STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6367
Order No. R-5897

APPLICATION OF PHILLIPS PETROLEUM
COMPANY FOR A PRESSURE MAINTENANCE
PROJECT, LEA COUNTY, NEW MEXICO.

Also see R-5871

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on October 25, 1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of January, 1979, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That by Division Order No. R-5871 dated November 27, 1978, statutory unitization was approved for the East Vacuum Grayburg-San Andres Unit Area, Lea County, New Mexico.

(3) That the applicant herein, Phillips Petroleum Company, seeks authority to institute a pressure maintenance project on the aforesaid East Vacuum Grayburg-San Andres Unit Area, Vacuum Grayburg-San Andres Pool, Lea County, New Mexico, by the injection of water into the San Andres formation through 59 wells, 31 of which would be drilled in 1979 during Phase II of the Project Development Program and 28 of which would be drilled in 1980 during Phase III of the Development Program.

(4) Applicant further seeks the designation of a project area for said pressure maintenance project and the promulgation of special rules and regulations governing said project including special allowable provisions.

(5) That for Phase I of the Project Development Program, applicant proposes to drill during 1979 ten producing wells at unorthodox locations as specified below:

TRACT NO.	WELL NO.	LOCATION	UNIT	SECTION
3229	005	1310' FSL and 1310' FWL	M	32
3202	001	1310' FSL and 1330' FEL	O	32
3202	003	1330' FNL and 1330' FEL	G	32
3328	002	1310' FSL and 1310' FWL	M	33
3366	001	1330' FNL and 1310' FWL	E	33
3333	004	1330' FNL and 1330' FEL	G	33
3456	005	1330' FNL and 1310' FWL	E	34
2801	002	1310' FSL and 1310' FWL	M	28
2801	004	1310' FSL and 1330' FEL	O	28
2721	001	1310' FSL and 1310' FWL	M	27

all in Township 17 South, Range 35 East, NMPM, Lea County, New Mexico.

(6) That during Phase II of the Development Program applicant proposes to drill 18 additional producing wells, all at unorthodox locations, and during Phase III of the Program applicant proposes to drill 26 additional producing wells, also at unorthodox locations.

(7) That all of the wells referred to in Findings Nos. (3), (5) and (6) above, being 59 injection wells at unorthodox locations and 54 producing wells at unorthodox locations, together with the currently completed producing wells in the Unit Area, will provide a thorough and efficient sweep of hydrocarbons throughout the unitized area, and will result in the recovery of otherwise unrecoverable oil, thereby preventing waste.

(8) That the above-described injection and producing wells, some of which would be at unorthodox locations along the unit boundaries in accordance with lease-line agreements with operators of offsetting lands, will not impair but will protect correlative rights.

(9) That the applicant's request for the designation of a Pressure Maintenance Project for the East Vacuum Grayburg-San Andres Unit Area, and for the promulgation of special rules and regulations governing said project, is in the interest of conservation and should be approved, subject to certain provisions.

(10) That the project area should consist of those proration units within the boundary of the East Vacuum Grayburg-San Andres Unit upon which is located an injection well and any directly or diagonally offsetting proration unit which contains a producing well.

(11) That the total project area allowable should be equal to the sum of the basic project area allowable plus the water injection credit allowable.

(12) That the basic project area allowable should be equal to 80 barrels of oil per day times the number of developed 40-acre proration units in the project area.

(13) That the water injection credit allowable should be based on the following formula:

$$\text{Water Injection Credit Allowable} = \left[\frac{\text{net water injected}}{\text{basic project area allowable voidage}}\right] \times \text{basic project area allowable}$$

and should be calculated in accordance with Exhibits "A" and "B" attached hereto and by reference made a part hereof.

(14) That the project area allowable should be produced from the wells within the project area in any proportion provided that any proration unit situated on the boundary of said East Vacuum Unit which proration unit is not directly or diagonally offset by a San Andres injection well outside the Unit or on the Unit boundary should not be permitted to produce in excess of 80 barrels of oil per day.

