Form 3160-3
(November 1983)
(formerly 9-331C)

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 1004-0136
Expires August 31, 1985

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

30-031-20948

APPLICATION FOR PERMIT TO DRILL, DEEPEN, OR PLUG BACK

5. LEASE DESIGNATION AND SERIAL NO.: NM-75099

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Federal 28

9. WELL NO.: 1

10. FIELD AND POOL, OR WILDCAT: Ojo Encino

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Section 28, T20N, R5W NMPM

1a. TYPE OF WORK: DRILL [X] DEEPEN [ ] PLUG BACK [ ]

b. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] OTHER — SINGLE ZONE [X] MULTIPLE ZONE [ ]

2. NAME OF OPERATOR: Merrion Oil & Gas Corporation

3. ADDRESS OF OPERATOR: P. O. Box 840, Farmington, New Mexico 87499

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.*)
At surface: 750' FNL & 2450' FEL
At proposed prod. zone: 944' FNL & 2130' FEL

12. COUNTY OR PARISH: McKinley

13. STATE: New Mexico

14. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE*: 20 miles South of Counselors, New Mexico

15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drlg. unit line, if any): 750' (190')

16. NO. OF ACRES IN LEASE: 2083

17. NO. OF ACRES ASSIGNED TO THIS WELL: W/80

18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT.: None

19. PROPOSED DEPTH: 6950' MD 5879' TVD

20. ROTARY OR CABLE TOOLS: Rotary

21. ELEVATIONS (Show whether DF, RT, GR, etc.): ~~6778~~ 6767 GR, 6790' RKB

This action is subject to technical and procedural review pursuant to 43 CFR 3165.3 and appeal pursuant to 43 CFR 3165.4

22. APPROX. DATE WORK WILL START*: March 15, 1991

23. PROPOSED CASING AND CEMENTING PROGRAM

DRILLING OPERATIONS AUTHORIZED ARE SUBJECT TO COMPLIANCE WITH ATTACHED "GENERAL REQUIREMENTS"

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH	QUANTITY OF CEMENT
12-1/4"	9-5/8"	36#/ft	± 240'	150 sx (177 cu.ft.)
8-3/4"	7"	23 & 20#/ft	± 5970'	600 sx (942 cu.ft.)
6-1/8"	4-1/2" Liner	11.6#/ft	± 6960' MD	None

Propose to drill a vertical well into the Jurassic Entrada, set 7" casing thru and cement in place. Optional completion may be made in vertical wellbore. Will plugback and mill a casing section ± 5480'. Will set a cement kop plug thru section, then drill directionally in a southeasterly direction. Will build angle ± 15°/100 ft. until horizontal at or near the Entrada top. Will drill a reach segment across the structure. A 4-1/2" pre-perf uncemented liner will be run for production configuration. * Will complete as an Entrada horizontal and/or vertical producer. A detailed plan is attached.

RECEIVED
MAR 21 1991
OIL CON. DIV.
DIST. 3

"Approval of this action does not warrant that the applicant holds legal or equitable rights or title to this lease."

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 _____ TITLE Operations Manager DATE January 30, 1991

(This space for Federal or State office use)

APPROVED AS AMENDED

PERMIT NO. _____ APPROVAL DATE _____

APPROVED BY _____ TITLE _____ DATE MAR 06 1991

CONDITIONS OF APPROVAL, IF ANY:

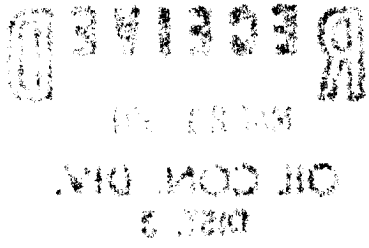
for AREA MANAGER

R-9458

Distribution:
O+6 - BLM, Farmington, NM
Well File

*See Instructions On Reverse Side

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.



Submit to Appropriate
District Office
State Lease - 4 copies
Fee Lease - 3 copies

DISTRICT I
P.O. Box 1980, Hobbs, NM 88240

DISTRICT II
P.O. Drawer DD, Artesia, NM 88210

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

State of New Mexico
Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION
P.O. Box 2088
Santa Fe, New Mexico 87504-2088

RECEIVED BLM
91 JAN 31 PM 1:08
OIO FARMINGTON, N.M.

Form C-102
Revised 1-1-89

WELL LOCATION AND ACREAGE DEDICATION PLAT

All Distances must be from the outer boundaries of the section

Operator	Lease	Well No.
MERRION OIL & GAS CORPORATION	FEDERAL 28	1

Unit Letter	Section	Township	Range	County
B	28	20 N	5 W NMPM	McKinley

Actual Footage Location of Well: BHL: 999FNL, 2130 FEL
750 feet from the North line and 2450 feet from the East line

Ground level Elev.	Producing Formation	Pool	Dedicated Acreage:
6767	ENTRADA	Ojo Encino EXT	80 Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

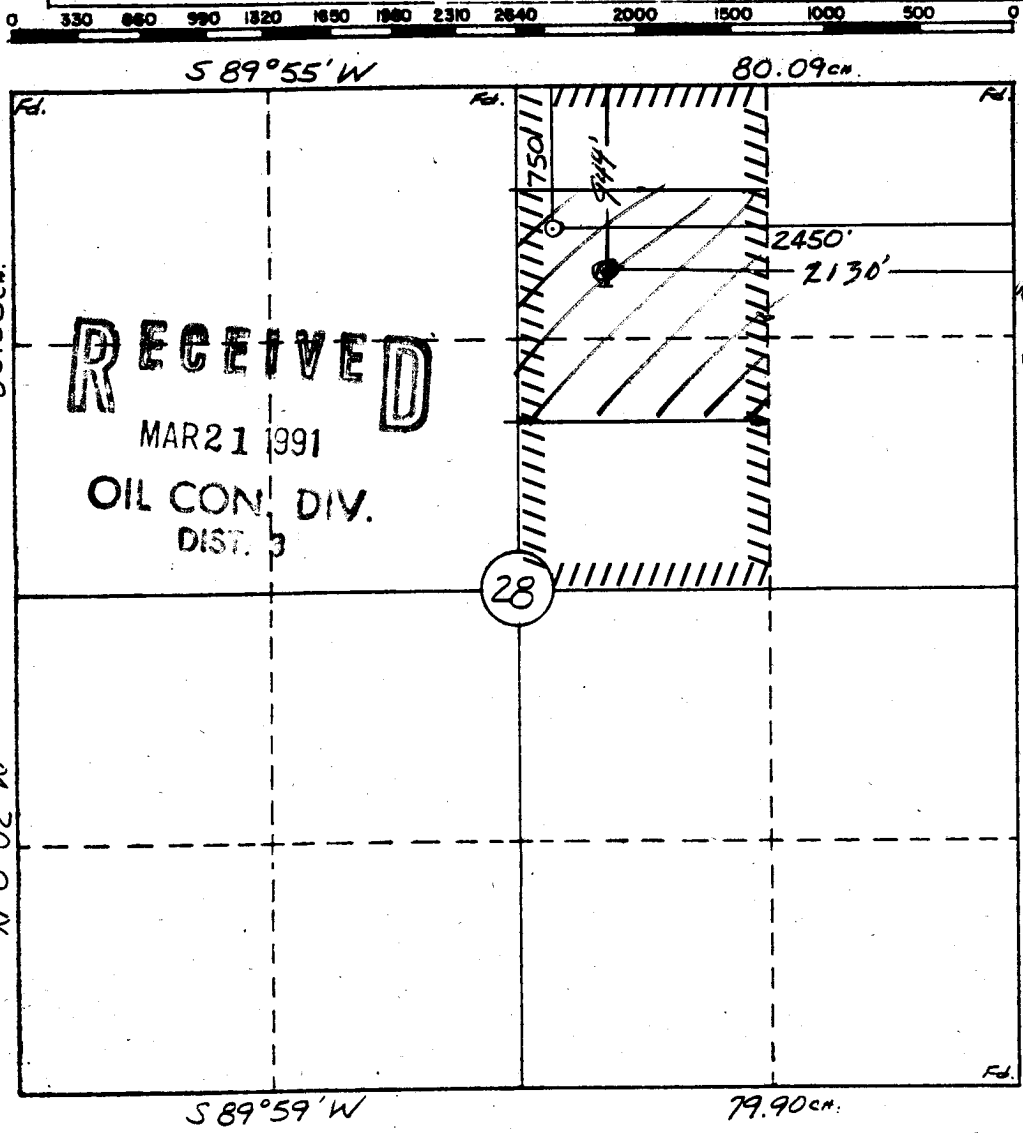
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interest of all owners been consolidated by communitization, unitization, force-pooling, etc.?

