Form 3160-3
(June 2015)

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FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
NMNM124664

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other

1c. Type of Completion: ☐ Hydraulic Fracturing ☑ Single Zone ☐ Multiple Zone

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

8. Lease Name and Well No.
GUNNER 8 FEDERAL COM
403H

2. Name of Operator
COG OPERATING LLC (229137)

9. API Well No.
30-025-46762

3a. Address
600 West Illinois Ave Midland TX 79701

3b. Phone No. *(include area code)*
(432)683-7443

10. Field and Pool, or Exploratory (98038)
RATTLESNAKE FLAT / WC-025 G-09 S2

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface NWNW / 430 FNL / 1018 FWL / LAT 32.07855 / LONG -103.497182
At proposed prod. zone SWSW / 50 FSL / 1310 FWL / LAT 32.050836 / LONG -103.496217

11. Sec., T. R. M. or Blk. and Survey or Area
SEC 5 / T26S / R34E / NMP

14. Distance in miles and direction from nearest town or post office*
18 miles

12. County or Parish
LEA

13. State
NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
100 feet

16. No of acres in lease
1120

17. Spacing Unit dedicated to this well
640

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
420 feet

19. Proposed Depth
11014 feet / 21191 feet

20. BLM/BIA Bond No. in file
FED: NMB000215

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
3338 feet

22. Approximate date work will start*
12/01/2019

23. Estimated duration
30 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification.
6. Such other site specific information and/or plans as may be requested by the BLM.

25. Signature	Name *(Printed/Typed)*	Date
(Electronic Submission)	Stan Wagner / Ph: (432)253-9685	06/13/2019

Title
Regulatory Advisor

Approved by *(Signature)*	Name *(Printed/Typed)*	Date
(Electronic Submission)	Christopher Walls / Ph: (575)234-2234	01/06/2020

Title	Office
Petroleum Engineer	CARLSBAD

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

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.

OCD Rec 01/14/2020

KZ 01/23/2020

SV

APPROVED WITH CONDITIONS

Approval Date: 01/06/2020

(Continued on page 2)

*(Instructions on page 2)

Additional Operator Remarks

Location of Well

1. SHL: NWNW / 430 FNL / 1018 FWL / TWSP: 26S / RANGE: 34E / SECTION: 5 / LAT: 32.07855 / LONG: -103.497182 (TVD: 0 feet, MD: 0 feet)
   PPP: NWNW / 100 FNL / 1310 FWL / TWSP: 26S / RANGE: 34E / SECTION: 5 / LAT: 32.079458 / LONG: -103.496241 (TVD: 10810 feet, MD: 10887 feet)
   BHL: SWSW / 50 FSL / 1310 FWL / TWSP: 26S / RANGE: 34E / SECTION: 8 / LAT: 32.050836 / LONG: -103.496217 (TVD: 11014 feet, MD: 21191 feet)

BLM Point of Contact

Name: Deborah Ham

Title: Legal Landlaw Examiner

Phone: 5752345965

Email: dham@blm.gov

PECOS DISTRICT
DRILLING OPERATIONS
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	**COG Operating LLC**
LEASE NO.:	**NMNM124664**
WELL NAME & NO.:	**Gunner 8 Federal Com 403H**
SURFACE HOLE FOOTAGE:	**430' FNL & 1018' FWL**
BOTTOM HOLE FOOTAGE	**50' FSL & 1310' FWL**
LOCATION:	**Section 5, T 26S, R 34E, NMPM**
COUNTY:	**Lea County, New Mexico**

H2S	○ Yes	◉ No	
Potash	◉ None	○ Secretary	○ R-111-P
Cave/Karst Potential	◉ Low	○ Medium	○ High
Variance	○ None	◉ Flex Hose	○ Other
Wellhead	○ Conventional	◉ Multibowl	○ Both
Other	☐ 4 String Area	☐ Capitan Reef	☐ WIPP
Other	☐ Fluid Filled	☐ Cement Squeeze	☐ Pilot Hole
Special Requirements	☐ Water Disposal	☑ COM	☐ Unit

A. HYDROGEN SULFIDE

1. Hydrogen Sulfide (H2S) monitors shall be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.

B. CASING

1. The **13-3/8"** surface casing shall be set at approximately **875'** (a minimum of 25' into the Rustler Anhydrite and above the salt) and cemented to surface.
   a. **If cement does not circulate to surface,** the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of **6 hours** after pumping cement, ideally between 8-10 hours after.
   b. WOC time for a primary cement job will be a minimum of **8 hours** or **500 psi** compressive strength, whichever is greater. This is to include the lead cement.
   c. If cement falls back, remedial cementing will be done prior to drilling out the shoe.
   d. WOC time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 psi compressive strength, whichever is greater.

2. The **9-5/8"** intermediate casing shall be cemented to surface.
   a. **If cement does not circulate to surface,** see B.1.a, c & d.
3. The **5-1/2"** production casing shall be cemented with at least **200' tie-back** into the previous casing. Operator shall provide method of verification.

C. PRESSURE CONTROL

1. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **5000 (5M)** psi.

D. SPECIAL REQUIREMENTS

1. Submit a Communitization Agreement to the Carlsbad Field Office, 620 E Greene St. Carlsbad, New Mexico 88220, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees of record), or certification that the operator has obtained the written signatures of all such owners and will make those signatures available to the BLM immediately upon request.
   a. The well sign on location shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

DR 1/6/2020

GENERAL REQUIREMENTS

1. The BLM is to be notified in advance for a representative to witness:
   a. Spudding the well (minimum of 24 hours)
   b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
   c. BOP/BOPE tests (minimum of 4 hours)
      ☒ Eddy County: Call the Carlsbad Field Office, (575) 361-2822
      ☒ Lea County: Call the Hobbs Field Station, (575) 393-3612
2. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval.
   a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
   b. When the operator proposes to set surface casing with Spudder Rig:
      i. Notify the BLM when moving in and removing the Spudder Rig.
      ii. Notify the BLM when moving in the 2nd Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
      iii. BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
3. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.
4. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be available upon request. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the

following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log. The casing intergrity test can be done (prior to the cement setting up) immediately after bumping the plug.

3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements. The casing intergrity test can be done (prior to the cement setting up) immediately after bumping the plug.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well-specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On the portion of well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.
8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

B. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: The flex line must meet the requirements of API 16C. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.
3. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:

a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.

b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.

c. Manufacturer representative shall install the test plug for the initial BOP test.

d. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.

e. Whenever any seal subject to test pressure is broken, all the tests in Onshore Order 2 III.A.2.i must be followed.

5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the BOP/BOPE tests.

   a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

   b. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time, except the casing pressure test which can be initiated immediately after bumping the plug (only applies to single-stage cement jobs).

   c. The tests shall be done by an independent service company utilizing a test plug. The results of the test shall be made available upon request.

   d. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.

   e. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes. This test shall be performed prior to the test at full stack pressure.

   f. BOP/BOPE must be tested within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth

exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

C. DRILLING MUD

1. Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

D. WASTE MATERIAL AND FLUIDS

1. All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.
2. Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

Intent [X] As Drilled [ ]

API #		
30-025-		
Operator Name: COG Operating LLC	Property Name: Gunner 8 Federal Com	Well Number 403H

Kick Off Point (KOP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
D	5	26S	34E						Lea
Latitude				Longitude					NAD 83

First Take Point (FTP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
D	5	26S	34E		100	North	1310	West	Lea
Latitude 32.079458				Longitude -103.496241					NAD 83

Last Take Point (LTP)

UL	Section	Township	Range	Lot	Feet	From N/S	Feet	From E/W	County
M	8	26S	34E		100	South	1310	West	Lea
Latitude 32.050973				Longitude -103.496217					NAD 83

Is this well the defining well for the Horizontal Spacing Unit? [X]

Is this well an infill well? [ ]

If infill is yes please provide API if available, Operator Name and well number for Defining well for Horizontal Spacing Unit.

