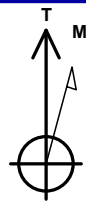


Occidental Petroleum

Project: Weld County, CO (UTM-NAD83)
 Site: 4N-68W-11 (S&B 5-11HZ Pad)
 Well: Shake 11-12HZ
 Wellbore: OH
 Design: OH



Azimuths to True North
 Magnetic North: 7.98°

Magnetic Field
 Strength: 51922.6nT
 Dip Angle: 66.58°
 Date: 3/8/2021
 Model: IGRF2020

PROJECT DETAILS: Weld County, CO (UTM-NAD83)

Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: Zone 13N (108 W to 102 W)

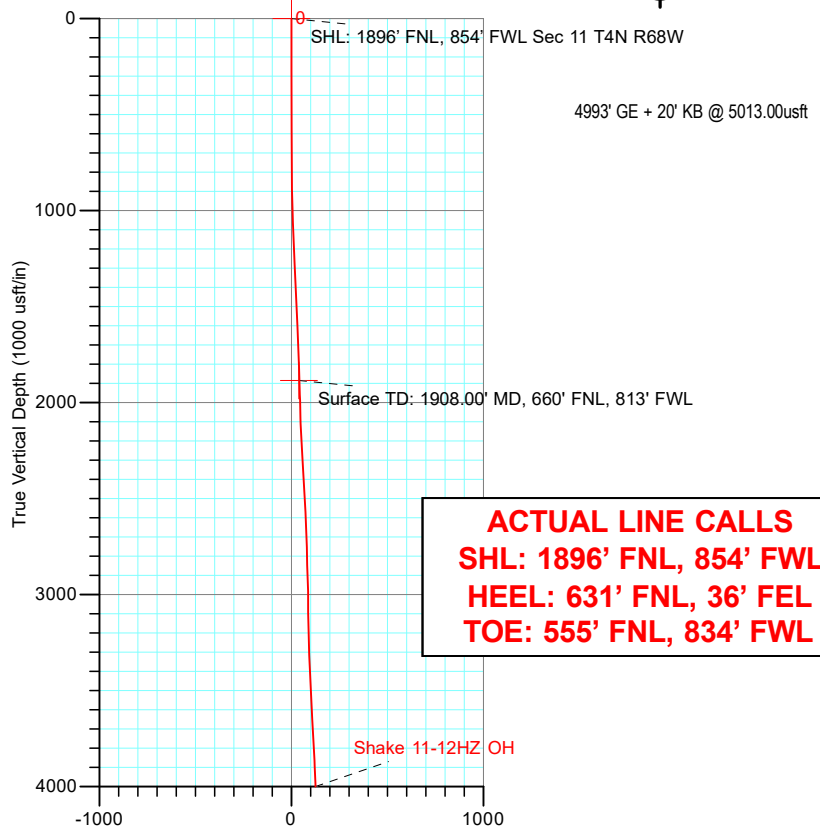


DESIGN TARGET DETAILS

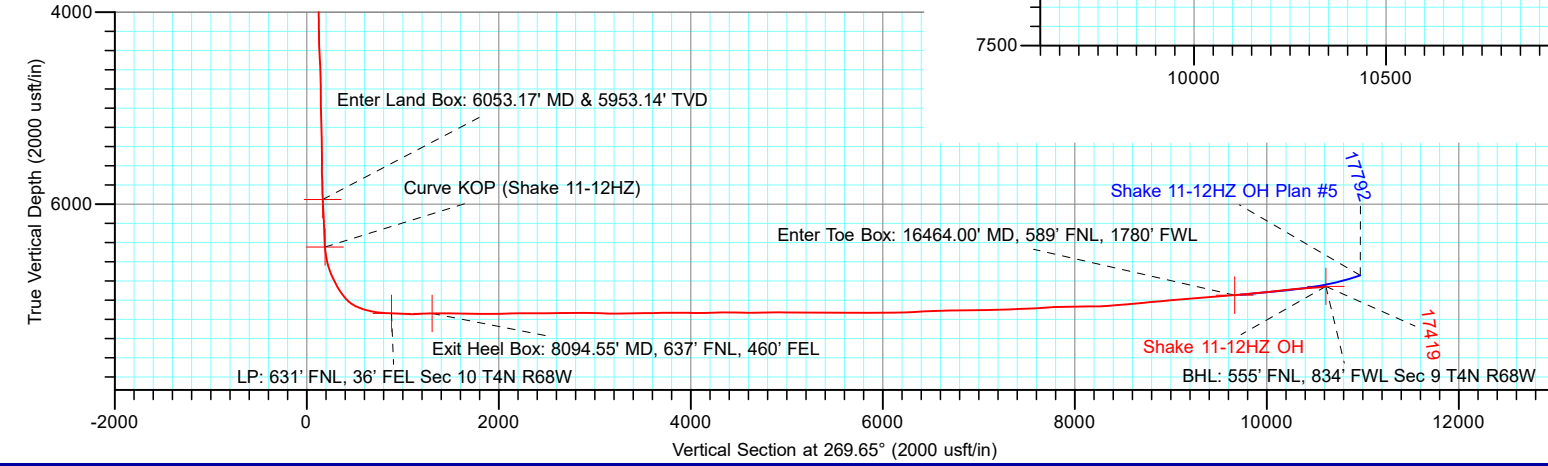
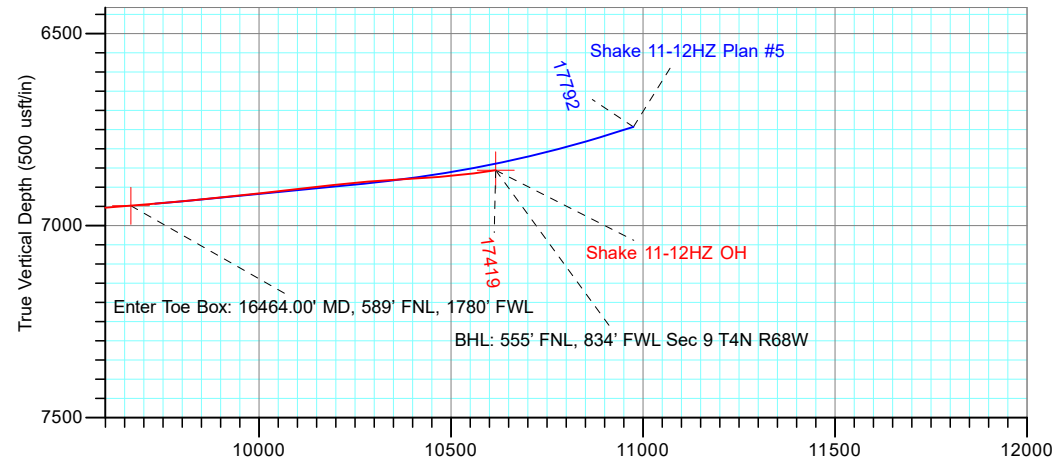
Name	TVD	+N/-S	+E/-W	Latitude	Longitude
BHL: 555' FNL, 834' FWL Sec 9 T4N R68W	6856.35	1190.75	-10624.20	40.333581	-105.014838
Curve KOP (Shake 11-12HZ)	6447.88	1109.43	-197.33	40.333364	-104.977423
Enter Land Box: 6053.17' MD & 5953.14' TVD	5953.14	1023.89	-172.29	40.333129	-104.977333
Enter Toe Box: 16464.00' MD, 589' FNL, 1780' FWL	6948.62	1180.12	-9674.10	40.333552	-105.011429
Exit Heel Box: 8094.55' MD, 637' FNL, 460' FEL	7139.33	1245.64	-1314.21	40.333737	-104.981431
LP: 631' FNL, 36' FEL Sec 10 T4N R68W	7138.12	1257.67	-890.17	40.333771	-104.979909
SHL: 1896' FNL, 854' FWL Sec 11 T4N R68W	0.00	0.00	0.00	40.330317	-104.976715
Surface TD: 1908.00' MD, 660' FNL, 813' FWL	1885.85	235.80	-41.28	40.330965	-104.976863

