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PENN GRADE MICELLAR DISPLACEMENT PROJECT

Final Report

Work Performed for the Department of Energy
Under Contract No. DE-AC21-76ET08002

Date Published—August 1982

Pennzoil Company
Bradford, Pennsylvania

U. S. DEPARTMENT OF ENERGY

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Final Report

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FINAL REPORT
PENN GRADE MICELLAR DISPLACEMENT PROJECT
JUNE 30, 1975 THROUGH DECEMBER 31, 1980

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JUNE 30, 1975 THROUGH DECEMBER 31, 1980

SUMMARY

The Penn Grade Micellar Displacement Project was a test of a Microemulsion Flooding process on typical post-waterflood Bradford Third Sand Reservoir. The project was located on Pennzoil's Lawry Lease in the heart of the Bradford Field in Northern Pennsylvania. The tertiary oil recovery system was Marathon Oil Company's Maraflood Process which utilized a custom designed micellar slug system and biopolymer mobility buffer.

The project was initiated June 30, 1975 with an Injectivity Test(1) (Phase I) to determine if Maraflood Process fluids could be successfully injected into low permeability Bradford Third Sand Reservoir. Satisfactory rates were achieved and a decision was made to proceed with the 24-acre Pattern Test(2) (Phase II).

Phase II of the Micellar Polymer Project contained 25 production wells and 16 injection wells and consisted of 16 inverted five-spots. (Figure 15). All injection wells and the central production well were cored in order to obtain the reservoir data necessary for pore volume control. All wells were completed open hole and shot with nitrogylcerin. Injection and production systems were installed to operate the project.

The injection of a 10% PV reservoir conditioning brine pre-flush containing 50,000 ppm NaCL was commenced on May 20, 1977.(2), (3) All individual five-spot patterns had received at least 10% of a PV brine injection by the time operation was switched over to micellar slug injection on

September 11, 1977.

The micellar slug was a blend of Witco TRS-16, Witco TRS-40, Platformer Charge, Neodol, Primary Amyl Alcohol, Normal Butyl Alcohol, and Lawry Supply Water. Plans called for the injection of a 9% PV slug. As injection continued, it became apparent that, despite efforts to control individual injection well rates, the five-spot pattern fillup time periods would vary considerably. This necessitated a period of time during which both micellar slug and polymer were being injected simultaneously. This was achieved through the use of a twin header-pump system that permitted injection of slug or polymer to individual wells as a function of fillup. This period lasted from February 17, 1978 through April 11, 1978.(3)

The biopolymer utilized for mobility control was Kelzan MF (Xanflood) a commercially available polysaccharide. Plans called for the injection of a three-step tapered viscosity sequence consisting of a 10% PV of 9 $\pm$ 0.5 cp. Spike, a 51% PV of 5.5 $\pm$ 0.5 cp. Body, and a 30% PV of 1.8 $\pm$ 0.2 cp. Tail. During the Spike injection phase, pressure parting occurred in various wells at irregular frequency. The injection rates (injection pressure) were controlled by the installation of varying lengths (25' to 100') of 3/16" or ¼" copper tubing which provided a method of control that did not shear the polymer solution. The cumulative Spike injection for the project was 15.3% PV, when the switch over to the Body injection phase was made on February 1, 1979.(4)

The Body injection phase continued from Spike termination through the end of project operations on November 20, 1980. The cumulative injection was 50.1% PV. Despite stable injection rates during this period and the subsequent removal of various lengths of copper tubing, gradually diminishing injection rates became a severe challange to the success of the

project. Problem wells treated with hydrochloric acid and sodium hypochlorite showed little if any improvement in injection rates. The inability to maintain satisfactory injection rates over the life of the project without pressure parting, which was unacceptable due to the small spacing, limited the economic potential of the project.

An evaluation core well, No. C-1, drilled in July, 1980, verified another suspected problem. The viscous micellar slug and polymer had displaced oil from the highest permeability sand (about 5 feet) of the designed reservoir which left the remaining tight sand essentially unaffected.

Since mobility control was not maintained during the project and could not be achieved by increased viscosity because of already inadequate injection rates, a decision was made to terminate project operations on November 20, 1980. The cumulative oil recovery was only 5.19% of the estimated pre-project oil in place so the project has to be considered a failure. Appendix A discusses the oil recovery efficiency in more detail.

The final cost of the project was $4,694,313 out of approved contract funds of $6,066,000 leaving surplus funding of $1,371,687.

INTRODUCTION

The Penn Grade Micellar Displacement Project was a tertiary oil recovery test of a micellar-polymer process in the Bradford Field located in Northern Pennsylvania.[1] This project, locally referred to as the Lawry Project, was funded by DOE Contract No. DE-AC21-76-ET08002. Originally, the $4,444,000 cost sharing project was scheduled from June 30, 1975 through June 30 1980, however, the contract was revised on September 28, 1978 to increase funding to $6,066,000 and extend the contract termination date to December 31, 1980.[4] The government funding was 50 percent or $3,033,000 with Pennzoil Company, Quaker State Oil Refining Corporation, and Witco Chemical Corporation equally sharing the remaining 50 percent of the cost. Pennzoil was operator for the test. Figure I shows the location of the Lawry Project.

The test utilized the Maraflood tm* process with Marathon Oil Company being a subcontractor for technical services. The objective of the Lawry Project was to demonstrate the efficiency and economics of using the Maraflood process, a micellar-polymer flooding process, in recovering tertiary oil from previously waterflooded, typically low permeability, Bradford Third Sand reservoir in the Bradford Field.

The project was conducted in two parts. Phase I consisted of the drilling, coring, and utilization of well No. HO-68 to determine the injectivity characteristics of Maraflood process fluids.[1] Phase I occurred from July 1975, through July, 1976 and the favorable results led to a decision to proceed with Phase II, the 24-acre project. Phase II, the development, operation, and evaluation of a 24-acre Maraflood test occurred from March, 1976 through December, 1980.[2],[3],[4]

* Trademark of Marathon Oil Company

The test site was selected because the reservoir conditions were typical of over 50 percent of the 85,000-acre Bradford Field. The 98-acre Lawry Lease had been successfully waterflooded from 1929 through 1964, and had recovered approximately 9,000 BO per acre. The project location was adjacent to considerable acreage owned by various companies to which a micellar-polymer process could be applied if this test was successful.(5)

PHASE I - INJECTIVITY TEST

OBJECTIVES

The objectives of Phase I of the Lawry Project were as follows:

1. Obtain a 6-inch diameter core of the Bradford Third Sand for micellar-polymer lab work.

2. Determine the injectivity characteristics of Maraflood process fluids in the low permeability Bradford Third Sand reservoir.

3. Evaluate the feasibility of proceeding with the 24-acre project, Phase II, to evaluate the commercial application of a micellar-polymer process for tertiary oil recovery from low permeability Bradford Third Sand.

The primary objective of Phase I was to determine if injection rates into the Bradford Third Sand would be sufficient for commerical operation.

DRILLING AND COMPLETION

Well No. HO-68 was spudded February 13, 1975, 12 inch conductor was set to 70 feet, 8-5/8 inch surface casing was set at 415 feet and cemented with 10 sacks of regular neat cement, and an 8 inch hole was drilled to the core point of 1,075 feet.

The Bradford Third Sand interval from 1,075 feet to 1,123 feet was rotary cored with a 7-3/4 inch by 6 inch diamond corehead in 10,000 to 20,000 ppm NaCl drilling fluid. Using a 10 foot barrel, 5 cuts were made and recovery was 45.9 feet of the 48 feet cored.

The core interval 1,083 feet to 1,121 feet was shipped to Marathon's Denver Research Center (DRC) for analysis and fluid displacement tests. Seven representative core samples were subjected to routine core analyses in Bradford and indicated the following reservoir properties: Average Porosity 14.5%, Average Permeability 19.3 md., and Average Oil Saturation 32.8.

The logging program which included Compensated Neutron, Gamma Ray, Density, Sonic, Induction, SP, Guard, Temperature, and Inclinometer, indicated the following comparison with core properties:

		CORE	LOG
1.	Bradford Third Sand Top	1083.3	1084
2.	Net Pay, Ft.	-	25
3.	Porosity, %	14.5	11.2
4.	Permeability, Md.	19.3	-
5.	Oil Saturation, %	32.8	27.9

The inclinometer showed the bottom hole at 1,130 feet to be displaced 11 feet horizontally north from the first reading at 425 feet. The average hole diameter before stimulation was 7.75 inches and after shot was 8.5 inches. Reservoir temperature was 64°F. and a fluid level indicated a reservoir pressure of 224 psi.

Stimulation was with 155 quarts of liquid nitroglycerin across the interval 1,085 feet to 1,124 feet. After cleanout, the well was tubed with 2-7/8 inch internally coated (Coal Tar Epoxy) tubing on a Butler Larkin tension packer set at 1,080 feet.

SURFACE FACILITIES

The surface facilities for Phase I consisted of a filtration and polymer mix plant, shear plant, pressure plant, office lab for quality

control, and storage tanks. These facilities which were leased to the project are illustrated on Figure 2. The systems which handled polymer and slug solutions were installed with plastic piping and internally plastic-coated steel to minimize the potential of iron pick-up, which degrades the polymer solution and causes wellbore plugging.

Fresh water was furnished from Lawry WSW No. 5, which was equipped with a 2.5 HP submersible pump to provide an adequate water supply of 350 BPD. The supply well, located 550 feet west of Well No. HO-68, produced good quality water, which was treated with sodium hypochlorite for bacterial control and was filtered through a Lakeside coal-bed filter.

The filtration and polymer mix plant housed the 5-foot x 5-1/2-foot Lakeside coal-bed filter, a 50-square foot DeLaval DE filter complete with precoat and slurry tanks, an Acrison Model 120-E mixer for dry polymer, two centrifugal pumps for transferring fluids, and meters for fluid measurement. An 85-barrel epoxy-coated polymer concentrate tank was located outside the building.

The shear plant was used in the second stage of polymer mixing. The hydration of dry Xanthan polymer was accelerated by shearing a concentrated polymer-water solution. The shear plant contained a centrifugal pump for fluid transfer and circulation and an Oilwell C-323 triplex pump equipped with a 25 HP electric motor. The piping discharge on the triplex pump was such that the polymer concentrate solution was sheared through a series of three orifice plates developing a 500 psi pressure drop per plate.

The pressure plant contained an FWI P-200-A triplex pump with 5 HP electric motor and a Milroyal Model C pump with 2 HP electric motor complete with Mercoid pressure controls. The Milroyal Model C pump was a constant

speed, variable stroke pump with positive volume control from 0.2 to 42 BPD. Although both pumps were used for Phase I injection, the Milroyal volume control pump provided over 99 percent of the injection requirements.

The office and lab were provided for operational and quality control supervision. Millipore tests, Brookfield viscosity measurements, pH, total iron, and chlorine measurements were made on a daily basis. A very high degree of quality control was maintained during Phase I, and all injected fluids were required to pass a 0.45 micron millipore test.

Phase I tank storage facilities contained four 210-barrel epoxy-coated tanks. One tank was used for Lakeside filtered fresh water and three tanks were used for polymer or micellar slug. The tanks were equipped with gas jet burners for heating during winter operations.

The wellhead was equipped with a lubricator for running a bottomhole pressure bomb without fluid injection interruption. The wellhead was also equipped with a sample port, pressure gauge, and dead weight pressure connection, and was winterized by providing a small insulated enclosure and heat lamp to prevent freezing.

OPERATIONS

Water Injection

Water injection began July 9, 1975. The injection pressure was initially restricted to under 600 psig WHP, which, when converted to BHP, was below the known formation parting pressure in this section of the Bradford Field. The initial injection rate was 76 BPD at 590 psig WHP. On July 20, 1975, the rate was set at 41 BPD, which was maintained until October 3, 1975. Over this period, WHP gradually increased from 445 psig on August 1 to 510 psig on October 3 at a cumulative injection of 3,415 BW.

Various tests were run during the water injection period. A 24-hour pressure falloff test was run on July 24, 1975 after injecting 797 BW. This test was used to determine reservoir characteristics and also indicated the pressence of a wellbore fracture. Standard analysis of the data gave the following results: Fluid Transmissibility (kh), 34.0 md.-ft.; Skin Factor, -3.1 to -4.2; and Volume Investigated during the test, 1.9 to 19 acres.

A Temperature log and Radioactive Tracer Surveys were run on August 11, 1975 after 1500 BW cumulative injection. The Tracer Surveys indicated complete packer seal at 1,080 feet and the following percentage injection profile:

RA - Solution		RA - Beads		
Interval	% Injection	Interval	% Injection	
1090 - 1095	20	1090 - 1094	4	
		1094 - 1098	16	20%
1102 - 1106	64			
		1098 - 1100	8	
1106 - 1115	16	1100 - 1102	12	
		1102 - 1104	23	
		1104 - 1106	12	55%
Total	100%			
		1106 - 1108	9	
		1108 - 1110	9	
		1110 - 1112	3	
		1112 - 1114	2	
		1114 - 1116	2	25%
		Total	100%	

Finally, step-rate injectivity tests were run to determine the potential for pressure parting the reservoir up to a WHP limit of 1000 psig. The results of a 16 point test, which measured injection rates at 50 psig increments from 250 psig to 1000 psig, indicated no adverse performance by pressure parting.

Micellar Slug Injection

A total of 452 barrels of micellar slug were injected into Well No. HO-68 during the period October 3-27, 1975. The average injection rate was 20.5 BPD over the 24-day period. The injection rate was maintained at a constant value for 22 days, and the wellhead injection pressure, taken with a dead weight gauge, increased from 510 psig to 923 psig. The performance is illustrated on Figure 3.

The micellar slug, which was mixed at Pennzoil's Project 7 test site at Cyclone, Pennsylvania, had the following composition:

	Bbls.	Volume %
TRS - 16*	32.2	5.46
TRS - 40*	32.5	5.51
Diesel	106.0	17.97
Amyl Alcohol	14.0	2.37
Butyl Alcohol	3.9	0.66
Water	401.4	68.03
Total	590.0	100.00

*Witco Brand Sulfonate

The slug was DE filtered at Cyclone to pass a 0.45 micron millipore test and was transferred by 100-bbl. tank truck to the Lawry test site. The slug, which passed daily wellhead checks for viscosity and 0.45 micron millipore quality control exhibited the following physical characteristics:

Viscosity - Brookfield @ 6 rpm	-	11.4 Centipoise @ 68°F. 11.9 Centipoise @ 64°F.
Specific Gravity	-	0.972 @ 64°F.
Critical Temperature	-	110°F. - High 52°F. - Low

Polymer Injection

Plans for this injection phase were to begin with a polymer having a viscosity of 6 to 7 centipoise. This viscosity was to be maintained until a reasonably stable injection pressure-rate relationship was obtained and then the viscosity would be increased to 10 centipoise.

The mobility buffer used in Well HO-68 was a custom-prepared polysaccharide biopolymer broth. Both 7 centipoise and 10 centipoise polymer solutions were injected during different periods of mobility buffer injection. The broth was mixed to approximately 350 ppm for 7 centipoise polymer and 500 ppm for 10 centipoise polymer. The biopolymer was DE filtered to pass a 0.45 micron millipore test. No shearing operation for polymer hydration was necessary in preparing the biopolymer solution using the broth.

A total of 2,867 barrels of biopolymer were injected into Well HO-68 during the period October 27, 1975 to February 25, 1976. Injection started with 7 centipoise biopolymer solution, and then viscosity was increased to 10 centipoise on January 16, 1976 and reduced to 7 centipoise again on February 19, 1976. The performance is illustrated on Figure 3.

The initial injection rate for the 7 centipoise biopolymer was 20 BPD at 850 psig wellhead pressure. A constant 20 BPD injection rate was maintained until the wellhead injection pressure stabilized at 877 psi after six days.

During the injection period, the following tests were run: Step-rate (7 cp viscosity), Step-rate (10 cp viscosity), and Pressure Fall-off (7 cp viscosity).

The four-point step-rate injectivity relationship for 7 cp viscosity biopolymer injection was determined by varying the injection rate and allow-

ing the pressure to stabilize. The test was conducted by going from lower to higher rates and allowing the injection pressure to stabilize over a 10-day period at each rate. The 7 cp viscosity biopolymer injection curve indicated that pressure parting occurred in the formation when the rate was increased from 35 BPD to 40 BPD, and the wellhead injection pressure exceeded the critical pressure of 1,165 psig.

A four-point step-rate injectivity relationship for 10 cp viscosity biopolymer was also determined by varying the injection rate and allowing the pressure to stabilize. Prior to starting the test, the 7 cp viscosity biopolymer injection rate was reduced from 40 BPD to 20 BPD for an eight-day pressure stabilization period. The biopolymer viscosity was then increased from 7 cp to 10 cp and the test was conducted by going from lower to higher injection rates and allowing the pressure to stabilize. The pressure stabilization periods for the first two injection rates were for 10 days each and the last two rates were for 6 days each. The 10 cp viscosity biopolymer injection curve indicated that pressure parting occurred in the formation when the rate was increased from 25 BPD to 30 BPD, and the wellhead injection pressure exceeded 1,122 psig.

The results of the step-rate tests indicated that the low permeability Bradford Third Sand in Well HO-68 would accept either 7 centipoise or 10 centipoise biopolymer injection at pressures below the established critical parting pressure as shown below:

Polymer Viscosity	Injection Rate-BPD	Critical Wellhead Pressure PSIG
7 cp	35	1165
10 cp	28 (extrapolated)	1165

After completing the 10 cp step-rate injectivity test, the biopolymer injection rate was reduced from 35 BPD to 20 BPD and the viscosity was reduced from 10 cp to 7 cp. The injection of 7 cp biopolymer was maintained for six days and the well was returned to water injection on February 25, 1976.

EVALUATION

The injectivity test accomplished all objectives, particularly with regard to the successful injection of Maraflood process fluids. A decision was made on May 3, 1976 to proceed with the 24-acre project.

PHASE II - 24 ACRE PROJECT

The objectives of Phase II of the Lawry Project were as follows:

1) Develop the 24-acre project consisting of nine enclosed five-spots on one and one-half acre spacing. This required the drilling and completion of 41 new wells (16 injectors and 25 producers) and the coring of the 16 injectors and the center producer.

2) Determine the reservoir properties based on core and log data.

3) Install plant and field equipment for operating the micellar-polymer flood.

4) Inject pre-flush brine to condition the reservoir fluids for slug injection.

5) Inject Maraflood micellar slug.

6) Inject mobility control polymer.

7) Provide for a major decision point for a performance

evaluation after 50 percent of a pore volume of slug and polymer has been injected.

8) Inject water.

9) Post-injection evaluation of the project.

Phase II was originally programmed for a period of four years. The objectives are placed in their proper time perspective by the Milestone Chart shown in Figure 4.

DEVELOPMENT

DRILLING

For Phase II, a total of 25 producing wells and 16 injection wells were drilled between March 16, 1976 and February 26, 1977. Excluding Well H-102 which was cored to obtain six inch diameter reservoir samples, all of the other producing wells were drilled to total depth with cable tools. All 16 injection wells and producing Well H-102 were drilled with cable tools to their respective core points (top of Bradford Third Sand) and then conventionally diamond cored to total depth.

Injection Well HO-69 and producing Well H-102 were drilled as 8-5/8 inch holes to their respective core points. Conductor pipe (11-3/4 inch O.D., 42 pound, H-40) was set at 12 and 30 feet, respectively, and 8-5/8 inch O.D., 24 pound, H-40 surface casing was cemented at 330 and 345 feet, respectively. The Bradford Third Sand was cored using a six-inch I.D. (7-3/4 inch O.D.) rotary diamond corehead.

The remaining 15 injectors all contained between 22 and 47 feet of 8-5/8 inch O.D., 24 pound, H-40 conductor pipe followed by 300 to 440 feet of seven-inch O.D., 20 pound, K-55 surface casing cemented with 10 sacks of regular neat cement to protect all fresh water zones. A 6-1/4

inch hole was drilled from seven-inch casing seat to the core point and then a 3-1/2 inch diamond core was taken of the pay horizon.

The remaining 24 producers all contained between 21 and 61 feet of 8-5/8 inch O.D., 24 pound, H-40 conductor pipe followed by 331 to 462 feet of seven-inch O.D., 20 pound, K-55 surface casing cemented with 10 sacks of regular neat cement to protect all fresh water zones. A 6-1/4 inch hole was then drilled to total depth.

CORING

The original core program called for diamond coring the Bradford Third Sand in eight injectors and the center producer. Later examinations of N-S and E-W cross sections by Marathon's research personnel revealed a need for additional cores to effectively determine net pay and for better operational control and injection evaluation. The revised program increased the number of core wells to include all 16 injectors and the center producer.

Six-inch diamond cores were cut from injection Well HO-69 and producing Well H-102 exclusively for lab bench work (fluid design core floods) by Marathon's Denver research group. The remaining 15 injection wells were conventionally cored with a 3-1/2 inch I.D. diamond core barrel. Representative samples from each foot of these 3-1/2 inch cores were analyzed for reservoir properties by the John DePetro Laboratory of Bradford. These 15 cores were then sent to Marathon's Denver Research Center for further reservoir analysis including relative permeability work and supplementary saturation determinations.

The core recovery for the entire program was greater than 99 percent, as total recovery was 857 feet out of 866 feet cored. The average recovery was 50.4 feet per well while the average core cut was 50.9 feet.

LOGGING

The primary purpose for logging the Lawry Project was to tie core determined reservoir properties to uncored wells. A preliminary examination of available data from the Lawry lease indicated that electric logs would not yield good definition of reservoir lithology due to the high resistivity of the water present in the formation resulting from years of waterflooding. These studies resulted in the recommendation of combination Gamma Ray-Denisity logs as the primary logs for the project.

The first well logged was injection Well HO-70 (a core well) permitting a log-core comparison to determine if the suite of logs chosen would be satisfactory. The well was logged by both Birdwell and Schlumberger to provide a second comparison for log quality, and the Gamma Ray-Compensated Formation Density logging suite was satisfactory for defining the petrophysical characteristics of the Bradford Third Sand.

Birdwell's combination Compensated Formation Density-Gamma Ray with Caliper log was then run on all 25 producers and the 15 remaining injectors. The Gamma Ray log was run from surface to total depth, while the Compensated Formation Density and Hole Caliper logs were run from the surface casing seat (approximately 400 feet) to total depth.

A Temperate log was run on injection Well HO-69, a six-inch core well, to obtain preliminary reservoir temperature data. Static formation temperature was approximately 64 degrees Fahrenheit, see Reference I, Figure 5.

Piper Well Survey's Hole Caliper with correlating Gamma Ray logs were run on all injectors, following nitro stimulation and cleanout, to determine the extent of net wellbore radius increase.

Birdwell later ran Radioactive Tracer and Temperature logs on selected injectors, which will be discussed under the section titled <u>OPERATIONS</u>.

COMPLETION

Injection Wells

The 16 injection wells were open hole completions in the Bradford Third Sand reservoir. Figure 5 illustrates a typical injection well completion.

After coring operations, the 16 wells were logged and then stimulated with liquid explosive (nitro) in the Bradford Third Sand. These shots, varying from 145 to 195 quarts of nitro per well, were to stimulate injection rates into the low permeability sands.

The wells were then cleaned out with cable tools to total depth and a disc-wall packer was run on 2-3/8 inch O.D. seamless tubing (internally plastic-coated). The 2-3/8 inch by 6-1/4 inch Larkin disc-wall packer was set at the top of the pay sand and 10 sacks of cement were placed on top of the packer, resulting in 100 feet of annulus fill-up between the 2-3/8 inch tubing and the 6-1/4 inch borehole.

Producing Wells

The 25 producing wells were open hole completions in the Bradford Third Sand reservoir. Figure 6 illustrates a typical production well completion.

After drilling to total depth, the wells were logged and then stimulated with liquid explosive (nitro) in the Bradford Third Sand to improve the drainage radius. These shots varied from 140 to 190 quarts of nitro per well.

Following cleanout to total depth with cable tools, the wells were equipped with 2-3/8 inch O.D. tubing, 5/8 inch rods, a 1-3/4 inch working barrel, and a Churchill Model 7M-25-53-30 (A.P.I. 25) electric pumping unit with cycle timer.

PLUG AND ABANDONMENTS

Thirteen old producing wells, H-12, H-25, H-33, H-34, H-35, H-46, H-54, H-70, H-73, H-74, H-75, H-86 and H-87, were plugged and abandoned in the project area, and two old wells previously plugged were re-entered for verification of proper plugging.

Abandonment required cementing the wells to approximately 50 feet above the shallowest oil producing sand (Chipmunk). A bridge was then set 25 feet below the surface casing seat. Ten sacks of cement were placed on top of the bridge, the casing filled with gravel, and a pipe marker was set on top of the casing. The locations of these wells are shown on Figure 7.

DESIGN AND ENGINEERING

Fluid System Design

General

All fluid design work was conducted by Marathon using the six-inch cores obtained during the coring program. The crude oil used in the design work was obtained from the Lawry lease, while the hydrocarbons used in slug formulations were obtained from the Witco refinery in Bradford. Synthetic waters, based on the analyses of the produced and supply water from the Lawry lease, were used exclusively.

A number of slugs were formulated and screened by a benchtop method, proprietary to Marathon. Those slugs which passed the preliminary screening were selected for disc flooding. Polymers were also evaluated prior to initiating the disc flooding tests.

Marathon evaluated all fluid systems in flood pot type tests using actual reservoir rock. Two-inch thick discs were cut from the six-inch

cores obtained in the project area. The core disc was then cut and machined to size and a center hole drilled. The disc cores were cold cleaned with a series of solvents, dried, mounted in a core holder, saturated with brine, flooded with oil to residual water saturation, and then flooded with water to residual oil saturation. Core pore volume and water permeability were determined during the water saturation phase of the operation.

A constant rate non-pulsating positive displacement pump was used to inject the micellar polymer process fluids. The core was flooded with 1.5 pore volumes of fluid from the center to the outer perimeter. Pressures were measured at the injection point and at three locations in progression from the center. Produced fluids were collected and measured to determine oil recovery. Pressure data were used as an indicator of the mobility control achieved in the core floods.

The cores obtained from the project area were very tight, and, although attempts were made to select the most permeable sections of the core for disc flooding, many core discs were too tight for fluid injection. Even when the most permeable sections of cores were used, it was difficult to flood at the desired rate. This necessiated redesigning the core flooding equipment to permit flooding at higher injection pressures.

The difficulty in obtaining permeable discs for core flooding necessitated attempts to clean and reuse core discs. A considerable amount of experimentation along this line was conducted before a procedure was established which made it possible to reuse discs, to a limited extent, in more than one flooding operation. It was impossible to clean the Maraflood fluids completely from the pore spaces, however, the reused cores proved satisfactory for use in the initial screening of slugs. Fresh cores were required for slug optimization work.

The need for injection of a pre-slug material was investigated by comparing oil recoveries from disc floods with and without pre-slug. The following results were obtained utilizing the same fluid system for each test pair except for the pre-slug, which varied in sodium chloride concentration.

Run No.	Pre-Slug	Oil Recovery (% OIP) (SO_r = 45% PV)
WR-04M	None	40.0%
WR-06M	Yes	57.6%
WR-247	None	27.6%
WR-248	20,000 ppm NaCl	34.4%
WR-231	20,000 ppm NaCl	36.4%
WR-234	50,000 ppm NaCl	42.7%
WR-246	20,000 ppm NaCl	27.8%
WR-245	50,000 ppm NaCl	44.9%
WR-286	20,000 ppm NaCl	48.2%
WR-287	50,000 ppm NaCl	74.7%

Note: The fluid systems were identical for the paired systems except for the pre-slug.

These comparisons were made at different times and with different fluid systems throughout the design phase of the project. It should be noted that in every case, additional recovery was obtained using a pre-slug material. The optimum salt concentration for the pre-flush brine was determined to be 50,000 ppm.

Micellar Slug

The initial step in slug design was to evaluate the available sulfonates and hydrocarbons in various combinations and concentrations in order to obtain slugs which by bench-top screening methods showed promise of having good oil displacement characteristics. Witco sulfonates were used along with a number of different hydrocarbon cuts obtained from the Witco refinery in Bradford, Pennsylvania. It had been deter-

mined by previous laboratory work, in conjunction with the Phase I injectivity test, that the slug viscosity should be in the neighborhood of 8-10 cp. Slugs mixed in the laboratory which had viscosities in this range and which passed the preliminary screening were then selected for more extensive disc flooding tests.

Many disc floods were run to test the various slugs. All runs were made at the reservoir temperature of 64 degrees Fahrenheit and at the frontal advance rate deemed comparable to the anticipated field frontal advance rate. The fluid injection procedure was to inject the pre-slug, then the indicated percentage pore volume of slug, followed by 90-100 percent pore volume of polymer, which was in turn displaced with a 50 percent pore volume of water. Total pore volume of fluids injected was 150 percent. The slug that gave the best oil displacement characteristics from a cost effective standpoint had the following composition:

	Weight %	Volume %
Witco TRS-16 (1)	4.66	4.20
Witco TRS-40 (2)	6.40	5.12
Platformer Charge	21.58	28.67
Lawry Supply Water	67.36	62.01

(1) Based on sulfonate activity of 64.4%.

(2) Based on sulfonate activity of 46.9%.

The above composition was stabilized with Neodol, primary amyl alcohol and normal butyl alcohol. The expected range for alcohol requirements was as follows:

	Weight %	Volume %
Neodol	0.99	0.90
Primary Amyl Alcohol	0.98-1.30	1.07-1.42
Normal Butyl Alcohol	0.94-1.56	1.06-1.77

Tests involving Neodol 25-3A (Ammonium) and Neodol 25-3S (Sodium) indicated the same viscosity versus alcohol behavior and temperature stability as the Neodol 23-3A, which had been previously tested but had become unavailable commercially. Neodol 25-3S was utilized in the project.

