

AMERADA HESS CORPORATION

OIL CONSERVATION DIVISION "D"  
Monument, New Mexico 88265  
RECEIVED

'89 OCT 17 AM 9 03

September 22, 1989

New Mexico Oil Conservation Commission  
P.O. Box 2088  
Santa Fe, New Mexico 87501

RE: E. Wood #7  
Request to Downhole Commingle  
the Tubb and Drinkard gas zones

Dear Sir;

Amerada Hess Corporation is requesting approval for an exception to rule 303-C to permit downhole commingling of the Tubb and Drinkard gas zones in the wellbore of the E. Wood #7. Presently the Drinkard zone is producing 7 mcfpd and the Tubb zone is CI due to zero production. The Tubb zone has proven uneconomical to produce due to fluid encroachment. If this application is approved, both gas zones will be turned together and placed on sucker rod pump so as to apply a continuous swabbing action in the wellbore and permit the flow of natural gas into the wellbore from both zones at an economical rate.

In the wellbore, the Tubb zone is perforated from 5886' to 6152' and the Drinkard zone is perforated from 6220'-6288'. Bottom hole pressures were calculated with the method documented in the following attachments.

The results of these calculations were:

TUBB:	340 psia @ 6019'	24 hour shut in
DRINKARD:	237 psia @ 6254'	24 hour shut in
ADJUSTED TO A COMMON DATUM		
TUBB:	342 psia @ 6254'	
DRINKARD:	237 psia @ 6254'	

No formation precipitation which might damage the formation is anticipated based on previous experience. Assuming 300 mcfpd total production with 217 mcfpd allocated to the Drinkard and 83 mcfpd to the Tubb, the combined stream value of \$399/day would be equal to the two individual streams.

No secondary recovery project involving this wellbore is under consideration at this time. If future recovery projects were to be considered, no problems with this commingling prospect jeopardizing the efficiency of a secondary recovery operation is anticipated.

Amerada Hess Corporation will be the operator of the said well on Unit A, 732' FNL, 641' FEL. Sec. 22, T-22S, R-37E, Lea County, New Mexico. Amerada Hess Corporation has common ownership of both zones with a working interest of 100% and an income interest of 81.25%.

A plat of the area is attached at the end of this letter. A division form C-116 which shows the production from the Drinkard is included.

Production decline curves have been supplied for both producing formations. Since the Tubb zone has not been produced since 1978, an actual estimate of anticipated decline could not be drawn therefore, a production decline for the Tubb zone is approximated to be 10%/year based on previous experience. A combined rate was calculated at 5.8%/yr.

Offset operators have been notified of this proposal by a copy of this letter.

If there are any questions regarding this proposal, please contact me at (505) 393-0087.

Sincerely,



Denise Ward-Wann  
Senior Petroleum Engineer

Conoco, Inc.  
P.O. Box 460  
Hobbs, New Mexico 88240

Meridian  
21 Desta Drive  
Midland, Texas 79705

Exxon  
P.O. Box 1600  
Midland, Texas 79701

New Mexico Oil Conservation Commission  
P.O. Box 1980  
Hobbs, New Mexico 88240

Chevron  
P.O. Box 670  
Hobbs, New Mexico 88240

Mobil Exploration & Producing U.S. Inc.  
P.O. Box 1800  
Hobbs, New Mexico 88240

Wagner & Brown  
P.O. Box 1714  
Midland, Texas 79702

Doyle Hartman Oil Operators  
Drawer H  
Jal, New Mexico 88252

Arch  
777 Taylor Street  
Suite II-A  
Ft. Worth, Texas 76102

# E. WOOD #7

Tubb Perfs - 5886'-6152'      Avg. depth ( $\bar{L}$ ) = 6019'

Drinkard Perfs - 6220'-6288'      Avg. depth ( $\bar{L}$ ) = 6254'

Tubb = .681

$\begin{matrix} & G \\ \text{Drinkard} & = .728 \\ & G \end{matrix}$

Assume Patm = 13.2 psia

Assume temp. grad. = 0.4 F/100'

Assume avg. surface temp. = 74 degrees F

BHT = 74°F + 6019' (.4/100') = 98°F  
(Tubb)

BHT = 74°F + 6254' (.4/100') = 99°F  
(Drinkard)

Psw = 280 + 13.2 = 293.2 psia  
(Tubb)

Psw = 188 + 13.2 = 201.2 psia  
(Drinkard)

## TUBB ZONE

SBHP

Formula: Psfs = Pwhs  $\frac{c}{z}$  e

$$\frac{T}{2} = \frac{74^{\circ}\text{F} + 98^{\circ}\text{F}}{2} + 460^{\circ}\text{R} = 546^{\circ}\text{R}$$

$$C = \frac{\gamma_g \bar{L}}{53.34 \bar{T}} = \frac{(.681)(6019)}{53.34 (546)} = 0.141$$