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Departure	Annotation
1908.00	9.76	348.49	1885.94	247.08	-43.48	41.97	252.22	Surface TD: 1908' MD
6053.17	11.71	346.17	5953.15	1023.89	-172.29	166.03	1043.18	Enter Land Box: 6053.17' MD
6556.00	11.77	333.99	6447.88	1109.43	-197.33	190.55	1133.11	KOP: 6556' MD
7670.00	87.58	269.50	7138.12	1257.67	-890.17	882.47	1857.96	LP: 7670' MD, 631' FNL, 36' FEL (40.333771, -104.979909)
8094.55	91.49	268.08	7139.33	1245.64	-1314.21	1306.57	2282.20	Exit Heel Box: 8094.55' MD
16464.00	94.54	269.25	6948.62	1180.12	-9674.10	9666.71	10644.64	Enter Toe Box: 16464' MD
17419.00	97.88	272.35	6856.35	1190.75	-10624.20	10616.73	11594.99	BHL: 17419' MD, 555' FNL, 834' FWL (40.333581, -105.014838)



ACTUAL LINE CALLS
SHL: 1896' FNL, 854' FWL
HEEL: 631' FNL, 36' FEL
TOE: 555' FNL, 834' FWL



TOTAL DIRECTIONAL SERVICES LLC

Design: OH (Shake 11-12HZ/OH)
 4N-68W-11 (S&B 5-11HZ Pad)
 Created By: Dustin Ault Date: 12:24, August 30 2021
 Date: _____
 Approved: _____ Date: _____

Occidental Petroleum

Project: Weld County, CO (UTM-NAD83)
 Site: 4N-68W-11 (S&B 5-11HZ Pad)
 Well: Shake 11-12HZ
 Wellbore: OH
 Design: OH

