Sea Level: 3437.00 US ft				
Comment :				
Slot Name Arcturus 18 Federal 5H	Position (Offsets relative to Site Centre)			
	+N / -S : 0.00 US ft	Northing : 606050.34 US ft	Latitude : 32° 39' 55.20"	
	+E / -W : 0.00 US ft	Easting : 674416.70 US ft	Longitude : 103° 54' 3.16"	
Slot TVD Reference : Ground Elevation				
Elevation above Mean Sea Level : 3437.00 US ft				
Comment :				
Well Name Arcturus 18 Federal 5H	Type : Main well		UWI :	Plan : Working Plan
	Rig Height Kelly Bushing : 26.00 US ft		Comment :	
	Relative to Mean Sea Level: 3463.00 US ft			
	Closure Distance : 4620.53 US ft		Closure Azimuth : 275.068°	
	Vertical Section (Position of Origin Relative to Slot)			
	+N / -S : 0.00 US ft		+E / -W : 0.00 US ft	Az : 269.88°
	Magnetic Parameters			
Model : BGGM	Field Strength : 48493.5nT	Dec : 7.53°	Dip : 60.45° Date : 15/Oct/2014	

Collision / Uncertainty Analysis

Primary Well	Start MD (US ft)	End MD (US ft)	Collision Risk Interval	No. of Std Deviations in Error Computation
Arcturus 18 Federal 5H (p)	0.00	12332.12	100.00	2

Secondary Well Names

Hackberry 18 Federal 2 (s)
 Sirius 17 Federal 5H (p)
 Arcturus 18 Fed 1H (s)
 Sirius 17 Fed 1H (s)

Anti Collision Report Terminology :

S.Minor, S.Major : Radii of the ellipse of uncertainty at the current location as seen in the along hole direction.

PHI : Angle between high-side vector and semi-minor axis

TVD Spread : Total TVD range of the ellipsoid of uncertainty at the current location

ES : Distance between the extremities of the primary and secondary uncertainty ellipsoids in the direction Cr-Cr

T.Face to Sec : Angle between the HI-Side vector of the primary well at the current location and line of closest approach between the two wells

Separation factors calculated using Pedal Curve (Independent Uncertainty). Well path created using minimum curvature.

5D Anti-Collision Report

Anti-Collision Proximity Summary (TVD relative to Kelly Bushing)

SF	Secondary Well Name	PPD MD (US.ft)	Sec MD (US.ft)	TVD (US.ft)	CC (US.ft)	ES (US.ft)	SF	Risk
	Sirius 17 Federal 5H (p)	4455.47	4454.24	4455.24	50.78	30.28	2.48	
	Hackberry 18 Federal 2 (s)	10793.55	7875.79	7882.28	281.43	178.55	2.74	
	Sirius 17 Fed 1H (s)	7440.04	7422.06	7419.91	109.04	75.64	3.27	
	Arcturus 18 Fed 1H (s)	7592.38	7578.05	7567.16	123.98	93.74	4.10	

Primary Well: Arcturus 18 Federal 5H (p) (TVD Relative to Kelly Bushing, All Azimuth Relative to GRID NORTH)									
MD (US.ft)	TVD (US.ft)	T Face to Sec (°)	S Major (US.ft)	S Minor (US.ft)	Nearest Well	CC (US.ft)	ES (US.ft)	SF	Risk
0.00	0.00	89.58	0.00	0.00	Sirius 17 Federal 5H (p)	50.00	49.24	65.85	
100.00	100.00	89.58	0.11	0.11	Sirius 17 Federal 5H (p)	49.99	49.01	51.04	
200.00	200.00	89.58	0.34	0.34	Sirius 17 Federal 5H (p)	49.99	48.56	35.01	
300.00	300.00	89.58	0.56	0.56	Sirius 17 Federal 5H (p)	49.99	48.11	26.63	
400.00	400.00	89.58	0.79	0.79	Sirius 17 Federal 5H (p)	49.99	47.66	21.49	
500.00	500.00	89.58	1.01	1.01	Sirius 17 Federal 5H (p)	49.99	47.22	18.01	
600.00	600.00	89.58	1.24	1.24	Sirius 17 Federal 5H (p)	49.99	46.77	15.50	
700.00	700.00	89.58	1.46	1.46	Sirius 17 Federal 5H (p)	49.99	46.32	13.60	
800.00	800.00	89.58	1.69	1.69	Sirius 17 Federal 5H (p)	49.99	45.87	12.12	
900.00	900.00	89.58	1.91	1.91	Sirius 17 Federal 5H (p)	49.99	45.42	10.93	
1000.00	1000.00	89.58	2.14	2.14	Sirius 17 Federal 5H (p)	49.99	44.97	9.95	
1100.00	1100.00	89.58	2.36	2.36	Sirius 17 Federal 5H (p)	49.99	44.52	9.13	
1200.00	1200.00	89.58	2.59	2.59	Sirius 17 Federal 5H (p)	49.99	44.07	8.44	
1300.00	1300.00	89.58	2.81	2.81	Sirius 17 Federal 5H (p)	49.99	43.62	7.84	
1400.00	1400.00	89.58	3.03	3.03	Sirius 17 Federal 5H (p)	49.99	43.17	7.33	
1500.00	1500.00	89.58	3.26	3.26	Sirius 17 Federal 5H (p)	49.99	42.72	6.87	
1600.00	1600.00	89.58	3.48	3.48	Sirius 17 Federal 5H (p)	49.99	42.27	6.47	
1700.00	1700.00	89.58	3.71	3.71	Sirius 17 Federal 5H (p)	49.99	41.82	6.12	
1800.00	1800.00	89.58	3.93	3.93	Sirius 17 Federal 5H (p)	49.99	41.37	5.80	
1900.00	1900.00	89.58	4.16	4.16	Sirius 17 Federal 5H (p)	49.99	40.92	5.51	
2000.00	2000.00	89.58	4.38	4.38	Sirius 17 Federal 5H (p)	49.99	40.47	5.25	
2100.00	2100.00	89.58	4.61	4.61	Sirius 17 Federal 5H (p)	49.99	40.02	5.01	
2200.00	2200.00	89.58	4.83	4.83	Sirius 17 Federal 5H (p)	49.99	39.57	4.80	
2300.00	2300.00	89.58	5.06	5.06	Sirius 17 Federal 5H (p)	49.99	39.12	4.60	
2400.00	2400.00	89.58	5.28	5.28	Sirius 17 Federal 5H (p)	49.99	38.67	4.42	
2500.00	2500.00	89.58	5.51	5.51	Sirius 17 Federal 5H (p)	49.99	38.22	4.25	
2600.00	2600.00	89.58	5.73	5.73	Sirius 17 Federal 5H (p)	49.99	37.77	4.09	
2700.00	2700.00	89.58	5.96	5.96	Sirius 17 Federal 5H (p)	49.99	37.33	3.95	
2800.00	2800.00	89.58	6.18	6.18	Sirius 17 Federal 5H (p)	49.99	36.88	3.81	

5D Anti-Collision Report

Primary Well: Arcturus 18 Federal 5H (p) (TVD Relative to Kelly Bushing: All Azimuth Relative to GRID NORTH)									
MD (USft)	TVD (USft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	Nearest Well	GC (USft)	ES (USft)	SF	Risk
2900.00	2900.00	89.58	6.41	6.41	Sirius 17 Federal 5H (p)	49.99	36.43	3.69	
3000.00	3000.00	89.58	6.63	6.63	Sirius 17 Federal 5H (p)	49.99	35.98	3.57	
3100.00	3100.00	89.58	6.86	6.86	Sirius 17 Federal 5H (p)	49.99	35.53	3.46	
3200.00	3200.00	89.58	7.08	7.08	Sirius 17 Federal 5H (p)	49.99	35.08	3.35	
3300.00	3300.00	89.58	7.31	7.31	Sirius 17 Federal 5H (p)	49.99	34.63	3.25	
3400.00	3400.00	89.58	7.53	7.53	Sirius 17 Federal 5H (p)	49.99	34.18	3.16	
3500.00	3500.00	89.58	7.76	7.76	Sirius 17 Federal 5H (p)	49.99	33.73	3.07	
3600.00	3600.00	89.58	7.98	7.98	Sirius 17 Federal 5H (p)	49.99	33.28	2.99	
3700.00	3700.00	89.58	8.20	8.20	Sirius 17 Federal 5H (p)	49.99	32.83	2.91	
3800.00	3800.00	89.58	8.43	8.43	Sirius 17 Federal 5H (p)	49.99	32.38	2.84	
3900.00	3900.00	89.58	8.65	8.65	Sirius 17 Federal 5H (p)	49.99	31.93	2.77	
4000.00	4000.00	89.58	8.88	8.88	Sirius 17 Federal 5H (p)	49.99	31.53	2.71	
4100.00	4100.00	89.58	9.10	9.10	Sirius 17 Federal 5H (p)	49.99	31.08	2.64	
4200.00	4199.99	88.79	9.33	9.33	Sirius 17 Federal 5H (p)	49.97	30.62	2.58	
4300.00	4299.96	91.79	9.55	9.55	Sirius 17 Federal 5H (p)	49.98	30.19	2.53	
4400.00	4399.86	96.76	9.77	9.76	Sirius 17 Federal 5H (p)	50.30	30.08	2.49	
4500.00	4499.68	103.51	10.00	9.98	Sirius 17 Federal 5H (p)	51.38	30.71	2.49	
4600.00	4599.37	111.62	10.22	10.19	Sirius 17 Federal 5H (p)	53.76	32.63	2.54	
4700.00	4698.90	120.39	10.45	10.40	Sirius 17 Federal 5H (p)	57.99	36.41	2.69	
4800.00	4798.27	129.00	10.68	10.61	Sirius 17 Federal 5H (p)	64.45	42.40	2.92	
4900.00	4897.57	136.22	10.91	10.83	Sirius 17 Federal 5H (p)	72.46	49.96	3.22	
5000.00	4996.88	141.95	11.15	11.06	Sirius 17 Federal 5H (p)	81.39	58.50	3.56	
5100.00	5096.18	146.51	11.39	11.29	Sirius 17 Federal 5H (p)	90.97	67.57	3.89	
5200.00	5195.49	150.19	11.63	11.51	Sirius 17 Federal 5H (p)	101.01	77.16	4.24	
5300.00	5294.79	153.19	11.88	11.74	Sirius 17 Federal 5H (p)	111.39	87.15	4.60	
5400.00	5394.10	155.68	12.13	11.97	Sirius 17 Federal 5H (p)	122.02	97.28	4.93	
5500.00	5493.40	157.77	12.38	12.20	Sirius 17 Federal 5H (p)	132.84	107.63	5.27	
5600.00	5592.71	159.54	12.63	12.43	Sirius 17 Federal 5H (p)	143.81	118.15	5.60	
5700.00	5692.01	161.06	12.89	12.66	Sirius 17 Federal 5H (p)	154.90	128.80	5.93	
5800.00	5791.32	162.38	13.15	12.89	Sirius 17 Federal 5H (p)	166.08	139.56	6.26	
5900.00	5890.63	163.53	13.41	13.12	Sirius 17 Federal 5H (p)	177.34	150.38	6.58	
6000.00	5989.93	164.54	13.67	13.35	Sirius 17 Federal 5H (p)	188.66	161.25	6.88	
6100.00	6089.24	165.44	13.93	13.58	Sirius 17 Federal 5H (p)	200.03	172.15	7.17	
6200.00	6188.54	166.24	14.20	13.81	Sirius 17 Federal 5H (p)	211.44	183.09	7.46	
6300.00	6287.85	24.63	14.46	14.05	Sirius 17 Fed 1H (s)	208.35	180.55	7.49	
6400.00	6387.15	25.96	14.73	14.28	Sirius 17 Fed 1H (s)	197.66	169.36	6.98	