API #		
Operator Name:	Property Name:	Well Number

KZ 06/29/2018

COG Production, LLC - Gunner 8 Federal Com #403H

1. Geologic Formations

TVD of target	11,014'	Pilot hole depth	NA
MD at TD:	21,192'	Deepest expected fresh water:	150'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	849	Water	
Top of Salt	1209	Salt	
Base of Salt	5039	Salt	
Lamar	5284	Salt Water	
Bell Canyon	5319	Salt Water	
Cherry Canyon	6385	Oil/Gas	
Brushy Canyon	8019	Oil/Gas	
Bone Spring Lime	9491	Oil/Gas	
U. Avalon Shale	9714	Oil/Gas	
L. Avalon Shale	10029	Oil/Gas	
1st Bone Spring Sand	10454	Target Zone	
2nd Bone Spring Sand	11129	Not Penetrated	
3rd Bone Spring Sand	X	Not Penetrated	
0	0	Not Penetrated	

2. Casing Program

Hole Size	Casing Interval From	Casing Interval To	Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
17.5"	0	875	13.375"	54.5	J55	STC	2.82	1.12	10.78
12.25"	0	3500	9.625"	40	J55	LTC	1.40	0.98	3.71
12.25"	3500	5304	9.625"	40	HCL80	LTC	1.39	1.42	6.54
8.75"	0	21,192	5.5"	17	P110	LTC	1.45	2.63	2.38
			BLM Minimum Safety Factor				1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse. Intermediate burst based on 0.7 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.
All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

COG Production, LLC - Gunner 8 Federal Com #403H

	Y or N
Is casing new? If used, attach certification as required in Onshore Order #1	Y
Does casing meet API specifications? If no, attach casing specification sheet.	Y
Is premium or uncommon casing planned? If yes attach casing specification sheet.	N
Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria).	Y
Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing?	Y
Is well located within Capitan Reef?	N
If yes, does production casing cement tie back a minimum of 50' above the Reef?	
Is well within the designated 4 string boundary?	
Is well located in SOPA but not in R-111-P?	N
If yes, are the first 2 strings cemented to surface and 3rd string cement tied back 500' into previous casing?	
Is well located in R-111-P and SOPA?	N
If yes, are the first three strings cemented to surface?	
Is 2nd string set 100' to 600' below the base of salt?	
Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

3. Cementing Program

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H_20 gal/sk	500# Comp. Strength (hours)	Slurry Description
Surf.	330	13.5	1.75	9	12	Lead: Class C + 4% Gel + 1% CaCl2
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl2
Inter.	1040	12.7	2.0	9.6	16	Lead: 35:65:6 C Blend
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl
5.5 Prod	800	11.9	2.5	19	72	Lead: 50:50:10 H Blend
	2720	14.4	1.24	5.7	19	Tail: 50:50:2 Class H Blend

Volumes Subject to Observed Hole Conditions and/or Fluid Caliper Results
Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC	% Excess
Surface	0'	50%
1st Intermediate	0'	50%
Production	4,804'	25% OH in Lateral (KOP to EOL) – 40% OH in Vertical

4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	x	Tested to:
12-1/4"	13-5/8"	2M	Annular	x	2000 psi
			Blind Ram		2M
			Pipe Ram		
			Double Ram		
			Other*		
8-3/4"	13-5/8"	3M	Annular	x	50% testing pressure
			Blind Ram	x	3M
			Pipe Ram	x	
			Double Ram		
			Other*		

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

X	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart.
	N Are anchors required by manufacturer?
N	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested.

5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	Surf. Shoe	FW Gel	8.6 - 8.8	28-34	N/C
Surf csg	9-5/8" Int shoe	Saturated Brine	10 - 10.1	28-34	N/C
9-5/8" Int shoe	Lateral TD	Cut Brine	8.6 - 9	28-34	N/C

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?	PVT/Pason/Visual Monitoring

6. Logging and Testing Procedures

Logging, Coring and Testing.	
Y	Will run GR/CNL from TD to surface (horizontal well – vertical portion of hole). Stated logs run will be in the Completion Report and submitted to the BLM.
Y	No Logs are planned based on well control or offset log information.
N	Drill stem test? If yes, explain.
N	Coring? If yes, explain.

Additional logs planned		Interval
N	Resistivity	Pilot Hole TD to ICP
N	Density	Pilot Hole TD to ICP
Y	CBL	Production casing (If cement not circulated to surface)
Y	Mud log	Intermediate shoe to TD
N	PEX	

7. Drilling Conditions

Condition	Specify what type and where?
BH Pressure at deepest TVD	5155 psi at 11014' TVD
Abnormal Temperature	NO 165 Deg. F.

No abnormal pressure or temperature conditions are anticipated. Sufficient mud materials to maintain mud properties and weight increase requirements will be kept on location at all times.

Sufficient supplies of Paper/LCM for periodic sweeps to control seepage and losses will be maintained on location.

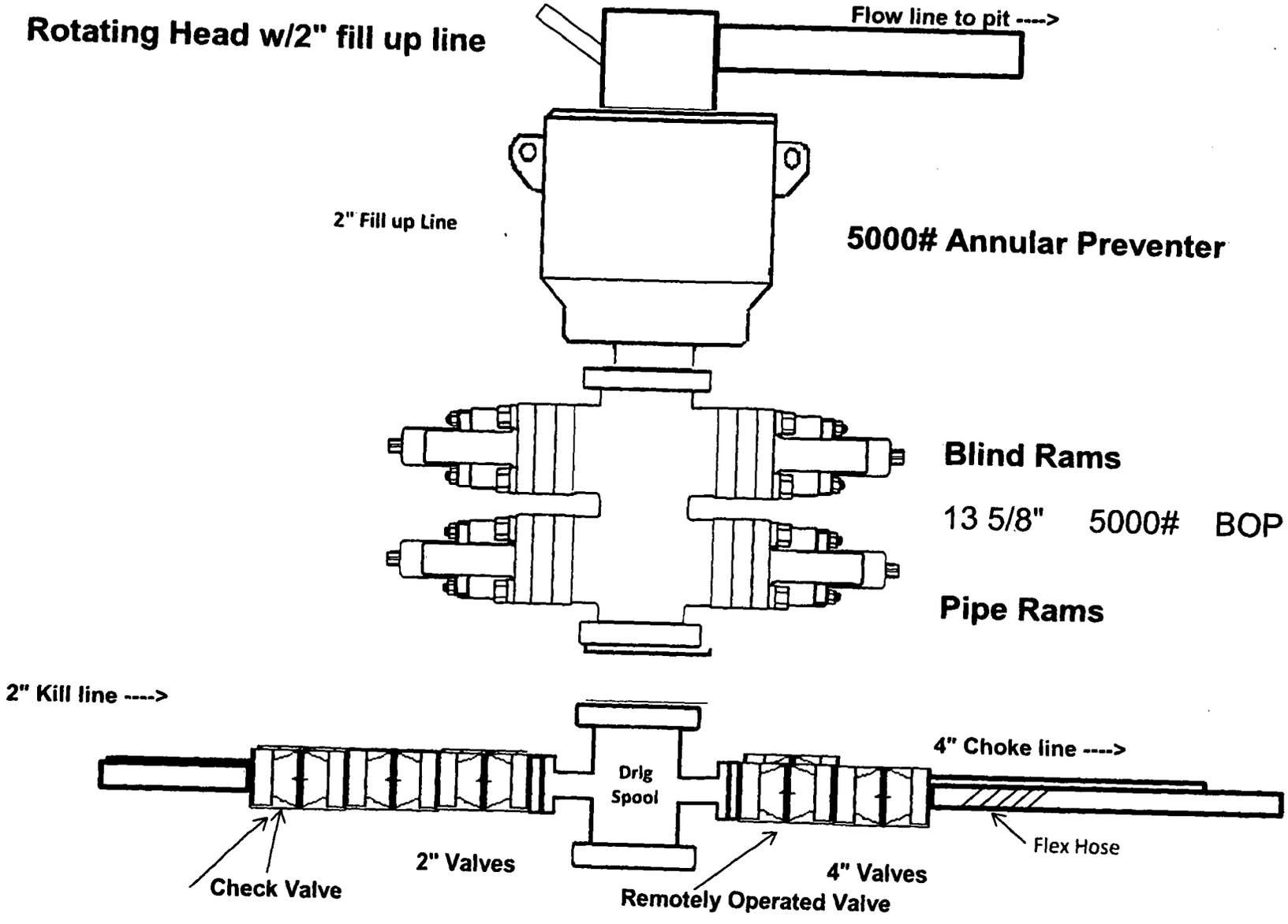
Hydrogen Sulfide (H2S) monitors will be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.	
N	H2S is present
Y	H2S Plan attached

