EL PASO NATURAL GAS COMPANY

April 30, 1954

HOBBS OFFICE OCC

Box 1384 Jal, New Mexico

1954 MAY 4 AM 10:32

New Mexico Oil Conservation Commission
P. O. Box 2045
Hobbs, New Mexico

ATTENTION: Mr. S. J. Stanley

Dear Sir:

Pursuant to Rule 701 (b), Rules and Regulations of the New Mexico Oil Conservation Commission, the following information is submitted with regard to use of the El Paso Natural Gas Company's Shepherd B-4 and Rhodes A-2 wells, located in Sections 5 and 22 respectively, of Township 26 South, Range 37 East, Lea County, New Mexico, for gas injection wells. Permission to use these wells has been submitted to the United States Geological Survey in accordance with the terms of the Rhodes Unit Agreement.

The following information is respectfully submitted as outlined in Rule 701 (b):

(1) Plat enclosed
(2) Yates formation of the Permian System
(3) The Yates sand is the formation to be affected by injection in both wells
Shepherd B-4, producing interval - 2825 to 2960 feet
Rhodes A-2, producing interval - 3050 to 3200 feet
(4) & (5) Logs and casing programs enclosed on Form C-105
(6) Residue gas and gas from gas wells is to be injected at the rate of approximately 5,000 MCFPD; however, this volume will vary depending upon market demands.
(7) El Paso Natural Gas Company
P. O. Box 1492
El Paso, Texas

El Paso Natural Gas Company
P. O. Box 1384
Jal, New Mexico

Yours truly,

EL PASO NATURAL GAS COMPANY

Larry C. Zink
Division Geologist

LCZ:ds
Enc.

To The Honorable Oil Conservation Commission
Santa Fe, New Mexico

Your petitioner, El Paso Natural Gas Company, a Delaware Corporation, doing business in the State of New Mexico, under a permit duly and legally issued and having its principal office at 1010 Bassett Tower, El Paso, Texas, presents herewith a proposed agreement for the operation of oil and gas leases upon State lands, and for the unitization and pooling of leases upon State lands with other leases, all as set forth in the proposed Unitization Agreement, which is attached hereto and made a part hereof for all purposes.

Your petitioner represents to the Commission that the proposed agreement will tend to promote the conservation of oil and gas, and the better utilization of reservoir energy; that under the operations proposed the State will receive its fair share of the recoverable oil or gas in place under its lands in the area affected; that said proposed agreement and operations thereunder will have the effect of preventing waste, and is fair to the royalty owners of the proposed pool; and that the agreement is in other respects for the best interests of the State.

Your petitioner requests that the Commission approve the proposed agreement, and enter such orders as will be necessary to carry out proper operations under such agreement.

Respectfully submitted.

EL PASO NATURAL GAS COMPANY
BY:

Vice-President

Plan of Operation of the Rhodes Unit Area
in Lea County, New Mexico
Supplemental to plan submitted July 8, 1944

The operator of Group 1 Unitized Substances (viz., El Paso Natural Gas Company) of the Rhodes Unit Area, Lea County, New Mexico, under Unit Agreement approved by the Secretary of Interior on June 29, 1944, proposes the following supplemental plan of operation for approval by the Supervisor of the District at Roswell, New Mexico. This plan as proposed shall be in effect until January 1, 1946, at which time Operator will submit a new plan of operation or supplement to this plan for the Supervisor's approval.

(1) Attached to this plan of operation, and for use in connection therewith, are the following exhibits:

Exhibit A - Map defining the areas, and showing pipe lines and wells related to this project.

Exhibit B - Past performance curves on all gas wells in the unit, showing accumulated production curves plotted against shut-in pressure.

Exhibit C - Gas well completion reports and back pressure method open flow tests on all gas wells within the area.

Exhibit D - Geological cross sections and Engineering Report.

