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Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FEB 13 2014
Farmington Field Office
Bureau of Land Management

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

5. Lease Serial No. **SF-078423**

6. If Indian, Allottee or Tribe Name

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE *- Other instructions on page 2.*

7. If Unit of CA/Agreement, Name and/or No. **San Juan 29-7**

1. Type of Well
[ ] Oil Well [X] Gas Well [ ] Other

8. Well Name and No. **San Juan 29-7 Unit 519**

2. Name of Operator **Burlington Resources Oil & Gas Company LP**

9. API Well No. **30-039-25268**

3a. Address **PO Box 4289, Farmington, NM 87499**

3b. Phone No. (include area code) **(505) 326-9700**

10. Field and Pool or Exploratory Area **Basin FC / Blanco PC**

4. Location of Well *(Footage, Sec., T.,R.,M., or Survey Description)*
Surface UNIT B (NWNE), 790' FNL & 1535' FEL, Sec. 8, T29N, R7W

11. Country or Parish, State **Rio Arriba , New Mexico**

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT OR OTHER DATA

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

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

ConocoPhillips Company intends to perform a workover of subject well per the attached procedure. A closed loop system will be utilized for this project. The H2S contingency plan is attached.

RCVD FEB 19'14
OIL CONS. DIV.
DIST. 3

14. I hereby certify that the foregoing is true and correct. Name *(Printed/Typed)*
Kenny Davis Title **STAFF REGULATORY TECHNICIAN**

Signature Date **2/13/2014**

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by
Original Signed: Stephen Mason Title Date **FEB 18 2014**

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

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.

(Instruction on page 2)

NMOCD

ConocoPhillips
SAN JUAN 29-7 UNIT 519
Expense - RTP Projects

Lat 36° 44' 43.26" N **Long 107° 35' 23.82" W**

PROCEDURE

1. Hold pre-job safety meeting. Comply with all NMOCD, BLM, and COPC safety and environmental regulations. Test rig anchors prior to moving in rig.

2. MIRU workover rig. Check casing, tubing, and bradenhead pressures and record them in Wellview. **If there is pressure on the BH, contact Wells Engineer.**

3. Remove existing piping on casing valve. RU blow lines from casing valves and begin blowing down casing pressure. Pressure test tubing to 1000 psi before unseating the pump, release pressure.

4. Unseat pump & kill well with produced Fruitland coal water, if necessary.

5. TOOH with rod string (per pertinent data sheet). **Save a sample of any scale/paraffin/asphaltene encountered.**

6. ND wellhead and NU BOPE. Pressure and function test BOP to 250 psi low and 1000 psi over SICP high to a maximum of 2000 psi held and charted for 10 minutes as per COP Well Control Manual. PU and remove tubing hanger and tag for fill, adding additional joints as needed. Record pressure test and fill depth in Wellview.

7. RU Tuboscope Unit to inspect tubing. TOOH with tubing (per pertinent data sheet). LD and replace any bad joints and record findings in WellView. **Make note of corrosion, scale, or paraffin and save a sample to give to the engineer for further analysis.**

8. PU bailer regardless of tag and CO to PBTD @ 3155'. If fill is too hard or too much to bail, contact Wells Engineer before utilizing the air package. TOOH. LD tubing bailer. **If fill could not be CO to PBTD, or well is making significant fill,** call Wells Engineer to inform how much fill was left and confirm/adjust landing depth.

9. TIH with tubing.

Tubing Wt/Grade:	4.7# J-55 EUE	
Land Tubing At:	3140	ftKB
Land F-Nipple At:	3104	ftKB
KB:	12	ft

Tubing and BHA Description	
1	2-3/8" Purge Valve
1	2-3/8" PGA-1 Joint
1	2-3/8" x 4' Pup Joint
1	2-3/8" (1.78" ID) F-Nipple
~97	2-3/8" Tubing Joints
XX	2-3/8" Pup Joints as needed
1	2-3/8" Tubing Joint

10. Establish barriers. ND BOP, NU B-1 Adapter, ratigan (or rod-lock), and flow tee (place rod ratigan below flow tee). RIH with rod string. Place guided rods where rod wear was found. If possible, put 2' or 4' pony below polished rod.

Rod Description		Pump Component Description
1	1" x 8' Gas Anchor/Dip Tube	**RHAC-Z 2" x 1-1/4" x 12' x 16' Insert pump.**
1	1.25" Insert Pump	
1	1" x 1' Lift Sub	BRASS NI CARB BARREL, 8' SM PLGR - .009, SN / NC, DOUBLE VALVED,
1	3/4" x 8' Guided Rod Sub	REG STEEL FITTINGS, 3/4" PIN, 1-5/8" FISH NECK, 8' GAS ANCHOR/DIP
1	21K JWD Shear Tool	TUBE
3	1.25" Sinker Bars	
1	3/4" x 8' Pony Rods	**Do not set pump to tag.**
119	3/4" Sucker Rods	
As Needed	3/4" Pony Rods	
1	1.25" x 22' Polished Rod	

11. Space out pump 1/2"/1000' in depth and seat pump. Load tubing with water to pressure test tubing and pump to 1000 psi. **Contact Liquid Level to run Dynomometer and perform hot flush.** Test for good pump action.