8. Other Facets of Operation

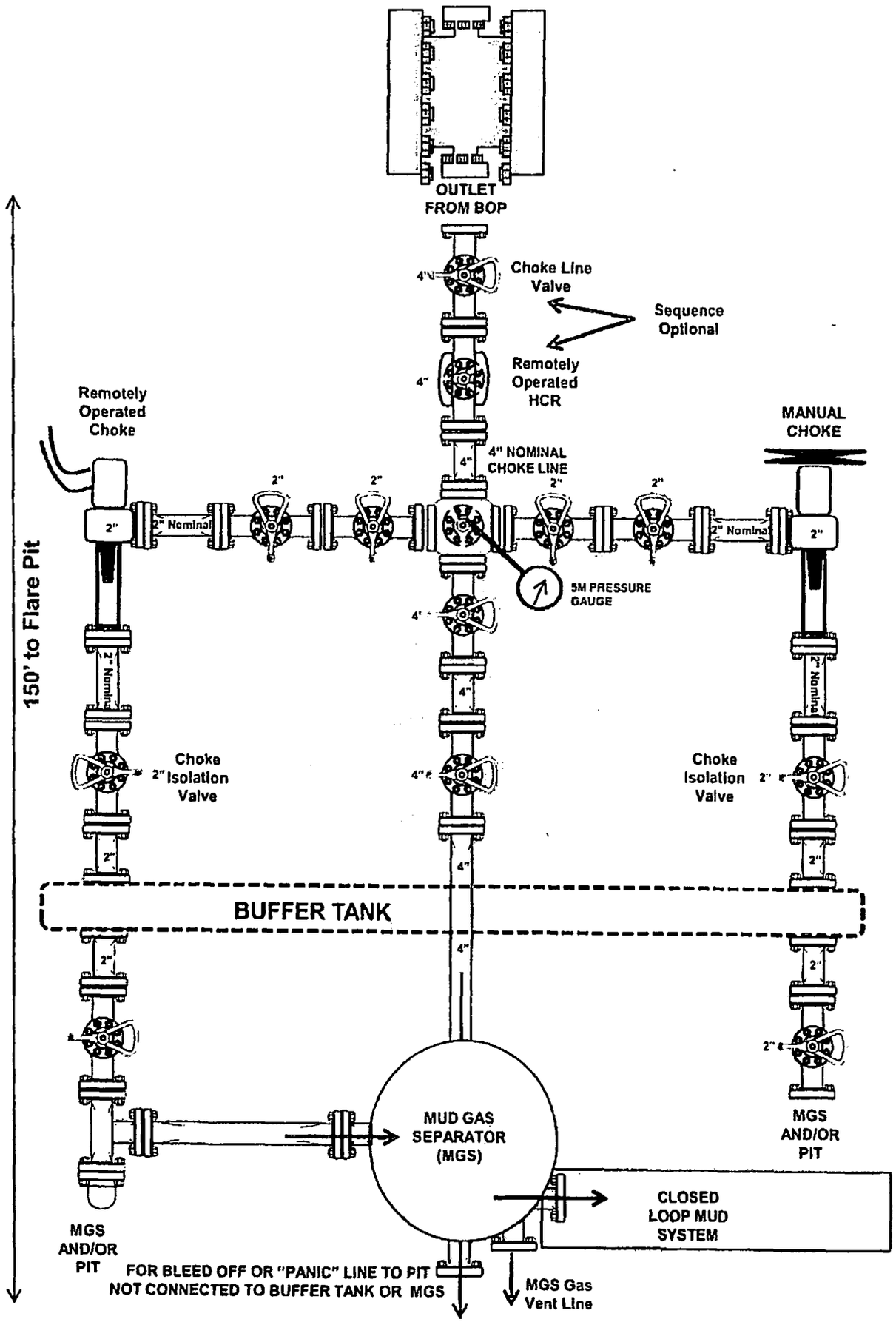
Y	Is it a walking operation?
N	Is casing pre-set?

x	H2S Plan.
x	BOP & Choke Schematics.
x	Directional Plan

5,000 psi BOP Schematic

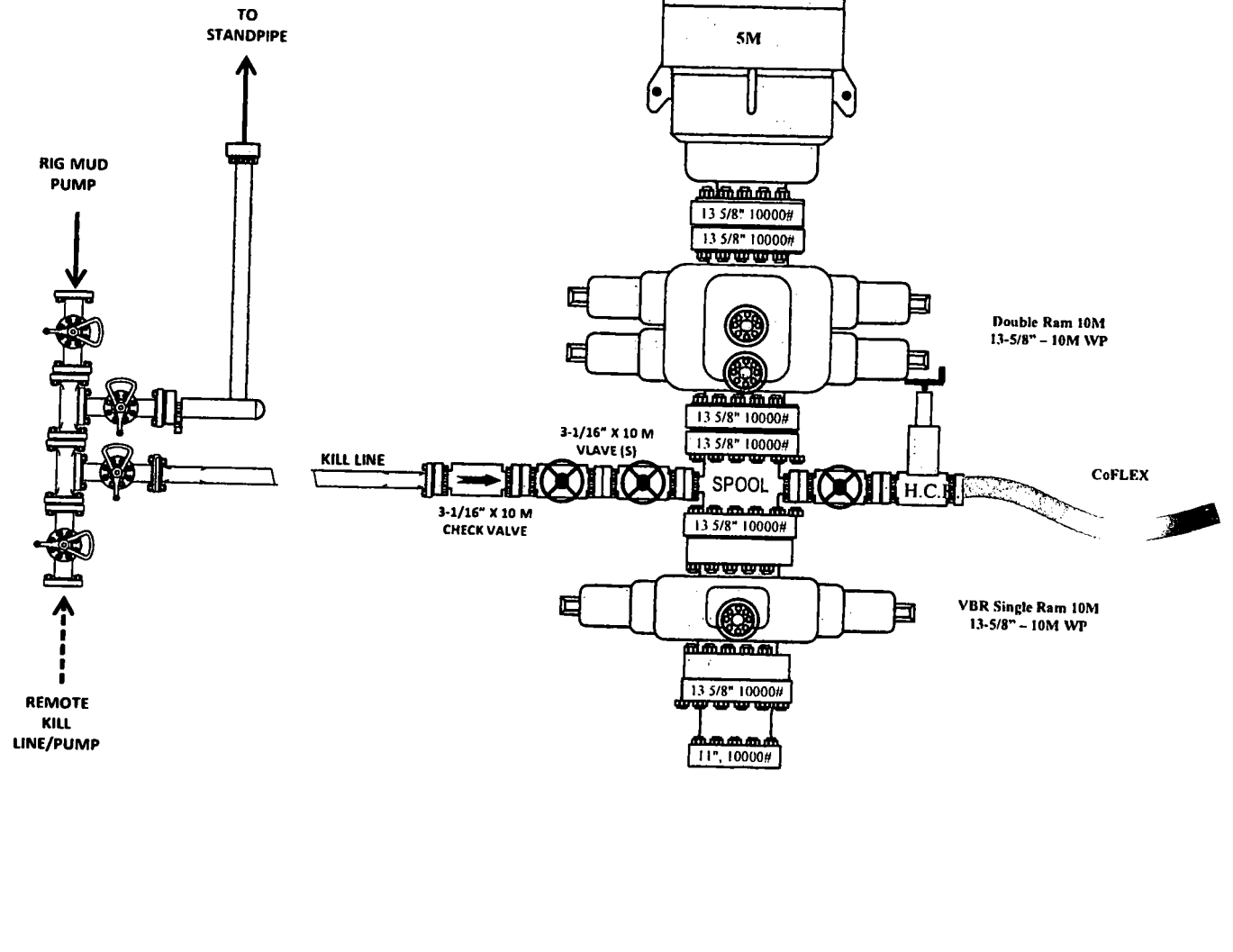


5M Choke Manifold Equipment (WITH MGS + CLOSED LOOP)