The recommended temperature stability and viscosity specifications were as follows:

Maximum Lower Temperature Stability:	$45^{o}F$
Minimum Upper Temperature Stability:	$95^{o}F$
Viscosity (6 RPM Brookfield at $64^{o}F$.):	7.5 - 9.0 cp

Disc floods were run utilizing Pennzoil field mixed slug and fresh discs to measure oil recovery versus slug size. All flood results are plotted in Figure 8, and the solid line in Figure 8 is a least square's match of all data with a linear portion forced through the origin. The breakpoint in the curve occurs at 10.88% PV slug. The high breakpoint is a result of the oil recovery values for the low slug size floods. It had been previously noted that oil recovery (% of post-waterflood Sor = 0.45) was dependent on post-waterflood residual oil saturation. Therefore, oil recovery for the low slug size floods was generally lower than normal due to higher post-waterflood oil saturations.

A cost effective slug size of 9% PV was agreed upon by the participants based on incremental economics indicated by the recovery data. The decision was also influenced by laboratory versus field recovery factors, directional flow, post-waterflood residual oil saturation, and other uncertain data.

Mobility Buffer

Two types of buffers are used in micellar polymer flooding for mobility control. Polyacrylamides achieve mobility control principally by

partial plugging (decreasing permeability) while polysaccharides achieve it mainly by body viscosity. While polysaccharides may decrese permeability to a certain extent, the decrease is small in relation to the decrease observed when polyacrylamides are used. Because of the permeability reduction characteristics of polyacrylamides, they cannot be used in a low permeability Bradford Third Sand reservoir. Field injectivity tests using presently available polyacrylamides in this reservoir, have shown marked decreases in injectivity in a short period of time with indications that very severe, if not total, plugging would eventually take place. Based on this experience, a polysaccharide (biopolymer) was selected as the mobility control agent for this project.

Polymer solution made from Quaker State broths were tested by Marathon and showed displacement qualities comparable to tests made with laboratory prepared Kelzan polymer solution. Pennzoil's field filtered NaOCl - treated Kelzan mobility buffer was also tested and demonstrated displacement qualities comparable to both Quaker State's field filtered broths and the laboratory prepared Kelzan polymer solutions used during the design phases of the project. Kelzan was chosen as the project mobility buffer due to the extent of testing and consistantly satisfactory performance.

A three-step tapered biopolymer mobility buffer injection sequence was recommended. Polymer properties and volumes for each sequence are specified as follows:

Sequence	Viscosity @ 60°F, 6 RPM	Concentration*	Volume**
"Spike"	9 ± 0.5 cp.	500 ppm minimum	68,458 bbls. (10% PV)
"Body"	5.5 ± 0.5 cp.	350 ppm minimum	349,134 bbls. (51% PV)

Sequence	Viscosity @ 60°F. 6 RPM	Concentration*	Volume**
"Tail"	1.8 ± 0.2 cp.	100 ppm minimum	205,373 Bbls. (30% PV)

* Mobility buffer is made up of Lawry supply water.

** Quantities all based upon reservoir pore volume of 684,577 Bbls.

Transient Testing

A transient testing program for the Lawry Project was designed by Marathon research personnel. The program consisted of three independent groups of tests: (1) A fluid level measurement program, (2) An interference testing program, and (3) A fall-off testing program.

The fluid level measurement program, which was initiated on December 12, 1976 was developed to determine the existing reservoir pressure distribution within the Lawry test pattern and whether or not this pressure pattern was changing with time. Seven series of fluid level tests were conducted on all 16 injection wells with the use of a float bob and measuring line. The final series of fluid levels were run on April 11, 1977, and the results indicated to a stabilized reservoir pressure of 467.2 psi. During all of the tests, the injection wells were static and open to atmosphere. The bottomhole pressures were referenced to the top of Bradford Third Sand and calculated based on a fluid gradient of 0.35 psi/foot for oil and 0.433 psi/foot for water.

The interference testing program, referred to as Phase I, was designed to investigate anisotropic reservoir properties. This program, conducted by Marathon research personnel, was carried out from April 18 to May 15, 1977 prior to brine pre-slug injection. The program, completed in one month, consisted of four interference tests utilizing four project

wells per test. The test patterns are shown in Figure 9.

Interference test data were analyzed by an automatic matching procedure that provided estimates of reservoir properties for an ideal isotropic homogeneous reservoir. Results were obtained from the same computer model for an ideal anisotropic but otherwise homogeneous reservoir. The anisotropic results are statistically better and consistent with other available data. The analysis included the effect of wellbore storage (afterflow) on observation well pressure data, and the effect of reservoir pressure trend in each observation well.

Active well data for each of the four interference tests were analyzed by finite difference techniques. The single well simulator contains methods to analyze multiple rate data with wellbore storage and skin. Normal Miller-Dyes-Hutchinson semilog plot techniques and type curves were also used to analyze the active well data.

The fall-off testing program, referred to as Phase II, required about two weeks and was designed to determine reservoir properties. This program, conducted by Pennzoil personnel, was initiated on June 27, 1977, following a pre-slug brine injection rate stabilization period. The program consisted of four test sequences, testing three injection wells simultaneously per sequence. The twelve injection wells not tested as active wells in Phase I were tested in Phase II. The triangular test patterns, illustrated in Figure 10, provided for minimum interference of stabilized conditions during each test sequence.

Falloff test data were analyzed by special type curves developed for stimulated wells. Five out of the twelve wells were analyzable by normal semilog plotting methods.

Fluid level surveys obtained prior to interference testing in the inactive pattern showed the existence of a pressure gradient across the Lawry site in a northwest - southeast direction. The magnitude of the gradient was about 200 psi. Average reservoir pressure estimates for five falloff tests indicated a pressure gradient existing in the active pattern. The trend was in about the same direction but about half the magnitude at the time the falloff tests were completed.

Interference tests showed that areas tested exhibited anisotropic (directional permeability) behavior. This was consistent with a modeling study design to match fluid level data in the test pattern before the interference tests were initiated. Average reservoir pressure calculations for falloff tests also indicated similar anisotropic behavior.

The primary use of the results was in subsequent work for performance matching and predictions. The results of the well test program were to be used to better understand the oil recovery behavior of the Lawry Project.

The conclusions of the Lawry Project transient testing program were as follows:

1) The Lawry test site was generally heterogeneous and anisotropic in the areas influenced by transient tests.

2) A pressure gradient existed across the inactive Lawry test site before interference tests were started. Falloff test data showed that a similar pressure gradient (direction) existed across the test pattern during brine pre-slug injection.

3) The analysis techniques described in this report and in detail in the Third Annual Report, provided acceptable average reservoir properties for the area influenced

by a specific well test in the Lawry site.

4) The layered properties (vertical heterogeneities) in the test site were not completely defined by the transient test program.

5) The existence of a natural fracture system in the Lawry test site was not confirmed by the transient test program.

Reservoir Study

A reservoir study was performed to determine the pore volumes for associated five-spot patterns to optimize the injection performance of expensive chemicals. The analyses of Compensated Formation Density - Gamma Ray logs and conventional cores were used to make these pore volume determinations. The total project pore volume calculated to be 684,577 barrels. Table 1, 2, and 3 present average net pay, porosity and pore volume data. An area of 1.5 acres was used in the calculations for each regular and inverted five-spot.

A weighted average equation was used to calculate the average net sand thickness for each regular and inverted five-spot. The equation used the center well thickness four times and the thickness from the four surrounding wells one time. The sum is divided by eight to give the average net sand thickness for the five-spot.

The net sand thickness for each well was calculated from the Compensated Density logs run in that particular well utilizing an 11 percent porosity cutoff. This porosity cutoff was determined by correlating Denisty logs and core analysis data. The 11% porosity cutoff corresponded consistently with 0.5 md. permeability below which occurred non-

floodable shale and sand. The highest net sand value, about 34 feet, occurred near wells HO-84 and H-90, and the lowest value, 19 feet, occurred around Well HO-78. The arithmetic average thickness for the total project was 28.99 feet. Figure 11 is a net sand isopach of the project area.

Since all of the injectors were cored, the average core porosity of each respective injector was used in the pore volume calculation for the 16 inverted five-spots. The exception was the H-69 inverted five-spot. Because this was a six-inch core used for disc flooding and was not submitted for routine core analysis, the porosity for this inverted five-spot was calculated from the average porosity of the four surrounding injectors. Figure 12 is a porosity isopach map of the project area. Average porosity for the project was 12.65 percent.

The average core porosity from the four surrounding injectors was used in the pore volume calculation for the nine regular five-spots.

A pore volume for the total project was calculated from the sum of the pore volumes of the 16 inverted five-spots.

The average permeability, utilizing the 11% porosity cutoff, was 7.65 md. Figure 13 is a permeability isopach map of the project area.

Oil saturation based on core analyses and the 11% porosity cutoff was just under 33 percent. This value was adjusted up to 40% to account for flushing that occurs during coring operations.

In summary, the average reservoir parameters for the Bradford Third Sand in the project area were as follows: 1,280 feet depth, 64 degrees Fahrenheit reservoir temperature, 28.99 feet net pay, 12.65 percent porosity, 7.65 md. permeability, 40 percent oil saturation, and 6.5 cp. crude oil viscosity.

Pattern Design

Phase II of the Lawry Project contained 25 producing and 16 injection wells drilled as regular one and one-half acre five-spots within a 13.5 acre square (Figure 14) surrounded by 16 producing wells, for a total developed area of 24 acres. The five-spot patterns, illustrated in Figure 15, were oriented 45 degrees off north to minimize the effects of the natural joint system which is known to exist in the Bradford Field.

The oriented five-spot pattern conformed with the original two-acre five-spot pattern employed in the secondary development of this lease and was positioned to avoid "old well" overlap where possible. All "old wells" were plugged and abandoned, and new wells were drilled for this test.

The one and one-half acre five-spot spacing would permit evaluation and appraisal for commercial application in a reasonable time period as specified in the DOE contract. The spacing would also provide maximum reservoir data for process control while maintaining development and chemical investments at a reasonable level.

SURFACE FACILITIES

Injection System

Fluid Storage

Storage facilities for the stock slug solution were located at Witco Chemical Corporation's Foster Brook Plant approximately five miles west of the Lawry test site. The system consisted of two 15,000 barrel steel tanks equipped with steam coils for temperature control, a 50 HP centrifugal circulating pump, and associated piping. A 3-inch Rockwell turbine meter was used for metering the slug components into

the mix tanks, and a float-type level indicator provided for an accurate measure of the tank contents. Figure 16 is a schematic of the stock slug facilities.

The fluid storage facilities that were located at the Lawry test site are shown in Figure 17. This tank battery provides for the storage of fresh supply water and micellar slug and polymer solutions. An elevation profile of the tank battery is illustrated in Figure 18.

The supply water, stored in two 210 barrel epoxy coated tanks, was treated with sodium hypochlorite prior to filtration through graded anthracite coal in an internally coated downflow filter. A float switch on the fresh water tanks activated the supply well pump and the chlorine feed pump to provide for an adequate supply of fresh makeup water.

The stock slug solution was stored in two 210 barrel steel tanks while semi-finished and finished injection fluids were stored in eight 210 barrel epoxy coated tanks. Four of these coated tanks were used to store unfiltered or "raw" fluids while the filtered fluids were stored in the four remaining tanks. One 100 barrel and two 210 barrel steel tanks were used for storing alcohols which were used in the slug mixing process. Two 140 barrel epoxy coated tanks held the polymer concentrate.

Each of the 210 barrel tanks was connected to the plant by two separate 4-inch PVC lines which provided for individual tank mixing. The polymer concentrate tanks utilized 6-inch PVC pipe to accommodate the flow of viscous polymer solution.

Gauging of the injection fluids was done using a Petrometer model 1700-2 level indicator. Each tank was connected to the measuring device located in the plant by a 1/4-inch polyethylene line, which, when purged with nitrogen, measured the fluid head in the tank as inches of mercury.

Injection Plant

The Phase II plant is shown in Figure 19, and Figure 20 illustrates several plant cross sections. A 4-inch PVC header system (Figure 21) was connected to the stock, raw, and filtered fluid tanks and was designed for the separate handling of each of these fluids. The header was connected to both a 5 HP and a 20 HP centrifugal pump which were used in preparing and circulating the injection fluids. A 3-inch Rockwell turbine meter on the discharge of each pump was used to meter the flow of fluids. A positive displacement Moyno pump was connected to the suction of each centrifugal pump to deliver small volumes of alcohols from a 55 gallon calibrated drum, during the slug mixing process.

An Acrison volumetric feeder was used to meter the dry polymer into a Hague wetting bowl, which was supplied with fresh makeup water through a 1½-inch Badger magnetic drive meter. A 3 HP centrifugal pump transmitted the polymer-water solution through a 6-inch header system and into one of the two 140 barrel concentrate tanks. A 10 HP positive displacement Lobe pump was used to circulate the polymer concentrate.

The shearing system, used to further hydrate the polymer solution, consisted of an Oilwell C-323 triplex pump which discharged into a shear module containing three orifice plates. Each plate contained 13 to 15 5/64-inch diameter holes. The module was designed to produce a pressure drop of 350 to 400 psig per orifice plate at a rate of approximately one barrel per minute.

The filtration system consisted of a 572 square foot Industrial (type 122.331) model "L" (D) diatomaceous earth filter. The filter

station was entirely skid mounted and equipped with a 20 HP centrifugal pre-coat pump, epoxy coated pre-coat and slurry tanks, and a positive displacement Milroyal slurrypump for continuous body feed addition. The filter unit was a dry cake discharge type in which the spent filter cake could be air-dried for recovery and disposal. The leaf assembly in the filter was extracted hydraulically for exposure of the filter screens and an air operated vibrating mechanism shook the filter cake free of the screens. The air supply was provided by a Gardner Denver model ESJ single stage electra screw compressor equipped with a water cooled aftercooler. Figure 22 illustrates the filtration system.

Each injection pump discharged into an 8-inch internally coated header system connected to the individual injection lines. Each injection line on the header system was equipped with an internally coated cartridge-type filter and 1¼-inch meter. Provisions were also available for fluid sampling and pressure measurement. An auxiliary header system constructed of 1¼-inch internally coated pipe was connected to the main header through flexible high pressure tubing. This header was designed to receive fluid from the backup triplex pump and divert it into any number of individual injection wells. This header arrangement provided for the simultaneous injection of two different fluids (i.e. slug and polymer) into selected injection wells. A schematic of the injection header is shown in Figure 23.

A small on-site laboratory was used to routinely monitor injection fluid and supply water quality. Laboratory equipment included a Brookfield model LVT viscometer with constant temperature bath, a Sargent-Welch model PBL pH meter, and a Hach model CN-39WR test kit. A millipore filtration test unit, consisting of a 1,200 cc capacity stainless steel cylinder and 47 mm filter retainer, was utilized in testing injection fluids for

particulate contamination.

Production System

Each production well had a separate $1\frac{1}{4}$-inch steel flowline to the central header (Figure 24) where total fluid production was separated into Farm A (enclosed five-spots) and Farm B (peripheral wells). Through this header, any well could be connected to the test separator facilities for flow testing, and individual well fluid sampling could be conducted.

Each farm utilized its own separator and stock tanks, and oil production from each farm was gauged daily before being released to a common tank. Produced water from each farm was separately metered before entering a header and common line. The produced water was then treated with sodium hypochlorite, an oxidizing agent, which is also effective in the control of algae, fungi, and other organic growths, and entered three 210 barrel retention tanks. The fluid level in these tanks was maintained by a float switch connected to an automatic valve at the discharge of a down flow anthracite filter (Figure 25) located in the Phase II filter house. Produced water was gravity fed through the filter and into two additional 210 barrel retention tanks for further settling. The fluid level in these tanks was controlled by a float switch connected to an automatic valve on a second anthracite filter which discharged into two 210 barrel holding tanks. The fluid level in these tanks activated a 50 HP double stage centrifugal pump which transmitted the fluid to another project for reinjection. Figure 17 gives an overall view of the Phase II injection and production facilites.

OPERATIONS

Injection

Brine

Pre-flush brine injection began May 20, 1977 and continued through September 11, 1977. The total average daily injection rate, cumulative injection, and average wellhead pressure for Total Project, Farm A, and Farm B are recorded in Tables 4, 5, and 6. Project injection rate and average plant pressure histories are illustrated in Figure 26.

The required brine injection was 10% PV or 68,459 barrels. Each injection well and associated inverted five-spot pattern received at least 10% PV injection and the final project cumulative injection was 113,908 barrels or 16.64% PV. Tables 7 through 22 list the daily average intake by well and Table 23 shows the recommended brine injection for each injection well pattern and the final cumulative volume.

The lab equipment at the Phase I test facilities were utilized to monitor and maintain daily injection fluid quality. The sodium chloride concentration of the pre-flush brine, which was recommended to be 50,000 ppm, ranged daily from 44,880 to 56,760 ppm because of brine maker temperature variations. The chloride concentration ranged from 27,200 to 34,400 ppm. The chlorine residual varied from .1 to .6 ppm. The pH varied from 6.8 to 7.6 and the millipore ratio, recommended to be less than 1.5, ranged from 1.06 to 1.37.

Pressure fall-off tests were conducted on all 16 injection wells on June 8, 1977, and September 10, 1977 to evaluate injectivity conditions. The wells all demonstrated typical pressure fall-off responses for wells without borehole skin damage. The change in pressure for each well, over one cycle of 60 to 600 seconds, varied from 15 to 50 psi. The empirical

limit for water injection wells in the Bradford Third Sand reservoir is a ΔP of 100 psi, above which a well may be considered to have some degree of skin damage. No abnormal behavior could be interpreted from the data.

From June 11 to June 23, Birdwell ran Dynamic (injecting) Temperature, Fluid-Type Radioactive Tracer, and Static Temperature logs on injection Wells HO-72, HO-73, HO-69, HO-82, HO-77, HO-70, HO-83, HO-76, and HO-80. The nine wells were all logged under normal injection conditions to evaluate vertical injection conformance throughout the project. These injection surveys revealed the general pattern occurring throughout the project of a relatively high percentage of injection going into a thin higher permeability section at the top of the reservoir sand. Wellhead pressures on the surveyed wells ranged from 160 to 295 psig.

To determine if injectivity profiles could be altered, the identical suite of logs was run on Wells HO-73 and HO-77, while the wells were at a stabilized wellhead pressure of 650 psig and approximately 2.5 times their previous rate. Rate-pressure relationships were monitored during the buildups to avoid fracture situations. The vertical conformance of Well HO-77 was favorably altered, while that of HO-73 was virtually unchanged.

During the brine injection period, efforts were made to maintain equal percentages of recommended injection. The following injection wells were shut in for the respective periods, having received 100% of the recommended brine injection:

Well No.	Shut in Period
HO-74	July 18-July 26
HO-75	July 25-July 26
HO-78	July 25-July 26

Well No.	Shut in Period
HO-79	July 23-July 26
HO-80	July 22-July 26
HO-81	July 25-July 26
HO-82	July 21-July 26
HO-83	July 18-July 26

These wells were partially reopened on July 26 to maintain some brine injection and subsequently avoid pressure dissipation. On August 3, all eight previously restricted injection wells were opened completely.

Total injection initially declined since there was no production to alleviate reservoir pressure buildup. However, once production started on May 31, the total injection rate climbed to approximately 1,100 BPD and stabilized there through September 11 at a plant pressure of approximately 300 psig.

On September 4, the last injection well received the recommended brine injection and the preparations for micellar slug injection were nearing completion. Brine injection was completed on September 11, 1977 and the changeover to micellar slug began.

Micellar Slug

On September 11, 1977, fresh water was substituted for brine and maintained through September 12. A total of 1,079 barrels of fresh water were injected and then the injection lines were flushed out. Micellar slug injection was started on September 12 immediately following these cleanup operations. The total average daily injection rate, cumulative injection, and average wellhead pressure for Total Project, Farm A, and Farm B are recorded in Tables 4, 5, and 6. Project injection rate and average plant pressure histories are illustrated in Figure 26. The micellar

slug ranged from 7.8 to 9.0 cp viscosity and passed a standard 0.45 micron filtration test. Tables 7 through 22 list the daily average intake by well, and Table 24 shows the recommended slug injection (9 percent PV) for each injection well pattern and the final volumes injected when slug was terminated for all sixteen injection wells. All slug injection percentages were based strictly on meter readings, and in reality these meters ran approximately 4.7% high. Numerous tests to determine meter efficiencies revealed that the actual injection was lower than the recorded injection due to the lower specific gravity (.930) of the micellar slug.

Seven sets of pressure falloff tests were run on slug injection wells between September 28, 1977 and April 6, 1978. No abnormal behavior could be interpreted from the data. It should be noted, that the ΔP between 60 and 600 seconds (1 cycle) determined from these falloffs continually declined with each successive test of a slug injection well. The higher pressure drop (ΔP) during the initial slug injection period was expected, with the viscous slug reducing effective permeability around the wellbore, similar, but not nearly as severe as a skin damage interpretation. As slug injection progressed, these pressure drops continually declined as a result of expanding slug continuity in the reservoir.

At the outset of slug injection, the plant pressure increased to 600 psig almost immediately. Then with pressure remaining constant, the total daily injection rate began a steady decline.

To optimize injection conformance and maximize rates, a series of plant pressure increases were made between October 4 and December 15, 1977. Each 50 psi increase, illustrated in Figure 26, was made following

at least one week of stabilization and observation. Then, as a result of pressure gradient calculations, a plant pressure limit of 1,150 psig was set to avoid pressure parting situations.

Efforts were made during micellar slug injection to maintain equal percentages of recommended injection volumes. Control of this situation would eliminate costly slug over-injection or the dissipation of reservoir pressure in areas resulting from having to shut-in injection wells. On November 2, 1977, injection Wells HO-74, HO-75, HO-76, HO-80, HO-81, HO-82, HO-83, and HO-84 were restricted by pinching back individual ball valves on the injection header. This proved to be a relatively ineffective method. On November 17, 1977, 1/32" diameter orifice plates were installed on the injection header downstream of the meters for each of the eight previously restricted injection wells. The orifice plates remained in place until February 3, 1978, when they were removed to establish stabilized rates at 1,150 psig plant pressure for polymer rate estimations. Several days later, due to relatively high injection rates, injection Wells HO-82 and HO-83 were again cut back by ball valve adjustments.

Despite efforts to equalize required injection percentages, it was apparent that a relatively wide distribution was inevitable. Following minor plant modifications, the project entered a period of dual fluid injection on February 17, 1978.

SLUG/POLYMER

From February 17 through April 11, 1978, both micellar slug and biopolymer were injected simultaneously into specific wells. Figure 26 illustrates the total daily injection rate and weighted average plant pressure during this period, while Figure 27 reveals a breakdown of daily

slug and polymer injection along with the respective plant pressures. As particular injection wells attained the 9% PV recommended slug injection for the inverted five-spot patterns, they were switched to polymer injection to avoid costly over-injection of micellar slug. All sixteen injection wells received the required slug injection as shown in Table 24, and the wells were switched to polymer as follows:

Injection Well Nos.	Polymer Initiation Date
HO-73, HO-74, HO-78, HO-79, HO-81, HO-82, HO-83.	February 17
HO-75, HO-76, HO-80	February 27
HO-84	March 9
HO-77	April 8
HO-72	April 9
HO-69	April 10
HO-70, HO-71	April 11

The cumulative micellar slug injection was 64,394 barrels or 9.41% of the total pore volume. By April 11, 1978, all sixteen injection wells were receiving biopolymer.

POLYMER

The injection of "spike" biopolymer (500 ppm, 9 $\pm$ 0.5 cp.) continued from February 17, 1978 through February 1, 1979. The cumulative injection was 105,148 barrels, or 15.3% of the total pore volume. The total average daily injection rate, cumulative injection, and average wellhead pressure for Total Project, Farm A, and Farm B, are recorded in Tables 4, 5, and 6. Project injection rate and average plant pressure histories are illustrated in Figure 26. Routine quality control checks of finished polymer solution, including the standard 0.45 micron filtration test and viscosity measurements of wellhead samples, demonstrated that the polymer

was consistently within specifications. Table 7 through 22 list the daily average intake by well and Table 25 shows the recommended polymer (spike) injection for each injection well pattern and the final volumes injected.

Ten pressure falloff tests were carried out on the injection wells during the period July 1, 1978 through February 1, 1979. No abnormal behavior could be interpreted from the data.

The total injection rate for all sixteen injection wells was initially 320 BPD at 1,080 psig plant pressure, but following pump modifications, the rate and pressure were increased to 360 BPD and 1,160 psig respectively.

During the period of polymer (spike) injection, several wells exhibited abnormal rate increases which required adjustment. Rate control was achieved by installing various lengths of copper tubing at the injection header to reduce effective pressure by additional friction without shearing the polymer. Table 26 is a summary of intake well rate adjustment for the period May 5, 1978 through February 1, 1979.

Further pump adjustments on May 23, 1978 reduced the injection rate to approximately 330 BPD at a plant pressure of 1,140 psig. With the total injection rate stabilized at 330 BPD, the plant pressure gradually increased to 1,190 psig by June, 1978, and then the total rate was allowed to decrease to about 239 BPD, in January, 1979, to control maximum plant pressure.

The injection of the "body" phase (350 ppm, 5.5 $\pm$ 0.5 cp) of the mobility buffer sequence continued from February 1, 1979, through November 20, 1980. The total cumulative injection was 174,806 barrels, or 50.1% of the total pore volume. The total average injection rate, cumulative injection, and average wellhead pressure for Total Project, Farm A, and Farm B are

recorded in Tables 4, 5, and 6. Project injection rates and average plant pressure histories are illustrated in Figure 26. Routine quality control checks of finished polymer solution, including the standard 0.45 micron filtration test and viscosity measurements of wellhead samples, demonstrated that the polymer was consistently within specifications. Tables 7 through 22 list the daily average intake by well and Table 27 shows the recommended polymer (body) injection for each injection well pattern and the final volumes injected.

Twenty-one sets of pressure dissipation tests were run on injection wells between February 1 and June 30, 1979. No abnormal behavior could be interpreted from the data.

Many of the intake wells restricted during "spike" polymer injection exhibited very stable rates into the "body" polymer sequence, resulting in the systematic removal of various lengths of copper tubing to improve the overall injection rate. Copper tubing in selected wells was removed in lengths of twenty-five feet, or less, and over a period of several weeks until the desired rate was achieved.

As a result of gradually diminishing injection rates, Well No. HO-77 and No. HO-80 were selected for stimulation attempts. In preparation, a string of 3/4" PVC pipe was run into each well to allow the stimulation chemicals to be spotted at the sand face.

The initial treatment included circulation of the well with fresh polymer solution in an attempt to displace any gels or contaminants which may have plated out on the sand face. No improvements in injection performance resulted.

Subsequent stimulation attempts involved the use of both hydrochloric acid and sodium hypochlorite. The acid or sodium hypochlorite was allowed to soak for approximately 18 hours and then was circulated out of the well

with fresh water before the resumption of polymer injection. Little improvement resulted from these treatments. The following is a summary of the stimulation attempts.

DATE	TREATMENT	RESULTS
8/02/79	Ran 1385' of 3/4" PVC Tubing into Well No. HO-80	
8/03/79	Circulated Well No. HO-80 with 14 Bbl. fresh polymer	No Improvement
8/24/79	Ran 1315' of 3/4" PVC Tubing into Well No. HO-77	
8/27/79	Circulated Well No. HO-77 with 15 Bbl. fresh polymer	No Improvement
10/04/79	Treated Well No. HO-80 with 4 Bbl. 10% inhibited HCl acid	Increased rate 3 B/D (Dropped back to base by 10/21/79)
10/11/79	Treated Well No. HO-77 with 4 Bbl. 10% inhibited HCl acid	No Improvement
10/29/79	Treated Well No. HO-80 with 2 Bbl. 32% inhibited HCl acid	No Improvement
11/14/79	Treated Well No. HO-80 with 4 Bbl. 32% inhibited HCl acid	9 B/D increase in intake rate (Dropped back to 0 by 11/17/79)
11/29/79	Treated Well No. HO-80 with 5 Bbl. 15% Sodium Hypochlorite	6 B/D increase in intake rate
12/20/79	Treated Well No. HO-77 with 5 Bbl. 15% Sodium Hypochlorite	3 B/D increase in intake rate

Polymer injection was terminated November 20, 1980 as a result of project performance conclusions which are discussed in the section titled EVALUATION PROGRAM. Fresh water was injected from November 20, 1980 through November 28, 1980, when all operations were terminated.

CHEMICAL HANDLING

Micellar Slug

The stock micellar slug solution, which represented forty-five percent of the final slug volume, was prepared at Witco's Foster Brook facilities. The components of the stock slug solution, including the oil and water soluble petroleum sulfonates, Neodol, and normal butyl and primary amyl alcohol, were brought to the Foster Brook site by tank truck, while the platformer charge and fresh water were available on site. Approximately 5,000 barrels of stock solution were prepared at a time and the delivery of chemicals was scheduled so that a predetermined sequence of chemical addition was followed. Platformer charge was metered first into the

tank to which the oil soluble sulfonate (TRS-16) was then added. The tank was then circulated using the 50 HP centrifugal pump to thoroughly mix the two components. Approximately one-half of the recommended volume of water was added to the tank followed by the water soluble sulfonate (TRS-40). The Neodol, normal butyl alcohol, primary amyl alcohol, and remaining volume of water were added and the tank was again circulated. Additive alcohols to be used for final adjustment of viscosity and stability of the slug solution were transported to the Lawry site for storage.

Circulation of the completed stock slug mixture was continued for eighteen to twenty-four hours during which time samples were withdrawn and tested for solution stability and viscosity. The finished stock solution, when diluted with the appropriate amount of fresh water, displayed a homogeneous appearance between 45 and 90°F. and a viscosity in the range of 7.5 to 9.0 cp. Additional circulation of the stock solution was carried out overnight three times a week, and for at least one hour before it was loaded on a tank truck for transportation to the Lawry site. This mixing schedule assured a homogeneous slug mixture and temperature. The stock slug was transported to the Lawry project as required and pumped into the two 210 barrel storage tanks. Samples were taken from each load of slug and checked for quality control at the plant lab.