Fig. 16-6

$$P_{pc} = 667 \text{ psia}$$

$$T_{pc} = 380^\circ \text{R}$$

$$T_r = \frac{\bar{T}}{T_{pc}} = \frac{546}{380} = 1.44$$

#### TRIAL & ERROR METHOD

$$\text{Assume: } P_{sfs} = 340 \text{ psia} \quad \bar{P} = \frac{340 + 293.2}{2} = 316.6 \text{ psia}$$

$$P_r = \frac{\bar{P}}{P_{pc}}$$

$$P_r = 316.6 \text{ psia} / 667 \text{ psia} = 0.47$$

$$T_r = 1.44$$

FIG. 16-4

$$Z = .955$$

$$P_{sfs} = P_{whs} e^{c/z} \\ P_{sfs} = 293 e^{.141/.955}$$

$$P_{sfs} = 340 \text{ psia}$$

## DRINKARD ZONE

$$\bar{T} = \frac{74^{\circ} + 99^{\circ}}{2} + 460^{\circ} = 546^{\circ} \text{R}$$

$$C = \frac{(.728)(6254)}{53.34 (546)} = .156$$

FIG. 16-6

$$P_{pc} = 664 \text{ psia}$$

$$T_{pc} = 390^{\circ} \text{R}$$

$$T_r = \frac{\bar{T}}{T_{pc}} = \frac{546}{390} = 1.40$$

## TRIAL & ERROR METHOD

$$\text{Assume: } P_{sfs} = 237 \text{ psia}$$

$$\bar{P} = \frac{237 + 201.2}{2} = 219 \text{ psia}$$

$$P_r = \frac{\bar{P}}{P_{pc}} = \frac{219}{664} = .33$$

$$T_r = 1.40$$

Fig. 16-4

$$Z = .962$$

$$P_{sfs} = P_{whs} e^{c/z}$$

$$P_{sfs} = 201 e^{.151/.962}$$

$$P_{sfs} = 237 \text{ psia}$$

TUBB SBHP @ 6019' = 340 psia  
 DRINKARD SBHP @ 6254' = 237 psia

Adjusted to a common datum @ 6254'  
 ∴ Tubb zone SBHP needs to be adjusted 235'

$$\bar{T} = \frac{98^{\circ} + 99^{\circ}}{2} + 460^{\circ} = 559^{\circ} \text{ R}$$

$$P_{pc} = 667 \text{ psia}$$

$$T_{pc} = 380^{\circ} \text{ R}$$

$$T_r = \frac{559}{380} = 1.47$$

$$C = \frac{(.681)(235)}{(53.34)(559)} = .0054$$

#### TRIAL & ERROR METHOD

$$\text{Assume: } P_{sfs} = 342 \text{ psia} \quad \bar{P} = \frac{342 + 340}{2} = 341$$

$$P_r = \frac{\bar{P}}{P_{pc}} = \frac{341 \text{ psia}}{667 \text{ psia}} = 0.51$$

$$T_r = 1.47$$

Fig. 16-4

$$Z = .952$$

$$P_{sfs} = 340 \text{ e}^{(.0054/.952)}$$

$$P_{sfs} = 342 \text{ psia}$$

∴ Psfs = 342 psia

Tubb adjusted to common datum of 6254'

TUBB ZONE SBHP = 342 psia @ 6254'

DRINKARD ZONE SBHP = 237 psia @ 6254'

50% of High Pressure Zone (Tubb) = 171 psia

Since low pressure zone 237 psia is greater than 50% of high pressure zone (171) psia no cross flow problem should exist.



E.WOOD #7

GAS STREAM VALUES

Gas Price as of AUGUST 1989

Drinkard - \$1.33 /mcf  
\*Tubb - \$1.33 /mcf

Assuming 300 mcfpd total production:

Drinkard production	-	(217 mcfpd) (\$1.33 mcf)	= \$288.61
Blaineby production	-	(83 mcfpd) (\$1.33 mcf)	= \$110.39

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\$399.00 /day

Combined stream value = (300 mcfpd) (\$1.33 /mcf) = \$399.00 /day

Values are equal.

\*Estimated price, no sales.

### DRINKARD DECLINE RATE

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$$\begin{aligned} Q_i &= 255 \text{ MCFPM} \\ Q &= 245 \text{ MCFPM} \\ t &= 1 \text{ yr} \end{aligned}$$

$$a = \frac{\ln 255}{\frac{245}{1}}$$

$$\begin{aligned} a &= .040 \\ a &= 4.0\%/yr \end{aligned}$$

### TUBB DECLINE RATE

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$$\begin{aligned} Q_i &= 100 \text{ MCFPM} \\ Q &= 90 \text{ MCFPM} \\ t &= 1 \text{ yr} \end{aligned}$$