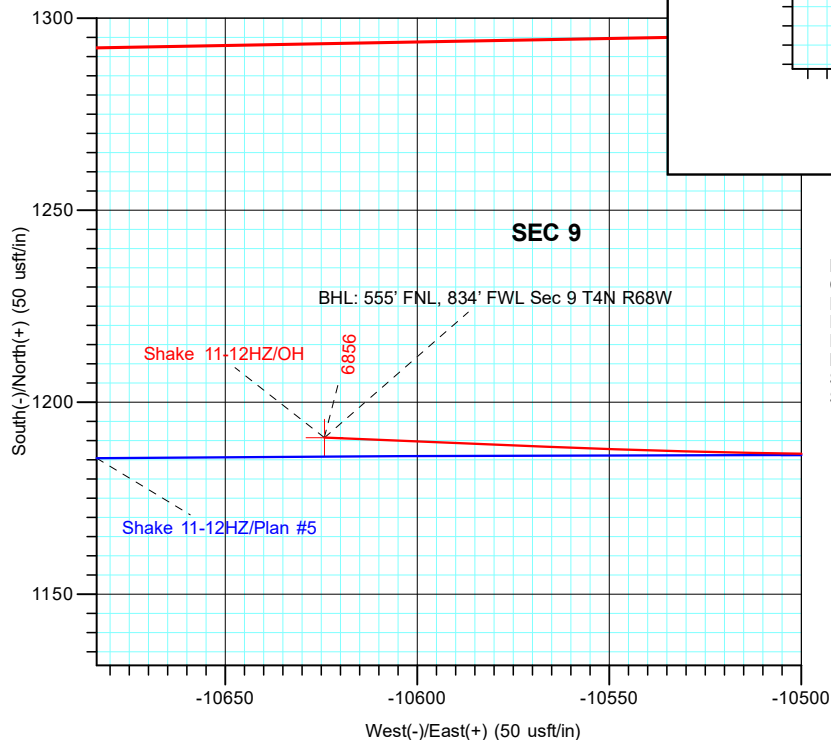
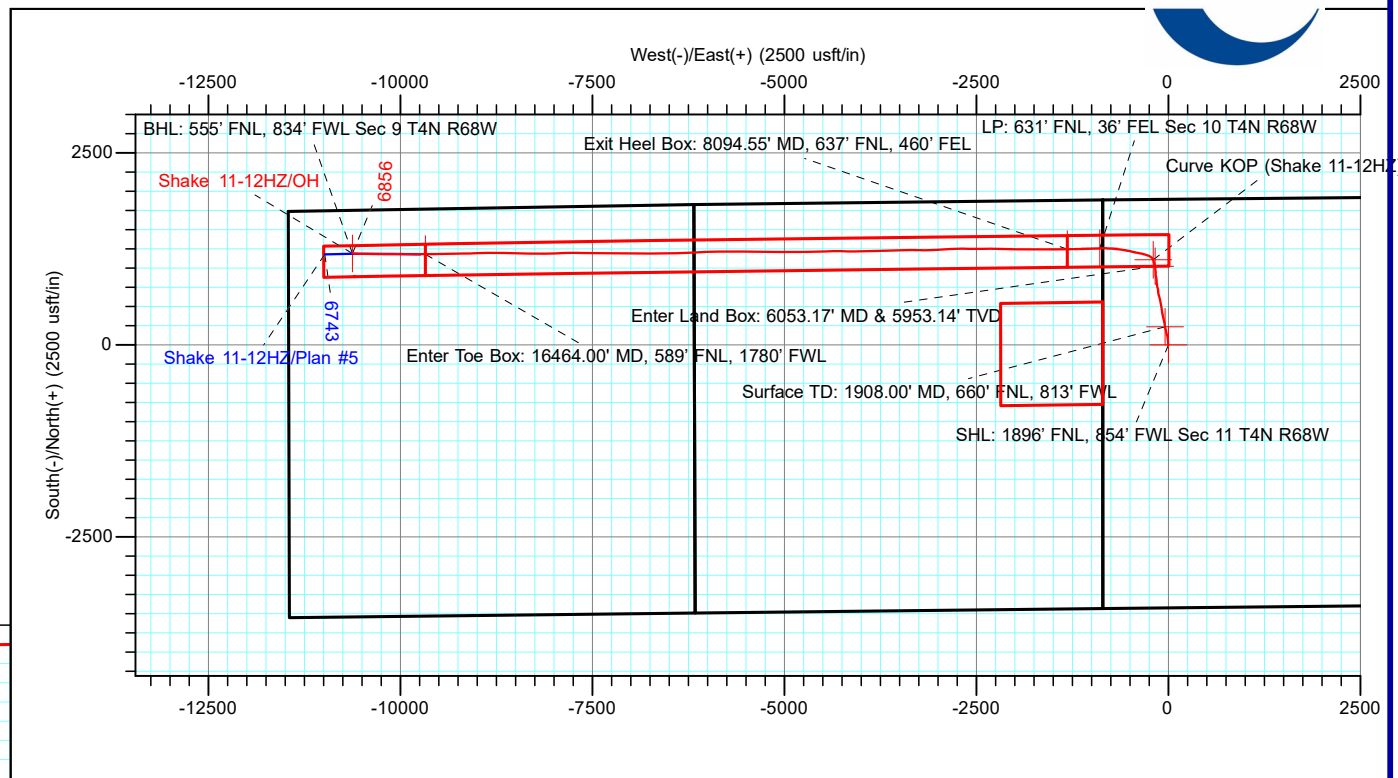
PROJECT DETAILS: Weld County, CO (UTM-NAD83)
 Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: Zone 13N (108 W to 102 W)



Azimuths to True North
 Magnetic North: 7.98°

Magnetic Field
 Strength: 51922.6nT
 Dip Angle: 66.58°
 Date: 3/8/2021
 Model: IGRF2021

ACTUAL LINE CALLS
SHL: 1896' FNL, 854' FWL
HEEL: 631' FNL, 36' FEL
TOE: 555' FNL, 834' FWL



DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL: 555' FNL, 834' FWL Sec 9 T4N R68W	6856.35	1190.75	-10624.20	14648207.49	1636281.61	40.333581	-105.014838
Curve KOP (Shake 11-12HZ)	6447.88	1109.43	-197.33	14648128.91	1646708.50	40.333364	-104.977423
Enter Land Box: 6053.17' MD & 5953.14' TVD	5953.14	1023.89	-172.29	14648043.38	1646733.57	40.333129	-104.977333
Enter Toe Box: 16464.00' MD, 589' FNL, 1780' FWL	6948.62	1180.12	-9674.10	14648197.11	1637231.71	40.333552	-105.011429
Exit Heel Box: 8094.55' MD, 637' FNL, 460' FEL	7139.33	1245.64	-1314.21	14648264.83	1645591.59	40.333737	-104.981431
LP: 631' FNL, 36' FEL Sec 10 T4N R68W	7138.12	1257.67	-890.17	14648276.98	1646015.63	40.333771	-104.979909
SHL: 1896' FNL, 854' FWL Sec 11 T4N R68W	0.00	0.00	0.00	14647019.54	1646906.12	40.330317	-104.976715
Surface TD: 1908.00' MD, 660' FNL, 813' FWL	1885.85	235.80	-41.28	14647255.33	1646864.78	40.330965	-104.976863

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Departure	Annotation
1908.00	9.76	348.49	1885.94	247.08	-43.48	41.97	252.22	Surface TD: 1908' MD
6053.17	11.71	346.17	5953.15	1023.89	-172.29	166.03	1043.18	Enter Land Box: 6053.17' MD
6556.00	11.77	333.99	6447.88	1109.43	-197.33	190.55	1133.11	KOP: 6556' MD
7670.00	87.58	269.50	7138.12	1257.67	-890.17	882.47	1857.96	LP: 7670' MD, 631' FNL, 36' FEL (40.333771, -104.979909)
8094.55	91.49	268.08	7139.33	1245.64	-1314.21	1306.57	2282.20	Exit Heel Box: 8094.55' MD
16464.00	94.54	269.25	6948.62	1180.12	-9674.10	9666.71	10644.64	Enter Toe Box: 16464' MD
17419.00	97.88	272.35	6856.35	1190.75	-10624.20	10616.73	11594.99	BHL: 17419' MD, 555' FNL, 834' FWL (40.333581, -105.014838)



TOTAL DIRECTIONAL SERVICES LLC

Design: OH (Shake 11-12HZ/OH)
 4N-68W-11 (S&B 5-11HZ Pad)
 Created By: Dustin Ault
 Date: 12:26, August 30 2021
 Approved: _____
 Date: _____