12. Notify lease operator that well is ready to be returned to production. RD, MOL.

ConocoPhillips

Current Schematic

SAN JUAN 29-7 UNIT #519

District	Field Name		API / UWI	County	State/Province
NORTH	ESN (FTLD COAL)	#3046	3003925268	RIO ARRIBA	NEW MEXICO

Original Spud Date	Surface Legal Location	East/West Distance (ft)	East/West Reference	North/South Distance (ft)	North/South Reference
6/9/1993	008-029N-007W-B	1,535.00	FEL	790.00	FNL

VERTICAL - Original Hole, 1/27/2014 1:46:06 PM

MD (ftKB)	TVD (ftKB)	Vertical schematic (actual)	Formation Tops
-1.0	-1.0		
12.1	12.1	Polished Rod Sinker Bar; -1.1-20.9; 22.00; 1 1/4	
21.0	21.0	Pony Rod 2', 8'; 20.9-30.9; 10.00; 3/4	
30.8	30.8	Tubing; 2 3/8; 4.70; J-55; 12.0; 43.1	
43.0	43.0		
43.1	43.1	Pup Jt; 2 3/8; 4.70; J-55; 43.1; 53.3	
245.7	245.7	SURFAC; 12.0-252.0 ftKB; 12 1/4 in	
246.7	246.7	Surface; 8 5/8; 8.097; 12.0; 246.8	
252.0	252.0	Tubing; 2 3/8; 4.70; J-55; 53.3; 3,072.1	
2,120.1	2,119.9	PROD1; 252.0-3,195.0 ftKB; 7 7/8 in	OJO ALAMO
2,196.9	2,196.7	Sucker Rod; 30.9-2,980.9; 2,950.00; 3/4	KIRTLAND
2,700.1	2,700.0		FRUITLAND
2,754.9	2,754.7		
2,756.9	2,756.7		
2,830.1	2,829.9	Fruitland Coal; 2,830.0-2,980.0 ftKB; 7/29/1993	
2,980.0	2,979.8		
2,981.0	2,980.8	Pony Rod; 2,980.9-2,996.9; 16.00; 3/4	
2,997.0	2,996.9		
3,003.0	3,002.8	Sinker Bar; 2,996.9-3,071.9; 75.00; 1 1/4	
3,004.9	3,004.7	Pictured Cliffs; 3,003.0-3,135.0 ftKB; 7/18/1993	PICTURED CLIFFS
3,071.9	3,071.7	Safety Joint; 3,071.9-3,072.4; 0.50; 3/4	
3,072.2	3,072.0		
3,072.5	3,072.3	Pup Jt; 2 3/8; 4.70; J-55; 3,072.1; 3,074.2	
3,074.1	3,073.9	Guided Pony Rod; 3,072.4-3,080.4; 8.00; 3/4	
3,080.4	3,080.2	Tubing; 2 3/8; 4.70; J-55; 3,074.2; 3,105.3	
3,105.3	3,105.1	3-Tube Pump; 3,080.4-3,105.4; 25.00; 1 1/4	
3,105.3	3,105.1	"F" Profile Nipple; 2 3/8; 3,105.3; 3,106.2	
3,106.3	3,106.1	Gas Anchor/Dip Tube; 3,105.4-3,117.4; 12.00; 1 1/2	
3,117.5	3,117.3	PGA-1 Modified Mud Anchor; 2 3/8; 4.70; J-55; 3,106.2; 3,139.5	
3,136.2	3,135.9		
3,139.4	3,139.2		
3,140.1	3,139.9	Bull Plug; 2 3/8; 3,139.5; 3,140.2	
3,150.3	3,150.1		
3,151.2	3,151.0		
3,154.9	3,154.6	PBTD; 3,155.0	
3,192.6	3,192.4		
3,193.9	3,193.7	Production; 4 1/2; 4.052; 12.0; 3,193.8	
3,194.9	3,194.7	TD - Original Hole; 3,195.0 ftKB	

Report Printed: 1/27/2014

ConocoPhillips
Remedial Rig
H_2S Contingency Plan

SAN JUAN 29-7 UNIT 519

790' FNL & 1535' FEL, Spot B, Section 08 -T 029N - R 007W
Lat 36° 44' 43.26" N Long 107° 35' 23.82" W

Prepared by	Jessie Dutko
Area Engineer	Jessica West
Rig Supervisor	Joe McElreath
COPC Rig Superintendent	Stan Terwilliger
COPC Expense Rig Manager	Mark Chambers

Table of Contents

Introduction

ConocoPhillips is planning a Pull rods and tubing, replace pump and bad joints, clean out fill, and run tubing

Data from the BLM indicates that hydrogen sulfide (H_2S) may be present in the gas formation. Hydrogen sulfide (H_2S) is a flammable and highly toxic gas, which in relatively small concentrations, can have adverse effects on people and equipment (refer to the section - Effects of H_2S).

