STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN LLC FOR APPROVAL OF A SALTWATER DISPOSAL WELL, LEA COUNTY, NEW MEXICO.	**COMM. CASE NO. 24123**
APPLICATIONS OF GOODNIGHT MIDSTREAM PERMIAN LLC FOR APPROVAL OF SALTWATER DISPOSAL WELLS, LEA COUNTY, NEW MEXICO.	**DIV. CASE NOS. 23614-23617**
APPLICATION OF GOODNIGHT MIDSTREAM PERMIAN, LLC TO AMEND ORDER NO. R-22026/SWD-2403 TO INCREASE THE APPROVED INJECTION RATE IN ITS ANDRE DAWSON SWD #1, LEA COUNTY, NEW MEXICO.	**DIV. CASE NO. 23775**
APPLICATIONS OF EMPIRE NEW MEXICO LLC TO REVOKE INJECTION AUTHORITY, LEA COUNTY, NEW MEXICO.	**DIV. CASE NOS. 24018-24020, 24025**

EMPIRE NEW MEXICO LLC'S
NOTICE OF SUPPLEMENTAL EXHIBITS

Empire New Mexico, LLC, through its undersigned counsel, submits the following supplemental exhibits that were admitted into the record during the hearing in these matters on April 11, 2025.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was served on the following counsel of record by electronic mail on May 14, 2025.

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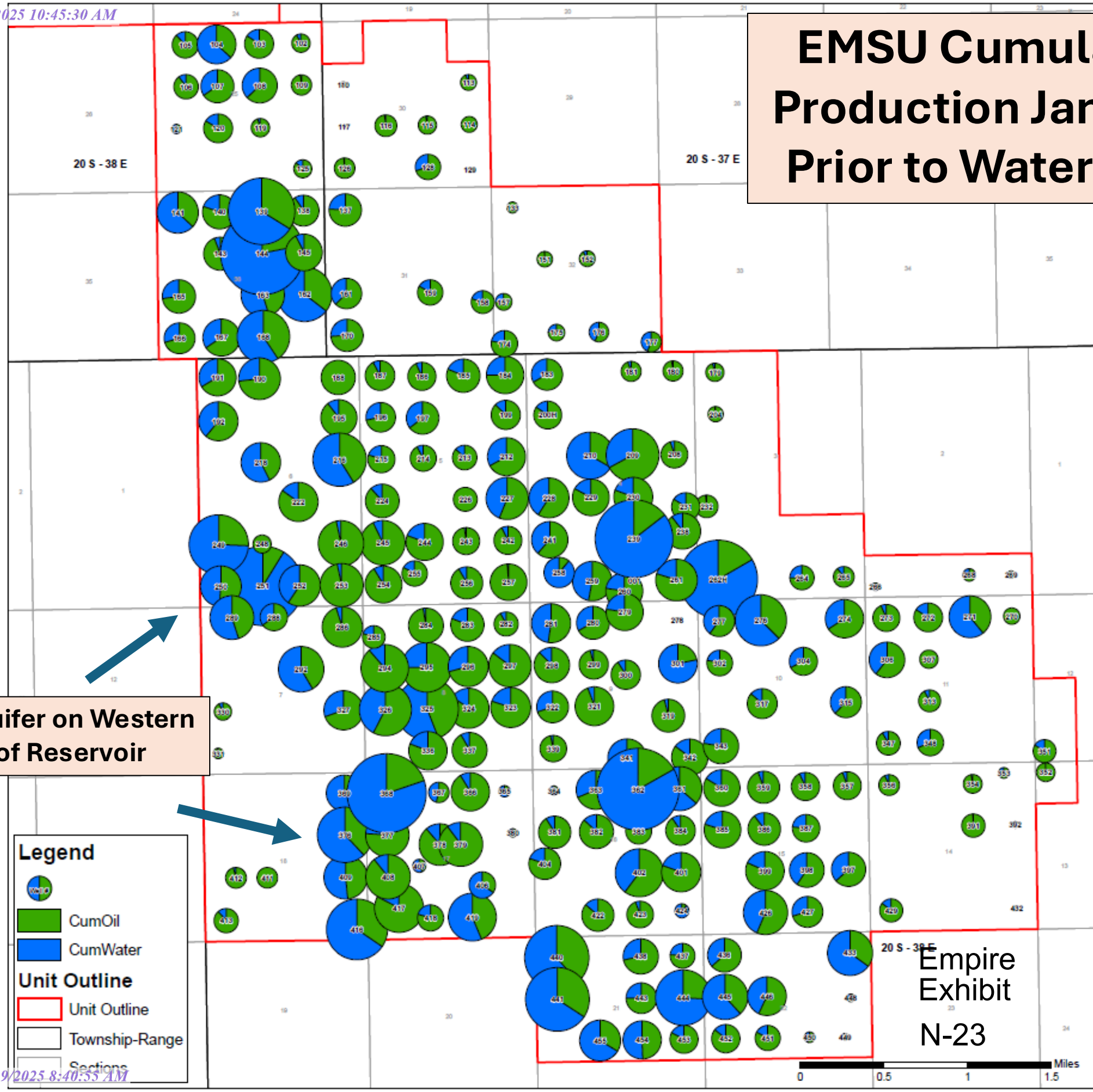
EMSU Cumulative Production Jan-1986 Prior to Waterflood



Weak Aquifer on Western Edge of Reservoir

Empire Exhibit N-23

Evidence of Communication Between San Andres & Grayburg

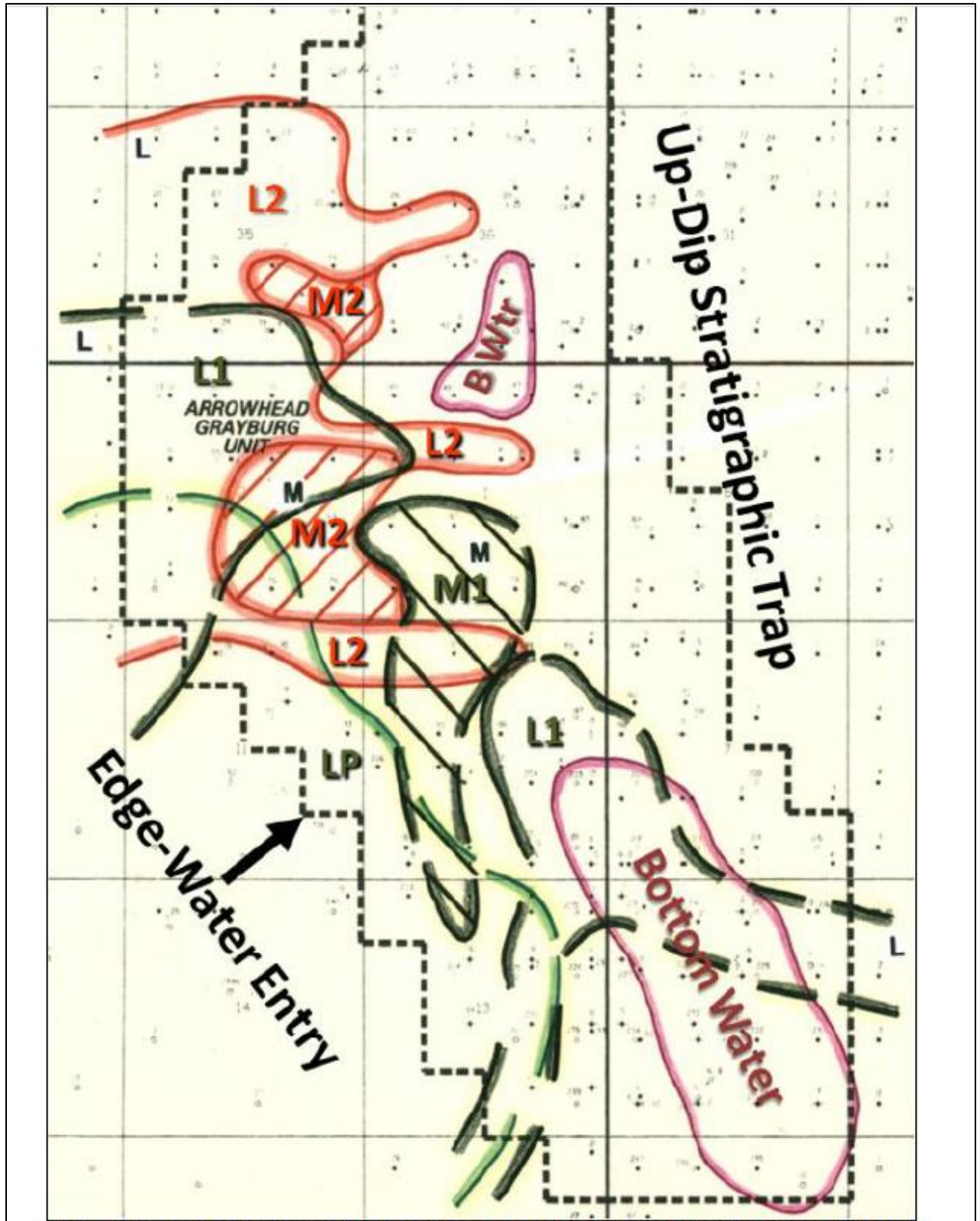


Figure 9.15. Grayburg Formation Arrowhead Grayburg Unit (AGU) with bottom water and four beds of high porosity-permeability dolograinstone that are each 0.5 m (1.5 ft) thick. These high perm streaks pulled water up-dip into the reservoir by a drop in reservoir pressure during field production. To avoid high water production these beds were not utilized as part of the waterflood.

Page 1001 – Dr. Robert Lindsay PhD

In a few well locations in Arrowhead there was also a problem with Upper San Andres Formation bottom-water production that ascended up into the Grayburg Formation strata via vertical plumes of water along swarms of narrow, short-spaced fractures (Figure 9.15).

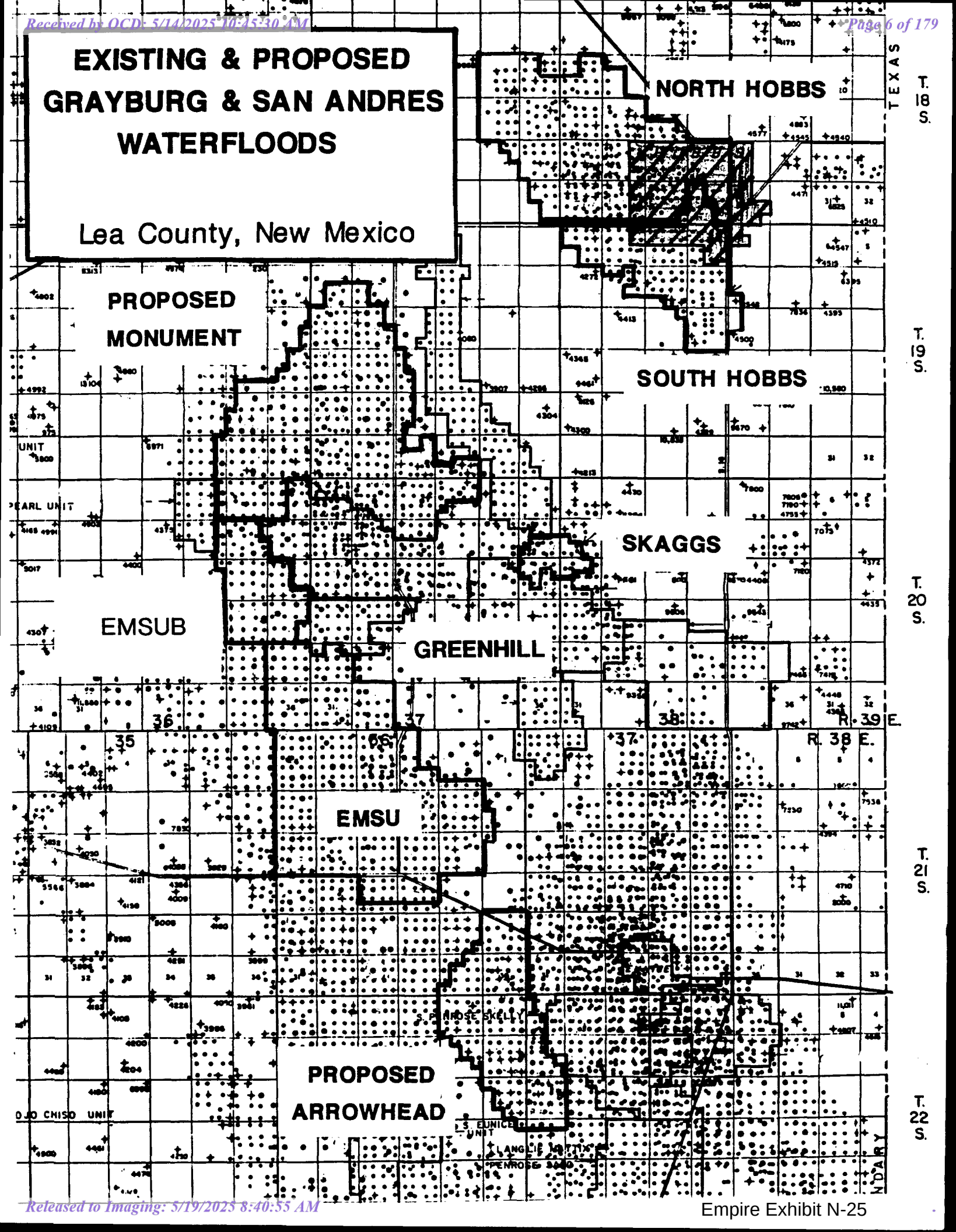
Page 1004 – Dr. Robert Lindsay PhD

These plumes of vertically-oriented Upper San Andres Formation bottom-water only affected small areas in the unit and in most cases only affected one well, though mapped as if the bottom-water was affecting a larger area (Figure 9.15). Similar vertically-oriented plumes of Upper San Andres Formation bottom-water were also encountered in individual wells further north in Eunice Monument South Unit (EMSU) and Eunice Monument South Unit Expansion Area B (EMSUB).

Empire Exhibit N-24

EXISTING & PROPOSED GRAYBURG & SAN ANDRES WATERFLOODS

Lea County, New Mexico



Empire Exhibit N-25

Morrow

AGU

10259

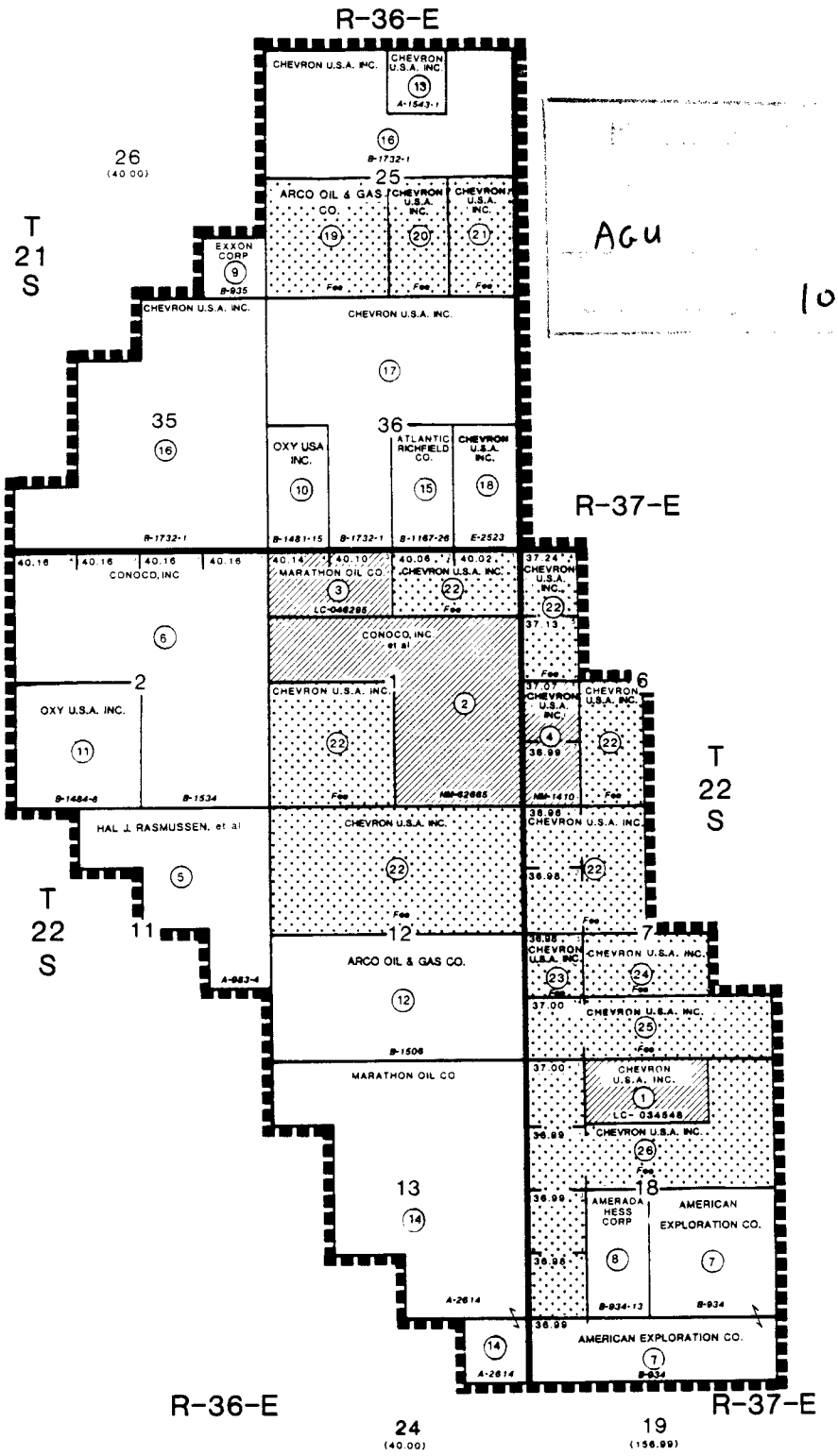


EXHIBIT "A"

ARROWHEAD GRAYBURG UNIT AREA

LEA COUNTY, NEW MEXICO

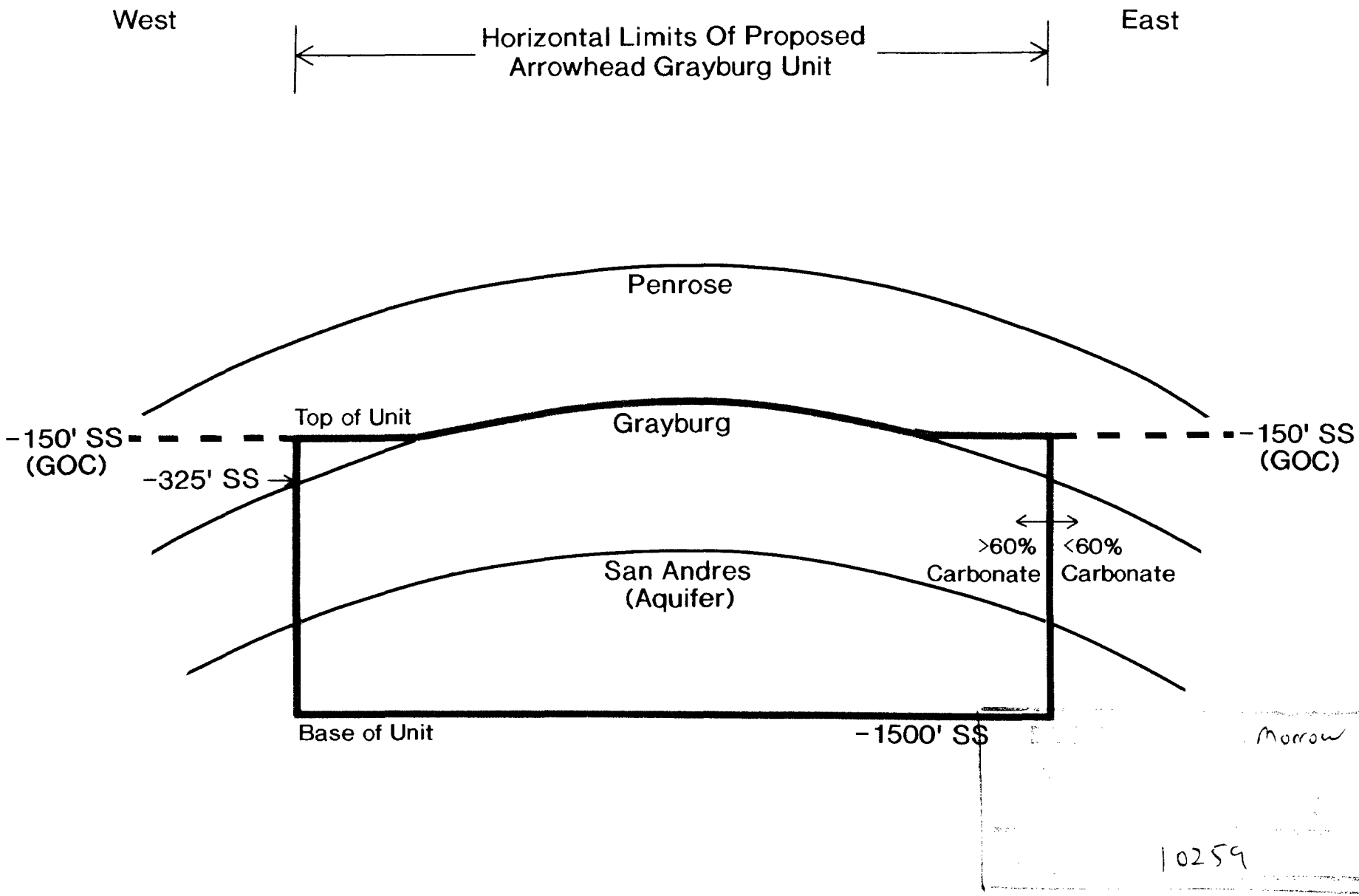
	ACREAGE	PERCENTAGE
FEDERAL LANDS	554.30	9.36%
STATE LANDS	3,597.63	60.75%
PATENTED LANDS	1,770.33	29.89%
TOTAL	5,922.26	100.00%

UNIT OUTLINE

TRACT NUMBERS

CHEVRON U.S.A. INC.
MIDLAND TX.

NOTE. UNLESS OTHERWISE INDICATED, THE VARIOUS SECTIONS ON THIS PLAT CONTAIN 640.00 AC



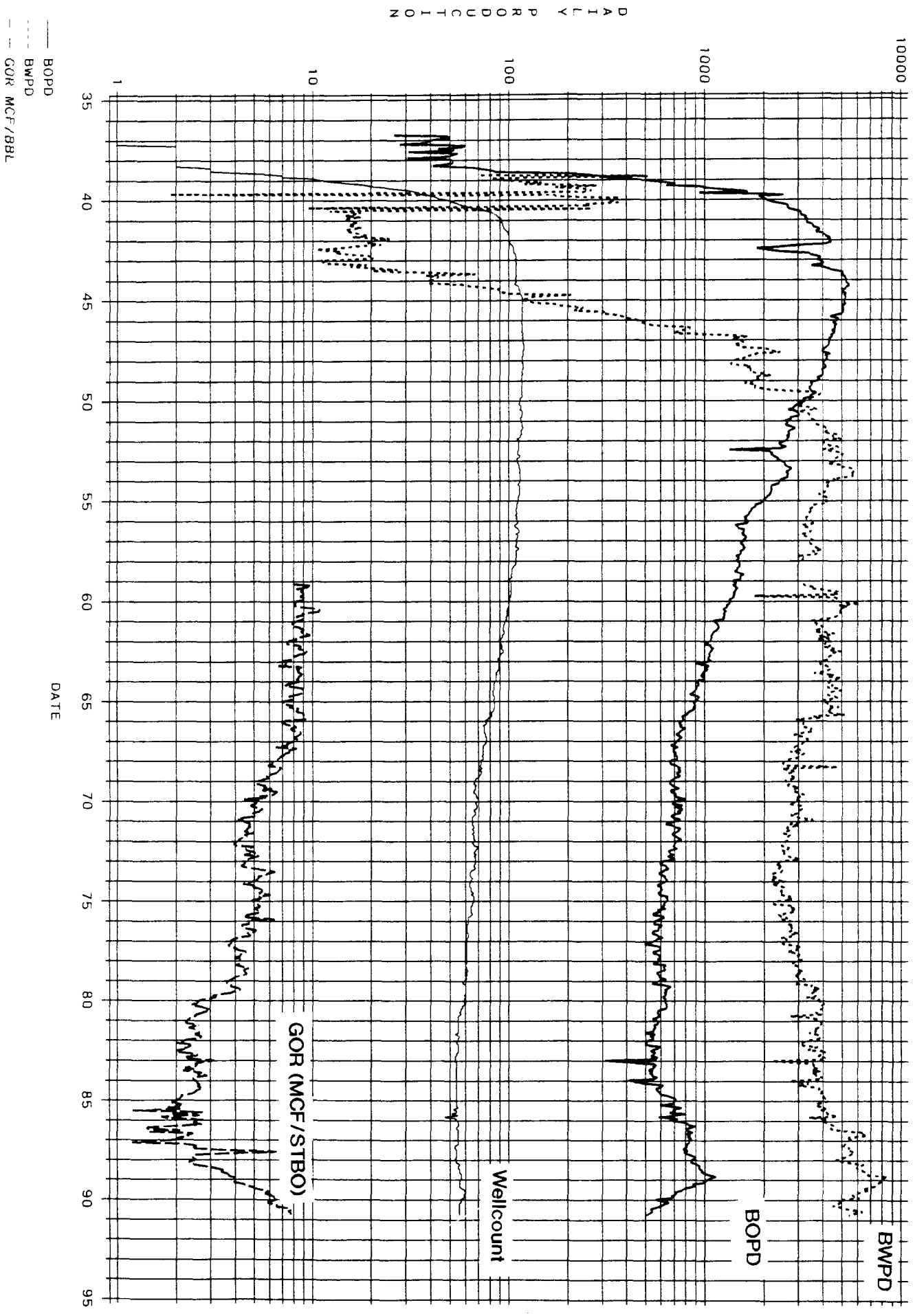
Schematic of Proposed Unit Limits – Arrowhead Grayburg

(Not To Scale)

DLL 2/91

PROPOSED ARROWHEAD GRAYBURG UNIT

PRODUCTION PLOT



Morrow

AGI

10259

Technical Committee Report
Proposed Arrowhead Grayburg Unit
Lea County, New Mexico

Chevron

September 1989

Technical Committee Report
Proposed Arrowhead Grayburg Unit
Lea County, New Mexico

September 1989

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E. Cross Sections and Base Map

I. INTRODUCTION

This report presents the information that Working Interest Owners charged the Technical Committee to develop concerning unitization and waterflooding of the Arrowhead Grayburg Pool (Figure 1). It includes: (1) recommended Unit boundaries, (2) a secondary recovery plan of action and performance prediction, and (3) parameters for use in negotiating Unit participation.

II. CONCLUSIONS

1) Secondary recovery potential is sufficient to economically justify unitizing and waterflooding the Arrowhead Grayburg Pool for the purpose of increasing ultimate recovery.

2) The proposed Unit has produced 30.8 MMSTBO as of January 1, 1989, which is 17.6% of the estimated 175.4 MMSTBO OOIP. Ultimate primary oil production is expected to reach 36.1 MMSTBO, or 20.6% OOIP.

3) Incremental reserves for waterflooding are estimated to be 15.0 MMSTBO. This value represents a secondary to ultimate primary recovery ratio of 50% for the "swept" portion of the Unit, and an overall S/P ratio of 41.6%.

4) A total investment of $28.2 MM will be required to install surface production and injection facilities, drill and equip new and replacement wells to develop the recommended waterflood pattern, perform remedial work on existing wells, and install new pumping equipment.

5) Incremental economics of the secondary recovery case to the base case of continued primary recovery indicate a discounted cash flow rate-of-return of 20% with a 10% discounted present-worth-profit of $24.6 MM.

III. RECOMMENDATIONS

1) The 5,922 acre area outlined in Figures 2, 3, and 4 should be unitized for the purpose of increasing ultimate recovery.

2) A waterflood project should be initiated in the proposed Unit.

3) The vertical limits of the unitized interval should extend from -150 ft from sea level or the top of the Grayburg formation, whichever is shallower, to a depth of -1,500 ft from sea level. The top of the Grayburg formation for unitization purposes is defined as that point at 3,671 ft in the Chevron Harry Leonard (NCT-C) No. 20 (located 660 ft FNL and 990 ft FWL of Section 36, T-21-S, R-36-E, Lea County, New Mexico) as recorded by the Gearhart Compensated Neutron Log measured from the Kelly Drive Bushing elevation of 3,532 ft and dated February 25, 1985.

4) The parameter tables (Appendix A) should be used by the Working Interest Owners for negotiation of an equitable participation formula.

5) A wellbore dedication incentive method, such as wellbore penalties or a wellbore inventory adjustment, should be adopted by the Working Interest Owners. The value of each useable wellbore should be set at $80,000 for use in the wellbore dedication incentive.

IV. RESERVOIR INFORMATION

POOL HISTORY

The Arrowhead Pool, located in Lea County, New Mexico (Figure 3), was discovered on May 24, 1938 by Continental's #1 State J-2 well (located in Section 2, T-22-S, R-36-E). Original reservoir pressure as reported by the Annual Report of the New Mexico Engineering Committee was 1,460 psi. The pool was subsequently developed on 40-acre spacing, with the majority of the wells being drilled and completed during the late 1930's and early 1940's. Completions were typically open-hole and included both the Queen and Grayburg formations. The wells initially flowed, but by the late 1940's and early 1950's, reservoir pressure had dropped, and artificial lift was installed. Peak oil production rate for the pool was 172,300 barrels per month in March of 1944.

In 1953, the New Mexico Oil Conservation Commission created the Eumont and Arrowhead Gas Pools. These pools overlie the existing Arrowhead and Penrose Skelly Oil Pools. The Commission defined the vertical limits of the Eumont and Arrowhead Gas Pools to include the Yates, Seven Rivers, and Queen formations, and contracted the vertical limits of the Arrowhead and Penrose Skelly Oil Pools to include only the Grayburg formation (Figure 5).

In 1956, the Commission subsequently ordered that wells which had completion intervals open across the top of the Grayburg formation (open in both the Arrowhead and Eumont Pools) be identified to the Commission for reclassification. As a result of this action, only a few wells within the proposed Unit were reclassified from the Arrowhead Pool to the Eumont Pool. The Commission did not order remedial work to isolate the two pools but did order that future wells be completed in such a manner as to prevent communication between the oil and gas pools. It is estimated that 40 to 50 of the wells in the proposed Unit have completion intervals which currently or historically have been simultaneously open in both the Queen and Grayburg formations.

GEOLOGY

The Arrowhead Pool is located on a northwest-southeast trending structural high (Figure 6), adjacent to and on strike with the Eunice Monument South Unit (EMSU). The productive interval, which is comprised of the Penrose (lowest member of the Queen formation) and the Grayburg formation, is similar in the two areas and consists of interbedded carbonates and siliciclastics deposited during a

period of overall sea level regression. These carbonates have been extensively dolomitized and form the primary reservoir in the Arrowhead Pool. There are a limited number of modern wireline logs and no core data available for the Arrowhead area.

Due to the similarities between these logs and those of the EMSU, the reservoirs are believed to be very comparable, and many of the ideas and conclusions generated from studies of the EMSU can be cautiously applied to the Arrowhead.

There has been a large quantity of data gathered and evaluated for the EMSU. Fifty-four new wells have been drilled, 17 were cored and 19 had Repeat Formation Test (RFT) data taken. Over 230 of the existing wells have also been relogged with modern porosity tools. These data are being used to characterize and evaluate the reservoir.

When the Arrowhead project is implemented, data acquisition will proceed with a program similar to that of the EMSU. There will be over 50 wells redrilled, of which six will be cored, and several will have RFT data taken. Existing wells without modern logs will be relogged using modern porosity tools. Once implementation is completed, the Arrowhead will have an extensive data base for reservoir characterization and management.

From the ongoing EMSU study, it was determined that the dolomites range from mudstones to oolitic grainstones indicating a wide range of depositional energies. The majority of the pay in the EMSU consists of packstones and grainstones with intercrystalline, intergranular, and moldic porosity. The six Grayburg zones that have been defined in the EMSU are also recognized in the Arrowhead (Figure 7).

Dolomite porosity development in the Arrowhead, based on wireline logs, is similar to that of the EMSU and is typical of a progradational depositional environment. On the western flank of the structure, reservoir-quality dolomite porosity extends into the upper Grayburg formation and Penrose. Moving updip to the east, the Penrose becomes sandy, and the dolomites in the upper Grayburg become tight. In the eastern portion of the pool, reservoir-quality dolomite porosity is found in Grayburg Zones 5 and 6.

A percent dolomite map (Figure 8) of Grayburg Zones 1 thru 5 was constructed to demonstrate this decrease in dolomite porosity to the east. It is an indirect way of determining the limits of dolomite porosity development and productivity of the reservoir, made necessary by the limited amount of

wireline porosity data available. A lower percentage of dolomite indicates areas of relatively low wave energy. Carbonate sediments in this environment tend to be fine-grained muds, resulting in non-reservoir mudstones. A higher percentage of dolomite indicates a higher energy environment which is more prone to grainstone deposition.

As in the EMSU, the siliciclastics present in the Grayburg formation are believed to be tight and nonproductive. The total volume of siliciclastic material increases in an easterly direction with an accompanying decrease in net pay. These siliciclastics, for the most part, are not true sandstones but sandy dolomites, usually consisting of less than 50% siliciclastic material, predominantly quartz. These quartz grains are subangular and very uniform in size. They are believed to have been initially deposited by eolian processes and subsequently reworked within the marine shoreline environment. The porosity associated with these siliciclastics is secondary and caused by the dissolution of feldspar grains. This secondary moldic porosity is poorly connected, resulting in non-effective porosity. In the EMSU these siliciclastics intervals have been found to be good vertical permeability barriers, and they should act as barriers in the Arrowhead reservoir as well.

The Arrowhead Pool is a predominantly solution gas drive reservoir that consists of the lower Penrose and Grayburg Zones 1 thru 5. Siliciclastics and tight mudstones which act as vertical permeability barriers are found throughout the reservoir, separating it from the active aquifer present in the Lower Grayburg (Zone 6) and San Andres. Based on the study of production data and individual well completion intervals, the original gas-oil contact (GOC) in the Arrowhead reservoir is believed to have been at approximately -150 feet from sea level. This contact has not changed significantly through time.

The original oil-water contact (OWC) in the Arrowhead is not known. Recent analysis of drill cuttings and core data on the western edge of the EMSU has resulted in an estimated original OWC in Grayburg Zones 1 thru 5 of -550 feet from sea level. After a vigorous well deepening and testing program in the EMSU, oil production has been established below -500 feet in Zone 5, substantiating this contact. Due to the close proximity of the Arrowhead to the EMSU, as well as the similarities of the reservoirs, the Arrowhead should have had a comparable original OWC in Grayburg Zones 1 thru 5.

The present OWC is also difficult to determine due to the limited number of recent deep tests in the Arrowhead reservoir. It is believed that the individual Grayburg zones on the western edge have each developed their own distinct OWC's because of different completion and production histories.

PRODUCTION HISTORY

Cumulative oil production for the proposed Unit was 30.8 MMSTBO on January 1, 1989. This value includes production classified as Arrowhead Grayburg, Penrose Skelly, Eumont Oil, Langlie Mattix, and Eunice Southwest San Andres. A total of 138 wells have produced from 134, 40-acre proration units within the proposed Unit. The average cumulative oil production has been 230 MSTBO per proration unit. Figure 9 indicates the historic production performance for the proposed Unit. Figures 10 through 18 present contour maps of cumulative and current production rates for oil, gas, water, water-oil ratio and gas-oil ratio for the proposed Unit.

Remaining primary reserves, calculated from individual tract decline curves, are 5.2 MMSTBO and 16.1 BCF gas. Ultimate primary oil recovery is expected to total 36.1 MMSTBO, which is 20.6% of the estimated OOIP.

Sufficient modern log data are not available to calculate an accurate volumetric OOIP for the Arrowhead Grayburg Pool. However, log to core transforms and reservoir characterizations developed for the EMSU can be applied to the proposed Unit because of the similarities between the two fields. Estimates of reservoir parameters utilizing the EMSU similarities are: porosity = 8%, Hnet = 85 ft, Swi = 25%, and Boi = 1.2 RB/STB. The OOIP calculated for the 5,320 acres that have produced from the proposed Unit, using the estimated reservoir parameters, is 175.4 MMSTBO. A summary of pertinent reservoir data is shown in Table 1.

Although the Arrowhead Pool has produced a significant volume of water, which could indicate a water-drive type recovery, solution gas drive is believed to be the predominant recovery mechanism. This conclusion is based on the pressure depletion of the pool and on the lack of an identifiable water production trend.

At discovery, reservoir pressure was reported to be 1,460 psi. In 1964, the last date pressure records were reported to the State for the Arrowhead Pool, the reservoir pressure had declined to 450 psi. Cumulative oil production at the

end of 1964 was 24.1 MMSTBO, or 67% of the expected ultimate primary production. The corresponding loss from original reservoir pressure at that time was 69%. If a water-drive mechanism exists, it is not of sufficient strength to maintain reservoir pressure and is probably not significantly affecting primary oil recovery.

Cumulative water production has been 54.8 MMBW (excluding production in 1958 when water records were not kept). Water producing rates and cumulatives vary significantly with location, and no single source of the water production is apparent. Figures 12 and 13 indicate cumulative water and cumulative water-oil ratio, respectively, for wells in the proposed Unit.

A portion of the water production is probably attributable to communication of Zones 4 and 5 with the Lower Grayburg and San Andres aquifers. Although siliciclastics between each zone generally prevent vertical communication, in some localized areas of the field they do not act as permeability barriers. When the barriers break down in the lower Grayburg members, the prolific San Andres aquifer can influx into the oil productive horizons resulting in large volumes of water production.

Other water production may be attributable to completions in the Penrose (Lower Queen) which has been found to be influenced by a water drive in the EMSU. Additional portions of the water production can be attributed to casing leaks, which have been identified in 36 wells.

Localized areas of high water production consist of less than five proration units. In most cases, wells adjacent to high water production areas have produced significantly less water. The change in water production appears to be independent of completion depth, both subsea and stratigraphically, and no clear water production trend is identifiable.

Based on the lack of uniform water production and the relationship of pressure depletion to recovery, solution gas drive is thought to be the predominant primary recovery mechanism with water influx having only a minor effect on recovery. The Arrowhead Grayburg Pool is therefore a good candidate for waterflooding with respect to primary recovery mechanism.

CURRENT STATUS

The proposed Unit includes all currently active Arrowhead Grayburg wells and several wells classified as Eumont, Langlie Mattix, Penrose Skelly, and Eunice San Andres Southwest.

The current production rate for the proposed Unit is 33,025 BOPM, 251,600 BWPM, and 128,714 MCFPM gas. There are a total of 57 actively producing wells completed in the proposed unitized interval, and 12 wells are shut-in or temporarily abandoned. Other historic completions have either been plugged back to a different horizon or have been permanently abandoned. Seven of the currently active wells are simultaneously producing from beyond the proposed vertical limits of the Unit and will require remedial work to isolate the unitized interval prior to the effective Unit date.

V. PROPOSED UNIT BOUNDARIES

The proposed limits of the Unit are as follows:

Vertical Limits:

> Defined as the top of the Grayburg formation (defined in Chevron's Harry Leonard (NCT-C) No. 20 well, located 660 ft FNL and 990 ft FWL, Section 36, T-21-S, R-36-E, at a depth of 3,671 feet on Gearhart's Compensated Density and Compensated Neutron Log dated 02/25/85), or -150 feet from sea level (whichever is shallower), to -1,500 feet from sea level.

Horizontal Limits:

> As outlined in Figure 3. Individual tracts are identified by location, operator, and lease in Table 2.

DISCUSSION

In August 1953, the New Mexico Oil Conservation Commission redefined the Eunice Monument and Arrowhead Pools and created the Eumont and Arrowhead Gas Pools. The Eunice and Monument Oil Pools were combined, and the vertical limits were redefined as the top of the Grayburg to the base of the San Andres, while the Arrowhead Oil Pool was redefined to consist only of the Grayburg formation (Figure 5). Many of the wells in both the Eunice Monument and Arrowhead Oil Pools had completion intervals open across the top of the Grayburg formation into the newly defined Eumont Pool and therefore outside of their defined pool. Some of these wells were reclassified, but most remained in their designated pool. This redefinition of pools in 1953 created complications in the choice of vertical limits for the EMSU as well as the proposed Arrowhead Unit.

VERTICAL LIMITS

The top of the proposed Arrowhead Unit is defined as the top of the Grayburg formation or -150 feet from the sea level, whichever is shallower. Several of the wells in the proposed Unit have completions that extend above the defined pool, into the Penrose (Eumont Pool). This situation also occurred at the EMSU and was successfully addressed by defining the Unit's upper limit as the top of the Grayburg or -100 feet, avoiding an excessive number of workovers to isolate the two pools. This -100 feet datum is the estimated gas-oil contact (GOC) at the EMSU. The estimated GOC for the Arrowhead Pool, as indicated by completion information, appears to be structurally lower at -150 feet. Typical completion intervals in the Arrowhead

Pool are shown in stick diagrams A-E, in Figures 19 thru 24.

The base of the proposed Unit is -1,500 feet from sea level. This depth ranges between 100 feet to 150 feet above the base of the San Andres formation (top Glorieta). This will include most of the San Andres formation within the Unit which will be an excellent source of make-up injection water. It is desirable to include the water supply in the unitized interval to avoid complications that could arise if the water supply wells produce hydrocarbons. By including the water supply in the unitized interval, hydrocarbon revenue and operating expenses associated with the operation of water supply wells will be shared equitably by the Owners. A subsea depth was chosen rather than a formation pick due to the lack of deep well control and the ease with which it can be applied.

HORIZONTAL LIMITS

The horizontal limits of the proposed Unit reflect the structural and stratigraphic components that define this combination trap. The western extent can be defined structurally, whereas the northern and eastern extent of the pool are defined by stratigraphy.

To the west of the proposed Unit, the entire Grayburg is structurally low and wet. Here the productive interval is confined to sandstones in the Queen formation. This flood is targeting the porous dolomites, and therefore, the proposed Unit boundary to the west was limited to areas where oil production was primarily from dolomites within the Grayburg and lower Penrose. From test information, cumulative production data, and cross sections, it has been determined that the productive limit of the Grayburg to the west is at -325 feet. Therefore, all 40-acre proration units on the western flank where the top of the Grayburg is at -325 feet or shallower will be included in the proposed Unit (Figure 6).

The proposed Unit is limited to the south by an existing Langlie Mattix waterflood. The Langlie Mattix Pool is defined from the base of the Grayburg formation to a point 100 feet above the base of the Seven Rivers formation. This waterflood is confined to the Penrose which is within the vertical limits of the proposed Arrowhead Unit. The Arrowhead Unit boundary will be directly offset by two active injectors in this waterflood, and a lease line injection agreement should be obtained upon unitization.

The eastern and northern boundaries of the proposed Unit were delineated using the percent dolomite map (Figure 8), cumulative production map (Figure 10), and cross sections. The percent dolomite map provides an indirect method for determining limits of dolomite porosity development and reservoir productivity. The best cumulative production has been from areas of 60% dolomite or greater. Where dolomite content is less than 60%, the reservoir quality is probably not adequate to be effectively waterflooded. The 60% dolomite contour on the percent dolomite map was used to define the eastern and northern boundaries of the proposed Unit.

EXCLUDED WELLS

There are five Arrowhead Grayburg Pool wells that were not included in the proposed Unit. These wells are listed below, along with the reasons for exclusion.

American Exploration's #7 and #43 'M' State

Located to the south in Section 19, T-22-S, R-37-E. These wells are within the active Langlie Mattix waterflood.

Adobe Oil's #1 State

Located to the east in Section 17, T-22-S, R-37-E. Dolomite content of only 53% (below the 60% cutoff). Cumulative production of only 3,505 BO.

Marathon's #15 McDonald State 'AC'

Located to the west in Section 14, T-22-S, R-36-E. Produced from the upper and middle Penrose sands (not the targeted dolomites). Estimated top of the Grayburg is -342 feet (below the -325 feet structural cutoff).

Wood, McShane & Tham's #13 'M' State

Located to the southeast in Section 20, T-22-S, R-37-E. Too far removed from the proposed Unit. Dolomite content of 52% (below the 60% cutoff). Cumulative production of only 9,459 BO.

OBJECTIONS

Zia Energy, Inc., owner of the deeper rights in Tract 8a, (Figure 4) has indicated opposition to the inclusion of its acreage in the proposed Unit. The Zia 'M' State No. 49

well, in the SE/4 of Section 18, T-22-S R-37-E, currently produces from Grayburg Zone 5 and the Lower Grayburg, classified as Eunice San Andres Southwest. Daily production averages less than 1 BOPD, 180 MCFGPD, and 600 BWPD. Consideration of Zia's desire to be excluded from the Unit should be addressed by the Working Interest Owners.

VI. SECONDARY RECOVERY POTENTIAL

Due to the absence of quantitative reservoir data, a rigorous conventional secondary recovery analysis cannot be performed. However, based on the geologic and production history similarities between the two fields, EMSU recovery predictions should be applicable to the proposed Arrowhead Unit.

The original EMSU prediction was based on a statistical average of West Texas and Southeast New Mexico carbonate waterflood performance. The EMSU Technical Committee identified typical ranges of performance indicators including: S/P (secondary to ultimate primary) recovery ratios, time to peak response, and peak oil production rate as a percentage of water injection rate. The same typical performance indicators have been applied to predict waterflood performance for the proposed Arrowhead Unit.

To derive a secondary performance prediction for the Unit, the performance indicators used by the EMSU are applied to the proposed waterflood area. This development area is based on the utilization of all currently active wells within the proposed unitized interval. Additionally, proration units that do not have available wells, but where sufficient reserves are believed to exist to justify the drilling of a new well, will be developed. Sufficient reserves to justify drilling are estimated to be 70,000 STBO, which may include additional primary as well as secondary reserves based on the S/P ratio. The proposed development pattern is an 80 acre 5-spot which is the same pattern used at the EMSU. The total project will consist of 52 injectors and 75 producers (Figure 25).

Cumulative production from the enclosed waterflood patterns as of 12/31/88 (including reductions of individual well cumulatives to reflect partial waterflood patterns) was 25.6 MMSTBO. This value represents 83% of the proposed Unit's total production. To determine secondary recovery potential, the S/P ratio used by the EMSU, 50%, is applied to 83% of the proposed Unit's ultimate expected primary recovery of 36.1 MMSTBO. The resulting incremental secondary recovery potential is calculated to be 15.0 MMSTBO. This value could be affected by the additional primary and secondary recovery generated by development of undrilled locations and undeveloped pay in existing wells. Additionally, the S/P ratio of 50% may be conservative. Recent review of Grayburg and San Andres waterfloods indicate that the typical S/P is in excess of 60%.

Injection rates for the proposed waterflood are expected to average 450 BWPD/well with a total injection rate of 23,400 BWPD. This rate is estimated based on the ratio of 85 ft net thickness in the Arrowhead Pool compared to the 134 ft at the EMSU, multiplied by the 700 BWPD per well average injection rate experienced in the EMSU.

Peak oil production rate for the proposed Unit is estimated to be 5,850 BOPD, based on 25% of the anticipated injection rate. Initial oil response is expected to occur three years after initial injection with peak response occurring after six years. The time to response is based on the EMSU performance indicator of initial response at one-half fill-up, peak response at fill-up (ignoring the effects of production during fill-up), and an estimated current gas saturation of 18%. The producing gas-oil ratio is expected to decrease from the current level of 3,000 scf/STBO to 450 scf/STBO as reservoir pressure increases. Figure 26 indicates the anticipated secondary recovery response.

The performance prediction does not include an initial loss in oil production resulting from the conversion of producing wells to water injectors. This is based on the net producing well count increase from 57 to 75. Although several of the currently active wells that are tentatively designated to be water injection wells in the proposed Unit produce higher than average oil rates, the loss from conversion is expected to be offset by the addition of new wells. The increase in the well count may actually result in a higher than current oil production rate.

VII. CAPITAL REQUIREMENTS

Total capital requirements to install and implement an 80-acre 5-spot waterflood in the Arrowhead Grayburg Pool are estimated to be $28.2 MM. Cost breakdowns and an investment schedule are shown in Tables 3 through 9.

SURFACE FACILITIES

Surface facilities costs are expected to total $9.0 MM. The facilities will include the production gathering system, water injection system, and an electrical distribution system. Cost estimates are based on the tentative well count of 75 producers, 52 injectors, and 2 water supply wells. The production gathering system is designed to handle 500 barrels of fluid per day per well, and the injection system will allow 500 barrels of water per day per injection well at a maximum surface pressure of 1,800 psi.

The production gathering system will consist of five satellite batteries, each with production testing, gas separation and sales capabilities. Oil and water will be transferred to a central battery for separation and oil sales. Fiberglass production flowlines and transfer lines will be utilized, making the system compatible with CO_2 in anticipation of future enhanced recovery operations. The injection system will consist of lined steel and high pressure fiberglass trunk lines distributing the water to metering manifolds. Each metering manifold will connect to four or five injection wells through high pressure fiberglass lines. A cost breakdown for the surface facilities is indicated on Table 4. Figures 27 through 29 present schematics of the surface facility designs.

DRILL AND COMPLETION COSTS

The total capital requirement estimate includes $11.45 MM to drill and complete 52 new wells, (34 producers, 16 injectors tors, and 2 water supply wells). The 52 new wells requirement is based on the availability of 57 currently active wells, eight currently shut-in or inactive wells, and an assumed additional 10 wells made available as a result of a wellbore dedication incentive, for the 129 total tentative well locations, including two water supply wells (Figure 25). The actual drill and completion cost requirements are dependent on the total number of useable wells dedicated to the Unit.

Drill and completion costs per well, including equipment, are estimated to be $220 M for producers, $200 M for injectors, and $385 M for water supply wells. Tables 5 through 7 indicate typical cost breakdowns for each type of well.

WORKOVER COSTS

Total workover requirements for producers and injectors are estimated to be $6.9 MM. To estimate workover cost, it was assumed that all wells dedicated to the Unit will require some remedial work. Each of the 67 currently available wells (active and inactive) that may be used in the proposed Unit were evaluated to determine the scope of workover activity that may be desired. The workover activities considered included: deepening, adding perfs, running liners, and adding cement behind pipe. All wells were assumed to require a basic workover including cleaning-out and acidizing. The average workover cost for the wells evaluated was estimated to be $60,000. The average cost was applied to the 67 available wells and the 10 assumed additional wells. An additional expense of $27,000 per water injection conversion was included for 36 wells, and a cost of $35,000 per pumping unit upgrade was included for 40 wells. Table 8 indicates the cost of each workover component.

