District I
PO Box 1980, Hobbs, NM 88241-1980

District II
811 South First, Artesia, NM 88210

District III
1000 Rio Brazos Rd., Aztec, NM 87410

District IV
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
2040 South Pacheco
Santa Fe, NM 87505

Form C-101
Revised October 18, 1994
Instructions on back
Submit to Appropriate District Office
State Lease - 6 Copies
Fee Lease - 5 Copies

☐ AMENDED REPORT

OCT 2003
RECEIVED
OCD - ARTESIA

APPLICATION FOR PERMIT TO DRILL, RE-ENTER, DEEPEN, PLUGBACK, OR ADD A ZONE

1Operator Name and Address	2OGRID Number
Perenco LLC 6 Desta Drive, Suite 6800 Midland, TX 79705	218885
	3API Number 30 - 0 15-33053

4Property Code	5Property Name	6Well No.
33040	State 1724	311

7Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West Line	County
N	31	17S	24E		660	South	1980	West	Eddy

8Proposed Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West Line	County
C	31	17S	24E		660	North	1980	West	Eddy

9Proposed Pool 1	10Proposed Pool 2
Wildcat Abo	Empire Antelope Sink Abo

11Work Type Code	12Well Type Code	13Cable/Rotary	14Lease Type Code	15Ground Level Elevation
N	G	R	S	3861
16Multiple	**17Proposed Depth**	**18Formation**	**19Contractor**	**20Spud Date**
No		Abo	To be bid	11-30-03

21Proposed Casing and Cement Program

Hole Size	Casing Size	Casing weight/foot	Setting Depth	Sacks of Cement	Estimated TOC
17-1/2"	13-3/8"	48#	170'	200	Surface
12-1/4"	9-5/8"	36#	1200 - 1500'	900	Surface
8-3/4"	7"	26#	4000'	600	1300'
6-1/8"	3800-8000' MD	Slotted Liner			

22Describe the proposed program. If this application is to DEEPEN or PLUG BACK give the data on the present productive zone and proposed new productive zone. Describe the blowout prevention program, if any. Use additional sheets if necessary.

Drill a new well to test the shallow gas horizons.
Drilling Program and directional plan attached

Blowout Prevention: 3000 psi double and annular BOP's

H2S Contingency Plan attached

NOTIFY OCD SPUD & TIME
TO WITNESS 8 5/8" CASING

Fresh Water Mud To 1500'

23I hereby certify that the information given above is true and complete to the best of my knowledge and belief.

Signature: Robin S. McCarley

Printed name: Robin S. McCarley

Title: Engineering Technician

Date: 10-15-03 Phone: 432 682-8553

OIL CONSERVATION DIVISION

Approved By: Gene W. Gum

Title: District Supervisor

Approval Date: OCT 17 2003 Expiration Date: OCT 17 2004

Conditions of Approval:
Attached: ☐

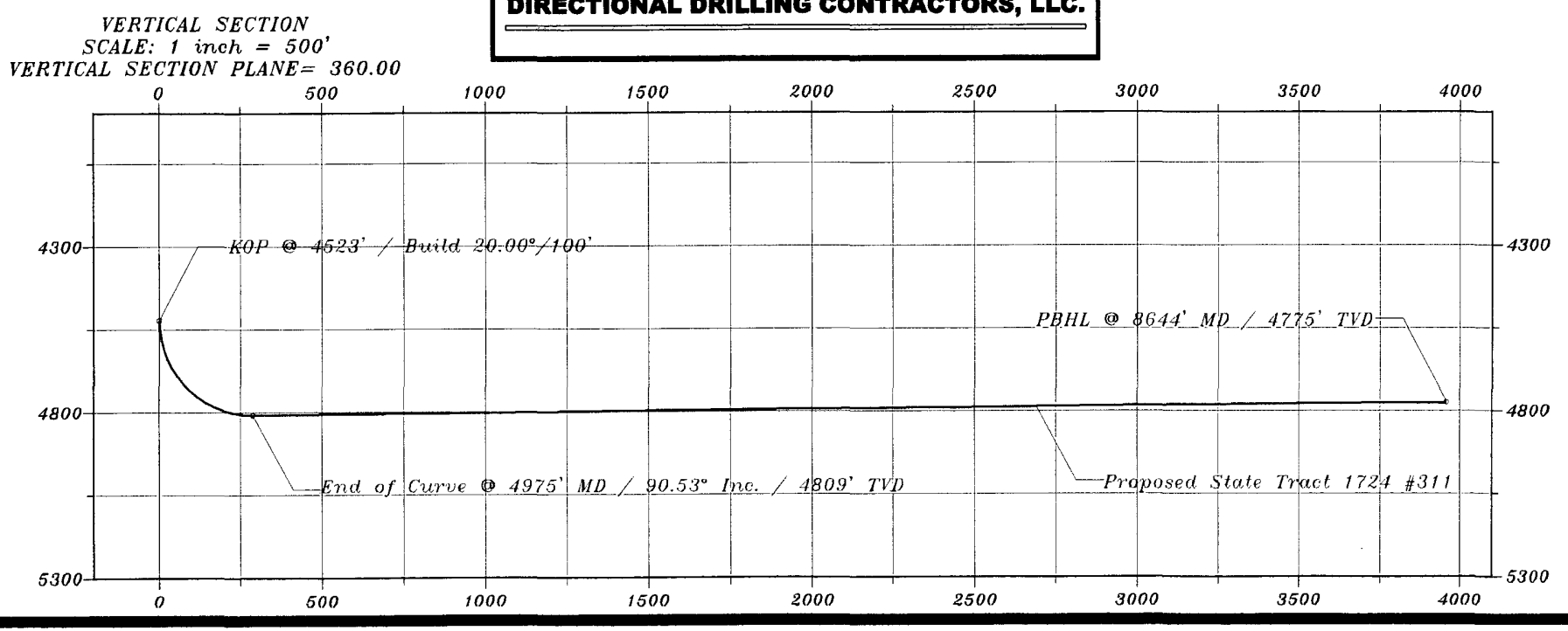
Perenco, LLC.