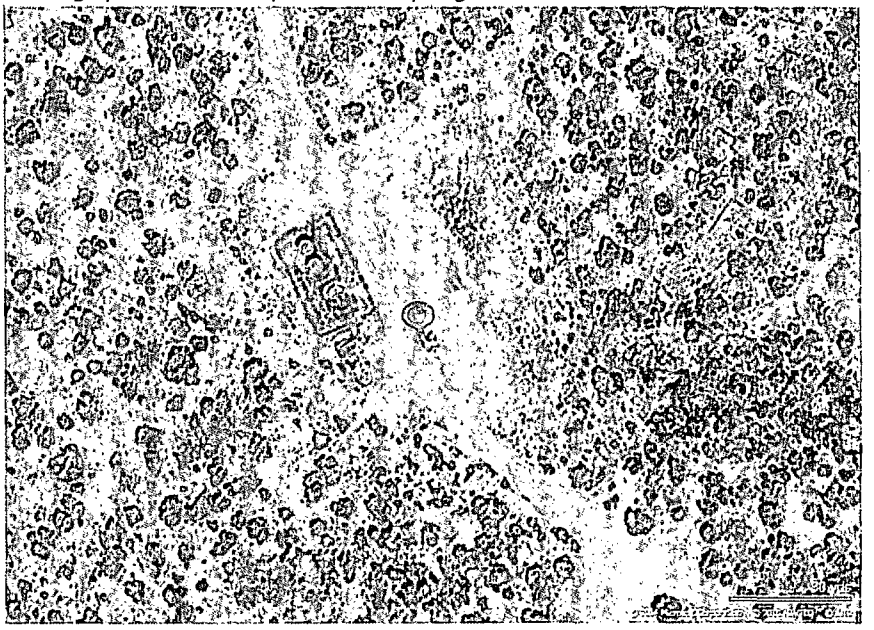
Precautionary measures concerning H_2S in this plan have been formulated based on the following assumptions:

ConocoPhillips is expecting the possibility of H2S from this location, although gas samples previously analyzed or taken from this well location indicate a concentration of less than 100ppm, levels of >100 ppm can be expected from this particular well based on BLM recommendation for this well site. This contingency plan will be provided should H2S levels arise during workover operations.

Based on Radius of Exposure (ROE) equations provided in the Department of Interior, Bureau of Land Management, Part II, 43 CFR Part 3160, Onshore Order No. 6, Hydrogen Sulfide Operations, the 100 ppm H2S ROE for a hypothetical well is 7.3 feet and the 500 ppm H2S ROE is 3.4 feet. These ROE are based upon 88 ppm H2S gas at a rate of 0.2 MMSCFD which includes a safety

No residences, schools, business or parks where the public could reasonably be expected to frequent fall within either the 100 ppm ROE or the 500 ppm ROE. The well is on Fee Land and the only roads in the ROE are dirt well servicing roads. The SAN JUAN 29-7 UNIT 519 is located ~1 mile E of Navajo City and 0.25 miles S of H64

This plan has been designated as a guide for well requirements and special considerations to provide for safe and efficient servicing operations in the presence of hydrogen sulfide.



500 ppm ROE	Red Circle	3.4'
100 ppm ROE	Blue Circle	7.3'

General Emergency Action

In the event an emergency situation occurs, the following action shall be initiated:

1. If the H2S alarm sounds, stop the workover activities immediately.

2. Evacuate quickly to the pre-designated "Safe Briefing Area".

3. Those who must enter the hazard area must wear self-contained breathing apparatus and use other appropriate safety equipment. Secure rig and close well in, if necessary, using self-contained breathing apparatus and other appropriate safety equipment. (Use the "buddy system" at all times.)

4. Account for all personnel and take appropriate action as necessary for personnel safety.

5. Raise appropriate color warning flag to describe the type of emergency.

The Rig Supervisor will assess the situation and assign duties to various persons to bring the situation under control. The Rig Supervisor will advise the ConocoPhillips Rig Superintendent as soon as the emergency will permit. In the event of a well kick, procedures outlined in the Operations Plan will be followed. Stations to be manned and duties to be performed will be discussed in the safety meeting and captured in the JSA prior to commencing rig operations.

Notification of local law enforcement agencies, residents and emergency vehicles as per the following Communications Directory, will be assigned by the ConocoPhillips Rig Superintendent.

Any press inquiries are to be referred to the ConocoPhillips Expense Rig Manager (Mark Chambers).

Contact Information

ALL AREA CODES ON THIS PAGE ARE 505 UNLESS OTHERWISE INDICATED

Expense Rig Department

Name	Office	Home	Cell
Expense Rig Manager			
Mark Chambers	326-9570	432-2447	215-2354
Expense Rig Superintendents			
Kelly Kolb	326-9582	327-2177	320-4785
Stanley Terwilliger	599-4066	793-4993	320-5921
Chris Adams	326-9838	334-1106	427-8904
Lyle Ehrlich	599-4002	327-7459	320-2613
Production Engineering			
Chris Pierson	326-9776		860-2533

Health, Safety & Environmental Department

Name	Office	Home	Cell
HSE Manager			
Sharon Zubrod	326-9793	436-2288	330-5395
HSE Representatives			
Shannon Donnelly	324-6181	(907)-394-0520	215-82985
Bryan Salazar	599-3413		320-7365
Contract Safety			
Steve Martinez (DMX Safety Alliance)	325-7233		320-0544
Ginger Lockeby (Advanced Safety)	324-0575		320-6250

