

UTAH OIL AND GAS CONSERVATION COMMISSION

REMARKS: WELL LOG _____ ELECTRIC LOGS _____ FILE **X** _____ WATER SANDS _____ LOCATION INSPECTED _____ SUB. REPORT/abd. _____

DATE FILED **4-22-91**

LAND: FEE & PATENTED _____ STATE LEASE NO. _____ PUBLIC LEASE NO. **INDIAN 4-20-H62-4376**

DRILLING APPROVED: **4-29-91**

SPUDED IN: _____

COMPLETED: **8-3-91 LA** PUT TO PRODUCING: _____

INITIAL PRODUCTION: _____

GRAVITY A.P.I. _____

GOR: _____

PRODUCING ZONES: _____

TOTAL DEPTH: _____

WELL ELEVATION: _____

DATE ABANDONED: **LA'D PER BLM EFF 8-30-91**

FIELD: **UNDESIGNATED**

UNIT: _____

COUNTY: **UINTAH**

WELL NO. **UTE 24-1** API NO. **43-047-32015**

LOCATION **460' FSL** FT. FROM (N) (S) LINE. **460' FWL** FT. FROM (E) (W) LINE. **SW SW** 1/4 - 1/4 SEC. **24**

TWP.	RGE.	SEC.	OPERATOR	TWP.	RGE.	SEC.	OPERATOR
4S	1E	24	WARREN AMERICAN OIL CO.				

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL, DEEPEN, OR PLUG BACK

1a. TYPE OF WORK
 DRILL DEEPEN PLUG BACK

b. TYPE OF WELL
 OIL WELL GAS WELL OTHER
 SINGLE ZONE MULTIPLE ZONE

2. NAME OF OPERATOR
 Warren American Oil Company

3. ADDRESS OF OPERATOR
 P.O. Box 470372 Tulsa, Oklahoma 74147-0372

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.)*
 At surface 460' FSL, 460' FWL SW SW
 At proposed prod. zone

14. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE*
 15 Miles south of Fort Duchesne, Utah

15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drig. unit line, if any) 460'

18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT.
 19. PROPOSED DEPTH 6500' GRRV

21. ELEVATIONS (Show whether DF, RT, GR, etc.)
 5094' F.R.

5. LEASE DESIGNATION AND SERIAL NO.
 14-20-H62-4376
 6. IF INDIAN, ALLOTTEE OR TRIBE NAME
 Ute
 7. UNIT AGREEMENT NAME
 8. FARM OR LEASE NAME
 9. WELL NO.
 24-1
 10. FIELD AND POOL, OR WILDCAT
 Undesignated 000
 11. SEC., T., E., N., OR BLK. AND SURVEY OR AREA
 Sec 24, T4S, R1E USB&M
 12. COUNTY OR PARISH
 Uintah
 13. STATE
 Utah

17. NO. OF ACRES ASSIGNED TO THIS WELL 40

20. ROTARY OR CABLE TOOLS
 Rotary

22. APPROX. DATE WORK WILL START*
 May 1, 1991

23. PROPOSED CASING AND CEMENTING PROGRAM

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH	QUANTITY OF CEMENT
12 1/4"	8 5/8"	J-55 24# STC	300 new	to surface
7 7/8"	5 1/2"	J-55 15.5# LTC	6500' new	as required

T.D. on this well will be 6500' in the Freen River Formation.

- See: 8 Point Compliance Program
 13 Point surface Use Plan
 B.O.P. Diagram
 Plat of Location
 Cut and fill Sheets
 Topographic Map

RECEIVED

APR 22 1991

DIVISION OF
 OIL GAS & MINING

IN ABOVE SPACE DESCRIBE PROPOSED PROGRAM: If proposal is to deepen or plug back, give data on present productive zone and proposed new productive zone. If proposal is to drill or deepen directionally, give pertinent data on subsurface locations and measured and true vertical depths. Give blowout preventer program, if any.

24. SIGNED [Signature] TITLE Agent DATE April 18, 1991

(This space for Federal or State office use)

APPROVED BY THE STATE
 OF UTAH DIVISION OF
 OIL, GAS, AND MINING

PERMIT NO. 43-047-30015 APPROVAL DATE

APPROVED BY _____ TITLE _____
 CONDITIONS OF APPROVAL, IF ANY:

DATE: 4-29-91
 BY: [Signature]
 WELL SPACING: 6/5-3-2

*See Instructions On Reverse Side

8 POINT COMPLIANCE PROGRAM

WELL NAME: Warren American Ute Tribal 24-1

LOCATION: S.W. of S.W. Sec. 24, T4S, R1E. U.S.L.& M.

LEASE NO.: TL-4376

ONSITE INSPECTION Date: 4/11/91

A. DRILLING PROGRAM

1. Surface Formation and Estimated Formation Tops:

Well will spud in the Uintah Formation.
Green River at 1500'.
Wasatch at 6500'.

2. Estimated Depth at Which Oil, Gas, Water or Other Mineral Bearing Zones are Expected to be Encountered:

	<u>FORMATION</u>	<u>ZONE</u>
Expected oil zones:	<u>Green River</u>	<u>4500' - 6500'</u>
Expected gas zones:	<u>Green River</u>	<u>4500' - 6500'</u>
Expected water zones:	<u>Upper Green River</u>	<u>0' - 4000'</u>
Expected mineral zones:	<u>None</u>	

All fresh water and prospectively valuable minerals (as described by BLM at onsite) encountered during drilling, will be recorded by depth and adequately protected. All oil and gas shows will be tested to determine commercial potential.

3. Pressure Control Equipment:

The rig will be equipped with 10", 3000 PSI, double ram B.O.P.'s with a 10", 3000 psi annular type B.O.P. Pipe rams and blind rams will be tested to 3000 PSI, and the annular B.O.P. will be tested to 1500 PSI before drilling out from surface casing. Pipe rams will be operationally checked each day, and blind rams every trip out of the hole. Accessories to B.O.P.'s include Kelly Cock, Floor Safety valve, and choke manifold of equivalent pressure rating. B.O.P. systems will be consistent with API RP53. Pressure tests will be conducted before drilling out from under casing strings which have been set and cemented in place. Blowout preventer controls will be installed prior to drilling the surface casing plug and will remain in use until the well is completed or abandoned. Preventers will be inspected and operated at least daily to insure good mechanical working order, and this inspection will be recorded on a daily drilling report.

Preventer will be pressure tested before drilling casing cement plugs and recorded on the daily drilling report.

The District Office should be notified with sufficient lead time, in order to have a BLM representative on location during pressure testing.

4. Casing Program and Auxiliary Equipment:

300' of 8 5/8", 24#/ft. casing will be set and cemented to surface. If the well is productive 5 1/2", 15.5#/ft. casing will be set from surface to T.D. Cement program will be determined at that time.

Anticipated cement tops will be reported as to depth; not the expected number of sacks of cement to be used. The District Office should be notified, with sufficient lead time, in order to have a BLM representative on location while running all casing strings and cementing.

5. Mud Program and Circulating Medium:

0' - 4500' Drill with fresh water.

4500'-T.D. Drill with 2% KCL water.

No chromate additives will be used in the mud system on Federal and Indian Lands without prior approval to ensure adequate protection of fresh water aquifers.

6. Coring, Logging and Testing Program:

No cores or drill stem tests will be taken. Open hole logs will be DLL with Gamma Ray and Micro SFL from T.D. to 3000'. FDC and CNL from T.D. to 4000'. Mud log from 3000' to T.D.

Whether the well is completed as a dry hole or as a producer, "Well Completion and Recompletion Report and Log" (Form 3160-4) will be submitted not later than 30 days after completion of the well or after completion of operations being performed, in accordance with 43 CFR 3164. Two copies of all logs, core descriptions, core analyses, well-test data, geologic summaries, sample description, and all other surveys or data obtained and compiled during the drilling, workover, and/or completion, will be filed with form 3160-4. Samples (cuttings, fluids, and/or gases) will be submitted when requested by authorized officer. (AO).

7. Abnormal Conditions, Bottom Hole Pressure and Potential Hazards:

The Holden 21-1 well drilled within 2 miles of here encountered H2S gas from two zones, 5578' - 5604' and 5756' - 5772' when the well was completed. No H2S was noted during the drilling of the Holden 21-1. H2S monitoring equipment will be used during the

drilling operations and the mud will be monitored for H2S as part of the mud logging operation. See H2S Contingence Plan.

Expected bottom hole pressure is 2200 PSI.

8. Anticipated Starting Dates and Notifications of Operations:

Location Construction: May 1, 1991

Spud Date: May 10, 1991

No location will be constructed or moved, no well will be plugged, and no drilling or workover equipment will be removed from a well to be placed in a suspended status without prior approval of the AO. If operations are to be suspended, prior approval of the AO will be obtained and notification given before resumption of operations.

The spud date will be reported to the AO within 48 hours after spudding. If the spudding occurs on a weekend or holiday, the report will be submitted on the following regular work day. The oral report will be followed up with a Sundry Notice.

In accordance with Onshore Oil and Gas Order No.1, this will be reported on Form 3160-6 "Monthly Report of Operations", starting with the month in which operations commence and continue each month until the well is physically plugged and abandoned. This report will be filed with the Vernal BLM District Office, 170 South 500 East, Vernal, Utah 84078.

Immediate Report: Spills, blowouts, fires, leaks, accidents, or any other unusual occurrences shall be promptly reported in accordance with requirements of NTL-3A or its revision.

If a replacement rig is contemplated for completion operations, a "Sundry Notice" (Form 3160-5) to that effect will be filed, for prior approval of the AO, and all conditions of this approved plan are applicable during all operations conducted with the replacement rig.

Should the well be successfully completed for production the AO will be notified when the well is placed in a producing status. Such notification will be sent by telegram or other written communication, not later than 5 days following the date on which the well is placed on production.

Pursuant to NTL-2B, with the approval of the District Engineer, produced water may be temporarily disposed of into lined pits for a period of up to 90 days. During the period so authorized, an application for approval of the disposal method, along with the required water analysis and other information, must be submitted to the District Engineer.

Pursuant to NTL-4A, leasees or operators are authorized to

vent/flare gas during initial well evaluation tests, not exceeding a period of 30 days or the production of 50 MCF of gas, whichever occurs first. An application must be filed with the District Engineer and approval received, for any venting/flaring of gas beyond the initial 30 days or authorized period.

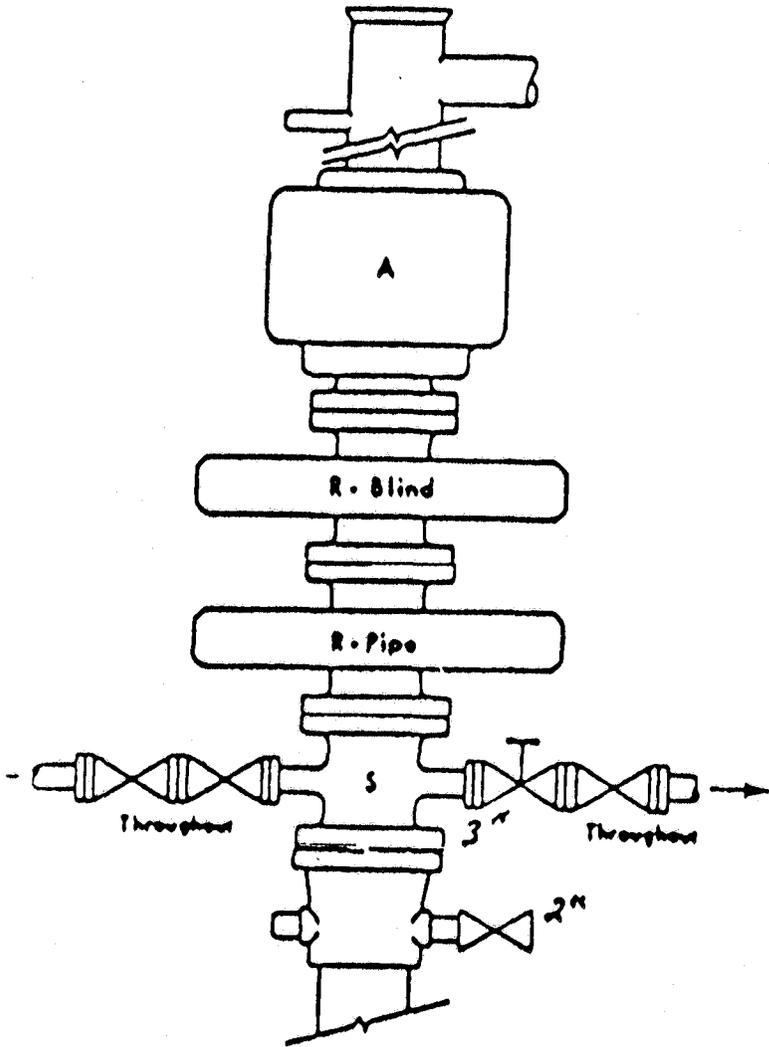
A schematic facilities diagram as required by 43 CFR 3162.7-2, 3162.7-3, and 3162.7-4 shall be submitted to the appropriate District Office within 30 days of installation or first production, whichever occurs first. All site security regulations as specified in 43 CFR 3162.7 shall be adhered to. All product lines entering and leaving hydrocarbon storage tanks will be effectively sealed in accordance with 43 CFR 3162.7-4.

A first production conference will be scheduled within 15 days after receipt of first production notice.

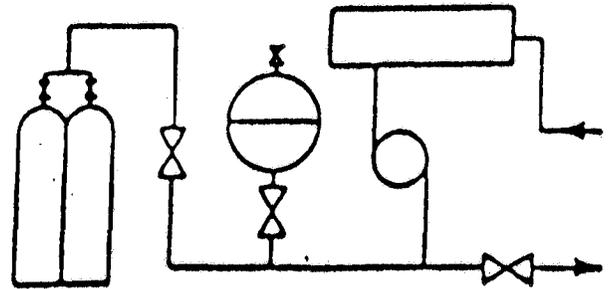
No well abandonment operations will be commenced without the prior approval of the AO. In the case of newly drilled dry holes or failures, and in emergency situations, oral approval will be obtained from the AO. A "Subsequent Report of Abandonment" form 3160-5, will be filed with the AO within 30 days following completion of the well for abandonment. This report will indicate where plugs were placed and current status of surface restoration. Final abandonment will not be approved until the surface reclamation work required by the approved APD or approved abandonment notice has been completed to the satisfaction of the AO or his representative, or the appropriate Surface Managing Agency.

Pursuant to Onshore Oil and Gas order No.1, leasees and operators have the responsibility to see that their exploration, development, production, and construction operations are conducted in a manner which conforms with applicable Federal laws and regulations and with State and local laws and regulations to the extent that such State and local laws are applicable to the operations on Federal or Indian lands.

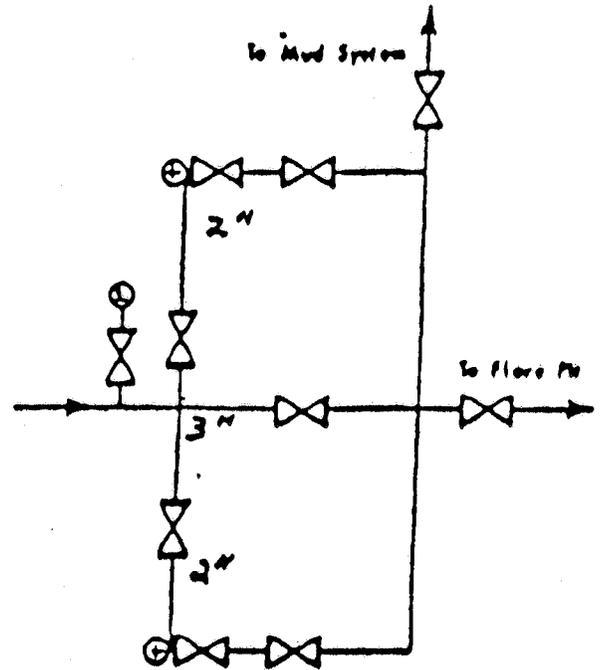
PRESSURE RATING
3,000 psi



BLOWOUT PREVENTION STACK



ACCUMULATOR SYSTEM

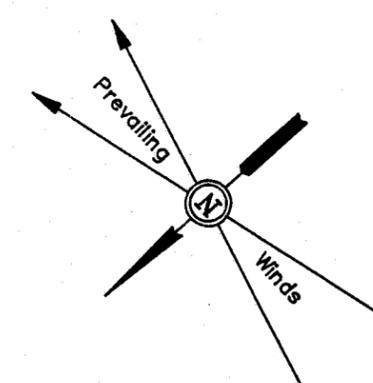
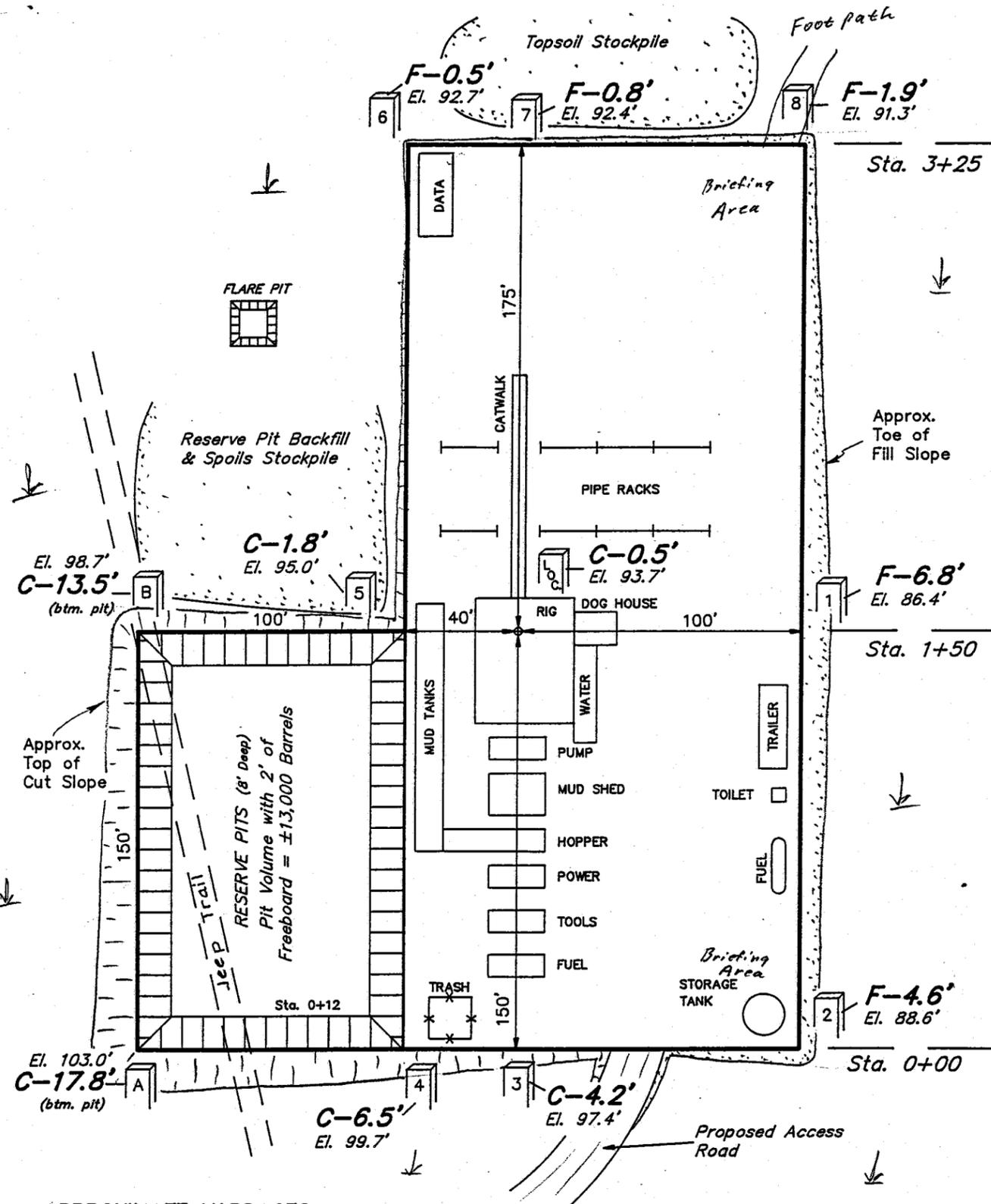


Floaged Connections Throughout
MANIFOLD SYSTEM

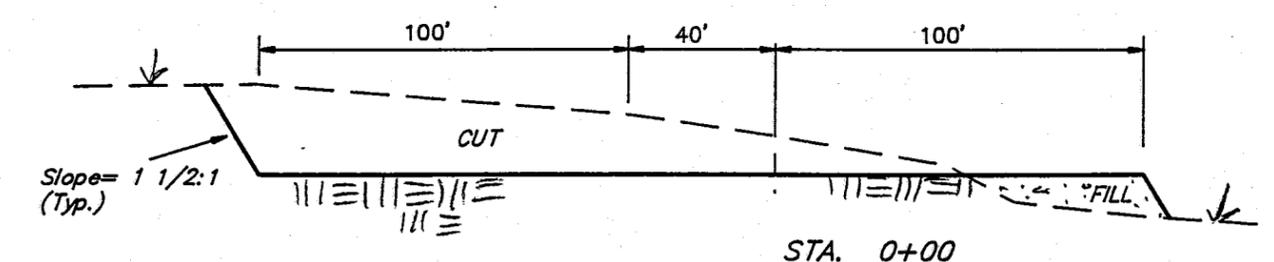
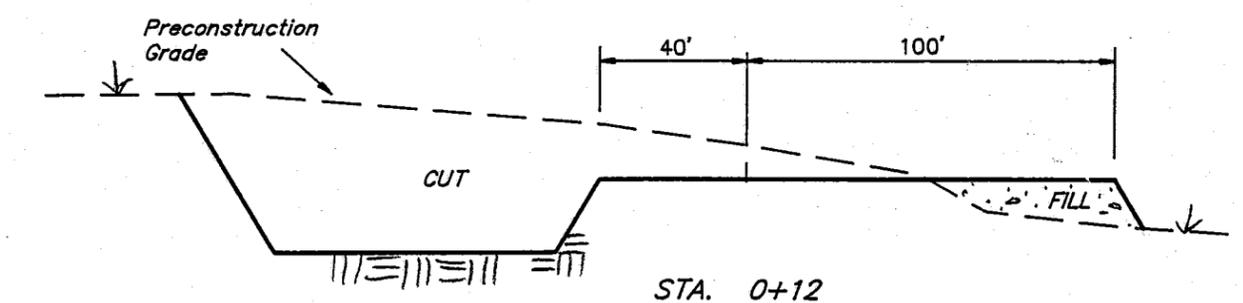
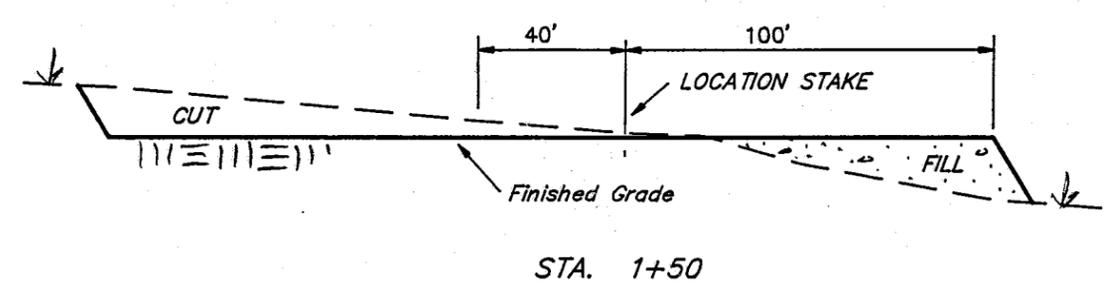
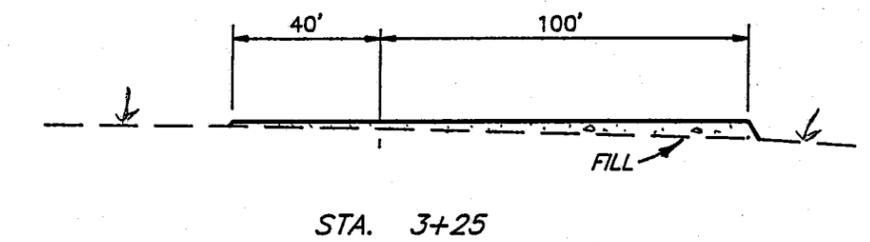
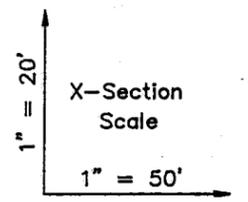
WARREN AMERICAN OIL CO.

LOCATION LAYOUT FOR

UTE TRIBAL #24-1
SECTION 24, T4S, R1E, U.S.B.&M.



SCALE: 1" = 50'
DATE: 3-26-91
Drawn By: J.R.S.



TYP. LOCATION LAYOUT

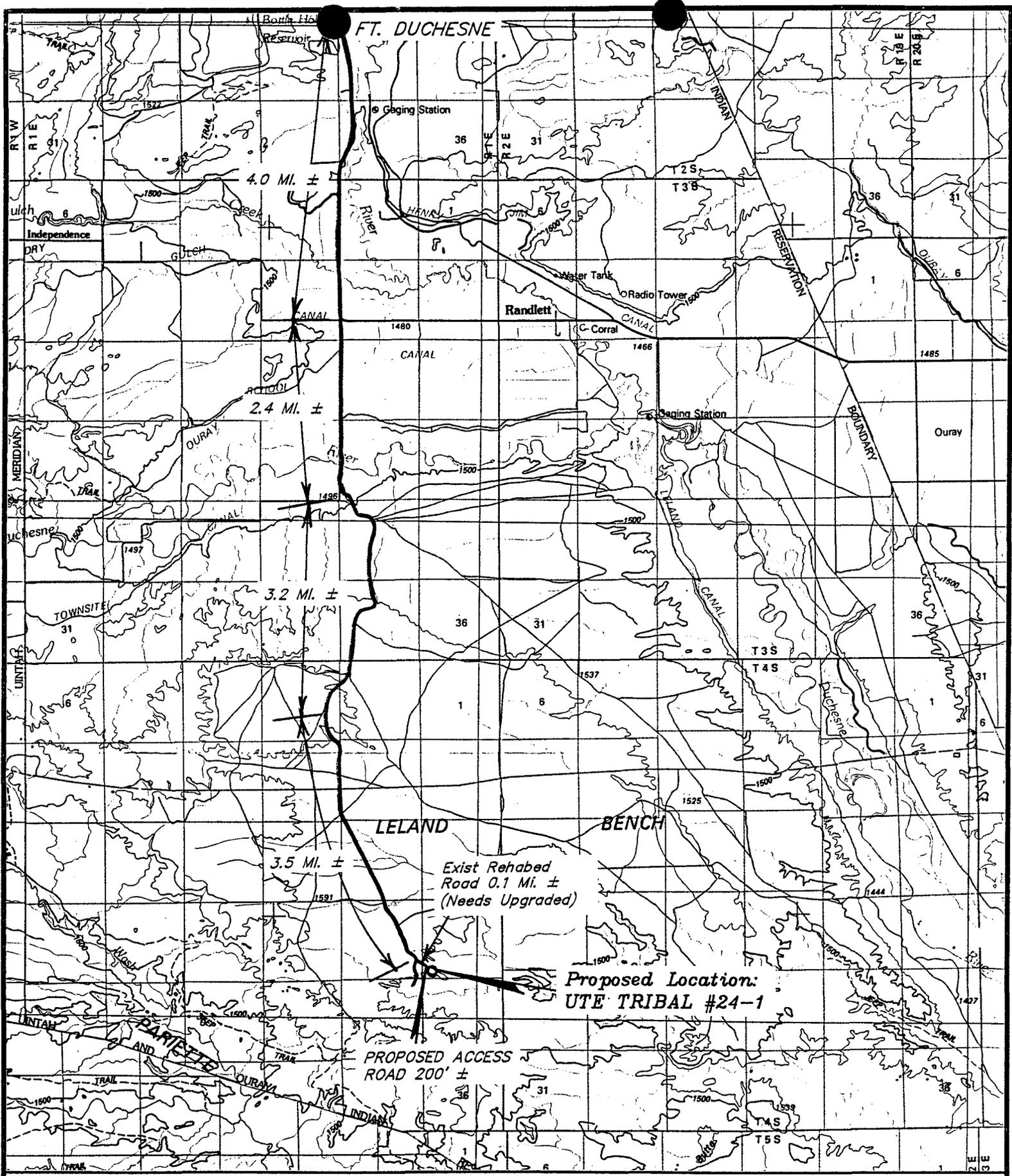
TYP. CROSS SECTIONS

Elev. Ungraded Ground at Location Stake = 5093.7'
Elev. Graded Ground at Location Stake = 5093.2'

APPROXIMATE YARDAGES

(12") Topsoil Stripping	= 2,260 Cu. Yds.
Remaining Location	= 7,160 Cu. Yds.
TOTAL CUT	= 9,420 CU.YDS.
FILL	= 4,400 CU.YDS.

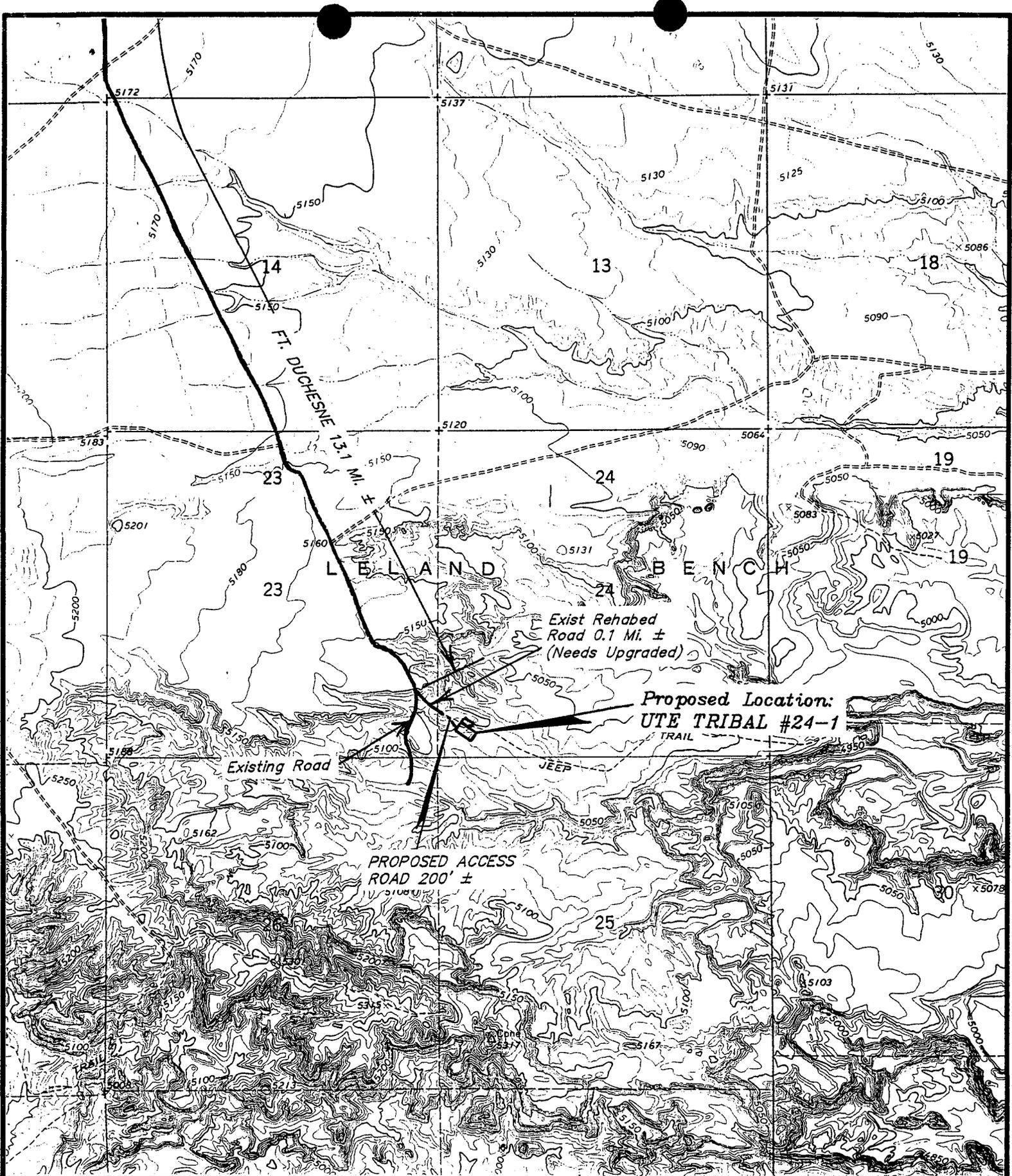
EXCESS MATERIAL AFTER 5% COMPACTION	= 4,790 Cu. Yds.
Topsoil & Pit Backfill (1/2 Pit Vol.)	= 4,060 Cu. Yds.
EXCESS UNBALANCE (After Rehabilitation)	= 730 Cu. Yds.