☐ Yes ☐ No If answer is "yes" type of consolidation _____

If answer is "no" list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary. _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interest, has been approved by the Division.



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MAR 21 1991
OIL CON. DIV.
DIST. 3

OPERATOR CERTIFICATION

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

Signature

Printed Name: Steven S. Dunn

Position: Operations Manager

Company: Merrion Oil & Gas Corp.

Date: January 30, 1991

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 knowledge and belief.

12-10-90

Date Surveyed

William E. Mahnke II

Signature & Seal of Professional Surveyor

WILLIAM E. MAHNKE II
NEW MEXICO
#8466
REGISTERED PROFESSIONAL LAND SURVEYOR

Certificate No. 8466

MERRION OIL & GAS CORPORATION

DRILLING TECHNICAL PROGRAM

ATTACHMENT TO FORM 3160-3

FEDERAL 28 NO. 1
650' FNL & 2450' FEL
Section 28, T20N, R5W
McKinley County, New Mexico

1. PROJECT OVERVIEW: Attached

2. DETAILED OPERATIONS PLAN: Attached

3. ESTIMATED FORMATION TOPS

FORMATION	DEPTH TVD	DEPTH MD DIRECTIONAL
Kirtland Shale	Surface	Surface
Pictured Cliffs	430'	430'
Mesaverde	1174'	1174'
Mancos	2855	2855'
Gallup	3664'	3664'
Dakota	4774'	4774'
Todilto	5841'	5960'
Entrada	5854'	6007'
Total Depth Vertical Well	5970'	N/A
Total Depth Horizontal Well	5879'	6950'

4. WELL CONTROL SYSTEM

A. Proposed blowout preventer system (schematic drawings attached) is series 900 double ram with choke and kill manifold.

B. Minimum required working pressure rating for BOP stack is 3000 psi.

C. BOP pressure testing will be conducted at time of installation and prior to drillout of surface casing shoe. The BOP's will be activated at minimum on each trip for a bit and recorded in driller's log.

5. DRILLING MUD PROGRAM

A. Surface hole will be drilled with fresh water - gel system, lime added to provide viscosity as needed.

B. 8-3/4" hole will be drilled into the Morrison utilizing a low solids, non-dispersed gel-water mud system. Additives such a starch, cmc, soda ash and others will be used to control mud characteristics as necessary.

Mud system will be changed to a non-damaging PHPA or MMLHC and drilling will continue to TD.

6-1/8" directional drilling will utilize the same PHPA or MMLHC System.

Lost circulation materials will be stored on location, as necessary, for use in restoring lost circulation.

INTERVAL		MUD SYSTEM	WEIGHT #/GAL	VISCOSITY SEC/QT	WATER LOSS CC
Vert	0 - 240'	GEL-LIME	9.0	35-45	NA
Vert	240'-5800'±	GEL-WTR ND	8.4-9.0	28-45	≤ 12
Vert	5800'-5970'±	GEL/BHC/STARCH	8.6-8.7	45-50	≤ 6
Dir	5480'-6950'±	GEL/BHC/STARCH	8.6-8.7	45-50	≤ 6

C. Mud trip monitoring will be done visually.

6. HAZARDS

A. No abnormal pressure is anticipated. However, 3M BOPs will be used under surface casing to total depth. Normal Entrada pressure gradient is ≈ 0.38 psi/ft of depth in this area. Formation pressure at total depth is ≈ 2230 psi. Water hydrostatic is 2533 psi.

B. No lost circulation has been encountered during previous drilling in this area.

C. No H_2S is expected to be encountered. However, should H_2S be found during drilling, detection and warning equipment will be installed.

D. Unintentional hole deviation is not expected to be a problem. Single shot surveys giving hole inclination will be run a minimum of every 500 feet. During horizontal drilling either MWD or wireline surveys will be utilized.

7. LOGGING AND TESTING

A. An IES Induction Log will be run from TD to surface. A Compensated Density Log will be run to cover zones of interest.

B. A drill stem test will be run to test the Entrada in the vertical well.

C. No core is anticipated.

D. Plans call for using a mud logging unit during drilling of the vertical and horizontal sections.

I. SUMMARY INFORMATION

Well Name	:	Federal 28 No. 1
Surface Location	:	750'fnl & 2,450'fel Sec 28, T20N, R5W McKinley County, New Mexico
Elevations	:	6,779' RKB 6,767' GL
Vertical TD	:	5,970' RKB
HORIZONTAL DATA		
Target Locations		
Top	:	944' fnl & 2,130'fel 374' in direction S58.7°E
Bottom	:	1,400'fnl & 1,380'fel 1,252' in direction S58.7°E
Target Depths		
Top	:	5,861' TVD RKB 6,071' MD RKB
Bottom	:	5,880' TVD RKB 6,950' MD RKB
Target Tolerance	:	15' vertical window
	:	7' above proposed line
	:	8' below proposed line
Total Depth	:	5,880' TVD RKB 6,950' MD RKB
Well Objective	:	Entrada Sandstone
Rigs		
Drilling	:	Unknown
Mill Section/Compl	:	Ram Rig No. 1
Estimated Rig Arrivals		
Drill Vertical	:	March 15, 1991
Mill Section	:	April 15, 1991
Drill Horizontal	:	April 30, 1991
Completion	:	May 15, 1991
Estimated Time on Well		
Drill Vertical	:	14 days
Mill Section	:	4 days
Horizontal	:	9 days
Completion	:	7 days

II. PROJECT OVERVIEW

The project objective is to confirm a seismically delineated southern extension of the Ojo Encino Entrada field, and to develop the Entrada formation in the same area, through the use of horizontal drilling technology. In order to accomplish this, it is proposed to drill the Federal 28 No. 1 well at a strategic location on the southern structural feature. (refer to figure No. 1)

The Ojo Encino field is located in McKinley County, New Mexico, approximately 85 miles southeast of Farmington, New Mexico. It in the area generally described as the Chaco Slope region of the San Juan Basin, and was discovered by Filon in August, 1976. Entrada Oil is trapped in the remnants of an ancient wind blown sand dune deposit of Jurrasic age. The reservoir rock is very clean by San Juan Basin standards. The porosity averages 25% and is accompanied by permeabilities in the range of 400 to 500 millidarcies. There is essentially no free gas in the oil and the drive mechanism is bottom water. Oil viscosity and gravity are about 8cp and 32°API respectively.