Occidental Petroleum

Weld County, CO (UTM-NAD83)

4N-68W-11 (S&B 5-11HZ Pad)

Shake 11-12HZ

OH

Design: OH

Standard Survey Report

30 August, 2021





Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Project	Weld County, CO (UTM-NAD83)		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Zone 13N (108 W to 102 W)		

Site	4N-68W-11 (S&B 5-11HZ Pad)				
Site Position:		Northing:	14,647,020.58 usft	Latitude:	40.330320
From:	Lat/Long	Easting:	1,646,741.13 usft	Longitude:	-104.977307
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.01 °

Well	Shake 11-12HZ					
Well Position	+N/-S	0.00 usft	Northing:	14,647,019.53 usft	Latitude:	40.330317
	+E/-W	0.00 usft	Easting:	1,646,906.12 usft	Longitude:	-104.976715
Position Uncertainty		3.28 usft	Wellhead Elevation:	usft	Ground Level:	4,993.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	3/8/2021	7.98	66.58	51,922.61497001

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	269.65	

Survey Program	Date	8/30/2021			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
96.00	1,843.00	Survey #1 - Surface MWD+IFR (OH)	APC_ISCWSA REV 2 MWD+	Fixed:v2:crustal field declination	
1,843.00	17,361.00	Survey #2 - MWD+IFR+MS (OH)	APC_ISCWSA REV 2 MWD+	Fixed:v2:Rockies, crustal dec + 3-axis correction	
17,419.00	17,419.00	Survey #3 - Proj to TD (OH)	APC_BLIND	OWSG BLIND	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHL: 1896' FNL, 854' FWL Sec 11 T4N R68W										
96.00	0.36	287.83	96.00	0.09	-0.29	0.29	0.38	0.38	0.00	
180.00	0.12	186.39	180.00	0.09	-0.55	0.55	0.48	-0.29	-120.76	
264.00	0.26	349.10	264.00	0.19	-0.59	0.59	0.45	0.17	193.70	
354.00	1.48	347.00	353.99	1.52	-0.89	0.88	1.36	1.36	-2.33	
443.00	3.25	358.70	442.91	5.16	-1.21	1.18	2.05	1.99	13.15	
533.00	4.44	1.07	532.70	11.19	-1.20	1.13	1.33	1.32	2.63	
623.00	6.31	355.44	622.30	19.61	-1.53	1.41	2.16	2.08	-6.26	



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
713.00	7.86	356.97	711.61	30.68	-2.25	2.06	1.73	1.72	1.70	
803.00	9.18	356.90	800.62	44.00	-2.96	2.69	1.47	1.47	-0.08	
893.00	10.79	355.66	889.25	59.57	-3.99	3.62	1.80	1.79	-1.38	
983.00	11.32	351.68	977.58	76.71	-5.90	5.44	1.03	0.59	-4.42	
1,073.00	10.51	349.29	1,065.96	93.52	-8.71	8.14	1.03	-0.90	-2.66	
1,163.00	10.16	346.70	1,154.50	109.31	-12.06	11.39	0.65	-0.39	-2.88	
1,253.00	11.11	345.89	1,242.95	125.44	-16.00	15.23	1.07	1.06	-0.90	
1,343.00	11.22	345.75	1,331.25	142.34	-20.27	19.40	0.13	0.12	-0.16	
1,432.00	10.95	344.97	1,418.59	158.89	-24.59	23.62	0.35	-0.30	-0.88	
1,522.00	11.31	344.73	1,506.89	175.66	-29.13	28.06	0.40	0.40	-0.27	
1,612.00	10.51	348.00	1,595.27	192.21	-33.16	31.99	1.12	-0.89	3.63	
1,702.00	11.94	350.40	1,683.54	209.42	-36.42	35.14	1.67	1.59	2.67	
1,792.00	10.48	349.02	1,771.82	226.63	-39.54	38.15	1.65	-1.62	-1.53	
1,843.00	10.61	349.39	1,821.96	235.80	-41.28	39.84	0.29	0.25	0.73	
1,905.88	9.79	348.53	1,883.85	246.73	-43.41	41.90	1.33	-1.30	-1.38	
Surface TD: 1908.00' MD, 660' FNL, 813' FWL										
1,908.00	9.76	348.49	1,885.94	247.08	-43.48	41.97	1.33	-1.30	-1.49	
Surface TD: 1908' MD										
1,922.00	9.58	348.28	1,899.74	249.38	-43.96	42.43	1.33	-1.30	-1.53	
2,014.00	11.80	353.00	1,990.14	266.22	-46.66	45.03	2.59	2.41	5.13	
2,107.00	10.89	349.77	2,081.32	284.30	-49.38	47.64	1.19	-0.98	-3.47	
2,199.00	12.96	348.12	2,171.33	302.95	-53.05	51.19	2.28	2.25	-1.79	
2,291.00	15.17	346.67	2,260.57	324.77	-57.95	55.96	2.43	2.40	-1.58	
2,385.00	15.12	346.26	2,351.30	348.64	-63.69	61.56	0.13	-0.05	-0.44	
2,478.00	15.26	344.96	2,441.05	372.24	-69.75	67.48	0.40	0.15	-1.40	
2,570.00	14.68	350.78	2,529.93	395.44	-74.76	72.34	1.75	-0.63	6.33	
2,662.00	12.65	352.00	2,619.33	416.93	-78.03	75.48	2.23	-2.21	1.33	
2,755.00	11.73	350.53	2,710.23	436.34	-81.00	78.34	1.04	-0.99	-1.58	
2,848.00	10.92	350.33	2,801.42	454.35	-84.04	81.26	0.87	-0.87	-0.22	
2,941.00	9.26	347.05	2,892.98	470.32	-87.20	84.32	1.89	-1.78	-3.53	
3,034.00	9.46	349.94	2,984.74	485.14	-90.21	87.24	0.55	0.22	3.11	
3,127.00	8.50	0.82	3,076.60	499.54	-91.44	88.39	2.09	-1.03	11.70	
3,219.00	9.95	354.62	3,167.41	514.25	-92.09	88.95	1.91	1.58	-6.74	
3,312.00	10.80	352.48	3,258.89	530.89	-93.99	90.74	1.00	0.91	-2.30	
3,405.00	11.04	343.66	3,350.22	548.08	-97.63	94.28	1.81	0.26	-9.48	
3,497.00	11.00	342.72	3,440.52	564.91	-102.72	99.26	0.20	-0.04	-1.02	
3,590.00	12.30	349.13	3,531.61	583.11	-107.22	103.66	1.97	1.40	6.89	
3,683.00	12.23	347.37	3,622.48	602.45	-111.24	107.56	0.41	-0.08	-1.89	
3,776.00	12.38	345.74	3,713.35	621.73	-115.85	112.05	0.41	0.16	-1.75	
3,869.00	11.20	343.51	3,804.38	640.05	-120.87	116.96	1.36	-1.27	-2.40	
3,962.00	9.25	340.03	3,895.90	655.74	-125.99	121.98	2.20	-2.10	-3.74	
4,056.00	9.02	354.55	3,988.72	670.17	-129.27	125.17	2.46	-0.24	15.45	
4,148.00	7.52	356.53	4,079.76	683.36	-130.32	126.14	1.66	-1.63	2.15	
4,241.00	8.49	350.67	4,171.86	696.21	-131.80	127.54	1.36	1.04	-6.30	