(15) That each of the newly drilled production or injection wells in the project should be equipped with surface casing set at approximately 350 feet and cemented to the surface and with "production" casing set at total depth, approximately 4900 feet.

(16) That the "production" casing on each of said newly drilled wells should be cemented to the surface, except that in any well in which an intermediate casing string has been run to below the top of the Yates formation and cemented to the surface, the "production" casing may be cemented back into the base of the intermediate casing string.

(17) That injection should be accomplished through tubing installed in a packer set within 100 feet of the uppermost perforation. The injection tubing should be corrosion protected by a non-reactive internal lining or coating. The casing-tubing

annulus in each injection well should be filled with an inert fluid and a surface pressure gauge or approved leak detection device should be attached to the annulus.

(18) The injection wells or system should be equipped with a pressure control device or acceptable substitute which will limit the surface injection pressure to no more than 0.2 psi per foot of depth to the uppermost perforation. Provision should be made for the Division Director to administratively authorize a pressure limitation in excess of the above upon showing by the Unit Operator that such higher pressure will not result in fracturing of the confining strata.

(19) All wells within the project area should be equipped with risers or in some other acceptable manner as to facilitate the periodic testing of the bradenhead for pressure or fluid production.

(20) That provision should be made for the Division Director to authorize placing wells on injection and the drilling of injection wells and additional producing wells at orthodox and unorthodox locations anywhere within the Unit Area without notice and hearing, provided that no unorthodox location is closer than ten feet to a quarter-quarter section line nor closer than 330 feet to the unit boundary, unless such well located closer than 330 feet to the unit boundary is covered by a lease-line agreement with the operator of the lands offsetting such well or the owner of the offsetting lands has waived objection to such location in writing.

(21) That there are a number of wells within the East Vacuum Grayburg-San Andres Unit Area and on lands offsetting the unit area which have previously been plugged and abandoned in a manner which may permit waters injected into the San Andres formation to escape into other formations, including the Salado formation and the shallow fresh water-bearing formations unless remedial action is taken on said wells prior to injection in their near vicinity.

(22) That there are a number of wells within the East Vacuum Grayburg-San Andres Unit Area and on lands offsetting the unit area which penetrate the Vacuum Grayburg-San Andres Pool and are completed in deeper pay zones, but which are cased and cemented in such a manner as may permit the escape of waters injected into the San Andres formation into other formations as described above.

(23) That those wells referred to in Findings Nos. (21) and (22) above which are inadequately plugged and abandoned or are inadequately cased and cemented, or are suspected of being so, include, but are not necessarily limited to, the wells listed in Exhibit "C" attached hereto and by reference made a part hereof.

(24) That no injection at greater than hydrostatic pressure should be made into the Grayburg or San Andres formation in any well in the East Vacuum Grayburg-San Andres Unit Area within one-half mile of any well listed on Exhibit "C" attached hereto until remedial action has been taken on such well to ensure that it will not serve as an avenue of escape for injected waters or until tests have been conducted on such well or other evidence concerning such well has been presented, all establishing to the satisfaction of the Supervisor of the Hobbs District Office of the Division that remedial work on such well is unnecessary.

IT IS THEREFORE ORDERED:

(1) That the applicant, Phillips Petroleum Company, is hereby authorized to institute and operate a pressure maintenance project in the East Vacuum Grayburg-San Andres Unit Area, Vacuum Grayburg-San Andres Pool, Lea County, New Mexico, by the injection of water into the San Andres formation through certain wells which will be administratively approved for water injection at some later date by the Division Director.

(2) That said project shall be designated the East Vacuum Unit Pressure Maintenance Project.