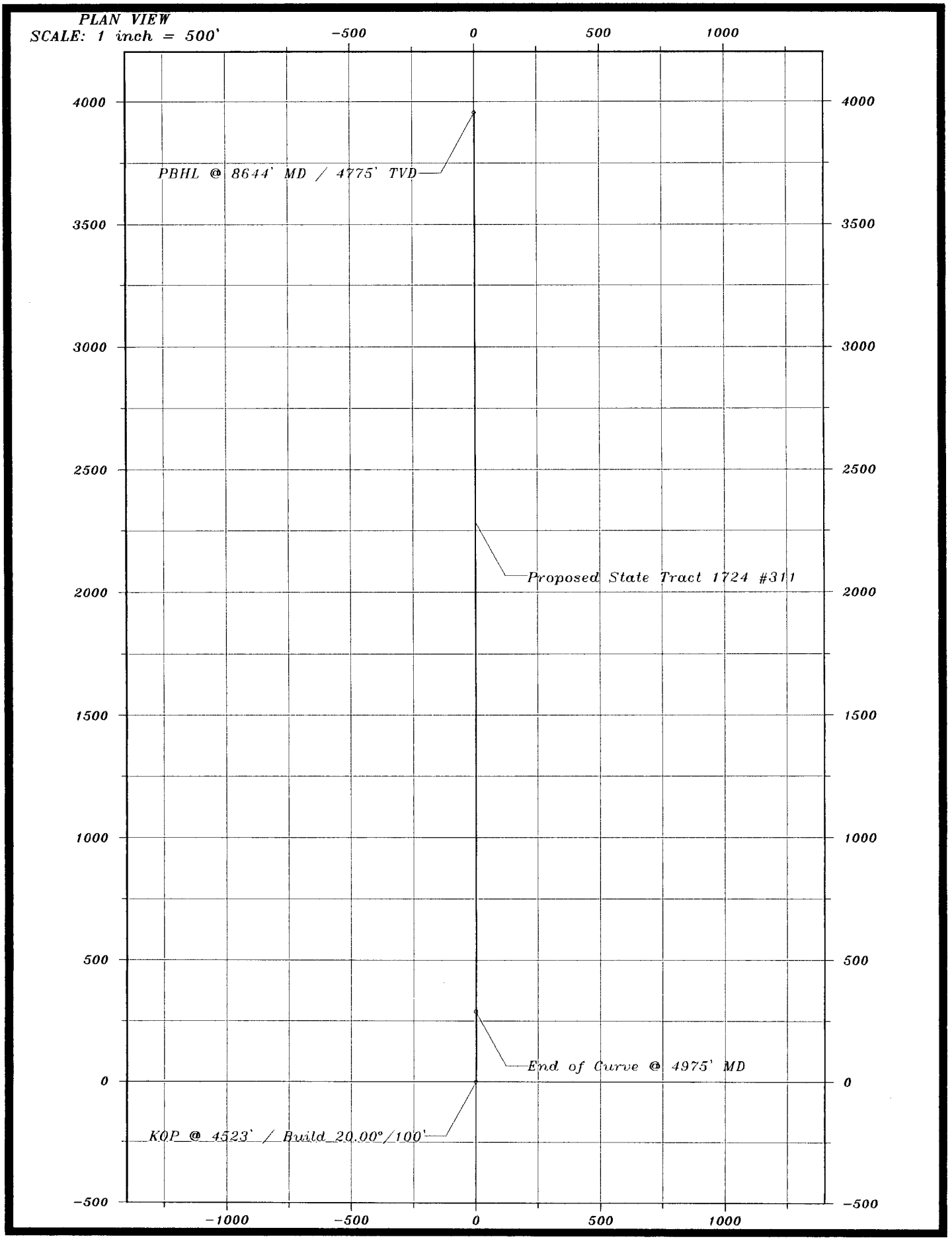
State Tract 1724 #311

Eddy County, New Mexico

Proposal 03-161

DIRECTIONAL DRILLING CONTRACTORS, LLC.




PLAN VIEW
SCALE: 1 inch = 500'
-500
0
500
1000
4000
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
PBHL @ 8644' MD / 4775' TVD
Proposed State Tract 1724 #311
End of Curve @ 4975' MD
KOP @ 4523' / Build 20.00°/100'

Perenco LLC

Eddy County, New Mexico
Perenco LLC

Eddy County
Eddy County Project
Section 29, T-24-S, R-24-E
Section 20, T-18-S, R-23-E
Section 31, T-17-S, R-24-E
5,000 TVD

Prepared for:
David Groff
Senior Drilling Engineer

Buckeye Inc.
Midland, Texas
Prepared by: Steve Spyres

October 10,2003

Perenco

Well Synopsis

OPERATOR:	*Perenco LLC*
WELL NAME:	**Eddy County Prospect**
DEPTH:	**5,000'**
LEGALS:	**Section 29, T-24-S, R-24-E** **Section 20, T-18-S, R-23-E** **Section 31, T-17-S, R-24-E**
COUNTY:	**Eddy**
STATE:	**New Mexico**
MUD TYPE:	**Surface - Spud Mud** **Intermediate - Brine** **Production - Salt gel Starch OR XCD Polymer**
ESTIMATED DAYS:	**10 - 12**
ESTIMATED DOLLARS:	**$5,500 - $6,000**
WAREHOUSE CONTACT:	**Office Artesia NM 505-748-1363 (24 hours)** **Office Midland TX 915-682-7422 (24 hours)**
MUD ENGINEER CONTACT:	**Dave Williamson** **Office Artesia NM 505-748-1363 (24 hours)** **Office Midland TX 915-682-7422 (24 hours)** **Cellular Artesia NM 505-748-7695** **Home Artesia NM 505- 746-4899**
OFFICE CONTACT:	**Steve Spyres** **Office 915-682-7422** **Cellular 915-634-0793** **Home 915-689-0410** **E-Mail** spyres@buckeyeinc.com
	October 10, 2003

- *Estimated days and dollars exclude <u>severe</u> loss of circulation, plugbacks, sidetracks, deviation from center and/or prolonged days on location for unexpected circumstances..*

- *Estimated dollars include materials, drayage, taxes - but exclude reconditioning, disposals and/or liquid dilution.*

0′ – 400′.

