PLAN OF OPERATION FOR THE GRAYBURG ZONE
UNDER
GRAYBURG COOPERATIVE AND UNIT AGREEMENT
EDDY COUNTY, NEW MEXICO

To Supervisor, United States Geological Survey
Roswell, New Mexico

Now comes, Grayburg Unit Association, the Unit Operator designated in the Grayburg Cooperative and Unit Agreement in Eddy County, New Mexico, and submits for the approval of the Oil and Gas Supervisor a plan of operation as agreed in accordance with Section 8 of said Agreement. The following plan of operation and development is for the present producing zone referred to in the Agreement as the Grayburg Zone and this plan of operation, when approved by said Oil and Gas Supervisor, shall constitute the further drilling and operating obligations of the Unit Operator under the Agreement as to that zone.

1. Development to Date: As of February 15, 1944, there have been drilled within the unit area, fourteen wells on the Grayburg Oil Company of New Mexico Burch "A" lease, including Burch #1 "A", 81 feet North of the South Line and 155 feet West of the East Line of NW/4 of Sec. 19, T 17S., R 30E., which was drilled to a total depth of 500 feet and operations were suspended on June 5, 1935. Report of plugging and abandonment of this well was approved on ~~January 29, 1937~~ August 30, 1933. The 13 wells drilled subsequently to #1 "A" Burch are all producing oil wells. On the Burch "B" lease there are nine wells, all of which are producing oil wells. On the Grayburg Keely "A" lease nine wells, including Keely #1 "A", 402 feet S of N Line and 238 feet E of W Line of the NE/4 of Sec. 26, T 17S., R 29E., which was drilled to the total depth of 500 feet and operations suspended on August 1, 1935. Report of plugging and abandonment was approved in August, 1933. The eight wells drilled subsequent to #1 "A" Keely are all producing oil wells. On the Grayburg Keely "B" lease, five wells have been drilled, all of which are producing oil wells. On the Western Production Company Burch "C" lease there are eight wells, all of which are producing oil wells, and on the Western Production Company Keely "C" lease there are eight wells, all of which are producing oil wells, however, #2 C and 3 "C" Keely are not included in the agreement as they are located outside the boundaries of the unit area. In addition to the aforesaid

wells there has been drilled one producing oil well on the Grayburg Oil Company of New Mexico Dexter lease. These 50 oil wells are producing from Zone 5 to Zone 10 in the Grayburg and San Andres Limestone formations of Permian age, these zone numbers being as designated by the United States Geological Survey. The majority of the wells are producing from Zones 9 and 10, located approximately 275 feet to 350 feet below the top of the San Andres Lime. Zones #9 and 10 are those from which the most prolific production is obtained and into which the gas is to be returned. All production developed to date at a depth of less than 3300 feet below the surface is that referred to in the Agreement as the Grayburg Zone.

2- Plan of Development Grayburg Zone:

(a) Well Spacing: All future wells shall be drilled in approximately the center of each 40 acre legal subdivision. Provided that upon acceptable showing by Unit Operator of necessary disability therefore based on structural or producing conditions and with approval of the Oil and Gas Supervisor, a well may be drilled at another location within a forty acre tract.

(b) Casing Program: The casing program shall be such as approved by the Oil and Gas Supervisor in connection with the notice of intention to drill each well to be drilled hereunder, and shall include a requirement for a string of casing to be set immediately above top of the salt and cemented with 50 sacks of cement, preceded by mud and circulated to the surface. With further provision for a production string of casing to be set not higher than the base of Zone 6 and cemented with 100 sacks of cement, preceded by mud and circulated to the surface, provided that such production string may be set at a lesser depth where commercial production should be encountered at such lesser depth and with approval of the Oil and Gas Supervisor.

Operator will set casing in such a manner as to properly conserve unitized substances, to adequately shut off any water and to expose all commercially productive horizons.

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Operator will set casing in such a manner as to properly conserve unitized substances, to adequately shut off any water and to expose all commercially productive horizons.