The workover cost estimate assumes that the majority of the wells will be deepened to Zone 5 and that many liners will need to be run. If early drilling and workover activities indicate that deepenings do not contribute to additional oil production and reserves or that liners are not necessary, this type of activity will cease, reducing workover expenses by as much as $750 M.

TESTING & CORING

The total capital requirement includes $500,000 for the gathering of reservoir information. This cost will include the coring and core analysis on six wells, pressure testing, and reservoir fluid PVT analysis. The data will be used to build an accurate reservoir model. The model can then be used to refine the secondary recovery prediction and optimize future oil recovery through reservoir management.

WELLBORE DEDICATION INCENTIVE

The drilling, completion, and workover cost estimates assume that a wellbore dedication incentive method will be used and that 10 additional wellbores will be made available to the Unit as a result of the incentive. The additional wells are currently shut-in or producing with marginal economics from other horizons. Securing these additional wells will enhance project economics for the Working Interest Owners as a whole by reducing total well costs by more than $1.2 MM.

The use of a wellbore dedication incentives is a common practice in modern units. The wellbore penalty method is probably the most widely used incentive. An alternative method is a wellbore inventory adjustment. Both methods are fair and equitable, but the method which is financially best for an individual owner depends on: (1) working interest participation, (2) the number of useable wellbores individually owned and contributed to the Unit, and (3) the total number of wellbores dedicated to the Unit. Determining which method is best for the majority of the Working Interest Owners cannot be done until these factors are established. The Technical Committee is not recommending a particular method but does recommend that a wellbore dedication incentive method be adopted by the Working Interest Owners.

A description of two dedication incentive methods is as follows:

WELLBORE PENALTY: One useable wellbore will be demanded from each proration unit that has historically produced from the unitized interval. Individual Owners will be charged their proportionate share of a wellbore penalty equal to the useable wellbore value for each demand well not contributed. Special allowances can be incorporated for proration units in which all wells were permanently plugged and abandoned prior to a certain date or that produced less than a specific cumulative oil.

WELLBORE INVENTORY: Useable wellbores dedicated to the Unit will be inventoried with a value equal to the "useable wellbore value", and an investment adjustment will be made for each owner based on his proportionate share of the value of all wellbores dedicated and the value of the wellbores he individually contributes.

Useable wellbores are defined for wells with different current status as follows:

(1) Currently active wells will be accepted as useable if no zones other than the unitized interval are open and the wellbore passes a casing integrity test (500 psi for 30 minutes) upon first entry by the Unit operator. If zones above the unitized interval are open, the non-unitized zones must be cement squeezed to isolate the unitized interval, pressure tested to 500 psi for 30 minutes, and cement in the production casing drilled-out; or, if open-hole, a liner must be run and set with cement to the top of the unitized interval, and the casing tested above the unitized interval to 500 psi for 30 minutes.

(2) Currently closed-in or TA'd wells will be accepted as useable if no zones other than the unitized interval are open (as above) and the well is free of scale, junk, and debris to the depth of deepest production from the unitized interval prior to being closed-in (PBTD from workovers in the unitized interval prior to shut-in). The well must pass a casing integrity test upon first entry by the Unit operator.

(3) Currently P&A'd or recompleted wells that have previously produced the unitized interval will be accepted as useable if they are restored to the unitized interval's last producing completion interval, are not open in non-unitized zones, are free of junk, scale and debris down to the PBTD prior to cessation of production, and pass a casing integrity test upon first entry by the Unit operator.

(4) Alternate wells from existing wellbores will be accepted as useable if all non-unitized zones have been abandoned (deeper zones plugged back with a CIBP or cement retainer capped with 35 ft of cement and pressure tested to 500 psi; shallower zones squeeze cemented, pressure tested and cement drilled-out in the production casing), they penetrate the unitized interval, have sufficient casing size (5½") to be deepened or have at least 4½" casing set through Zone 5 of the Grayburg formation, are adequately cemented, and pass a casing integrity test upon first entry by the Unit operator.

(5) Newly drilled wells will be accepted as useable if they are drilled to the base of Zone 5, cased to TD with 5½" or larger casing, are cemented from TD to surface, and pass a casing integrity test.

Tables 10 and 11 indicate completion information for wells that are currently or have historically produced from the proposed unitized interval.

The intent of the useable wellbore definition is to insure all wellbores that are dedicated to the Unit are in reasonably good physical condition and can be used by the Unit in ways consistent with its purpose. All wells dedicated to the Unit will be subject to a casing integrity test. If a well is determined to be not useable upon first entry by the Unit operator, the contributor of the well will be given the option of:

(1) Withdrawal of the wellbore from the Unit, subject to a wellbore penalty or inventory adjustment.

(2) Repair of the wellbore by the contributor without the removal of liability (wellbore penalty or inventory adjustment) if the wellbore does not meet the useable wellbore definition on the subsequent entry by the Unit operator.

(3) Repair of the wellbore by the Unit operator at the contributor's expense for up to $80,000. The Unit operator may elect to not accept a non-useable wellbore for repair if repair cost estimates exceed the value of a useable wellbore.

INVESTMENT SCHEDULE

It is estimated that the full-scale waterflood can be installed in 1.5 project years. During the first year, 46 new wells will be drilled, 100% of the surface facilities will be constructed, one water supply well will be drilled, and 75% of the workovers will be completed. During the next one-half year, the remaining wells will be drilled and workovers completed. Tangible expenses for upgrading pumping capacities on producing wells will occur during the first five years of the project as increasing reservoir pressure dictates.

A detailed project investment schedule is indicated in Table 9.

VIII. ECONOMICS

Economic analysis of the proposed waterflood indicates that the project is profitable for the Unit as a whole. Incremental economics of the waterflood, compared to the base case of remaining primary, indicate a 20% discounted cash flow rate-of-return and a 10% discounted present-worth-profit of $24.6 MM for the $28.2 MM investment. Assumptions used for the economic analysis are:

1) The base case consists of 57 wells producing 965 BOPD, with remaining reserves of 4.7 MMSTBO as of 7/1/90.

2) Incremental oil recovery will total 15.0 MMSTBO.

3) The GOR for the incremental case will decline from the current level of 3,000 SCF/STBO to 450 SCF/STBO as the reservoir pressure increases. The base case GOR is held flat at 3,000 SCF/STBO.

4) Base case operating expenses are $35/producing well day held flat for the remaining life. Operating expenses for the proposed case will escalate to $83/producing well day (including overhead), over the first several years, and decline as injection terminates near the end of the project life.

5) Oil and gas prices are held flat at $18.00/BO and $1.80/MCF.

6) Royalty burdens of 1/8 are assumed for all tracts.

7) Estimated drilling and construction overhead charges of $450,000 were included in the investment.

Economics for individual Working Interest Owners will vary depending on actual royalty burdens, proportionate share of remaining primary and project production, actual investments including wellbore penalties or inventory adjustments, and oil and gas price forecast methods used.

Tables 12 and 13 indicate base case and waterflood case production and expense schedules.

IX. EQUITY PARAMETERS

The Technical Committee was charged to determine the following parameters for Unit participation negotiations:

1) Cumulative Oil Production
2) Remaining Primary Oil and Gas Reserves
3) Ultimate Primary Oil Reserves
4) Current Oil and Gas Production Rates
5) Gross Acreage
6) Useable Wellbores

Subsequently, the Technical Committee has elected to eliminate the parameter Useable Wellbores from the list.

Actual wellbores that will be contributed to the Unit will not be known until after the effective Unit date, and a wellbore will not be determined as useable until after it is contributed. Therefore, the Unit participation allocations would probably have to be reallocated once it is known which wellbores dedicated to the Unit are "useable". The Technical Committee determined that value for useable wellbores will be more appropriately addressed by using a wellbore dedication incentive.

The equity parameter, Gross Acreage, has been addressed in two different ways: Gross Acre-ft and Surface Acres. The Working Interest Owners should determine what percentage of each term should be included in the participation formula.

The parameter, Gross Acre-ft, was introduced to allow for allocation of ownership on tracts where there is a change in ownership with depth. This term is based on gross thickness and acreage owned in both the hydrocarbon productive interval and aquifer (San Andres) portion of the Unit.

The parameter, Surface Acres, was introduced with allocation of ownership limited to the hydrocarbon productive interval only. Since the actual oil-water contact is not specifically known, this term is based on ownership from the top of the Unit to 325 ft below the top of the Grayburg formation. This term includes the hydrocarbon producing interval across the unit area but excludes the majority of the aquifer ownership.

Appendix A indicates allocations of equity parameters by Tract and by Owner. Appendix C indicates the ownership information used for the allocation of ownership on each tract.

Cumulative oil production is based on values through 12/31/88. No adjustment of cumulative oil production was made for wells with completions simultaneously producing the unitized interval and the non-unitized interval. It is assumed that all production from the non-unitized interval in these wells was gas since the top of the Unit is at the estimated gas-oil contact.

Current oil and gas production rates are based on reported production for the fourth quarter of 1988. Remaining oil and gas reserves are calculated using decline rates based on analysis of individual tract production, applied to appropriate initial production rates for 01/01/89, and extrapolated to an economic limit of 2 BOEG/day per well (Appendix B). Ultimate primary oil recovery is the summation of cumulative and remaining oil reserves.

BCC/pf 07249/09

PROPOSED ARROWHEAD GRAYBURG UNIT
CHARGES FOR THE TECHNICAL COMMITTEE
MAY 5, 1988

1) Determine the horizontal and vertical boundaries for the proposed Unit, and prepare a base-map indicating the boundaries and Tract numbers within the Unit.

2) Develop a plan of secondary recovery for the Unit, including a cost estimate, and a prediction of secondary recovery production rates and reserves.

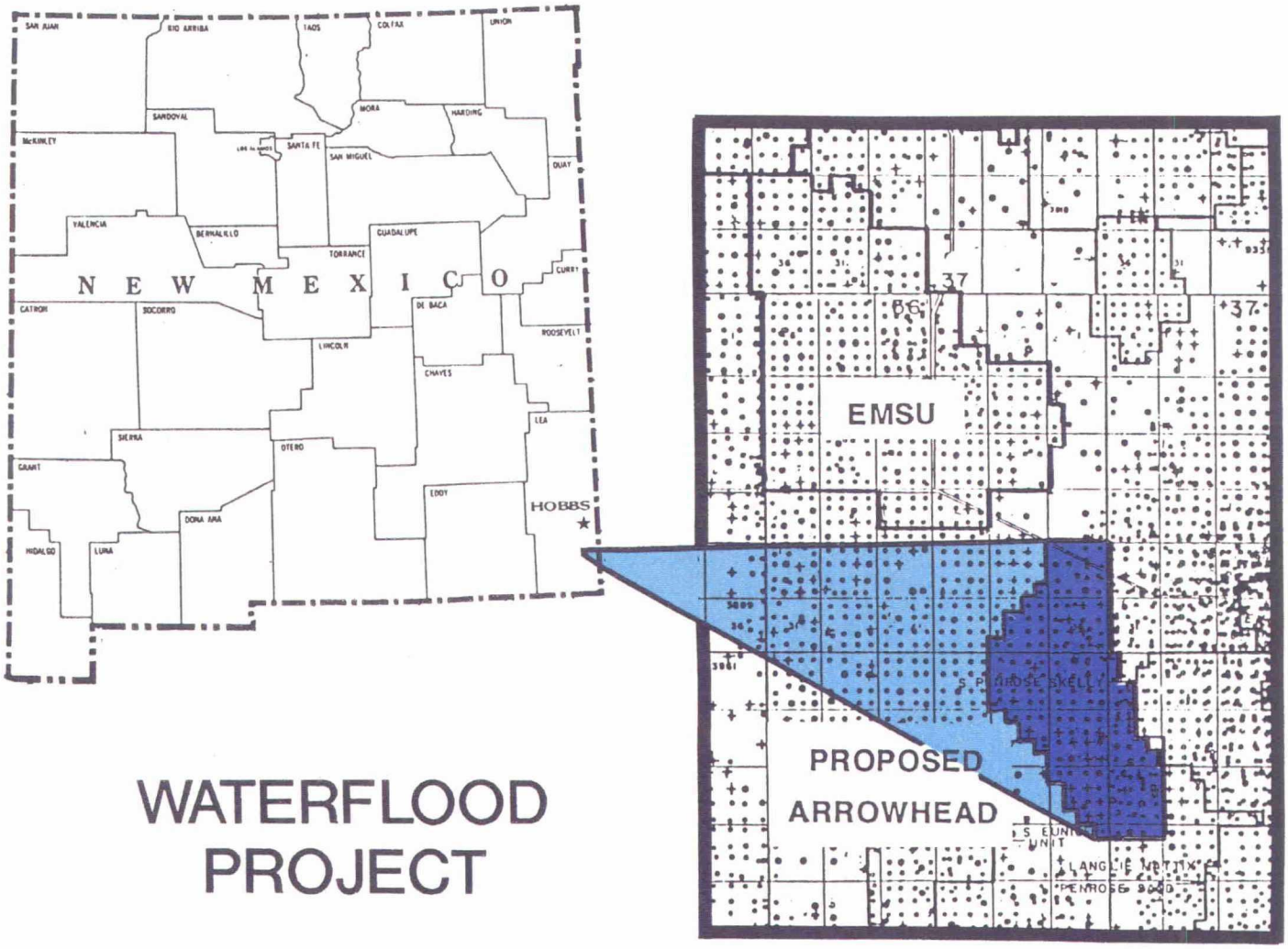
3) Prepare a tabulation of equity parameters to be used for Tract participation negotiations. The parameters should include:

   a) Cumulative Oil Production
   b) Remaining Primary Oil & Gas Reserves
   c) Ultimate Primary Oil Reserves
   d) Current Oil & Gas Production Rates
   e) Gross Acreage
   f) Useable Wellbores

Fig. 1

PROPOSED ARROWHEAD GRAYBURG UNIT

Lea County, New Mexico



WATERFLOOD PROJECT

Fig. 2

Proposed Arrowhead Grayburg Unit
STUDY AREA

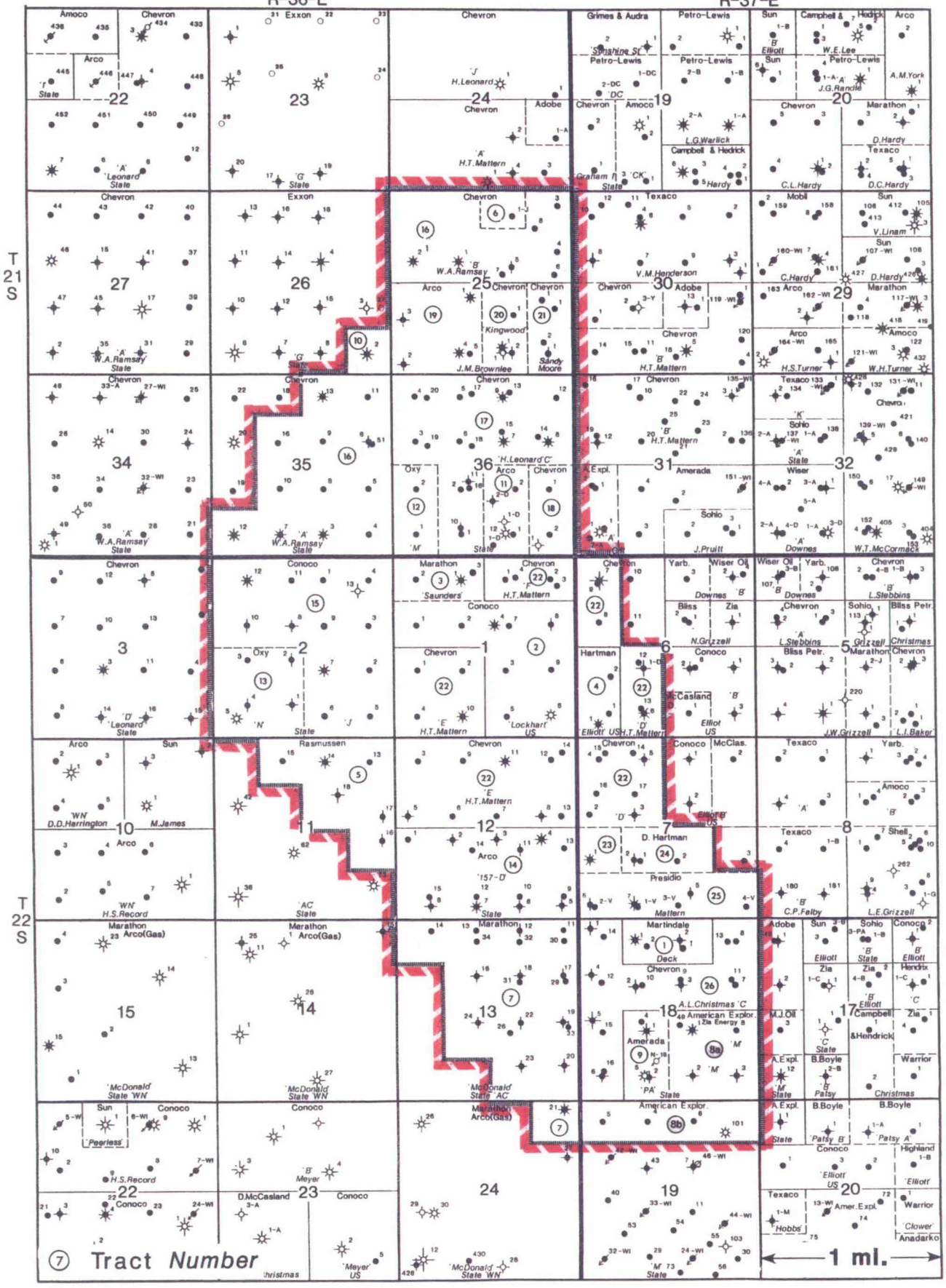
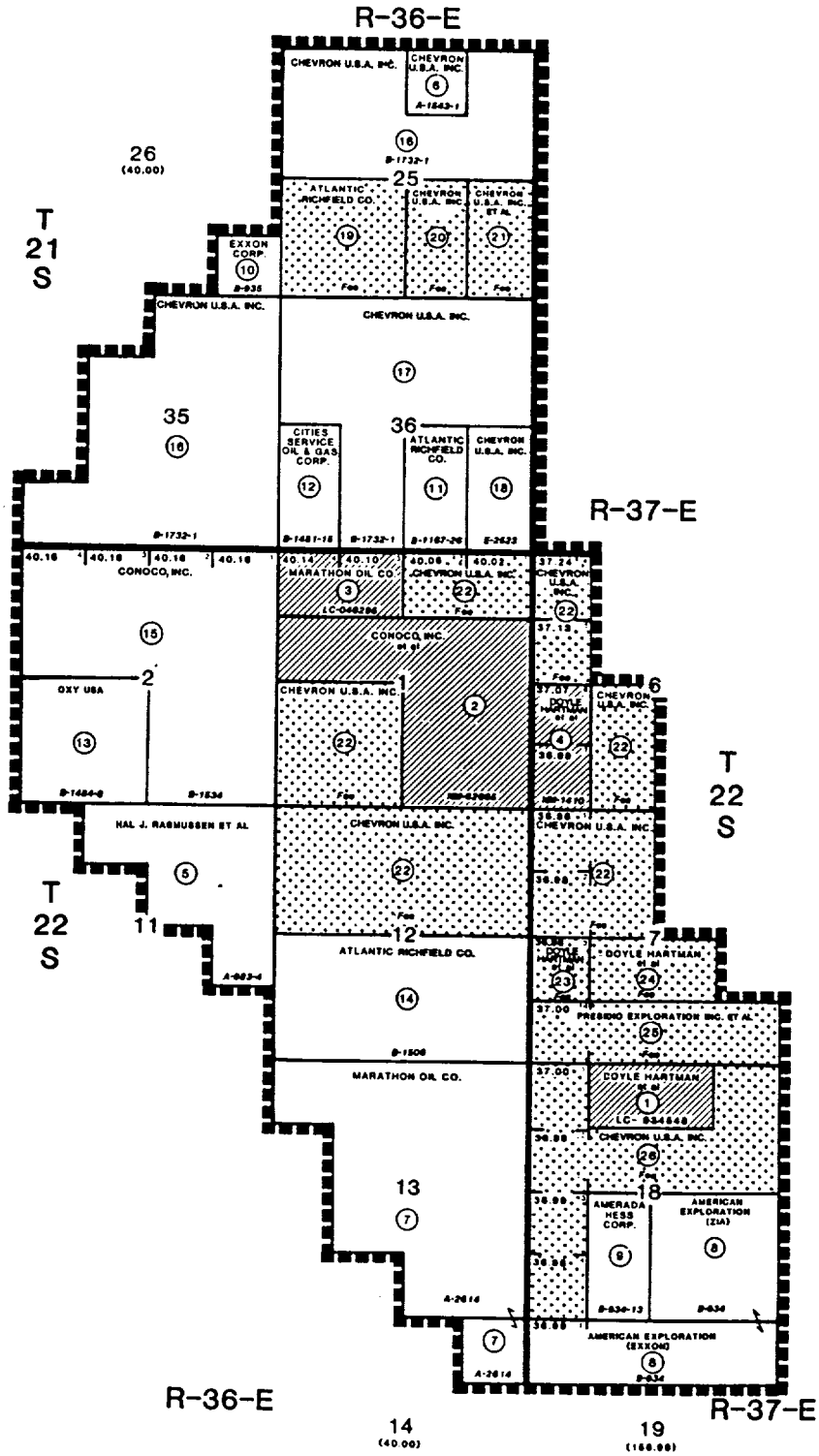


Fig. 3



ARROWHEAD GRAYBURG UNIT AREA

LEA COUNTY, NEW MEXICO

	ACREAGE	PERCENTAGE
FEDERAL LANDS	554.30	9.36%
STATE LANDS	3,597.63	60.75%
PATENTED LANDS	1,770.33	29.89%
TOTAL	5,922.26	100.00%

UNIT OUTLINE

TRACT NUMBERS

0 1/2 1 MILE

CHEVRON U.S.A. INC.

NOTE: UNLESS OTHERWISE INDICATED, THE VARIOUS SECTIONS ON THIS PLAT CONTAIN 640.00 AC.

Fig. 4

POOL LIMITS
ARROWHEAD STUDY AREA

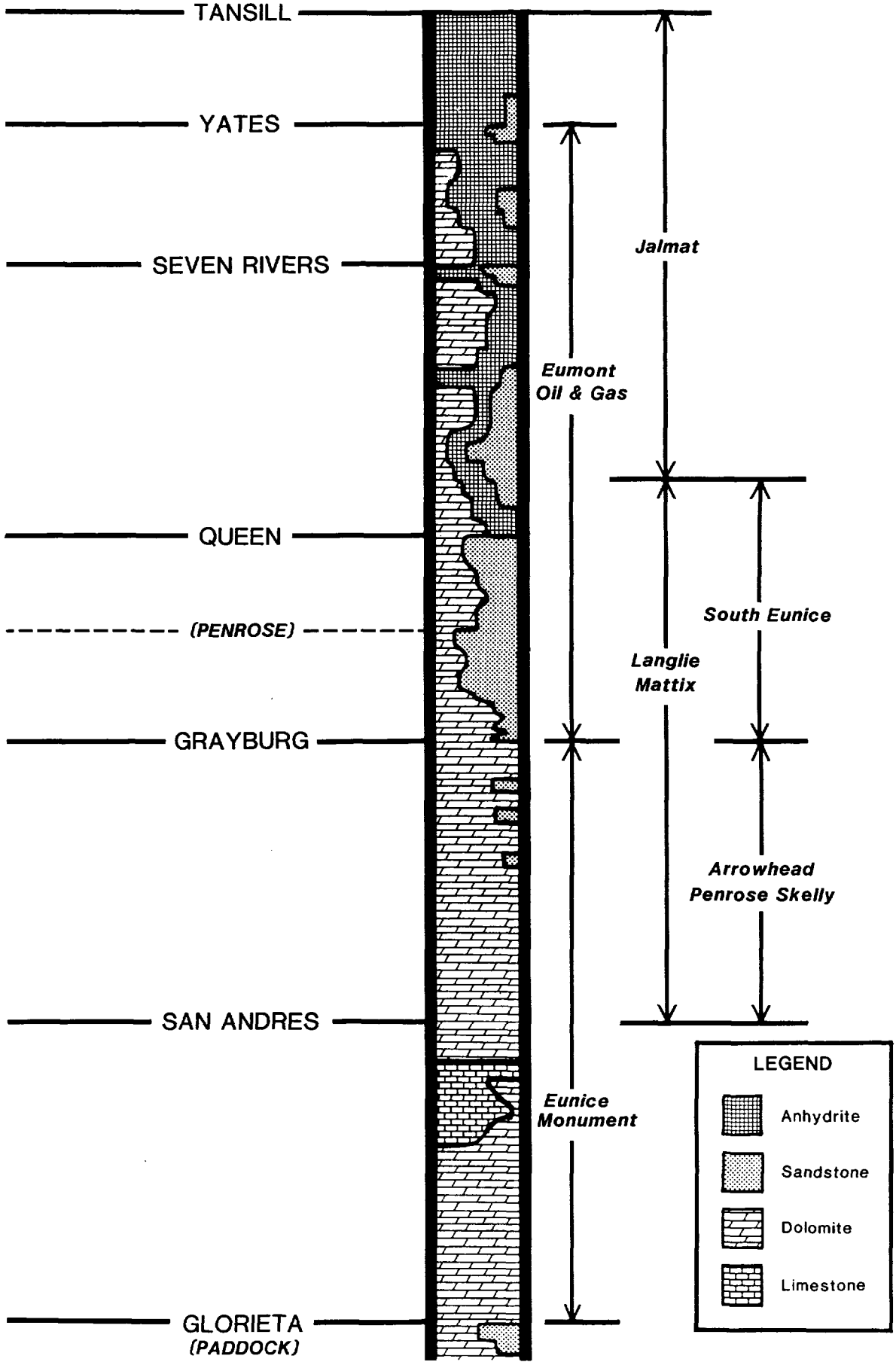


Fig. 5

Proposed Arrowhead Grayburg Unit Study Area
STRUCTURE T/GRAYBURG

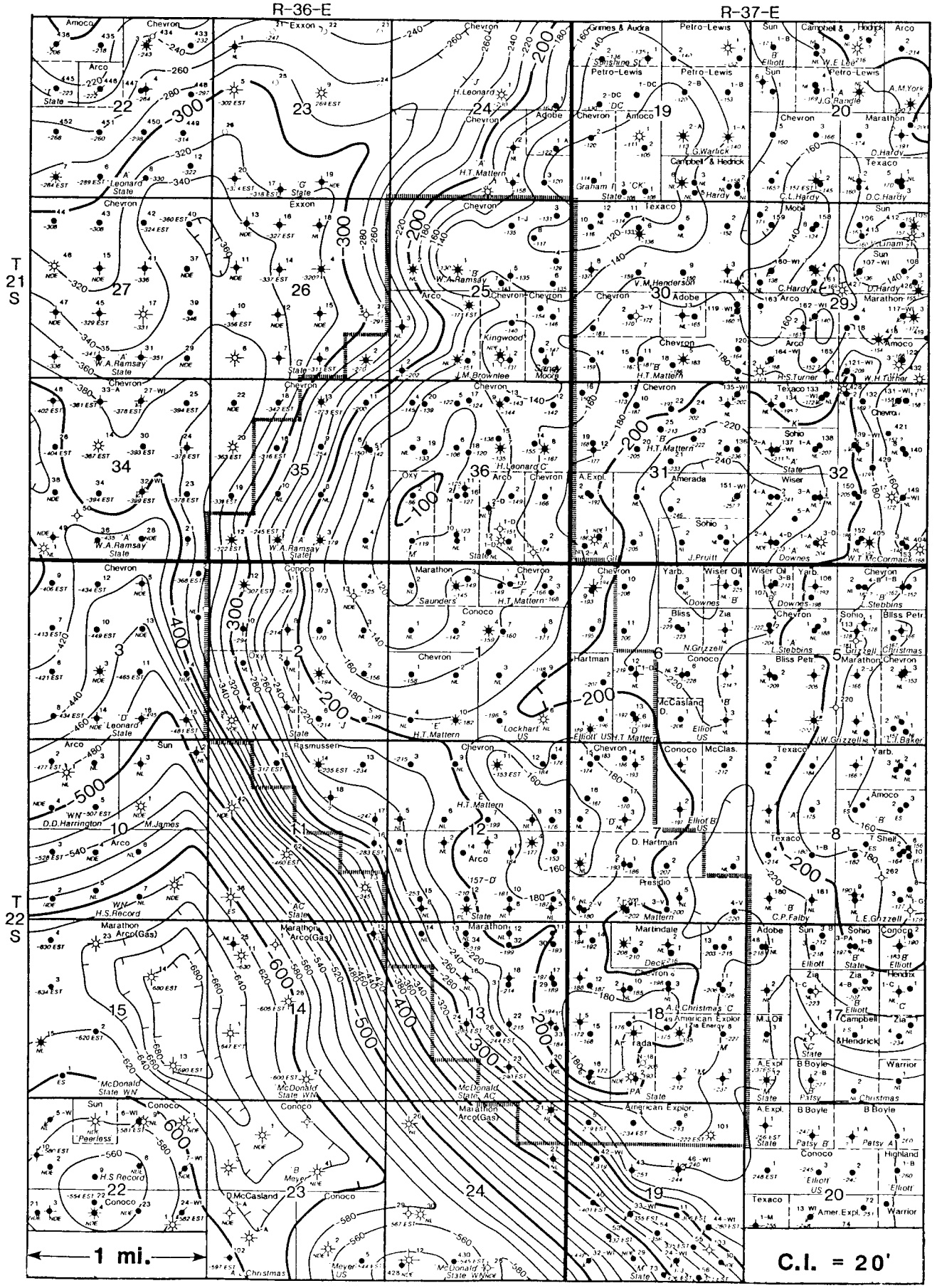


Fig. 6

TYPE LOG
Chevron (Gulf)

H.Leonard 'C' #20
SECTION 36 T21S R36E

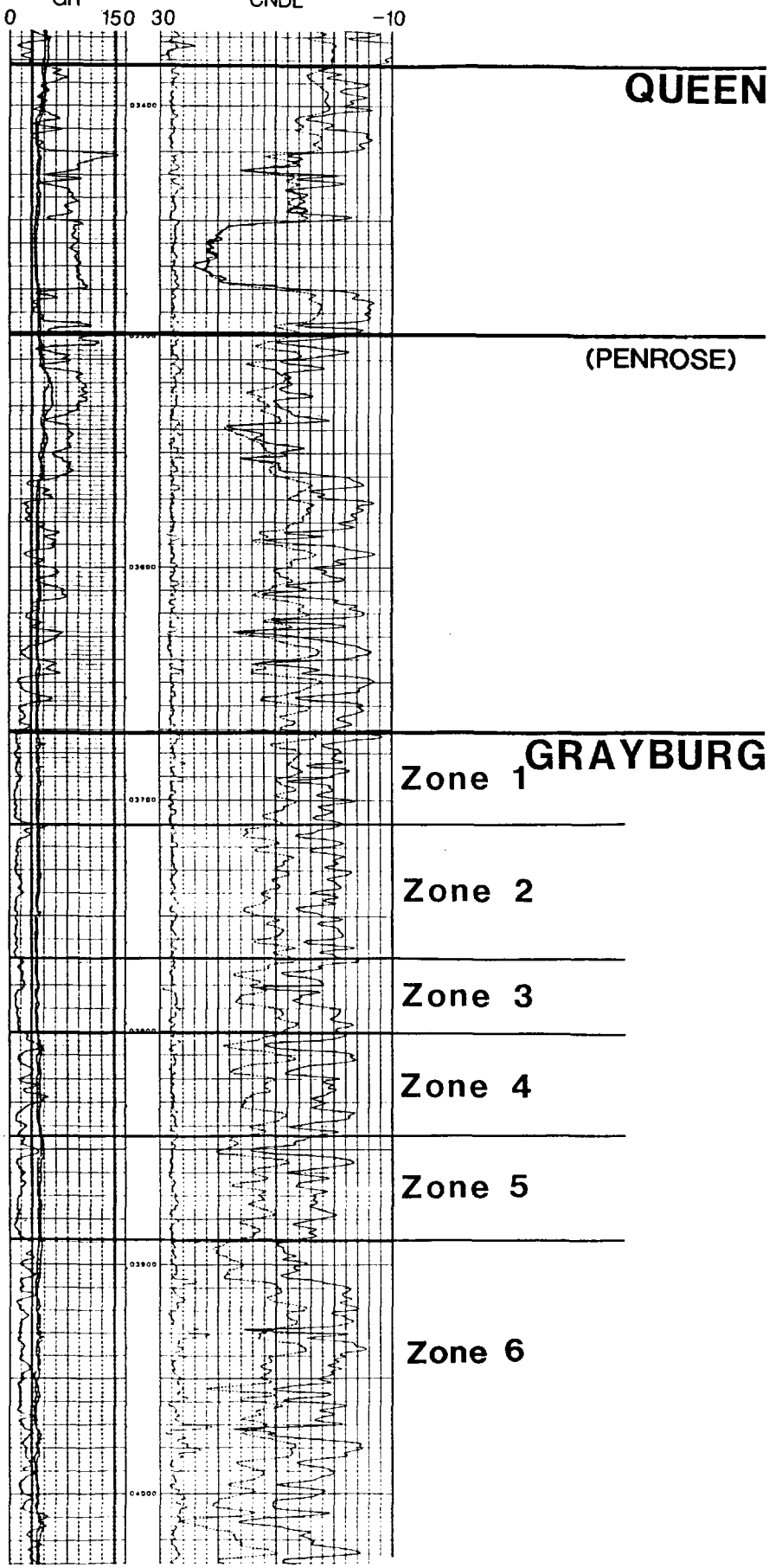


Fig. 7

Study Area

% DOLOMITE MAP (GRAYBURG ZONES 1-5)

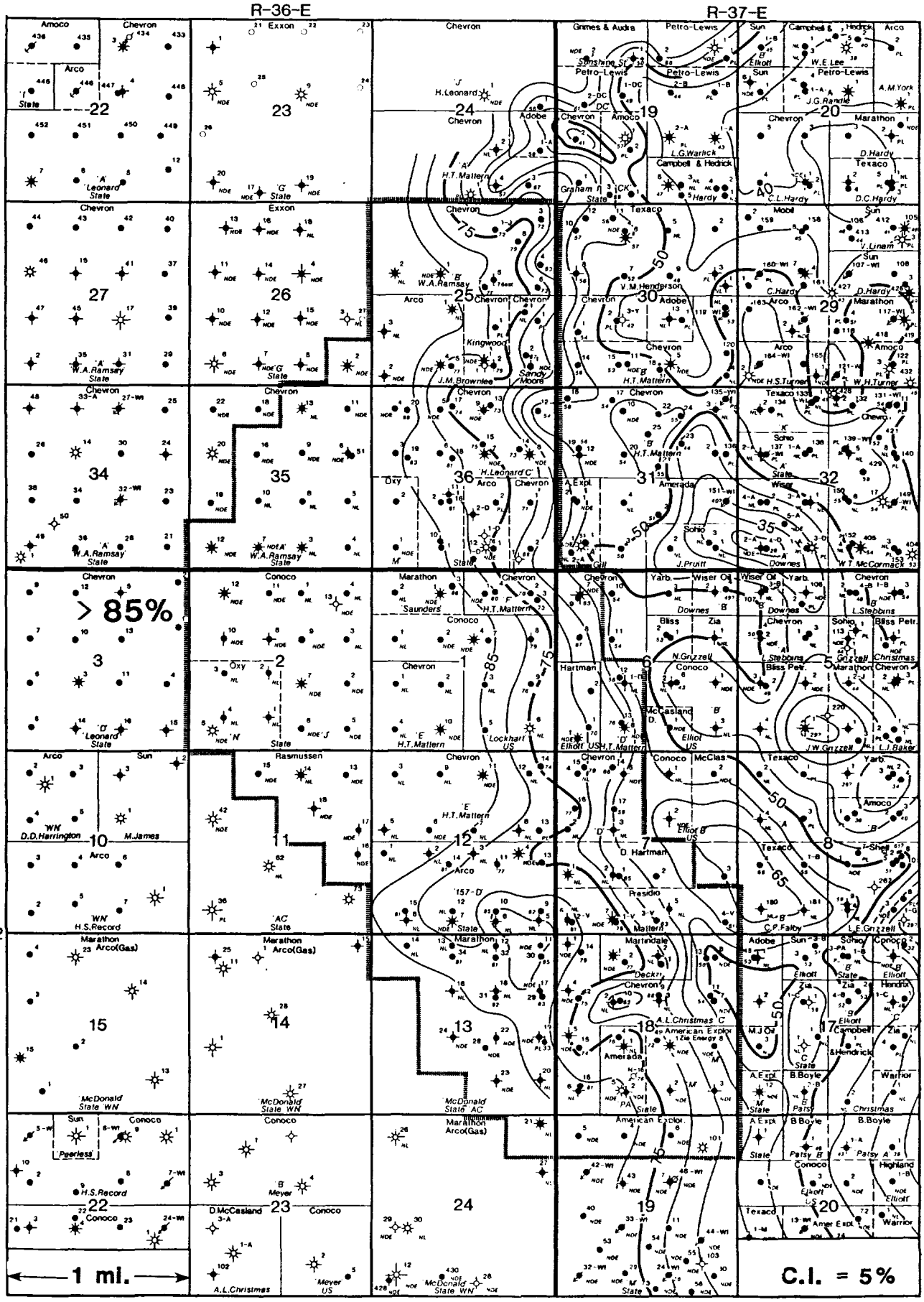


Fig. 8

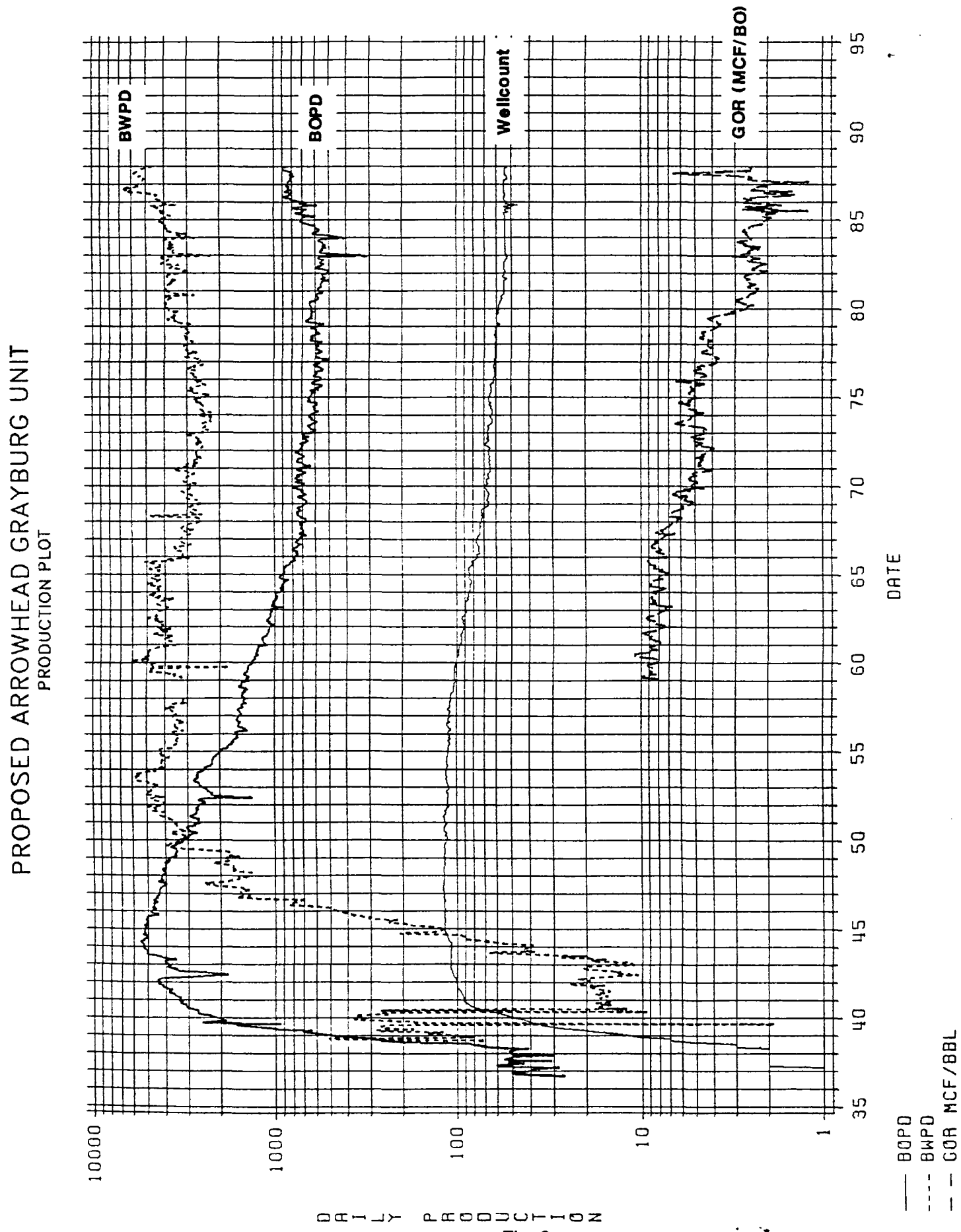

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
BWPD
BOPD
Wellcount
GOR (MCF/BO)
10000
1000
100
10
1
DAILY PRODUCTION
35
40
45
50
55
60
65
70
75
80
85
90
95
DATE
BOPD
BWPD
GOR MCF/BBL

Fig. 9

Proposed Arrowhead Grayburg Unit
Study Area
CUMULATIVE OIL (MBO)

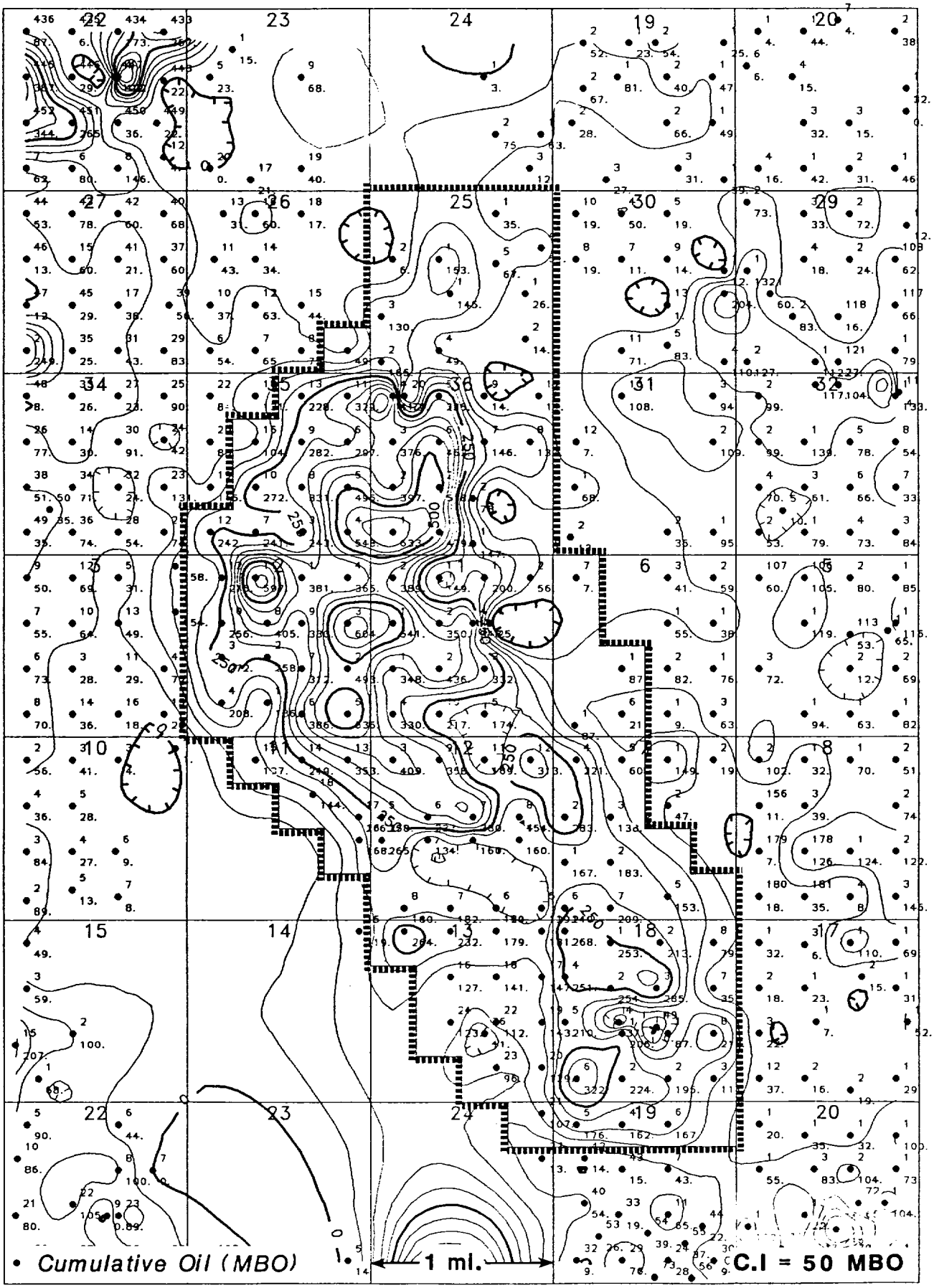


Fig. 10

Proposed Arrowhead Grayburg Unit
Unit Area
CUMULATIVE OIL (MBO)

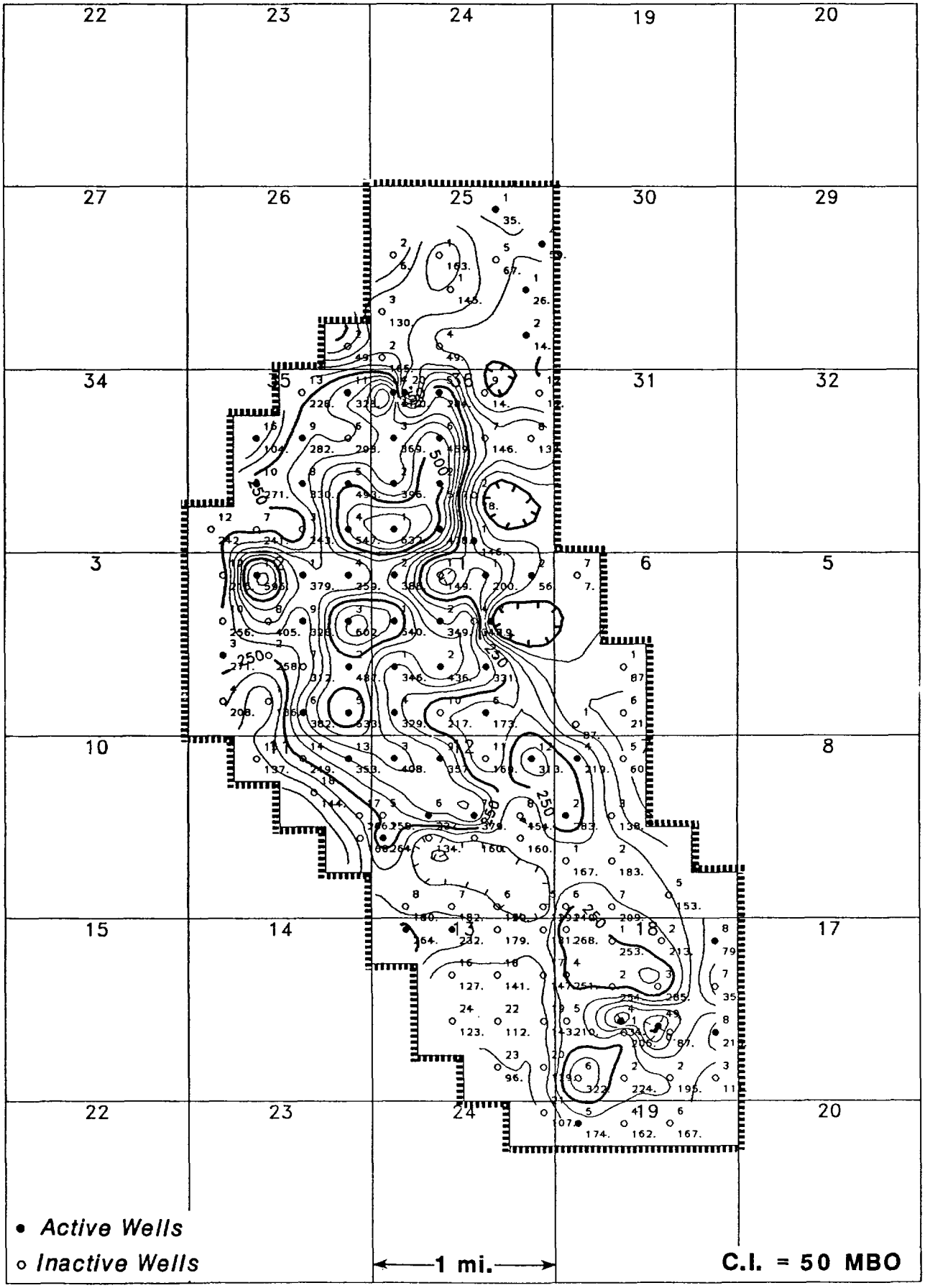


Fig. 11

Proposed Arrowhead Grayburg Unit
Unit Area
CUMULATIVE WATER (MBW)