Well Control Resources

Name	Office	
Cudd Well Control Co.	(713)-849-2769	24 hr Contact

Contact Information

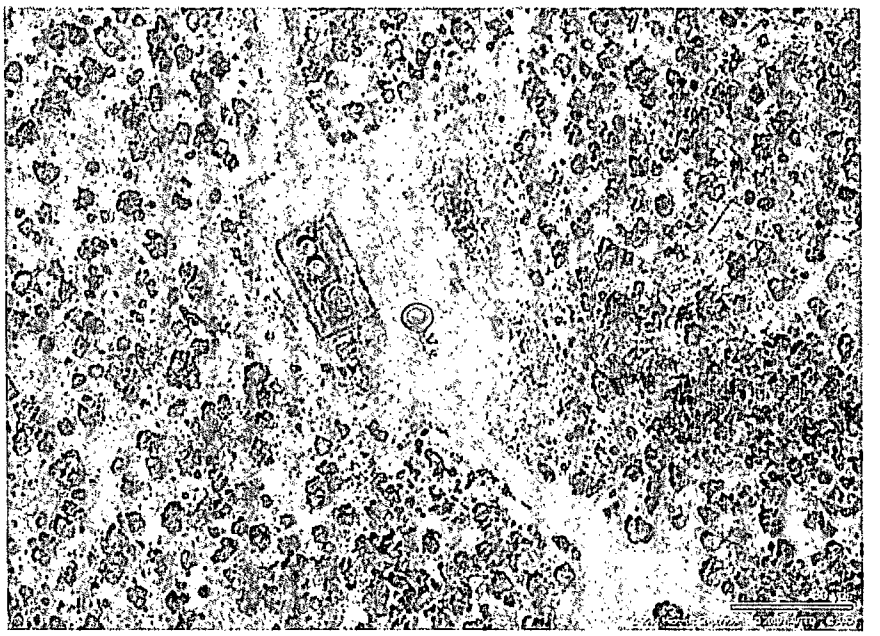
ALL AREA CODES ON THIS PAGE ARE 505 UNLESS OTHERWISE INDICATED

Agencies

Name			
State Police/Sheriff/City Police			
New Mexico State Police		325-7547	
San Juan County Sheriff's Department	911	334-6622	
San Juan County Police Department	911	334-6622	
Ambulance	911	334-6622	
Fire Department	911	334-6622	
Air Care 1	911	599-6046	1-800-452-9990
Bureau of Land Management			
Farmington Office		599-8900	
New Mexico Oil Conservation Division			
Aztec Office		334-6178	
Hospitals			
San Juan Regional Medical Center		325-5011	

List of Public Areas

No residences, schools, business, parks or other areas where the public could reasonably be expected to frequent were found to be within the 100 ppm ROE or 500ppm ROE. Included is an aerial map indicating the physical location of the Radius of Exposure. All land within the 100 ppm radius of exposure from the wellhead is still on the wellpad.



500 ppm ROE	Red Circle	3.4'
100 ppm ROE	Blue Circle	7.3'

Responsibilities

All Personnel

All Personnel on the ConocoPhillips location shall be familiarized with the procedures outlined in this directive.

All personnel will attend to their personal safety first.

Report to the "Safe Briefing Area" and follow the instructions of the rig supervisor.

Rig Supervisor

Ensure that a Safety Contractor representative and Toolpusher are on site.

It is the responsibility of the Rig Supervisor to see that all personnel on the ConocoPhillips location observe these safety and emergency procedures.

The Rig Supervisor will advise the ConocoPhillips Rig Superintendent whenever the procedures as specified herein are complied with or cannot be followed. A checklist (attached) will be utilized. One (1) completed copy of the checklist will be forwarded to the ConocoPhillips Rig Superintendent and one copy to ConocoPhillips HSE Department.

The Rig Supervisor shall keep the number of personnel on location to a minimum during hazardous operations.

The Rig Supervisor shall be trained in the use of all safety equipment and completely briefed on safety and emergency procedures. This shall include full knowledge of the requirements in this contingency plan.

It is the responsibility of the Rig Supervisor to see that all Contractors have been adequately trained in the handling of emergency situations. He should satisfy himself that this is the case. He should notify the ConocoPhillips Rig Superintendent if the Contractor fails to fulfill this responsibility.

If an unexpected emergency occurs, or the H2S alarm sounds, the Rig Supervisor (or Toolpusher) will assess the situation and will advise all personnel what conditions exist. Action to be taken under each of three possible conditions is as follows:

CONDITION I - POTENTIAL DANGER TO LIFE
(such as hazardous amount of toxic gasses detected at surface)

Order nonessential personnel out of the potential danger area and display the YELLOW CONDITION I warning sign and flag.

Order all essential personnel to check their safety equipment to see that it is working properly and in the proper location (see supervisor's checklist). Persons without respiratory protection cannot work in the hazard area.

Notify Rig Superintendent of condition and action taken.

Increase gas monitoring activities and continue operations as appropriate.

CONDITION II - MODERATE DANGER TO LIFE
(such as circulating out a potentially toxic gas kick)
IN ADDITION TO CONDITION I REQUIREMENTS

Display only the ORANGE CONDITION II warning sign and flag.

Direct corrective action to control flow of gas.

Set up roadblocks and restrict personnel movements to a minimum.

CONDITION III - EXTREME DANGER TO LIFE
(when it appears that well control will be lost)
IN ADDITION TO CONDITION I and II REQUIREMENTS

Display only the RED CONDITION III warning sign and flag.

Contact and request local police to evacuate people and to control traffic within the danger zone. Should the condition be immediately dangerous to the public, take necessary life saving action until local police arrive.

Ignite the well if necessary. (See the following section - Igniting the Well.)

Contract Rig Supervisor (Toolpusher)

A Toolpusher will be on-site at all times when a contingency plan is in place.

In the absence or incapacitation of the Rig Supervisor, the Toolpusher will assume all responsibilities designated herein to the Rig Supervisor.

Assist the Rig Supervisor and Safety Representative in training crews for handling emergency situations.