Plans call for drilling a vertical 8 3/4" hole to 5,970'KB, through the Entrada formation. If the geology is confirmed, 7" casing will be run either through the Entrada or to a horizontal well kick-off point and cemented in place. This decision will be made at the time of drilling and will be determined by the desirability of producing the vertical wellbore. Once the 7" casing is set, the drilling rig will move off and final horizontal equipment mobilization will take place.

A completion rig will move on and conduct the plug back and casing milling operations.

The drilling rig will move back on and begin the directional drilling. A 6 1/8" hole will be drilled using a double bend steerable motor configuration with a wireline steering tool for control. An average build rate of 15°/100ft is proposed.

The plan further calls for the well to reach a maximum angle of 88.8° eight feet vertically below the Entrada top. The horizontal section will then be drilled with a steerable motor assembly controlled by Ensco's wet connect steering tool, to a total estimated depth of 6,950'MD. The length of the horizontal section will be about 879 feet.

Completion will be made by running a preperforated, uncemented 4 1/2" liner through the pay section. Above the preperforated liner a 4 1/2" blank liner with a CTC OH packer and packoff liner hanger will be run. The blank

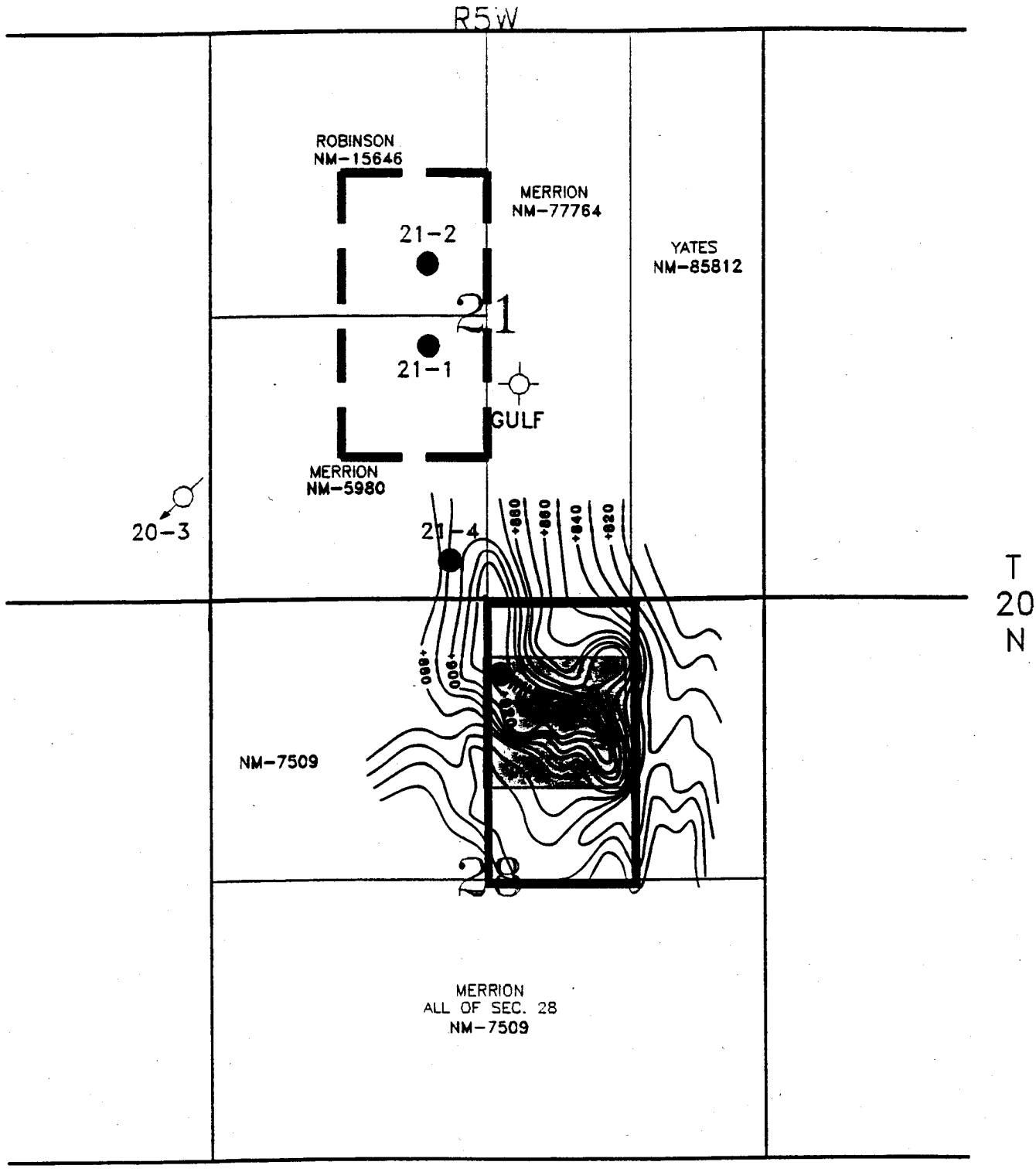


EXHIBIT NO. 2
CASE 10196
NMOCD HEARING
FEB. 7, 1991

PROPOSED 80 ACRE PRORATION UNIT

OJO ENCINO FIELD OUTLINE

PROPOSED 1320' X 1200' TARGET

MERRION OIL & GAS CORP.
610 REILLY AVE., FARMINGTON, NEW MEXICO
(505) 327-9801

OJO ENCINO FIELD

MC KINLEY COUNTY, NEW MEXICO

ENTRADA STRUCTURE

ENGINEERING: STEVE DUNN DATE: 1/4/91
DRAFTING: M.E.G. SCALE: 3 3/4" = 1 MILE

liner will be uncemented except for inflation of the CTC packer.

The drilling rig will move off. A completion rig will move on, clean out the well, and run the required production equipment.

III. DETAILED OPERATIONS PLAN

A. PRE-SPUD MEETING

A pre-spud meeting will be held in Farmington for Merrion, Drilling Contractor and Service Company personnel. Any final modifications required in the drilling program will be agreed upon at that time. All material and service requirements will be thoroughly reviewed at this meeting to ensure proper coordination between companies and that all cross over subs and critical needs are identified.

B. VERTICAL WELL DRILLING

1. General Remarks

The vertical well drilling phase will be conducted by drilling with conventional mud to a point near the Entrada top. Drilling will be continued with a non-damaging MMH mud into the Entrada. A drillstem test will be conducted prior to drilling the necessary rathole, after which logs will be run and 7" casing will be cemented in place.