(3) That the following unorthodox locations are hereby approved for new producing wells which are to be drilled by the unit operator during Phase I of the Project Development Program:

TRACT NO.	WELL NO.	LOCATION	UNIT	SECTION
3229	005	1310' FSL and 1310' FWL	M	32
3202	001	1310' FSL and 1330' FEL	O	32
3202	003	1330' FNL and 1330' FEL	G	32
3328	002	1310' FSL and 1310' FWL	M	33
3366	001	1330' FNL and 1310' FWL	E	33
3333	004	1330' FNL and 1330' FEL	G	33
3456	005	1330' FNL and 1310' FWL	E	34
2801	002	1310' FSL and 1310' FWL	M	28
2801	004	1310' FSL and 1330' FEL	O	28
2721	001	1310' FSL and 1310' FWL	M	27

all in Township 17 South, Range 35 East, NMPM, Lea County, New Mexico.

(4) That Special Rules and Regulations governing the East Vacuum Unit Pressure Maintenance Project are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
EAST VACUUM UNIT PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the East Vacuum Unit Pressure Maintenance Project shall consist of those proration units within the boundaries of the East Vacuum Grayburg-San Andres Unit upon which is located an injection well and any directly or diagonally offsetting proration unit which contains a producing well.

RULE 2. The project area shall receive a project area allowable, and said project area allowable shall be the sum of the basic project area allowable plus the water injection credit allowable.

RULE 3. The basic project area allowable shall be equal to 80 barrels of oil per day times the number of developed 40-acre proration units in the project area.

RULE 4. The water injection credit allowable shall be contingent upon full reservoir voidage replacement of all produced fluids and shall be based upon the following formula:

$$\text{Water Injection Credit Allowable} = \left[\frac{\text{Net Water Injected}}{\text{Basic Project Area Allowable Reservoir Voidage}}\right]_{-1} \times \text{Basic Project Area Allowable}$$

The water injection credit allowable shall be calculated in accordance with the procedures and parameters depicted on Exhibits "A" and "B" to Order No. R-5897.

In no event shall the water injection credit allowable be less than zero, i.e., negative numbers derived from application of the above formula shall be ignored.

RULE 5. The weighted average project area reservoir pressure shall be determined prior to commencement of injection of water into the reservoir and at least annually thereafter. The weighted average project area pressure shall be determined from the pressures in at least ten representative wells selected by the unit operator and the Supervisor of the Hobbs District Office of the Division.

RULE 6. The project area allowable may be produced from the wells within the project area in any proportion provided, however, that any proration unit situated on the boundary of the East Vacuum Unit which proration unit is not directly or diagonally offset by a San Andres injection well outside said East Vacuum Unit or on the East Vacuum Unit boundary shall not be permitted to produce in excess of 80 barrels of oil per day.

RULE 7. Those wells within the East Vacuum Unit Area that are not included within the project area as defined above shall be prorated in accordance with the Rules and Regulations of the Division.

RULE 8. The Division Director shall have authority to approve, without notice and hearing, the drilling of wells at unorthodox locations anywhere within the unit boundary, provided however, no unorthodox location shall be closer than ten feet to any quarter-quarter section line, and provided further, that no such unorthodox location shall be closer than 330 feet to the outer boundary of the unit area, unless such well is covered by a lease-line agreement with the operator of the lands offsetting such well, and a copy of the lease-line agreement accompanies the application for such unorthodox location, or unless such offset operator has waived objection to the proposed unorthodox location in writing, and his waiver accompanies the application.

RULE 9. No well shall be placed on water injection in the East Vacuum Unit Area unless the Division Director has approved such well for injection. Applications for injection approval shall be filed in accordance with Rule 701 of the Division Rules and Regulations.

RULE 10. Each newly drilled injection or producing well shall be equipped with a minimum of 350 feet of surface casing and "production" casing run to total depth (approximately 4900 feet). All casing strings shall be cemented to the surface except that in any well in which an intermediate casing string has been run to below the top of the Yates formation and cemented to the surface, the "production" string may be cemented back into the base of the intermediate casing.

RULE 11. Injection shall be accomplished through tubing installed in a packer set within 100 feet of the uppermost perforation. The injection tubing shall be corrosion protected by a non-reactive internal lining or coating. The casing-tubing annulus in each injection well shall be filled with an inert fluid and a surface pressure gauge or approved leak detection device shall be attached to the annulus.