(2) (a) Description of acreage committed to Rhodes Unit Area:

Township 26 South, Range 37 East,
N. M. P. Meridian.

Sec. 7: NE¼NE¼

Oil rights only above 4000' and all gas rights in:

Sec. 9: SE¼NE¼

Gas rights only to 4000' depth in:

Sec. 4: W½NW¼; SW¼; W½SE¼; SE¼SE¼
Sec.10: SW¼SW¼; SE¼SE¼
Sec.15: NE¼NE¼; NW¼NW¼; S½N½
Sec. 5: All
Sec. 6: NE¼NW¼; NE¼; N½SE¼; SE¼SE¼
Sec. 8: NW¼; N½SW¼; SE¼SW¼; E½
Sec. 9: E½NE¼; NW¼NE¼; W½; SE¼
Sec.10: W½NW¼; SE¼NW¼
Sec.15: S½
Sec.17: N½NE¼
Sec.21: E½NE¼; NW¼NE¼
Sec.22: All
Sec.26: All
Sec.27: E½
Sec.28: S½

(b) Gas wells owned and operated by Operator within the unit:

C. C. Cagle (a) No. 1 (Lease No. 41665), located 1650' from South line and 1650' from West line of Section 9, Township 26 South, Range 37 East, Lea County, New Mexico.

C. C. Cagle (a) No. 2 (Lease No. 41665), located 990' South and 990' West of the Northeast Corner of the NW¼ of Section 9, Township 26 South, Range 37 East, Lea County, New Mexico.

C. C. Cagle (b) No. 1 (Lease No. 41665), located 660' from West and 1980' from South lines of Section 15, Township 26 South, Range 37 East, Lea County, New Mexico.

C. C. Cagle (b) No. 2 (Lease No. 41665), located Center of SW¼ of SW¼ of Section 15, Township 26 South, Range 37 East, Lea County, New Mexico.

H. G. Moberly (b) No. 1 (Lease No. 41666), located Center of the NE¼ of the NE¼ of Section 21, Township 26 South, Range 37 East, Lea County, New Mexico.

H. G. Moberly (b) No. 2 (Lease No. 41666), located Center of the NW¼ of the NE¼ of Section 21, Township 26 South, Range 37 East, Lea County, New Mexico.

W. H. Rhodes (a) No. 1 (Lease No. 41652), located 990' South of North line and 330' West of East line of NE¼ of NW¼ of Section 22, Township 26 South, Range 37 East, Lea County, New Mexico.

W. H. Rhodes (a) No. 2 (Lease No. 41652), located 1650' from South and 1650' from East lines of Section 22, Township 26 South, Range 37 East, Lea County, New Mexico.

C. W. Shepherd (a) No. 1 (Lease No. 41667), located 330' from East line and 2310' from North line of Section 6, Township 26 South, Range 37 East, Lea County, New Mexico.

C. W. Shepherd (b) No. 1 (Lease No. 41667), located 2310' North of South line and 330' East of West line of Section 5, Township 26 South, Range 37 East, Lea County, New Mexico.

C. W. Shepherd (b) No. 2 (Lease No. 41667), located 330' South of North line and 990' West of East line of SE¼ of Section 6, Township 26 South, Range 37 East, Lea County, New Mexico.

C. W. Shepherd (b) No. 3 (Lease No. 41667), located 990' South and 990' West of the Northeast corner of Section 5, Township 26 South, Range 37 East, Lea County, New Mexico.

C. W. Shepherd (b) No. 4 (Lease No. 41667), located 1320' North and 1320' West of the Southeast corner of Section 5, Township 26 South, Range 37 East, Lea County, New Mexico.

State of New Mexico "Y" Lease Well No. 1 (Lease No. 80650), located 660' North and 1270' West of the Southeast corner of the NE¼ of Section 16, Township 26 South, Range 37 East, Lea County, New Mexico.