2. Procedure

1. Build access road, location, set anchors and run water line from separation facilities for drilling water.
2. MIRU Drilling rig.
3. Spud 12 1/4" hole. Drill to 240'KB. Condition hole. Take a survey.
4. Run 6 Jts of 9 5/8" 36lb/ft J-55 casing to 240'KB. Cement in place with 150 sx class "G", 1% $CaCl_2$ (TOC @ surface w/ 100% excess in gage hole). WOCT 10 hours, nipple up BOPs. Pressure test to 600 psi for 30 min after 8 hours WOCT.
5. Drill out with 8 3/4" bit, non-magnetic DC and remaining drill string assembly. Circulating fluid is non-dispersed gel base fluid with fluid loss control < 12cc.
6. Run SS surveys on slick line minimum every 500 ft. If rate of build is 1° per 100 ft or more, run SS surveys minimum of 100 ft intervals.
7. RU Mud Logging Unit out from under surface to provide hydrocarbon measurement and sample descriptions.
8. Stop drilling ~ 5,800'KB. Pull off bottom. Dump mud pits and fill with MMH system (specifications detailed below in the Horizontal drilling section).

9. Displace hole with new mud system. Bypass old mud to reserve pit.
10. Drill 15 ft into Entrada (est top @ 5841'KB). Condition hole if shows warrant and POH.
11. Run DST test of Entrada if desired as follows:

10-15 Min	Initial Flow Period
60 Minute	Initial Shut-in Period
60 Minute	Final Flow Period
120 Minute	Final Shut-in Period

POH with DST string.
12. RIH, drill to TD @ ~5,970'KB. Condition for logs. POH.
13. Run OH IES Induction and Formation Density surveys. RD loggers.
14. Deliver 7" 23lb/ft J-55 casing to location. Tally and drift all casing upon arrival. Clean all pins and collars with diesel and wire brush. Identify, mark and separate 2 jts of 7" 20lb/ft casing. Place on separate racks to avoid mixing with 23lb/ft casing.
15. Pickup 7" casing shoe. Make it up to one 7" shoe joint. Install one casing centralizer on the shoe jt. Set assembly in the slips.
16. Pick up a differential fill or equivalent float collar and make it up to the shoe joint.
17. RIH w/ 7" 23lb casing, place centralizers on every other collar. Use total 6 centralizers.
18. At Kickoff Point depth, ~5,480', run the 2 jts of 20lb casing. Place casing ~ 5,455'-5,535'KB. Run a centralizer on joint above and below the 20lb casing.
19. Run Stage tool in string, set below Mancos top @ 2,855' (exact depths will be picked from OH surveys).
20. Circulate last joint down. Circulate minimum 1 full circulation prior to cementing.
21. RU cementers and cement first stage while reciprocating 7" csg slowly. Pump 300 sx class 'G' 2% gel, yield 1.22 ft^3 per sack, run lead wiper plug, drop following plug and displace to float collar w/ H_2O and mud.
22. Drop opening bomb. Pressure up and open the DV tool. Circulate for 3 hrs minimum to allow 1st stage cmnt to set.
23. Cement second stage with 250 sx class 'G' 2% extender, yield 2.06 ft^3/sx, followed by 50sx class 'G', 2% gel as above. Actual cement volumes will be adjusted using hole caliper log to bring cement to surface.
24. Drop closing bomb and displace to stage tool. Pressure up and close tool. Release pressure.
25. Set casing in the slips as cemented. Cut off and place a protective cover over the casing stub.
26. Pump mud from steel drilling pits into 400bbl storage tanks on location.
27. Release drilling rig.

3. Materials & Services

Dowell Schlumberger
Class 'G' cement & additives

Wellhead Services, Inc
Wellhead equipment

Weatherford International
Float equipment

Piedra Supply
Casing and tubulars

Unibar
Drilling Mud
Mud Engineer

Schlumberger
Open Hole surveys

Halliburton
Drill stem test services

C. VERTICAL WELL COMPLETION

(THIS COMPLETION IS OPTIONAL & DEPENDENT UPON TIME CONSTRAINTS)

1. Clean up location. install 7"x 3 1/2" tubing head (series 600 or greater) and place a protective cover over the wellbore opening.
2. MIRU completion unit. Nipple up BOPs and set reverse equipment.
3. Deliver 2 7/8" EUE 6.5lb/ft J55 8rd work string to location. Tally all pipe on location. Drift prior to running.
4. Pick up 6 1/8" mill tooth bit, casing scraper and 2 7/8" tubing. RIH. Tag and drill out DV tool ~ 2,870'KB.
5. Clean out to the float collar. Pressure test casing to 3000psi for 15 minutes.
6. Roll hole with a 10 bbl guar gel plug followed by produced water. Swab well to 2500ft. POH.
7. RU wireline. Run GR Correlation survey from PBTD across all zones of interest...Entrada, Dakota, Gallup, Mesaverde.
8. Perforate the Entrada with 4 JSPF ~top 10 feet. Perfs will be chosen from OH surveys.
9. Rih with 2 7/8" tbg, SN and packer. Set above perfs and swab test to ensure adequate inflow. Report rates, FL, and recoveries. POH.
10. Run production tbg and DH equipment, if desired. Put on production to test. RDMO.

D. SECTION MILLING

1. General remarks

A section will be cut in the 7" casing between 5,460' and 5,530', to initiate the angle build and lateral intervals of the wellbore. To facilitate this operation, two joints of 7", 20.0 lb/ft, J-55 casing will be placed across the interval when the 7" casing is run on the vertical well. Centralization will be used above and below the section interval to ensure that the casing is adequately centered and bonded. The work in this interval will be performed with a completion rig, prior to the drilling rig moving in to location to drill the horizontal interval. The MMH mud system used to drill the Entrada and stored at location will be treated and reused to mill the section, set and dress the cement plug.

2. Procedure.

1. Move in and rig up.
2. Set cement retainer in the 7" casing at 5,550'.
3. Pick up section mill and RIH. Mill section from 5,460' to 5,530'. Use MMH drilling fluid, increasing viscosity as required with fresh additions of gel and MMH to effectively remove the steel cuttings from the hole. Keep a minimum surface system; less than 100 bbls is recommended.
4. RIH open ended and circulate hole clean to top of cement retainer.
5. Set balanced cement plug, from 5,550' to 5300', with densified Class G slurry. POH to 5300' and circulate out. Batch mix cement slurry to ensure that a uniform slurry density is pumped. Do not reverse, since there will be a possibility of lost returns with the 70' of open hole exposed.
6. RIH with bit and dress off top of plug to 5,450'. If cement is not hard, consideration will be given to additional WOC time, or possibly setting another plug.
7. Rig down and move out.

3. Cement Recipe

65 sx Class G, 1.5% D-65 BWOC

Density	17.5 lb/gal
Yield	0.94 ft^3/sk
Water	3.39 gal/sk

4. Materials and Services

Oilfield Rentals
5-3/4" section mill

Service man

Dowell Schlumberger
Class G cement & additives
7" cement retainer

Unibar
Mud additives - 40 sx gel, 10 sx BHC, 5 sx caustic soda.
mud engineer

E. ANGLE BUILD INTERVAL

1. General Remarks

The build interval will be drilled with a 4-3/4" bent housing mud motor assembly, using a PDC bit. The initial orientation will be made with a gyro, due to magnetic interference from the casing. When clear of the casing influence, directional control will be obtained with Ensco's proprietary wireline wet connect steering tool system. The build rate has been planned at 15°/100 ft., which is readily obtainable with these tools.