Will be trained for all well control or emergency situations as contained herein and how to properly use all safety equipment.

HSE Department

Shall provide safety and environmental information and guidance when required.

Shall review and approve any changes in safety or environmental procedures.

Shall assist as appropriate with operating and maintenance procedures for the safety equipment called for in this plan.

Shall assist with arranging initial training on safety procedures and equipment. Shall provide assistance as needed for follow up training.

Rig Contractor

Shall have personnel properly trained in First Aid/CPR and H2S Awareness.

Shall keep personnel trained in use of safety equipment and safety procedures.

Visitors, Service Personnel (Vendors) and Others

Only personnel authorized by the Rig Supervisor shall be permitted to enter area when an emergency condition exists.

Shall be permitted to enter area under an emergency condition only if needed and then only after being properly instructed in use of safety equipment and have necessary equipment issued or available.

Vendors must have all of their personnel trained in H2S procedures who will be on location during any work which could result in an H2S release through rig release.

Igniting the Well

Responsibility

The decision to ignite the well is the responsibility of the ConocoPhillips Rig Superintendent. However, the decision should be made only as a last resort and in a situation where it is clear that:

Human life or property is endangered.

There is no hope of controlling the blowout under the prevailing conditions at the well.

In all cases, an attempt should be made to notify the Rig Superintendent of the plans to ignite the well, if time permits. However, the Rig Superintendent and Rig Supervisor must not delay a decision if human life is threatened.

If the well is ignited, the burning H2S will be converted to sulfur dioxide (SO2), which is also highly toxic. Do not assume that the area is safe after the well is ignited. Follow through with all plans to evacuate endangered persons.

Means of Ignition

In preparation for igniting the well, keep unnecessary persons in the "Safe Briefing Area". A two person team is required for the actual ignition. Both team members will wear self-contained breathing units and will have 200 feet retrieval ropes attached to safety harnesses. One team member is responsible for checking the atmosphere for explosive gasses with the quad gas monitor. The other member is responsible for igniting the well. Persons remaining in the "Safe Briefing Area" will closely watch the ignition team; and should either man be overcome, they will immediately pull him to safety by the retrieval ropes and apply revival measures.

The primary method for igniting the well will be with a 25 mm meteortype flare gun. (The location of the flare gun (if available) will be discussed during and noted in the JSA.) These guns have a range of approximately 500 feet. If this method fails or well conditions are such that a safer or better method is apparent, then an alternate method should be used.

Always ignite the well from upwind and do not approach the well any closer than warranted.

Select a location to fire the flare gun that provides maximum protection to the ignition team (behind equipment) while keeping in visible sight by personnel in the "Safe Briefing Area".

Choose a location that has good accessibility and from which retreat can easily be made.

Before firing the flare gun or igniting flammable material, check the atmosphere at your location for combustible gasses with explosimeter.

Precautionary Measures

Two areas shall be designated as safe briefing areas, each located, as a minimum: 150 feet from the wellhead and vent discharge area; spaced 160 degrees apart on an arc, with the wellhead as the center point; and as best suited for topographical considerations and prevailing winds. Six Niosh approved Positive Pressure SCBAs shall be located as follows: one in the Rig Supervisor's vehicle, one in the Tool Pusher's trailer, and two at each of the "Safe Briefing Areas". Packs should be readily accessible and properly protected from exposure to the elements.

Emergency equipment shall be on location as described in the H2S Contingency Equipment Checklist.

A copy of all emergency telephone numbers shall be posted on the rig equipment trailer, at the "Safe Briefing Areas" and in the Rig Supervisor's vehicle.

Wind direction indicators shall be located where at least one can be viewed from any position on the location.

An automatic hydrogen sulfide (H2S) monitor shall be provided, with detectors placed at the flow line and rig floor. Either of these detectors shall be capable of sensing a minimum of 5 ppm H2S in air and shall be able to independently activate visual and audio alarms. Both the visual alarm and the audible alarm will be activated at 10 ppm. The audible alarm must be capable of alerting people at any point on the location.

A sign that reads, "Caution - Poisonous Gas May be Present", will be posted at the last intersection leading to location.

If conditions warrant, two (2) explosion-proof, 24 inch or larger, electric fans will be located: (a) one on the rig floor to blow fumes downwind; (b) the second under the rig floor to clear gas from the substructure.

The well-site shall be equipped with commercial communications. The equipment should be located for safe access and should not be an ignition source.

The Rig Supervisor's vehicle should always be parked a safe distance (at least 100 feet) from the rig, and in an upwind direction when feasible.

For all well kicks, the Operations Plan will be followed. All rig personnel shall be trained, and drills shall be conducted to insure proper well control procedures.

The checklist of all emergency equipment (see Rig Supervisor's checklist) shall be completed prior to starting work as identified in the introduction. The Rig Supervisor shall inspect the equipment with assistance, as needed, from ConocoPhillips HSE personnel as to working condition, proper placement, etc. The inspection will be noted on the checklist. A copy of the checklist will be placed in the Rig Supervisor's files and one copy each will be provided to the Rig Superintendent and HSE Department.

A Safety Contractor will be on-site monitoring head count, enforcing that all personnel on location will have no facial hair in face piece seal area, keeping only essential personnel on location, and all personnel on location are trained to work in an H2S environment. They will also be the designated rescue agent for injured.