$$a = \frac{\ln 100}{\frac{90}{1}}$$

$$\begin{aligned} a &= .10.5 \\ a &= 10.5\%/yr \end{aligned}$$

### COMBINED DECLINE RATE

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$$\begin{aligned} Q_i &= 355 \text{ MCFPM} \\ Q &= 335 \text{ MCFPM} \\ t &= 1 \text{ yr} \end{aligned}$$

$$a = \frac{\ln 355}{\frac{335}{1}}$$

$$\begin{aligned} a &= .579 \\ a &= 5.8\%/yr \end{aligned}$$

# ALLOCATION BASES ON DECLINE RATES

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If:  $x = \text{Tubb}$   
 $1-x = \text{Drinkard}$

$$a_c = x(a)_{\text{Tubb}} + 1-x(a)_{\text{Drinkard}}$$

$$.058 = .105(x) + 1-x(.040)$$

$$.058 = .105x + .040 - .040x$$

$$.058 - .040 = .105x - .040x$$

$$.018 = .065$$

$$x = .277$$

$$1 - x = .723$$

Tubb Allocation = 27.7%  
Drinkard Allocation = 72.3%

FIG. 16-4  
Compressibility factors at low reduced pressures

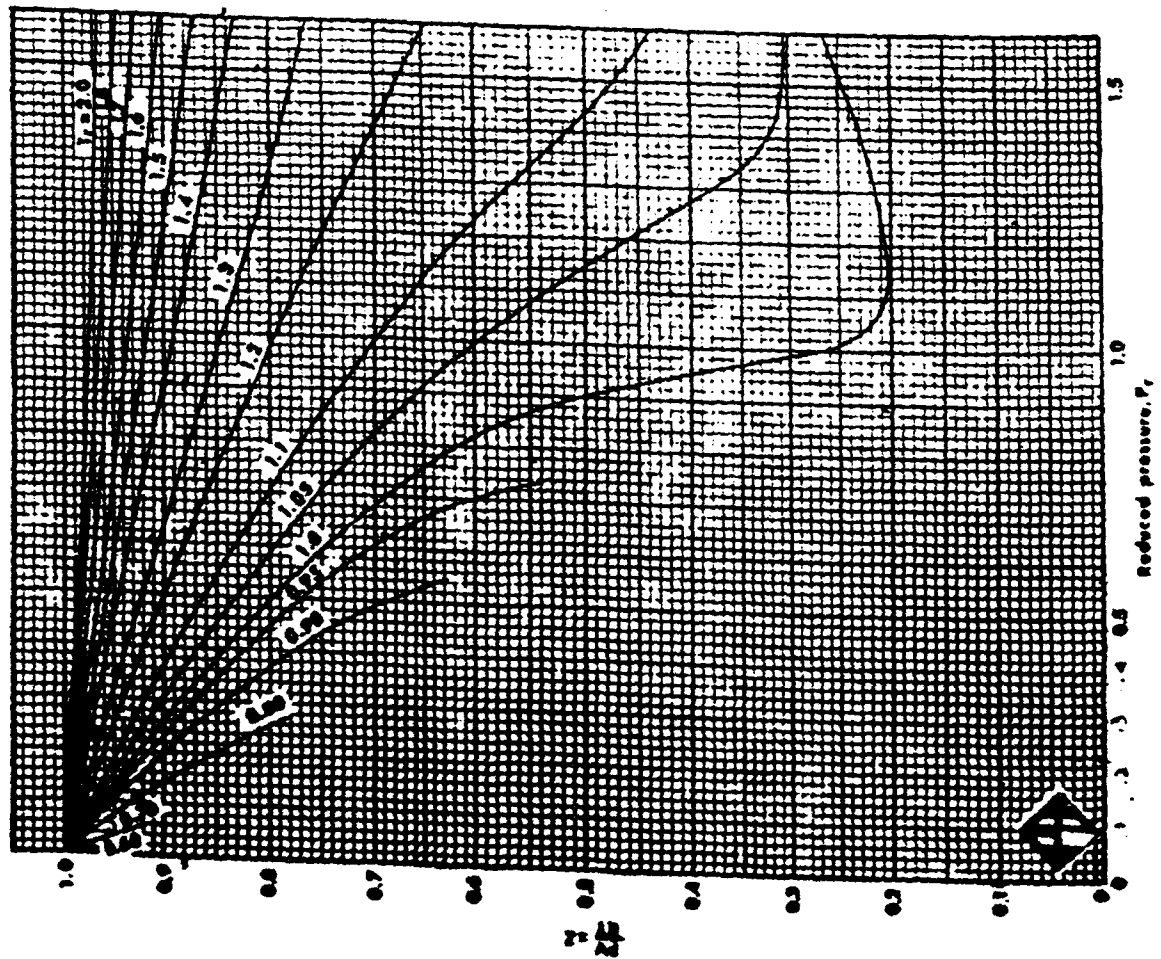
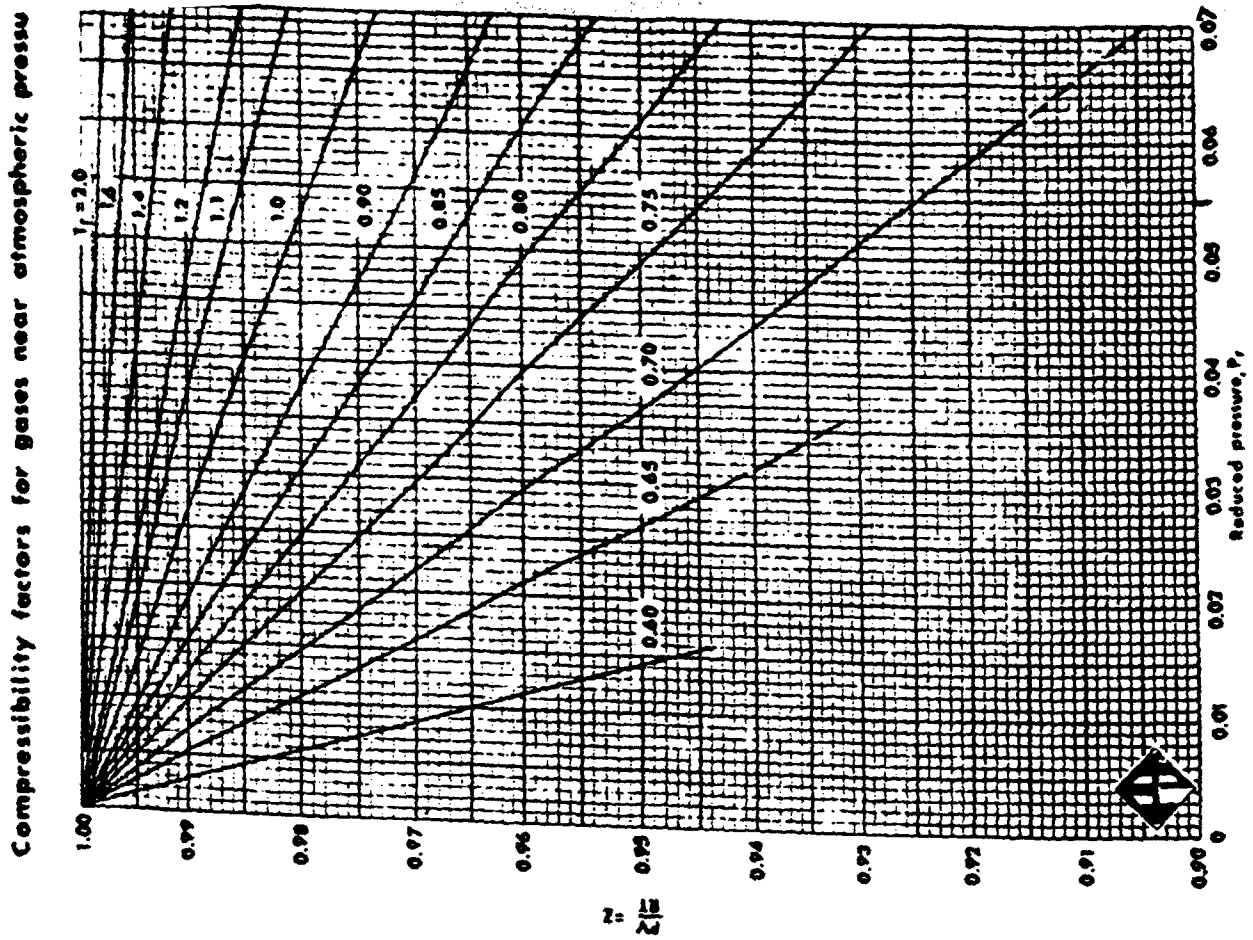