0' – 200+/- Drill a 17 1/2" hole and set 13 3/8" casing.	
Buckeye Type Fluid	Fresh water native mud and or gel and lime.
Potential Hazards	Hole cleaning, drag & total loss of returns.

Drilling Fluid Recommendations

Interval Depth (Feet) (MD/TVD)	Fluid Density (PPG.)	Viscosity (sec./qt)	Plastic Viscosity (cps)	Yield Point (lbs/100 ft.^{2})	PH	Filtrate - API (Cm3/30 min.)	Solids (% Volume)	Chloride (Mg/L)
0 – 200′	8.4 – 9.6	32 - 38	NC	NC	9.5	NC	>8	2 k

0′ – 200′

- Spud with Bentonite flocculated with lime for sufficient viscosity to clean hole.
- Mix paper as needed for seepage.
- Mix Cotton Seed Hulls if any lost circulation occurs.

Drill with no returns to casing point if losses become severe. Running Fresh water to control viscosity and mud weight.

200′ – 1,500′

200' – 1,500′ Drill a 12 1/4" hole and set 9 5/8 ' casing								
Fluid Type	Fresh water							
Potential Hazards	Hole cleaning							
Drilling Fluid Recommendations								
Interval Depth (Feet) (MD/TVD)	Fluid Density (PPG.)	Viscosity (sec./qt)	Plastic Viscosity (cps)	Yield Point (lbs/100 ft.^{2})	pH	Filtrate - API (Cm3/30 min.)	Solids (% Volume)	Chloride (Mg/L)
200′ – 1,500′	8.4 – 9.2	28	NC	NC	10.5	NC	>5	5 - 7 k

200′ – 1,500′

- Drill out from under surface casing with fresh water using a controlled section of the reserve pit and allow fluid to brine up from the salt section. Drilling out with fresh water causes wash outs in the salt section.
- Use lime for an 11 pH as needed.
- Use ground paper for any seepage that may be encountered.
- Use Bentonite for sweeps or for any excessive drag or hole problems thru this interval.
- Use PhPa as needed to keep fluid clean.

1,500' – 5,000'

1,500' – 5,000' Drill a 8 ¾"" hole and set 7" casing.								
Fluid Type	Fresh water							
Potential Hazards	Hole cleaning, Abo Shale, Tight hole							
Drilling Fluid Recommendations								
Interval Depth (Feet) (MD/TVD)	Fluid Density (PPG.)	Viscosity (sec./qt)	Plastic Viscosity (cps)	Yield Point (lbs/100 ft.^{2})	pH	Filtrate - API (Cm3/30 min.)	Solids (% Volume)	Chloride (Mg/L)
1,500' – 4,800'	8.4 – 8.8	28- 29	NC	NC	11.0	NC	>5	1 – 8 k
4,800' – 5,000	8.8 - 9.3	28 - 29	NC	NC	10.0	10- 12	>5	1 – 8 k

1,500' – 5,000'

- Drill out with fresh water circulating a controlled section of reserve pit.
- Use lime for pH of 10.5.
- Use paper as needed of any seepage.
- Also, use Bentonite for any sweeps for hole cleaning problems that may be encountered.
- Use PhPa as needed to keep fluid clean and drill solids to a minimum.
- It is also suggested that a good hydraulics program should be implemented when drilling out from the 9 5/8" casing.

4,800' – 5,000'

- Approximately 200' prior to topping Abo Shale go back to steel pits and start mud up.
- Use lime for pH of 10.5.
- Yellow Starch for 10 – 12 cc filtrate.
- Prior to mixing Yellow Starch, mix Alpha 125 (Biocide) to prevent any bacteria degradation. This should be mixed at one bucket per 150 bbls of fluid in system.
- At TD, suggest sweeping hole with viscous Bentonite slurry.
- Maintain these properties until TD.

Possible Problems

There is a possible total loss of circulation in the surface hole. If this is a encountered mix 1 – 2 LCM pill and if returns are not established then drill to TD of surface hole pumping LCM pills and run casing. If cement is not circulated on surface pipe, it will be necessary to 1" cement on backside to attain cement to surface. No anticipated hole problems should occur until after topping Abo Shale formation. Prior to topping the Abo could have some unconsolidated formation (Detrital type). That could cause some hole cleaning problems.
Could also have some excessive drag on connections.

Hydraulics' Programs

Need to run a good hydraulics program to help ensure good hole cleaning and to get maximum penetrations rates from bit selections. This will also help prevent washouts in shale sections that could cause hole-cleaning problems. The optimum flow rate is approximately 250 to 280 GPM with 1,500-PSI standpipe.

H2S
CONTINGENCY PLAN
INDEX

PERENCO LLC

DRIVING DIRECTIONS TO THE STATE 1724 #311 WELL
SECTION 31, TOWNSHIP 17 SOUTH, RANGE 24 EAST, N.M.P.M.
EDDY COUNTY, NEW MEXICO

Beginning at the intersection of State Highway 83 and County Road 8 approximately 3.0 miles east of Hope, New Mexico.

Then travel south on County Road 8 approximately 2.0 miles to a "Y" in road.

Then take east fork of "Y" and travel approximately 0.5 mile to a gate.

Then travel through gate and past ranch house approximately 0.5 mile to a two-track road.

Then travel east on said two-track approximately 2.0 miles to a point, which lies approximately 650' north of said proposed well #311.