TOPOGRAPHIC
 MAP "A"
 DATE 3-26-91



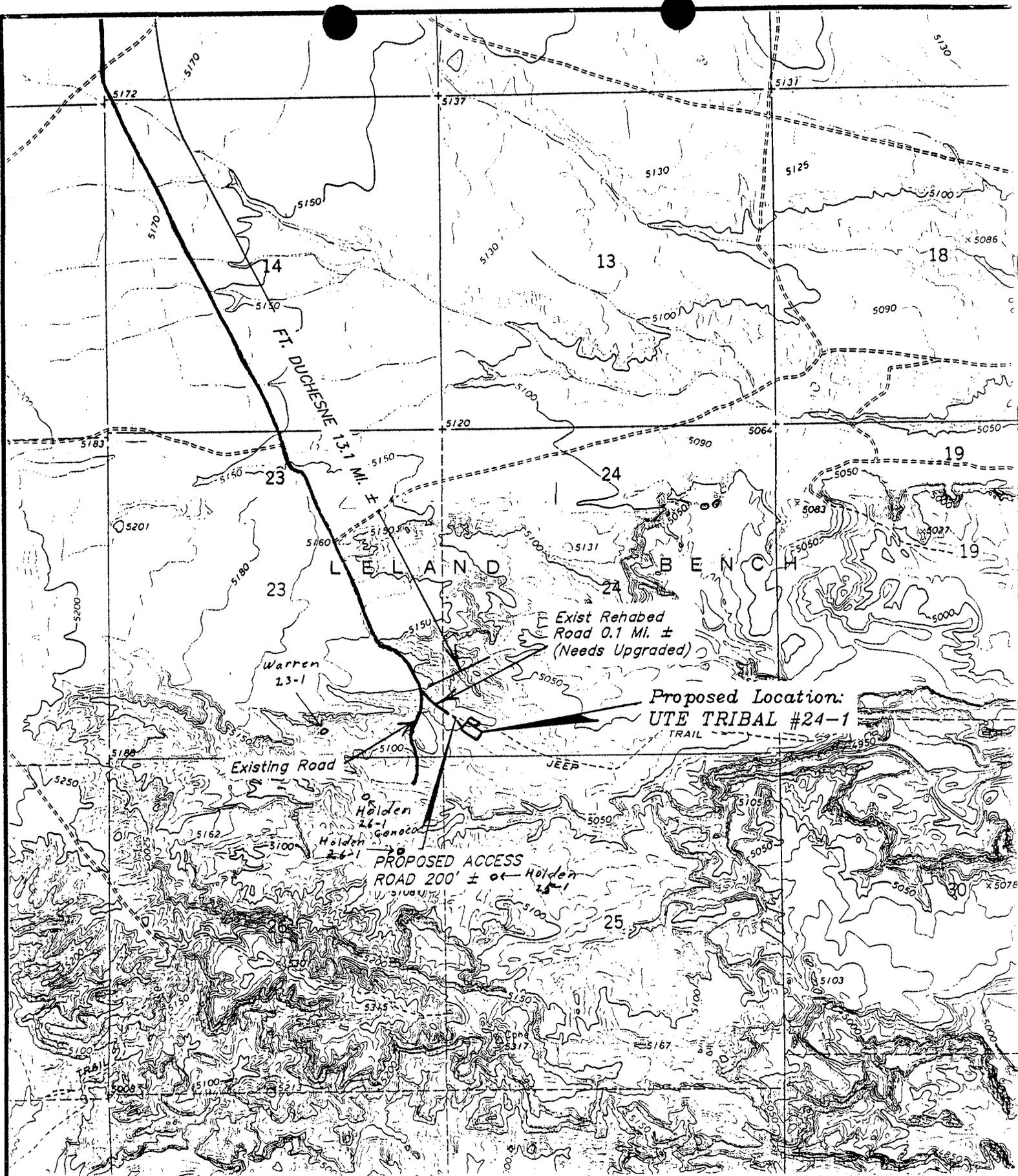
WARREN AMERICAN OIL CO.
 UTE TRIBAL #24-1
 SECTION 24, T4S, R1E, U.S.M.



TOPOGRAPHIC
 MAP "B"
 SCALE: 1" = 2000'
 DATE 3-26-91



WARREN AMERICAN OIL CO.
 UTE TRIBAL #24-1
 SECTION 24, T4S, R1E, U.S.M.



TOPOGRAPHIC
 MAP "B"
 SCALE: 1" = 2000'
 DATE 3-26-91



WARREN AMERICAN OIL CO.

UTE TRIBAL #24-1
 SECTION 24, T4S, R1E, U.S.M.

FILING FOR WATER IN THE STATE OF UTAH

Rec. by Ly
 Fee Rec. 3000
 Receipt # 30038
 Microfilmed _____
 Roll # _____

RECEIVED
 JAN 28 1991

APPLICATION TO APPROPRIATE WATER

DIVISION OF WATER RIGHTS

For the purpose of acquiring the right to use a portion of the unappropriated water of the State of Utah, application is hereby made to the State Engineer, based upon the following showing of facts, submitted in accordance with the requirements of Title 73, Chapter 3 of the Utah Code Annotated 1953, as amended.

WATER RIGHT NUMBER: 43 - 10273

APPLICATION NUMBER: T54124

1. OWNERSHIP INFORMATION:

LAND OWNED?

A. NAME: West Hazmat Trucking Corporation
 ADDRESS: P.O. Box 1667, Vernal, UT 84078

INTEREST: 100%

B. PRIORITY DATE: January 24, 1991

FILING DATE: January 24, 1991

2. SOURCE INFORMATION:

A. QUANTITY OF WATER: 20.0 acre-feet

B. DIRECT SOURCE: Duchesne River

COUNTY: Uintah

C. POINT OF DIVERSION -- SURFACE:

(1) N 2400 feet E 200 feet from SW corner, Section 23, T 3S, R 1E, USBM
 DIVERT WORKS: Pump into tank trucks
 SOURCE: Duchesne River

D. COMMON DESCRIPTION:

3. WATER USE INFORMATION:

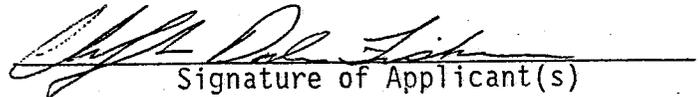
OIL EXPLORATION: from Feb 1 to Jan 31. Oil well Drilling and completion of seven oil wells on Leland Bench.

4. PLACE OF USE: (which includes all or part of the following legal subdivisions:)

BASE	TOWN	RANG	SEC	NORTH-EAST ¼				NORTH-WEST ¼				SOUTH-WEST ¼				SOUTH-EAST ¼															
				NE	NW	SW	SE																								
US	3S	1E	31	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
			32	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
			33	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
			34	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
			35	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
			36	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X	■	■	■	■	X	X	X	X
US	4S	1E	Entire TOWNSHIP																												

5. SIGNATURE OF APPLICANT(S):

The applicant(s) hereby acknowledge(s) that he/she/they are citizen(s) of the United States of America or intend(s) to become such a citizen(s). The quantity of water sought to be appropriated is limited to that which can be beneficially used for the purposes herein described. The undersigned hereby acknowledges that even though he/she/they may have been assisted in the preparation of the above-numbered application through the courtesy of the employees of the Division of Water Rights, all responsibility for the accuracy of information contained herein, at the time of filing, rests with the applicant(s).


Signature of Applicant(s)

STATE ENGINEER'S ENDORSEMENT

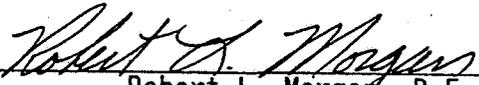
WATER RIGHT NUMBER: 43 - 10273

APPLICATION NO. T54124

1. January 24, 1991 Application received by LZ.
 2. January 30, 1991 Application designated for APPROVAL by RWL and KLJ.
 3. Comments:
-
-

Conditions:

This application is hereby APPROVED, dated February 8, 1991, subject to prior rights and this application will expire on February 8, 1992.


Robert L. Morgan, P.E.
State Engineer

CONTINGENCY PLAN

WARREN AMERICAN OIL CO.

Ute Tribal 24-1

Section 24, T4S, R1E U.S.B.&M.

COCHRANE RESOURCES, INC.

Engineering
Wellsite Supervision
Lease Operating

P.O. Box 1656
Roosevelt, Utah 84066
Phone (801) 722-5081

April 23, 1991

Bureau of Land Management
Vernal District Office
170 South 500 East
Vernal, Utah 84078

Dear Sir:

Please find attached the H2S Safety Plan for the Warren American 24-1 well.

This well is within two miles of the Holden 21-1 well which encountered H2S while completing two zones at 5756' - 5772' and from 5578' - 5604'. The highest reading while swab testing these intervals was 7000 PPM.

No H2S was noticed while drilling the Holden 21-1 , and at no time did the well kick or act like any zone was over pressured. While testing the H2S intervals, neither one attempted to flow, and both had been sand fraced.

On the safety program items 1 through 6 will be set up before drilling out from surface and 7 through 11 will be followed if H2S is detected. Under Part B "General" Part #1 will be followed from start of drilling, 2 and 3 will be initiated if H2S is detected.

"Other Equipment"

A rotary head will be in use by the time the rig gets to a depth of 5000'.

The BOP stack on the rig (Olsen Rig #7) has H2S trim. The choke lies and manifold are schedule 80 pipe.

Any H2S gas influx while drilling will be controlled with mud weight, and gas buster will be used to separate the gas if necessary.

Although there are no residences in the area there is a country road approximately one mile from these wells. If the situation indicates, the proper authorities will be notified and the road will be closed.

Warren American would like to ask for a variance from OnShore

Order #6 concerning metallurgical properties of all equipment that has the potential of coming into contact with H2S. It is felt that the equipment proposed in the APD and H2S Contingency Plan is suitable for these wells.

Please advise if you have any questions.

Yours truly,



Ken Allen

OPERATING PROCEDURES

GENERAL

Before this H2S Contingency Plan becomes operational, the Drilling Contractor's personnel, necessary service company personnel, and operators personnel shall be thoroughly trained in the use of breathing equipment, emergency procedures, responsibilities, and first aid. The Operator shall keep a list of all personnel who have been through the special training programs on the drill site.

All personnel shall be given a copy of the "Danger H2S Safety Equipment and Personal Safety" pamphlet. This report summarizes the steps to be taken during the two conditions under which the well may be drilled. It lists general information about toxic gases, explains the physiological effects of H2S classified operating conditions and informs each reader of his general responsibilities concerning safety equipment and emergency procedures. The Company Drilling Foreman shall keep a list of all persons that have read the report and verify they have read it and understand it thoroughly.

All personnel, without exception, when coming on the drill site must proceed directly to the Company Drilling Foreman for assignment of breathing apparatus and to be assured that he has a breathing apparatus. An Instruction and orientation briefing will also be held, if needed.

Upon coming on the drill site, each person shall also pick up a copy of the "Danger H2S Safety Equipment and Personal Safety" and verify that he has read it by signing the last page. The signed page should be forwarded to the Company Drilling Foreman, or his designated Representative.

PRIOR TO DRILLING OUT OF THE INTERMEDIATE CASING

A list of emergency stations and phone numbers of personnel to be contacted will be sent to the rig and should be posted at the following places:

1. Company Drilling Foreman's Office
2. Drilling Contractor's Toolpush Office

PRIOR TO DRILLING OUT OF THE INTERMEDIATE CASING

All safety equipment and H2S related hardware must be set up as required by the Company Operating the Well. (Such as, Location of Briefing Areas, Breathing Equipment, etc.) All Safety Equipment must be inspected routinely paying particular attention to resuscitators and breathing air facilities. Watch out for leaks resulting in frequent bleeding from breathing the air bottles.

PROCEDURE PROGRAM

SAFETY PROGRAM

A. DRILL SITE

1. The drilling rig will be located to allow prevailing winds to blow across the rig toward the reserve pit.
2. Brief stations will be provided with a safety equipment trailer at one or more stations. Personnel will assemble at the most upwind station under alarm conditions, or when so ordered by the Drilling Foreman or the Safety Representative. A wind sock or streamer will be anchored to the trailer.

A second streamer will be anchored at the end of the catwalk on a pole about 30' high so as to be in easy view of the rig floor and visible at night.

A separate supply of air cylinders must be located at the opposite side of location than the Safety Unit.

3. Warning signs will be posted on the access road to the location. "NO SMOKING" signs will be posted.
4. One automatic H₂S monitor will be provided by the Safety company and the detector will be at the shale shaker. Another automatic detector will be on the rig floor monitoring either on the rig floor or in the logging unit. Should the alarm be shut off to silence the siren, the blinker light must continue to warn of H₂S presence. The safety representative will continuously monitor the detector and will reactivate the alarm if H₂S concentrations increase to a dangerous level.
5. An escape road will be provided. It is to be used only in an emergency.
6. Do not permit sleeping in cars on location. Maintain a parking area remote from the location preferable on the predominate upwind side of the site.
7. Explosion proof electric fans (bug blowers) will be positioned to insure adequate circulation at all critical locations.
8. Commercial telephone service will be provided, if available.
9. A rig intercommunication system will be provided.
10. A gas trap, choke manifold and degasser will be installed.
11. A kill line, securely anchored and of ample strength will be laid to the well-head from a safe location. This line is to be used only in an emergency.

B. GENERAL

1. A safety advisor will be available. It will be his duty to conduct safety meetings and training sessions and to be certain all safety equipment needed is installed and operative.
2. A Drilling Foreman and a Contractor's Foreman will be required on location and awake at all times. The Drilling Foreman on duty will have complete charge of the rig operation and will take whatever action is deemed necessary to insure personnel safety, to protect the well, and to prevent property damage.
3. A mud engineer will be on location at all times when drilling at the depth H2S may be expected.

H2S EMERGENCY PROCEDURES

The emergency procedures outlined in this section will be implemented under the following operating conditions:

CONDITION: EXTREME DANGER TO LIFE

If, at any time as much as 10 ppm of H2S is detected, the following steps shall be taken.

1. Driller shall shut down mud pumps and put his mask on.
2. The following personnel shall immediately put on their breathing equipment with the mask.
 - a. All personnel on the rig floor
 - b. All personnel at the mud pits, and
 - c. All personnel required to work below and down wind of rig floor.
3. Notify the Company Drilling Foreman and the Toolpusher that you have H2S on your monitoring system.
4. The mud engineer shall run sulfide determination on the flowing mud.
5. Immediately begin to ascertain the source of the H2S and take steps to suppress the H2S. Drilling will not proceed until the source is determined and the well is circulated. Rig floor and mud pit personnel will keep breathing equipment on while monitoring this circulation.
6. The Supervisors shall make sure all non-essential personnel are out of the potential danger area, mud pit area, mud shack, etc. All persons who remain in potential danger area must utilize the "Buddy System".
7. Have all personnel check their safety equipment to see that it is working properly and in proper location.

8. Check all gas monitoring devices and increase gas monitoring activities with the portable hand operated H2S and Gas Detector Units.

DO NOT PANIC

The Company Drilling Foreman will assess the situation and assign duties to each person to bring the situation under control.

EMERGENCY PROCEDURES AT THE DRILLING RIG

When the H2S monitors activate the siren and blinker light, toxic gas is present.

DO NOT PANIC

1. Put on your gas mask!
2. Render assistance!
3. Follow instructions!

DO NOT PANIC

The Company Drilling Foreman will assess the situation, outline a control program and assign duties.

All work done after H2S is known to be present will be based upon the assessment of this situation.

IGNITING THE WELL

A. RESPONSIBILITY

1. The decision to ignite the well is the responsibility of the Company Drilling Foreman. In his absence or incapacity, the Contractor's Foreman will assume all responsibility. In their absence or incapacity, the contract driller will be in charge.
2. The decision to ignite the well is to be made as a last resort when it is clear, that.....
 - a. There is a definite threat to Human life and Machinery
 - b. There is no hope of containing the well under prevailing conditions.
 - c. Time and circumstances permitting an attempt will be made to notify the area office. If human life is threatened the decision must not be delayed.

B. INSTRUCTIONS FOR IGNITING THE WELL

1. Two people are required for the initial igniting procedure. Both men will wear self-contained breathing units. Each man will have a retrieval rope around his waist. One man is responsible for checking the atmosphere for explosive gases with an Explosimeter.

The other is responsible for lighting the well. Keep personnel not assigned special duties within the "Safe Briefing Area". Those in the "Safe Briefing Area" will be alert to the needs of the two men assigned to ignite the well. Should either of these men be overcome by fumes, they will immediately pull him to safety by the retrieval ropes.

2. The primary method for igniting the well is a 12 gauge meteorotype flare gun. It has a range of approximately 500 feet. If this method fails or well conditions are such that a safer or better method is apparent, then the alternate should be used.
3. If the well is ignited, the burning hydrogen sulfide will be converted to sulfur dioxide which is also poisonous. Therefore,

DO NOT ASSUME THAT THE AREA IS SAFE AFTER THE GAS IS IGNITED.

CONTINUE TO OBSERVE EMERGENCY PROCEDURES AND FOLLOW THE INSTRUCTIONS OF SUPERVISORS.

SAFETY EQUIPMENT FOR COMPLIANCE WITH NTL-10

Personal protective equipment must be provided and used. Men who are expected to use respiratory equipment in an area where an emergency would require this protection will be carefully instructed in the proper use and told why the equipment is being used. Careful attention will be given the most minute details in order to avoid possible misuse of the equipment during periods of extreme stress.

Self-contained breathing apparatus provides complete respiratory and eye protection in any concentration of toxic gases and under any condition of oxygen deficiency. The wearer is independent of the surrounding atmosphere because he is breathing with a system admitting no outside air. It consists of a full face mask, corrugated rubber breathing tube, demand regulator, air supply cylinder, and harness. Pure breathing air from the high pressure (2200 psi) supply cylinder flow to the mask automatically through the demand regulator which reduces the pressure to a breathing level. Upon inhalation, air flows into the mask at a rate precisely regulated to the user's demand. Upon exhalation, the flow to the mask stops, and the exhaled breath passes through a valve in the face piece to the surrounding atmosphere. An audible alarm can be added to the apparatus, between the 45 cubic foot cylinder and the high pressure hose, which rings at 400 psi and warns the wearer to leave the contaminated area for a new cylinder of air.

To enable men to work in toxic atmosphere for prolonged periods of time, a hose line with quick disconnect can be attached to the unit connecting it to a 300 cubic foot air cylinder. The installation of a hose bank series manifold on the rig floor connected to a series of 300 cubic foot bottles at a remote location allows both rig crew members and supervisors to remain with "mask on" for an extended period. By having two banks of bottles feeding the floor alternately bottles can be replaced and the time can be extended indefinitely.

The derrickman is provided with a mask unit and 10 minute escape cylinder connected to one or more 300 cubic foot air cylinders through a quick disconnect "T". If evacuation via trolley or ladder becomes necessary, he will also have a full bottle of air in his own self-contained breathing apparatus.

All respiratory protective equipment, when not in use, should be stored in a clean, cool, dry place, and out of direct sunlight to retard the deterioration of rubber parts. After each use the mask assembly will be scrubbed with soap and water, rinsed thoroughly, and dried. Disinfecting may be accomplished through the use of a Pine Sol compound prior to rinsing. Air cylinders can be recharged to full condition from a cascade system of three 300 cubic foot cylinders, connecting pigtailed, and charging hose assembly. Men in each crew will be trained as to the proper techniques of bottle filling.

CONSIDERATIONS DURING THE DRILLING
OF A
HYDROGEN SULFIDE WELL

TABLE A

TOXICITY OF VARIOUS GASES

COMMON NAME	CHEMICAL FORMULA	SPECIFIC GRAVITY AIR 1	THRESHOLD LIMIT 1	HAZARDOUS LIMIT	LETHAL CONCENTRATION
Hydrogen Cyanide	HCN	0.94	10 ppm	150 ppm/ 1 hour	300 ppm
Hydrogen Sulfide	H ₂ S	1.189	20 ppm	250 ppm/ 1 hour	600 ppm
Sulfur Dioxide	SO ₂	2.21	5 ppm	-----	1000 ppm
Chlorine	CL ₂	2.45	1 ppm	4 ppm/ 1 hour	1000 ppm
Carbon Monoxide	CO	9.97	50 ppm	400 ppm/ 1 hour	1000 ppm
Carbon Dioxide	CO ₂	1.52	5000 ppm	5%	10%
Methane	CH ₄	0.55	9000 ppm (9%)	Combustible above 5% in air	

1. Threshold - Concentration at which it is believed that all workers may repeatedly be exposed, day after day, without adverse effect.
2. Hazardous - Concentration that may cause death.
3. Lethal - Concentration that will cause death with short-term exposure.

HYDROGEN SULFIDE

<u>%</u>	<u>PPM</u>	<u>GR/100 SCF</u>	<u>EFFECTS</u>
0.001	10	.65	Obvious and unpleasant odor.
0.002	20	1.30	Safe for 8 hours exposure.
0.01	100	6.48	Kills smells in 3 to 15 minutes; may sting eyes and throat.
0.02	200	12.96	Kills smell shortly; stings eyes and throat.
0.05	500	32.96	Dizziness; breathing ceases in a few minutes; needs prompt artificial respiration.
0.07	700	45.36	Unconscious quickly; death will result if not rescued.
0.1	1000	64.80	Unconscious at once; followed by death within minutes.

SULFUR DIOXIDE

<u>%</u>	<u>PPM</u>	<u>EFFECTS</u>
.0005	3 to 5	Pungent odor -- normally a person can detect SO ₂ in this range.
.001	10	Safe for 8 hours exposure.
.0012	12	Throat irritation, coughing, constriction of the chest, tearing and smarting of the eyes.
.015	150	So irritating that it can only be endured for a few minutes.
.05	500	Causes a sense of suffocation, even with first breath.

CONSIDERATIONS DURING THE DRILLING OF A SOUR GAS WELL

INTRODUCTION

This memorandum is intended to familiarize you with the conditions that can exist when drilling a well to formations that contain H₂S and the precautions Drilling Services have taken in designing the well program and safety program to provide maximum safety.

You should become familiar with all safety equipment on the rig, its use, and availability. The windsocks and windstreamers are provided to know which direction the wind is blowing so that the "SAFE BRIEFING AREA" can be easily defined. You should become wind conscious and observe these wind direction indicators. All persons aboard the rig will receive instructions on the use of safety equipment and on what to do during an H₂S emergency. The well will be monitored with H₂S continuous monitoring-type detectors.

Drilling operations in known H₂S zones, or when H₂S has been detected in the drilling fluid or atmosphere, will be performed under three possible conditions:

CONDITION 1: POTENTIAL DANGER

Warning Sign

None

Alarm

Less than 10ppm-none
10ppm-One red light, continuous horn blast.

Characterized By:

Drilling operations under control. Routine drilling operations in zones that may contain Hydrogen Sulfide. This condition will be in effect continuously unless it is necessary to go to Condition 11. This condition remains in effect until H₂S is detected and as long as the concentration does not exceed 10 ppm.

General Action:

1. Be alert for a condition change.
2. Check safety equipment for proper functioning. Keep it available.

CONDITION 11: EXTREME DANGER TO LIFE

Alarm

Light flashing and continuous horn blast

Characterized By:

Critical well operations, well control problems, and in the extreme, loss of well control. Poisonous gases may be present at or above threshold levels (as defined under Toxicity of Various Gases).

General Actions:

1. All personnel shall put on their protective breathing equipment. All non-working personnel shall proceed to the safer breathing area. All personnel not required in the well control operations may be evacuated.
2. Follow the instructions of the Drilling Foreman and Supervisors.
3. The Drilling Foreman will initiate emergency action as provided in the Contingency Plan as appropriate.
4. The Drilling Foreman, after consultation with the Drilling Services, will ignite the well if deemed necessary as outlined in the Contingency Plan under "Igniting the Well". Supervisors will conduct any necessary operation with an absolute minimum of personnel. All persons will wear a self-contained breathing apparatus and will restrict their movements to those directed by the Drilling Foreman and Supervisors.
5. If the well is ignited, the burning Hydrogen Sulfide will be converted to Sulphur Dioxide which is also poisonous. Therefore, DO NOT ASSUME THAT THE AREA IS SAFE AFTER THE GAS IS IGNITED. CONTINUE TO OBSERVE EMERGENCY PROCEDURES AND FOLLOW THE INSTRUCTIONS OF THE DRILLING FOREMAN AND SUPERVISORS.

During an emergency, persons should utilize the "Buddy System" to prevent anyone from entering a gas area alone whether he is using breathing equipment or not. If a person is overcome by H₂S, do not attempt to rescue him without a "Buddy" standing by. A retrieval rope would be used before entering a contaminated area. If you are wearing a mask, do not remove it until you are absolutely certain the air is safe to breath. If a sudden gas release occurs without warning, you should:

1. Hold your breath and rapidly evacuate the area containing the H₂S. Move upwind, if possible.
2. Put on a mask.

3. Help anyone who may be affected by gas. NOTE: Put on your breathing equipment before helping anyone overcome by H₂S. Then take him to a safe area and administer oxygen.
4. Evacuate quickly to the "SAFE BRIEFING AREA" to receive instructions from the Drilling Foreman.
5. DO NOT PANIC

The Oil Company intends to keep all formations overbalanced so that no intrusion of gas will occur. However, we have provided plans in the event of an emergency so that we will be able to handle one with a minimum of trouble. If you are on the rig during Operating Conditions 1 & 11, it is essential that you follow the instructions of the Supervisors.

Copies of the "H₂S Contingency Plan" are available from the Drilling Foreman. This plan sets out precautionary measures, safety equipment, emergency procedures, responsibilities and duties pertaining to the drilling of a sour gas well. All personnel should become familiar with the contents of the plan and afterwards should sign the log in the Chart Room indicating that they have read and do understand the plan. Particular attention should be paid to the following topics:

1. H₂S EMERGENCY PROCEDURE
2. RESPONSIBILITIES AND DUTIES
3. RIG LAYOUT-LOCATION OF BRIEFING AREA, BREATHING EQUIPMENT, ETC.

TOXICITY OF VARIOUS GASES

The Table A lists various gases and the concentrations at which they become dangerous.

PROPERTIES OF GASES

The produced gas will probably be a mixture of carbon dioxide, hydrogen sulfide, and methane.

Carbon dioxide (CO₂) is usually considered inert and is commonly used to extinguish fires. It is heavier than air (1.5 times), and CO₂ will concentrate in low areas of quiet air. Humans cannot breathe air containing more than 10% CO₂ without losing consciousness. Air containing 5% CO₂ will cause disorientation in a few minutes. Continued exposure to CO₂ after being effected will cause convulsions, coma and respiratory failure.

The threshold limit of CO₂ is 5000 ppm. Short-term exposure to 50,000 ppm (5%) is reasonable. This gas is colorless and odorless and can be tolerated in relatively high concentration.

HYDROGEN SULFIDE

Although the slightest presence of H₂S in the air is normally detectable by its characteristic "rotten egg" odor, it is dangerous to rely on the odor as a means of detecting excessive concentrations because the sense of smell is rapidly lost,

allowing lethal concentrations to be accumulated without warning. The Table B indicates the poisonous nature of hydrogen sulfide, which is more toxic than carbon monoxide.

Hydrogen Sulfide itself is a colorless and transparent gas and is flammable. It is heavier than air, and hence, may accumulate in low places.

SULPHUR DIOXIDE

Sulphur Dioxide (SO₂) is produced during the burning of H₂S. Although SO₂ is heavier than air, it will be picked up by a breeze and carried downwind at elevated temperatures. While sulphur dioxide is extremely irritating to the eyes and mucous membranes of the upper respiratory tract, it has exceptionally good warning powers in this respect. The Table C indicates the toxic nature of the gas.

Sulphur Dioxide is a colorless, transparent gas and is non-flammable.

BUDDY SYSTEM

In this manual, reference is made to the "Buddy System". This means that personnel should watch out for each other and, when possible, should work in pairs. While Drilling Operations have made extensive preparations for your safety, you should be aware of first aid procedures in the event someone else becomes careless. First aid for H₂S victims is based primarily on rescue breathing and include:

- A. Move victim for fresh air at once. Don't jeopardize your safety, wear a mask then get a mask on the victim.
- B. If the victim is unconscious and not breathing - take him at once to the Safe Briefing Area and apply mouth-to-mouth artificial respiration without inter-ruption until a resuscitator is available. Use the resuscitator until normal breathing is restored. Symptoms may pass off rapidly, however, keep the victim warm and take him for medical attention.

BREATHING EQUIPMENT DRILLS FOR ON SITE PERSONNEL

NOTE: This drill shall include the following personnel:

1. Rig Crew and Roustabout
2. Pusher and Roustabouts assigned to essential duty during an emergency
3. Mud Logger
4. Mud Engineer
5. Drilling Services Toolpusher
6. Oil Company's Foreman

A drill, with breathing equipment, will be conducted once a week with each crew, including the Mud Logger and Mud Engineer. The purpose of the drill is to instruct the crews in the operation and use of breathing and H₂S related emergency equipment and to allow them to become acquainted with using the equipment under working conditions. The crews should be trained to put on breathing equipment within one minute after H₂S emergency has been alerted.

The following procedure shall be used for the first few weekly drills until the Drilling Foreman is satisfied that the crews are proficient with the equipment. (Note: This drill will be made only while the bit is inside the casing. It is to be conducted as outlined under "Emergency Procedures - Condition 111 of the Contingency Plan").

1. All personnel on the rig shall be informed that a drill will be given.
2. A qualified person shall initiate the drill by manually activating the alarm system for Condition 111.
3. The Driller shall shut down the mud pumps and continue to rotate the drill pipe while all crew personnel put on their breathing equipment. The Mud Logger, Mud Engineer, Toolpusher, and Oil Company Personnel should put on their breathing equipment. The Driller should put on his breathing equipment and connect to the supplies air from the cascaded air supply.
4. Once breathing equipment is on, the Driller shall pick up the Kelly and check for flow.
5. The Driller shall proceed as if the well was flowing; simulate well shut-in procedures as shown on the well control procedure chart of Contingency Plan.
6. The Mud Logger shall continue to monitor his equipment with his breathing equipment.
7. The Mud Engineer shall perform a test on the flowline for mud weight and funnel viscosity and run a GGT Test on the mud to check to determine the sulfide concentration. This part of the drill is important because we want to make it a standard practice that a GGT Test be run every time anything unusual happens.
8. During the drill, the Drilling Foreman and Toolpusher will observe the work and make sure that everyone is using his equipment properly.

Note: 1. Once the Drilling Foreman is satisfied that personnel are proficient with the breathing equipment, and H2S emergency procedure, he may conduct a weekly minimal drill where the breathing equipment is only put on and checked for operation.

Note: 2. A record of attendance shall be kept for these weekly drills and shall also be included on daily tour sheet.

BREATHING EQUIPMENT DRILLS AND TRAINING SESSIONS FOR OFF-DUTY PERSONNEL

NOTE: To Include: All personnel on the rig, except on-duty rig crew, Mud Logger, Mud Engineer, and Toolpusher.

An H2S drill and training session shall be given once a week to all off duty personnel. This training will be conducted to instruct personnel in the operation and use of breathing and H2S related emergency equipment and to review various operating procedures in the "H2S Contingency Plan".

Initial drills shall include:

1. General information about the breathing apparatus which shall include length of time it can be worn, warning signals when pressure is depleting, packing and storage procedures, etc.
2. How to put the mask on and test for leaks around face and hose connection.

Initially, these drills shall be conducted as often as necessary to acquaint the crews with the equipment. After the Drilling Foreman is convinced that all personnel are trained, a weekly drill shall be conducted. This drill may be initiated at any time. Prior to the drill, the Rig Crew on duty must be informed that it is only a practice drill. The drill will be initiated by the "Condition II" warning signal. At this time, all off duty personnel will immediately get their assigned gas masks on, and report to the "Safe Briefing Area", which will depend on the wind direction. Personnel should be trained to report to the "Safe Briefing Area" with their emergency equipment within five minutes after the alarm is sounded.

A weekly training and information session shall be conducted after the drill to answer any H2S related questions and to cover one or more of the following:

- a. Condition I and II alert and steps to be taken by all personnel.
- b. Make personnel conscious of the importance of wind direction when dealing with H2S.
- c. Proper use of all types of breathing equipment.
- d. Proper use of oxygen resuscitators.
- e. Proper use of H2S detectors.
- f. The "Buddy System" and the procedure for rescuing a person overcome by H2S.
- g. Responsibilities and duties.
- h. Location of H2S Safety Equipment.
- i. Other parts of the "H2S Contingency Plan" that should be reviewed.

NOTE: A record of attendance shall be kept for weekly drill and training sessions. These drills and training sessions shall also be included in the morning drill reports.

Some of the Key Items OSHA Compliance Officers Look For at a Drilling Rig

1. Class I, Div. I, wiring and lighting, i.e., explosion-proof fixtures on drilling floor and in doghouse. Condition of wiring around rig.
2. Electrical grounding of wiring and electrical devices
3. Rotary table guard.
4. Sharp teeth on tongs.
5. Wire rope accured with clips (adequate #) properly.
6. Condition of hoisting line and frequently of removal of deteriorated line.
7. Removal of slippery substances from drilling floor.
8. Guard rails on drilling floor and stairs.
9. Ladder safety climbing devices for use of derrickman.
10. Use of lanyard and safety belt by derrickman.
11. Proper installation of geronimo line and carriage.
12. Proper stacking of drill pipe; supports for pipe.
13. Spark arrestors on diesel (or gas) engines.
14. No riding of elevator.
15. Condition of girts on derrick.
16. Presence of H₂S detector heads as shale shaker, mud tanks, cellar, and drilling floor. Audible, visual alarm for system. Wind sock to show wind direction. H₂S evacuation training and practice for evacuation.
17. H₂S respirators for all employees and others who visit site.
18. H₂S system and precautions applicable to known sour crude areas and all wildcat operations.
19. Respirators, face shield, goggles, rubber gloves, rubber apron, rubber boots available and used for those mixing mud with caustic chemicals, asbestos, acids.
20. Blowout preventor shutdown valve located as specified by API and IADC.
21. BOP practice drills, documentation of same.
22. Training of employees in emergency operations, document.
23. Proper storage of fuels, proper distances from drilling site.
24. Guard rails at mud tanks.
25. Guard rails or rope around reserve pit.
26. CPR training for at least one man on rig at all times.
27. Designation of authorized smoking areas and signs to denote nonsmoking areas.
28. Adequate guarding of moving parts of machinery, i.e., belts, pulleys, shafts with projecting coupling collars, etc.
29. Guarding of cathead.
30. Standard railing around crown sheave (pulley), stabbing board.
31. Hard hats and safety goggles used by all of drilling crew.
32. Safety belts and lanyards free of defects.
33. Catwalk between pipe tubs or racks in good shape.
34. Permanent piping to doghouse for use of propane for heating, no jerry rig lines.
35. Securing of equipment, such as BOP when in pre-installation.
36. Procedures for drill stem test, i.e., no exposed flames, no ignition sources present, no smoking.
37. Steel-toed safety shoes for all crew members. Should have built-in metatarsal guards.
38. Securing kelly hose at both ends with chain.
39. No electrical cable laying on ground unless they are steel jacketed
40. Active safety program. If one is present and documented, OSHA considers this as a "good faith" effort by employer.
41. Means to transport injured to medical facilities to include stretcher and necessary accoutrements.
42. First aid supplies.
43. State inspected certified builders.