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
4,335.00	9.98	0.94	4,264.64	711.21	-132.79	128.44	2.36	1.59	10.93	
4,428.00	11.35	345.47	4,356.05	728.13	-134.96	130.51	3.40	1.47	-16.63	
4,522.00	10.87	341.98	4,448.29	745.51	-140.02	135.46	0.88	-0.51	-3.71	
4,614.00	13.11	350.16	4,538.29	764.04	-144.49	139.82	3.05	2.43	8.89	
4,706.00	13.09	353.21	4,627.89	784.67	-147.50	142.70	0.75	-0.02	3.32	
4,801.00	11.01	350.31	4,720.80	804.29	-150.30	145.38	2.28	-2.19	-3.05	
4,917.00	9.32	1.45	4,834.98	824.61	-151.93	146.89	2.23	-1.46	9.60	
5,011.00	9.67	359.59	4,927.69	840.11	-151.79	146.66	0.50	0.37	-1.98	
5,104.00	9.16	348.00	5,019.45	855.16	-153.39	148.16	2.11	-0.55	-12.46	
5,198.00	9.73	349.26	5,112.18	870.29	-156.42	151.10	0.65	0.61	1.34	
5,290.00	9.30	346.66	5,202.91	885.16	-159.59	154.18	0.66	-0.47	-2.83	
5,383.00	10.88	350.15	5,294.47	901.12	-162.82	157.31	1.82	1.70	3.75	
5,475.00	11.36	1.91	5,384.75	918.73	-164.00	158.39	2.52	0.52	12.78	
5,567.00	11.08	358.94	5,475.00	936.63	-163.87	158.14	0.70	-0.30	-3.23	
5,661.00	10.44	359.26	5,567.34	954.17	-164.14	158.31	0.68	-0.68	0.34	
5,755.00	9.88	349.97	5,659.87	970.63	-165.66	159.73	1.84	-0.60	-9.88	
5,847.00	10.05	355.40	5,750.49	986.41	-167.68	161.65	1.04	0.18	5.90	
5,940.00	9.99	356.14	5,842.07	1,002.54	-168.87	162.74	0.15	-0.06	0.80	
6,032.00	11.77	348.18	5,932.42	1,019.69	-171.33	165.10	2.53	1.93	-8.65	
6,053.17	11.71	346.17	5,953.15	1,023.89	-172.29	166.03	1.95	-0.29	-9.49	
Enter Land Box: 6053.17' MD - Enter Land Box: 6053.17' MD & 5953.14' TVD										
6,124.00	11.61	339.34	6,022.52	1,037.54	-176.52	170.18	1.95	-0.14	-9.64	
6,219.00	10.41	343.56	6,115.77	1,054.72	-182.32	175.87	1.52	-1.26	4.44	
6,312.00	8.47	341.34	6,207.50	1,069.27	-186.89	180.36	2.12	-2.09	-2.39	
6,405.00	9.29	354.28	6,299.40	1,083.22	-189.83	183.21	2.32	0.88	13.91	
6,498.00	10.72	342.79	6,390.99	1,098.96	-193.14	186.42	2.63	1.54	-12.35	
6,556.00	11.77	333.99	6,447.88	1,109.43	-197.33	190.55	3.47	1.82	-15.17	
KOP: 6556' MD - Curve KOP (Shake 11-12HZ)										
6,590.00	12.50	329.57	6,481.12	1,115.72	-200.71	193.90	3.47	2.14	-13.00	
6,682.00	16.03	318.45	6,570.29	1,133.82	-214.19	207.26	4.84	3.84	-12.09	
6,775.00	19.97	301.44	6,658.78	1,151.73	-236.28	229.24	7.02	4.24	-18.29	
6,868.00	24.94	290.63	6,744.74	1,166.94	-268.21	261.08	6.93	5.34	-11.62	
6,960.00	29.06	284.81	6,826.71	1,179.49	-307.99	300.78	5.32	4.48	-6.33	
7,053.00	33.52	281.91	6,906.16	1,190.57	-354.98	347.70	5.06	4.80	-3.12	
7,145.00	40.71	280.51	6,979.48	1,201.30	-409.41	402.06	7.87	7.82	-1.52	
7,238.00	57.09	283.76	7,040.42	1,216.22	-477.62	470.18	17.80	17.61	3.49	
7,331.00	69.79	279.80	7,081.93	1,233.01	-558.90	551.35	14.17	13.66	-4.26	
7,424.00	76.45	276.90	7,108.92	1,245.89	-646.89	639.27	7.76	7.16	-3.12	
7,518.00	81.87	273.94	7,126.60	1,254.58	-738.76	731.08	6.54	5.77	-3.15	
7,612.00	87.26	270.11	7,135.50	1,257.87	-832.22	824.53	7.02	5.73	-4.07	
7,670.00	87.58	269.50	7,138.12	1,257.67	-890.17	882.47	1.19	0.54	-1.05	
LP: 7670' MD, 631' FNL, 36' FEL (40.333771, -104.979909) - LP: 631' FNL, 36' FEL Sec 10 T4N R68W										
7,704.00	87.76	269.14	7,139.50	1,257.27	-924.13	916.44	1.19	0.54	-1.05	