The finished slug solution was prepared by mixing forty-five percent (by volume) stock slug solution with fifty-five percent Lawry supply water and adding the required amounts of normal butyl and primary amyl alcohol to obtain the desired fluid viscosity and solution stability. This mixing step was accomplished by pumping the stock solution into a stream of fresh water at a predetermined rate and into one of four coated storage tanks for

raw mixed slug. The alcohols, introduced by Moyno pump, were metered simultaneously from a calibrated polyethylene drum. After all of the components were added, the tanks were circulated using the 20 HP centrifugal pump and samples were withdrawn for quality control. The fluid temperature was maintained between 62 and 68°F. and regular circulation and periodic sampling were performed. Figure 28 is a schematic of the slug mixing process.

Before filtration of the finished micellar slug solution, the DE filter was prepared for operation by depositing several grades of filteraids on the filter screens. The filter chamber was filled with the raw mixed slug solution and approximately twenty barrels were pumped into the precoat tank. The slug was circulated between the filter and precoat tank using the 20 HP centrifugal precoat pump, while Solkafloc, a fine fibrous material, was added to the slug in the precoat tank. The filteraid was deposited on the screens by the circulating fluid and then a fine grade of diatomaceous earth was added to the precoat tank and applied in a similar manner on top of the fibrous filteraid. Once the precoat operation was complete, the quality of the filtrate was checked by running a standard 0.45 micron millipore test. The filter was put on stream by feeding the inlet with the raw mixed slug solution and discharging into one of the four coated storage tanks for finished slug. The filtration was carried out at a rate of 0.2 gallons per square foot per minute with a continuous body feed concentration of 750 ppm. Sufficient slug was filtered to meet the anticipated daily injection requirements and then the filter was returned to the precoat cycle. After approximately 1,800 barrels of throughput, the pressure drop across the filter would approach 40 psig and the filter run was terminated.

Due to the nature of the micellar solution, a conventional backwash

operation was not possible and a dry-cake discharge method was used. The filter was purged with air at a rate of approximately 235 SCFM while the chamber pressure was regulated at 25 psig. The slug was displaced from the filter through a heel drain back into the precoat tank and then air was passed through the cake on the filter leaves. This step expelled virtually all of the slug from the filter cake and resulted in complete recovery of the slug solution from the filter unit. After thirty minutes of air drying, the filter unit was opened and the leaf assembly rolled out over a hopper into which the spent diatomaceous earth was expelled by vibration.

The filtered slug was gravity fed into the plant to supply the main triplex injection pump. Daily quality control measures included millipore filtration tests and viscosity measurements from injection header and individual wellhead samples.

Micellar Slug/Polymer

Since various wells received their designated pore volume percentage of micellar slug before other wells, the fluid handling system was modified to accommodate the simultaneous injection of both slug and polymer. The tank batteries were divided to insure the separation of the two fluids, and a separate polymer suction line was run from two of the filtered storage tanks to the backup triplex injection pump. By diverting the flow of polymer to the auxiliary polymer header, polymer injection could be initiated into any one of the sixteen injection wells. In order to utilize the capacity of the injection pump, polymer injection was not initiated until at least six intake wells received their required volume of slug. A schematic of the dual injection system is shown in Figure 29.

During the period of simultaneous slug and polymer injection, the slug solution was prepared and filtered every second or third day according to injection requirements and the polymer was mixed and filtered daily. Contamination of the polymer solution with slug was avoided by thoroughly flushing the mixing system with supply water, storing this water in two mixed slug tanks, and using this rinse water as makeup water for slug mixing. No system flushing was required prior to slug preparation.

Polymer

Preparation of polymer for injection involved four stages: dispersion of dry polymer in supply water at a concentration of 6,000 ppm, high pressure shearing of the polymer concentrate, dilution of the sheared concentrate with an appropriate amount of water, and DE-filtration. Figure 30 is a schematic of the polymer mixing procedure.

The dry polymer was fed through the volumetric feeder into the wetting bowl and supplied with fresh water at a rate sufficient to produce a concentration of 6,000 ppm polymer in water. The polymer-water dispersion was then pumped by a 3 HP centrifugal pump into the 6-inch header system through which the polymer was transmitted into one of the two 140 barrel concentrate tanks. The concentrate was circulated using the positive displacement Lobe pump to promote hydration. In order to disperse any gels or clumps of unhydrated polymer, the concentrate was sheared by passing it through the high pressure shear unit (Figure 21). The sheared concentrate was discharged into a stream of circulating fresh supply water contained in one of the four raw mix tanks. One barrel of sheared concentrate per 11-12 barrels of water produced a viscosity of 8.5 to 9.5 cp. The finished polymer solution was held overnight, during which time the fluid temperature was elevated to

66-68°F., and the polymer solution was circulated intermittently using a 5 HP centrifugal pump activated by a time clock.

The procedure for filtration of the polymer solution was essentially the same as that for the slug. A coarser grade of diatomaceous earth was incorporated into the precoat and body feed to give optimum flow rates, and the body feed concentration was increased to 1,200 ppm to compensate for the increased level of contaminents in the form of bacerial debris and gels. A filtration rate of 0.25 gallons per square foot per minute was maintained and a throughput of 1,600 barrels per cycle was obtained.

Bacterial degradation of the polymer solution was prevented by the addition of 250 ppm formaldehyde at the discharge of the DE-filter by means of a chemical feed pump. This treatment, plus chlorination of the supply water resulted in excellent retention characteristics.

The filtered polymer solution entered the suction of a triplex injection pump and was discharged into the injection header system. During the polymer phase of injection, rate control of individual injection wells was accomplished by installing coils of either 1/4-inch or 3/16-inch diameter copper tubing on the injection header. Figure 23 shows the injection header and shear relief arrangement.

After switching over to "body" polymer injection from "spike" polymer injection, several minor operational changes resulted in more efficient utilization of the facilities. Instead of mixing and filtering the polymer solution at final concentration and viscosity (350 ppm and 5.5 $\pm$ 0.5 cp), polymer was prepared and filtered at approximately 650 ppm (13 - 16 cp). This filtered polymer was diluted to the desired viscosity with supply water which was DE-filtered following each polymer

cycle. Any additional makeup water required for viscosity adjustment was filtered through a Filterite model 18MC3-2 filter, which contained nine 5-micron cotton wound filters. Sufficient formaldehyde was added with the dilution water to result in a final concentration of 250 ppm.

Production

Production from the 25 project wells began May 31, 1977 and was monitored daily from the nine enclosed five-spot pattern wells (Farm A), and the sixteen surrounding producers (Farm B) through the termination of operations on November 28, 1980. Total project average daily production rates are illustrated in Figure 31. The average daily oil and water production from the Total Project, Farm A, and Farm B are listed in Tables 28, 29, and 30. Individual well production histories are found in Tables 31 through 55.

Figures illustrating production and production-injection relations for the Total Project, Farm A, and Farm B are summarized as follows:

Description	Figure Nos.
Fluid production rates, oil cut versus time	32 33 34
Cumulative fluid produced, oil cut versus time	35 36 37
Fluid injection rate, cumulative fluid injection versus time	38 39 40
Total fluid produced versus total fluid injected	41 42 43
Instantaneous, cumulative oil cut versus total fluid injected	44 45 46
Total fluid produced, injected versus time	47 48 49

The extensive produced water analysis program was described in the Third Annual Report. Regular samples from all 25 producing wells and

Farm A and Farm B separators were analyzed for pH, Hydrogen Sulfide, Alkalinity to Phenolphthalein (as $CaCO_3$), Alkalinity to Methyl Orange (as $CaCO_3$), Chlorides, Total Hardness, Calcium, Magnesium, Sulfates, Phosphate, Manganese, Total Iron, Total Solids (Dissolved), Specific Gravity (60°F.) 160°F., Sodium, Silica, Resistivity (OHM-Meters) 77°F., Barium, Methylene Blue Active Substance, Slug Sulfonates by Liquid Chromatography, and Polymer Concentration by Colorimetric Analyses. The following analyses, determined from July 1, 1980 to the project termination and previously unpublished, are contained in this report:

Analyses	Table No.
pH*	56
Chloride *	57
Total Hardness (as $CaCO_3$)*	58
Calcium*	59
Iron (Total)*	60
Methylene Blue Active Substances*	61
Hydrogen Sulfide	62
Alkalinity to Phenolphthalein (as $CaCO_3$)	**
Alkalinity to Methyl Orange (as $CaCO_3$)	63
Magnesium	64
Sulfate	65
Manganese	66
Total Solids (Dissolved)	67
Specific Gravity (60°F.)	68
Sodium	69
Resistivity (OHM-Meters) 77°F.	70
Barium	71

*Tested every month; all others tested every three months

**Negative

The cumulative oil and water production through November 20, 1980 was 14,224 barrels and 621,072 barrels, respectively. This represented 5.19% of the oil in place at the start of Phase II on May 31, 1977. The peak production rate of 14 BOPD occurred in June, 1979, which also coincided with the highest oil cut (3.6%) obtained. Oil production began a prolonged steady decline from that point to 10 BOPD at the termination of operations on November 20, 1980.

EVALUATION PROGRAM

Core Well No. C-1

At a meeting of the DOE-Lawry Operating Committee on April 24, 1980, a decision was made to drill evaluation Core Well No. C-1 located 55 feet north of injection well No. HO-84 (Figure 50). Several maps summarize the data reviewed at that meeting. For individual production wells, Figure 51 illustrates cumulative percent pore volume of oil produced, Figure 52 illustrates cumulative barrels of oil produced, and Figure 53 illustrates cumulative barrels of micellar slug produced, and Figure 54 illustrates cumulative barrels of polymer produced for the period June 1977 through January 1980. Figure 52 also indicates the injection wells suspected of pressure parting at least once during the indicated period.

The primary reasons for choosing this well location was that the HO-84 five-spot pattern had the best oil production and a severe chemical production imbalance. Injection Well No. HO-84 was known to have experienced pressure parting and Well No. HO-110 produced significant oil, micellar slug, and polymer. Therefore, a core well between these two wells would reveal reasons for the inefficiency of this micellar-polymer system in a known problem five-spot pattern.

The well was spudded on July 25, 1980 and a 4-inch rotary diamond core

was cut from 1,407 feet to 1,462 feet. The coring operation utilized 20,000 ppm NaCl brine to maintain consistency with the previous 17 project cores. Recovery was 54.9 feet out of 55 feet of core cut. Samples were sent to John DePetro in Bradford for routine analyses, and additional samples were sent to Marathon in Denver for core fluid analyses work. The routine analyses are illustrated in Table 6 of Appendix A and in Figure 55.

The well was then logged openhole by Birdwell using an Induction, Gamma Ray, Caliper, Compensated Density, and Inclinometer Program. The logs are illustrated in Figure 56.

After logging, the well was completed with 4-1/2 inch fiberglass casing cemented across the Bradford Third Sand to 10 feet above the sand. Fiberglass casing permitted induction logging which was repeated on August 27, 1980 (Figure 57).

Injection Well No. HO-84 had been shut in July 31 to prevent interference in coring operations and the initial two sets of logs, which were run to provide background readings under static conditions. The well was turned back in on August 28 and allowed to stabilize for 50 days. On October 17, Birdwell relogged the well with a Gamma Ray-Induction Program, which is illustrated in Figure 57.

The core, when compared with Well No. HO-84 and other project cores, indicated that only the four or five feet of Bradford Third Sand with 10 to 50 md. permeability had lower oil saturations. The remaining reservoir was, as far as core oil saturation determinations, in a pre-Maraflood state.

The logs showed resistivity kicks in the top four or five feet of Bradford Third Sand, which coincided with the section of highest permeability and decreased oil saturation in the core. The high resistivity was due to

the presence of Maraflood chemicals which were found in samples analyzed by Marathon. These data are documented in Table 6 of Appendix A.

Performance Evaluation

The low, premature, and drawn out oil production response constitutes a failure to achieve anticipated project performance. Production should have peaked at several times the 5% oil cut observed for Farm A (Figure 20). The response should have occurred at 30% PV (plus or minus 5% PV) Maraflood chemicals injected instead of at 13 to 18% PV, which was the actual 30 to 35% PV (Figure 45) after correcting for the 17% PV preflush. The prolonged response should not have occurred in an efficient micellar-polymer flood.

The low, premature oil response indicates poor vertical conformance which could have been due to natural permeability distribution, natural or induced fractures, or some combination thereof. Core Well No. C-1 verifies this problem. Reservoir heterogeneity could possibly be compensated for by increasing micellar slug viscosity; however, an injection rate of 1.5 BPDPF would be required for an economically successful flood whereas actual rates of only one third of that amount were achieved with the Lawry micellar slug system.

The drawn out response suggests substantial heterogeneity even in the most permeable section or inefficient immiscible type displacement in which no effective oil bank was formed. The lack of any significant decrease in watercut, due to a reduction in relative permeability to water, which should occur if oil is banked, would seem to indicate the latter.

Inefficient displacement problems could have been due to loss of mobility control or sulfonate partitioning. There is evidence to indicate that separation of the different equivalent weight sulfonates does occur in the reservoir, but this phenomenon does not appear to be detrimental to the micellar slug performance. Loss of mobility control could be the result of

polymer degradation or unforeseen reactions between micellar slug and/or polymer and reservoir rock and/or fluids. There was no indication that biopolymer degraded in the reservoir because tests performed on produced water containing polymer indicated that produced water viscosity was close to the value anticipated for the measured polymer concentration. No clear evidence substantiated either of these two possibilities.

Poor conformance was the only verified problem, and predicted performance corrected for this variable compares closely to actual project production history. Marathon has prepared a Final Project Report, included as Appendix A, which delves deeper into this aspect of project evaluation.

Final oil recovery of 2.08% PV is equivalent to 5.19% OIP based on an estimated 40% PV pre-Maraflood oil saturation. This percentage recovery and the inability to correct conformance problems by increased injection fluid viscosity shows that this Maraflood system is probably not applicable to the majority of the Bradford Field.

SCHEDULE OF EXPENDITURES

The cumulative cost for the Penn Grade Micellar Displacement Project from June 30, 1975 through the final contract date of December 31, 1980, was $4,694,313. This does not include credit for salvaged equipment or abandonment expenses which occurred in early 1981 and are illustrated in Table 72. The final distribution of expenses among participants is illustrated in Table 73, which shows that with approved contract funds of $6,066,000 and actual expenditures of $4,694,313, the project was completed with surplus funding of $1,371,687.

Table 74 is a chronology of monthly and cumulative expenditures through the final contract date December 31, 1980, and Table 75 details the actual calendarized expenditure breakdown. Figure 58 is a cumulative expenditure

graph illustrating the actual expenditure rate compared with the pre-contract estimated schedule.

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TABLE 1

TOTAL PROJECT PORE VOLUME

LAWRY PHASE II

16 - Inverted 5-Spot Pore Volumes

	Avg. Ft. Net Pay	Avg. ø %	Bbls.PV
HO-69	29.50	12.67	43,495
HO-70	29.88	13.08	45,481
HO-71	29.38	12.07	41,267
HO-72	30.50	13.10	46,496
HO-73	31.75	12.54	46,332
HO-74	27.25	12.26	38,877
HO-75	29.88	13.29	46,211
HO-76	31.38	13.00	47,472
HO-77	30.38	12.49	44,156
HO-78	25.25	11.83	34,761
HO-79	28.38	12.67	41,844
HO-80	28.88	12.70	42,682
HO-81	24.63	12.70	36,401
HO-82	30.63	13.05	46,516
HO-83	26.00	12.81	38,758
HO-84	30.13	12.50	43,828
Total Project	28.99	12.65	684,577

TABLE 2

9 - REGULAR 5-SPOT PORE VOLUMES

LAWRY PHASE II

	Avg. Ft. Net Pay	Avg. ø %	Bbls. PV
H-94	30.25	12.73	44,812
H-97	29.13	12.57	42,611
H-98	30.00	12.63	44,093
H-101	31.25	12.88	46,839
H-102	30.88	12.72	45,709
H-103	27.00	12.32	38,709
H-106	29.50	12.86	44,147
H-107	26.50	12.68	39,103
H-110	29.75	12.77	44,210

TABLE 3

NET SAND THICKNESS

(11% Porosity Cutoff)

LAWRY PHASE II

Injectors	Feet of Net Pay	Producers	Feet of Net Pay
HO-69	29	H-90	34
HO-70	29	H-91	26
HO-71	30	H-92	32
HO-72	30	H-93	31
HO-73	33	H-94	31
HO-74	25	H-95	30
HO-75	29	H-96	32
HO-76	33	H-97	27
HO-77	32	H-98	31
HO-78	23	H-99	29
HO-79	27	H-100	32
HO-80	29	H-101	32
HO-81	24	H-102	31
HO-82	31	H-103	28
HO-83	27	H-104	26
HO-84	31	H-105	27
		H-106	29
		H-107	25
		H-108	27
		H-109	31
		H-110	30
		H-111	21
		H-112	31
		H-113	24
		H-114	32

INJECTION DATA FOR GROUP TOTAL FROM 6/ 1/77 TO 7/ 1/78 PAGE 1

PORE VOLUME = 684577 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 273831 BBL.

WELL NAMES :	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-99	H-100	H-101	H-102	H-103	H-104	H-105	H-106	H-107
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-108	H-109	H-110	H-111	H-112	H-113	H-114	H-070	H-071
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-072	H-073	H-069	H-074	H-075	H-076	H-077	H-078	H-079
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-080	H-081	H-082	H-083	H-084				
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000				

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	1041.2	0.0	245.9	6216	0	0	0	0	6216	0.0000
7/ 1/77	999.1	0.0	211.6	37452	0	0	0	0	37452	0.0000
8/ 1/77	1030.8	0.0	211.6	68423	0	0	0	0	68423	0.0000
9/ 1/77	1088.5	0.0	211.6	101927	0	0	0	0	101927	0.0000
9/13/77	646.3	0.0	211.6	114989	0	0	0	0	114989	0.0000
10/ 1/77	395.5	0.0	523.1	114989	11633	0	0	0	126622	0.0000
11/ 1/77	313.8	0.0	709.4	114989	23895	0	0	0	138884	0.0000
12/ 1/77	333.6	0.0	745.6	114989	33308	0	0	0	148297	0.0000
1/ 1/78	339.5	0.0	840.6	114989	43650	0	0	0	158639	0.0000
2/ 1/78	335.6	0.0	1066.6	114989	53243	0	0	0	168232	0.0000
2/17/78	332.9	0.0	1066.6	114989	58613	0	0	0	173602	0.0000
2/28/78	353.7	0.0	1066.6	114989	60532	2292	0	0	177814	0.0000
3/ 1/78	389.8	0.0	1017.5	114989	60533	2555	0	0	178177	0.0000
3/10/78	337.8	0.0	1017.5	114989	61526	5171	0	0	181686	0.0000
4/ 1/78	338.0	0.0	1029.4	114989	63231	11997	0	0	190217	0.0000
4/ 9/78	338.3	0.0	1029.4	114989	63824	14107	0	0	192921	0.0000
4/10/78	337.2	0.0	1029.4	114989	63883	14336	0	0	193259	0.0000
4/11/78	335.7	0.0	1029.4	114989	63927	14680	0	0	193596	0.0000
5/ 1/78	358.6	0.0	1098.1	114989	63927	21393	0	0	200310	0.0000
6/ 1/78	330.6	0.0	1098.8	114989	63927	32510	0	0	211427	0.0000
7/ 1/78	325.9	0.0	1079.4	114989	63927	42427	0	0	221344	0.0000

INJECTION DATA FOR GROUP TOTAL FROM 8/ 1/78 TO 1/ 1/80 PAGE 2

PORE VOLUME = 684577 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 273831 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
8/ 1/78	337.2	0.0	1057.5	114989	63927	52654	0	0	231571	0.0000
9/ 1/78	315.6	0.0	1052.2	114989	63927	63106	0	0	242023	0.0000
10/ 1/78	310.8	0.0	979.1	114989	63927	72574	0	0	251491	0.0000
11/ 1/78	262.5	0.0	970.9	114989	63927	82210	0	0	261127	0.0000
12/ 1/78	247.9	0.0	991.3	114989	63927	90086	0	0	269003	0.0000
1/ 1/79	239.0	0.0	1019.4	114989	63927	97772	0	0	276689	0.0000
2/ 1/79	256.9	0.0	1028.8	114989	63927	105181	0	0	284098	0.0000
3/ 1/79	259.6	0.0	1040.6	114989	63927	112374	0	0	291291	0.0000
4/ 1/79	259.8	0.0	1033.8	114989	63927	120423	0	0	299340	0.0000
5/ 1/79	259.4	0.0	1045.6	114989	63927	128211	0	0	307128	0.0000
6/ 1/79	275.3	0.0	1033.1	114989	63927	136252	0	0	315169	0.0000
7/ 1/79	276.9	0.0	1065.0	114989	63927	144511	0	0	323428	0.0000
8/ 1/79	272.8	0.0	1050.3	114989	63927	153094	0	0	332011	0.0000
9/ 1/79	279.1	0.0	1047.5	114989	63927	161550	0	0	340467	0.0000
10/ 1/79	268.6	0.0	1067.5	114989	63927	169923	0	0	348840	0.0000
11/ 1/79	268.0	0.0	1050.0	114989	63927	178249	0	0	357166	0.0000
12/ 1/79	272.6	0.0	1048.1	114989	63927	186290	0	0	365207	0.0000
1/ 1/80	274.0	0.0	1024.4	114989	63927	194742	0	0	373659	0.0000
2/ 1/80	271.5	0.0	1030.3	114989	63927	203236	0	0	382153	0.0000
3/ 1/80	268.6	0.0	971.9	114989	63927	211110	0	0	390026	0.0000
4/ 1/80	307.0	0.0	1047.5	114989	63927	219438	0	0	398354	0.0000
5/ 1/80	277.5	0.0	1048.1	114989	63927	228649	0	0	407565	0.0000
6/ 1/80	272.8	0.0	1041.3	114989	63927	237252	0	0	416168	0.0000
7/ 1/80	265.4	0.0	978.6	114989	63927	245435	0	0	424351	0.0000
8/ 1/80	238.4	0.0	991.3	114989	63927	253663	0	0	432579	0.0000
9/ 1/80	253.3	0.0	1043.4	114989	63927	261052	0	0	439968	0.0000
10/ 1/80	247.3	0.0	1.0	114989	63927	268650	0	0	447566	0.0000
11/ 1/80	245.1	0.0	1.0	114989	63927	276315	0	0	455231	0.0000
11/20/80	0.0	0.0	0.0	114989	63927	280973	0	0	459889	0.0000

INJECTION DATA FOR GROUP FARM A FROM 6/ 1/77 TO 1/ 1/79 PAGE 1

PORE VOLUME = 388647 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 155447 BBL.

WELL NAMES :	H-94	H-97	H-98	H-101	H-102	H-103	H-106	H-107	H-110
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-070	H-071	H-072	H-073	H-069	H-074	H-075	H-076	H-077
WELL FRACTION :	0.25000	0.50000	0.50000	0.50000	1.00000	0.50000	0.25000	1.00000	1.00000

WELL NAMES :	H-078	H-079	H-080	H-081	H-082	H-083	H-084
WELL FRACTION :	0.25000	0.50000	1.00000	0.50000	0.50000	0.50000	0.25000

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	576.7	0.0	248.1	3450	0	0	0	0	3450	0.0000
7/ 1/77	571.5	0.0	213.3	20751	0	0	0	0	20751	0.0000
8/ 1/77	599.8	0.0	213.3	38467	0	0	0	0	38467	0.0000
9/ 1/77	601.3	0.0	213.3	57060	0	0	0	0	57060	0.0000
9/13/77	361.3	0.0	213.3	64276	0	0	0	0	64276	0.0000
10/ 1/77	221.9	0.0	523.6	64276	6504	0	0	0	70780	0.0000
11/ 1/77	177.6	0.0	709.2	64276	13383	0	0	0	77659	0.0000
12/ 1/77	187.8	0.0	746.9	64276	18711	0	0	0	82987	0.0000
1/ 1/78	172.5	0.0	842.8	64276	24533	0	0	0	88808	0.0000
2/ 1/78	138.1	0.0	1069.7	64276	29881	0	0	0	94157	0.0000
2/17/78	212.3	0.0	1069.7	64276	32892	0	0	0	97168	0.0000
2/28/78	198.0	0.0	1069.7	64276	34119	1107	0	0	99502	0.0000
3/ 1/78	214.9	0.0	1017.8	64276	34177	1248	0	0	99700	0.0000
3/10/78	214.4	0.0	1017.8	64276	34684	2675	0	0	101634	0.0000
4/ 1/78	196.1	0.0	1028.6	64276	35804	6271	0	0	106350	0.0000
4/ 9/78	186.4	0.0	1028.6	64276	36193	7370	0	0	107839	0.0000
4/10/78	185.9	0.0	1028.6	64276	36227	7523	0	0	108026	0.0000
4/11/78	184.7	0.0	1028.6	64276	36253	7683	0	0	108211	0.0000
5/ 1/78	194.5	0.0	1102.8	64276	36253	11377	0	0	111906	0.0000
6/ 1/78	178.3	0.0	1103.3	64276	36253	17408	0	0	117936	0.0000
7/ 1/78	181.9	0.0	1083.1	64276	36253	22756	0	0	123265	0.0000
8/ 1/78	184.9	0.0	1070.3	64276	36253	28395	0	0	128924	0.0000
9/ 1/78	169.0	0.0	1066.1	64276	36253	34126	0	0	134654	0.0000
10/ 1/78	164.6	0.0	1030.2	64276	36253	39194	0	0	139723	0.0000
11/ 1/78	139.2	0.0	984.4	64276	36253	44297	0	0	144825	0.0000
12/ 1/78	130.9	0.0	1006.7	64276	36253	48472	0	0	149000	0.0000
1/ 1/79	127.0	0.0	1036.9	64276	36253	52531	0	0	153060	0.0000

INJECTION DATA FOR GROUP FARM A FROM 2/ 1/79 TO 12/ 1/80 PAGE 2

PORE VOLUME = 388647 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 155447 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
2/ 1/79	132.8	0.0	1044.7	64276	36253	56468	0	0	156997	0.0000
3/ 1/79	133.6	0.0	1056.9	64276	36253	60215	0	0	160744	0.0000
4/ 1/79	132.2	0.0	1053.3	64276	36253	64355	0	0	164884	0.0000
5/ 1/79	130.6	0.0	1061.9	64276	36253	68323	0	0	168851	0.0000
6/ 1/79	136.6	0.0	1050.8	64276	36253	72371	0	0	172900	0.0000
7/ 1/79	137.7	0.0	1082.2	64276	36253	76469	0	0	176997	0.0000
8/ 1/79	131.4	0.0	1069.0	64276	36253	80737	0	0	181266	0.0000
9/ 1/79	133.8	0.0	1065.3	64276	36253	84809	0	0	185338	0.0000
10/ 1/79	127.6	0.0	1082.5	64276	36253	88822	0	0	189350	0.0000
11/ 1/79	126.6	0.0	1067.2	64276	36253	92777	0	0	193305	0.0000
12/ 1/79	129.4	0.0	1066.9	64276	36253	96575	0	0	197103	0.0000
1/ 1/80	128.3	0.0	1042.5	64276	36253	100586	0	0	201114	0.0000
2/ 1/80	126.6	0.0	1050.3	64276	36253	104562	0	0	205091	0.0000
3/ 1/80	123.7	0.0	998.7	64276	36253	108233	0	0	208762	0.0000
4/ 1/80	143.1	0.0	1070.3	64276	36253	112067	0	0	212596	0.0000
5/ 1/80	129.8	0.0	1070.3	64276	36253	116361	0	0	216889	0.0000
6/ 1/80	124.4	0.0	1062.5	64276	36253	120384	0	0	220913	0.0000
7/ 1/80	120.2	0.0	1036.7	64276	36253	124115	0	0	224643	0.0000
8/ 1/80	112.6	0.0	1050.0	64276	36253	127841	0	0	228369	0.0000
9/ 1/80	116.4	0.0	1065.6	64276	36253	131332	0	0	231861	0.0000
10/ 1/80	114.5	0.0	1.0	64276	36253	134823	0	0	235352	0.0000
11/ 1/80	113.0	0.0	1.0	64276	36253	138373	0	0	238901	0.0000
11/30/80	0.0	0.0	0.0	64276	36253	140520	0	0	241049	0.0000

INJECTION DATA FOR GROUP FARM B FROM 6/ 1/77 TO 10/ 1/78 PAGE 1

PORE VOLUME = 235960 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 118384 BBL.