(c) Proposed Wells: Wells will be drilled in workmanlike manner and at a reasonable rate of exploitation with the intention of defining the limits of commercial production in the Grayburg Zone at the earliest possible date. Unit Operator proposes to commence the drilling of four wells during the calendar year of 1944, such wells to be located as follows: Grayburg Oil Company of New Mexico #10 "B" Burch to be located C NENW of Sec. 30, T 17S., R 30E., Grayburg Oil Company of New Mexico #4 "B" Keely to be located C NENE of Sec. 26, T 17S., R 29E., Western Production Company #10 "C" Keely to be located C SENW of Sec. 25, T 17S., R 29E., Western Production Company #11 "C" Keely to be located C SWNE of Sec. 25, T 17S., R 29E. Unit Operator may drill such additional wells as he sees fit and with the approval of the Oil and Gas Supervisor. If any well to be drilled hereunder proves to be a non-commercial well or dry hole, then in such event the obligation to drill subsequent wells provided for herein during the period covered by this plan of development may be modified with the approval of the Oil and Gas Supervisor.

(d) Operation of Repressuring Project:

(1) Injection Wells: The following described wells have been selected for injection of gas. Grayburg Oil Company of New Mexico #5 "B" Burch, C NESW of Sec. 23, T 17S., R 29E., Grayburg Oil Company of New Mexico #3 "B" Keely, C SWSW of Sec. 24, T 17S., R 29E., Grayburg Oil Company of New Mexico #5 "A" Keely, C NENESE of Sec. 24, T 17S., R 29E., Western Production Company #3 "C" Burch, C NWSWSE of Sec. 19, T 17S., R 30E., Grayburg Oil Company of New Mexico #8 "A" Burch, C SENENW of Sec. 19, T 17S., R 30E. These wells were selected as injection wells from available data relating to bottom hole pressures, gas-oil ratios and producing zones which may be efficiently used for the injection of gas. Grayburg Oil Company of New Mexico #5 "B" Burch with a bottom hole pressure of 611 pounds is located in the intermediate pressure area and has both zones 9 and 10 open, Grayburg Oil Company of New Mexico #3 "B" Keely with a bottom hole pressure

of 526 pounds is located in the intermediate pressure area and has Zone 9 open, Grayburg Oil Company of New Mexico #5 "A" Keely with a bottom hole pressure of 547 pounds is located in the intermediate pressure area and has Zones 9 and 10 open, Western Production Company #3 "C" Burch with a bottom hole pressure of 337 pounds is located in the low pressure area and has Zones 9 and 10 open. These wells will be used for the first injection of gas when operations are commenced on the repressuring program. The Grayburg Oil Company of New Mexico #8 "A" Burch has also been selected for an injection well to be used if sufficient volume of gas is available and if Unit Operator feels that inclusion of said well would be beneficial. Grayburg Oil Company of New Mexico #8 "A" Burch with a bottom hole pressure of 281 pounds is located in the low pressure area and among the older wells which have been more nearly depleted than those in other parts of the field, and has Zones 9 and 10 open. The low pressure area is that part of the field with a bottom hole pressure of 0 to 400 pounds, the intermediate pressure area is from 400 to 700 pounds and the high pressure area is that with a bottom hole pressure of 700 pounds or higher. It is felt that ~~inasmuch as~~ the three wells in the western part of the field in the intermediate pressure area will contribute toward the repressuring of the intermediate zone and will increase the formation pressure in this area, at the same time maintaining the pressure in the high pressure area of the central part of the field. The injection well on the eastern side of the field being Western Production Company #3 "C" Burch should serve to increase the pressure in that low pressure area. The inclusion of Grayburg Oil Company of New Mexico #8 "A" Burch in the north eastern part of the field, which is the low pressure area, will tend to either form a gas cap exerting a downward pressure and or will tend to repressure the low pressure area, either of which should have some beneficial effect on ultimate recovery.

