

Results of Directional Survey

API number:	30-025-40773		
OGRID:		Operator:	COG OPERATING LLC
		Property:	PATTERSON B-52 FEDERAL COM # 2H

surface	ULSTR:	A	05	T 19S	R 32E
				330 FNL	330 FEL

BH Loc	ULSTR:	D	05	T 19S	R 32E
13776	MD	9303.0	TVD	411 FNL	333 FWL
					4947 FEL

Top Perf/OH	ULSTR:	A	05	T 19S	R 32E
9634	MD	9428.0	TVD	361 FNL	816 FEL

Bot Perf/OH	ULSTR:	D	05	T 19S	R 32E
13680	MD	9304.4	TVD	411 FNL	429 FWL
					4851 FEL

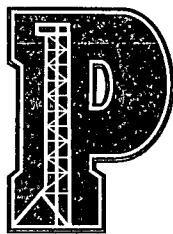
	MD	N/S	E/W	VD
	9602	-24.80	-455.60	9419.6
TOP PERFS/OH	9634	-31.20	-485.80	9428.00
	9634	-31.20	-485.80	9428.00
	13623	-81.10	-4464.40	9305.30
BOT PERFS/OH	13680	-80.95	-4521.40	9304.44
	13776	-80.70	-4617.40	9303.00

NEXT TO LAST	13623	-81.10	-4464.40	9305.30
LAST READING	13776	-80.70	-4617.40	9303.00
TD	13776	-80.70	-4617.40	9303.00

Surface Location	330	FN	330	FE
Projected BHL	411	FN	4947	FE
Location of				
Top Perfs/OH	361	FN	816	FE
Bottom Perfs/OH	411	FN	4851	FE

SUMMARY of Subsurface Locations

Surface Location	A-05-19S-32E	330	FN	330	FE	Vert. Depth
Top Perfs/OH	A-05-19S-32E	361	FN	816	FE	9428.00
Bottom Perfs/OH	D-05-19S-32E	411	FN	4851	FE	9304.44
Projected TD	D-05-19S-32E	411	FN	4947	FE	9303.00



PATRIOT DRILLING, LLC

OPERATOR: COG Operating. LLC
WELL/LEASE: Patterson B-52 Federal Com # 2 H
COUNTY: Lea Co., New Mexico
Sec. 5, T19S, R32E

HOBBS OCD

FEB 05 2013

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STATE OF NEW MEXICO
DEVIATION REPORT

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
404	3/4	5,864	3/4
703	1/2	6,148	1/4
993	1	6,423	1 1/4
1,318	1 1/4	6,867	1
1,705	1/2	7,059	1
2,015	1	7,281	1 1/2
2,467	1 1/2	7,515	2 1/2
2,656	1 1/2	7,711	3
2,777	1 1/4	7,780	2 3/4
2,844	1	7,948	3
2,939	1 1/4	8,109	2
3,033	1 3/4	8,324	1 1/2
3,273	1	8,456	1
3,419	1 1/4	8,612	1 1/4
3,952	1 1/4	8,805	3/4
4,559	3/4	8,837	1 1/4
4,906	1/2	8,868	2 1/2
5,192	1 1/4	8,900	2 3/4
5,477	1	8,932	1 1/4

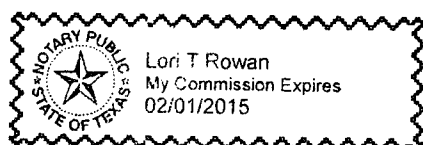
SUR: A-05-19s-32e, 330/N & 330/E
BHL: D-05-19s-32e, 411/N & 4947/E
API # 30-025-40773

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 29th day of October, 2012 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2015



Lori T. Rowan
Notary Public for Ector Co., Texas



A GYRO TECHNOLOGIES INC. COMPANY

PO Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

SUR: A-05-19s-32e, 330/N & 330/E
BHL: D-05-19s-32e, 411/N & 4947/E
API # 30-025-40773

October 25, 2012

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

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FEB 05 2013

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Attn: Kanica Castillo

RE: **Patterson B 52 Federal Com-No. 002H**

Please find enclosed a copy of the survey from 0.00' to 8610.00' ran on the above referenced well.

If I can be of any further service please do not hesitate to call me at 800-606-4976.

Sincerely,

Keith Havelka
Operations

Company: COG Operating, LLC (Concho)
Lease/Well: Patterson B 52 Federal Com / No. 002H



Rig Name: Patriot #6
State/County: New Mexico / Lea
Latitude: 32.70, Longitude: -103.78
GRID North is 0.30 Degrees East of True North
VS-Azi: 0.00 Degrees



HOBBS OCD

FEB 05 2013

RECEIVED

Depth Reference : RKB= 17'
DRILLOG HA GYRO SURVEY CALCULATIONS
Filename: patterson b52 federal #2h_int.ut
Minimum Curvature Method
Report Date/Time: 10/25/2012 / 16:45

SUR: A-05-19s-32e, 330/N & 330/E
BHL: D-05-19s-32e, 411/N & 4947/E
API # 30-025-40773

Vaughn Energy Services
Midland, Texas
432-563-5444
Surveyor: Troy Hardin
Patterson B 52 Federal Com No. 002H / API 30-025-40773