WELL NAMES :	H-90	H-91	H-92	H-93	H-95	H-98	H-99	H-100	H-104
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-105	H-108	H-109	H-111	H-112	H-113	H-114	H-070	H-071
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.75000	0.50000
WELL NAMES :	H-072	H-073	H-074	H-075	H-078	H-079	H-081	H-082	H-083
WELL FRACTION :	0.50000	0.50000	0.50000	0.75000	0.75000	0.50000	0.50000	0.50000	0.50000
WELL NAMES :	H-084								
WELL FRACTION :	0.75000								

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS						
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	464.5	0.0	243.2	2766	0	0	0	0	2766	0.0000
7/ 1/77	427.6	0.0	209.3	16701	0	0	0	0	16701	0.0000
8/ 1/77	431.0	0.0	209.3	29956	0	0	0	0	29956	0.0000
9/ 1/77	437.2	0.0	209.3	44867	0	0	0	0	44867	0.0000
9/13/77	284.9	0.0	209.3	50714	0	0	0	0	50714	0.0000
10/ 1/77	173.7	0.0	522.5	50714	5128	0	0	0	55842	0.0000
11/ 1/77	136.2	0.0	709.6	50714	10512	0	0	0	61225	0.0000
12/ 1/77	145.8	0.0	743.9	50714	14596	0	0	0	65310	0.0000
1/ 1/78	136.9	0.0	637.9	50714	19117	0	0	0	69831	0.0000
2/ 1/78	147.5	0.0	1062.5	50714	23361	0	0	0	74075	0.0000
2/17/78	170.6	0.0	1062.5	50714	25721	0	0	0	76434	0.0000
2/28/78	165.7	0.0	1062.5	50714	26413	1185	0	0	78311	0.0000
3/ 1/78	175.0	0.0	1017.1	50714	26456	1307	0	0	78477	0.0000
3/10/78	173.4	0.0	1017.1	50714	26842	2496	0	0	80052	0.0000
4/ 1/78	151.9	0.0	1030.4	50714	27427	5726	0	0	83867	0.0000
4/ 9/78	151.9	0.0	1030.4	50714	27631	6737	0	0	85082	0.0000
4/10/78	151.3	0.0	1030.4	50714	27657	6863	0	0	85234	0.0000
4/11/78	151.0	0.0	1030.4	50714	27674	6997	0	0	85385	0.0000
5/ 1/78	164.1	0.0	1092.1	50714	27674	10016	0	0	88404	0.0000
6/ 1/78	152.3	0.0	1092.9	50714	27674	15103	0	0	93491	0.0000
7/ 1/78	148.0	0.0	1074.6	50714	27674	19671	0	0	98059	0.0000
8/ 1/78	152.3	0.0	1041.1	50714	27674	24259	0	0	102647	0.0000
9/ 1/78	146.7	0.0	1034.3	50714	27674	28981	0	0	107369	0.0000
10/ 1/78	146.2	0.0	913.5	50714	27674	33380	0	0	111768	0.0000

INJECTION DATA FOR GROUP FARM B FROM 11/ 1/78 TO 11/ 1/80 PAGE 2

PORE VOLUME = 235960 BBL. INITIAL OIL SATURATION = 40.000 %. INITIAL OIL IN PLACE = 118384 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

LAWRY-ERDA PROJECT

DATE	ALLOCATED INJECTION RATES LIQUID	GAS	AVG. INJ. PRESSURE	CUMULATIVE INJECTION TOTALS						
MO/DY/YR	BBL/DAY	MCF/DAY	PSI	PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
11/ 1/78	123.4	0.0	953.6	50714	27674	37914	0	0	116302	0.0000
12/ 1/78	117.0	0.0	971.4	50714	27674	41614	0	0	120002	0.0000
1/ 1/79	112.0	0.0	996.8	50714	27674	45241	0	0	123629	0.0000
2/ 1/79	123.1	0.0	1008.2	50714	27674	48713	0	0	127101	0.0000
3/ 1/79	126.1	0.0	1019.6	50714	27674	52159	0	0	130547	0.0000
4/ 1/79	127.3	0.0	1008.6	50714	27674	56068	0	0	134456	0.0000
5/ 1/79	128.8	0.0	1024.6	50714	27674	59888	0	0	138276	0.0000
6/ 1/79	138.7	0.0	1010.4	50714	27674	63881	0	0	142269	0.0000
7/ 1/79	139.2	0.0	1042.9	50714	27674	68043	0	0	146431	0.0000
8/ 1/79	141.4	0.0	1026.3	50714	27674	72357	0	0	150745	0.0000
9/ 1/79	145.3	0.0	1024.6	50714	27674	76741	0	0	155129	0.0000
10/ 1/79	141.0	0.0	1048.2	50714	27674	81101	0	0	159489	0.0000
11/ 1/79	141.4	0.0	1027.9	50714	27674	85472	0	0	163860	0.0000
12/ 1/79	143.3	0.0	1023.9	50714	27674	89715	0	0	168103	0.0000
1/ 1/80	145.7	0.0	1001.1	50714	27674	94156	0	0	172544	0.0000
2/ 1/80	144.9	0.0	1004.6	50714	27674	98674	0	0	177062	0.0000
3/ 1/80	145.0	0.0	937.6	50714	27674	102877	0	0	181265	0.0000
4/ 1/80	163.9	0.0	1018.2	50714	27674	107370	0	0	185758	0.0000
5/ 1/80	147.7	0.0	1019.6	50714	27674	112288	0	0	190676	0.0000
6/ 1/80	148.4	0.0	1013.9	50714	27674	116868	0	0	195256	0.0000
7/ 1/80	145.2	0.0	904.3	50714	27674	121320	0	0	199708	0.0000
8/ 1/80	125.7	0.0	915.7	50714	27674	125822	0	0	204210	0.0000
9/ 1/80	136.9	0.0	1015.0	50714	27674	129720	0	0	208108	0.0000
10/ 1/80	132.8	0.0	1.0	50714	27674	133826	0	0	212214	0.0000
11/ 1/80	132.1	0.0	1.0	50714	27674	137942	0	0	216330	0.0000
11/20/80	0.0	0.0	0.0	50714	27674	140452	0	0	218840	0.0000

TABLE 7

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 11/ 1/79 PAGE 1

WELL: H-070

WRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
/DY/YR											
/ 1/77	PRSLUG	59.5	0.0	320.0	443	0	0	0	0	443	0.000
/ 1/77	PRSLUG	64.7	0.0	290.0	2229	0	0	0	0	2229	0.000
7 1/77	PRSLUG	65.7	0.0	290.0	4234	0	0	0	0	4234	0.000
/ 1/77	PRSLUG	65.2	0.0	290.0	6270	0	0	0	0	6270	0.000
/13/77	SLUG	32.7	0.0	290.0	7051	0	0	0	0	7051	0.000
7 1/77	SLUG	19.4	0.0	580.0	7051	588	0	0	0	7639	0.000
/ 1/77	SLUG	18.3	0.0	780.0	7051	1190	0	0	0	8241	0.000
/ 1/77	SLUG	18.9	0.0	1020.0	7051	1738	0	0	0	8789	0.000
7 1/78	SLUG	17.5	0.0	1050.0	7051	2323	0	0	0	9374	0.000
/ 1/78	SLUG	15.2	0.0	1150.0	7051	2864	0	0	0	9915	0.000
/17/78	SLUG	15.2	0.0	1150.0	7051	3107	0	0	0	10158	0.000
/28/78	SLUG	15.2	0.0	1150.0	7051	3275	0	0	0	10326	0.000
/ 1/78	SLUG	15.2	0.0	1120.0	7051	3290	0	0	0	10341	0.000
/10/78	SLUG	15.2	0.0	1120.0	7051	3427	0	0	0	10478	0.000
7 1/78	SLUG	14.8	0.0	1090.0	7051	3761	0	0	0	10812	0.000
/ 9/78	SLUG	14.8	0.0	1090.0	7051	3877	0	0	0	10928	0.000
/10/78	SLUG	14.8	0.0	1090.0	7051	3892	0	0	0	10943	0.000
/11/78	MOBLFF	14.7	0.0	1090.0	7051	3906	0	0	0	10957	0.000
/ 1/78	MOBLFF	20.3	0.0	1130.0	7051	3906	294	0	0	11251	0.000
/ 1/78	MOBLFF	23.8	0.0	1130.0	7051	3906	924	0	0	11881	0.000
7 1/78	MOBLFF	27.5	0.0	1120.0	7051	3906	1632	0	0	12589	0.000
3/ 1/78	MOBLFF	31.2	0.0	1140.0	7051	3906	2494	0	0	13441	0.000
9/ 1/78	MOBLFF	24.4	0.0	1140.0	7051	3906	3449	0	0	14406	0.000
0/ 1/78	MOBLFF	18.8	0.0	1150.0	7051	3906	4180	0	0	15137	0.000
1/ 1/78	MOBLFF	15.9	0.0	1150.0	7051	3906	4762	0	0	15719	0.000
2/ 1/78	MOBLFF	14.8	0.0	1140.0	7051	3906	5239	0	0	16196	0.000
1/ 1/79	MOBLFF	15.3	0.0	1130.0	7051	3906	5693	0	0	16650	0.000
2/ 1/79	MOBLFF	16.5	0.0	1130.0	7051	3906	6167	0	0	17124	0.000
3/ 1/79	MOBLFF	16.4	0.0	1160.0	7051	3906	6629	0	0	17586	0.000
4/ 1/79	MOBLFF	14.7	0.0	1050.0	7051	3906	7137	0	0	18094	0.000
5/ 1/79	MOBLFF	12.0	0.0	1150.0	7051	3906	7579	0	0	18536	0.000
6/ 1/79	MOBLFF	11.0	0.0	1150.0	7051	3906	7950	0	0	18907	0.000
7/ 1/79	MOBLFF	10.4	0.0	1190.0	7051	3906	8282	0	0	19238	0.000
8/ 1/79	MOBLFF	26.3	0.0	1096.0	7051	3906	8602	0	0	19559	0.000
9/ 1/79	MOBLFF	29.8	0.0	1120.0	7051	3906	9418	0	0	20375	0.000
0/ 1/79	MOBLFF	25.4	0.0	1130.0	7051	3906	10307	0	0	21264	0.000
1/ 1/79	MOBLFF	25.0	0.0	1130.0	7051	3906	11124	0	0	22081	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-070

WRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
0/DY/YR											
12/ 1/79	MOBLFF	29.2	0.0	1120.0	7051	3906	11873	0	0	22830	0.000
1/ 1/80	MOBLFF	28.5	0.0	1090.0	7051	3906	12779	0	0	23736	0.000
2/ 1/80	MOBLFF	25.3	0.0	1080.0	7051	3906	13662	0	0	24618	0.000
3/ 1/80	MOBLFF	26.8	0.0	1080.0	7051	3906	14394	0	0	25351	0.000
4/ 1/80	MOBLFF	27.5	0.0	1080.0	7051	3906	15220	0	0	26177	0.000
5/ 1/80	MOBLFF	27.7	0.0	1080.0	7051	3906	16046	0	0	27003	0.000
6/ 1/80	MOBLFF	27.0	0.0	1080.0	7051	3906	16906	0	0	27863	0.000
7/ 1/80	MOBLFF	25.9	0.0	1100.0	7051	3906	17715	0	0	28672	0.000
8/ 1/80	MOBLFF	24.5	0.0	1120.0	7051	3906	18518	0	0	29475	0.000
9/ 1/80	MOBLFF	25.5	0.0	1100.0	7051	3906	19270	0	0	30227	0.000
10/ 1/80	MOBLFF	25.5	0.0	1.0	7051	3906	20034	0	0	30991	0.000
11/ 1/80	MOBLFF	25.0	0.0	0.0	7051	3906	20824	0	0	31781	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	7051	3906	21249	0	0	32256	0.000

TABLE 8

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 1./ 1/79 PAGE 1

WELL: H-071

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	38.7	0.0	295.0	265	0	0	0	0	265	0.000
7/ 1/77	PRSLUG	41.7	0.0	260.0	1431	0	0	0	0	1431	0.000
8/ 1/77	PRSLUG	41.0	0.0	260.0	2725	0	0	0	0	2725	0.000
9/ 1/77	PRSLUG	41.3	0.0	260.0	3995	0	0	0	0	3995	0.000
9/13/77	SLUG	23.1	0.0	260.0	4490	0	0	0	0	4490	0.000
10/ 1/77	SLUG	17.6	0.0	555.0	4490	505	0	0	0	4995	0.000
11/ 1/77	SLUG	17.0	0.0	780.0	4490	1051	0	0	0	5541	0.000
12/ 1/77	SLUG	17.3	0.0	990.0	4490	1561	0	0	0	6051	0.000
1/ 1/78	SLUG	16.[illegible]	0.0	1030.0	4490	2097	0	0	0	6587	0.000
2/ 1/78	SLUG	14.8	0.0	1140.0	4490	2596	0	0	0	7086	0.000
2/17/78	SLUG	14.8	0.0	1140.0	4490	2832	0	0	0	7322	0.000
2/28/78	SLUG	14.8	0.0	1140.0	4490	2995	0	0	0	7485	0.000
3/ 1/78	SLUG	14.4	0.0	1100.0	4490	3010	0	0	0	7500	0.000
3/10/78	SLUG	14.4	0.0	1100.0	4490	3137	0	0	0	7627	0.000
4/ 1/78	SLUG	13.8	0.0	1080.0	4490	3447	0	0	0	7937	0.000
4/ 9/78	SLUG	13.8	0.0	1080.0	4490	3557	0	0	0	8047	0.000
4/10/78	SLUG	13.8	0.0	1080.0	4490	3571	0	0	0	8061	0.000
4/11/78	MOBLFF	12.9	0.0	1080.0	4490	3585	0	0	0	8075	0.000
5/ 1/78	MOBLFF	12.8	0.0	1160.0	4490	3585	258	0	0	8333	0.000
6/ 1/78	MOBLFF	13.4	0.0	1160.0	4490	3585	650	0	0	8725	0.000
7/ 1/78	MOBLFF	13.2	0.0	1170.0	4490	3585	1051	0	0	9126	0.000
8/ 1/78	MOBLFF	12.8	0.0	1140.0	4490	3585	1461	0	0	9536	0.000
9/ 1/78	MOBLFF	12.5	0.0	1160.0	4490	3585	1857	0	0	9932	0.000
10/ 1/78	MOBLFF	10.9	0.0	1160.0	4490	3585	2232	0	0	10307	0.000
11/ 1/78	MOBLFF	10.2	0.0	1140.0	4490	3585	2570	0	0	10645	0.000
12/ 1/78	MOBLFF	9.6	0.0	1130.0	4490	3585	2876	0	0	10951	0.000
1/ 1/79	MOBLFF	9.3	0.0	1130.0	4490	3585	3175	0	0	11250	0.000
2/ 1/79	MOBLFF	8.9	0.0	1120.0	4490	3585	3464	0	0	11539	0.000
3/ 1/79	MOBLFF	8.8	0.0	1140.0	4490	3585	3713	0	0	11788	0.000
4/ 1/79	MOBLFF	8.8	0.0	1130.0	4490	3585	3985	0	0	12060	0.000
5/ 1/79	MOBLFF	8.5	0.0	1140.0	4490	3585	4248	0	0	12323	0.000
6/ 1/79	MOBLFF	8.5	0.0	1140.0	4490	3585	4512	0	0	12587	0.000
7/ 1/79	MOBLFF	8.5	0.0	1170.0	4490	3585	4768	0	0	12843	0.000
8/ 1/79	MOBLFF	8.4	0.0	1150.0	4490	3585	5030	0	0	13105	0.000
9/ 1/79	MOBLFF	11.0	0.0	1150.0	4490	3585	5289	0	0	13364	0.000
10/ 1/79	MOBLFF	10.4	0.0	1160.0	4490	3585	5618	0	0	13693	0.000
11/ 1/79	MOBLFF	9.0	0.0	1140.0	4490	3585	5939	0	0	14014	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 1./ 1/80 PAGE 2

WELL: H-071

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	9.0	0.0	1140.0	4490	3585	6228	0	0	14301	0.000
1/ 1/80	MOBLFF	8.9	0.0	1130.0	4490	3585	6504	0	0	14579	0.000
2/ 1/80	MOBLFF	8.9	0.0	1130.0	4490	3585	6760	0	0	14855	0.000
3/ 1/80	MOBLFF	8.8	0.0	1140.0	4490	3585	7038	0	0	15113	0.000
4/ 1/80	MOBLFF	8.8	0.0	1150.0	4490	3585	7312	0	0	15386	0.000
5/ 1/80	MOBLFF	8.8	0.0	1150.0	4490	3585	7575	0	0	15650	0.000
6/ 1/80	MOBLFF	8.8	0.0	1140.0	4490	3585	7840	0	0	15923	0.000
7/ 1/80	MOBLFF	8.5	0.0	1140.0	4490	3585	8112	0	0	16187	0.000
8/ 1/80	MOBLFF	7.9	0.0	1160.0	4490	3585	8369	0	0	16444	0.000
9/ 1/80	MOBLFF	8.4	0.0	1140.0	4490	3585	8613	0	0	16688	0.000
10/ 1/80	MOBLFF	8.4	0.0	1.0	4490	3585	8856	0	0	16931	0.000
11/ 1/80	MOBLFF	7.8	0.0	1.0	4490	3585	9107	0	0	17182	0.000
11/30/80	MOBLFF	0.0	0.0	0.0	4490	3585	9254	0	0	17329	0.000

TABLE 9

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-072

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE		INJECTION		TOTALS		
MO/DY/YR		LIQUID BBL/DAY	GAS MCF/DAY	PSI	PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	57.5	0.0	750.0	381	0	0	0	0	381	0.000
7/ 1/77	PRSLUG	61.8	0.0	750.0	2105	0	0	0	0	2105	0.000
8/ 1/77	PRSLUG	62.4	0.0	750.0	4014	0	0	0	0	4014	0.000
9/ 1/77	PRSLUG	61.2	0.0	750.0	5948	0	0	0	0	5948	0.000
9/13/77	SLUG	34.5	0.0	750.0	6681	0	0	0	0	6681	0.000
10/ 1/77	SLUG	21.2	0.0	560.0	6681	621	0	0	0	7302	0.000
11/ 1/77	SLUG	20.0	0.0	750.0	6681	1274	0	0	0	7955	0.000
12/ 1/77	SLUG	21.8	0.0	1010.0	6681	1875	0	0	0	8556	0.000
1/ 1/78	SLUG	19.7	0.0	1110.0	6681	2546	0	0	0	9227	0.000
2/ 1/78	SLUG	16.2	0.0	1150.0	6681	3157	0	0	0	9838	0.000
2/17/78	SLUG	16.4	0.0	1150.0	6681	3415	0	0	0	10096	0.000
2/28/78	SLUG	16.4	0.0	1150.0	6681	3592	0	0	0	10273	0.000
3/ 1/78	SLUG	16.3	0.0	1070.0	6681	3608	0	0	0	10289	0.000
3/10/78	SLUG	16.3	0.0	1070.0	6681	3755	0	0	0	10436	0.000
4/ 1/78	SLUG	15.3	0.0	1080.0	6681	4113	0	0	0	10794	0.000
4/ 9/78	SLUG	15.3	0.0	1080.0	6681	4236	0	0	0	10917	0.000
4/10/78	MOBLFF	14.2	0.0	1080.0	6681	4251	0	0	0	10932	0.000
4/11/78	MOBLFF	14.2	0.0	1080.0	6681	4251	14	0	0	10946	0.000
5/ 1/78	MOBLFF	14.6	0.0	1170.0	6681	4251	298	0	0	11230	0.000
6/ 1/78	MOBLFF	14.5	0.0	1170.0	6681	4251	757	0	0	11689	0.000
7/ 1/78	MOBLFF	13.4	0.0	1170.0	6681	4251	1193	0	0	12125	0.000
8/ 1/78	MOBLFF	13.5	0.0	1160.0	6681	4251	1794	0	0	12726	0.000
9/ 1/78	MOBLFF	13.4	0.0	1160.0	6681	4251	2367	0	0	13299	0.000
10/ 1/78	MOBLFF	13.2	0.0	1150.0	6681	4251	2829	0	0	13761	0.000
11/ 1/78	MOBLFF	12.4	0.0	1160.0	6681	4251	3234	0	0	14166	0.000
12/ 1/78	MOBLFF	12.8	0.0	1140.0	6681	4251	3605	0	0	14537	0.000
1/ 1/79	MOBLFF	12.2	0.0	1140.0	6681	4251	3995	0	0	14927	0.000
2/ 1/79	MOBLFF	12.3	0.0	1130.0	6681	4251	4373	0	0	15305	0.000
3/ 1/79	MOBLFF	11.9	0.0	1140.0	6681	4251	4716	0	0	15648	0.000
4/ 1/79	MOBLFF	12.9	0.0	1140.0	6681	4251	5086	0	0	16018	0.000
5/ 1/79	MOBLFF	13.0	0.0	1140.0	6681	4251	5474	0	0	16406	0.000
6/ 1/79	MOBLFF	13.2	0.0	1140.0	6681	4251	5877	0	0	16809	0.000
7/ 1/79	MOBLFF	12.1	0.0	1180.0	6681	4251	6272	0	0	17204	0.000
8/ 1/79	MOBLFF	11.0	0.0	1130.0	6681	4251	6648	0	0	17580	0.000
9/ 1/79	MOBLFF	9.5	0.0	1150.0	6681	4251	6990	0	0	17922	0.000
10/ 1/79	MOBLFF	9.0	0.0	1150.0	6681	4251	7275	0	0	18207	0.000
11/ 1/79	MOBLFF	8.5	0.0	1150.0	6681	4251	7554	0	0	18486	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-072

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE		INJECTION		TOTALS		
MO/DY/YR		LIQUID BBL/DAY	GAS MCF/DAY	PSI	PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	8.0	0.0	1140.0	6681	4251	7808	0	0	18740	0.000
1/ 1/80	MOBLFF	7.7	0.0	1130.0	6681	4251	8055	0	0	18987	0.000
2/ 1/80	MOBLFF	7.8	0.0	1140.0	6681	4251	8293	0	0	19225	0.000
3/ 1/80	MOBLFF	8.2	0.0	1140.0	6681	4251	8514	0	0	19446	0.000
4/ 1/80	MOBLFF	14.9	0.0	1140.0	6681	4251	8766	0	0	19698	0.000
5/ 1/80	MOBLFF	14.5	0.0	1140.0	6681	4251	9214	0	0	20146	0.000
6/ 1/80	MOBLFF	12.7	0.0	1130.0	6681	4251	9662	0	0	20594	0.000
7/ 1/80	MOBLFF	10.2	0.0	1130.0	6681	4251	10044	0	0	20976	0.000
8/ 1/80	MOBLFF	9.3	0.0	1150.0	6681	4251	10360	0	0	21292	0.000
9/ 1/80	MOBLFF	8.2	0.0	1100.0	6681	4251	10653	0	0	21585	0.000
10/ 1/80	MOBLFF	7.3	0.0	1.0	6681	4251	10900	0	0	21832	0.000
11/ 1/80	MOBLFF	7.4	0.0	1.0	6681	4251	11142	0	0	22074	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	6681	4251	11283	0	0	22215	0.000

TABLE 10

INJECTION DATA FOR INJECTION WELL FROM 5/ 1/77 TO 1./ 1/79 PAGE 1

WELL: H-073

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	PRSLUG	71.8	0.0	280.0	382	0	0	0	0	382	0.000
7/ 1/77	PRSLUG	80.4	0.0	220.0	2536	0	0	0	0	2536	0.000
8/ 1/77	PRSLUG	75.0	0.0	220.0	5029	0	0	0	0	5029	0.000
9/ 1/77	PRSLUG	75.0	0.0	220.0	7372	0	0	0	0	7372	0.000
9/13/77	SLUG	41.0	0.0	220.0	8272	0	0	0	0	8272	0.000
10/ 1/77	SLUG	25.3	0.0	525.0	8272	749	0	0	0	9021	0.000
11/ 1/77	SLUG	25.[illegible]	0.0	760.0	8272	1534	0	0	0	9806	0.000
12/ 1/77	SLUG	27.9	0.0	960.0	8272	2286	0	0	0	10558	0.000
1/ 1/78	SLUG	27.2	0.0	1000.0	8272	3151	0	0	0	11423	0.000
2/ 1/78	SLUG	22.9	0.0	1100.0	8272	3994	0	0	0	12266	0.000
2/17/78	MOBLFF	20.0	0.0	1100.0	8272	4361	0	0	0	12633	0.000
2/28/78	MOBLFF	20.0	0.0	1100.0	8272	4361	227	0	0	12859	0.000
3/ 1/78	MOBLFF	23.0	0.0	1050.0	8272	4361	247	0	0	12880	0.000
3/10/78	MOBLFF	23.0	0.0	1050.0	8272	4361	461	0	0	13094	0.000
4/ 1/78	MOBLFF	25.7	0.0	1040.0	8272	4361	985	0	0	13618	0.000
4/ 9/78	MOBLFF	25.7	0.0	1040.0	8272	4361	1191	0	0	13824	0.000
4/10/78	MOBLFF	25.7	0.0	1040.0	8272	4361	1217	0	0	13849	0.000
4/11/78	MOBLFF	25.7	0.0	1040.0	8272	4361	1242	0	0	13875	0.000
5/ 1/78	MOBLFF	31.0	0.0	1140.0	8272	4361	1756	0	0	14389	0.000
6/ 1/78	MOBLFF	27.0	0.0	1140.0	8272	4361	2717	0	0	15350	0.000
7/ 1/78	MOBLFF	23.3	0.0	1100.0	8272	4361	3552	0	0	16185	0.000
8/ 1/78	MOBLFF	23.5	0.0	1100.0	8272	4361	4273	0	0	16906	0.000
9/ 1/78	MOBLFF	21.0	0.0	1080.0	8272	4361	5002	0	0	17634	0.000
10/ 1/78	MOBLFF	25.0	0.0	1080.0	8272	4361	5655	0	0	18288	0.000
11/ 1/78	MOBLFF	27.2	0.0	960.0	8272	4361	6431	0	0	19064	0.000
12/ 1/78	MOBLFF	20.7	0.0	990.0	8272	4361	7246	0	0	19881	0.000
1/ 1/79	MOBLFF	17.0	0.0	1000.0	8272	4361	7889	0	0	20522	0.000
2/ 1/79	MOBLFF	15.0	0.0	1020.0	8272	4361	8416	0	0	21049	0.000
3/ 1/79	MOBLFF	16.9	0.0	1030.0	8272	4361	8859	0	0	21492	0.000
4/ 1/79	MOBLFF	17.3	0.0	1030.0	8272	4361	9382	0	0	22015	0.000
5/ 1/79	MOBLFF	17.8	0.0	1040.0	8272	4361	9902	0	0	22535	0.000
6/ 1/79	MOBLFF	19.9	0.0	1020.0	8272	4361	10455	0	0	23088	0.000
7/ 1/79	MOBLFF	20.5	0.0	1050.0	8272	4361	11052	0	0	23685	0.000
8/ 1/79	MOBLFF	18.2	0.0	1030.0	8272	4361	11688	0	0	24321	0.000
9/ 1/79	MOBLFF	18.5	0.0	1030.0	8272	4361	12253	0	0	24886	0.000
10/ 1/79	MOBLFF	17.3	0.0	1150.0	8272	4361	12808	0	0	25441	0.000
11/ 1/79	MOBLFF	16.5	0.0	1150.0	8272	4361	13343	0	0	25976	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 1./ 1/80 PAGE 2

WELL: H-073

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
12/ 1/79	MOBLFF	17.5	0.0	1050.0	8272	4361	13831	0	0	26464	0.000
1/ 1/80	MOBLFF	17.9	0.0	1030.0	8272	4361	14368	0	0	27001	0.000
2/ 1/80	MOBLFF	17.0	0.0	1040.0	8272	4361	14923	0	0	27556	0.000
3/ 1/80	MOBLFF	15.0	0.0	1040.0	8272	4361	15417	0	0	28050	0.000
4/ 1/80	MOBLFF	15.2	0.0	1060.0	8272	4361	15902	0	0	28535	0.000
5/ 1/80	MOBLFF	14.8	0.0	1070.0	8272	4361	16359	0	0	28992	0.000
6/ 1/80	MOBLFF	14.[illegible]	0.0	1070.0	8272	4361	16817	0	0	29450	0.000
7/ 1/80	MOBLFF	14.0	0.0	1060.0	8272	4361	17241	0	0	29874	0.000
8/ 1/80	MOBLFF	15.1	0.0	1060.0	8272	4361	17675	0	0	30308	0.000
9/ 1/80	MOBLFF	15.3	0.0	1060.0	8272	4361	18143	0	0	30776	0.000
10/ 1/80	MOBLFF	15.2	0.0	1.0	8272	4361	18601	0	0	31234	0.000
11/ 1/80	MOBLFF	15.7	0.0	1.0	8272	4361	19071	0	0	31704	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	8272	4361	19389	0	0	32021	0.000

TABLE 11

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 1./ 1/79 PAGE 1

WELL: H-069

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	PRSLUG	44.5	0.0	280.0	280	0	0	0	0	280	0.000
7/ 1/77	PRSLUG	52.4	0.0	230.0	1616	0	0	0	0	1616	0.000
8/ 1/77	PRSLUG	46.2	0.0	230.0	3239	0	0	0	0	3239	0.000
9/ 1/77	PRSLUG	43.8	0.0	230.0	4672	0	0	0	0	4672	0.000
9/13/77	SLUG	30.4	0.0	230.0	5197	0	0	0	0	5197	0.000
10/ 1/77	SLUG	13.7	0.0	540.0	5197	547	0	0	0	5744	0.000
11/ 1/77	SLUG	13.5	0.0	730.0	5197	1126	0	0	0	6323	0.000
12/ 1/77	SLUG	18.9	0.0	980.0	5197	1680	0	0	0	6877	0.000
1/ 1/78	SLUG	17.6	0.0	1020.0	5197	2265	0	0	0	7462	0.000
2/ 1/78	SLUG	16.4	0.0	1120.0	5197	2810	0	0	0	8007	0.000
2/17/78	SLUG	16.4	0.0	1120.0	5197	3073	0	0	0	8270	0.000
2/28/78	SLUG	16.4	0.0	1120.0	5197	3253	0	0	0	8450	0.000
3/ 1/78	SLUG	16.3	0.0	1080.0	5197	3270	0	0	0	8467	0.000
3/10/78	SLUG	16.3	0.0	1080.0	5197	3417	0	0	0	8614	0.000
4/ 1/78	SLUG	15.4	0.0	1060.0	5197	3776	0	0	0	8973	0.000
4/ 9/78	SLUG	15.4	0.0	1060.0	5197	3899	0	0	0	9096	0.000
4/10/78	SLUG	15.4	0.0	1060.0	5197	3914	0	0	0	9111	0.000
4/11/78	MOBLFF	14.7	0.0	1060.0	5197	3930	0	0	0	9127	0.000
5/ 1/78	MOBLFF	14.6	0.0	1150.0	5197	3930	293	0	0	9420	0.000
6/ 1/78	MOBLFF	14.4	0.0	1150.0	5197	3930	746	0	0	9873	0.000
7/ 1/78	MOBLFF	20.8	0.0	1080.0	5197	3930	1179	0	0	10306	0.000
8/ 1/78	MOBLFF	15.6	0.0	1100.0	5197	3930	1825	0	0	10952	0.000
9/ 1/78	MOBLFF	11.7	0.0	1100.0	5197	3930	2310	0	0	11437	0.000
10/ 1/78	MOBLFF	15.4	0.0	1100.0	5197	3930	2660	0	0	11787	0.000
11/ 1/78	MOBLFF	11.4	0.0	1110.0	5197	3930	3136	0	0	12265	0.000
12/ 1/78	MOBLFF	9.8	0.0	1100.0	5197	3930	3480	0	0	12607	0.000
1/ 1/79	MOBLFF	9.4	0.0	1100.0	5197	3930	3784	0	0	12911	0.000
2/ 1/79	MOBLFF	9.9	0.0	1100.0	5197	3930	4074	0	0	13201	0.000
3/ 1/79	MOBLFF	9.2	0.0	1130.0	5197	3930	4351	0	0	13478	0.000
4/ 1/79	MOBLFF	8.7	0.0	1130.0	5197	3930	4636	0	0	13763	0.000
5/ 1/79	MOBLFF	8.2	0.0	1140.0	5197	3930	4897	0	0	14024	0.000
6/ 1/79	MOBLFF	8.5	0.0	1140.0	5197	3930	5150	0	0	14277	0.000
7/ 1/79	MOBLFF	10.3	0.0	1170.0	5197	3930	5406	0	0	14533	0.000
8/ 1/79	MOBLFF	8.8	0.0	1130.0	5197	3930	5724	0	0	14851	0.000
9/ 1/79	MOBLFF	7.5	0.0	1140.0	5197	3930	5997	0	0	15124	0.000
10/ 1/79	MOBLFF	6.9	0.0	1150.0	5197	3930	6221	0	0	15348	0.000
11/ 1/79	MOBLFF	4.9	0.0	1140.0	5197	3930	6434	0	0	15561	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 1./ 1/80 PAGE 2