Rotary Rig Safety Inspection Checklist

Drilling Company _____

Rig No. _____ Tour: _____ Date: _____

Check all equipment listed below if used on rig being inspected.
 Check () if O.K., check () if item needs action. Check "Corr." when corrected.

	O.K.	Corr.		O.K.	Corr.
Rig signs out	()	()	Pipe baskets	()	()
OSHA Poster posted	()	()	Drill pipe	()	()
OSHA Form 100, Log up-to-date	()	()	Drill collars	()	()
Emergency Phone Number card	()	()	Engines	()	()
Emergency aid provisions	()	()	Belt guards	()	()
Radio	()	()	Drive guards	()	()
Rig toilet facility	()	()	Pump belts	()	()
Crew drinking water	()	()	Start engines	()	()
All hands instructed or in- training program	()	()	All belts	()	()
Crew safety meeting held	()	()	Kelly hose	()	()
Company safety manual on rig	()	()	Load lines	()	()
Fire extinguishers	()	()	Wire rope, slings and clips	()	()
First aid kits	()	()	Fuel lines	()	()
Trained First Aiders on each tour	()	()	Fuel tank	()	()
Dog House housekeeping	()	()	Trailer House	()	()
Tool House housekeeping	()	()	All high press fittings & lines	()	()
General housekeeping	()	()	B.O.P. shield	()	()
Safe access to all areas	()	()	Welding equipment	()	()
Hard hats	()	()	Condition of brake	()	()
Safety shoes	()	()	Condition of clutch	()	()
Safety goggles	()	()	All air valves	()	()
Hearing protection	()	()	Air compressors	()	()
Condition of hand tools	()	()	Water lines for fire	()	()
Hammer handles	()	()	Water truck	()	()
Chisel heads	()	()	Shear relief valves/cover	()	()
Wrenches	()	()	Mud hopper	()	()
Condition of cathead(s)	()	()	Cellar clean	()	()
Spinning line(s)	()	()	Dead line	()	()
Condition of slips	()	()	Dead line clamps	()	()
Condition of dogs	()	()	Condition of base	()	()
Condition of tongs	()	()	Condition of shoes	()	()
Condition of tong dies	()	()	Condition of pins	()	()
Safety line on rotary hose	()	()	Condition of derrick	()	()
Drilling line	()	()	Mast bolts tight	()	()
Cat line & sheave	()	()	Sheaves & crown	()	()
Monkey board	()	()	Crown platform & railing	()	()
Safety belt	()	()	Rig ladder	()	()
Escape line, trolley	()	()	Climbing safety device and belt	()	()
Escape line anchor	()	()	Ladders, portable	()	()
Floors -- free of holes	()	()	Electric lines	()	()
Floor railing	()	()	Bulbs guarded	()	()
Hand rails	()	()	Drop cords	()	()
Walks	()	()	Lights	()	()
Stairs and stair rails	()	()	Light plant	()	()
			Terminals	()	()

To be completed by Driller first tour after rig up
 Mark out items not applicable on rig
 Describe specific problems on back

INSPECTED BY _____
 PUSHER _____
 RECEIVED IN OFFICE _____

Safety Check List

Land Rigs

YES or NO

PIPE RACKS AND ADJACENT AREAS

- _____ 1. Is condition of the pipe racks satisfactory?
- _____ 2. Do pipe racks have sufficient matting?
- _____ 3. Are cat walk boards in good condition?
- _____ 4. Is pipe ramp in good condition?
- _____ 5. Is lighting system sufficient in this area?
- _____ 6. Is any method used for chocking pipe on pipe racks?
- _____ 7. If so, is it satisfactory?
- _____ 8. Is good housekeeping being practiced throughout this area?

SUBSTRUCTURE

- _____ 9. Are all beams in place?
- _____ 10. Are all necessary bolts, pins and retainer pins in place?
- _____ 11. Are there any excessive bent places in any of the beams?
- _____ 12. Are all bolts and tie-downs tightened securely?
- _____ 13. Is there excessive oil on matting boards?
- _____ 14. Are air tanks in structure being drained each tour?
- _____ 15. Is the general appearance of the substructure good?
- _____ 16. Are there sufficient lights for this area?
- _____ 17. Are lighting fixtures in good condition?
- _____ 18. Is good housekeeping being practiced throughout this area?

BOP'S AND MANIFOLD

- _____ 19. Are all bolts and nuts in casing head, BOP's and flanged openings?
- _____ 20. Are BOP's being opened and closed regularly?
- _____ 21. Is the remote control unit and accumulator in good condition?
- _____ 22. Are there any leaks in lines to BOP hook-up?
- _____ 23. Are ram handles and wheels hooked up to BOP's?
- _____ 24. Are ram handles and wheels hung so they will turn freely?
- _____ 25. Are there any low pressure connections in BOP hook-up?
- _____ 26. Are discharge lines anchored down?
- _____ 27. Are BOP's snubbed off properly to center the rotary hole?

MUD TANKS AND SHALESHAKER

- _____ 29. Are all lights, light sockets, and terminal boxes satisfactory?
- _____ 30. Are guards over belts on shaleshaker and end of vibrator shaft?
- _____ 31. Are gun lines and jet lines made up of high pressure connections?
- _____ 32. Are there control handles on mud guns?
- _____ 33. Is caustic mixing barrel rigged safely?
- _____ 34. Are goggles available?
- _____ 35. Are walkways and handrails around tanks in good condition?
- _____ 36. Are steps in satisfactory condition?
- _____ 37. Is good housekeeping being practiced throughout this area?

MUD PUMPS AND MUD MANIFOLD

- _____ 38. Are all necessary guards in place?

- _____ 39. Are shear relief settings within maximum working pressure of pump?
- _____ 40. Are all shear relief valve covers in place?
- _____ 41. Are there any missing studs or nuts on pumps?
- _____ 42. Are down-stream lines on pump snubbed down?
- _____ 43. Is working area around pumps satisfactory?
- _____ 44. Are all lights, light sockets, terminal boxes in good condition?
- _____ 45. Are hand tools in good working order?
- _____ 46. Is good housekeeping being practiced throughout this area?

AUXILIARY HOUSES

- _____ 47. Are all necessary guards in place?
- _____ 48. Is there a relief valve on air tank and is it working properly?
- _____ 49. Are air tanks being drained each tour?
- _____ 50. Are air tanks and drain valves in good condition?
- _____ 51. Is switchboard in satisfactory condition?
- _____ 52. Is there excessive oil and grease on floor and under engines?

CLOTHES CHANGING & TOOL HOUSE

- _____ 53. Is good housekeeping being practiced inside house as well as adjacent area?

ENGINE AREA & RIG FLOOR

- _____ 54. Are all necessary guards in place?
- _____ 55. Does engine exhaust have either spark arrester or water tied into exhaust?
- _____ 56. Are all steps and handrails leading from rig floor to ground level in good condition?
- _____ 57. Are steps and handrails from rig floor to engine level in good condition?
- _____ 58. Are steps retainer bolts in top section of each set of steps?
- _____ 59. Are all handrails in good condition?
- _____ 60. Are there any tools being hung on top section of handrails?
- _____ 61. Is the floor around the rotary table in satisfactory condition?
- _____ 62. Is tar paper or cocoa mats provided around rotary table?
- _____ 63. Are rotary tongs in satisfactory condition?
- _____ 64. Do tong weight buckets or tong lines have junk iron attached?
- _____ 65. Are tongs snubbed properly and tong snub lines in good condition?
- _____ 66. Is break-out line on lead tongs of proper length?
- _____ 67. Are timbers in good condition where pipe is racked?
- _____ 68. Is condition of derrick floor in satisfactory condition?
- _____ 69. Are all floor wings supported properly and retainer bolts in place?
- _____ 70. Are catheads provided with catline divider?
- _____ 71. Are catheads in satisfactory condition and not grooved?
- _____ 72. Is catline in safe working condition?
- _____ 73. Is air hoist (brakes, hand control, line guide, hoist line) in good condition?
- _____ 74. Is there a line guide on air hoist?
- _____ 75. Is there sufficient amount of First Aid material available?
- _____ 76. Does Toolpusher have a Doctor list and First Aid list of materials in trailer?
- _____ 77. Are there visitors hats available on this rig?
- _____ 78. Is good housekeeping being practiced throughout this area?
- _____ 79. Is inside BOP working and on the floor?

DERRICK

- _____ 80. Is derrick ladder in good condition?
- _____ 81. Is the monkey board in satisfactory condition?
- _____ 82. Is safety belt on monkey board in good condition?
- _____ 83. Is water table run-around in good condition?
- _____ 84. Is the condition of lines for derrick climber satisfactory?
- _____ 85. Is derrick climbing equipment anchored properly in derrick?
- _____ 86. Is condition of derrick climbing belt satisfactory?
- _____ 87. Is condition of sheaves satisfactory, anchored at crown properly?
- _____ 88. Is crown area free of excessive grease?
- _____ 89. Are all girts and braces in derrick in satisfactory condition?
- _____ 90. Are all girts and braces sufficiently bolted down?
- _____ 91. Are tong lines or other lines anchored to braces or girts?
- _____ 92. Are stand-pipes properly braced to derrick?
- _____ 93. Is derrick lighting system strung properly?
- _____ 94. Are all light fixtures explosion-proof?
- _____ 95. Is derrick lighting sufficient?
- _____ 96. Are rotary hoses snubbed off properly at standpipe area?
- _____ 97. Is rotary hose that is being used snubbed off at swivel?
- _____ 98. Is derrick free of any loose objects?
- _____ 99. Is line guide equipment in good condition?
- _____ 100. Is there a windbreak for monkey board?
- _____ 101. Is stabbing board in good condition and well secured to derrick?

GENERAL INFORMATION

- _____ 102. Is housekeeping in general - excellent, good or bad?
- _____ 103. How many fire extinguishers on job and are they in good condition?
- _____ 104. Is miscellaneous auxiliary equipment in good condition?
- _____ 105. Are welding machine, leads, and holders in good condition?
- _____ 106. Are cutting rig, hoses, regulators, gauges, and torch in good condition?
- _____ 107. Are extra bottles and empties well secured in rack?
- _____ 108. Do all bottles have caps?
- _____ 109. Are hard hats and steel toe boots being worn by everyone?
- _____ 110. Are there any unsafe practices being observed?
- _____ 111. Are crews having regular safety meetings?

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RECOMMENDED PRACTICES AND
CHECKLISTS FOR DRILLING OPERATIONS
IN AREAS WHERE H₂S IS A POTENTIAL HAZARD

DRILLSITE LOCATION

1. The rig will be situated on the location such that prevailing winds blow across the rig toward the reserve pit or at right angles to a line from the rig to the reserve pit.
2. The entrance to the location will be designed so it can be barricaded if Hydrogen Sulfide emergency conditions arise. Appropriate warning signs and flags will be placed at the location entrance.
3. A minimum of two (BRIEFING AREAS) will be established in such locations that at least one area will be upwind at all times. These areas will be 200 feet from the well head. Upon recognition of an emergency situation, all personnel will assemble at the areas to don their protective breathing equipment.
4. A Safety Equipment Trailer will be located in the SAFE BRIEFING AREA.
5. Windsocks and wind streamers will be placed on the location in a manner that they are visible from all points of the location. A windsock will be placed at the entrance of the location to be checked before entering the location, visible from V door and 180 degrees from it.
6. The mud tank will be located so as to minimize the danger from gas that breaks out of the drilling fluid.
7. Electric power plants will be located as far from the wellbore as practical so that it may be used under conditions where it would otherwise have to be shut down.
8. All windbreakers and rig curtains will be removed from around the derrick floor and monkey board, regardless of weather conditions, when working in any zone which may contain Hydrogen Sulfide.
9. When working at a depth where Hydrogen Sulfide may be encountered, appropriate warning signs will be posted on all access roads to the location and at all stairways leading to the derrick floor.
10. Appropriate smoking areas will be designated and smoking will be prohibited elsewhere.
11. On the rig, by the radio, will be posted a list of current emergency telephone numbers.
12. Reliable 24-hour radio and/or telephone communication will be available at the rig.

13. There will be a secondary escape route from the location opposite from the direction of prevailing winds.
14. (H₂S) detector locations (should at least include cellar and mud tanks at shale shakers).

SPECIAL EQUIPMENT

1. Two flare lines will be laid at a 90-degree angle from the well to facilitate flaring as necessary.
2. Blowout preventors and choke manifolds will be (H₂S) trim.
3. An automatic (H₂S) monitor will be installed with both visual and audible alarms located where it can be seen and/or heard throughout the drilling location. The visual alarm will be set to trigger at 10 ppm of (H₂S), and the audible alarm will be set to trigger at 20 ppm of (H₂S).
4. There will be enough safety equipment, breathing air-packs for 21 men.
5. It is advised an adequate (H₂S) scavenger material be on location. It is to be added to mud system if any trace of (H₂S) is detected.

INSTRUCTIONS TO PERSONNEL WHERE HYDROGEN SULFIDE MAY BE ENCOUNTERED

1. Every person involved in the operation will be informed of the characteristics of Hydrogen Sulfide, its dangers, safe procedures to be used when it is encountered and recommended first-aid procedures for regular rig personnel.
2. The (H₂S) Supervisor will conduct training sessions and will repeat as deemed necessary by him or as instructed by the Drilling Foreman.
3. INSTRUCTIONS WILL INCLUDE THE FOLLOWING:
 - a. Danger of Hydrogen Sulfide
 - b. Use and limitation of air equipment
 - c. Use of resuscitator, organization of "Buddy System" and first-aid procedures.
 - d. Use of (H₂S) detection devices: designation of responsible people.

- e. Explanation of rig layout and policy on visitors, designation of smoking areas, emphasis of the importance of wind direction.
 - f. Explanation of the functions of (H₂S) Supervisor.
 - g. Explanation and organization of (H₂S) Drill.
 - h. Explanation of the overall emergency plan with emphasis given to the evacuation phase of the plan.
4. The above instructions will be attended by every person involved in the operation.
 5. Visitors will be instructed to report to the DRILLING FOREMAN.
 6. Visitors will be refused entrance for lack of Safety Equipment. If special operations are in progress, or for other reasons involving safety.

CHECKLIST FOR BLOWOUT PREVENTION PROGRAM

1. Is there a set of drawings available to the rig showing the BOP stack, lines, valves and manifolds required for assembly?
2. Do all items meet or exceed the pressure rating of the assembly?
3. Is assembly rating equal to or greater than casing burst pressure or formation breakdown pressure, whichever is lesser?
4. If the master rams are closed, is it possible to pump into the well?
5. Are casing head connections tied to choke manifold?
6. Are choke discharge lines manifold and arranged so that fluids can be discarded, gas separated safely or mud recovered and degassed?
7. Will the degassing system handle all mud at necessary flow rates?
8. Can gas separated from the mud be safely discharged or flared?
9. Can rams be locked in closed position from outside substructure?
10. Does an alternate or isolated source of power exist so that accumulator can be recharged should gas be leaking around rig?
11. Does the stack have clearance for tool joints between preventors so pipe can be stripped in the hole?
12. Is an inside BOP available on the rig floor for closing inside of drill pipe and can it be manually stabbed?
13. Is an inside BOP available on the rig floor for closing inside of drill collars and can it be manually stabbed?
14. Can the collars be fastened down quickly?
15. Are relief lines of large capacity available, if needed to hold pressure down on surface casing?
16. Are choke discharge lines as straight as practical, heavy duty, and well-anchored and supported?
17. Are choke flow lines and valves well-supported and anchored?
18. Can all necessary manipulations of the BOP assembly be made without going under rig floor?

19. Is the stack flanges and connections protected during moving?
20. Are stacks well anchored and can it be aligned conveniently, if necessary.
21. Are there master valves on the choke flowline and each choke manifold wing and these used for closure to allow downstream repairs?
22. Is there a fill-up line separate from the kill line and is it normally used?
23. Is the choke flowline straight or has only sweeping bends?
24. Are sufficient variable chokes available with a ration to handle expected pressures?
25. Are there both floor-mounted and remote accumulator controls and are these clearly labeled?
26. Are the off-floor controls effective if the floor unit is destroyed?
27. Can rams be closed without losing pressure to the Hydril?
28. Are control lines of pressure rating equal to accumulator pump pressure capability or adequately protected by relief lines?
29. Do accumulator pumps automatically recharge accumulator?
30. Are BOP control lines positioned low so that they are not likely to be destroyed quickly by fire?
31. Is the kelly cock wrench available and easily found?
32. Are extra parts for chokes on hand?
33. Is there a totalizing pit indicator and recorder mounted in easy view of the Driller?
34. Is there a flow indicator for out-of-the-hole conditions or can the flowline discharge be seen from the rig floor?
35. Does rig have a pump stroke counter for use in critical hole filling checks?
36. Is there a boll weevil plug available for testing BOP's?

37. Is a test joint and packer available for testing the top joints of casing?
38. Are extra ring gaskets, bonnet sealing rings and BOP flange bolts on hand?
39. If procedures required, is a kelly cock test sub on hand?

Testing and Maintenance

1. Is there available a step-by-step set of illustrations showing how to test all BOP items, including top casing joints, in a minimum number of steps?
2. Are these steps followed after each nipple-up and at specified intervals thereafter? What intervals _____

3. Is a drawing available showing how to test the more critical items of BOP equipment and is this done after each approximate 48-hour drilling period or other specified interval? What Other intervals _____

4. Have the preventors been shopped in the past year?
5. On each trip are the ram-type BOP's operated and all kill and choke lines flushed?
6. Are valve handles attached?
7. Can all preventors be closed in 19 seconds or less with pumps off and with a remaining accumulator volume of 50 per cent of original at a pressure of 1200 psi?
8. Have wireline lubricators been tested to maximum expected pressure?
9. Are recommended closing pressures for Hydril on the drill pipe in use, known and used when the Hydril is tested?

PROCEDURES

1. Is there a specified procedure for hole filling (number of stands) and is this done 4 - 5 times as often when drill collars are pulled?

2. Does crew check for hole swabbing on the first few stands using a pump stroke counter?
3. Is the crew instructed not to "cheat" on hole filling to be sure pipe pulls are dry?

H₂S CHECKLIST FOR APD OR PLAN OF OPERATIONS

Items 1 - 4 to be shown on site layout diagram (part 9 of NTL-6 13-point checklist).

1. Two safety briefing areas at least 200' from wellhead and arranged so that at least one area will always be upwind of the well at all times.
2. Direction of prevailing winds.
3. Wind sock locations.
4. A second emergency escape route from the location opposite from direction of prevailing wind.
5. Number, types and storage locations of H₂S respirators for all personnel. Maximum number of personnel to be expected at any one time.
6. H₂S detector locations (should at least include cellar and mud tanks at shale shakes). Type and location of audible, visual alarm to be used.
7. H₂S evacuation and emergency training procedures and frequency.
8. Area residents within a two-mile radius, and agencies, to be notified in an emergency.
9. Types and quantities of mud additives and scavengers to be available at location for H₂S operations.
10. Design features and operational procedures to be used to protect the drill string, casing, wellhead, BOP's, choke lines and manifold and other well-killing equipment in H₂S environments.

U.S.G.S. INSPECTION RECORD

HYDROGEN SULFIDE OPERATIONS

1. Are number and locations of safe briefings adequate?
2. Are footpaths to briefing areas marked, lighted and unobstructed?
3. Are H₂S safety instructions and contingency plan posted?
4. Are "no smoking" rules enforced?
5. Is required personnel safety equipment available? (Protective breathing apparatus) (Resuscitator) (Portable H₂S detectors) (First-Aid Kit)
6. Have weekly H₂S drills been held and recorded on Drillers' log?
7. Is H₂S detection and monitoring equipment properly installed with sensing points at critical locations?
8. Is wind direction equipment installed?
9. Are danger signs and flags available?
10. Is kill line installed to safe area?
11. Is flare system installed and operable?
12. Is mud/gas separator installed and operable?
13. Are explosion-proof ventilation fans available for use?
14. Is pH of water base mud maintained at 10.0 or above?
15. Is mud system treated with H₂S neutralizing additive?

CHECKLIST FOR DRILLING OR WORKOVER IN H₂S ENVIRONMENT
(pending approval of proposed NTL-10)

Items 1 - 4 to be shown on site layout diagram (part 9 of NTL-6 13-point checklist).

1. Two safety briefing areas at least 200 feet from wellhead and arranged so that at least one area will always be upwind of the well at all times.
2. Direction of prevailing winds.
3. Wind sock locations. (Minimum of 2) (NTL-10, 11-A(4))
4. A second emergency escape route from the location. (Flagged trail minimum)
5. Number, types and storage locations of H₂S respirators for personnel and number of personnel to be expected at any one time.
6. H₂S detector locations (should at least include cellar or bell nipple and mud tanks at shale shaker). Type and location of audible, visual alarm to be used. (NTL-10, 11-A(3))
7. H₂S evacuation and emergency training procedures and frequency. (NTL-10, 11-A-(1)(b))
8. Area residents within a two-mile radius, and agencies, to be notified in an emergency (contingency plan). (NTL-10, 1-D)
9. Types and quantities of mud additives and scavengers to be available at location for H₂S operations.
10. Design features and operational procedures to be used to protect the drill string, casing strings, wellhead, BOP's, choke lines and manifold and other well-killing equipment in H₂S environments. (A certification by the operator on the APD that all equipment meets standards for H₂S service is acceptable for compliance.
11. Appropriate warning signs and flags on all access roads to location. (NTL-10, 11(4))
12. Provision for blocking or monitoring access to location during critical operations.

13. Ventilation fan under rig floor.
14. In event of uncontrolled blowout, which local official has authority to ignite flow?
15. Swabbing or drillstem testing fluids containing H₂S should be through a separator to permit flaring of gas. Flare should have continuous pilot light to insure ignition of all such gas.

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API
RECOMMENDED PRACTICES
FOR
SAFE DRILLING OF WELLS
CONTAINING HYDROGEN SULFIDE

OFFICIAL PUBLICATION



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API RECOMMENDED PRACTICES FOR SAFE DRILLING OF WELLS CONTAINING HYDROGEN SULFIDE

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API RECOMMENDED PRACTICES FOR SAFE DRILLING OF WELLS CONTAINING HYDROGEN SULFIDE

FOREWORD

a. Initial efforts to develop a publication related to this overall subject were begun and advanced by a work group of the Production Safety Committee under API's Committee on Safety and Fire Protection. Because of the "non-divisional status" of the Committee on Safety and Fire Protection, a decision was reached to refer their draft material to the Production Department for further work and final approval as an official API publication.

b. This recommended practice was finalized by the

Subcommittee on Blowout Prevention Equipment Systems, the membership of which is listed on the preceding page. It is published under the sponsorship of the Executive Committee on Drilling and Production Practice of the American Petroleum Institute's Production Department.

c. This recommended practice prescribes safety recommendations and outlines safety guidelines and procedures developed within the petroleum industry for conducting inland or offshore drilling operations where hydrogen sulfide gas may be encountered.

SECTION 1

SCOPE

1.1 Drilling operations where hydrogen sulfide may be encountered should include provisions to use the safety guidelines outlined in this publication. These guidelines should be administered where there is a reasonable expectation that hydrogen sulfide gas bearing zones will be encountered that could potentially result in atmospheric concentration of 20 ppm or more of hydrogen sulfide. These are requirements for deep, high pressure wells located in or near a populated area.

1.2 Several factors, including but not limited to hydrogen sulfide content, potential surface pressure, potential flow characteristics, and geographical location, may dictate modifications or exceptions to the recommendations set forth herein. These safety recommendations have been developed, considering land locations with unconfined areal boundaries, to

safeguard personnel at the rig site and surrounding area and to minimize risk exposure to rig equipment. Recognizing that there are many locations with confined boundaries (such as locations found in marsh, marine, urban, and mountainous areas), attention should be given to safety recommendations resulting from these geographical limitations. Additional safety guidelines for these confined locations are set forth under Section 4, "Location".

1.3 Recommended safety procedures on rank wildcat drilling operations should be initiated immediately after setting of the intermediate casing string. On development wells or wells where knowledge of formation type allows good correlation, recommended safety procedures should begin well in advance of reaching a depth where hydrogen sulfide may be encountered.

SECTION 2

INTRODUCTION

2.1 The demand for hydrocarbons necessitates the drilling of deep, high pressure wells which may contain hydrogen sulfide. If hydrogen sulfide is encountered, the concentration of hydrogen sulfide involved may present hazards abnormal to routine drilling activities. Drilling operations involving high hydrogen sulfide concentrations present problems involving personnel and equipment which require special precautions by the petroleum industry due to the extremely acidic and toxic nature of hydrogen sulfide. Design of drilling equipment must include consideration of its possible exposure to hydrogen sulfide.

2.2 The petroleum industry, through experience and effort, has developed guidelines for safe drilling operations under conditions involving hydrogen sulfide. However, continuous industry effort including meticulous planning, careful equipment selection and layout, development of detailed operating procedures and emergency procedures, provision of appropriate safety equipment, and intensive personnel training are necessary to ensure successful and safe operations. All effective countermeasures to emergencies imply some degree of prior planning. The effectiveness of emergency countermeasures is usually proportionate to the thoroughness and soundness of the planning effort.

SECTION 3

HYDROGEN SULFIDE PHYSICAL PROPERTIES AND TOXICITY

3.1 Hydrogen sulfide is extremely toxic. The acceptable ceiling concentration for eight-hour exposure is 20 ppm, which is .002% by volume. Hydrogen sulfide is heavier than air (specific gravity = 1.19) and colorless. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. Hydrogen

sulfide is almost as toxic as hydrogen cyanide and is between five and six times more toxic than carbon monoxide. Toxicity data for hydrogen sulfide and various other gases are compared in Table I. Physical effects at various hydrogen sulfide exposure levels are presented in Table II.

TABLE I
TOXICITY OF VARIOUS GASES

Common Name	Chemical Formula	Specific Gravity (SG) SG Air = 1	Threshold ¹ Limit	Hazardous ² Limit	Lethal ³ Concentration
Hydrogen Cyanide	HCN	0.940	10 ppm	150 ppm/hr	300 ppm
Hydrogen Sulfide	H ₂ S	1.176	10 ppm ⁴ 20 ppm ⁵	250 ppm/hr	600 ppm
Sulfur Dioxide	SO ₂	2.210	6 ppm	—	1000 ppm
Chlorine	Cl ₂	2.450	1 ppm	4 ppm/hr	1000 ppm
Carbon Monoxide	CO	0.970	50 ppm	400 ppm/hr	1000 ppm
Carbon Dioxide	CO ₂	1.520	5000 ppm	5%	10%
Methane	CH ₄	0.550	90,000 ppm (9%)	Combustible above 5% in Air	—

¹Threshold Limit—concentration at which it is believed that all workers may be repeatedly exposed day after day without adverse effects.

²Hazardous Limit—concentration that may cause death.

³Lethal Concentration—concentration that will cause death with short-term exposure.

⁴Threshold Limit = 10 PPM—1972 ACGIH (American Conference of Governmental Industrial Hygienists).

⁵Threshold Limit = 20 PPM—1966 ANSI acceptable ceiling concentration for eight-hour exposure (based on 40-hour week) is 20 PPM. OSHA Rules and Regulations (Federal Register, Volume 37, No. 202, Part II, dated October 18, 1972).

TABLE II
PHYSICAL EFFECTS OF HYDROGEN SULFIDE*

Concentration			Physical Effects
percent (%)	ppm	grains/ 100 std. ft. ³ **	
0.001	10	.63	Obvious and unpleasant odor.
0.002	20	1.26	Safe for 8 hours exposure.
0.01	100	6.30	Kills smell in 3 to 15 minutes; may sting eyes and throat.
0.02	200	12.59	Kills smell shortly; stings eyes and throat.
0.05	500	31.49	Dizziness; breathing ceases in a few minutes; needs prompt artificial respiration.
0.07	700	44.08	Unconscious quickly; death will result if not rescued promptly.
0.10	1000	62.98	Unconscious at once; followed by death within minutes.

*Caution: Hydrogen sulfide is a colorless and transparent gas and is flammable. It is heavier than air and may accumulate in low places.

**Based on 14 hydrogen sulfide = 629.77 grains/100 std. ft.³ at 14.696 psia and 59°F. or 101.325 kPa and 15°C.

SECTION 4

LOCATIONS

LOCATIONS WITH UNCONFINED BOUNDARIES

4.1 Drilling locations with unconfined boundaries are usually found on land where a typical rig layout can be planned as shown in Fig. 1. Such locations should be planned to obtain maximum safety benefits consistent with rig configurations, terrain, and prevailing winds. Rig components should be arranged on the location so the prevailing wind will blow across the rig toward the reserve pit(s).

4.2 The entrance to the location should be designed so that it can be barricaded if hydrogen sulfide emergency conditions arise. An auxiliary exit (or entrance) should be available so that in case of a catastrophe a shift in wind direction would not preclude escape from the location. Appropriate warning

signs and flags should be placed at all location entrances.

4.3 Prevailing wind data should be considered in locating protection centers and birthing areas (sheds or trailers) on either side of the location 200 feet or more from the wellbore so they offset prevailing winds perpendicularly, or at a 45-degree angle if wind direction tends to shift in the area. Personnel protective equipment should be stored in both protection centers or if a movable trailer is used, it should be kept upwind of existing winds. When wind is from the prevailing direction, both protection centers should be accessible. If the wind is quartering, one center should always be accessible. If needed in a crisis, materials and protective equipment located in a downwind protection center may be moved up-

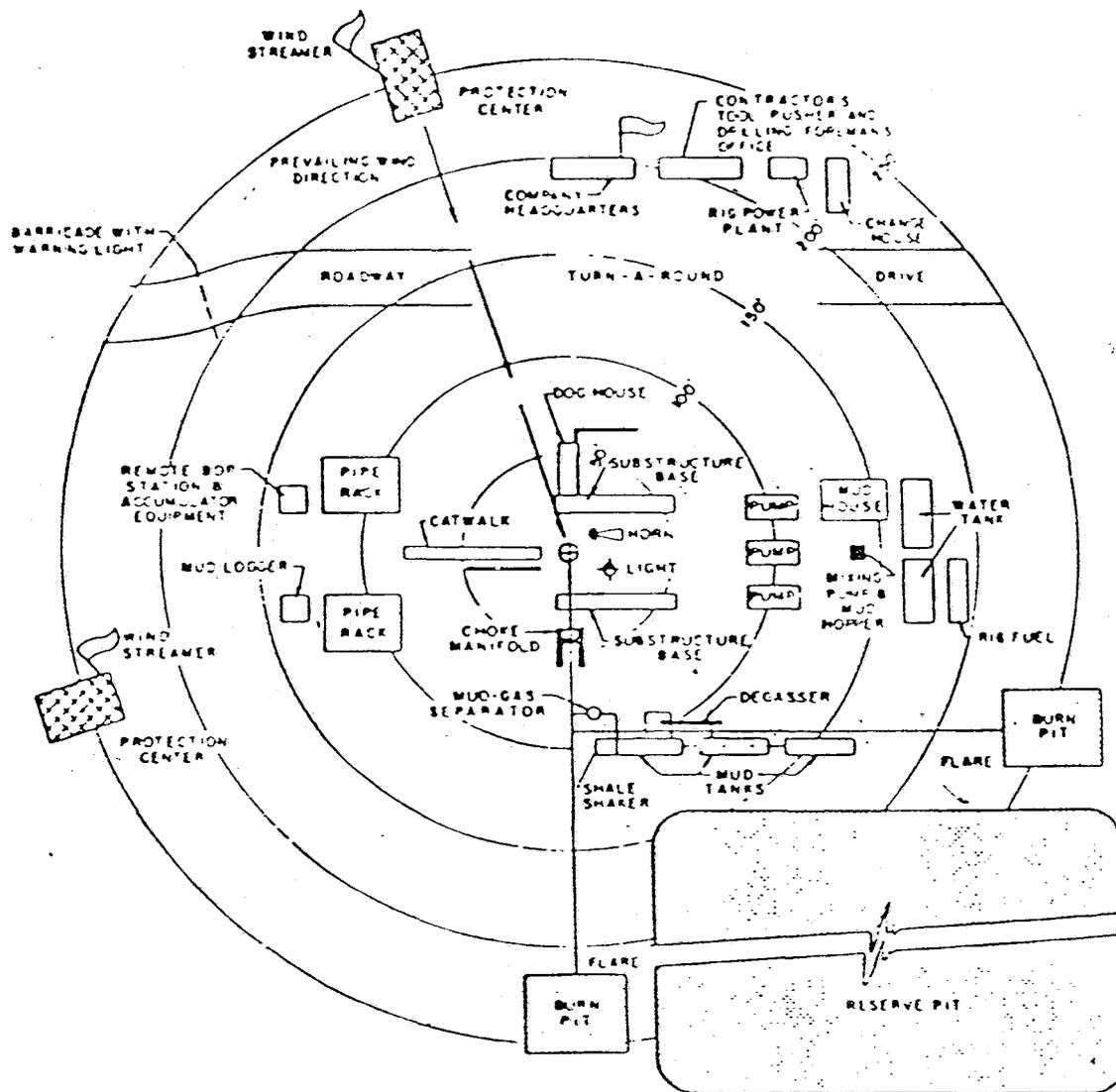


FIG. 1
 TYPICAL DRILLING EQUIPMENT
 LAYOUT—UNCONFINED LOCATION

wind after donning adequate protective equipment. An equipment trailer or other similar structure can be utilized as a third protection center under such emergency conditions. Upon recognition of an emergency situation, all personnel should assemble at the designated protection center for instructions.