5D Anti-Collision Report

Primary Well : Arcturus 18 Federal 5H (p) (TVD Relative to Kelly Bushing, All Azimuth Relative to GRID NORTH)									
MD (US/ft)	TVD (US/ft)	True to Sec (°)	S Major (US/ft)	S Minor (US/ft)	Nearest Well	CG (US/ft)	ES (US/ft)	SF	Risk
6500.00	6486.46	27.44	15.00	14.51	Sirius 17 Fed 1H (s)	187.15	158.37	6.50	
6600.00	6585.76	29.11	15.27	14.74	Sirius 17 Fed 1H (s)	176.92	147.67	6.05	
6700.00	6685.07	30.97	15.54	14.98	Sirius 17 Fed 1H (s)	167.21	137.53	5.63	
6800.00	6784.37	32.94	15.82	15.21	Sirius 17 Fed 1H (s)	157.88	127.78	5.24	
6900.00	6883.68	35.14	16.09	15.44	Sirius 17 Fed 1H (s)	148.70	118.08	4.86	
7000.00	6982.98	37.71	16.36	15.67	Sirius 17 Fed 1H (s)	139.46	108.33	4.48	
7100.00	7082.29	40.67	16.64	15.91	Sirius 17 Fed 1H (s)	130.45	98.89	4.13	
7200.00	7181.60	44.07	16.92	16.14	Sirius 17 Fed 1H (s)	122.57	90.49	3.82	
7300.00	7280.90	48.20	17.20	16.38	Sirius 17 Fed 1H (s)	115.54	82.92	3.54	
7400.00	7380.21	62.45	17.47	16.61	Sirius 17 Fed 1H (s)	109.46	76.33	3.30	
7500.00	7478.86	120.56	17.46	16.82	Sirius 17 Fed 1H (s)	113.28	79.60	3.36	
7600.00	7574.24	143.12	17.32	16.87	Sirius 17 Fed 1H (s)	135.13	100.84	3.94	
7700.00	7663.45	121.30	17.43	16.31	Arcturus 18 Fed 1H (s)	139.25	108.12	4.47	
7800.00	7743.78	136.58	17.77	15.33	Arcturus 18 Fed 1H (s)	179.24	147.43	5.63	
7900.00	7812.79	145.97	18.27	14.17	Arcturus 18 Fed 1H (s)	240.81	208.49	7.45	
8000.00	7868.39	150.63	18.99	12.96	Arcturus 18 Fed 1H (s)	318.15	285.50	9.74	
8100.00	7908.87	150.64	20.01	11.89	Arcturus 18 Fed 1H (s)	406.46	373.66	12.39	
8200.00	7933.02	141.95	21.32	11.18	Arcturus 18 Fed 1H (s)	501.87	468.91	15.23	
8300.00	7940.10	85.94	22.83	10.98	Arcturus 18 Fed 1H (s)	600.82	567.79	18.19	
8400.00	7937.71	78.84	24.60	11.24	Arcturus 18 Fed 1H (s)	700.48	667.41	21.18	
8500.00	7935.31	77.13	26.57	11.54	Arcturus 18 Fed 1H (s)	800.21	767.15	24.20	
8600.00	7932.90	353.30	28.63	11.88	Sirius 17 Fed 1H (s)	981.74	945.67	27.22	
8700.00	7930.50	353.99	30.78	12.26	Sirius 17 Fed 1H (s)	1081.60	1045.54	30.00	
8800.00	7928.09	179.56	33.01	12.66	Arcturus 18 Fed 1H (s)	895.57	867.98	32.47	
8900.00	7925.69	179.55	35.29	13.09	Arcturus 18 Fed 1H (s)	896.90	868.47	31.55	
9000.00	7923.28	179.53	37.70	13.54	Arcturus 18 Fed 1H (s)	898.09	868.78	30.65	
9100.00	7920.88	179.51	40.16	14.02	Arcturus 18 Fed 1H (s)	899.43	869.18	29.73	
9200.00	7918.47	179.47	42.66	14.54	Arcturus 18 Fed 1H (s)	900.33	869.10	28.84	
9300.00	7916.07	179.34	45.18	15.07	Arcturus 18 Fed 1H (s)	898.71	866.45	27.86	
9400.00	7913.66	179.26	47.72	15.63	Arcturus 18 Fed 1H (s)	897.27	863.94	26.93	
9500.00	7911.26	179.17	50.29	16.20	Arcturus 18 Fed 1H (s)	895.51	861.08	26.01	
9600.00	7908.85	179.10	52.88	16.77	Arcturus 18 Fed 1H (s)	893.89	858.38	25.17	
9700.00	7906.45	179.02	55.48	17.30	Arcturus 18 Fed 1H (s)	892.89	856.31	24.41	
9800.00	7904.04	267.30	58.09	17.89	Hackberry 18 Federal 2 (s)	1028.56	982.92	22.54	
9900.00	7901.64	267.47	60.72	18.54	Hackberry 18 Federal 2 (s)	932.78	885.39	19.68	
10000.00	7899.23	267.64	63.35	19.16	Hackberry 18 Federal 2 (s)	837.99	788.25	16.85	

5D Anti-Collision Report

Primary Well : Arcturus 18 Federal 5H (p) (TVD Relative to Kelly Bushing ; All Azimuth Relative to GRID NORTH)									
IRL MD (US ft)	TVD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	Nearest Well	CC (US ft)	ES (US ft)	SF	Risk
10100.00	7896.83	267.81	66.00	19.76	Hackberry 18 Federal 2 (s)	744.56	691.85	14.13	
10200.00	7894.42	267.98	68.66	20.41	Hackberry 18 Federal 2 (s)	653.07	596.74	11.59	
10300.00	7892.02	268.15	71.32	21.01	Hackberry 18 Federal 2 (s)	564.49	502.97	9.18	
10400.00	7889.61	268.32	73.99	21.61	Hackberry 18 Federal 2 (s)	480.40	412.20	7.04	
10500.00	7887.21	268.49	76.66	22.28	Hackberry 18 Federal 2 (s)	403.63	326.51	5.23	
10600.00	7884.82	268.77	79.34	22.95	Hackberry 18 Federal 2 (s)	339.20	251.29	3.86	
10700.00	7883.46	269.04	82.03	23.63	Hackberry 18 Federal 2 (s)	295.26	196.96	3.00	
10800.00	7882.20	268.97	84.72	24.30	Hackberry 18 Federal 2 (s)	281.60	178.71	2.74	
10900.00	7880.95	268.90	87.41	24.96	Hackberry 18 Federal 2 (s)	302.36	204.42	3.09	
11000.00	7879.70	268.84	90.11	25.64	Hackberry 18 Federal 2 (s)	351.49	263.17	3.98	
11100.00	7878.44	268.77	92.81	26.31	Hackberry 18 Federal 2 (s)	419.12	340.85	5.35	
11200.00	7877.19	268.70	95.52	26.99	Hackberry 18 Federal 2 (s)	497.78	427.39	7.07	
11300.00	7875.94	268.64	98.22	27.67	Hackberry 18 Federal 2 (s)	583.01	518.79	9.08	
11400.00	7874.68	268.57	100.94	28.35	Hackberry 18 Federal 2 (s)	672.33	612.89	11.31	
11500.00	7873.43	268.51	103.65	29.04	Hackberry 18 Federal 2 (s)	764.29	708.37	13.67	
11600.00	7872.18	181.39	106.36	29.72	Arcturus 18 Fed 1H (s)	888.25	827.23	14.55	
11700.00	7870.92	181.65	109.08	30.41	Arcturus 18 Fed 1H (s)	888.36	825.81	14.20	
11800.00	7869.67	181.84	111.80	31.10	Arcturus 18 Fed 1H (s)	888.58	824.59	13.89	
11900.00	7868.42	181.89	114.52	31.80	Arcturus 18 Fed 1H (s)	889.28	823.85	13.59	
12000.00	7867.16	181.95	117.24	32.49	Arcturus 18 Fed 1H (s)	889.01	822.08	13.28	
12100.00	7865.91	182.02	119.97	33.19	Arcturus 18 Fed 1H (s)	887.70	819.28	12.97	
12200.00	7864.66	182.12	122.69	33.89	Arcturus 18 Fed 1H (s)	885.38	815.43	12.66	
12300.00	7863.40	182.22	125.42	34.58	Arcturus 18 Fed 1H (s)	882.17	810.76	12.35	
12332.12	7863.00	182.22	126.29	34.81	Arcturus 18 Fed 1H (s)	881.78	810.12	12.31	