2. Procedure

1. Move in drilling rig and rig up.
2. Pick up 4-3/4" drill collars, make up 6-1/8" bit and dress off plug to 5480'.
3. Pick up angle build drilling assembly. The following should be used as a guide to the selection of BHA and drill string to initiate the angle build: (top down)

   Drill Pipe, 3-1/2" Grade E
   Drill Collars, 4-3/4"
   Grade S drill pipe, 3-1/2" OD
   Non Magnetic Drill Collars, 4-3/4" OD
   UBHO sub
   Float sub
   Bent sub
   Trudril 4-3/4" adjustable BH motor
   Bit, 6-1/8" OD, IADC series M6-4-6

4. Orient the angle building assembly using a surface readout gyro tool, and commence time drilling off the cement plug, which will result in the most efficient kickoff. The proposed configuration may build angle at a higher rate than desired, but it is critical to achieve a fast kickoff and not to fall behind the planned 15°/100 ft build rate. A Security HZ35-2 polycrystalline diamond bit will be used, and it is anticipated that this bit should drill the entire angle build and lateral interval.

5. As soon as there is enough inclination for accurate high side tool face measurements, run the wet connect steering tool. This will only require the bit to withdrawn into the 7" casing. Approximately 60' of hole will have been drilled at this time.

6. Drill ahead, building angle at the desired 15°/100 ft. If necessary, the assembly can be pulled to adjust configuration.

7. If drag problems develop during the build, short trips will be made back into the 7" casing each 90 feet drilled. A stabilized reaming run will be made if the problems persist.

8. Drilling with the double bend motor assembly will be stopped when the inclination has reached about 85 degrees to allow for the projected on-bottom survey and follow through. Circulate a minimum of two bottoms up while working the string, to ensure that the hole is cleaned of cuttings.

9. Make up clean out BHA and RIH. Ream as needed from the kick-off point to total depth.

3. Drilling Fluid Program

The drilling fluid used to drill the Morrison and Entrada intervals will be a light weight, low solids, mixed metal layered hydroxide (MMH) mud system. A minimum of clay solids will be used in formulation, and it is essential that the tanks are thoroughly cleaned prior to mixing the new mud. Weight should be controlled at 8.6 lb/gal or less, and fluid loss should be kept below 6 ml/30 min once the top of the Entrada is reached. Prior to reaching the Entrada, the API fluid loss should be maintained between 10 and 15 ml/30 min.

Hole cleaning in horizontal wells presents unusual problems, in that there are three different intervals in the well, each requiring different fluid rheological properties. The best cleaning in the horizontal interval comes from turbulent flow, but this results in poor cleaning in the angle build and vertical intervals. The benefit of the MMH mud system is that it has very rapid gellation times, while also being very shear thinning. This has the benefit of instantly suspending cuttings when pumping ceases, while providing excellent hole cleaning and low frictional pressure losses. The planned flow rates of 200 gal/min will give annular velocities of about 195 ft/min between the hole and the 3-1/2" pipe.

Good solids control will be essential to an economic and non-damaging mud. A Cagle high thrust, fine screen shaker will be used, with initial screen sizes of 200 mesh or finer. The rig desilter should be checked to ensure that the inlet manifold

pressure is at least 35 lb/in^2, and will be run at all times while drilling. A Bird high speed centrifuge will be used to process the system at 200 gal/min to remove the remaining drilled solids. If it is not possible to keep the mud weight within specification while drilling, due to high ROP or any other reason, additional solids control equipment will be rented.

Suggested Mud Properties

Mud weight	8.6- 8.7 lb/gal
Funnel Viscosity	45 - 50 sec/qt
Yield value @ 125°F	20 - 25 lbs100 ft^2
API Filtrate (Morrison)	10 - 15 ml/30 min.
(Entrada)	< 6 ml/30 min.
pH	10.0 - 10.5
Solids Content	< 5% by volume

Volume Requirements

Hole Volume @ 6950'	255 bbls
Surface Volume	600 bbls
Dilution/contingency	710 bbls
	1,565 bbls

Formulation

Wyoming Bentonite	8.0 lb/bbl
MMH	0.75 lb/bbl
Starch	3.0 lb/bbl
X-cide 207	0.06 lb/bbl
Caustic Soda	0.5 lb/bbl

4. Bit and Hydraulic Program

Bit No.	Make	Type	IADC Code	Jets	Depth In
1	Security	HZ35-2	M6-4-6	11,11,11	5,480

Anticipated Hydraulics

Pump rates	180 - 200 gal/min
Standpipe Pressure	1600 - 2400 lb/in^2

These numbers should be used as a rough guide only, as hydraulics will be altered at wellsite as dictated by hole conditions.

Offset Well Bit Information

Morrison / Entrada

Well	Size	Type	Feet	Hours	Ft/hr	WOB/RPM	Remarks
15-6	8.75	F3	1251	84.75	14.8	35/60	
21-3	8.75	J33	1439	143.75	10.0	40/50	
16-2	8.75	F3	960	57.0	16.8		
1 SF	8.75	S86	800	82.0	9.8		
20-4	8.75	F3	1102	59.25	18.6		
21-4	8.75	F3	1056	68.0	15.5		
AB 1	8.75	FP52	1149	70.75	16.2		
15-2	8.75	F3	1272	84.0	15.0	35/50	
15-2H	6.125	HP51	433	33.5	12.9	10/260	3 runs
15-2H	6.125	B35M	846	41.0	20.6	10/260	PDC

1. Materials and Services

Drilling Tools

Ensco Technology Company
- Angle Build motor
- Angle hold steerable motor
- Rotating wet connect steering tool system
- Surface read-out gyro
- Non-magnetic drill collars
- Stabilizers
- Cross over subs
- Directional drillers and surveyors

Security Diamond Products
- 6-1/8" PDC bit, type HZ35-2
- Bit breaker for PDC bit
- 1 set jet nozzles, size 11/32", installed in bit

Drill Bit & Supply
- 2 ea 6-1/8" bits, IADC series 5-1-7X
- 2 sets Jet Nozzles for bits, size 10/32
- 2 sets Jet Nozzles for bits, size 12/32
- 1 ea Jet Nozzle pliers
- 1 ea bit breaker for 6-1/8" roller cone bit

Oilfield Rentals
- 50 jts 3-1/2" 13.3 lb/ft Grade S drill pipe

24 ea 4-3/4 x 2-1/4" drill collars (if not supplied by contractor)
2 ea 4-3/4" HE drilling jars.

Quadco
Cagle High speed shale shaker
1 set each 175, 200 and 225 mesh screens
Bird centrifuge

Mud Materials - Unibar

Item	Unit	Quantity
Bentonite	100 lb	60
Caustic Soda	50 lb	10
BHC (MMH)	25 lb	25
Starch	50 lb	50
X-cide 207	1 gal	10
KB-40 corrosion inhibitor	5 gal	6

F. LATERAL INTERVAL

1. Procedure

The lateral section will be drilled maintaining an angle of approximately 88.8°, so that 18' vertically of the Entrada Sandstone is drilled over the planned 880' interval. The section will be drilled using a fully stabilized bent housing steerable system, which will allow drill string rotation for normal drilling. This system will allow directional corrections to be made without tripping out of the hole, by orienting and drilling without surface rotation.