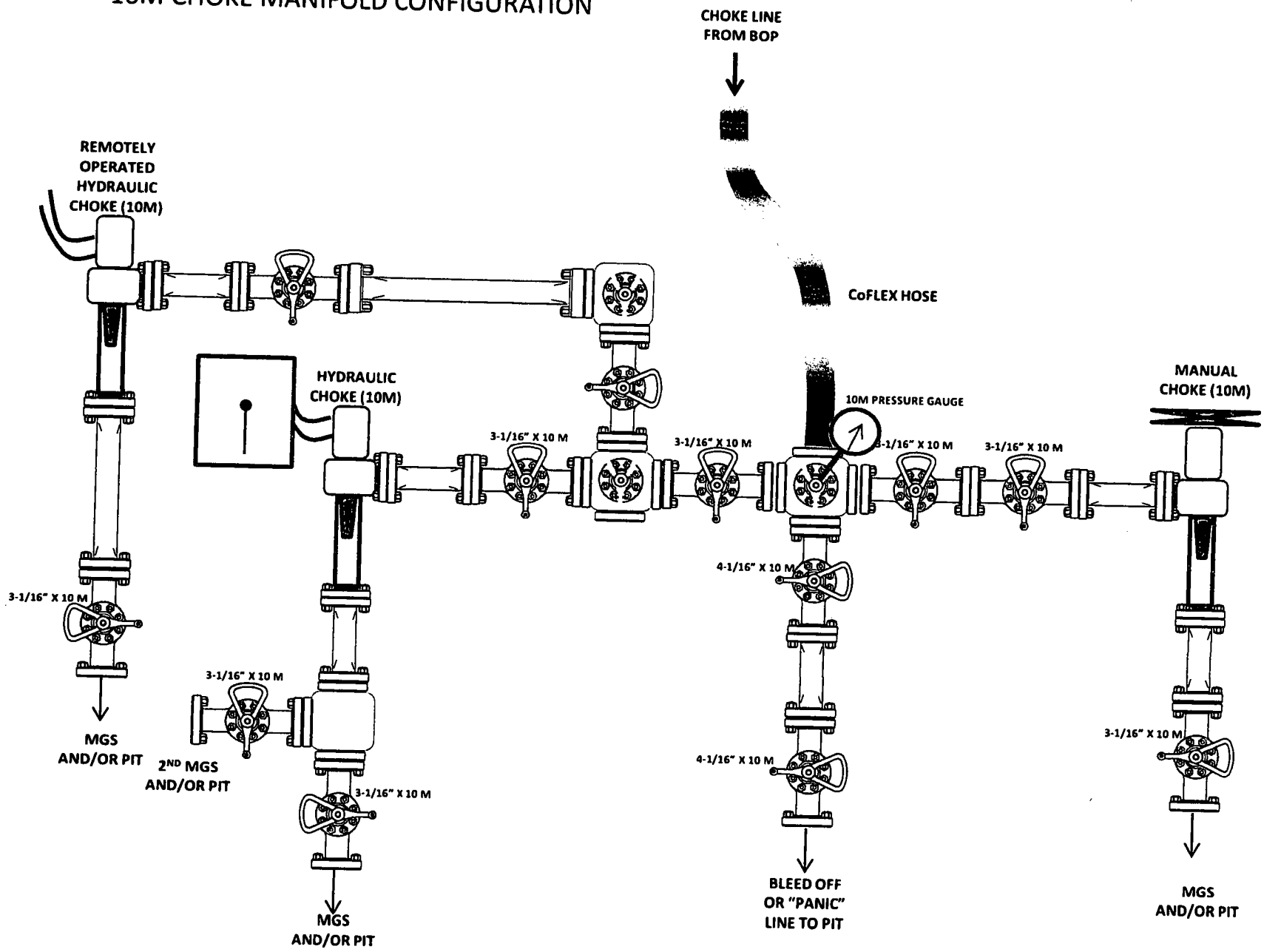
10M BOP Stack

10M REMOTE KILL SCHEMATIC



10M BOP Stack
(5M Annular)

10M CHOKE MANIFOLD CONFIGURATION



1. Component and Preventer Compatibility Table

The table below covers drilling and casing of the 10M MASP portion of the well and outlines the tubular and the compatible preventers in use. Combined with the mud program, the below documents that two barriers to flow can be maintained at all times, independent of the rating of the annular preventer.

Component	OD	Preventer	RWP
Drill pipe	5"	Upper 4.5-7" VBR Lower 4.5-7" VBR	10M
HWDP	5"		
Jars	5"		
Drill collars and MWD tools	6.25-6.75"		
Mud Motor	6.75"		
Production casing	5.5"		
ALL	0-13-5/8"	Annular	5M
Open-hole	-	Blind Rams	10M

VBR = Variable Bore Ram with compatible range listed in chart.

2. Well Control and Shut-In Procedures

Well control procedures are specific to the rig equipment and the operation at the time the kick occurs. Below are minimum tasks prescribed to assure a proper shut-in while drilling, tripping, running casing, pipe out of the hole (open hole), and moving the BHA through the BOPs. The maximum pressure at which well control is transferred from the annular to another compatible ram is 2500 psi.

Drilling:

1. Sound the alarm (alert rig crew)
2. Space out the drill string
3. Shut down pumps and stop the rotary
4. Shut-in the well with the annular with HCR and choke in closed position
5. Confirm the well is shut-in
6. Notify contractor and company representatives
7. Read and record the following data
    - Time of shut-in
    - SIDPP and SICP
    - Pit gain
8. If pressure has increased to or is anticipated to increase to 2500 psi, confirm spacing and close the upper pipe rams.
9. Prepare for well kill operation.

Tripping:

1. Sound alarm (alert rig crew)
2. Stab full opening safety valve and close the valve
3. Space out the drill string
4. Shut-in the well with the annular with HCR and choke in closed position
5. Confirm shut-in
6. Notify contractor and company representatives
7. Read and record the following data:

- Time of shut-in
- SIDPP and SICP
- Pit gain

8. If pressure has increased to or is anticipated to increase to 2500 psi, confirm spacing and close the upper pipe rams.
9. Prepare for well kill operation.

Running Casing

1. Sound alarm (alert rig crew)
2. Stab crossover and valve and close the valve
3. Shut-in the well with annular with HCR and choke in closed position
4. Confirm shut-in
5. Notify contractor and company representatives
6. Read and record the following data
   - Time of shut-in
   - SIDPP and SICP
   - Pit gain
7. If pressure has increased to or is anticipated to increase to 2500 psi, confirm spacing and close the upper pipe rams.
8. Prepare for well kill operation

No Pipe in Hole (Open Hole)

1. At any point when pipe or BHA are not in BOP stack, well will be shut in with blind rams, HCR will be open and choke will be closed. If pressure increase is observed:
2. Sound alarm (alert crew)
3. Confirm shut-in
4. Notify contractor and company representatives
5. Read and record the following data
   - Time of shut-in
   - Time of pressure increase
   - SICP
6. Prepare for well kill operation

Pulling BHA through BOP Stack

1. Prior to pulling last joint/stand of drillpipe through the stack, perform a flow check. If well is flowing:
   a. Sound alarm (alert crew)
   b. Stab full opening safety valve and close the valve
   c. Space out drill string with tool joint just beneath the upper pipe ram.
   d. Shut-in the well with upper pipe ram with HCR and choke in closed position
   e. Confirm shut-in
   f. Notify contractor and company representatives
   g. Read and record the following data
      - Time of shut-in
      - SIDPP and SICP
      - Pit gain
   h. Prepare for well kill operation.

2. With BHA in the stack:
    a. If possible to pick up high enough, pull BHA clear of the stack
        i. Follow "Open Hole" procedure above
    b. If impossible to pick up high enough to pull BHA clear of the stack:
        i. Stab crossover, make up one joint/stand of drill pipe, and full opening safety valve and close
        ii. Space out drill string with tool joint just beneath the upper pipe ram.
        iii. Shut-in the well with upper pipe ram with HCR and choke in closed position
        iv. Confirm shut-in
        v. Notify contractor and company representatives
        vi. Read and record the following:
            - Time of shut-in
            - SIDPP and SICP
            - Pit gain
        vii. Prepare for well kill operation.

3. Well Control Drills

Well control drills are specific to the rig equipment, personnel and operation at the time a kick occurs. Each crew will execute one drill weekly relevant to ongoing operations, but will make a reasonable attempt to vary the type of drills. The drills will be recorded in the daily drilling log. Below are minimum tasks for respective well control drills.

Drilling/Pit:

Action	Responsible Party
Initiate Drill • Lift Flow Sensor or Pit Float to indicate a kick • Immediately record start time	Company Representative / Rig Manager
Recognition • Driller and/or Crew recognizes indicator • Driller stop drilling, pick up off bottom and spaces out drill string, stop pumps and rotary • Conduct flow check	Driller
Initiate Action • Sound alarm, notify rig crew that the well is flowing	Company Representative / Rig Manager
Reaction • Driller moves BOP remote and stands by • Crew is at their assigned stations • Time is stopped • Record time and drill type in the Drilling Report	Driller / Crew

Tripping Pit Drills (either in the hole or out of the hole)

Action	Responsible Party
Initiate Drill • Lift Flow Sensor or Pit Float to indicate a kick • Immediately record start time	Company Representative / Rig Manager
Recognition • Driller recognizes indicator • Suspends tripping operations • Conduct Flow Check	Driller
Initiate Action • Sound alarm, notify rig crew that the well is flowing	Company Representative / Rig Manager
Reaction • Position tool joint above rotary and set slips • Stab FOSV and close valve • Driller moves to BOP remote and stands by • Crew is at their assigned stations • Time is stopped • Record time and drill type in the Drilling Report	Driller / Crew

Choke

Action	Responsible Party
• Have designated choke operator on station at the choke panel • Close annular preventer • Pressure annulus up 200-300 psi • Pump slowly to bump the float and obtain SIDPP • At choke operator instruction, slowly bring pumps online to slow pump rate while holding casing pressure constant at the SICP. • Allow time for the well to stabilize. Mark and record circulating drillpipe pressure. • Measure time lag on drillpipe gauge after choke adjustments. • Hold casing pressure constant as pumps are slowed down while choke is closed. • Record time and drill type in the Drilling Report	Company Man / Rig Manager & Rig Crew