DISTRICT I
1625 N. French Dr., Hobbs, NM 88240

DISTRICT II
P.O. Drawer DD, Artesia, NM 88211-0719

DISTRICT III
1000 Rio Brazos Rd., Aztec, NM 87410

DISTRICT IV
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
2040 South Pacheco
Santa Fe, NM 87505

Form C-102
Revised August 15, 2000
Submit to Appropriate District Office
State Lease - 4 Copies
Fee Lease - 3 Copies

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number	Pool Code	Pool Name
		Wildcat

Property Code	Property Name	Well Number
	STATE 1724	311

OGRID No.	Operator Name	Elevation
	PERENCO LLC	3861'

Surface Location

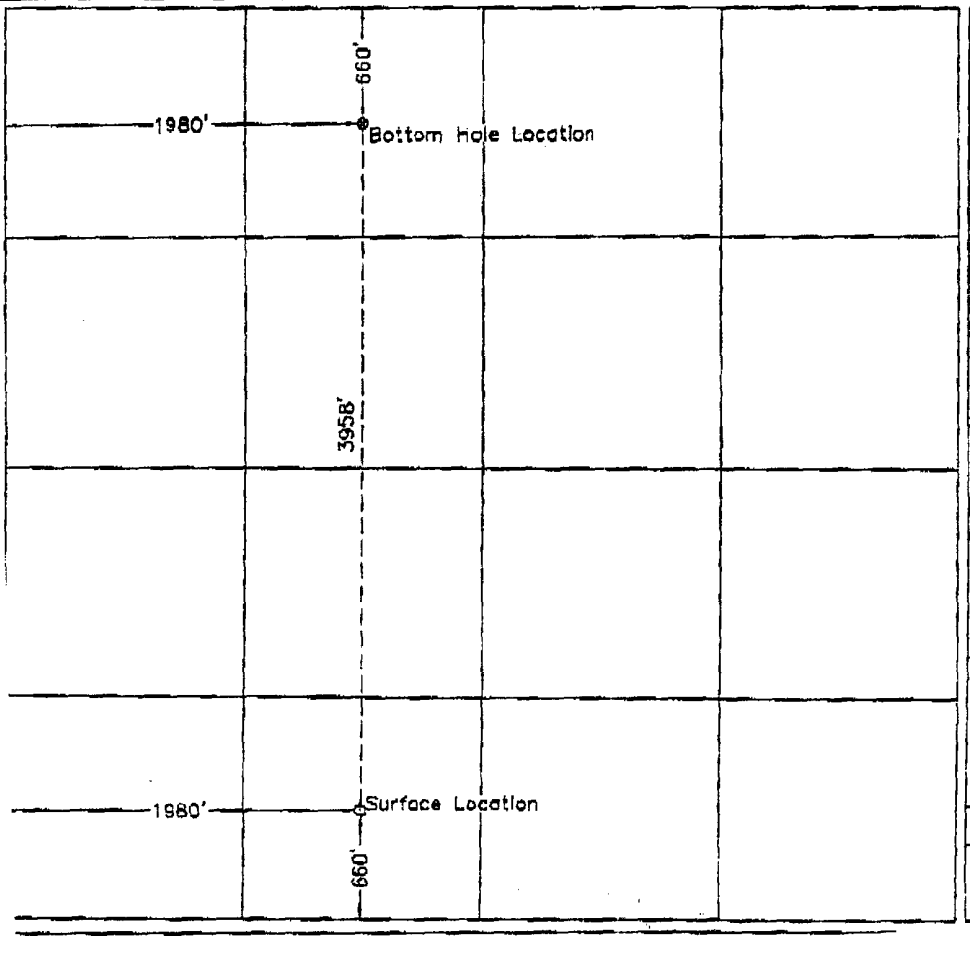
UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
N	31	17 S	24 E		660	SOUTH	1980	WEST	EDDY

Bottom Hole Location If Different From Surface

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
C	31	17 S	24 E		660	NORTH	1980	WEST	EDDY

Dedicated Acres	Joint or Infill	Consolidation Code	Order No.

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



OPERATOR CERTIFICATION

I hereby certify the the information contained herein is true and complete to the best of my knowledge and belief.

Robin S. McCarley
Signature

Robin S. McCarley
Printed Name

Eng. Tech.
Title

09/30/03
Date

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervison, and that the same is true and correct to the best of my belief.

September 10, 2003
Date Surveyed

Signature & Seal of Professional Surveyor

LVA

W.O. Num. 2003-0630

Certificate No. MACON McDONALD 12185

SAFETY

It is the policy of PERENCO LLC. That in all operations to do everything possible to insure the safety of its employees and the contractor's employees on the job site. Additionally, to provide for the safety and comfort of persons near the operation by protecting the environment to the fullest degree possible.

The primary purpose of the procedures outlined herein is to guide the personnel on location in the event that Hydrogen Sulfide (H_2S) reaches the surface