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/S (usft)	+E/W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
7,709.28	87.72	269.10	7,139.71	1,257.19	-929.41	921.71	1.17	-0.83	-0.83	
LP (Shake 11-12HZ)										
7,796.00	87.00	268.38	7,143.71	1,255.28	-1,016.02	1,008.33	1.17	-0.83	-0.83	
7,889.00	89.77	269.08	7,146.33	1,253.22	-1,108.95	1,101.27	3.07	2.98	0.75	
7,982.00	93.11	267.30	7,143.99	1,250.29	-1,201.85	1,194.19	4.07	3.59	-1.91	
8,074.00	91.93	267.82	7,139.94	1,246.37	-1,293.68	1,286.04	1.40	-1.28	0.57	
8,094.55	91.49	268.08	7,139.33	1,245.64	-1,314.21	1,306.58	2.49	-2.16	1.25	
Exit Heel Box: 8094.55' MD - Exit Heel Box: 8094.55' MD, 637' FNL, 460' FEL										
8,168.00	89.90	268.99	7,138.44	1,243.76	-1,387.62	1,380.00	2.49	-2.16	1.24	
8,262.00	89.36	270.38	7,139.05	1,243.24	-1,481.62	1,474.00	1.59	-0.57	1.48	
8,355.00	88.48	269.31	7,140.80	1,242.99	-1,574.60	1,566.98	1.49	-0.95	-1.15	
8,448.00	90.13	270.62	7,141.93	1,242.93	-1,667.59	1,659.96	2.27	1.77	1.41	
8,541.00	89.32	270.02	7,142.38	1,243.45	-1,760.58	1,752.95	1.08	-0.87	-0.65	
8,634.00	88.85	270.66	7,143.86	1,244.01	-1,853.57	1,845.94	0.85	-0.51	0.69	
8,726.00	90.31	271.09	7,144.54	1,245.41	-1,945.55	1,937.91	1.65	1.59	0.47	
8,818.00	92.21	272.42	7,142.51	1,248.23	-2,037.48	2,029.82	2.52	2.07	1.45	
8,911.00	91.83	271.62	7,139.24	1,251.50	-2,130.37	2,122.68	0.95	-0.41	-0.86	
9,005.00	90.93	271.23	7,136.97	1,253.84	-2,224.31	2,216.61	1.04	-0.96	-0.41	
9,098.00	89.33	268.69	7,136.76	1,253.77	-2,317.30	2,309.59	3.23	-1.72	-2.73	
9,191.00	90.54	269.06	7,136.87	1,251.95	-2,410.28	2,402.58	1.36	1.30	0.40	
9,286.00	89.34	268.98	7,136.97	1,250.32	-2,505.26	2,497.58	1.27	-1.26	-0.08	
9,378.00	90.96	271.21	7,136.72	1,250.48	-2,597.25	2,589.56	3.00	1.76	2.42	
9,470.00	90.41	271.45	7,135.63	1,252.61	-2,689.22	2,681.52	0.65	-0.60	0.26	
9,562.00	92.07	267.80	7,133.63	1,252.01	-2,781.18	2,773.48	4.36	1.80	-3.97	
9,656.00	89.41	266.70	7,132.42	1,247.50	-2,875.05	2,867.38	3.06	-2.83	-1.17	
9,749.00	88.90	264.72	7,133.79	1,240.55	-2,967.78	2,960.14	2.20	-0.55	-2.13	
9,842.00	87.42	268.12	7,136.78	1,234.74	-3,060.53	3,052.93	3.99	-1.59	3.66	
9,935.00	88.54	270.84	7,140.06	1,233.90	-3,153.46	3,145.86	3.16	1.20	2.92	
10,027.00	91.37	270.34	7,140.13	1,234.85	-3,245.44	3,237.84	3.12	3.08	-0.54	
10,121.00	91.18	270.00	7,138.04	1,235.12	-3,339.42	3,331.81	0.41	-0.20	-0.36	
10,213.00	91.10	269.55	7,136.21	1,234.76	-3,431.40	3,423.79	0.50	-0.09	-0.49	
10,307.00	90.68	268.57	7,134.75	1,233.22	-3,525.38	3,517.78	1.13	-0.45	-1.04	
10,399.00	90.18	267.30	7,134.06	1,229.91	-3,617.31	3,609.73	1.48	-0.54	-1.38	
10,492.00	90.31	266.85	7,133.66	1,225.16	-3,710.19	3,702.64	0.50	0.14	-0.48	
10,585.00	89.88	269.06	7,133.50	1,221.84	-3,803.12	3,795.59	2.42	-0.46	2.38	
10,678.00	90.10	269.53	7,133.52	1,220.70	-3,896.12	3,888.59	0.56	0.24	0.51	
10,771.00	89.59	270.43	7,133.77	1,220.67	-3,989.11	3,981.58	1.11	-0.55	0.97	
10,866.00	89.69	268.45	7,134.37	1,219.74	-4,084.10	4,076.58	2.09	0.11	-2.08	
10,959.00	91.76	271.19	7,133.19	1,219.44	-4,177.08	4,169.55	3.69	2.23	2.95	
11,053.00	91.82	270.78	7,130.26	1,221.06	-4,271.02	4,263.48	0.44	0.06	-0.44	
11,145.00	89.83	269.09	7,128.93	1,220.96	-4,363.00	4,355.46	2.84	-2.16	-1.84	
11,238.00	89.10	267.31	7,129.80	1,218.03	-4,455.95	4,448.43	2.07	-0.78	-1.91	
11,331.00	88.64	269.24	7,131.63	1,215.24	-4,548.89	4,541.38	2.13	-0.49	2.08	
11,424.00	90.19	268.72	7,132.58	1,213.58	-4,641.86	4,634.36	1.76	1.67	-0.56	