WELL: H-069

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
12/ 1/79	MOBLFF	4.5	0.0	1150.0	5197	3930	6582	0	0	15709	0.000
1/ 1/80	MOBLFF	4.3	0.0	1100.0	5197	3930	6724	0	0	15848	0.000
2/ 1/80	MOBLFF	4.0	0.0	1140.0	5197	3930	6855	0	0	15982	0.000
3/ 1/80	MOBLFF	4.0	0.0	1130.0	5197	3930	6995	0	0	16122	0.000
4/ 1/80	MOBLFF	4.0	0.0	1150.0	5197	3930	7144	0	0	16271	0.000
5/ 1/80	MOBLFF	3.9	0.0	1140.0	5197	3930	7283	0	0	16410	0.000
6/ 1/80	MOBLFF	4.9	0.0	1140.0	5197	3930	7543	0	0	16670	0.000
7/ 1/80	MOBLFF	4.4	0.0	1150.0	5197	3930	7689	0	0	16816	0.000
8/ 1/80	MOBLFF	4.0	0.0	1160.0	5197	3930	7826	0	0	16953	0.000
9/ 1/80	MOBLFF	4.4	0.0	1150.0	5197	3930	7951	0	0	17078	0.000
10/ 1/80	MOBLFF	4.0	0.0	0.0	5197	3930	8073	0	0	17200	0.000
11/ 1/80	MOBLFF	3.8	0.0	0.0	5197	3930	8196	0	0	17323	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	5197	3930	8265	0	0	17392	0.000

TABLE 12

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 11/ 1/79 PAGE 1

WELL: H-074

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	30.0	0.0	270.0	508	0	0	0	0	508	0.000
7/ 1/77	PRSLUG	47.8	0.0	250.0	2907	0	0	0	0	2907	0.000
8/ 1/77	PRSLUG	78.2	0.0	250.0	4390	0	0	0	0	4390	0.000
9/ 1/77	PRSLUG	94.9	0.0	250.0	6812	0	0	0	0	6812	0.000
9/13/77	SLUG	43.4	0.0	250.0	7830	0	0	0	0	7830	0.000
10/ 1/77	SLUG	26.8	0.0	550.0	7830	782	0	0	0	8612	0.000
11/ 1/77	SLUG	19.2	0.0	750.0	7830	1612	0	0	0	9442	0.000
12/ 1/77	SLUG	19.5	0.0	560.0	7830	2188	0	0	0	10018	0.000
1/ 1/78	SLUG	18.9	0.0	650.0	7830	2794	0	0	0	10624	0.000
2/ 1/78	SLUG	24.8	0.0	1050.0	7830	3381	0	0	0	11211	0.000
2/17/78	MOBLFF	22.8	0.0	1050.0	7830	3775	0	0	0	11605	0.000
2/28/78	MOBLFF	22.8	0.0	1050.0	7830	3775	249	0	0	11853	0.000
3/ 1/78	MOBLFF	23.8	0.0	1070.0	7830	3775	271	0	0	11876	0.000
3/10/78	MOBLFF	23.8	0.0	1070.0	7830	3775	483	0	0	12088	0.000
4/ 1/78	MOBLFF	20.9	0.0	1070.0	7830	3775	1002	0	0	12607	0.000
4/ 9/78	MOBLFF	20.9	0.0	1070.0	7830	3775	1169	0	0	12774	0.000
4/10/78	MOBLFF	20.9	0.0	1070.0	7830	3775	1190	0	0	12795	0.000
4/11/78	MOBLFF	20.9	0.0	1070.0	7830	3775	1211	0	0	12816	0.000
5/ 1/78	MOBLFF	17.2	0.0	1150.0	7830	3775	1629	0	0	13234	0.000
6/ 1/78	MOBLFF	15.8	0.0	1150.0	7830	3775	2246	0	0	13851	0.000
7/ 1/78	MOBLFF	17.8	0.0	1160.0	7830	3775	2804	0	0	14409	0.000
8/ 1/78	MOBLFF	16.8	0.0	1160.0	7830	3775	3350	0	0	14955	0.000
9/ 1/78	MOBLFF	15.9	0.0	1140.0	7830	3775	3870	0	0	15475	0.000
10/ 1/78	MOBLFF	15.5	0.0	1150.0	7830	3775	4347	0	0	15952	0.000
11/ 1/78	MOBLFF	14.9	0.0	1140.0	7830	3775	4826	0	0	16431	0.000
12/ 1/78	MOBLFF	14.8	0.0	1130.0	7830	3775	5272	0	0	16877	0.000
1/ 1/79	MOBLFF	13.4	0.0	1130.0	7830	3775	5724	0	0	17329	0.000
2/ 1/79	MOBLFF	12.4	0.0	1120.0	7830	3775	6140	0	0	17745	0.000
3/ 1/79	MOBLFF	11.7	0.0	1130.0	7830	3775	6487	0	0	18092	0.000
4/ 1/79	MOBLFF	11.0	0.0	1130.0	7830	3775	6849	0	0	18454	0.000
5/ 1/79	MOBLFF	10.2	0.0	1150.0	7830	3775	7178	0	0	18783	0.000
6/ 1/79	MOBLFF	9.8	0.0	1140.0	7830	3775	7492	0	0	19097	0.000
7/ 1/79	MOBLFF	9.3	0.0	1160.0	7830	3775	7786	0	0	19391	0.000
8/ 1/79	MOBLFF	8.5	0.0	1130.0	7830	3775	8074	0	0	19679	0.000
9/ 1/79	MOBLFF	8.4	0.0	1140.0	7830	3775	8336	0	0	19941	0.000
10/ 1/79	MOBLFF	9.0	0.0	1140.0	7830	3775	8588	0	0	20193	0.000
11/ 1/79	MOBLFF	22.7	0.0	1040.0	7830	3775	8868	0	0	20473	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-074

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	16.4	0.0	1140.0	7830	3775	9550	0	0	21155	0.000
1/ 1/80	MOBLFF	15.2	0.0	1120.0	7830	3775	10058	0	0	21663	0.000
2/ 1/80	MOBLFF	13.2	0.0	1130.0	7830	3775	10530	0	0	22135	0.000
3/ 1/80	MOBLFF	11.2	0.0	1030.0	7830	3775	10914	0	0	22519	0.000
4/ 1/80	MOBLFF	12.0	0.0	1150.0	7830	3775	11258	0	0	22863	0.000
5/ 1/80	MOBLFF	12.0	0.0	1140.0	7830	3775	11618	0	0	23223	0.000
6/ 1/80	MOBLFF	9.9	0.0	1140.0	7830	3775	11989	0	0	23594	0.000
7/ 1/80	MOBLFF	7.9	0.0	1140.0	7830	3775	12286	0	0	23891	0.000
8/ 1/80	MOBLFF	6.3	0.0	1150.0	7830	3775	12530	0	0	24135	0.000
9/ 1/80	MOBLFF	7.4	0.0	1140.0	7830	3775	12726	0	0	24331	0.000
10/ 1/80	MOBLFF	7.6	0.0	1.0	7830	3775	12949	0	0	24554	0.000
11/ 1/80	MOBLFF	5.9	0.0	1.0	7830	3775	13186	0	0	24791	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	7830	3775	13297	0	0	24902	0.000

TABLE 13

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 11/ 1/79 PAGE 1

WELL: H-075

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	75.5	0.0	230.0	496	0	0	0	0	496	0.000
7/ 1/77	PRSLUG	56.4	0.0	170.0	2792	0	0	0	0	2792	0.000
8/ 1/77	PRSLUG	75.5	0.0	170.0	4849	0	0	0	0	4849	0.000
9/ 1/77	PRSLUG	78.8	0.0	170.0	7188	0	0	0	0	7188	0.000
9/13/77	SLUG	43.8	0.0	170.0	8134	0	0	0	0	8134	0.000
10/ 1/77	SLUG	30.5	0.0	510.0	8134	874	0	0	0	9008	0.000
11/ 1/77	SLUG	20.5	0.0	710.0	8134	1813	0	0	0	9947	0.000
12/ 1/77	SLUG	21.5	0.0	520.0	8134	2422	0	0	0	10556	0.000
1/ 1/78	SLUG	20.2	0.0	630.0	8134	3087	0	0	0	11221	0.000
2/ 1/78	SLUG	25.8	0.0	1040.0	8134	3711	0	0	0	11845	0.000
2/17/78	SLUG	25.8	0.0	1040.0	8134	4121	0	0	0	12255	0.000
2/28/78	MOBLFF	19.0	0.0	1040.0	8134	4403	0	0	0	12537	0.000
3/ 1/78	MOBLFF	23.5	0.0	980.0	8134	4403	19	0	0	12556	0.000
3/10/78	MOBLFF	23.5	0.0	980.0	8134	4403	232	0	0	12768	0.000
4/ 1/78	MOBLFF	21.2	0.0	1010.0	8134	4403	746	0	0	13285	0.000
4/ 9/78	MOBLFF	21.2	0.0	1010.0	8134	4403	917	0	0	13454	0.000
4/10/78	MOBLFF	21.2	0.0	1010.0	8134	4403	938	0	0	13475	0.000
4/11/78	MOBLFF	21.2	0.0	1010.0	8134	4403	959	0	0	13497	0.000
5/ 1/78	MOBLFF	20.5	0.0	1110.0	8134	4403	1382	0	0	13919	0.000
6/ 1/78	MOBLFF	18.7	0.0	1110.0	8134	4403	2012	0	0	14549	0.000
7/ 1/78	MOBLFF	17.5	0.0	1110.0	8134	4403	2572	0	0	15109	0.000
8/ 1/78	MOBLFF	16.7	0.0	1040.0	8134	4403	3115	0	0	15652	0.000
9/ 1/78	MOBLFF	20.8	0.0	1000.0	8134	4403	3634	0	0	16171	0.000
10/ 1/78	MOBLFF	22.2	0.0	950.0	8134	4403	4256	0	0	16795	0.000
11/ 1/78	MOBLFF	14.8	0.0	870.0	8134	4403	4943	0	0	17480	0.000
12/ 1/78	MOBLFF	13.2	0.0	880.0	8134	4403	5386	0	0	17923	0.000
1/ 1/79	MOBLFF	11.7	0.0	900.0	8134	4403	5796	0	0	18333	0.000
2/ 1/79	MOBLFF	17.5	0.0	960.0	8134	4403	6160	0	0	18697	0.000
3/ 1/79	MOBLFF	17.8	0.0	980.0	8134	4403	6650	0	0	19187	0.000
4/ 1/79	MOBLFF	17.3	0.0	990.0	8134	4403	7202	0	0	19739	0.000
5/ 1/79	MOBLFF	17.9	0.0	1000.0	8134	4403	7724	0	0	20258	0.000
6/ 1/79	MOBLFF	18.4	0.0	990.0	8134	4403	8276	0	0	20813	0.000
7/ 1/79	MOBLFF	18.8	0.0	1030.0	8134	4403	8927	0	0	21364	0.000
8/ 1/79	MOBLFF	16.0	0.0	1030.0	8134	4403	9405	0	0	21942	0.000
9/ 1/79	MOBLFF	15.6	0.0	1030.0	8134	4403	9902	0	0	22438	0.000
10/ 1/79	MOBLFF	13.9	0.0	1140.0	8134	4403	10369	0	0	22906	0.000
11/ 1/79	MOBLFF	12.8	0.0	1030.0	8134	4403	10799	0	0	23336	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-075

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	12.9	0.0	1040.0	8134	4403	11178	0	0	23715	0.000
1/ 1/80	MOBLFF	14.9	0.0	1020.0	8134	4403	11579	0	0	24116	0.000
2/ 1/80	MOBLFF	15.8	0.0	1010.0	8134	4403	12040	0	0	24577	0.000
3/ 1/80	MOBLFF	16.3	0.0	1000.0	8134	4403	12498	0	0	25035	0.000
4/ 1/80	MOBLFF	16.2	0.0	1020.0	8134	4403	13004	0	0	25541	0.000
5/ 1/80	MOBLFF	16.0	0.0	1030.0	8134	4403	13490	0	0	26027	0.000
6/ 1/80	MOBLFF	16.0	0.0	1020.0	8134	4403	13985	0	0	26522	0.000
7/ 1/80	MOBLFF	15.5	0.0	1020.0	8134	4403	14465	0	0	27002	0.000
8/ 1/80	MOBLFF	14.0	0.0	1040.0	8134	4403	14944	0	0	27481	0.000
9/ 1/80	MOBLFF	14.8	0.0	1010.0	8134	4403	15378	0	0	27915	0.000
10/ 1/80	MOBLFF	17.2	0.0	1.0	8134	4403	15938	0	0	28473	0.000
11/ 1/80	MOBLFF	13.2	0.0	1.0	8134	4403	16465	0	0	29002	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	8134	4403	16810	0	0	29347	0.000

TABLE 14

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-076

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	68.2	0.0	250.0	425	0	0	0	0	425	0.000
7/ 1/77	PRSLUG	82.0	0.0	220.0	2470	0	0	0	0	2470	0.000
8/ 1/77	PRSLUG	74.3	0.0	220.0	5011	0	0	0	0	5011	0.000
9/ 1/77	PRSLUG	77.8	0.0	220.0	7315	0	0	0	0	7315	0.000
9/13/77	SLUG	45.0	0.0	220.0	8249	0	0	0	0	8249	0.000
10/ 1/77	SLUG	29.5	0.0	520.0	8249	838	0	0	0	9087	0.000
11/ 1/77	SLUG	20.7	0.0	720.0	8249	1747	0	0	0	9996	0.000
12/ 1/77	SLUG	23.3	0.0	560.0	8249	2373	0	0	0	10622	0.000
1/ 1/78	SLUG	18.9	0.0	700.0	8249	3094	0	0	0	11343	0.000
2/ 1/78	SLUG	24.8	0.0	1055.0	8249	3681	0	0	0	11930	0.000
2/17/78	SLUG	24.8	0.0	1055.0	8249	4074	0	0	0	12323	0.000
2/23/78	MOBLFF	17.0	0.0	1055.0	8249	4344	0	0	0	12593	0.000
3/ 1/78	MOBLFF	25.7	0.0	980.0	8249	4344	17	0	0	12610	0.000
3/10/78	MOBLFF	25.7	0.0	980.0	8249	4344	250	0	0	12843	0.000
4/ 1/78	MOBLFF	23.8	0.0	1020.0	8249	4344	820	0	0	13413	0.000
4/ 9/78	MOBLFF	23.8	0.0	1020.0	8249	4344	1009	0	0	13602	0.000
4/10/78	MOBLFF	23.8	0.0	1020.0	8249	4344	1032	0	0	13625	0.000
4/11/78	MOBLFF	23.8	0.0	1020.0	8249	4344	1056	0	0	13649	0.000
5/ 1/78	MOBLFF	25.4	0.0	1120.0	8249	4344	1527	0	0	14120	0.000
6/ 1/78	MOBLFF	23.9	0.0	1120.0	8249	4344	2313	0	0	14906	0.000
7/ 1/78	MOBLFF	23.4	0.0	1110.0	8249	4344	3029	0	0	15622	0.000
8/ 1/78	MOBLFF	31.7	0.0	1120.0	8249	4344	3910	0	0	16503	0.000
9/ 1/78	MOBLFF	30.1	0.0	1120.0	8249	4344	4894	0	0	17487	0.000
10/ 1/78	MOBLFF	25.2	0.0	1110.0	8249	4344	5797	0	0	18390	0.000
11/ 1/78	MOBLFF	18.9	0.0	820.0	8249	4344	6577	0	0	19170	0.000
12/ 1/78	MOBLFF	19.1	0.0	930.0	8249	4344	7144	0	0	19737	0.000
1/ 1/79	MOBLFF	21.7	0.0	1070.0	8249	4344	7735	0	0	20328	0.000
2/ 1/79	MOBLFF	22.6	0.0	1090.0	8249	4344	8409	0	0	21002	0.000
3/ 1/79	MOBLFF	23.0	0.0	1090.0	8249	4344	9043	0	0	21636	0.000
4/ 1/79	MOBLFF	22.7	0.0	1100.0	8249	4344	9757	0	0	22350	0.000
5/ 1/79	MOBLFF	22.0	0.0	1110.0	8249	4344	10438	0	0	23031	0.000
6/ 1/79	MOBLFF	21.5	0.0	1100.0	8249	4344	11121	0	0	23714	0.000
7/ 1/79	MOBLFF	20.5	0.0	1130.0	8249	4344	11765	0	0	24358	0.000
8/ 1/79	MOBLFF	20.4	0.0	1120.0	8249	4344	12400	0	0	24993	0.000
9/ 1/79	MOBLFF	19.5	0.0	1110.0	8249	4344	13032	0	0	25625	0.000
10/ 1/79	MOBLFF	18.8	0.0	1110.0	8249	4344	13627	0	0	26220	0.000
11/ 1/79	MOBLFF	17.8	0.0	1120.0	8249	4344	14210	0	0	26803	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 12/ 1/80 PAGE 2

WELL: H-076

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	17.2	0.0	1110.0	8249	4344	14743	0	0	27336	0.000
1/ 1/80	MOBLFF	16.2	0.0	1090.0	8249	4344	15272	0	0	27865	0.000
2/ 1/80	MOBLFF	16.0	0.0	1090.0	8249	4344	15774	0	0	28367	0.000
3/ 1/80	MOBLFF	15.7	0.0	1090.0	8249	4344	16237	0	0	28830	0.000
4/ 1/80	MOBLFF	15.4	0.0	1120.0	8249	4344	16723	0	0	29316	0.000
5/ 1/80	MOBLFF	15.2	0.0	1120.0	8249	4344	17184	0	0	29777	0.000
6/ 1/80	MOBLFF	14.8	0.0	1120.0	8249	4344	17655	0	0	30248	0.000
7/ 1/80	MOBLFF	14.5	0.0	1120.0	8249	4344	18100	0	0	30693	0.000
8/ 1/80	MOBLFF	14.8	0.0	1140.0	8249	4344	18550	0	0	31143	0.000
9/ 1/80	MOBLFF	14.7	0.0	1120.0	8249	4344	19003	0	0	31596	0.000
10/ 1/80	MOBLFF	15.0	0.0	1.0	8249	4344	19450	0	0	32043	0.000
11/ 1/80	MOBLFF	15.8	0.0	0.0	8249	4344	19916	0	0	32509	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	8249	4344	20211	0	0	32805	0.000

TABLE 15

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 11/ 1/79 PAGE 1

WELL: H-077

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	57.[illegible]	0.0	270.0	333	0	0	0	0	333	0.000
7/ 1/77	PRSLUG	69.4	0.0	230.0	2047	0	0	0	0	2047	0.000
8/ 1/77	PRSLUG	62.0	0.0	230.0	4197	0	0	0	0	4197	0.000
9/ 1/77	PRSLUG	59.0	0.0	230.0	6119	0	0	0	0	6119	0.000
9/13/77	SLUG	32.7	0.0	230.0	6837	0	0	0	0	6837	0.000
10/ 1/77	SLUG	20.0	0.0	530.0	6837	589	0	0	0	7426	0.000
11/ 1/77	SLUG	19.7	0.0	710.0	6837	1228	0	0	0	8065	0.000
12/ 1/77	SLUG	20.0	0.0	970.0	6837	1818	0	0	0	8655	0.000
1/ 1/78	SLUG	17.9	0.0	1080.0	6837	2438	0	0	0	9275	0.000
2/ 1/78	SLUG	16.0	0.0	1120.0	6837	2993	0	0	0	9830	0.000
2/17/78	SLUG	16.5	0.0	1120.0	6837	3254	0	0	0	10091	0.000
2/28/78	SLUG	15.3	0.0	1120.0	6837	3434	0	0	0	10271	0.000
3/ 1/78	SLUG	15.0	0.0	1030.0	6837	3450	0	0	0	10287	0.000
3/10/78	SLUG	15.5	0.0	1030.0	6837	3590	0	0	0	10427	0.000
4/ 1/78	SLUG	15.[illegible]	0.0	1040.0	6837	3933	0	0	0	10770	0.000
4/ 9/78	MOBLFF	15.4	0.0	1040.0	6837	4054	0	0	0	10891	0.000
4/10/78	MOBLFF	15.4	0.0	1040.0	6837	4054	15	0	0	10906	0.000
4/11/78	MOBLFF	15.4	0.0	1040.0	6837	4054	31	0	0	10922	0.000
5/ 1/78	MOBLFF	15.5	0.0	1130.0	6837	4054	339	0	0	11230	0.000
6/ 1/78	MOBLFF	14.9	0.0	1130.0	6837	4054	819	0	0	11710	0.000
7/ 1/78	MOBLFF	13.5	0.0	1130.0	6837	4054	1265	0	0	12156	0.000
8/ 1/78	MOBLFF	12.4	0.0	1120.0	6837	4054	1684	0	0	12575	0.000
9/ 1/78	MOBLFF	11.4	0.0	1130.0	6837	4054	2068	0	0	12959	0.000
10/ 1/78	MOBLFF	10.0	0.0	1120.0	6837	4054	2409	0	0	13300	0.000
11/ 1/78	MOBLFF	10.0	0.0	1130.0	6837	4054	2720	0	0	13611	0.000
12/ 1/78	MOBLFF	9.2	0.0	1120.0	6837	4054	3020	0	0	13911	0.000
1/ 1/79	MOBLFF	8.5	0.0	1110.0	6837	4054	3304	0	0	14195	0.000
2/ 1/79	MOBLFF	7.7	0.0	1100.0	6837	4054	3562	0	0	14452	0.000
3/ 1/79	MOBLFF	7.5	0.0	1120.0	6837	4054	3776	0	0	14667	0.000
4/ 1/79	MOBLFF	6.9	0.0	1120.0	6837	4054	4002	0	0	14893	0.000
5/ 1/79	MOBLFF	6.7	0.0	1120.0	6837	4054	4209	0	0	15100	0.000
6/ 1/79	MOBLFF	6.4	0.0	1120.0	6837	4054	4416	0	0	15307	0.000
7/ 1/79	MOBLFF	5.8	0.0	1150.0	6837	4054	4607	0	0	15498	0.000
8/ 1/79	MOBLFF	5.2	0.0	1140.0	6837	4054	4786	0	0	15677	0.000
9/ 1/79	MOBLFF	4.9	0.0	1120.0	6837	4054	4976	0	0	15867	0.000
10/ 1/79	MOBLFF	5.0	0.0	1150.0	6837	4054	5123	0	0	16014	0.000
11/ 1/79	MOBLFF	4.5	0.0	1130.0	6837	4054	5276	0	0	16169	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-077

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	4.8	0.0	1140.0	6837	4054	5414	0	0	16305	0.000
1/ 1/80	MOBLFF	5.3	0.0	1120.0	6837	4054	5563	0	0	16454	0.000
2/ 1/80	MOBLFF	4.4	0.0	1120.0	6837	4054	5728	0	0	16619	0.000
3/ 1/80	MOBLFF	3.8	0.0	1120.0	6837	4054	5855	0	0	16746	0.000
4/ 1/80	MOBLFF	3.8	0.0	1150.0	6837	4054	5966	0	0	16857	0.000
5/ 1/80	MOBLFF	3.7	0.0	1150.0	6837	4054	6079	0	0	16970	0.000
6/ 1/80	MOBLFF	3.7	0.0	1130.0	6837	4054	6194	0	0	17085	0.000
7/ 1/80	MOBLFF	3.4	0.0	1140.0	6837	4054	6304	0	0	17195	0.000
8/ 1/80	MOBLFF	3.2	0.0	1160.0	6837	4054	6409	0	0	17300	0.000
9/ 1/80	MOBLFF	3.2	0.0	1150.0	6837	4054	6506	0	0	17397	0.000
10/ 1/80	MOBLFF	3.0	0.0	1.0	6837	4054	6602	0	0	17492	0.000
11/ 1/80	MOBLFF	2.7	0.0	1.0	6837	4054	6694	0	0	17585	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	6837	4054	6740	0	0	17639	0.000

TABLE 16

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 11/ 1/79 PAGE 1

WELL: H-078

LARRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	57.5	0.0	270.0	317	0	0	0	0	317	0.000
7/ 1/77	PRSLUG	52.4	0.0	210.0	2041	0	0	0	0	2041	0.000
8/ 1/77	PRSLUG	54.8	0.0	210.0	3665	0	0	0	0	3665	0.000
9/ 1/77	PRSLUG	56.1	0.0	210.0	5359	0	0	0	0	5359	0.000
9/13/77	SLUG	31.2	0.0	210.0	6032	0	0	0	0	6032	0.000
10/ 1/77	SLUG	19.0	0.0	530.0	6032	562	0	0	0	6594	0.000
11/ 1/77	SLUG	19.1	0.0	700.0	6032	1152	0	0	0	7184	0.000
12/ 1/77	SLUG	20.0	0.0	970.0	6032	1725	0	0	0	7757	0.000
1/ 1/78	SLUG	18.5	0.0	1070.0	6032	2345	0	0	0	8377	0.000
2/ 1/78	SLUG	16.0	0.0	1110.0	6032	2917	0	0	0	8949	0.000
2/17/78	MOBLFF	14.1	0.0	1110.0	6032	3173	0	0	0	9205	0.000
2/28/78	MOBLFF	14.1	0.0	1110.0	6032	3173	155	0	0	9360	0.000
3/ 1/78	MOBLFF	16.8	0.0	1020.0	6032	3173	169	0	0	9374	0.000
3/10/78	MOBLFF	16.8	0.0	1020.0	6032	3173	320	0	0	9525	0.000
4/ 1/78	MOBLFF	15.1	0.0	1040.0	6032	3173	690	0	0	9895	0.000
4/ 9/78	MOBLFF	15.1	0.0	1040.0	6032	3173	811	0	0	10016	0.000
4/10/78	MOBLFF	15.1	0.0	1040.0	6032	3173	826	0	0	10031	0.000
4/11/78	MOBLFF	15.1	0.0	1040.0	6032	3173	841	0	0	10046	0.000
5/ 1/78	MOBLFF	17.2	0.0	1140.0	6032	3173	1143	0	0	10348	0.000
6/ 1/78	MOBLFF	16.4	0.0	1140.0	6032	3173	1675	0	0	10880	0.000
7/ 1/78	MOBLFF	15.7	0.0	1130.0	6032	3173	2167	0	0	11372	0.000
8/ 1/78	MOBLFF	19.3	0.0	950.0	6032	3173	2653	0	0	11858	0.000
9/ 1/78	MOBLFF	25.2	0.0	890.0	6032	3173	3251	0	0	12456	0.000
10/ 1/78	MOBLFF	27.3	0.0	900.0	6032	3173	4006	0	0	13211	0.000
11/ 1/78	MOBLFF	20.3	0.0	870.0	6032	3173	4853	0	0	14058	0.000
12/ 1/78	MOBLFF	21.7	0.0	890.0	6032	3173	5462	0	0	14667	0.000
1/ 1/79	MOBLFF	22.4	0.0	950.0	6032	3173	6135	0	0	15340	0.000
2/ 1/79	MOBLFF	24.2	0.0	920.0	6032	3173	6829	0	0	16034	0.000
3/ 1/79	MOBLFF	27.0	0.0	920.0	6032	3173	7506	0	0	16711	0.000
4/ 1/79	MOBLFF	28.8	0.0	940.0	6032	3173	8369	0	0	17574	0.000
5/ 1/79	MOBLFF	29.7	0.0	940.0	6032	3173	9228	0	0	18433	0.000
6/ 1/79	MOBLFF	31.7	0.0	930.0	6032	3173	10150	0	0	19355	0.000
7/ 1/79	MOBLFF	33.3	0.0	950.0	6032	3173	11100	0	0	20305	0.000
8/ 1/79	MOBLFF	32.0	0.0	920.0	6032	3173	12131	0	0	21336	0.000
9/ 1/79	MOBLFF	33.1	0.0	920.0	6032	3173	13123	0	0	22328	0.000
10/ 1/79	MOBLFF	32.5	0.0	920.0	6032	3173	14116	0	0	23321	0.000
11/ 1/79	MOBLFF	33.0	0.0	930.0	6032	3173	15116	0	0	24321	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-078

LARRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	35.3	0.0	910.0	6032	3173	16106	0	0	25311	0.000
1/ 1/80	MOBLFF	36.8	0.0	880.0	6032	3173	17199	0	0	26404	0.000
2/ 1/80	MOBLFF	36.6	0.0	900.0	6032	3173	18339	0	0	27544	0.000
3/ 1/80	MOBLFF	36.4	0.0	890.0	6032	3173	19400	0	0	28605	0.000
4/ 1/80	MOBLFF	35.8	0.0	910.0	6032	3173	20528	0	0	29733	0.000
5/ 1/80	MOBLFF	35.3	0.0	910.0	6032	3173	21602	0	0	30807	0.000
6/ 1/80	MOBLFF	35.6	0.0	920.0	6032	3173	22728	0	0	31933	0.000
7/ 1/80	MOBLFF	35.8	0.0	920.0	6032	3173	23796	0	0	33001	0.000
8/ 1/80	MOBLFF	36.6	0.0	920.0	6032	3173	24907	0	0	34112	0.000
9/ 1/80	MOBLFF	36.4	0.0	910.0	6032	3173	26041	0	0	35246	0.000
10/ 1/80	MOBLFF	36.[illegible]	0.0	[illegible].0	6032	3173	27132	0	0	36337	0.000
11/ 1/80	MOBLFF	35.9	0.0	1.0	6032	3173	28251	0	0	37456	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	6032	3173	28932	0	0	38137	0.000

TABLE 17

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-079

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	70.9	0.0	200.0	436	0	0	0	0	436	0.000
7/ 1/77	PRSLUG	62.2	0.0	170.0	2563	0	0	0	0	2563	0.000
8/ 1/77	PRSLUG	71.9	0.0	170.0	4491	0	0	0	0	4491	0.000
9/ 1/77	PRSLUG	70.8	0.0	170.0	6719	0	0	0	0	6719	0.000
9/13/77	SLUG	43.1	0.0	170.0	7569	0	0	0	0	7569	0.000
10/ 1/77	SLUG	25.3	0.0	510.0	7569	775	0	0	0	8344	0.000
11/ 1/77	SLUG	23.7	0.0	660.0	7569	1560	0	0	0	9129	0.000
12/ 1/77	SLUG	25.6	0.0	940.0	7569	2271	0	0	0	9840	0.000
1/ 1/78	SLUG	17.5	0.0	1040.0	7569	3066	0	0	0	10635	0.000
2/ 1/78	SLUG	19.3	0.0	1080.0	7569	3671	0	0	0	11240	0.000
2/17/78	MOBLFF	13.6	0.0	1080.0	7569	3980	0	0	0	11549	0.000
2/28/78	MOBLFF	13.8	0.0	1080.0	7569	3980	205	0	0	11753	0.000
3/ 1/78	MOBLFF	17.9	0.0	970.0	7569	3980	223	0	0	11772	0.000
3/10/78	MOBLFF	17.9	0.0	970.0	7569	3980	403	0	0	11951	0.000
4/ 1/78	MOBLFF	18.4	0.0	1010.0	7569	3980	841	0	0	12390	0.000
4/ 9/78	MOBLFF	18.4	0.0	1010.0	7569	3980	988	0	0	12537	0.000
4/10/78	MOBLFF	18.4	0.0	1010.0	7569	3980	1007	0	0	12556	0.000
4/11/78	MOBLFF	18.4	0.0	1010.0	7569	3980	1025	0	0	12574	0.000
5/ 1/78	MOBLFF	19.1	0.0	1100.0	7569	3980	1393	0	0	12942	0.000
6/ 1/78	MOBLFF	18.4	0.0	1110.0	7569	3980	1985	0	0	13534	0.000
7/ 1/78	MOBLFF	18.5	0.0	1100.0	7569	3980	2538	0	0	14087	0.000
8/ 1/78	MOBLFF	18.5	0.0	1090.0	7569	3980	3111	0	0	14660	0.000
9/ 1/78	MOBLFF	17.5	0.0	930.0	7569	3980	3683	0	0	15232	0.000
10/ 1/78	MOBLFF	18.4	0.0	930.0	7569	3980	4209	0	0	15758	0.000
11/ 1/78	MOBLFF	17.1	0.0	940.0	7569	3980	4776	0	0	16327	0.000
12/ 1/78	MOBLFF	16.1	0.0	950.0	7569	3980	5292	0	0	16841	0.000
1/ 1/79	MOBLFF	14.2	0.0	990.0	7569	3980	5791	0	0	17340	0.000
2/ 1/79	MOBLFF	17.3	0.0	1080.0	7569	3980	6232	0	0	17781	0.000
3/ 1/79	MOBLFF	15.7	0.0	1090.0	7569	3980	6717	0	0	18266	0.000
4/ 1/79	MOBLFF	15.1	0.0	1080.0	7569	3980	7234	0	0	18783	0.000
5/ 1/79	MOBLFF	15.8	0.0	1080.0	7569	3980	7718	0	0	19267	0.000
6/ 1/79	MOBLFF	24.3	0.0	950.0	7569	3980	8202	0	0	19751	0.000
7/ 1/79	MOBLFF	29.4	0.0	970.0	7569	3980	8930	0	0	20479	0.000
8/ 1/79	MOBLFF	25.8	0.0	980.0	7569	3980	9840	0	0	21389	0.000
9/ 1/79	MOBLFF	25.7	0.0	990.0	7569	3980	10639	0	0	22188	0.000
10/ 1/79	MOBLFF	26.8	0.0	1000.0	7569	3980	11411	0	0	22960	0.000
11/ 1/79	MOBLFF	25.4	0.0	1000.0	7569	3980	12242	0	0	23791	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 12/ 1/80 PAGE 2

WELL: H-079

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	27.0	0.0	990.0	7569	3980	13035	0	0	24582	0.000
1/ 1/80	MOBLFF	28.7	0.0	930.0	7569	3980	13871	0	0	25420	0.000
2/ 1/80	MOBLFF	34.0	0.0	920.0	7569	3980	14762	0	0	26311	0.000
3/ 1/80	MOBLFF	32.3	0.0	900.0	7569	3980	15746	0	0	27297	0.000
4/ 1/80	MOBLFF	66.1	0.0	930.0	7569	3980	16766	0	0	28315	0.000
5/ 1/80	MOBLFF	32.3	0.0	940.0	7569	3980	18749	0	0	30298	0.000
6/ 1/80	MOBLFF	32.8	0.0	930.0	7569	3980	19756	0	0	31305	0.000
7/ 1/80	MOBLFF	32.9	0.0	940.0	7569	3980	20741	0	0	32290	0.000
8/ 1/80	MOBLFF	32.6	0.0	950.0	7569	3980	21760	0	0	33309	0.000
9/ 1/80	MOBLFF	32.3	0.0	950.0	7569	3980	22771	0	0	34320	0.000
10/ 1/80	MOBLFF	32.0	0.0	1.0	7569	3980	23746	0	0	35295	0.000
11/ 1/80	MOBLFF	31.3	0.0	1.0	7569	3980	24737	0	0	36286	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	7569	3980	25332	0	0	36881	0.000

TABLE 18

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-080

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	PRSLUG	69.0	0.0	220.0	406	0	0	0	0	406	0.000
7/ 1/77	PRSLUG	67.2	0.0	190.0	2500	0	0	0	0	2500	0.000
8/ 1/77	PRSLUG	69.0	0.0	190.0	4580	0	0	0	0	4580	0.000
9/ 1/77	PRSLUG	70.0	0.0	190.0	6719	0	0	0	0	6719	0.000
9/13/77	SLUG	43.7	0.0	190.0	7566	0	0	0	0	7566	0.000
10/ 1/77	SLUG	27.2	0.0	510.0	7566	790	0	0	0	8356	0.000
11/ 1/77	SLUG	19.3	0.0	670.0	7566	1634	0	0	0	9200	0.000
12/ 1/77	SLUG	19.7	0.0	520.0	7566	2214	0	0	0	9780	0.000
1/ 1/78	SLUG	19.4	0.0	630.0	7566	2826	0	0	0	10392	0.000
2/ 1/78	SLUG	23.0	0.0	1060.0	7566	3426	0	0	0	10992	0.000
2/17/78	SLUG	23.0	0.0	1060.0	7566	3794	0	0	0	11360	0.000
2/28/78	MOBLFF	18.0	0.0	1060.0	7566	4047	0	0	0	11613	0.000
3/ 1/78	MOBLFF	20.7	0.0	980.0	7566	4047	18	0	0	11631	0.000
3/10/78	MOBLFF	20.7	0.0	980.0	7566	4047	204	0	0	11817	0.000
4/ 1/78	MOBLFF	14.9	0.0	980.0	7566	4047	660	0	0	12273	0.000
4/ 9/78	MOBLFF	14.7	0.0	980.0	7566	4047	779	0	0	12392	0.000
4/10/78	MOBLFF	14.9	0.0	980.0	7566	4047	794	0	0	12407	0.000
4/11/78	MOBLFF	14.9	0.0	980.0	7566	4047	809	0	0	12422	0.000
5/ 1/78	MOBLFF	13.0	0.0	1100.0	7566	4047	1108	0	0	12721	0.000
6/ 1/78	MOBLFF	11.7	0.0	1100.0	7566	4047	1530	0	0	13143	0.000
7/ 1/78	MOBLFF	10.0	0.0	1120.0	7566	4047	1888	0	0	13494	0.000
8/ 1/78	MOBLFF	15.2	0.0	1100.0	7566	4047	2209	0	0	13822	0.000
9/ 1/78	MOBLFF	12.0	0.0	1100.0	7566	4047	2679	0	0	14292	0.000
10/ 1/78	MOBLFF	9.8	0.0	1100.0	7566	4047	3036	0	0	14651	0.000
11/ 1/78	MOBLFF	8.9	0.0	1100.0	7566	4047	3342	0	0	14955	0.000
12/ 1/78	MOBLFF	8.4	0.0	1090.0	7566	4047	3608	0	0	15221	0.000
1/ 1/79	MOBLFF	7.0	0.0	1080.0	7566	4047	3869	0	0	15482	0.000
2/ 1/79	MOBLFF	7.2	0.0	1080.0	7566	4047	4105	0	0	15718	0.000
3/ 1/79	MOBLFF	6.8	0.0	1090.0	7566	4047	4305	0	0	15918	0.000
4/ 1/79	MOBLFF	6.2	0.0	1080.0	7566	4047	4515	0	0	16128	0.000
5/ 1/79	MOBLFF	5.7	0.0	1080.0	7566	4047	4702	0	0	16315	0.000
6/ 1/79	MOBLFF	5.5	0.0	1080.0	7566	4047	4880	0	0	16493	0.000
7/ 1/79	MOBLFF	5.2	0.0	1110.0	7566	4047	5044	0	0	16657	0.000
8/ 1/79	MOBLFF	2.4	0.0	1100.0	7566	4047	5203	0	0	16816	0.000
9/ 1/79	MOBLFF	6.2	0.0	1110.0	7566	4047	5276	0	0	16889	0.000
10/ 1/79	MOBLFF	3.3	0.0	1120.0	7566	4047	5461	0	0	17074	0.000
11/ 1/79	MOBLFF	2.5	0.0	1100.0	7566	4047	5564	0	0	17177	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-080

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
12/ 1/79	MOBLFF	7.4	0.0	1100.0	7566	4047	5640	0	0	17253	0.000
1/ 1/80	MOBLFF	5.9	0.0	1080.0	7566	4047	5869	0	0	17482	0.000
2/ 1/80	MOBLFF	4.4	0.0	1090.0	7566	4047	6055	0	0	17666	0.000
3/ 1/80	MOBLFF	4.2	0.0	1090.0	7566	4047	6182	0	0	17795	0.000
4/ 1/80	MOBLFF	4.2	0.0	1120.0	7566	4047	6313	0	0	17926	0.000
5/ 1/80	MOBLFF	4.3	0.0	1120.0	7566	4047	6438	0	0	18051	0.000
6/ 1/80	MOBLFF	4.0	0.0	1110.0	7566	4047	6570	0	0	18183	0.000
7/ 1/80	MOBLFF	3.7	0.0	1110.0	7566	4047	6689	0	0	18302	0.000
8/ 1/80	MOBLFF	3.0	0.0	1120.0	7566	4047	6804	0	0	18417	0.000
9/ 1/80	MOBLFF	3.2	0.0	1100.0	7566	4047	6916	0	0	18529	0.000
10/ 1/80	MOBLFF	3.0	0.0	1.0	7566	4047	7010	0	0	18623	0.000
11/ 1/80	MOBLFF	2.7	0.0	1.0	7566	4047	7103	0	0	18716	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	7566	4047	7153	0	0	18766	0.000

TABLE 19

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 1./ 1/79 PAGE 1

WELL: H-081

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	PRSLUG	58.6	0.0	230.0	327	0	0	0	0	327	0.000
7/ 1/77	PRSLUG	59.7	0.0	200.0	2086	0	0	0	0	2086	0.000
8/ 1/77	PRSLUG	63.7	0.0	200.0	3942	0	0	0	0	3942	0.000
9/ 1/77	PRSLUG	65.3	0.0	200.0	5918	0	0	0	0	5918	0.000
9/13/77	SLUG	41.9	0.0	200.0	6702	0	0	0	0	6702	0.000
10/ 1/77	SLUG	25.5	0.0	520.0	6702	754	0	0	0	7456	0.000
11/ 1/77	SLUG	18.8	0.0	680.0	6702	1544	0	0	0	8246	0.000
12/ 1/77	SLUG	17.5	0.0	530.0	6702	2107	0	0	0	8809	0.000
1/ 1/78	SLUG	17.2	0.0	640.0	6702	2649	0	0	0	9351	0.000
2/ 1/78	SLUG	21.7	0.0	1080.0	6702	3179	0	0	0	9881	0.000
2/17/78	MOBLFF	17.9	0.0	1080.0	6702	3526	0	0	0	10228	0.000
2/28/78	MOBLFF	17.9	0.0	1080.0	6702	3526	197	0	0	10425	0.000
3/ 1/78	MOBLFF	22.0	0.0	990.0	6702	3526	215	0	0	10443	0.000
3/10/78	MOBLFF	22.0	0.0	990.0	6702	3526	413	0	0	10641	0.000
4/ 1/78	MOBLFF	19.7	0.0	1020.0	6702	3526	897	0	0	11125	0.000
4/ 9/78	MOBLFF	19.7	0.0	1020.0	6702	3526	1054	0	0	11282	0.000
4/10/78	MOBLFF	19.7	0.0	1020.0	6702	3526	1074	0	0	11302	0.000
4/11/78	MOBLFF	19.7	0.0	1020.0	6702	3526	1093	0	0	11322	0.000
5/ 1/78	MOBLFF	36.2	0.0	960.0	6702	3526	1487	0	0	11715	0.000
6/ 1/78	MOBLFF	28.9	0.0	960.0	6702	3526	2606	0	0	12836	0.000
7/ 1/78	MOBLFF	26.0	0.0	900.0	6702	3526	3476	0	0	13704	0.000
8/ 1/78	MOBLFF	25.8	0.0	870.0	6702	3526	4282	0	0	14510	0.000
9/ 1/78	MOBLFF	24.6	0.0	910.0	6702	3526	5083	0	0	15311	0.000
10/ 1/78	MOBLFF	27.7	0.0	830.0	6702	3526	5806	0	0	16036	0.000
11/ 1/78	MOBLFF	22.4	0.0	740.0	6702	3526	6666	0	0	16896	0.000
12/ 1/78	MOBLFF	19.6	0.0	790.0	6702	3526	7340	0	0	17568	0.000
1/ 1/79	MOBLFF	15.2	0.0	900.0	6702	3526	7949	0	0	18177	0.000
2/ 1/79	MOBLFF	22.4	0.0	900.0	6702	3526	8419	0	0	18647	0.000
3/ 1/79	MOBLFF	23.2	0.0	890.0	6702	3526	9046	0	0	19274	0.000
4/ 1/79	MOBLFF	23.6	0.0	890.0	6702	3526	9764	0	0	19992	0.000
5/ 1/79	MOBLFF	24.0	0.0	900.0	6702	3526	10473	0	0	20701	0.000
6/ 1/79	MOBLFF	24.7	0.0	890.0	6702	3526	11218	0	0	21446	0.000
7/ 1/79	MOBLFF	24.8	0.0	930.0	6702	3526	11959	0	0	22187	0.000
8/ 1/79	MOBLFF	24.3	0.0	920.0	6702	3526	12728	0	0	22956	0.000
9/ 1/79	MOBLFF	25.0	0.0	920.0	6702	3526	13489	0	0	23709	0.000
10/ 1/79	MOBLFF	24.7	0.0	910.0	6702	3526	14232	0	0	24460	0.000
11/ 1/79	MOBLFF	24.2	0.0	900.0	6702	3526	14999	0	0	25227	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 1./ 1/80 PAGE 2

WELL: H-081

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
12/ 1/79	MOBLFF	24.8	0.0	900.0	6702	3526	15726	0	0	25954	0.000
1/ 1/80	MOBLFF	25.2	0.0	880.0	6702	3526	16496	0	0	26724	0.000
2/ 1/80	MOBLFF	25.2	0.0	880.0	6702	3526	17273	0	0	27501	0.000
3/ 1/80	MOBLFF	25.4	0.0	91.0	6702	3526	18003	0	0	28231	0.000
4/ 1/80	MOBLFF	25.4	0.0	900.0	6702	3526	18780	0	0	29008	0.000
5/ 1/80	MOBLFF	25.0	0.0	910.0	6702	3526	19532	0	0	29760	0.000
6/ 1/80	MOBLFF	24.6	0.0	900.0	6702	3526	20306	0	0	30536	0.000
7/ 1/80	MOBLFF	25.0	0.0	900.0	6702	3526	21051	0	0	31279	0.000
8/ 1/80	MOBLFF	25.5	0.0	900.0	6702	3526	21825	0	0	32053	0.000
9/ 1/80	MOBLFF	25.5	0.0	895.0	6702	3526	22608	0	0	32836	0.000
10/ 1/80	MOBLFF	25.5	0.0	1.0	6702	3526	23374	0	0	33602	0.000
11/ 1/80	MOBLFF	25.2	0.0	1.0	6702	3526	24164	0	0	34392	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	6702	3526	24642	0	0	34870	0.000

TABLE 20

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-082

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	95.5	0.0	180.0	473	0	0	0	0	473	0.000
7/ 1/77	PRSLUG	97.2	0.0	165.0	3037	0	0	0	0	3037	0.000
8/ 1/77	PRSLUG	83.3	0.0	165.0	5119	0	0	0	0	5119	0.000
9/ 1/77	PRSLUG	75.0	0.0	165.0	7700	0	0	0	0	7700	0.000
9/13/77	SLUG	53.0	0.0	165.0	8610	0	0	0	0	8610	0.000
10/ 1/77	SLUG	32.3	0.0	480.0	8610	954	0	0	0	9564	0.000
11/ 1/77	SLUG	19.8	0.0	560.0	8610	1924	0	0	0	10534	0.000
12/ 1/77	SLUG	17.9	0.0	400.0	8610	2519	0	0	0	11129	0.000
1/ 1/78	SLUG	20.0	0.0	540.0	8610	3137	0	0	0	11747	0.000
2/ 1/78	SLUG	32.6	0.0	780.0	8610	3757	0	0	0	12367	0.000
2/17/78	MOBLFF	71.2	0.0	780.0	8610	4279	0	0	0	12889	0.000
2/28/78	MOBLFF	71.2	0.0	780.0	8610	4279	783	0	0	13672	0.000
3/ 1/78	MOBLFF	71.7	0.0	950.0	8610	4279	854	0	0	13743	0.000
3/10/78	MOBLFF	71.7	0.0	950.0	8610	4279	1500	0	0	14389	0.000
4/ 1/78	MOBLFF	50.4	0.0	980.0	8610	4279	3078	0	0	15967	0.000
4/ 9/78	MOBLFF	50.4	0.0	980.0	8610	4279	3481	0	0	16370	0.000
4/10/78	MOBLFF	50.4	0.0	980.0	8610	4279	3532	0	0	16420	0.000
4/11/78	MOBLFF	50.4	0.0	980.0	8610	4279	3582	0	0	16471	0.000
5/ 1/78	MOBLFF	43.4	0.0	900.0	8610	4279	4589	0	0	17478	0.000
6/ 1/78	MOBLFF	34.5	0.0	900.0	8610	4279	5935	0	0	18824	0.000
7/ 1/78	MOBLFF	29.1	0.0	900.0	8610	4279	6971	0	0	19860	0.000
8/ 1/78	MOBLFF	31.5	0.0	790.0	8610	4279	7872	0	0	20761	0.000
9/ 1/78	MOBLFF	30.0	0.0	825.0	8610	4279	8847	0	0	21736	0.000
10/ 1/78	MOBLFF	23.5	0.0	830.0	8610	4279	9764	0	0	22653	0.000
11/ 1/78	MOBLFF	22.0	0.0	650.0	8610	4279	10647	0	0	23536	0.000
12/ 1/78	MOBLFF	23.0	0.0	750.0	8610	4279	11306	0	0	24195	0.000
1/ 1/79	MOBLFF	25.5	0.0	760.0	8610	4279	12038	0	0	24927	0.000
2/ 1/79	MOBLFF	25.0	0.0	770.0	8610	4279	12838	0	0	25727	0.000
3/ 1/79	MOBLFF	25.9	0.0	780.0	8610	4279	13561	0	0	26450	0.000
4/ 1/79	MOBLFF	25.7	0.0	770.0	8610	4279	14363	0	0	27252	0.000
5/ 1/79	MOBLFF	25.8	0.0	780.0	8610	4279	15135	0	0	28024	0.000
6/ 1/79	MOBLFF	25.7	0.0	790.0	8610	4279	15935	0	0	28824	0.000
7/ 1/79	MOBLFF	25.5	0.0	820.0	8610	4279	16708	0	0	29595	0.000
8/ 1/79	MOBLFF	25.1	0.0	920.0	8610	4279	17495	0	0	30384	0.000
9/ 1/79	MOBLFF	25.1	0.0	820.0	8610	4279	18274	0	0	31163	0.000
10/ 1/79	MOBLFF	24.8	0.0	830.0	8610	4279	19026	0	0	31915	0.000
11/ 1/79	MOBLFF	24.4	0.0	820.0	8610	4279	19796	0	0	32685	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 12/ 1/80 PAGE 2

WELL: H-082

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	24.3	0.0	820.0	8610	4279	20527	0	0	33416	0.000
1/ 1/80	MOBLFF	24.1	0.0	810.0	8610	4279	21281	0	0	34170	0.000
2/ 1/80	MOBLFF	23.8	0.0	820.0	8610	4279	22029	0	0	34918	0.000
3/ 1/80	MOBLFF	23.8	0.0	830.0	8610	4279	22720	0	0	35609	0.000
4/ 1/80	MOBLFF	23.7	0.0	840.0	8610	4279	23459	0	0	36348	0.000
5/ 1/80	MOBLFF	23.8	0.0	840.0	8610	4279	24170	0	0	37059	0.000
6/ 1/80	MOBLFF	24.1	0.0	820.0	8610	4279	24909	0	0	37798	0.000
7/ 1/80	MOBLFF	23.8	0.0	840.0	8610	4279	25631	0	0	38520	0.000
8/ 1/80	MOBLFF	23.3	0.0	850.0	8610	4279	26368	0	0	39257	0.000
9/ 1/80	MOBLFF	23.8	0.0	850.0	8610	4279	27091	0	0	39980	0.000
10/ 1/80	MOBLFF	23.4	0.0	1.0	8610	4279	27799	0	0	40688	0.000
11/ 1/80	MOBLFF	23.0	0.0	1.0	8610	4279	28524	0	0	41413	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	8610	4279	28961	0	0	41850	0.000

TABLE 21

INJECTION DATA FOR INJECTION WELL FROM 5/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-083

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
6/ 1/77	PRSLUG	83.5	0.0	180.0	481	0	0	0	0	481	0.000
7/ 1/77	PRSLUG	53.6	0.0	170.0	2987	0	0	0	0	2987	0.000
8/ 1/77	PRSLUG	87.8	0.0	170.0	4654	0	0	0	0	4654	0.000
9/ 1/77	PRSLUG	86.4	0.0	170.0	7375	0	0	0	0	7375	0.000
9/15/77	SLUG	53.0	0.0	170.0	8412	0	0	0	0	8412	0.000
10/ 1/77	SLUG	31.6	0.0	430.0	8412	954	0	0	0	9366	0.000
11/ 1/77	SLUG	18.1	0.0	650.0	8412	1935	0	0	0	10347	0.000
12/ 1/77	SLUG	22.5	0.0	430.0	8412	2478	0	0	0	10890	0.000
1/ 1/78	SLUG	20.5	0.0	590.0	8412	3174	0	0	0	11586	0.000
2/ 1/78	SLUG	24.0	0.0	1000.0	8412	3820	0	0	0	12232	0.000
2/17/78	MOBLFF	43.4	0.0	1000.0	8412	4204	0	0	0	12616	0.000
2/28/78	MOBLFF	43.4	0.0	1000.0	8412	4204	477	0	0	13093	0.000
3/ 1/78	MOBLFF	42.6	0.0	950.0	8412	4204	521	0	0	13137	0.000
3/10/78	MOBLFF	42.6	0.0	950.0	8412	4204	905	0	0	13521	0.000
4/ 1/78	MOBLFF	35.3	0.0	980.0	8412	4204	1843	0	0	14459	0.000
4/ 9/78	MOBLFF	35.3	0.0	980.0	8412	4204	2125	0	0	14741	0.000
4/10/78	MOBLFF	35.3	0.0	980.0	8412	4204	2161	0	0	14777	0.000
4/11/78	MOBLFF	35.3	0.0	980.0	8412	4204	2196	0	0	14812	0.000
5/ 1/78	MOBLFF	35.3	0.0	1050.0	8412	4204	2903	0	0	15519	0.000
6/ 1/78	MOBLFF	31.6	0.0	1050.0	8412	4204	3997	0	0	16613	0.000
7/ 1/78	MOBLFF	30.8	0.0	1000.0	8412	4204	4950	0	0	17566	0.000
8/ 1/78	MOBLFF	30.2	0.0	980.0	8412	4204	5896	0	0	18514	0.000
9/ 1/78	MOBLFF	27.0	0.0	990.0	8412	4204	6834	0	0	19450	0.000
10/ 1/78	MOBLFF	27.3	0.0	1000.0	8412	4204	7645	0	0	20261	0.000
11/ 1/78	MOBLFF	20.5	0.0	895.0	8412	4204	8490	0	0	21106	0.000
12/ 1/78	MOBLFF	19.6	0.0	780.0	8412	4204	9105	0	0	21721	0.000
1/ 1/79	MOBLFF	20.9	0.0	900.0	8412	4204	9714	0	0	22330	0.000
2/ 1/79	MOBLFF	21.4	0.0	900.0	8412	4204	10361	0	0	22977	0.000
3/ 1/79	MOBLFF	20.7	0.0	910.0	8412	4204	10961	0	0	23577	0.000
4/ 1/79	MOBLFF	20.3	0.0	920.0	8412	4204	11604	0	0	24220	0.000
5/ 1/79	MOBLFF	20.2	0.0	920.0	8412	4204	12213	0	0	24829	0.000
6/ 1/79	MOBLFF	19.5	0.0	910.0	8412	4204	12839	0	0	25455	0.000
7/ 1/79	MOBLFF	17.0	0.0	960.0	8412	4204	13423	0	0	26039	0.000
8/ 1/79	MOBLFF	13.4	0.0	950.0	8412	4204	14012	0	0	26628	0.000
9/ 1/79	MOBLFF	17.6	0.0	950.0	8412	4204	14581	0	0	27197	0.000
10/ 1/79	MOBLFF	17.7	0.0	960.0	8412	4204	15109	0	0	27725	0.000
11/ 1/79	MOBLFF	17.1	0.0	950.0	8412	4204	15658	0	0	28274	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 11/ 1/80 PAGE 2

WELL: H-083

LAWRY-ERDA PROJECT

DATE	TYPE	ALLOCATED INJECTION RATES		INJECTION PRESSURE	CUMULATIVE INJECTION TOTALS						
		LIQUID	GAS		PRE SLUG	SLUG	MOBILITY BUFFER	WATER #1	WATER #2	TOTAL FLUID	TOTAL GAS
MO/DY/YR		BBL/DAY	MCF/DAY	PSI	BBL	BBL	BBL	BBL	BBL	BBL	MMCF
12/ 1/79	MOBLFF	16.8	0.0	960.0	8412	4204	16170	0	0	28786	0.000
1/ 1/80	MOBLFF	16.1	0.0	940.0	8412	4204	16692	0	0	29308	0.000
2/ 1/80	MOBLFF	16.2	0.0	945.0	8412	4204	17192	0	0	29807	0.000
3/ 1/80	MOBLFF	15.8	0.0	950.0	8412	4204	17661	0	0	30277	0.000
4/ 1/80	MOBLFF	15.8	0.0	930.0	8412	4204	18151	0	0	30767	0.000
5/ 1/80	MOBLFF	15.8	0.0	980.0	8412	4204	18624	0	0	31240	0.000
6/ 1/80	MOBLFF	15.4	0.0	950.0	8412	4204	19109	0	0	31725	0.000
7/ 1/80	MOBLFF	15.3	0.0	950.0	8412	4204	19571	0	0	32187	0.000
8/ 1/80	MOBLFF	16.0	0.0	980.0	8412	4204	20046	0	0	32662	0.000
9/ 1/80	MOBLFF	15.8	0.0	970.0	8412	4204	20543	0	0	33159	0.000
10/ 1/80	MOBLFF	16.2	0.0	1.0	8412	4204	21016	0	0	33632	0.000
11/ 1/80	MOBLFF	15.9	0.0	1.0	8412	4204	21517	0	0	34133	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	8412	4204	21819	0	0	34435	0.000

TABLE 22

INJECTION DATA FOR INJECTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-084

