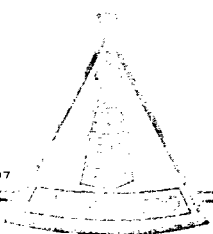


Case F. 16 5686
BLS



ANADARKO PRODUCTION COMPANY

GENERAL OFFICE
P. O. BOX 9317
FORT WORTH, TEXAS 76107

1014 W. AVENUE K
AREA CODE 505 396-4018

LOVINGTON, NEW MEXICO 88260
CABLE ADDRESS: ANDARK

P. O. Box 67
Loco Hills, New Mexico 88255
April 5, 1977

New Mexico Oil Conservation Commission
P. O. Drawer DD
Artesia, New Mexico 88210

Attn: Mr. Bill Gressett

Re: CASE NO. 5686
Order No. R-5224
Premier L & M Waterflood Project

Federal L No. 2
UL E, Sec. 31, T-17S, R-30E
Eddy County, New Mexico

RECEIVED

APR 8 1977

O. C. C.
ARTESIA, OFFICE

This letter is written in response to a provision of Order No. R-5224 which states "the operator should conduct tests to determine the pressure at which injection into said well may be maintained without causing fracturing of the cement or formation around the well and resultant migration of injected fluid out of the injection zone".

Current Rate and Pressure - 103 BWPD @ 1400#.

Cement - During October, 1967 a 4½" liner was set through the Grayburg pay zones and cemented with 100 sacks of Class C w/2% CaCL. Halliburton cementing tables show this cement to possess 3935 psi compressive strength at 80° F (bottom hole temperature) after 72 hours setting time.

Dowell Chemical Company's frac guide formulas are used in the calculations shown below to determine the maximum wellhead pressure attained at the time fracturing occurs around the immediate well bore. This fracture pressure is generally agreed to be the instant shut down pressure after a frac job. The Federal L #2 was fraced during September, 1972 w/35,000 gals gelled water and 35,000# sand. The instant shut down pressure was 1600#. (see attached Dowell treating report - Exhibit #1) This was recorded after the flush and while the hole was loaded with fresh water.

$$P_F \text{ (Fracture Pressure)} = P_{FGD}$$

where: P_{FG} = fracturing gradient

D = depth = 3002' (top perforation)

$$\text{Fracturing gradient} = \frac{P_h + P_w - P_f - P_{pf}}{D}$$

where: P_h = hydrostatic pressure, psi = specific gravity x
wt/ft of fresh water x D = 1.06 (see Exhibit #2)
x .433 x 3002 = 1378#

P_w = wellhead pressure, psi = I.S.D.P. = 1600#

P_f = pipe friction pressure, psi = at the rate of
103 BWPD

I assume this figure to be equal to or only
slightly greater than zero, therefore = 0#

P_{pf} = perforation friction pressure, psi = same
as P_f = 0#

Then: $\left(P_F = \frac{P_h + P_w - P_f - P_{pf}}{D} \times D \right) = (P_h + P_w - P_f - P_{pf}) =$

$$(P_h + P_w) = (1378\# + 1600\#) = 2978 \text{ psi}$$

Therefore: Fracturing can occur when a wellhead pressure of 1600# together with a hydrostatic of 1378# applies a total force of 2978 psi on the perforations at a depth of 3002'.

It should be noted that this fracturing can occur in a horizontal plane and still be contained within the pay zone. Dowell's frac guide says that a fracture gradient of $<.7$ consists of vertical fractures; $>.7$ but <1 = vertical or horizontal and >1 = horizontal fractures. The fracture gradient here calculates:

$$P_{FG} = \frac{P_h + P_w - P_f - P_{pf}}{D} = \frac{1378 + 1600 - 0 - 0}{3002} = .992$$

This .992 strongly suggests horizontal fractures. Due to this slow rate it would seem that the depth of penetration of a fracture would be quite limited.

Also fracturing can occur between sand stringers within the Grayburg Section without harmful effects since the Grayburg section frequently contains multiple thin sands and our intention is to ultimately flood all sand stringers in this zone.

RECEIVED

APR 8 1977

O. C. C.
ARTESIA, OFFICE

Jimmy E. Duckles

9-7-74

WELL NUMBER 1-2	LOCATION JACKSON	CUSTOMER REPRESENTATIVE MR. D. Bell	TREATMENT NUMBER 05-13-51
FORMATION PREMIER	STATE NEW MEXICO	JOB DONE DOWN TUBING <input checked="" type="checkbox"/> CASING <input type="checkbox"/> ANNULUS <input type="checkbox"/>	ALLOWABLE PRESSURE TUG: 5000 CSG:
TYPE OF WELL OIL <input checked="" type="checkbox"/> GAS <input type="checkbox"/> WATER <input type="checkbox"/>		AGE OF WELL NEW WELL <input type="checkbox"/> REWORK <input type="checkbox"/>	
TOTAL DEPTH 27		CIRC. DIA.	
CASING SIZE 4 1/2" 95	CASING DEPTH 2632	TUBING SIZE 2 7/8"	TUBING DEPTH 2050
LINER SIZE	LINER DEPTH	PACKER TYPE Dowell	PACKER DEPTH 2000
OPEN HOLE	CSG. OR ANNUL. VOL.	TUG VOLUME 17.4	STATIC CHG.
PERFORATED INTERVALS			
DEPTH	NO. OF HOLES	DEPTH	NO. OF HOLES
3002			
3012			
FOR CONVERSION PURPOSES 24 BBLS EQUALS 1000 GALLONS			
TREATED ON LOCATION: 11-45			