RULE 12. The injection wells or system shall be equipped with a pressure control device or acceptable substitute which will limit the surface injection pressure to no more than 0.2 psi per foot of depth to the uppermost perforation. The Division Director may administratively authorize a pressure limitation in excess of the above upon showing by the unit operator that such higher pressure will not result in fracturing of the confining strata.

RULE 13. All wells within the project area shall be equipped with risers or in some other acceptable manner as to facilitate the periodic testing of the bradenhead for pressure or fluid production.

RULE 14. The unit operator shall immediately notify the Supervisor of the Hobbs District Office of the Division of the failure of the tubing or packer in any of said injection wells, the leakage of water or oil from or around any producing well, the leakage of water or oil from or around any plugged and abandoned well within the project area, or any other evidence of fluid migration from the injection zone, and shall take such timely steps as may be necessary or required to correct such failure or leakage.

RULE 15. Each month the project operator shall submit to the Division a Pressure Maintenance Project Operator's Report, on a form prescribed by the Division, outlining thereon the data required and requesting allowables for each of the several wells in the Project as well as the total project area allowable.

RULE 16. The Division shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for the wells in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and, except as provided under Rule 6 above, may be produced from the wells in the Project in any proportion.

IT IS FURTHER ORDERED:

(1) That no injection at greater than hydrostatic pressure shall be made into the Grayburg or San Andres formation in any well in the East Vacuum Grayburg-San Andres Unit Area within one-half mile of any well listed on Exhibit "C" attached hereto until remedial action has been taken on such well to ensure that it will not serve as an avenue of escape for injected waters, or until tests have been conducted on such well or other evidence concerning such well has been presented

establishing to the satisfaction of the Supervisor of the Hobbs District Office of the Division that remedial work on such well is unnecessary.

(2) That Order No. R-3150 which authorized a pilot waterflood project in this area is hereby rescinded.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

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EAST VACUUM GRAYBURG-SAN ANDRES UNIT
PRESSURE MAINTENANCE PROJECT

VACUUM GRAYBURG-SAN ANDRES POOL, LEA COUNTY, NEW MEXICO

WATER INJECTION CREDIT ALLOWABLE CALCULATION DATA

ATTACHMENT TO _____, 19__, REPORT

$$\text{Water Injection Credit Allowable} = \left[\frac{W_i - W_p}{BPAA \left[B_o + \frac{(R_p - R_s)}{(1{,}000)} B_g \right]} - 1 \right] BPAA$$

W_i = _____ = Average daily water injection, barrels per day, project area only.

W_p = _____ = Average daily water produced, barrels per day, project area only.

BPAA = _____ = Basic project area allowable, 80 bopd x _____ (number of developed 40-acre tracts in project area).

_____ = Weighted average project area reservoir pressure, psig, from _____, 19__, survey data.

B_o = _____ = Oil formation volume factor, reservoir barrels per stock tank barrel (Exhibit B).

R_p = _____ = Producing gas-oil ratio, cubic feet per barrel, project area only.

R_s = _____ = Solution gas-oil ratio, cubic feet per barrel (Exhibit B).

B_g = _____ = Gas formation volume factor, reservoir barrels per Mcf (Exhibit B).

Water injection credit allowable for _____, 19__, = _____ barrels of oil per day.