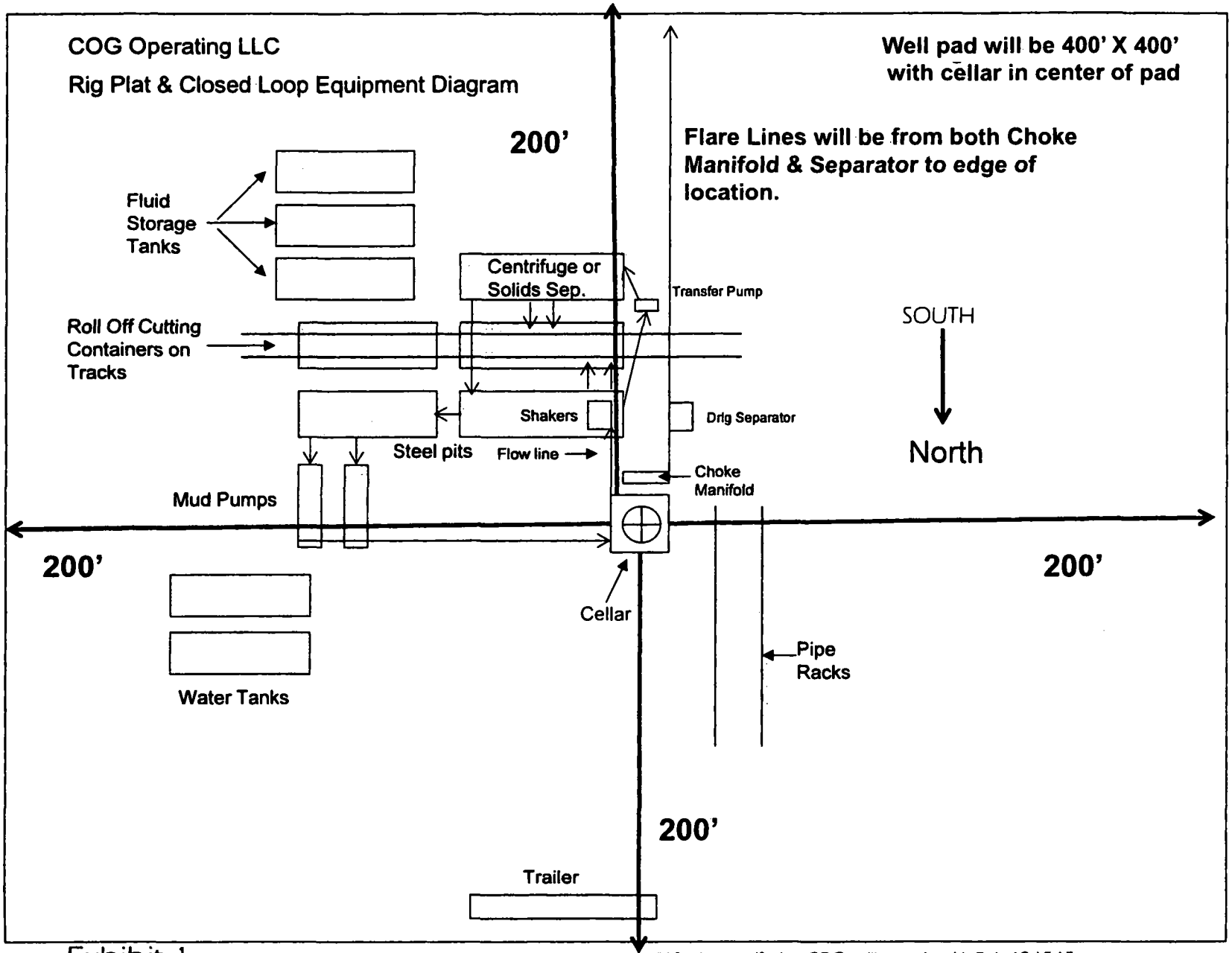


Exhibit 1

"I further certify that COG will comply with Rule 19.15.17 NMAC by using a Closed Loop System."

COG OPERATING LLC
HYDROGEN SULFIDE DRILLING OPERATIONS PLAN

1. HYDROGEN SULFIDE TRAINING

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on this well:

a. The hazards and characteristics of hydrogen sulfide (H_2S).
b. The proper use and maintenance of personal protective equipment and life support systems.
c. The proper use of H_2S detectors, alarms, warning systems, briefing areas, evacuation procedures, and prevailing winds.
d. The proper techniques for first aid and rescue procedures.

In addition, supervisory personnel will be trained in the following areas:

a. The effects of H2S on metal components. If high tensile tubulars are to be used, personnel will be trained in their special maintenance requirements.
b. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
c. The contents and requirements of the H_2S Drilling Operations Plan and the Public Protection Plan.

There will be an initial training session just prior to encountering a known or probable H2S zone (within 3 days or 500 feet) and weekly H2S and well control drills for all personnel in each crew. The initial training session shall include a review of the site specific H2S Drilling Operations Plan and the Public Protection Plan. This plan shall be available at the well site. All personnel will be required to carry documentation that they have received the proper training.

2. H_2S SAFETY EQUIPMENT AND SYSTEMS

Note: All H_2S safety equipment and systems will be installed, tested, and operational when drilling reaches a depth of 500 feet above, or three days prior to penetrating the first zone containing or reasonably expected to contain H2S. If H2S greater than 100 ppm is encountered in the gas stream we will shut in and install H2S equipment.

a. Well Control Equipment:
   Flare line.
   Choke manifold with remotely operated choke.
   Blind rams and pipe rams to accommodate all pipe sizes with properly sized closing unit.
   Auxiliary equipment to include: annular preventer, mud-gas separator, rotating head.

b. Protective equipment for essential personnel:
Mark II Surviveair 30-minute units located in the dog house and at briefing areas.

c. H2S detection and monitoring equipment:
2 - portable H2S monitor positioned on location for best coverage and response. These units have warning lights and audible sirens when H2S levels of 20 ppm are reached.

d. Visual warning systems:
Caution/Danger signs shall be posted on roads providing direct access to location. Signs will be painted a high visibility yellow with black lettering of sufficient size to be readable at a reasonable distance from the immediate location. Bilingual signs will be used, when appropriate. See example attached.

e. Mud Program:
The mud program has been designed to minimize the volume of H2S circulated to the surface.

f. Metallurgy:
All drill strings, casings, tubing, wellhead, blowout preventers, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H2S service.

g. Communication:
Company vehicles equipped with cellular telephone.

COG OPERATING LLC has conducted a review to determine if an H2S contingency plan is required for the above referenced well. We were able to conclude that any potential hazardous volume would be minimal. H2S concentrations of wells in this area from surface to TD are low enough; therefore, we do not believe that an H2S contingency plan is necessary.

WARNING

YOU ARE ENTERING AN H_2S AREA
AUTHORIZED PERSONNEL ONLY

1. ***BEARDS OR CONTACT LENSES NOT ALLOWED***
2. ***HARD HATS REQUIRED***
3. ***SMOKING IN DESIGNATED AREAS ONLY***
4. ***BE WIND CONSCIOUS AT ALL TIMES***
5. ***CK WITH COG OPERATING LLC FOREMAN AT MAIN OFFICE***

COG OPERATING LLC

1-575-748-6940

EMERGENCY CALL LIST

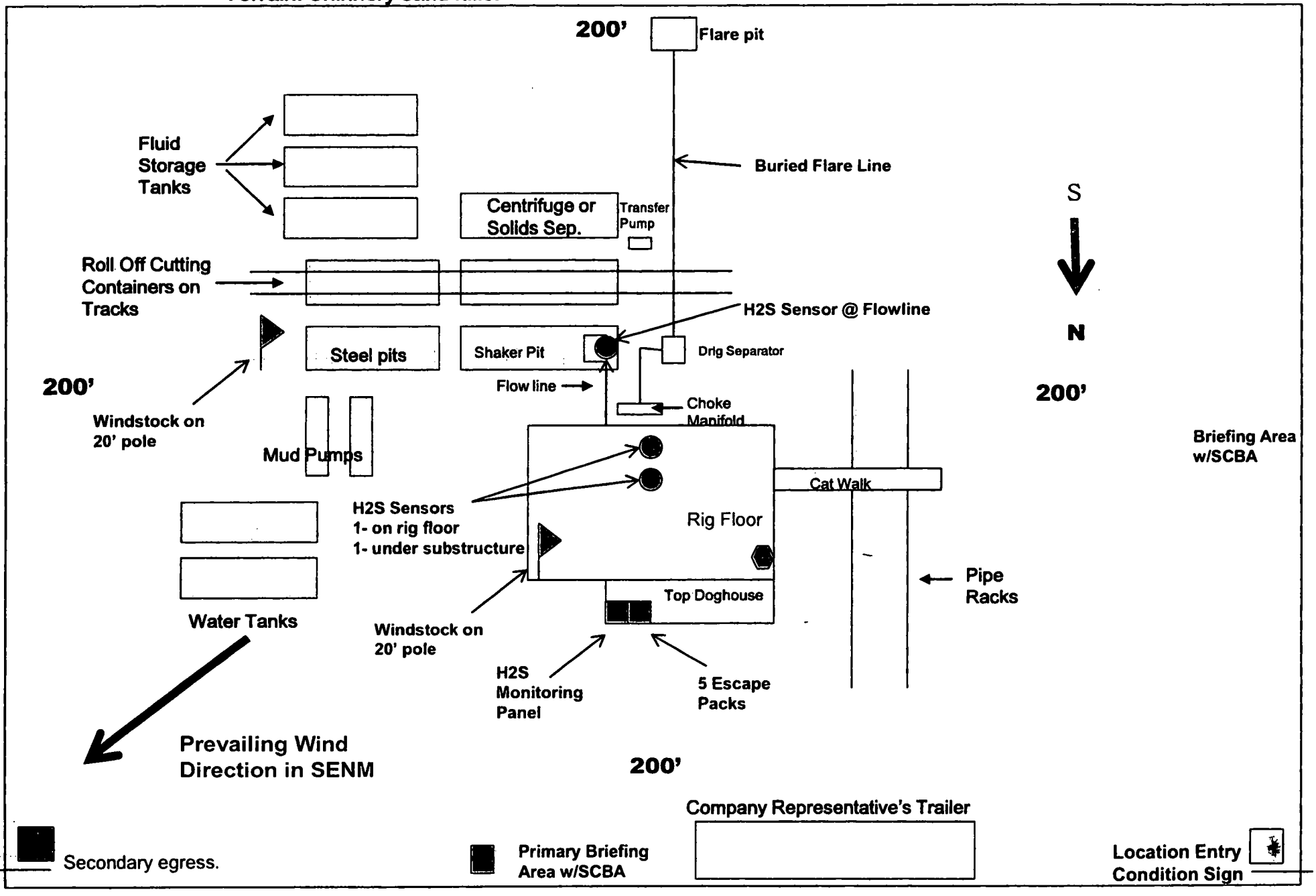
	OFFICE	MOBILE
COG OPERATING LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