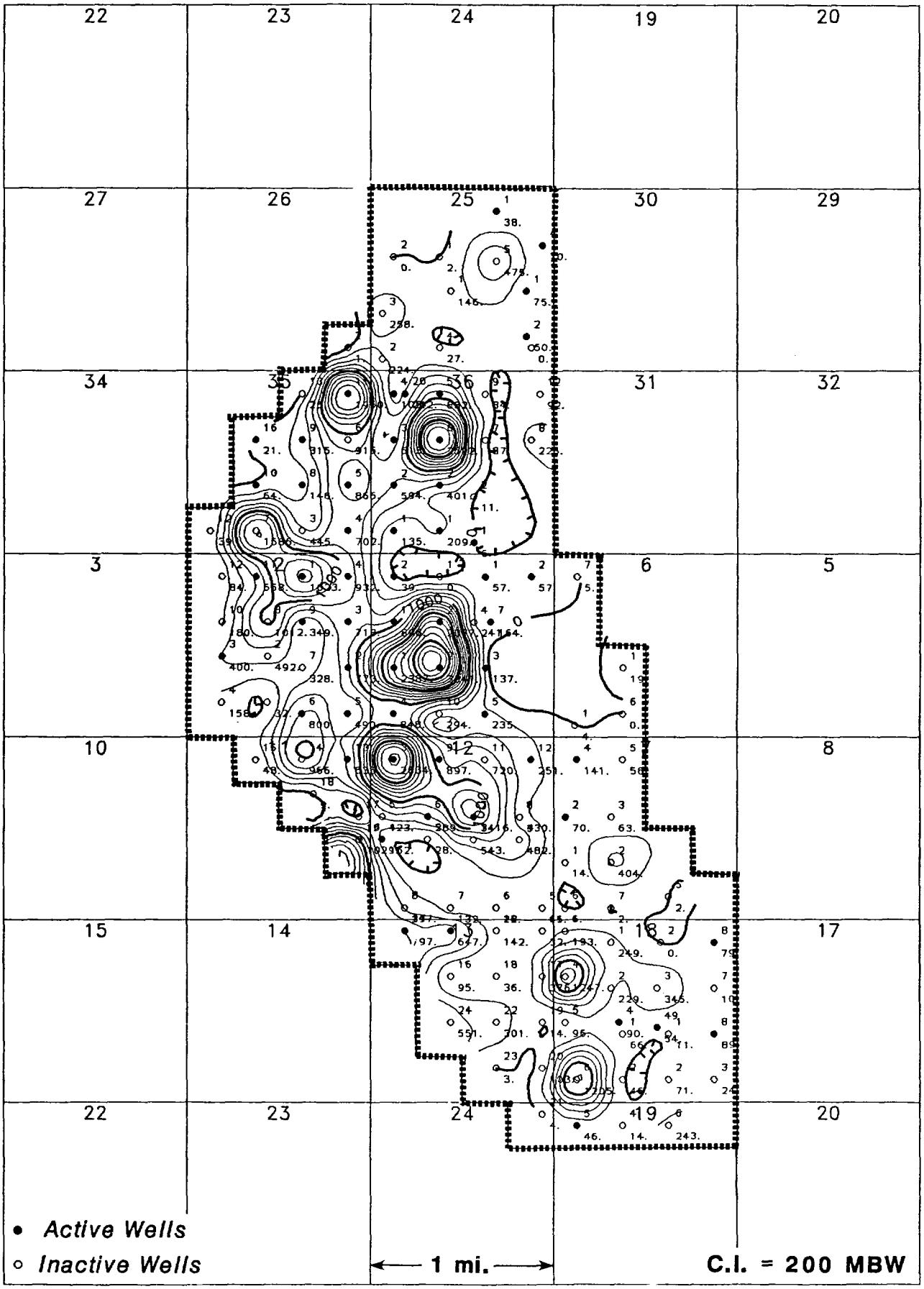


Fig. 12

Proposed Arrowhead Grayburg Unit
Unit Area
CUMULATIVE WOR

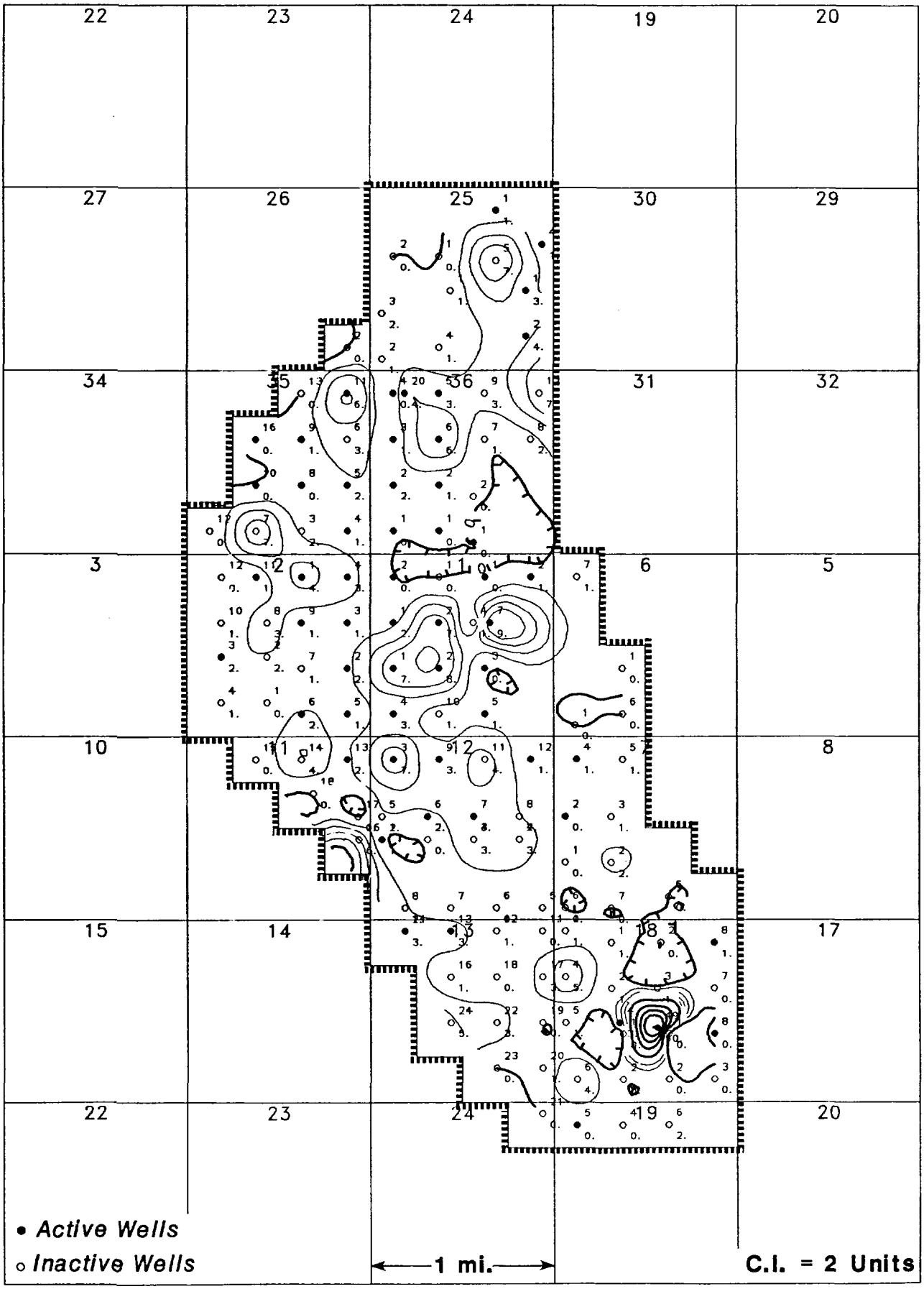


Fig.13

Proposed Arrowhead Grayburg Unit
Unit Area
CURRENT OIL PRODUCTION (BOPD)

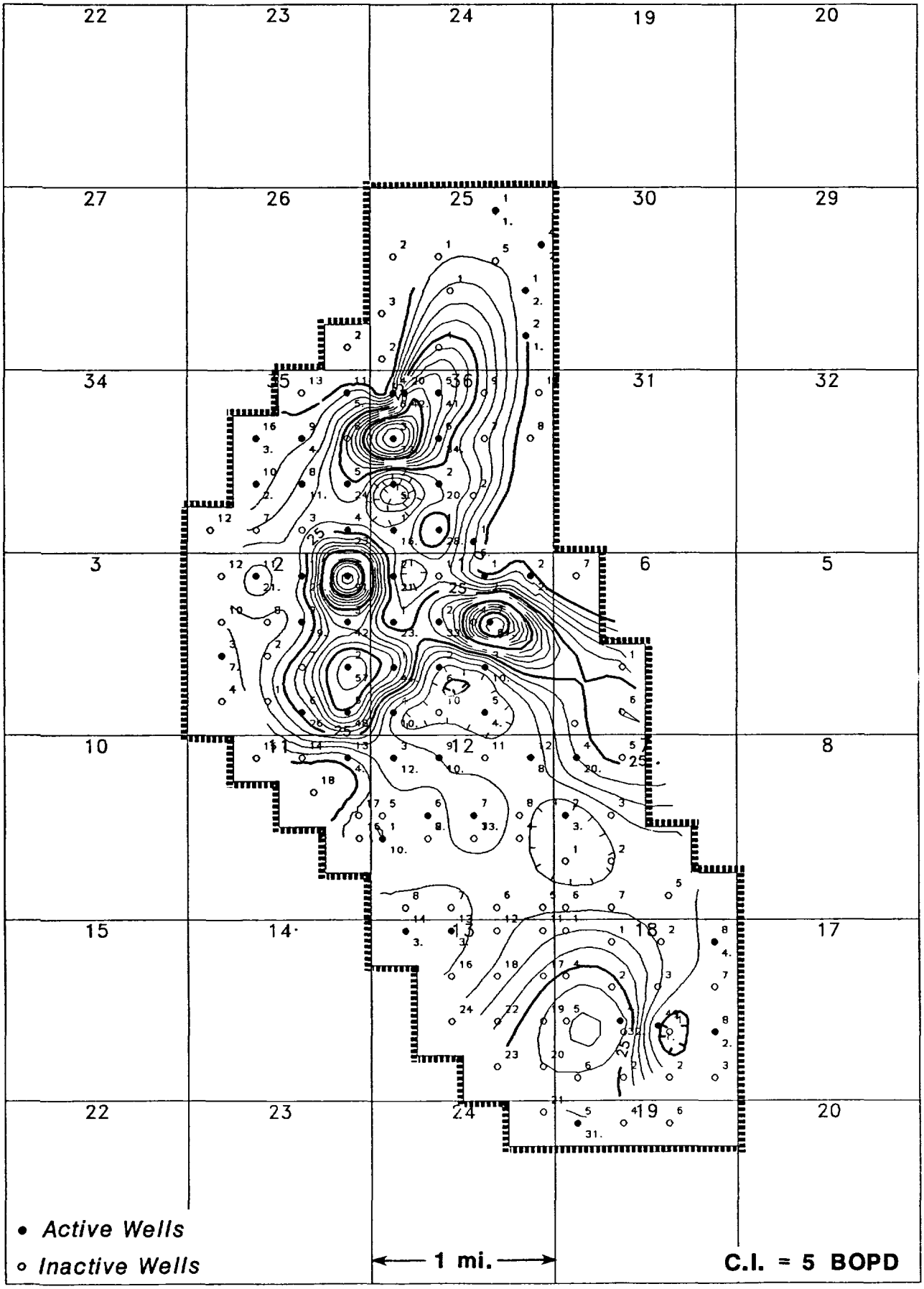


Fig. 14

Proposed Arrowhead Grayburg Unit
Unit Area
CURRENT WATER PRODUCTION (BWPD)

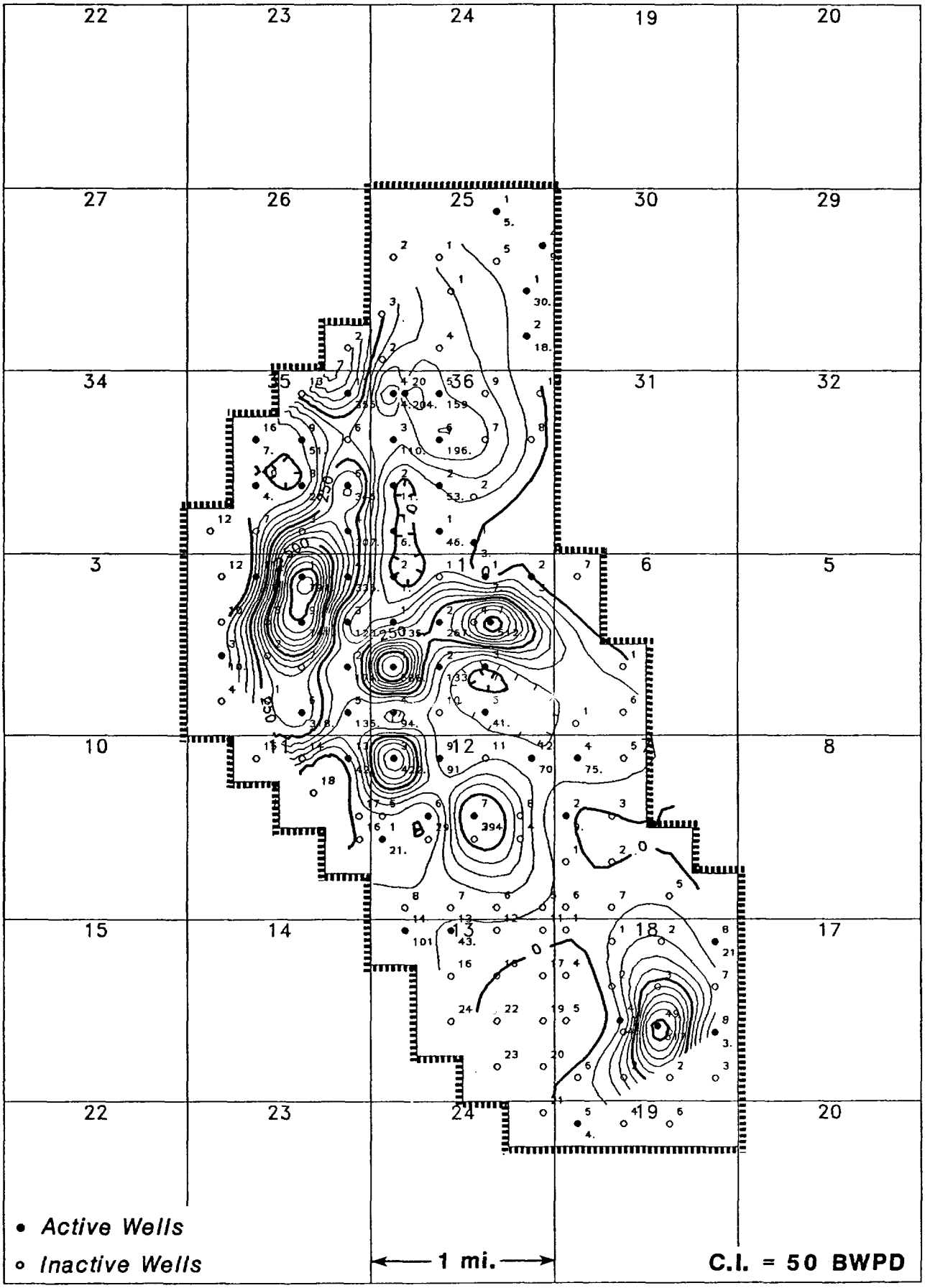


Fig. 15

Proposed Arrowhead Grayburg Unit
Unit Area
CURRENT GAS PRODUCTION (MCFPD)

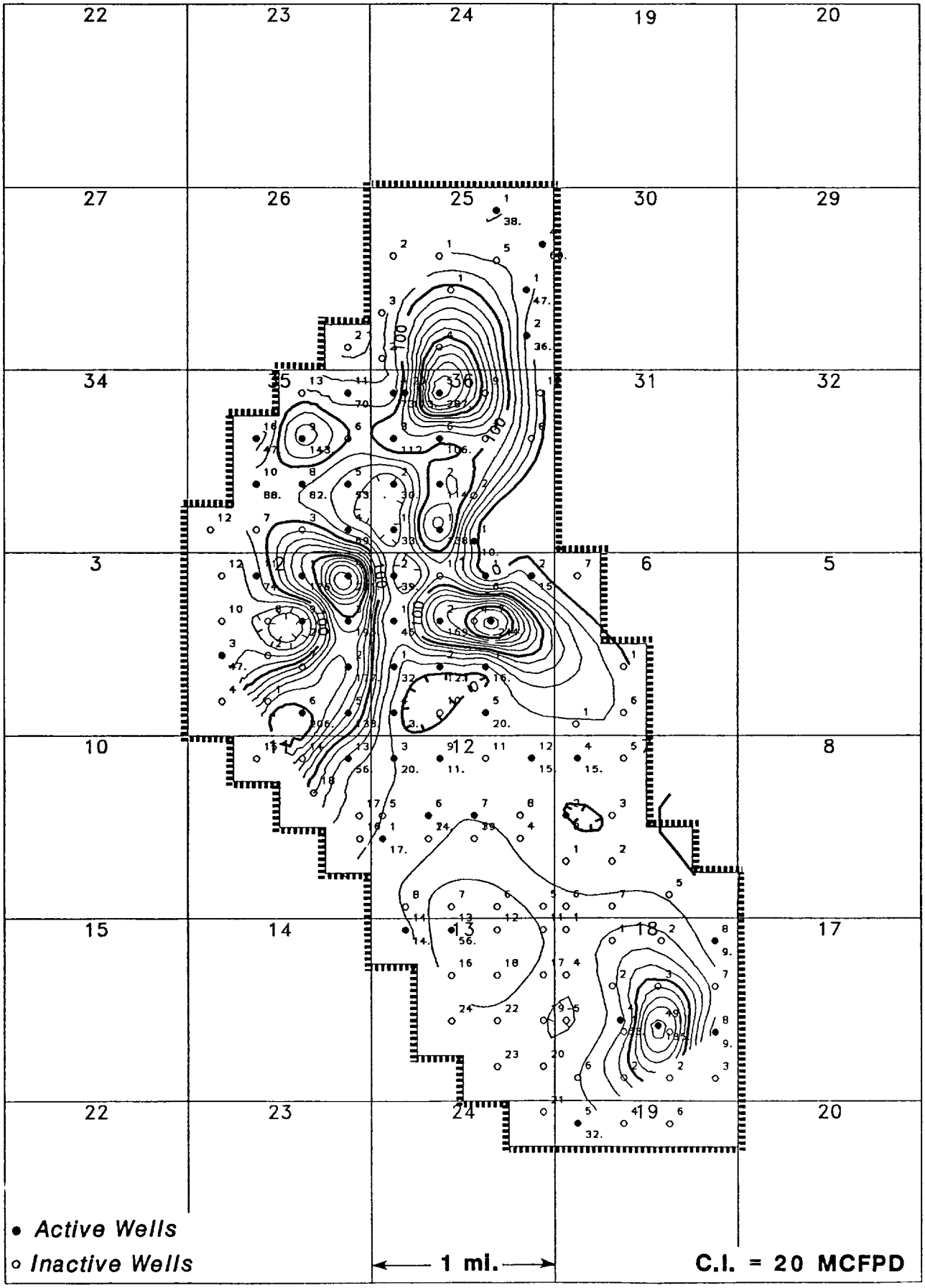


Fig. 16

Proposed Arrowhead Grayburg Unit
Unit Area
Current Producing Water-Oil Ratio

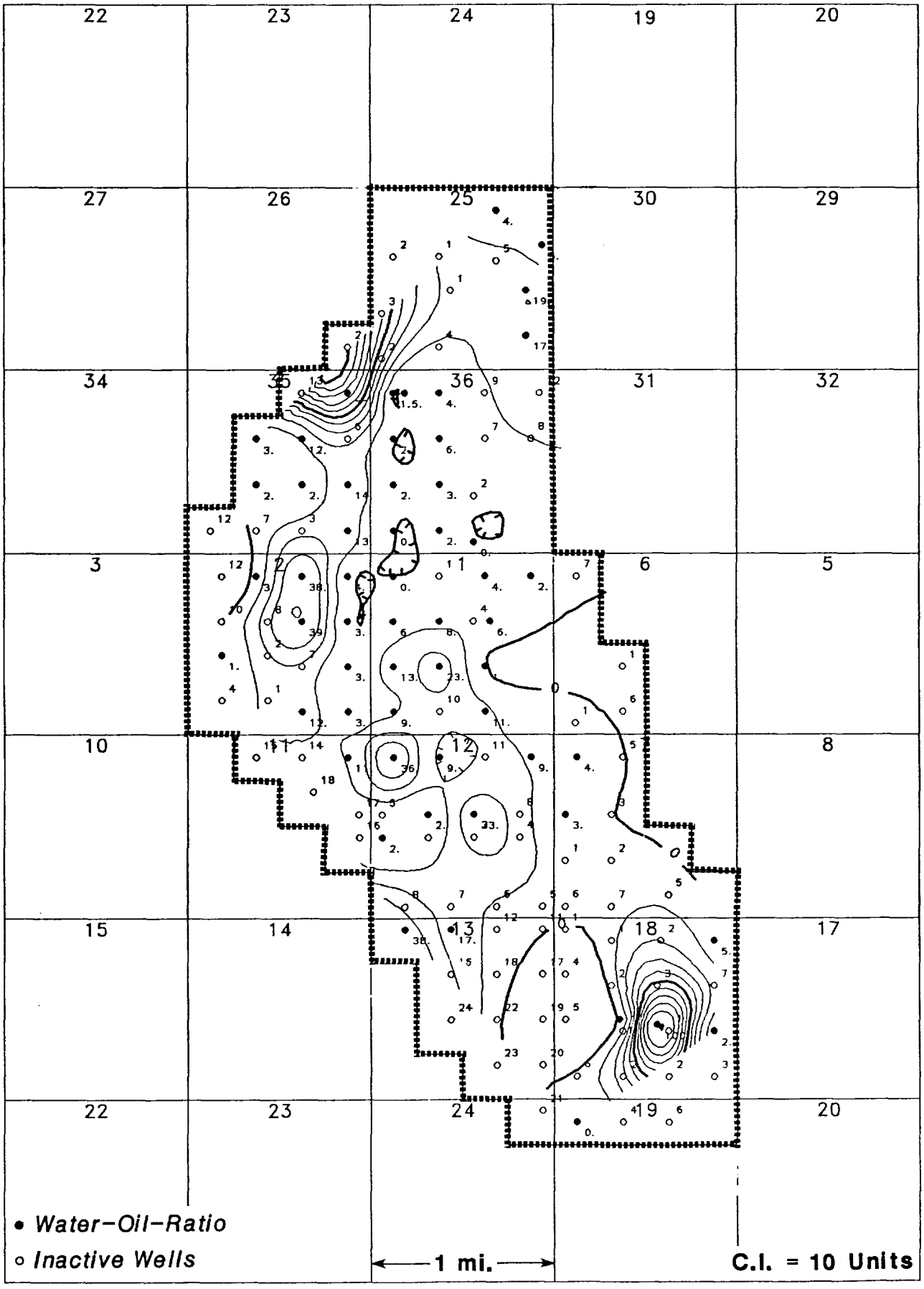


Fig. 17

Proposed Arrowhead Grayburg Unit
Unit Area
Current Producing GOR (MCF/STBO)

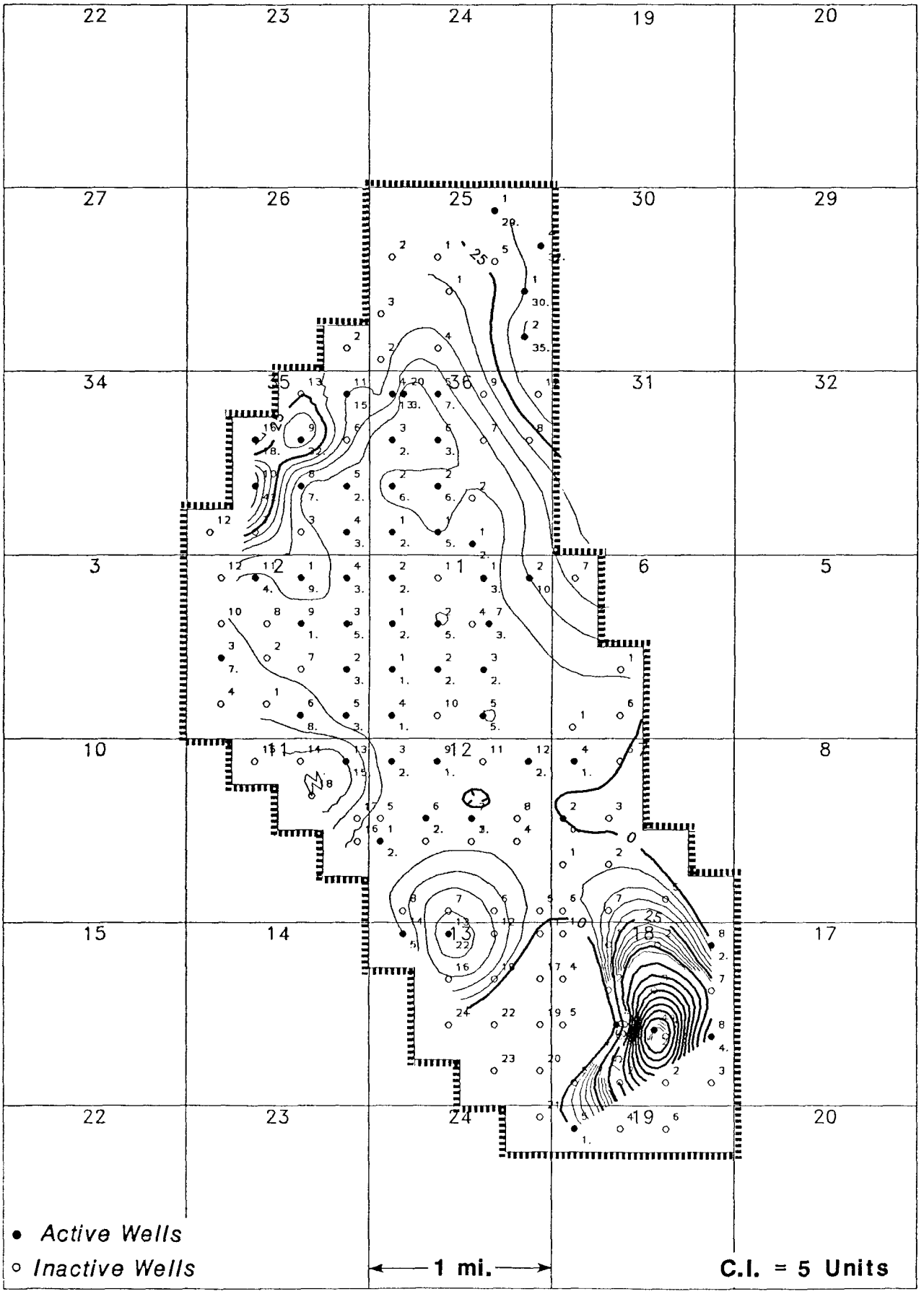


Fig. 18

Proposed Arrowhead Grayburg Unit

STICK DIAGRAM INDEX MAP

Fig. 19

PROPOSED ARROWHEAD GRAYBURG UNIT
TYPICAL COMPLETION INTERVAL

Stick Diagram 'A' (Index Map – Fig. 19)

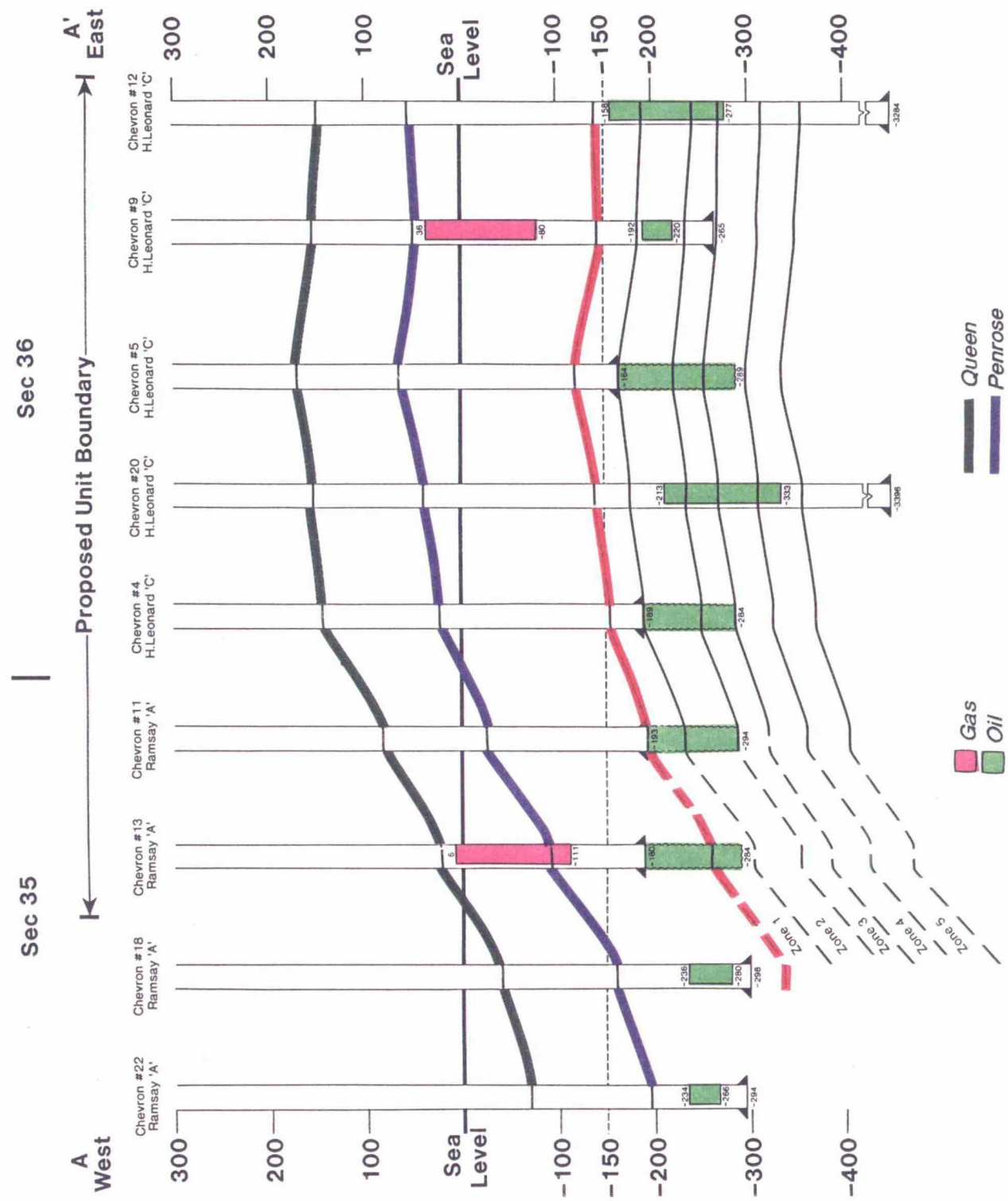


Fig. 20

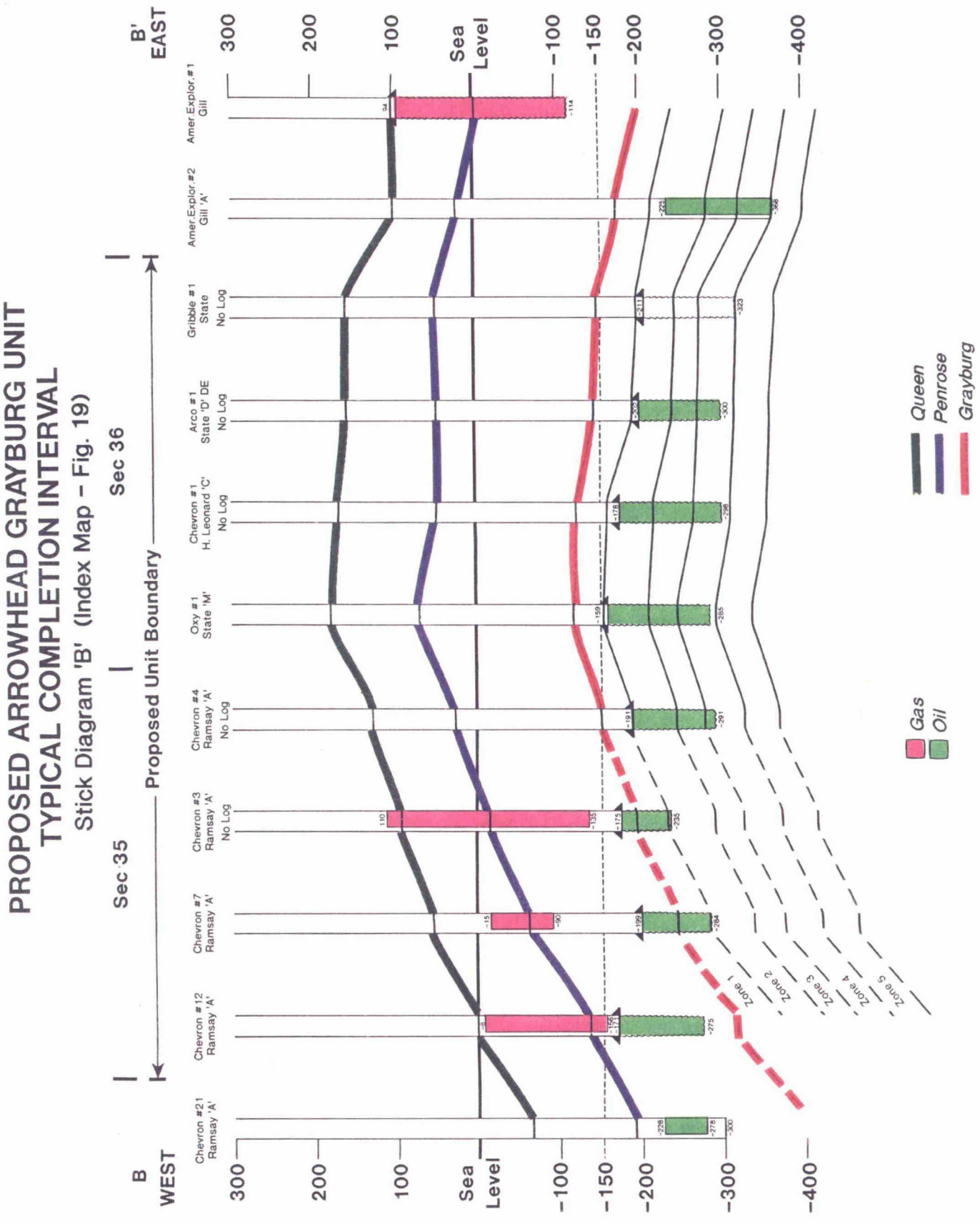

PROPOSED ARROWHEAD GRAYBURG UNIT
TYPICAL COMPLETION INTERVAL
Stick Diagram 'B' (Index Map – Fig. 19)
B WEST
B' EAST
Sec 35
Sec 36
Proposed Unit Boundary
Chevron #21 Ramsay 'A'
Chevron #12 Ramsay 'A'
Chevron #7 Ramsay 'A'
Chevron #3 Ramsay 'A' No Log
Chevron #4 Ramsay 'A' No Log
Oxy #1 State 'M'
Chevron #1 H. Leonard 'C' No Log
Arco #1 State 'D' DE No Log
Gribble #1 State No Log
Amer.Explor.#2 Gill 'A'
Amer.Explor.#1 Gill
300
200
100
Sea Level
-100
-150
-200
-300
-400
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Gas
Oil
Queen
Penrose
Grayburg

Fig. 21

PROPOSED ARROWHEAD GRAYBURG UNIT
TYPICAL COMPLETION INTERVAL
Stick Diagram 'C' (Index Map – Fig. 19)

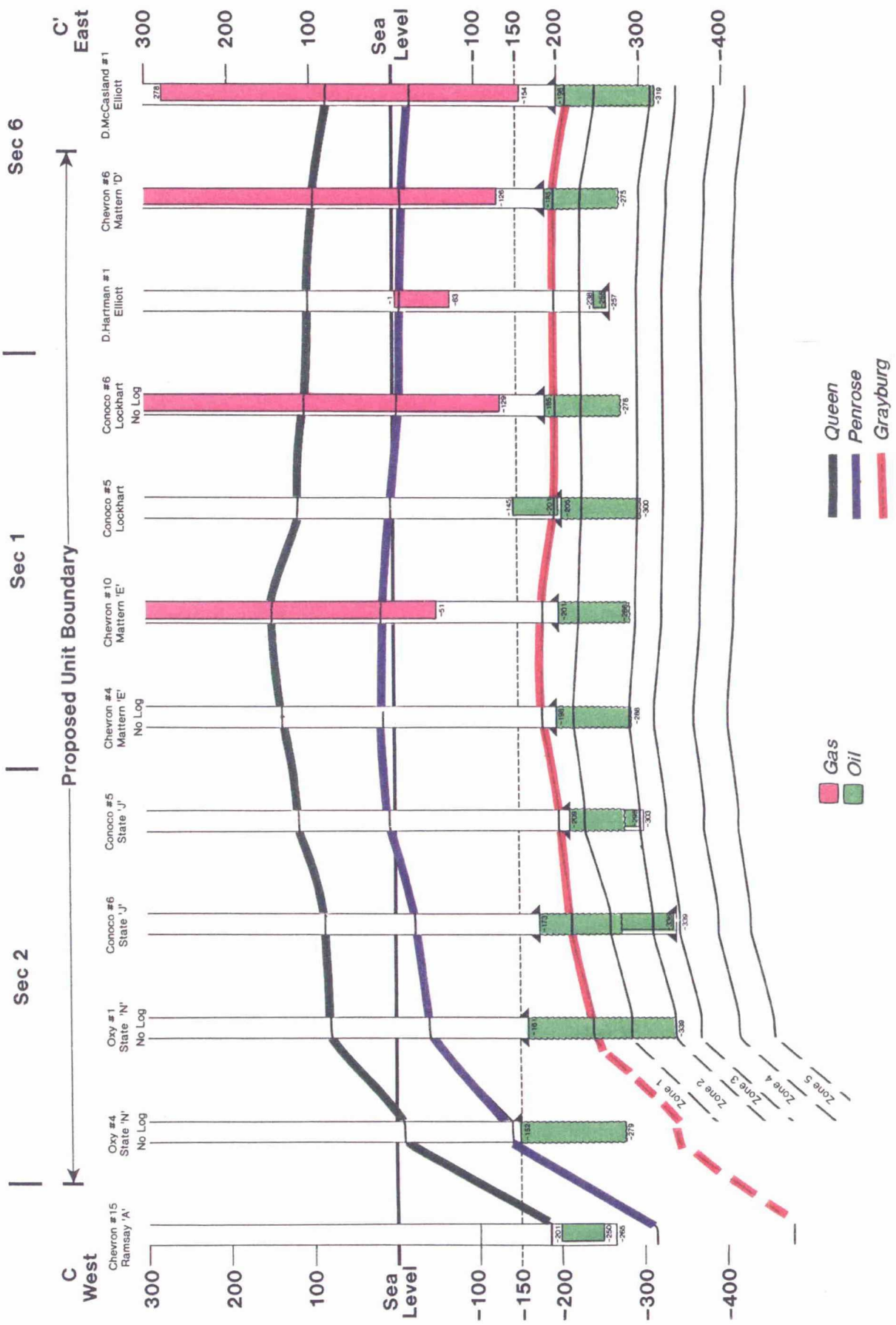


Fig. 22

PROPOSED ARROWHEAD GRAYBURG UNIT
TYPICAL COMPLETION INTERVAL
Stick Diagram 'D' (Index Map – Fig. 19)

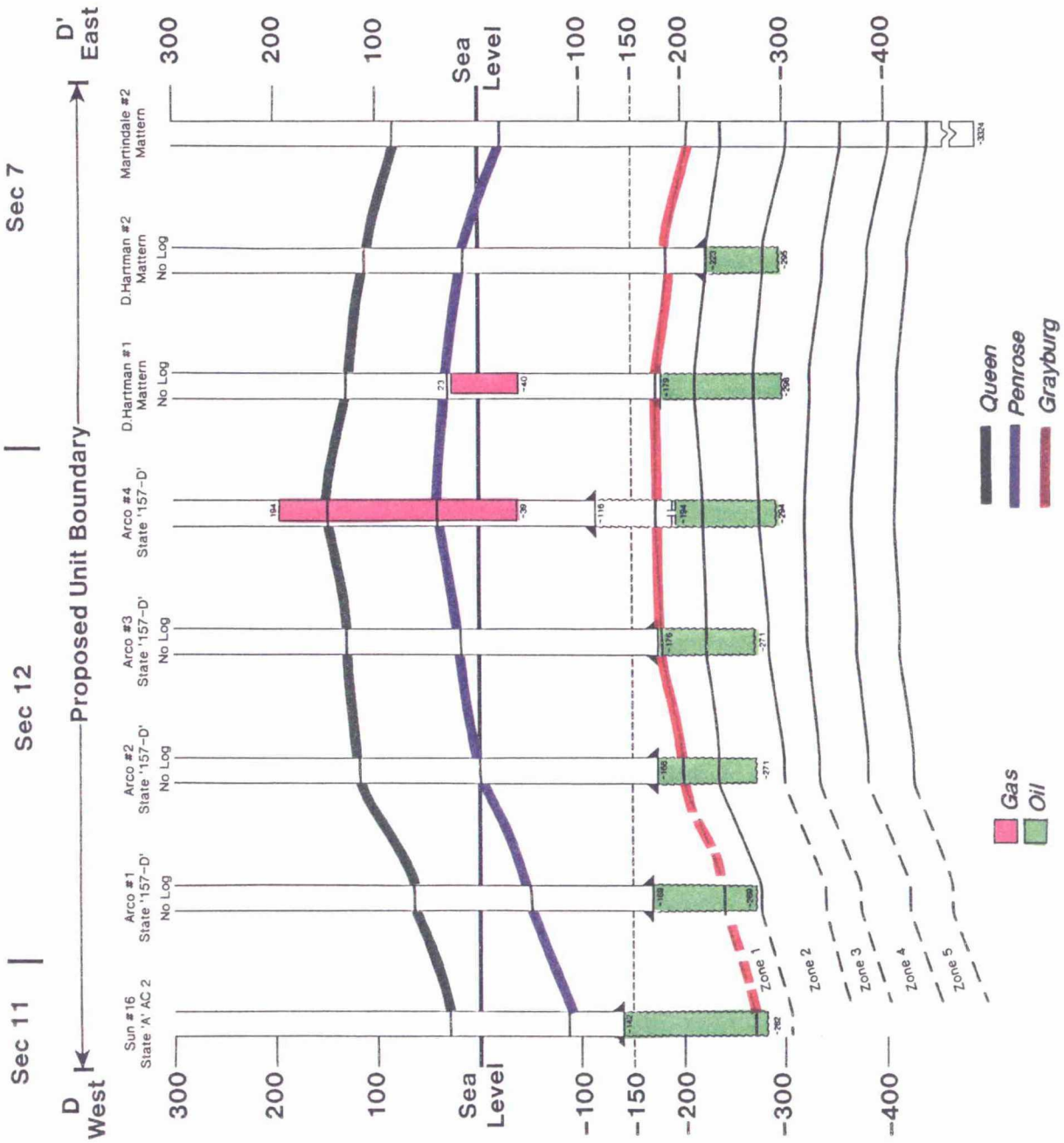


Fig. 23

PROPOSED ARROWHEAD GRAYBURG UNIT
TYPICAL COMPLETION INTERVAL

Stick Diagram 'E' (Index Map – Fig. 19)

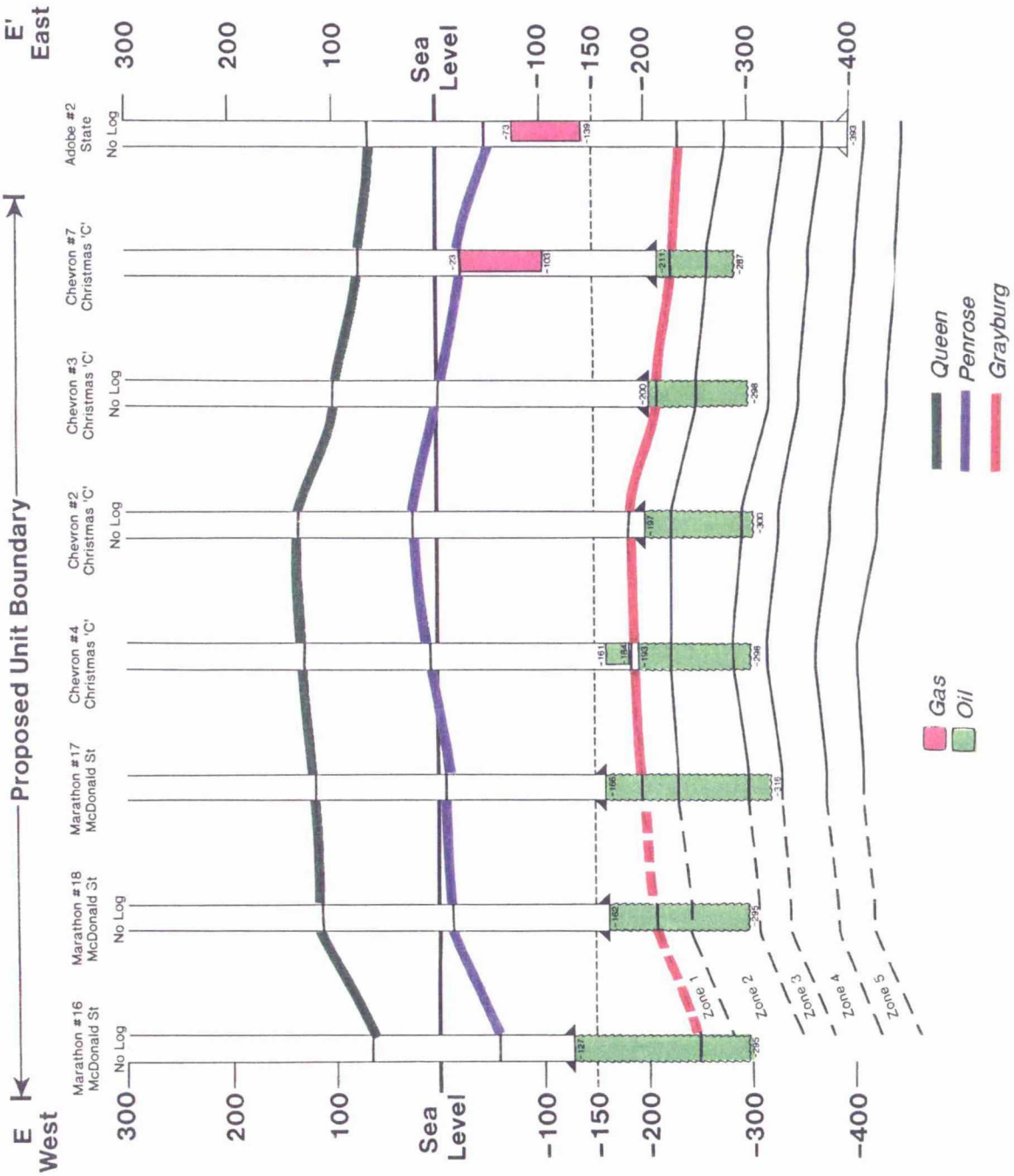


Fig. 24

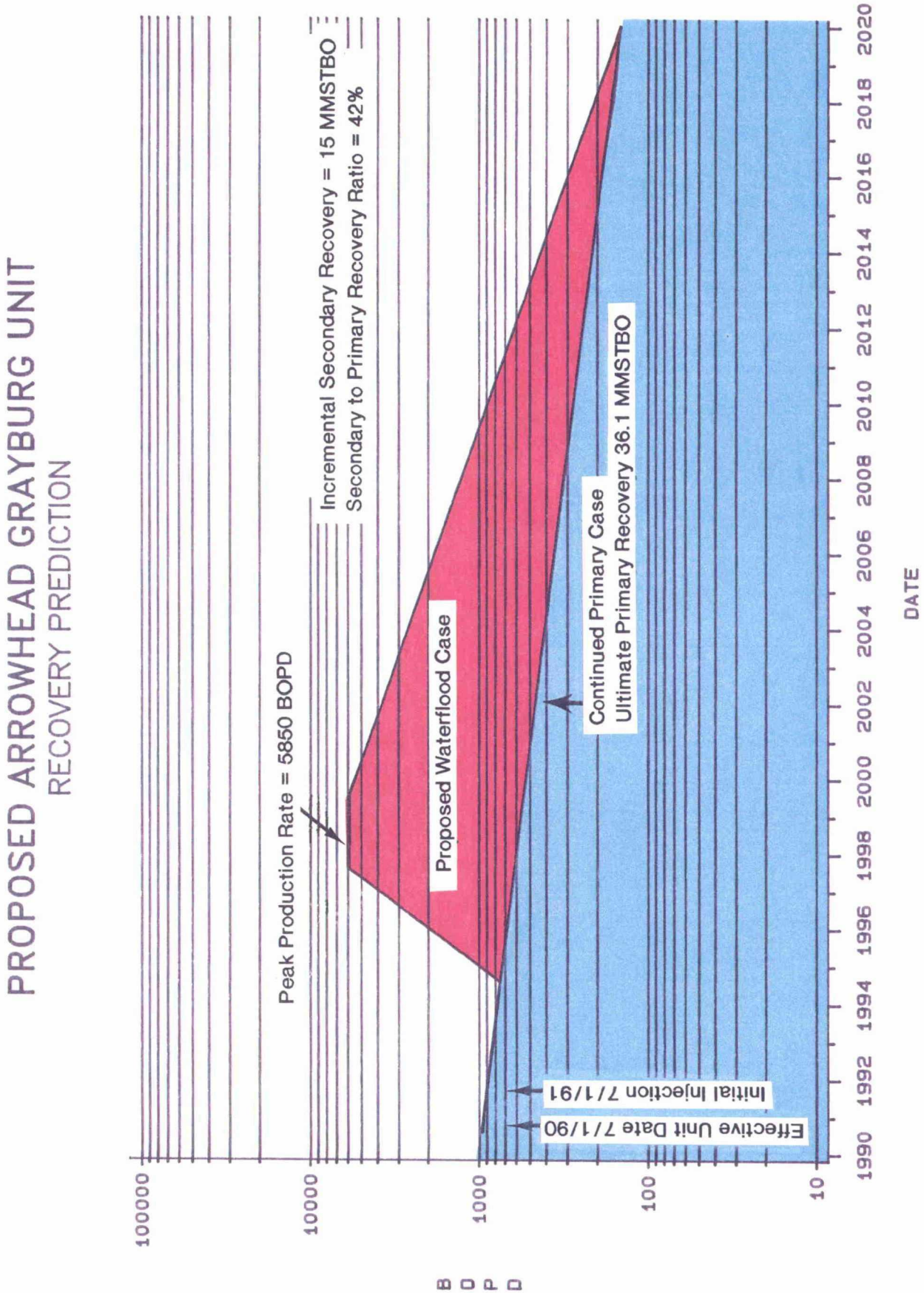

PROPOSED ARROWHEAD GRAYBURG UNIT
RECOVERY PREDICTION
Peak Production Rate = 5850 BOPD
Incremental Secondary Recovery = 15 MMSTBO
Secondary to Primary Recovery Ratio = 42%
Proposed Waterflood Case
Continued Primary Case
Ultimate Primary Recovery 36.1 MMSTBO
Initial Injection 7/1/91
Effective Unit Date 7/1/90
100000
10000
1000
100
10
BOPD
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
DATE