EXHIBIT "A"
ORDER NO. R-5897

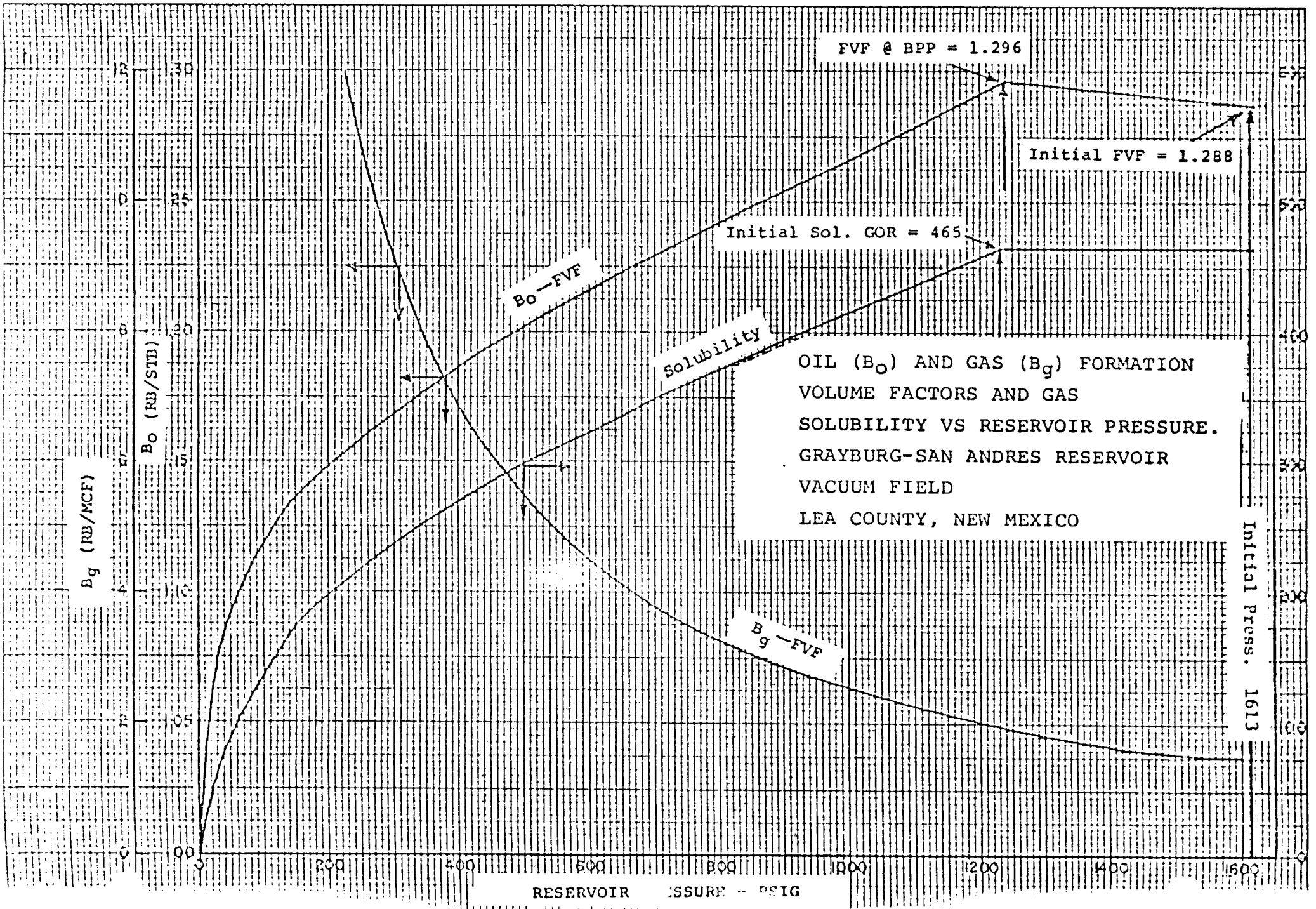
FVF @ BPP = 1.296
Initial FVF = 1.288
Initial Sol. GOR = 465
Bo — FVF
Solubility
Bg — FVF
OIL (B_o) AND GAS (B_g) FORMATION VOLUME FACTORS AND GAS SOLUBILITY VS RESERVOIR PRESSURE.
GRAYBURG-SAN ANDRES RESERVOIR
VACUUM FIELD
LEA COUNTY, NEW MEXICO
Initial Press. 1613
Bg (RB/MCF)
Bo (RB/STB)
RESERVOIR PRESSURE - PSIG
0
200
400
600
800
1000
1200
1400
1600