Special Safety Training

The minimum training for personnel working in affected areas shall include the following elements:

Hazards, characteristics and symptoms of hydrogen sulfide (H2S), sulfur dioxide (SO2), carbon monoxide (CO), methane gas, and other hazardous substances as may be appropriate. Effects of these substances are discussed in a section that follows.

Effect on metal components of the system.

Safety precautions to include possible sources at the site.

Operation of safety equipment and life support means and systems.

Corrective action and shutdown procedures.

Detection and measurements of H2S, CO and combustible gas.

THE RIG SUPERVISOR ON LOCATION SHALL BE RESPONSIBLE FOR THE OVERALL ON-SITE OPERATION, INCLUDING THE SAFETY AND TRAINING PROGRAM.

All personnel, contracted or employed on an unscheduled basis, shall be trained as a minimum in the severity of H2S and other toxic gasses, safety precautions, evacuation procedures, and as appropriate, the use of respiratory protection equipment. This training shall be completed prior to entering the H2S location. Visitors shall also be instructed regarding these matters.

To promote efficient safety procedures, an on-site toxic gas safety program, which includes a drill and training session, shall be established for all crews. Records of attendance shall be maintained on the workover rig.

Equipment and Material Specifications

Wellhead and blowout equipment is to conform as per Operations Plan.

BOP equipment will be tested to pressure rating prior to starting any work, with all testing witnessed and recorded by the Rig Supervisor.

The BOP will be operationally tested on every trip. BOP drills will be held prior to operation with the potential to release H2S, these will be recorded on the Rig Supervisor's report.

Downhole equipment planned for this well will be listed in the Operations' Plan. Ensure that any equipment has been designed in accordance with ConocoPhillips' requirements for sour service.

H2S Contingency Equipment Checklist

_____	(All)	Personnel training with attendance records on site.
_____	(2)	Cleared land areas for use as "Safe Briefing Areas", 150' from wellhead, and 160° apart
_____	(1)	Warning sign with current well condition indicator, located at last intersection to location so vehicles may have turn-around area.
_____	(3)	Wind direction indicators, located to provide visibility from any place on location.
_____	(3)	No Smoking signs on drive posts.
_____	(3)	Safe Briefing Area signs on drive posts.
_____	(2)	Fans - electric motor driven and explosion proof; one located on rig floor, and one located in substructure (if conditions warrant).
_____	(1)	H2S monitor (continuous) located on rig floor with detectors (sensitivity of 5 ppm in air) located at the flow line, mud pits discharge, and on the rig floor.
_____	(1)	Alarm system capable of individual activation by any detector with maximum settings as follows: visual and audible alarms at 10 ppm (audible must be capable of alerting personnel at any point on location).
_____	(5)	Niosh Approved Positive Pressure SCBAs - 30 min. self-contained breathing apparatus: one in the supervisor's office, and two at each of the "Safe Briefing Areas". Easily accessible, and protected from exposure to the elements.
_____	(3)	Condition warning flags (1 each yellow, orange, and red).
_____	(1)	Trailer - full enclosure, at location entrance (based on prevailing winds), containing everything below
_____	(1)	Length of Stain Polymetric Tube Type Detectors with lower range tubes for CO2, H2S, and SO2
_____	(1)	MSHA Explosimeter (or equivalent).
_____	(1)	Flare gun - 25mm meteor type with flares.
_____	(2)	Derrick safety belts with 10' tail ropes.
_____	(2)	200' retrieval ropes.
_____	(3)	Hearing protectors - muff type.
_____	(1)	First aid kit - 25 unit.
_____	(3)	Flashlights w/batteries (explosion-proof & watertight).
_____	(1)	Disinfectant, cleaner, and towels for breathing apparatus
_____	(1)	Inspection records for breathing apparatus and air supply.
_____	(1)	Fire extinguisher (rated 60:BC).
_____	(4)	Emergency telephone numbers in plastic weatherproof holders located at: rig equipment trailer; Rig Supervisor's vehicle; in both Safe Briefing Areas

Effects of H2S and Other Gases on Workover Operations

Hydrogen Sulfide - H_2S

Hydrogen sulfide is a colorless, flammable, extremely poisonous gas. It is 1.2 times as heavy as air and will accumulate in low areas. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. It can be detected by smell at a concentration in air of only 0.02 ppm. Exposure to 10 ppm can be tolerated up to 8 hours without respiratory equipment. Respiratory equipment is required to protect workers should conditions exceed the foregoing allowable exposure limit. Concentrations in excess of 20 ppm have an effect on the olfactory nerve which deadens the sense of smell. Unconsciousness can occur without warning within seconds of inhalation at concentrations above 500 ppm.

Concentration Percentage %	Parts Per Million ppm	Physical Effect
0.001	10	Obvious and unpleasant odor. Current ACGIH TLV allowed for 8 hour exposure.
0.01	100	Kills smell in 3 to 15 minutes, may sting eyes & throat.
0.02	200	Kills smell shortly, stings eyes & throat.
0.05	500	Dizziness, breathing ceases in a few minutes. Needs prompt artificial respiration.
0.07	700	Unconscious quickly; death will result if not rescued promptly.
0.1	1000	Unconscious at once; followed by death within minutes.

Sulfur Dioxide - SO_2

Sulfur dioxide is a colorless, nonflammable, intensely irritating gas and 2.2 times heavier than air. It is a by-product of combustion of hydrogen sulfide and is highly toxic. Exposure to 2 ppm can be tolerated for a maximum of 8 hrs. Respiratory equipment will be available and should be used by personnel measuring SO2 concentration downwind from a flare.

