

BOPCO, L.P.
201 MAIN ST.
FORT WORTH, TEXAS 76102-3131
817/390-8400

June 6, 2012

FEDERAL EXPRESS

Bureau of Land Management
Carlsbad District Office
620 E. Green St.
Carlsbad, New Mexico 88220
Attn: Mr. Wesley Ingram

New Mexico State Land Office
Commissioner of Public Lands
310 Old Santa Fe Trail
Santa Fe, New Mexico 87501
Attention: Mr. Pete Martinez

New Mexico Oil Conservation Division
1220 St. Francis
Santa Fe, New Mexico 87505
Attention: Mr. William Jones

Re: Commercial Determination
PLU Big Sinks 27 Federal #1H
First Bone Spring Shale Formation
Eddy County, New Mexico

Gentlemen:

Please find attached hereto one (1) copy of Bass' commercial determination worksheets and exhibits which indicate that the subject well is a commercial well in the Bone Spring Formation. Please indicate your concurrence to the above Commercial Determination. Upon your execution hereof, Bass will submit a participating area for the well.

Thank you very much and should you have any questions or comments in regard to the attached commercial determination, please do not hesitate to contact the undersigned.

Very truly yours,


Andy Morrison

Bureau of Land Management

New Mexico State Land Office

New Mexico Oil Conservation Division

By: _____

By: _____

By: _____

Its: _____

Its: _____

Its: _____

Date: _____

Date: _____

Date: _____

WORKSHEET FOR COMMERCIAL DETERMINATION AND PARTICIPATING AREA IN FEDERAL UNITS

WELL DATA

WELL PLU BIG SINKS 27 FEDERAL COM 1H FORMATION FIRST BONE SPRING SHALE

LOCATION P UNIT, 215 FEET FROM South LINE & 400 FEET FROM East LINE

SECTION 27 TOWNSHIP 24S RANGE 30E COUNTY EDDY NEW MEXICO

SPUD DATE 1/1/2011 COMPLETION DATE 05/06/2011 INITIAL PRODUCTION 05/06/2011

PERFORATIONS 9200' to 13725'

BHL: NENE 380' FNL 427' FEL of Sec 27 T24S R30E

STIMULATION:

ACID _____

FRACTURE Frac with 60,000 gal 15% HCL, 97500 bbls frac fluid 4,800,000# sand

POTENTIAL 4/19/2011: 36 BOPD, 292 MCFPD, 883 BWPD

(Attach Copy of C-105. Attach Copy of Wellbore Sketch of Completed Well.)

VOLUMETRIC CALCULATION

	SANDS PERFORATED		SANDS NOT PERFORATED BUT POTENTIALLY PRODUCTIVE	
Area (A) proration unit size, acres	<u>160</u>	_____	_____	_____
Porosity (por), %	<u>7%</u>	_____	_____	_____
Water saturation (Sw), %	<u>35%</u>	_____	_____	_____
Net Thickness (h), ft.	<u>67</u>	_____	_____	_____
Temperature (T), Fahrenheit	<u>120</u>	_____	_____	_____
Bottom Hole pressure (P), psia	<u>4,232</u>	_____	_____	_____
Recovery factor (RF), %	<u>45%</u>	_____	_____	_____
Recoverable gas, BCF *(See eq. below)	<u>2.9</u>	_____	_____	_____

*Sometimes unable to match performance due to volumetric uncertainty.

Formula = $(7758) (A) (h) (por) (1-Sw)(RF)/Bgi$

Bgi = 0.58 RB/MCF

Continued

PERFORMANCE DATA

(If sufficient history exists, attach plot of oil production rate v time.)

CUMULATIVE PRODUCTION TO 09/01/2011 90,675 MCF Gas 28,778 BBL Oil

INITIAL RATE (qi) 1290 MCFPD

ECONOMIC LIMIT (ql) 40

HYPERBOLIC DECLINE RATE, dy n=1.5 d=75.2%

REMAINING GAS (Q) = 1,005,755

ULTIMATE RECOVERABLE GAS (mcf) 1,096,430

(Attach plat showing proration unit and participating area.)

ECONOMIC

GROSS WELL COST \$ \$3,150 (to the depth of formation completed)

COMPLETION COST \$ 3,150

GROSS TOTAL COST \$ \$6,300

YEAR	GROSS GAS MMCF	BFIT NET INCOME (\$M)	OPERATING COST (\$M) INCL SEV & AD VAL TAX	5% NET BFIT DISCOUNTED CASH FLOW
ZERO				
1	190.2	4,207.8	757.7	-2,906.3
2	137.8	3,048.2	492.0	2,421.3
3	82.5	1,979.8	352.0	1,466.9
4	62.4	1,569.1	316.2	1,074.7
5	51.3	1,343.9	296.6	855.3
6	44.1	1,197.3	283.9	710.4
7	39.0	1,091.5	274.7	604.9
8	35.2	1,012.1	267.8	525.0
9	32.2	949.5	262.4	461.5
10	29.7	900.5	258.1	410.9
REMAINDER	391.9	14,624.7	6788.4	3,299.4
TOTAL	1,096	31,924.4	10349.83	8,924.1

WELL IS COMMERCIAL

Lease: PLU BIG SINKS 27 FED 1H
 Field: POKER LAKE
 Operator: BOPCO
 County: EDDY State: NM
 Oil Differential: -3.59867 \$/BBL
 Gas Wellhead Differential: -1.11

DATE : 11/03/2011
 TIME : 10:18:39
 DBS : CHK0101
 SETTINGS : cnj0511
 QUALIFIER: CNJ0511

R E S E R V E S A N D E C O N O M I C S

AS OF DATE: 05/2011

--END-- MO-YEAR	GROSS OIL PRODUCTION ---MMBLS---	GROSS GAS PRODUCTION ---MMCF---	NET OIL PRODUCTION ---MMBLS---	NET GAS PRODUCTION ---MMCF---	NET NGL PROD ---MMBLS---	NET EQUIV PRODUCTION ---MMCF---	----- OIL ---\$/BBL---	PRICES GAS ---\$/MCF---	----- NGL ---\$/BBL---	NET OIL SALES ---M\$---	NET GAS SALES ---M\$---	NET NGL SALES ---M\$---
12-2011	49.65	190.24	43.45	118.10	12.28	452.48	77.401	3.367	36.43	3362.70	397.66	447.48
12-2012	34.19	137.83	29.92	85.57	8.90	318.46	80.901	3.387	38.00	2420.17	289.83	338.22
12-2013	21.56	82.53	18.87	51.24	5.33	196.41	84.401	3.447	39.57	1592.29	176.62	210.91
12-2014	16.54	62.38	14.47	38.73	4.03	149.73	87.741	3.457	41.08	1269.75	133.88	165.47
12-2015	13.70	51.30	11.99	31.85	3.31	123.65	90.931	3.547	42.51	1090.04	112.98	140.84
12-2016	11.83	44.13	10.36	27.40	2.85	106.63	93.951	3.627	43.87	972.88	99.37	125.01
12-2017	10.50	39.04	9.19	24.23	2.52	94.47	96.811	3.647	45.15	889.28	88.38	113.82
12-2018	9.48	35.20	8.30	21.85	2.27	85.28	99.521	3.697	46.37	825.96	80.78	105.40
12-2019	8.69	32.18	7.60	19.98	2.08	78.05	102.061	3.757	47.52	775.67	75.06	98.75
12-2020	8.04	29.74	7.03	18.46	1.92	72.18	104.451	3.937	48.59	734.47	72.69	93.32
12-2021	7.50	27.72	6.56	17.21	1.79	67.30	106.681	4.127	49.59	699.72	71.01	88.76
12-2022	7.04	26.00	6.16	16.14	1.68	63.16	108.751	4.277	50.52	669.75	69.02	84.81
12-2023	6.64	24.43	5.81	15.17	1.58	59.52	110.661	4.467	51.38	643.40	67.76	81.08
12-2024	6.30	22.97	5.51	14.26	1.48	56.24	112.411	4.687	52.17	619.76	66.83	77.38
12-2025	5.99	21.59	5.24	13.40	1.39	53.19	114.001	4.857	52.88	597.08	65.10	73.73
12-2026	5.69	20.30	4.98	12.60	1.31	50.32	115.431	4.987	53.53	574.34	62.84	70.15
12-2027	5.40	19.08	4.73	11.84	1.23	47.60	116.701	5.127	54.10	551.63	60.72	66.65
S TOT	228.73	866.66	200.14	538.03	55.96	2074.67	91.380	3.700	42.56	18288.90	1990.57	2381.76
AFTER	72.15	229.77	63.13	142.65	14.84	610.48	120.703	5.704	55.87	7620.45	813.66	829.02
TOTAL	300.89	1096.43	263.28	680.68	70.80	2685.14	98.411	4.120	45.35	25909.34	2804.23	3210.78