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.08	48.58	100.00	0.05	0.05	0.07	48.58	0.08
200.00	0.16	97.16	200.00	0.07	0.24	0.25	72.87	0.12
300.00	0.13	120.37	300.00	0.00	0.48	0.48	90.09	0.06
400.00	0.10	143.59	400.00	-0.13	0.63	0.64	101.78	0.05
500.00	0.08	181.93	500.00	-0.28	0.68	0.74	112.02	0.06
600.00	0.06	220.28	600.00	-0.39	0.65	0.75	120.99	0.05
700.00	0.32	242.68	700.00	-0.55	0.37	0.66	146.65	0.26
800.00	0.57	265.09	800.00	-0.72	-0.38	0.82	207.69	0.31
900.00	0.71	268.18	899.99	-0.79	-1.50	1.69	242.25	0.14
1000.00	0.84	271.27	999.98	-0.79	-2.85	2.95	254.47	0.14
1100.00	0.91	273.79	1099.97	-0.72	-4.37	4.43	260.62	0.08
1200.00	0.98	276.30	1199.95	-0.58	-6.01	6.04	264.53	0.08
1300.00	0.71	262.80	1299.94	-0.56	-7.48	7.50	265.73	0.34
1400.00	0.44	249.30	1399.94	-0.77	-8.45	8.49	264.78	0.30
1500.00	0.48	227.96	1499.94	-1.19	-9.12	9.20	262.58	0.18
1600.00	0.53	206.62	1599.93	-1.88	-9.64	9.82	258.96	0.19
1700.00	0.40	168.41	1699.93	-2.64	-9.78	10.12	254.91	0.33
1800.00	0.28	130.19	1799.93	-3.14	-9.52	10.02	251.75	0.25

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	0.49	110.79	1899.92	-3.45	-8.93	9.57	248.88	0.25
2000.00	0.71	91.39	1999.92	-3.62	-7.91	8.70	245.43	0.29
2100.00	0.97	85.66	2099.91	-3.57	-6.45	7.37	241.06	0.28
2200.00	1.24	79.92	2199.89	-3.31	-4.54	5.62	233.88	0.29
2300.00	1.24	75.84	2299.87	-2.86	-2.43	3.75	220.31	0.09
2400.00	1.25	71.76	2399.84	-2.25	-0.34	2.28	188.61	0.09
2500.00	1.34	63.86	2499.82	-1.40	1.74	2.23	128.76	0.20
2600.00	1.43	55.96	2599.79	-0.18	3.83	3.83	92.74	0.21
2700.00	1.23	49.78	2699.76	1.21	5.69	5.81	77.97	0.25
2800.00	1.03	43.59	2799.74	2.56	7.13	7.57	70.25	0.23
2900.00	1.10	42.90	2899.72	3.92	8.41	9.28	65.01	0.07
3000.00	1.18	42.21	2999.70	5.38	9.75	11.14	61.09	0.07
3100.00	1.41	35.82	3099.68	7.14	11.16	13.25	57.38	0.28
3200.00	1.65	29.42	3199.64	9.39	12.59	15.70	53.27	0.29
3300.00	1.55	26.76	3299.60	11.85	13.90	18.26	49.56	0.12
3400.00	1.45	24.09	3399.57	14.20	15.02	20.67	46.61	0.12
3500.00	1.39	24.29	3499.54	16.46	16.04	22.98	44.25	0.06
3600.00	1.33	24.49	3599.51	18.62	17.01	25.22	42.42	0.06
3700.00	1.21	21.02	3699.49	20.66	17.88	27.32	40.86	0.14
3800.00	1.10	17.56	3799.47	22.56	18.54	29.21	39.42	0.14
3900.00	1.01	15.06	3899.45	24.32	19.06	30.90	38.08	0.10
4000.00	0.92	12.55	3999.44	25.95	19.46	32.44	36.87	0.10
4100.00	0.87	11.13	4099.42	27.48	19.78	33.86	35.75	0.05
4200.00	0.83	9.72	4199.41	28.94	20.05	35.21	34.71	0.05
4300.00	0.80	9.19	4299.40	30.35	20.29	36.51	33.76	0.03
4400.00	0.77	8.66	4399.39	31.70	20.50	37.75	32.89	0.03
4500.00	0.71	12.65	4499.38	32.96	20.74	38.94	32.17	0.07
4600.00	0.66	16.64	4599.38	34.12	21.04	40.09	31.65	0.07
4700.00	0.65	3.44	4699.37	35.25	21.24	41.15	31.07	0.15
4800.00	0.64	350.24	4799.36	36.37	21.18	42.08	30.21	0.15
4900.00	0.59	345.54	4899.36	37.41	20.95	42.88	29.25	0.07
5000.00	0.53	340.83	4999.35	38.35	20.67	43.56	28.33	0.07
5100.00	0.72	315.53	5099.35	39.23	20.08	44.07	27.10	0.33
5200.00	0.91	290.23	5199.34	39.96	18.89	44.20	25.30	0.40
5300.00	1.19	291.28	5299.32	40.61	17.17	44.09	22.92	0.28
5400.00	1.47	292.33	5399.29	41.48	15.02	44.11	19.90	0.28
5500.00	1.27	294.51	5499.27	42.43	12.82	44.32	16.81	0.20
5600.00	1.08	296.69	5599.24	43.31	10.96	44.68	14.21	0.20
5700.00	0.96	292.75	5699.23	44.06	9.35	45.04	11.98	0.13