Fig. 26

Proposed Arrowhead Grayburg Unit Well Locations

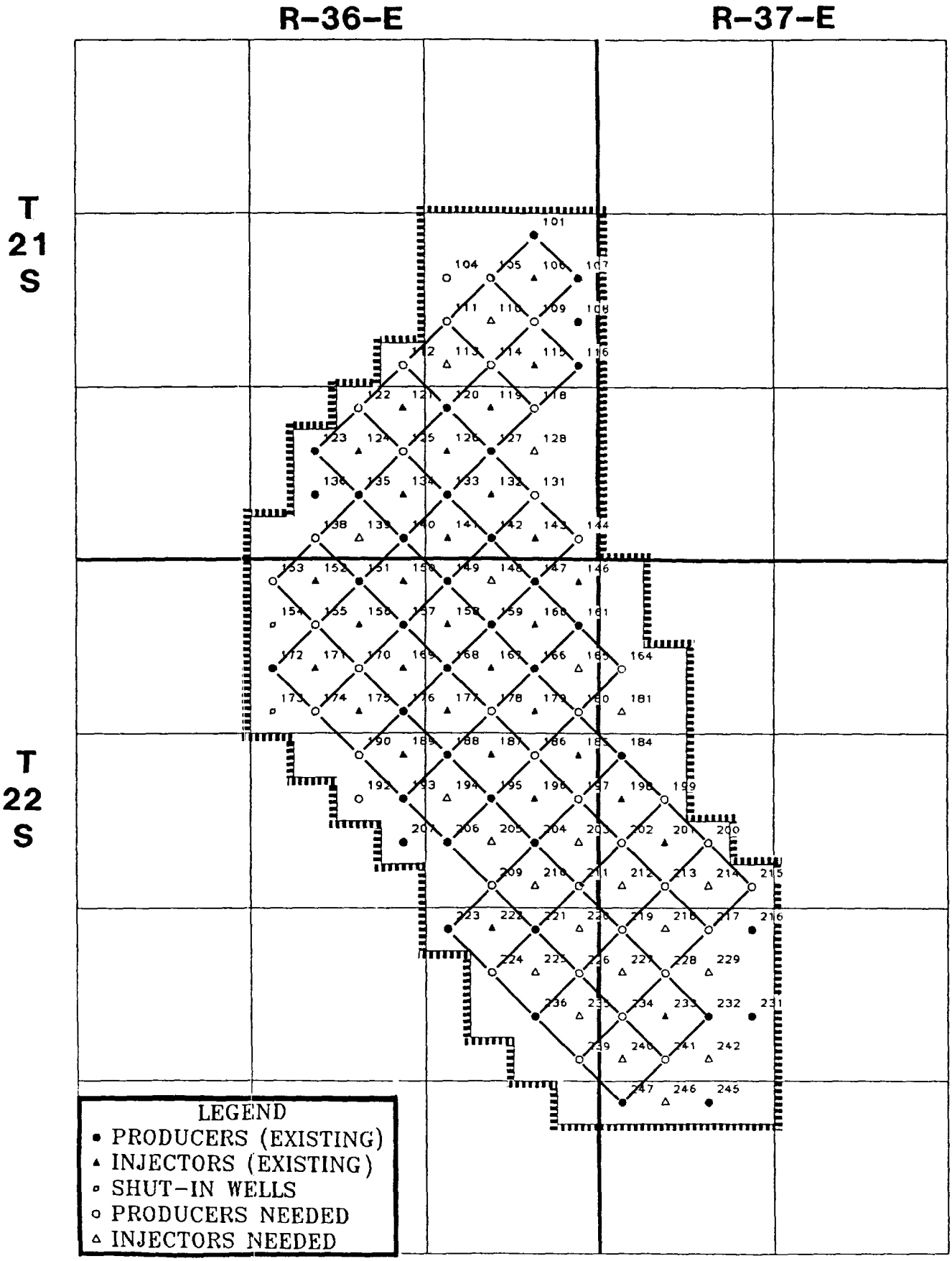


Fig.25

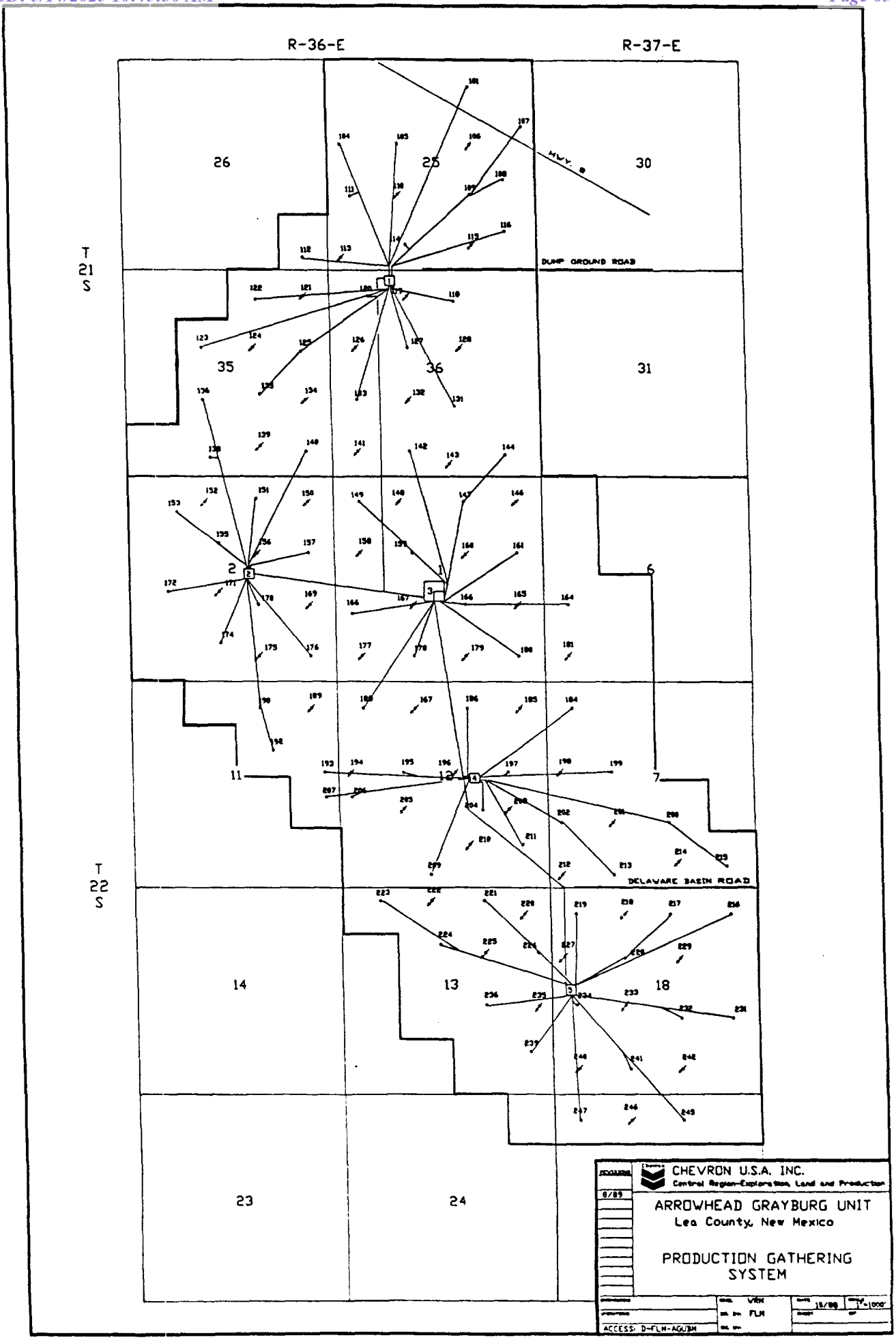

R-36-E
R-37-E
T 21 S
T 22 S
26
25
30
35
36
31
6
2
1
11
12
7
14
13
18
23
24
HWY. 8
DUMP GROUND ROAD
DELAWARE BASIN ROAD
CHEVRON U.S.A. INC.
Central Region-Exploration, Land and Production
ARROWHEAD GRAYBURG UNIT
Lea County, New Mexico
PRODUCTION GATHERING SYSTEM
8/89
ACCESS: D-FLW-AGUBM

Fig. 27

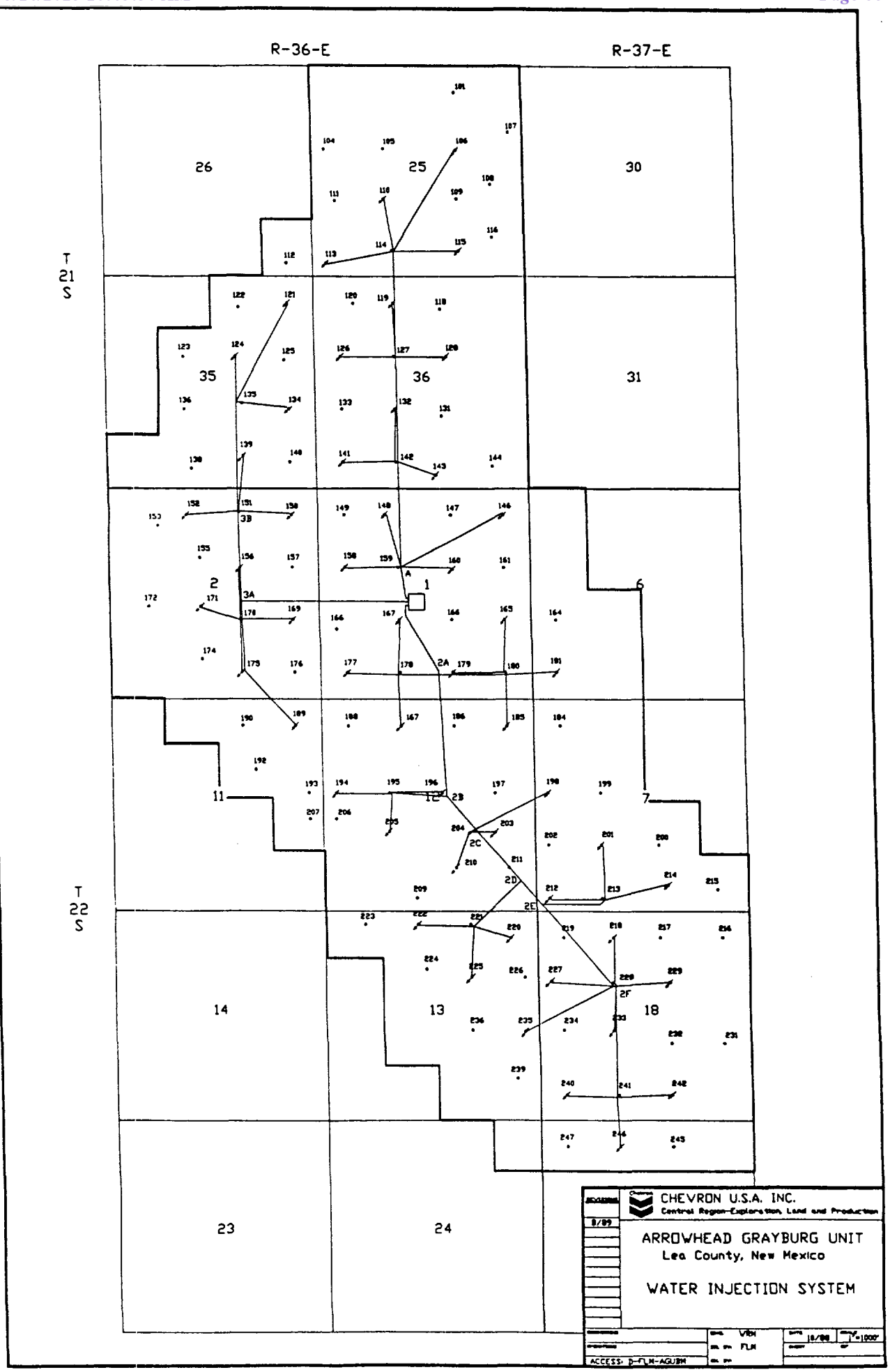

R-36-E
R-37-E
T 21 S
T 22 S
26
25
30
35
36
31
2
1
6
11
12
7
14
13
18
23
24
CHEVRON U.S.A. INC.
Central Region-Exploration, Land and Production
ARROWHEAD GRAYBURG UNIT
Lea County, New Mexico
WATER INJECTION SYSTEM

Fig. 28

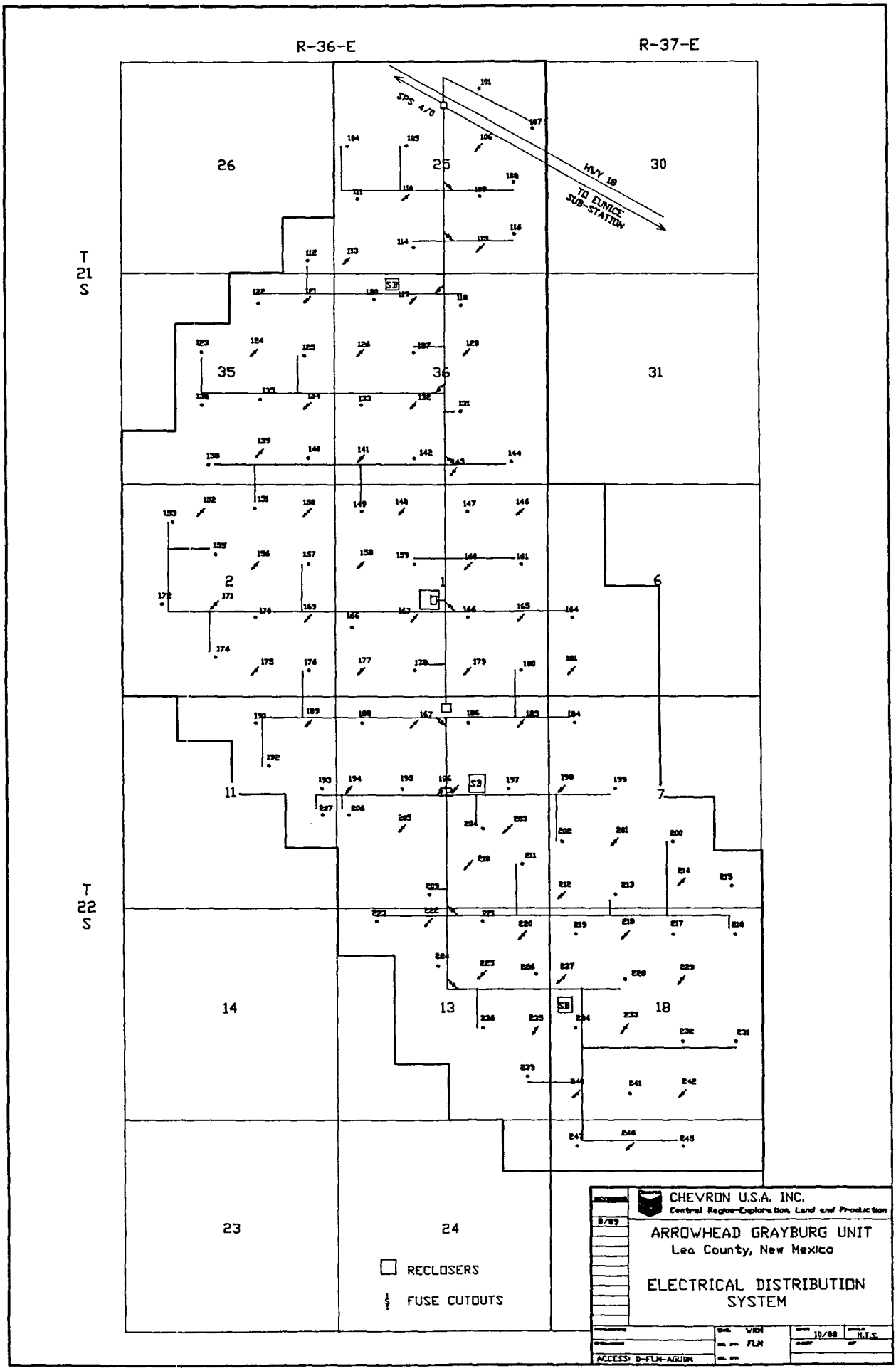

R-36-E
R-37-E
T 21 S
T 22 S
26
25
30
35
36
31
2
1
6
11
7
14
13
18
23
24
SB
HWY 18
TO EUNICE SUB-STATION
RECLOSERS
FUSE CUTOUTS
CHEVRON U.S.A. INC.
Central Region-Exploration, Land and Production
ARROWHEAD GRAYBURG UNIT
Lea County, New Mexico
ELECTRICAL DISTRIBUTION SYSTEM
8/89
VRH
FLN
10/88
N.T.S.
ACCESS: D-FLH-AGUBM

Fig. 29

TABLE 1

PROPOSED ARROWHEAD GRAYBURG UNIT
PERTINENT RESERVOIR DATA

Pool Discovery Well:	Continental State J-2 No. 1
Discovery Date:	5-24-38
Producing Formation:	Grayburg
Lithology:	Dolomite
Average Porosity:	8%
Average Net Thickness:	85 ft
Swi:	25%
Initial Reservoir Pressure (250 S.S.):	1460 psi
Reservoir Temperature:	90° F
Oil Gravity (API):	34°
Cumulative Oil Recovery (12-31-88):	30.8 MMSTBO
Predicted Ultimate Primary Recovery:	36.1 MMSTBO
OOIP:	175.4 MMSTBO

TABLE 2
PROPOSED ARROWHEAD GRAYBURG UNIT
TRACT DEFINITIONS

TRACT	OPERATOR	LEASE	SECTION	TOWNSHIP	RANGE
1	Chevron	Elliott B 6	18	22-S	37-E
2	Conoco	Lockhart B 1	1	22-S	36-E
3	Marathon	C. J. Saunders	1	22-S	36-E
4	Chevron	Ruby Crosby	6	22-S	37-E
5	Hal Rasmussen	State A	11	22-S	36-E
6	Chevron	Graham State (NCT-J)	25	21-S	36-E
7	Marathon	McDonald State	13,24	22-S	36-E
8a	American Exploration (Zia)	New Mexico M State	18	22-S	37-E
8b	American Exploration	New Mexico M State	19	22-S	37-E
9	Amerada Hess	State PA	18	22-S	37-E
10	Exxon	New Mexico G State	26	21-S	36-E
11	Arco	State D DE	36	21-S	36-E
12	Oxy USA	State M	36	21-S	36-E
13	Oxy USA	State N	2	22-S	36-E
14	Arco	State 157 D	12	22-S	36-E
15	Conoco	State J 2	2	22-S	36-E
16	Chevron	W A Ramsay (NCT-A & B)	25,35	21-S	36-E
17	Chevron	Harry Leonard (NCT-C)	36	21-S	36-E
18	Chevron	State 36	36	21-S	36-E
19	Arco	Brownlee	25	22-S	36-E
20	Chevron	Kingwood	25	22-S	36-E
21	Chevron	Sandy	25	22-S	36-E
22	Chevron	H. T. Mattern (NCT-D, E, & F)	1,12 / 6,9	22-S	36-E/37-E
23	Chevron	Mattern	7	22-S	37-E
24	Chevron	Mattern	7	22-S	37-E
25	Presidio Exploration	Mattern	7	22-S	37-E
26	Chevron	A. L. Christmas (NCT-C)	18	22-S	37-E

TABLE 3
PROPOSED ARROWHEAD GRAYBURG UNIT
TOTAL CAPITAL INVESTMENT REQUIREMENTS

	INTANGIBLES	TANGIBLES	TOTAL
D&C New Producers	$ 3,740,000	$ 3,740,000	$ 7,480,000
D&C New Injectors	1,760,000	1,440,000	3,200,000
D&C Water Supply Wells	340,000	430,000	770,000
Producing Well Workovers	2,098,000	1,445,000	3,543,000
Injection Well Workovers	2,272,000	1,041,000	3,313,000
Testing and Coring	500,000	0	500,000
Surface Facilities	0	8,950,000	8,950,000
Construction and Drilling Overhead	450,000	0	450,000
	$11,160,000	$17,046,000	$28,206,000

TABLE 4
PROPOSED ARROWHEAD GRAYBURG UNIT
SURFACE FACILITIES COST ESTIMATE

Satellite Batteries	$1,000,000
Central Battery and Water Injection Plant	2,420,000
Production Gathering System	1,600,000
Water Injection System	1,580,000
Electrical Distribution System	800,000
Road Construction	350,000
Damages	300,000
Miscellaneous	900,000
Water Supply Dismantling & Restoration Control & Data System Surveying Engineering and Inspection	
	$8,950,000

TABLE 5
PROPOSED ARROWHEAD GRAYBURG UNIT
DRILLING AND COMPLETION COST ESTIMATE
PRODUCING WELL

	Intangible	Tangible	Total
Contract Drilling - Day Rate Drlg Rig 1 day @ $4,000 Compl Rig 4 days @ $1,500	$ 10,000	$ 0	$ 10,000
Contract Drilling - Footage Rate 4000 feet @ $10.00	40,000	0	40,000
Drilling Supervision 8 days @ $500	4,000	0	4,000
Drilling Fluids	2,000	0	2,000
Well Supplies & Non-Salvageable Materials	2,000	0	2,000
Transportation Costs	2,000	0	2,000
Drill Pipe, Bits and Tools	1,000	0	1,000
Subsurface Contract Rentals and Services	15,000	0	15,000
Formation Treatment	4,000	0	4,000
Other Subsurface Costs	4,000	0	4,000
Logging	8,000	0	8,000
Casing & Tubing 1350 ft 8-5/8" @ $12.00 4000 ft 5½" @ $8.00 4000 ft 2-7/8" IPC @ $4.25	0	65,000	65,000
Wellhead, Rods, TAC	0	15,000	15,000
Cement Services	12,000	0	12,000
Site Preparation	6,000	0	6,000
Pumping Unit, Motor, Controls	0	30,000	30,000
Total	$110,000	$110,000	$220,000

TABLE 6
PROPOSED ARROWHEAD GRAYBURG UNIT
DRILLING AND COMPLETION COST ESTIMATE
INJECTION WELL

	Intangible	Tangible	Total
Contract Drilling - Day Rate Drlg Rig 1 day @ $4,000 Compl Rig 4 days @ $1,500	$ 10,000	$ 0	$ 10,000
Contract Drilling - Footage Rate 4000 feet @ $10.00	40,000	0	40,000
Drilling Supervision 8 days @ $500	4,000	0	4,000
Drilling Fluids	2,000	0	2,000
Well Supplies & Non-Salvageable Materials	2,000	0	2,000
Transportation Costs	2,000	0	2,000
Drill Pipe, Bits and Tools	1,000	0	1,000
Subsurface Contract Rentals and Services	15,000	0	15,000
Formation Treatment	4,000	0	4,000
Other Subsurface Costs	4,000	0	4,000
Logging	8,000	0	8,000
Casing & Tubing 1350 ft 8-5/8" @ $12.00 4000 ft 5½" @ $8.00 4000 ft 2-3/8" IPC @ $6.00	0	72,000	72,000
Wellhead, Packer	0	15,000	15,000
Cement Services	12,000	0	12,000
Site Preparation	6,000	0	6,000
Misc. Surface Equipment	0	3,000	3,000
Total	$100,000	$ 90,000	$200,000

TABLE 7
PROPOSED ARROWHEAD GRAYBURG UNIT
DRILLING AND COMPLETION COST ESTIMATE
WATER SUPPLY WELL

	Intangible	Tangible	Total
Contract Drilling - Day Rate Drlg Rig 2 days @ $4,000 Compl Rig 4 days @ $1,500	$ 14,000	$ 0	$ 14,000
Contract Drilling - Footage Rate 5000 feet @ $13.00	65,000	0	65,000
Drilling Supervision 16 days @ $500	8,000	0	8,000
Drilling Fluids	5,000	0	5,000
Well Supplies & Non-Salvageable Materials	2,000	0	2,000
Transportation Costs	5,000	0	5,000
Drill Pipe, Bits and Tools	3,000	0	3,000
Subsurface Contract Rentals and Services	15,000	0	15,000
Formation Treatment	4,000	0	4,000
Other Subsurface Costs	4,000	0	4,000
Logging	12,000	0	12,000
Casing & Tubing 1350 ft 11-3/4" @ $15.00 4000 ft 8-5/8" @ $12.00 4000 ft 5½ IPC @ $10.00	0	110,000	110,000
Wellhead	0	20,000	20,000
Cement Services	25,000	0	25,000
Site Preparation	8,000	0	8,000
Pumping Unit, Motor, Controls, Submersible Pump	0	85,000	85,000
Total	$170,000	$215,000	$385,000

TABLE 8

PROPOSED ARROWHEAD GRAYBURG UNIT

WORKOVER COST ESTIMATE

	Intangibles	Tangibles	Total
Basic Workover			
Cased - hole	$25,000	$ 0	$25,000
Open - hole	35,000	0	35,000
Additional Procedures			
Deepening	$12,000	$ 0	$12,000
Liner	27,000	3,000	30,000
Add Perfs	8,000	0	8,000
Cement Squeeze	23,000	0	23,000
WI Conversion	0	27,000	27,000
Upgrade Pumping Equipment	0	35,000	35,000

TABLE 9
PROPOSED ARROWHEAD GRAYBURG UNIT
CAPITAL INVESTMENT SCHEDULE

YEAR	DRILLING AND COMPLETION INTANGIBLE	DRILLING AND COMPLETION TANGIBLE	WORKOVERS AND CONVERSIONS INTANGIBLE	WORKOVERS AND CONVERSIONS TANGIBLE	SURFACE FACILITY CONSTRUCTION	DRILLING AND CONSTRUCTION OVERHEAD	TOTAL
1	$5,730,000	$4,955,000	$3,277,500	$1,094,500	$8,950,000	$300,000	$24,307,000
2	610,000	655,000	1,092,500	551,500	0	150,000	3,059,000
3	0	0	0	280,000	0	0	280,000
4	0	0	0	280,000	0	0	280,000
5	0	0	0	280,000	0	0	280,000
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
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14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
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21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0
TOTAL	$6,340,000	$5,610,000	$4,370,000	$2,486,000	$8,950,000	$450,000	$28,206,000

Table 10
Proposed Arrowhead Grayburg Unit
Completion Data for Existing Wells

TRACT	UNIT	OPERATOR	LEASE	WELL	DATUM	TD	LAST PBTD	CASING SIZE	SETTING DEPTH	LINER SIZE	LINER BOTTOM	TOP COMPLETION	SUBSEA	BOTTOM COMPLETION	SUBSEA	TOP UNIT SUBSEA	
ACTIVE WELLS																	
2	158	CONOCO	LOCKHART 'B'	1	3529	3825	3825	5.5	3739			3739	-210	3825	-296	-125	
2	159	CONOCO	LOCKHART 'B'	2	3524	3860	3847	5.5	3731	3.5	3860	3740	-216	3835	-311	-142	
2	166	CONOCO	LOCKHART 'B'	3	3502	3840	3840	5.5	3682			3682	-180	3840	-338	-150	
2	8	CONOCO	LOCKHART 'B'	5	3489	3789	3789	5.5	3694			3634	-145	3789	-300	-150	)
2	160	CONOCO	LOCKHART 'B'	7	3506	6860	6860	7	6860			3701	-195	3820	-314	-150	
3	149	MARATHON	SAUNDERS	2	3553	3850	3850	7	3747			3747	-194	3850	-297	-115	
5	189	RASMUSSEN	STATE 'A' AC 2	13	3521	3876	3876	7	3705	5.5	3876	3637	-116	3704	-183	-150	*
6	101	CHEVRON	GRAHAM STATE 'J'	1	3528	5270	5150	4.5	5270			3725	-197	3797	-269	-135	
7	222	MARATHON	MCDONALD	13	3492	3760	3760	5.5	3641			3641	-149	3760	-268	-150	*
7	223	MARATHON	MCDONALD	14	3509	3800	3800	5.5	3690			3690	-181	3800	-291	-150	
8A	231	AMERICAN	M STATE	8	3411	3693	3620	5.5	3693			3430	-19	3604	-193	-150	*
8A	232	ZIA ENERGY	M STATE	49	3427	6730	5400	5.5	6719			3806	-379	3909	-482	-150	
8B	247	AMERICAN	M STATE	5	3440	3719	3718	5.5	3718			3540	-100	3715	-275	-150	*
8B	245	AMERICAN	M STATE	6	3424	3717	3637	5.5	3714			3603	-179	3633	-209	-150	
9	233	AMERADA HESS	STATE 'PA'	4	3436	6763	3770	5.5	6762			3602	-166	3684	-248	-150	
11	143	ARCO	STATE 'D' DE	1	3509	3809	3800	5.5	3711			3711	-202	3800	-291	-150	
12	141	OXY USA	STATE 'M'	1	3544	3840	3836	7	3714	5	3836	3782	-238	3816	-272	-119	
12	133	OXY USA	STATE 'M'	2	3555	3850	3832	5.5	3700	4	3832	3730	-175	3800	-245	-86	
13	172	OXY USA	STATE 'N'	3	3539	3820	3820	5.5	3702			3702	-163	3820	-281	-150	
14	206	ARCO	STATE '157-O'	1	3507	3776	3776	7	3676			3676	-169	3776	-269	-150	
15	151	CONOCO	STATE 'J-2'	1	3567	3835	3835	5.5	3497	4	3835	3756	-189	3826	-259	-150	
15	169	CONOCO	STATE 'J-2'	2	3539	3833	3833	5.5	3739	4	3840	3743	-204	3822	-283	-150	
15	157	CONOCO	STATE 'J-2'	3	3554	3860	3860	5.5	3728			3728	-174	3860	-306	-145	
15	150	CONOCO	STATE 'J-2'	4	3563	3875	3875	5.5	3738	4	3875	3760	-197	3868	-305	-125	
15	176	CONOCO	STATE 'J-2'	5	3513	3810	3810	5.5	3722	4	3816	3744	-231	3808	-295	-150	
15	175	CONOCO	STATE 'J-2'	6	3533	3872	3872	5.5	3706	4	3872	3648	-115	3869	-336	-150	*)
15	156	CONOCO	STATE 'J-2'	9	3549	3878	3878	5.5	3712			3712	-163	3878	-329	-150	
15	152	CONOCO	STATE 'J-2'	11	3572	3915	3909	5.5	3715	4	3915	3850	-278	3900	-328	-150	
16	140	CHEVRON	WA RAMSAY 'A'	4	3569	3860	3860	6	3760			3760	-191	3860	-291	-130	
16	134	CHEVRON	WA RAMSAY 'A'	5	3570	3960	3860	5.5	3765			3765	-195	3860	-290	-140	
16	135	CHEVRON	WA RAMSAY 'A'	8	3579	3870	3870	5.5	3758			3758	-179	3870	-291	-150	
16	124	CHEVRON	WA RAMSAY 'A'	9	3566	3856	3811	5.5	3748			3748	-182	3811	-245	-150	
16	136	CHEVRON	WA RAMSAY 'A'	10	3588	3880	3864	5.5	3769			3769	-181	3864	-276	-150	
16	121	CHEVRON	WA RAMSAY 'A'	11	3541	3835	3835	5.5	3734			3734	-193	3835	-294	-150	
16	123	CHEVRON	WA RAMSAY 'A'	16	3574	3875	3872	5.5	3875			3804	-230	3864	-290	-150	
16	107	CHEVRON	WA RAMSAY 'B'	4	3525	5225	5100	4.5	5224			3720	-195	3789	-264	-133	

Table 10
Proposed Arrowhead Grayburg Unit
Completion Data for Existing Wells

TRACT	UNIT	OPERATOR	LEASE	WELL	DATUM	TD	LAST PBTD	CASING SIZE	SETTING DEPTH	LINER SIZE	LINER BOTTOM	TOP COMPLETION	SUBSEA	BOTTOM COMPLETION	SUBSEA	TOP UNIT SUBSEA	
17	142	CHEVRON	H LEONARD 'C'	1	3523	3820	3820	6	3700			3700	-177	3820	-297	-123	
17	132	CHEVRON	H LEONARD 'C'	2	3528	3825	3825	5.5	3719			3719	-191	3825	-297	-128	
17	126	CHEVRON	H LEONARD 'C'	3	3544	3840	3800	5.5	3739			3739	-195	3800	-256	-133	
17	120	CHEVRON	H LEONARD 'C'	4	3541	3825	3788	5.5	3730			3730	-189	3788	-247	-142	
17	119	CHEVRON	H LEONARD 'C'	5	3511	3800	3800	5.5	3675			3675	-164	3800	-289	-123	
17	127	CHEVRON	H LEONARD 'C'	6	3541	3830	3830	5.5	3730			3730	-189	3830	-289	-114	
17	120	CHEVRON	H LEONARD 'C'	20	3533	6930	4120	5.5	3746			3746	-213	3866	-333	-142	
21	108	CHEVRON	SANDY	1	3536	3899	3883	5.5	3726			3716	-180	3818	-282	-150	
21	116	CHEVRON	SANDY	2	3526	3930	3908	5.5	3666			3666	-140	3889	-363	-149	**
22	198	CHEVRON	HT MATTERN 'D'	2	3455	3740	3740	5.5	3670			3670	-215	3740	-285	-150	
22	184	CHEVRON	HT MATTERN 'D'	4	3466	3755	3755	5.5	3675			3675	-209	3755	-289	-150	
22	168	CHEVRON	HT MATTERN 'E'	1	3529	3790	3790	6	3725			3725	-196	3790	-261	-150	
22	167	CHEVRON	HT MATTERN 'E'	2	3509	3770	3770	6	3695			3695	-186	3770	-261	-150	
22	188	CHEVRON	HT MATTERN 'E'	3	3501	3780	3780	6	3685			3685	-184	3780	-279	-150	
22	177	CHEVRON	HT MATTERN 'E'	4	3502	3790	3790	6	3700			3700	-198	3790	-288	-150	
22	195	CHEVRON	HT MATTERN 'E'	6	3487	3765	3739	5.5	3669			3669	-182	3739	-252	-150	
22	196	CHEVRON	HT MATTERN 'E'	7	3477	3760	3760	5.5	3655			3655	-178	3760	-283	-150	
22	187	CHEVRON	HT MATTERN 'E'	9	3488	3780	3780	5.5	3685			3685	-197	3780	-292	-150	
22	185	CHEVRON	HT MATTERN 'E'	12	3467	3755	3755	5.5	3680			3680	-213	3755	-288	-150	
22	147	CHEVRON	HT MATTERN 'F'	1	3513	3805	3786	6	3705			3705	-192	3786	-273	-146	
22	146	CHEVRON	HT MATTERN 'F'	2	3489	3900	3860	5.5	3900			3652	-163	3799	-310	-150	
26	216	CHEVRON	AL CHRISTMAS 'C'	8	3419	3700	3697	5.5	3700			3625	-206	3696	-277	-150	
INACTIVE WELLS																	
5	207	RASMUSSEN	STATE 'A' AC 2	16	3520	3802	3802	7	3662			3662	-142	3802	-282	-150	**
5	193	RASMUSSEN	STATE 'A' AC 2	17	3520	3790	3755	7	3665			3665	-145	3755	-235	-150	**
7	221	MARATHON	MCDONALD	12	3476	3760	3760	5.5	3619			3619	-143	3760	-284	-150	**
7	226	MARATHON	MCDONALD	17	3463	3779	3779	4.5	3627			3627	-164	3779	-316	-150	
7	236	MARATHON	MCDONALD	22	3473	3781	3781	4.5	3724			3724	-251	3781	-308	-150	
13	171	OXY USA	STATE 'N'	2	3529	3810	3810	5.5	3700			3700	-171	3810	-281	-150	
13	173	OXY USA	STATE 'N'	4	3556	3835	3835	5.5	3708			3708	-152	3835	-279	-150	
15	154	CONOCO	STATE 'J-2'	10	3554	3944	3809	5.5	3700			3662	-108	3944	-390	-150	**
16	106	CHEVRON	WA RAMSAY 'B'	5	3537	3900	3855	4.5	3897			3730	-193	3796	-259	-139	
24	201	HARTMAN	MATTERN	2	3445	3740	3740	5.5	3668			3668	-223	3740	-295	-150	
25	214	PRESIDIO	MATTERN	5	3426	3746	3746	6.675	3414	5.5	3454	3454	-28	3746	-320	-150	
25	212	PRESIDIO	MATTERN	6	3445	3740	3740	5.5	3647			3647	-202	3740	-295	-150	

Table 11

Proposed Arrowhead Grayburg Unit
Historic Completion Data for Recompleted and P&A'd Wells

TRACT	UNIT	OPERATOR	LEASE	WELL	STATUS	DATUM	TD	LAST PBTD	CASING SIZE	SETTING DEPTH	LINER SIZE	LINER BOTTOM	TOP COMPLETION	SUBSEA	BOTTOM COMPLETION	SUBSEA	TOP UNIT SUBSEA
1	218	HARTMAN	RUBY CROSBY	1	RC	3436	3735	3735	5.5	3638			3638	-202	3735	-299	-150
1	217	HARTMAN	RUBY CROSBY	2	PA	3428	3780	3728	5.5	3638			3638	-210	3728	-300	-150
2	160	CONOCO	LOCKHART 'B'	4	RC	3513	3800	3800	5.5	3727			3727	-214	3800	-287	-150
3	148	MARATHON	SAUNDERS	1	RC	3539	3830	3830	5.5	3700			3700	-161	3830	-291	-141
4	180	HARTMAN	ELLIOTT	1	RC	3467	3724	3723	5.5	3723			3705	-238	3722	-255	-150
5	190	RASMUSSEN	STATE 'A' AC 2	14	RC	3540	3790	3790	7	3680			3680	-140	3790	-250	-150
5	X	RASMUSSEN	STATE 'A' AC 2	15	RC	3561	3856	3851	7	3710			3710	-149	3851	-290	-150
5	192	RASMUSSEN	STATE 'A' AC 2	18	PA	3533	3902	3800	7	3660	4.3	3902	3675	-142	3780	-247	-150
7	220	MARATHON	MCDONALD	11	RC	3452	3735	3735	7	3632			3632	-180	3735	-283	-150
7	224	MARATHON	MCDONALD	16	PA	3495	3790	3790	4.5	3622			3622	-127	3790	-295	-150
7	224	MARATHON	MCDONALD	18	PA	3480	3775	3775	4.5	3642			3642	-162	3775	-295	-150
7	235	MARATHON	MCDONALD	19	PA	3457	3757	3757	4.5	3720			3720	-263	3757	-300	-150
7	239	MARATHON	MCDONALD	20	PA	3458	3750	3750	4.5	3682			3682	-224	3750	-292	-150
7	X	MARATHON	MCDONALD	21	RC	3441	3716	3716	4.5	3503			3503	-62	3716	-275	-150
7	X	MARATHON	MCDONALD	23	PA	3470	3745	3745	4.5	3553			3552	-82	3745	-275	-150
7	X	MARATHON	MCDONALD	24	PA	3487	3762	3762	4.5	3553			3553	-66	3762	-275	-150
8A	232	AMERICAN	M STATE	1	RC	3422	3715	3715	7	3609			3609	-187	3715	-293	-150
8A	242	AMERICAN	M STATE	2	PA	3429	3720	3720	5.5	3617			3617	-188	3720	-291	-150
8A	X	AMERICAN	M STATE	3	PA	3410	3710	3700	5.5	3600			3561	-151	3700	-290	-150
8B	246	AMERICAN	M STATE	4	RC	3426	3714	3714	5.5	3578			3578	-152	3714	-288	-150
9	233	AMERADA HESS	STATE 'PA'	1	PA	3429	3724	3724	5.5	3640			3640	-211	3724	-295	-150
9	241	AMERADA HESS	STATE 'PA'	2	PA	3442	3724	3724	5.5	3640			3640	-198	3724	-282	-150
10	112	EXXON	STATE 'G'	2	RC	3528	3828	3828	5.5	3828			3726	-198	3816	-288	-150
11	131	ARCO	STATE 'D' DE	2	PA	3526	3811	3811	5.5	3715			3715	-189	3811	-285	-149
13	174	OXY USA	STATE 'N'	1	PA	3539	3878	3878	5.5	3700			3700	-161	3878	-339	-150
14	205	ARCO	STATE '157-D'	2	PA	3488	3759	3759	7	3656			3656	-168	3759	-271	-150
14	204	ARCO	STATE '157-D'	3	PA	3474	3745	3745	7	3650			3650	-176	3745	-271	-150
14	203	ARCO	STATE '157-D'	4	RC	3456	3750	3750	7	3572			3572	-116	3750	-294	-150
14	211	ARCO	STATE '157-D'	5	PA	3442	3726	3726	7	3569			3569	-127	3726	-284	-150
14	210	ARCO	STATE '157-D'	6	PA	3475	3741	3741	5.5	3602			3602	-127	3741	-266	-150
14	209	ARCO	STATE '157-D'	7	RC	3482	3761	3700	5.5	3650			3650	-168	3700	-218	-150
14	X	ARCO	STATE '157-D'	8	PA	3506	3777	3777	5.5	3674			3674	-168	3777	-271	-150
15	170	CONOCO	STATE 'J-2'	7	RC	3531	3825	3825	5.5	3715	4	3825	3808	-277	3822	-291	-150
15	155	CONOCO	STATE 'J-2'	8	PA	3554	3866	3866	5.5	3704	4	3866	3847	-293	3861	-307	-150
15	153	CONOCO	STATE 'J-2'	12	RC	3574	3850	3850	5.5	3680	4	3850	3791	-217	3820	-246	-150
16	139	CHEVRON	WA RAMSAY 'A'	3	RC	3576	3810	3810	6	3750			3750	-174	3810	-234	-150
16	125	CHEVRON	WA RAMSAY 'A'	6	PA	3560	3850	3758	5.5	3750			3718	-158	3758	-198	-148
16	138	CHEVRON	WA RAMSAY 'A'	7	RC	3586	3870	3870	5.5	3785			3785	-199	3870	-284	-150

Table 11
Proposed Arrowhead Grayburg Unit
Historic Completion Data for Recompleted and P&A'd Wells

ACT	UNIT	OPERATOR	LEASE	WELL	STATUS	DATUM	TD	LAST PBTD	CASING SIZE	SETTING DEPTH	LINER SIZE	LINER BOTTOM	TOP COMPLETION	SUBSEA	BOTTOM COMPLETION	SUBSEA	TOP UNI SUBSEA
16	X	CHEVRON	WA RAMSAY 'A'	12	RC	3590	3865	3865	5.5	3761			3761	-171	3865	-275	-150
16	122	CHEVRON	WA RAMSAY 'A'	13	RC	3561	3845	3845	5.5	3741			3741	-180	3845	-284	-150
16	105	CHEVRON	WA RAMSAY 'B'	1	RC	3564	3860	3860	5.5	3747			3747	-183	3860	-296	-130
16	104	CHEVRON	WA RAMSAY 'B'	2	RC	3562	3855	3855	5.5	3746			3746	-184	3855	-293	-150
17	128	CHEVRON	H LEONARD 'C'	6	RC	3507	3805	3805	5.5	3712			3712	-205	3805	-298	-137
17	X	CHEVRON	H LEONARD 'C'	8	RC	3487	3780	3780	5.5	3700			3700	-213	3780	-293	-150
17	118	CHEVRON	H LEONARD 'C'	9	RC	3510	3775	3740	5.5	3775			3702	-192	3730	-220	-144
17	X	CHEVRON	H LEONARD 'C'	12	RC	3515	6800	6766	7	5999	4	6766	3674	-159	3793	-278	-142
19	110	ARCO	BROWNLEE	1	RC	3547	3867	3867	7	3730			3730	-183	3867	-320	-150
19	113	ARCO	BROWNLEE	2	PA	3515	3807	3807	5.5	3723			3723	-208	3807	-292	-150
19	111	ARCO	BROWNLEE	3	PA	3538	3845	3845	5.5	3755			3755	-217	3845	-307	-150
19	114	ARCO	BROWNLEE	4	RC	3522	3800	3800	5.5	3691			3691	-169	3800	-278	-150
22	X	CHEVRON	HT MATTERN 'D'	1	PA	3462	3795	3775	6	3420			3420	42	3775	-313	-150
22	X	CHEVRON	HT MATTERN 'D'	3	PA	3449	3750	3750	5.5	3641			3641	-192	3750	-301	-150
22	X	CHEVRON	HT MATTERN 'D'	5	PA	3449	3745	3723	5.5	3637			3627	-178	3723	-274	-150
22	X	CHEVRON	HT MATTERN 'D'	6	RC	3470	3745	3722	5.5	3655			3655	-185	3722	-252	-150
22	X	CHEVRON	HT MATTERN 'D'	7	RC	3479	3790	3790	5.5	3790			3712	-233	3786	-307	-150
22	194	CHEVRON	HT MATTERN 'E'	5	PA	3508	3785	3785	5.5	3690			3690	-182	3785	-277	-150
22	197	CHEVRON	HT MATTERN 'E'	8	PA	3461	3750	3736	5.5	3654			3654	-193	3736	-275	-150
22	178	CHEVRON	HT MATTERN 'E'	10	PA	3504	3790	3756	5.5	3705			3705	-201	3756	-252	-150
22	186	CHEVRON	HT MATTERN 'E'	11	RC	3478	3775	3775	5.5	3680			3680	-202	3775	-297	-150
23	202	HARTMAN	MATTERN	1	RC	3452	3750	3733	5.5	3631	4	3733	3715	-263	3725	-273	-150
25	213	PRESIDIO	MATTERN	7	RC	3438	3735	3735	5.5	3640			3640	-202	3735	-297	-150
26	219	CHEVRON	AL CHRISTMAS 'C	1	RC	3454	3730	3638	5.5	3640			3615	-161	3636	-182	-150
26	228	CHEVRON	AL CHRISTMAS 'C	2	PA	3430	3730	3730	5.5	3627			3627	-197	3730	-300	-150
26	229	CHEVRON	AL CHRISTMAS 'C	3	PA	3422	3720	3720	5.5	3622			3622	-200	3720	-298	-150
26	227	CHEVRON	AL CHRISTMAS 'C	4	PA	3442	3740	3740	5.5	3635			3635	-193	3740	-298	-150
26	234	CHEVRON	AL CHRISTMAS 'C	5	PA	3450	3745	3745	5.5	3665			3665	-215	3745	-295	-150
26	240	CHEVRON	AL CHRISTMAS 'C	6	PA	3448	3740	3740	5.5	3665			3665	-217	3740	-292	-150
26	X	CHEVRON	AL CHRISTMAS 'C	7	RC	3425	3700	3700	5.5	3624			3624	-199	3700	-275	-150

** Indicates completions that extend beyond the proposed unit boundaries.

TABLE 12
PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION AND EXPENSE SCHEDULE
REMAINING PRIMARY CASE

YEAR	OIL PRODUCTION (BOPY)	GAS PRODUCTION (MCFPY)	OPERATING COSTS ($/YEAR)	ABANDONMENT COSTS ($/YEAR)
1	341,494	1,053,850	$728,175	$ 0
2	320,219	988,196	728,175	0
3	300,269	926,631	728,175	0
4	281,563	868,902	728,175	0
5	264,021	814,769	728,175	0
6	247,573	764,009	728,175	0
7	232,149	716,411	728,175	0
8	217,686	671,779	728,175	0
9	204,124	629,927	728,175	0
10	191,407	590,683	728,175	0
11	179,483	553,883	728,175	0
12	168,301	519,376	728,175	0
13	157,816	487,019	728,175	0
14	147,984	456,678	728,175	0
15	138,764	428,227	728,175	0
16	130,119	401,548	728,175	0
17	122,013	376,532	728,175	0
18	114,411	353,074	728,175	0
19	107,284	331,077	728,175	0
20	100,600	310,451	728,175	0
21	94,333	291,110	728,175	0
22	88,456	272,974	728,175	0
23	82,945	255,968	728,175	0
24	77,777	240,021	728,175	0
25	72,932	225,068	728,175	0
26	68,388	211,046	728,175	0
27	64,128	197,898	728,175	0
28	60,132	185,569	728,175	0
29	56,386	174,008	728,175	0
30	52,873	163,167	728,175	570,000
	4,685,630	14,459,851	$21,845,250	$570,000

TABLE 13
PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION AND EXPENSE SCHEDULE
WATERFLOOD CASE

YEAR	INVESTMENTS ($)	OIL PRODUCTION BOPY	GAS PRODUCTION (MCFPY)	OPERATING COSTS $/YEAR	ABANDONMENT COSTS $/YEAR
1	$24,307,000	341,494	1,051,802	$1,564,900	$ 0
2	3,059,000	320,219	912,624	1,942,530	0
3	280,000	300,269	600,538	2,079,400	0
4	280,000	281,563	366,032	2,216,280	0
5	280,000	391,645	176,240	2,284,718	0
6	0	777,815	350,017	2,284,718	0
7	0	1,545,045	695,270	2,284,718	0
8	0	2,135,250	960,863	2,284,718	0
9	0	2,135,250	960,863	2,284,718	0
10	0	1,953,845	879,230	2,284,718	0
11	0	1,630,484	733,718	2,284,718	0
12	0	1,360,639	612,288	2,284,718	0
13	0	1,135,453	510,954	2,284,718	0
14	0	947,535	426,391	2,284,718	0
15	0	790,718	355,823	2,284,718	0
16	0	659,854	296,934	2,284,718	0
17	0	550,649	247,792	2,284,718	0
18	0	459,516	206,782	2,284,718	0
19	0	383,466	172,560	2,284,718	0
20	0	320,003	144,001	2,284,718	0
21	0	267,042	120,169	2,284,718	0
22	0	222,847	100,281	2,284,718	0
23	0	185,966	83,685	2,284,718	0
24	0	155,188	69,835	2,284,718	0
25	0	129,505	58,277	1,828,000	0
26	0	108,072	48,632	1,523,000	0
27	0	90,186	40,584	1,218,500	0
28	0	75,260	33,867	1,218,500	430,000
29	0	62,804	28,262	1,218,500	430,000
30	0	52,410	23,585	1,218,500	430,000
	$28,206,000	19,769,992	11,267,899	$61,722,470	$1,290,000