4.4 All equipment should be located and spaced to take advantage of prevailing winds and to provide for good air movement (see Fig. 1). Eliminate as many sources of potential gas accumulation as possible in this manner.

4.5 A windsock should be installed on top of the derrick and at least three sets of wind streamers on streamer poles should be displayed, one set at the location entrance and one set at each of the location protection centers. Personnel should develop wind direction consciousness. Personnel should cultivate the habit of quickly moving upwind in the event of any emergency involving release of gas.

4.6 Large blowers or fans (hug blowers) should be used to direct vapors in the desired direction as protection against calm or extremely light winds. Use of such blower ventilation equipment should be considered on the rig floor, around the derrick substructure, at the shale shaker, and at any other points where hydrogen sulfide might accumulate and need to be dispersed.

4.7 The mud logging trailer should be located away from the shale shaker, mud tank and a minimum of 125 feet from the wellbore.

4.8 Shale shaker mud tanks should be located so as to minimize the danger from any gas that breaks out of the drilling fluid.

4.9 Electric power plant(s) should be located as far from the wellbore as practical so that it may be used under conditions where it otherwise would have to be shut down. All electric wiring, devices, and lights should conform to the National Electrical Code according to the classified area surrounding drilling rigs as set out in *API RP 500B*^{*}. The drilling location should be adequately lighted at night. Consideration should be given to having available an emergency lighting system such as a battery pack floodlight.

4.10 Burn pits should be located at 90 degrees to each other to allow reduction of inherent hazards by changing from one pit to the other if the wind direction changes. Adequate space should be cleared of brush and grass around flares and burn pits to prevent fires.

4.11 Appropriate "No Smoking" signs should be exhibited at strategic points around the rig site. Smoking should not be permitted in specific areas adjacent to the wellbore, rig floor, and mud pits.

4.12 If the drilling location is fairly remote and several hours from available help and additional safety equipment or supplies, planning considerations

should be given to additional contingency items such as extra bottled breathing air or a high pressure compressor for recharging breathing air bottles, a 24-hour communication center, and additional first-aid supplies.

LOCATIONS WITH CONFINED BOUNDARIES

4.13 Drilling locations with confined boundaries are usually found in marsh, marine, urban, or mountainous areas. A typical rig layout for such confined drilling locations is illustrated in Fig. 2. A number of special considerations should be given these type locations due to their geographical limitations.

4.14 The location entrance should be designed so that it can be barricaded if hydrogen sulfide emergency conditions arise. An auxiliary exit (or entrance) should be available so that in case of a catastrophe, a shift in wind direction would not preclude escape from the location.

4.15 Protection centers and briefing areas for confined locations should be located on each side of the location as far from the wellbore as is practical. When wind is from the prevailing direction, both protection centers should be accessible. On marine locations, the heliport deck and the bow or stern of the drilling vessel should be considered for locating protection centers. Upon recognition of an emergency situation, all personnel should assemble at the designated protection center for instruction.

4.16 Warning signs, warning flags (or balls), windsocks, and wind streamers should be displayed so as to be visible from as many points as practical on the ground, maindeck, rig floor, boats, or helicopters. Possible locations for these items are the derrick, hilltop, mast, heliport, and bow or stern of the drilling vessel.

4.17 In many instances, the location of the shale shaker, mud tanks, and mud logging trailer will be permanently fixed in close proximity to the wellbore. Adequate hazard warning signs should be posted in these areas and alternate personnel escape routes should be planned in the location layout. Additional mechanical blowers (fans) placed in these locations can help to reduce the risk exposure.

4.18 Flare lines should be as long as possible, commensurate with the location geographical limitations. One flare line should be installed perpendicular to the prevailing wind direction and another flare line should be installed parallel to the prevailing wind direction, if practical. An exception to this might be on a "ship-shape" floating drilling vessel where flare lines installed to the bow and stern of the ship would be the best arrangement. Flare lines should be secured with chains and boomers or other suitable means if ground staking is not possible.

4.19 If the drilling location is fairly remote and several hours from available help and additional safety equipment or supplies, planning considerations should be given to additional contingency items such as extra bottled breathing air or a high pressure compressor for recharging breathing air bottles, a 24-hour communication center, and additional first-aid supplies.

^{*}*API RP 500B API Recommended Practice for Classification of Areas for Electrical Installations at Drilling Rigs and Production Facilities on Land and on Marine Fixed and Mobile Platforms*, Second Edition, July 1973 is available from API Production Department, 211 North Texas, Suite 1700, Dallas, TX 75201.

SECTION 5

RIG EQUIPMENT

DRILL PIPE

5.1 Steel drill pipe for use in a hydrogen sulfide environment should be constructed of material hav-

ing a yield strength of 95,000 psi or less, because of the potential material embrittlement problems. Drill stem joints near the top of the drill string are nur-

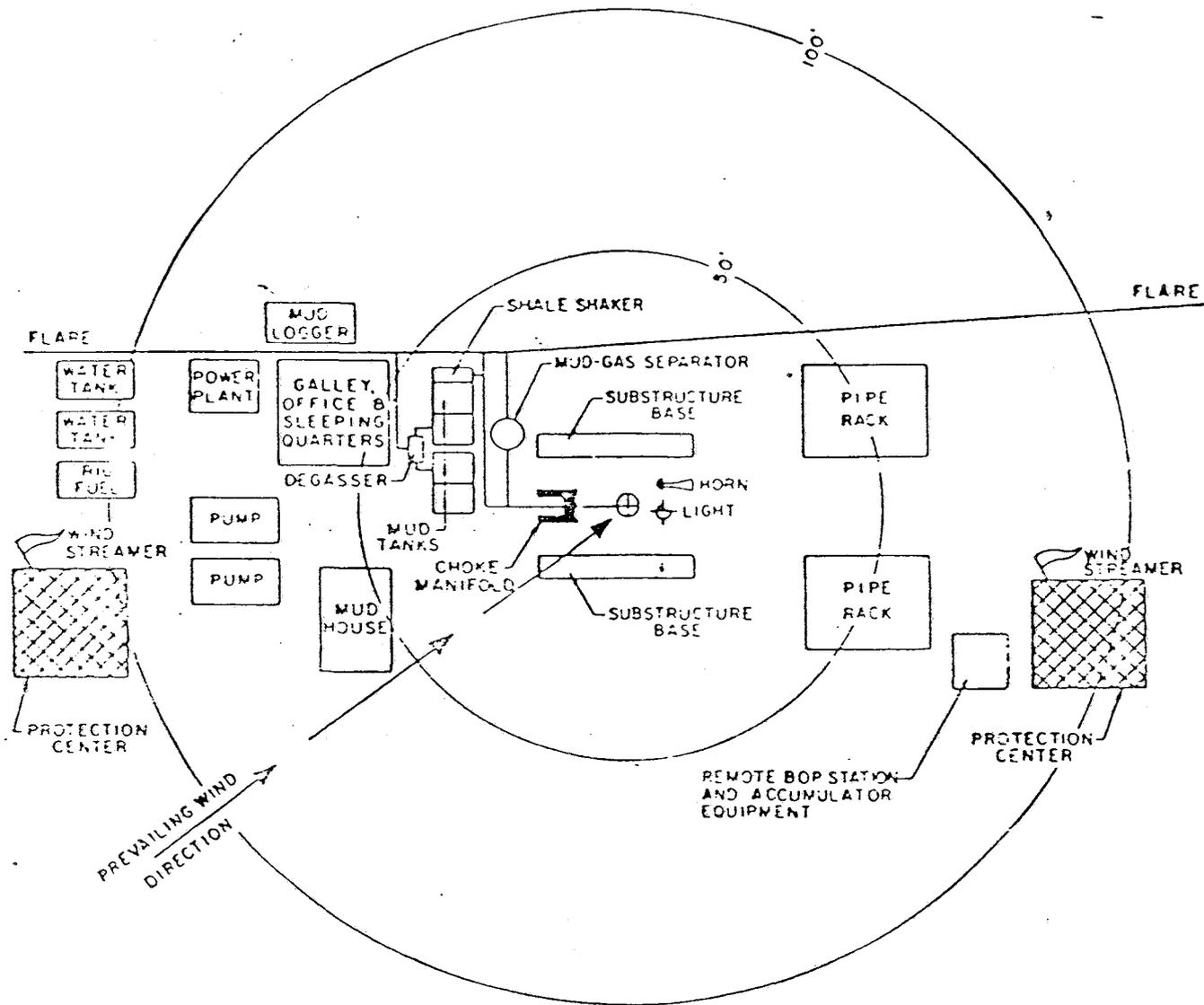


FIG. 2
TYPICAL DRILLING EQUIPMENT
LAYOUT—CONFINED LOCATION

mally under the highest stress levels during drilling operations and do not have the protection of elevated downhole temperatures. These factors should be considered in the overall selection and design of the drill string to be used in a hydrogen sulfide environment. Drill collars normally operate at an elevated downhole temperature due to the elevated temperature and with all other factors being equal, drill collars are not as susceptible to embrittlement if exposed to a hydrogen sulfide environment.

BLOWOUT PREVENTION EQUIPMENT

5.2 Blowout preventers should meet or exceed the recommendations for hydrogen sulfide service as set forth in the latest edition of *API RP 53*. Manufacturer certification of the blowout preventer equipment for

API RP 53 Recommended Practices for Blowout Prevention Equipment Systems, First Edition, February 1976, is available from API Production Department, 211 North Ervay, Suite 1700, Dallas, TX 75201.

hydrogen sulfide service is desirable. On extremely hazardous wells, a special auxiliary kill line 2" or more in diameter should be installed in the direction of the prevailing wind. This kill line should terminate at a suitable location to allow setting up pump trucks, mud tanks, and bulk barite tanks.

5.3 The closing unit should be located a safe distance from the wellbore and positioned for maximum utilization based on the prevailing wind direction. Auxiliary closing unit controls should be provided so they can be activated if the primary controls are not accessible. Auxiliary power source(s) for the closing unit pumps should be provided in case normal rig power and/or air are lost.

5.4 Refer to the latest edition of *API RP 53* for recommendations covering installation and use of the choke manifold, kill line, remote kill line, Kelly cock, lower Kelly valve, safety valves, and inside blowout preventer for hydrogen sulfide service.

SECTION 6 SPECIAL EQUIPMENT

FLARE LINES

6.1 A degasser should be installed for separating gas from the drilling fluid between the first and second mud tanks. Flare lines should be installed from the degasser, choke manifold, and mud/gas separator to the burn pits. Flare lines should be of such diameter to allow easy, nonrestricted flow of gas containing hydrogen sulfide. Flare lines should be as long as practical (150 ft. minimum) with one flare line installed parallel to and the other flare line installed perpendicular to the prevailing wind direction. These lines should be targeted with running trees and securely staked. Upon installation, flare

lines should be tested with air, natural gas, or butane to assure proper operation.

BURN PIT AND FLARE IGNITION

6.2 A suitable method should be provided for igniting gas containing hydrogen sulfide at the burn pit or flare. This can be accomplished through use of either an automatic ignition system including a source of pilot gas or by installing the system in such a manner to allow gas ignition through use of flare guns, roman candles, etc. A combustible gas indicator should be provided for identifying the presence of combustible gas mixtures.

SECTION 7 HYDROGEN SULFIDE DETECTION

7.1 An automatic hydrogen sulfide monitor should be installed with a combination visual and audible alarm system located where it can be seen and/or heard throughout the drilling location. This system should have the capability of being activated from several points. Additional hydrogen sulfide monitors may be desirable.

7.2 The automatic hydrogen sulfide monitor should have a probe at the shale shaker and a probe should be positioned on the bell nipple. The automatic monitor should be set to trigger the drilling location

visual/audible alarms when the hydrogen sulfide concentration in the atmosphere reaches 20 ppm.

7.3 In addition to the automatic hydrogen sulfide detection equipment, several hand-operated, bellows-type hydrogen sulfide detectors should be available with a supply of detector tubes.

7.4 A sulfur dioxide detector should be available for checking the sulfur dioxide level in the flare area when gas containing hydrogen sulfide is being burned.

SECTION 8 BREATHING EQUIPMENT

8.1 Masks which are designed to merely neutralize toxic gas do not provide the necessary protection and should never be used in drilling operations when a hydrogen sulfide environment may be encountered.

8.2 Self-contained breathing equipment is recommended for use in drilling operations involving a hydrogen sulfide environment. Two basic types of self-contained breathing apparatus are available and widely used in industry drilling operations:

- Pressure-demand, fresh-air breathing equipment provides protection in any atmospheric concentration of hydrogen sulfide. This equipment has an alarm that signals when the

breathing air supply is getting low, and can be serviced with a reserve air bottle.

- Chemical units are available which convert exhaled breath into oxygen. These units are relatively light and can be used with a minimum of restriction to the wearer. An alarm system is incorporated which signals when the chemical supply is getting low, and replaceable chemical canisters are available for servicing the units.

8.3 Combination pressure-demand, air-line breathing equipment, with auxiliary self-contained air supply for emergency egress, is acceptable for use in drilling operations involving a hydrogen sulfide environment.

8.4 Masks should be stored in the location protection centers (sheds or trailers) and in other storage facilities located strategically around the operation, so that no person in normal work routine is more than "one breath away" from a mask. Appropriate racks should be available in the protection centers or other storage facilities for hanging masks. Every person working in the area (including geologist, mud engineer, service personnel, etc.) should be required

to wear air breathing equipment during critical or emergency periods.

8.5 During well killing or other rig operation(s) requiring certain personnel to remain in a toxic environment, a back-up air manifold pressure-demand, fresh-air breathing system may be employed with connection points at the necessary locations.

8.6 Resuscitators with spare oxygen bottle should be provided at each location center or trailer.

SECTION 9

PLANS

9.1 All zones known to contain or suspected of containing hydrogen sulfide should be noted on the well prognosis and/or work plan.

9.2 Hydrogen sulfide is highly corrosive to steel; and, at high stress levels extreme metal embrittlement may occur in a very short time. All tubular goods, wellhead equipment, and other drilling related equipment which may be exposed to a hydrogen sulfide environment during the course of operations should be selected considering metallurgical properties which will reduce the chance of failure from hydrogen sulfide embrittlement.

9.3 To minimize intrusion of hydrogen sulfide bearing gas into the wellbore, drilling fluid density (weight) should be controlled at a level to prevent gas intrusion so that the only hydrogen sulfide entering the borehole will be from the drilled cuttings. Caution: Excessive drilling fluid density can result in loss of circulation.

9.4 Well planning should include consideration of use of a hydrogen sulfide scavenger in the drilling fluid system to reduce the reaction of the hydrogen sulfide on the drill string, pump fluid ends, chokes, and piping. Scavengers also reduce the amount of hydrogen sulfide reaching the surface. Hydrogen sulfide scavengers may be added as required to maintain a concentration in the drilling fluid sufficient to react with all hydrogen sulfide entering the drilling fluid.

9.5 The pH of the drilling fluid should be maintained above 9.5 at all times. In some cases, this may require a pH of approximately 11.5 to prevent a reduction in pH below 9.5 while round tripping the drill string.

9.6 Plans for drill stem testing operations should include consideration of the aforementioned points as well as information presented in API RP 70*, Section 8. Adherence to these considerations will severely limit conventional drill stem testing of deep, high pressure zones containing hydrogen sulfide.

9.7 If the overall well prognosis and/or work plan will permit, use of an oil base drilling fluids system will reduce the risk of metal embrittlement during drilling operations.

CONTINGENCY

9.8 A listing of emergency telephone numbers and radio contact procedure instructions should be prepared and maintained, considering the need to contact all or any portion of the following:

- a. ambulances,
- b. hospitals,
- c. doctors,
- d. helicopter service,

* API RP 70, API Recommended Practices for Drill Stem Testing and Operating Limits is available from API Production Department, 211 North Ervay, Suite 1700, Dallas, TX 75201

- e. veterinarians,
- f. state highway patrol,
- g. county (parish) sheriff,
- h. city police (if near a city or town),
- i. state civil defense agency,
- j. state national guard,
- k. state air and water conservation agency.

These telephone numbers and methods for proper contact and/or notification to obtain immediate help or assistance should be prominently displayed at strategic points on the drilling location. It may prove desirable to contact some of the aforementioned services or agencies and explain the detailed circumstances under which their assistance may be needed and why a quick response would be necessary. Trial runs by ambulance services and/or helicopter services may be desirable, with instructions requiring attendants to be familiar with proper first-aid treatment for personnel who have been exposed to hydrogen sulfide.

9.9 A clear plastic container with a listing of current emergency telephone numbers and a map of the local area with all residential areas clearly marked should be located at both drilling location headquarters (operating company and drilling contractor) and in each location protection center or trailer.

9.10 Detailed operating conditions should be defined and posted for all personnel. Emergency procedures and duties should be clearly defined, including responsibilities of all applicable supervisory personnel.

9.11 Detailed step-by-step remedial procedures should be developed and posted to cover two emergency occasions:

- a. when a well control problem occurs while making a trip,
- b. when a well control problem occurs while drilling.

9.12 Established practices for installation of, testing, and maintaining blowout preventers should be followed. Regular scheduled and unscheduled drilling crew well control drills should be held.

9.13 If gas cutting of drilling fluid is encountered, blowout preventers should be closed while maintaining drilling fluid circulation through the choke lines to the mud-gas separator. The mud-gas separator should be connected into the flare line system. Normally, after circulating for a few hours the gas will decrease so the blowout preventers can be opened and normal drilling operations resumed without use of the choke system. The degasser should be used until the drilling fluid is free of entrained gas.

9.14 Personnel should put on applicable protective equipment when the hydrogen sulfide concentration in the atmosphere reaches or exceeds 20 ppm. After circulating out all gas cut returns, the shale shaker area should be periodically checked with a gas

sulfide detection equipment until the concentration of hydrogen sulfide in the atmosphere drops below 20 ppm. Breathing equipment may then be removed until the hydrogen sulfide concentration again rises to the 20 ppm concentration level.

9.15 Nonessential personnel should be prohibited from remaining in or entering contaminated areas where the hydrogen sulfide concentration in the atmosphere exceeds 20 ppm. Exposure to hydrogen sulfide contamination should be reduced by shutting down air conditioning, heating, or ventilation systems which service enclosures for personnel.

9.16 "Gas discipline" rules should be adhered to. When the "masks on" requirement exists, there are no exceptions.

9.17 When coming out of the hole with a core barrel under suspected hydrogen sulfide conditions, the drilling crew should wear protective equipment while pulling the last twenty stands or at any time hydrogen sulfide reaches the surface. "Masks on" should be continued while opening the core barrel and examining the core.

9.18 Ignition of the well should be a last resort when human life and property are endangered and there is no hope of controlling the well blowout. If

the well is ignited, the burning hydrogen sulfide will produce sulfur dioxide which is also highly toxic.

9.19 For functional and sanitary reasons, masks should be washed and sterilized in accordance with manufacturers' recommendations.

9.20 One wind velocity and wind direction weather station should be installed.

9.21 Approved wall type first aid kits with standard contents fill should be provided at each of the protection centers or trailers with a spare fill. Kit contents should be periodically inventoried and missing items replaced.

9.22 A minimum of five 30-pound dry chemical fire extinguishers should be strategically located around the drilling location.

9.23 Two rolls (500-foot total length) of 400-pound test, soft, fire-resistant rope should be provided for use as safety lines.

9.24 A rigid, body-fitting type litter should be provided in a location readily accessible to the work area.

9.25 A slide or other means for quick and safe escape of rig personnel from the rig floor to the ground or surface of the water should be provided.

SECTION 10

EVACUATION

10.1 The area within a two-mile radius of the well location should be checked out using a contour map. Due to high pressure dispersion, except on a dead calm day with a tremendous release of heavily concentrated vapors, the probability of lethal concentration of hydrogen sulfide beyond a one-mile radius is unlikely. Prevailing wind direction should be noted on the contour map. A thorough physical reconnaissance of the area should be made and the map noted to show the locations of houses, schools, barns, pens, roads, animals, and anything else that might cause people to be present who might need to be warned and/or evacuated in a crisis situation.

10.2 All houses shown on the contour map should be assigned a number and a listing compiled of the names of all residents of each house. An emergency reference record should be prepared containing the

names of persons residing in the area, telephone number contacts, and the map house number in which they reside. The possibility of alerting in advance all persons within the danger zone should be considered prior to entering the potential hydrogen sulfide bearing zone.

10.3 The contour map should be constructed to show one-half mile radius, one-mile radius, and two-mile radius from the drilling well location. A transparent sheet of plastic can be used to make an overlay showing wind direction and a 45-degree fallout zone that can be rotated on the map to fit existing wind direction. In an emergency, this procedure can be used to select the high priority areas and individuals to be warned and/or evacuated and to organize the warning and evacuation programs.

SECTION 11

TRAINING

11.1 Every person who will be at the location in any capacity should be familiar with requirements of the emergency procedures and should participate in the training program. This includes operating company personnel, rig personnel, and service company personnel. Personnel training should start in regular safety meetings as soon as possible after the drilling routine is established and should be appropriately intensified as the operation progresses.

11.2 Minimum personnel training should provide coverage of the following points or programs:

- Detailed explanation of the seriousness of encountering hydrogen sulfide in drilling operations.
- Explanation of rig layout details, prevailing winds, importance of adequate ventilation, use of mechanical blowers (fans), utilization of windsock and wind streamers, personnel move-

ment in an upwind direction, and evacuation routes.

- Personnel drills with breathing equipment. These drills should be initiated by actuating the hydrogen sulfide alarm. All personnel should proceed to the designated briefing area in accordance with the emergency procedures, don breathing equipment, and await instructions. They should then perform a short period of rig work routine in the breathing equipment.

- Use, care, and servicing of:
 - Protective breathing equipment (self-contained breathing apparatus, emergency escape air bottles, hose line, etc.). Respirators should be stored in a convenient, clean, and sanitary location and a record kept of inspection dates and findings on all breathing equipment maintained for emergency

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APPENDIX I
SAFETY EQUIPMENT

Safety trailer with eight 380 cu. ft. cylinder Cascade Air Supply System,
1500 ft. low pressure air line with quick connects.

- 3 Low pressure manifolds
- 8 Workline units
- 7 Thirty-minute S.C.B.A.
- 2 Wind socks
- 1 First-aid kit
- 1 Oxygen resuscitator
- 1 Gas detector (pump style)
- 1 Four channel electronic H2S monitor
- 2 Briefing area signs
- 1 Thirty pound fire extinguisher
- 1 Eye wash station
- 1 Fire blanket
- 1 Stretcher
- 2 250 ft. lengths of rope with harnesses

APPENDIX 2

LIST OF RESIDENCES WITHIN A TWO MILE RADIUS

NONE

APPENDIX 3

COMPANY & CONTRACT PERSONNEL

WARREN AMERICAN OIL COMPANY
P O Box 470372
Tulsa, Oklahoma

918-492-8100

Dave Mullin

COMPANY REP: Ken Allen

801-722-5081 Office
801-722-9966 residence

DRILLING COMPANY:

Olsen Drilling Company
Allen L. (Buck) Olsen - President

303-292-9930

SAFETY COMPANY:

BELL Safety
DeWard (Pete) Murray - Manager

303-675-5274 office
303-675-2754 residence

APPENDIX 4

EMERGENCY TELEPHONE NUMBERS

DUCHESNE COUNTY HOSPITAL

801-722-4691

LIFE FLIGHT L.D.S. HOSPITAL S.L.C. UTAH

801-321-1234
801-321-1911

AREA DOCTORS:

DR. TERRY BUXTON

801-722-4691 office
801-722-2104 residence

DR. KEITH EVANS

801-722-4652 office

AMBULANCE SERVICE:

UTE INDIAN TRIBE

801-722-2911

TRIBAL AMBULANCE

801-722-2285

UINTAH COUNTY SHERIFF-LLOYD MECHAM

801-781-4222
911

APPENDIX 5

KUIN: 105.9 Radio Station	Vernal, UTah	801-789-1059
	Roosevelt, UTah	801-722-4920
KVEL: 920 Radio Station	Vernal, Utah	801-789-0920
	Roosevelt, UTah	801-722-4920
Roosevelt Municipal Airport:	Poleline Rd.	801-722-4741
	Roosevelt, Utah	

APPENDIX 6

B.L.M. (VERNAL)

801-789-1362

Mr. Cody Hansen

Mr. Jerry Kenczka

Mr. Ed Rorsman

E.P.A. Air Quality Control - Salt Lake City Utah

801-538-6108

APPENDIX 7

The tops of the H2S Bearing Zones are known.

All essential rig personnel will be trained. All safety equipment will be in place 500 ft. above these zones.

Recommended Guidelines for Training Personnel on Drilling Locations Where Hydrogen Sulfide Gas May Be Encountered

LAND OPERATIONS TRAINING PROCEDURES

When drilling in an area where known or suspected hydrogen sulfide gas (H₂S) may be encountered, definite training requirements must be carried out. The following training guidelines will provide precautions for personnel and equipment for a successful operation. The procedures will apply on any oil or gas drilling location. These guidelines meet requirements of many government regulatory agencies.

PHASE I. ARRIVAL AT WORKSITE

At the drilling location, the following preliminary steps should be taken:

- A. The employees should be introduced to their driller or supervisor.
- B. The employees will be introduced to the supervisor in charge of the operation.
- C. The employees will be introduced to the person in charge of training.
- D. They should be informed of the current well condition in relation to the drilling in progress.
- E. Safety rules should be explained to all personnel.

PHASE II. INTRODUCTION TO HYDROGEN SULFIDE CONSIDERATIONS

- A. Explain the properties of H₂S to new or transferring employees and the potential hazards of working in an environment of hydrogen sulfide gas.
- B. Long hair, large bushy sideburns, full beard, false teeth or contact lenses can interfere with the function of the mask. Eardrums should be checked for perforations. Any prospective employee with any of these impairments to mask operation must agree to abide by the company rules and make any corrections needed to comply with the H₂S equipment regulations.
- C. The employee should review a copy of the following:
 1. Company instructions on H₂S and SO₂.
 2. Toxicity table and properties of both H₂S and SO₂.
 3. Name or title of immediate supervisor and outline of training procedures.
- D. An H₂S training film or slide/tape should be available to show the employee during his orientation.
- E. At the conclusion of the indoctrination, the new or prospective employee should sign a form stating that he understands and agrees to abide by the company requirements. This form should be kept for future reference.

PHASE III. H₂S PROGRAM BRIEFING

The person in charge of training should explain the following:

- A. The H₂S contingency plan. This is a written document outlining the requirements, procedures and instructions for drilling a hydrogen sulfide well. This plan specifically elaborates on the type of well and drilling safety equipment. It describes the procedures to be followed during H₂S encounter, the type of training that will be performed and an evacuation plan. This booklet shall be located in an area accessible to all personnel and reviewed by each individual. Questions concerning the material in this booklet should be brought to the attention of the individual's supervisor.
- B. H₂S sensing and monitoring equipment (including personal monitors). It should be explained in the training program that H₂S detection systems are installed on the location to provide maximum safety to all personnel. It should be emphasized that a fixed automatic system provides continuous detection throughout the day. The portable units are used for random sampling to detect H₂S. Since each location is different, the following is an outline that can be used in training personnel relative to H₂S detection systems.
 1. Fixed Automatic Manned Detection System
 - a. Location of monitor
 - b. Operating procedure
 - c. Describe the alarms and warning lights
 - d. Location of lights
 - e. Location of alarm
 - f. Location of sensors

2. Portable Detection Device

- a. Stored location
- b. Operating procedures

1) Use of portable units should never be used in detecting presence of hydrogen sulfide.

D. Respiratory equipment. Respiratory equipment is one of the major facilities in providing personnel safety. Each individual should be totally familiar with each unit available on the drilling location. He should understand the procedure for operation, limitations, and maintenance. Since each individual company uses different types, brands, and placement of equipment and since rig designs differ, the following outline can be used to prepare a training program for personnel.

1. Rescue Units

- a. Location of units
- b. Operating procedures of unit
- c. Donning units
- d. Maintenance and storage of unit
- e. Changing air cylinders
- f. Recharging air cylinder

2. Work Unit

- a. Location of units
- b. Operating procedures of unit
- c. Donning unit
- d. Maintenance and storage of unit
- e. Changing air cylinder
- f. Recharging air cylinder

3. Escape Units

- a. Location of units
- b. Operating of unit
- c. Donning unit
- d. Maintenance and storage of unit
- e. Recharging air cylinder

4. Cascade Recharging System

- a. Location of units
- b. Operating procedures of unit
- c. Maintenance and storage of unit
- d. Recharging air cylinder

5. Cascade Long Duration System

- a. Location of units
- b. Operating procedures of unit
- c. Limitations of unit
- d. Regulator of unit
- e. Maintenance and storage of unit

6. Air Stations

- a. Location of unit
- b. Operating procedures of unit
- c. Limitation of unit
- d. Maintenance of unit

7. Air Compressor

- a. Location of units
- b. Operating procedures of unit
- c. Limitation of unit
- d. Filters
- e. Air intake
- f. Maintenance of unit

E. Buddy Systems. When hydrogen sulfide is encountered over 10 ppm, all individuals should perform their jobs in pairs. This practice is known as the "buddy system". The training program should cover the reasons why this procedure is necessary.

F. Essential and non-essential personnel.

F. Emergency communication items. (Chalkboard, voice packs, bull horns, etc.) Chalkboards are used on a H₂S location for communication between individuals when wearing respiratory equipment because a person cannot talk when wearing face mask. It should be pointed out during the training session where the chalkboard is located.

H. Safe briefing stations. There should be a minimum of two (2) briefing areas on each H₂S location, upwind of the drilling rig. During the training program it should be pointed out where the briefing areas are located and the conditions when the personnel should report to them.

I. Two H₂S conditions (moderate danger to life and extreme danger to life & operating conditions in each is attached)

C. The employee will be required to don and use an air breathing apparatus for demonstration purposes. Explain how:

1. The pressure gauge is read
2. The regulator functions.
3. The low pressure alarm functions
4. The harness is to fit the body.
5. The mask is donned
6. The mask view plate is cleared of condensation
7. The pressure tank is to be filled or replaced.
8. The unit is serviced, sanitized, and stored back into its case for quick use.

Explain maintenance and bottle changing procedure so that they may correct minor malfunctions in order to keep the unit in service.

The employee will be required to practice donning the breathing apparatus in one minute or less starting with a closed apparatus case.

H. Institute a buddy system and explain its importance.

I. Explain the meaning of essential and non-essential personnel.

1. Essential personnel are members of the drilling crew whose services will be required to contain the well in the event of an H₂S emergency. These include (1) the contractors' toolpusher, (2) operator's drilling foreman, (3) mud analysis personnel, and (4) other persons needing protection on the rig - the mechanic, the electrician, the welder, the engineers.
2. Non-essential personnel are all other persons on the installation whose services are not required to contain the well
3. Each company should assign work duties and responsibilities to best utilize their personnel.

J. Operating Procedures - For familiarization purposes, all training should include the hazards that may be encountered during the following:

- a. Tripping
- b. Coring
- c. Drill stem testing (where applicable)
- d. Kicks
- e. H₂S in mud
- f. Neutralization of H₂S

K. Explain the proper use of emergency communications items (chalk board, voice packs, bull horns, etc.) during drills or potential emergencies.

L. Show the employee the location of each safe briefing area. The air recharging stations in the safety areas are to be explained, and the supervisor in charge of the station during a drill or potential emergency will direct personnel in their duties.

M. Conditions classification Areas

1. "Moderate Danger to Life" condition exists when drilling depth is within 1000 feet of the expected H₂S formation. All personnel should remain in a ready condition to react at the sound of the alarm.
2. "Extreme Danger to Life" will exist when H₂S escapes into the atmosphere and activates the alarm system.

N. All wind direction indicators (flags, wind socks, and streamers) are to be indicated to the employee so that he will be aware of wind direction and the importance of running into the wind to a safe area when the H₂S alarm sounds.

O. First aid training will be required with special emphasis on mouth-to-mouth resuscitation. Personnel will be instructed on the proper use of the oxygen resuscitator.

The training supervisor will record that each employee has satisfactorily completed the training program. After the personnel are trained, drills for H₂S emergency conditions will be carried out once each week or more often if conditions warrant. Records will be maintained on date of drills and personnel that participated.

PHASE V SERVICE AND VISITING PERSONNEL

Only essential personnel will be allowed on location when Condition II (orange) or Condition III (red) situation exists. All service personnel will receive proper H₂S emergency training and a record of training will be maintained. Previous agreement should be made regarding who will provide breathing equipment for service of visiting personnel.

PHASE VI BREATHING EQUIPMENT/WARNING SYSTEM MAINTENANCE AND TRAINING

All air breathing equipment should be checked for condition a minimum of once each week. H₂S detection and monitoring equipment should be checked daily to make certain that the equipment is functioning properly. Record dates of inspection of all equipment and tag personal breathing equipment with date of inspection.