Secondary Well : Hackberry 18 Federal 2 (s) (TVD Relative to Kelly Bushing (Primary) ; All Azimuth Relative to GRID NORTH)									
IRL MD (US ft)	TVD (US ft)	Sec MD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	CC (US ft)	ES (US ft)	SF	Risk
0.00	13.00	0.00	273.12	0.00	0.00	2965.91	2965.23	4387.33	
100.00	81.44	68.44	273.12	0.11	0.11	2966.15	2965.26	3316.12	
200.00	145.37	132.38	273.10	0.25	0.25	2967.29	2966.02	2352.32	
300.00	199.38	186.42	273.08	0.37	0.37	2969.90	2968.29	1845.20	
400.00	278.42	265.55	273.04	0.58	0.58	2973.75	2971.70	1455.18	
500.00	375.17	362.43	272.98	0.84	0.83	2977.95	2975.43	1183.03	
600.00	502.53	489.92	272.93	1.17	1.16	2981.83	2978.76	972.15	
700.00	613.99	601.45	272.89	1.46	1.46	2984.86	2981.28	832.36	
800.00	713.34	700.85	272.85	1.73	1.72	2987.76	2983.68	733.35	
900.00	820.69	808.26	272.82	2.02	2.01	2990.53	2985.94	652.21	
1000.00	924.46	912.08	272.79	2.29	2.28	2993.12	2988.03	588.52	
1100.00	1029.59	1017.25	272.75	2.57	2.56	2995.56	2989.97	535.87	
1200.00	1135.95	1123.65	272.73	2.86	2.84	2997.81	2991.71	491.65	
1300.00	1245.91	1233.64	272.70	3.15	3.14	2999.79	2993.17	453.54	
1400.00	1357.36	1345.11	272.68	3.45	3.43	3001.40	2994.27	420.69	
1500.00	1473.52	1461.28	272.66	3.76	3.74	3002.59	2994.92	391.65	

5D Anti-Collision Report

Secondary Well: Hackberry 18 Federal 2 (s) (TVD Relative to Kelly Bushing (Primary)) All Azimuth Relative to GRID NORTH									
PrkID (US/ft)	TVD (US/ft)	SecMD (US/ft)	In-Facet/Sec (S)	S-Major (US/ft)	S-Minor (US/ft)	ICC (US/ft)	ES (US/ft)	RSF	Risk
1600.00	1589.49	1577.25	272.65	4.06	4.04	3003.18	2994.99	366.48	
1700.00	1706.18	1693.95	272.64	4.27	4.25	3003.26	2994.63	348.14	
1800.00	1813.56	1801.33	272.64	4.32	4.31	3002.92	2994.02	337.25	
1900.00	1914.03	1901.80	272.64	4.36	4.34	3002.46	2993.30	327.71	
2000.00	2013.31	2001.08	272.64	4.43	4.42	3002.01	2992.54	317.24	
2100.00	2106.64	2094.41	272.63	4.58	4.57	3001.67	2991.84	305.34	
2200.00	2201.30	2189.07	272.61	4.78	4.77	3001.54	2991.28	292.51	
2300.00	2298.83	2286.61	272.59	5.01	5.00	3001.55	2990.82	279.95	
2400.00	2398.13	2385.92	272.57	5.25	5.24	3001.60	2990.41	268.21	
2500.00	2494.25	2482.05	272.55	5.49	5.48	3001.72	2990.06	257.51	
2600.00	2593.21	2581.02	272.52	5.74	5.73	3001.94	2989.81	247.44	
2700.00	2694.39	2682.21	272.50	6.00	5.99	3002.15	2989.54	238.03	
2800.00	2793.84	2781.66	272.47	6.25	6.24	3002.34	2989.25	229.40	
2900.00	2892.43	2880.26	272.45	6.50	6.49	3002.57	2989.00	221.38	
3000.00	2991.28	2979.12	272.44	6.76	6.75	3002.84	2988.80	213.84	
3100.00	3090.52	3078.35	272.43	7.02	7.01	3003.14	2988.62	206.76	
3200.00	3189.47	3177.30	272.42	7.28	7.27	3003.48	2988.47	200.15	
3300.00	3288.51	3276.35	272.41	7.53	7.52	3003.84	2988.36	193.99	
3400.00	3388.89	3376.73	272.41	7.79	7.78	3004.22	2988.26	188.17	
3500.00	3489.41	3477.25	272.40	8.05	8.04	3004.58	2988.13	182.66	
3600.00	3588.42	3576.26	272.38	8.31	8.30	3004.95	2988.02	177.49	
3700.00	3686.63	3674.48	272.36	8.57	8.56	3005.36	2987.95	172.64	
3800.00	3785.22	3773.08	272.34	8.83	8.81	3005.83	2987.95	168.06	
3900.00	3884.90	3872.76	272.32	9.09	9.08	3006.33	2987.96	163.67	
4000.00	3984.63	3972.50	272.30	9.35	9.34	3006.84	2988.02	159.82	
4100.00	4085.03	4072.91	272.28	9.62	9.60	3007.35	2988.04	155.76	
4200.00	4185.35	4173.23	270.46	9.88	9.87	3007.83	2988.03	151.89	
4300.00	4283.70	4271.59	270.41	10.14	10.13	3008.32	2988.03	148.30	
4400.00	4381.15	4369.04	270.32	10.40	10.38	3008.87	2988.11	144.92	
4500.00	4478.20	4466.10	270.20	10.65	10.63	3009.51	2988.28	141.76	
4600.00	4575.33	4563.23	270.05	10.90	10.88	3010.25	2988.57	138.82	
4700.00	4670.99	4658.89	269.87	11.14	11.13	3011.12	2988.95	135.84	
4800.00	4767.69	4755.60	269.66	11.38	11.36	3012.16	2989.52	133.09	
4900.00	4866.33	4854.25	269.43	11.61	11.60	3013.28	2990.21	130.58	
5000.00	4965.12	4953.05	269.21	11.84	11.82	3014.48	2990.90	127.88	
5100.00	5063.61	5051.54	268.99	12.05	12.04	3015.74	2991.69	125.44	
5200.00	5163.79	5151.73	268.76	12.26	12.25	3017.06	2992.55	123.12	
5300.00	5265.53	5253.47	268.54	12.47	12.46	3018.35	2993.39	120.91	
5400.00	5365.19	5353.13	268.32	12.67	12.65	3019.63	2994.22	118.82	
5500.00	5463.78	5451.73	268.10	12.86	12.85	3020.98	2995.13	116.84	
5600.00	5562.84	5550.80	267.88	13.06	13.04	3022.39	2996.09	114.94	
5700.00	5661.57	5649.54	267.67	13.25	13.23	3023.85	2997.12	113.11	
5800.00	5757.85	5745.82	267.46	13.43	13.42	3025.40	2998.24	111.38	
5900.00	5851.42	5839.39	267.26	13.61	13.60	3027.15	2999.57	109.75	
6000.00	5942.22	5930.21	267.06	13.79	13.77	3029.16	3001.15	108.12	
6100.00	6031.22	6019.22	266.88	13.96	13.94	3031.57	3003.11	106.50	
6200.00	6128.91	6116.93	266.67	14.14	14.13	3034.19	3005.26	104.88	
6300.00	6225.73	6213.78	266.47	14.33	14.32	3036.92	3007.53	103.35	
6400.00	6322.55	6310.61	266.27	14.53	14.52	3039.76	3009.93	101.89	
6500.00	6418.33	6406.43	266.07	14.73	14.72	3042.76	3012.47	100.48	
6600.00	6517.40	6505.52	265.86	14.95	14.94	3045.85	3015.10	99.07	
6700.00	6619.18	6607.33	265.64	15.19	15.17	3048.95	3017.69	97.54	
6800.00	6724.33	6712.49	265.41	15.43	15.42	3051.94	3020.15	96.01	
6900.00	6822.44	6810.62	265.20	15.66	15.64	3054.90	3022.61	94.60	
7000.00	6920.52	6908.73	264.99	15.89	15.87	3057.96	3025.16	93.24	
7100.00	7024.17	7012.40	264.77	16.13	16.11	3061.01	3027.70	91.89	
7200.00	7133.33	7121.57	264.54	16.39	16.37	3063.84	3030.00	90.54	
7300.00	7234.96	7223.21	264.32	16.62	16.60	3066.54	3032.19	89.29	