EMERGENCY RESPONSE NUMBERS

	OFFICE
STATE POLICE	575-748-9718
EDDY COUNTY SHERIFF	575-746-2701
EMERGENCY MEDICAL SERVICES (AMBULANCE)	911 or 575-746-2701
EDDY COUNTY EMERGENCY MANAGEMENT (HARRY BURGESS)	575-887-9511
STATE EMERGENCY RESPONSE CENTER (SERC)	575-476-9620
CARLSBAD POLICE DEPARTMENT	575-885-2111
CARLSBAD FIRE DEPARTMENT	575-885-3125
NEW MEXICO OIL CONSERVATION DIVISION	575-748-1283
INDIAN FIRE & SAFETY	800-530-8693
HALLIBURTON SERVICES	800-844-8451

COG Operating LLC
H_2S Equipment Schematic
Terrain: Shinnery sand hills.

Well pad will be 400' x 400' with cellar in center of pad



PHOENIX
TECHNOLOGY SERVICES

COG Operating LLC

Lea County, NM (NAD27 NME)
Gunner 8 Federal Com
403H

OH

Plan: Plan 1 06-04-19

Standard Planning Report

04 June, 2019

CONCHO

Database:	USA Compass	**Local Co-ordinate Reference:**	Well 403H
Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Project	Lea County, NM (NAD27 NME)		
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	Gunner 8 Federal Com				
Site Position:		**Northing:**	393,259.80 usft	**Latitude:**	32° 4' 42.3312 N
From:	Map	**Easting:**	759,100.10 usft	**Longitude:**	103° 29' 48.5249 W
Position Uncertainty:	0.00 usft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	0.44 °

Well	403H					
Well Position	**+N/-S**	0.20 usft	**Northing:**	393,260.00 usft	**Latitude:**	32° 4' 42.3309 N
	+E/-W	30.00 usft	**Easting:**	759,130.10 usft	**Longitude:**	103° 29' 48.1763 W
Position Uncertainty		0.00 usft	**Wellhead Elevation:**		**Ground Level:**	3,338.80 usft

Wellbore	OH				
Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	MVHD	8/4/2019	6.58	59.72	47,706.83905193

Design	Plan 1 06-04-19				
Audit Notes:					
Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00
Vertical Section:	**Depth From (TVD) (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Direction (°)**	
	0.00	0.00	0.00	177.86	

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,749.93	5.00	37.03	1,749.61	8.70	6.56	2.00	2.00	0.00	37.03	
7,000.67	5.00	37.03	6,980.39	373.91	282.12	0.00	0.00	0.00	0.00	
7,250.60	0.00	0.00	7,230.00	382.61	288.68	2.00	-2.00	0.00	180.00	
10,401.65	0.00	0.00	10,381.05	382.61	288.68	0.00	0.00	0.00	0.00	
11,298.18	89.65	179.52	10,954.00	-186.85	293.48	10.00	10.00	20.02	179.52	
21,191.56	89.65	179.52	11,014.00	-10,079.70	376.80	0.00	0.00	0.00	0.00	BHL - Gunner 8 Fe

Database:	USA Compass	**Local Co-ordinate Reference:**	Well 403H
Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 2.00°/100' Build									
1,600.00	2.00	37.03	1,599.98	1.39	1.05	-1.35	2.00	2.00	0.00
1,700.00	4.00	37.03	1,699.84	5.57	4.20	-5.41	2.00	2.00	0.00
1,749.93	5.00	37.03	1,749.61	8.70	6.56	-8.45	2.00	2.00	0.00
Hold 5.00° Inc at 37.03° Azm									
1,800.00	5.00	37.03	1,799.49	12.18	9.19	-11.83	0.00	0.00	0.00
1,900.00	5.00	37.03	1,899.11	19.14	14.44	-18.58	0.00	0.00	0.00
2,000.00	5.00	37.03	1,998.73	26.09	19.69	-25.34	0.00	0.00	0.00
2,100.00	5.00	37.03	2,098.35	33.05	24.93	-32.09	0.00	0.00	0.00
2,200.00	5.00	37.03	2,197.97	40.00	30.18	-38.85	0.00	0.00	0.00
2,300.00	5.00	37.03	2,297.59	46.96	35.43	-45.60	0.00	0.00	0.00
2,400.00	5.00	37.03	2,397.21	53.91	40.68	-52.36	0.00	0.00	0.00
2,500.00	5.00	37.03	2,496.83	60.87	45.93	-59.11	0.00	0.00	0.00
2,600.00	5.00	37.03	2,596.45	67.82	51.17	-65.87	0.00	0.00	0.00
2,700.00	5.00	37.03	2,696.07	74.78	56.42	-72.62	0.00	0.00	0.00
2,800.00	5.00	37.03	2,795.69	81.73	61.67	-79.37	0.00	0.00	0.00
2,900.00	5.00	37.03	2,895.31	88.69	66.92	-86.13	0.00	0.00	0.00
3,000.00	5.00	37.03	2,994.93	95.65	72.17	-92.88	0.00	0.00	0.00
3,100.00	5.00	37.03	3,094.55	102.60	77.41	-99.64	0.00	0.00	0.00
3,200.00	5.00	37.03	3,194.17	109.56	82.66	-106.39	0.00	0.00	0.00
3,300.00	5.00	37.03	3,293.79	116.51	87.91	-113.15	0.00	0.00	0.00
3,400.00	5.00	37.03	3,393.41	123.47	93.16	-119.90	0.00	0.00	0.00
3,500.00	5.00	37.03	3,493.03	130.42	98.40	-126.66	0.00	0.00	0.00
3,600.00	5.00	37.03	3,592.65	137.38	103.65	-133.41	0.00	0.00	0.00
3,700.00	5.00	37.03	3,692.27	144.33	108.90	-140.17	0.00	0.00	0.00
3,800.00	5.00	37.03	3,791.89	151.29	114.15	-146.92	0.00	0.00	0.00
3,900.00	5.00	37.03	3,891.51	158.25	119.40	-153.67	0.00	0.00	0.00
4,000.00	5.00	37.03	3,991.13	165.20	124.64	-160.43	0.00	0.00	0.00
4,100.00	5.00	37.03	4,090.75	172.16	129.89	-167.18	0.00	0.00	0.00
4,200.00	5.00	37.03	4,190.37	179.11	135.14	-173.94	0.00	0.00	0.00
4,300.00	5.00	37.03	4,289.98	186.07	140.39	-180.69	0.00	0.00	0.00
4,400.00	5.00	37.03	4,389.60	193.02	145.64	-187.45	0.00	0.00	0.00
4,500.00	5.00	37.03	4,489.22	199.98	150.88	-194.20	0.00	0.00	0.00
4,600.00	5.00	37.03	4,588.84	206.93	156.13	-200.96	0.00	0.00	0.00
4,700.00	5.00	37.03	4,688.46	213.89	161.38	-207.71	0.00	0.00	0.00
4,800.00	5.00	37.03	4,788.08	220.84	166.63	-214.47	0.00	0.00	0.00
4,900.00	5.00	37.03	4,887.70	227.80	171.88	-221.22	0.00	0.00	0.00
5,000.00	5.00	37.03	4,987.32	234.76	177.12	-227.98	0.00	0.00	0.00
5,100.00	5.00	37.03	5,086.94	241.71	182.37	-234.73	0.00	0.00	0.00
5,200.00	5.00	37.03	5,186.56	248.67	187.62	-241.48	0.00	0.00	0.00
5,300.00	5.00	37.03	5,286.18	255.62	192.87	-248.24	0.00	0.00	0.00
5,400.00	5.00	37.03	5,385.80	262.58	198.12	-254.99	0.00	0.00	0.00
5,500.00	5.00	37.03	5,485.42	269.53	203.36	-261.75	0.00	0.00	0.00
5,600.00	5.00	37.03	5,585.04	276.49	208.61	-268.50	0.00	0.00	0.00
5,700.00	5.00	37.03	5,684.66	283.44	213.86	-275.26	0.00	0.00	0.00
5,800.00	5.00	37.03	5,784.28	290.40	219.11	-282.01	0.00	0.00	0.00
5,900.00	5.00	37.03	5,883.90	297.36	224.36	-288.77	0.00	0.00	0.00
6,000.00	5.00	37.03	5,983.52	304.31	229.60	-295.52	0.00	0.00	0.00
6,100.00	5.00	37.03	6,083.14	311.27	234.85	-302.28	0.00	0.00	0.00
6,200.00	5.00	37.03	6,182.76	318.22	240.10	-309.03	0.00	0.00	0.00
6,300.00	5.00	37.03	6,282.38	325.18	245.35	-315.79	0.00	0.00	0.00
6,400.00	5.00	37.03	6,382.00	332.13	250.59	-322.54	0.00	0.00	0.00