PHASE VII H₂S DRILLS

In order to train all personnel on location for efficiency in their assigned emergency duties, an H₂S drill will be held daily. Once it is decided that all personnel function satisfactorily, the drills should be held on a weekly basis.

The fact is to be instilled in all rig personnel that the sounding alarm means only one thing: H₂S is present, and everyone is to proceed to his assigned station.

The following steps are to be taken when an H₂S alarm sounds:

- A. All essential personnel will don their air breathing equipment. Assigned individuals will check the breathing air supply valves for the piped air systems. The driller will take necessary precautions as indicated by the contingency plan.
- B. Bag blowers should be made operational and all open flames should be extinguished.
- C. Implement the buddy system and act upon directions from the supervisor.
- D. If there are non-essential personnel on location, they will don their air breathing equipment and move off location.
- E. Gates to location entrance will be closed and patrolled and the red flag will be displayed at gate indicating that "Extreme Danger to Life" condition exists at rig.
- F. After the drill, the H₂S contingency plan regarding notifying local authorities and alerting residents near the location of possible need to evacuate the area should be discussed.
- G. Once the "all clear" signal is given, initiate the following steps:
 1. The H₂S person-in-charge is to check the air breathing compressors, cascades, and air piping to determine any malfunctions that might have occurred and make necessary corrections.
 2. Self-contained breathing equipment will be recharged for next use and checked for damages or malfunctions. Each will be properly stored.
 3. Hose line egress units will be checked for damages and malfunctions are readied.
 4. The H₂S person-in-charge will check out any problems that might have occurred with the H₂S sensing and monitoring equipment.
 5. Portable H₂S monitoring instruments will be used to check low areas or dead air areas around the rig for any accumulation of H₂S.
 6. Report any damages that occurred to the H₂S equipment.
- H. Keep records on all H₂S drills. Records should include:
 1. Date
 2. Time
 3. Drilling depth
 4. Time required to complete the drill
 5. Weather conditions
 6. Names of personnel participating in the drill
 7. Brief description of activities conducted on rig floor and safe briefing areas.
 8. Improper acts of personnel or the malfunctions of equipment noted during drill. Each H₂S drill is also to be noted in the daily drilling reports.

PHASE VIII EVACUATION

At the sound of an H₂S alarm, the supervisor-in-charge will evaluate the condition and determine the action necessary.

- A. Upon notice to evacuate from the supervisor-in-charge, any non-essential personnel should leave immediately.
- B. If it is determined nothing else can be done to contain the well, all essential personnel will proceed to the safe briefing areas and evacuate.
- C. Notify regulatory authorities of the emergency condition. Aid in the evacuation of residents in the possible danger area if necessary.
- D. Maintain security of location. The operating company will give authorization for only essential personnel to re-enter the location.

PHASE IX FIRING OF THE WELL

When all personnel have been evacuated from the drilling location and it is determined necessary for safety, the contingency plan for "Firing of the Well" will be executed. All personnel in the area are to be advised to remain clear of the burning well with the explanation that sulphur dioxide (SO₂), which is also a poisonous gas, is created when H₂S is burned.

- A. A watch will be maintained until wild well is under control.

J. Wind direction indicators. Wind socks are used on a H₂S location to advise the crew members of the direction of the wind. When H₂S becomes present on the location, the individual will know where to move upwind to his proper protective equipment station. During the training program, the instructor should advise the individual where the wind socks are located.

K. Warning Signs.

L. Bug Blowers. Bug blowers are used on a H₂S drilling site to direct the hydrogen sulfide gas during low wind days. The location of the blowers and the correct operating procedure should be pointed out to the drilling crews during the training session.

M. Flare lines (advise as to purposes). During the training session, the individual should be advised that a flare gun is on the location for lighting the well as a last resort. It should be pointed out who is directly responsible to use the flare gun.

N. Explosion Meter. It should be emphasized during the session that there is an explosion meter on location, where it is placed, how it should be used, and who is responsible for it.

O. Safety Belts and Ropes. Safety belts and ropes on a H₂S location are used to pull an individual who has blacked out in a confined area. The location of safety belts and ropes and the reason for their use should be pointed out to the drilling crew during the training session.

P. First aid requirements.

PHASE IV. TRAINING PROCEDURES

Procedures are to include:

A. Review the H₂S contingency plan.

B. View the H₂S visual training aids.

C. Point out the locations of the H₂S sensors, describe their function.

D. Point out the locations of each audible and visual alarm panel and explain how to distinguish between the two emergency conditions.

E. Point out the location of briefing areas and the conditions for reporting to them.

F. Explain the cascade system:

1. Air Compressor

2. Piping: The inspection and maintenance of fittings required.

3. Air reservoir

a. Unit locations

b. Limitations of units

c. Regulator of unit

d. Operating procedures

e. Changing cylinders

f. Recharging cylinders

g. Maintenance and storage of units

4. Manifold air stations

a. Locations

b. Limitations

c. Operating procedures

d. Maintenance and storage

5. Hose line units

a. Locations and precautions

b. Limitations: bottle pressure, hose length, hose pressure

6. Operation of unit: hoseline and escape unit

a. Pressure gauge

b. Regulator

c. Low pressure alarm

d. Hoseline (egress unit) for demonstration purposes

(1) Harness

(2) Mask

(3) Clear mask view plate

(4) Filling or replacing the pressure tank

(5) Servicing, sanitizing, and storage of unit into its case for quick use when needed

7. Explain maintenance and bottle changing procedure so that they may correct minor malfunctions in order to keep the unit in service. The employee will be required to practice donning the breathing apparatus in one minute or less, starting with a closed apparatus case. It should be explained to all that support vessels are equipped with breathing equipment and hose line connections for their use when evacuating the immediate area.

RESCUE BREATHING

WHAT IS RESCUE BREATHING?

It is the use of your own breath to revive someone who is unable to breathe for himself. It is the oldest and most effective of resuscitation. The air you exhale is not "spent". It contains enough oxygen to save a person's life. By placing your mouth over the mouth or nose of an unconscious person, you can inflate his lungs and breathe for him.

WHEN TO USE:

Danger signs indicating a lack of oxygen in the blood and the need for help with breathing are:

Absence of breathing movements,
blue color of lips, tongue and
fingernails . . .

Start rescue breathing at once!
A short time without oxygen can
cause serious damage to the
brain. DELAY MAY BE FATAL!

DON'T WASTE TIME BY: Feeling
victim's pulse...finding special
equipment...moving victim...going
for help...getting to shore...

DON'T EVEN WAIT TO BE SURE the
victim needs help...

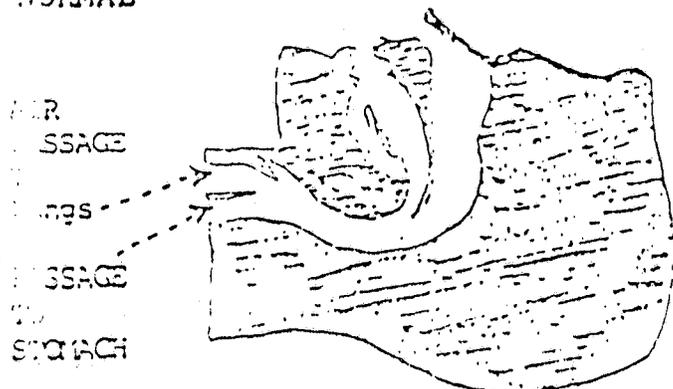
RELAXED TONGUE OBSTRUCTS BREATHING

BEFORE STARTING RESCUE BREATHING, IT IS ESSENTIAL TO MOVE THE TONGUE FORWARD SO AIR CAN REACH THE LUNGS. Sometimes the victim who is not breathing will start breathing by himself if the tongue obstruction is removed.

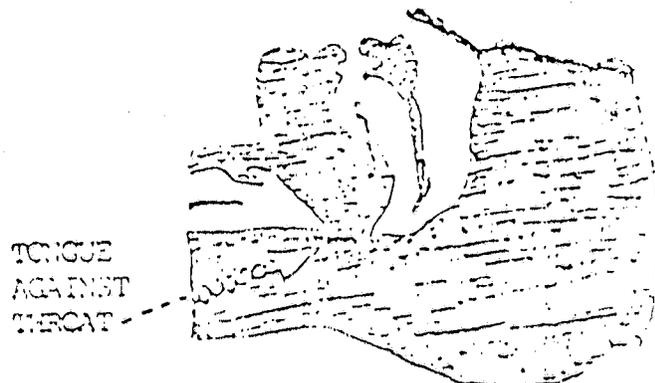
During normal breathing, air flows easily through the nose or mouth to and from the lungs...

But when a person loses consciousness, his relaxed tongue can completely block the movement of air through his throat...

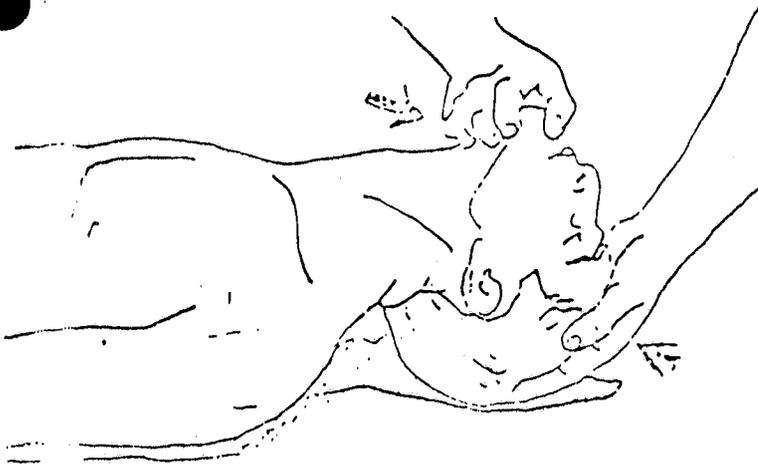
NORMAL



UNCONSCIOUS



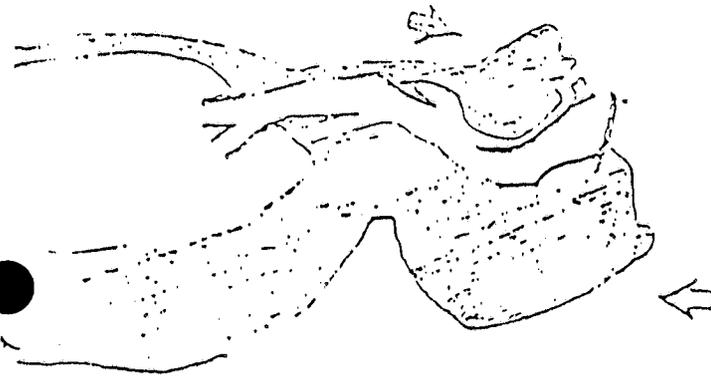
HOW TO PREVENT TONGUE OBSTRUCTION



There are several methods of keeping the victim's tongue from blocking his throat.

1. The head tilt - the most simple method, and the one used for instruction throughout this book.

...Using one hand, hold the crown of his head firmly and push backward.
...Pull his chin upward with the other hand.
...Hold his head tilted as far back as you can - until the skin over throat is stretched tight.



2. Lift chin by grasping lower teeth with thumbs.
3. Lift jaw upward, placing both hands on corners of jawbone near earlobes.

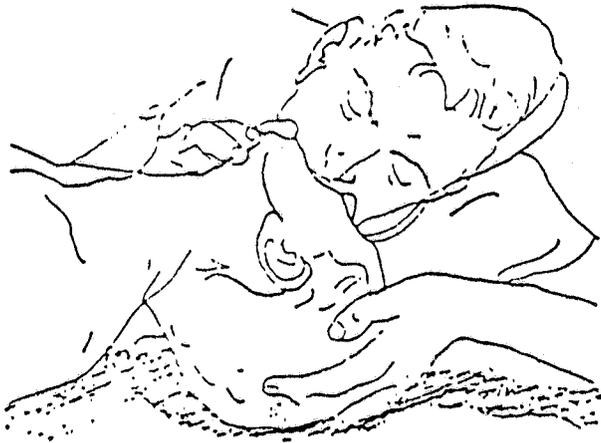
RESCUE BREATHING FOR ADULT VICTIMS

INFLATE CHEST 12 TIMES A MINUTE

STEPS TO FOLLOW:

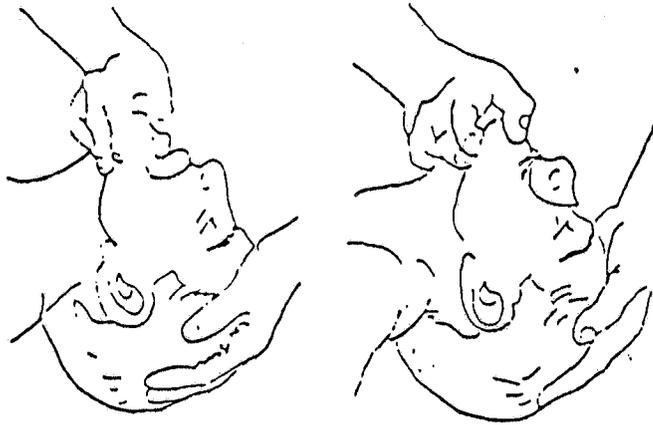
1. If practical, place the victim on his back with his head lower than his chest. If not, leave him as he is. As long as you have access to his mouth or nose, rescue breathing can be done with the victim sitting in an automobile, pinned under debris, suspended on a safety belt on an electric power line, or floating face up in water.
2. Lift his neck and tilt his head back. This procedure is important to keep his relaxed tongue from blocking his throat.
3. Take a deep breath. Open your mouth wide. Blow air into the victim through his mouth or through his nose until you see his chest rise.





Mouth-to-mouth breathing - Seal your lips widely around the victim's mouth. With your thumb, fold his lip down to keep his mouth open during inflation and exhalation. To prevent leakage during inflation, press your cheek against his nostrils (or pinch his nostrils shut).

Mouth-to-nose breathing - Seal your lips widely on the victim's cheeks around his nose. Be sure your lips don't close his nostrils. Close his mouth with your thumb on his lower lip.



4. Remove your mouth and turn your head to one side to let the air escape from the victim's lungs, to take your next breath, and to reduce the possibility of infection. When doing mouth-to-nose breathing, it may be necessary to hold the victim's mouth open so that he may also exhale through it.
5. If you do not see his chest rise, follow procedures for clearing victim's throat.

RESCUE BREATHING FOR INFANTS AND SMALL CHILDREN



1. Place the victim on his back and gently lift his neck and tilt his head back.
2. Seal your lips around his mouth and nose and blow air gently until you are sure his chest expands. It takes only a little air.
3. Stop blowing as soon as his chest starts to rise and let him breathe out.
4. Inflate chest 20 times a minute.



WHEN RESCUE BREATHING, TAKE AN OCCASIONAL DEEP BREATH IF YOU FEEL THE NEED FOR MORE AIR.

V. PHYSICAL AND CHEMICAL PROPERTIES
OF HYDROGEN SULFIDE H₂S

1. Extremely toxic (almost as toxic as Hydrogen Cyanide and 5 to 6 times more toxic than Carbon Monoxide).
2. Colorless.
3. Offensive odor, often described as that of rotten eggs.
4. Heavier than air-specific gravity 1.189 (Air = 1.000 @ 60 F.).
Vapors may travel considerable distance to a source of ignition and flash back.
5. Forms an explosive mixture with a concentration between 4.3 and 46 percent by volume with auto-ignition occurring at 500 F.
6. Burns with a blue flame and produces Sulfur Dioxide (SO₂), which is less toxic than Hydrogen Sulfide but very irritating to eyes and lungs and causes serious injury.
7. Soluble in both water and liquid hydrocarbons.
8. Produces irritation to eyes, throat and respiratory system.
9. Threshold Limit Value (TLV) - Maximum of eight hours exposure.
10. Corrosive to all electrochemical series metals.
11. Boiling Point (-79 F).
12. Melting Point (-177 F).

I. PHYSICAL EFFECTS OF HYDROGEN SULFIDE POISONING

THE PRINCIPAL HAZARD IS DEATH BY INHALATION. When the amount of gas absorbed into the blood stream exceeds that which is readily oxidized, systemic poisoning results, with a general action on the nervous system. Labored respiration occurs shortly, and respiratory paralysis may follow immediately at concentrations of 700 ppm and above. This condition may be reached almost without warning as the originally detected odor of Hydrogen Sulfide may have disappeared due to olfactory paralysis. Death then occurs from asphyxiation unless the exposed person is removed immediately to fresh air and breathing stimulated by artificial respiration. Other levels of exposure may cause the following symptoms individually or in combinations:

- a. Headache
- b. Dizziness
- c. Excitement
- d. Nausea or gastro-intestinal disturbances
- e. Dryness and sensation of pain in nose, throat and chest
- f. Coughing
- g. Drowsiness

All personnel should be alerted to the fact that detection of Hydrogen Sulfide solely by smell is highly dangerous as the sense of smell is rapidly paralyzed by the gas.

11. TREATMENT FOR HYDROGEN SULFIDE POISONING

INHALATION

As Hydrogen Sulfide in the blood oxidizes rapidly, symptoms of acute poisoning pass off when inhalation of the gas ceases. It is important, therefore, to get the victim of poisoning to fresh air as quickly as possible. He should be kept at rest and chilling should be prevented. If respiration is slow, labored, or impaired, artificial respiration may be necessary. Most persons overcome by Hydrogen Sulfide may be revived if artificial respiration is applied before the heart action ceases. Victims of poisoning should be under the care of a physician as soon as possible. Irritation due to sub-acute poisoning may lead to serious complications such as pneumonia. Under those conditions, treatment by the physician necessarily would be symptomatic. The patient should be kept in fresh air, and hygienic conditions should be watched carefully.

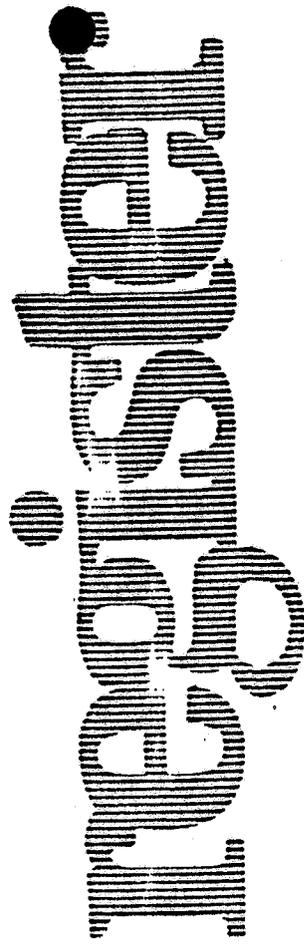
CONTACT WITH EYES

Eye contact with liquid and/or gas containing Hydrogen Sulfide will cause painful irritation (conjunctivitis). Keep patient in a darkened room, apply ice compresses to eyes, put ice on forehead, and send for a physician. Eye irritation caused by exposure to Hydrogen Sulfide requires treatment by a physician, preferably an eye specialist. The progress to recovery in these cases is usually good.

CONTACT WITH SKIN

Skin absorption is very low. Skin discoloration is possible after contact with liquids containing Hydrogen Sulfide. If such skin contact is suspected, the area should be thoroughly washed.

Friday
November 23, 1990



Part II

**Department of the
Interior**

Bureau of Land Management

43 CFR Part 3160

**Onshore Oil and Gas Operations; Federal
and Indian Oil and Gas Leases; Onshore
Oil and Gas Order No. 6, Hydrogen
Sulfide Operations; Final Rule**

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

43 CFR Part 3160

[AA-610-00-4111-02; Circular No. 2630]

RIN 1004-AA67

Onshore Oil and Gas Operations;
Federal and Indian Oil and Gas Leases;
Onshore Oil and Gas Order No. 6,
Hydrogen Sulfide OperationsAGENCY: Bureau of Land Management,
Interior.

ACTION: Final rule.

SUMMARY: This final rule provides for the issuance of Onshore Oil and Gas Order No. 6, Hydrogen Sulfide Operations, which implements and supplements the provisions of 43 CFR 3162.1, 3162.5-1, 3162.5-2, and 3162.5-3. The purpose of this order is to protect public health and safety and those personnel essential to maintaining control of the well. This Order addresses the requirements for conducting operations in a hydrogen sulfide environment. Specifically, it identifies the necessary applications, approvals, and reports required to conduct hydrogen sulfide operations and where necessary, the components required for a Public Protection Plan. It also identifies the specific operating requirements for conducting drilling, completion, workover, and production operations in a hydrogen sulfide environment. In addition, this Order details enforcement actions and allows for variances from the specific standards. This final rule also amends 43 CFR 3164.1, Onshore Oil and Gas Orders, paragraph (b).

EFFECTIVE DATE: January 22, 1991.

ADDRESSES: Inquiries or suggestions should be sent to: Director (610), Bureau of Land Management, Premier Building, Room 601, 1649 C Street NW., Washington, DC 20240.

FOR FURTHER INFORMATION CONTACT: Sie Ling Chiang, (202) 653-2133, or Chris Hanson, (414) 297-4421.

SUPPLEMENTARY INFORMATION: A proposed rule for issuing Onshore Oil and Gas Order No. 6, Hydrogen Sulfide Operations, was published in the Federal Register on May 16, 1989 (54 FR 21075), with a 60-day comment period. An extension for submission of comments until July 31, 1989, was granted and published July 24, 1989 (54 FR 30766). Comments were received from 12 sources, including 2 industry associations, 5 industrial entities, and 5 Government entities.

Several changes and additions were made in the definitions section for clarification in response to the comments. Changes were also made in the requirements section in response to comments.

Those comments relating directly to the proposed rule have been grouped by subject matter and will be discussed as a group rather than individually.

General Comments

One commenter suggested that drilling operations be discussed separately in the Order and that completions and workovers be discussed with production operations. This Order has delineated those provisions in the drilling section which have specific applicability to completions and workovers. In addition, the minimum standards identified for all operations will remain the same regardless of organizational format. Therefore, this suggestion was not adopted.

It was recommended that a discussion of the Forest Service's (FS) role in the Public Protection Plan should be presented in this Order. The Mineral Leasing Reform Act of 1987 did not grant any specific authority in this regard to the FS. The regulations that pertain to the FS under that Act were published on March 21, 1990 (55 FR 10423). These regulations acknowledge that compliance is required with applicable Onshore Oil and Gas Orders issued by the Department of the Interior, Bureau of Land Management (BLM) as specified under 36 CFR 228.112(c)(7). The requirement for a Public Protection Plan to be included in this Order is pursuant to BLM's regulatory authority set forth in 43 CFR 3161.2. The BLM assumes the primary role and responsibility for Public Protection Plans. In the development of a Public Protection Plan, however, the operator should consider the role of the FS where the agency is the primary Federal land manager. For operations where the FS is the surface managing agency, all plans required by this Order will be forwarded to the FS along with the applicable parts of the submitted Application for Permit to Drill in accordance with existing regulations, policy and procedures.

One commenter stated that the threshold criteria throughout the Order of 100 ppm of H₂S in the gas stream and 10 ppm of H₂S in the ambient air is confusing. The following is an explanation of the provision. In addition, the wording has been changed in Sections III.A.1. and III.C.1.c. for further clarification. The 100 ppm H₂S in the gas stream is used solely as a threshold criterion to identify those wells and facilities which are subject to

the requirements of this Order. The criterion of 10 ppm of H₂S in the ambient air applies to situations where protection of essential personnel and/or the public health and safety is an issue. The Drilling Operations Plan is implemented at 500 feet above the first potential H₂S zone or 3 days prior to penetrating the first identified H₂S formation (whichever comes first) for all wells subject to this Order. In addition, if 10 ppm of H₂S in the ambient air is indicated at any of the sensing points, additional measures will be taken. It should be noted that the 10 ppm of H₂S in the ambient air is not used as a factor in determining which wells and/or facilities are subject to this Order.

One commenter stated that the BLM does not have any means of routinely verifying the threshold criterion of 100 ppm H₂S in the gas stream to ensure that all wells which meet the criterion are properly subjected to the requirements of this Order. The BLM conditionally accepts many types of data from oil and gas operators with respect to wells on Federal and Indian oil and gas leases. However, the BLM reserves the right to conduct or require an independent analysis of the gas.

Two comments were received regarding the limits of the authorized officer's discretionary authority with respect to enforcement where major isolations exist. This Order supplements the existing oil and gas operating regulations (43 CFR 3160), and the discretionary authority is defined throughout 43 CFR 3163. Further, the introductory paragraph in section III of this Order has been rewritten to clarify this authority and additional guidance will be provided to the BLM's authorized officers via internal manuals.

It was suggested that all specific references to Onshore Order No. 1 be removed. The BLM agrees with this recommendation since Order No. 1 is currently being revised. However, general references to Onshore Order No. 1 have been retained in this rulemaking because various provisions are applicable to Order No. 6.

One commenter suggested that the status of H₂S and SO₂ under the Comprehensive Environmental Resource Compensation and Liability Act (CERCLA) should be discussed. CERCLA specifically exempts natural gas. The Environmental Protection Agency has considered all constituents of natural gas, such as H₂S and SO₂, as meeting this exemption. Therefore, the comment was not adopted.

One commenter felt that it is undesirable for the BLM to classify the severity of each violation, state the

corrective action, and specify the normal abatement period in the Order. The oil and gas industry and its associations have indicated in numerous meetings with BLM representatives that they would like to know how the BLM will generally view non-compliances and the normal enforcement actions. Therefore, based on this consideration, the BLM has decided to incorporate these provisions in all its Onshore Oil and Gas Orders.

It was recommended that this rule be made effective at least 60 days after the date of publication to provide operators adequate notice. This suggestion has been adopted.

Specific Comments

I.A. Authority

One commenter contended that the terms of this Order should be promulgated either as an amendment to 43 CFR part 3162 or as an appendix to 43 CFR part 3160 so that it would be included in the Code of Federal Regulations. The commenter stated that publication of an Order results in redundancy and inconsistency, but did not identify any inconsistency. No redundancy or inconsistency has been found. As authorized by 43 CFR 3164.1, this Order implements and supplements the requirements of 43 CFR part 3162. It is being properly promulgated through the notice and comment procedures of the Administrative Procedures Act. The Code of Federal Regulations makes reference to the Order's existence and location in the Federal Register. Technical requirements of this type are more appropriately addressed in an Onshore Oil and Gas Order than in general regulations.

One commenter stated that to track the enabling statutes, this Order should take the form of operating guidelines with suggested violation levels, rather than strictly enforceable minimum standards. The commenter did not cite any provisions in the enabling statutes that prohibit the Secretary of the Interior from promulgating strictly enforceable minimum standards. The statutes cited in the authority section of this Order give broad rulemaking authority to the Secretary (See especially 30 U.S.C. 187 and 189). Numerous Orders imposing such minimum standards have been promulgated. Onshore Oil and Gas Orders No. 2 through 5 also contain strictly enforceable minimum standards with specified violation levels.

One commenter contended that the BLM lacks statutory authority to assess strict liability type penalties under 43 CFR 3163.1. The BLM did not propose any revision of 43 CFR 3163.1 in the

current rulemaking; so no response is required. The commenter is referred to the preamble in the final rule promulgating 43 CFR 3163.1 published February 20, 1987 (52 FR 5384).

I.B. Purpose

Two commenters suggested that the BLM should enter into a Memorandum of Understanding (MOU) with the Federal Occupational Safety and Health Administration (OSHA) regarding protection of "essential personnel" to avoid confusion. The BLM has coordinated with OSHA in the development of this Order and both agencies agree that no conflict or overlap exists. The references to "essential personnel" in the Order are for control of the well (43 CFR 3162.5-2) and for protection of public health and safety (43 CFR 3162.5-3). An MOU is not necessary for either agency to implement regulations pertaining to their respective authorities, and therefore, this suggestion was not adopted.

The phrase referring to enforcement actions was removed and the wording changed to be consistent with the provisions contained in the Order. It is not the intent of this Order to specify enforcement actions, but rather the gravity of violations, probable corrective actions, and the normal abatement period for each requirement.

I.C. Scope

Two commenters recommended that the Order provide for a specific exclusion from the minimum standards for "remote facilities" where human life or property would not be in jeopardy. They further indicated that if an exclusion is not provided, operators would routinely request variances from minimum standards for such wells which would create unnecessary paperwork for the operator and the BLM. The purpose of the Order is to ensure control of the well and hence a conservation of the hydrocarbon resource as well as to protect public health and safety. The Order requires only a drilling operations plan for such "remote" wells and, in general, a variance from those minimum standards would not be granted.

One commenter stated that the Order should apply to Indian Mineral Development Agreements. The BLM provides technical assistance to the Bureau of Indian Affairs in the review and enforcement of these agreements. The BLM is presently developing a policy to address its operational responsibilities concerning such documents and the applicability of this Order.

It also suggested that the Order should not apply to wells in unit agreements including American Petroleum Institute (API) unit agreements, except for those drilled on Federal or Indian lands. The applicability of this Order will be consistent with the provisions contained in individual agreements and the agency's current policy regarding the jurisdiction and enforcement of all oil and gas operating regulations for non-Federal wells committed to such agreements.

For consistency with the changes made in response to the comments on Section III.B.2.b.ii.(e), the words "or property" have been removed from the first sentence.

II. Definitions

Several comments indicated that confusion existed in use of the terms "release . . . that may endanger the public" and "potentially hazardous volume". For clarification, the term "release . . . that may endanger the public" has been removed and references are now made to the term "potentially hazardous volume" which has been defined in Section II, of the Order. The ambient air concentrations identified in this definition are derived through radius of exposure calculations and are used to determine if a potentially hazardous volume of H₂S exists.

It was recommended that a definition be included for the term "remote facilities" based on a suggested language change in the Requirements section of the Order. It is not prudent to classify wells subject to the Order by virtue of their distance from public facilities. Therefore, the suggestion was not adopted.

Authorized Representative. This term was not necessary for this Order and was removed. As a result, several definitions have been redesignated in the final rule.

Escape Rate. One commenter suggested a language change for item 1. of this definition. Such language was redundant to the criteria used in the definition of "Radius of exposure" and, therefore, was not adopted.

Two commenters felt that the use of "absolute open flow rate" (AOF) for an entire production facility was unreasonable while five commenters felt that it was unreasonable to use this standard in calculating the escape rate for a gas well. For drilling wells, the five commenters suggested alternative language of "maximum wellhead deliverability against zero back pressure." One commenter suggested

that the operator should be allowed a choice of methods to calculate the escape rate for wells. It was also suggested that a new subcategory be developed for exploratory wells. The BLM recognizes the commenters' desire for flexibility, but believes that its obligation for the protection of public health and safety is an overriding concern. Therefore, the agency used a more conservative approach in calculating the escape rate by using an AOF determination for individual wells and the maximum daily gas handling volumes for production facilities. One commenter suggested that the operator should be given a choice of methods to calculate the "escape rate" in developed areas. The commenter is referred to the definition which allows the operator to use data from offset wells in lieu of calculations, if satisfactory to the authorized officer.

Essential Personnel. It was suggested that the term "essential personnel" be removed since non-essential personnel may be required to stay at their station when H₂S is present. The definition of "essential personnel" indicates that persons who have a necessary function when H₂S is present, would be classified as "essential personnel." Further, the Order states that all personnel shall be trained and that non-essential personnel shall be moved to a safe area once 10 ppm of H₂S in the ambient air is reached at any detection point. Therefore, this suggestion was not adopted.

Two commenters indicated that OSHA rules adequately cover essential personnel. This Order augments OSHA requirements in that it provides for the protection of essential personnel from the standpoint of maintaining control of the well for the purposes of public health and safety and conservation of the hydrocarbon resources.

Three commenters recommended that all Government personnel, including the BLM's inspectors, be subject to the same training and provisions of this Order as apply to "essential personnel." Inspectors are considered non-essential personnel for purposes of this Order. However it is BLM policy that they be properly trained and equipped prior to inspecting H₂S operations.

Gas Well. It was suggested that this definition be consistent with other BLM policy. This suggestion was adopted and the definition changed accordingly.

H₂S Drilling Operations Plan. Three commenters suggested that this term be changed to "H₂S Contingency Plan" to be consistent with other BLM regulations and Orders. The citation in the regulations at 43 CFR 3162.5-1(d) is general in nature and is supplemented by this Order. Therefore, no change is

necessary. The references to H₂S Contingency Plan in Order No. 1 have been removed and replaced by H₂S Drilling Operations Plan and Public Protection Plan, as applicable. Requiring only a Drilling Operations Plan and, when necessary, a Public Protection Plan will save submission of unnecessary paperwork and is more definitive in nature.

Major Violation and Minor Violation. It was suggested that the violations be incorporated as guidelines only. The commenter is referred to the BLM's previous response under Section LA of this preamble. Two commenters recommended that a "moderate" violation level be incorporated to better utilize the authorized officer's discretionary authority and to avoid upgrading minor violations to major ones. It is the intent of the BLM to upgrade minor violations to major where warranted. The BLM has determined that it will classify violations as either major or minor as defined in 43 CFR 3160.0-5. For further justification regarding violation levels, the commenter is referred to the preamble of the final rule Implementing the Federal Oil and Gas Royalty Management Act published on February 20, 1987 (52 FR 5384).

Oil Well. It was suggested that this definition be consistent with other BLM policy. This suggestion was adopted and the definition changed accordingly.

Production Facilities. For consistency with BLM policy, the words "for royalty purposes" have been removed and replaced with "approved measurement point."

Prompt Correction. It was suggested that immediate correction of all alleged noncompliances should not be required, but that many "discrepancies could be safely delayed." The inclusion of this standard is necessary to resolve those noncompliance actions which cause or threaten immediate, substantial and adverse impacts on public health and safety. Therefore, this comment was not adopted.