--END-- MO-YEAR	NO.OF WELLS	AD VALOREM TAX ---M\$---	PRODUCTION TAX ---M\$---	OTHER OPER EXPENSES ---M\$---	DIRECT EXPENSES ---M\$---	OVERHEAD EXPENSES ---M\$---	TOTAL OPER EXPENSES ---M\$---	EQUITY INVESTMENT ---M\$---	FUTURE NET CASHFLOW ---M\$---	CUMULATIVE CASHFLOW ---M\$---	CUM. DISC. CASHFLOW ---M\$---
12-2011	1.	7.70	357.95	0.00	392.00	0.00	392.00	6300.00	-2849.80	-2849.80	-2906.26
12-2012	1.	5.58	259.43	0.00	227.00	0.00	227.00	0.00	2556.21	-293.60	-484.95
12-2013	1.	3.62	168.33	0.00	180.00	0.00	180.00	0.00	1627.87	1334.28	981.90
12-2014	1.	2.87	133.35	0.00	180.00	0.00	180.00	0.00	1252.88	2587.16	2056.61
12-2015	1.	2.46	114.18	0.00	180.00	0.00	180.00	0.00	1047.21	3634.37	2911.93
12-2016	1.	2.19	101.71	0.00	180.00	0.00	180.00	0.00	913.36	4547.73	3622.30
12-2017	1.	2.00	92.71	0.00	180.00	0.00	180.00	0.00	816.78	5364.51	4227.24
12-2018	1.	1.85	85.96	0.00	180.00	0.00	180.00	0.00	744.33	6108.84	4752.24
12-2019	1.	1.74	80.63	0.00	180.00	0.00	180.00	0.00	687.11	6795.95	5213.78
12-2020	1.	1.65	76.48	0.00	180.00	0.00	180.00	0.00	642.35	7438.31	5624.69
12-2021	1.	1.57	73.01	0.00	180.00	0.00	180.00	0.00	604.91	8043.22	5993.21
12-2022	1.	1.51	69.96	0.00	180.00	0.00	180.00	0.00	572.11	8615.33	6325.14
12-2023	1.	1.45	67.31	0.00	180.00	0.00	180.00	0.00	543.48	9158.81	6625.44
12-2024	1.	1.40	64.91	0.00	180.00	0.00	180.00	0.00	517.67	9676.47	6897.85
12-2025	1.	1.35	62.53	0.00	180.00	0.00	180.00	0.00	492.04	10168.51	7144.45
12-2026	1.	1.29	60.09	0.00	180.00	0.00	180.00	0.00	465.94	10634.45	7366.85
12-2027	1.	1.24	57.69	0.00	180.00	0.00	180.00	0.00	440.07	11074.52	7566.89
S TOT	1.	41.47	1926.24	0.00	3319.00	0.00	3319.00	6300.00	11074.52	11074.52	7566.89
AFTER	1.	16.95	786.18	0.00	4260.00	0.00	4260.00	16.00	4184.00	15258.52	8924.13
TOTAL	1.	58.42	2712.42	0.00	7579.00	0.00	7579.00	6316.00	15258.52	15258.52	8924.13

	OIL -----	GAS -----		P.W. % -----	P.W., M\$ -----
GROSS WELLS	1.0	0.0	LIFE, YRS.	40.33	0.00
GROSS ULT., MB & MMF	300.887	1096.430	DISCOUNT %	5.00	5.00
GROSS CUM., MB & MMF	0.000	0.000	UNDISCOUNTED PAYOUT, YRS.	1.85	8.00
GROSS RES., MB & MMF	300.887	1096.430	DISCOUNTED PAYOUT, YRS.	2.00	10.00
NET RES., MB & MMF	263.276	680.677	UNDISCOUNTED NET/INVEST.	3.42	12.00
NET REVENUE, M\$	25909.344	2804.232	DISCOUNTED NET/INVEST.	2.42	14.00
INITIAL PRICE, \$	77.401	3.367	RATE-OF-RETURN, PCT.	48.09	16.00
INITIAL N.I., PCT.	87.500	87.500	INITIAL W.I., PCT.	100.000	20.00
NET EQUIV RES., MMCFE		2685.144	REVERSION, YRS.	0.00	25.00
					30.00
PLANT GROSS PROD (MU)	80.917				40.00
PLANT NET PROD (MU)	70.802				50.00
PLANT NET REVENUES (M\$)	3210.780				60.00
					80.00
					100.00

Rsv_Cat: 1PDP Loc: 27 024S 030E
 Aries_Code: RLT0770 Prop_Num: 632407

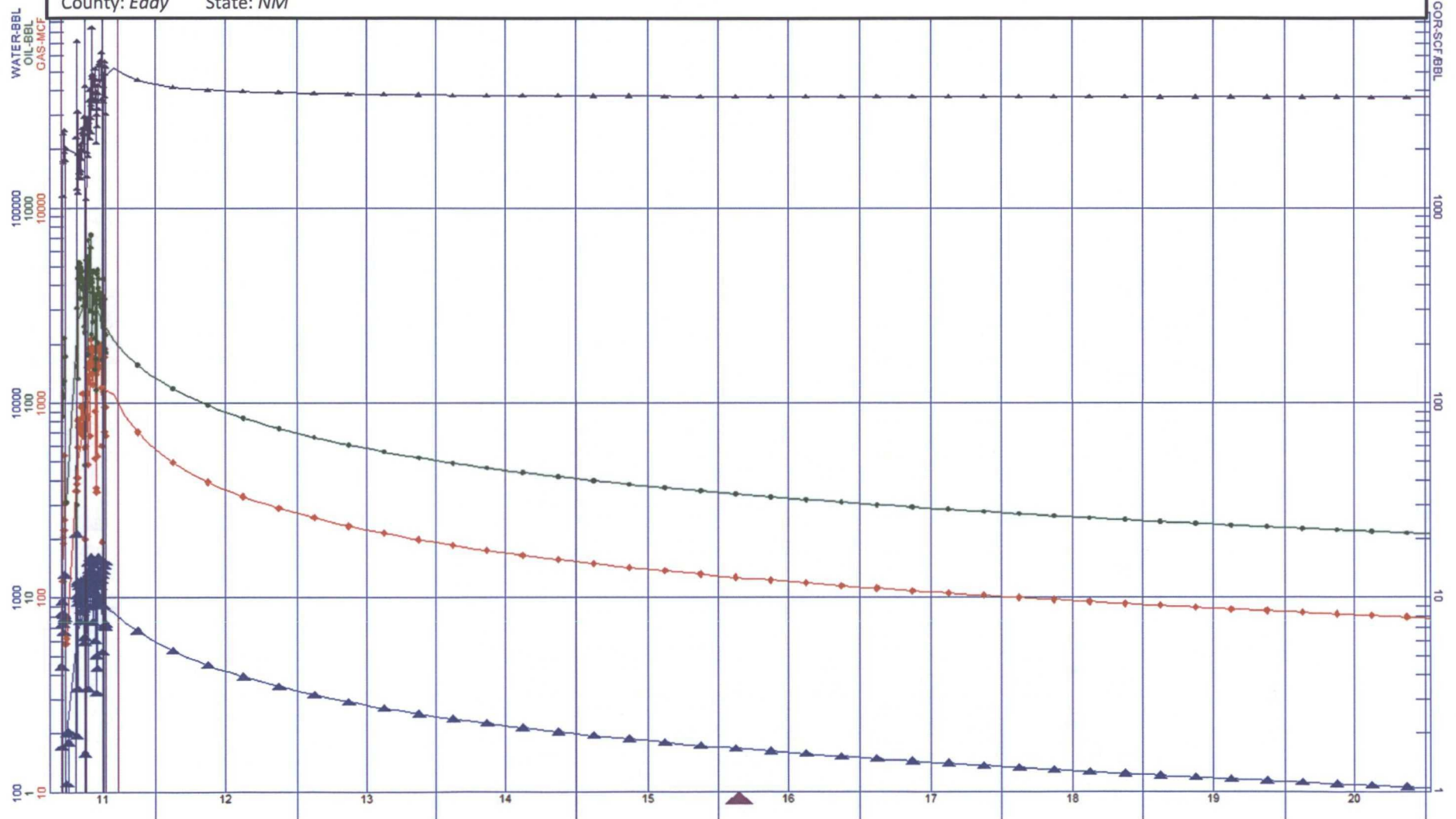
District: PERMIAN

Lease: PLU Big Sinks 27 Federal Com #1H

Field: Poker Lake

Operator: BOPCO

County: Eddy State: NM



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECEIVED

JUN 6 2011

FORM APPROVED
OMB No. 1004-0137
Expires: July 31, 2010

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

1a. Type of Well ☒ Oil Well ☐ Gas Well ☐ Dry ☐ Other		5. Lease Serial No. NMNM02862
b. Type of Completion ☒ New Well ☐ Work Over ☐ Deepen ☐ Plug Back ☐ Diff. Resvr. Other		6. If Indian, Allottee or Tribe Name
2. Name of Operator CHESAPEAKE OPERATING INC		7. Unit or CA Agreement Name and No NMNM71016X
Contact: LYNDEE SONGER E-Mail: lyndee.songer@chk.com		8. Lease Name and Well No PLU BIG SINKS 27 FEDERAL 1H
3. Address OKLAHOMA CITY, OK 73154-0496		9. API Well No. 30-015-38319-00-S1
3a. Phone No. (include area code) Ph: 405-935-2411		10. Field and Pool, or Exploratory WILDCAT
4. Location of Well (Report location clearly and in accordance with Federal requirements)* At surface SESE 215FSL 400FEL At top prod interval reported below SESE 215FSL 400FEL At total depth NENE 380FNL 427FEL		11. Sec., T., R., M., or Block and Survey or Area Sec 27 T24S R30E Mer NMP
14. Date Spudded 01/01/2011	15. Date T.D. Reached 02/11/2011	12. County or Parish EDDY
16. Date Completed ☐ D & A ☒ Ready to Prod. 05/06/2011		13. State NM
17. Elevations (DF, KB, RT, GL)* 3352 GL		