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
11,516.00	91.11	269.61	7,131.54	1,212.24	-4,733.84	4,726.35	1.39	1.00	0.97	
11,609.00	91.69	268.39	7,129.27	1,210.62	-4,826.80	4,819.32	1.45	0.62	-1.31	
11,702.00	89.93	270.71	7,127.95	1,209.89	-4,919.78	4,912.30	3.13	-1.89	2.49	
11,795.00	89.48	270.19	7,128.43	1,210.62	-5,012.77	5,005.29	0.74	-0.48	-0.56	
11,887.00	88.99	269.49	7,129.66	1,210.36	-5,104.76	5,097.28	0.93	-0.53	-0.76	
11,980.00	89.85	271.44	7,130.60	1,211.12	-5,197.75	5,190.26	2.29	0.92	2.10	
12,072.00	89.79	271.95	7,130.89	1,213.84	-5,289.71	5,282.20	0.56	-0.07	0.55	
12,166.00	89.68	270.86	7,131.33	1,216.14	-5,383.68	5,376.15	1.17	-0.12	-1.16	
12,259.00	89.88	270.23	7,131.68	1,217.03	-5,476.67	5,469.14	0.71	0.22	-0.68	
12,353.00	89.61	270.06	7,132.10	1,217.26	-5,570.67	5,563.13	0.34	-0.29	-0.18	
12,447.00	89.64	270.45	7,132.72	1,217.68	-5,664.67	5,657.13	0.42	0.03	0.41	
12,540.00	89.40	268.62	7,133.50	1,216.93	-5,757.66	5,750.12	1.98	-0.26	-1.97	
12,633.00	90.33	268.64	7,133.71	1,214.70	-5,850.63	5,843.10	1.00	1.00	0.02	
12,725.00	90.68	269.35	7,132.90	1,213.09	-5,942.61	5,935.09	0.86	0.38	0.77	
12,818.00	90.96	267.73	7,131.57	1,210.72	-6,035.57	6,028.06	1.77	0.30	-1.74	
12,913.00	90.30	266.51	7,130.53	1,205.95	-6,130.44	6,122.96	1.46	-0.69	-1.28	
13,004.00	92.65	268.07	7,128.19	1,201.65	-6,221.30	6,213.84	3.10	2.58	1.71	
13,097.00	91.25	268.07	7,125.02	1,198.52	-6,314.19	6,306.75	1.51	-1.51	0.00	
13,190.00	92.91	268.69	7,121.65	1,195.89	-6,407.09	6,399.67	1.91	1.78	0.67	
13,282.00	93.01	269.11	7,116.89	1,194.13	-6,498.95	6,491.53	0.47	0.11	0.46	
13,375.00	92.57	268.85	7,112.37	1,192.47	-6,591.82	6,584.42	0.55	-0.47	-0.28	
13,469.00	93.37	270.75	7,107.50	1,192.14	-6,685.69	6,678.29	2.19	0.85	2.02	
13,562.00	90.41	269.25	7,104.43	1,192.14	-6,778.63	6,771.22	3.57	-3.18	-1.61	
13,654.00	89.23	268.25	7,104.72	1,190.14	-6,870.60	6,863.21	1.68	-1.28	-1.09	
13,749.00	89.50	270.81	7,105.77	1,189.36	-6,965.59	6,958.19	2.71	0.28	2.69	
13,841.00	91.62	271.05	7,104.87	1,190.85	-7,057.57	7,050.16	2.32	2.30	0.26	
13,933.00	90.50	272.45	7,103.17	1,193.66	-7,149.50	7,142.08	1.95	-1.22	1.52	
14,025.00	92.75	270.75	7,100.56	1,196.23	-7,241.42	7,233.98	3.06	2.45	-1.85	
14,116.00	92.17	269.32	7,096.66	1,196.28	-7,332.33	7,324.89	1.69	-0.64	-1.57	
14,210.00	91.61	269.02	7,093.56	1,194.92	-7,426.27	7,418.83	0.68	-0.60	-0.32	
14,302.00	93.25	270.74	7,089.66	1,194.73	-7,518.18	7,510.74	2.58	1.78	1.87	
14,394.00	93.61	270.97	7,084.15	1,196.10	-7,610.01	7,602.56	0.46	0.39	0.25	
14,486.00	93.68	270.90	7,078.30	1,197.60	-7,701.81	7,694.35	0.11	0.08	-0.08	
14,579.00	92.80	269.90	7,073.05	1,198.24	-7,794.66	7,787.19	1.43	-0.95	-1.08	
14,671.00	90.35	267.73	7,070.52	1,196.34	-7,886.59	7,879.13	3.56	-2.66	-2.36	
14,763.00	90.98	267.79	7,069.45	1,192.75	-7,978.51	7,971.08	0.69	0.68	0.07	
14,855.00	91.42	269.84	7,067.52	1,190.84	-8,070.47	8,063.04	2.28	0.48	2.23	
14,949.00	90.95	268.23	7,065.58	1,189.26	-8,164.43	8,157.01	1.78	-0.50	-1.71	
15,042.25	90.33	269.99	7,064.54	1,187.81	-8,257.66	8,250.25	2.00	-0.67	1.88	
TGT 1 (Shake 11-12HZ)										
15,043.00	90.32	270.00	7,064.54	1,187.81	-8,258.41	8,251.00	2.00	-0.67	1.88	
15,136.00	94.05	272.37	7,060.99	1,189.73	-8,351.30	8,343.88	4.75	4.01	2.55	
15,229.00	95.17	272.58	7,053.52	1,193.73	-8,443.91	8,436.46	1.23	1.20	0.23	
15,321.00	94.46	271.73	7,045.79	1,197.18	-8,535.52	8,528.05	1.20	-0.77	-0.92	