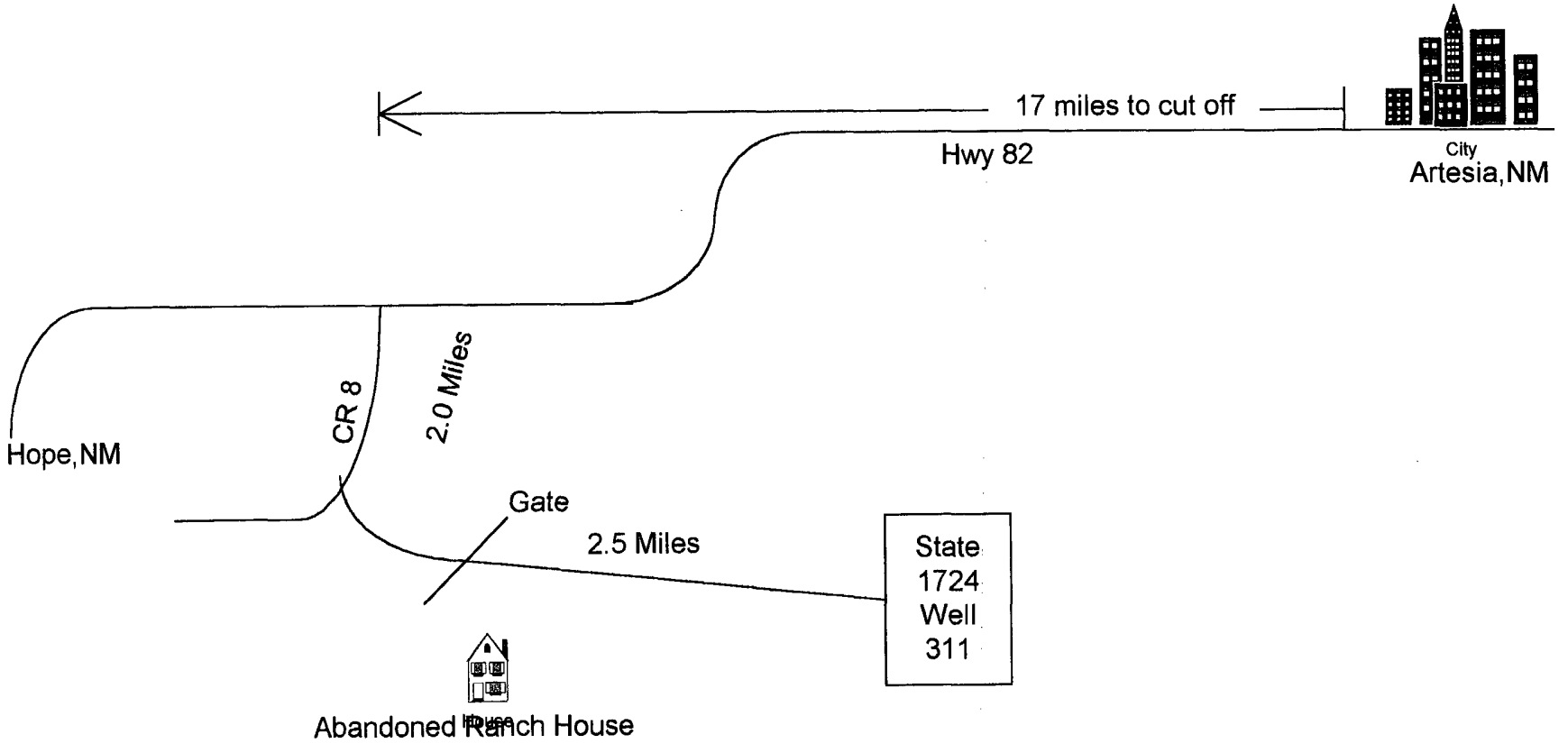
TO PROTECT THEIR OWN SAFETY AND THE SAFETY OF OTHERS, ALL PERSONNEL ON THE JOB SITE WILL RIGIDLY ADHERE TO THIS PLAN

Initial Suspected Problem Zone:	WILD CAT
Potential Open Flow Capacity	unknown
Expected Concentration:	1000 ppm

The plan should be implemented before drilling into the formation at 3075 feet.

The cementing, casing and mud program is contained in the PERENCO LLC. Program.

STATE 1724
WELL# 311



EMERGENCY CALL LIST

PUBLIC SAFETY

AGENCY	LOCATION	TELEPHONE #
Sheriff's Department	EDDY COUNTY N.M.	505 746-5004
Ambulance Service	EDDY COUNTY N.M.	505 746-5004
Fire Department	EDDY COUNTY N.M.	505 746-5004
Department of Public Safety	EDDY COUNTY N.M.	505 746-5004
Highway Department	EDDY COUNTY N.M.	505 746-5004
OIL CONSERVATION DIVISION	SANTA FE NEW MEXICO	505 476-3440
U.S. Dept. of Labor		

EMERGENCY NOTIFICATION

EVACUATION PLAN

The following general plan has been developed in the event that any public evacuation becomes necessary.

1. Perenco LLC.has requested and has been assured the support of the various public safety entities in the area.

2. Any evacuation will be conducted by the Eddy County Sheriff's Department and supported by the New Mexico State Police.

3. Assistance from other public safety entities may be requested if required.
4. The included maps detail the area of the wellsite including the inventory of the public within the radius of exposure of the well.

5. In the event that there is any suspected problem on the well, the wellsite supervisor will notify the Eddy County Sheriff's Office (505 746-5004) for ALERT STATUS.

6. ALERT STATUS will require that available public support personnel will proceed to the Eddy County Sheriff's Office in Artesia NM and standby for instructions.

7. If isolation and evacuation are necessary, then units will be dispatched to points marked on the map with instructions to maintain roadblocks.

8. Evacuation teams will then proceed to sectors to be evacuated. Evacuation procedure will follow appropriate consideration for wind conditions.

9. On-Site personnel will establish safe perimeters using H_2S & LEL Detectors.

10. The Oil Conservation Division and other authorities will be notified as soon as possible.

11. Other supplemental contractors will be contacted and called in as needed.

EMERGENCY CALL LIST
PERENCO LLC.

DAVID GRAFE	DISTRICT MANAGER	432 683-5698 HOME 432 688-0943 OFFI
BRAD ENGLISH	DRILLING & PROD	432-689-7901 HOME 432-631-9650 OFFI
CASEY DAVIDSON	DRILLING & PROD	325 884-3487 HOME 325 277-0221 OFFI

EMERGENCY CALL LIST

PATTERSON UTI DRILLING

Jack Wilson	Tool Pusher	806 893-2065
	(Rig Phone)	806 893-2852
Fred Spruiell	Drilling Superintendent	806 893-2224

EMERGENCY CALL LIST
RESIDENTS WITHIN 3000 FOOT RADIUS OF EXPOSURE

NONE

EMERGENCY CALL LIST

MEDICAL SUPPORT

AGENCY	LOCATION	TELEPHONE #
ARTESIA GENERAL HOSPITIAL	ARTESIA N.M.	505 746-2999
AMBULANCE SERVICE	ASTESIA N.M.	505 746-5004

EMERGENCY PROCEDURES

RESPONSIBILITY

In the event of a release of potentially hazardous amounts of H2S, all personnel will immediately proceed upwind to the nearest designated safe area and prepare to don their protective breathing equipment. Perenco LLC. Representative will immediately, upon assessing the situation, set this plan into action by taking the proper procedures to contain the gas and notify the appropriate people and agencies.

If the Perenco LLC. Representative is incapacitated or not on location, this responsibility will fall to the PATTERSON Drilling Company's Tool pusher.

PERENCO LLC.

1. In an emergency situation, the Operations Supervisor on duty will have complete responsibility and will take whatever action is deemed necessary in an emergency situation to insure all personnel's safety, to protect the well and to prevent property damage.

2. The Operations Supervisor shall advise the Operations Superintendent when procedures as specified herein have been met, will inform of emergencies and deviation from the plan, and see that procedures are observed at all times.