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5800.00	0.85	288.82	5799.22	44.62	7.88	45.31	10.01	0.13
5900.00	0.90	290.08	5899.20	45.13	6.44	45.59	8.12	0.06
6000.00	0.96	291.34	5999.19	45.70	4.92	45.97	6.15	0.06
6100.00	1.03	291.66	6099.18	46.34	3.31	46.45	4.09	0.07
6200.00	1.10	291.98	6199.16	47.03	1.59	47.05	1.94	0.07
6300.00	1.08	294.87	6299.14	47.78	-0.16	47.78	359.81	0.06
6400.00	1.07	297.77	6399.12	48.61	-1.84	48.65	357.84	0.06
6500.00	1.11	303.90	6499.11	49.59	-3.47	49.71	356.00	0.13
6600.00	1.16	310.02	6599.09	50.78	-5.05	51.03	354.32	0.13
6700.00	1.18	313.78	6699.07	52.15	-6.57	52.56	352.82	0.08
6800.00	1.20	317.53	6799.04	53.63	-8.01	54.22	351.50	0.08
6900.00	1.18	313.55	6899.02	55.10	-9.46	55.91	350.26	0.08
7000.00	1.16	309.57	6999.00	56.45	-10.98	57.51	348.99	0.08
7100.00	1.53	302.76	7098.97	57.82	-12.89	59.24	347.44	0.41
7200.00	1.91	295.96	7198.93	59.27	-15.50	61.26	345.34	0.43
7300.00	1.89	286.89	7298.87	60.48	-18.58	63.27	342.93	0.30
7400.00	1.87	277.82	7398.82	61.18	-21.77	64.94	340.41	0.30
7500.00	1.91	298.62	7498.77	62.20	-24.86	66.98	338.22	0.69
7600.00	1.96	319.43	7598.71	64.30	-27.44	69.91	336.89	0.70
7700.00	2.28	309.04	7698.64	66.85	-30.09	73.31	335.77	0.50
7800.00	2.60	298.65	7798.55	69.19	-33.63	76.93	334.08	0.55
7900.00	2.67	296.58	7898.45	71.32	-37.70	80.67	332.14	0.11
8000.00	2.73	294.51	7998.34	73.35	-41.95	84.50	330.24	0.11
8100.00	2.32	290.19	8098.24	75.04	-46.01	88.02	328.48	0.45
8200.00	1.92	285.86	8198.17	76.19	-49.53	90.88	326.97	0.43
8300.00	1.58	264.37	8298.12	76.52	-52.51	92.80	325.54	0.73
8400.00	1.23	242.87	8398.10	75.89	-54.83	93.63	324.15	0.62
8500.00	1.16	264.83	8498.07	75.31	-56.80	94.33	322.98	0.46
8610.00	1.09	286.79	8608.05	75.51	-58.90	95.77	322.04	0.39



Vaughn Energy Services

Midland, Texas

432-563-5444

Surveyor: Troy Hardin

Patterson B 52 Federal Com No. 002H / API 30-025-40773



Depth=8610.0, Inc=1.1, AzG=286.8

Depth=7400.0, Inc=1.9, AzG=277.8

Depth=4900.0, Inc=0.6, AzG=345.5

Depth=0.0, Inc=0.0, AzG=0.0

Depth=1700.0, Inc=0.4, AzG=168.4

N+/S-

-W/+E

VES Survey Date: 10/19/2012

SUR: A-05-19s-32e, 330/N & 330/E
BHL: D-05-19s-32e, 411/N & 4947/E
API # 30-025-40773



A Schlumberger Company

COG Operating LLC

Lea County(NAD27)
Patterson B-52 Federal
#2H
OH

Design: OH

Pathfinder X&Y Report

26 October, 2012

HOBBS OCD

FEB 05 2013

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Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Project	Lea County(NAD27)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Patterson B-52 Federal		
Site Position:		Northing:	617,258.000 usft
From:	Map	Easting:	670,083.900 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32.695722
		Longitude:	-103.780455
		Grid Convergence:	0.30 "

Well	#2H					
Well Position	+N/-S	0.0 usft	Northing:	617,258.000 usft	Latitude:	32.695722
	+E/-W	0.0 usft	Easting:	670,083.900 usft	Longitude:	-103.780455
Position Uncertainty	0.0 usft		Wellhead Elevation:	usft	Ground Level:	3,674.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	(GRF200510	7/19/2012	7.57	60.59	48,806

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	269.22	



Pathfinder
Pathfinder X&Y Report



Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey Program		Date			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	8,610.0	Gyro #1 (OH)	NS-GYRO-MS	North sensing gyrocompassing m/s	
8,805.0	13,776.0	MWD #2 (OH)	MWD	MWD - Standard	