FIG. 16-5



vapors. For example for propane at 300 psia and 140°F., turn to the Mollier chart for propane, Fig. 17-6, locate the 300 psia and 140°F point, and interpolate on the constant specific volume lines to obtain 0.33 cu ft./lb. Dividing this into 1 gives 3.03 lb/cu ft as the density,  $D_T$ . If the compressibility is required,

$$Z = \frac{M P}{10.73 T D_T}$$

Symbols have been defined previously. Then

$$Z = \frac{(44.09) (300)}{(10.73) (460 + 140) (3.03)} = 0.68$$

### ACID GASES

Natural gases which contain  $H_2S$  and/or  $CO_2$  frequently exhibit different compressibility factor behavior than do sweet gases. Wichert and Aziz (Gas Processing, Canada, pp 20-25, January February 1971; Hydrocarbon Processing, pp 119-122, May 1972) present a simple easy to use calculational procedure to account for these differences. The method uses the standard gas compressibility factor chart (Figure 16-3) and provides accurate sour gas compressibili-

ties for gas compositions that contain as much as 80% total acid gas.

Wichert and Aziz define a "Critical temperature adjustment factor" which is a function of the concentrations of  $CO_2$  and  $H_2S$  in the sour gas. This correction factor is then used to adjust the pseudo critical temperature and pressure of the sour gases according to the equations:

$$T_c^1 = T_c - \epsilon$$

$$P_c^1 = \frac{P_c T_c^1}{[T_c + B(1-B)\epsilon]}$$

Where:

$T_c$  = Mole Fraction average pseudo critical temperature

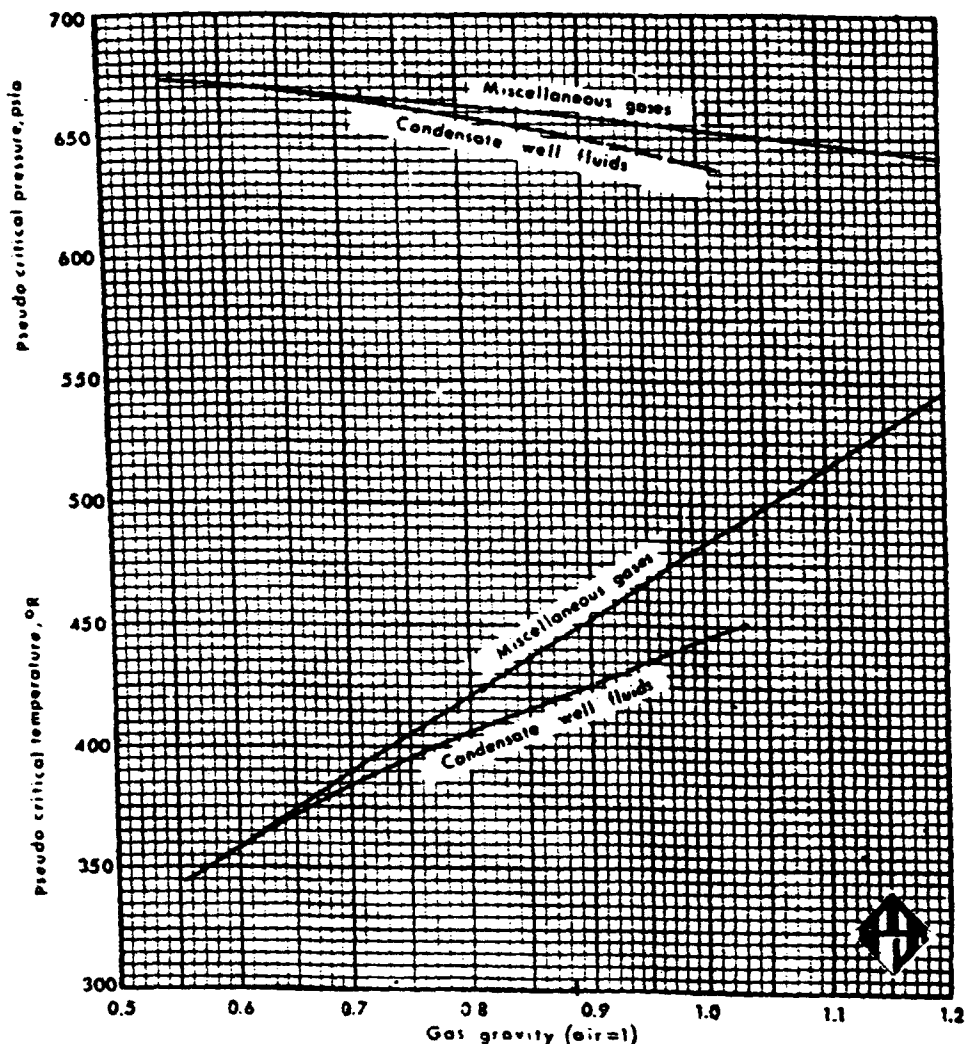
$P_c$  = Mole Fraction average pseudo critical pressure

$T_c^1$  = Pseudo critical temperature adjusted for acid gas composition

(Text cont'd. p. 16-15)