3. The Operations Supervisor shall advise each contractor, Service Company, and all others entering the site that Hydrogen Sulfide may be encountered and the potential hazards that may exist. This may be delegated to another competent person.

4. The Rig Site Management Team will keep the number of persons on location to a minimum during hazardous operations.

5. The Operations Supervisor will assess the situation when alarm sounds, and issue work orders. When conditions warrant, the Operations Supervisor orders all personnel to "Safe Briefing Areas".

6. The Operations Supervisor will direct corrective actions to control flow of gas.

7. The Operations Supervisor has full responsibility for the decision to ignite the well. The decision will be made only as a last resort.

PATTERSON DRILLING COMPANY

1. The Toolpusher will assume all responsibilities of the Operations Supervisor in an emergency situation in the event that the Operations Supervisor becomes incapacitated

2. The Toolpusher will order the Driller to secure the rig, if time permits.

EMERGENCY PROCEDURES

DRILLING CREW ACTIONS

1. All personnel will don their protective breathing apparatus. The drilling crew will take necessary precaution as indicated in Operating Procedures.
2. The "Buddy System" will be implemented. All personnel will act upon directions from the Operator's Representative.
3. If there are nonessential personnel on location, they will move off location.
4. Entrance to the location will be patrolled, and the proper well condition flag will be displayed at the entrance to the location.

IN THE EVENT OF AN ACCIDENTAL RELEASE OF POTENTIALLY HAZARDOUS VOLUME OF H2S, THE FOLLOWING PROCEDURES WILL BE TAKEN:

1. All personnel on location will be accounted for and emergency search should begin for any missing.

2. All search missions will be conducted under fresh air masks in teams of two. Should the search team need to approach the well, safety harness and rope should be used.

3. All individual companies and agencies should be contacted according to the EMERGENCY CALL LIST.

4. An assigned crew member will blockade the entrance to the location. No unauthorized personnel will be allowed entry into the location.

5. The Operator's Representative will remain on location and attempt to regain control of the well.

6. The Company's designated representatives will begin evacuation of those persons in immediate danger.

TEMPORARY SERVICE PERSONNEL

All service personnel, such as cementing crews, logging crews, specialists, mechanics and welders will furnish their own safety equipment as required to comply with OSHA and Perenco LLC.

VISITORS

Visitors and nonessential personnel will be prohibited from remaining in, or entering a contaminated area where Hydrogen Sulfide concentration in the atmosphere exceeds 10 ppm.

NOTE: WHEN HYDROGEN SULFIDE MIGHT BE ENCOUNTERED, NO PERSONNEL ON LOCATION WILL BE PERMITTED TO SLEEP IN VEHICLES.

INSTRUCTIONS FOR IGNITING THE WELL

THE DECISION TO IGNITE THE WELL IS THE RESPONSIBILITY OF THE PERENCO, LLC... In the event he is incapacitated or unavailable, it becomes the responsibility of the PATTERSON DRILLING COMPANY RIG SUPERINTENDENT. The decision to ignite the well should be made only as a last resort and in the situation where it is clear that:

1. Human life is in danger

2. There is no hope of controlling the well under current conditions.

The Perenco LLC.Office should be notified as soon as possible. The first phase of evacuation should be initiated immediately.
Once the decision has been made the following procedures should be followed:

1. Four (4) people, wearing self-contained breathing apparatus will be needed for the actual lighting of the well. They must first establish the flammable perimeter by using an explosimeter or Tri-Gas Meter. This should be established at 30% to 40% of the lower flammable limits.

2. After the flammable perimeter has been established and everyone removed from the area, the ignition team should select a site upwind of the well, from which to ignite. This site should offer the maximum protection and have a clear path for retreat from the area.

3. The ignition team should have safety harness and lanyards attached and manned before attempting ignition. If the leak is not ignited on the first attempt, move in 20 to 30 feet and fire again. Continue to monitor with the explosimeter or Tri-Gas and never fire from an area with over 75% of the Lower Explosive Limit (LEL). If having trouble igniting the well, try firing 40 degrees to 90 degrees on either side of the well.

4. After ignition or attempted ignition, the toxic perimeter must be established and evacuation continued until the well is contained.

5. All personnel will act only as directed by the person in charge of the operations.

EQUIPMENT TO BE PROVIDED BY SAFETY INTERNATIONAL

SAFETY TRAILER PACKAGE #2

1. Five (5) Escape Capsules
2. Four (4) 30-Minute Rescue Unit
3. Two (2) Windsocks
4. Two (2) Briefing Area Signs
5. Two (2) Condition Signs with Flags
6. One (1) electronic Monitor with three (3) Sensor Heads, and warning system as needed
7. One (1) Air Trailer With work Units In Trailer

NOTE: Additional equipment may be required due to noise levels, staffing changes and/or well condition changes.

SPECIAL EQUIPMENT

1. Flare lines should be as long as practical and securely staked. A burn pit should be equipped with walls high enough to deflect the flare up away from grass and trees.

2. An electronic Hydrogen Sulfide monitor will be installed with a combination visual and audible alarm system located where it can be seen and/or heard throughout the drilling location. In high noise areas, a strobe light shall be installed. The number of alarms needed may vary from location to location.

3. An electronic Hydrogen Sulfide monitor will be installed with an audible alarm system located where it can be heard throughout the residence.

4. The electronic Hydrogen Sulfide monitoring system will be calibrated to actuate the low alarm (visual alarm) at a concentration of 10-ppm Hydrogen Sulfide in the atmosphere and the high alarm at a concentration of 15-ppm Hydrogen Sulfide in the atmosphere.

5. Extra equipment will be available if required to provide adequate respiratory protection for all personnel on location.

DRILL STEM TEST

1. All drill stem tests of Hydrogen Sulfide zones will be approved by the Texas Railroad Commission.

2. Drill stem testing of Hydrogen Sulfide zones will be permitted only during daylight hours.

3. All nonessential personnel will be moved to "Safe Briefing Area".

4. Put on air mask before formation fluids are expected at the surface and continue "MASKS ON" until flares are lighted and work areas test less than 10 ppm Hydrogen Sulfide and the area has been declared safe.