MD (usft)	Inc (")	Azi (azimuth) (")	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg ("/100usft)	Northing (usft)	Easting (usft)
0.0	0.00	0.00	0.0	-3,692.0	0.0	0.0	0.0	0.00	617,258.00	670,083.90
100.0	0.08	48.58	100.0	-3,592.0	0.0	0.1	-0.1	0.08	617,258.05	670,083.95
200.0	0.16	97.16	200.0	-3,492.0	0.1	0.2	-0.2	0.12	617,258.07	670,084.14
300.0	0.13	120.37	300.0	-3,392.0	0.0	0.5	-0.5	0.07	617,258.00	670,084.38
400.0	0.10	143.59	400.0	-3,292.0	-0.1	0.6	-0.6	0.05	617,257.87	670,084.53
500.0	0.08	181.93	500.0	-3,192.0	-0.3	0.7	-0.7	0.06	617,257.73	670,084.58
600.0	0.06	220.28	600.0	-3,092.0	-0.4	0.6	-0.6	0.05	617,257.62	670,084.54
700.0	0.32	242.68	700.0	-2,992.0	-0.5	0.4	-0.4	0.27	617,257.45	670,084.26
800.0	0.57	265.09	800.0	-2,892.0	-0.7	-0.4	0.4	0.30	617,257.28	670,083.52
900.0	0.71	268.18	900.0	-2,792.0	-0.8	-1.5	1.5	0.14	617,257.22	670,082.40
1,000.0	0.84	271.27	1,000.0	-2,692.0	-0.8	-2.9	2.9	0.14	617,257.22	670,081.05
1,100.0	0.91	273.79	1,100.0	-2,592.0	-0.7	-4.4	4.4	0.08	617,257.29	670,079.52
1,200.0	0.98	276.30	1,200.0	-2,492.0	-0.6	-6.0	6.0	0.08	617,257.43	670,077.88
1,300.0	0.71	262.80	1,299.9	-2,392.1	-0.6	-7.5	7.5	0.33	617,257.45	670,076.42
1,400.0	0.44	249.30	1,399.9	-2,292.1	-0.8	-8.5	8.5	0.30	617,257.24	670,075.44
1,500.0	0.48	227.96	1,499.9	-2,192.1	-1.2	-9.1	9.1	0.17	617,256.82	670,074.77
1,600.0	0.53	206.62	1,599.9	-2,092.1	-1.9	-9.6	9.7	0.19	617,256.13	670,074.26
1,700.0	0.40	168.41	1,699.9	-1,992.1	-2.6	-9.8	9.8	0.33	617,255.37	670,074.12
1,800.0	0.28	130.19	1,799.9	-1,892.1	-3.1	-9.5	9.6	0.25	617,254.87	670,074.37
1,900.0	0.49	110.79	1,899.9	-1,792.1	-3.4	-8.9	9.0	0.24	617,254.56	670,074.96
2,000.0	0.71	91.39	1,999.9	-1,692.1	-3.6	-7.9	8.0	0.30	617,254.39	670,075.98

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
2,100.0	0.97	85.66	2,099.9	-1,592.1	-3.6	-6.5	6.5	0.27	617,254.44	670,077.44	
2,200.0	1.24	79.92	2,199.9	-1,492.1	-3.3	-4.5	4.6	0.29	617,254.70	670,079.35	
2,300.0	1.24	75.84	2,299.9	-1,392.1	-2.8	-2.4	2.5	0.09	617,255.15	670,081.47	
2,400.0	1.25	71.76	2,399.8	-1,292.2	-2.2	-0.3	0.4	0.09	617,255.76	670,083.55	
2,500.0	1.34	63.86	2,499.8	-1,192.2	-1.4	1.7	-1.7	0.20	617,256.61	670,085.64	
2,600.0	1.43	55.96	2,599.8	-1,092.2	-0.2	3.8	-3.8	0.21	617,257.83	670,087.72	
2,700.0	1.23	49.78	2,699.8	-992.2	1.2	5.7	-5.7	0.25	617,259.22	670,089.58	
2,800.0	1.03	43.59	2,799.7	-892.3	2.6	7.1	-7.1	0.23	617,260.56	670,091.01	
2,900.0	1.10	42.90	2,899.7	-792.3	3.9	8.4	-8.4	0.07	617,261.92	670,092.29	
3,000.0	1.18	42.21	2,999.7	-692.3	5.4	9.7	-9.8	0.08	617,263.38	670,093.63	
3,100.0	1.41	35.82	3,099.7	-592.3	7.1	11.1	-11.2	0.27	617,265.14	670,095.04	
3,200.0	1.65	29.42	3,199.6	-492.4	9.4	12.6	-12.7	0.29	617,267.39	670,096.47	
3,300.0	1.55	26.76	3,299.6	-392.4	11.9	13.9	-14.0	0.12	617,269.86	670,097.79	
3,400.0	1.45	24.09	3,399.6	-292.4	14.2	15.0	-15.2	0.12	617,272.22	670,098.91	
3,500.0	1.39	24.29	3,499.5	-192.5	16.5	16.0	-16.3	0.06	617,274.48	670,099.93	
3,600.0	1.33	24.49	3,599.5	-92.5	18.6	17.0	-17.3	0.06	617,276.64	670,100.91	
3,700.0	1.21	21.02	3,699.5	7.5	20.7	17.9	-18.1	0.14	617,278.68	670,101.77	
3,800.0	1.10	17.56	3,799.5	107.5	22.6	18.5	-18.8	0.13	617,280.58	670,102.44	
3,900.0	1.01	15.06	3,899.4	207.4	24.4	19.1	-19.4	0.10	617,282.35	670,102.96	
4,000.0	0.92	12.55	3,999.4	307.4	26.0	19.5	-19.8	0.10	617,283.98	670,103.36	
4,100.0	0.87	11.13	4,099.4	407.4	27.5	19.8	-20.2	0.05	617,285.51	670,103.68	
4,200.0	0.83	9.72	4,199.4	507.4	29.0	20.0	-20.4	0.05	617,286.97	670,103.95	
4,300.0	0.80	9.19	4,299.4	607.4	30.4	20.3	-20.7	0.03	617,288.38	670,104.18	
4,400.0	0.77	8.66	4,399.4	707.4	31.7	20.5	-20.9	0.03	617,289.73	670,104.40	
4,500.0	0.71	12.65	4,499.4	807.4	33.0	20.7	-21.2	0.08	617,291.00	670,104.63	
4,600.0	0.66	16.64	4,599.4	907.4	34.2	21.0	-21.5	0.07	617,292.15	670,104.93	
4,700.0	0.65	3.44	4,699.4	1,007.4	35.3	21.2	-21.7	0.15	617,293.27	670,105.13	