18. Total Depth MD TVD 13753 9066	19. Plug Back T.D. MD TVD 13656 8969	20. Depth Bridge Plug Set MD TVD
21. Type Electric & Other Mechanical Logs Run (Submit copy of each) CBL GAMMARAY		22. Was well cored? ☒ No ☐ Yes (Submit analysis) Was DST run? ☒ No ☐ Yes (Submit analysis) Directional Survey? ☐ No ☒ Yes (Submit analysis)

23. Casing and Liner Record (Report all strings set in well)

Hole Size	Size/Grade	Wt. (#/ft.)	Top (MD)	Bottom (MD)	Stage Cementer Depth	No. of Sks. & Type of Cement	Slurry Vol. (BBL)	Cement Top*	Amount Pulled
17.500	13.375 H-40	48.0	0	1355		1400		0	
11.000	8.625 K-55	32.0	0	3945		1950		0	
7.875	5.500 L-80	20.0	0	13753	4550	1843		3010	

24. Tubing Record

Size	Depth Set (MD)	Packer Depth (MD)	Size	Depth Set (MD)	Packer Depth (MD)	Size	Depth Set (MD)	Packer Depth (MD)
2.875		8585						

25. Producing Intervals

Formation	Top	Bottom	Perforated Interval	Size	No. Holes	Perf. Status
A) BONE SPRING	9200	13725	9200 TO 13725		480	open
B)						
C)						
D)						

26. Perforation Record

Formation	Top	Bottom	Perforated Interval	Size	No. Holes	Perf. Status
A) BONE SPRING	9200	13725	9200 TO 13725		480	open

27. Acid, Fracture, Treatment, Cement Squeeze, Etc.

Depth Interval	Amount and Type of Material
9200 TO 13725	gal 15% HCL, 97500 bbls fluid, 4800000# sand

28. Production - Interval A

Date First Produced	Test Date	Hours Tested	Test Production	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method
05/06/2011	04/19/2011	24	→	36.0	292.0	883.0			POW

28b. Production - Interval C

Date First Produced	Test Date	Hours Tested	Test Production	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method
			→						
Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate	Oil BBL	Gas MCF	Water BBL	Gas:Oil Ratio	Well Status	
			→						

28c. Production - Interval D

Date First Produced	Test Date	Hours Tested	Test Production	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method
			→						
Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate	Oil BBL	Gas MCF	Water BBL	Gas:Oil Ratio	Well Status	
			→						

29. Disposition of Gas (Sold, used for fuel, vented, etc.)
SOLD

30. Summary of Porous Zones (Include Aquifers):

Show all important zones of porosity and contents thereof. Cored intervals and all drill-stem tests, including depth interval tested, cushion used, time tool open, flowing and shut-in pressures and recoveries.

31. Formation (Log) Markers

Formation	Top	Bottom	Descriptions, Contents, etc.	Name	Top Meas. Depth
				RUSTLER	1191
				BASE OF SALT	3762
				BELL CANYON	3836
				CHERRY CANYON	4584
				BRUSHY CANYON	5564

32. Additional remarks (include plugging procedure):
CONFIDENTIAL

#52 CONT.
AVALON SAND 7323
AVALON SHALE 7412
FIRST BONE SPRING CARBONATE 8166
FIRST BONE SPRING SAND 8670

33. Circle enclosed attachments:

- | | | | |
|---|--------------------|---------------|-----------------------|
| 1. Electrical/Mechanical Logs (1 full set req'd.) | 2. Geologic Report | 3. DST Report | 4. Directional Survey |
| 5. Sundry Notice for plugging and cement verification | 6. Core Analysis | 7. Other: | |

34. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records (see attached instructions):

Electronic Submission #108699 Verified by the BLM Well Information System.

For CHESAPEAKE OPERATING INC., sent to the Carlsbad

Committed to AFMSS for processing by DEBORAH MCKINNEY on 05/24/2011 (11DLM0781SE)

Name (please print) LYNDEE SONGER

Title REGULATORY COMPLIANCE ANALYST

Signature (Electronic Submission)

Date 05/20/2011

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.

**** REVISED ** REVISED ** REVISED ** REVISED ** REVISED ** REVISED ** REVISED ****

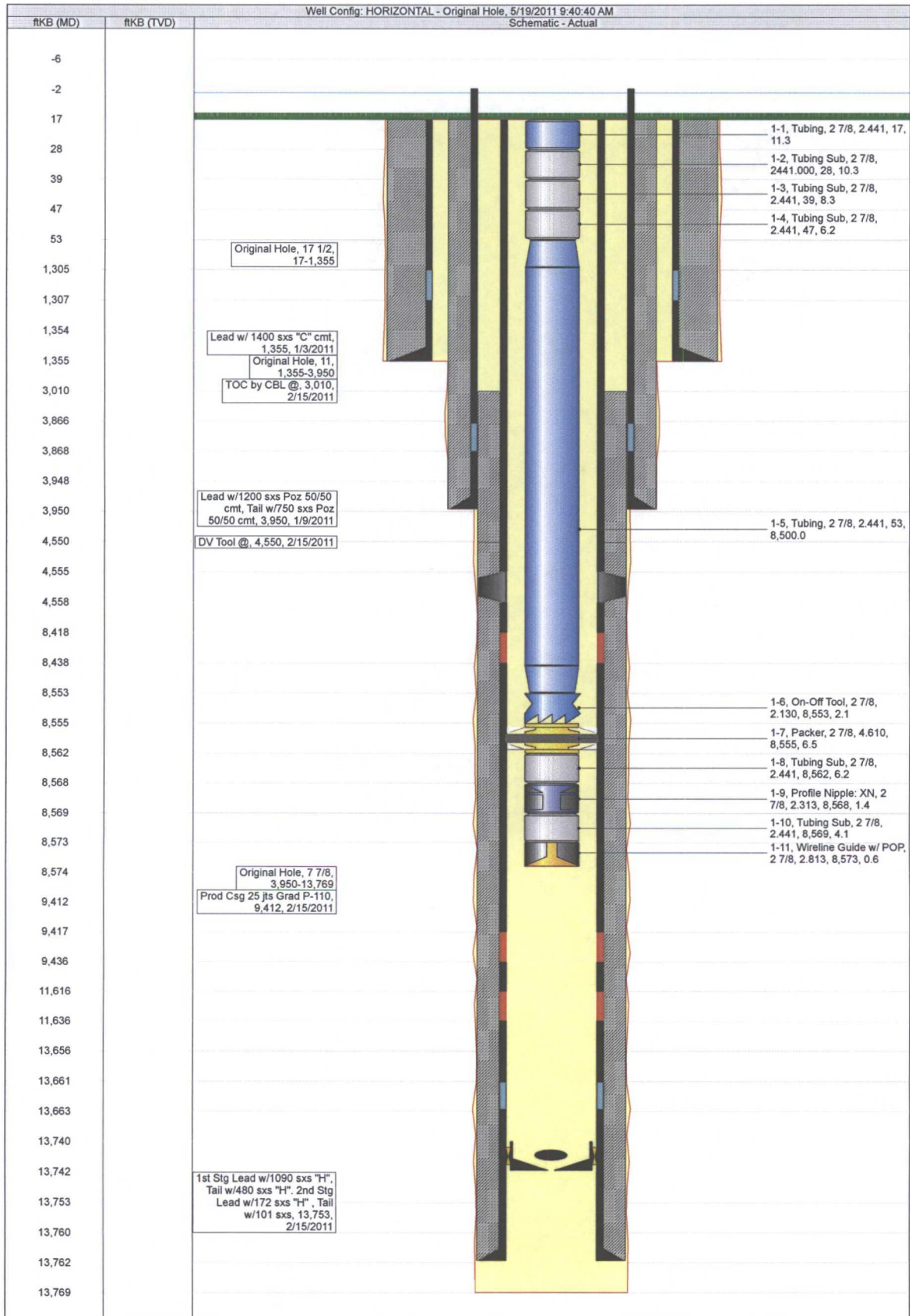


BLM PLU Schematic
PLU BIG SINKS 27 FEDERAL 1H

CONFIDENTIAL

Field:
County: EDDY
State: NEW MEXICO
Location: SEC 27-24S-30E, 100 FSL & 400 FEL
Elevation: GL 3,352.0 KB 3,369.0
KB Height: 17.0

Spud Date: 1/1/2011
Initial Compl. Date:
API #: 3001538319
CHK Property #: 632407
1st Prod Date: 5/6/2011
PBSD: Original Hole - 13769.0
TD: 13,769.0





Ryan Energy Directional Drilling Report

Field: Eddy Co, NM NAD 83
Site: PLU Big Sinks 27 Federal 1H
Well: PLU Big Sinks 27 Federal 1H
Wellpath: 27 Fed 1H ST1

Prepared For:

Chesapeake Operating, Inc.



Ryan Energy Technology

**19510 Oil Center Blvd
Houston, TX 77073
Ph: 281-443-1414
Fx: 281-443-1676**

www.ryanenergy.com



Chesapeake Operating, Inc.