5D Anti-Collision Report

Secondary Well: Hackberry 18 Federal 2 (s) (TVD Relative to Kelly Bushing (Primary)) : All Azimuth Relative to GRID NORTH									
Pri MD (US ft)	TVD (US ft)	Sec MD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	CC (US ft)	ES (US ft)	SF	Risk
7400.00	7336.16	7324.43	273.45	16.83	16.81	3069.09	3034.27	88.14	
7500.00	7432.84	7421.13	323.52	17.01	16.99	3061.17	3025.92	86.84	
7600.00	7520.63	7508.93	336.78	17.17	17.15	3036.36	3000.66	85.04	
7700.00	7607.90	7596.23	341.49	17.33	17.31	2995.40	2959.27	82.91	
7800.00	7691.36	7679.72	343.19	17.49	17.47	2939.38	2902.84	80.43	
7900.00	7766.02	7754.40	343.13	17.62	17.60	2869.93	2832.98	77.67	
8000.00	7826.81	7815.22	341.31	17.73	17.71	2789.14	2751.85	74.80	
8100.00	7870.66	7859.07	336.44	17.80	17.78	2699.54	2662.00	71.90	
8200.00	7897.45	7885.87	322.65	17.85	17.83	2603.90	2566.14	68.97	
8300.00	7906.45	7894.87	268.88	17.86	17.84	2505.11	2467.22	66.11	
8400.00	7905.58	7894.01	264.85	17.86	17.84	2405.78	2367.71	63.21	
8500.00	7904.71	7893.13	265.03	17.86	17.84	2306.50	2268.27	60.34	
8600.00	7903.83	7892.25	265.20	17.86	17.84	2207.28	2168.88	57.48	
8700.00	7902.95	7891.38	265.38	17.86	17.84	2108.14	2069.53	54.61	
8800.00	7902.08	7890.51	265.56	17.85	17.83	2009.08	1970.25	51.74	
8900.00	7901.21	7889.64	265.73	17.85	17.83	1910.12	1871.04	48.87	
9000.00	7900.35	7888.77	265.91	17.85	17.83	1811.28	1771.88	45.98	
9100.00	7899.48	7887.91	266.09	17.85	17.83	1712.57	1672.80	43.06	
9200.00	7898.62	7887.04	266.26	17.85	17.83	1614.01	1573.75	40.09	
9300.00	7897.76	7886.19	266.44	17.85	17.83	1515.65	1474.82	37.13	
9400.00	7896.91	7885.33	266.61	17.84	17.83	1417.51	1376.06	34.19	
9500.00	7896.05	7884.48	266.78	17.84	17.82	1319.66	1277.48	31.29	
9600.00	7895.20	7883.62	266.96	17.84	17.82	1222.15	1179.01	28.34	
9700.00	7894.36	7882.78	267.13	17.84	17.82	1125.07	1080.70	25.35	
9800.00	7893.51	7881.93	267.30	17.84	17.82	1028.56	982.92	22.54	
9900.00	7892.67	7881.08	267.47	17.84	17.82	932.78	885.39	19.68	
10000.00	7891.82	7880.24	267.64	17.84	17.82	837.99	788.25	16.85	
10100.00	7890.99	7879.40	267.81	17.83	17.82	744.56	691.85	14.13	
10200.00	7890.15	7878.57	267.98	17.83	17.81	653.07	596.74	11.59	
10300.00	7889.32	7877.73	268.15	17.83	17.81	564.49	502.97	9.18	
10400.00	7888.48	7876.90	268.32	17.83	17.81	480.40	412.20	7.04	
10500.00	7887.66	7876.07	268.49	17.83	17.81	403.63	326.51	5.23	
10600.00	7886.84	7875.26	268.77	17.83	17.81	339.20	251.29	3.86	
10700.00	7887.06	7875.48	269.04	17.83	17.81	295.26	196.96	3.00	
10800.00	7887.39	7875.81	268.97	17.83	17.81	281.60	178.71	2.74	
10900.00	7887.72	7876.14	268.90	17.83	17.81	302.36	204.42	3.09	
11000.00	7888.05	7876.47	268.84	17.83	17.81	351.49	263.17	3.98	
11100.00	7888.38	7876.80	268.77	17.83	17.81	419.12	340.85	5.35	
11200.00	7888.70	7877.12	268.70	17.83	17.81	497.78	427.39	7.07	
11300.00	7889.03	7877.45	268.64	17.83	17.81	583.01	518.79	9.08	
11400.00	7889.35	7877.77	268.57	17.83	17.81	672.33	612.89	11.31	
11500.00	7889.68	7878.09	268.51	17.83	17.81	764.29	708.37	13.67	
11600.00	7890.00	7878.42	268.44	17.83	17.81	858.06	804.88	16.13	
11700.00	7890.32	7878.74	268.37	17.83	17.81	953.09	902.17	18.72	
11800.00	7890.64	7879.06	268.31	17.83	17.82	1049.05	999.82	21.31	
11900.00	7890.96	7879.38	268.24	17.83	17.82	1145.70	1097.86	23.95	
12000.00	7891.28	7879.70	268.18	17.84	17.82	1242.88	1196.22	26.64	
12100.00	7891.60	7880.01	268.11	17.84	17.82	1340.47	1294.84	29.38	
12200.00	7891.91	7880.33	268.05	17.84	17.82	1438.40	1393.60	32.11	
12300.00	7892.23	7880.65	267.99	17.84	17.82	1536.59	1492.39	34.77	
12332.12	7892.33	7880.75	267.96	17.84	17.82	1568.18	1524.16	35.63	

Secondary Well: Sirius 17 Federal 5H (p) (TVD Relative to Kelly Bushing (Primary)) : All Azimuth Relative to GRID NORTH									
Pri MD (US ft)	TVD (US ft)	Sec MD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	CC (US ft)	ES (US ft)	SF	Risk
0.00	1.00	0.00	89.58	0.00	0.00	50.00	49.24	65.85	
100.00	100.00	99.00	89.58	0.11	0.11	49.99	49.01	51.04	
200.00	200.00	199.00	89.58	0.34	0.34	49.99	48.56	35.01	
300.00	300.00	299.00	89.58	0.56	0.56	49.99	48.11	26.63	

5D Anti-Collision Report

Secondary Well: Sirius 17 Federal SH (p) (TVD Relative to Kelly Bushing (Primary) ; All Azimuth Relative to GRID NORTH)								
Prim MD (US/ft)	TVD (US/ft)	Sec MD (US/ft)	In-Facet (Sec (°))	S-Major (US/ft)	S-Minor (US/ft)	CC (US/ft)	IES (US/ft)	SF
400.00	400.00	399.00	89.58	0.78	0.78	49.99	47.66	21.49
500.00	500.00	499.00	89.58	1.01	1.01	49.99	47.22	18.01
600.00	600.00	599.00	89.58	1.23	1.23	49.99	46.77	15.50
700.00	700.00	699.00	89.58	1.46	1.46	49.99	46.32	13.60
800.00	800.00	799.00	89.58	1.68	1.68	49.99	45.87	12.12
900.00	900.00	899.00	89.58	1.91	1.91	49.99	45.42	10.93
1000.00	1000.00	999.00	89.58	2.13	2.13	49.99	44.97	9.95
1100.00	1100.00	1099.00	89.58	2.36	2.36	49.99	44.52	9.13
1200.00	1200.00	1199.00	89.58	2.58	2.58	49.99	44.07	8.44
1300.00	1300.00	1299.00	89.58	2.81	2.81	49.99	43.62	7.84
1400.00	1400.00	1399.00	89.58	3.03	3.03	49.99	43.17	7.33
1500.00	1500.00	1499.00	89.58	3.26	3.26	49.99	42.72	6.87
1600.00	1600.00	1599.00	89.58	3.48	3.48	49.99	42.27	6.47
1700.00	1700.00	1699.00	89.58	3.71	3.71	49.99	41.82	6.12
1800.00	1800.00	1799.00	89.58	3.93	3.93	49.99	41.37	5.80
1900.00	1900.00	1899.00	89.58	4.16	4.16	49.99	40.92	5.51
2000.00	2000.00	1999.00	89.58	4.38	4.38	49.99	40.47	5.25
2100.00	2100.00	2099.00	89.58	4.61	4.61	49.99	40.02	5.01
2200.00	2200.00	2199.00	89.58	4.83	4.83	49.99	39.57	4.80
2300.00	2300.00	2299.00	89.58	5.06	5.06	49.99	39.12	4.60
2400.00	2400.00	2399.00	89.58	5.28	5.28	49.99	38.67	4.42
2500.00	2500.00	2499.00	89.58	5.51	5.51	49.99	38.22	4.25
2600.00	2600.00	2599.00	89.58	5.73	5.73	49.99	37.77	4.09
2700.00	2700.00	2699.00	89.58	5.95	5.95	49.99	37.33	3.95
2800.00	2800.00	2799.00	89.58	6.18	6.18	49.99	36.88	3.81
2900.00	2900.00	2899.00	89.58	6.40	6.40	49.99	36.43	3.69
3000.00	3000.00	2999.00	89.58	6.63	6.63	49.99	35.98	3.57
3100.00	3100.00	3099.00	89.58	6.85	6.85	49.99	35.53	3.46
3200.00	3200.00	3199.00	89.58	7.08	7.08	49.99	35.08	3.35
3300.00	3300.00	3299.00	89.58	7.30	7.30	49.99	34.63	3.25
3400.00	3400.00	3399.00	89.58	7.53	7.53	49.99	34.18	3.16
3500.00	3500.00	3499.00	89.58	7.75	7.75	49.99	33.73	3.07
3600.00	3600.00	3599.00	89.58	7.98	7.98	49.99	33.28	2.99
3700.00	3700.00	3699.00	89.58	8.20	8.20	49.99	32.83	2.91
3800.00	3800.00	3799.00	89.58	8.43	8.43	49.99	32.38	2.84
3900.00	3900.00	3899.00	89.58	8.65	8.65	49.99	31.93	2.77
4000.00	4000.00	3999.00	89.58	8.88	8.88	49.99	31.53	2.71
4100.00	4100.00	4099.00	89.58	9.10	9.10	49.99	31.08	2.64
4200.00	4199.99	4198.99	88.79	9.33	9.33	49.97	30.62	2.58
4300.00	4299.96	4298.96	91.79	9.55	9.55	49.98	30.19	2.53
4400.00	4399.86	4398.86	96.76	9.78	9.78	50.30	30.08	2.49
4500.00	4499.68	4498.68	103.51	10.00	10.00	51.38	30.71	2.49
4600.00	4599.37	4598.37	111.62	10.22	10.22	53.76	32.63	2.54
4700.00	4698.90	4697.90	120.39	10.45	10.45	57.99	36.41	2.69
4800.00	4798.27	4797.27	129.00	10.67	10.67	64.45	42.40	2.92
4900.00	4897.57	4896.57	136.22	10.89	10.89	72.46	49.96	3.22
5000.00	4996.88	4995.88	141.95	11.12	11.12	81.39	58.50	3.56
5100.00	5096.18	5095.18	146.51	11.34	11.34	90.97	67.57	3.89
5200.00	5195.49	5194.49	150.19	11.56	11.56	101.01	77.16	4.24
5300.00	5294.79	5293.79	153.19	11.79	11.79	111.39	87.15	4.60
5400.00	5394.10	5393.10	155.68	12.01	12.01	122.02	97.28	4.93
5500.00	5493.40	5492.40	157.77	12.23	12.23	132.84	107.63	5.27
5600.00	5592.71	5591.71	159.54	12.46	12.46	143.81	118.15	5.60
5700.00	5692.01	5691.01	161.06	12.68	12.68	154.90	128.80	5.93
5800.00	5791.32	5790.32	162.38	12.90	12.90	166.08	139.56	6.26
5900.00	5890.63	5889.63	163.53	13.13	13.13	177.34	150.38	6.58
6000.00	5989.93	5988.93	164.54	13.35	13.35	188.66	161.25	6.88
6100.00	6089.24	6088.24	165.44	13.57	13.57	200.03	172.15	7.17