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
4,800.0	0.64	350.24	4,799.4	1,107.4	36.4	21.2	-21.7	0.15	617,294.39	670,105.07	
4,900.0	0.59	345.54	4,899.4	1,207.4	37.4	20.9	-21.5	0.07	617,295.44	670,104.85	
5,000.0	0.53	340.83	4,999.4	1,307.4	38.4	20.7	-21.2	0.08	617,296.37	670,104.57	
5,100.0	0.72	315.53	5,099.3	1,407.3	39.3	20.1	-20.6	0.33	617,297.26	670,103.98	
5,200.0	0.91	290.23	5,199.3	1,507.3	40.0	18.9	-19.4	0.40	617,297.98	670,102.79	
5,300.0	1.19	291.28	5,299.3	1,607.3	40.6	17.2	-17.7	0.28	617,298.63	670,101.08	
5,400.0	1.47	292.33	5,399.3	1,707.3	41.5	15.0	-15.6	0.28	617,299.50	670,098.92	
5,500.0	1.27	294.51	5,499.3	1,807.3	42.4	12.8	-13.4	0.21	617,300.44	670,096.73	
5,600.0	1.08	296.69	5,599.2	1,907.2	43.3	11.0	-11.6	0.20	617,301.33	670,094.88	
5,700.0	0.96	292.75	5,699.2	2,007.2	44.1	9.4	-10.0	0.14	617,302.07	670,093.26	
5,800.0	0.85	288.82	5,799.2	2,107.2	44.6	7.9	-8.5	0.13	617,302.64	670,091.79	
5,900.0	0.90	290.08	5,899.2	2,207.2	45.1	6.4	-7.1	0.05	617,303.15	670,090.35	
6,000.0	0.96	291.34	5,999.2	2,307.2	45.7	4.9	-5.6	0.06	617,303.72	670,088.83	
6,100.0	1.03	291.66	6,099.2	2,407.2	46.4	3.3	-3.9	0.07	617,304.36	670,087.22	
6,200.0	1.10	291.98	6,199.2	2,507.2	47.0	1.6	-2.2	0.07	617,305.05	670,085.49	
6,300.0	1.08	294.87	6,299.1	2,607.1	47.8	-0.2	-0.5	0.06	617,305.80	670,083.75	
6,400.0	1.07	297.77	6,399.1	2,707.1	48.6	-1.8	1.2	0.06	617,306.64	670,082.06	
6,500.0	1.11	303.90	6,499.1	2,807.1	49.6	-3.5	2.8	0.12	617,307.61	670,080.43	
6,600.0	1.16	310.02	6,599.1	2,907.1	50.8	-5.0	4.4	0.13	617,308.80	670,078.86	
6,700.0	1.18	313.78	6,699.1	3,007.1	52.2	-6.6	5.9	0.08	617,310.17	670,077.34	
6,800.0	1.20	317.53	6,799.0	3,107.0	53.6	-8.0	7.3	0.08	617,311.65	670,075.89	
6,900.0	1.18	313.55	6,899.0	3,207.0	55.1	-9.5	8.7	0.09	617,313.13	670,074.43	
7,000.0	1.16	309.57	6,999.0	3,307.0	56.5	-11.0	10.2	0.08	617,314.49	670,072.91	
7,100.0	1.53	302.76	7,099.0	3,407.0	57.9	-12.9	12.1	0.40	617,315.85	670,071.00	
7,200.0	1.91	295.96	7,198.9	3,506.9	59.3	-15.5	14.7	0.43	617,317.31	670,068.38	
7,300.0	1.89	286.89	7,298.9	3,606.9	60.5	-18.6	17.8	0.30	617,318.51	670,065.31	
7,400.0	1.87	277.82	7,398.8	3,706.8	61.2	-21.8	21.0	0.30	617,319.21	670,062.11	