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Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,500.00	5.00	37.03	6,481.62	339.09	255.84	-329.29	0.00	0.00	0.00
6,600.00	5.00	37.03	6,581.24	346.04	261.09	-336.05	0.00	0.00	0.00
6,700.00	5.00	37.03	6,680.86	353.00	266.34	-342.80	0.00	0.00	0.00
6,800.00	5.00	37.03	6,780.48	359.95	271.59	-349.56	0.00	0.00	0.00
6,900.00	5.00	37.03	6,880.10	366.91	276.83	-356.31	0.00	0.00	0.00
7,000.00	5.00	37.03	6,979.72	373.87	282.08	-363.07	0.00	0.00	0.00
7,000.67	5.00	37.03	6,980.39	373.91	282.12	-363.11	0.00	0.00	0.00
Begin 2.00°/100' Drop									
7,100.00	3.01	37.03	7,079.47	379.45	286.30	-368.49	2.00	-2.00	0.00
7,200.00	1.01	37.03	7,179.40	382.25	288.41	-371.21	2.00	-2.00	0.00
7,250.60	0.00	0.00	7,230.00	382.61	288.68	-371.56	2.00	-2.00	0.00
Begin Vertical Hold									
10,401.65	0.00	0.00	10,381.05	382.61	288.68	-371.56	0.00	0.00	0.00
KOP2, Begin 10.00°/100' Build									
10,500.00	9.83	179.52	10,478.91	374.19	288.75	-363.14	10.00	10.00	0.00
10,600.00	19.83	179.52	10,575.46	348.62	288.97	-337.58	10.00	10.00	0.00
10,700.00	29.83	179.52	10,666.10	306.68	289.32	-295.65	10.00	10.00	0.00
10,800.00	39.83	179.52	10,748.07	249.63	289.80	-238.63	10.00	10.00	0.00
10,900.00	49.83	179.52	10,818.90	179.21	290.39	-168.24	10.00	10.00	0.00
11,000.00	59.83	179.52	10,876.42	97.57	291.08	-86.63	10.00	10.00	0.00
11,100.00	69.83	179.52	10,918.89	7.18	291.84	3.73	10.00	10.00	0.00
11,200.00	79.83	179.52	10,945.01	-89.21	292.65	100.08	10.00	10.00	0.00
11,298.18	89.65	179.52	10,954.00	-186.85	293.48	197.69	10.00	10.00	0.00
LP, Hold 89.65° Inc at 179.52° Azm									
11,300.00	89.65	179.52	10,954.01	-188.67	293.49	199.51	0.00	0.00	0.00
11,400.00	89.65	179.52	10,954.62	-288.67	294.33	299.46	0.00	0.00	0.00
11,500.00	89.65	179.52	10,955.22	-388.66	295.18	399.42	0.00	0.00	0.00
11,600.00	89.65	179.52	10,955.83	-488.66	296.02	499.37	0.00	0.00	0.00
11,700.00	89.65	179.52	10,956.43	-588.65	296.86	599.33	0.00	0.00	0.00
11,800.00	89.65	179.52	10,957.04	-688.65	297.70	699.29	0.00	0.00	0.00
11,900.00	89.65	179.52	10,957.65	-788.64	298.55	799.24	0.00	0.00	0.00
12,000.00	89.65	179.52	10,958.25	-888.64	299.39	899.20	0.00	0.00	0.00
12,100.00	89.65	179.52	10,958.86	-988.63	300.23	999.16	0.00	0.00	0.00
12,200.00	89.65	179.52	10,959.47	-1,088.63	301.07	1,099.11	0.00	0.00	0.00
12,300.00	89.65	179.52	10,960.07	-1,188.62	301.91	1,199.07	0.00	0.00	0.00
12,400.00	89.65	179.52	10,960.68	-1,288.61	302.76	1,299.03	0.00	0.00	0.00
12,500.00	89.65	179.52	10,961.29	-1,388.61	303.60	1,398.98	0.00	0.00	0.00
12,600.00	89.65	179.52	10,961.89	-1,488.60	304.44	1,498.94	0.00	0.00	0.00
12,700.00	89.65	179.52	10,962.50	-1,588.60	305.28	1,598.89	0.00	0.00	0.00
12,800.00	89.65	179.52	10,963.11	-1,688.59	306.12	1,698.85	0.00	0.00	0.00
12,900.00	89.65	179.52	10,963.71	-1,788.59	306.97	1,798.81	0.00	0.00	0.00
13,000.00	89.65	179.52	10,964.32	-1,888.58	307.81	1,898.76	0.00	0.00	0.00
13,100.00	89.65	179.52	10,964.93	-1,988.58	308.65	1,998.72	0.00	0.00	0.00
13,200.00	89.65	179.52	10,965.53	-2,088.57	309.49	2,098.68	0.00	0.00	0.00
13,300.00	89.65	179.52	10,966.14	-2,188.57	310.34	2,198.63	0.00	0.00	0.00
13,400.00	89.65	179.52	10,966.74	-2,288.56	311.18	2,298.59	0.00	0.00	0.00
13,500.00	89.65	179.52	10,967.35	-2,388.56	312.02	2,398.54	0.00	0.00	0.00
13,600.00	89.65	179.52	10,967.96	-2,488.55	312.86	2,498.50	0.00	0.00	0.00
13,700.00	89.65	179.52	10,968.56	-2,588.54	313.70	2,598.46	0.00	0.00	0.00
13,800.00	89.65	179.52	10,969.17	-2,688.54	314.55	2,698.41	0.00	0.00	0.00
13,900.00	89.65	179.52	10,969.78	-2,788.53	315.39	2,798.37	0.00	0.00	0.00
14,000.00	89.65	179.52	10,970.38	-2,888.53	316.23	2,898.33	0.00	0.00	0.00
14,100.00	89.65	179.52	10,970.99	-2,988.52	317.07	2,998.28	0.00	0.00	0.00