5D Anti-Collision Report

Secondary Well : Sirius 17 Federal 5H (p) (TVD Relative to Kelly Bushing (Primary)) : All Azimuth Relative to GRID NORTH)									
Prim MD (US.ft)	TVD (US.ft)	Sec MD (US.ft)	T Face to Sec (°)	S Major (US.ft)	S Minor (US.ft)	CC (US.ft)	ES (US.ft)	SF	Risk
6200.00	6188.54	6187.54	166.24	13.80	13.80	211.44	183.09	7.46	
6300.00	6287.85	6286.85	166.96	14.02	14.02	222.89	194.07	7.73	
6400.00	6387.15	6386.15	167.61	14.24	14.24	234.37	205.09	8.00	
6500.00	6486.46	6485.46	168.20	14.47	14.47	245.88	216.14	8.27	
6600.00	6585.76	6584.76	168.73	14.69	14.69	257.41	227.21	8.52	
6700.00	6685.07	6684.07	169.22	14.91	14.91	268.96	238.31	8.77	
6800.00	6784.37	6783.37	169.67	15.14	15.14	280.53	249.43	9.02	
6900.00	6883.68	6882.68	170.09	15.36	15.36	292.12	260.56	9.26	
7000.00	6982.98	6981.98	170.47	15.58	15.58	303.72	271.71	9.49	
7100.00	7082.29	7081.29	170.82	15.81	15.81	315.33	282.87	9.72	
7200.00	7181.60	7180.60	171.15	16.03	16.03	326.95	294.05	9.94	
7300.00	7280.90	7279.90	171.46	16.25	16.25	338.59	305.23	10.15	
7400.00	7380.21	7379.21	181.19	16.48	16.48	350.24	316.44	10.36	
7500.00	7478.86	7477.86	231.41	16.70	16.70	363.12	328.87	10.60	
7600.00	7593.59	7592.74	241.42	16.95	16.82	377.84	343.16	10.89	
7700.00	7699.77	7702.11	238.82	17.19	16.52	393.39	358.30	11.21	
7800.00	7761.17	7769.12	236.54	17.34	16.06	422.58	387.00	11.87	
7900.00	7790.99	7803.34	238.76	17.43	15.78	472.12	436.39	13.21	
8000.00	7801.21	7815.39	246.57	17.46	15.67	539.43	503.69	15.09	
8100.00	7798.88	7812.63	260.29	17.45	15.69	618.28	582.65	17.35	
8200.00	7787.85	7799.67	278.13	17.42	15.81	702.69	667.04	19.71	
8300.00	7770.26	7779.41	295.43	17.37	15.98	788.04	752.42	22.12	
8400.00	7750.84	7757.55	297.99	17.31	16.13	873.56	837.85	24.46	
8500.00	7733.85	7738.81	299.60	17.27	16.25	961.07	925.36	26.91	
8600.00	7718.93	7722.61	300.97	17.24	16.37	1050.24	1014.41	29.31	
8700.00	7705.77	7708.50	302.15	17.20	16.48	1140.78	1104.88	31.78	
8800.00	7694.11	7696.11	303.16	17.17	16.55	1232.46	1196.52	34.29	
8900.00	7683.72	7685.17	304.05	17.15	16.61	1325.08	1289.07	36.80	
9000.00	7674.42	7675.43	304.83	17.13	16.66	1418.52	1382.41	39.28	
9100.00	7666.06	7666.73	305.52	17.11	16.69	1512.64	1476.44	41.79	
9200.00	7658.50	7658.90	306.14	17.09	16.72	1607.35	1571.08	44.32	
9300.00	7651.65	7651.83	306.69	17.08	16.74	1702.56	1666.24	46.87	
9400.00	7645.41	7645.41	307.19	17.07	16.76	1798.21	1761.85	49.46	
9500.00	7639.70	7639.55	307.64	17.05	16.77	1894.25	1857.88	52.08	
9600.00	7634.47	7634.20	308.05	17.04	16.78	1990.62	1954.15	54.58	
9700.00	7629.65	7629.28	308.42	17.03	16.79	2087.28	2050.75	57.14	
9800.00	7625.20	7624.75	308.76	17.02	16.79	2184.21	2147.63	59.70	
9900.00	7621.09	7620.57	309.08	17.01	16.79	2281.37	2244.73	62.27	
10000.00	7617.27	7616.69	309.37	17.00	16.79	2378.73	2342.02	64.80	
10100.00	7613.72	7613.08	309.64	16.99	16.80	2476.28	2439.53	67.37	
10200.00	7610.40	7609.73	309.89	16.99	16.80	2574.00	2537.21	69.97	
10300.00	7607.30	7606.59	310.12	16.98	16.79	2671.87	2635.04	72.54	
10400.00	7604.40	7603.66	310.34	16.97	16.79	2769.88	2733.01	75.13	
10500.00	7601.68	7600.91	310.54	16.97	16.80	2868.00	2831.10	77.72	
10600.00	7599.12	7598.32	310.06	16.96	16.81	2966.25	2929.32	80.32	
10700.00	7596.90	7596.08	308.11	16.96	16.81	3064.71	3027.74	82.91	
10800.00	7594.82	7593.99	308.28	16.95	16.82	3163.27	3126.27	85.50	
10900.00	7592.86	7592.01	308.44	16.95	16.82	3261.91	3224.88	88.09	
11000.00	7591.00	7590.14	308.59	16.95	16.82	3360.63	3323.56	90.67	
11100.00	7589.24	7588.36	308.73	16.94	16.83	3459.41	3422.31	93.24	
11200.00	7587.57	7586.68	308.86	16.94	16.83	3558.26	3521.12	95.82	
11300.00	7585.98	7585.08	308.99	16.93	16.83	3657.16	3619.99	98.39	
11400.00	7584.47	7583.56	309.10	16.93	16.84	3756.12	3718.91	100.96	
11500.00	7583.03	7582.12	309.22	16.93	16.84	3855.13	3817.88	103.50	
11600.00	7581.66	7580.74	309.33	16.92	16.84	3954.18	3916.89	106.04	
11700.00	7580.35	7579.42	309.43	16.92	16.84	4053.28	4015.95	108.58	
11800.00	7579.10	7578.17	309.53	16.92	16.84	4152.42	4115.05	111.11	
11900.00	7577.90	7576.96	309.62	16.92	16.84	4251.60	4214.18	113.63	

5D Anti-Collision Report

Secondary Well : Sirius 17 Federal 5H (p) (TVD Relative to Kelly Bushing (Primary) : All Azimuth Relative to GRID NORTH)									Risk
Pri MD (US-ft)	TVD (US-ft)	Sec MD (US-ft)	T Face to Sec (°)	S Major (US-ft)	S Minor (US-ft)	CC (US-ft)	ES (US-ft)	SF	
12000.00	7576.75	7575.81	309.71	16.91	16.85	4350.81	4313.35	116.15	
12100.00	7575.65	7574.71	309.80	16.91	16.85	4450.05	4412.55	118.67	
12200.00	7574.60	7573.65	309.88	16.91	16.85	4549.33	4511.79	121.18	
12300.00	7573.59	7572.64	309.96	16.91	16.85	4648.64	4611.05	123.69	
12332.12	7573.27	7572.32	309.98	16.91	16.85	4680.54	4642.94	124.49	

Secondary Well : Arcturus 18 Fed 1H (s) (TVD Relative to Kelly Bushing (Primary) : All Azimuth Relative to GRID NORTH)									Risk
Pri MD (US-ft)	TVD (US-ft)	Sec MD (US-ft)	T Face to Sec (°)	S Major (US-ft)	S Minor (US-ft)	CC (US-ft)	ES (US-ft)	SF	
0.00	-0.07	2.93	5.61	0.02	0.02	437.97	437.27	619.31	
100.00	97.69	100.69	5.59	0.14	0.14	438.25	437.32	470.92	
200.00	197.47	200.47	5.56	0.40	0.40	438.80	437.38	309.58	
300.00	297.47	300.48	5.53	0.66	0.66	439.37	437.47	230.53	
400.00	397.14	400.14	5.49	0.93	0.93	439.99	437.60	183.93	
500.00	497.11	500.12	5.47	1.18	1.18	440.64	437.77	153.43	
600.00	597.30	600.31	5.50	1.42	1.42	441.28	437.94	132.35	
700.00	697.47	700.49	5.55	1.64	1.64	441.87	438.09	117.07	
800.00	797.99	801.01	5.65	1.84	1.84	442.38	438.18	105.36	
900.00	897.81	900.83	5.76	2.04	2.04	442.85	438.23	95.83	
1000.00	997.96	1000.99	5.88	2.25	2.25	443.33	438.27	87.67	
1100.00	1097.83	1100.86	6.04	2.46	2.46	443.80	438.30	80.70	
1200.00	1197.12	1200.17	6.20	2.69	2.69	444.37	438.43	74.75	
1300.00	1296.92	1299.98	6.40	2.92	2.92	445.04	438.64	69.52	
1400.00	1394.74	1397.83	6.67	3.15	3.15	445.98	439.12	65.05	
1500.00	1494.00	1497.13	7.01	3.39	3.39	447.24	439.91	61.04	
1600.00	1593.13	1596.32	7.40	3.63	3.63	448.68	440.89	57.59	
1700.00	1692.15	1695.40	7.82	3.88	3.88	450.31	442.06	54.55	
1800.00	1791.22	1794.56	8.28	4.13	4.13	452.16	443.42	51.76	
1900.00	1890.11	1893.55	8.79	4.38	4.37	454.22	445.00	49.30	
2000.00	1990.25	1993.80	9.30	4.64	4.63	456.38	446.69	47.06	
2100.00	2090.74	2094.37	9.74	4.90	4.89	458.46	448.28	45.03	
2200.00	2191.53	2195.22	10.11	5.16	5.15	460.40	449.73	43.16	
2300.00	2291.21	2294.96	10.41	5.37	5.36	462.32	451.22	41.66	
2400.00	2391.72	2395.49	10.42	5.40	5.39	464.15	452.81	40.92	
2500.00	2492.94	2496.81	9.89	5.42	5.39	465.81	454.21	40.14	
2600.00	2594.77	2598.87	9.08	5.44	5.40	467.13	455.28	39.42	
2700.00	2695.76	2700.17	8.12	5.48	5.43	468.14	456.02	38.63	
2800.00	2796.82	2801.56	7.13	5.53	5.48	468.94	456.57	37.91	
2900.00	2898.16	2903.21	6.16	5.60	5.53	469.47	456.80	37.05	
3000.00	2999.47	3004.84	5.19	5.66	5.58	469.72	456.78	36.30	
3100.00	3098.50	3104.19	4.21	5.74	5.65	469.84	456.60	35.47	
3200.00	3197.64	3203.71	3.14	5.83	5.72	470.36	456.79	34.65	
3300.00	3297.41	3303.85	2.11	5.93	5.80	470.78	456.87	33.85	
3400.00	3401.64	3408.26	1.36	6.03	5.90	471.21	456.98	33.10	
3500.00	3500.30	3506.98	1.00	6.12	6.00	470.57	456.01	32.33	
3600.00	3597.78	3604.46	1.00	6.21	6.09	470.97	456.11	31.68	
3700.00	3698.80	3705.48	1.04	6.31	6.19	471.35	456.17	31.03	
3800.00	3797.50	3804.18	1.05	6.41	6.29	471.68	456.17	30.40	
3900.00	3897.63	3904.31	1.10	6.51	6.40	472.25	456.41	29.81	
4000.00	4000.47	4007.16	1.16	6.63	6.51	472.48	456.35	29.28	
4100.00	4100.09	4106.78	1.21	6.74	6.63	472.40	455.93	28.68	
4200.00	4199.84	4206.53	359.48	6.86	6.75	471.53	454.72	28.05	
4300.00	4298.85	4305.54	359.49	6.98	6.88	469.06	451.91	27.34	
4400.00	4399.31	4406.00	359.53	7.11	7.01	464.85	447.34	26.55	
4500.00	4497.71	4504.40	359.54	7.24	7.14	459.04	441.18	25.71	
4600.00	4597.94	4604.64	359.60	7.37	7.28	451.61	433.41	24.81	
4700.00	4698.47	4705.16	359.67	7.51	7.42	442.13	423.54	23.78	
4800.00	4796.03	4802.73	359.76	7.65	7.56	431.18	412.22	22.74	
4900.00	4895.43	4902.13	359.86	7.79	7.70	420.05	400.76	21.78	