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Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	EW (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)	
7,500.0	1.91	298.62	7,498.8	3,806.8	62.2	-24.9	24.0	0.68	617,320.23	670,059.03	
7,600.0	1.96	319.43	7,598.7	3,906.7	64.3	-27.4	26.6	0.70	617,322.33	670,056.46	
7,700.0	2.28	309.04	7,698.6	4,006.6	66.9	-30.1	29.2	0.50	617,324.88	670,053.80	
7,800.0	2.60	298.65	7,798.6	4,106.6	69.2	-33.6	32.7	0.54	617,327.22	670,050.26	
7,900.0	2.67	296.58	7,898.4	4,206.4	71.4	-37.7	36.7	0.12	617,329.35	670,046.19	
8,000.0	2.73	294.51	7,998.3	4,306.3	73.4	-42.0	41.0	0.11	617,331.38	670,041.94	
8,100.0	2.32	290.19	8,098.2	4,406.2	75.1	-46.0	45.0	0.45	617,333.07	670,037.87	
8,200.0	1.92	285.86	8,198.2	4,506.2	76.2	-49.5	48.5	0.43	617,334.23	670,034.36	
8,300.0	1.58	264.37	8,298.1	4,606.1	76.5	-52.5	51.5	0.73	617,334.55	670,031.38	
8,400.0	1.23	242.87	8,398.1	4,706.1	75.9	-54.8	53.8	0.63	617,333.93	670,029.05	
8,500.0	1.16	264.83	8,498.1	4,806.1	75.3	-56.8	55.8	0.46	617,333.34	670,027.09	
8,610.0	1.09	286.79	8,608.1	4,916.1	75.5	-58.9	57.9	0.39	617,333.55	670,024.98	
8,805.0	0.62	304.58	8,803.0	5,111.0	76.7	-61.6	60.5	0.27	617,334.68	670,022.33	
8,837.0	1.14	266.00	8,835.0	5,143.0	76.8	-62.0	61.0	2.38	617,334.76	670,021.87	
KOP - 8837.0 'MD, 8835.0 'TVD, 76.8 'N, -62.0 'E											
8,868.0	2.37	247.19	8,866.0	5,174.0	76.5	-62.9	61.9	4.33	617,334.49	670,020.98	
8,900.0	2.64	245.26	8,898.0	5,206.0	75.9	-64.2	63.2	0.88	617,333.92	670,019.70	
8,932.0	4.75	244.91	8,929.9	5,237.9	75.1	-66.1	65.0	6.59	617,333.05	670,017.83	
8,963.0	8.62	247.98	8,960.7	5,268.7	73.6	-69.4	68.4	12.53	617,331.64	670,014.51	
8,995.0	12.93	248.60	8,992.1	5,300.1	71.4	-74.9	74.0	13.47	617,329.43	670,008.95	
9,027.0	16.71	251.67	9,023.1	5,331.1	68.7	-82.7	81.7	12.06	617,326.68	670,001.25	
9,058.0	19.87	252.02	9,052.5	5,360.5	65.6	-91.9	91.0	10.20	617,323.65	669,992.00	
9,090.0	23.04	251.41	9,082.3	5,390.3	62.0	-103.0	102.2	9.93	617,319.97	669,980.89	
9,122.0	26.20	249.74	9,111.4	5,419.4	57.5	-115.6	114.8	10.11	617,315.53	669,968.33	
9,153.0	29.90	249.83	9,138.7	5,446.7	52.5	-129.3	128.5	11.94	617,310.49	669,954.65	
9,185.0	33.24	250.44	9,166.0	5,474.0	46.8	-145.0	144.4	10.48	617,304.80	669,938.89	
9,217.0	34.82	252.73	9,192.5	5,500.5	41.2	-162.0	161.4	6.36	617,299.15	669,921.90	



A Schlumberger Company

Pathfinder
Pathfinder X&Y Report



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9,248.0	36.93	254.14	9,217.6	5,525.6	36.0	-179.4	178.9	7.31	617,293.98	669,904.49	
9,280.0	39.57	254.49	9,242.7	5,550.7	30.6	-198.5	198.0	8.28	617,288.63	669,885.42	
9,312.0	43.00	255.37	9,266.8	5,574.8	25.1	-218.9	218.5	10.87	617,283.14	669,865.03	
9,343.0	45.64	255.89	9,289.0	5,597.0	19.8	-239.8	239.6	8.60	617,277.77	669,844.05	
9,375.0	48.89	256.77	9,310.7	5,618.7	14.2	-262.7	262.5	10.35	617,272.22	669,821.22	
9,407.0	51.70	257.65	9,331.1	5,639.1	8.8	-286.7	286.5	9.03	617,266.78	669,797.21	
9,438.0	54.87	257.91	9,349.6	5,657.6	3.5	-311.0	310.9	10.25	617,261.52	669,772.93	
9,470.0	57.86	258.71	9,367.4	5,675.4	-1.9	-337.1	337.1	9.57	617,256.12	669,746.84	
9,507.0	63.22	259.58	9,385.6	5,693.6	-7.9	-368.7	368.8	14.63	617,250.07	669,715.21	
9,539.0	67.53	259.41	9,398.9	5,706.9	-13.2	-397.3	397.4	13.48	617,244.76	669,686.62	
9,571.0	71.05	258.79	9,410.2	5,718.2	-18.9	-426.7	426.9	11.15	617,239.10	669,657.23	
9,602.0	73.60	258.18	9,419.6	5,727.6	-24.8	-455.6	455.9	8.44	617,233.20	669,628.29	
9,634.0	75.97	257.74	9,428.0	5,736.0	-31.2	-485.8	486.2	7.52	617,226.76	669,598.09	
9,666.0	77.38	257.91	9,435.4	5,743.4	-37.8	-516.2	516.7	4.44	617,220.20	669,567.66	
9,697.0	79.67	259.23	9,441.5	5,749.5	-43.8	-546.0	546.6	8.48	617,214.18	669,537.88	
9,729.0	83.01	259.94	9,446.4	5,754.4	-49.5	-577.1	577.8	10.67	617,208.46	669,506.77	
9,760.0	86.09	259.50	9,449.3	5,757.3	-55.0	-607.5	608.2	10.04	617,202.95	669,476.41	
9,792.0	87.49	260.38	9,451.1	5,759.1	-60.6	-638.9	639.7	5.17	617,197.37	669,444.95	
9,824.0	88.37	262.40	9,452.3	5,760.3	-65.4	-670.6	671.4	6.88	617,192.59	669,413.34	
9,856.0	89.25	264.77	9,452.9	5,760.9	-69.0	-702.4	703.2	7.90	617,189.01	669,381.55	
9,887.0	91.01	265.74	9,452.9	5,760.9	-71.6	-733.2	734.2	6.48	617,186.45	669,350.65	
LP - 9887.0 'MD, 9452.9 'TVD, -71.6 'N, -733.2 'E											
9,919.0	91.80	266.35	9,452.1	5,760.1	-73.8	-765.2	766.1	3.12	617,184.24	669,318.74	
9,951.0	91.98	266.97	9,451.0	5,759.0	-75.6	-797.1	798.0	2.02	617,182.38	669,286.81	
9,982.0	91.98	269.08	9,449.9	5,757.9	-76.7	-828.0	829.0	6.80	617,181.31	669,255.85	
10,077.0	92.15	270.22	9,446.5	5,754.5	-77.3	-923.0	924.0	1.21	617,180.73	669,160.92	
10,172.0	92.07	269.87	9,443.0	5,751.0	-77.2	-1,017.9	1,018.9	0.38	617,180.81	669,065.98	