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Tract

TRACT	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
1	465,366	0	465,366	0.0	0.0	0	80.00	108,000.00
2	1,759,082	749,143	2,508,225	4,593.3	15,143.0	2,414,487	320.00	433,320.00
3	536,424	56,757	593,181	647.0	1,207.7	93,251	80.24	109,849.20
4	86,986	0	86,986	0.0	0.0	0	74.06	99,981.00
5	1,256,799	5,878	1,262,677	111.7	1,729.3	59,722	240.00	324,000.00
6	35,102	3,190	38,292	40.0	1,175.3	82,481	40.00	54,600.00
7	1,980,703	24,046	2,004,749	160.0	2,154.0	278,119	520.00	702,000.00
8A UPPER	607,293	2,084	609,377	62.3	270.7	8,363	107.21	41,840.00
8A LOWER	83	2,291	2,374	20.7	5,660.0	518,590	52.79	174,160.00
8B	502,537	178,065	680,602	937.7	966.7	177,886	156.99	211,936.50
9	462,904	120,566	583,470	987.0	1,636.0	201,706	80.00	108,000.00
10	49,446	0	49,446	0.0	0.0	0	40.00	54,000.00
11	224,314	21,552	245,866	192.0	309.3	32,263	80.00	108,040.00
12	1,028,687	129,193	1,157,880	635.7	1,935.7	352,954	80.00	111,800.00
13	873,124	53,154	926,278	207.3	1,453.0	354,274	160.00	216,000.00
14	1,358,847	27,263	1,386,110	313.0	513.3	42,557	320.00	432,000.00
15	4,853,177	1,617,565	6,470,742	9,937.0	38,861.0	4,901,223	480.64	650,068.00
16	3,900,755	185,177	4,085,932	2,293.7	18,775.3	1,454,192	760.00	1,030,680.00
17	2,897,572	1,309,041	4,206,613	7,459.7	28,858.0	3,616,881	400.00	546,560.00
18	0	0	0	0.0	0.0	0	80.00	108,000.00
19	489,027	0	489,027	0.0	0.0	0	160.00	216,000.00
20	0	0	0	0.0	0.0	0	80.00	108,920.00
21	39,706	6,820	46,526	79.7	2,542.3	216,329	80.00	108,040.00
22	4,773,017	692,746	5,465,763	4,210.7	5,256.3	984,392	868.39	1,172,486.74
23	167,424	0	167,424	0.0	0.0	0	36.98	49,923.00
24	183,025	0	183,025	0.0	0.0	0	80.00	108,000.00
25	603,349	0	603,349	0.0	0.0	0	157.00	211,950.00
26	1,703,938	45,455	1,749,393	136.0	267.3	352,364	307.96	415,746.00
TOTAL	30,838,687	5,229,986	36,068,673	33,024.5	128,714.2	16,142,034	5,922.26	8,015,900.44

Proposed Arrowhead Grayburg Unit
Equity Parameters
Percent of Total by Tract

TRACT	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
1	1.509033	0.000000	1.290222	0.000000	0.000000	0.000000	1.350836	1.347322
2	5.704140	14.323996	6.954026	13.908765	11.764825	14.957762	5.403343	5.405756
3	1.739451	1.085223	1.644588	1.959152	0.938280	0.577691	1.354888	1.370391
4	0.282068	0.000000	0.241168	0.000000	0.000000	0.000000	1.250536	1.247283
5	4.075397	0.112390	3.500758	0.338234	1.343519	0.369978	4.052507	4.041966
6	0.113825	0.060994	0.106164	0.121122	0.913108	0.510970	0.675418	0.681146
7	6.422786	0.459772	5.558145	0.484489	1.673475	1.722949	8.780432	8.757594
8A UPPER	1.969257	0.039847	1.689491	0.188648	0.210311	0.051809	1.810289	0.521963
8A LOWER	0.000269	0.043805	0.006582	0.062681	4.397339	3.212668	0.691383	2.172682
8B	1.629567	3.404694	1.886962	2.839407	0.751044	1.102005	2.650846	2.643951
9	1.501050	2.305283	1.617664	2.988690	1.271033	1.249570	1.350836	1.347322
10	0.160338	0.000000	0.137088	0.000000	0.000000	0.000000	0.675418	0.673661
11	0.727379	0.412085	0.681661	0.581387	0.240300	0.199869	1.350836	1.347821
12	3.335703	2.470236	3.210210	1.924935	1.503874	2.186552	1.350836	1.394728
13	2.831262	1.016332	2.568096	0.627716	1.128858	2.194730	2.701671	2.694644
14	4.406306	0.521282	3.842975	0.947781	0.398790	0.263641	5.403343	5.389288
15	15.737301	30.928668	17.940061	30.089782	30.191696	30.363107	8.115821	8.109731
16	12.648901	3.540679	11.328202	6.945450	14.586813	9.008728	12.832939	12.857944
17	9.395899	25.029532	11.662788	22.588381	22.420215	22.406600	6.754178	6.818448
18	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.350836	1.347322
19	1.585758	0.000000	1.355822	0.000000	0.000000	0.000000	2.701671	2.694644
20	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.350836	1.358799
21	0.128754	0.130402	0.128993	0.241336	1.975151	1.340159	1.350836	1.347821
22	15.477368	13.245657	15.153768	12.750231	4.083699	6.098314	14.663152	14.627012
23	0.542902	0.000000	0.464181	0.000000	0.000000	0.000000	0.624424	0.622800
24	0.593492	0.000000	0.507435	0.000000	0.000000	0.000000	1.350836	1.347322
25	1.956468	0.000000	1.672778	0.000000	0.000000	0.000000	2.651015	2.644120
26	5.525326	0.869123	4.850173	0.411815	0.207669	2.182897	5.200042	5.186517
TOTAL	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000	100.00000

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

OWNER	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
ABBY	0	0	0	0.0	0.0	0	0.00	20,087.44
AMERADA	462,904	120,566	583,470	987.0	1,636.0	201,706	80.00	108,000.00
AMERICAN	1,109,830	180,149	1,289,979	1,000.0	1,237.4	186,249	213.46	85,593.79
AMOCO	439,771	187,286	627,056	1,148.3	3,785.8	603,622	80.00	108,330.00
ARCO	2,511,959	236,101	2,748,059	1,653.3	4,608.4	678,442	640.00	784,020.25
BROWN	27,910	0	27,910	0.0	0.0	0	10.73	10,041.16
BRYANT	2,482	426	2,908	5.0	158.9	13,521	3.48	1,137.50
BURR	3,612	0	3,612	0.0	0.0	0	1.13	601.49
CHEVRON	14,116,027	2,429,289	16,545,315	15,363.1	60,501.4	7,296,740	2783.54	3,702,960.54
CONOCO	5,292,948	1,804,851	7,097,798	11,085.3	42,646.8	5,504,845	560.64	758,398.00
DASCO	162,470	0	162,470	0.0	0.0	0	43.45	127,327.65
DAVIDSON	115,568	0	115,568	0.0	0.0	0	36.19	19,247.58
ENRON	0	0	0	0.0	0.0	0	0.00	17,576.51
EXXON	49,446	0	49,446	0.0	0.0	0	90.74	222,182.71
FLETCHER	3,612	0	3,612	0.0	0.0	0	1.13	601.49
HANNIFIN	0	0	0	0.0	0.0	0	0.00	12,855.96
MARATHON	2,517,127	80,803	2,597,930	807.0	3,361.7	371,370	600.24	811,849.20
MCBRIDE	0	0	0	0.0	0.0	0	0.00	27,318.91
MOORE	0	0	0	0.0	0.0	0	12.25	4,000.00
MUSSETT	70,495	0	70,495	0.0	0.0	0	16.05	44,560.86
NERMYR	7,223	0	7,223	0.0	0.0	0	2.26	1,202.97
OXY	1,901,811	182,347	2,084,158	843.0	3,388.7	707,228	240.00	327,800.00
PARA MIA	147,160	0	147,160	0.0	0.0	0	39.91	115,176.64
PRESIDIO	55,802	0	55,802	0.0	0.0	0	21.45	20,077.00
RASMUSSEN	157,100	735	157,835	14.0	216.2	7,465	30.00	40,500.00
SUMMERS	162,470	0	162,470	0.0	0.0	0	43.45	127,327.66
SUTTON	3,612	0	3,612	0.0	0.0	0	1.13	601.49
VETETO	15,312	0	15,312	0.0	0.0	0	3.54	12,152.43
WALSH	402,253	0	402,253	0.0	0.0	0	104.67	44,195.54
WESTWAY	0	0	0	0.0	0.0	0	0.00	2,510.93
WILLIAMS	1,099,699	5,143	1,104,842	97.7	1,513.1	52,257	210.00	283,500.00
ZIA	83	2,291	2,374	20.7	5,660.0	518,590	52.79	174,160.00
TOTAL	30,838,687	5,229,986	36,068,673	33,024.5	128,714.2	16,142,034	5,922.26	8,015,900.44

Proposed Arrowhead Grayburg Unit

Equity Parameters

Percent of Total by Owner

OWNER	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
ABBY	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2506
AMERADA	1.5010	2.3053	1.6177	2.9887	1.2710	1.2496	1.3508	1.3473
AMERICAN	3.5988	3.4445	3.5765	3.0281	0.9614	1.1538	3.6044	1.0678
AMOCO	1.4260	3.5810	1.7385	3.4772	2.9412	3.7394	1.3508	1.3514
ARCO	8.1455	4.5144	7.6190	5.0064	3.5803	4.2030	10.8067	9.7808
BROWN	0.0905	0.0000	0.0774	0.0000	0.0000	0.0000	0.1811	0.1253
BRYANT	0.0080	0.0082	0.0081	0.0151	0.1234	0.0838	0.0588	0.0142
BURR	0.0117	0.0000	0.0100	0.0000	0.0000	0.0000	0.0191	0.0075
CHEVRON	45.7738	46.4492	45.8717	46.5204	47.0044	45.2034	47.0014	46.1952
CONOCO	17.1633	34.5097	19.6786	33.5670	33.1329	34.1025	9.4667	9.4612
DASCO	0.5268	0.0000	0.4504	0.0000	0.0000	0.0000	0.7337	1.5884
DAVIDSON	0.3748	0.0000	0.3204	0.0000	0.0000	0.0000	0.6112	0.2401
ENRON	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2193
EXXON	0.1603	0.0000	0.1371	0.0000	0.0000	0.0000	1.5321	2.7718
FLETCHER	0.0117	0.0000	0.0100	0.0000	0.0000	0.0000	0.0191	0.0075
HANNIFIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1604
MARATHON	8.1622	1.5450	7.2027	2.4436	2.6118	2.3006	10.1353	10.1280
MCBRIDE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3408
MOORE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2069	0.0499
MUSSETT	0.2286	0.0000	0.1954	0.0000	0.0000	0.0000	0.2710	0.5559
NERMYR	0.0234	0.0000	0.0200	0.0000	0.0000	0.0000	0.0382	0.0150
OXY	6.1670	3.4866	5.7783	2.5527	2.6327	4.3813	4.0525	4.0894
PARA MIA	0.4772	0.0000	0.4080	0.0000	0.0000	0.0000	0.6739	1.4369
PRESIDIO	0.1809	0.0000	0.1547	0.0000	0.0000	0.0000	0.3622	0.2505
RASMUSSEN	0.5094	0.0140	0.4376	0.0423	0.1679	0.0462	0.5066	0.5052
SUMMERS	0.5268	0.0000	0.4504	0.0000	0.0000	0.0000	0.7337	1.5884
SUTTON	0.0117	0.0000	0.0100	0.0000	0.0000	0.0000	0.0191	0.0075
VETETO	0.0497	0.0000	0.0425	0.0000	0.0000	0.0000	0.0598	0.1516
WALSH	1.3044	0.0000	1.1152	0.0000	0.0000	0.0000	1.7674	0.5513
WESTWAY	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0313
WILLIAMS	3.5660	0.0983	3.0632	0.2960	1.1756	0.3237	3.5459	3.5367
ZIA	0.0003	0.0438	0.0066	0.0627	4.3973	3.2127	0.8914	2.1727
	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

OWNER	TRACT	WI	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
ABBY	11*	0.0000	0	0	0	0.0	0.0	0	0.00	20,087.44
AMERADA	9	100.0000	462,904	120,566	583,470	967.0	1,636.0	201,706	80.00	108,000.00
AMERICAN	8A(U)	100.0000	607,293	2,084	609,377	62.3	270.7	8,363	107.21	41,840.00
	8B(U)*	100.0000	502,537	178,065	680,602	937.7	966.7	177,886	106.25	43,753.79
COMPANY TOTAL			1,109,830	180,149	1,289,979	1,000.0	1,237.4	186,249	213.46	85,593.79
AMOCO	2	25.0000	439,771	187,286	627,056	1,148.3	3,785.8	603,622	80.00	108,330.00
ARCO	2	25.0000	439,771	187,286	627,056	1,148.3	3,785.8	603,622	80.00	108,330.00
	11*	100.0000	224,314	21,552	245,866	192.0	309.3	32,263	80.00	27,690.25
	14	100.0000	1,358,847	27,263	1,386,110	313.0	513.3	42,557	320.00	432,000.00
	19	100.0000	489,027	0	489,027	0.0	0.0	0	160.00	216,000.00
COMPANY TOTAL			2,511,959	236,101	2,748,059	1,653.3	4,608.4	678,442	640.00	784,020.25
BROWN	4*	0.0000	0	0	0	0.0	0.0	0	0.98	365.64
	23	16.6700	27,910	0	27,910	0.0	0.0	0	6.16	8,322.16
	24*	0.0000	0	0	0	0.0	0.0	0	1.46	546.78
	25*	0.0000	0	0	0	0.0	0.0	0	2.12	806.59
COMPANY TOTAL			27,910	0	27,910	0.0	0.0	0	10.73	10,041.16
BRYANT	21*	6.2500	2,482	426	2,908	5.0	158.9	13,521	3.48	1,137.50
BURR	1*	0.3906	1,818	0	1,818	0.0	0.0	0	0.31	134.06
	4*	0.4863	425	0	425	0.0	0.0	0	0.36	140.85
	23	0.3906	654	0	654	0.0	0.0	0	0.14	195.01
	24*	0.3906	715	0	715	0.0	0.0	0	0.31	131.56
COMPANY TOTAL			3,612	0	3,612	0.0	0.0	0	1.13	601.49

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

OWNER	TRACT	WI	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
CHEVRON	1 *	35.5469	165,423	0	165,423	0.0	0.0	0	28.44	12,199.69
	2	25.0000	439,771	187,286	627,056	1,148.3	3,785.8	603,622	80.00	108,330.00
	4 *	44.4336	38,651	0	38,651	0.0	0.0	0	32.91	12,817.35
	6	100.0000	35,102	3,190	38,292	40.0	1,175.3	82,481	40.00	54,600.00
	16	100.0000	3,900,755	185,177	4,085,932	2,293.7	18,775.3	1,454,192	760.00	1,030,680.00
	17	100.0000	2,897,572	1,309,041	4,206,613	7,459.7	28,858.0	3,616,881	400.00	546,560.00
	18	100.0000	0	0	0	0.0	0.0	0	80.00	108,000.00
	20	100.0000	0	0	0	0.0	0.0	0	80.00	108,920.00
	21 *	93.7500	37,224	6,394	43,618	74.7	2,383.4	202,808	64.26	102,902.50
	22	100.0000	4,773,017	692,746	5,465,763	4,210.7	5,256.3	984,392	868.39	1,172,486.74
	23	35.5469	59,514	0	59,514	0.0	0.0	0	13.15	17,746.07
	24 *	35.5469	65,060	0	65,060	0.0	0.0	0	28.44	11,972.19
	26	100.0000	1,703,938	45,455	1,749,393	136.0	267.3	352,364	307.96	415,746.00
COMPANY TOTAL			14,116,027	2,429,289	16,545,315	15,363.1	60,501.4	7,296,740	2783.54	3,702,960.54
CONOCO	2	25.0000	439,771	187,286	627,056	1,148.3	3,785.8	603,622	80.00	108,330.00
	15	100.0000	4,853,177	1,617,565	6,470,742	9,937.0	38,861.0	4,901,223	480.64	650,068.00
COMPANY TOTAL			5,292,948	1,804,851	7,097,798	11,085.3	42,646.8	5,504,845	560.64	758,398.00
DASCO	1 *	14.1667	65,927	0	65,927	0.0	0.0	0	11.33	27,579.98
	4 *	12.5000	10,873	0	10,873	0.0	0.0	0	8.28	25,173.37
	24 *	14.4930	26,525	0	26,525	0.0	0.0	0	10.32	25,947.83
	25 *	9.8024	59,144	0	59,144	0.0	0.0	0	13.52	48,626.48
COMPANY TOTAL			162,470	0	162,470	0.0	0.0	0	43.45	127,327.65
DAVIDSON	1 *	12.5000	58,171	0	58,171	0.0	0.0	0	10.00	4,290.00
	4 *	15.6250	13,592	0	13,592	0.0	0.0	0	11.57	4,507.20
	23	12.5000	20,928	0	20,928	0.0	0.0	0	4.62	6,240.38
	24 *	12.5000	22,878	0	22,878	0.0	0.0	0	10.00	4,210.00
COMPANY TOTAL			115,568	0	115,568	0.0	0.0	0	36.19	19,247.58

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

OWNER	TRACT	WI	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
ENRON	11*	0.0000	0	0	0	0.0	0.0	0	0.00	17,576.51
EXXON	8B(L)*	0.0000	0	0	0	0.0	0.0	0	50.74	168,182.71
	10	100.0000	49,446	0	49,446	0.0	0.0	0	40.00	54,000.00
COMPANY TOTAL			49,446	0	49,446	0.0	0.0	0	90.74	222,182.71
FLETCHER	1*	0.3906	1,818	0	1,818	0.0	0.0	0	0.31	134.06
	4*	0.4883	425	0	425	0.0	0.0	0	0.36	140.85
	23	0.3906	654	0	654	0.0	0.0	0	0.14	195.01
	24*	0.3906	715	0	715	0.0	0.0	0	0.31	131.56
COMPANY TOTAL			3,612	0	3,612	0.0	0.0	0	1.13	601.49
HANNIFIN	11*	0.0000	0	0	0	0.0	0.0	0	0.00	12,855.96
MARATHON	3	100.0000	536,424	56,757	593,181	647.0	1,207.7	93,251	80.24	109,849.20
	7	100.0000	1,980,703	24,046	2,004,749	160.0	2,154.0	278,119	520.00	702,000.00
COMPANY TOTAL			2,517,127	80,803	2,597,930	807.0	3,361.7	371,370	600.24	811,849.20
MCBRIDE	11*	0.0000	0	0	0	0.0	0.0	0	0.00	27,318.91
MOORE	21*	0.0000	0	0	0	0.0	0.0	0	12.25	4,000.00
MUSSETT	1*	7.5000	34,902	0	34,902	0.0	0.0	0	6.00	8,100.00
	4*	0.0000	0	0	0	0.0	0.0	0	0.00	5,335.12
	24*	6.5217	11,936	0	11,936	0.0	0.0	0	4.64	11,676.52
	25*	3.9211	23,656	0	23,656	0.0	0.0	0	5.41	19,449.22
COMPANY TOTAL			70,495	0	70,495	0.0	0.0	0	16.05	44,560.86

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

OWNER	TRACT	WI	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
NERMYR	1 *	0.7813	3,636	0	3,636	0.0	0.0	0	0.63	268.13
	4 *	0.9676	849	0	849	0.0	0.0	0	0.72	281.70
	23	0.7813	1,308	0	1,308	0.0	0.0	0	0.29	390.02
	24 *	0.7813	1,430	0	1,430	0.0	0.0	0	0.63	263.13
COMPANY TOTAL			7,223	0	7,223	0.0	0.0	0	2.26	1,202.97
OXY	12	100.0000	1,028,687	129,193	1,157,880	635.7	1,935.7	352,954	80.00	111,800.00
	13	100.0000	873,124	53,154	926,278	207.3	1,453.0	354,274	160.00	216,000.00
COMPANY TOTAL			1,901,811	182,347	2,084,158	843.0	3,388.7	707,228	240.00	327,800.00
PARA MIA	1 *	12.7174	59,182	0	59,182	0.0	0.0	0	10.17	24,946.96
	4 *	12.5000	10,873	0	10,873	0.0	0.0	0	8.28	23,111.52
	24 *	13.0435	23,873	0	23,873	0.0	0.0	0	9.29	23,353.04
	25 *	8.8221	53,231	0	53,231	0.0	0.0	0	12.17	43,765.12
COMPANY TOTAL			147,160	0	147,160	0.0	0.0	0	39.91	115,176.64
PRESIDIO	4 *	0.0000	0	0	0	0.0	0.0	0	1.95	731.27
	23	33.3300	55,802	0	55,802	0.0	0.0	0	12.33	16,639.34
	24 *	0.0000	0	0	0	0.0	0.0	0	2.93	1,093.22
	25 *	0.0000	0	0	0	0.0	0.0	0	4.24	1,613.17
COMPANY TOTAL			55,802	0	55,802	0.0	0.0	0	21.45	20,077.00
RASMUSSEN	5	12.5000	157,100	735	157,835	14.0	216.2	7,465	30.00	40,500.00
SUMMERS	1 *	14.1667	65,927	0	65,927	0.0	0.0	0	11.33	27,579.99
	4 *	12.5000	10,873	0	10,873	0.0	0.0	0	8.28	25,173.37
	24 *	14.4930	26,525	0	26,525	0.0	0.0	0	10.32	25,947.83
	25 *	9.8024	59,144	0	59,144	0.0	0.0	0	13.52	48,626.48
COMPANY TOTAL			162,470	0	162,470	0.0	0.0	0	43.45	127,327.66

Proposed Arrowhead Grayburg Unit
Value of Equity Parameters by Owner

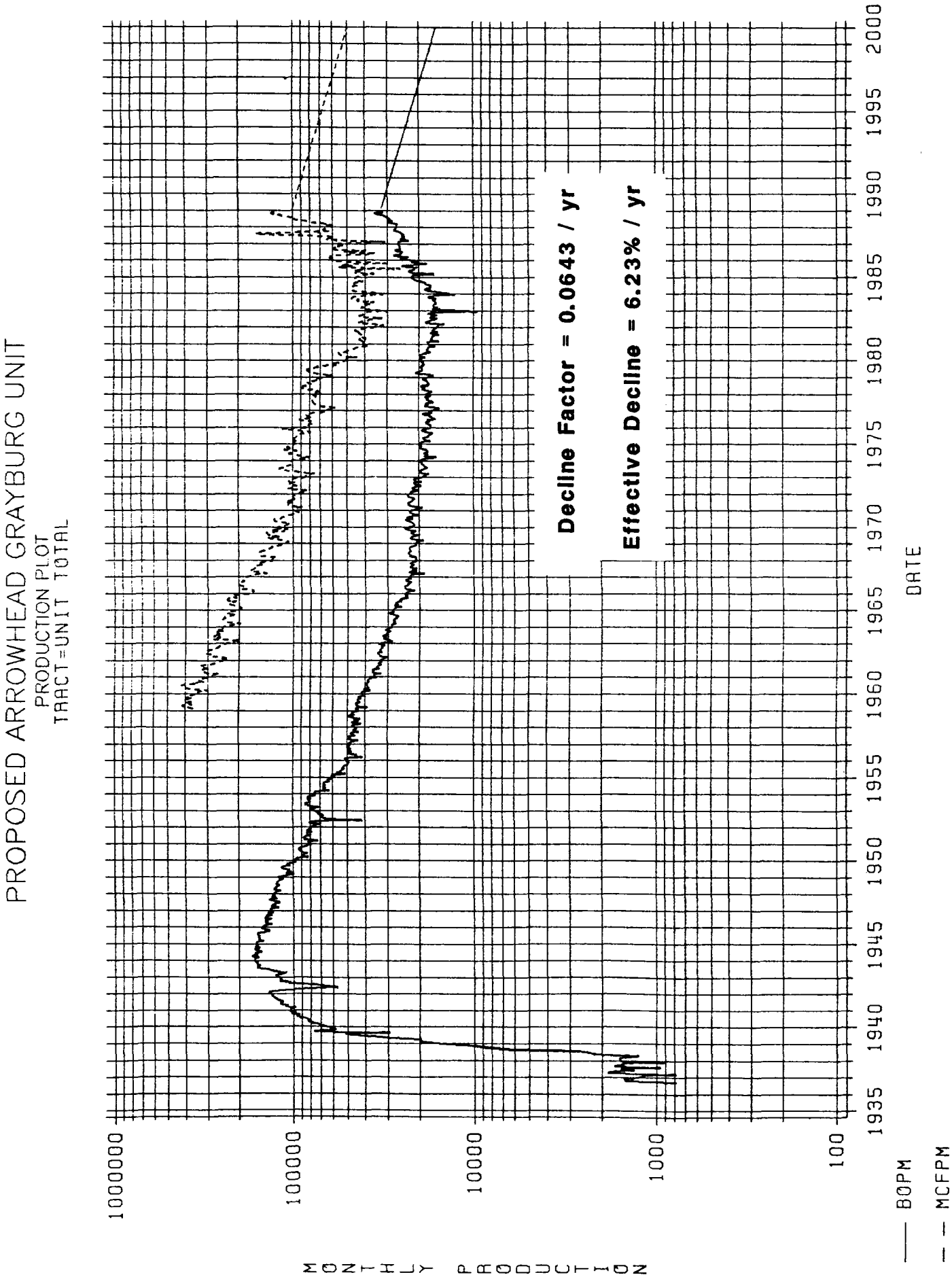
OWNER	TRACT	WI	CUMULATIVE OIL (12-31-88)	REMAINING OIL RESERVES (1-1-89)	ULTIMATE PRIMARY OIL RECOVERY	CURRENT OIL RATE (4Q-1988)	CURRENT GAS RATE (4Q-1988)	REMAINING GAS RESERVES (1-1-89)	SURFACE ACRES	GROSS ACRE-FT
SUTTON	1 *	0.3906	1,818	0	1,818	0.0	0.0	0	0.31	134.06
	4 *	0.4883	425	0	425	0.0	0.0	0	0.36	140.85
	23	0.3906	654	0	654	0.0	0.0	0	0.14	195.01
	24 *	0.3906	715	0	715	0.0	0.0	0	0.31	131.56
COMPANY TOTAL			3,612	0	3,612	0.0	0.0	0	1.13	601.49
VETETO	1 *	1.4493	6,745	0	6,745	0.0	0.0	0	1.16	2,633.09
	4 *	0.0000	0	0	0	0.0	0.0	0	0.00	2,061.92
	24 *	1.4493	2,653	0	2,653	0.0	0.0	0	1.03	2,594.78
	25 *	0.9802	5,914	0	5,914	0.0	0.0	0	1.35	4,862.65
COMPANY TOTAL			15,312	0	15,312	0.0	0.0	0	3.54	12,152.43
WALSH	25 *	66.6700	402,253	0	402,253	0.0	0.0	0	104.67	44,195.54
WESTWAY	11 *	0.0000	0	0	0	0.0	0.0	0	0.00	2,510.93
WILLIAMS	5	87.5000	1,099,699	5,143	1,104,842	97.7	1,513.1	52,257	210.00	283,500.00
ZIA	8A(L)	100.0000	83	2,291	2,374	20.7	5,660.0	518,590	52.79	174,160.00
TOTAL			30,838,687	5,229,986	36,068,673	33,024.5	128,714.2	16,142,034	5,922.26	8,015,900.44

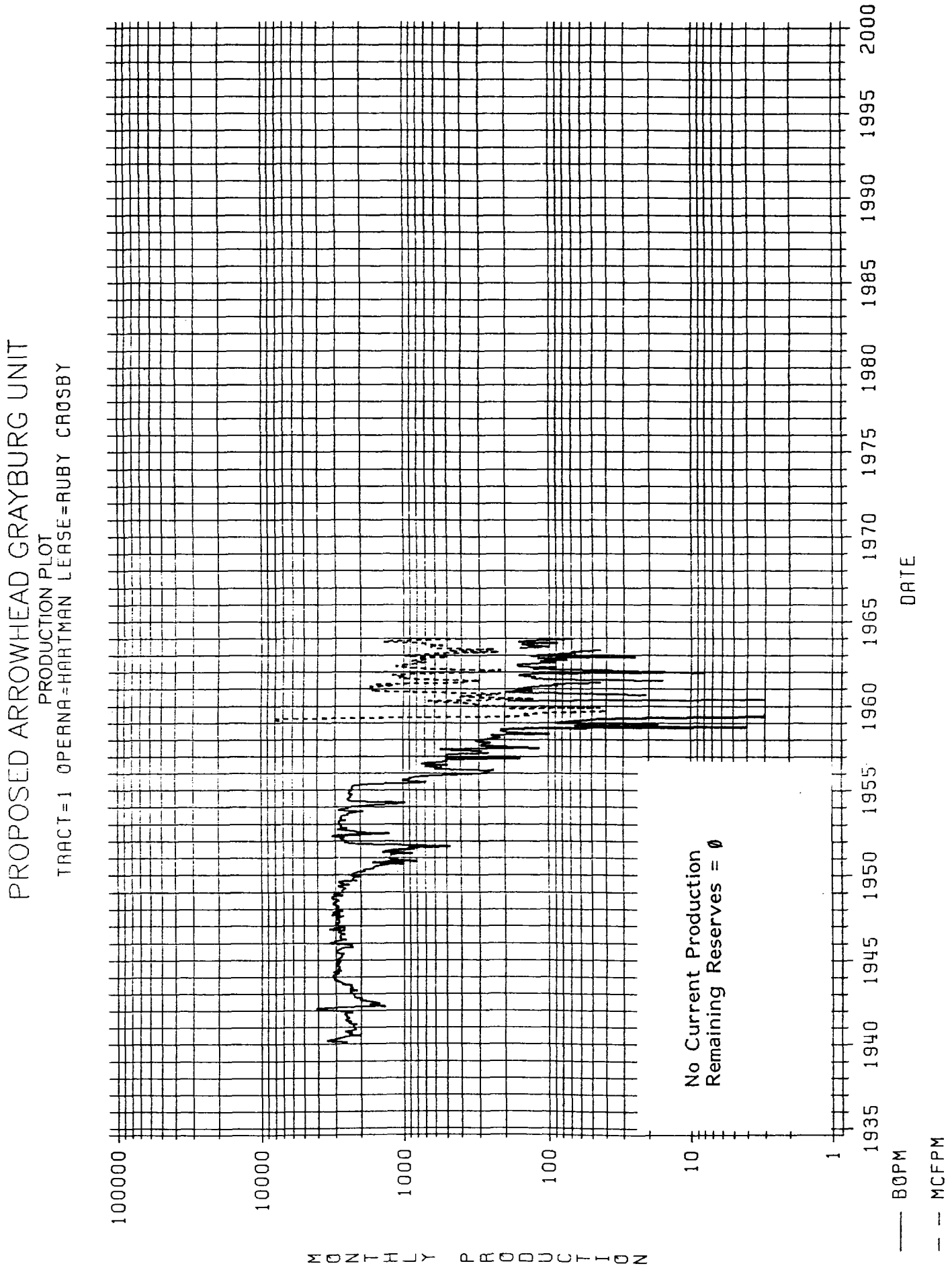
* Working interests are different for production and acreage equities. Indicated WI is for production equity. Consult ownership information tables (Appendix C) for detail.

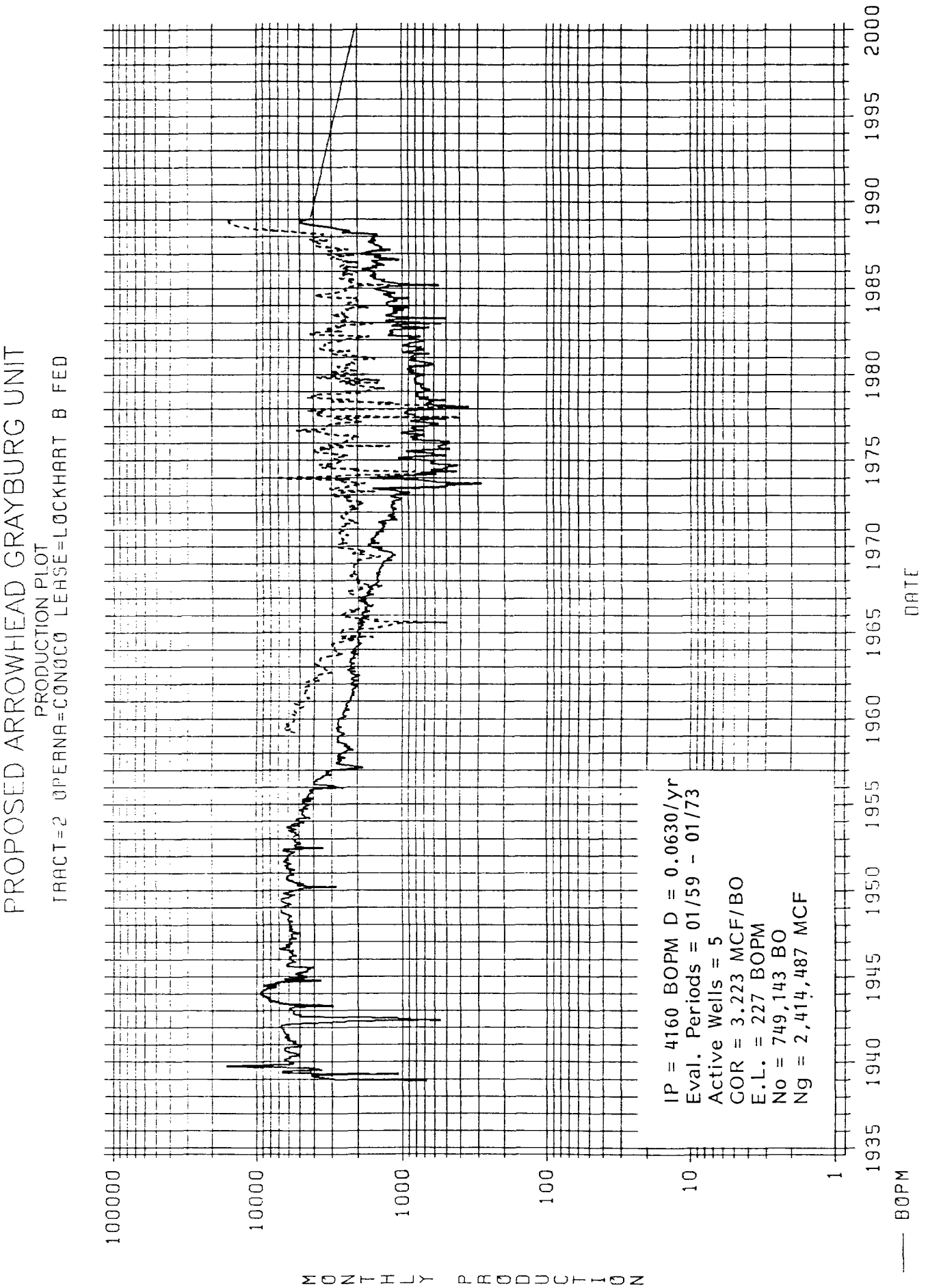
PROPOSED ARROWHEAD GRAYBURG UNIT
REMAINING RESERVES

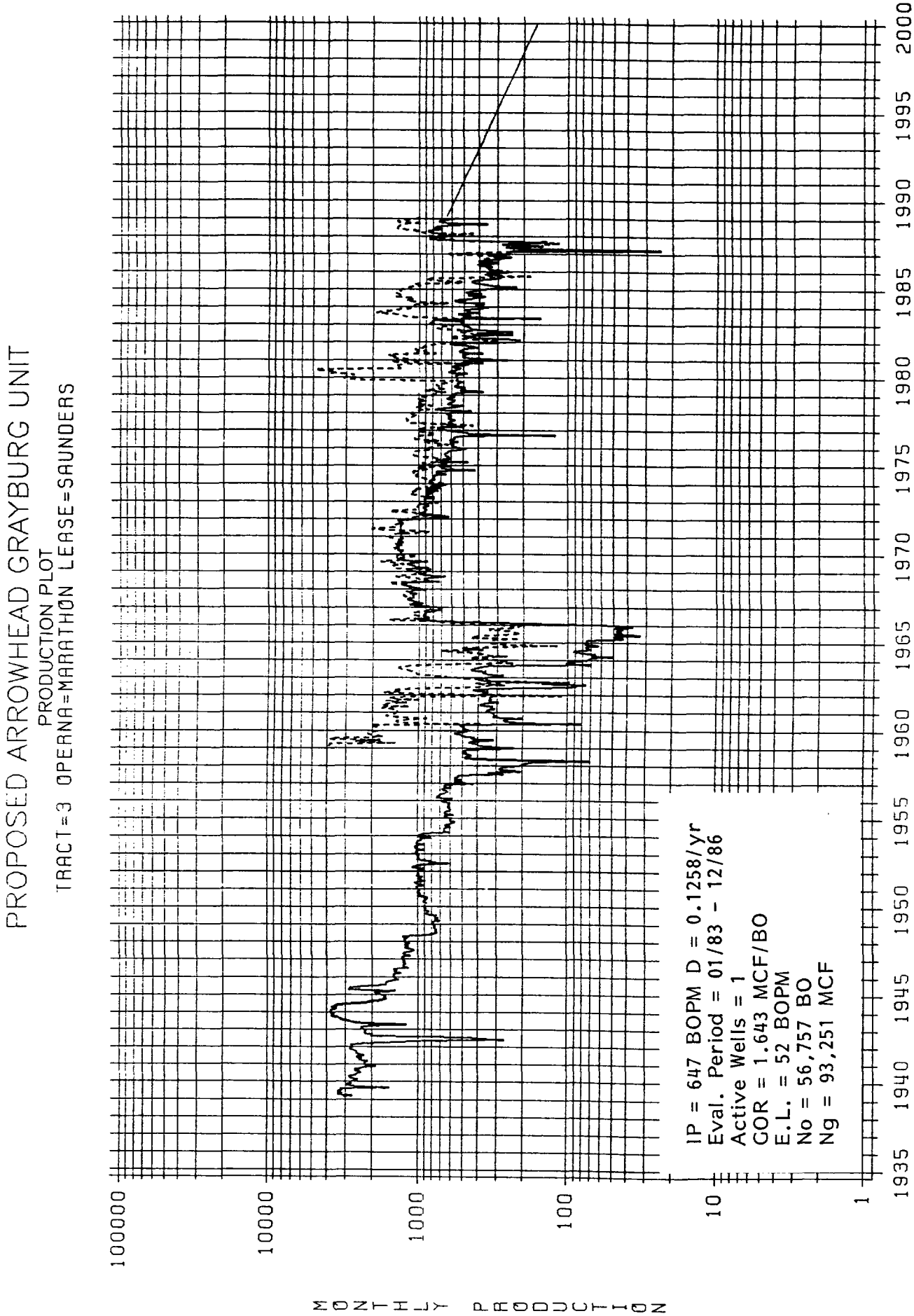
	TRACT	I.P. BOPM OR MCFPM	E.L. BOPM OR MCFPM	DECLINE FACTOR	REMAINING OIL RESERVES	GOR (MCF/BO)	REMAINING GAS RESERVES
	1	0	0	0.0000	0	0	0
	2	4160	227	0.0630	749,143	3.223	2,414,487
	3	647	52	0.1258	56,757	1.643	93,251
	4	0	0	0.0000	0	0	0
	5	112	30	0.1674	5,878	10.160	59,722
*	6	987	433	0.0806	3,190	25.853	82,481
	7	160	56	0.0519	24,046	11.566	278,119
	8A Upper	62	43	0.1094	2,084	4.013	8,363
*	8A Lower	6461	575	0.1362	2,291	226.398	518,590
	8B	929	55	0.0589	178,065	0.999	177,886
	9	1117	51	0.1061	120,566	1.673	201,706
	10	0	0	0.0000	0	0	0
	11	302	52	0.1392	21,552	1.497	32,263
	12	614	94	0.0483	129,193	2.732	352,954
	13	300	36	0.0596	53,154	6.665	354,274
	14	306	52	0.1118	27,263	1.561	42,557
	15	9669	368	0.0690	1,617,565	3.030	4,901,223
	16	2147	269	0.1217	185,177	7.853	1,454,192
	17	7496	329	0.0657	1,309,041	2,763	3,616,881
	18	0	0	0.0000	0	0	0
	19	0	0	0.0000	0	0	0
	20	0	0	0.0000	0	0	0
*	21	2228	912	0.0730	6,820	31.721	216,329
	22	4036	630	0.0590	692,746	1.421	984,392
	23	0	0	0.0000	0	0	0
	24	0	0	0.0000	0	0	0
	25	0	0	0.0000	0	0	0
	26	134	34	0.0264	45,455	7.752	352,364
TOTAL					5,229,984		16,142,035

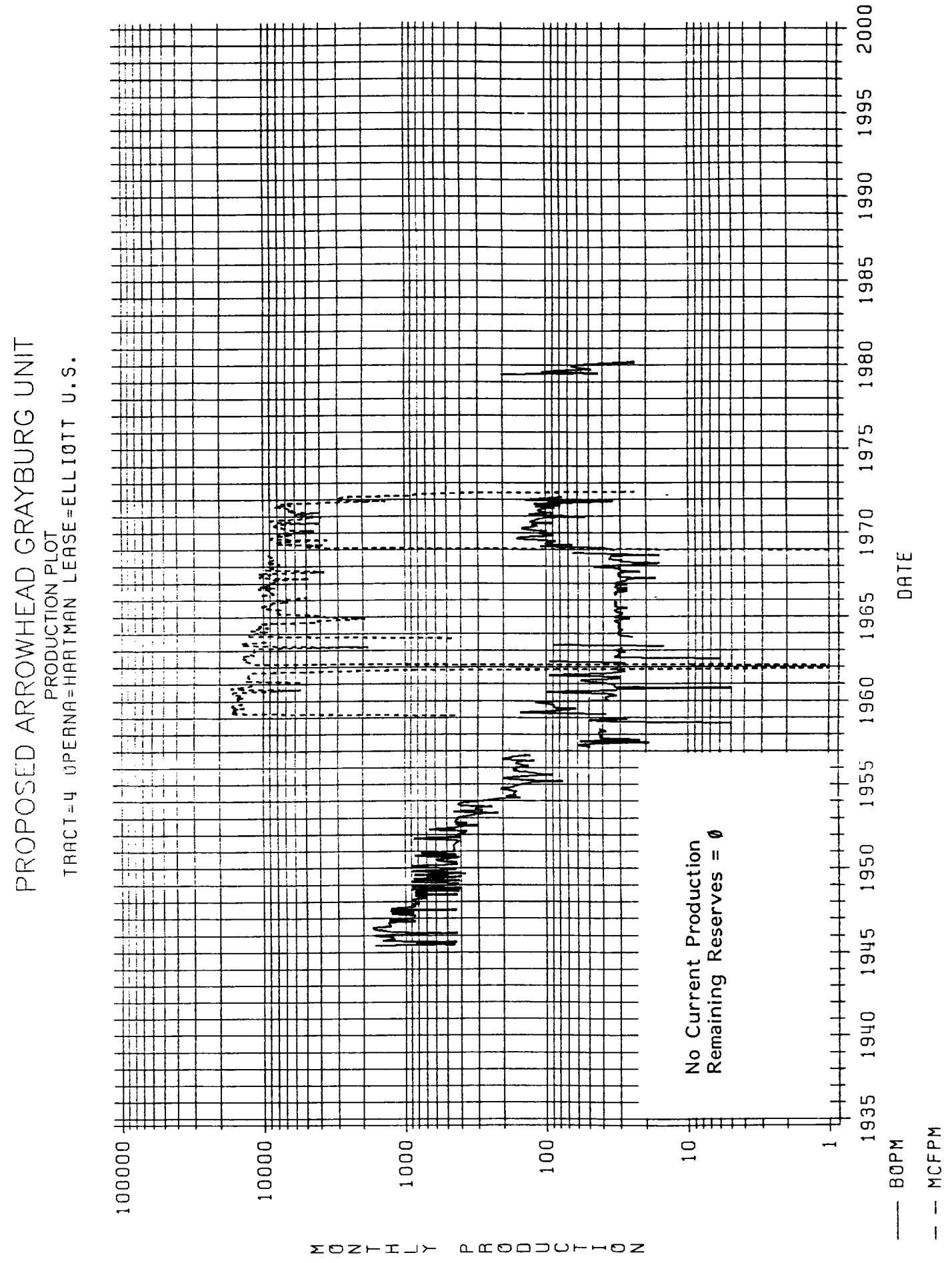
* Denotes reserves based on gas decline.