Methane - CH_4

Methane is the major component of natural gas and is colorless, odorless and extremely flammable. The chief danger from methane is explosion. Mixture of CO2, H2S and CH4 will burn if the total H2S and CH4 content, in any ratio, is above 25 percent. Also the presence of methane causes an oxygen deficient environment and requires adequate ventilation for breathing.

Carbon Monoxide - CO

Carbon monoxide is a colorless, odorless toxic gas. Its toxicity results from preferential reaction with the hemoglobin in the blood; however, it has no unique toxic action on any of the bodily tissues. CO displaces oxygen from hemoglobin and reduces the oxygen carrying capability of the blood.
The primary danger from CO is that it binds with hemoglobin within the blood, thereby preventing

oxygen / blood transfer. Respiratory equipment should be considered for atmospheres containing greater than 25 ppm. Exposure to 25 ppm is allowed up to 8 hours; however, at higher levels it will tend to cause headaches, dizziness and nausea. Concentrations above 1200 ppm are considered immediately dangerous to life and health.

In addition to the toxic effects of CO, carbon monoxide burns readily in air. The flammability limits of CO in air change with pressure. At atmospheric pressure, however, the lower limit is ± 12.5% and upper limit is ± 74%.

Properties of Various Gases

Common Name	Chemical Formula	Specific Gravity	Time Weighted Average*	IDLH**	Lethal Conc.***	LFL	UFL
		Air = 1	ppm	ppm	ppm	%	%
Hydrogen Sulfide	H2S	1.18	10	100	600	4.3	46
Sulfur Dioxide	SO2	2.21	2	---	1000	---	---
Methane	CH4	0.55	---	---	---	5.3	14
Carbon Monoxide	CO	0.97	25	1200	---	12.5	74

* Time Weighted Average (TWA) - Employee's average exposure in any eight-hour work, of a 40-hour work week that shall not be exceeded

** Hazardous Concentration that may cause death

*** Lethal Concentration that will cause death with short term exposure

H2S Effects

Effects of H2S in Fluids

When H2S is entrained in a fluid, it will disassociate to some degree depending on the pH of the system.

Undisassociated hydrogen sulfide is the molecule that attacks steel surfaces and causes corrosion and embrittlement. At a low pH, nearly all of the H2S in a system is in this molecular state. With increasing pH, H2S disassociation increases so that above pH 10, effectively all of the H2S is disassociated into bisulfide and sulfide ions. These ions are relatively harmless in the mud as long as the high pH is maintained. If pH is lowered, the reaction will be reversed and hydrogen sulfide gas will be evolved.

In addition to sulfide ions, disassociation of H2S in drilling mud produces hydrogen ions, which will react with hydroxyl ions in a high pH mud to form water. With sufficient H2S contamination, excess lime, if any, can be depleted and pH will begin to drop. A sufficient decrease in pH will, as previously stated, evolve H2S gas.

It is therefore desirable to know whether H2S has been encountered at the least possible time. This can be accomplished by testing the mud or other working fluids for sulfide ions daily, as described in the sulfide testing procedures that follow (API RP 13B).

Corrosion Effects of H2S on Steel

The three forms of hydrogen sulfide corrosion of steel are as follows:

general or weight loss
localized or pitting
sulfide stress cracking

In both general and localized corrosion, hydrogen sulfide reacts with the steel to produce iron sulfide. General corrosion is characterized by the formation of an iron sulfide film on the surface of the steel. After long periods of exposure, weight loss can lead to a significant reduction in strength. Localized corrosion is much more serious and predominantly occurs in the pH range below six. Chloride or similar ions must be present for pitting to occur. Iron chloride accumulates at the metal to iron sulfide film interface and promotes a localized attack. Pitting corrosion has not presented a significant problem in drilling operations.

Of foremost concern is sulfide stress cracking or hydrogen embrittlement where failure may take place without warning or significant metal loss. This problem is related to strength of the steel, hydrogen sulfide concentration, pH, exposure time, and temperature and stress level of the steel. Hydrogen sulfide absorbed on the metal surface promotes the entry of atomic hydrogen into the metal. The atomic hydrogen that enters the steel matrix diffuses to positions of high stress where it can induce hydrogen embrittlement. Thus, brittle failure can occur at stress levels significantly less than normal yield stress. A high total dissolved sulfide concentration can be tolerated if the pH is high enough (9.5 or greater).

Sulfide Testing Procedure

HACH TEST

PROCEDURE FOR ESTIMATING FILTRATE SULFIDE

Equipment:

Special test vial with vented cap
Lead acetate test paper to fit cap
Color comparison chart
Distilled water
Hypodermic syringe
Defoamer (such as octyl alcohol or sulfated castor oil)
0.1N acid, sulfuric or hydrochloric

The Hach Hydrogen Sulfide Test Kit (Model HS-7) must consist of the highlighted items above.

Procedure:

Place one disk of dry lead acetate test paper inside the dry cap of the test vial.

Measure 2.5 cm3 of freshly collected mud filtrate into the test vial. Dilute to the 25 cm3 with distilled water.

Add 2 cm3 of 0.1N acid, immediately add a fresh seltzer tablet, and quickly place the cap with the test paper on the vial. Allow the seltzer tablet to dissolve and then wait one minute.