Gregory (b) No. 1 (Lease No. P. P. 032510), located 660' East of West line and 1980' South of North line of Section 15, Township 26 South, Range 37 East, Lea County, New Mexico.

State (a) No. 1, located 330' West of East line and 330' North of South line, Section 16, Township 26 South, Range 37 East, Lea County, New Mexico.

Farnsworth (e) No. 1 (Lease No. P. P. 030180), located 1650' East of West line and 990' North of South line, Section 4, Township 26 South, Range 37 East, Lea County, New Mexico.

(3) General Discussion of Operator's Plan.

Operator's main line requirements vary from 93 M^2CF daily during summer months to 142 M^2CF daily during winter months, with a daily average of 126 M^2CF. After completion of Operator's present expansion program, 99 M^2CF daily of low pressure residue gas will be taken into Operater's main line; this gas will be supplemented with high pressure natural gas from wells to fulfill Operator's requirements.

Low pressure residue gas will be taken in the approximate amounts and from operators listed herein, the gas being compressed from extraction plant operating pressures to 550 lbs. desulphurized and dehydrated before entering Operator's pipe line system:

Operator	Plant Location	Plt Oper Pressure	MCF/day
El Paso Natural Gas Co.-Phillips Pet. Co. Plant #2	Jal	73#	51,000
*Phillips Petroleum Co.	Eunice	45#	37,000
*Warren Petroleum Corp.	Monument	80#	11,000
Total residue available			99,000 MCF/day**

*Gas taken from these two plants will be compressed, desulphurized and dehydrated at Operator's Eunice Plant.

**All MCF figures used in this plan are 10 oz. above 14.4# pressure base.

Supplemental high pressure natural gas from natural gas wells will be gathered through Operator's high pressure gathering system and processed at Operator's No. 1 Plant where natural gasoline will be extracted, sour natural gas desulphurized and all natural gas dehydrated before entering Operator's main line. The amount of supplemental high pressure natural gas required for pipe line requirements will vary from month to month; however, the amount required should average approximately 13 M^2CF

daily, with a low of minus 5-1/2 M^2CF (resulting in cutting off 5-1/2 M^2CF daily of residue) and a high of 43 M^2CF.

The requirements for natural gas will be taken on some equitable basis from the 65 natural gas wells the Operator has tied into its high pressure gathering system. The Operator plans to take enough natural gas to insure the holding of all leases from which wells, tied in at the present and wells to be tied in in the future, are producing. In so doing, the Operator will be required to take gas in amounts which exceed its pipe line requirements; this surplus gas will be injected into the Rhodes storage project.

Additional gas not considered in this plan will result from Operator's plans for immediate construction of gathering system to purchase vent or separator gas from oil producing wells in the Keystone Area, Winkler County, Texas. The producing zone for wells to be tied in will be the Ellenberger. Withdrawals from this area will be negligible upon completion of the pipe line system, increasing as the field is developed to an ultimate of not less than 10 M^2CF. This gas will be processed at Operator's No. 1 gasoline extraction, purification and dehydration plant before entering Operator's main line.

Operator proposes to inject surplus residue gas in the amount of 22,000 MCF daily during periods of low main line requirements into the Rhodes storage project, with the right to withdraw gas from the reservoir or reservoirs during peak demand periods or emergencies due to line breaks or plant failures. Operator anticipates the annual amount of gas injected to be 5,000,000 MCF net above withdrawals. In this way, the project has a two fold purpose: (1) storage of gas which would otherwise be wasted; (2) as a cushion to protect the Operator by having an abundant supply of gas available to meet peak demands and emergencies.

(4) Operation of Oil Producing Wells

Operator has been designated as operator of certain oil producing wells within the Unit area by owner. Production from these wells will be handled by the Operator for account of owner. Wells which are to be operated in this manner are listed herein:

Rhodes A-1
Rhodes A-2
Moberly A-2

These wells shall be operated in such a manner as not to interfere with the project and eliminate the possibilities of the drainage of gas from the reservoir.