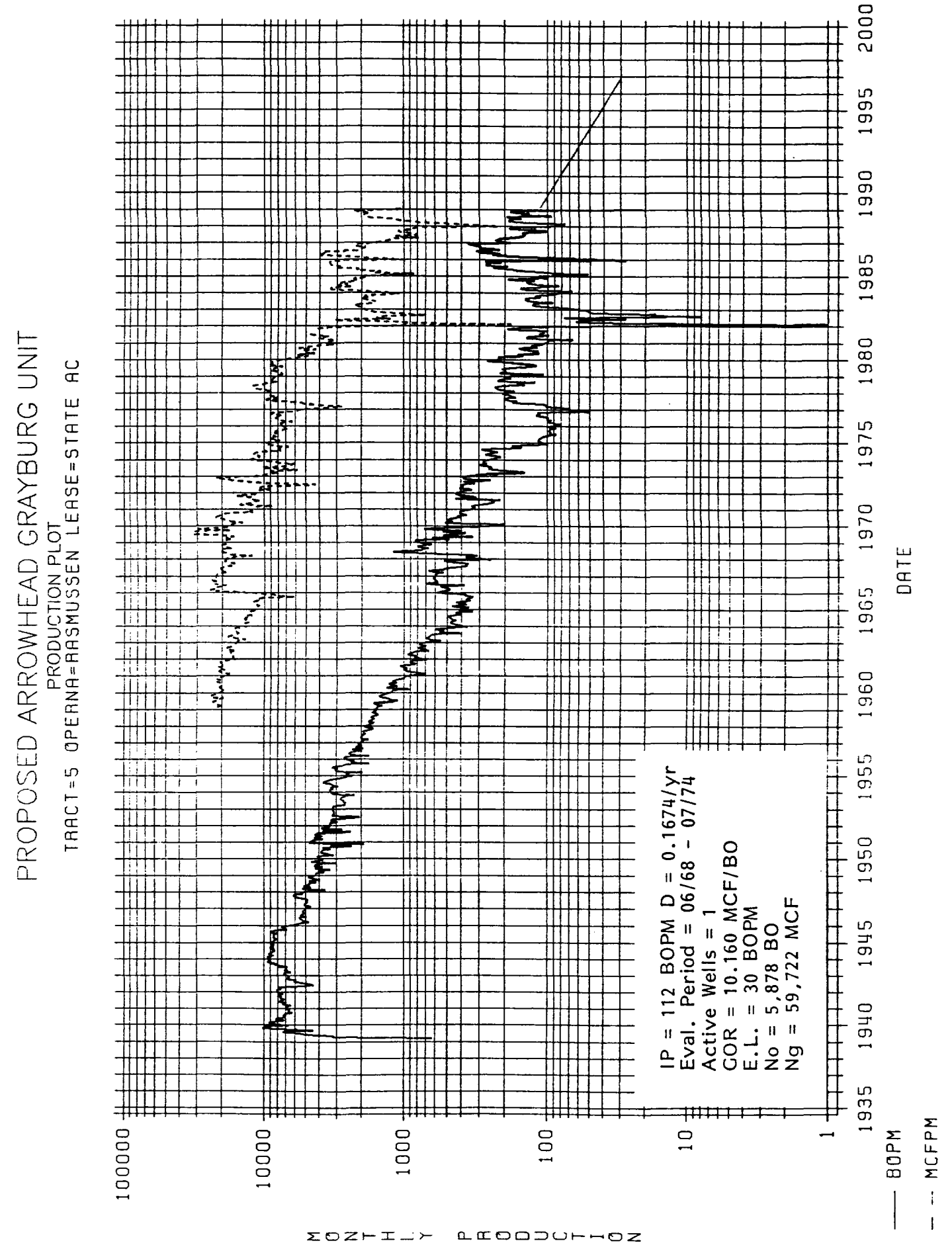

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=UNIT TOTAL
Decline Factor = 0.0643 / yr
Effective Decline = 6.23% / yr
MONTHLY PRODUCTION
1000000
100000
10000
1000
100
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

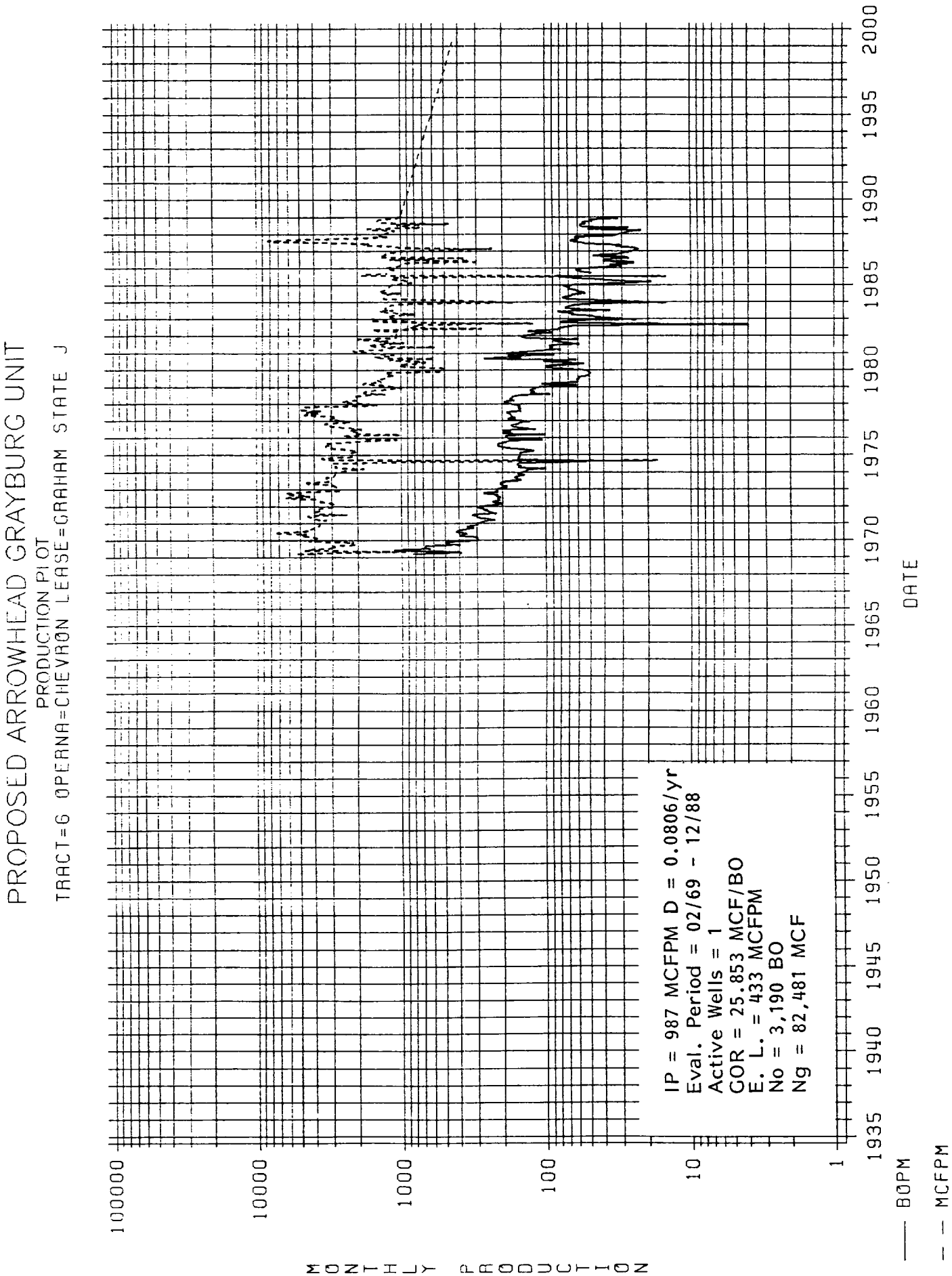

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=1 OPERNA=HARTMAN LEASE=RUBY CROSBY
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
No Current Production
Remaining Reserves = 0
BOPM
MCFPM

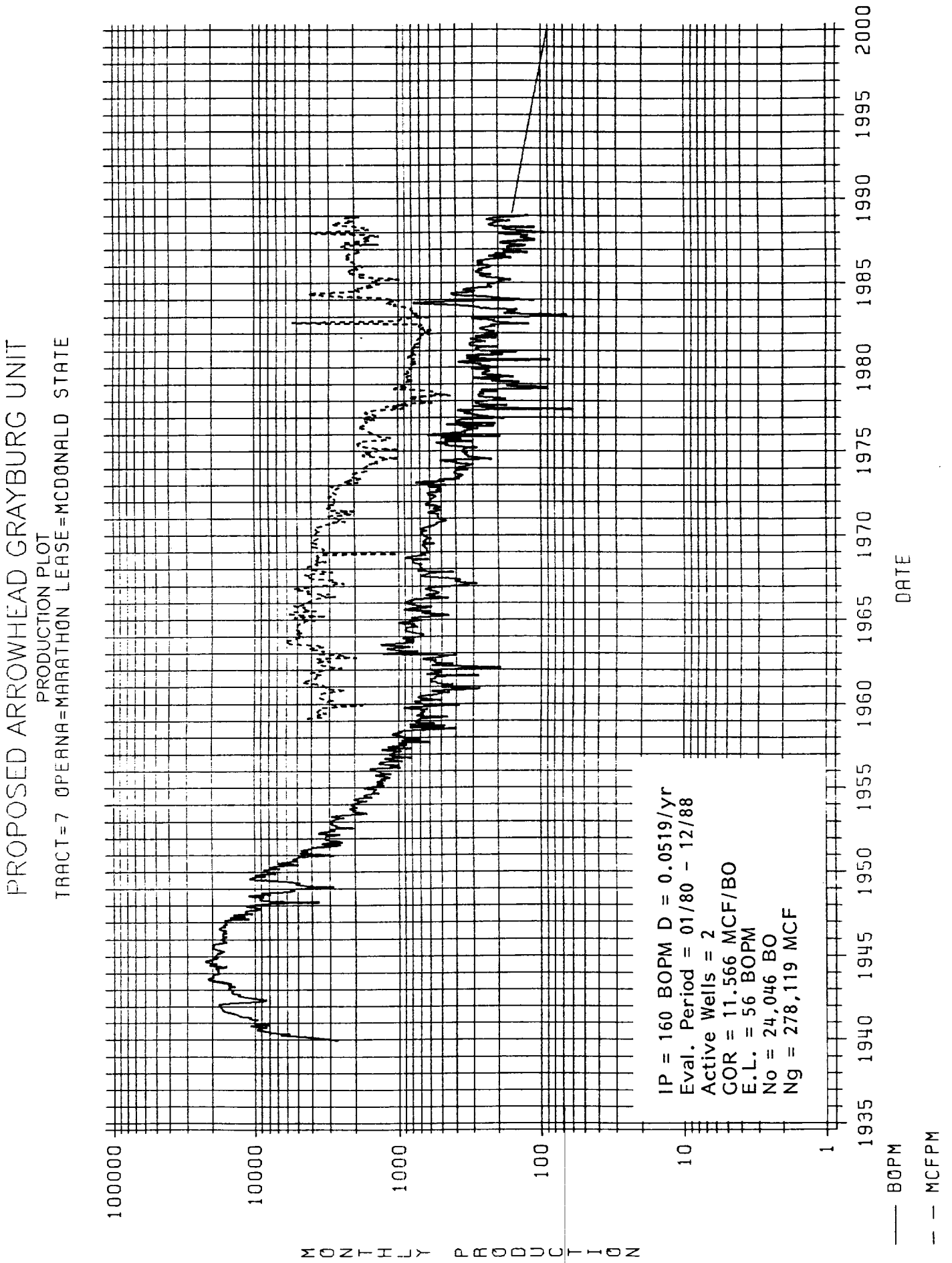

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=2 OPERNA=CONOCO LEASE=LOCKHART B FED
IP = 4160 BOPM D = 0.0630/yr
Eval. Periods = 01/59 - 01/73
Active Wells = 5
COR = 3.223 MCF/BO
E.L. = 227 BOPM
No = 749,143 BO
Ng = 2,414,487 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

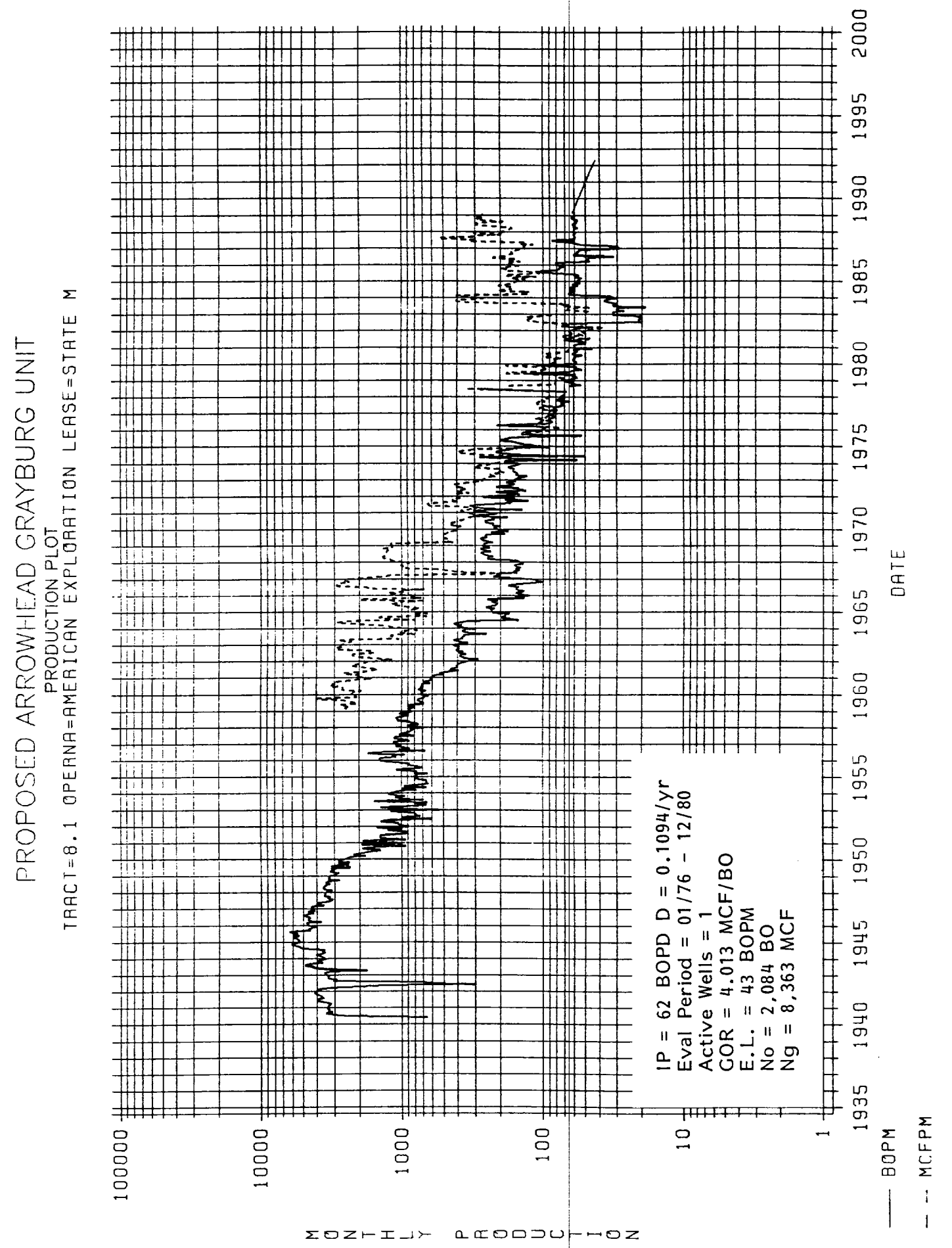

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=3 OPERNA=MARATHON LEASE=SAUNDERS
IP = 647 BOPM D = 0.1258/yr
Eval. Period = 01/83 - 12/86
Active Wells = 1
GOR = 1.643 MCF/BO
E.L. = 52 BOPM
No = 56,757 BO
Ng = 93,251 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

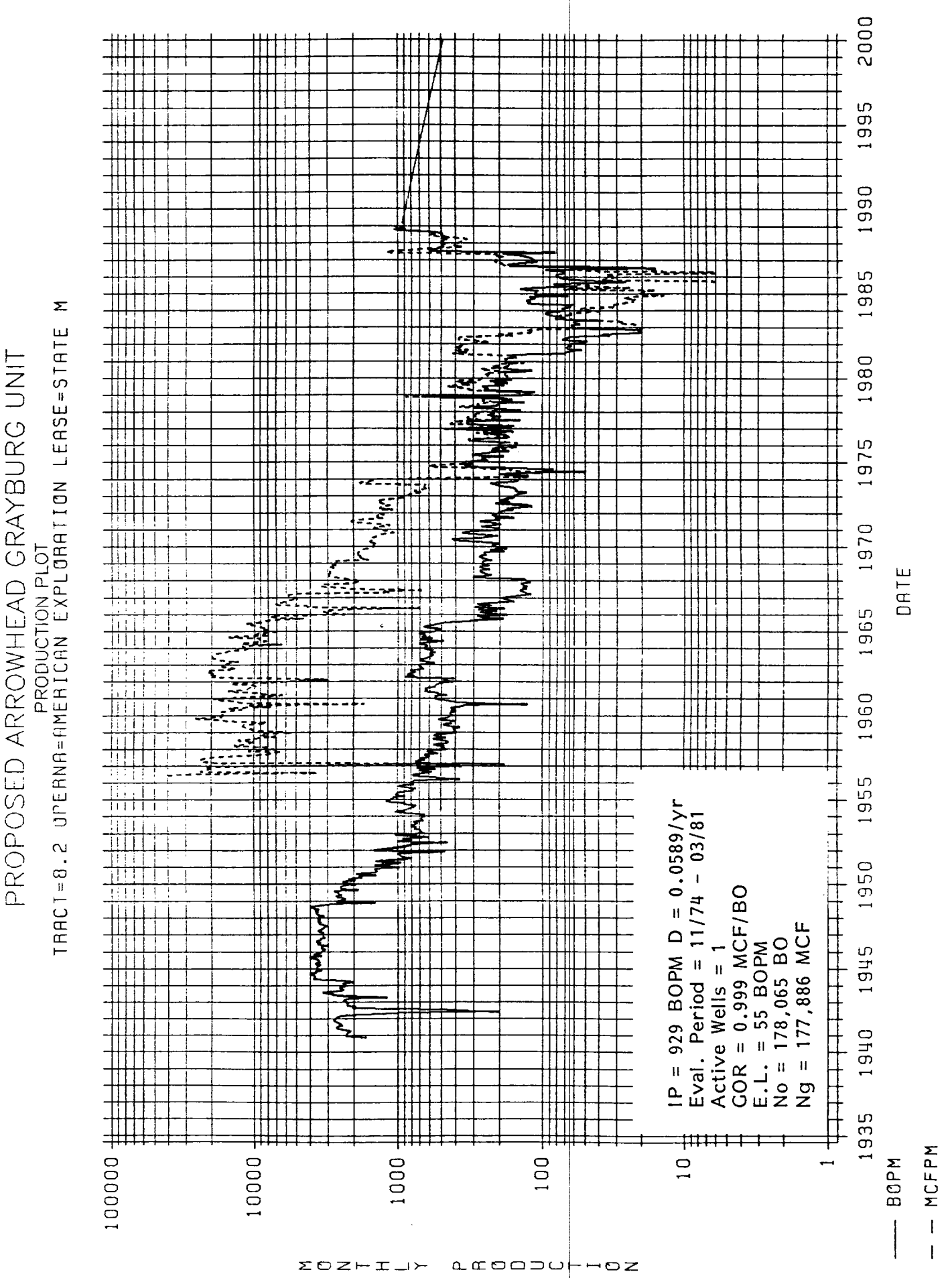

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=4 OPERNA=HARTMAN LEASE=ELLIOTT U.S.
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
No Current Production
Remaining Reserves = 0
BOPM
MCFPM

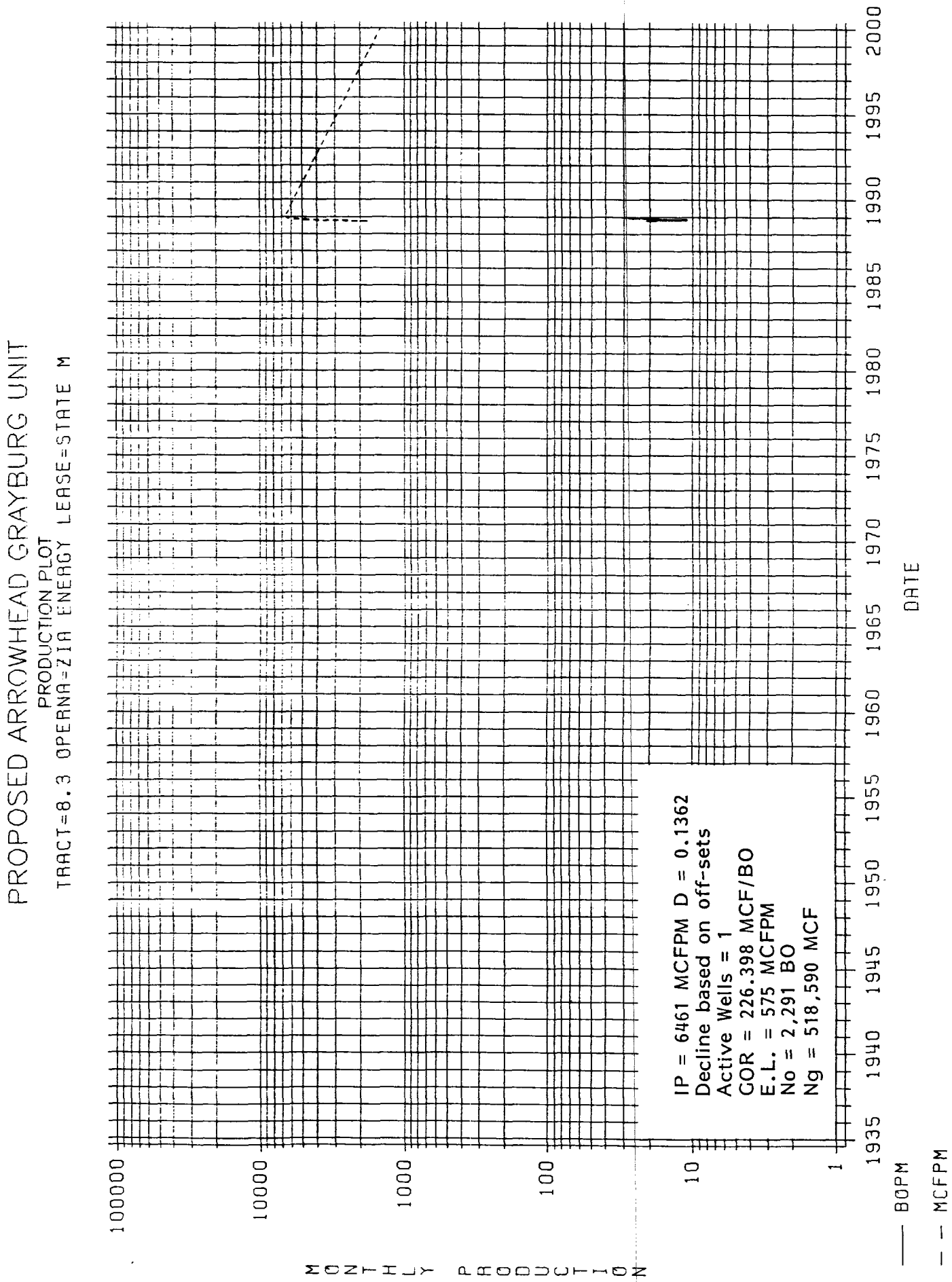

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=5 OPERNA=RASMUSSEN LEASE=STATE AC
IP = 112 BOPM D = 0.1674/yr
Eval. Period = 06/68 - 07/74
Active Wells = 1
COR = 10.160 MCF/BO
E.L. = 30 BOPM
No = 5,878 BO
Ng = 59,722 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

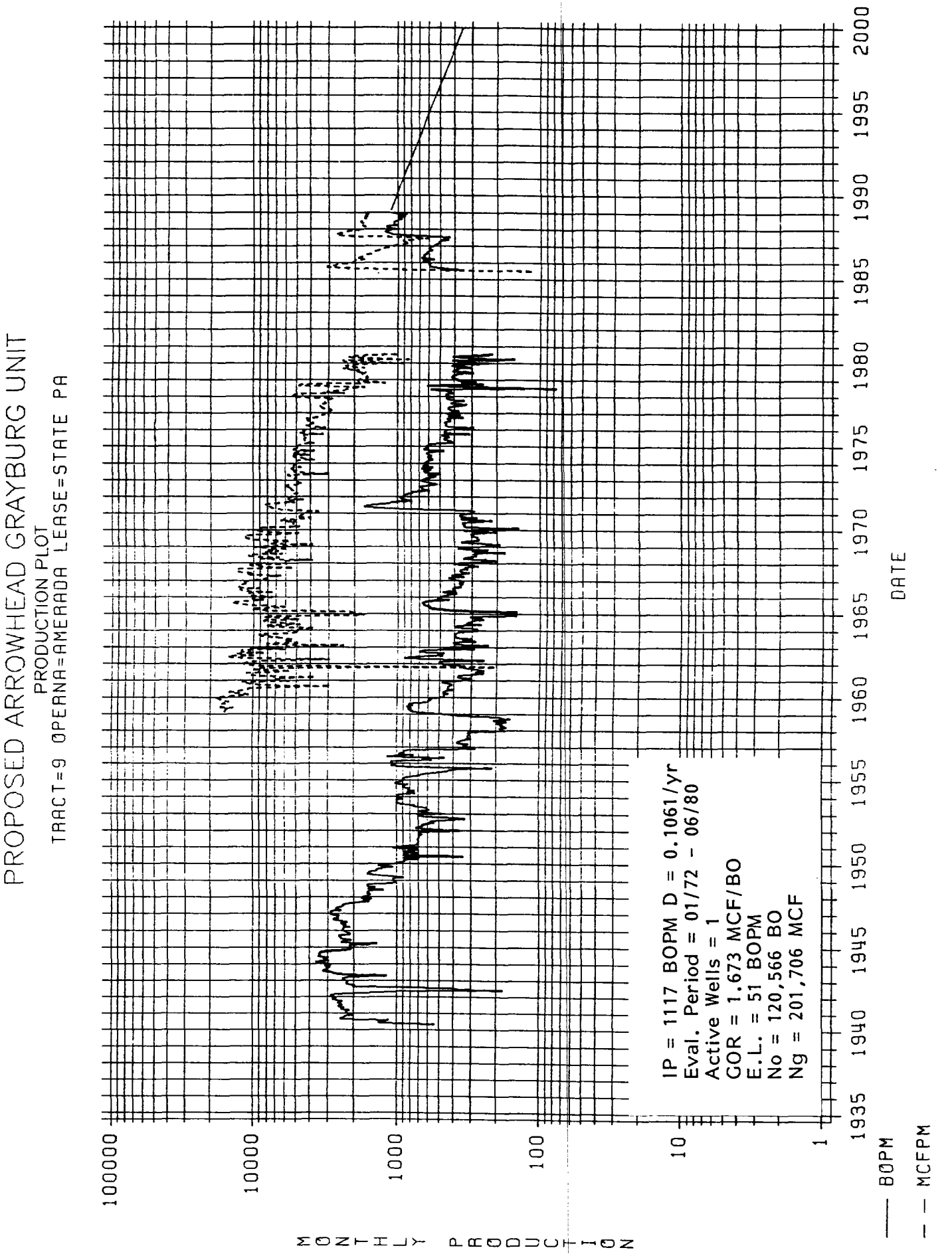

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PILOT
TRACT=6 OPERNA=CHEVRON LEASE=GRAHAM STATE J
IP = 987 MCFPM D = 0.0806/yr
Eval. Period = 02/69 - 12/88
Active Wells = 1
GOR = 25.853 MCF/BO
E. L. = 433 MCFPM
No = 3,190 BO
Ng = 82,481 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

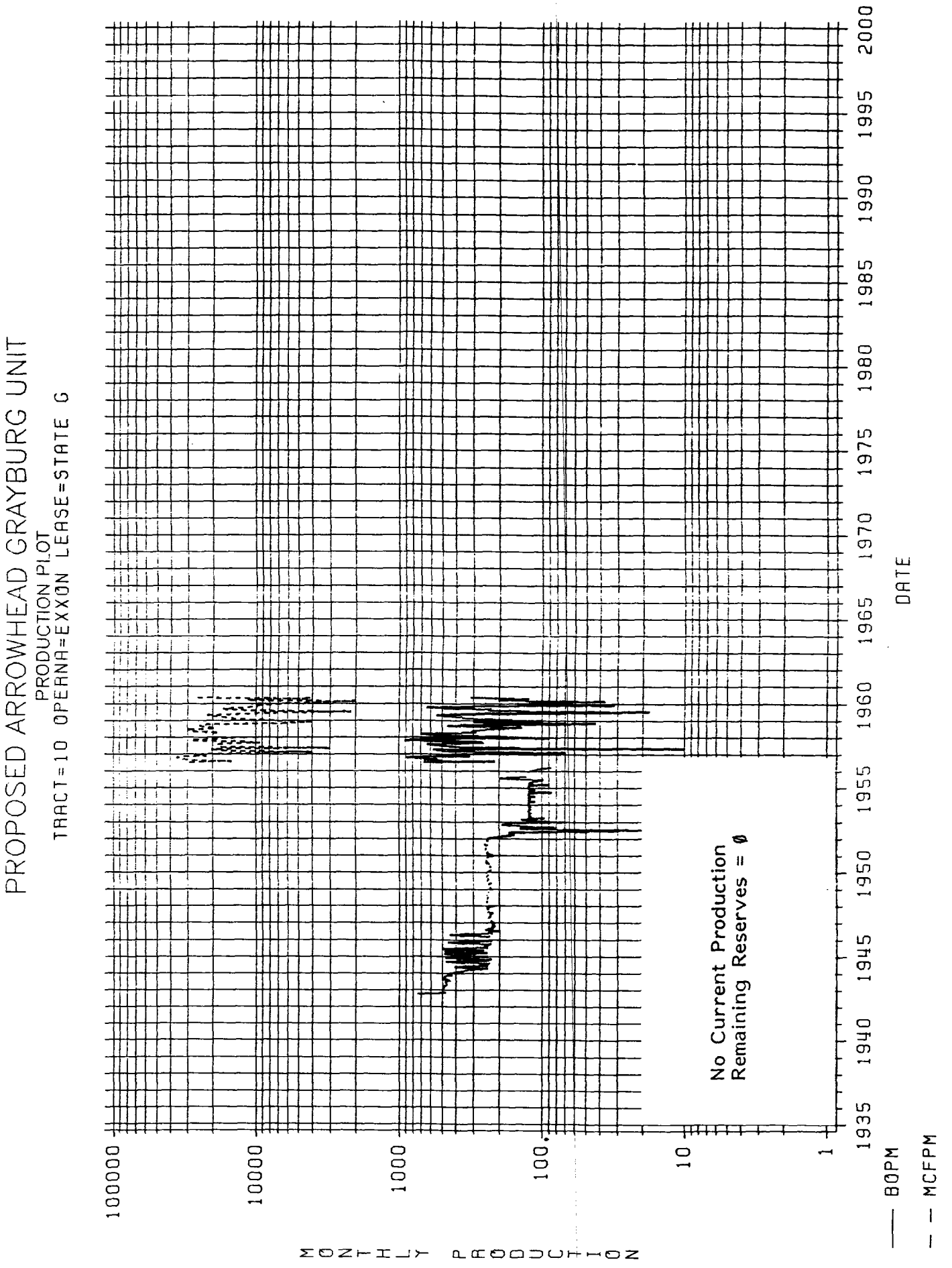

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=7 OPERNA=MARATHON LEASE=MCDONALD STATE
IP = 160 BOPM D = 0.0519/yr
Eval. Period = 01/80 - 12/88
Active Wells = 2
COR = 11.566 MCF/BO
E.L. = 56 BOPM
No = 24,046 BO
Ng = 278,119 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

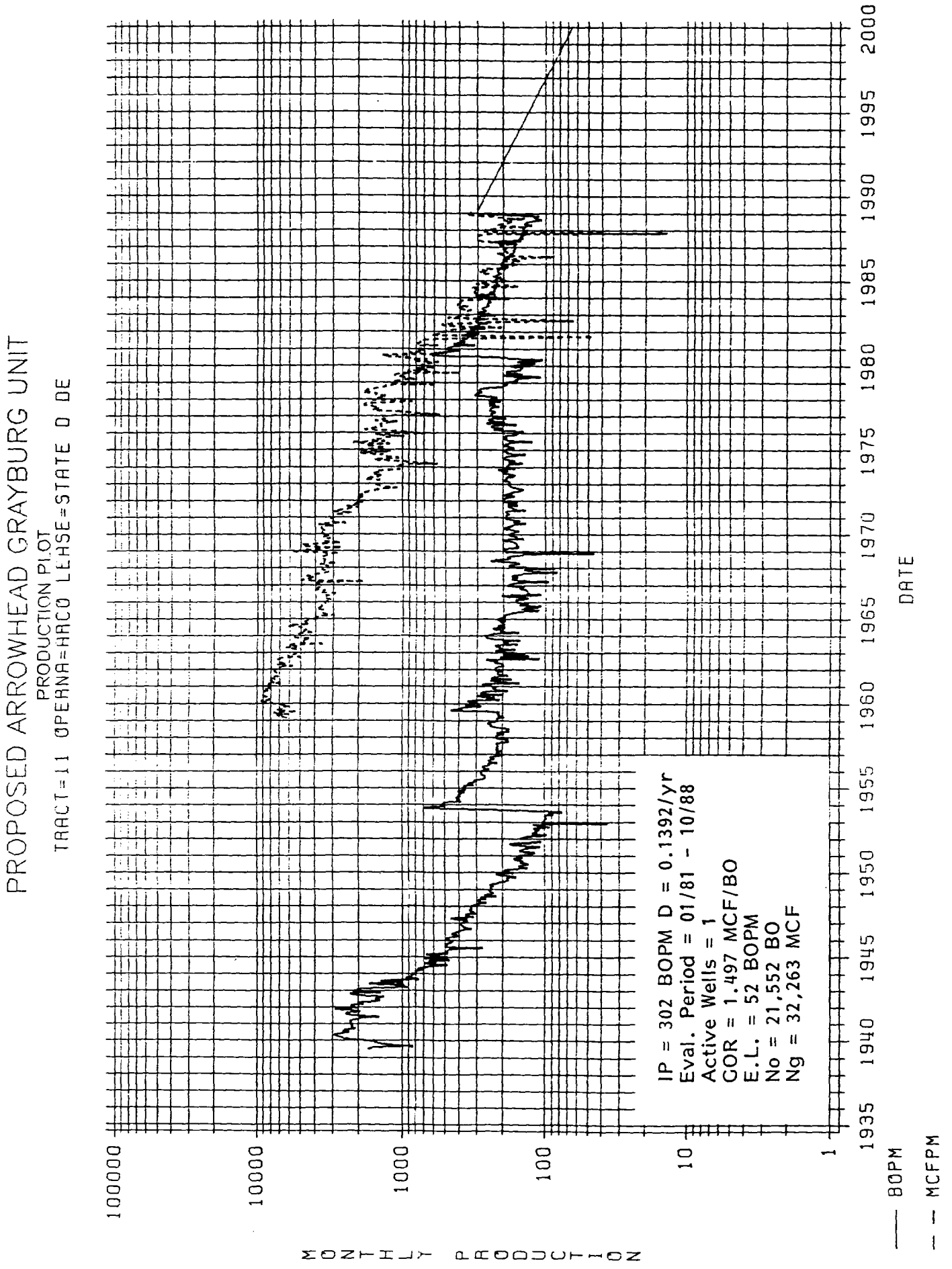

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=8.1 OPERNA=AMERICAN EXPLORATION LEASE=STATE M
IP = 62 BOPD D = 0.1094/yr
Eval Period = 01/76 - 12/80
Active Wells = 1
GOR = 4.013 MCF/BO
E.L. = 43 BOPM
No = 2,084 BO
Ng = 8,363 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

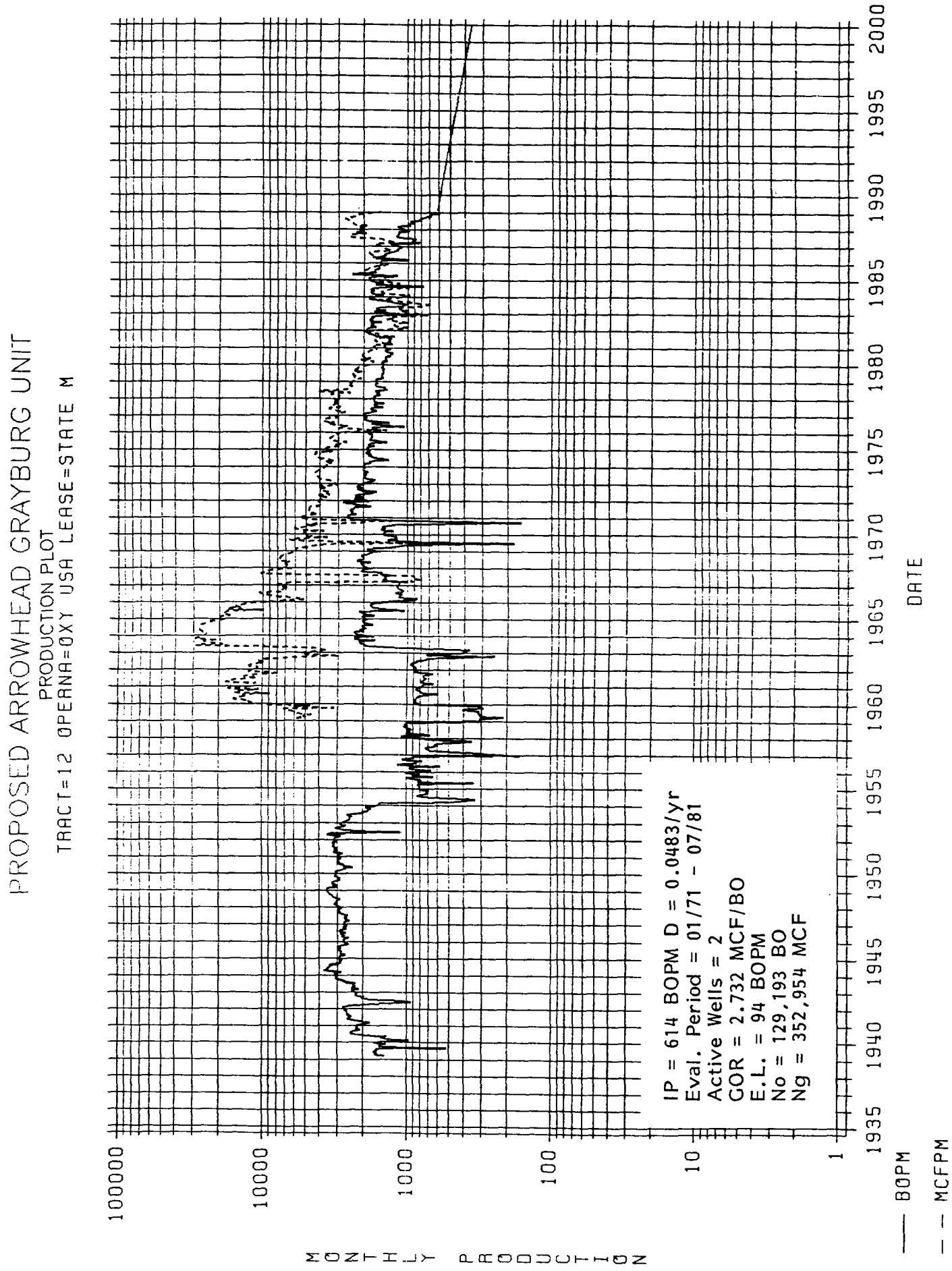

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=8.2 UPERNA=AMERICAN EXPLORATION LEASE=STATE M
IP = 929 BOPM D = 0.0589/yr
Eval. Period = 11/74 - 03/81
Active Wells = 1
COR = 0.999 MCF/BO
E.L. = 55 BOPM
No = 178,065 BO
Ng = 177,886 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

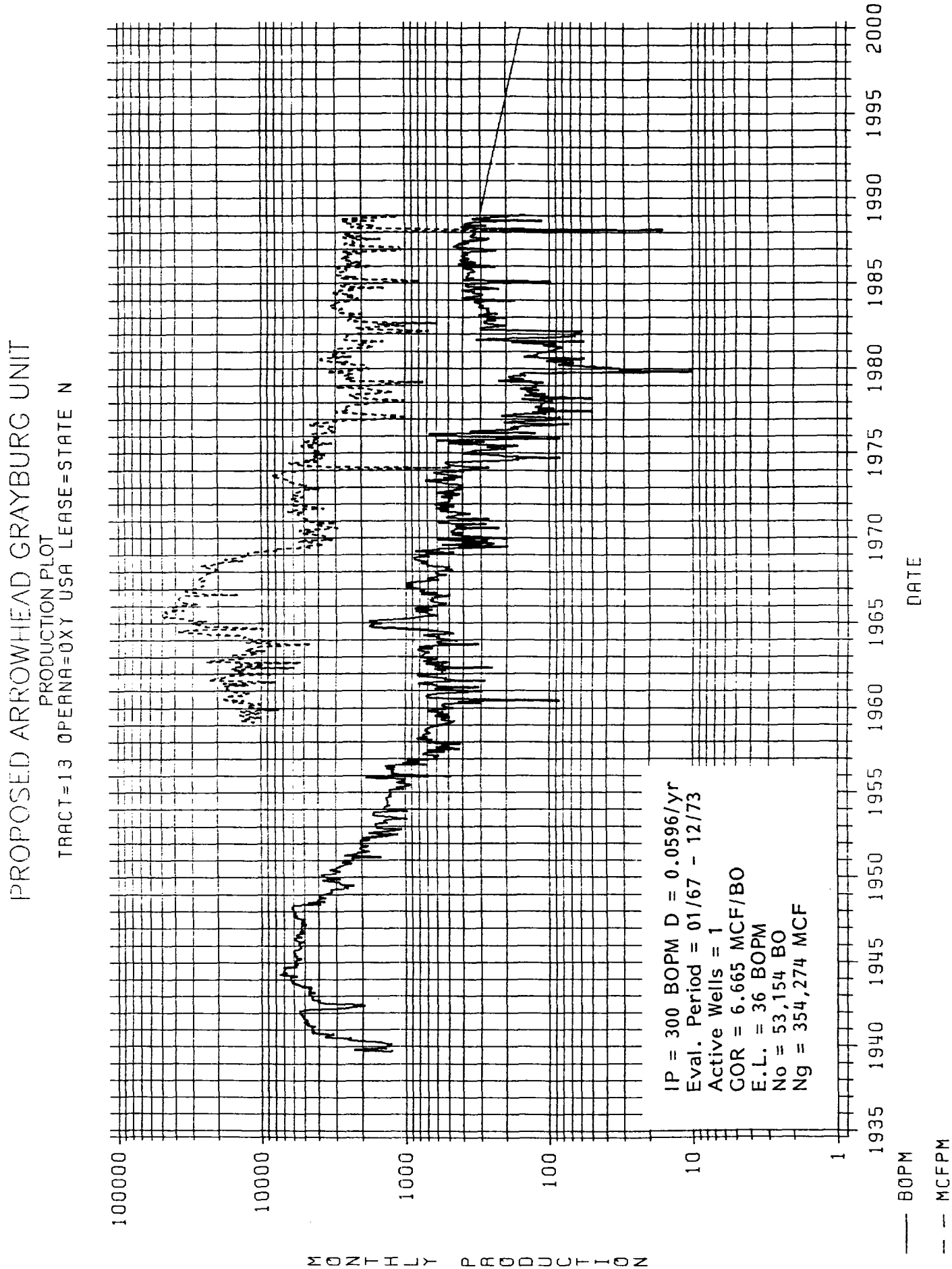

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=8.3 OPERNA=ZIA ENERGY LEASE=STATE M
IP = 6461 MCFPM D = 0.1362
Decline based on off-sets
Active Wells = 1
GOR = 226.398 MCF/BO
E.L. = 575 MCFPM
No = 2,291 BO
Ng = 518,590 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

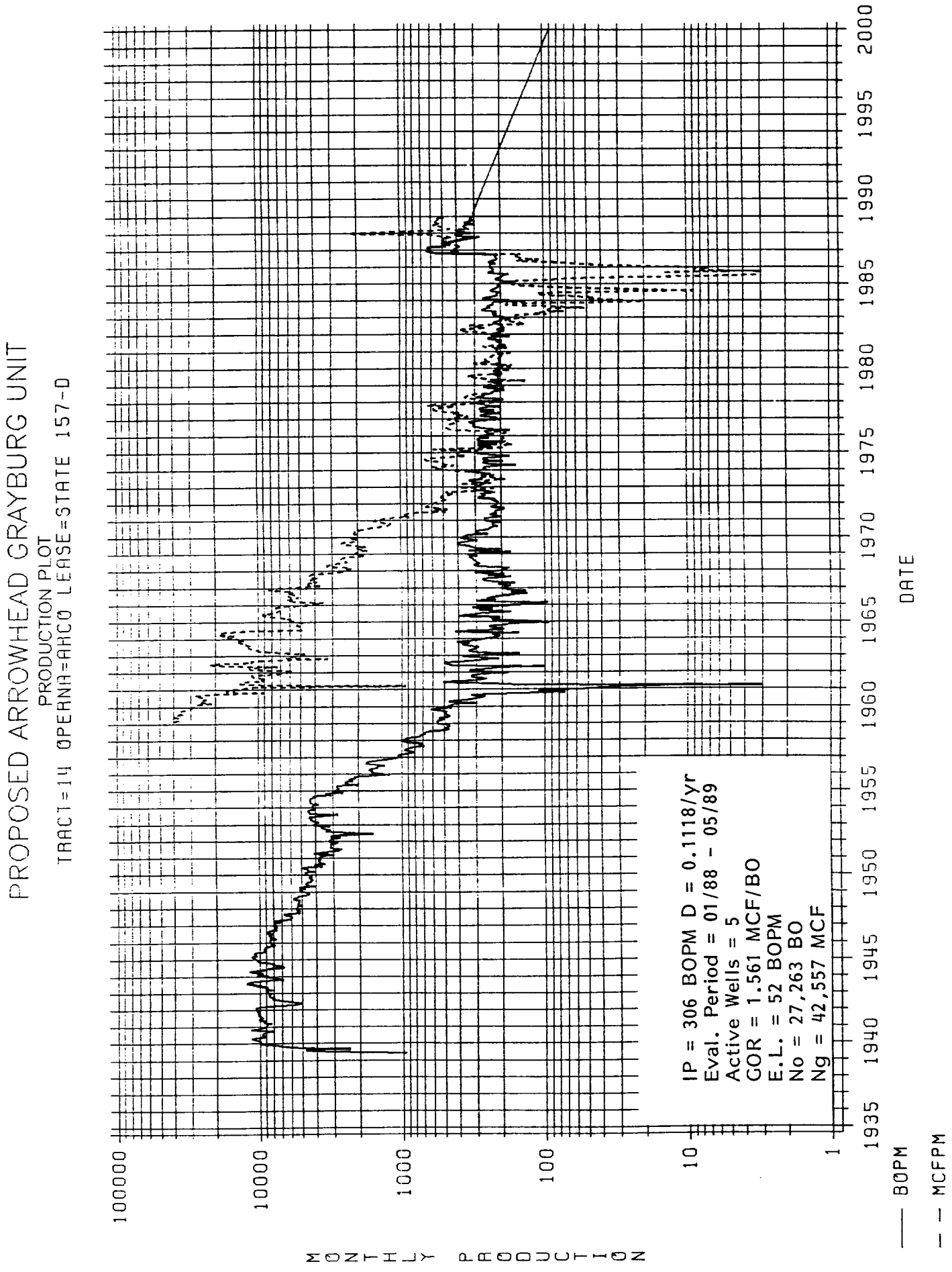

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=9 OPERNA=AMERADA LEASE=STATE PA
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
IP = 1117 BOPM D = 0.1061/yr
Eval. Period = 01/72 - 06/80
Active Wells = 1
GOR = 1,673 MCF/BO
E.L. = 51 BOPM
No = 120,566 BO
Ng = 201,706 MCF
BOPM
MCFPM

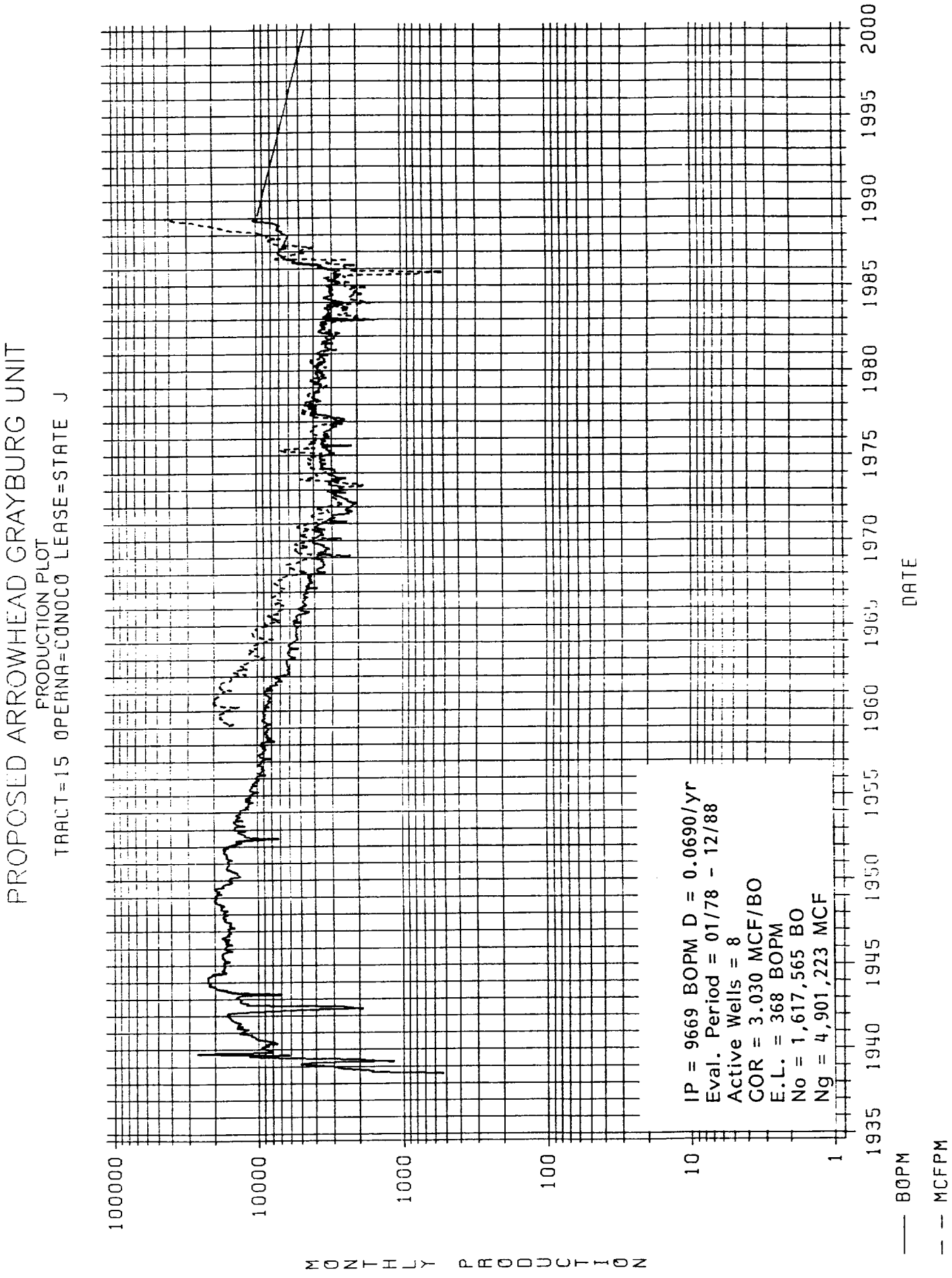

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=10 OPERNA=EXXON LEASE=STATE G
No Current Production
Remaining Reserves = 0
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

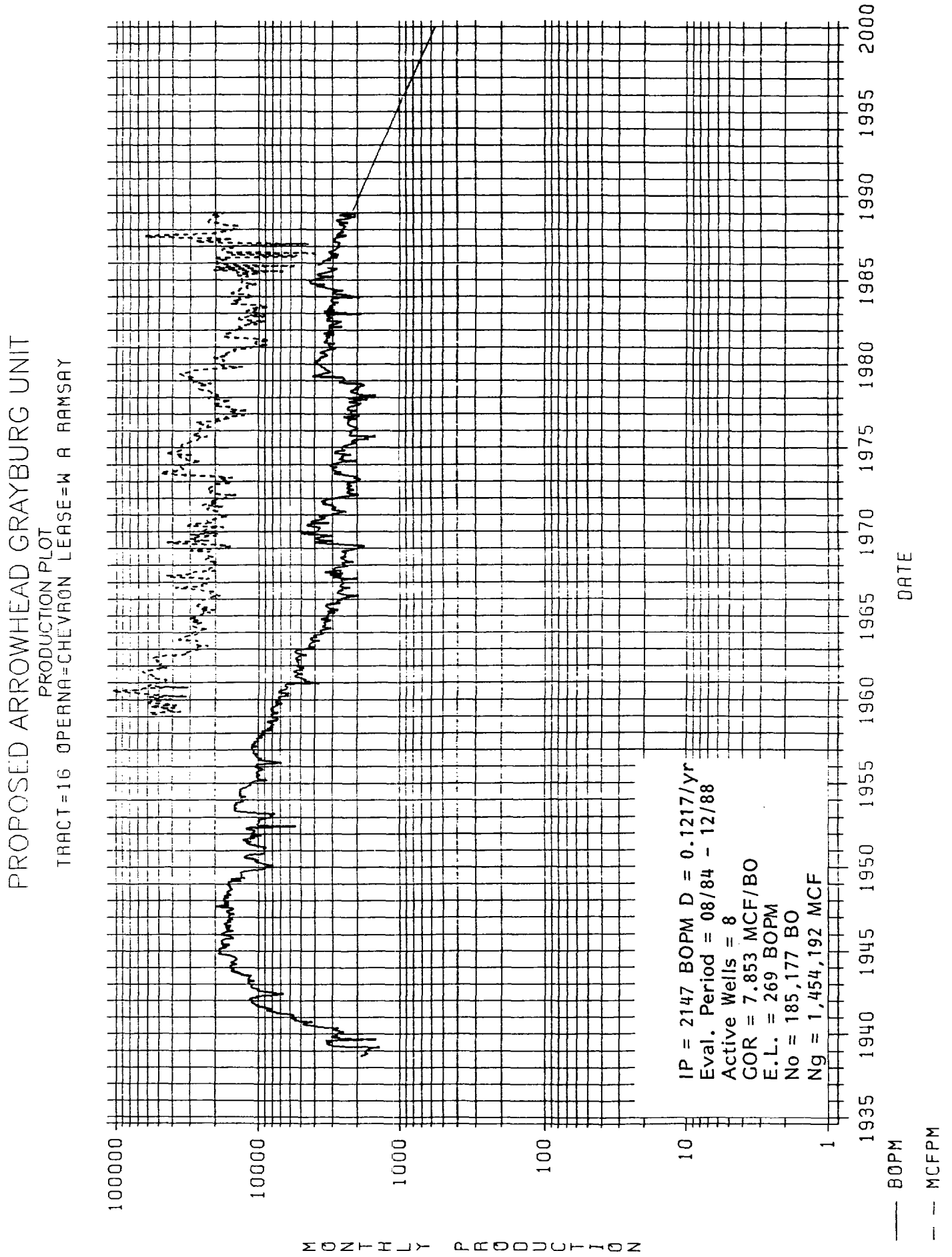

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=11 OPERNA=HACO LEHSE=STATE D DE
IP = 302 BOPM D = 0.1392/yr
Eval. Period = 01/81 - 10/88
Active Wells = 1
COR = 1.497 MCF/BO
E.L. = 52 BOPM
No = 21,552 BO
Ng = 32,263 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