Remove lead acetate paper and observe for brown coloration. If no coloration can be detected, then report the soluble sulfide as zero. If brown coloration is present, compare the test paper with color comparison chart. Read the appropriate ppm value (0.1, 0.3, 0.5, 1, 2, or 5) from the color chart and multiply by 10 to obtain the test result (1, 3, 5, 10, 20, or 50).

If the test paper matches the darkest color (5 ppm) on the color chart, the test result must be interpreted as greater than 50 ppm.

Report the test result as filtrate sulfide in ppm.

For a test range of 10 to 500 ppm, dilute 1.0 cm3 of filtrate with 9.0 cm3 of distilled water. Use 2.5 cm3 of the diluted filtrate for the sulfide determination. Multiply the color chart value by 100 to obtain the test result

It is important to note that this test is not highly accurate. The results should be interpreted as rough estimates.

The method may be used for water using 25 cm3 samples or the same dilution procedure used for mulled filtrate. This method may also be used for mud but the probably meaning of the results is very uncertain. There could also be considerable difficulty in obtaining a representative sample of diluted mud.

Definitions

CH4	Methane is the major component of natural gas and is colorless, odorless and extremely flammable. The chief danger from methane is explosion. Mixture of CO2, H2S and CH4 will burn if the total H2S and CH4 content, in any ratio, is above 25 percent. Also the presence of methane causes an oxygen deficient environment and requires adequate ventilation for breathing.
CO	Carbon monoxide is a colorless, odorless toxic gas. Its toxicity results from preferential reaction with the hemoglobin in the blood; however, it has no unique toxic action on any of the bodily tissues. CO displaces oxygen from hemoglobin and reduces the oxygen carrying capability of the blood. The primary danger from CO is that it binds with hemoglobin within the blood, thereby preventing oxygen / blood transfer. Respiratory equipment should be considered for atmospheres containing greater than 25 ppm. Exposure to 25 ppm is allowed up to 8 hours; however, at higher levels it will tend to cause headaches, dizziness and nausea. Concentrations above 1200 ppm are considered immediately dangerous to life and health. In addition to the toxic effects of CO, carbon monoxide burns readily in air. The flammability limits of CO in air change with pressure. At atmospheric pressure, however, the lower limit is +12.5% and upper limit is +74%.
CO2	Carbon dioxide is colorless, non-flammable and at low concentrations odorless. At concentrations higher than atmospheric the gas can have a acidic odor and at concentrations much higher than atmospheric the gas will act as an asphyxiant.
H2S	Hydrogen sulfide is a colorless, flammable, extremely poisonous gas. It is 1.2 times as heavy as air and will accumulate in low areas. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. It can be detected by smell at a concentration in air of only 0.02 ppm. Exposure to 10 ppm can be tolerated up to 8 hours without respiratory equipment. Respiratory equipment is required to protect workers should conditions exceed the foregoing allowable exposure limit. Concentrations in excess of 20 ppm have an effect on the olfactory nerve which deadens the sense of smell. Unconsciousness can occur without warning within seconds of inhalation at concentrations above 500 ppm.
JSA	Job Safety Analysis
PPM	Parts per Million
Rig Supervisor	Individual (COP employee or contract employee) who supervises workover operations including all rig operations, commonly referred to as the "Company Man"
Rig Superintendent	ConocoPhillips employee who supervises the rig supervisor
SO2	Sulfur dioxide is a colorless, nonflammable, intensely irritating gas and 2.2 times heavier than air. It is a by-product of combustion of hydrogen sulfide and is highly toxic. Exposure to 2 ppm can be tolerated for a maximum of 8 hrs. Respiratory equipment will be available and should be used by personnel measuring SO2 concentration downwind
Toolpusher	Supervisor employed by the rig contractor (well servicing company) to supervise the rig crew

References

1. "API Recommended Practices for Safe Drilling of Wells Containing Hydrogen Sulfide", (API RP 49) American Petroleum Institute, Dallas, Texas, 1974.

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3. Clark, R. K., "Hydrogen Sulfide in Water-Base Drilling Fluids - I: Chemistry, Corrosion and Treatment", Technical Progress Report BRC 35-77, Shell Development, Houston, Texas, 1977.

4. "Contingency Plan for Drilling, Completion and Workover, Sour Gas Wells, Safety Regulations and Emergency Procedures", Shell Oil Company, Michigan Operations, Traverse City, Michigan, 1974.

5. "Contingency Plan for the Drilling of Taylor DT 653, Ventura Avenue Field, Ventura County, California; Safety Procedures and Precautionary measures", Shell Oil Company, West Coast Division, Los Angeles, California, 1973.

6. "Drilling Contingency Plan for McElmo Dome Area", Shell Oil Company, Midland Operations, Midland, Texas, 1976.

7. "Drilling Fluid Engineering Manual", Magcobar Operations, Dresser Industries Inc., Houston, Texas, 1972.

8. "Rule 36: Oil, Gas or Geothermal Resource Operation in Hydrogen Sulfide Areas", Railroad Commission of Texas, Oil and Gas Division, Austin, Texas, 1976, as amended effective September 15, 1985.

9. "Safe Practices for Drilling and Well Servicing Operations", Volumes I and II, Shell Oil company Exploration and Production.

10. "Sulfide Stress Cracking Resistant Metallic Material for Oil Field Equipment", NACE Standard MR-01-75, National Association of Corrosion Engineers, Katy, Texas, 1978.

11. "Onshore Order No. 6, Hydrogen Sulfide Operations", Department of the Interior, Bureau of Land Management, 43 CFR Part 3160.