TIME	INJECTION		PRESSURE		SERVICE LOG
	RATE	BBLS IN	CSG.	TBG.	
1:00					LAY LINES - WAIT TO RUN TUBING
1:05					START F.W. TO BREAK FM
1:10					STOP PUMPS - FM. WON'T BREAK - SPOT 2 BBL ACID
1:15					START F.W. TO BREAK FM
1:20					START ACID
1:25	6	10		3000	ACID IN - START RF-40 PAD
1:30		10			STOP PAD - LET ACID SOAK
1:40					CONTINUE RF-40 PAD
1:45	1 1/2	110		3300	ALL PAD - START 20-40 SAND 1/2 #/GAL
1:50	20	43		3300	INCREASE SAND CONC. TO 1 #/GAL
1:55	20 1/2	264		3150	" " " " 1 1/2 #/GAL
2:00	21	282		3100	ALL 20-40 SAND - START 10-20 SAND 1 #/GAL
2:05	21	120		3100	ALL SAND - START F.W. FLUSH
2:10	18	40		2600	FLUSH COMPLETE
<div> <div>151P</div> <div>1600</div> <div>15min.</div> <div>1500</div> </div>					

TIME LEFT LOCATION	AVG. LIQUID INJ. RATE 20.5	ADJ. RATE (SOLIDS INC.) 21	TOTAL FLUID PUMPED OIL WATER	ACID	15%	1000
TIME PRESSURE	AVG. PRESSURE 3200	FINAL PUMP IN PRESSURE 3150	SHUT IN PRESSURE IMMEDIATE 15 MINUTES	PROPS AND LIQUIDS INJECTED		
				TYPE	SIZE OR PURPOSE	AMOUNT
				RF-40	PAD - FRAS	35,000
				SAND	20-40	20,000
				SAND	10-20	20,000
				L-35	GY PEAN	20,000
DOWELL ENGINEER J. A. Consovo				PROD. BEFORE TREATMENT		
CUSTOMER REP. CONTACTED				PROD. AFTER TREATMENT		
CUSTOMER <input type="checkbox"/> SATISFACTORY <input type="checkbox"/> UNSATISFACTORY <input type="checkbox"/> UNKNOWN				TEST ALLOWABLE		

WATER ANALYSIS REPORT

Client: Indefatigable Production Co. ADDRESS: Loco Hills, New Mex. DATE: 6/9/76

Source: Referral J. A. M Lease DATE SAMPLED: 6/1/76 ANALYSIS NO.: 11506

Analysis	Mg/L	*Meq/L
1. pH	6.4	
2. H ₂ S (Qualitative)	Pos.	
3. Specific Gravity	1.060	
4. Dissolved Solids	78,924	
5. Suspended Solids		
6. Phenolphthalein Alkalinity (CaCO ₃)		
7. Methyl Orange Alkalinity (CaCO ₃)	630	
8. Bicarbonate (HCO ₃)	HCO ₃ 769 ÷ 61 12.6	HCO ₃
9. Chlorides (Cl)	Cl 46,000 ÷ 35.5 1,296	Cl
10. Sulfates (SO ₄)	SO ₄ 3,000 ÷ 48 63	SO ₄
11. Calcium (Ca)	Ca 3,200 ÷ 20 160	Ca
12. Magnesium (Mg)	Mg 2,187 ÷ 12.2 179	Mg
13. Total Hardness (CaCO ₃)	17,000	
14. Total Iron (Fe)	9.0 ppm	
15. Barium (Qualitative)		

*Milli equivalents per liter

PROBABLE MINERAL COMPOSITION

Compound	Equiv. Wt.	X	Meq/L	=	Mg/L
Ca					
Ca (HCO ₃) ₂	81.04		12.6		1,021
Ca SO ₄	60.07		63		4,290
Ca Cl ₂	55.50		84		4,662
Mg (HCO ₃) ₂	73.17				
Mg SO ₄	60.19				
Mg Cl ₂	47.62		179		3,580
Na HCO ₃	34.00				
Na ₂ SO ₄	71.03				
Na Cl	58.46		1,033		60,431

Concentration Values Distilled Water 20°C
 Ca CO₃ 13 Mg/L
 Ca SO₄ 2,090 Mg/L
 Mg CO₃ 103 Mg/L

ANALYST: J. B. NIX

DATE: 6/9/76

LABORATORY: TRETOLITE

Client: Indefatigable Production Co. ADDRESS: Loco Hills, New Mex. DATE: 6/9/76

Respectfully submitted
TRETOLITE COMPANY

RayShaffner

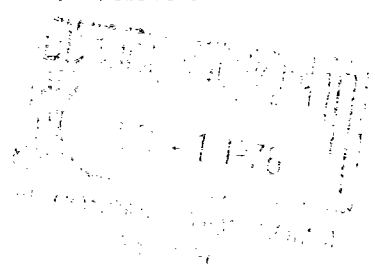
Other _____

ANADARKO PRODUCTION COMPANY

A Panhandle Eastern Pipe Line Company Subsidiary

Two Greenway Plaza East, Suite 410
Houston, Texas 77046
(713) 626-7610

May 27, 1976



Mr. Joe D. Ramey, Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Ramey:

In response to your question raised in Case 5686 regarding the injection pressure encountered in Anadarko's Loco Hills Flood, Eddy County, New Mexico, we submit the following data:

Maximum wellhead pressure after fillup was 1660 psi at a typical injection rate of 650 BWPD. The pressure varied with rate and was as low as 1200 psi in some wells.

Our office in Loco Hills reports that the community of Loco Hills is supplied fresh water by Caprock Water Company.

Yours very truly,

A handwritten signature in dark ink is located below the 'Yours very truly,' text. The signature appears to read 'D. G. Kernaghan' and is written in a cursive style.

D. G. Kernaghan
Division Evaluation Engineer

DGK/mm