Field: Eddy Co, NM NAD 83
 Site: PLU Big Sinks 27 Federal 1H
 Well: PLU Big Sinks 27 Federal 1H
 Wellpath: 27 Fed 1H ST1



Azimuths to Grid North
 True North: -0.25°
 Magnetic North: 7.51°

Magnetic Field
 Strength: 48624nT
 Dip Angle: 60.11°
 Date: 1/21/2011
 Model: IGRF2010

TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
PBHL	9079.39	4724.38	-26.88	435073.10	687260.49	32°11'42.760N	103°51'41.762W	Point

FIELD DETAILS

Eddy Co, NM NAD 83
 USA

Geodetic System: US State Plane Coordinate System 1983
 Ellipsoid: GRS 1980
 Zone: New Mexico, Eastern Zone
 Magnetic Model: IGRF2010

System Datum: Mean Sea Level
 Local North: Grid North

WELLPATH DETAILS

27 Fed 1H ST1

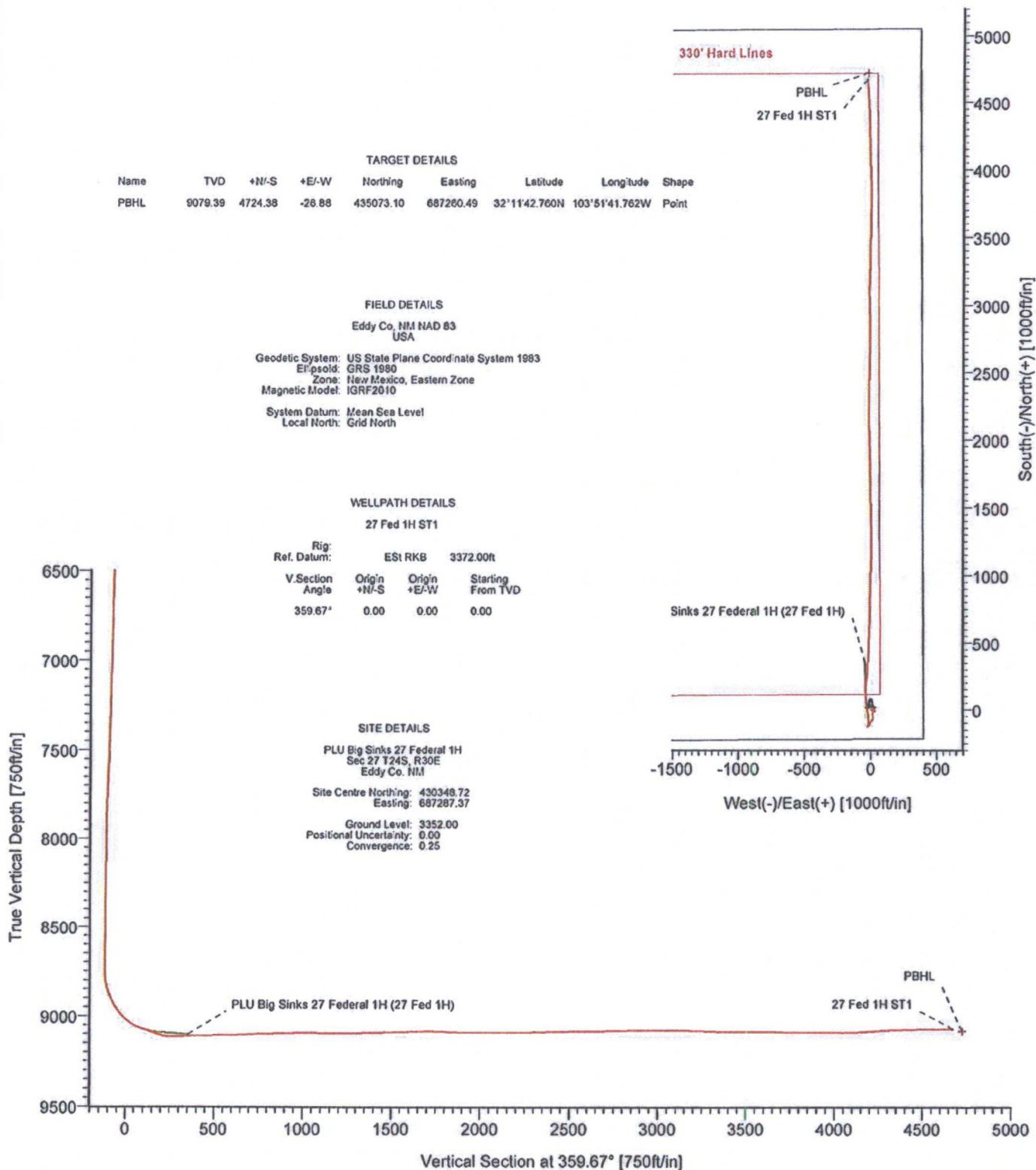
Rig:	EST RKB		3372.00ft
Ref. Datum:			
V.Section	Origin	Origin	Starting
Angle	+N/-S	+E/-W	From TVD
359.67°	0.00	0.00	0.00

SITE DETAILS

PLU Big Sinks 27 Federal 1H
 Sec 27 T24S, R30E
 Eddy Co, NM

Site Centre Northing: 430348.72
 Easting: 687287.37

Ground Level: 3352.00
 Positional Uncertainty: 0.00
 Convergence: 0.25





Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc.	Date: 2/15/2011	Time: 15:12:54	Page: 1
Field: Eddy Co, NM NAD 83	Co-ordinate(NE) Reference:	Site: PLU Big Sinks 27 Federal 1H	
Site: PLU Big Sinks 27 Federal 1H	Vertical (TVD) Reference:	ESI RKB 3372.0	
Well: PLU Big Sinks 27 Federal 1H	Section (VS) Reference:	Well (0.00N,0.00E,359.67Azi)	
Wellpath: 27 Fed 1H	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Field: Eddy Co, NM NAD 83

USA

Map System: US State Plane Coordinate System 1983

Geo Datum: GRS 1980

Sys Datum: Mean Sea Level

Map Zone:

New Mexico, Eastern Zone

Coordinate System:

Site Centre

Geomagnetic Model:

IGRF2010

Site: PLU Big Sinks 27 Federal 1H
Sec 27 T24S, R30E
Eddy Co, NM

Site Position:	Northings:	430348.72 ft	Latitude:	32 10 56.007 N
From: Map	Easting:	687287.37 ft	Longitude:	103 51 41.690 W
Position Uncertainty:	0.00 ft		North Reference:	Grid
Ground Level:	3352.00 ft		Grid Convergence:	0.25 deg

Well: PLU Big Sinks 27 Federal 1H

Slot Name:

Well Position:	+N/S	0.00 ft	Northings:	430348.72 ft	Latitude:	32 10 56.007 N
	+E/W	0.00 ft	Easting:	687287.37 ft	Longitude:	103 51 41.690 W
Position Uncertainty:	0.00 ft					

Wellpath: 27 Fed 1H

Drilled From:

Surface

Current Datum:	ESI RKB	Height	3372.00 ft	Tie-on Depth:	0.00 ft
Magnetic Data:	1/11/2011			Above System Datum:	Mean Sea Level
Field Strength:	48627 nT			Declination:	7.77 deg
Vertical Section:	Depth From (TVD)	+N/S		Mag Dip Angle:	60.11 deg
	ft	ft		+E/W	Direction
				ft	deg
	0.00	0.00	0.00		359.67

Survey Program for Definitive Wellpath

Date: 2/15/2011

Validated: No

Version: 6

Actual From To
ft ft

Survey

Toolcode

Tool Name

100.00	8635.00	Survey #1 (100.00-8635.00)	Gyro	Gyro
8692.00	9366.00	Survey #2 (8692.00-9366.00)	Ryan MWD	Ryan MWD
9424.00	9424.00	Survey #3 (9424.00-9424.00)	Projection	Projection

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/S ft	+E/W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	TIE LINE
100.00	0.12	181.55	100.00	-0.10	0.00	-0.10	0.12	0.12	0.00	Gyro
200.00	0.22	186.66	200.00	-0.40	-0.03	-0.40	0.10	0.10	5.11	Gyro
300.00	0.15	125.43	300.00	-0.67	0.06	-0.67	0.20	-0.07	-61.23	Gyro
400.00	0.75	93.49	400.00	-0.78	0.82	-0.79	0.63	0.60	-31.94	Gyro
500.00	1.03	87.76	499.98	-0.79	2.37	-0.80	0.29	0.28	-5.73	Gyro
600.00	1.34	90.72	599.96	-0.77	4.44	-0.79	0.32	0.31	2.96	Gyro
700.00	2.13	91.73	699.92	-0.84	7.46	-0.88	0.79	0.79	1.01	Gyro
800.00	2.66	95.54	799.83	-1.12	11.63	-1.18	0.55	0.53	3.81	Gyro
900.00	2.08	117.17	899.74	-2.17	15.55	-2.26	1.06	-0.58	21.63	Gyro
1000.00	2.23	137.57	999.67	-4.43	18.48	-4.54	0.78	0.15	20.40	Gyro
1100.00	1.95	153.84	1099.61	-7.40	20.54	-7.52	0.65	-0.28	16.27	Gyro
1200.00	1.32	147.18	1199.57	-9.89	21.92	-10.02	0.66	-0.63	-6.66	Gyro
1270.60	1.12	122.73	1270.15	-10.95	22.94	-11.08	0.78	-0.28	-34.63	Gyro
1365.80	0.92	101.46	1365.34	-11.60	24.47	-11.75	0.45	-0.21	-22.34	Gyro
1461.10	0.56	104.91	1460.63	-11.88	25.67	-12.02	0.38	-0.38	3.62	Gyro
1556.30	0.42	120.75	1555.83	-12.17	26.42	-12.33	0.20	-0.15	16.64	Gyro
1651.50	0.14	99.24	1651.02	-12.37	26.83	-12.53	0.31	-0.29	-22.59	Gyro
1746.70	0.38	29.89	1746.22	-12.12	27.11	-12.27	0.37	0.25	-72.85	Gyro
1842.00	0.45	33.41	1841.52	-11.53	27.47	-11.69	0.08	0.07	3.69	Gyro
1937.20	0.56	35.10	1936.72	-10.84	27.94	-11.00	0.12	0.12	1.78	Gyro



Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc.	Date: 2/15/2011	Time: 15:12:54	Page: 2
Field: Eddy Co, NM NAD 83	Co-ordinate(NE) Reference:	Site: PLU Big Sinks 27 Federal 1H	
Site: PLU Big Sinks 27 Federal 1H	Vertical (TYD) Reference:	Est RKB 3372.0	
Well: PLU Big Sinks 27 Federal 1H	Section (VS) Reference:	Well (0.00N, 0.00E, 359.67Az)	
Wellpath: 27 Fed 1H	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Survey

MD ft	Incl deg	Azim deg	TYD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
2032.40	0.89	16.88	2031.91	-9.75	28.43	-9.91	0.42	0.35	-19.14	Gyro
2127.70	1.33	350.61	2127.19	-7.95	28.46	-8.11	0.69	0.46	-27.57	Gyro
2222.90	1.76	342.89	2222.36	-5.46	27.85	-5.62	0.50	0.45	-8.11	Gyro
2318.10	2.07	343.16	2317.50	-2.42	26.92	-2.57	0.33	0.33	0.28	Gyro
2413.30	2.11	339.16	2412.64	0.86	25.80	0.72	0.16	0.04	-4.20	Gyro
2508.60	1.55	326.10	2507.89	3.57	24.46	3.43	0.73	-0.59	-13.70	Gyro
2603.80	1.24	303.35	2603.06	5.21	22.88	5.08	0.66	-0.33	-23.90	Gyro
2699.00	0.95	295.47	2698.26	6.11	21.31	5.99	0.34	-0.30	-8.28	Gyro
2794.30	0.80	295.02	2793.54	6.73	19.99	6.62	0.16	-0.16	-0.47	Gyro
2889.50	0.70	236.72	2888.73	6.70	18.90	6.59	0.77	-0.11	-61.24	Gyro
2984.70	1.53	199.97	2983.91	5.18	17.98	5.08	1.11	0.87	-38.60	Gyro
3080.00	2.46	194.60	3079.15	2.01	17.03	1.91	0.99	0.98	-5.63	Gyro
3175.20	2.74	198.89	3174.25	-2.12	15.78	-2.21	0.36	0.29	4.51	Gyro
3270.40	2.93	193.75	3269.34	-6.64	14.46	-6.72	0.33	0.20	-5.40	Gyro
3365.70	3.10	188.43	3364.51	-11.55	13.51	-11.63	0.34	0.18	-5.58	Gyro
3460.90	3.29	190.62	3459.56	-16.78	12.63	-16.86	0.24	0.20	2.30	Gyro
3556.10	3.18	185.18	3554.61	-22.10	11.88	-22.17	0.34	-0.12	-5.71	Gyro
3651.30	3.10	185.46	3649.66	-27.29	11.40	-27.36	0.09	-0.08	0.29	Gyro
3746.60	2.61	177.59	3744.85	-32.02	11.25	-32.09	0.66	-0.51	-8.26	Gyro
3841.80	2.07	168.73	3839.97	-35.88	11.67	-35.94	0.68	-0.57	-9.31	Gyro
3937.00	1.44	177.67	3935.12	-38.76	12.06	-38.83	0.72	-0.66	9.39	Gyro
4032.30	1.27	176.28	4030.39	-41.01	12.18	-41.08	0.18	-0.18	-1.46	Gyro
4127.50	1.19	174.84	4125.57	-43.05	12.33	-43.12	0.09	-0.08	-1.51	Gyro
4222.70	1.12	178.41	4220.75	-44.96	12.45	-45.03	0.11	-0.07	3.75	Gyro
4317.90	1.00	167.38	4315.94	-46.70	12.66	-46.77	0.25	-0.13	-11.59	Gyro
4413.20	0.93	152.98	4411.22	-48.20	13.19	-48.28	0.26	-0.07	-15.11	Gyro
4603.60	0.68	156.46	4601.60	-50.61	14.34	-50.70	0.13	-0.13	1.83	Gyro
4698.90	0.61	147.05	4696.90	-51.56	14.84	-51.64	0.13	-0.07	-9.87	Gyro
4794.10	0.49	135.98	4792.09	-52.28	15.40	-52.36	0.17	-0.13	-11.63	Gyro
4889.30	0.48	158.32	4887.29	-52.94	15.83	-53.03	0.20	-0.01	23.47	Gyro
4984.60	0.44	170.18	4982.59	-53.67	16.04	-53.76	0.11	-0.04	12.44	Gyro
5079.80	0.38	180.75	5077.79	-54.35	16.10	-54.44	0.10	-0.06	11.10	Gyro
5175.00	0.37	188.26	5172.98	-54.97	16.05	-55.06	0.05	-0.01	7.89	Gyro
5270.30	0.45	193.57	5268.28	-55.63	15.92	-55.73	0.09	0.08	5.57	Gyro
5365.50	0.43	199.62	5363.48	-56.33	15.71	-56.42	0.05	-0.02	6.36	Gyro
5460.70	0.42	193.01	5458.68	-57.01	15.51	-57.10	0.05	-0.01	-6.94	Gyro
5555.90	0.48	188.52	5553.87	-57.75	15.38	-57.83	0.07	0.06	-4.72	Gyro
5651.20	0.52	191.10	5649.17	-58.56	15.23	-58.65	0.05	0.04	2.71	Gyro
5746.40	0.58	181.93	5744.36	-59.47	15.13	-59.56	0.11	0.06	-9.63	Gyro
5841.60	0.75	184.99	5839.56	-60.57	15.06	-60.66	0.18	0.18	3.21	Gyro
5936.90	0.85	186.08	5934.85	-61.90	14.93	-61.98	0.11	0.10	1.14	Gyro
6032.10	0.89	194.84	6030.04	-63.31	14.67	-63.40	0.15	0.04	9.20	Gyro
6127.30	1.18	198.04	6125.22	-64.96	14.18	-65.04	0.31	0.30	3.36	Gyro
6222.60	1.41	198.58	6220.50	-67.00	13.50	-67.08	0.24	0.24	0.57	Gyro
6317.80	1.27	212.24	6315.67	-69.01	12.56	-69.08	0.37	-0.15	14.35	Gyro
6413.00	1.17	224.89	6410.85	-70.59	11.32	-70.65	0.30	-0.11	13.29	Gyro
6508.20	1.24	226.32	6506.03	-71.99	9.88	-72.04	0.08	0.07	1.50	Gyro
6603.50	1.55	230.50	6601.30	-73.52	8.14	-73.57	0.34	0.33	4.39	Gyro
6698.70	1.60	224.41	6696.47	-75.29	6.22	-75.32	0.18	0.05	-6.40	Gyro
6793.90	1.58	226.18	6791.63	-77.15	4.34	-77.17	0.06	-0.02	1.66	Gyro
6889.20	1.62	225.06	6886.89	-79.01	2.44	-79.02	0.05	0.04	-1.18	Gyro
6984.40	1.62	216.78	6982.05	-81.04	0.68	-81.04	0.25	0.00	-8.70	Gyro
7079.60	1.68	206.12	7077.21	-83.37	-0.74	-83.36	0.33	0.06	-11.20	Gyro
7174.00	1.71	202.37	7172.47	-85.94	-1.89	-85.92	0.12	0.03	-3.93	Gyro



Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc.	Date: 2/15/2011	Time: 15:12:54	Page: 3
Field: Eddy Co, NM NAD 83	Co-ordinate(NE) Reference:	Site: PLU Big Sinks 27.Federal 1H	
Site: PLU Big Sinks 27.Federal 1H	Vertical (TVD) Reference:	EST RKB 3372.0	
Well: PLU Big Sinks 27.Federal 1H	Section (VS) Reference:	Well (0.00N,0.00E,359.67Azi)	
Wellpath: 27.Fed 1H	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Survey