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
15,414.00	95.22	269.59	7,037.95	1,198.25	-8,628.18	8,620.69	2.43	0.82	-2.30
15,507.00	96.23	269.66	7,028.67	1,197.64	-8,720.71	8,713.23	1.09	1.09	0.08
15,600.00	94.51	269.36	7,019.97	1,196.85	-8,813.29	8,805.82	1.88	-1.85	-0.32
15,692.00	95.26	268.70	7,012.13	1,195.30	-8,904.94	8,897.48	1.08	0.82	-0.72
15,786.00	95.65	268.44	7,003.20	1,192.96	-8,998.49	8,991.03	0.50	0.41	-0.28
15,879.00	93.94	269.04	6,995.42	1,190.93	-9,091.14	9,083.69	1.95	-1.84	0.65
15,971.00	94.91	269.96	6,988.32	1,190.12	-9,182.86	9,175.42	1.45	1.05	1.00
16,064.00	95.36	269.12	6,980.00	1,189.38	-9,275.48	9,268.04	1.02	0.48	-0.90
16,156.00	95.09	267.02	6,971.62	1,186.29	-9,367.04	9,359.62	2.29	-0.29	-2.28
16,248.00	93.94	269.87	6,964.38	1,183.81	-9,458.71	9,451.30	3.33	-1.25	3.10
16,342.00	94.17	269.08	6,957.73	1,182.95	-9,552.47	9,545.07	0.87	0.24	-0.84
16,434.00	94.30	268.21	6,950.94	1,180.78	-9,644.19	9,636.80	0.95	0.14	-0.95
16,464.00	94.54	269.25	6,948.62	1,180.12	-9,674.10	9,666.71	3.56	0.81	3.48
Enter Toe Box: 16464' MD - Enter Toe Box: 16464.00' MD, 589' FNL, 1780' FWL									
16,527.00	95.05	271.45	6,943.35	1,180.50	-9,736.87	9,729.48	3.56	0.80	3.49
16,620.00	95.62	271.61	6,934.71	1,182.98	-9,829.43	9,822.02	0.64	0.61	0.17
16,714.00	95.86	269.39	6,925.30	1,183.79	-9,922.95	9,915.54	2.36	0.26	-2.36
16,806.00	96.18	267.80	6,915.66	1,181.55	-10,014.41	10,007.01	1.75	0.35	-1.73
16,899.00	96.48	270.90	6,905.40	1,180.50	-10,106.83	10,099.43	3.33	0.32	3.33
16,992.00	96.38	270.56	6,894.98	1,181.68	-10,199.24	10,191.83	0.38	-0.11	-0.37
17,085.00	95.10	270.72	6,885.68	1,182.71	-10,291.76	10,284.35	1.39	-1.38	0.17
17,178.00	93.09	271.84	6,879.04	1,184.78	-10,384.50	10,377.07	2.47	-2.16	1.20
17,270.00	93.77	270.18	6,873.54	1,186.40	-10,476.31	10,468.87	1.95	0.74	-1.80
17,361.00	97.88	272.35	6,864.30	1,188.40	-10,566.80	10,559.34	5.10	4.52	2.38
17,419.00	97.88	272.35	6,856.35	1,190.75	-10,624.20	10,616.73	0.00	0.00	0.00
BHL: 17419' MD, 555' FNL, 834' FWL (40.333581, -105.014838) - BHL: 555' FNL, 834' FWL Sec 9 T4N R68W - PBHL (Shake 11-12HZ)									



Total Directional Services

Survey Report



Company:	Occidental Petroleum	Local Co-ordinate Reference:	Well Shake 11-12HZ
Project:	Weld County, CO (UTM-NAD83)	TVD Reference:	4993' GE + 20' KB @ 5013.00usft
Site:	4N-68W-11 (S&B 5-11HZ Pad)	MD Reference:	4993' GE + 20' KB @ 5013.00usft
Well:	Shake 11-12HZ	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM 5000.15 Single User Db

Design Targets										
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
SHL: 1896' FNL, 854' FV - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	14,647,019.53	1,646,906.12	40.330317	-104.976715	
Surface TD: 1908.00' MI - actual wellpath misses target center by 11.31usft at 1905.96usft MD (1883.93 TVD, 246.74 N, -43.42 E) - Point	0.00	0.00	1,885.85	235.80	-41.28	14,647,255.32	1,646,864.78	40.330965	-104.976863	
Enter Land Box: 6053.17 - actual wellpath hits target center - Point	0.00	0.00	5,953.15	1,023.89	-172.29	14,648,043.38	1,646,733.57	40.333129	-104.977333	
Curve KOP (Shake 11-1: - actual wellpath hits target center - Point	0.00	0.00	6,447.88	1,109.43	-197.33	14,648,128.91	1,646,708.50	40.333364	-104.977423	
BHL: 555' FNL, 834' FW - actual wellpath hits target center - Point	0.00	0.00	6,856.35	1,190.75	-10,624.20	14,648,207.49	1,636,281.61	40.333581	-105.014838	
Enter Toe Box: 16464.00 - actual wellpath hits target center - Point	0.00	0.00	6,948.62	1,180.12	-9,674.10	14,648,197.11	1,637,231.71	40.333553	-105.011429	
LP: 631' FNL, 36' FEL S - actual wellpath hits target center - Point	0.00	0.00	7,138.12	1,257.67	-890.17	14,648,276.97	1,646,015.62	40.333771	-104.979909	
Exit Heel Box: 8094.55' I - actual wellpath hits target center - Point	0.00	0.00	7,139.33	1,245.64	-1,314.21	14,648,264.83	1,645,591.58	40.333738	-104.981431	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
1,908.00	1,885.94	247.08	-43.48	Surface TD: 1908' MD	
6,053.17	5,953.15	1,023.89	-172.29	Enter Land Box: 6053.17' MD	
6,556.00	6,447.88	1,109.43	-197.33	KOP: 6556' MD	
7,670.00	7,138.12	1,257.67	-890.17	LP: 7670' MD, 631' FNL, 36' FEL (40.333771, -104.979909)	
8,094.55	7,139.33	1,245.64	-1,314.21	Exit Heel Box: 8094.55' MD	
16,464.00	6,948.62	1,180.12	-9,674.10	Enter Toe Box: 16464' MD	
17,419.00	6,856.35	1,190.75	-10,624.20	BHL: 17419' MD, 555' FNL, 834' FWL (40.333581, -105.014838)	

Checked By: _____ Approved By: _____ Date: _____