Radius of Exposure. One commenter pointed out that use of different methods and calculations using the Pasquill-Gifford equation for the 100 and 500 ppm radii of exposure results in different radii of exposures. The BLM recognizes this and provides for use of other models if approved by the authorized officer. The operator would be required to demonstrate the applicability and acceptability of the model to the situation. Three commenters indicated that there is a high degree of variability in air quality models recommended for use when the H₂S concentration exceeds 10 percent. One of the commenters

suggested that the Pasquill-Gifford equation coupled with the other assumptions is so conservative that it could not be applied to concentrations in excess of 10 percent, and that section II.S.3. should be removed. Another commenter questioned how one of a series of models is to be selected. The BLM agrees that there is a high degree of variability between models, and therefore the operator has the option to utilize the model most applicable to the specific situation. The EPA's "Guidelines on Air Quality Models—(EPA-450/2-78-027R)" is intended to assist operators in this selection. The BLM does not agree that the Pasquill-Gifford equation is extremely conservative, but rather that its assumptions become less valid at concentrations in excess of 10 percent in stable atmospheres. Therefore, the suggestion to remove section II.S.3. was not adopted. Alternative wording was also suggested for section II.S.3. so that the operator would not be limited to those models contained in the EPA publication previously referenced. This suggestion was adopted and the language incorporated into the Order.

III. Requirements

In reference to the opening paragraph, two commenters suggested that the discretionary authority of the authorized officer be limited. One of the commenters suggested that the authorized officer's authority to require measures that vary from the minimum standards in the Order be amended to require the mutual consent of the operator. The BLM assumes a regulatory role in setting the minimum standards and this rulemaking process provides for operator input. These are minimum standards that would apply on a national basis. The authorized officer will rely on staff for any additional requirements deemed necessary on a local or geographic basis and if warranted, issue a Notice to Lessees (NTL) pursuant to 43 CFR 3164.2. All additional requirements would be subject to review pursuant to 43 CFR 3165.3. Therefore, the suggestion was not adopted. However, for purposes of clarity, the introductory paragraph in section III. was rewritten.

A.1. Several commenters suggested that when there are multiple filings for wells in a single field, the operator should be allowed to submit one Drilling Operations Plan, supplemented by the well site diagram for each well as required in Onshore Oil and Gas Order No. 1. The BLM agrees that this would save paperwork for both the operator and the authorized officer. This

suggestion was adopted and expanded to include Public Protection Plans.

One commenter suggested that except where a general populace alert program is being used, the BLM should not require a Public Protection Plan for approval, but rather have the operator certify that one will be prepared and in place prior to the provisions of III.C.1.b. going into effect. The BLM has a regulatory responsibility to ensure that reasonable and prudent measures to protect public health and safety are in place before approving any action within its authority. Implementation of the suggested procedure would not fulfill that responsibility.

It was suggested that the following be required in the Drilling Operations Plan: duties, responsibilities, and procedures to be initiated at various H₂S concentrations; procedures for evacuation of personnel; agencies to be notified; and a list of medical personnel and facilities. The duties, responsibilities, and procedures for H₂S concentrations are required in section III.C.; the procedures for personnel evacuation in section III.C.3.e.; and the agencies to be notified in section III.A.3.b. of the Order. The requirements for medical personnel and facilities are covered by OSHA regulations and are not within the BLM's authority.

The scope of this section was expanded to include the BLM's intent that a single Public Protection Plan may also be submitted for a lease, communitization agreement, unit or field where applicable. To eliminate redundancy, the phrase "and the APD shall not be approved by the authorized officer" was removed from the last sentence of the first paragraph.

A.1.a. Several commenters stated that the requirement to include a statement of certification unnecessarily extends the normal contractor/operator working relationships and suggested alternative wording. The BLM agrees that certification is unnecessary since the contractor is obligated to provide such training and the operator is responsible for securing a written statement in accordance with the requirements of this Order. The phrase "of certification" has been removed from the provision.

A.1.b. Four commenters questioned the requirement of a map showing the terrain of the area surrounding the well site. It was suggested that the requirement be removed or that reference be made to Onshore Oil and Gas Order No. 1 which requires submission of a topographic map. Knowledge of the surrounding terrain is critical to evaluation of the H₂S Drilling Operations Plan. However, if the topographic map submitted in

accordance with Order No. 1 is of sufficient clarity, scale and coverage. It would suffice in meeting this requirement. One commenter suggested that due to the long lead time between approval and actual drilling, the operator be allowed to submit two diagrams. The BLM agrees in part with this recommendation. If conditions change from the time an APD containing the initial diagram is approved to the time of actual drilling, a Sundry Notice with a revised diagram reflecting the necessary changes can be submitted for approval.

One commenter suggested that weather/seasonal changes be listed in this requirement. The dispersion models are conservative and deal with most temperature and weather conditions. In addition, the authorized officer may request additional information, when necessary. Therefore, this suggestion was not adopted. The same commenter suggested that "essential personnel" be specifically identified here and that all rig personnel be treated equally in the Order. The BLM is responsible only for those personnel necessary for well control (i.e., essential personnel) and OSHA is responsible for general worker safety. Therefore, the operator should have the latitude to determine which category of personnel are necessary to meet the minimum safety standards. It was also suggested that a requirement to include the location of permanent sensors and audible/visual alarms be identified here. The commenter is referred to section III.C.3.c. which specifically requires the location for such equipment.

A.1.c. Four commenters questioned the need for a complete description of the H₂S equipment/systems. They felt that it would be a burdensome submission of information. The BLM partially addressed this concern by removing the words "and their use." It is the BLM's intent for the operator to provide a complete description of specific equipment/systems required in the Order because such a description is necessary for the authorized officer to properly evaluate the acceptability of the H₂S Drilling Operations Plan to fulfill the BLM's public health and safety responsibilities.

Two commenters questioned the requirement for remote controlled chokes on all drilling wells. The BLM considers this equipment necessary for timely and efficient well control so as to minimize the release of H₂S. In areas where there are known low volume/low pressure reservoirs, variances should be requested by the operator.

Three commenters suggested that the word "permanent" in section III.A.1.c.iii.

be changed. The BLM agrees that this word is not appropriate since the duration of drilling operations is short term.

It was recommended that the heading "Mud program" be changed to "Mud program and scavengers". Scavengers are a type of additive which is included in the subsection. Such a change would be repetitive and therefore, was not adopted.

A.2.a. Two commenters suggested that the operator simply calculate the radii of exposure and advise the authorized officer when the criteria in Section III.B.1. have been exceeded rather than submit the calculations. The BLM considers this information necessary to identify all facilities subject to this Order and ensure compliance with the required radius of exposure calculation methods. It is the BLM's intent to review the submission on a timely basis. Therefore, this suggestion was not adopted.

It was suggested that the respective time periods of 180 days and one year for submission of radii exposure calculations and a Pacific Protection Plan for each existing production facility be significantly shortened. The BLM considers these time periods as being reasonable and consistent with the operational equipment requirements specified in section III.D. of the Order. The commenter also suggested that the time period of 60 days for submission of a Public Protection Plan for a new production facility, where applicable, should be increased. The BLM considers 60 days to be adequate time for the preparation and submission of this plan. The 60-day requirement is also commensurate with timeframes required by the BLM for other plans (e.g. site security plans).

Two commenters suggested that water flowlines be excluded from the calculations required in this paragraph. The BLM agrees and this change has been made in the final rule.

A.2.b. Two commenters suggested various timeframes for the operator to submit an H₂S component gas analysis for each well to the authorized officer. The authorized officer has the authority under 43 CFR 3162.4-2 to require tests when necessary.

A.2.c. Several commenters stated that the notification requirement for unspecified changes in H₂S concentration or the radius of exposure was not reasonable and suggested various limitations and timeframes. The BLM agrees in part and the requirement has been changed to apply only when increases of 5 percent or more of the H₂S concentration or radius of exposure

occurs over that initially required under sections III.A.2.a. and III.A.2.b. of the Order. The 60-day requirement for notification is considered reasonable and has been retained.

A.3.b. Three commenters questioned the meaning of the phrase "that may endanger the public" and suggested alternate wording. The BLM agrees in part and replaced it with "a potentially hazardous volume" which has been defined in the Order. In addition, for purposes of clarity, the phrase "accidental release" has been changed to "any release". One commenter stated that the notification requirement is redundant with the requirements of the Superfund Amendments and Reauthorization Act (SARA), Title III, SARA, Title III does not ensure that the authorized officer will be notified and, therefore, this requirement has been retained. Two commenters questioned the need to elaborate on subsequent violations. The BLM agrees and such wording has been removed. One commenter suggested that the violation be major. The BLM is primarily concerned with adequate operator implementation of the Public Protection Plan and control of the H₂S upon detection of a release that may affect public health and safety rather than a notification requirement that does not directly affect public health and safety. Therefore, this suggestion was not adopted. It was also recommended that the criteria for reporting and the category of violation be tied to the severity of the release similar to the criteria in the current Notice to Lessees—3A. Since public endangerment is the primary criteria and not necessarily the volume of release, this suggestion was not adopted.

For purposes of consistency with the definition of "potentially hazardous volume", the term "SO₂" has been removed from this requirement. Requirements regarding SO₂ are addressed in other sections of this Order. SO₂ is not associated with ordinary release of H₂S unless H₂S is ignited. However, the BLM does not intend by deleting this reference to imply that SO₂ is not potentially hazardous.

B.1. One reviewer felt that the phrase "and special precautions taken" in the introductory paragraph is superfluous. The BLM agrees and the phrase has been removed.

It was recommended that a single Public Protection Plan be required where wells and facilities exceeded an unspecified minimum level or are located within ¼ mile of a public place. The Order provides for a single plan in

section III.B.2. The recommended criteria would be more stringent than the proposed minimum standard and radii of exposure is a more reasonable criterion for public safety than distance alone. Therefore, this suggestion was not adopted.

One commenter suggested that an exception to public notification be written into Public Protection Plans and accepted where releases of H₂S are common (e.g., plant upsets). Any releases resulting in H₂S levels as defined under "potentially hazardous volume" constitute a public hazard and warrant public notification. Therefore, this suggestion was not adopted.

It was recommended that the phrase "or other areas where the public could reasonably be expected to frequent" as used in this section and other sections of the Order be changed to "or other public areas that can expect to be populated". No reason was provided and the phrase did not appear to improve clarity. Therefore it was not adopted.

B.2.a.i. Several commenters were received suggesting that the phrase "potentially hazardous release" be changed or defined. The BLM agrees and the phrase has been changed to "potentially hazardous volume". In addition, the term "SO₂" has been removed for consistency with the definition of "potentially hazardous volume".

For purposes of consistency with section III.A.1. and to clarify the BLM's intent, the phrase "For production" has been removed from the beginning of the second sentence.

B.2.a.ii. One commenter felt that release of a potentially hazardous volume of H₂S should not be classified as a violation. The Order does not provide for a violation for the incidental release of H₂S because it could occur at anytime beyond the operator's control. However, the Order does provide that, upon detection of such a release, the operator is responsible for implementing the Public Protection Plan in order to protect public health and safety. Failure to implement this plan in the event of a release constitutes a violation. The same commenter suggested that the operator should have strong input in the Public Protection Plan. Since the operator is responsible for preparing the plan, he/she is the primary contributor to the document.

The term "SO₂" has been removed for consistency with the definition of "potentially hazardous volume".

B.2.a.iii. One commenter suggested that the abatement period for workover operations be changed to 24 hours. The BLM agrees and has adopted this recommendation.

B.2.b.i. One commenter suggested that the second sentence of this paragraph be removed and wording added in the following section to allow the use of general populace alert plan as is used in Texas. Another commenter felt that the wording was ambiguous. It is the BLM's intent that alternate plans may be used and latitude for alternatives is provided in the existing wording. However, if the operator proposes to use a populace alert plan only, a variance should be requested. Further, the language provides latitude to the operator to submit an adequate plan in areas of high population density, given the variety of conditions that may occur nationwide.

B.2.b.ii.(b) Four commenters suggested the use of "exposed to H₂S concentrations of 100 ppm" in this provision since the term "area of exposure" is not defined. The suggestion was adopted in part and the wording changed to "the 100 ppm radius of exposure". For clarity, the phrases "those responsible for safety of public roadways" and "as defined by the applicability criteria in section III.B.1." were incorporated into the first sentence. Two commenters suggested removing the last sentence, since the operating provisions of the Order provide adequate protection for nearby residents, while another commenter felt that the requirement was not stringent enough to provide adequate public protection. The BLM agrees that adequate public protection measures are provided in other sections of the Order, and therefore the sentence has been removed.

B.2.b.ii.(e) One reviewer recommended that the words "by visit or letter" be added after the words "Advance briefing". This suggestion was adopted and modified to read "Advance briefings, by visit, meeting, or letter . . ." Several commenters suggested that the phrase "or things that may be endangered" be removed from the end of the section since one of the primary purposes of the Order is to protect the public. The BLM agrees and it has been removed.

B.2.b.ii.(g) In order to clarify the BLM's intent to provide protection from the hazards of SO₂ and for consistency with section III.C.4.a.iv., a reference to SO₂ monitoring has been added for inclusion in the Public Protection Plan.

C.1. One commenter expressed confusion over the applicability of the 100 ppm in the gas stream criterion and the 20 ppm ambient concentration and stated that the Order appears to differ from the criteria specified in Onshore Oil and Gas Order No. 2. The reviewer is directed to the General Comments

section of this preamble for clarification on the applicability criteria. The 10 ppm ambient concentration for taking measures to protect personnel is based on the revised OSHA criteria published in the Federal Register on January 19, 1989 (54 FR 2490). For consistency, the BLM will make appropriate changes to Order No. 2.

It was suggested that the Drilling Operations Plan be available at the well site only when operations are actually being conducted. The BLM agrees and the words "during operations" have been added to this section. The section has been further expanded to make clear when the operator is subject to this requirement.

C.1.b. One commenter disagreed that H₂S training should be completed and equipment be made operational at 500 feet above or 3 days prior to the first potential H₂S zone while another commenter endorsed the requirement, but suggested that the violation be classified as minor. It is critical that operating personnel be adequately trained a reasonable amount of time prior to the date it is expected that H₂S will be encountered so that they can respond competently and quickly to protect public health and safety. The BLM considers the requirement reasonable and that the violation classification for failure to take these measures is consistent with the definition of "major".

It was recommended that the caveat of "or the atmospheric concentration of H₂S reaches 10 ppm" be added to the criteria in this section. The 100 ppm criterion is used solely for determining which wells are subject to the provisions of this Order, and should not be confused with the ambient standards to which the operator is subject once the Order is in effect. Since this section deals with the basic applicability of the Order rather than ambient concentration, this suggestion was not adopted.

It was recommended that the phrase "unless detrimental to well control" be removed from subsection I. The BLM believes that situations do exist where shutting the well in may be detrimental to well control, which is one of the primary lines of defense to prevent a release of a hazardous volume of H₂S gas. Therefore, the suggestion was not adopted.

One reviewer suggested that for consistency, the time periods for notifying the authorized officer as used in this section should be stated in terms of business days. The BLM agrees and the wording has been changed in subsection iii. Time periods for

corrective actions are properly stated as hours or calendar days.

Two commenters suggested that the authorized officer be authorized to approve interim resumption of operations prior to the requirements being met in this section where the operator can show that adequate safeguards are being employed to protect the public. It was recommended that the words "general populace alert plan" also be inserted here. The BLM considers the minimum standards to be reasonable. In addition, the authorized officer may approve resumption of drilling operations in emergency situations, or a variance could be requested by the operator. Therefore, these suggestions were not adopted.

C.2.a. Two commenters disagreed that two means of egress should be required at all well sites. The BLM considers this requirement important to maximize safe egress from drilling and completion sites. The Order provides for only one road and a foot path when a secondary road is not practical. Three commenters suggested that the violation should be changed from major to minor. The Bureau agrees with this recommendation since failure to meet this requirement does not meet the criteria for a major violation as defined in this Order.

C.2.b. Two reviewers suggested that the violation be changed from major to minor. The BLM agrees with this recommendation since failure to meet this requirement does not meet the criteria for a major violation as defined in this Order.

Two commenters stated that secondary escape routes are just as important in workover operations as they are for drilling and completion operations. The BLM believes that more unknown factors such as H₂S concentration, pressures, and flow rates exist in drilling and completion operations and therefore, require more safety contingencies.

C.3.a. One commenter reiterated earlier concerns that the BLM is establishing recommended practices as enforceable regulations here. The commenter is referred to the discussion in this preamble on section 1.A.

Three commenters suggested that the requirement to "certify" training of all personnel be removed for various reasons related to contract relationships and numerous suggestions for alternate wording were made. The BLM recognizes the potential contractual problems associated with the word, "certify" and has replaced it with the word "ensure".

Two commenters suggested that the training requirements should apply only

to essential personnel. The BLM believes that all personnel working around H₂S should be trained although additional provisions are made for "essential" personnel. Therefore, this suggestion was not adopted.

One commenter questioned the jurisdiction of this Order since specific operations were not listed. This Order extends to the same operations that are subject to the oil and gas regulations contained in 43 CFR part 3180.

It was suggested that the phrase "or its equivalent" in subsection I be removed. No rationale was provided and since the driller's log recommended by the International Association of Drilling Contractors is not used in all geographic areas, this suggestion was not adopted.

It was recommended that the violation in subsection iii. be changed from major to minor. The BLM agrees with this recommendation since failure to meet this requirement does not meet the criteria for a major violation as defined in this Order.

C.3.b.i. Several commenters suggested that the word "ensure" be changed to "require" for various reasons relating to the operator's ability to oversee subcontractors. It is the BLM's intent that the word "ensure" as used in this Order means that an operator will monitor contractor/subcontractor operations on site such that they meet the minimum standards as set forth in this Order. Therefore, this suggestion was not adopted.

It was recommended that the word "shall" be changed to "must" with respect to providing a breathing apparatus for the derrickman. The word "shall" means that it is required, and therefore this suggestion was not adopted. It was also suggested that provisions for a line from a cascade system be added here. The Order does not preclude the use of this system. However, the BLM considers this proposal to be unreasonable as a minimum standard. Therefore, this suggestion was not adopted.

One commenter suggested that the Order specifically require the use of "pressure-demand type" breathing apparatus. The cited standard (ANSI Z88.2-1980) includes this requirement as well as other standards for this equipment. This standard sufficiently describes the requirements; however, this section of the Order was modified to clarify that all working equipment must be a pressure-demand type.

The first sentence of this requirement was modified to clarify that the current edition of the ANSI standard is applicable.

C.3.b.ii. It was recommended that breathing apparatus be required for all personnel. The BLM believes that a prudent operator will provide equipment for all personnel, but as a minimum standard, given the BLM's limited authority, it will be required for essential personnel only.

C.3.b.iii. Two commenters suggested that the violation for a lack of communication devices should be changed from major to minor. The BLM considers communication essential to the proper implementation of a Drilling Operations and/or Public Protection Plan. Since communication has a direct bearing on public health and safety, the violation of major was retained.

C.3.c. Three commenters suggested that the threshold limits for the visual and audible alarms of 10 and 15 ppm, respectively, were not appropriate, especially the 15 ppm level. The BLM recognizes the standard of 20 ppm as used in industry and advocated by the American Petroleum Institute. However, to be consistent with the Federal OSHA requirements, the BLM adopted the limits of 10 ppm time-weighted average and 15 ppm short-term exposure for H₂S.

It was recommended that a sensor be required in the cellar in lieu of the bell nipple, and that a sensor be placed in the mud house. It is logical that H₂S would break out at the bell nipple and be sensed earlier than in the cellar itself. A sensor at the bell nipple should sense any H₂S breaking out of the mud before it reaches the shale shaker. Therefore, this suggestion was not adopted.

One commenter suggested that a requirement for a public address system be added. This requirement may be appropriate for confined operations but not in unconfined areas such as the majority of onshore locations. The majority of onshore locations do not have camp facilities associated with the drilling operation, and for those that do, the authorized officer may require such a provision on a site-specific basis. Further, the briefing areas provide a place for communication with workers. Therefore, this suggestion was not adopted. The same commenter also stated that testing of the monitoring equipment to manufacturer's standards was not appropriate since it would allow the manufacturer to determine testing and calibration standards. The BLM currently considers the manufacturer's recommended standards to be reasonable as minimum standards for testing. Another commenter suggested that the Order incorporate calibration standards. BLM agrees and modified the text to include the calibration of H₂S detection and monitoring equipment in accordance

with the manufacturer's recommendation. Also, the Minerals Management Service of the Department of the Interior is conducting an evaluation of calibration frequencies. BLM will consider the results of this evaluation and possibly develop calibration frequency standards. Any alternative methods of calibration or suggestions regarding calibration frequency requirements may be sent to the Director of BLM at the address specified in the beginning of this preamble.

C.3.d. One commenter suggested that the wind direction indicators be placed at the briefing areas since they may not be visible if the light plant fails. This possibility was considered, and the present wording "shall be visible at all times" provides the operator with latitude to meet this requirement on a site-specific basis. Therefore, this suggestion was not adopted.

Two commenters suggested that it may be necessary to have two signs posted on the access routes leading to a drilling site to allow large vehicles or those with trailers adequate time and space to turn around safely. This suggestion was adopted in part and the provision has been amended to allow vehicles adequate opportunity to turn around prior to reaching the well site.

Two commenters expressed concern as to the requirement for bilingual or multilingual signs. One commenter questioned the authorized officer's knowledge to determine where such a requirement is appropriate and the other requested that the current, in-place signs be accepted or grandfathered to minimize economic impacts to industry. The authorized officer is aware of those areas where bilingual or multilingual signing would be appropriate and the number of areas is considered to be minimal. Therefore, the economic impact would be minimal.

Several commenters stated that the requirement to have essential personnel put on their masks, move non-essential personnel, and display red flags when 10 ppm of H₂S is detected at any sensing point was unnecessarily restrictive. The commenters further suggested alternative wording. The BLM believes that such measures are essential to ensure adequate well control and public health and safety. The BLM agrees with one reviewer that operations should be allowed to proceed once these measures are implemented. This recommendation was incorporated by separating part of the language from section 3.C.d.vii and placing it into the new section 3.C.e. which provides for securing the area and allowing operations to proceed once non-essential personnel have been

moved and essential personnel have donned protective breathing apparatus. One commenter suggested that this requirement only be applicable to detection points as required by the Order. The BLM believes that any prudent operator will not ignore readings from any detection point which indicates a problem. These requirements are minimum standards, and inspection and enforcement will be in accordance with the approved Application for Permit to Drill. Therefore, this suggestion was not adopted.

C.3.e. For purposes of clarity, the phrase "an area secured and conditions are below 10 ppm" has been removed and replaced with the word "accomplished".

C.4.a. It was suggested that well testing and swabbing during completion and workover operations should be specifically discussed and the operator should be granted more flexibility. The BLM believes there is little basic difference in operating procedures here and that the minimum standards are applicable to workovers and completions. Furthermore, where differences do exist, they have been stated. Therefore, this suggestion was not adopted.

C.4.a.i. Several commenters disagreed that the use of a mud system should be the minimum standard for drilling, completions, and workovers. All commenters contended that aerated mud and non-mud systems can be used in some situations, primarily in low-pressure H₂S zones. The BLM recognizes that these situations exist. However, in the interest of public health and safety, the use of mud systems as the minimum standard is considered appropriate. The operator may request a variance in those cases cited by the commenters.

C.4.a.ii. Two commenters suggested that this provision be amended to read "where operating pressures are sufficient". Neither commenter provided any rationale for their suggestion and the term "sufficient" is ambiguous. The existing wording as a minimum standard meets the intent of protecting public health and safety.

C.4.a.iii. Three commenters suggested that the flare line lengths should be changed to 100 feet to be consistent with Order No. 2. Flare lines of 150 feet are considered reasonable for H₂S locations due to the additional risk involved and that larger locations may be necessary. The BLM does not agree that this provision needs to be consistent with Order No. 2 since the two Orders deal with different conditions. Therefore, this suggestion was not adopted.

C.4.a.v. Two commenters felt that this requirement was unnecessary and that the violation should not be major. The BLM considers that this measure is reasonable for the protection of public health and safety and that the potential hazard to the public if it is violated is significant. Therefore, the violation gravity of major is appropriate.

C.4.a.vi. It was suggested that the wording be changed to require SO₂ monitoring equipment only when there is a reasonable expectation that the public may be exposed to 2 ppm or greater of SO₂. It is the BLM's intent that this provision include "essential personnel" who are necessary for well control as well as the public. Therefore, this suggestion was not adopted.

One commenter stated that the 2 ppm SO₂ level should not be a threshold, but a continuous level. It is the BLM's intent that the minimum standards used in this Order are for sustained levels. In addition, the reference to 2 ppm or greater of SO₂ in parentheses was removed since it was unnecessary.

C.4.a.vii. One commenter pointed out that the BLM did not use any SO₂ applicability criteria in determining when a public protection plan is to be submitted. The BLM used only H₂S concentration in developing the applicability criteria, but recognizes that SO₂ results from flaring the H₂S and is hazardous. Therefore, keying solely on H₂S also includes safety measures for SO₂ as a burned by-product of H₂S.

C.4.a.viii. Three commenters suggested that the requirement for a remote controlled choke for all operations was unnecessary and made various suggestions as to the conditions in which it should be required, including specific pressures, abnormal pressures, or proximity to public areas. In addition, it was suggested that the violation gravity be changed from major to minor. The remote controlled choke is considered necessary for well control not only for purposes of public health and safety, but also for conservation of the resources. For these reasons, the violation gravity has been retained as major.

C.4.a.ix. Several commenters suggested that requiring rotating heads for all exploratory wells is overly restrictive and that they should only be required when drilling in an underbalanced condition or where formation pressure cannot be reliably estimated. Exploratory drilling necessarily involves a high degree of uncertainty as to the pressures, conditions, or formations that may be encountered during drilling operations. Therefore, in the interest of public

health and safety this requirement is considered necessary.

C.4.b.i. Two commenters urged that the requirement for maintaining a pH of 10 or greater in mud systems containing polymers be eliminated or an exception be granted for polymer muds. The commenters failed to be specific about the type of polymer system and polymer use. The term "polymer mud" includes many different types and chemically different polymer compounds. Since most polymers are mainly used for viscosity development, versus fluid loss control or shale stabilization, higher pH in many polymer systems yields maximum viscosity development. Individual mud system proposals contained in an Application for Permit to Drill (APD) are required to consider the necessity of higher mud pH when inhibiting H₂S returns to the surface and to weigh the expense of eliminating some mud additives not conducive in high pH mud environments to those that are. This minimum standard also contains a provision for the use of lesser pH muds if formation conditions or mud types justify it. The commenters also stated that corrosion control can be achieved by means other than increased pH. Another purpose of increasing pH is to prevent H₂S from reaching the surface by formation of sulfide radicals and increased scavenger efficiency. Therefore, the minimum standard for maintaining a mud pH of at least 10 is retained unless specifically approved in the APD or through a variance request.

It was suggested that the Order state that clear fluids may be used for workover and completion activities when such fluids are adequate for well control. The Order is silent on this point, and therefore such fluids may be used during those activities.

The first sentence has been reworded to clarify the BLM's intent to require a pH of 10 as a minimum standard, unless formation conditions dictate otherwise. In addition, the word "prevent" has been changed to "minimize" to more accurately describe the effects of pH with respect to H₂S.

C.4.b.iii. One commenter was confused by this requirement since it appeared to duplicate C.4.b.i. There is a significant difference between controlling the pH of the mud and the addition of scavengers and additives to the mud to control surface observed H₂S. It is because additional measures may be necessary when drilling unknown formations to control H₂S reaching the surface even if the 10-ph standard is met. The commenter also suggested that the violation gravity be changed from major to minor but

provided no rationale. This suggestion was not adopted.

C.4.c. It was suggested that the word "suitable" in the first sentence be replaced with "designed per the requirements of API Recommended Practice-49 (RP-49)". This Order and RP-49 both utilize NACE standards. However, RP-49 utilizes additional standards not applicable to this requirement, therefore the more specific NACE standards have been referenced.

Several commenters suggested that the word "prevent" in the first sentence of the second paragraph be changed to "minimize" since these measures do not assure the prevention of stress corrosion cracking or embrittlement. The BLM agrees and the wording was changed.

Two commenters pointed out that NACE Standard MR-01-75 is not applicable in concentrations of less than 100 ppm of H₂S. The BLM recognizes this and it should be understood that the requirements of this Order do not apply unless 100 ppm or greater of H₂S is anticipated in the gas stream. However, this standard is deemed appropriate when the applicability criteria for this Order have been met.

It was suggested that the last sentence of the second paragraph be removed since obtaining the manufacturer's verification for H₂S service may be difficult for some existing equipment. The BLM does not see a reasonable alternative approach to determining suitability for H₂S service and considers it necessary for protecting public health and safety. Further, such verification would be difficult only in a very few cases, resulting in a negligible impact to industry overall. Therefore, the BLM considers this requirement to be reasonable and the suggestion was not adopted.

The fourth sentence of this requirement was modified to clarify that the current edition of the NACE standard is applicable.

C.4.d. Two commenters suggested that the paragraph be changed to allow for drill stem tests under certain conditions other than closed-chamber tests during daylight hours. The BLM recognizes that with proper planning and use of appropriate facilities, these tests can be conducted under other conditions. The existing language in the Order provides this latitude, and therefore no changes are necessary.

It was suggested that this paragraph be more specific to ensure that all gas is run through a separator and flared. The requirements of section III.C.4. are applicable to all operations, including testing, completions, and workovers. Therefore, no changes are necessary.

D.1.a. One commenter suggested that the words "that meet the criteria for requirement of H₂S controls but" be inserted between the words "facilities" and "which" to clarify what facilities are meant by the word "all". The initial criterion of 100 ppm H₂S in the gas stream for the applicability of this Order is sufficiently clear to determine the facilities included in this paragraph. Therefore, this suggestion was not adopted.

It was suggested that the timeframe for conformance be changed from 1 year to 6 months. Information submitted to the BLM indicates that it may take as long as 6 months to acquire some of the necessary equipment and since the commenter offered no rationale for the suggestion, the 1-year requirement is considered reasonable.

One commenter suggested that this paragraph make it clear to which equipment this requirement applies. The commenter is referred to the response provided under D.1.a. above.

D.2. It was recommended that the criteria for applicability be changed from 500 to 100 ppm H₂S for storage tank vapors. The commenter did not provide any rationale and the data submitted in response to proposed Order No. 2 in 1984 indicates that with the volumes of gas involved and using standard operating procedures, less than 500 ppm in this situation does not constitute a hazard to public health and safety.

D.2.d. Two commenters suggested that signs with colors of yellow and black should also be allowed under this requirement to be consistent with III.C.3.d.iii. The BLM believes that during production, H₂S hazards are known to be present. Therefore, danger signs (red, white and black) are appropriate rather than using caution signs (yellow and black) which are required during the drilling stage when H₂S may be, but is not necessarily known to be, present. Therefore, this suggestion was not adopted. One commenter suggested that it should be left to the operator's discretion as to the appropriate use of bilingual or multilingual signs. The authorized officers of the Bureau are very cognizant of those areas where such signs are appropriate, and therefore this suggestion was not adopted.

D.2.f. One commenter expressed that flexibility should be provided for those areas where the population adjacent to the H₂S operations is sparse and primarily consists of businesses associated with the oil and gas industry. This provision is intended to protect the general public, and if a situation as described occurs, a variance with

appropriate alternate measures could be approved by the authorized officer.

Two commenters suggested that the words "other equivalent means" be added to this paragraph and section III.D.3.c. to provide more flexibility to the operator. This minimum requirement is considered reasonable when the specified criteria are met. The BLM recognizes that special cases will arise where alternative measures may be acceptable but has determined that a variance should be requested in such cases.

In reference to this paragraph and section III.D.3.c., one commenter expressed the view that the criteria of being within ¼ mile of an incorporated area may not be reasonable since some municipalities have incorporated large amounts of undeveloped land. The BLM recognizes this concern, but this would not be true for the majority of field situations. In situations where it does occur, the operator should request a variance.

Two commenters stated that the requirement to keep gates locked could endanger authorized personnel working at the site. The BLM agrees and has added Section III.D.2.g. to make it clear that the gates are to be locked when unattended by the operator. This section also specifies the degree of violation, corrective action, and the normal abatement period.

D.3.b. Several commenters questioned the reasonableness of requiring danger signs at all points where the well flowlines and lease gathering lines cross public or lease roads. They expressed concern that this requirement would cause an unnecessary cost and create potential visual degradation. They also stated that the placement of a sign at the entrance to each field or lease area would be adequate. It is the BLM's intent to identify sources where 100 ppm or more of H₂S in the gas stream may constitute a potential hazard. Therefore, the signing requirement is considered a reasonable measure to protect public health and safety. One of the same commenters also questioned the scope of this requirement. This requirement is applicable to all flowlines up to the approved measurement point.

D.3.d. For consistency with section III.D.2.g., the same requirement concerning locked gates has been established for production facilities under section III.D.3.d. Subsequent sections were redesignated accordingly.

D.3.e. (Redesignated D.3.f.) One commenter questioned what is meant by a "secondary means of immediate well control". The BLM intends this to mean that it is required to be on the stem of the christmas tree and that a wing valve

would not meet this requirement. The same commenter recommended that this provision should only be applied to high volume/high pressure wells. All wells subject to the terms of this Order have the potential to create a hazardous environment, not just high volume/high pressure wells. Therefore, this suggestion was not adopted.

Two commenters also suggested that the requirement should be more flexible by specifically allowing the use of remotely operated valves triggered by a fixed ambient monitor. The existing wording provides the flexibility requested, and therefore this suggestion was not adopted.