FIG.16-6

Pseudocritical properties of natural gases





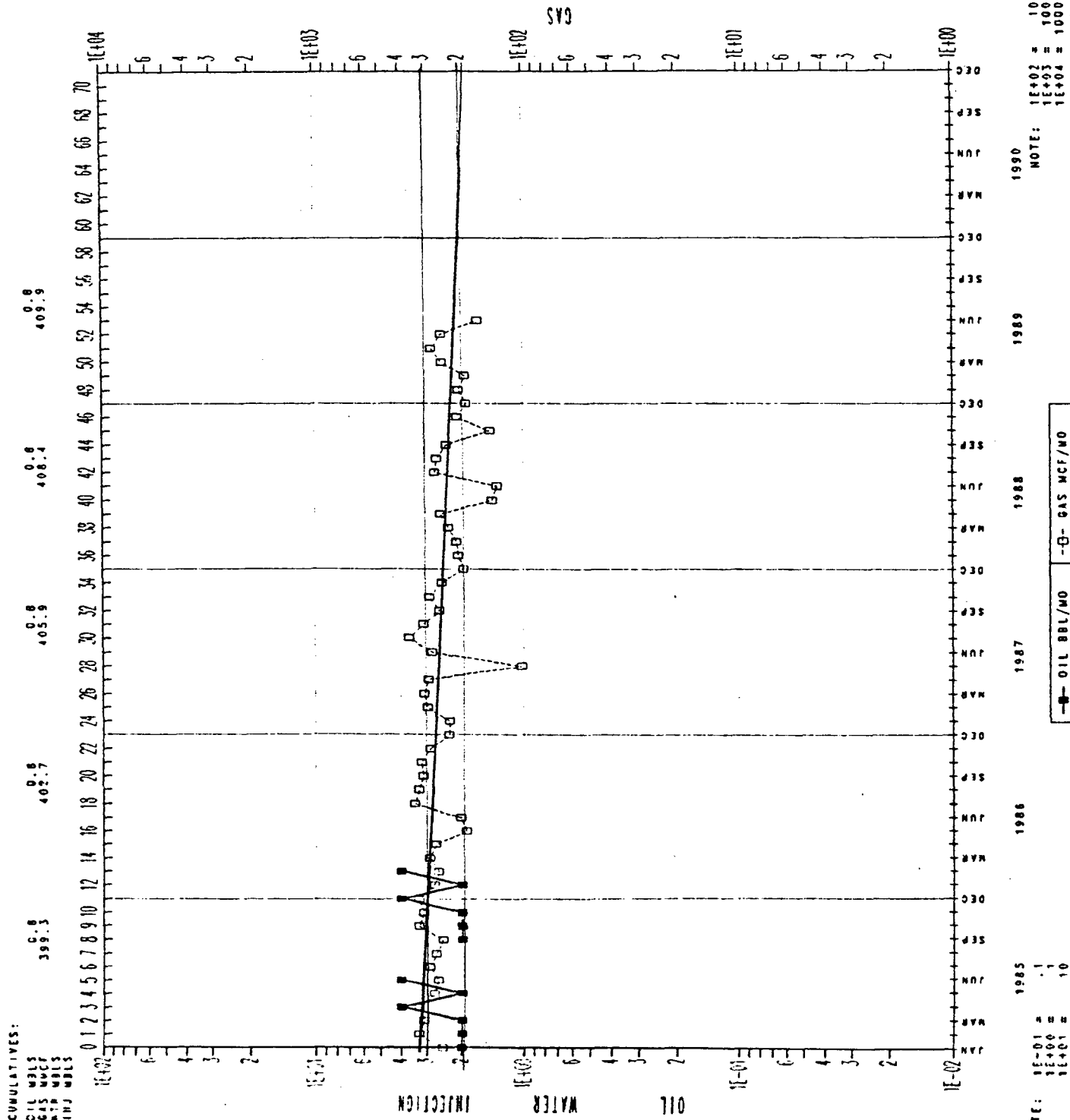
PILOT DATE: 8/9/89  
PILOT NO.: 1463

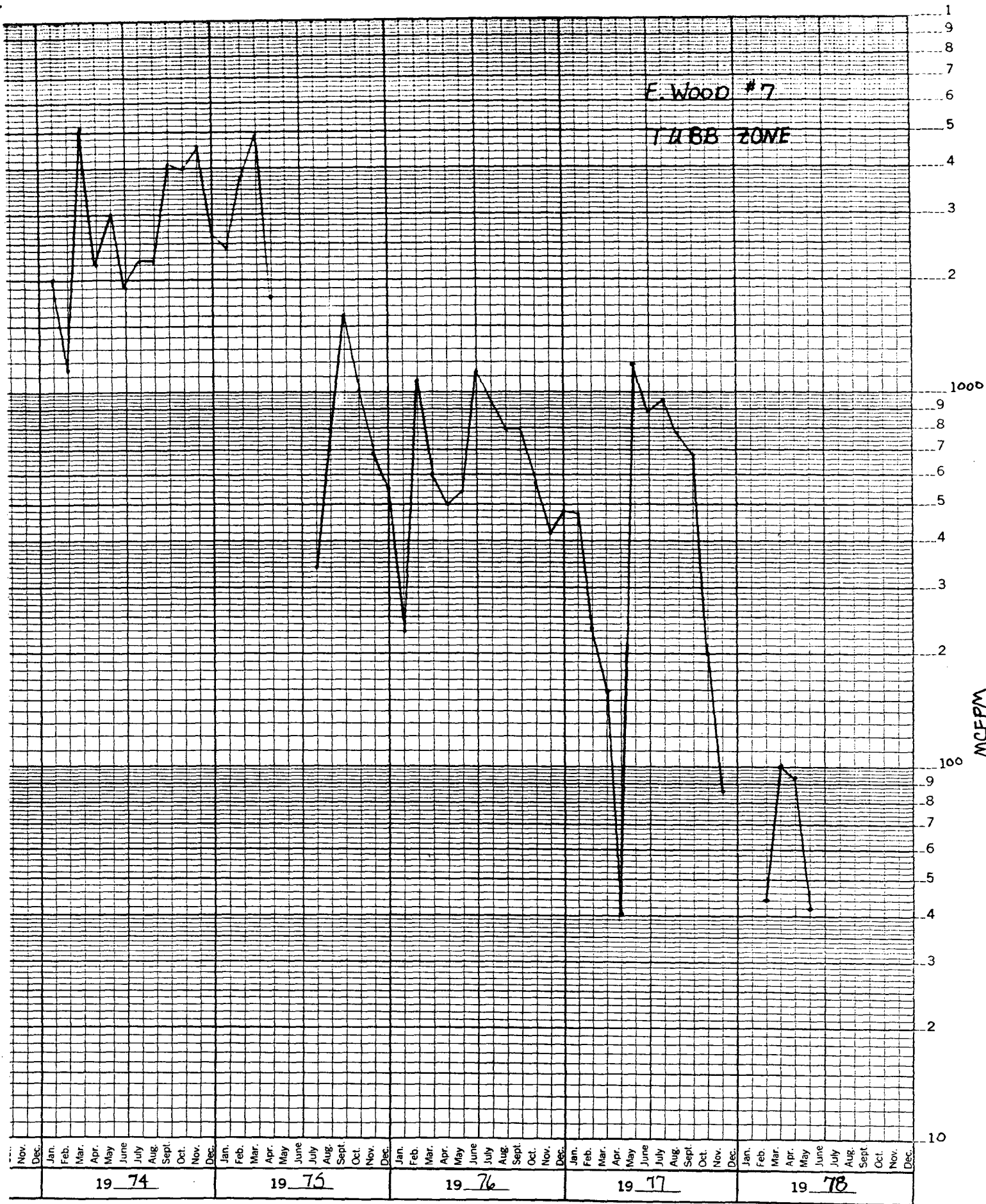
REGION: SOUTHWEST REGION P80  
FIELD: CORTICE FIELD  
POOL: /BENTLEY/  
LEASE: 02771 WOOD, EUGENE  
WELL: 71  
STATE CODE: 34 NEW MEXICO  
POB CODE: 623

STATUS:  
41 ON 6/15/89

GAS  
FLIGHTING

$$\ln \frac{255}{245} = 4.0\% / yr$$







Submit 2 copies to Appropriate District Office.

DISTRICT I  
P.O. Box 1900, Hobbs, NM 88240  
DISTRICT II  
P.O. Drawer DD, Arreda, NM 88210  
DISTRICT III  
1000 Rio Grande Rd., Alamogordo, NM 87410

State of New Mexico  
Energy, Minerals and Natural Resources Department

Form C-116  
Revised 1/1/89

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

GAS - OIL RATIO TEST

Operator AMERADA HESS CORPORATION		Pool Drinkard		County Lea												
Address Drawer D, Monument, New Mexico 88265		TYPE OF TEST - (X)		Scheduled <input type="checkbox"/> Special <input checked="" type="checkbox"/>												
LEASE NAME	WELL NO.	LOCATION				DATE OF TEST	SIZE OF TEST	CHOKE SIZE	TRQA. PRESS.	DAILY ALLOW. ABLE	LENGTH OF TEST HOURS	PROD. DURING TEST			GAS - OIL RATIO CU.FT/BBL.	
		U	S	T	R							WATER BBL.	GRAV. OIL	GAS MCF.		