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10,267.0	91.71	269.34	9,439.9	5,747.9	-77.8	-1,112.9	1,113.8	0.67	617,180.15	668,971.04
10,362.0	91.98	270.57	9,436.8	5,744.8	-77.9	-1,207.8	1,208.8	1.32	617,180.08	668,876.09
10,457.0	91.80	270.04	9,433.7	5,741.7	-77.4	-1,302.8	1,303.7	0.59	617,180.58	668,781.14
10,552.0	92.15	270.04	9,430.4	5,738.4	-77.4	-1,397.7	1,398.6	0.37	617,180.65	668,686.20
10,647.0	92.51	269.78	9,426.6	5,734.6	-77.5	-1,492.6	1,493.5	0.47	617,180.50	668,591.28
10,741.0	92.86	270.13	9,422.2	5,730.2	-77.6	-1,586.5	1,587.4	0.53	617,180.42	668,497.38
10,836.0	90.66	270.48	9,419.2	5,727.2	-77.1	-1,681.5	1,682.4	2.34	617,180.93	668,402.43
10,931.0	90.57	270.40	9,418.2	5,726.2	-76.3	-1,776.5	1,777.3	0.13	617,181.66	668,307.44
11,026.0	90.84	269.87	9,417.0	5,725.0	-76.1	-1,871.5	1,872.3	0.63	617,181.88	668,212.45
11,121.0	90.57	269.52	9,415.9	5,723.9	-76.6	-1,966.4	1,967.3	0.47	617,181.38	668,117.46
11,216.0	89.96	269.08	9,415.4	5,723.4	-77.8	-2,061.4	2,062.3	0.79	617,180.22	668,022.47
11,311.0	91.89	269.78	9,413.9	5,721.9	-78.7	-2,156.4	2,157.3	2.16	617,179.27	667,927.49
11,406.0	92.42	269.16	9,410.3	5,718.3	-79.6	-2,251.3	2,252.2	0.86	617,178.39	667,832.56
11,501.0	92.95	268.99	9,405.9	5,713.9	-81.1	-2,346.2	2,347.1	0.59	617,176.86	667,737.68
11,596.0	93.03	270.22	9,400.9	5,708.9	-81.8	-2,441.1	2,442.0	1.30	617,176.21	667,642.81
11,691.0	93.65	269.60	9,395.4	5,703.4	-81.9	-2,535.9	2,536.8	0.92	617,176.06	667,547.97
11,786.0	93.30	270.66	9,389.6	5,697.6	-81.7	-2,630.8	2,631.6	1.17	617,176.27	667,453.15
11,881.0	93.12	271.36	9,384.3	5,692.3	-80.1	-2,725.6	2,726.4	0.76	617,177.95	667,358.31
11,976.0	93.74	270.92	9,378.6	5,686.6	-78.2	-2,820.4	2,821.2	0.80	617,179.83	667,263.50
12,071.0	92.77	271.10	9,373.2	5,681.2	-76.5	-2,915.2	2,916.0	1.04	617,181.51	667,168.67
12,166.0	93.30	270.75	9,368.2	5,676.2	-75.0	-3,010.1	3,010.8	0.67	617,183.04	667,073.82
12,261.0	94.62	270.22	9,361.6	5,669.6	-74.2	-3,104.8	3,105.6	1.50	617,183.84	666,979.05
12,356.0	94.44	270.83	9,354.1	5,662.1	-73.3	-3,199.5	3,200.3	0.67	617,184.71	666,884.35
12,450.0	95.14	270.48	9,346.3	5,654.3	-72.2	-3,293.2	3,293.9	0.83	617,185.78	666,790.69
12,545.0	93.39	268.81	9,339.2	5,647.2	-72.8	-3,387.9	3,388.6	2.54	617,185.19	666,695.96
12,640.0	94.00	267.14	9,333.1	5,641.1	-76.2	-3,482.7	3,483.4	1.87	617,181.84	666,601.22
12,735.0	94.62	266.09	9,326.0	5,634.0	-81.8	-3,577.2	3,578.0	1.28	617,176.25	666,506.66

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: OH

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Survey												
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	TVDSS (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)		
12,830.0	93.74	267.76	9,319.0	5,627.0	-86.8	-3,671.9	3,672.7	1.98	617,171.17	666,412.05		
12,925.0	90.92	269.95	9,315.2	5,623.2	-88.7	-3,766.7	3,767.6	3.76	617,169.27	666,317.16		
13,020.0	88.02	270.13	9,316.1	5,624.1	-88.7	-3,861.7	3,862.6	3.06	617,169.34	666,222.18		
13,115.0	90.13	270.75	9,317.6	5,625.6	-87.9	-3,956.7	3,957.5	2.31	617,170.07	666,127.20		
13,210.0	91.01	271.01	9,316.6	5,624.6	-86.5	-4,051.7	4,052.5	0.97	617,171.53	666,032.21		
13,305.0	91.80	270.92	9,314.3	5,622.3	-84.9	-4,146.6	4,147.4	0.84	617,173.13	665,937.26		
13,400.0	93.65	270.70	9,309.8	5,617.8	-83.5	-4,241.5	4,242.3	1.96	617,174.47	665,842.38		
13,432.0	92.33	270.78	9,308.1	5,616.1	-83.1	-4,273.5	4,274.2	4.13	617,174.88	665,810.42		
13,527.0	90.13	270.75	9,306.1	5,614.1	-81.9	-4,368.4	4,369.1	2.32	617,176.15	665,715.46		
13,623.0	90.84	270.15	9,305.3	5,613.3	-81.1	-4,464.4	4,465.1	0.97	617,176.90	665,619.47		
13,776.0	90.84	270.15	9,303.0	5,611.0	-80.7	-4,617.4	4,618.1	0.00	617,177.30	665,466.48		
PROJECTED BHL - 13776.0 'MD, 9303.0 'TVD, -80.7 'N, -4617.4 'E - PBHL (Patterson B-52 #2H)												