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
6/ 1/77	PRSLUG	61.4	0.0	150.0	263	0	0	0	0	263	0.000
7/ 1/77	PRSLUG	70.5	0.0	160.0	2105	0	0	0	0	2105	0.000
8/ 1/77	PRSLUG	57.7	0.0	160.0	4284	0	0	0	0	4284	0.000
9/ 1/77	PRSLUG	75.9	0.0	160.0	6446	0	0	0	0	6446	0.000
9/13/77	SLUG	41.8	0.0	160.0	7357	0	0	0	0	7357	0.000
10/ 1/77	SLUG	25.5	0.0	470.0	7357	752	0	0	0	8109	0.000
11/ 1/77	SLUG	16.4	0.0	540.0	7357	1572	0	0	0	8929	0.000
12/ 1/77	SLUG	13.5	0.0	520.0	7357	2054	0	0	0	9411	0.000
1/ 1/78	SLUG	20.5	0.0	670.0	7357	2659	0	0	0	10016	0.000
2/ 1/78	SLUG	22.4	0.0	1030.0	7357	3287	0	0	0	10644	0.000
2/18/78	SLUG	22.4	0.0	1030.0	7357	3646	0	0	0	11003	0.000
3/ 1/78	SLUG	21.7	0.0	940.0	7357	3892	0	0	0	11249	0.000
3/10/78	MOBLFF	19.6	0.0	940.0	7357	3915	0	0	0	11272	0.000
4/ 1/78	MOBLFF	18.7	0.0	970.0	7357	4110	0	0	0	11467	0.000
4/ 9/78	MOBLFF	18.7	0.0	970.0	7357	4110	432	0	0	11899	0.000
4/10/78	MOBLFF	18.7	0.0	970.0	7357	4110	562	0	0	12049	0.000
4/11/78	MOBLFF	18.7	0.0	970.0	7357	4110	600	0	0	12067	0.000
5/ 1/78	MOBLFF	17.4	0.0	1060.0	7357	4110	619	0	0	12086	0.000
6/ 1/78	MOBLFF	17.0	0.0	1060.0	7357	4110	993	0	0	12460	0.000
7/ 1/78	MOBLFF	18.5	0.0	1070.0	7357	4110	1595	0	0	13062	0.000
8/ 1/78	MOBLFF	17.6	0.0	1060.0	7357	4110	2166	0	0	13633	0.000
9/ 1/78	MOBLFF	16.5	0.0	1060.0	7357	4110	2732	0	0	14199	0.000
10/ 1/78	MOBLFF	15.9	0.0	1060.0	7357	4110	3276	0	0	14745	0.000
11/ 1/78	MOBLFF	15.7	0.0	1060.0	7357	4110	3736	0	0	15203	0.000
12/ 1/78	MOBLFF	15.4	0.0	1050.0	7357	4110	4230	0	0	15697	0.000
1/ 1/79	MOBLFF	14.6	0.0	1030.0	7357	4110	4702	0	0	16169	0.000
2/ 1/79	MOBLFF	15.0	0.0	1040.0	7357	4110	5180	0	0	16647	0.000
3/ 1/79	MOBLFF	15.6	0.0	1050.0	7357	4110	5632	0	0	17099	0.000
4/ 1/79	MOBLFF	18.6	0.0	1040.0	7357	4110	6053	0	0	17520	0.000
5/ 1/79	MOBLFF	22.0	0.0	1040.0	7357	4110	6537	0	0	18004	0.000
6/ 1/79	MOBLFF	26.9	0.0	1040.0	7357	4110	7095	0	0	18562	0.000
7/ 1/79	MOBLFF	24.0	0.0	1070.0	7357	4110	7776	0	0	19245	0.000
8/ 1/79	MOBLFF	21.2	0.0	1060.0	7357	4110	8584	0	0	20051	0.000
9/ 1/79	MOBLFF	21.6	0.0	1060.0	7357	4110	9327	0	0	20794	0.000
10/ 1/79	MOBLFF	22.4	0.0	1060.0	7357	4110	9963	0	0	21450	0.000
11/ 1/79	MOBLFF	18.6	0.0	1070.0	7357	4110	10635	0	0	22098	0.000
					7357	4110	11324	0	0	22791	0.000

INJECTION DATA FOR INJECTION WELL FROM 12/ 1/79 TO 12/ 1/80 PAGE 2

WELL: H-084

LAWRY-ERDA PROJECT

DATE MO/DY/YR	TYPE	ALLOCATED INJECTION RATES LIQUID BBL/DAY	GAS MCF/DAY	INJECTION PRESSURE PSI	CUMULATIVE INJECTION TOTALS PRE SLUG BBL	SLUG BBL	MOBILITY BUFFER BBL	WATER #1 BBL	WATER #2 BBL	TOTAL FLUID BBL	TOTAL GAS MMCF
12/ 1/79	MOBLFF	17.8	0.0	1060.0	7357	4110	11882	0	0	23349	0.000
1/ 1/80	MOBLFF	18.4	0.0	1040.0	7357	4110	12434	0	0	23901	0.000
2/ 1/80	MOBLFF	18.2	0.0	1050.0	7357	4110	13004	0	0	24471	0.000
3/ 1/80	MOBLFF	19.8	0.0	1040.0	7357	4110	13533	0	0	25000	0.000
4/ 1/80	MOBLFF	18.0	0.0	1060.0	7357	4110	14146	0	0	25613	0.000
5/ 1/80	MOBLFF	13.9	0.0	1050.0	7357	4110	14685	0	0	26152	0.000
6/ 1/80	MOBLFF	24.2	0.0	1050.0	7357	4110	15272	0	0	26739	0.000
7/ 1/80	MOBLFF	24.9	0.0	0.0	7357	4110	15999	0	0	27466	0.000
8/ 1/80	MOBLFF	2.2	0.0	0.0	7357	4110	16771	0	0	28238	0.000
9/ 1/80	MOBLFF	11.4	0.0	1050.0	7357	4110	16838	0	0	28305	0.000
10/ 1/80	MOBLFF	7.9	0.0	1.0	7357	4110	17172	0	0	28639	0.000
11/ 1/80	MOBLFF	8.5	0.0	1.0	7357	4110	17417	0	0	28884	0.000
11/20/80	MOBLFF	0.0	0.0	0.0	7357	4110	17578	0	0	29045	0.000

TABLE 23

BRINE INJECTION REQUIREMENTS

Well No.	Recommended Injection (Barrels)	Cumulative Injection Through September 11, 1977 (Barrels)	Percentage of Requirement (%)
69	4,350	5,153	118.5
70	4,548	6,992	153.7
71	4,127	4,449	107.8
72	4,650	6,621	142.4
73	4,633	8,199	177.0
74	3,888	7,745	199.2
75	4,621	8,055	174.3
76	4,747	8,171	172.1
77	4,416	6,778	153.5
78	3,476	5,976	171.9
79	4,184	7,498	179.2
80	4,268	7,496	175.6
81	3,640	6,636	182.3
82	4,652	8,534	183.4
83	3,876	8,326	214.8
84	4,383	7,281	166.1
Total	68,459	113,908	166.4

TABLE 24

SLUG INJECTION REQUIREMENTS

Well No.	Recommended Injection (Barrels)	Cumulative Injection Through April 12, 1978 (Barrels)	Percentage of Requirement (%)
69	3,915	3,931	100.4
70	4,093	3,923	95.9
71	3,714	3,597	96.8
72	4,185	4,252	101.6
73	4,170	4,407	105.7
74	3,499	3,803	108.7
75	4,159	4,410	106.0
76	4,273	4,352	101.8
77	3,974	4,058	102.1
78	3,129	3,205	102.4
79	3,766	4,119	109.4
80	3,841	4,070	106.0
81	3,276	3,570	109.0
82	4,186	4,334	103.5
83	3,488	4,253	121.9
84	3,945	4,110	104.2
Total	61,612	64,394	104.5

TABLE 25

POLYMER (SPIKE) INJECTION REQUIREMENTS

Well No.	Recommended Injection (10% PV, Barrels)	Cumulative Injection Through February 1, 1979 (Barrels)	Percentage of Requirement (%)
70	4,548	6,140	135.0
71	4,127	3,434	83.2
72	4,650	4,356	93.7
73	4,633	8,411	181.5
69	4,350	4,056	93.2
74	3,888	6,131	157.7
75	4,621	6,179	133.7
76	4,747	8,451	178.0
77	4,416	3,538	80.0
78	3,476	6,838	196.7
79	4,184	6,232	148.9
80	4,268	4,093	95.9
81	3,640	8,421	231.3
82	4,652	12,883	276.9
83	3,876	10,338	266.7
84	4,383	5,647	128.8
Total	68,459	105,148	153.6

TABLE 26

SUMMARY OF INJECTION RATE CONTROL

DURING POLYMER (SPIKE) PHASE

Well No.	Restriction Date	Reason	Coil Size	Coil Addition or Removal (-)	Total Copper Coil (ft)
HO-70	5-16-78	Rate Increase	1/4"	50'	
HO-73	5-23-78	Rate Increase	1/4"	50'	
	11-29-78	Replacing 1/4"	3/16"	50'	
HO-69	7-10-78	Rate Increase	3/16"	25'	
HO-75	8-05-78	Rate Increase	3/16"	25'	
	10-31-78	Insuff. Reduct.	3/16"	50'	
	11-16-78	Insuff. Reduct.	3/16"	50'	
HO-76	10-28-78	Rate Increase	3/16"	100'	
	12-20-78			-25'	75'-3/16"
	12-23-78			-25'	50'-3/16"
HO-78	8-23-78	Rate Increase	3/16"	25'	
	10-31-78	Insuff. Reduct.	3/16"	50'	75'-3/16"
	12-20-78			-25'	50'-3/16"
	12-23-78			-25'	25'-3/16"
HO-79	9-26-78	Rate Increase	3/16"	25'	25'-3/16"
	9-27-78	Insuff. Reduct.	3/16"	25'	50'-3/16"
HO-81	6-17-78	Rate Increase	3/16"	50'	50'-3/16"
	10-28-78	Insuff. Reduct.	3/16"	50'	100'-3/16"
	11-16-78	Insuff. Reduct.	3/16"	25'	125'-3/16"
HO-82	6-17-78	Rate Increase	3/16"	50'	50'-3/16"
	10-24-78	Insuff. Reduct.	3/16"	25'	75'-3/16"
	10-25-78	Insuff. Reduct.	3/16"	25'	100'-3/16"
	12-20-78			-25'	75'-3/16"
	12-23-78			-25'	50'-3/16"
HO-83	5-30-78		1/4"	100'	100'-1/4"
	10-28-78	Replacing 1/4"	3/16"	100'	100'-3/16"
	11-16-78	Insuff. Reduct.	3/16"	50'	150'-3/16"
	12-20-78			-25'	125'-3/16"
	12-23-78			-25'	100'-3/16"

TABLE 27

POLYMER (BODY) INJECTION REQUIREMENTS

Well No.	Recommended Injection (50% PV, Barrels)	Cumulative Injection Through November 20, 1980 (Barrels)	Percentage of Requirement (%)
70	22,740	15,140	66.6
71	20,633	5,789	28.0
72	23,248	7,002	30.1
73	23,166	10,973	47.4
69	21,747	4,082	18.8
74	19,438	7,150	36.8
75	23,105	10,649	46.1
76	23,736	11,796	49.7
77	22,078	3,182	14.4
78	17,380	22,116	127.2
79	20,922	18,092	86.5
80	21,341	3,045	14.3
81	18,200	16,228	89.2
82	23,258	16,120	69.3
83	19,379	11,453	59.1
84	21,914	11,989	54.7
Total	342,285	174,806	51.1

PORE VOLUME = 684577 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 273831 BBL.

WELL NAMES :	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-99	H-100	H-101	H-102	H-103	H-104	H-105	H-106	H-107
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-108	H-109	H-110	H-111	H-112	H-113	H-114	H-070	H-071
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-072	H-073	H-074	H-075	H-076	H-077	H-078	H-079
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-080	H-081	H-082	H-083	H-084
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000

LAWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	17	1410	1427	0	0	0.0	0	0	0.0	0.000	1.2	0	0.0	0
7/ 1/77	11	1176	1187	0	517	0.2	42295	42812	6.3	0.000	0.9	0	1.2	0
8/ 1/77	10	1034	1044	0	862	0.3	78761	79623	11.6	0.000	1.0	0	1.1	0
9/ 1/77	10	1033	1043	0	1180	0.4	110801	111981	16.4	0.000	1.0	0	1.1	0
9/15/77	10	1033	1043	0	1300	0.5	123192	124493	18.2	0.000	1.0	0	1.0	0
10/ 1/77	9	544	553	0	1487	0.5	141777	143261	20.9	0.000	1.5	0	1.0	0
11/ 1/77	7	456	463	0	1748	0.6	158653	160400	23.4	0.000	1.4	0	1.1	0
12/ 1/77	8	443	450	0	1949	0.7	172337	174285	25.5	0.000	1.7	0	1.1	0
1/ 1/78	8	421	429	0	2185	0.8	186059	188243	27.5	0.000	1.9	0	1.2	0
2/ 1/78	8	450	459	0	2435	0.9	199102	201537	29.4	0.000	1.8	0	1.2	0
2/17/78	8	450	459	0	2569	0.9	206308	208878	30.5	0.000	1.8	0	1.2	0
2/28/78	8	450	459	0	2662	1.0	211263	213925	31.2	0.000	1.8	0	1.2	0
3/ 1/78	7	505	512	0	2670	1.0	211713	214383	31.3	0.000	1.4	0	1.2	0
3/10/78	7	505	512	0	2735	1.0	216259	218994	32.0	0.000	1.4	0	1.2	0
4/ 1/78	7	462	469	0	2994	1.1	227372	230266	33.6	0.000	1.5	0	1.3	0
4/ 9/78	7	462	469	0	2948	1.1	231069	234018	34.2	0.000	1.5	0	1.3	0
4/10/78	7	462	469	0	2955	1.1	231532	234487	34.3	0.000	1.5	0	1.3	0
4/11/78	7	462	469	0	2962	1.1	231994	234956	34.3	0.000	1.5	0	1.3	0
5/ 1/78	8	452	460	0	3098	1.1	241237	244336	35.7	0.000	1.7	0	1.3	0
6/ 1/78	9	432	440	0	3347	1.2	255242	258589	37.8	0.000	2.0	0	1.3	0
7/ 1/78	9	450	459	0	3605	1.3	268190	271795	39.7	0.000	2.1	0	1.3	0

PRODUCTION DATA FOR GROUP TOTAL FROM 8/ 1/78 TO 11/ 1/80 PAGE 2

PORE VOLUME = 684577 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 273831 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

LAWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
8/ 1/78	11	465	476	0	3895	1.4	282127	286023	41.8	0.000	2.2	0	1.4	0
9/ 1/78	12	460	472	0	4225	1.5	296545	300773	43.9	0.000	2.6	0	1.4	0
10/ 1/78	12	441	452	0	4594	1.7	310340	314931	46.0	0.000	2.6	0	1.5	0
11/ 1/78	12	392	403	0	4959	1.8	323997	328956	48.1	0.000	2.9	0	1.5	0
12/ 1/78	12	372	383	0	5314	1.9	335748	341059	49.8	0.000	3.0	0	1.6	0
1/ 1/79	12	386	397	0	5672	2.1	347269	352941	51.6	0.000	2.9	0	1.6	0
2/ 1/79	12	378	389	0	6030	2.2	359224	365255	53.4	0.000	3.0	0	1.7	0
3/ 1/79	13	374	387	0	6380	2.3	369801	376180	54.9	0.000	3.3	0	1.7	0
4/ 1/79	13	400	413	0	6760	2.5	381390	388150	56.7	0.000	3.3	0	1.7	0
5/ 1/79	13	358	371	0	7164	2.6	393375	400540	58.5	0.000	3.6	0	1.8	0
6/ 1/79	14	371	385	0	7589	2.8	404473	412055	60.2	0.000	3.6	0	1.8	0
7/ 1/79	13	382	395	0	7997	2.9	415599	423592	61.9	0.000	3.4	0	1.9	0
8/ 1/79	14	375	388	0	8412	3.1	427427	435839	63.7	0.000	3.5	0	1.9	0
9/ 1/79	13	371	384	0	8833	3.2	439037	447868	65.4	0.000	3.5	0	2.0	0
10/ 1/79	13	371	384	0	9237	3.4	450153	459386	67.1	0.000	3.4	0	2.0	0
11/ 1/79	13	381	394	0	9644	3.5	461651	471295	68.8	0.000	3.3	0	2.0	0
12/ 1/79	13	375	388	0	10032	3.7	473085	483116	70.6	0.000	3.3	0	2.1	0
1/ 1/80	12	341	353	0	10430	3.8	484708	495135	72.3	0.000	3.4	0	2.1	0
2/ 1/80	12	339	351	0	10805	3.9	495271	506077	73.9	0.000	3.4	0	2.1	0
3/ 1/80	12	371	383	0	11197	4.1	505111	516267	75.4	0.000	3.2	0	2.2	0
4/ 1/80	12	346	358	0	11535	4.2	516620	528154	77.2	0.000	3.4	0	2.2	0
5/ 1/80	12	374	387	0	11896	4.3	526994	538890	78.7	0.000	3.2	0	2.2	0
6/ 1/80	10	353	363	0	12274	4.5	538598	550872	80.5	0.000	2.8	0	2.2	0
7/ 1/80	12	364	376	0	12677	4.6	549190	561767	82.1	0.000	3.1	0	2.2	0
8/ 1/80	11	340	352	0	12940	4.7	560473	573413	83.8	0.000	3.2	0	2.3	0
9/ 1/80	10	342	353	0	13287	4.9	571027	584313	85.4	0.000	3.0	0	2.3	0
10/ 1/80	10	341	351	0	13607	5.0	581301	594902	86.9	0.000	2.9	0	2.3	0
11/ 1/80	10	341	351	0	13917	5.1	591269	605782	88.5	0.000	2.8	0	2.3	0
11/20/80	0	0	0	0	14107	5.2	598339	612442	89.5	0.000	0.0	0	2.3	0

PRODUCTION DATA FOR GROUP FARM A FROM 6/ 1/77 TO 1/ 1/79 PAGE 1

PORE VOLUME = 388617 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 155447 BBL.

WELL NAMES :	H-94	H-97	H-98	H-101	H-102	H-103	H-106	H-107	H-110
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

WELL NAMES :	H-070	H-071	H-072	H-073	H-069	H-074	H-075	H-076	H-077
WELL FRACTION :	0.25000	0.50000	0.50000	0.50000	1.00000	0.50000	0.25000	1.00000	1.00000

WELL NAMES :	H-078	H-079	H-080	H-081	H-082	H-083	H-084
WELL FRACTION :	0.25000	0.50000	1.00000	0.50000	0.50000	0.50000	0.25000

AWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
D/DY/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	8	631	639	0	0	0.0	0	0	0.0	0.000	1.3	0	0.0	0
7/ 1/77	5	526	532	0	245	0.2	18932	19177	4.9	0.000	1.0	0	1.3	0
8/ 1/77	5	486	491	0	414	0.3	35253	35664	9.2	0.000	1.0	0	1.2	0
9/ 1/77	4	387	391	0	965	0.4	50321	50886	13.1	0.000	0.9	0	1.1	0
9/13/77	4	387	391	0	609	0.4	54969	55578	14.3	0.000	0.9	0	1.1	0
10/ 1/77	4	197	201	0	675	0.4	61941	62616	16.1	0.000	1.9	0	1.1	0
11/ 1/77	3	168	170	0	795	0.5	68040	68835	17.7	0.000	1.5	0	1.2	0
12/ 1/77	3	165	168	0	874	0.6	73074	73946	19.0	0.000	1.9	0	1.2	0
1/ 1/78	3	157	160	0	969	0.6	78200	79168	20.4	0.000	2.0	0	1.2	0
2/ 1/78	4	178	182	0	1069	0.7	83052	84121	21.6	0.000	2.1	0	1.3	0
2/17/78	4	178	182	0	1139	0.7	85900	87030	22.4	0.000	2.1	0	1.3	0
2/28/78	4	178	182	0	1173	0.8	87858	89031	22.9	0.000	2.1	0	1.3	0
3/ 1/78	4	194	198	0	1177	0.8	88036	89212	23.0	0.000	1.8	0	1.3	0
3/10/78	4	194	198	0	1210	0.8	89783	90993	23.4	0.000	1.8	0	1.3	0
4/ 1/78	4	172	176	0	1290	0.8	94056	95346	24.5	0.000	2.3	0	1.4	0
4/ 9/78	4	172	176	0	1322	0.9	95433	96755	24.9	0.000	2.3	0	1.4	0
4/10/78	4	172	176	0	1326	0.9	95605	96931	24.9	0.000	2.3	0	1.4	0
4/11/78	4	172	176	0	1330	0.9	95777	97107	25.0	0.000	2.3	0	1.4	0
5/ 1/78	4	174	177	0	1410	0.9	99221	100630	25.9	0.000	2.0	0	1.4	0
6/ 1/78	5	174	179	0	1523	1.0	104606	106127	27.3	0.000	2.7	0	1.4	0
7/ 1/78	5	172	177	0	1664	1.1	109834	111498	28.7	0.000	3.0	0	1.5	0
8/ 1/78	5	195	201	0	1830	1.2	115163	116993	30.1	0.000	3.0	0	1.6	0
9/ 1/78	8	176	183	0	2018	1.3	121214	123232	31.7	0.000	4.1	0	1.6	0
10/ 1/78	7	157	164	0	2246	1.4	126491	128737	33.1	0.000	4.5	0	1.7	0
11/ 1/78	6	139	145	0	2477	1.6	131356	133829	34.4	0.000	3.9	0	1.8	0
12/ 1/78	5	125	130	0	2647	1.7	135534	138176	35.6	0.000	4.0	0	1.9	0
1/ 1/79	6	144	150	0	2803	1.8	139407	142210	36.6	0.000	3.8	0	2.0	0

PRODUCTION DATA FOR GROUP FARM A FROM 2/ 1/79 TO 11/ 1/80 PAGE 2

PORE VOLUME = 388617 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 155447 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

AWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
2/ 1/79	5	137	142	0	2979	1.9	143875	146854	37.8	0.000	3.8	0	2.0	0
3/ 1/79	7	139	145	0	3139	2.0	147706	150838	38.8	0.000	4.5	0	2.1	0
4/ 1/79	8	157	165	0	3334	2.1	152010	155345	40.0	0.000	4.7	0	2.1	0
5/ 1/79	7	140	146	0	3588	2.3	156723	160292	41.2	0.000	4.6	0	2.2	0
6/ 1/79	7	139	147	0	3777	2.4	161051	164828	42.4	0.000	5.1	0	2.3	0
7/ 1/79	7	144	151	0	3999	2.6	165233	169233	43.5	0.000	4.6	0	2.4	0
8/ 1/79	6	144	150	0	4219	2.7	169688	173900	44.7	0.000	4.2	0	2.4	0
9/ 1/79	7	133	140	0	4410	2.8	174150	178560	45.9	0.000	4.9	0	2.5	0
10/ 1/79	7	133	140	0	4615	3.0	178147	182762	47.0	0.000	4.8	0	2.5	0
11/ 1/79	6	138	144	0	4829	3.1	182268	187089	48.1	0.000	4.5	0	2.6	0
12/ 1/79	7	142	149	0	5016	3.2	186400	191416	49.3	0.000	5.0	0	2.6	0
1/ 1/80	6	118	124	0	5248	3.4	190798	196043	50.4	0.000	4.7	0	2.7	0
2/ 1/80	6	113	119	0	5424	3.5	194455	199879	51.4	0.000	4.7	0	2.7	0
3/ 1/80	6	122	128	0	5587	3.6	197738	203326	52.3	0.000	4.9	0	2.7	0
4/ 1/80	6	118	124	0	5782	3.7	201525	207307	53.3	0.000	5.0	0	2.8	0
5/ 1/80	5	114	119	0	5968	3.8	205053	211021	54.3	0.000	4.6	0	2.8	0
6/ 1/80	5	109	114	0	6136	3.9	208581	214718	55.3	0.000	4.2	0	2.9	0
7/ 1/80	5	120	125	0	6282	4.0	211864	218146	56.1	0.000	4.4	0	2.9	0
8/ 1/80	5	117	123	0	6457	4.2	215581	222033	57.1	0.000	4.2	0	2.9	0
9/ 1/80	4	106	111	0	6614	4.3	219223	225834	58.1	0.000	4.0	0	2.9	0
10/ 1/80	4	102	106	0	6744	4.3	222407	229152	59.0	0.000	4.1	0	2.9	0
11/ 1/80	4	104	108	0	6880	4.4	225565	232445	59.8	0.000	3.6	0	3.0	0
11/20/80	0	0	0	0	6954	4.5	227545	234499	60.3	0.000	0.0	0	3.0	0

PRODUCTION DATA FOR GROUP FARM 8 FROM 6/ 1/77 TO 10/ 1/78 PAGE 1

PORE VOLUME = 293960 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 118384 BBL.

WELL NAMES :	H-90	H-91	H-92	H-93	H-95	H-96	H-99	H-100	H-104
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
WELL NAMES :	H-105	H-108	H-109	H-111	H-112	H-113	H-114	H-070	H-071
WELL FRACTION :	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.75000	0.50000
WELL NAMES :	H-072	H-073	H-074	H-075	H-078	H-079	H-081	H-082	H-083
WELL FRACTION :	0.50000	0.50000	0.50000	0.75000	0.75000	0.50000	0.50000	0.50000	0.50000
WELL NAMES :	H-084								
WELL FRACTION :	0.75000								

AWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
DD/MM/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	9	779	788	0	0	0.0	0	0	0.0	0.000	1.1	0	0.0	0
7/ 1/77	6	650	656	0	272	0.2	22363	22635	8.0	0.000	0.9	0	1.1	0
8/ 1/77	5	547	553	0	452	0.4	43508	43960	14.9	0.000	1.0	0	1.0	0
9/ 1/77	6	645	652	0	616	0.5	60480	61095	20.6	0.000	1.0	0	1.0	0
9/13/77	6	645	652	0	692	0.6	68223	68915	23.3	0.000	1.0	0	1.0	0
10/ 1/77	5	348	352	0	808	0.7	79837	80645	27.2	0.000	1.3	0	1.0	0
11/ 1/77	4	288	292	0	953	0.8	90613	91565	30.9	0.000	1.4	0	1.0	0
12/ 1/77	4	277	282	0	1078	0.9	99262	100340	33.9	0.000	1.6	0	1.1	0
1/ 1/78	5	264	269	0	1216	1.0	107859	109075	36.9	0.000	1.8	0	1.1	0
2/ 1/78	5	272	277	0	1366	1.2	116050	117416	39.7	0.000	1.6	0	1.2	0
2/17/78	5	272	277	0	1439	1.2	120409	121848	41.2	0.000	1.6	0	1.2	0
2/28/78	5	272	277	0	1489	1.3	123405	124894	42.2	0.000	1.6	0	1.2	0
3/ 1/78	4	311	315	0	1497	1.3	123678	125171	42.3	0.000	1.1	0	1.2	0
3/10/78	4	311	315	0	1525	1.3	126476	128001	43.2	0.000	1.1	0	1.2	0
4/ 1/78	3	290	293	0	1604	1.4	133317	134920	45.6	0.000	1.0	0	1.2	0
4/ 9/78	3	290	293	0	1627	1.4	135637	137263	46.4	0.000	1.0	0	1.2	0
4/10/78	3	290	293	0	1629	1.4	135927	137556	46.5	0.000	1.0	0	1.2	0
4/11/78	3	290	293	0	1633	1.4	136217	137849	46.6	0.000	1.0	0	1.2	0
5/ 1/78	4	278	282	0	1690	1.4	142016	143706	48.6	0.000	1.6	0	1.2	0
6/ 1/78	4	257	261	0	1828	1.5	150635	152462	51.5	0.000	1.5	0	1.2	0
7/ 1/78	4	278	282	0	1941	1.6	158356	160297	54.2	0.000	1.4	0	1.2	0
8/ 1/78	5	270	275	0	2067	1.7	168964	169031	57.1	0.000	1.7	0	1.2	0
9/ 1/78	5	284	288	0	2210	1.9	175331	177541	60.0	0.000	1.6	0	1.2	0
10/ 1/78	5	284	288	0	2345	2.0	183848	186194	62.9	0.000	1.6	0	1.3	0

PRODUCTION DATA FOR GROUP FARM 8 FROM 11/ 1/78 TO 11/ 1/80 PAGE 2

PORE VOLUME = 293960 BBL. INITIAL OIL SATURATION = 40.0 %. INTIAL OIL IN PLACE = 118384 BBL.