E. WOOD	7	A	22	22S	37E	10-12-89	F	W0	40#	MGW	24	0	0	0	10	10,000

Instructions:

During gas-oil ratio test, each well shall be produced at a rate not exceeding the top unit allowable for the pool in which well is located by more than 25 percent. Operator is encouraged to take advantage of this 25 percent tolerance in order that well can be assigned increased allowable when authorized by the Division.

Gas volumes must be reported in MCF measured at a pressure base of 15.025 psia and a temperature of 60° F. Specific gravity base will be 0.60.

Report casing pressure in lieu of tubing pressure for any well producing through casing.

(See Rule 301, Rule 1116 & appropriate pool rules.)

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

*Dinois Had-Nann*

Signature  
Senior Petroleum Engineer

Printed name and title  
October 13, 1989 505-393-0087

Date Telephone No.

COMPLETION - SCHEMATIC

LEASE NAME

E. WOOD

WELL NO.

7

TYPE COMPLETION

☐ SINGLE

☒ DUAL

☐ OTHER

LOCATION

Unit A 732' FNL, 641' FEL, Sec. 22, T-22S, R-37E

TD 6440'

PBD 6288'

KB

DF 3360'

NO. PROD. WELLS ON LSE.

FLOWING

PUMPING

GL

ZONE TO BE WORKED ON

Tubb/Drinkard

CURRENT COMPLETION ZONE

CSG. PERFS. OR OH INTERVAL

Tubb - 5886'-6152'

Drinkard 6220'-6288'

CURRENT TEST (SHOW DATE)

PRESENT ALLOW.