It was recommended that the requirement for automatic shut-in equipment should be at the discretion of the authorized officer. However, the commenter did not offer any rationale for this suggestion. The BLM considers this requirement to be the appropriate minimum standard in order to promote conservation of the oil and gas resource, protect public health and safety, and prevent environment degradation. Therefore, this suggestion was not adopted.

One commenter suggested that existing wells be "grandfathered" and reviewed on a case-by-case basis with respect to the secondary means of well control specified in this section and the automatic safety valves or shutdowns specified in D.3.g. (Redesignated D.3.h.). Existing wells potentially constitute the majority of the hazards and to "grandfather" them does not meet one of the primary purposes of this Order, which is to protect public health and safety. Therefore, this suggestion was not adopted.

D.3.f. (Redesignated D.3.g.) It was recommended that all existing equipment that is in a safe working condition be specifically accepted as meeting the metallurgy standards, and that equipment which is not in a safe working condition be replaced. By safe the BLM means the equipment is operating as intended. The BLM agrees with this recommendation and has incorporated wording under section D.1.a. to exempt certain production equipment from metallurgical requirements. This exemption would not apply to new operational equipment, equipment that is unsafe, or repair and/or replacement parts.

D.3.g. (Redesignated D.3.h.) One commenter expressed that this requirement was ambiguously worded and suggested alternate wording. The BLM adopted the suggestion in part by adding "or other appropriate shut-in controls for wells equipped with

artificial lifts" at the end of the sentence.

It was noted that no requirement existed for utilizing the safety valves or shutdowns as required by this section. Therefore, a section requiring these controls to be activated upon a release of a potentially hazardous volume of H₂S was created and numbered as section III.D.3.i. in the final rule. All subsequent sections were redesignated accordingly.

D.3.h. (Redesignated as III.D.1.c.) The provisions of this section were intended to apply to both production facilities and storage tanks. Therefore, this section was moved and redesignated as section III.D.1.c. in the final rule. In addition, the wording was slightly modified to clarify the intent of this requirement.

Several commenters stated that the requirement for vapor recovery when the H₂S concentration reached 10 ppm or more at 50 feet from the facility was overly restrictive primarily because it does not constitute a hazard at that level, and the applicability criteria for the Order of 100 ppm in the gas stream was sufficiently restrictive. The 100 ppm concentration in the gas stream cannot be equated to the 10 ppm radius of exposure. A 10 ppm ambient concentration of H₂S implies a flow that could subject the public to a sustained level of H₂S. The 10 ppm level is the maximum acceptable for 8-hour working conditions, but is not acceptable for general public exposure. Further, such facilities are not fenced unless the criteria in D.2.f. or D.3.c. are met. Therefore, the requirement is considered reasonable in view of the concern for public health and safety.

It was suggested that the word "boundary" be added here to clarify the external limit of the facility. The term "production facility" has been adequately defined in the Order, and therefore the suggestion was not adopted.

D.3.i. (Redesignated (D.3.j.) Two commenters stated that although they supported the intent of this section, they felt the wording was awkward and questioned the authorized officer's

qualifications to specify the design for modifying the facility. The BLM agrees that the wording is awkward. Further the intent was not to have the authorized officer specify the facility design. Therefore, the wording was changed for clarity and to indicate that the authorized officer will retain approval authority over, but not specify the design for modifying, the facility.

One commenter suggested that the phrase "or other areas where the public could reasonably be expected to frequent" needed to have limits placed on it. The BLM disagrees and this suggestion was not adopted.

It was suggested that this requirement be amended to make it clear that the limits do not apply in emergency or upset conditions. The BLM has partially adopted this suggestion by adding wording to show that it applies to sustained concentrations, but that modifications are subject to review by the authorized officer.

D.4. It was noted that no Violation, Corrective Action, or Normal Abatement Period existed for this requirement. These provisions were added in the final rule.

IV. Variances from Requirements

For consistency with Order No. 2, two commenters suggested that this Order specifically provide for verbal variances to be followed up by written requests. This Order, where appropriate, makes provisions for verbal variances, so that a general provision to that effect is not necessary here. It was also suggested that the Order require that variances be documented for the protection of the operator. This is provided for in the section which requires that variances "shall be submitted in writing" to the authorized officer.

Editorial and grammatical corrections and changes have been made as necessary.

The principal authors of this final rule are Chris Hanson of the Milwaukee District Office, Wisconsin; Hank Szymanski of the Washington, DC, Office; Bill Douglas of the Wyoming State Office, Ken Baker of the Great Falls Resource Area Office, Montana

and Jim Rasmussen, formerly of the Elko District Office, Nevada, assisted by AJ Ricbau of the Wyoming State Office and the Orders Task Group, Mike Pool of the Division of Legislation and Regulatory Management, and the Office of the Solicitor, Department of the Interior.

It is hereby determined that this final rule does not constitute a major Federal action significantly affecting the quality of the human environment and that no detailed statement pursuant to section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)) is required.

The Department of the Interior has determined that this document is not a major rule under Executive Order 12291 and will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 et seq.).

The information collection requirements contained in this rulemaking have been approved by the Office of Management and Budget under 44 U.S.C. 3501 et seq. and are included in one of the following approvals: 1004-0134, 1004-0135 or 1004-0138.

List of Subjects in 43 CFR Part 3160

Government contracts, Mineral Royalties, Oil and gas exploration, Oil and gas production, Public lands-mineral resources, Indian lands-mineral resources, Reporting requirements.

Under the authorities stated below, part 3160, Group 3100, subchapter C, chapter II of title 43 of the Code of Federal Regulations is amended as set forth below:

Dated: October 12, 1990.

James M. Hughes,

Deputy Assistant Secretary of the Interior.

PART 3160—[AMENDED]

1. The authority citation for 43 CFR part 3160 continues to read:

§ 3164.1 [Amended]

2. Section 3164.1(b) is amended by revising the table which is part of § 3164.1(b):

(b) . . .

Order No.	Subject	Effective date	FEDERAL REGISTER reference	Super-cedes
1.	Approval of operations.	Nov. 21, 1983	48 FR 48916, and 48 FR 56226.	NTL-6.
2.	Drilling operations.	Dec. 19, 1988	53 FR 46798.	None.
3.	Site security.	Mar. 27, 1989	54 FR 8060	NTL-7.

Order No.	Subject	Effective date	FEDERAL REGISTER reference	Super-bodies
4	Measurement of oil	Aug. 23, 1989	54 FR 8086	None.
5	Measurement of Gas	March 27, 1989 for new facilities; August 23, 1989 for existing facilities measuring 200 MCF or more per day of gas; February 26, 1990 for existing facilities producing less than 200 MCF per day of gas.	54 FR 8100	None.
6	Hydrogen sulfide operations	January 22, 1991	56 FR	None.

Note: Numbers will be assigned by the Washington Office, Bureau of Land Management, to additional Orders as they are prepared for publication and added to this table.

Authority: The Mineral Leasing Act, as amended and supplemented (30 U.S.C. 181 et seq.); the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359); the Act of May 31, 1930 (30 U.S.C. 301-316); the Act of March 3, 1909, as amended (25 U.S.C. 396); the Act of May 11, 1938, as amended (25 U.S.C. 390a-396a); the Act of February 28, 1891, as amended (25 U.S.C. 397); the Act of May 29, 1924 (25 U.S.C. 394); the Act of March 3, 1927 (25 U.S.C. 398a-398c); the Act of June 30, 1919, as amended (25 U.S.C. 399); R.S. 441 (43 U.S.C. 1457); Attorney General's Opinion of April 2, 1941 (40 Op. Atty. Gen. 41); the Federal Property and Administrative Services Act of 1949, as amended (40 U.S.C. 471 et seq.); the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.); the Act of December 12, 1980 (42 U.S.C. 6508); the Combined Hydrocarbon Leasing Act of 1981 (95 Stat. 1070); the Federal Oil and Gas Royalty Management Act of 1982 (90 U.S.C. 1701 et seq.); and the Indian Mineral Development Act of 1982 (25 U.S.C. 2102 et seq.).

Appendix—Text of Oil and Gas Order No. 6

Note: This appendix is published for information only and will not appear in the Code of Federal Regulations.

I. Introduction.

- A. Authority.
- B. Purpose.
- C. Scope.

II. Definitions.

III. Requirements.

- A. Applications, Approvals, and Reports.
- B. Public Protection.
- C. Drilling/Completion/Workover Requirements.
- D. Production Requirements.

IV. Variances from Requirements, Attachments

I. Introduction

A. Authority

This Order is established pursuant to the authority granted to the Secretary of the Interior through various Federal and Indian mineral leasing statutes and the Federal Oil and Gas Royalty Management Act of 1982. This authority has been delegated to the Bureau of Land Management and is implemented by the onshore oil and gas operating

regulations contained in 43 CFR part 3160. More specifically, this Order implements and supplements the provisions of § 3162.1—General Requirements; § 3162.5-1(a)(c)(d)—Environmental Obligations; § 3162.5-2(a)—Control of Wells; and § 3162.5-3—Safety Precautions.

43 CFR 3161.3 specifically authorizes the Director, Bureau of Land Management, to issue Onshore Oil and Gas Orders, when necessary, to implement or supplement the operating regulations and provides that all such Orders shall be binding on the operator(s) of all Federal and Indian (except Osage Tribe) oil and gas leases which have been, or may hereafter be, issued. The authorized officer has the authority pursuant to 43 CFR 3161.2 to implement the provisions of this Order, require additional information, and approve any plans, applications, or variances required or allowed by the Order.

The authorized officer may, pursuant to 43 CFR 3164.2, issue Notices to Lessees and Operators (NLT's), after notice and comment, to supplement or provide variances of this Order as necessary to accommodate special conditions on a State or area-wide basis. Further information concerning variances may be found in section IV. of this Order.

B. Purpose

The purpose of this Order is to protect public health and safety and those personnel essential to maintaining control of the well. This Order identifies the Bureau of Land Management's uniform national requirements and minimum standards of performance expected from operators when conducting operations involving oil or gas that is known or could reasonably be expected to contain hydrogen sulfide (H₂S) or which results in the emission of sulfur dioxide (SO₂) as a result of flaring H₂S. This Order also identifies the gravity of violations, probable corrective action(s), and normal abatement periods.

C. Scope

This Order is applicable to all onshore Federal and Indian (except Osage Tribe) oil and gas leases when drilling, completing, testing, reworking, producing, injecting, gathering, storing, or treating operations are being conducted in zones which are known or could reasonably be expected to contain H₂S or which, when flared, could produce SO₂, in such concentrations that upon release they could constitute a hazard to human life. The requirements and minimum standards of this Order do not apply when operating in zones where H₂S is presently known not to be present or cannot reasonably be expected to be present in concentrations of 100 parts per million (ppm) or more in the gas stream.

The requirements and minimum standards in this Order do not relieve an operator from compliance with any applicable Federal, State, or local requirement(s) regarding H₂S or SO₂ which are more stringent.

II. Definitions

A. "Authorized officer" means any employee of the Bureau of Land Management authorized to perform the duties described in 43 CFR Groups 3000 and 3100 (3000.0-5).

B. *Christmas tree* means an assembly of valves and fittings used to control production and provide access to the producing tubing string. The assembly includes all equipment above the tubing-head top flange.

C. *Dispersion technique* means a mathematical representation of the physical and chemical transportation, dilution, and transformation of H₂S gas emitted into the atmosphere.

D. *Escape rate* means that the maximum volume (Q) used as the escape rate in determining the radius of exposure shall be that specified below, as applicable:

1. For a production facility, the escape rate shall be calculated using the maximum daily rate of gas produced through that facility or the best estimate thereof;

2. For gas wells, the escape rate shall be calculated by using the current daily

absolute open-flow rate against atmospheric pressure;

3. For oil wells, the escape rate shall be calculated by multiplying the producing gas/oil ratio by the maximum daily production rate or best estimate thereof;

4. For a well being drilled in a developed area, the escape rate may be determined by using the offset wells completed in the interval(s) in question.

E. *Essential personnel* means those on-site personnel directly associated with the operation being conducted and necessary to maintain control of the well.

F. *Exploratory well* means any well drilled beyond the known producing limits of a pool.

G. *Gas well* means a well for which the energy equivalent of the gas produced, including the entrained liquid hydrocarbons, exceeds the energy equivalent of the oil produced.

H. *H₂S Drilling Operations Plan* means a written plan which provides for safety of essential personnel and for maintaining control of the well with regard to H₂S and SO₂.

I. *Lessee* means a person or entity holding record title in a lease issued by the United States (3160.0-5).

J. *Major violation* means noncompliance which causes or threatens immediate, substantial, and adverse impacts on public health and safety, the environment, production accountability, or royalty income (3160.0-5).

K. *Minor violation* means noncompliance which does not rise to the level of a major violation (3160.0-5).

L. *Oil well* means a well for which the energy equivalent of the oil produced exceeds the energy equivalent of the gas produced, including the entrained liquid hydrocarbons.

M. *Operating rights owner* means a person or entity holding operating rights in a lease issued by the United States. A lessee may also be an operating rights owner if the operating rights in a lease or portion thereof have not been severed from record title (3160.0-5).

N. *Operator* means any person or entity including but not limited to the lessee or operating rights owner who has stated in writing to the authorized officer that he/she is responsible under the terms of the lease for the operations conducted on the leased lands or a portion thereof (3160.0-5).

O. *Potentially hazardous volume* means a volume of gas of such H₂S concentration and flow rate that it may result in radius of exposure-calculated ambient concentrations of 100 ppm H₂S at any occupied residence, school, church, park, school bus stop, place of

business or other area where the public could reasonably be expected to frequent, or 500 ppm H₂S at any Federal, State, County or municipal road or highway.

P. *Production facilities* means any wellhead, flowline, piping, treating, or separating equipment, water disposal pits, processing plant or combination thereof prior to the approved measurement point for any lease, communitization agreement, or unit participating area.

Q. *Prompt correction* means immediate correction of violations, with operation suspended if required at the discretion of the authorized officer.

R. *Public Protection Plan* means a written plan which provides for the safety of the potentially affected public with regard to H₂S and SO₂.

S. *Radius of exposure* means the calculation resulting from using the following Pasquill-Gifford derived equation, or by such other method(s) as may be approved by the authorized officer:

1. For determining the 100 ppm radius of exposure where the H₂S concentration in the gas stream is less than 10 percent:

$$X = [1.589] \{H_2S \text{ concentration}\} \{Q\}^{0.475}$$

or

2. For determining the 500 ppm radius of exposure where the H₂S concentration in the gas stream is less than 10 percent:

$$X = [(0.4546)(H_2S \text{ concentration})\{Q\}]^{0.475}$$

where:

X = radius of exposure in feet;

H₂S Concentration = decimal equivalent of the mole or volume fractions (percent) of H₂S in the gaseous mixture;

Q = maximum volume of gas determined to be available for escape in cubic feet per day (at standard conditions of 14.73 psia and 60°F).

3. For determining the 100 ppm or the 500 ppm radius of exposure in gas streams containing H₂S concentrations of 10 percent or greater, a dispersion technique that takes into account representative wind speed, direction, atmospheric stability, complex terrain, other dispersion features shall be utilized. Such techniques may include, but shall not be limited to one of a series of computer models outlined in The Environmental Protection Agency's "Guidelines on Air Quality Models—(EPA-450/2-78-027R)."

4. Where multiple H₂S sources (i.e., wells, treatment equipment, flowlines, etc.) are present, the operator may elect to utilize a radius of exposure which covers a larger area than would be calculated using radius of exposure formula for each component part of the drilling/completion/workover/production system.

5. For a well being drilled in an area where insufficient data exists to calculate a radius of exposure, but where H₂S could reasonably be expected to be present in concentrations in excess of 100 ppm in the gas stream, a 100 ppm radius of exposure equal to 3,000 feet shall be assumed.

T. *Zones known to contain H₂S* means geological formations in a field where prior drilling, logging, coring, testing, or producing operations have confirmed that H₂S-bearing zones will be encountered that contain 100 ppm or more of H₂S in the gas stream.

U. *Zones known not to contain H₂S* means geological formations in a field where prior drilling, logging, coring, testing, or producing operations have confirmed the absence of H₂S-bearing zones that contain 100 ppm or more of H₂S in the gas stream.

V. *Zones which can reasonably be expected to contain H₂S* means geological formations in the area which have not had prior drilling, but prior drilling to the same formations in similar field(s) within the same geologic basin indicates there is a potential for 100 ppm or more of H₂S in the gas stream.

W. *Zones which cannot reasonably be expected to contain H₂S* means geological formations in the area which have not had prior drilling, but prior drilling to the same formations in similar field(s) within the same geologic basin indicates there is not a potential for 100 ppm or more of H₂S in the gas stream.

III. Requirements

The requirements of this Order are the minimum acceptable standards with regard to H₂S operations. This Order also classifies violations as major or minor for purposes of the assessment and penalty provisions of 43 CFR part 3163, specifies the corrective action which will probably be required, and establishes the normal abatement period following detection of a major or minor violation in which the violator may take such corrective action without incurring an assessment. However, the authorized officer may, after consideration of all appropriate factors, require reasonable and necessary standards, corrective actions and abatement periods that may in some cases, vary from those specified in this Order that he/she determines to be necessary to protect public health and safety, the environment, or to maintain control of a well to prevent waste of Federal mineral resources. To the extent such standards, actions or abatement periods differ from those set forth in this Order, they may be subject to review pursuant to 43 CFR 3165.3.

c. The 100 ppm radius of exposure is equal to or greater than 3,000 feet where facilities or roads are maintained for direct public access.

Additional specific requirements for drilling/completion/workover or producing operations are described in sections III.C. and III.D. of this Order, respectively.

2. Public Protection Plan

a. *Plan Submission/Implementation/Availability*—A Public Protection Plan providing details of actions to alert and protect the public in the event of a release of a potentially hazardous volume of H₂S shall be submitted to the authorized officer as required by Section III.A.1. for drilling or by section III.A.2.a. for producing operations when the applicability criteria established in section III.B.1. of this Order are met. One plan may be submitted for each well, lease, communitization agreement, unit, or field, at the operator's discretion. The Public Protection Plan shall be maintained and updated, in accordance with section III.A.3.a.

ii. The Public Protection Plan shall be activated immediately upon detection of release of a potentially hazardous volume of H₂S.

Violation: Major.

Corrective Action: Immediate implementation of the public protection plan.

Normal Abatement Period: Prompt correction required.

iii. A copy of the Public Protection Plan shall be available at the drilling/completion site for such wells and at the facility, field office, or with the pumper, as appropriate, for producing wells, facilities, and during workover operations.

Violation: Minor.

Corrective Action: Make copy of Plan available.

Normal Abatement Period: 24 hours (drilling/completion/workover), 5 to 7 days (production).

b. *Plan Content* 1. The details of the Public Protection Plan may vary according to the site specific characteristics (concentration, volume, terrain, etc.) expected to be encountered and the number and proximity of the population potentially at risk. In the areas of high population density or in other special cases, the authorized officer may require more stringent plans to be developed. These may include public education seminars, mass alert systems, and use of sirens, telephone, radio, and television depending on the number of people at risk and their location with respect to the well site.

ii. The Public Protection Plan shall include:

(a) The responsibilities and duties of key personnel, and instructions for alerting the public and requesting assistance;

(b) A list of names and telephone numbers of residents, those responsible for safety of public roadways, and individuals responsible for the safety of occupants of buildings within the 100 ppm radius of exposure (e.g. school principals, building managers, etc.) as defined by the applicability criteria in section III.B.1. The operator shall ensure that those who are at the greatest risk are notified first. The plan shall define when and how people are to be notified in case of an H₂S emergency.

(c) A telephone call list (including telephone numbers) for requesting assistance from law enforcement, fire department, and medical personnel and Federal and State regulatory agencies, as required. Necessary information to be communicated and the emergency responses that may be required shall be listed. This information shall be based on previous contacts with these organizations;

(d) A legible 100 ppm (or 3,000 feet, if conditions unknown) radius plat of all private and public dwellings, schools, roads, recreational areas, and other areas where the public might reasonably be expected to frequent;

(e) Advance briefings, by visit, meeting or letter to the people identified in section III.B.2.b.ii(b), including:

- Hazards of H₂S and SO₂;
- Necessity for an emergency action plan;
- Possible sources of H₂S and SO₂;
- Instructions for reporting a leak to the operator;
- The manner in which the public shall be notified of an emergency; and
- Steps to be taken in case of an emergency, including evacuation of any people;

(f) Guidelines for the ignition of the H₂S-bearing gas. The Plan shall designate the title or position of the person(s) who has the authority to ignite the escaping gas and define when, how, and by whom the gas is to be ignited;

(g) Additional measures necessary following the release of H₂S and SO₂ until the release is contained are as follows:

- Monitoring of H₂S and SO₂ levels and wind direction in the affected area;
- Maintenance of site security and access control;
- Communication of status of well control; and
- Other necessary measures as required by the authorized officer; and

(h) For production facilities, a description of the detection system(s)

utilized to determine the concentration of H₂S released.

C. Drilling/Completion/Workover Requirements

1. General

a. A copy of the H₂S Drilling Operations Plan shall be available during operations at the well site beginning when the operation is subject to the terms of this Order (i.e., 3 days or 500 feet of known or probable H₂S zone).

Violation: Minor.

Corrective Action: Make copy of Plan available.

Normal Abatement Period: 24 hours.

b. Initial H₂S training shall be completed and all H₂S related safety equipment shall be installed, tested, and operational when drilling reaches a depth of 500 feet above, or 3 days prior to penetrating (whichever comes first) the first zone containing or reasonably expected to contain H₂S. A specific H₂S operations plan for completion and workover operations will not be required for approval. For completion and workover operations, all required equipment and warning systems shall be operational and training completed prior to commencing operations.

Violation: Major.

Corrective Action: Implement H₂S operational requirements, such as completion of training and/or installation, repair, or replacement of equipment, as necessary.

Normal Abatement Period: Prompt correction required.

c. If H₂S was not anticipated at the time the APD was approved, but is encountered in excess of 100 ppm in the gas stream, the following measures shall be taken:

(i) the operator shall immediately ensure control of the well, suspend drilling ahead operations (unless detrimental to well control), and obtain materials and safety equipment to bring the operations into compliance with the applicable provisions of this Order.

Violation: Major.

Corrective Action: Implement H₂S operational requirements, as applicable.

Normal Abatement Period: Prompt correction required.

ii. The operator shall notify the authorized officer of the event and the mitigating steps that have or are being taken as soon as possible, but no later than the next business day. If said notification is subsequent to actual resumption of drilling operations, the operator shall notify the authorized officer of the date that drilling was

A. Applications, Approvals, and Reports**1. Drilling**

For proposed drilling operations where formations will be penetrated which have zones known to contain or which could reasonably be expected to contain concentrations of H₂S of 100 ppm or more in the gas stream, H₂S Drilling Operation Plan and if the applicability criteria in section III.B.1 are met, a Public Protection Plan as outlined in section III.B.2.b, shall be submitted as part of the Application for Permit to Drill (APD) (refer to Oil and Gas Order No. 1). In cases where multiple filings are being made with a single drilling plan, a single H₂S Drilling Operations Plan and, if applicable, a single Public Protection Plan may be submitted for the lease, communitization agreement, unit or field in accordance with Order No. 1. Failure to submit either the H₂S Drilling Operations Plan or the Public Protection Plan when required by this Order shall result in an incomplete APD pursuant to 43 CFR 3162.3-1.

The H₂S Drilling Operations Plan shall fully describe the manner in which the requirements and minimum standards in section III.C, shall be met and implemented. As required by this Order (section III.C.), the following must be submitted in the H₂S Drilling Operations Plan:

- a. Statement that all personnel shall receive proper H₂S training in accordance with section III.C.3.a.
- b. A legible well site diagram of accurate scale (may be included as part of the Well Site Layout as required by Onshore Order No. 1) showing the following:
 - i. Drill rig orientation
 - ii. Prevailing wind direction
 - iii. Terrain of surrounding area
 - iv. Location of all briefing areas (designate primary briefing area)
 - v. Location of access road(s) (including secondary egress)
 - vi. Location of flare line(s) and pit(s)
 - vii. Location of caution and/or danger signs
 - viii. Location of wind direction indicators
- c. As required by this Order, a complete description of the following H₂S safety equipment/systems:
 - i. Well control equipment
 - Flare line(s) and means of ignition
 - Remote controlled choke
 - Flare gun/flares
 - Mud-gas separator and rotating head (if exploratory well)
 - ii. Protective equipment for essential personnel.

- Location, type, storage and maintenance of all working and escape breathing apparatus
- Means of communication when using protective breathing apparatus
- iii. H₂S detection and monitoring equipment.
 - H₂S sensors and associated audible/visual alarm(s)
 - Portable H₂S and SO₂ monitor(s)
 - iv. Visual warning systems.
- Wind direction indicators
- Caution/danger sign(s) and flag(s)
- v. Mud program.
 - Mud system and additives
 - Mud degassing system
 - vi. Metallurgy.
 - Metallurgical properties of all tubular goods and well control equipment which could be exposed to H₂S (section III.C.4.c.)
 - vii. Means of communication from wellsite.
 - d. Plans for well testing.

2. Production

a. For each existing production facility having an H₂S concentration of 100 ppm or more in the gas stream, the operator shall calculate and submit the calculations to the authorized officer within 180 days of the effective date of this Order, the 100 and, if applicable, the 500 ppm radii of exposure for all facilities to determine if the applicability criteria section III.B.1. of this order are met. Radii of exposure calculations shall not be required for oil or water flowlines. Further, if any of the applicability criteria (section III.B.1.) are met, the operator shall submit a complete Public Protection Plan which meets the requirements of section III.B.2.b. to the authorized officer within 1 year of the effective date of this Order. For production facilities constructed after the effective date of this Order and meeting the above minimum concentration (100 ppm in gas stream), the operator shall report the radii of exposure calculations, and if the applicability criteria (section III.B.1) are met, submit a complete Public Protection Plan (section III.B.2.b.) to the authorized officer within 60 days after completion of production facilities.

Violation: Minor for failure to submit required information.

Corrective Action: Submit required information (radii of exposure and/or complete Public Protection Plan).

Normal Abatement Period: 20 to 40 days.

b. The operator shall initially test the H₂S concentration of the gas stream for each well or production facility and

shall make the results available to the authorized officer, upon request.

Violation: Minor.

Corrective Action: Test gas from well or production facility.

Normal Abatement Period: 20 to 40 days.

c. If operational or production alterations result in a 5% or more increase in the H₂S concentration (i.e., well recompletion, increased GOR's) or the radius of exposure as calculated under sections III.A.2.a. and III.A.2.b., notification of such changes shall be submitted to the authorized officer within 60 days after identification of the change.

Violation: Minor.

Corrective Action: Submit information to authorized officer.

Normal Abatement Period: 20 to 40 days.

3. Plans and Reports

a. H₂S Drilling Operations Plan(s) or Public Protection Plan(s) shall be reviewed by the operator on an annual basis and a copy of any necessary revisions shall be submitted to the authorized officer upon request.

Violation: Minor.

Corrective Action: Submit information to authorized officer.

Normal Abatement Period: 20 to 40 days.

b. Any release of a potentially hazardous volume of H₂S shall be reported to the authorized officer as soon as practicable, but no later than 24 hours following identification of the release.

Violation: Minor.

Corrective Action: Report undesirable event to the authorized officer.

Normal Abatement Period: 24 hours.

B. Public Protection**1. Applicability Criteria**

For both drilling/completion/workover and production operations, the H₂S radius of exposure shall be determined on all wells and production facilities subject to this Order. A Public Protection Plan (Section III.B.2) shall be required when any of the following conditions apply:

a. The 100 ppm radius of exposure is greater than 50 feet and includes any occupied residence, school, church, park, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent.

b. The 500 ppm radius of exposure is greater than 50 feet and includes any part of a Federal, State, County, or municipal road or highway owned and principally maintained for public use; or

resumed no later than the next business day.

Violation: Minor.

Corrective Action: Notify authorized officer.

Normal Abatement Period: 24 hours.

iii. It is the operator's responsibility to ensure that the applicable requirements of this Order have been met prior to the resumption of drilling ahead operations. Drilling ahead operations will not be suspended pending receipt of a written H₂S Drilling Operations Plan(s) and, if necessary, Public Protection Plan(s) provided that complete copies of the applicable Plan(s) are filed with the authorized officer for approval within 5 business days following resumption of drilling ahead operations.

Violation: Minor.

Corrective Action: Submit plans to authorization officer.

Normal Abatement Period: 5 days.

2. Locations.

a. Where practical, 2 roads shall be established, 1 at each end of the location, or as dictated by prevailing winds and terrain. If an alternate road is not practical, a clearly marked footpath shall be provided to a safe area. The purpose of such an alternate escape route is only to provide a means of egress to a safe area.

Violation: Minor.

Corrective Action: Designate or establish an alternate escape route.

Normal Abatement Period: 24 hours.

b. The alternate escape route shall be kept passable at all times.

Violation: Minor.

Corrective Action: Make alternate escape route passable.

Normal Abatement Period: 24 hours.

c. For workovers, a secondary means of egress shall be designated.

Violation: Minor.

Corrective Action: Designate secondary means of egress.

Normal Abatement Period: 24 hours.

3. Personnel Protection

a. Training Program. The operator shall ensure that all personnel who will be working at the wellsite will be properly trained in H₂S drilling and contingency procedures in accordance with the general training requirements outlined in the American Petroleum Institute's (API) *Recommended Practice (RP) 49 (April 15, 1987 or subsequent editions) for Safe Drilling of Wells Containing Hydrogen Sulfide, Section 2*. The operator also shall ensure that the training will be accomplished prior to a well coming under the terms of this Order (i.e., 3 days or 500 feet of known or probable H₂S zone). In addition to the requirements of API-RP49, a minimum

of an initial training session and weekly H₂S and well control drills for all personnel in each working crew shall be conducted. The initial training session for each well shall include a review of the site specific Drilling Operations Plan and, if applicable, the Public Protection Plan.

Violation: Major.

Corrective Action: Train all personnel and conduct drills.

Normal Abatement Period: Prompt correction required.

i. All training sessions and drills shall be recorded on the driller's log or its equivalent.

Violation: Minor.

Corrective Action: Record on driller's log or equivalent.

Normal Abatement Period: 24 hours.

ii. For drilling/completion/workover wells, at least 2 briefing areas shall be designated for assembly of personnel during emergency conditions, located a minimum of 150 feet from the well bore and 1 of the briefing areas shall be upwind of the well at all times. The briefing area located most normally upwind shall be designated as the "Primary Briefing Area."

Violation: Major.

Corrective Action: Designate briefing areas.

Normal Abatement Period: 24 hours.

iii. One person (by job title) shall be designated and identified to all on-site personnel as the person primarily responsible for the overall operation of the on-site safety and training programs.

Violation: Minor.

Corrective Action: Designate safety responsibilities.

Normal Abatement Period: 24 hours.

b. *Protective Equipment:* 1. The operator shall ensure that proper respirator protection equipment program is implemented, in accordance with the current American National Standards Institute (ANSI) Standard Z.88.2-1980 "Practices for Respiratory Protection." Proper protective breathing apparatus shall be readily accessible to all essential personnel on a drilling/completion/workover site. Escape and pressure-demand type working equipment shall be provided for essential personnel in the H₂S environment to maintain or regain control of the well. For pressure-demand type working equipment those essential personnel shall be able to obtain a, continuous seal to the face with the equipment. The operator shall ensure that service companies have the proper respiratory protection equipment when called to the location. Lightweight, escape-type, self-contained breathing apparatus with a minimum of 5-minute rated supply shall be readily accessible

at a location for the derrickman and at any other location(s) where escape from an H₂S contaminated atmosphere would be difficult.

Violation: Major.

Corrective Action: Acquire, repair, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

ii. Storage and maintenance of protective breathing apparatus shall be planned to ensure that at least 1 working apparatus per person is readily available for all essential personnel.

Violation: Major.

Corrective Action: Acquire or rearrange equipment, as necessary.

Normal Abatement Period: Prompt correction required.

iii. The following additional safety equipment shall be available for use:

(a) Effective means of communication when using protective breathing apparatus;

(b) Flare gun and flares to ignite the well;

(c) Telephone, radio, mobile phone, or any other device that provides communication from a safe area at the rig location, where practical.

Violation: Major.

Corrective Action: Acquire, repair, or replace equipment.

Normal Abatement Period: 24 hours.

c. *H₂S Detection and Monitoring Equipment:* 1. Each drilling/completion site shall have an H₂S detection and monitoring system that automatically activates visible and audible alarms when the ambient air concentration H₂S reaches the threshold limits of 10 and 15 ppm in air, respectively. The sensors shall have a rapid response time and be capable of sensing a minimum of 10 ppm of H₂S in ambient air, with at least 3 sensing points located at the shale shaker, rig floor, and bell nipple for a drilling site and the cellar, rig floor, and circulating tanks or shale shaker for a completion site. The detection system shall be installed, calibrated, tested, and maintained in accordance with the manufacturer's recommendations.

Violation: Major.

Corrective Action: Install, repair, calibrate, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

ii. All tests of the H₂S monitoring system shall be recorded on the driller's log or its equivalent.

Violation: Minor.

Corrective Action: Record on driller's log or equivalent.

Normal Abatement Period: 24 hours.

iii. For workover operations, 1 operational sensing point shall be

located as close to the wellbore as practical. Additional sensing points may be necessary for large and/or long-term operations.

Violation: Major.

Corrective Action: Install, repair, calibrate, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

d. Visible Warning System. i.