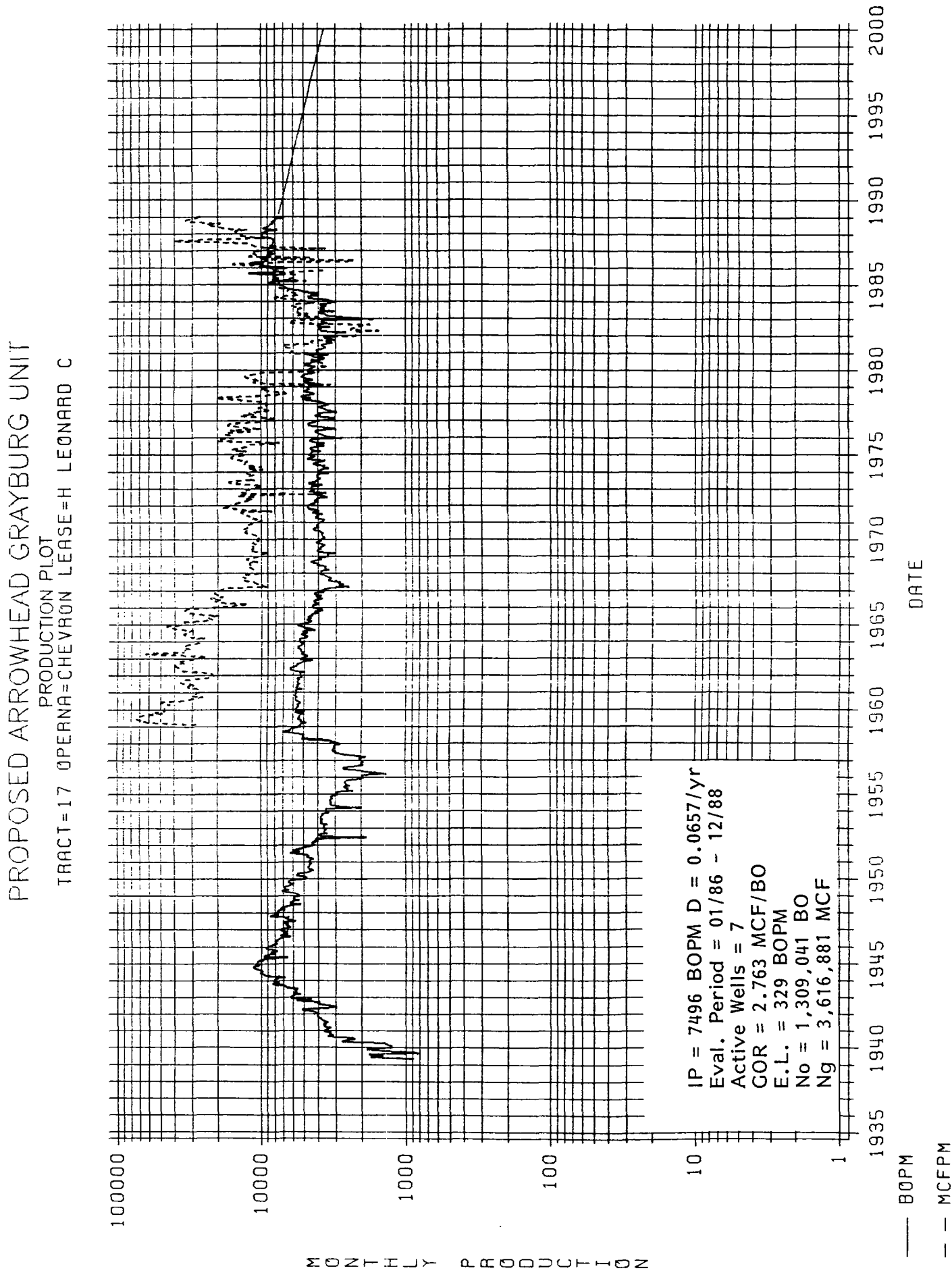

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=12 OPERNA=0XY USA LEASE=STATE M
IP = 614 BOPM D = 0.0483/yr
Eval. Period = 01/71 - 07/81
Active Wells = 2
GOR = 2.732 MCF/BO
E.L. = 94 BOPM
No = 129,193 BO
Ng = 352,954 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

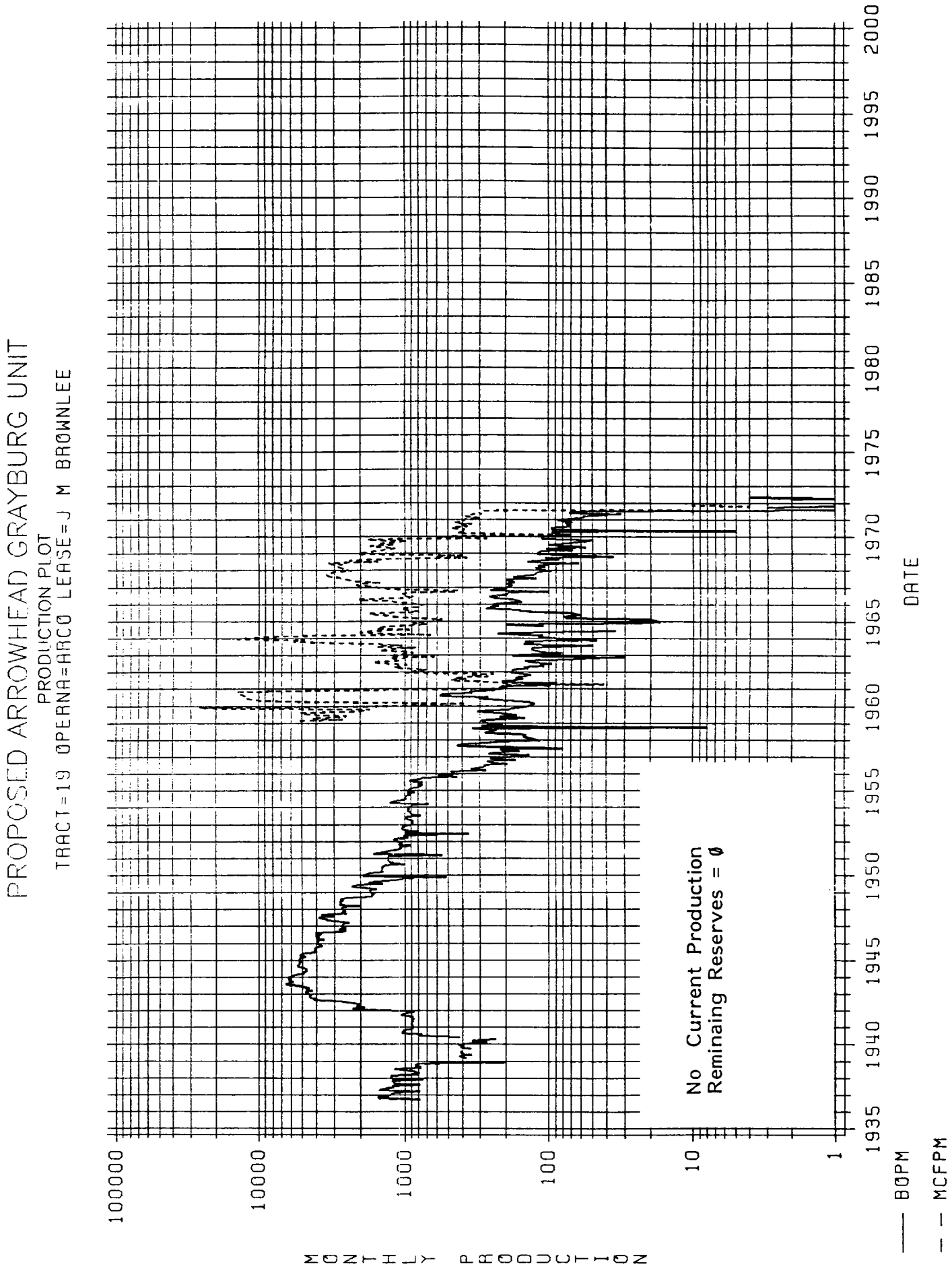

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=13 OPERNA=OXY USA LEASE=STATE N
IP = 300 BOPM D = 0.0596/yr
Eval. Period = 01/67 - 12/73
Active Wells = 1
COR = 6.665 MCF/BO
E.L. = 36 BOPM
No = 53,154 BO
Ng = 354,274 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

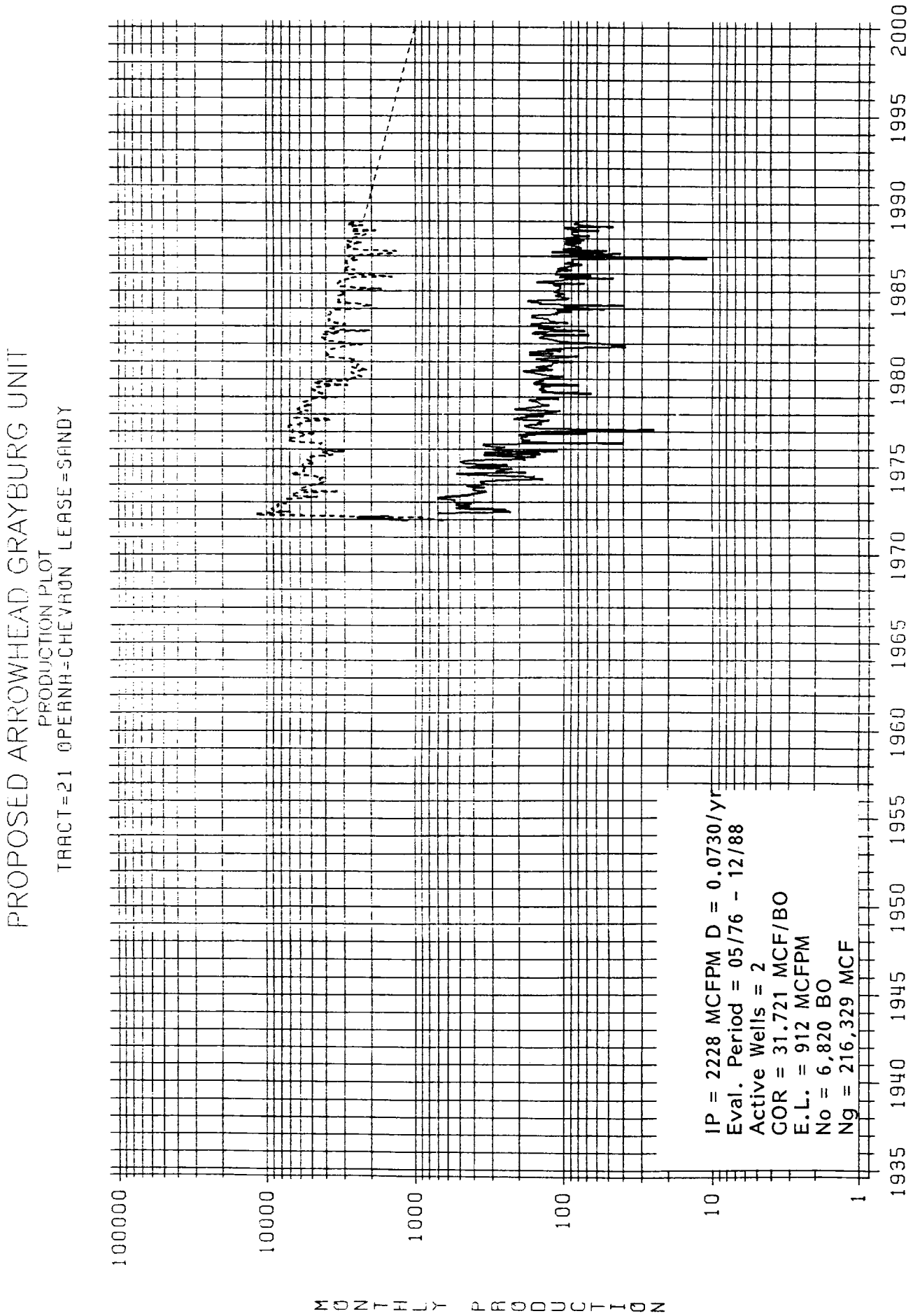

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=14 OPERN=ARCO LEASE=STATE 157-D
IP = 306 BOPM D = 0.1118/yr
Eval. Period = 01/88 - 05/89
Active Wells = 5
GOR = 1.561 MCF/BO
E.L. = 52 BOPM
No = 27,263 BO
Ng = 42,557 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

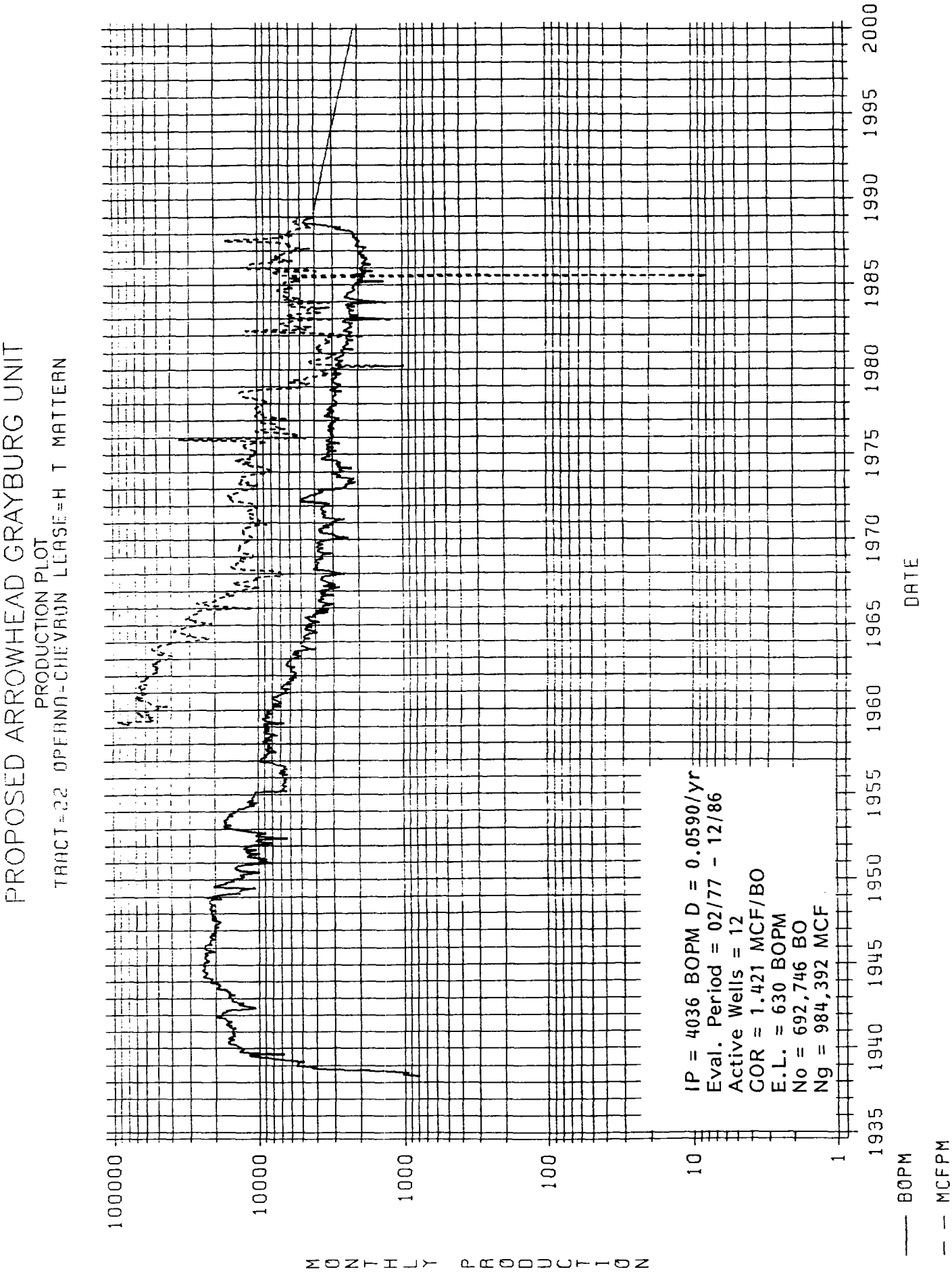

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=15 OPERNA=CONOCO LEASE=STATE J
IP = 9669 BOPM D = 0.0690/yr
Eval. Period = 01/78 - 12/88
Active Wells = 8
COR = 3.030 MCF/BO
E.L. = 368 BOPM
No = 1,617,565 BO
Ng = 4,901,223 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

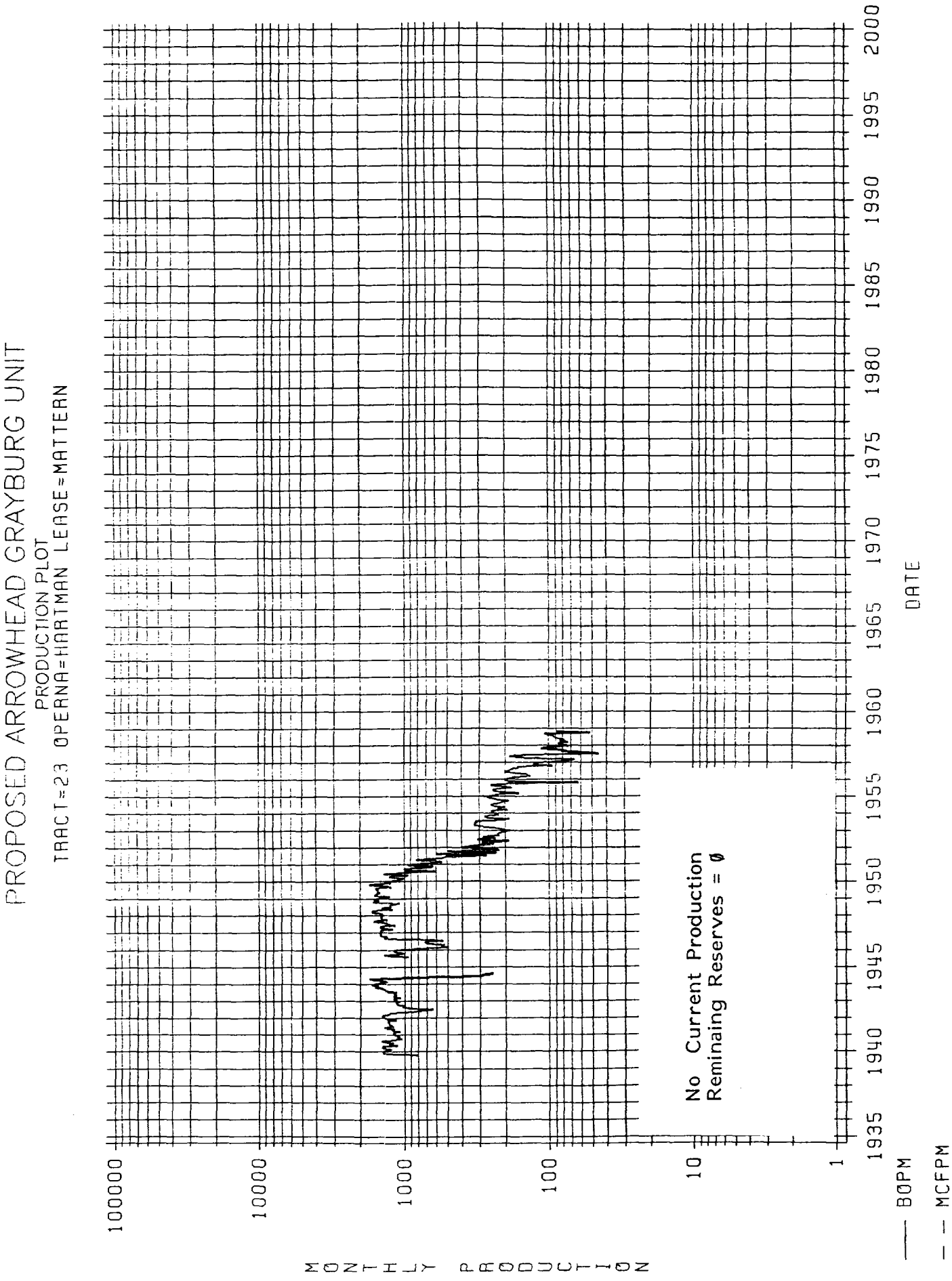

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=16 OPERN=CHEVRON LEASE=W A RAMSAY
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
IP = 2147 BOPM D = 0.1217/yr
Eval. Period = 08/84 - 12/88
Active Wells = 8
COR = 7.853 MCF/BO
E.L. = 269 BOPM
No = 185,177 BO
Ng = 1,454,192 MCF
BOPM
MCFPM

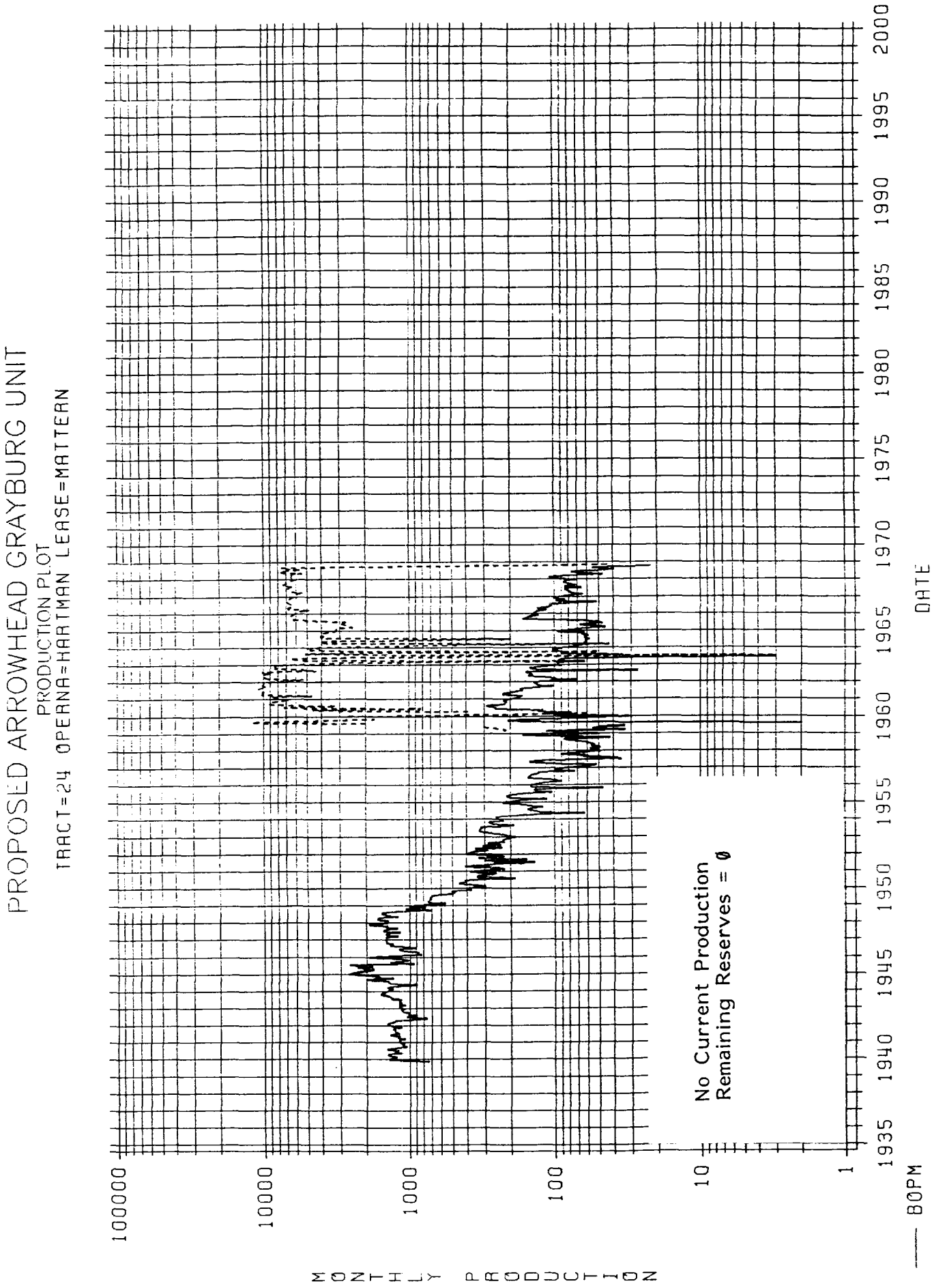

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=17 OPERNA=CHEVRON LEASE=H LEONARD C
IP = 7496 BOPM D = 0.0657/yr
Eval. Period = 01/86 - 12/88
Active Wells = 7
COR = 2.763 MCF/BO
E.L. = 329 BOPM
No = 1,309,041 BO
Ng = 3,616,881 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

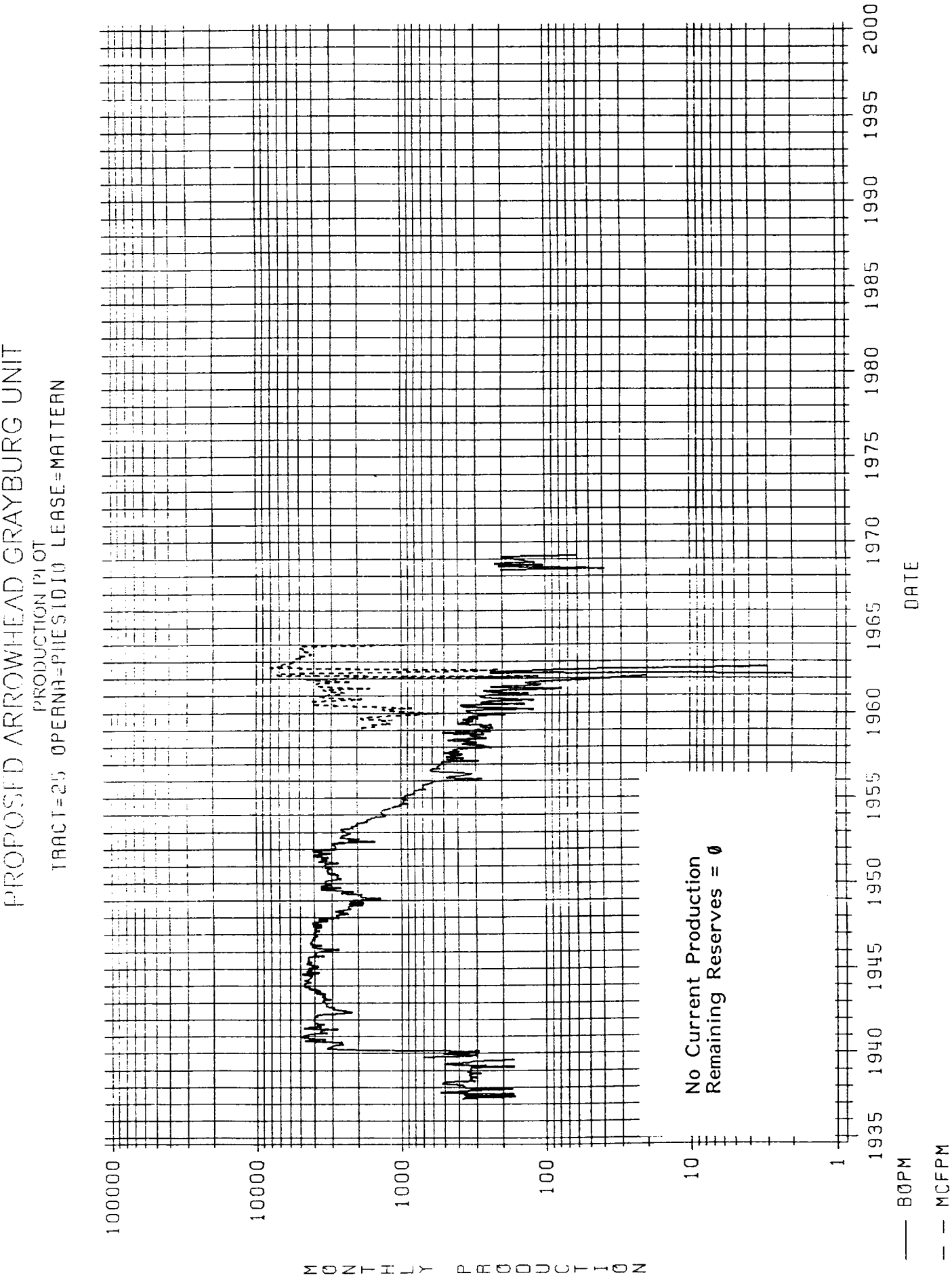

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=19 OPERNA=ARCO LEASE=J M BROWNLEE
No Current Production
Reminaing Reserves = 0
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

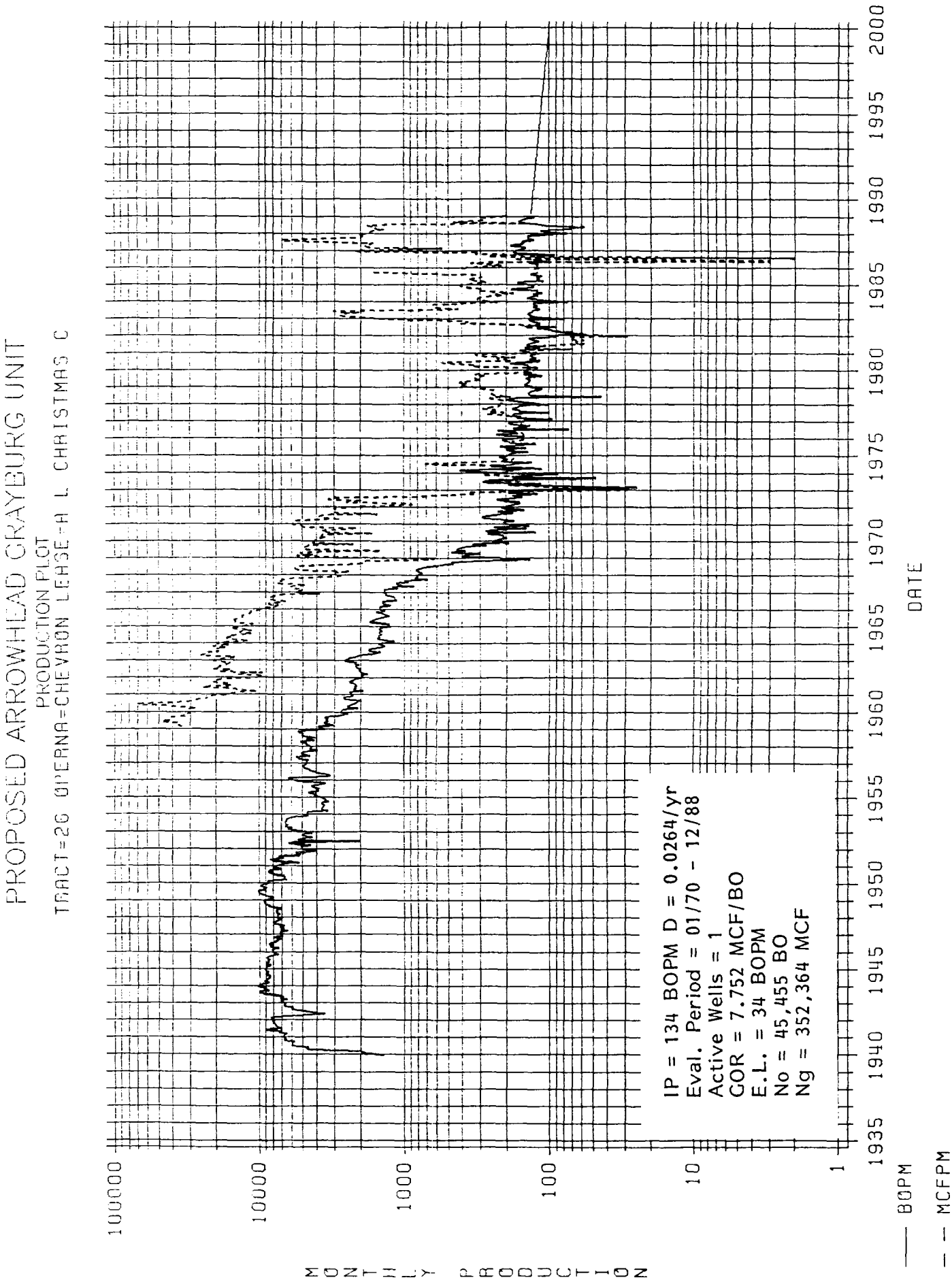

PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=21 OPERN=CHEVRON LEASE=SANDY
IP = 2228 MCFPM D = 0.0730/yr
Eval. Period = 05/76 - 12/88
Active Wells = 2
GOR = 31,721 MCF/BO
E.L. = 912 MCFPM
No = 6,820 BO
Ng = 216,329 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM


PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=22 OPERNO-CHEVRON LEASE=H T MATTERN
IP = 4036 BOPM D = 0.0590/yr
Eval. Period = 02/77 - 12/86
Active Wells = 12
COR = 1.421 MCF/BO
E.L. = 630 BOPM
No = 692,746 BO
Ng = 984,392 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM


PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=23 OPERNA=HARTMAN LEASE=MATTERN
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
No Current Production
Reminaing Reserves = Ø
BOPM
MCFPM


PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=24 OPERNA=HARTMAN LEASE=MATTERN
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
No Current Production
Remaining Reserves = 0
BOPM
MCFPM


PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=25 OPERATOR=PIESIDIO LEASE=MATTERN
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
No Current Production
Remaining Reserves = 0
BOPM
MCFPM


PROPOSED ARROWHEAD GRAYBURG UNIT
PRODUCTION PLOT
TRACT=26 OPERNA=CHEVRON LEASE-H L CHRISTMAS C
IP = 134 BOPM D = 0.0264/yr
Eval. Period = 01/70 - 12/88
Active Wells = 1
GOR = 7.752 MCF/BO
E.L. = 34 BOPM
No = 45,455 BO
Ng = 352,364 MCF
MONTHLY PRODUCTION
100000
10000
1000
100
10
1
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
DATE
BOPM
MCFPM

Tract No. 1

Operator: Chevron U.S.A.

Lease: Ruby Crosby

Description: NE4 NW4 & NW4 NE4
Sec. 18, T-22-S, R-37-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	3435' to 4000'	Chevron U.S.A.*	35.546875%
		James A. Davidson	12.500000%
		Ruth Sutton	0.390625%
		Larry Nermyr	0.781250%
		James E. & Laveta T. Burr	0.390625%
		Jack Fletcher	0.390625%
		Dasco Energy	14.166670%
		Para Mia	12.717370%
		Jack Mussett	7.500000%
		Burton Veteto	1.449300%
		Louise C. Summers	14.166700%
			100.000040%
	4000'-6800'+	Para Mia	27.934800%
		Burton Veteto	2.898600%
		Jack Mussett	7.500000%
		Dasco Energy	30.833300%
		Louise C. Summers	30.833300%
			100.000000%

Cumulative Oil Production (12-31-87)	465,366 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	465,366 BO

Comments: *Ownership limited to the proposed unitized interval only.

Tract No. 2

Operator: Conoco Inc.

Lease: Lockhart B 1 Federal

Description: S2 N2 & SE4,
Sec. 1, T-22-S, R-36-E,
Lea County, NM

Acreage: 320 acres

WI Owners:	
Conoco Inc.	25%
Chevron U.S.A.	25%
Amoco Production Co.	25%
ARCO Oil & Gas	25%
	100%

Cumulative Oil Production (12-31-87)	1,718,511 BO
Oil Production 1988	40,571 BO
Cumulative Oil Production (12-31-88)	1,759,082 BO

Tract No. 3

Operator: Marathon Oil Company

Lease: C. J. Saunders

Description: N2 NW4
Sec. 1, T-22-S, R-36-E,
Lea County, NM

Acreage: 80.24 acres

WI Owners:	Marathon Oil Company	100%

Cumulative Oil Production (12-31-87)	528,238 BO
Oil Production 1988	8,186 BO
Cumulative Oil Production	536,424 BO

Tract No. 4

Operator: Chevron U.S.A.

Lease: Elliott B 6

Description: W2 SW4
Sec. 6, T-22-S, R-37-E,
Lea County, NM

Acreage: 74.06 acres

WI Owners:

Surface to 3650'	Chevron U.S.A.*	44.43359375%
	James A. Davidson	15.62500000%
	Ruth Sutton	0.48828125%
	Larry Nermyr	0.97656250%
	James E. & Laveta T. Burr	0.48828125%
	Jack Fletcher	0.48828125%
	Presidio Oil Co.	25.00000000%
	Trust U/D Donaldson Brown	12.50000000%
		100.00000000%
3650' to 4000'	Chevron U.S.A.	44.43359375%
	James A. Davidson	15.62500000%
	Ruth Sutton	0.48828125%
	Larry Nermyr	0.97656250%
	James E. & Laveta T. Burr	0.48828125%
	Jack Fletcher	0.48828125%
	Para Mia	12.50000000%
	Dasco Energy	12.50000000%
	Louise C. Summers	12.50000000%
		100.00000000%
4000' to 6900'	Para Mia	27.934800%
	Burton Veteto	2.898600%
	Jack Mussett	7.500000%
	Dasco Energy	30.833300%
	Louise C. Summers	30.833300%
		100.000000%

Cumulative Oil Production (12-31-87)	86,986 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	86,986 BO

Comments: *Ownership limited to the proposed unitized interval only.

Tract No. 5

Operator: Hal J. Rasmussen Operating, Inc.

Lease: State A AC 2

Description: NE4 & NE4 NW4 & NE4 SE4
Sec. 11, T-22-S, R-36-E,
Lea County, NM

Acreage: 240 acres

WI Owners:		
	Hal J. Rasmussen	12.5%
	The Williams Partnership	87.5%
		100.0%

Cumulative Oil Production (12-31-87)	1,255,146 BO
Oil Production 1988	1,653 BO
Cumulative Oil Production (12-31-88)	1,256,799 BO

Tract No. 6

Operator: Chevron U.S.A.

Lease: Graham State (NCT-J)

Description: NW4 NE4
Sec. 25, T-21-S, R-36-E,
Lea County, NM

Acreage: 40 acres

WI Owners: Chevron U.S.A. 100%

Cumulative Oil Production (12-31-87)	34,585 BO
Oil Production 1988	517 BO
Cumulative Oil Production (12-31-88)	35,102 BO

Comments: Production classified as Penrose Skelly Grayburg.

Tract No. 7

Operator: Marathon Oil Company

Lease: McDonald State

Description: E2 & E2 NW4 & NW4 NW4 & NE4 SW4
Sec. 13, & NE4 NE4
Sec. 24, T-22-S, R-36-E,
Lea County, NM

Acreage: 520 acres

WI Owners: Marathon Oil Co. 100%

Cumulative Oil Production (12-31-87)	1,978,513 BO
Oil Production 1988	2,190 BO
Cumulative Oil Production (12-31-88)	1,980,703 BO

Tract No. 8a (Upper)

Operator: American Exploration Co.

Lease: New Mexico M State

Description: SE4
Sec. 18, T-22-S, R-37-E,
Lea County, NM

Acreage: 160 acres

WI Owners: Surface to the Top of the San Andres

American Exploration	100%

Cumulative Oil Production (12-31-87)	606,576 BO
Oil Production 1988	717 BO
Cumulative Oil Production (12-31-88)	607,293 BO

Comments: 'M' State No. 8 classified as Langlie Mattix.

Tract No. 8a (Lower)

Operator: Zia Energy

Lease: New Mexico M State

Description: SE4
Sec. 18, T-22-S, R-37-E,
Lea County, NM

Acreage: 160 acres

WI Owners: Below the Top of the San Andres

Zia Energy	100%

Cumulative Oil Production (12-31-87)	0 BO
Oil Production 1988	83 BO
Cumulative Oil Production (12-31-88)	83 BO

Comments: 'M' State No. 49 classified as Eunice, San Andres, Southwest

Tract No. 8b

Operator: American Exploration Co.

Lease: New Mexico M State

Description: N2 N2
Sec. 19, T-22-S, R-37-E,
Lea County, NM

Acreage: 156.99 acres

WI Owners: Surface to the Top of the San Andres

American Exploration	100%

Below the Top of the San Andres

Exxon	100%

Cumulative Oil Production (12-31-87)	494,726 BO
Oil Production 1988	7,811 BO
Cumulative Oil Production (12-31-88)	502,537 BO

Comments: Production classified as Arrowhead Grayburg and Langlie Mattix.

Tract No. 9

Operator: Amerada Hess Corp.

Lease: State PA

Description: E2 SW4
Sec. 18, T-22-S, R-37-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	Amerada Hess Corp.	100%

Cumulative Oil Production (12-31-87)	450,799 BO
Oil Production 1988	12,105 BO
Cumulative Oil Production (12-31-88)	462,904 BO

Tract No. 10

Operator: Exxon

Lease: New Mexico G State

Description: SE4 SE4
Sec. 26, T-21-S, R-36-E,
Lea County, NM

Acreage: 40 acres

WI Owners: Exxon 100%

Cumulative Oil Production (12-31-87)	49,446 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	49,446 BO

Tract No. 11

Operator: ARCO Oil & Gas

Lease: State D DE

Description: W2 SE4
Sec. 36, T-21-S, R-36-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	Surface to 4000'	ARCO Oil & Gas	100.000%
	Below 4000'	McBride Oil & Gas	24.000%
		Hanson-McBride Pet. Co.	10.000%
		Abby Corporation	25.000%
		Barbara Hannifin	16.000%
		ENRON	21.875%
		Westway Petroleum	3.125%
			100.000%

Cumulative Oil Production (12-31-87)	222,586 BO
Oil Production 1988	1,728 BO
Cumulative Oil Production (12-31-88)	224,314 BO

Tract No. 12

Operator: OXY U.S.A.

Lease: State M

Description: W2 SW4
Sec. 36, T-21-S, R-36-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	OXY U.S.A.	100%

Cumulative Oil Production (12-31-87)	1,018,763 BO
Oil Production 1988	9,924 BO
Cumulative Oil Production (12-31-88)	1,028,687 BO

Tract No. 13

Operator: OXY U.S.A.

Lease: State N

Description: SW4
Sec. 2, T-22-S, R-36-E,
Lea County, NM

Acreage: 160 acres

WI Owners:	OXY U.S.A.	100%

Cumulative Oil Production (12-31-87)	870,010 BO
Oil Production 1988	3,114 BO
Cumulative Oil Production (12-31-88)	873,124 BO

Tract No. 14

Operator: ARCO Oil & Gas

Lease: State 157 D

Description: S2
Sec. 12, T-22-S, R-36-E,
Lea County, NM

Acreage: 320 acres

WI Owners: ARCO Oil & Gas 100%

Cumulative Oil Production (12-31-87)	1,354,846 BO
Oil Production 1988	4,001 BO
Cumulative Oil Production (12-31-88)	1,358,847 BO

Tract No. 15

Operator: Conoco Inc.

Lease: State J 2

Description: N2 & SE4
Sec. 2, T-22-S, R-36-E,
Lea County, NM

Acreage: 480.64 acres

WI Owners: Conoco Inc. 100%

Cumulative Oil Production (12-31-87)	4,759,163 BO
Oil Production 1988	94,014 BO
Cumulative Oil Production (12-31-88)	4,853,177 BO

Tract No. 16

Operator: Chevron U.S.A.

Lease: W. A. Ramsay (NCT-A & B)

Description: NW4 & NE4 NE4 & S2 NE4, Sec. 25,
& E2 & SE4 NW4 & NE4 SW4 & S2 SW4
Sec. 35, T-21-S, R-36-E,
Lea County, NM

Acreage: 760 acres

WI Owners:	Chevron U.S.A.	100%

Cumulative Oil Production (12-31-87)	3,871,847 BO
Oil Production 1988	28,908 BO
Cumulative Oil Production (12-31-88)	3,900,755 BO

Tract No. 17

Operator: Chevron U.S.A.

Lease: Harry Leonard (NCT-C)

Description: N2 & E2 SW4
Sec. 36, T-21-S, R-36-E,
Lea County, NM

Acreage: 400 acres

WI Owners:	Chevron U.S.A.	100%

Cumulative Oil Production (12-31-87)	2,797,952 BO
Oil Production 1988	99,620 BO
Cumulative Oil Production (12-31-88)	2,897,572 BO

Tract No. 18

Operator: Chevron U.S.A.

Lease: State 36

Description: E2 & SE4,
Sec. 36, T-21-S, R-36-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	Chevron U.S.A.	100.00%

Cumulative Oil Production (12-31-87)	0 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	0 BO

Tract No. 19

Operator: ARCO Oil & Gas

Lease: J. M. Brownlee

Description: SW4
Sec. 25, T-21-S, R-36-E,
Lea County, NM

Acreage: 160 acres

WI Owners: ARCO Oil & Gas 100%

Cumulative Oil Production (12-31-87)	489,027 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	489,027 BO

Tract No. 20

Operator: Chevron U.S.A.

Lease: Kingwood

Description: W2 SE4,
Sec. 25, T-21-S, R-36-E,
Lea County, NM

Acreage: 80 acres

WI Owners:	Chevron U.S.A.	100.00%

Cumulative Oil Production (12-31-87)	0 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	0 BO

Tract No. 21

Operator: Chevron U.S.A.

Lease: Sandy

Description: E2 SE4,
Sec. 25, T-21-S, R-36-E,
Lea County, NM

Acreage: 80 acres

WI Owners:			
	Top of the Grayburg to 3900'		
		Chevron U.S.A.	93.75%
		John Bryant	6.25%
			100.00%
	3900'-3950'	J. H. Moore	100.00%
	3950'-6250'	Chevron U.S.A.	100.00%

Cumulative Oil Production (12-31-87)	38,777 BO
Oil Production 1988	929 BO
Cumulative Oil Production (12-31-88)	39,706 BO

Comments: Production classified as Penrose Skelly Grayburg

Tract No. 22

Operator: Chevron U.S.A.

Lease: H. T. Mattern (NCT-D, E, & F)

Description: N2 NE4 & SW4 Sec. 1,
& N2 Sec. 12, T-22-S, R-36-E,
& W2 NW4 & E2 SW4 Sec. 6,
& NW4 Sec. 7, T-22-S, R-37-E,
Lea County, NM

Acreage: 868.39 acres

WI Owners: Chevron U.S.A. 100%

Cumulative Oil Production (12-31-87)	4,729,801 BO
Oil Production 1988	43,216 BO
Cumulative Oil Production (12-31-88)	4,773,017 BO

Tract No. 23

Operator: Chevron U.S.A.

Lease: Mattern

Description: NW4 SW4
Sec. 7, T-22-S, R-37-E,
Lea County, NM

Acreage: 36.98 acres

WI Owners:	
Presidio Oil Co.	33.330000%
Trust U/D Donaldson Brown	16.670000%
Chevron U.S.A.*	35.546875%
James A. Davidson	12.500000%
James E. Burr	0.390625%
Larry E. Nermyr	0.781250%
Jack Fletcher	0.390625%
Ruth Sutton	0.390625%
	100.000000%

Cumulative Oil Production (12-31-87)	167,424 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	167,424 BO

Comments: *Ownership limited to the proposed unitized interval only.

Tract No. 24

Operator: Chevron U.S.A.

Lease: Mattern

Description: NE4 SW4 & NW4 SE4
Sec. 7, T-22-S, R-37-E,
Lea County, NM

Acreage: 80 acres

WI Owners:

Surface to 3620'	Presidio Oil Co.	33.330000%
	Trust U/D Donaldson Brown	16.670000%
	Chevron U.S.A.*	35.546875%
	James A. Davidson	12.500000%
	James E. Burr	0.390625%
	Larry Nermyr	0.781250%
	Jack Fletcher	0.390625%
	Ruth Sutton	0.390625%
		100.000000%
3620'-4000'	Chevron U.S.A.	35.5468750%
	James A. Davidson	12.5000000%
	James E. Burr	0.3906250%
	Larry Nermyr	0.7812500%
	Jack Fletcher	0.3906250%
	Ruth Sutton	0.3906250%
	Para Mia	13.0434780%
	Dasco Energy	14.4927535%
	Louise C. Summers	14.4927535%
	Burton Veteto	1.4492750%
	Jack Mussett	6.5217390%
		99.9999990%
4000' to 6500'+	Para Mia	26.0869560%
	Dasco Energy	28.9855070%
	Louise C. Summers	28.9855070%
	Burton Veteto	2.8985500%
	Jack Mussett	13.0434780%
		99.9999980%

Cumulative Oil Production (12-31-87)	183,025 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	183,025 BO

Comments: *Ownership limited to the proposed unitized interval only.

Tract No. 25

Operator: Presidio Oil Co.

Lease: Mattern

Description: S2 S2
Sec. 7, T-22-S, R-37-E,
Lea County, NM

Acreage: 157.00 acres

WI Owners:

Surface to 3610'*		
	Mary Walsh	66.67000000%
	Presidio Oil Co.	22.22000000%
	Trust U/D Donaldson Brown	11.11000000%
		100.00000000%
3610'-4000'	Mary Walsh	66.67000000%
	Para Mia	8.82265741%
	Dasco Energy	9.80266437%
	Louise C. Summers	9.80266437%
	Burton Veteto	0.98026643%
	Jack Mussett	3.92078895%
		99.99904153%
4000' to 6800'+	Para Mia	26.47061930%
	Dasco Energy	29.41093420%
	Louise C. Summers	29.41093420%
	Burton Veteto	2.94109340%
	Jack Mussett	11.76354320%
		99.99712430%

Cumulative Oil Production (12-31-87)	603,349 BO
Oil Production 1988	0 BO
Cumulative Oil Production (12-31-88)	603,349 BO

Comments: *Ownership changes at 3630' in SE SE,
3620' in SW SE,
3635' in SE SW,
3610' in SW SW.

Tract No. 26

Operator: Chevron U.S.A.

Lease: A. L. Christmas (NCT-C)

Description: W2 W2 & SE4 NW4 & SW4 NE4 & E2 NE4
Sec. 18, T-22-S, R-37-E,
Lea County, NM

Acreage: 307.96 acres

WI Owners: Chevron U.S.A. 100%

Cumulative Oil Production (12-31-87)	1,702,534 BO
Oil Production 1988	1,404 BO
Cumulative Oil Production (12-31-88)	1,703,938 BO

Comments: Production classified as Arrowhead and Eumont for Well No. 1.

BCC/pf 4704/06278/03

FIRST TECHNICAL COMMITTEE MEETING
PROPOSED ARROWHEAD GRAYBURG UNIT
AUGUST 4, 1988

A Technical Committee meeting for the proposed Arrowhead Grayburg Unit was held at 9:30 a.m. on August 4, 1988, at Chevron's Division office in Hobbs, New Mexico. Fifteen attendees, representing 11 companies and 90.8% of the cumulative oil produced as of 12-31-87, were present and are shown on the attached list.