It is important to drift all pipe, collars, subs and tools to 2.25" as they are first picked up. The ability to run and retrieve the Ensco rotating wet connect steering tool in the event of stuck pipe depends on a clear 2-1/4" ID drill string.

Two sets of drilling jars will be run in the string, one located immediately above the non-magnetic drill collars in the BHA segment, and a second set in the lower part of the drill collars in the vertical part of the well. The lower jars are for jarring a stuck BHA, which is most likely to occur because of cuttings accumulation. The upper set of jars are for jarring the string loose from the angle build interval, where keyseat formation is most likely. The upper jars are normally unable to deliver enough force to free the BHA due to low side friction dissipating the energy.

Individual settings for the jars will be decided at wellsite, after observation of the magnitude of up and down drags.

It is **extremely important** to ensure that at no time are the steel drill collars allowed to exit the 7" casing . Likewise, the drilling jars should never be run in a position where they are subjected to rotation in the build curvature.

The following should be used as a guide to the selection of BHA and drill string to drill the lateral interval of the well: (top down)

Drill Pipe, 3-1/2" Grade E
Drill Collars, 4-3/4"
Jars, Houston Engineers, 4-3/4" OD
Drill Collars, 4-3/4"
Drill Pipe, 3-1/2" Grade S
Crossover sub
Jars, Houston Engineers, 4-2/4" OD
Non Magnetic Drill Collars
UBHO sub
Float sub
Non Magnetic IB stabilizer
Trudril steerable adjustable BH motor, 4-3/4"
Bit, 6-1/8" OD, IADC series M6-4-6

Each connection, reciprocate the pipe and circulate at least 5 minutes. Short trips will be made back to the 7" casing window at intervals not to exceed 300' or 18 hours, whichever comes first. Additional short trips will be made if the surface torque and weight readings indicate impending hole problems. These short trips materially assist in removing the cuttings bed, and give good indication of imminent hole problems, such as keyseat formation in the curve.

Drill at the specified inclination until ROP and cuttings indicate that the lateral wellbore has exited the Entrada sandstone and drilled back into the overlying Todilto Limestone. This is expected to be at approximately 6,950' MD, but drilling will continue as long as the well remains within the producing formation. When drilling of the hole is complete, circulate at least two full circulations, or until the hole cleans up; reciprocation of the pipe will help. Make a short trip back inside the 7" casing, run back to bottom and circulate at least one full circulation before POH to run 4-1/2" liner.

2. Bit and Hydraulic Program

Bit No.	Make	Type	IADC Code	Jets	Depth In
RR1	Security	HZ35-2	M6-4-6	11,11,11	6,080

Anticipated Hydraulics

Pump rates	180 - 200 gal/min
Standpipe Pressure	1800 - 2400 lb/in^2

These numbers should be used as a rough guide only, as hydraulics will be altered at wellsite as dictated by hole conditions.

G. LINER PROCEDURE

1. General Remarks

The Liner will be a string of 4 1/2", 11.60 lb/ft, K55, 8rd LT&C, Range 3 casing. The portion of the liner which will be situated in the producing formation will be pre-perforated with 4 each 1/2" diameter holes per foot. Above the Entrada top, conventional plain pipe will be hung back into the 7" procuction casing.

The liner will be run in the hole, circulated to bottom, hung, and a CTC open hole packer inflated, with one trip in the hole. The system consists of an internal tubing string which connects from the bottom of the liner hanger running tool to a packoff bushing located just above the liner shoe. At the junction of the plain and the pre-perforated liner, there is an external casing packer. The tubing string has a swab assembly, and a plug landing seat, both of which are located in the vicinity of the external casing packer. The tubing string will be 2 7/8" 6.4lb/ft N80 Armco Sealock.

2. Procedure

1. Tally all casing and tubing upon arrival at location, and remove all thread protectors and clean pins and boxes with wire brush and diesel. Drift all tubulars on rack, or when picked up.
2. Pick up TIW type LA set shoe, make it up to the 10' casing pup joint and set in slips.
3. Make up the TIW drillable packoff bushing to the top of the pup joint. Use thread locking compound on this connection.
4. Pick up required number of joints of pre-perforated liner and run in the hole. The number of joints will be determined at location after logging, but will be approximately 21.
5. Make up the CTC Payzone external casing packer to the liner in slips.

6. Make up and run plain casing in the hole.
7. Make up adaptor plate to the liner in slips, to act as a work surface for running the internal tubing string.
8. Pick up TIW slick joint, set in slips, and make up 6' long tubing pup joint.
9. Make up and run required amount of 2 7/8" tubing.
10. Pick up TIW swab assembly with 6' long tubing pup joint. Make up to inner string and run in hole.
11. Make up and run required space-out amount of 2 7/8" tubing.
12. Make up liner hanger with left hand jay, type L setting collar and liner swivel, with running tool installed. Make up inner string connection to tubing string, pick up and remove tubing slips and adaptor plate. Lower and make up liner hanger connection to the liner in slips. Lower liner with running tool, set slips on the 8' handling nipple which is make up to the running tool.
13. Run the liner in the hole on 3 1/2" Grade 'S" and Grade 'E' drill pipe. Circulate as needed to wash liner down until it reaches setting depth.
14. Circulate hole at least 2 full circulations, reciprocating liner slowly in 40' strokes, until the shakers clean up completely. The mud should be according to specification at this time.
15. Set the packoff liner hanger by left hand rotation, 3/4 turn at the hanger. After the liner is set, get off the hanger by rotating 21 turns to the right at the type L setting collar.
16. Pick up plug dropping head and make ;up to the drill string. Pressure test the cementing lines to the rig floor to 3500psi.
17. Drop first plug, chase with batch mixed cement slurry followed by displacement fluid. When plug lands in its seat, pressure up to 500 psi to shift sealing iron dogs into locating position.
18. Continue to pressure up and open CTC packer for inflation with cement.
19. Inflate packer with cement, and operate closing valve. When finished, bleed down tubing string to 0 psi.
20. Pick up slowly, pull out of the liner with the running string, laying down work string, running tool, swab assembly, and inner string.
21. Lay down remaining drill pipe and drill collars. Pump remaining mud from tanks into frack tank for later use if desired. RDMO.

3. Materials and Services

Piedra Supply
36 jts 4-1/2", 11.6 lb/ft, K-55, 8rd LT&C Range 3 casing, pre-perforated with 4 each 1/2" holes per foot.
30 jts 4-1/2", 11.6 lb/ft, N-80, 8rd LT&C Range 3 casing
85 jts 2-7/8", 6.4 lb/ft, N-80 NUE tubing with Armco Seal Lock connections.