5D Anti-Collision Report

Secondary Well : Arcturus 18 Fed 1H(s) (TVD Relative to Kelly Bushing (Primary) : All Azimuth Relative to GRID NORTH)								
BrkMD (US/ft)	TVD (US/ft)	SecMD (US/ft)	If Face to Sec (°)	S Major (US/ft)	S Minor (US/ft)	IGC (US/ft)	IES (US/ft)	Risk
5000.00	4997.54	5004.25	359.98	7.94	7.86	408.45	388.76	20.75
5100.00	5096.40	5103.11	0.15	8.09	8.01	396.39	376.32	19.75
5200.00	5194.74	5201.47	0.39	8.24	8.16	384.83	364.39	18.82
5300.00	5292.91	5299.66	0.72	8.39	8.31	373.29	352.47	17.93
5400.00	5390.74	5397.51	1.03	8.54	8.47	362.30	341.10	17.09
5500.00	5489.27	5496.06	1.34	8.69	8.62	351.58	330.00	16.30
5600.00	5588.48	5595.29	1.62	8.85	8.79	341.04	319.09	15.53
5700.00	5687.83	5694.65	1.86	9.01	8.95	330.52	308.18	14.79
5800.00	5788.71	5795.54	2.18	9.18	9.12	319.85	297.12	14.07
5900.00	5887.37	5894.22	2.51	9.34	9.29	308.96	285.85	13.37
6000.00	5985.45	5992.32	2.89	9.51	9.45	298.47	274.98	12.71
6100.00	6085.58	6092.46	3.27	9.68	9.63	288.12	264.24	12.06
6200.00	6184.97	6191.87	3.68	9.85	9.80	277.65	253.36	11.43
6300.00	6284.53	6291.45	4.07	10.02	9.98	267.17	242.48	10.82
6400.00	6384.52	6391.44	4.39	10.20	10.16	256.55	231.46	10.22
6500.00	6484.24	6491.17	4.74	10.37	10.33	245.83	220.32	9.64
6600.00	6584.51	6591.44	5.16	10.55	10.51	234.72	208.79	9.05
6700.00	6682.74	6689.68	5.56	10.73	10.69	223.77	197.42	8.49
6800.00	6781.99	6788.94	6.12	10.91	10.87	213.31	186.54	7.97
6900.00	6883.45	6890.40	6.69	11.09	11.05	202.23	175.04	7.44
7000.00	6984.58	6991.54	6.82	11.28	11.24	190.17	162.57	6.89
7100.00	7084.42	7091.39	6.95	11.46	11.43	177.36	149.35	6.33
7200.00	7183.12	7190.11	7.10	11.64	11.61	164.59	136.18	5.79
7300.00	7282.73	7289.73	7.21	11.83	11.79	151.98	123.15	5.27
7400.00	7382.01	7389.03	16.82	12.01	11.98	138.98	109.72	4.75
7500.00	7481.89	7488.93	73.16	12.20	12.16	127.90	98.28	4.32
7600.00	7578.11	7585.18	100.17	12.38	12.34	124.21	93.94	4.10
7700.00	7667.23	7674.35	121.30	12.54	12.51	139.25	108.12	4.47
7800.00	7747.83	7754.99	136.58	12.69	12.66	179.24	147.43	5.63
7900.00	7817.19	7824.40	145.97	12.82	12.79	240.81	208.49	7.45
8000.00	7873.75	7880.99	150.63	12.93	12.90	318.15	285.50	9.74
8100.00	7914.22	7921.49	150.64	13.01	12.98	406.46	373.66	12.39
8200.00	7938.28	7945.56	141.95	13.05	13.02	501.87	468.91	15.23
8300.00	7945.71	7953.00	85.94	13.07	13.04	600.82	567.79	18.19
8400.00	7944.04	7951.33	78.84	13.06	13.04	700.48	667.41	21.18
8500.00	7942.37	7949.66	77.13	13.06	13.03	800.21	767.15	24.20
8600.00	8823.73	9553.86	179.28	28.39	13.55	891.09	864.99	34.15
8700.00	8823.08	9632.34	179.39	30.24	13.84	892.64	865.85	33.31
8800.00	8823.63	9731.80	179.56	32.63	14.22	895.57	867.98	32.47
8900.00	8822.41	9851.81	179.55	35.59	14.65	896.90	868.47	31.55
9000.00	8821.30	9943.23	179.53	37.89	15.06	898.09	868.78	30.65
9100.00	8820.21	10046.26	179.51	40.51	15.53	899.43	869.18	29.73
9200.00	8818.39	10161.34	179.47	43.46	16.02	900.33	869.10	28.84
9300.00	8814.01	10271.18	179.34	46.30	16.54	898.71	866.45	27.86
9400.00	8810.15	10371.22	179.26	48.91	17.06	897.27	863.94	26.93
9500.00	8805.82	10474.76	179.17	51.63	17.60	895.51	861.08	26.01
9600.00	8802.09	10566.76	179.10	54.05	18.11	893.89	858.38	25.17
9700.00	8798.62	10668.14	179.02	56.74	18.66	892.89	856.31	24.41
9800.00	8795.90	10755.94	178.95	59.07	19.16	892.23	854.54	23.67
9900.00	8793.60	10859.04	178.87	61.82	19.75	892.44	853.52	22.93
10000.00	8790.51	10964.21	178.76	64.62	20.36	891.93	851.80	22.22
10100.00	8788.78	11044.71	178.71	66.80	20.84	892.23	850.97	21.63
10200.00	8788.02	11144.49	178.70	69.47	21.44	893.87	851.39	21.04
10300.00	8787.50	11236.18	178.75	71.93	22.00	895.69	852.08	20.54
10400.00	8787.47	11338.55	178.89	74.67	22.62	898.03	853.13	20.00
10500.00	8787.05	11440.96	179.01	77.44	23.26	899.99	853.79	19.48
10600.00	8786.19	11545.58	179.12	80.26	23.92	901.53	854.01	18.97
10700.00	8784.95	11648.46	179.25	83.04	24.57	901.67	852.83	18.46

5D Anti-Collision Report

Secondary Well : Arcturus 18 Fed 1H (s) (TVD Relative to Kelly Bushing (Primary) : All Azimuth Relative to GRID NORTH)								
Prim MD (US ft)	TVD (US ft)	Sec MD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	CC (US ft)	ES (US ft)	SF
10800.00	8783.25	11752.61	179.38	85.85	25.24	901.26	851.10	17.97
10900.00	8781.04	11859.16	179.55	88.73	25.92	900.42	848.92	17.48
11000.00	8776.69	11980.40	179.68	92.03	26.69	898.11	845.20	16.97
11100.00	8772.59	12067.33	179.77	94.33	27.27	894.70	840.51	16.51
11200.00	8769.97	12162.45	180.07	96.85	27.90	893.16	837.66	16.09
11300.00	8767.34	12255.17	180.40	99.32	28.51	891.63	834.82	15.70
11400.00	8765.48	12355.64	180.75	102.12	29.18	891.08	832.92	15.32
11500.00	8762.37	12466.45	181.07	105.02	29.91	889.59	829.93	14.91
11600.00	8760.07	12550.42	181.39	107.37	30.48	888.25	827.23	14.55
11700.00	8758.83	12648.65	181.65	110.05	31.14	888.36	825.81	14.20
11800.00	8757.78	12741.51	181.84	112.63	31.77	888.58	824.59	13.89
11900.00	8757.17	12845.18	181.89	115.45	32.47	889.28	823.85	13.59
12000.00	8755.46	12955.95	181.95	118.47	33.23	889.01	822.08	13.28
12100.00	8752.65	13063.95	182.02	121.42	33.96	887.70	819.28	12.97
12200.00	8748.66	13173.77	182.12	124.41	34.71	885.38	815.43	12.66
12300.00	8744.10	13275.00	182.22	127.17	35.40	882.17	810.76	12.35
12332.12	8744.10	13275.00	182.22	127.17	35.40	881.78	810.12	12.31