EXHIBIT "C"

WELLS SUSPECTED OF BEING INADEQUATELY PLUGGED AND ABANDONED OR INADEQUATELY CASED AND CEMENTED

Rpt of 11/2

OPERATOR	LEASE	WELL NO.	UNIT	SEC-TWP-RGE
Mobil	State P	7	P	22-17S-35E 3-6 m Work to commence
Penrose	State	2	N	24-17S-35E commenced 11/1
Phillips	Santa Fe	15	A	28-17S-35E completed 3/29/8
Phillips	Santa Fe	16	L	5-18S-35E completed 4/28/
Phillips	Santa Fe	37	F	28-17S-35E compl 6/23/80
Phillips	Santa Fe	47	C	35-17S-35E compl 8/1/80
Shell	State U	1	C	3-18S-35E compl 9/13/80
Shell	State VAA	6	K	5-18S-35E compl 6-27-8
Shell	State C	1	I	24-17S-34E compl 7-14-8
Shell	State I	1	E	29-17S-35E compl 3-19-80
Shell	State S	1	I	21-17S-35E compl 8-16-80
Stoltz etal.	Abo	1	O	24-17S-35E to commence 3-6 m
Zapata	Shell State	1	O	23-17S-35E compl 11/2/80
Barnett	State B	1	D	19-17S-35E to commence 3-6 m
Jones	State	2	A	35-17S-35E compl 10/11/80
Penrose	Scarborough	1	C	25-17S-35E to commence 3-6
Amoco	State CV	1	F	25-17S-35E * compl 7-29-80
Amoco	State CV	4	L	25-17S-35E compl 7-12-80
Amoco	State CV	5	F	25-17S-35E to commence 3-6
Chevron	State 6-34	4	J	34-17S-35E to commence 3-6 m
Cities Service	State BJ	2	K	35-17S-35E compl 9-28-80
Crusader	State	1	E	20-17S-35E compl 8-29-80
Crusader	State	2	C	19-17S-35E compl 10-23-80
Crusader	State	3	N	18-17S-35E P&A 9-30-80
Exxon	State J	1	M	19-17S-35E now working over compl 1-3 mos
Exxon	State J	2	L	19-17S-35E commenced 10-27-
Exxon	State AC	1	H	22-17S-35E Compl. 11-6-80
Great Western	State E	2	L	25-17S-35E compl 4-9-80
Marathon	Warn State	1	M	23-17S-35E compl 7-21-80
Amoco	State CV	2	E	25-17S-35E hearing exceptio
Amoco	State CV	2-Y	E	25-17S-35E compl P103 filed 6-
Millard Deck	Carthay State	2	G	20-17S-35E *
Exxon	State K	17	P	32-17S-35E Exxon will commen
Marathon	Staplin State	1	L	20-17S-35E *
Marathon	Warn State	1	B	4-18S-35E *
Mobil	N.Vac.AboUnit	207	H	24-17S-34E *
Pennzoil	Phillips State	1	A	28-17S-35E *
Pennzoil	Phillips State	2	F	28-17S-35E *
Phillips	Vac.AboUnit	6-68	H	34-17S-35E compl 9-20-79
Phillips	Vac.Abo Unit	1-9	J	27-17S-35E compl 9-20-79
Phillips	Vac.Abo Unit	7-3	P	27-17S-35E *
Phillips	Vac.Abo Unit	7-4	I	27-17S-35E *
Phillips	Vac.Abo Unit	9-5	H	33-17S-35E *
Phillips	Vac.Abo Unit	13-2	E	4-18S-35E *

* = exception granted

OPERATOR	LEASE	WELL NO.	UNIT	SEC-TWP-RGE
Phillips	Vac.Abo Unit	14-3	N	5-18S-35E *
Phillips	Vac.Abo Unit	14-4	L	5-18S-35E *
Shell	State V	6	P	27-17S-35E *
Shell	State K	1	O	19-17S-35E *

* = exception granted

EXHIBIT "C"
ORDER NO. R-5897