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
8,837.0	8,835.0	76.8	-62.0	KOP - 8837.0 'MD, 8835.0 'TVD, 76.8 'N, -62.0 'E	
9,887.0	9,452.9	-71.6	-733.2	LP - 9887.0 'MD, 9452.9 'TVD, -71.6 'N, -733.2 'E	
13,776.0	9,303.0	-80.7	-4,617.4	PROJECTED BHL - 13776.0 'MD, 9303.0 'TVD, -80.7 'N, -4617.4 'E	

Checked By: _____ Approved By: _____ Date: _____



Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Plan: Post Gyro Plan #2 (#2H/OH)

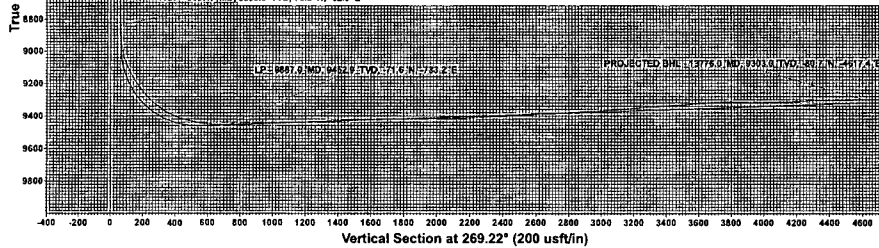
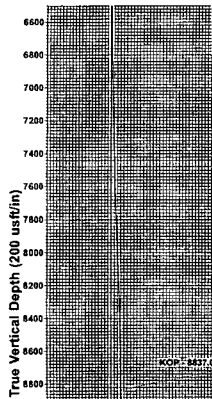
WELL DETAILS: #2H

Ground Elevation: 3674.8
RWB Elevation: KB = 15' @ 3592.8uoft (Original Well Elev)
Rig Name: Original Well Elev

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.6	0.0	617258.000	670083.900	32.695722	-103.780455	

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL (Patterson B-52 #2H)	9320.0	-63.1	-4622.3	617194.900	655461.600	Point



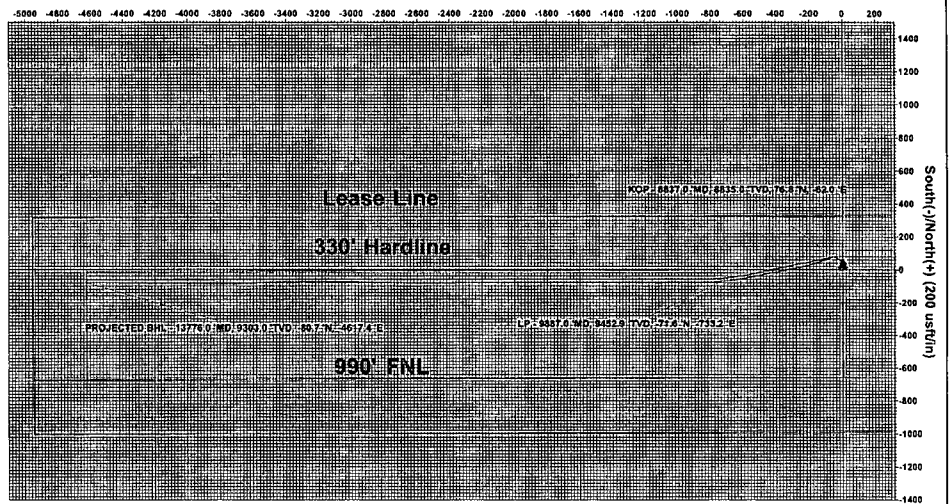
Azimuths to Grid North
True North: -0.30°
Magnetic North: 7.27°

Magnetic Field
Strength: 48806.0snT
Dip Angle: 60.59°
Date: 7/19/2012
Model: IGRF200510



A Schlumberger Company

West(-)/East(+) (200 usft/in)



SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Diag	TFace	VFace	Target
8616.0	1.08	280.79	8608.1	75.5	-58.9	0.00	0.00	57.8	
8994.0	1.08	260.00	8992.0	76.0	-66.0	0.13	-103.30	65.0	
9750.2	81.86	258.00	9460.0	-26.2	-548.0	12.00	-2.00	548.4	
10047.0	91.97	259.91	9450.0	-37.4	-643.4	4.00	85.27	844.1	
13829.1	91.97	259.91	9320.0	-63.1	-4622.3	0.00	0.00	4622.7	PBHL (Patterson B-52 #2H)

EOW

PROJECT DETAILS: Lea County(NAD27)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid

Plan: Post Gyro Plan #2 (#2H/OH)

Created By: Michael Trout Date: 13-08, October 26 2012
Checked: Date:

DATE: 10/26/2012
TIME: 10:00 AM
PAGE: 1
FILE: Post Gyro Plan #2