Database:	USA Compass	**Local Co-ordinate Reference:**	Well 403H
Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,200.00	89.65	179.52	10,971.60	-3,088.52	317.92	3,098.24	0.00	0.00	0.00
14,300.00	89.65	179.52	10,972.20	-3,188.51	318.76	3,198.19	0.00	0.00	0.00
14,400.00	89.65	179.52	10,972.81	-3,288.51	319.60	3,298.15	0.00	0.00	0.00
14,500.00	89.65	179.52	10,973.42	-3,388.50	320.44	3,398.11	0.00	0.00	0.00
14,600.00	89.65	179.52	10,974.02	-3,488.50	321.28	3,498.06	0.00	0.00	0.00
14,700.00	89.65	179.52	10,974.63	-3,588.49	322.13	3,598.02	0.00	0.00	0.00
14,800.00	89.65	179.52	10,975.24	-3,688.49	322.97	3,697.98	0.00	0.00	0.00
14,900.00	89.65	179.52	10,975.84	-3,788.48	323.81	3,797.93	0.00	0.00	0.00
15,000.00	89.65	179.52	10,976.45	-3,888.47	324.65	3,897.89	0.00	0.00	0.00
15,100.00	89.65	179.52	10,977.06	-3,988.47	325.50	3,997.84	0.00	0.00	0.00
15,200.00	89.65	179.52	10,977.66	-4,088.46	326.34	4,097.80	0.00	0.00	0.00
15,300.00	89.65	179.52	10,978.27	-4,188.46	327.18	4,197.76	0.00	0.00	0.00
15,400.00	89.65	179.52	10,978.87	-4,288.45	328.02	4,297.71	0.00	0.00	0.00
15,500.00	89.65	179.52	10,979.48	-4,388.45	328.86	4,397.67	0.00	0.00	0.00
15,600.00	89.65	179.52	10,980.09	-4,488.44	329.71	4,497.63	0.00	0.00	0.00
15,700.00	89.65	179.52	10,980.69	-4,588.44	330.55	4,597.58	0.00	0.00	0.00
15,800.00	89.65	179.52	10,981.30	-4,688.43	331.39	4,697.54	0.00	0.00	0.00
15,900.00	89.65	179.52	10,981.91	-4,788.43	332.23	4,797.49	0.00	0.00	0.00
16,000.00	89.65	179.52	10,982.51	-4,888.42	333.08	4,897.45	0.00	0.00	0.00
16,100.00	89.65	179.52	10,983.12	-4,988.42	333.92	4,997.41	0.00	0.00	0.00
16,200.00	89.65	179.52	10,983.73	-5,088.41	334.76	5,097.36	0.00	0.00	0.00
16,300.00	89.65	179.52	10,984.33	-5,188.40	335.60	5,197.32	0.00	0.00	0.00
16,400.00	89.65	179.52	10,984.94	-5,288.40	336.44	5,297.28	0.00	0.00	0.00
16,500.00	89.65	179.52	10,985.55	-5,388.39	337.29	5,397.23	0.00	0.00	0.00
16,600.00	89.65	179.52	10,986.15	-5,488.39	338.13	5,497.19	0.00	0.00	0.00
16,700.00	89.65	179.52	10,986.76	-5,588.38	338.97	5,597.15	0.00	0.00	0.00
16,800.00	89.65	179.52	10,987.37	-5,688.38	339.81	5,697.10	0.00	0.00	0.00
16,900.00	89.65	179.52	10,987.97	-5,788.37	340.66	5,797.06	0.00	0.00	0.00
17,000.00	89.65	179.52	10,988.58	-5,888.37	341.50	5,897.01	0.00	0.00	0.00
17,100.00	89.65	179.52	10,989.19	-5,988.36	342.34	5,996.97	0.00	0.00	0.00
17,200.00	89.65	179.52	10,989.79	-6,088.36	343.18	6,096.93	0.00	0.00	0.00
17,300.00	89.65	179.52	10,990.40	-6,188.35	344.02	6,196.88	0.00	0.00	0.00
17,400.00	89.65	179.52	10,991.00	-6,288.35	344.87	6,296.84	0.00	0.00	0.00
17,500.00	89.65	179.52	10,991.61	-6,388.34	345.71	6,396.80	0.00	0.00	0.00
17,600.00	89.65	179.52	10,992.22	-6,488.33	346.55	6,496.75	0.00	0.00	0.00
17,700.00	89.65	179.52	10,992.82	-6,588.33	347.39	6,596.71	0.00	0.00	0.00
17,800.00	89.65	179.52	10,993.43	-6,688.32	348.24	6,696.66	0.00	0.00	0.00
17,900.00	89.65	179.52	10,994.04	-6,788.32	349.08	6,796.62	0.00	0.00	0.00
18,000.00	89.65	179.52	10,994.64	-6,888.31	349.92	6,896.58	0.00	0.00	0.00
18,100.00	89.65	179.52	10,995.25	-6,988.31	350.76	6,996.53	0.00	0.00	0.00
18,200.00	89.65	179.52	10,995.86	-7,088.30	351.60	7,096.49	0.00	0.00	0.00
18,300.00	89.65	179.52	10,996.46	-7,188.30	352.45	7,196.45	0.00	0.00	0.00
18,400.00	89.65	179.52	10,997.07	-7,288.29	353.29	7,296.40	0.00	0.00	0.00
18,500.00	89.65	179.52	10,997.68	-7,388.29	354.13	7,396.36	0.00	0.00	0.00
18,600.00	89.65	179.52	10,998.28	-7,488.28	354.97	7,496.31	0.00	0.00	0.00
18,700.00	89.65	179.52	10,998.89	-7,588.28	355.82	7,596.27	0.00	0.00	0.00
18,800.00	89.65	179.52	10,999.50	-7,688.27	356.66	7,696.23	0.00	0.00	0.00
18,900.00	89.65	179.52	11,000.10	-7,788.26	357.50	7,796.18	0.00	0.00	0.00
19,000.00	89.65	179.52	11,000.71	-7,888.26	358.34	7,896.14	0.00	0.00	0.00
19,100.00	89.65	179.52	11,001.32	-7,988.25	359.18	7,996.10	0.00	0.00	0.00
19,200.00	89.65	179.52	11,001.92	-8,088.25	360.03	8,096.05	0.00	0.00	0.00
19,300.00	89.65	179.52	11,002.53	-8,188.24	360.87	8,196.01	0.00	0.00	0.00
19,400.00	89.65	179.52	11,003.13	-8,288.24	361.71	8,295.96	0.00	0.00	0.00
19,500.00	89.65	179.52	11,003.74	-8,388.23	362.55	8,395.92	0.00	0.00	0.00

Database:	USA Compass	**Local Co-ordinate Reference:**	Well 403H
Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
19,600.00	89.65	179.52	11,004.35	-8,488.23	363.40	8,495.88	0.00	0.00	0.00
19,700.00	89.65	179.52	11,004.95	-8,588.22	364.24	8,595.83	0.00	0.00	0.00
19,800.00	89.65	179.52	11,005.56	-8,688.22	365.08	8,695.79	0.00	0.00	0.00
19,900.00	89.65	179.52	11,006.17	-8,788.21	365.92	8,795.75	0.00	0.00	0.00
20,000.00	89.65	179.52	11,006.77	-8,888.21	366.76	8,895.70	0.00	0.00	0.00
20,100.00	89.65	179.52	11,007.38	-8,988.20	367.61	8,995.66	0.00	0.00	0.00
20,200.00	89.65	179.52	11,007.99	-9,088.19	368.45	9,095.62	0.00	0.00	0.00
20,300.00	89.65	179.52	11,008.59	-9,188.19	369.29	9,195.57	0.00	0.00	0.00
20,400.00	89.65	179.52	11,009.20	-9,288.18	370.13	9,295.53	0.00	0.00	0.00
20,500.00	89.65	179.52	11,009.81	-9,388.18	370.98	9,395.48	0.00	0.00	0.00
20,600.00	89.65	179.52	11,010.41	-9,488.17	371.82	9,495.44	0.00	0.00	0.00
20,700.00	89.65	179.52	11,011.02	-9,588.17	372.66	9,595.40	0.00	0.00	0.00
20,800.00	89.65	179.52	11,011.63	-9,688.16	373.50	9,695.35	0.00	0.00	0.00
20,900.00	89.65	179.52	11,012.23	-9,788.16	374.34	9,795.31	0.00	0.00	0.00
21,000.00	89.65	179.52	11,012.84	-9,888.15	375.19	9,895.27	0.00	0.00	0.00
21,100.00	89.65	179.52	11,013.44	-9,988.15	376.03	9,995.22	0.00	0.00	0.00
21,191.56	89.65	179.52	11,014.00	-10,079.70	376.80	10,086.74	0.00	0.00	0.00
TD at 21191.56									

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
FTP - Gunner 8 Fede - plan misses target center by 203.09usft at 10887.64usft MD (10810.82 TVD, 188.57 N, 290.31 E) - Point	0.00	0.00	10,954.00	332.60	289.10	393,592.60	759,419.20	32° 4' 45.5999 N	103° 29' 44.7864 W
LTP - Gunner 8 Feder - plan misses target center by 41.56usft at 21100.00usft MD (11013.44 TVD, -9988.15 N, 376.03 E) - Point	0.00	0.00	11,013.70	-10,029.70	376.30	383,230.30	759,506.40	32° 3' 3.0523 N	103° 29' 44.7077 W
BHL - Gunner 8 Fede - plan hits target center - Point	0.00	0.00	11,014.00	-10,079.70	376.80	383,180.30	759,506.90	32° 3' 2.5575 N	103° 29' 44.7064 W

Database:	USA Compass	**Local Co-ordinate Reference:**	Well 403H
Company:	COG Operating LLC	**TVD Reference:**	RKB @ 3368.80usft (Scan Quest)
Project:	Lea County, NM (NAD27 NME)	**MD Reference:**	RKB @ 3368.80usft (Scan Quest)
Site:	Gunner 8 Federal Com	**North Reference:**	Grid
Well:	403H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 06-04-19		

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
848.80	848.80	Rustler		0.35	177.86
1,208.80	1,208.80	TOS		0.35	177.86
5,050.26	5,037.39	BOS (Fletcher)		0.35	177.86
5,296.09	5,282.29	LMAR (Top Delaware)		0.35	177.86
5,331.21	5,317.27	BLCN		0.35	177.86
6,400.83	6,382.83	CYCN		0.35	177.86
8,037.13	8,016.53	BYCN		0.35	177.86
9,509.13	9,488.53	Bone Sprg (BSGL)		0.35	177.86
9,732.13	9,711.53	U Avalon Sh		0.35	177.86
10,047.13	10,026.53	L Avalon Sh		0.35	177.86
10,328.13	10,307.53	B Avalon Sh		0.35	177.86
10,472.34	10,451.56	FBSG_sand		0.35	177.86

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,500.00	1,500.00	0.00	0.00	KOP, Begin 2.00°/100' Build
1,749.93	1,749.61	8.70	6.56	Hold 5.00° Inc at 37.03° Azm
7,000.67	6,980.39	373.91	282.12	Begin 2.00°/100' Drop
7,250.60	7,230.00	382.61	288.68	Begin Vertical Hold
10,401.65	10,381.05	382.61	288.68	KOP2, Begin 10.00°/100' Build
11,298.18	10,954.00	-186.85	293.48	LP, Hold 89.65° Inc at 179.52° Azm
21,191.56	11,014.00	-10,079.70	376.80	TD at 21191.56