Secondary Well : Sirius 17 Fed 1H (s) (TVD Relative to Kelly Bushing (Primary) : All Azimuth Relative to GRID NORTH)								
Prim MD (US ft)	TVD (US ft)	Sec MD (US ft)	T Face to Sec (°)	S Major (US ft)	S Minor (US ft)	CC (US ft)	ES (US ft)	SF
0.00	-0.01	2.59	6.38	0.02	0.02	388.31	387.61	552.66
100.00	99.43	102.03	6.31	0.12	0.12	388.39	387.47	424.59
200.00	199.73	202.33	6.20	0.32	0.32	388.50	387.15	289.41
300.00	300.01	302.61	6.10	0.53	0.53	388.53	386.76	218.85
400.00	401.20	403.81	5.97	0.75	0.75	388.38	386.16	174.85
500.00	502.71	505.33	5.78	0.98	0.98	387.87	385.21	145.28
600.00	604.16	606.79	5.57	1.20	1.20	386.98	383.86	124.26
700.00	704.42	707.07	5.37	1.42	1.42	385.87	382.31	108.46
800.00	804.74	807.41	5.21	1.63	1.62	384.67	380.68	96.42
900.00	904.31	906.99	5.09	1.83	1.82	383.50	379.09	86.96
1000.00	1004.85	1007.54	5.03	2.04	2.03	382.29	377.45	79.00
1100.00	1103.91	1106.60	5.03	2.24	2.23	381.15	375.88	72.35
1200.00	1203.65	1206.34	5.05	2.44	2.44	380.15	374.46	66.80
1300.00	1302.62	1305.32	5.13	2.65	2.65	379.32	373.20	61.94
1400.00	1400.79	1403.49	5.28	2.86	2.84	378.87	372.33	57.91
1500.00	1499.44	1502.16	5.49	3.06	3.05	378.84	371.86	54.28
1600.00	1598.47	1601.21	5.77	3.27	3.26	379.12	371.70	51.09
1700.00	1697.87	1700.63	6.11	3.48	3.48	379.60	371.74	48.28
1800.00	1797.38	1800.17	6.47	3.70	3.69	380.22	371.92	45.80
1900.00	1896.21	1899.03	6.87	3.91	3.91	381.07	372.32	43.58
2000.00	1996.44	1999.31	7.30	4.13	4.13	382.03	372.84	41.58
2100.00	2096.65	2099.57	7.75	4.34	4.34	382.94	373.31	39.80
2200.00	2196.05	2199.02	8.19	4.55	4.55	383.89	373.84	38.20
2300.00	2296.17	2299.18	8.59	4.76	4.75	384.90	374.42	36.72
2400.00	2396.59	2399.64	8.94	4.96	4.95	385.84	374.93	35.35
2500.00	2496.99	2500.06	9.26	5.16	5.15	386.67	375.32	34.07
2600.00	2596.10	2599.20	9.58	5.37	5.36	387.57	375.80	32.93
2700.00	2696.32	2699.45	9.90	5.58	5.57	388.54	376.32	31.79
2800.00	2796.22	2799.37	10.21	5.79	5.78	389.50	376.86	30.80
2900.00	2896.05	2899.22	10.47	5.99	5.98	390.49	377.43	29.89
3000.00	2996.41	2999.60	10.68	6.20	6.19	391.46	377.95	28.97
3100.00	3097.66	3100.86	10.85	6.41	6.40	392.22	378.27	28.11
3200.00	3197.60	3200.81	11.00	6.62	6.61	392.82	378.44	27.31
3300.00	3298.00	3301.22	11.15	6.84	6.82	393.38	378.56	26.54
3400.00	3397.32	3400.54	11.29	7.04	7.03	393.97	378.72	25.84
3500.00	3497.20	3500.43	11.42	7.25	7.23	394.67	378.99	25.18
3600.00	3597.21	3600.44	11.51	7.46	7.44	395.38	379.28	24.56
3700.00	3697.86	3701.09	11.58	7.67	7.65	396.00	379.47	23.96

5D Anti-Collision Report

Secondary Well: Sirius 17 Fed 1H (s) (TVD Relative to Kelly Bushing (Primary)) : All Azimuth Relative to GRID NORTH)									
Prim MD (US/ft)	TVD (US/ft)	Sec MD (US/ft)	Face to Sec (s)	S-Major (US/ft)	S-Minor (US/ft)	CC (US/ft)	ES (US/ft)	SF	Risk
3800.00	3797.53	3800.76	11.65	7.88	7.86	396.58	379.62	23.38	
3900.00	3897.94	3901.18	11.71	8.09	8.07	397.15	379.75	22.82	
4000.00	3998.35	4001.60	11.78	8.30	8.28	397.62	379.82	22.34	
4100.00	4097.58	4100.83	11.83	8.51	8.49	398.13	379.89	21.83	
4200.00	4196.40	4199.65	10.11	8.72	8.69	398.02	379.35	21.32	
4300.00	4294.67	4297.92	10.20	8.92	8.90	396.56	377.46	20.76	
4400.00	4394.85	4398.11	10.33	9.13	9.11	393.58	374.05	20.15	
4500.00	4494.88	4498.15	10.48	9.34	9.32	388.83	368.88	19.49	
4600.00	4594.70	4597.98	10.70	9.55	9.53	382.34	361.98	18.78	
4700.00	4694.97	4698.25	11.02	9.76	9.74	374.06	353.24	17.97	
4800.00	4794.54	4797.83	11.45	9.97	9.95	364.03	342.76	17.11	
4900.00	4895.28	4898.58	11.98	10.18	10.16	353.34	331.64	16.28	
5000.00	4994.28	4997.58	12.58	10.39	10.37	342.54	320.42	15.49	
5100.00	5093.76	5097.07	13.23	10.60	10.58	331.81	309.26	14.72	
5200.00	5193.33	5196.66	13.96	10.81	10.79	321.06	298.08	13.97	
5300.00	5292.31	5295.65	14.78	11.02	11.00	310.39	286.96	13.25	
5400.00	5391.09	5394.44	15.61	11.23	11.20	299.93	276.06	12.57	
5500.00	5490.06	5493.43	16.46	11.44	11.41	289.69	265.38	11.92	
5600.00	5589.57	5592.95	17.34	11.65	11.62	279.56	254.83	11.30	
5700.00	5688.80	5692.19	18.25	11.86	11.82	269.50	244.31	10.70	
5800.00	5788.01	5791.41	19.17	12.06	12.03	259.57	233.93	10.12	
5900.00	5887.46	5890.87	20.10	12.27	12.24	249.75	223.65	9.57	
6000.00	5987.76	5991.17	21.12	12.48	12.45	239.82	213.29	9.04	
6100.00	6088.30	6091.72	22.23	12.69	12.66	229.54	202.58	8.51	
6200.00	6187.95	6191.37	23.39	12.90	12.87	219.00	191.64	8.00	
6300.00	6288.00	6291.42	24.63	13.11	13.08	208.35	180.55	7.49	
6400.00	6387.10	6390.52	25.96	13.32	13.28	197.66	169.36	6.98	
6500.00	6486.45	6489.87	27.44	13.52	13.49	187.15	158.37	6.50	
6600.00	6585.18	6588.60	29.11	13.73	13.70	176.92	147.67	6.05	
6700.00	6683.95	6687.37	30.97	13.94	13.91	167.21	137.53	5.63	
6800.00	6783.37	6786.80	32.94	14.14	14.11	157.88	127.78	5.24	
6900.00	6882.86	6886.29	35.14	14.35	14.32	148.70	118.08	4.86	
7000.00	6983.15	6986.58	37.71	14.56	14.53	139.46	108.33	4.48	
7100.00	7081.52	7084.95	40.67	14.77	14.74	130.45	98.89	4.13	
7200.00	7180.33	7183.77	44.07	14.98	14.95	122.57	90.49	3.82	
7300.00	7279.44	7282.88	48.20	15.18	15.15	115.54	82.92	3.54	
7400.00	7378.72	7382.18	62.45	15.39	15.36	109.46	76.33	3.30	
7500.00	7478.01	7481.47	120.56	15.60	15.57	113.28	79.60	3.36	
7600.00	7572.70	7576.16	143.12	15.80	15.77	135.13	100.84	3.94	
7700.00	7659.91	7663.38	155.54	15.98	15.95	176.49	141.69	5.07	
7800.00	7737.43	7740.93	162.92	16.15	16.11	235.31	200.13	6.69	
7900.00	7803.22	7806.75	167.43	16.28	16.25	308.41	272.87	8.68	
8000.00	7856.83	7860.39	170.34	16.40	16.36	392.58	356.83	10.98	
8100.00	7895.18	7898.75	172.32	16.48	16.44	484.85	448.93	13.50	
8200.00	7917.28	7920.86	174.21	16.53	16.49	582.36	546.30	16.15	
8300.00	7921.84	7925.42	349.44	16.54	16.50	682.14	646.09	18.93	
8400.00	7916.55	7920.13	351.40	16.53	16.49	782.00	745.96	21.70	
8500.00	7911.17	7914.75	352.46	16.51	16.48	881.87	845.81	24.45	
8600.00	7905.73	7909.31	353.30	16.50	16.46	981.74	945.67	27.22	
8700.00	7900.22	7903.79	353.99	16.49	16.45	1081.60	1045.54	30.00	
8800.00	7894.69	7898.27	354.56	16.48	16.44	1181.46	1145.41	32.78	
8900.00	7889.24	7892.81	355.03	16.47	16.43	1281.32	1245.29	35.56	
9000.00	7883.74	7887.31	355.44	16.46	16.42	1381.18	1345.16	38.34	
9100.00	7878.21	7881.77	355.79	16.44	16.41	1481.04	1445.03	41.13	
9200.00	7872.64	7876.20	356.10	16.43	16.40	1580.90	1544.87	43.88	
9300.00	7867.02	7870.58	356.36	16.42	16.38	1680.76	1644.71	46.63	
9400.00	7861.37	7864.93	356.60	16.41	16.37	1780.62	1744.55	49.37	
9500.00	7855.68	7859.23	356.82	16.40	16.36	1880.47	1844.39	52.11	