In order to control the injection of gas into Zones 9 and 10, Unit Operator will install tubing and packers in each injection well in such a manner that gas will be confined to those

zones below the packer. Packer points will be as follows: Grayburg Oil Company of New Mexico #5 "B" Burch, 2675 feet, Grayburg Oil Company of New Mexico #3 "B" Keely, 2800 feet, Grayburg Oil Company of New Mexico #5 "A" Keely, 2845 feet, Western Production Company #3 "C" Burch, 2950 feet, Grayburg Oil Company of New Mexico #8 "A" Burch, 2985 feet. Upon installation of packer, annular space behind tubing will be filled with a gel-substance from the top of the packer back to within the casing shoe of the production string thus effectively sealing the formation above the packer, and annular space will then be loaded with oil on top of the gel and sufficient back pressure built up at surface with tubing head closed to assure an effective packer seal. Packer points have been selected so as to be in the hardest possible formation available between desired producing zones.

(2) Compressors and Gas Volume: Operator has installed 3 compressors with total of 330 H.P. and capacity of 1,250,000 cubic feet of gas operating under 20 pound intake pressure and 900 pound discharge pressure.

During January 1944, on test, gas volume from the field averaged 1,354 MCF with an average production of 1,428 BOPD and an average gas-oil ratio of 947 CFG/1BO.

Operator proposes to inject gas into the various wells at a maximum pressure of 700 pounds which will be sufficient to cause a differential in all of the selected injection wells. Gas volume for the various wells will be allocated in accordance with their capacity and ability to take the gas and depending upon pressure build up and observed reservoir behavior. Unit Operator feels that due to intangible factors involved in regard to capacity of injection wells and related reservoir, volume should be regulated in this manner until some results are observed.

(3) Production: Unit Operator will produce the wells in such a manner as to efficiently and economically obtain the

the maximum recovery. Top allowable wells with a gas-oil ratio in excess of 2,500 and marginal wells with ratios in excess of 3,500 will be shut in, the oil production adjusted to reduce the ratio, or remedial work will be performed. It is intended that an average overall gas-oil ratio of not to exceed 2,000 will be maintained in the field so as to conserve gas and reservoir energy.

As long as present top allowable is 48 barrels per day, or more, Unit Operator will forfeit allowable normally allocated to the injection wells. However, if present top allowable of 48 barrels of oil per day is decreased to a lesser figure, this plan may be modified with the approval of the Oil and Gas Supervisor, so as to allow operator to reallocate to various other wells on the same basic lease, the production which would normally be allowed the various injection wells.

(4) Regulations: Drilling and producing operations hereunder shall be conducted in conformance with applicable Federal and State laws and regulations. The allocation of production normally allowed injection wells to other wells on the same basic lease, as provided in Section 3 hereof, shall be subject to the prior approval of the New Mexico Oil Conservation Commission.

(5) Engineering Data: Operator will take such tests as is necessary to determine at all times the condition of the reservoir pressure, gas-oil ratio, productivity and condition of producing wells, and to accomplish this, field wide gas-oil ratio and bottom hole pressure tests will be taken at intervals of at least every three months, with appropriate records of all such tests and information kept up to date at all times and available to the Oil and Gas Supervisor at any time. In event of excessive gas through-put at any time, individual gas-oil ratios will be taken immediately and corrective steps performed.

3. Modification of Plan: This plan may be modified from time to time by the Unit Operator with the approval of The Oil and Gas Supervisor to meet changed conditions or to take advantage of information obtained from drilling of any said wells which might make the location of any subsequent well to be drilled hereunder unreasonable and to meet changed conditions which may develop in the operation of the repressuring program. This plan of operation to remain in effect to December 31, 1944, prior to which date Unit Operator shall submit for the approval of the Oil and Gas Supervisor a new plan of operation or appropriate modification or amendment of this plan, for the calendar year of 1945.

Respectfully submitted,

GRAYBURG UNIT ASSOCIATION

By: A. J. Braddock

APPROVED this the 6th day

of April, 1944

L. G. Snow

Oil and Gas Supervisor
Roswell, New Mexico