TOP FIELD ALLOW.

GOR LIMIT

SPACING

CASING: Surface

SIZE 13" 40#

DEPTH 192'

TOP CEMENT Circ.

CASING: Intermediate

SIZE 8-5/8" 28#

DEPTH 2,758'

TOP CEMENT Circ.

CASING: Production

SIZE 5-1/2" 15.5#

DEPTH 6,440'

TOP CEMENT 3,192'

SUMMARY OF PREVIOUS WORKOVERS

- 1/48 Supdded. Perforated 6402'-6438' (144 holes)
- 3/54 Dolofrac w/5000 gals. gel & 2500# sand. Perf. 5945'-6110' (660 holes). Acid 5945'-6110' w/5000 gals. 15%. Dolofrac 5945'-6110' w/5000 gals. gel & 2500# sand. Acid 6402'-6438' w/500 gals. 6%.
- 3/56 Sand oil frac 5945'-6110' w/25,000 gals. oil & 20,000# sand.
- 3/63 Perf. 5886'-5900' & 6102'-6152'. Acid 5886'-5900' w/5 gals. 15%. Acid 6128'-6152' w/1000 gals. 15%. Sand oil frac 5886'-6152' w/20,000 gals. oil & 40,000# sand.
- 4/75 Tagged fill at 6296'. Dumped 1-1/2 sks. cmt. on top to +6288'. Perfs. 6220'-6288' (38 holes) Acid w/ 1500 gals. 15% w/64 balls. Frac w/30,000 gals. gel, 46,500# sand, 700# salta & 350# Benzoic flakes. Set Model D at 6200'.

RECOMMENDATION AND JUSTIFICATION

SUBMITTED BY

There is no  
a way of getting  
out of the world  
in any way but  
the way of the cross

**FLCN TEST NO. 1**

Well opened at (hour, date):	Upper Completion	Lower Completion
9:00 A.M. 3-7-89		
Indicate by ( X ) the zone producing.....		X
Pressure at beginning of test.....	280	188 ✓
Stabilized? (Yes or No).....	YES	YES
Maximum pressure during test.....	280 ✓	188 ✓
Minimum pressure during test.....	280	45
Pressure at conclusion of test.....	280	45
Pressure change during test (Maximum minus Minimum).....	--	143
Was pressure change an increase or a decrease?.....	--	decrease
Well closed at (hour, date):	Total Time On Production	
9:00 A.M. 3-8-89	24	
Oil Production	Gas Production	
During Test: 0 bbls; Grav. 0	During Test 7	MCF; GOR --

### Remarks

		Upper Completion	Lower Completion
Well opened at (hour, date): _____			
Indicate by ( X ) the zone producing.....			
Pressure at beginning of test.....			
Stabilized? (Yes or No).....			
Maximum pressure during test.....			
Minimum pressure during test.....			
Pressure at conclusion of test.....			
Pressure change during test (Maximum minus Minimum).....			
Was pressure change an increase or a decrease?.....			
Well closed at (hour, date) _____	Total time on Production _____		
Oil Production _____	Gas Production _____		
During Test: _____ bbls; Grav. _____	During Test _____ MCF; GOR _____		
Remarks Tubb Zone Temporarily abandoned.			

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

knowledge. **MAR 16 1989**   
Approved \_\_\_\_\_ 19  
New Mexico Oil Conservation Commission

Operator, Amerada Hess Corp.

B7 Kenda Johnson

**By** \_\_\_\_\_ **ORIGINAL SIGNED BY JERRY SEXTON**  
**Title** \_\_\_\_\_ **DISTRICT I SUPERVISOR**

Title Production Technician  
Date 3-14-89



STATE OF NEW MEXICO  
ENERGY AND MINERALS DEPARTMENT  
OIL CONSERVATION DIVISION  
HOBBS DISTRICT OFFICE

RECEIVED

'89 OCT 19 AM 10 00

10-18-89

GARREY CARRUTHERS  
GOVERNOR

POST OFFICE BOX 1980  
HOBBS, NEW MEXICO 88241-1980  
(505) 393-6161

OIL CONSERVATION DIVISION  
P. O. BOX 2088  
SANTA FE, NEW MEXICO 87501

RE: Proposed:

MC \_\_\_\_\_  
DHC X \_\_\_\_\_  
NSL \_\_\_\_\_  
NSP \_\_\_\_\_  
SWD \_\_\_\_\_  
WFX \_\_\_\_\_  
PMX \_\_\_\_\_

Gentlemen:

I have examined the application for the:

Amerada Hess Corp., E. Wood #7-A 22-22-37  
Operator Lease & Well No. Unit S-T-R

and my recommendations are as follows:

OK  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Yours very truly,

Jerry Sexton  
Supervisor, District 1

/ed