(5) Preliminary Construction

Construction required prior to start of actual injection of gas into the storage area is as follows:

(a) Construction and erection of combined desulphurization and dehydration plant having a capacity of 50 M^2CF at Operator's Eunice Plant.

(b) Construction and erection of 5 - 800 HP compressors at Operator's Eunice Plant to compress gas from 45# to 550#, increasing capacity of this plant from 26 M^2CF to 48 M^2CF.

(c) Construction of 31 miles of 16" pipe line to carry residue gas from Operator's Eunice Plant to Operator's Jal No. 1 Plant.

(d) Conversion of Operator's Jal No. 1 Plant Compressor Station from 600# WP to 2000# WP. At present time, conversion of one compressor will give capacity of 22,000 MCF at 800# discharge pressure, which should furnish an adequate supply of injection gas for an 18 months' period. One compressor will be left as at present; this will enable the Operator to withdraw gas from the reservoir with the low pressure compressor until such time as sufficient reservoir pressure has been attained to cause the wells to produce into Operator's high pressure gathering system.

When the need for additional residue gas or higher pressures for injection into the wells is felt, the Operator will convert the remaining compressor for injection purposes.

(e) An injection pipe line system will be constructed, independent of the existing gathering system. The injection system will have a capacity of 22 M^2CF daily and a working pressure of 2000# at the compressor station and 1750# WP at the injection wells. The Operator does not anticipate pressure requirements as high as 1750# at the wells; however, in the interest of safety both from the standpoint of elimination of hazards and insuring a system which will meet all ultimate requirements the extreme pressures were used.

(f) To further conserve gas, the Operator proposes to construct an extensive low pressure gathering system to gather vent gas from oil producing wells south and southwest of the sweet gas area - (see attached map for layout of system). A recent survey of vent gas available shows 4,500 MCF per day; this gas will be processed through El Paso Natural Gas Co. - Phillips Petroleum Co. No. 2 gasoline extraction plant and a large portion of the gas will be compressed for use in Operator's main line.

(g) Wells purchased by the Operator from The Texas Company and Stanolind Oil & Gas Company will be inspected and neeessary repairs or changes in well head connections will be made. Tubing will be run in wells requiring tubing, in order to facilitate the draining of fluid from the well bore and running bottom hole pressures.

(h) Construction of Keystone gathering system as previously mentioned. In view of anticipated slow increase of gas withdrawals from this area, it has not been considered as affecting this plan. Estimated completion date of preliminary construction is January 1, 1945, contingent upon reasonable deliveries of material now on order and authorization for use of additional materials which will be required.

(6) Injection Wells

The Operator considers the Rhodes Unit Area to consist of two separate gas reservoirs, namely: (1) the sweet gas reservoir, and (2) the sour gas reservoir. Present plans are to inject sweet dehydrated residue gas into both reservoirs, using the well (or wells) which is found to be most efficient for injection purposes in each area.

Operator's engineers and geologists are making studies of all well logs, records and structural positions and will make recommendations for an injection in each area. In the absence of porosity and permeability

determination records, particular attention is being paid to the following: the ability of each well to produce, initial open flow capacities and the last back pressure method open flow test made on these wells. A report of these recommendations and findings will be made available to the Supervisor as evidence to support this plan.

Operator has applied for authorization from Supervisor, United States Geological Survey, Roswell, New Mexico, to make preliminary injection tests on various wells in the Unit to determine amounts of gas which may be injected with the main line operating pressure of 500#. A record of the gas injected and injection pressure required will be maintained and made available to the Supervisor of the United States Geological Survey, Roswell, as supporting evidence to this plan. The well reacting most favorably to these tests will be used as the first injection well, with the Operator having the right to use any well or wells for injection purposes so as to control the flow of gas in the reservoir. Operator will immediately notify Supervisor of any changes made in injection wells.