SAFETY INTERNATIONAL, INC.

ODESSA, TEXAS

915 580-3770

(24 HR ANSWERING SERVICE)

EMERGENCY PERSONNEL

October 15, 2003

MARK GRAVES	PRESIDENT	432 580-3770 432 425-8002 CELL
REGGIE PHILLIPS	VICE PRESIDENT	432 580-3770 432 425-8000 CELL
KENNETH PHILLIPS	OPERATIONS MGR	432 580-3770 432 425-8031 CELL

TRAINING

Every person working in any capacity on the lease will be required to review the emergency procedures and will participate in the training program.
Perenco LLC.will provides personnel to direct the training program and indoctrinate all authorized persons on the lease in the proper use of the safety equipment.
The training personnel will work individually with each member until they are satisfied that the crewmember is familiar with the emergency procedures and the training program. This should be accomplished prior to an individual's work operation.
Training will include hands-on use of all equipment in order to familiarize the trainees with the safety equipment. Training of residence in the Hazards and Characteristics of Hydrogen Sulfide Gas will be conducted as well as hands on training of the Escape units on proper use.

SAFETY TRAINING

1. Hydrogen Sulfide Safety Training will be provided to all personnel and residence, within close proximity of the flow line, at 1,000 feet above the expected H_2S formation. The training sessions will cover, but will not be limited to the following

a. General information on H_2S and SO_2 gas

b. Hazards of H_2S and SO_2 gas

c. Safety equipment on location

d. Proper use and care of personal protective equipment

e. Operational procedures in dealing with H_2S gas

f. Evacuation procedures

g. Chemicals to be used in mud to control H_2S

h. First aid, reviving an H_2S victim, toxicity, etc.

I. Designated safe briefing area (S.B.A.)

j. Metallurgical considerations

NOTE: Once H_2S Safety Procedures are established on location, no personnel with beards or facial hair, which will interfere with face seal or mask, will be allowed on location.

EMERGENCY CONDITIONS

Operating Conditions

A. Emergency Procedures and Definition of Warning Flags

1. Condition: **YELLOW** -- NORMAL OPERATION

2. Condition: **ORANGE**—POTENTIAL DANGER, CAUTION

a. Cause for condition:

* Circulating up drilling breaks
* Trip gas after trip
* Circulating out gas on choke
* Poisonous gas present, but below threshold concentrations

b. **Safety actions:**

* Check safety equipment and keep it with you
* Be alert for a change in conditions
* Follow instructions

3. **Condition:** **RED**—EXTREME DANGER

a. **Cause for condition:**

* Uncontrolled flow from the well with lethal concentrations of H_2S

b. **Safety actions**:

* Masks On. All personnel will have protective breathing equipment with them. All personnel will stay in safe briefing area unless instructed to do otherwise.

* The decision to ignite the well is the responsibility of the company representative and should be made only as a last resort, when it is clear that:

i. Human life is endangered

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

* Order evacuation of local people within the danger zone.

THE USE OF SELF CONTAINED BREATHING EQUIPMENT

1. Respirators shall be inspected frequently at random, to insure that they are properly used, cleaned and maintained

2. Anyone who may use the respirators shall be trained in how to insure proper face piece to face seal. They shall wear respirators in normal air the wear it in a test atmosphere. (Note: such items as fasicial hair-bread or side burns-and eyeglasses temple pieces will not allow a proper seal). Anyone who may be reasonably accepted to wear resiptors should have these items removed before entering a toxic atmosphere; a special mask must be obtained for anyone who must wear eye glasses. Contact lens should not be allowed.

3. Maintenance and care respirators:

A. A program for maintenance and care of respirators shall include the following:

* Inspection for defects, including leak checks
* Cleaning and disinfecting
* Repair
* Storage

B. Inspection: Self-contained breathing apparatus for emergency use shall be inspected monthly for the following and a permanent record kept of these inspections.

* Fully charged cylinders
* Regulator and warning devise operation
* Condition of face piece and connections
* Elastic or rubber parts shall be stretched or massaged to keep them pliable and prevent deterioration.

C. Routinely used respirators shall be collected cleaned and disinfected as frequently as necessary to insure proper protection is provided.

4. A person assigned a task that requires use of self-contained breathing equipment, should be certified, physically fit for breathing equipment usage by the local physician at least annually and shall have passed a quantitative fir test on the equipment that he/she will use.

5. Respirators should be worn

THE USE OF SELF CONTAINED BREATHING EQUIPMENT...

A. When breaking out any line where H_2S can reasonably be expected.

B. When sampling air in areas to determine if toxic concentrations of H_2S exist.

C. When working in areas where over 15 ppm H_2S has been detected.

D. At any time there is a doubt as to the H_2S concentration in the zone to be entered.

Toxicity

Common Name	Chemical Formula	Specific Gravity(SG) Air=1	Threshold [1] Limit	Hazard [2] Limit	Lethal [3] Concentration
Hydrogen Cyanide	**HCN**	0.94	10 ppm	150 ppm/hr	300 ppm
Hydrogen Sulfide	**H_2S**	**1.18**	**10 ppm[4] 15 ppm[5]**	**250 ppm/hr**	**600 ppm**
Sulfur Dioxide	**SO_2**	2.21	2 ppm	----------	1,000 ppm
Chlorine	**Cl_2**	2.45	1 ppm	4 ppm/hr	1,000 ppm
Carbon Monoxide	**CO**	0.97	50 ppm	400 ppm/hr	1,000 ppm
Carbon Dioxide	**CO_2**	1.52	5,000 ppm	5%	10 %
Methane	**CH_4**	0.55	90,000 ppm	Combustible Above 5% in Air	----------

[1]**Threshold Limit** – Concentration at which it is believed that all workers may be repeatedly exposed day after day without adverse effects.
[2]**Hazardous Limit** – Concentration that may cause death.
[3]**Lethal Concentration** – Concentration that will cause death with short-term exposure.
[4]**Threshold Limit = 10 ppm** – 1972 ACGIH (American Conference of Governmental Industrial Hygienist).
[5]**Threshold Limit = 15 ppm** – 1989 ANSI acceptable Ceiling concentration for eight-hour exposure (based on 40-hour work week) is 15 ppm. OSHA Rules and regulations (Federal Register, Volume 54, No. 12, dated January 19,1989)