5D Anti-Collision Report

Secondary Well	Sirius 17 Fed 1H (s)	(TVD Relative to Kelly Bushing (Primary))	All Azimuth Relative to GRID NORTH)						
P/MD (US/ft)	TVD (US/ft)	SecMD (US/ft)	Tr Face to Sec (°)	S-Major (US/ft)	S-Minor (US/ft)	GC (US/ft)	ES (US/ft)	SF	Risk
9600.00	7849.95	7853.50	357.01	16.38	16.35	1980.33	1944.24	54.87	
9700.00	7844.17	7847.72	357.18	16.37	16.34	2080.18	2044.12	57.69	
9800.00	7838.36	7841.90	357.34	16.36	16.32	2180.04	2143.97	60.44	
9900.00	7832.50	7836.04	357.48	16.35	16.31	2279.89	2243.81	63.19	
10000.00	7826.60	7830.14	357.62	16.33	16.30	2379.74	2343.63	65.90	
10100.00	7820.66	7824.20	357.74	16.32	16.29	2479.59	2443.43	68.57	
10200.00	7814.67	7818.21	357.85	16.31	16.27	2579.44	2543.28	71.33	
10300.00	7808.64	7812.17	357.95	16.30	16.26	2679.29	2643.13	74.09	
10400.00	7802.57	7806.10	358.04	16.28	16.25	2779.14	2742.96	76.83	
10500.00	7796.45	7799.98	358.13	16.27	16.23	2878.98	2842.80	79.57	
10600.00	7791.85	7795.37	358.10	16.26	16.22	2978.83	2942.64	82.31	
10700.00	7788.15	7791.67	357.80	16.25	16.22	3078.73	3042.51	85.01	
10800.00	7784.58	7788.10	357.86	16.24	16.21	3178.63	3142.39	87.71	
10900.00	7781.05	7784.57	357.93	16.24	16.20	3278.54	3242.28	90.41	
11000.00	7777.56	7781.07	357.98	16.23	16.20	3378.45	3342.16	93.10	
11100.00	7774.10	7777.62	358.04	16.22	16.19	3478.36	3442.05	95.79	
11200.00	7770.69	7774.20	358.09	16.22	16.18	3578.27	3541.93	98.47	
11300.00	7767.31	7770.82	358.14	16.21	16.17	3678.18	3641.81	101.15	
11400.00	7763.97	7767.48	358.18	16.20	16.17	3778.09	3741.70	103.82	
11500.00	7760.66	7764.17	358.23	16.19	16.16	3878.00	3841.58	106.48	
11600.00	7757.39	7760.90	358.27	16.19	16.15	3977.92	3941.47	109.13	
11700.00	7754.15	7757.66	358.31	16.18	16.15	4077.83	4041.35	111.77	
11800.00	7750.95	7754.46	358.34	16.17	16.14	4177.75	4141.23	114.41	
11900.00	7747.78	7751.29	358.38	16.17	16.13	4277.66	4241.11	117.04	
12000.00	7744.65	7748.15	358.41	16.16	16.13	4377.58	4341.00	119.66	
12100.00	7741.55	7745.05	358.45	16.15	16.12	4477.50	4440.88	122.27	
12200.00	7738.48	7741.98	358.48	16.15	16.11	4577.42	4540.76	124.88	
12300.00	7735.44	7738.94	358.50	16.14	16.11	4677.34	4640.65	127.48	
12332.12	7734.47	7737.97	358.51	16.14	16.11	4709.44	4672.73	128.31	

**Weatherford****Weatherford Drilling Services**

GeoDec4 v2.0.0.3

Report Date: August 12, 2014
Job Number: _____
Customer: Devon Energy
Well Name: Arcturus 18 Federal 5H
API Number: _____
Rig Name: _____
Location: Eddy Co, NM Nad83 NME
Block: _____
Engineer: RWJ

NAD83 / New Mexico East (ftUS)

NAD83 (1986)

Projected Coordinate System

Geodetic Coordinate System

Datum: North American Datum 1983 (1986)

Datum: North American Datum 1983 (1986)

Ellipsoid: GRS 1980

Ellipsoid: GRS 1980

EPSG: 2257

EPSG: 4269

North: 606050.34 US Survey Foot

Latitude: 32.665333 Degree

East: 674416.70 US Survey Foot

Longitude: -103.900879 Degree

Convergence: 0.23°

Declination: 7.53°

Total Correction: 7.30°

Datum Transformation: none

Geodetic Location WGS84

MSL Elevation = 0 m

Latitude = 32° 39' 55.20" N

Longitude = 103° 54' 03.16" W

Magnetic Declination = 7.53 deg

[True North Offset]

Local Gravity = .9988 g

Checksum = 6588

Local Field Strength = 48494 nT

Magnetic Vector X = 23710 nT

Magnetic Dip = 60.45 deg

Magnetic Vector Y = 3136 nT

Magnetic Model = bggm2014.dat

Magnetic Vector Z = 42186 nT

Run Date = October 15, 2014

Magnetic Vector H = 23916 nT

Signed: _____

Date: _____

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**PECOS DISTRICT
CONDITIONS OF APPROVAL**

OPERATOR'S NAME:	Devon Energy Production Company, LP.
LEASE NO.:	NMLC-069464A
WELL NAME & NO.:	Arcturus 18 Federal 5H
SURFACE HOLE FOOTAGE:	2080' FSL & 0070' FWL
BOTTOM HOLE FOOTAGE:	2080' FSL & 0340' FEL
LOCATION:	Section 18, T. 19 S., R 31 E., NMPM
COUNTY:	Eddy County, New Mexico

The original COAs still stand with the following drilling modifications:

I. DRILLING

A. DRILLING OPERATIONS REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ **Eddy County**

Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,
(575) 361-2822

1. **Hydrogen Sulfide (H₂S) monitors shall be installed prior to drilling out the surface shoe. If H₂S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.**
2. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a “Major” violation.**
3. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works is located, this does not include the dog house or stairway area.

4. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

B. CASING

Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.

Centralizers required on surface casing per Onshore Order 2.III.B.1.f.

Wait on cement (WOC) time prior to drilling out for a primary cement job will be a minimum 18 hours for a water basin, 24 hours in the potash area, or 500 pounds compressive strength, whichever is greater for all casing strings. DURING THIS WOC TIME, NO DRILL PIPE, ETC. SHALL BE RUN IN THE HOLE. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. IF OPERATOR DOES NOT HAVE THE WELL SPECIFIC CEMENT DETAILS ONSITE PRIOR TO PUMPING THE CEMENT FOR EACH CASING STRING, THE WOC WILL BE 30 HOURS. See individual casing strings for details regarding lead cement slurry requirements.

No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.

Capitan Reef

Secretary's Potash

Medium Cave/Karst

Possibility of water and brine flows in the Artesia and Salado Groups.

Possibility of lost circulation in the Artesia Group and Capitan Reef.

1. The **20 inch** surface casing shall be set at approximately **520 feet (in a competent bed below the Magenta Dolomite, which is a Member of the Rustler, and if salt is encountered, set casing at least 25 feet above the salt)** and cemented to the surface.
 - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.
 - b. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry.**
 - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.
 - d. If cement falls back, remedial cementing will be done prior to drilling out that string.
2. The minimum required fill of cement behind the **13-3/8 inch 1st** intermediate casing is:
☒ Cement to surface. If cement does not circulate see B.1.a, c-d above. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to Potash and cave/karst.**
3. The minimum required fill of cement behind the **9-5/8 inch 2nd** intermediate casing, which shall be set at approximately **4000 feet**, is:

Operator has proposed DV tool at depth of 2500', but will adjust cement proportionately if moved. DV tool shall be set a minimum of 50' below previous shoe and a minimum of 200' above current shoe. Operator shall submit sundry if DV tool depth cannot be set in this range. If an ECP is used, it is to be set a minimum of 50' below the shoe to provide cement across the shoe. If it cannot be set below the shoe, a CBL shall be run to verify cement coverage.

- a. First stage to DV tool:

- ☒ Cement to circulate. If cement does not circulate, contact the appropriate BLM office before proceeding with second stage cement job. Operator should have plans as to how they will achieve circulation on the next stage.

b. Second stage above DV tool:

- ☒ Cement to surface. If cement does not circulate see B.1.a, c-d above. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to Capitan Reef and Potash. Excess calculates to 3% - Additional cement may be required.**

Centralizers required on horizontal leg, must be type for horizontal service and a minimum of one every other joint.

Production Casing Option #1:

4. The minimum required fill of cement behind the **5-1/2** inch production casing is:

Operator has proposed DV tool at depth of 5000', but will adjust cement proportionately if moved. DV tool shall be set a minimum of 50' below previous shoe and a minimum of 200' above current shoe. Operator shall submit sundry if DV tool depth cannot be set in this range.

a. First stage to DV tool:

- ☒ Cement to circulate. If cement does not circulate, contact the appropriate BLM office before proceeding with second stage cement job. Operator should have plans as to how they will achieve approved top of cement on the next stage. **Excess calculates to 10% - Additional cement may be required.**

b. Second stage above DV tool:

- ☒ Cement should tie-back at least **50 feet above the Capitan Reef**. Operator shall provide method of verification. **Excess calculates to 1% - Additional cement may be required.**

Production Casing Option #2:

5. The minimum required fill of cement behind the **7 X 5-1/2** inch production casing is:

- ☒ Cement should tie-back at least **50 feet above the Capitan Reef**. Operator shall provide method of verification. **Excess calculates to 7% - Additional cement may be required.**

6. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

C. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. Variance approved to use flex line from BOP to choke manifold. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. **Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.** If the BLM inspector questions the straightness of the hose, a BLM engineer will be contacted and will review in the field or via picture supplied by inspector to determine if changes are required (operator shall expect delays if this occurs).
3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **2000 (2M)** psi.
 - a. **For surface casing only:** If the BOP/BOPE is to be tested against casing, the wait on cement (WOC) time for that casing is to be met (see WOC statement at start of casing section). Independent service company required.
4. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the **13-3/8 1st** intermediate casing shoe shall be **3000 (3M)** psi.
5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
 - a. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time.
 - b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (18 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).

- c. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock.
- d. The results of the test shall be reported to the appropriate BLM office.
- e. All tests are required to be recorded on a calibrated test chart. **A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.**
- f. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.

D. DRILL STEM TEST

If drill stem tests are performed, Onshore Order 2.III.D shall be followed.

E. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

JAM 101414