The same procedure as above will be followed in determining a suitable injection well for the sour gas area; also, the same operating procedure will be followed. Such preliminary tests for the sour gas area will be

delayed until the compressor conversion at the No. 1 Plant and construction of the injection system have been completed, as present pressures are inadequate.

Condition of Reservoirs & Control of Injected Gas

At the present time there is a differential of approximately 180# in the two reservoir shut-in pressures - the sweet reservoir shut-in pressure being 360# and the sour reservoir shut-in pressure being 540# (excluding the Farnsworth C-1 well on which the shut-in pressure is higher, being estimated at 640#). There are definite indications of communication between the two reservoirs, with this high differential pressure being evidenced by an increase in H_2S and shut-in pressure of State Y-1 well.

In order to eliminate or at least minimize this hazard the Operator will first build up the sweet gas reservoir pressure to equal that of the sour gas reservoir; after having accomplished this, the two reservoir pressures will be maintained as nearly equal as practical. With the exception of the above, the sour gas area is apparently well protected from drainage. Cross Sections of the area and logs of wells in this area will be submitted by our geologists as a supplement to this proposal.

Plan of Operation
Rhodes Unit Area

A careful study has been made of the sweet gas reservoir as to possibility of leakage. Apparently the reservoir is well protected except in the south and southwest portion of the Unit. Oil producing wells operated by Krupa - Flaherty are potential sources of drainage in that several of these wells apparently have gas sands below the casing; these sands at present are non-productive because of an oil seal resulting from the oil sand having a higher bottom hole pressure than the gas sand. By reason of this it is a natural assumption that as the sweet gas reservoir pressure is increased these gas sands will become active, with increasing gas - oil ratios resulting. Operator's engineers are making studies of logs and condition of all oil producing wells of all operators, to determine the types of remedial work which may be used to eliminate this possibility of leakage. The Operator, by installation of the low pressure gathering system, will be in a position to recover any gas which may be lost by leakage until necessary remedial work can be done.

A geological and engineering report of oil producing wells within the Unit will be compiled and made a supplement to this plan. This report will include bottom hole pressures, if the producers will give permission

to make such tests.

At present the indicated maximum reservoir pressure to be attained will be 1000#; however, performance of the gas movement and reaction of reservoir may alter this pressure. Operator is ultimately interested in storing a maximum amount of gas at the maximum pressure; however, the Operator will control the injection of gas and reservoir so as not to jeopardize the project.

(7) Tests and Testing Procedure

Operator will run a bottom hole pressure survey on each well after wells within the Unit have been shut in for a 48 hour period prior to commencement of gas injection; tests of this type will be taken after each succeeding 3 months' period. The pressure increase curve will be plotted against the accumulated gas injected curve and a copy of this curve will be made available to the Supervisor of the United States Geological Survey, Roswell, New Mexico.

Prior to bottom hole pressure test shut-ins, H_2S tests will be taken; these tests may be of particular value in the sour gas area as only sweet gas will be injected. Any channelling may result in a decreasing H_2S.

Specific gravity tests will be taken prior to shut-ins; these tests may be of particular value

to indicate leakage to oil producing wells because gas to be injected will have a .640 SpG as compared to a present vent gas SpG of .750 - the assumption being that leakage of any consequence would result in a gas with a SpG between the two mentioned.

GPM's will be taken periodically as injected gas will be practically nil to charcoal tests while present GPM tests on oil producing wells average 1.0 GPM and on dry gas wells .4 GPM.

Gas- oil ratio tests will be made monthly on oil producing wells in the southern part of the Unit. Any appreciable increase in gas, as reflected in the weekly charts on the low pressure gathering system, will be investigated and spot oil - gas ratios will be made as required.

Results of all tests will be made available to Supervisor of United States Geological Survey in Roswell, New Mexico.

EXHIBIT A

Map defining the areas, and showing pipe lines and wells related to this project.