Mr. T. A. Etchison, Chevron, welcomed the attendees and briefly reviewed the agenda for the meeting. He then reviewed the events of the Working Interest Owners' meeting held on May 5, 1988. Mr. Etchison recommended that the voting procedure of 75% cumulative oil as of 12-31-87 for approval, as adopted by the Working Interest Owners, be used by the Technical Committee. Mr. Etchison asked if there was any objection and there was none. He also emphasized that the Technical Committee was a working group and that votes by the Technical Committee representatives would not be binding on the WIO's.

Mr. Etchison then reviewed the charges for the Technical Committee as set by the Working Interest Owners. He pointed out that due to variations in ownership with depth on several tracts, the acreage equity parameter could be more readily handled if it were to be changed to be gross acre-ft. Mr. Don Jacks, Exxon, asked if the variations in ownership occurred within the limits of the Grayburg, and Mr. Etchison responded yes. Mr. Etchison then asked if there was any objection to changing the equity parameter of "Gross Acreage" to "Gross Acre-ft" and there was none.

Mr. Etchison then presented a tentative timetable for the Technical Committee study (attached). He stated that a completed Technical Committee report to the WIO's could be ready as early as April of 1989, but to do this, all parties' dedicated efforts will be needed. He stressed that the timetable was tentative, and that the Technical Committee proceedings may take longer. He also pointed out that it is planned to postpone the calculation of the Unit equity parameter table until the other charges were nearly complete.

Mr. R. A. Smith, Chevron, presented the geological information used by Chevron to select the proposed Unit boundaries. He stated that the proposed vertical limits extend from -150' s.s. or the top of the Grayburg formation to -1500' s.s. Mr. Smith stated that these boundaries minimize the number of workovers required to isolate Penrose production in wells that produce from the Queen and Grayburg formation. It was also pointed out that -150' s.s. appeared

to be the gas-oil contact. He noted that this was the same approach used in the EMSU. Mr. Smith stated that extending the Unit to -1500' s.s. would include the greater part of the San Andres formation, to within 100' of the Glorietta. The purpose for inclusion of the San Andres was to ensure adequate water supply and to simplify accounting should a water supply well produce hydrocarbons.

Mr. Smith then continued by defining the method used to establish the areal boundaries. He stated that the western edge was defined structurally by -325' s.s. The eastern boundaries were defined by a percent dolomite evaluation of the pay interval. Mr. Smith stated that wells with less than 60% dolomite (greater than 40% sand) would have poor pay quality and probably not be waterfloodable. This was reenforced by an iso-cumulative oil production map which indicated that cumulative oil production is related to percent dolomite.

Mr. Jay Vashler, Conoco, asked if the San Andres was being included for water supply only. Mr. Etchison responded that there had been some discrepancies on the call for the top of the San Andres, and that the entire oil column would be evaluated for waterflooding. The major part of the San Andres which is not oil productive will be unitized solely for water supply. Ms. Cindy Ellis, ARCO, questioned if Chevron planned to waterflood the Queen formation where it is included in the western portion of the Unit. She expressed concern about damage to the Eumont gas interval, and stated that the top of the Grayburg may be a better unit boundary. Bryan Cotner, Chevron, pointed out that it would be impossible to allocate production to the Grayburg for wells that have produced both Queen and Grayburg, supporting the proposed boundary at -150' s.s. which does not require an allocation. He remarked that excluding water injection from the Queen to protect gas reserves above the Unit could be handled in operation of the waterflood. After brief additional discussion, Mr. T. A. Etchison sought approval of the boundaries as proposed by Chevron to be the area subject to the Technical Committee report. There was no objection. The Unit boundaries for the Technical Committee report are shown on the attached plat, and have vertical limits of a depth of -150 ft. s.s. or the top of the Grayburg formation, whichever is shallower, to a depth of -1500 ft. s.s.

Mr. Bryan Cotner then reviewed information packets distributed to attendees. He asked each committee representative to review the cumulative oil and ownership data for accuracy, and to contact him if there was a discrepancy. He also stated that the cumulatives were based on the New Mexico Oil & Gas Engineering Committee reports.

Mr. Etchison then requested that the Unit area operators complete wellbore data sheets supplied. The information is to be used to construct wellbore diagrams and to estimate drilling and recompletion costs for the proposed Unit. Representatives were asked to complete the forms for any

wells that they operate in, or within a ½ mile radius beyond, the areal boundaries of the Unit.

Mr. Steve Burke, Chevron, then distributed Division Order and Payee List data sheets to be completed by the Unit area operators. Mr. Burke stated that the ownership sheets would be used to verify and correct information that Chevron has already compiled, and to obtain addresses of the royalty owners.

After several comments and questions concerning the proposed unit boundaries the meeting was adjourned at 11:00 a.m.

If you have any questions, additions or corrections concerning the above minutes, please contact Mssrs. T. A. Etchison or B. C. Cotner at (505) 393-4121.

BCC:bdw

PROPOSED ARROWHEAD GRAYBURG UNIT
FIRST TECHNICAL COMMITTEE MEETING
HOBBS, NEW MEXICO
AUGUST 4, 1988

LIST OF ATTENDEES

NAME	COMPANY	TITLE
Bryan Cotner	Chevron	Reservoir Eng.
Randy Smith	Chevron	Geologist
John Lawrence	OXY U.S.A., Inc	Reservoir Eng.
David Mussett	Jack Mussett	
Don Jacks	Exxon Joint Int	Reservoir Eng.
Greg Cielinski	Sun E & P	Reservoir Eng.
Jerry Hoover	Conoco	Sr. Res. Eng.
Jay Vashler	Conoco	Engineer
George Ricks	DASCO	
Don Bratton	Zia	Engineer
Bob Anthony	Amerada Hess	Oper. Engineer
Tom Zapatka	Marathon	Oper. Engineer
Ted Etchison	Chevron	Sr. Pet. Eng.
Steve Burke	Chevron	Land Rep.
Cindy Ellis	ARCO	Engineer

SECOND TECHNICAL COMMITTEE MEETING
PROPOSED ARROWHEAD GRAYBURG UNIT

October 27, 1988

A Technical Committee meeting for the proposed Arrowhead Grayburg Unit (AGU) was held at 9:30 a.m. on October 27, 1988. Nineteen attendees representing 11 companies and 88% of the cumulative oil production as of 12-31-87 were present and are shown on the attached list.

Mr. T. A. Etchison, Chevron, welcomed the attendees and briefly reviewed the agenda for the meeting. He reviewed the events of the First Working Interest Owners' meeting, the First Technical Committee meeting, and the charges for the Technical Committee. Mr. Etchison then reviewed the responses to the wellbore and Division Order information requests that have been received by Chevron. He stated that the wellbore information that Chevron has received represents 75% of the wellbores within the proposed unit.

Mr. Bryan Cotner, Chevron, reviewed the secondary recovery prediction originally presented at the May 5, 1988 Working Interest Owners' meeting. He reiterated that the prediction was based on the same analogies used by the Eunice Monument South Unit (EMSU) and that the resulting incremental secondary recovery for the AGU is estimated to be 17 MMSTBO.

Mr. Cotner then discussed the basis of the tentative well locations for the proposed unit. He stated that the initial plan would call for an 80-acre 5-spot consisting of 74 producers and 52 injectors. Future adjustments to the pattern may be made based on experience in the EMSU or based on possible pulse testing work in the AGU. The tentative locations utilize all actively producing wells within the unit, and any "new drills" will have to be thought to have sufficient reserves to justify drilling. The reserves will be based on both primary and secondary potential. Mr. Cotner gave examples of several wells that were plugged-back out of the Grayburg while producing at rates that would be commercial to produce today. Some of the wells were abandoned because they stopped flowing or because they started producing moderate amounts of water. When asked if the offsetting producers would have produced the remainder of the reserves left in the plugged-back well, Mr. Cotner made reference to the recent Conoco recompletion of the Lockhart 'B' No. 7 which is producing around 80 BOPD, and which is on the same proration unit as the No. 4 which was plugged back in 1974.

Mr. Cotner stated that 69 of the 124 tentative locations will come from existing completions, requiring 55 additional

wells to come from plugbacks, re-entries, or redrills. Because of the significant need for additional wells, some method of wellbore dedication incentive should be used. He estimated that 5 to 10 additional wellbores would be contributed with an incentive, reducing total unit costs by approximately $1.5MM.

Mr. Russell Miller, Chevron, gave an overview of the surface production and injection facilities based on the tentative well locations and preliminary performance predictions. The production gathering system will consist of five production testing satellite batteries and one central treating and sales battery. The production gathering system will consist of 270,000 feet of low pressure fiberglass pipe, including 2" and 3" flowlines and 6" liquid transfer lines. The injection system will consist of 15 injection manifolds, 106,000 feet of 2" through 4" high pressure fiberglass pipe, and 18,000 feet of 6" lined steel trunk line. The water injection plant will initially consist of de-staged vertical cam pumps, with stages added as pressure requirements dictate. The electrical distribution system will consist of 25 miles of new electrical lines. He also estimated that 18 batteries would be dismantled. Mr. Miller estimated total surface facilities costs at $8.95MM and that construction could be complete within one year of commencement. The original cost estimate presented to the Working Interest Owners was $9.2MM.

Mr. Etchison outlined recent production tests in Tract 8a located in the SE/4 of Section 18, T-22-S, R-37-E. Zia Energy has completed the State No. 49 'M' in Grayburg Zone 5 and lower Grayburg (as defined by Chevron) classified as Eunice, S.W. San Andres. Zia's ownership begins at the top of Zone 5. The well has produced at rates as high as 3.5 BOPD + 305 MCFPD + 752 BWPD. It is currently producing 1 BOPD + 150 MCFPD + 500 BWPD. Mr. Etchison stated that this was being brought to the attention of the Technical Committee for informational purposes. After discussion concerning the consequences of deleting Zia's acreage from the unit, Mr. Don Bratton of Zia Energy said that they were testing the interval to determine its value, and their participation in the unit would be dependent on whether or not they would have fair compensation for their gas value. If not, they would seek removal from the unit.

Mr. Etchison then discussed the need and complexity of defining useable wellbores. He stated that, generally, wells currently producing or plugged-back wells that are restored to their previously producing environments would be considered as useable. He stated that new or alternate wells would have to be compatible with the needs of the unit, in terms of depth and ability to be worked on. The

topic will be discussed at the next Technical Committee meeting at which time Chevron will propose a set of definitions.

Mr. Etchison then discussed the drawbacks of the use of wellbores as an equity parameter in participation negotiations, and recommended that it be removed from the equity parameters to be calculated. He proposed that a wellbore dedication incentive, such as wellbore penalties, would be more appropriate than the use of useable wellbores in the participation formula. A wellbore value of between $100M and $120M was presented as the probable value to be used in the incentive method. After a brief discussion concerning wellbore penalties, Chevron moved that useable wellbores be removed from the equity parameter list, and that the Technical Committee recommend a wellbore dedication incentive method. The motion was seconded by Conoco and passed with 80.2% voting for, 8.2% voting against, and 11.6% not voting (absent). Following the vote there was additional discussion concerning wellbore penalties and wellbore inventories as methods of incentive. It was decided that various wellbore dedication incentive scenarios will be discussed at the next meeting.

Mr. Etchison asked if there were any other items for discussion. Mr. Don Bratton asked if a cut-off date for production that is to be used for equity calculations had been considered. Mr. Etchison commented that a cut-off date has been delayed until as late in the Technical Committee proceedings as possible as current production and remaining reserves will be the last equity parameters addressed.

Mr. Etchison then re-capped the accomplishments of the meeting and stated that the next meeting was tentatively scheduled for late January or early February 1989. He said items for discussion at the next meeting would include: defining useable wellbores, wellbore contribution incentives, estimates of drilling and workover costs for the unit, an updated secondary recovery prediction, and equity parameter calculations. The meeting adjourned at 11:15 a.m.

If you have any questions, additions or corrections concerning the minutes, please contact Mr. T. A. Etchison or Mr. B. C. Cotner at (505) 393-4121.

PROPOSED ARROWHEAD GRAYBURG UNIT
SECOND TECHNICAL COMMITTEE MEETING
HOBBS, NEW MEXICO
October 27, 1988

LIST OF ATTENDEES

NAME	COMPANY	TITLE
Bryan Cotner	Chevron	Reservoir Engineer
Ted Etchison	Chevron	Sr. Petr. Engineer
Randy Smith	Chevron	Geologist
Bob Anthony	Amerada Hess	Operations Engineer
Jay Vashler	Conoco	Engineer
Jerry Hoover	Conoco	Sr. Reservoir Engr.
Cindy Ellis	Arco	Sr. Reservoir Engr.
David Mussett	J. D. Mussett	Geologist
Bob Hogan	American Exploration	Engineer
Tom Zapatka	Marathon	Engineer
Chris Gros	Chevron	Sr. D&C Engineer
Greg Cielinski	Sun	Reservoir Enginer
Gary Greer	Amerada Hess	District Engineer
Russel Miller	Chevron	D&C Engineer
Don Bratton	Zia	Engineer
George Ricks	DASCO	
Ron Henderson	Presidio Oil Co.	Operations Engineer
Jim Hefley	Amerada Hess Corp.	Unit Manager
Bruce Mailey	Amerada Hess Corp.	Unit Engineer

PROPOSED ARROWHEAD GRAYBURG UNIT
SECOND TECHNICAL COMMITTEE MEETING
HOBBS, NEW MEXICO
October 27, 1988

Motion made by T. A. Etchison, Chevron, to delete "useable wellbores" from the equity parameters, and instead, the Technical Committee should make a recommendation to the Working Interest Owners concerning a wellbore dedication incentive program. Motion seconded by Jerry Hoover, Conoco. Votes were as follows:

WI OWNER	% CUM OIL	FOR	AGAINST	ABSENT
Amerada Hess	1.48150010	X		
American Exploration	3.61930490	X		
Amoco Production	1.41192318			X
Arco Oil & Gas	8.20310777		X	
Trust U/D D Brown	0.09172169			X
John Bryant	0.00796476			X
James Burr	0.01186883			X
Chevron U.S.A. Inc.	44.70374102	X		
Conoco Inc.	17.05237598	X		
DASCO Energy	0.53393472	X		
James Davidson	0.37980264			X
Jack Fletcher	0.01186898			X
Doyle Hartman	1.08006370			X
Marathon Oil Company	8.23815463	X		
Jack Mussett	0.23168061	X		
Larry Nermyr	0.02373766			X
Oxy U.S.A.	6.20723958			X
Para Mia Inc.	0.48361360			X
Presidio	0.18338836	X		
R. L. Summers Est.	0.53393516			X
Sun E & P Company	4.12489586	X		
Ruth Sutton	0.01186940			X
Burton Veteto	0.05031918			X
Mary F. Walsh	1.32195842			X
Zia Energy	0.00000000	X		
TOTAL	99.99997073%	80.16897618%	8.20310777%	11.62788678%

Motion carried.

Third Technical Committee Meeting
Proposed Arrowhead Grayburg Unit
February 24, 1989

The Third Technical Committee meeting for the proposed Arrowhead Grayburg Unit (AGU) was held at 9:30 a.m., February 24, 1989. Fourteen attendees representing nine companies and 89.9% of the cumulative oil production as of 12/31/87 were present and are shown on the attached list.

Mr. T. A. Etchison, Chevron, welcomed attendees and briefly reviewed the agenda for the meeting. He reviewed the charges for the Technical Committee, as set by the Working Interest Owners, and discussed accomplishments to date. Mr. Etchison then pointed out a typographical error on the interim voting interest tabulation (cumulative oil 12/31/87) that was attached to the letter to Exxon dated Jan. 20, 1989. Copies of the letter were mailed to all WIO's. The erroneous table indicates that Enron has cumulative oil of 49,446 BO and 0.16% voting interest, and that Exxon has Ø cumulative and Ø% interest. The table should have indicated that Enron has Ø cumulative oil and percent interest and Exxon has 49,446 BO cumulative which equates to 0.16223508% interest.

Mr. B. C. Cotner, Chevron, then reviewed the original secondary recovery prediction presented at the WIO's meeting in May 1988. He stated that the prediction was based on the same analogy that was used for the Eunice Monument South Unit (EMSU) prediction, which assumes a secondary to primary ratio of 0.5. The original prediction assumed an incremental secondary recovery of 17 MMSTBO based on an ultimate primary recovery of 34 MMSTBO. Mr. Cotner then presented a tentative 80-acre 5-spot well location map which is based on currently active wells completed in the unitized interval, and all additional locations that can be justified to drill based on secondary and additional primary recovery potential. He stated that the secondary recovery potential for the additional locations is estimated based on 50% of the ultimate primary recovery from the "swept" area, assuming no areal sweep beyond the confines of the peripheral patterns.

Mr. Cotner stated that the revised secondary recovery prediction based on the "swept" area obtained from the tentative well locations is 15 MMSTBO. He then presented an updated recovery prediction curve and referred to the predicted recovery table in the information packet.

Mr. Cotner then presented well cost estimates. He stated that of the 129 tentative wells, 67 would come from existing completions and that 62 additional wells will be required. The first case he presented assumed that all 62 additional wells would be "new-drills". In addition to the drill and completion costs for the new wells, there will be workover expenses for the existing wells, including some deepenings, liners, water injection conversions,

and upgrading of pumping equipment. Mr. Cotner said that estimates of workover requirements were based on the wellbore data supplied by the operators or obtained from the New Mexico OCD well files. He then presented a probable case estimate that is based on 10 additional wells being dedicated to the unit, reducing the number of "new-drills" to 52. The total well cost for the high case is estimated to be $20,038 M with a total project cost of $28,988 M. For the probable case the total well cost is estimated to be $18,806 M and the total project cost is estimated to be $27,756 M. Mr. Cotner said the $1.2 MM savings from having 10 additional wells dedicated to the unit indicates the benefit of some type of wellbore dedication incentive. He then presented investment schedules which assumed that the project will be installed over 1 1/2 years and that the pumping equipment upgrades will occur during the first five years.

Mr. Cotner then proposed a definition of useable wellbores which would accept all active producing wells that are limited to production from the unitized interval. Other wells would be accepted if they meet specific criteria. All wells will be required to pass a casing integrity test to be acceptable. Mr. Etchison stated that the intention of the definition was to insure that the WIO's well costs are not unnecessarily increased by the contribution of wellbores in substandard condition. Ms. Cindy Ellis, Arco, asked if the definition that was presented will be incorporated in the Unit operating agreement. Mr. Cotner responded that the useable wellbore definition in the Unit agreement will reflect the intent of the definition he presented, but may be worded differently. Mr. John Lawrence, OXY U.S.A., asked if the proposed definition was the same as used by the EMSU. Mr. Etchison stated that the EMSU agreement was less specific. When Mr. Etchison asked for a motion to accept the definition, Mr. Jerry Hoover, Conoco, suggested that it be tabled until the next meeting to allow further evaluation by the Technical Committee members.

Mr. Cotner then presented a proposed wellbore valuation of $80,000, based on anticipated workover costs for existing wells compared to the cost to drill and complete a new well. Mr. Hoover, Conoco, suggested that voting on acceptance of $80,000 as the wellbore value also be postponed until the next meeting.

Cut-off dates for production equity parameters were then discussed. Mr. Etchison moved that 12/31/88 be used for the cut-off date for cumulative oil. Jerry Hoover, Conoco, seconded the motion, and it passed unanimously. Mr. Etchison then moved that remaining reserves be calculated from 1/1/89. Jerry Hoover, Conoco, seconded. After a brief discussion the motion passed unanimously. Mr. Etchison then proposed that current oil and gas rates be based on the monthly averages for 1988. After discussing the effect of workovers over the last couple of years, it was recommended that production from December 1988 be used. George Ricks, Dasco, recommended that data for different scenarios,

including monthly average for the last 1 year, the last six months, and for December be presented. He suggested that the WIO's will decide which current rate should be used for equity negotiations. Mr. Etchison stated that current oil and gas rates based on December 1988 production, the last six months of 1988, and the monthly average for 1988 will be presented at the next meeting.

Mr. Cotner then reviewed the vertical limits of the proposed unit and presented a map that indicates the subsea depth of top of the unit for each proration unit. He then reviewed tracts that have changes in ownership with depth within the proposed unitized interval. He also reviewed tabulated data of gross-acre feet by tract and proration unit.

Mr. Etchison then recapped the events of the meeting. He stated that the next meeting would be in late April or early May, at which time we would try to establish remaining oil and gas reserves for each tract and finalize a wellbore definition and value. The meeting adjourned at 11:00 a.m.

If you have any additions or corrections to the minutes, please contact B. C. Cotner at (505) 393-4121.

Proposed Arrowhead Grayburg Unit
Third Technical Committee Meeting
February 24, 1989

List of Attendees

Name	Company	Title
Bryan C. Cotner	Chevron U.S.A. Inc.	Reservoir Engineer
Randy A. Smith	Chevron U.S.A. Inc.	Geologist
T. A. Etchison	Chevron U.S.A. Inc.	Sr. Petroleum Engr.
John Lawrence	OXY U.S.A., Inc.	Reservoir Engineer
Craig Kent	Marathon	Production Engineer
Bob Hogan	American Exploration	Reservoir Engineer
Cindy Ellis	ARCO	O/A Engineer
Bob Anthony	Amerada Hess Corp.	Oper. Engineer
Don Bratton	Zia Energy	Engineer
George Ricks	Dasco Energy	
Jay Vashler	Conoco	Engineer
Jerry Hoover	Conoco	Sr. Reservoir Engr.
Russell Miller	Chevron U.S.A. Inc.	D&C Engineer
John Ladd	Chevron U.S.A. Inc.	Sr. D&C Engineer

Fourth Technical Committee Meeting
Proposed Arrowhead Grayburg Unit
May 25, 1989

The Fourth Technical Committee Meeting for the proposed A.G.U. (Arrowhead Grayburg Unit) was held at 9:30 a.m., May 25, 1989 at the Chevron office in Hobbs, New Mexico. Fourteen attendees representing 9 companies and 89.9% of the voting interest (cumulative oil production as of 12/31/87) were present and are shown on the attached list.

Introduction.

Mr. T. A. Etchison, Chevron, welcomed attendees and briefly reviewed the agenda for the meeting. He reviewed the charges for the Technical Committee, as set by the Working Interest Owners (WIO's) and discussed which charges had been accomplished to date.

Useable Wellbore Definition and Wellbore Value

Mr. Etchison reviewed the need for a wellbore dedication incentive to decrease the total capital investment for the Unit. He referred to a wellbore penalty method and a wellbore inventory method. He proposed that the Technical Committee not recommend a specific method to the WIO's, but that it be recommended that a dedication incentive be used. After a brief discussion of the differences between the wellbore penalty method and the wellbore inventory method, Mr. Etchison reviewed the $80,000 useable wellbore value and useable wellbore definition proposed at the Third Technical Committee meeting.

Mr. Etchison clarified that operators dedicating wellbores determined to be not "useable" by the Unit operator, would be liable for $80,000 of the expense, plus their proportionate share (working interest) of the Unit's expense, to make the well "useable". It was also stated that operators would have the option to repair their wells at their own expense and risk, but they would still be obligated for the first $80,000 if the well was still not "useable" when dedicated to the Unit.

Mr. Etchison then made the motion: A useable wellbore, for wellbore dedication incentives, will be defined based on the criteria presented at the Fourth Technical Committee meeting (attached), and the value of a useable wellbore will be $80,000. Ms. Cindy Ellis, Arco, seconded the motion. The motion passed with 88.41% approval.

Gross Acre-ft

Mr. Etchison reviewed the equity parameter Gross Acre-ft. He stated that the unitized interval has been defined as the top of the Grayburg formation or -150 feet from sea level (fsl), whichever is shallower, to -1500 ft fsl. He stated that the purpose of including depths to -1500 ft was to include the water supply aquifer, so, if in event the water supply wells were to produce hydrocarbons, the revenues from those hydrocarbons could be properly distributed. Mr. Etchison stated that Chevron had received several comments from Technical Committee members expressing concerns about the allocation of acreage equity for the proposed Unit. They were concerned about a disproportionate share of the acreage equity being proportioned to owners having rights below the limits of commercial production.

Mr. Etchison presented an alternative to the Gross Acre-ft parameter, based on surface acres, and allocated to owners based on rights from the top of the Unit to 325 ft below the top of the Grayburg formation. He then reviewed the allocation of acreage equity under Gross Acre-ft and the new proposal.

Chevron made a motion to replace the Gross Acre-ft equity parameter with surface acres and to base ownership in tracts with a vertical split in ownership on rights from the top of the Unit to 325 ft below the top of the Grayburg. There was no second.

Further discussion of the proposal included the question of proper treatment of the San Andres aquifer if it is determined to be commercially productive of hydrocarbons. Mr. Etchison stated that the Unit should include the water supply horizon, but if it is subsequently determined to be commercially productive of hydrocarbons, the Unit orders and boundaries can be amended.

During the discussions concerning the inclusion of the San Andres formation as a water supply source within the boundaries of the Unit, Mr. Don Bratton, Zia Energy, discussed production from the Eunice San Andres Southwest in the State M. No. 49. He suggested that the base of the Unit be defined as the top of the San Andres formation and that Chevron situate the water-supply wells on their own acreage to handle the production of hydrocarbons from water supply wells. He stated that Zia would prefer to be excluded from the Unit.

Mr. George Ricks, Dasco, made the motion to add the acreage parameter of Surface Acres, with allocation of ownership as Mr. Etchison presented, to the equity parameter list (in addition to Gross Acre-ft). Mr. Bob Hogan, American Exploration, seconded the motion. The motion passed with 89.9% approval.

Cumulative Oil

Mr. Etchison referred to the cumulative oil data provided in the information packets distributed at the meeting. He mentioned that cumulative oil through 12-31-88 was listed by well, by tract and by owner (based on ownership take-off information). There were no objections to the data, as presented.

Current Oil & Gas Rates

Mr. Etchison referred to the current oil and gas production rate tables that indicate production based on on: 1) all of 1988, 2) last one-half of 1988, 3) last quarter 1988, and 4) December 1988. He stated that the gas rate tables mailed with the announcement of the meeting contained a typographical error that has since been corrected. Mr. Etchison proposed that the Committee choose one value of current rate to supply in the Technical Committee Report.

Chevron moved that the last one-half of 1988 average monthly rates be used. There was no second. Mr. Etchison then suggested that each time period for current rate be voted on, and the one with the greatest percentage approval would be used in the report. Current oil rates based on the average active monthly production for the last quarter 1988 were selected with 81.68% approval. (The voting summary is attached).

Mr. Bob Hogan, American Exploration, moved that the current gas rate also be based on the last-quarter 1988 average active monthly gas production, (same as current oil). Mr. Donald Price, Marathon, seconded the motion. The motion carried with 81.68% approval.

Remaining Oil and Gas Reserves

Mr. Bryan Cotner, Chevron, presented estimates of remaining oil and gas reserves for each tract. He reviewed the assumptions made in Chevron's estimations of remaining reserves. He noted that inactive tracts (no current production), were assumed to have no remaining reserves. Mr. Cotner suggested that the Committee review each tract and adjust the decline or make whatever change in the general assumptions necessary to equitably determine remaining reserves for that tract.

The finalized remaining oil and gas reserves are shown in the attached table and were accepted with approval by 89.36% of the voting interest.

Other Business

Mr. Etchison stated that the meeting completed the basic work charged to the Technical Committee. He said that Chevron would use the work from the four Technical Committee meetings to compile the Technical Committee Report. Additionally, he stated that an updated secondary recovery performance prediction based on EMSU simulation may also be included in the report. He estimated that the report would be finished during late summer, at which time it would be distributed to the Technical Committee members with a letter ballot for acceptance. Once 75% of the voting interest in the Technical Committee accepts the report, the second WIO's meeting will be called. Mr. Etchison stated that there will only be another Technical Committee meeting if it is necessary to accept the report. The meeting adjourned at 3:00 p.m.

If you have any additions or corrections to the minutes, please contact B. C. Cotner at (505)393-4121.

BCC/sad 05309/01

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
May 25, 1989

List of Attendees

Name	Company	Title
Randy A. Smith	Chevron USA	Geologist
Ted A. Etchison	Chevron USA	Sr. Petroleum Engineer
Bryan C. Cotner	Chevron USA	Reservoir Engineer
Bruce Mailey	Amerada	Unit Engineer
Bob Anthony	Amerada	Operating Engineer
Don Bratton	Zia	Engineer
Jay Vashler	Conoco	Production Engineer
Jerry Hoover	Conoco	Sr. Reservoir Engineer
Donald Price	Marathon	Production Engineer
George Ricks	DASCO	
Cindy Ellis	Arco	O/A Engineer
John. J. Lawrence	Oxy	Reservoir Engineer
Bob Hogan	AEC	Engineer
John Prindle	Chevron USA	NOJV Coordinator

BCC/sad 05309/01

Arrowhead Grayburg Unit
Useable Well
Definition

(1) Active Wells (Producing 12-88)

Will be accepted as useable if no zones other than the unitized interval are open. If zones above the unitized interval are open, the owners must squeeze the non-unit zone, drill out the cement in the production casing, or set a liner to the top of the unitized interval*, and pressure test the casing above the unitized interval to 500 psi for 30 minutes.

(2) Closed in or TA'd Wells

Will be acceptable as useable if no zones other than the unitized interval are open (as above) and the well is free of scale, junk, and debris to a depth of the deepest production from the unitized interval prior to being closed-in. (PBTD from workovers in the unitized interval prior to shutting in.)

(3) Re-entries of P&A'd or Recompleted Wells That Previously Produced the Unitized Interval.

Will be accepted as useable if they have been restored to the previous unitized interval producing condition (completion interval, depth), are not open in non-unitized zones, and are free of scale, junk and debris down to the PBTD prior to the cessation of production from the unitized interval.

(4) Alternate Wells from Existing Wellbores

Will be accepted as useable if all non-unitized formations have been abandoned, (deeper zones plugged back with CIBP, or cement retainer, shallower zones cement squeezed and pressure tested), they penetrate the unitized interval, and have sufficient casing size (5 1/2") to be deepened or have at least 4 1/2" casing set through Zone 5 of the Grayburg formation, and are adequately cemented.

(5) Alternate Wells (new)

Will be accepted if they are drilled to a depth equivalent to the base of Zone 5, cased to TD with 5 1/2" or larger casing, and cemented from TD to surface.

The intent of the useable wellbore definition is to insure that all wellbores that are dedicated are in reasonably good physical condition and can be used in ways consistent with the purpose of the Unit. All wells dedicated will be subject to a casing integrity test. Any well failing a casing integrity test upon the initial entry by the Unit operator, will be repaired or replaced at Working Interest Owner's expense, not to exceed $80,000.

* If a well requires a liner to isolate the unitized interval, the Unit operator may assume the responsibility to set it, if doing so is consistent with the proposed workovers for the well.

PROPOSED ARROWHEAD GRAYBURG UNIT
EQUITY PARAMETERS

TRACT	CUMULATIVE OIL (12-31-88) STBO	REMAINING OIL RESERVES (1-1-89) STBO	ULTIMATE PRIMARY RECOVERY STBO	CURRENT OIL RATE (4th Q- 1988) BOPM	CURRENT GAS RATE (4th Q- 1988) MCFPM	REMAINING GAS RESERVES (1-1-89) MCF	SURFACE ACRES	GROSS ACRE-FT
1	465,366	0	465,366	0.0	0.0	0	80.00	108,000.00
2	1,759,082	749,143	2,508,225	4,593.3	15,143.0	2,414,487	320.00	433,320.00
3	536,424	56,757	593,181	647.0	1,207.7	93,251	80.24	109,849.20
4	86,986	0	86,986	0.0	0.0	0	74.06	99,981.00
5	1,256,799	5,878	1,262,677	111.7	1,729.3	59,722	240.00	324,000.00
6	35,102	3,190	38,292	40.0	1,175.3	82,481	40.00	54,600.00
7	1,980,703	24,046	2,004,749	160.0	2,154.0	278,119	520.00	702,000.00
8A UPPER	607,293	2,084	609,377	62.3	270.7	8,363	107.06	41,839.96
8A LOWER	83	2,291	2,374	20.7	5,660.0	518,590	52.94	174,160.04
8B	502,537	178,065	680,602	937.7	966.7	177,886	156.99	211,936.50
9	462,904	120,566	583,470	987.0	1,636.0	201,706	80.00	108,000.00
10	49,446	0	49,446	0.0	0.0	0	40.00	54,000.00
11	224,314	21,552	245,866	192.0	309.3	32,263	80.00	108,040.00
12	1,028,687	129,193	1,157,880	635.7	1,935.7	352,954	80.00	111,800.00
13	873,124	53,154	926,278	207.3	1,453.0	354,274	160.00	216,000.00
14	1,358,847	27,263	1,386,110	313.0	513.3	42,557	320.00	432,000.00
15	4,853,177	1,617,565	6,470,742	9,937.0	38,861.0	4,901,223	480.64	650,068.00
16	3,900,755	185,177	4,085,932	2,293.7	18,775.3	1,454,192	760.00	1,030,680.00
17	2,897,572	1,309,041	4,206,613	7,459.7	28,858.0	3,616,881	400.00	546,560.00
18	0	0	0	0.0	0.0	0	80.00	108,000.00
19	489,027	0	489,027	0.0	0.0	0	160.00	216,000.00
20	0	0	0	0.0	0.0	0	80.00	108,920.00
21	39,706	6,820	46,526	79.7	2,542.3	216,329	80.00	108,040.00
22	4,773,017	692,746	5,465,763	4,210.7	5,256.3	984,392	868.39	1,172,486.74
23	167,424	0	167,424	0.0	0.0	0	36.98	49,923.00
24	183,025	0	183,025	0.0	0.0	0	80.00	108,000.00
25	603,349	0	603,349	0.0	0.0	0	157.00	211,950.00
26	1,703,938	45,455	1,749,393	136.0	267.3	352,364	307.96	415,746.00
TOTAL	30,838,687	5,229,986	36,068,673	33,024.5	128,714.2	16,142,034	5,922.26	8,015,900.44

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion by Chevron:
Accept Useable Wellbore Definition and Establish the Useable Wellbore Value of $80,000.
Seconded by Arco.

WI Owner	% CUM OIL	VOTE	% FOR
ABBY CORPORATION	0.00000000		0
AMERADA HESS	1.47909659	Abstain	0
AMERICAN EXPLORATION	3.61343311	For	3.6134331
AMOCO PRODUCTION	1.40963254		0
ARCO OIL & GAS	8.18979945	For	8.1897994
TRUST U/D D BROWN	0.09157289		0
JOHN BRYANT	0.00795184		0
JAMES BURR	0.01184958		0
CHEVRON USA	44.63121587	For	44.631215
CONOCO INC	17.02471104	For	17.024711
DASCO ENERGY	0.53306849	For	0.5330684
JAMES DAVIDSON	0.37918647		0
ENRON	0.00000000		0
EXXON COMPANY	0.16223508		0
JACK FLETCHER	0.01184973		0
HANNIFIN	0.00000000		0
HANSON OPERATING CO.	0.00000000		0
HANSON-MCBRIDE	0.00000000		0
DOYLE HARTMAN	1.07831153		0
MARATHON OIL CO.	8.22478945	For	8.2247894
J H MOORE	0.00000000		0
JACK MUSSETT	0.23130474		0
LARRY NERMYR	0.02369915		0
OXY U.S.A.	6.19716926	For	6.1971692
PARA MIA INC.	0.48282901		0
PRESIDIO	0.18309084		0
HAL RASMUSSEN	0.51477548		0
L. C. SUMMERS	0.53306893		0
RUTH SUTTON	0.01184958		0
BURTON VETETO	0.05023755		0
MARY F. WALSH	1.31981374		0
WESTWAY	0.00000000		0
WILLIAMS PARTNERS.	3.60342836		0
ZIA ENERGY	0.00000000	Against	0
	99.9999703		88.41419

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion by Dasco:
Add Surface Acres allocated based on Owership from the Top of the Unit to 325 ft. Below the Top of the Grayburg Formation to the List of Equity Parameters.
Seconded by American Exploration.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	For	1.4790965	0
AMERICAN EXPLORATION	3.61343311	For	3.6134331	0
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	For	8.1897994	0
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	For	17.024711	0
DASCO ENERGY	0.53306849	For	0.5330684	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	For	8.2247894	0
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	For	6.1971692	0
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		89.89328	0.00000

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion: Current oil rate based on average monthly for all of 1988.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	For	1.4790965	0
AMERICAN EXPLORATION	3.61343311	Against	0	3.6134331142
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	Against	0	8.189799454
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	Against	0	17.024711041
DASCO ENERGY	0.53306849	Abstain	0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	For	8.2247894	0
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	For	6.1971692	0
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		60.53227	28.82794

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion: Current Oil rate based on the last-half 1988 average monthly.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	Against	0	1.47909659
AMERICAN EXPLORATION	3.61343311	Against	0	3.61343311
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	Against	0	8.18979945
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	Against	0	17.02471104
DASCO ENERGY	0.53306849	Abstain	0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	Against	0	8.22478945
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	Against	0	6.19716926
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		44.63122	44.72900

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion: Current oil rate based on last quarter 1988 average monthly.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	Against	0	1.47909659
AMERICAN EXPLORATION	3.61343311	For	3.6134331	0
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	For	8.1897994	0
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	For	17.024711	0
DASCO ENERGY	0.53306849	Abstain	0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	For	8.2247894	0
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	Against	0	6.19716926
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		81.68395	7.67627

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion: Current oil rate based on December 1988 production.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	For	1.4790965	0
AMERICAN EXPLORATION	3.61343311	For	3.6134331	0
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	For	8.1897994	0
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	Against	0	17.0247110
DASCO ENERGY	0.53306849	Abstain	0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	Against	0	8.22478945
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	Against	0	6.19716926
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		57.91355	31.44667

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion by American Exploration:
Use last quarter average active monthly gas production for current gas production rate (same as current oil).
Seconded by Marathon.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	Against	0	1.47909659
AMERICAN EXPLORATION	3.61343311	For	3.6134331	0
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	For	8.1897994	0
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	For	17.024711	0
DASCO ENERGY	0.53306849	Abstain	0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	For	8.2247894	0
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	Against	0	6.19716926
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		81.68395	7.67627

Proposed Arrowhead Grayburg Unit
Fourth Technical Committee Meeting
Vote Tally
Based On 12-31-87 Cumulative Oil

Motion: Establish Remaining Oil & Gas Reserves as Specified on the Attached Table.

WI Owner	% CUM OIL	VOTE	FOR	AGAINST
ABBY CORPORATION	0.00000000		0	0
AMERADA HESS	1.47909659	For	1.4790965	0
AMERICAN EXPLORATION	3.61343311	For	3.6134331	0
AMOCO PRODUCTION	1.40963254		0	0
ARCO OIL & GAS	8.18979945	For	8.1897994	0
TRUST U/D D BROWN	0.09157289		0	0
JOHN BRYANT	0.00795184		0	0
JAMES BURR	0.01184958		0	0
CHEVRON USA	44.63121587	For	44.631215	0
CONOCO INC	17.02471104	For	17.024711	0
DASCO ENERGY	0.53306849		0	0
JAMES DAVIDSON	0.37918647		0	0
ENRON	0.00000000		0	0
EXXON COMPANY	0.16223508		0	0
JACK FLETCHER	0.01184973		0	0
HANNIFIN	0.00000000		0	0
HANSON OPERATING CO.	0.00000000		0	0
HANSON-MCBRIDE	0.00000000		0	0
DOYLE HARTMAN	1.07831153		0	0
MARATHON OIL CO.	8.22478945	For	8.2247894	0
J H MOORE	0.00000000		0	0
JACK MUSSETT	0.23130474		0	0
LARRY NERMYR	0.02369915		0	0
OXY U.S.A.	6.19716926	For	6.1971692	0
PARA MIA INC.	0.48282901		0	0
PRESIDIO	0.18309084		0	0
HAL RASMUSSEN	0.51477548		0	0
L. C. SUMMERS	0.53306893		0	0
RUTH SUTTON	0.01184958		0	0
BURTON VETETO	0.05023755		0	0
MARY F. WALSH	1.31981374		0	0
WESTWAY	0.00000000		0	0
WILLIAMS PARTNERS.	3.60342836		0	0
ZIA ENERGY	0.00000000		0	0
	99.9999703		89.36021	0.00000

Proposed Arrowhead Grayburg Unit
Remaining Reserves

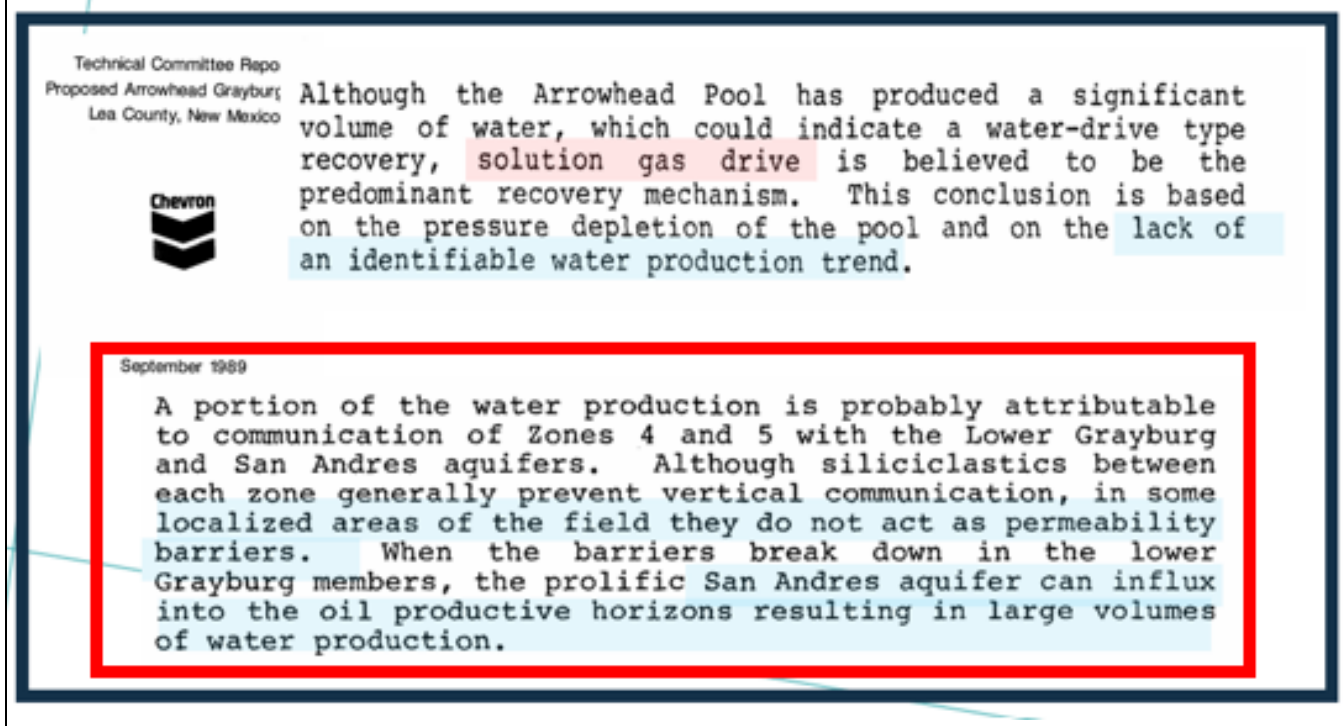
	TRACT	IP (12-88)	E.L.	DECLINE FACTOR	REMAINING OIL RESERVES	1988 GOR (MCF/BO)	REMAINING GAS RESERVES
	1	0	0	0.0000	0	0	0
	2	4160	227	0.0630	749,143	3.223	2,414,487
	3	647	52	0.1258	56,757	1.643	93,251
	4	0	0	0.0000	0	0	0
	5	112	30	0.1674	5,878	10.160	59,722
*	6	987	433	0.0806	3,190	25.853	82,481
	7	160	56	0.0519	24,046	11.566	278,119
	8A UPPER	62	43	0.1094	2,084	4.013	8,363
*	8A LOWER	6461	575	0.1362	2,291	226.398	518,590
	8B	929	55	0.0589	178,065	0.999	177,886
	9	1117	51	0.1061	120,566	1.673	201,706
	10	0	0	0.0000	0	0	0
	11	302	52	0.1392	21,552	1.497	32,263
	12	614	94	0.0483	129,193	2.732	352,954
	13	300	36	0.0596	53,154	6.665	354,274
	14	306	52	0.1118	27,263	1.561	42,557
	15	9669	368	0.0690	1,617,565	3.030	4,901,223
	16	2147	269	0.1217	185,177	7.853	1,454,192
	17	7496	329	0.0657	1,309,041	2.763	3,616,881
	18	0	0	0.0000	0	0	0
	19	0	0	0.0000	0	0	0
	20	0	0	0.0000	0	0	0
*	21	2228	912	0.0730	6,820	31.721	216,329
	22	4036	630	0.0590	692,746	1.421	984,392
	23	0	0	0.0000	0	0	0
	24	0	0	0.0000	0	0	0
	25	0	0	0.0000	0	0	0
	26	134	34	0.0264	45,455	7.752	352,364
	TOTAL				5,229,984		16,142,035

* Denotes Tracts based on Gas Decline

Evidence of Communication Between San Andres & Grayburg

- **1996 Chevron paper "Utilization of Geological Mapping Techniques to Track Scaling Tendencies in the Eunice Monument South Unit Waterflood, Lea County, New Mexico"**

During the time of primary production prior to unitization and initiating the waterflood in the Eunice Monument field, barium sulfate scale deposition was experienced in a number of producing wells. Although the drilling was confined to the Penrose and Grayburg formations, apparently some **San Andres water was finding its way into the wellbore of these wells** and resulted in a barium sulfate scale, barite, deposition problem.



Technical Committee Repo
Proposed Arrowhead Grayburg
Lea County, New Mexico

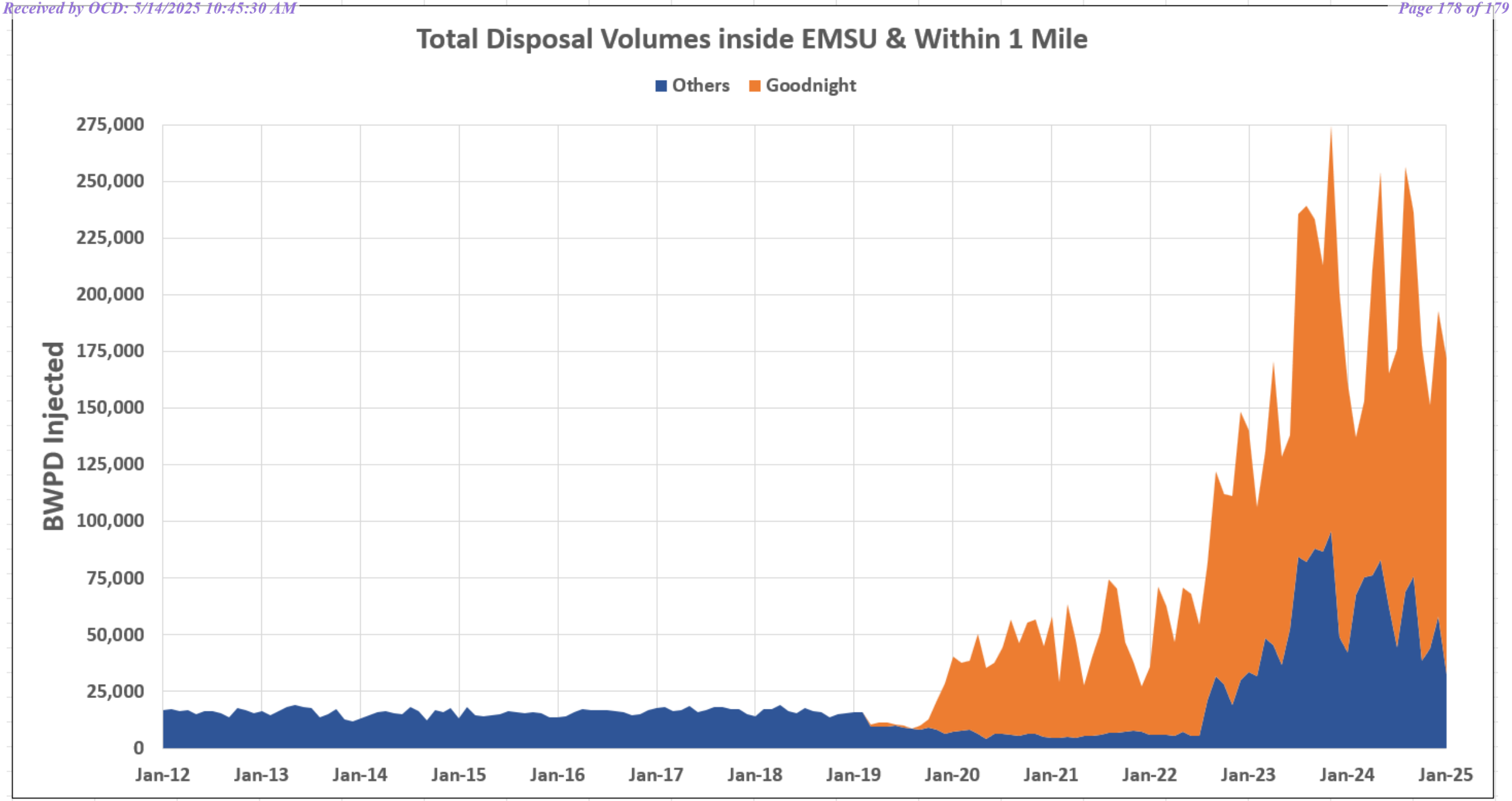
Chevron

Although the Arrowhead Pool has produced a significant volume of water, which could indicate a water-drive type recovery, solution gas drive is believed to be the predominant recovery mechanism. This conclusion is based on the pressure depletion of the pool and on the lack of an identifiable water production trend.

September 1989

A portion of the water production is probably attributable to communication of Zones 4 and 5 with the Lower Grayburg and San Andres aquifers. Although siliciclastics between each zone generally prevent vertical communication, in some localized areas of the field they do not act as permeability barriers. When the barriers break down in the lower Grayburg members, the prolific San Andres aquifer can influx into the oil productive horizons resulting in large volumes of water production.

Empire Exhibit N-26



Empire Exhibit N-27

Source: NMOCD Website

Empire Exhibit N-28