PHYSICAL EFFECTS OF HYDROGEN SULFIDE POISONING

THE PRINCIPAL HAZARD IS DEATH BY INHALATION

When the amount of gas absorbed into the bloodstream 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 500 ppm and above. This condition may be reached almost without warning as the originally detected odor of H_2S may have disappeared due to olfactory paralysis. Death then occurs from asphyxiation unless the exposed person is removed immediately to fresh air and breathing is stimulated by artificial respiration. Other levels of exposure may cause the following symptoms individually or in combination:

1. Headache
2. Dizziness
3. Excitement
4. Nausea or gastro-intestinal disturbances
5. Dryness and sensation of pain in nose, throat, and chest
6. Coughing
7. Drowsiness

All personnel should be alerted to the fact that detection of H_2S solely by sense of smell is highly dangerous, as the sense of smell is rapidly paralyzed by the gas. 10 ppm of H_2S detected should be treated as if it were 500 ppm.

TREATMENT OF 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 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.

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. The irritation caused by exposure to Hydrogen Sulfide requires treatment by a physician, preferably an eye specialist. The prognosis for recovery in these cases is usually good.

CONTACT WITH SKIN

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

CHARACTERISTICS OF HYDROGEN SULFIDE

1. Extremely toxic (Poisonous).

2. Heavier than air and colorless.

3. Has the odor of rotten eggs, in small amounts.

4. Burns with a blue flame and produces Sulpher Dioxide (SO_2) Gas, which is very irritating to eyes and lungs. The SO_2 is as toxic as H_2S, but the severe discomfort at low concentration acts as a barrier to human exposure to toxic levels of this gas.

5. H_2S forms explosive mixture with air between 4.3% and 46% by volume

6. H_2S is soluble in water but becomes less soluble as the water temperature increases.

7. The toxicity of Hydrogen Sulfide is second only to Hydrogen Cyanide and is between 5 and 6 times more toxic than Carbon Monoxide.

8. Produces irritation to eyes, throat and respiratory tract.

EFFECTS OF HYDROGEN SULFIDE ON METAL

Hydrogen Sulfide dissolves in water to form a weak acid that can cause some pitting, particularly in the presence of Oxygen and/or Carbon Dioxide. However, the most significant action of H_2S is its contribution to a form of Hydrogen embrittlement known as Sulfide Stress Cracking. Sulfide Stress Cracking is a result of metals being subjected to high stress levels in a corrosive environment where H_2S is present. The metal will often fail in a brittle manner. Sulfide stress cracking of steel is dependent upon and determined by:

1. Strength (hardness) of the steel - the higher the strength, the greater the susceptibility to sulfide stress cracking. Steels having yield strengths up to 95,000 psi and hardness up to Rc22 are generally resistant to sulfide stress cracking. These limitations can be extended slightly higher for properly quenched and tempered materials.

2. Total member stress (load) - higher the stress level (load) the greater the susceptibility to sulfide stress cracking.

3. Corrosive environment - corrosive reactions, acids, bacterial action, thermal degradation of low pH fluid environment.

Toxicity of Hydrogen Sulfide to Humans

PPM**	0-2 Minutes	2 - 15 Minutes	15 - 30 Minutes	30 Minutes One Hour	1 – 4 Hours	4 – 8 Hours	8 – 48 Hours
20 – 100				Mild, conjunctivitis, respiratory tract irritation	Symptoms worsen, fatigue, headache	Symptoms worsen	
100 – 150		Coughing, Irritation of eyes, loss of sense of smell	Disturbed respiration, pain in eyes, sleepiness	Throat Irritation	Salivation and mucous discharge, sharp pain in eyes, coughing	Increased symptoms	Death
150 – 200		Loss of sense of smell	Throat & eye Irritation	Throat & eye Irritation	Difficult, blurred vision, light shy	Death	
200 -350	Irritation of eyes, loss of smell	Irritation of eyes	Painful secretion of tears, weariness	Light shy, nasal catarrh, pain in eyes, difficult breathing	Death		
350 – 450	Loss of sense of smell	Irritation of eyes, dizziness	Difficult Respiration, coughing, irritation of eyes, fatigue, nausea	Death			
450 – 700	Respiratory disturbances, Irritation of eyes, collapse, unconsciousness	Death	Death				
Over 700	Death						

FIGURE 1 **Susceptibility varies greatly between Individuals**

*** Data secured from experiments of dogs which have a susceptibility similar to humans.**
****PPM – parts per million**

PROCEDURAL CHECK LIST

PERFORMED EACH TOUR BY THE DRILLING CONTRACTOR PERSONNEL

1. Check fire extinguishers to see that they have the proper charge.

2. Check pump pressure on standpipe gauge and choke manifold gauge to assure proper communication between gauges and also comparison of pressure reading on each gauge.

Make a visual check of H_2S monitoring system.

PERFORMED EACH WEEK BY DRILLING CONTRACTOR PERSONNEL

1. Function test BOP.

PERFORMED EACH WEEK BY ON-SITE SAFETY PERSONNEL

Perform unannounced H2S drill with each crew.

2. Check each piece of breathing equipment to make sure that demand regulator is working. This requires that the bottle be opened and the mask assembly be put on tight enough so that when you inhale, you get air.

3. Check butane supply for burn pit for volume and to make sure 1" line is not plugged. Check automatic ignition system.

4. Check all Work Pack units for operation; demand regulator, escape bottle air volume, supply bottle air volume.

5. Check breathing equipment mask assembly to see that straps are loosened and turned back ready to put on.

6. Check pressure on breathing equipment air bottles to make sure they are charged to full volume.

7. Confirm pressure on all supply air bottles

8. Perform breathing equipment drills with onsite personnel.

9. Perform H2S drill to include residents within R.O.E.

PERFOMED EACH WEEK BY RIG SUPERINTENDENT

1. Perform an unannounced BOP drill with each crew.