1 can Thread locking compound
3 ea Klampon protectors for 4-1/2" casing
5 gal API modified thread compound

TIW
1 ea TIW LA liner setshoe, with aluminum nose guide, 4-1/2" 8rd LT&C box up..
1 ea TIW drillable packoff bushing with 4-1/2" 8rd LT&C box up, pin down
1 ea slick joint for drillable packoff bushing, 15' long with 2-7/8" Armco Seal Lock box up
1 ea Locator sub, with 4-1/2" 8rd LT&C box up, pin down
1 ea liner swivel
1 ea TIW Packoff style liner hanger, with 4-1/2" 8rd LT&C pin down, LH jay
1 ea 5-1/2" TIW Type L setting collar, with 4-1/2" 8rd LT&C thread down
1 ea TIW 5-1/2" mechanical liner hanger running tool.
1 ea TIW swab assembly for inflation of CTC packer, and drillpipe dart landing seat.
2 ea TIW pump down plugs with 2-7/8" and 3-1/2" rubbers.
1 ea plug dropping head, with 3-1/2 IF connection

Completion Tool Company
1 ea 4-1/2" CTC Payzone packer, with 20' seal length, 11.6 lb/ft, K-55 grade.
1 ea 4-1/2" sub set, 8' long top sub LT&C box up, 2' bottom sub, LT&C pin down.

Oilfield Rentals /
1 set Handling tools for 4-1/2" LT&C casing
1 set slip type handling tools for 2-7/8" tubing
1 ea stabbing guide for 2-7/8" tubing
6 ea 3-1/8" OD drill collars with 2-3/8" IF connections
1 ea 3-7/8" OD flat bottom junk mill with 2-3/8" Regular pin
1 ea bit sub, 2-3/8" regular box X 2-3/8" IF box

Justis Supply
1 ea 4-1/2" casing pup joint, 10' long, with 8rd LT&C connections (wt & grade unimportant)
1 ea 2-7/8", 6.4 lb/ft, N-80 NUE tubing pup joint, 10' long with Armco Seal Lock connections.
1 ea 2-7/8", 6.4 lb/ft, N-80 NUE tubing pup joint, 15' long with Armco Seal Lock connections.
2 ea 2-7/8", 6.4 lb/ft, N-80 NUE tubing pup joint, 5' long with Armco Seal Lock connections.
1 ea crossover sub, 3-1/2 IF box X 2-7/8" Armco Seal Lock pin
1 ea crossover sub, 2-7/8" Armco Seal Lock box X 2-3/8" IF pin
1 ea slotted adaptor plate for handling 2-7/8" tubing

Dowell Schlumberger
Cementing System

OPTION #2

1) DRILL VERTICAL THRU ENTRADA TO CONFIRM GEOLOGY
2) SET 7" @ TD COMPLETE ENTRADA, TEST
3) MILL SECTION, DRILL HORIZONTAL WELL

LOCATION 750' FNL & 2450' FEL
SEC 28, T20N, R5W
MC KINLEY COUNTY, N.M.

ELEVATIONS: KB 6,779,
GL 6,767

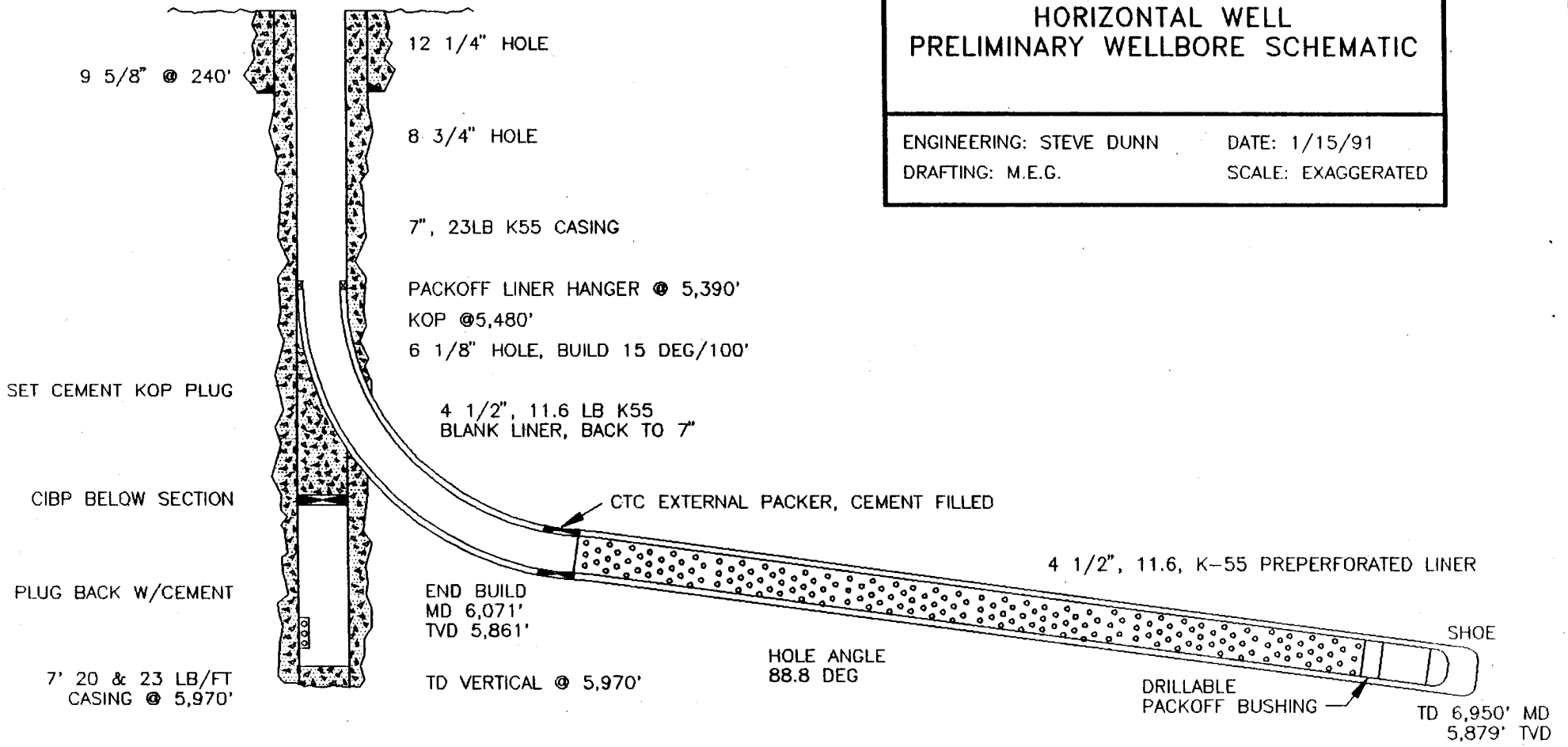
MERRION OIL & GAS CORP.