MD ft	Incl deg	Azimi deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
7270.10	1.98	201.89	7267.62	-88.78	-3.05	-88.76	0.28	0.28	-0.50	Gyro
7365.30	1.77	200.06	7362.77	-91.68	-4.16	-91.66	0.23	-0.22	-1.92	Gyro
7460.50	1.83	200.07	7457.93	-94.49	-5.19	-94.46	0.06	0.06	0.01	Gyro
7555.80	1.96	200.36	7553.17	-97.45	-6.28	-97.41	0.14	0.14	0.30	Gyro
7651.00	1.98	198.63	7648.32	-100.53	-7.37	-100.49	0.07	0.02	-1.82	Gyro
7746.20	2.24	199.55	7743.45	-103.84	-8.52	-103.79	0.28	0.27	0.97	Gyro
7841.50	1.91	205.09	7838.69	-107.04	-9.81	-106.98	0.40	-0.35	5.81	Gyro
7936.70	1.50	231.51	7933.85	-109.25	-11.46	-109.18	0.92	-0.43	27.75	Gyro
8031.90	2.06	230.27	8029.00	-111.12	-13.75	-111.04	0.59	0.59	-1.30	Gyro
8127.10	1.02	249.92	8124.17	-112.50	-15.87	-112.41	1.21	-1.09	20.64	Gyro
8222.40	1.58	246.31	8219.44	-113.32	-17.87	-113.22	0.59	0.59	-3.79	Gyro
8254.10	1.69	242.63	8251.13	-113.71	-18.68	-113.60	0.48	0.35	-11.61	Gyro
8349.30	1.58	234.01	8346.29	-115.13	-20.99	-115.01	0.28	-0.12	-9.05	Gyro
8444.50	1.46	258.09	8441.46	-116.15	-23.24	-116.02	0.88	-0.13	25.29	Gyro
8539.80	1.01	208.02	8536.74	-117.14	-24.82	-117.00	1.18	-0.47	-52.54	Gyro
8635.00	1.05	174.65	8631.92	-118.75	-25.13	-118.61	0.62	0.04	-35.05	Gyro
8692.00	1.40	114.30	8688.91	-119.56	-24.45	-119.42	2.22	0.61	-105.88	Ryan MWD
8729.00	1.50	120.60	8725.90	-119.99	-23.62	-119.85	0.51	0.27	-17.03	Ryan MWD
8761.00	3.70	52.90	8757.87	-119.58	-22.44	-119.45	10.70	6.87	-211.56	Ryan MWD
8793.00	8.80	21.70	8789.68	-116.68	-20.71	-116.56	18.59	15.94	-97.50	Ryan MWD
8825.00	13.60	7.90	8821.07	-110.68	-19.28	-110.56	17.08	15.00	-43.12	Ryan MWD
8857.00	18.10	3.20	8851.84	-101.98	-18.49	-101.88	14.61	14.06	-14.69	Ryan MWD
8889.00	22.00	359.50	8881.90	-91.02	-18.26	-90.92	12.81	12.19	-11.56	Ryan MWD
8920.00	25.60	355.50	8910.26	-78.53	-18.84	-78.42	12.72	11.61	-12.90	Ryan MWD
8953.00	29.40	353.80	8939.53	-63.37	-20.27	-63.25	11.76	11.52	-5.15	Ryan MWD
8984.00	34.90	352.50	8965.76	-47.00	-22.26	-46.87	17.88	17.74	-4.19	Ryan MWD
9016.00	42.00	353.10	8990.81	-27.27	-24.74	-27.13	22.22	22.19	1.87	Ryan MWD
9048.00	48.40	352.70	9013.34	-4.75	-27.55	-4.59	20.02	20.00	-1.25	Ryan MWD
9080.00	55.00	352.90	9033.17	20.15	-30.69	-20.33	20.63	20.62	-0.62	Ryan MWD
9111.00	61.60	353.30	9049.45	46.32	-33.86	46.52	21.32	21.29	1.29	Ryan MWD
9143.00	68.50	353.60	9062.94	75.13	-37.16	75.34	21.58	21.56	0.94	Ryan MWD
9175.00	74.30	355.40	9073.14	105.30	-40.06	105.53	18.89	18.12	5.62	Ryan MWD
9201.00	77.55	357.68	9079.46	130.47	-41.58	130.71	15.12	12.50	8.77	Ryan MWD
9207.00	78.30	358.20	9080.72	136.34	-41.79	136.57	15.10	12.50	8.67	Ryan MWD
9238.00	82.50	359.90	9085.89	166.89	-42.29	167.13	14.59	13.55	-5.48	Ryan MWD
9270.00	84.90	0.10	9089.40	198.69	-42.29	198.93	7.53	7.50	0.63	Ryan MWD
9302.00	86.80	0.60	9091.71	230.61	-42.10	230.85	6.14	5.94	1.56	Ryan MWD
9334.00	87.20	0.10	9093.39	262.56	-41.90	262.80	2.00	1.25	-1.56	Ryan MWD
9340.00	87.01	0.06	9093.69	268.56	-41.89	268.79	3.24	-3.17	-0.67	Ryan MWD
9366.00	86.20	359.90	9095.23	294.51	-41.90	294.75	3.18	-3.12	-0.62	Ryan MWD
9424.00	86.20	359.90	9099.08	352.38	-42.00	352.62	0.00	0.00	0.00	PROJECTED to TD



Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc.		Date: 2/15/2011	Time: 15:27:29	Page: 1						
Field: Eddy Co, NM NAD 83		Co-ordinate(NF) Reference:	Site: PLU Big Sinks 27 Federal 1H							
Site: PLU Big Sinks 27 Federal 1H		Vertical (TVD) Reference:	EST RKB 3372.0							
Well: PLU Big Sinks 27 Federal 1H		Section (VS) Reference:	Well (0.00N,0.00E,359.67Azi)							
Wellpath: 27 Fed 1H ST1		Survey Calculation Method:	Minimum Curvature Db: Sybase							
Field: Eddy Co, NM NAD 83										
USA										
Map System: US State Plane Coordinate System 1983		Map Zone:	New Mexico, Eastern Zone							
Geo Datum: GRS 1980		Coordinate System:	Site Centre							
Sys Datum: Mean Sea Level		Geomagnetic Model:	IGRF2010							
Site: PLU Big Sinks 27 Federal 1H										
Sec 27 T24S, R30E										
Eddy Co, NM										
Site Position:	From: Map	Northing: 430348.72 ft	Latitude: 32 10 56.007 N							
Position Uncertainty:	0.00 ft	Easting: 687287.37 ft	Longitude: 103 51 41.690 W							
Ground Level:	3352.00 ft	North Reference:	Grid							
		Grid Convergence:	0.25 deg							
Well: PLU Big Sinks 27 Federal 1H										
Slot Name:										
Well Position:	+N-S 0.00 ft	Northing: 430348.72 ft	Latitude: 32 10 56.007 N							
	+E-W 0.00 ft	Easting: 687287.37 ft	Longitude: 103 51 41.690 W							
Position Uncertainty:	0.00 ft									
Wellpath: 27 Fed 1H ST1										
Current Datum:	EST RKB	Height: 3372.00 ft	Tie-on Depth:	Surface 0.00 ft						
Magnetic Data:	1/21/2011		Above System Datum:	Mean Sea Level						
Field Strength:	48624 nT		Declination:	7.77 deg						
Vertical Section:	Depth From (TVD)	+N-S	Mag Dip Angle:	60.11 deg						
	ft	ft	+E-W	Direction deg						
	0.00	0.00	0.00	359.67						
Survey Program for Definitive Wellpath										
Date: 2/15/2011	Validated: No	Version: 0								
Actual From	To	Survey	Toolcode	Tool Name						
ft	ft									
100.00	8635.00	Survey #1 (100.00-8635.00)	Gyro	Gyro						
8692.00	13596.00	Survey #2 (8692.00-13596.00)	Ryan MWD	Ryan MWD						
13753.00	13753.00	Survey #541 (13753.00-13753.00)	Projection	Projection						
Survey										
MD	Incl	Azim	TVD	+N-S	+E-W	VS	DLS	Build	Turn	Tool/Comment
ft	deg	deg	ft	ft	ft	ft	deg/100ft	deg/100ft	deg/100ft	
9175.00	74.30	355.40	9073.14	105.30	-40.06	105.53	0.00	0.00	0.00	Tie In
9215.00	67.00	2.20	9086.40	142.98	-40.90	143.22	24.29	-18.25	17.00	Ryan MWD
9246.00	70.80	6.10	9097.56	171.82	-38.79	172.04	16.97	12.26	12.58	Ryan MWD
9278.00	77.10	7.00	9106.40	202.35	-35.28	202.55	19.87	19.69	2.81	Ryan MWD
9310.00	83.50	6.00	9111.79	233.67	-31.72	233.85	20.24	20.00	-3.12	Ryan MWD
9342.00	90.30	4.30	9113.52	265.48	-28.85	265.64	21.90	21.25	-5.31	Ryan MWD
9391.00	93.60	2.80	9111.85	314.35	-25.82	314.49	7.40	6.73	-3.06	Ryan MWD
9406.00	94.10	2.70	9110.85	329.30	-25.10	329.44	3.40	3.33	-0.67	Ryan MWD
9437.00	93.10	2.30	9108.90	360.21	-23.75	360.34	3.47	-3.23	-1.29	Ryan MWD
9469.00	91.30	2.20	9107.67	392.16	-22.50	392.28	5.63	-5.62	-0.31	Ryan MWD
9501.00	90.90	1.90	9107.06	424.13	-21.35	424.25	1.56	-1.25	-0.94	Ryan MWD
9533.00	90.60	1.70	9106.64	456.11	-20.35	456.22	1.13	-0.94	-0.62	Ryan MWD
9564.00	90.70	1.80	9106.29	487.10	-19.40	487.20	0.46	0.32	0.32	Ryan MWD
9596.00	90.10	1.50	9106.06	519.08	-18.48	519.18	2.10	-1.87	-0.94	Ryan MWD
9628.00	89.80	1.50	9106.09	551.07	-17.64	551.16	0.94	-0.94	0.00	Ryan MWD
9660.00	91.90	1.80	9105.62	583.05	-16.72	583.14	6.63	6.56	0.94	Ryan MWD
9691.00	92.60	2.40	9104.40	614.01	-15.59	614.09	2.97	2.26	1.94	Ryan MWD
9723.00	92.80	2.20	9102.89	645.95	-14.30	646.02	0.88	0.62	-0.62	Ryan MWD
9755.00	92.80	2.10	9101.33	677.88	-13.10	677.95	0.31	0.00	-0.31	Ryan MWD
9787.00	93.00	2.20	9099.71	709.82	-11.91	709.88	0.70	0.62	0.31	Ryan MWD
9819.00	93.00	2.20	9098.04	741.75	-10.68	741.80	0.00	0.00	0.00	Ryan MWD



Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc. Date: 2/15/2011 Time: 15:27:29 Page: 2
Field: Eddy Co, NM NAD 83 Co-ordinate(NE) Reference: Site: PLU Big Sinks 27 Federal 1H
Site: PLU Big Sinks 27 Federal 1H Vertical (TVD) Reference: EST RKB 3372.0
Well: PLU Big Sinks 27 Federal 1H Section (VS) Reference: Well (0.00N,0.00E,359.67Azi)
Wellpath: 27.Fed 1H ST1 Survey Calculation Method: Minimum Curvature Db: Sybase

Survey

MD ft	Incl deg	Azlm deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
9850.00	91.20	1.40	9096.90	772.72	-9.71	772.76	6.35	-5.81	-2.58	Ryan MWD
9882.00	90.20	0.80	9096.51	804.71	-9.09	804.75	3.64	-3.12	-1.87	Ryan MWD
9914.00	90.80	0.80	9096.23	836.70	-8.64	836.74	1.87	-1.87	0.00	Ryan MWD
9946.00	91.00	0.80	9095.73	868.70	-8.20	868.73	0.62	0.62	0.00	Ryan MWD
9977.00	91.30	0.70	9095.11	899.69	-7.79	899.72	1.02	0.97	-0.32	Ryan MWD
10009.00	91.90	0.70	9094.21	931.67	-7.40	931.70	1.87	1.87	0.00	Ryan MWD
10041.00	90.50	1.80	9093.54	963.66	-6.70	963.68	5.56	-4.37	3.44	Ryan MWD
10073.00	89.90	2.20	9093.43	995.64	-5.59	995.65	2.25	-1.87	1.25	Ryan MWD
10105.00	90.00	1.90	9093.46	1027.62	-4.44	1027.62	0.99	0.31	-0.94	Ryan MWD
10136.00	89.60	1.90	9093.57	1058.60	-3.41	1058.60	1.29	-1.29	0.00	Ryan MWD
10168.00	89.50	1.80	9093.82	1090.58	-2.38	1090.58	0.44	-0.31	-0.31	Ryan MWD
10200.00	89.50	1.90	9094.10	1122.56	-1.35	1122.55	0.31	0.00	0.31	Ryan MWD
10232.00	89.10	1.50	9094.49	1154.55	-0.40	1154.53	1.77	-1.25	-1.25	Ryan MWD
10263.00	88.60	1.40	9095.11	1185.53	0.39	1185.51	1.64	-1.61	-0.32	Ryan MWD
10295.00	90.10	0.10	9095.47	1217.52	0.80	1217.50	6.20	4.69	-4.06	Ryan MWD
10327.00	90.80	359.30	9095.22	1249.52	0.64	1249.50	3.32	2.19	-2.50	Ryan MWD
10358.00	91.20	359.10	9094.68	1280.51	0.20	1280.49	1.44	1.29	-0.65	Ryan MWD
10390.00	91.10	359.00	9094.04	1312.50	-0.33	1312.48	0.44	-0.31	-0.31	Ryan MWD
10422.00	90.90	358.80	9093.48	1344.49	-0.94	1344.47	0.88	-0.62	-0.62	Ryan MWD
10454.00	91.00	358.70	9092.95	1376.48	-1.64	1376.47	0.44	0.31	-0.31	Ryan MWD
10486.00	90.80	358.90	9092.45	1408.47	-2.31	1408.46	0.88	-0.62	0.62	Ryan MWD
10517.00	91.90	358.70	9091.72	1439.45	-2.96	1439.45	3.61	3.55	-0.65	Ryan MWD
10549.00	92.50	358.70	9090.49	1471.42	-3.68	1471.42	1.87	1.87	0.00	Ryan MWD
10581.00	92.90	358.80	9088.98	1503.38	-4.38	1503.38	1.29	1.25	0.31	Ryan MWD
10612.00	91.50	359.10	9087.79	1534.35	-4.95	1534.35	4.62	-4.52	0.97	Ryan MWD
10644.00	91.60	359.00	9086.92	1566.33	-5.48	1566.34	0.44	0.31	-0.31	Ryan MWD
10676.00	91.60	359.00	9086.03	1598.32	-6.04	1598.32	0.00	0.00	0.00	Ryan MWD
10708.00	91.70	359.40	9085.11	1630.30	-6.48	1630.31	1.29	0.31	1.25	Ryan MWD
10740.00	91.70	359.20	9084.16	1662.28	-6.87	1662.29	0.62	0.00	-0.62	Ryan MWD
10771.00	91.30	358.90	9083.35	1693.27	-7.39	1693.28	1.61	-1.29	-0.97	Ryan MWD
10803.00	88.60	358.60	9083.38	1725.26	-8.09	1725.27	8.49	-8.44	-0.94	Ryan MWD
10835.00	88.30	358.40	9084.24	1757.23	-8.92	1757.26	1.13	-0.94	-0.62	Ryan MWD
10867.00	87.80	358.40	9085.33	1789.20	-9.82	1789.23	1.56	-1.56	0.00	Ryan MWD
10898.00	87.60	358.50	9086.58	1820.17	-10.65	1820.20	0.72	-0.65	-0.32	Ryan MWD
10930.00	87.40	358.50	9087.97	1852.13	-11.49	1852.16	0.62	-0.62	0.00	Ryan MWD
10962.00	87.20	358.50	9089.48	1884.08	-12.33	1884.12	0.62	-0.62	0.00	Ryan MWD
10993.00	89.40	358.30	9090.40	1915.05	-13.19	1915.10	7.13	7.10	-0.65	Ryan MWD
11025.00	89.80	358.20	9090.62	1947.04	-14.17	1947.08	1.29	1.25	-0.31	Ryan MWD
11057.00	89.70	358.20	9090.76	1979.02	-15.18	1979.07	0.31	-0.31	0.00	Ryan MWD
11088.00	89.70	358.00	9090.92	2010.00	-16.20	2010.06	0.65	0.00	-0.65	Ryan MWD
11120.00	89.80	357.90	9091.06	2041.98	-17.35	2042.05	0.44	0.31	-0.31	Ryan MWD
11152.00	90.30	358.80	9091.04	2073.97	-18.27	2074.04	3.22	1.56	2.81	Ryan MWD
11184.00	90.20	359.20	9090.90	2105.96	-18.83	2106.04	1.29	-0.31	1.25	Ryan MWD
11215.00	89.90	359.10	9090.87	2136.96	-19.29	2137.03	1.02	-0.97	-0.32	Ryan MWD
11247.00	89.70	359.00	9090.98	2168.95	-19.82	2169.03	0.70	-0.62	-0.31	Ryan MWD
11279.00	90.90	359.60	9090.81	2200.95	-20.21	2201.03	4.19	3.75	1.87	Ryan MWD
11311.00	91.60	0.40	9090.11	2232.94	-20.21	2233.02	3.32	2.19	2.50	Ryan MWD
11343.00	91.60	0.20	9089.22	2264.93	-20.04	2265.01	0.62	0.00	-0.62	Ryan MWD
11374.00	91.90	0.10	9088.27	2295.91	-19.96	2295.99	1.02	0.97	-0.32	Ryan MWD
11406.00	91.90	359.80	9087.21	2327.90	-19.99	2327.97	0.94	0.00	-0.94	Ryan MWD
11438.00	91.40	1.20	9086.29	2359.88	-19.71	2359.96	4.64	-1.56	4.38	Ryan MWD
11470.00	91.10	1.20	9085.59	2391.87	-19.04	2391.94	0.94	-0.94	0.00	Ryan MWD
11502.00	91.00	1.20	9085.01	2423.85	-18.37	2423.92	0.31	-0.31	0.00	Ryan MWD
11533.00	91.00	1.00	9084.47	2454.84	-17.77	2454.91	0.65	0.00	-0.65	Ryan MWD



Ryan Energy Technologies Survey Report



Company: Chesapeake Operating, Inc.	Date: 2/15/2011	Time: 15:27:29	Page: 3
Field: Eddy Co. NM NAD 83	Co-ordinate(NE) Reference:	Site: PLU Big Sinks 27 Federal 1H	
Site: PLU Big Sinks 27 Federal 1H	Vertical (TVD) Reference:	ESI RKB 3372.0	
Well: PLU Big Sinks 27 Federal 1H	Section (VS) Reference:	Well (0.00N,0.00E,359.67Azi)	
Wellpath: 27 Fed 1H ST1	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Survey