Equipment to indicate wind direction at all times shall be installed at prominent locations and shall be visible at all times during drilling operations. At least 2 such wind direction indicators (i.e., windsocks, windvanes, pennants with tailstreamers, etc.) shall be located at separate elevations (i.e., near ground level, rig floor, and/or treetop height). At least 1 wind direction indicator shall be clearly visible from all principal working areas at all times so that wind direction can be easily determined. For completion/workover operations, 1 wind direction indicator shall suffice, provided it is visible from all principal working areas on the location. In addition, a wind direction indicator at each of the 2 briefing areas shall be provided if the wind direction indicator(s) previously required in this paragraph are not visible from the briefing areas.

Violation: Minor.

Corrective Action: Install, repair, move, or replace wind direction indicator(s), as necessary.

Normal Abatement Period: 24 hours.

ii. At any time when the terms of this Order are in effect, operational danger or caution sign(s) shall be displayed along all controlled accesses to the site.

Violation: Minor.

Corrective Action: Erect appropriate signs.

Normal Abatement Period: 24 hours.

iii. Each sign shall be painted a high-visibility red, black and white, or yellow with black lettering.

Violation: Minor.

Corrective Action: Replace or alter sign, as necessary.

Normal Abatement Period: 5 to 20 days.

iv. The sign(s) shall be legible and large enough to be read by all persons entering the well site and be placed a minimum of 200 feet but no more than 500 feet from the well site which allows vehicles to turn around at a safe distance prior to reaching the site.

Violation: Major.

Corrective Action: Replace, alter, or move sign, as necessary.

Normal Abatement Period: 24 hours.

v. The sign(s) shall read:

**DANGER—POISON GAS—
HYDROGEN SULFIDE**

and in smaller lettering:

Do Not Approach If Red Flag is Flying or equivalent language if approved by the authorized officer.

Where appropriate, bilingual or multilingual danger sign(s) shall be used.

Violation: Minor.

Corrective Action: Alter sign(s) as necessary.

Normal Abatement Period: 5 to 20 days.

vi. All sign(s) and, when appropriate, flag(s) shall be visible to all personnel approaching the location under normal lighting and weather conditions.

Violation: Major.

Corrective Action: Erect or move sign(s) and/or flag(s), as necessary.

Normal Abatement Period: 24 hours.

vii. When H₂S is detected in excess of 10 ppm at any detection point, red flag(s) shall be displayed.

Violation: Major.

Corrective Action: Display red flag.

Normal Abatement Period: Prompt correction required.

e. *Warning System Response.* When H₂S is detected in excess of 10 ppm at any detection point, all non-essential personnel shall be moved to a safe area and essential personnel (i.e., those necessary to maintain control of the well) shall wear pressure-demand type protective breathing apparatus. Once accomplished, operations may proceed.

Violation: Major.

Corrective Action: Move non-essential personnel to safe area and mask-up essential personnel.

Normal Abatement Period: Prompt correction required.

4. Operating Procedures and Equipment

a. *General/Operations.* Drilling/completion/workover operations in H₂S areas shall be subject to the following requirements:

i. If zones containing in excess of 100 ppm of H₂S gas are encountered while drilling with air, gas, mist, other non-mud circulating mediums or aerated mud, the well shall be killed with a water or oil-based mud and mud shall be used thereafter as the circulating medium for continued drilling.

Violation: Major.

Corrective Action: Convert to appropriate fluid medium.

Normal Abatement Period: Prompt correction required.

ii. A flare system shall be designed and installed to safely gather and burn H₂S-bearing gas.

Violation: Major.

Corrective Action: Install flare system.

Normal Abatement Period: Prompt correction required.

iii. Flare lines shall be located as far from the operating site as feasible and in a manner to compensate for wind changes. The flare line(s) mouth(s) shall be located not less than 150 feet from the wellbore unless otherwise approved by the authorized officer. Flare lines shall be straight unless targeted with running tees.

Violation: Minor.

Corrective Action: Adjust flare line(s) as necessary.

Normal Abatement Period: 24 hours.

iv. The flare system shall be equipped with a suitable and safe means of ignition.

Violation: Major.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 24 hours.

v. Where noncombustible gas is to be flared, the system shall be provided supplemental fuel to maintain ignition.

Violation: Major.

Corrective Action: Acquire supplemental fuel.

Normal Abatement Period: 24 hours.

vi. At any wellsite where SO₂ may be released as a result of flaring of H₂S during drilling, completion, or workover operations, the operator shall make SO₂ portable detection equipment available for checking the SO₂ level in the flare impact area.

Violation: Minor.

Corrective Action: Acquire, repair, or replace equipment as necessary.

Normal Abatement Period: 24 hours to 3 days.

vii. If the flare impact area reaches a sustained ambient threshold level of 2 ppm or greater of SO₂ in air and includes any occupied residence, school, church, park, or place of business, or other area where the public could reasonably be expected to frequent, the Public Protection Plan shall be implemented.

Violation: Major.

Corrective Action: Contain SO₂ release and/or implement Public Protection Plan.

Normal Abatement Period: Prompt correction required.

viii. A remote controlled choke shall be installed for all H₂S drilling and, where feasible, for completion operations. A remote controlled valve may be used in lieu of this requirement for completion operations.

Violation: Major.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

ix. Mud-gas separators and rotating heads shall be installed and operable for all exploratory wells.

Violation: Major.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: Prompt correction required.

b. **Mud Program.** A pH of 10 or above in a fresh water-base mud system shall be maintained to control corrosion. H₂S gas returns to surface, and minimize sulfide stress cracking and embrittlement unless other formation conditions or mud types justify a lesser pH level.

Violation: Major.

Corrective Action: Adjust pH.

Normal Abatement Period: Prompt correction required.

ii. Drilling mud containing H₂S gas shall be degassed in accordance with API's RP-49, § 5.14, at an optimum location for the rig configuration. These gases shall be piped into the flare system.

Violation: Major.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 24 hours.

iii. Sufficient quantities of mud additives shall be maintained on location to scavenge and/or neutralize H₂S where formation pressures are unknown.

Violation: Major.

Corrective Action: Obtain proper mud additives.

Normal Abatement Period: 24 hours.

c. **Metallurgical Equipment.** All equipment that has the potential to be exposed to H₂S shall be suitable for H₂S service. Equipment which shall meet these metallurgical standards include the drill string, casing, wellhead, blowout preventer assembly, casing head and spool, rotating head, kill lines, choke, choke manifold and lines, valves, mud-gas separators, drill-stem test tools, test units, tubing, flanges, and other related equipment.

To minimize stress corrosion cracking and/or H₂S embrittlement, the equipment shall be constructed of material whose metallurgical properties are chosen with consideration for both an H₂S working environment and the anticipated stress. The metallurgical properties of the materials used shall conform to the current National Association of Corrosion Engineers (NACE) Standard MR-01-75, *Material Requirement, Sulfide Stress Cracking Resistant Metallic Material for Oil Field Equipment*. These metallurgical properties include the grade of steel, the processing method (rolled, normalized, tempered, and/or quenched), and the resulting strength properties. The

working environment considerations include the H₂S concentration, the well fluid pH, and the wellbore pressures and temperatures. Elastomers, packing, and similar inner parts exposed to H₂S shall be resistant at the maximum anticipated temperature of exposure. The manufacturer's verification of design for use in an H₂S environment shall be sufficient verification of suitable service in accordance with this Order.

Violation: Major.

Corrective Action: Install, repair, or replace appropriate equipment, as necessary.

Normal Abatement Period: Prompt correction required.

d. **Well Testing in an H₂S Environment.** Testing shall be performed with a minimum number of personnel in the immediate vicinity which are necessary to safely and adequately operate the test equipment. Except with prior approval by the authorized officer, the drill-stem testing of H₂S zones shall be conducted only during daylight hours and formation fluids shall not be flowed to the surface (closed chamber only).

Violation: Major.

Corrective Action: Terminate the well test.

Normal Abatement Period: Prompt correction required.

D. Production Requirements

1. General

a. All existing production facilities which do not currently meet the requirements and minimum standards set forth in this section shall be brought into conformance within 1 year after the effective date of this Order. All existing equipment that is in a safe working condition as of the effective date of this Order is specifically exempt from the metallurgical requirements prescribed in section III D.3.g.

Violation: Minor.

Corrective Action: Bring facility into compliance.

Normal Abatement Period: 60 days.

b. Production facilities constructed after the effective date of this Order shall be designed, constructed, and operated to meet the requirements and minimum standards set forth in this section. Any variations from the standards or established time frames shall be approved by the authorized officer in accordance with the provisions of section IV. of this Order. Except for storage tanks, a determination of the radius of exposure for all production facilities shall be made in the manner prescribed in section II. S. of this Order.

Violation: Minor.

Corrective Action: Bring facility into compliance.

Normal Abatement Period: 60 days.

c. At any production facility or storage tank(s) where the sustained ambient H₂S concentration is in excess of 10 ppm at 50 feet from the production facility or storage tank(s) as measured at ground level under calm (1 mph) conditions, the operator shall collect or reduce vapors from the system and they shall be sold, beneficially used, reinjected, or flared provided terrain and conditions permit.

Violation: Major, if a health or safety problem to the public is imminent, otherwise minor.

Corrective Action: Bring facility into compliance.

Normal Abatement Period: 3 days for major, 30 days for minor.

2. Storage Tanks.

Storage tanks containing produced fluids and utilized as part of a production operation and operated at or near atmospheric pressure, where the vapor accumulation has an H₂S concentration in excess of 500 ppm in the tank, shall be subject to the following:

a. No determination of a radius of exposure need be made for storage tanks.

b. All stairs/ladders leading to the top of storage tanks shall be chained and/or marked to restrict entry. For any storage tank(s) which require fencing (Section III.D.2.f), a danger sign posted at the gate(s) shall suffice in lieu of this requirement.

Violation: Minor.

Corrective Action: Chain or mark stair(s)/ladder(s) or post sign, as necessary.

Normal Abatement Period: 5 to 20 days.

c. A danger sign shall be posted on or within 50 feet of the storage tank(s) to alert the public of the potential H₂S danger. For any storage tank(s) which require fencing (section III.D.2.f), a danger sign posted at the locked gate(s) shall suffice in lieu of this requirement.

Violation: Minor.

Corrective Action: Post or move sign(s), as necessary.

Normal Abatement Period: 5 to 20 days.

d. The sign(s) shall be painted in high-visibility red, black, and white. The sign(s) shall read:

DANGER—POISON GAS—HYDROGEN SULFIDE

or equivalent language if approved by the authorized officer. Where

appropriate, bilingual or multilingual warning signs shall be used.

Violation: Minor.

Corrective Action: Post, move, replace, or alter sign(s), as necessary.
Normal Abatement Period: 20 to 40 days.

e. At least 1 permanent wind direction indicator shall be installed so that wind direction can be easily determined at or approaching the storage tank(s).

Violation: Minor.

Corrective Action: Install, repair, or replace wind direction indicator, as necessary.

Normal Abatement Period: 20 to 40 days.

f. A minimum 5-foot chain-link, 5-strand barbed wire, or comparable type fence and gate(s) that restrict(s) public access shall be required when storage tanks are located within ¼ mile of or contained inside a city or incorporated limits of a town or within ¼ mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or where the public could reasonably be expected to frequent.

Violation: Minor.

Corrective Action: Install, repair, or replace fence and/or gate(s), as necessary.

Normal Abatement Period: 20 to 40 days.

g. Gate(s), as required by section III.D.2.f. shall be locked when unattended by the operator.

Violation: Minor.

Corrective Action: Lock gate.

Normal Abatement Period: 24 hours.

3. Production Facilities

Production facilities containing 100 ppm or more of H₂S in the gas stream shall be subject to the following:

a. Danger signs as specified in section III.D.2.d. of this Order shall be posted on or within 50 feet of each production facility to alert the public of the potential H₂S danger. In the event the storage tanks and production facilities are located at the same site, 1 such danger sign shall suffice. Further, for any facilities which require fencing (section III.D.2.f.), 1 such danger sign at the gate(s) shall suffice in lieu of this requirement.

Violation: Minor.

Corrective Action: Post, move, or alter sign(s), as necessary.

Normal Abatement Period: 5 to 20 days.

b. Danger signs, as specified in section III.D.2.d. of this Order, shall be required for well flowlines and lease gathering lines that carry H₂S gas. Placement shall be where said lines cross public or lease roads. The signs shall be legible and shall contain sufficient additional

information to permit a determination of the owner of the line.

Violation: Minor.

Corrective Action: Post, move, or alter sign(s), as necessary.

Normal Abatement Period: 5 to 20 days.

c. Fencing, as specified in section III.D.2.f., shall be required when production facilities are located within ¼ mile of or contained inside a city or incorporated limits of a town or within ¼ mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or any other area where the public could reasonably be expected to frequent. Flowlines are exempted from this additional fencing requirement.

Violation: Minor.

Corrective Action: Install, repair, or replace fence, and/or gate(s), as necessary.

Normal Abatement Period: 20 to 40 days.

d. Gate(s), as required by section III.D.3.c. shall be locked when unattended by the operator.

Violation: Minor.

Corrective Action: Lock gate.

Normal Abatement Period: 24 hours.

e. Wind direction indicator(s) as specified in section III.D.2.e. of this Order shall be required. In the event the storage tanks and production facilities are located at the same site, 1 such indicator shall suffice. Flowlines are exempt from this requirement.

Violation: Minor.

Corrective Action: Install, repair, or replace wind direction indicator(s), as necessary.

Normal Abatement Period: 20 to 40 days.

f. All wells, unless produced by artificial lift, shall possess a secondary means of immediate well control through the use of appropriate Christmas tree and/or downhole completion equipment. Such equipment shall allow downhole accessibility (reentry) under pressure for permanent well control operations. If the applicability criteria stated in Section III.B.1. of this Order are met, a minimum of 2 master valves shall be installed.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

g. All equipment shall be chosen with consideration for both a H₂S working environment and anticipated stresses. NACE Standard MR-01-75 shall be used for metallic equipment selection and, if applicable, adequate protection by chemical inhibition or other such

method that controls or limits the corrosive effects of H₂S shall be used.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

h. Where the 100 ppm radius of exposure for H₂S includes any occupied residence, place of business, school, or other inhabited structure or any area where the public may reasonably be expected to frequent, the operator shall install automatic safety valves or shutdowns at the wellhead, or other appropriate shut-in controls for wells equipped with artificial lift.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

i. The automatic safety valves or shutdowns, as required by section III.D.3.h. shall be set to activate upon a release of a potentially hazardous volume of H₂S.

Violation: Major.

Corrective Action: Repair, replace or adjust equipment, as necessary.

Normal Abatement Period: Prompt correction required.

j. If the sustained ambient concentration of H₂S or SO₂ from a production facility which is venting or flaring reaches a concentration of H₂S (10ppm) or SO₂ (2ppm), respectively, at any of the following locations, the operator shall modify the production facility as approved by the authorized officer. The locations include any occupied residence, school, church, park, playground, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent.

Violation: Major.

Corrective Action: Repair facility to bring into compliance.

Normal Abatement Period: Prompt correction required.

4. Public Protection.

When conditions as defined in section III.B.1. of this Order exist, a Public Protection Plan for producing operations shall be submitted to the authorized officer in accordance with section III.B.2.a. of this Order which includes the provisions of section III.B.2.b.

Violation: Minor.

Corrective Action: Submit Public Protection Plan.

Normal Abatement Period: 20 to 40 days.

appropriate, bilingual or multilingual warning signs shall be used.

Violation: Minor.

Corrective Action: Post, move, replace, or alter sign(s), as necessary.
Normal Abatement Period: 20 to 40 days.

e. At least 1 permanent wind direction indicator shall be installed so that wind direction can be easily determined at or approaching the storage tank(s).

Violation: Minor.

Corrective Action: Install, repair, or replace wind direction indicator, as necessary.
Normal Abatement Period: 20 to 40 days.

f. A minimum 5-foot chain-link, 5-strand barbed wire, or comparable type fence and gate(s) that restrict(s) public access shall be required when storage tanks are located within ¼ mile of or contained inside a city or incorporated limits of a town or within ¼ mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or where the public could reasonably be expected to frequent.

Violation: Minor.

Corrective Action: Install, repair, or replace fence and/or gate(s), as necessary.

Normal Abatement Period: 20 to 40 days.

g. Gate(s), as required by section III.D.2.f. shall be locked when unattended by the operator.

Violation: Minor.

Corrective Action: Lock gate.

Normal Abatement Period: 24 hours.

3. Production Facilities

Production facilities containing 100 ppm or more of H₂S in the gas stream shall be subject to the following:

a. Danger signs as specified in section III.D.2.d. of this Order shall be posted on or within 50 feet of each production facility to alert the public of the potential H₂S danger. In the event the storage tanks and production facilities are located at the same site, 1 such danger sign shall suffice. Further, for any facilities which require fencing (section III.D.2.f.), 1 such danger sign at the gate(s) shall suffice in lieu of this requirement.

Violation: Minor.

Corrective Action: Post, move, or alter sign(s), as necessary.

Normal Abatement Period: 5 to 20 days.

b. Danger signs, as specified in section III.D.2.d. of this Order, shall be required for well flowlines and lease gathering lines that carry H₂S gas. Placement shall be where said lines cross public or lease roads. The signs shall be legible and shall contain sufficient additional

information to permit a determination of the owner of the line.

Violation: Minor.

Corrective Action: Post, move, or alter sign(s), as necessary.

Normal Abatement Period: 5 to 20 days.

c. Fencing, as specified in section III.D.2.f., shall be required when production facilities are located within ¼ mile of or contained inside a city or incorporated limits of a town or within ¼ mile of an occupied residence, school, church, park, playground, school bus stop, place of business, or any other area where the public could reasonably be expected to frequent. Flowlines are exempted from this additional fencing requirement.

Violation: Minor.

Corrective Action: Install, repair, or replace fence, and/or gate(s), as necessary.

Normal Abatement Period: 20 to 40 days.

d. Gate(s), as required by section III.D.3.c. shall be locked when unattended by the operator.

Violation: Minor.

Corrective Action: Lock gate.

Normal Abatement Period: 24 hours.

e. Wind direction indicator(s) as specified in section III.D.2.e. of this Order shall be required. In the event the storage tanks and production facilities are located at the same site, 1 such indicator shall suffice. Flowlines are exempt from this requirement.

Violation: Minor.

Corrective Action: Install, repair, or replace wind direction indicator(s), as necessary.

Normal Abatement Period: 20 to 40 days.

f. All wells, unless produced by artificial lift, shall possess a secondary means of immediate well control through the use of appropriate Christmas tree and/or downhole completion equipment. Such equipment shall allow downhole accessibility (reentry) under pressure for permanent well control operations. If the applicability criteria stated in Section III.B.1. of this Order are met, a minimum of 2 master valves shall be installed.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

g. All equipment shall be chosen with consideration for both a H₂S working environment and anticipated stresses. NACE Standard MR-01-75 shall be used for metallic equipment selection and, if applicable, adequate protection by chemical inhibition or other such

method that controls or limits the corrosive effects of H₂S shall be used.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

h. Where the 100 ppm radius of exposure for H₂S includes any occupied residence, place of business, school, or other inhabited structure or any area where the public may reasonably be expected to frequent, the operator shall install automatic safety valves or shutdowns at the wellhead, or other appropriate shut-in controls for wells equipped with artificial lift.

Violation: Minor.

Corrective Action: Install, repair, or replace equipment, as necessary.

Normal Abatement Period: 20 to 40 days.

i. The automatic safety valves or shutdowns, as required by section III.D.3.h. shall be set to activate upon a release of a potentially hazardous volume of H₂S.

Violation: Major.

Corrective Action: Repair, replace or adjust equipment, as necessary.

Normal Abatement Period: Prompt correction required.

j. If the sustained ambient concentration of H₂S or SO₂ from a production facility which is venting or flaring reaches a concentration of H₂S (10ppm) or SO₂ (2ppm), respectively, at any of the following locations, the operator shall modify the production facility as approved by the authorized officer. The locations include any occupied residence, school, church, park, playground, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent.

Violation: Major.

Corrective Action: Repair facility to bring into compliance.

Normal Abatement Period: Prompt correction required.

4. Public Protection.

When conditions as defined in section III.B.1. of this Order exist, a Public Protection Plan for producing operations shall be submitted to the authorized officer in accordance with section III.B.2.a. of this Order which includes the provisions of section III.B.2.b.

Violation: Minor.

Corrective Action: Submit Public Protection Plan.

Normal Abatement Period: 20 to 40 days.

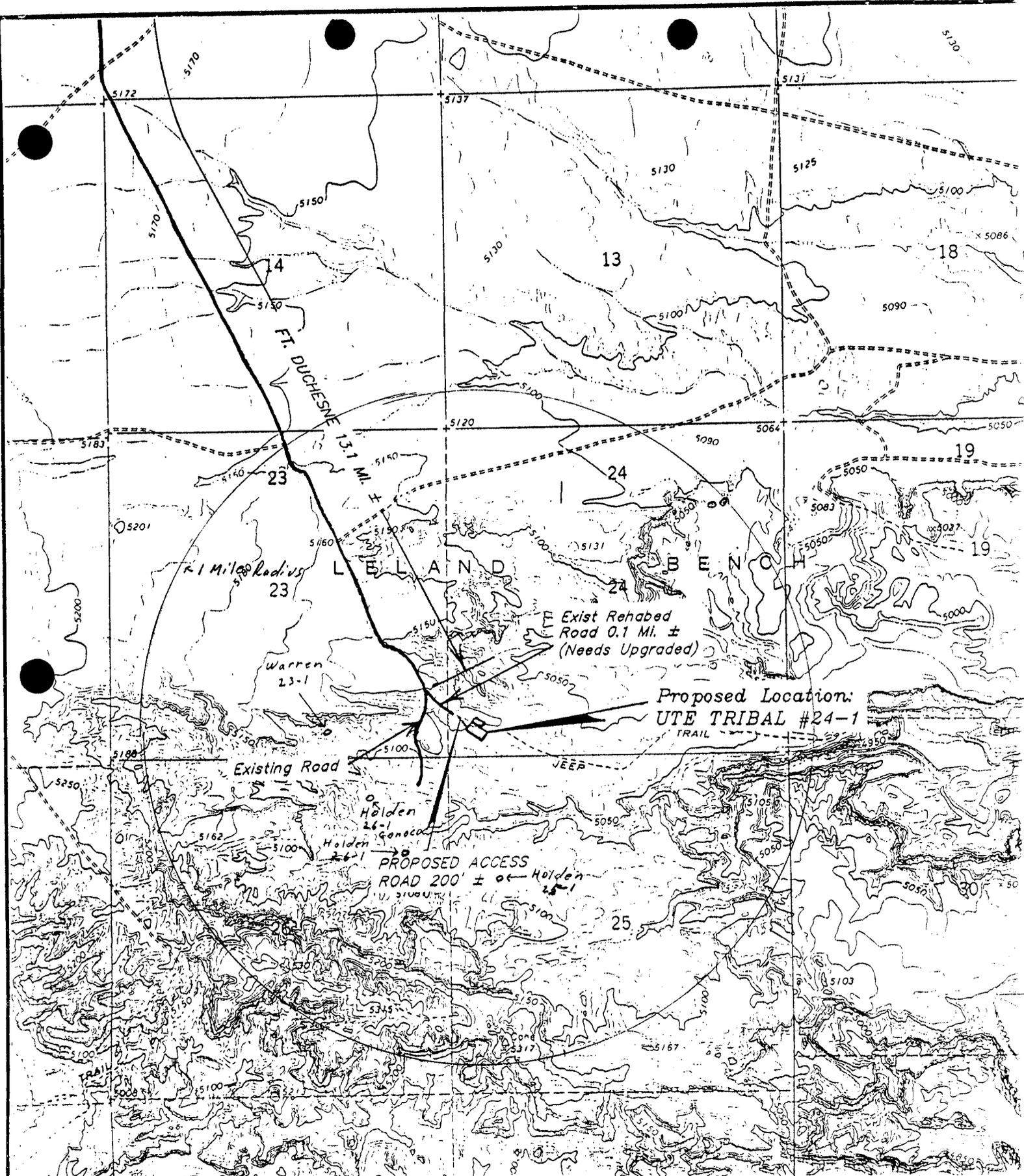
IV. Variances from Requirements

An operator may request the authorized officer to approve a variance from any of the requirements prescribed in section III hereof. All such requests shall be submitted in writing to the appropriate authorized officer and

provide information as to the circumstances which warrant approval of the variance(s) requested and the proposed alternative methods by which the related requirement(s) of minimum standard(s) are to be satisfied. The authorized officer, after considering all

relevant factors, may approve the requested variance(s) if it is determined that the proposed alternative(s) meets or exceeds the objectives of the applicable requirement(s) or minimum standard(s).

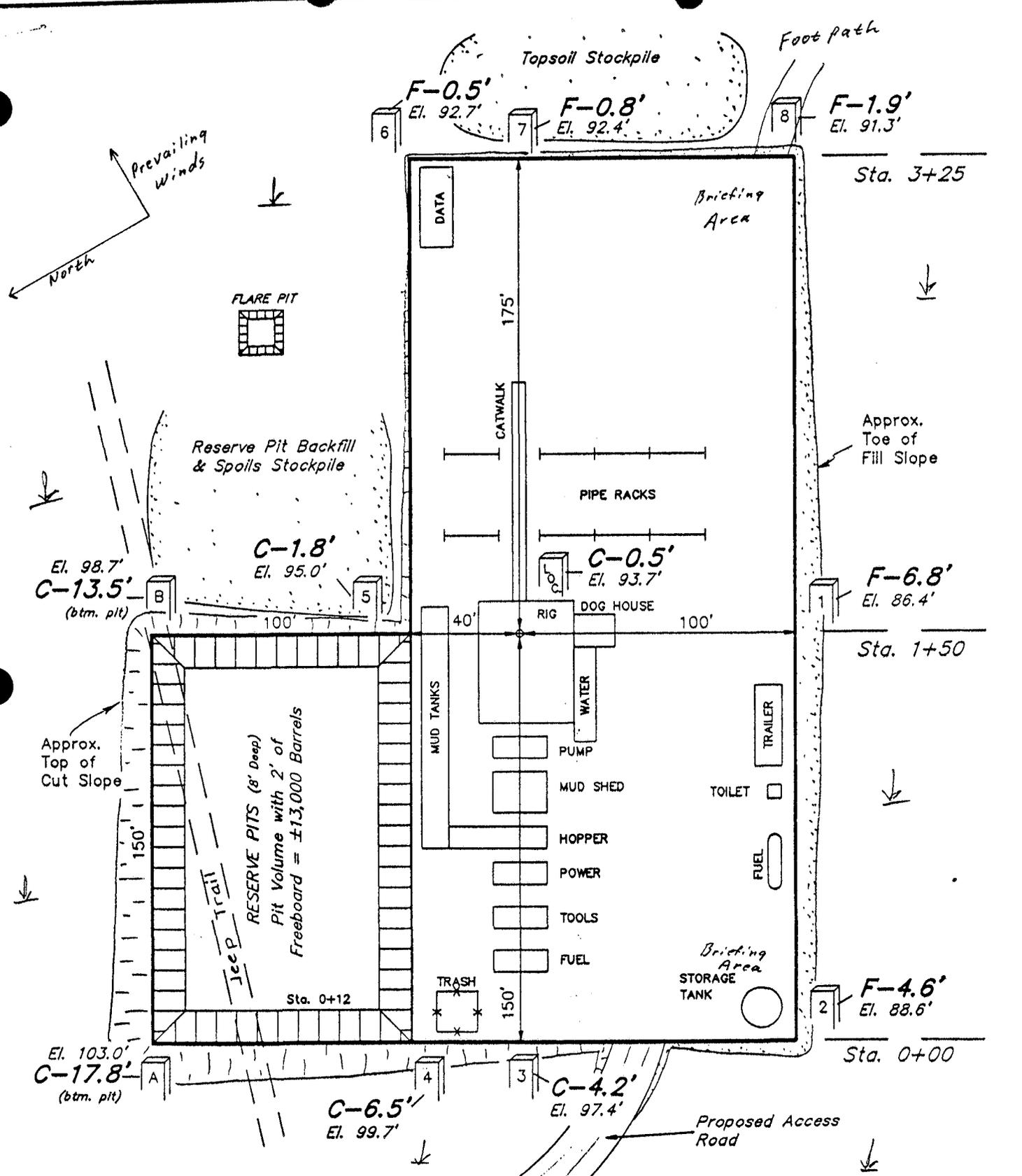
[FR Doc. 90-27426 Filed 11-21-90; 8:45 am]
BILLING CODE 4310-25-01



TOPOGRAPHIC
 MAP "B"
 SCALE: 1" = 2000'
 DATE 3-26-91



WARREN AMERICAN OIL CO.
 UTE TRIBAL #24-1
 SECTION 24, T4S, R1E, U.S.M.



APPROXIMATE YARDAGES

(12") Topsoil Stripping	= 2,260 Cu. Yds.
Remaining Location	= 7,160 Cu. Yds.
TOTAL CUT	= 9,420 CU.YDS.
FILL	= 4,400 CU.YDS.

EXCESS MATERIAL AFTER 5% COMPACTION	= 4,790 Cu. Yds.
Topsoil & Pit Backfill (1/2 Pit Vol.)	= 4,060 Cu. Yds.
EXCESS UNBALANCE (After Rehabilitation)	= 730 Cu. Yds.

Ele
Ele

OPERATOR Winn American Oil Co 10800 DATE 4-08-91

WELL NAME Wte 014-1

SEC S5SW 04 T 4S R 1E COUNTY Mintah

43-047-30015
API NUMBER

Indian (O)
TYPE OF LEASE

CHECK OFF:

PLAT.

BOND

NEAREST WELL

LEASE

FIELD
SBM

POTASH OR
OIL SHALE

PROCESSING COMMENTS:

No other producing well within Sec 04.
Water Permit 43-10073 (T54104) West Hazmat

APPROVAL LETTER:

SPACING:

R615-2-3

N/A
UNIT

R615-3-2

N/A
CAUSE NO. & DATE

R615-3-3

STIPULATIONS:

CC: BIA



State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Norman H. Bangertter
Governor

Dee C. Hansen
Executive Director

Dianne R. Nielson, Ph.D.
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

April 29, 1991

Warren American Oil Company
P. O. Box 470372
Tulsa, Oklahoma 74147-0372

Gentlemen:

Re: Ute 24-1 Well, 460 feet from the South line, 460 feet from the West line, SW SW, Section 24, Township 4 South, Range 1 East, Uintah County, Utah

Approval to drill the referenced well is hereby granted in accordance with R615-3-2, Oil and Gas Conservation General Rules.

In addition, the following actions are necessary to fully comply with this approval:

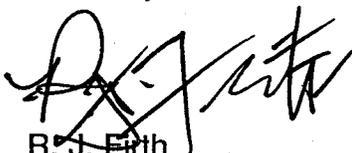
1. Spudding notification within 24 hours after drilling operations commence.
2. Submittal of Entity Action Form 6, within five working days following spudding and whenever a change in operations or interests necessitates an entity status change.
3. Submittal of the Report of Water Encountered During Drilling, Form 7.
4. Prompt notification in the event it is necessary to plug and abandon the well. Notify R. J. Firth, Associate Director, (Office) (801) 538-5340, (Home) 571-6068, or J. L. Thompson, Lead Inspector, (Home) 298-9318.
5. Compliance with the requirements of Utah Admin. R.615-3-20, Gas Flaring or Venting.

Page 2
Warren American Oil Company
Ute 24-1
April 29, 1991

6. Prior to commencement of the proposed drilling operations, plans for facilities for disposal of sanitary wastes at the drill site shall be submitted to the local health department. These drilling operations and any subsequent well operations must be conducted in accordance with applicable state and local health department regulations. A list of local health departments and copies of applicable regulations are available from the Division of Environmental Health, Bureau of Drinking Water/Sanitation, telephone (801) 538-6159.
7. This approval shall expire one (1) year after date of issuance unless substantial and continuous operation is underway or an application for an extension is made prior to the approval expiration date.

The API number assigned to this well is 43-047-32015.

Sincerely,



R. J. Firth
Associate Director, Oil & Gas

tas
Enclosures
cc: Bureau of Land Management
Bureau of Indian Affairs
J. L. Thompson
we14/1-18



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Vernal District Office
170 South 500 East
Vernal, Utah 84078

TAKE
PRIDE IN
AMERICA

IN REPLY REFER TO:

3162.35
UT08438

August 22, 1991

RECEIVED

AUG 27 1991

DIVISION OF
OIL GAS & MINING

Warren American Oil Co.
P. O. Box 470372
Tulsa, OK 74147-0372

Re: Application for Permit to Drill
Well No. 24-1
Section 24, T4S, R1E
Agreement No. 14-20-H62-4376

43-047-32015

Gentlemen:

We are returning the referenced Application for Permit to Drill without prejudice as per your request. If you intend to drill at this location at a future date, a new Application for Permit to Drill must be submitted.

If you have any questions, please contact Margie Herrmann of this office at (801) 789-1362.

Sincerely,

Howard B. Cleavinger II
Assistant District Manager
for Minerals

Enclosure

cc: Ken Allen



State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

August 30, 1991

Warren American Oil Company
P.O. Box 470372
Tulsa, Oklahoma 74147-0372

Re: Well No. Ute #24-1, Sec. 24, T. 4S, R. 1E, Uintah County, Utah
API No. 43-047-32015

In response to Bureau of Land Management action and your request for cancellation of the Application for Permit to Drill, approval to drill the above referenced well is hereby rescinded. A new Application for Permit to Drill must be filed with this office for approval prior to the commencement of any future work on the subject location.

If any previously unreported operations have been performed on this well location, it is imperative that you notify the Division of Oil, Gas and Mining immediately.

Sincerely,

Don Staley
Administrative Supervisor
Oil and Gas

DME/lc
cc: Bureau of Land Management - Vernal
R.J. Firth
Well file
WOI230