610 REILLY AVE., FARMINGTON, NEW MEXICO
(505) 327-9801

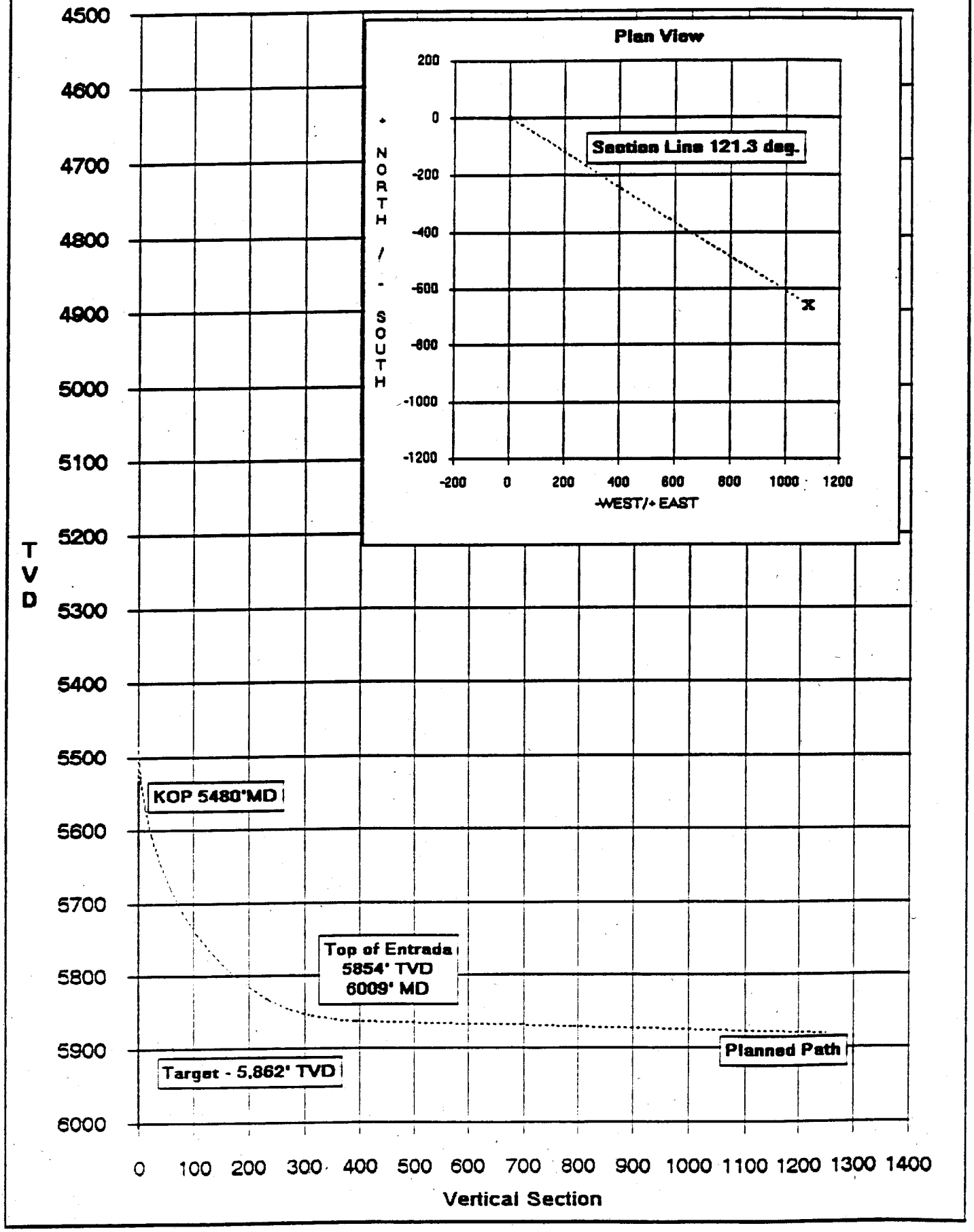
FEDERAL 28 NO. 1

HORIZONTAL WELL
PRELIMINARY WELLBORE SCHEMATIC

ENGINEERING: STEVE DUNN DATE: 1/15/91
DRAFTING: M.E.G. SCALE: EXAGGERATED

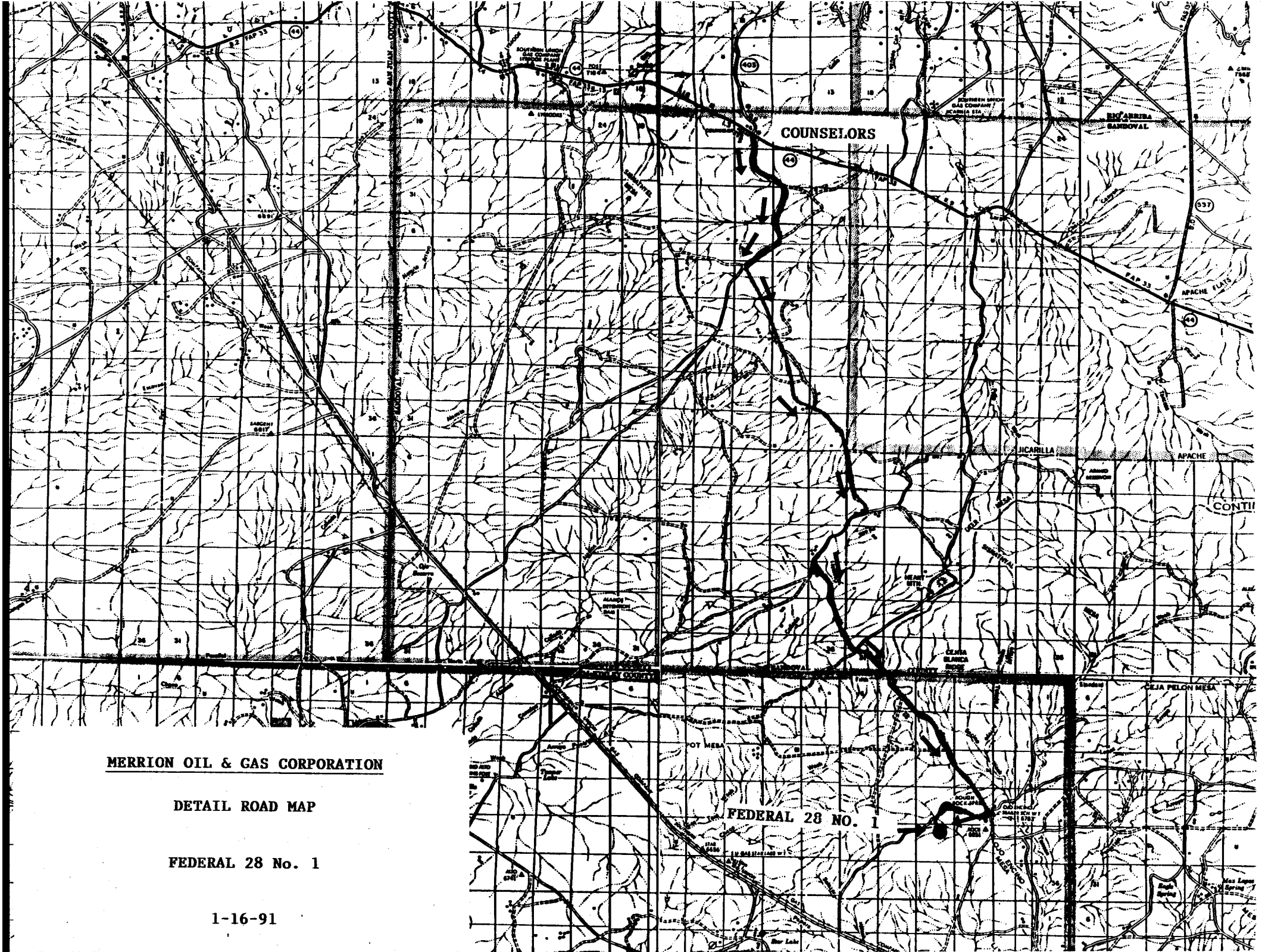


Federal 28-1 Directional Plot



Note: All in feet

12/19/90



MERRION OIL & GAS CORPORATION

DETAIL ROAD MAP

FEDERAL 28 No. 1

1-16-91