MD ft	Incl deg	Azini deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
11565.00	91.10	1.20	9083.88	2486.83	-17.16	2486.89	0.70	0.31	0.62	Ryan MWD
11596.00	91.00	1.00	9083.31	2517.82	-16.57	2517.88	0.72	-0.32	-0.65	Ryan MWD
11628.00	90.60	0.80	9082.87	2549.81	-16.06	2549.87	1.40	-1.25	-0.62	Ryan MWD
11660.00	90.20	0.80	9082.64	2581.81	-15.62	2581.86	1.25	-1.25	0.00	Ryan MWD
11692.00	89.90	0.40	9082.61	2613.81	-15.28	2613.85	1.56	-0.94	-1.25	Ryan MWD
11723.00	91.10	0.90	9082.34	2644.81	-14.93	2644.85	4.19	3.87	-1.61	Ryan MWD
11755.00	91.30	1.00	9081.67	2676.79	-14.40	2676.83	0.70	0.62	0.31	Ryan MWD
11787.00	91.30	0.80	9080.95	2708.78	-13.90	2708.82	0.62	0.00	-0.62	Ryan MWD
11819.00	91.10	0.60	9080.28	2740.77	-13.51	2740.80	0.88	-0.62	-0.62	Ryan MWD
11851.00	90.90	0.30	9079.72	2772.77	-13.25	2772.80	1.13	-0.62	-0.94	Ryan MWD
11882.00	91.30	0.10	9079.12	2803.76	-13.15	2803.79	1.44	1.29	-0.65	Ryan MWD
11914.00	91.10	359.80	9078.45	2835.75	-13.17	2835.78	1.13	-0.62	-0.94	Ryan MWD
11946.00	90.60	359.40	9077.98	2867.75	-13.40	2867.78	2.00	-1.56	-1.25	Ryan MWD
11977.00	90.60	359.10	9077.65	2898.74	-13.80	2898.78	0.97	0.00	-0.97	Ryan MWD
12009.00	90.70	358.60	9077.29	2930.74	-14.45	2930.77	1.59	0.31	-1.56	Ryan MWD
12041.00	90.60	358.30	9076.93	2962.72	-15.31	2962.76	0.99	-0.31	-0.94	Ryan MWD
12073.00	89.80	357.90	9076.82	2994.70	-16.37	2994.75	2.80	-2.50	-1.25	Ryan MWD
12105.00	90.30	358.40	9076.79	3026.69	-17.40	3026.74	2.21	1.56	1.56	Ryan MWD
12137.00	89.70	359.10	9076.79	3058.68	-18.10	3058.73	2.88	-1.87	2.19	Ryan MWD
12168.00	89.90	359.20	9076.90	3089.68	-18.56	3089.73	0.72	0.65	0.32	Ryan MWD
12200.00	88.80	1.30	9077.26	3121.67	-18.42	3121.72	7.41	-3.44	-6.56	Ryan MWD
12232.00	88.30	1.50	9078.07	3153.65	-17.64	3153.70	1.68	-1.56	0.62	Ryan MWD
12264.00	88.10	1.40	9079.07	3185.62	-16.83	3185.67	0.70	-0.62	-0.31	Ryan MWD
12295.00	88.30	1.50	9080.05	3216.60	-16.05	3216.64	0.72	0.65	0.32	Ryan MWD
12359.00	88.00	1.10	9082.11	3280.55	-14.60	3280.58	0.78	-0.47	-0.62	Ryan MWD
12454.00	88.40	1.80	9085.10	3375.47	-12.19	3375.49	0.85	0.42	0.74	Ryan MWD
12549.00	90.40	1.90	9086.09	3470.41	-9.13	3470.41	2.11	2.11	0.11	Ryan MWD
12644.00	90.00	1.00	9085.76	3565.38	-6.72	3565.36	1.04	-0.42	-0.95	Ryan MWD
12740.00	89.80	0.60	9085.93	3661.37	-5.38	3661.34	0.47	-0.21	-0.42	Ryan MWD
12835.00	89.80	0.40	9086.26	3756.37	-4.55	3756.33	0.21	0.00	-0.21	Ryan MWD
12930.00	88.80	0.10	9087.42	3851.36	-4.14	3851.32	1.10	-1.05	-0.32	Ryan MWD
13025.00	89.90	358.40	9088.50	3946.34	-5.38	3946.30	2.13	1.16	-1.79	Ryan MWD
13120.00	89.80	357.90	9088.75	4041.29	-8.45	4041.27	0.54	-0.11	-0.53	Ryan MWD
13215.00	93.40	358.40	9086.10	4136.18	-11.52	4136.18	3.83	3.79	0.53	Ryan MWD
13310.00	93.60	357.90	9080.30	4230.96	-14.58	4230.97	0.57	0.21	-0.53	Ryan MWD
13405.00	92.00	358.70	9075.66	4325.80	-17.39	4325.83	1.88	-1.68	0.84	Ryan MWD
13501.00	91.80	358.00	9072.47	4421.71	-20.15	4421.75	0.76	-0.21	-0.73	Ryan MWD
13596.00	91.20	357.10	9069.99	4516.58	-24.21	4516.65	1.14	-0.63	-0.95	Ryan MWD
13753.00	91.20	357.10	9066.70	4673.35	-32.15	4673.46	0.00	0.00	0.00	Projection

Figure 52. Average annual world oil prices in three cases, 1980–2035 (2009 dollars per barrel)

	Reference	High Oil Price	Low Oil Price
1980	76.16		
1981	73.52		
1982	61.24		
1983	51.61		
1984	47.76		
1985	43.91		
1986	23.18		
1987	28.79		
1988	23.16		
1989	27.44		
1990	33.00		
1991	28.00		
1992	26.13		
1993	22.89		
1994	20.91		
1995	21.96		
1996	25.87		
1997	23.71		
1998	16.41		
1999	21.69		
2000	33.34		
2001	27.85		
2002	27.58		
2003	32.05		
2004	41.55		
2005	54.99		
2006	62.10		
2007	66.30		
2008	87.11		
2009	36.53		
2010	77.50	77.50	77.50
2011	81.00	109.34	60.01
2012	84.50	125.55	56.87
2013	88.00	135.00	56.00
2014	91.34	140.64	55.47
2015	94.53	146.03	54.97
2016	97.55	151.16	54.49
2017	100.41	156.03	54.04
2018	103.12	160.65	53.61
2019	105.66	165.01	53.20
2020	108.05	169.12	52.82
2021	110.28	172.97	52.46
2022	112.35	176.56	52.13
2023	114.26	179.89	51.82
2024	116.01	182.97	51.53
2025	117.60	185.79	51.27
2026	119.03	188.36	51.03
2027	120.30	190.67	50.81
2028	121.42	192.72	50.62
2029	122.37	194.51	50.45
2030	123.17	196.05	50.31
2031	123.81	197.33	50.19
2032	124.28	198.36	50.09
2033	124.60	199.13	50.02
2034	124.76	199.64	49.97
2035	125.00	200.00	50.00

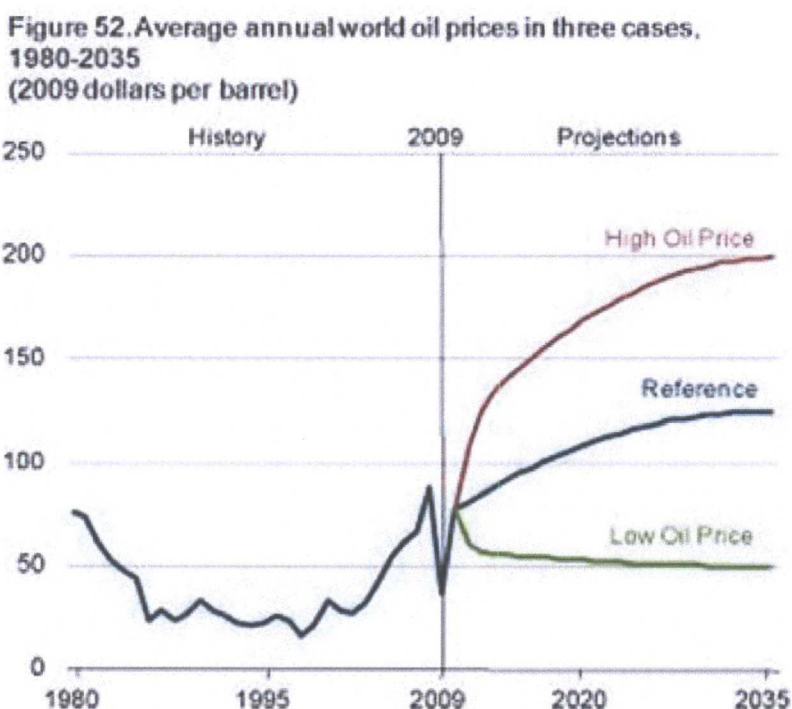


Figure 86. Annual average lower 48 wellhead and Henry Hub spot market prices for natural gas, 1990-2035 (2009 dollars per million Btu)

	Henry Hub Spot Market	Lower 48 Wellhead
1990	2.58	2.58
1991	2.18	2.36
1992	2.54	2.43
1993	2.97	2.85
1994	2.64	2.56
1995	2.27	2.06
1996	3.63	2.86
1997	3.24	3.05
1998	2.68	2.59
1999	2.87	2.71
2000	5.34	4.36
2001	4.78	5.04
2002	4.01	3.54
2003	6.37	5.92
2004	6.68	6.22
2005	9.68	7.82
2006	7.15	6.91
2007	7.19	6.42
2008	8.94	7.96
2009	3.95	3.62
2010	4.43	3.98
2011	4.48	3.99
2012	4.50	3.98
2013	4.56	4.04
2014	4.57	4.05
2015	4.66	4.13
2016	4.74	4.20
2017	4.76	4.22
2018	4.81	4.26
2019	4.87	4.31
2020	5.05	4.47
2021	5.24	4.64
2022	5.39	4.77
2023	5.58	4.94
2024	5.80	5.13
2025	5.97	5.29
2026	6.10	5.40
2027	6.24	5.52
2028	6.31	5.59
2029	6.35	5.62
2030	6.40	5.66
2031	6.49	5.75
2032	6.62	5.86
2033	6.74	5.96
2034	6.87	6.09
2035	7.07	6.26

Figure 86. Annual average lower 48 wellhead and Henry Hub spot market prices for natural gas, 1990-2035 (2009 dollars per million Btu)