SEE PAGE 1 FOR WELLS AND THEIR FRACTIONS

AWRY-ERDA PROJECT

DATE	PRODUCTION RATES				CUMULATIVE PRODUCTION						PRODUCTION		CUMULATIVE	
	OIL	WATER	TOTAL FLUID	GAS	OIL		WATER	TOTAL FLUID		GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
DD/MM/YR	B/D	B/D	B/D	MCF/D	BBL	%OIP	BBL	BBL	%PV	MMCF	%	SCF/BBL	%	MCF/BBL
11/ 1/78	6	252	259	0	2488	2.1	192640	195126	65.9	0.000	2.4	0	1.3	0
12/ 1/78	6	247	253	0	2670	2.3	200214	202884	68.6	0.000	2.5	0	1.3	0
1/ 1/79	6	242	247	0	2869	2.4	207862	210730	71.2	0.000	2.4	0	1.4	0
2/ 1/79	6	241	247	0	3051	2.6	215350	218401	73.8	0.000	2.5	0	1.4	0
3/ 1/79	6	235	241	0	3227	2.7	222095	225322	76.1	0.000	2.7	0	1.4	0
4/ 1/79	6	242	248	0	3428	2.9	229379	232805	78.7	0.000	2.3	0	1.5	0
5/ 1/79	7	218	225	0	3596	3.0	236652	240248	81.2	0.000	3.0	0	1.5	0
6/ 1/79	6	231	238	0	3805	3.2	243422	247227	83.5	0.000	2.8	0	1.5	0
7/ 1/79	7	238	245	0	3994	3.4	250365	254359	85.9	0.000	2.7	0	1.6	0
8/ 1/79	7	231	238	0	4200	3.5	257739	261939	88.5	0.000	3.0	0	1.6	0
9/ 1/79	7	237	244	0	4421	3.7	264887	269308	91.0	0.000	2.7	0	1.6	0
10/ 1/79	7	238	245	0	4618	3.9	272006	276624	93.5	0.000	2.7	0	1.7	0
11/ 1/79	6	243	250	0	4822	4.1	279384	284206	96.0	0.000	2.6	0	1.7	0
12/ 1/79	5	232	238	0	5016	4.2	286684	291700	98.6	0.000	2.3	0	1.7	0
1/ 1/80	6	223	229	0	5184	4.4	293908	299092	101.1	0.000	2.8	0	1.7	0
2/ 1/80	6	226	232	0	5387	4.5	300816	306197	103.5	0.000	2.8	0	1.8	0
3/ 1/80	6	249	255	0	5569	4.7	307372	312942	105.7	0.000	2.3	0	1.8	0
4/ 1/80	6	228	234	0	5757	4.9	315095	320848	108.4	0.000	2.5	0	1.8	0
5/ 1/80	7	260	267	0	5928	5.0	321941	327869	110.8	0.000	2.5	0	1.8	0
6/ 1/80	5	244	249	0	6138	5.2	330016	336154	113.6	0.000	2.1	0	1.8	0
7/ 1/80	6	244	250	0	6295	5.3	337325	343621	116.1	0.000	2.5	0	1.8	0
8/ 1/80	6	223	229	0	6487	5.5	344892	351380	118.7	0.000	2.6	0	1.8	0
9/ 1/80	6	235	242	0	6675	5.6	351804	358479	121.1	0.000	2.5	0	1.9	0
10/ 1/80	6	239	245	0	6857	5.8	358893	365751	123.6	0.000	2.3	0	1.9	0
11/ 1/80	6	236	242	0	7037	5.9	366304	373337	126.1	0.000	2.5	0	1.9	0
11/20/80	0	0	0	0	7149	6.0	370794	377943	127.7	0.000	0.0	0	1.9	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: B-90

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL	GAS-OIL	OIL	GAS-OIL
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	CUT %	RATIO SCF/BBL	CUT %	RATIO MCF/BBL
6/ 1/77	0.0	42.3	42.3	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	35.6	35.6	0.0	0	1284	1284	0.000	0.0	0	0.0	0
8/ 1/77	0.0	30.2	30.2	0.0	0	2388	2388	0.000	0.0	0	0.0	0
9/ 1/77	0.1	30.3	30.3	0.0	0	3324	3324	0.000	0.2	0	0.0	0
9/13/77	0.1	30.3	30.3	0.0	1	3687	3688	0.000	0.2	0	0.0	0
10/ 1/77	0.1	17.6	17.7	0.0	2	4231	4233	0.000	0.6	0	0.0	0
11/ 1/77	0.0	13.2	13.2	0.0	5	4777	4782	0.000	0.0	0	0.1	0
12/ 1/77	0.0	14.5	14.5	0.0	5	5174	5179	0.000	0.0	0	0.1	0
1/ 1/78	0.0	15.1	15.1	0.0	5	5623	5628	0.000	0.0	0	0.1	0
2/ 1/78	0.0	15.1	15.1	0.0	5	6092	6097	0.000	0.0	0	0.1	0
2/11/78	0.0	15.1	15.1	0.0	5	6334	6339	0.000	0.0	0	0.1	0
2/28/78	0.0	15.1	15.1	0.0	5	6500	6505	0.000	0.0	0	0.1	0
3/ 1/78	0.0	13.2	13.2	0.0	5	6515	6520	0.000	0.0	0	0.1	0
3/10/78	0.0	13.2	13.2	0.0	5	6634	6639	0.000	0.0	0	0.1	0
4/ 1/78	0.0	12.6	12.6	0.0	5	6925	6930	0.000	0.0	0	0.1	0
4/ 9/78	0.0	12.6	12.6	0.0	5	7026	7031	0.000	0.0	0	0.1	0
4/10/78	0.0	12.6	12.6	0.0	5	7039	7044	0.000	0.0	0	0.1	0
4/11/78	0.0	12.6	12.6	0.0	5	7051	7056	0.000	0.0	0	0.1	0
5/ 1/78	0.0	11.3	11.3	0.0	5	7303	7308	0.000	0.0	0	0.1	0
6/ 1/78	0.0	15.1	15.1	0.0	5	7655	7660	0.000	0.0	0	0.1	0
7/ 1/78	0.2	17.6	17.8	0.0	5	8108	8114	0.000	1.1	0	0.1	0
8/ 1/78	0.0	17.6	17.6	0.0	11	8654	8665	0.000	0.0	0	0.1	0
9/ 1/78	0.0	17.0	17.0	0.0	11	9200	9216	0.000	0.0	0	0.1	0
10/ 1/78	0.3	13.2	13.5	0.0	11	9711	9722	0.000	2.2	0	0.1	0
11/ 1/78	0.1	12.6	12.7	0.0	21	10120	10141	0.000	1.1	0	0.2	0
12/ 1/78	0.2	12.3	12.5	0.0	25	10498	10523	0.000	1.2	0	0.2	0
1/ 1/79	0.2	11.9	12.1	0.0	30	10879	10909	0.000	1.5	0	0.3	0
2/ 1/79	0.0	11.3	11.3	0.0	35	11249	11285	0.000	0.0	0	0.3	0
3/ 1/79	0.1	10.7	10.9	0.0	35	11567	11602	0.000	1.3	0	0.3	0
4/ 1/79	0.1	10.1	10.2	0.0	40	11899	11938	0.000	1.2	0	0.3	0
5/ 1/79	0.2	9.8	10.0	0.0	43	12202	12245	0.000	2.3	0	0.4	0
6/ 1/79	0.1	8.8	9.0	0.0	50	12504	12555	0.000	1.5	0	0.4	0
7/ 1/79	0.0	8.8	8.8	0.0	54	12769	12824	0.000	0.0	0	0.4	0
8/ 1/79	0.0	9.5	9.5	0.0	54	13042	13097	0.000	0.0	0	0.4	0
9/ 1/79	0.2	9.7	9.9	0.0	54	13335	13390	0.000	1.6	0	0.4	0
10/ 1/79	0.2	9.4	9.6	0.0	59	13628	13687	0.000	1.6	0	0.4	0
11/ 1/79	0.2	10.7	10.9	0.0	64	13920	13984	0.000	1.6	0	0.5	0
12/ 1/79	0.2	10.7	10.9	0.0	69	14241	14310	0.000	1.6	0	0.5	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: B-90

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL	GAS-OIL	OIL	GAS-OIL
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	CUT %	RATIO SCF/BBL	CUT %	RATIO MCF/BBL
1/ 1/80	0.4	15.0	15.4	0.0	75	14572	14647	0.000	2.4	0	0.5	0
2/ 1/80	0.2	9.7	9.9	0.0	86	15038	15124	0.000	1.9	0	0.6	0
3/ 1/80	0.2	15.3	15.4	0.0	92	15320	15411	0.000	0.5	0	0.6	0
4/ 1/80	0.2	10.2	10.2	0.0	97	15933	16030	0.000	1.6	0	0.6	0
5/ 1/80	0.3	15.1	15.4	0.0	102	16234	16336	0.000	2.0	0	0.6	0
6/ 1/80	0.1	10.2	10.2	0.0	111	16703	16814	0.000	1.3	0	0.7	0
7/ 1/80	0.2	11.0	11.2	0.0	115	17005	17120	0.000	1.4	0	0.7	0
8/ 1/80	0.2	9.4	9.6	0.0	120	17347	17467	0.000	1.7	0	0.7	0
9/ 1/80	0.2	9.4	9.6	0.0	125	17639	17764	0.000	1.7	0	0.7	0
10/ 1/80	0.1	12.6	12.7	0.0	130	17922	18052	0.000	1.2	0	0.7	0
11/ 1/80	0.1	13.2	13.4	0.0	134	18313	18447	0.000	1.0	0	0.7	0
11/20/80	0.0	0.0	0.0	0.0	137	18564	18701	0.000	0.0	0	0.7	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: B-91

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	44.7	44.7	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	37.1	37.1	0.0	0	1341	1341	0.000	0.0	0	0.0	0
8/ 1/77	0.0	31.5	31.5	0.0	0	2491	2491	0.000	0.0	0	0.0	0
9/ 1/77	0.5	36.0	36.5	0.0	0	3468	3468	0.000	1.3	0	0.0	0
9/15/77	0.5	36.0	36.5	0.0	6	3900	3905	0.000	1.3	0	0.1	0
10/ 1/77	0.6	17.3	17.9	0.0	15	4548	4562	0.000	3.5	0	0.3	0
11/ 1/77	0.0	15.3	15.3	0.0	34	5094	5116	0.000	0.0	0	0.7	0
12/ 1/77	0.0	13.2	13.2	0.0	34	5557	5591	0.000	0.0	0	0.6	0
1/ 1/78	0.0	11.3	11.3	0.0	34	5967	6001	0.000	0.0	0	0.6	0
2/ 1/78	0.0	14.5	14.5	0.0	34	6319	6353	0.000	0.0	0	0.5	0
2/17/78	0.0	14.5	14.5	0.0	34	6550	6584	0.000	0.0	0	0.5	0
2/28/78	0.0	14.5	14.5	0.0	34	6710	6744	0.000	0.0	0	0.5	0
3/ 1/78	0.0	13.5	13.5	0.0	34	6724	6758	0.000	0.0	0	0.5	0
3/10/78	0.0	13.5	13.5	0.0	34	6846	6880	0.000	0.0	0	0.5	0
4/ 1/78	0.0	12.6	12.6	0.0	34	7143	7177	0.000	0.0	0	0.5	0
4/ 9/78	0.0	12.6	12.6	0.0	34	7244	7278	0.000	0.0	0	0.5	0
4/10/78	0.0	12.6	12.6	0.0	34	7256	7290	0.000	0.0	0	0.5	0
4/11/78	0.0	12.6	12.6	0.0	34	7269	7303	0.000	0.0	0	0.5	0
5/ 1/78	0.0	10.7	10.7	0.0	34	7521	7555	0.000	0.0	0	0.5	0
6/ 1/78	0.0	12.0	12.0	0.0	34	7853	7887	0.000	0.0	0	0.4	0
7/ 1/78	0.0	12.6	12.6	0.0	34	8212	8256	0.000	0.0	0	0.4	0
8/ 1/78	0.0	11.7	11.7	0.0	34	8602	8637	0.000	0.0	0	0.4	0
9/ 1/78	0.3	11.2	11.5	0.0	34	8964	8998	0.000	2.2	0	0.4	0
10/ 1/78	0.0	14.5	14.5	0.0	42	9300	9342	0.000	0.0	0	0.4	0
11/ 1/78	0.0	9.5	9.5	0.0	42	9750	9794	0.000	0.0	0	0.4	0
12/ 1/78	0.0	8.5	8.5	0.0	42	10033	10075	0.000	0.0	0	0.4	0
1/ 1/79	0.0	8.2	8.2	0.0	42	10297	10338	0.000	0.0	0	0.4	0
2/ 1/79	0.4	11.9	12.3	0.0	42	10551	10592	0.000	3.0	0	0.4	0
3/ 1/79	0.1	8.8	8.9	0.0	52	10884	10935	0.000	1.6	0	0.5	0
4/ 1/79	0.0	7.8	7.8	0.0	56	11157	11213	0.000	0.0	0	0.5	0
5/ 1/79	0.0	7.6	7.6	0.0	56	11384	11440	0.000	0.0	0	0.5	0
6/ 1/79	0.0	8.8	8.8	0.0	56	11619	11674	0.000	0.0	0	0.5	0
7/ 1/79	0.0	8.8	8.8	0.0	56	11893	11937	0.000	0.0	0	0.5	0
8/ 1/79	0.2	9.4	9.6	0.0	56	12156	12212	0.000	1.6	0	0.5	0
9/ 1/79	0.2	11.3	11.5	0.0	61	12449	12510	0.000	1.4	0	0.5	0
10/ 1/79	0.2	11.3	11.6	0.0	66	12788	12854	0.000	2.1	0	0.5	0
11/ 1/79	0.4	11.3	11.6	0.0	73	13139	13212	0.000	3.0	0	0.6	0
12/ 1/79	0.2	11.3	11.5	0.0	84	13478	13562	0.000	1.5	0	0.6	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: B-91

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.2	12.6	12.7	0.0	89	13828	13916	0.000	1.4	0	0.6	0
2/ 1/80	0.2	11.3	11.5	0.0	95	14218	14312	0.000	1.6	0	0.7	0
3/ 1/80	0.3	10.6	10.9	0.0	100	14545	14645	0.000	2.6	0	0.7	0
4/ 1/80	0.2	10.7	10.9	0.0	109	14875	14984	0.000	1.5	0	0.7	0
5/ 1/80	0.4	10.1	10.1	0.0	114	15146	15307	0.000	0.0	0	0.7	0
6/ 1/80	0.1	9.5	9.6	0.0	114	15508	15622	0.000	1.3	0	0.7	0
7/ 1/80	0.1	12.0	12.0	0.0	119	15792	15910	0.000	0.6	0	0.7	0
8/ 1/80	0.2	9.4	9.6	0.0	120	16163	16283	0.000	1.7	0	0.7	0
9/ 1/80	0.0	15.2	15.2	0.0	125	16455	16580	0.000	0.0	0	0.8	0
10/ 1/80	0.1	8.8	9.0	0.0	125	16912	17037	0.000	1.6	0	0.7	0
11/ 1/80	0.1	8.8	9.0	0.0	129	17185	17314	0.000	1.5	0	0.7	0
11/20/80	0.0	0.0	0.0	0.0	132	17353	17485	0.000	0.0	0	0.8	0

TABLE 33

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-42

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	41.0	41.0	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	34.1	34.1	0.0	0	1230	1230	0.000	0.0	0	0.0	0
8/ 1/77	0.0	28.9	28.9	0.0	0	2287	2287	0.000	0.0	0	0.0	0
9/ 1/77	0.2	29.6	29.8	0.0	0	3194	3194	0.000	0.6	0	0.0	0
9/15/77	0.2	29.6	29.8	0.0	2	3539	3541	0.000	0.6	0	0.1	0
10/ 1/77	0.0	15.8	15.8	0.0	5	4073	4078	0.000	0.0	0	0.1	0
11/ 1/77	0.0	13.2	13.2	0.0	5	4562	4567	0.000	0.0	0	0.1	0
12/ 1/77	0.1	14.5	14.6	0.0	5	4959	4964	0.000	0.8	0	0.1	0
1/ 1/78	0.0	13.2	13.2	0.0	9	5409	5418	0.000	0.0	0	0.2	0
2/ 1/78	0.0	13.9	13.9	0.0	9	5819	5828	0.000	0.0	0	0.2	0
2/28/78	0.0	13.9	13.9	0.0	9	6041	6050	0.000	0.0	0	0.1	0
3/ 1/78	0.0	13.9	13.9	0.0	9	6193	6202	0.000	0.0	0	0.1	0
3/ 1/78	0.0	12.3	12.3	0.0	9	6207	6216	0.000	0.0	0	0.1	0
3/10/78	0.0	12.3	12.3	0.0	9	6318	6327	0.000	0.0	0	0.1	0
4/ 1/78	0.0	18.9	18.9	0.0	9	6588	6597	0.000	0.0	0	0.1	0
4/ 9/78	0.0	18.9	18.9	0.0	9	6740	6749	0.000	0.0	0	0.1	0
4/10/78	0.0	18.9	18.9	0.0	9	6758	6767	0.000	0.0	0	0.1	0
4/11/78	0.0	18.9	18.9	0.0	9	6777	6786	0.000	0.0	0	0.1	0
5/ 1/78	0.0	12.0	12.0	0.0	9	7155	7164	0.000	0.0	0	0.1	0
6/ 1/78	0.0	12.1	12.1	0.0	9	7526	7535	0.000	0.0	0	0.1	0
7/ 1/78	0.0	17.6	17.6	0.0	9	7889	7898	0.000	0.0	0	0.1	0
8/ 1/78	0.0	17.6	17.6	0.0	9	8435	8444	0.000	0.0	0	0.1	0
9/ 1/78	0.5	17.4	17.9	0.0	9	8982	8991	0.000	2.9	0	0.1	0
10/ 1/78	0.0	15.1	15.1	0.0	25	9504	9529	0.000	0.0	0	0.3	0
11/ 1/78	0.1	17.0	17.1	0.0	25	9973	9998	0.000	0.8	0	0.2	0
12/ 1/78	0.3	14.2	14.5	0.0	29	10483	10512	0.000	2.2	0	0.3	0
1/ 1/79	0.0	13.9	13.9	0.0	39	10922	10961	0.000	0.0	0	0.4	0
2/ 1/79	0.0	12.6	12.6	0.0	39	11352	11391	0.000	0.0	0	0.3	0
3/ 1/79	0.3	13.9	14.2	0.0	39	11704	11743	0.000	2.1	0	0.3	0
4/ 1/79	0.3	12.9	13.1	0.0	48	12134	12182	0.000	2.0	0	0.4	0
5/ 1/79	0.2	12.0	12.2	0.0	56	12521	12576	0.000	1.9	0	0.4	0
6/ 1/79	0.1	10.7	10.9	0.0	63	12891	12954	0.000	1.2	0	0.5	0
7/ 1/79	0.1	10.7	10.9	0.0	67	13213	13280	0.000	1.4	0	0.5	0
8/ 1/79	0.2	11.3	11.5	0.0	72	13545	13617	0.000	1.3	0	0.5	0
9/ 1/79	0.2	9.7	9.9	0.0	77	13896	13972	0.000	1.6	0	0.5	0
10/ 1/79	0.2	10.2	10.2	0.0	81	14168	14270	0.000	1.5	0	0.6	0
11/ 1/79	0.2	12.6	12.7	0.0	86	14500	14587	0.000	1.3	0	0.6	0
12/ 1/79	0.3	12.0	12.3	0.0	91	14878	14969	0.000	2.7	0	0.6	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-42

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.6	15.0	15.6	0.0	101	15247	15349	0.000	3.6	0	0.7	0
2/ 1/80	0.2	8.8	9.0	0.0	119	15712	15831	0.000	2.1	0	0.8	0
3/ 1/80	0.2	12.6	12.7	0.0	125	15956	16091	0.000	1.4	0	0.8	0
4/ 1/80	0.2	9.4	9.6	0.0	130	16356	16486	0.000	1.7	0	0.8	0
5/ 1/80	0.3	15.1	15.4	0.0	135	16639	16774	0.000	2.0	0	0.8	0
6/ 1/80	0.1	15.1	15.3	0.0	144	17107	17251	0.000	0.8	0	0.8	0
7/ 1/80	0.1	13.0	13.1	0.0	148	17561	17709	0.000	0.6	0	0.8	0
8/ 1/80	0.2	13.2	13.4	0.0	151	17994	18115	0.000	1.2	0	0.8	0
9/ 1/80	0.2	13.2	13.4	0.0	155	18374	18527	0.000	1.2	0	0.8	0
10/ 1/80	0.1	15.1	15.2	0.0	160	18770	18931	0.000	0.5	0	0.8	0
11/ 1/80	0.1	12.6	12.7	0.0	163	19239	19401	0.000	1.0	0	0.8	0
11/20/80	0.0	0.0	0.0	0.0	165	19478	19643	0.000	0.0	0	0.8	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-93

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	24.1	24.1	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	20.0	20.0	0.0	0	723	723	0.000	0.0	0	0.0	0
8/ 1/77	0.0	17.0	17.0	0.0	0	1343	1343	0.000	0.0	0	0.0	0
9/ 1/77	0.2	17.0	17.2	0.0	0	1870	1870	0.000	1.0	0	0.0	0
9/13/77	0.2	17.0	17.2	0.0	2	2075	2077	0.000	1.0	0	0.1	0
10/ 1/77	0.0	25.0	25.0	0.0	5	2382	2387	0.000	0.0	0	0.2	0
11/ 1/77	0.0	8.2	8.2	0.0	5	3182	3186	0.000	0.0	0	0.2	0
12/ 1/77	0.0	8.2	8.2	0.0	5	3428	3433	0.000	0.0	0	0.2	0
1/ 1/78	0.0	7.6	7.6	0.0	5	3682	3687	0.000	0.0	0	0.1	0
2/ 1/78	1.5	7.0	8.4	0.0	5	3916	3922	0.000	17.3	0	0.1	0
2/17/78	1.5	7.0	8.4	0.0	29	4028	4056	0.000	17.3	0	0.7	0
2/28/78	1.5	7.0	8.4	0.0	45	4105	4149	0.000	17.3	0	1.1	0
3/ 1/78	0.0	6.0	6.0	0.0	46	4112	4158	0.000	0.0	0	1.1	0
3/10/78	0.0	6.0	6.0	0.0	48	4166	4212	0.000	0.0	0	1.1	0
4/ 1/78	0.0	5.0	5.0	0.0	48	4298	4344	0.000	0.0	0	1.1	0
4/ 9/78	0.0	5.0	5.0	0.0	48	4338	4384	0.000	0.0	0	1.1	0
4/10/78	0.0	5.0	5.0	0.0	48	4343	4389	0.000	0.0	0	1.1	0
4/11/78	0.0	5.0	5.0	0.0	48	4348	4394	0.000	0.0	0	1.0	0
5/ 1/78	0.0	5.0	5.0	0.0	48	4449	4495	0.000	0.0	0	1.0	0
6/ 1/78	0.0	8.0	8.0	0.0	48	4605	4651	0.000	0.0	0	1.0	0
7/ 1/78	0.0	7.0	7.0	0.0	48	4870	4916	0.000	0.0	0	0.9	0
8/ 1/78	0.0	4.7	4.7	0.0	48	5104	5150	0.000	0.0	0	0.9	0
9/ 1/78	0.0	5.0	5.0	0.0	48	5250	5296	0.000	0.0	0	0.9	0
10/ 1/78	0.0	6.9	6.9	0.0	48	5401	5446	0.000	0.0	0	0.8	0
11/ 1/78	0.0	5.7	5.7	0.0	48	5616	5662	0.000	0.0	0	0.8	0
12/ 1/78	0.0	7.0	7.0	0.0	48	5786	5832	0.000	0.0	0	0.8	0
1/ 1/79	0.0	6.9	6.9	0.0	48	6021	6067	0.000	0.0	0	0.8	0
2/ 1/79	0.4	8.1	8.5	0.0	48	6236	6282	0.000	4.3	0	0.7	0
3/ 1/79	0.1	6.3	6.4	0.0	58	6463	6519	0.000	2.2	0	0.9	0
4/ 1/79	0.0	3.8	3.8	0.0	61	6658	6719	0.000	0.0	0	0.9	0
5/ 1/79	0.1	3.8	3.9	0.0	61	6771	6832	0.000	3.7	0	0.9	0
6/ 1/79	0.0	6.9	6.9	0.0	65	6888	6954	0.000	0.0	0	0.9	0
7/ 1/79	0.0	5.7	5.7	0.0	65	7096	7162	0.000	0.0	0	0.9	0
8/ 1/79	0.0	5.0	5.0	0.0	65	7272	7337	0.000	0.0	0	0.9	0
9/ 1/79	0.0	5.7	5.7	0.0	65	7428	7494	0.000	0.0	0	0.9	0
10/ 1/79	0.0	5.0	5.0	0.0	65	7598	7664	0.000	0.0	0	0.9	0
11/ 1/79	0.4	6.2	6.6	0.0	65	7755	7820	0.000	5.3	0	0.8	0
12/ 1/79	0.3	6.3	6.6	0.0	76	7942	8018	0.000	5.1	0	0.9	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-93

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	5.0	5.3	0.0	86	8136	8222	0.000	7.0	0	1.0	0
2/ 1/80	0.2	4.4	4.5	0.0	98	8289	8387	0.000	4.1	0	1.2	0
3/ 1/80	0.2	4.2	4.3	0.0	103	8416	8519	0.000	4.2	0	1.2	0
4/ 1/80	0.2	3.8	3.9	0.0	109	8542	8651	0.000	4.1	0	1.3	0
5/ 1/80	0.1	5.0	5.2	0.0	113	8655	8768	0.000	2.6	0	1.3	0
6/ 1/80	0.0	4.4	4.4	0.0	118	8811	8929	0.000	0.0	0	1.3	0
7/ 1/80	0.1	5.0	5.1	0.0	118	8943	9061	0.000	1.5	0	1.3	0
8/ 1/80	0.2	5.0	5.3	0.0	120	9099	9219	0.000	3.1	0	1.3	0
9/ 1/80	0.2	7.5	7.7	0.0	125	9255	9380	0.000	2.1	0	1.3	0
10/ 1/80	0.1	5.6	5.7	0.0	130	9431	9561	0.000	1.3	0	1.4	0
11/ 1/80	0.1	3.6	3.7	0.0	132	9654	9786	0.000	3.3	0	1.4	0
11/20/80	0.0	0.0	0.0	0.0	135	9726	9861	0.000	0.0	0	1.4	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-94

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	1.0	52.3	53.3	0.0	0	0	0	0.000	1.9	0	0.0	0
7/ 1/77	0.7	43.7	44.4	0.0	31	1569	1600	0.000	1.5	0	1.9	0
8/ 1/77	0.6	37.1	37.7	0.0	51	2924	2975	0.000	1.6	0	1.7	0
9/ 1/77	0.1	10.5	10.6	0.0	70	4076	4146	0.000	0.6	0	1.7	0
9/13/77	0.1	10.5	10.6	0.0	71	4202	4272	0.000	0.6	0	1.7	0
10/ 1/77	1.1	15.8	16.9	0.0	72	4391	4462	0.000	6.5	0	1.6	0
11/ 1/77	0.1	13.9	14.0	0.0	106	4880	4986	0.000	1.0	0	2.1	0
12/ 1/77	0.1	12.0	12.1	0.0	110	5296	5406	0.000	1.1	0	2.0	0
1/ 1/78	0.0	10.1	10.1	0.0	114	5668	5782	0.000	0.0	0	2.0	0
2/ 1/78	0.2	22.6	22.8	0.0	114	5980	6095	0.000	1.0	0	1.9	0
2/1 /78	0.2	22.6	22.8	0.0	118	6342	6460	0.000	1.0	0	1.8	0
2/28/78	0.2	22.6	22.8	0.0	121	6590	6711	0.000	1.0	0	1.8	0
3/ 1/78	0.2	12.6	12.7	0.0	121	6613	6734	0.000	1.5	0	1.8	0
3/10/78	0.2	12.6	12.7	0.0	123	6726	6848	0.000	1.5	0	1.8	0
4/ 1/78	0.2	9.4	9.6	0.0	127	7002	7126	0.000	2.0	0	1.8	0
4/ 5/78	0.2	9.4	9.6	0.0	128	7077	7205	0.000	2.0	0	1.8	0
4/10/78	0.2	9.4	9.6	0.0	128	7086	7215	0.000	2.0	0	1.8	0
4/14/78	0.2	9.4	9.6	0.0	129	7096	7224	0.000	2.0	0	1.8	0
5/ 1/78	0.1	10.4	10.5	0.0	132	7284	7416	0.000	0.9	0	1.8	0
6/ 1/78	0.2	11.3	11.5	0.0	135	7605	7741	0.000	1.4	0	1.7	0
7/ 1/78	0.0	10.7	10.7	0.0	140	7945	8085	0.000	0.0	0	1.7	0
8/ 1/78	0.0	10.7	10.7	0.0	140	8277	8417	0.000	0.0	0	1.7	0
9/ 1/78	0.0	12.0	12.0	0.0	140	8609	8749	0.000	0.0	0	1.6	0
10/ 1/78	0.4	13.2	13.7	0.0	140	8968	9108	0.000	3.3	0	1.5	0
11/ 1/78	0.3	8.8	9.1	0.0	154	9378	9532	0.000	3.3	0	1.6	0
12/ 1/78	0.0	10.1	10.1	0.0	163	9642	9805	0.000	0.0	0	1.7	0
1/ 1/79	0.0	9.5	9.5	0.0	163	9954	10117	0.000	0.0	0	1.6	0
2/ 1/79	0.2	8.8	9.0	0.0	163	10247	10410	0.000	2.0	0	1.6	0
3/ 1/79	0.3	8.8	9.1	0.0	168	10493	10661	0.000	3.2	0	1.6	0
4/ 1/79	0.5	14.5	15.1	0.0	177	10767	10944	0.000	3.5	0	1.6	0
5/ 1/79	0.3	5.2	5.5	0.0	193	11203	11396	0.000	3.5	0	1.7	0
6/ 1/79	0.3	7.6	7.9	0.0	202	11456	11659	0.000	3.6	0	1.7	0
7/ 1/79	0.2	7.6	7.8	0.0	211	11684	11894	0.000	2.7	0	1.8	0
8/ 1/79	0.3	7.6	7.9	0.0	217	11918	12135	0.000	4.1	0	1.8	0
9/ 1/79	0.2	8.2	8.3	0.0	227	12151	12378	0.000	1.9	0	1.8	0
10/ 1/79	0.6	8.2	8.8	0.0	232	12397	12628	0.000	7.2	0	1.8	0
11/ 1/79	0.7	15.6	16.3	0.0	251	12649	12900	0.000	4.3	0	1.9	0
12/ 1/79	0.7	10.0	10.7	0.0	272	13117	13389	0.000	7.0	0	2.0	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 12/ 1/80 PAGE 2

WELL: H-94

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.6	11.4	12.0	0.0	296	13426	13722	0.000	4.6	0	2.2	0
2/ 1/80	0.4	10.0	10.4	0.0	313	13780	14093	0.000	3.8	0	2.2	0
3/ 1/80	0.4	11.3	11.6	0.0	324	14070	14394	0.000	3.2	0	2.3	0
4/ 1/80	0.7	7.5	8.1	0.0	338	14419	14754	0.000	8.3	0	2.3	0
5/ 1/80	0.5	9.1	9.6	0.0	358	14643	14998	0.000	5.4	0	2.4	0
6/ 1/80	0.3	1.6	1.9	0.0	372	14925	15297	0.000	14.2	0	2.4	0
7/ 1/80	0.3	10.1	10.4	0.0	380	14974	15354	0.000	3.0	0	2.5	0
8/ 1/80	0.3	5.1	5.5	0.0	390	15285	15675	0.000	3.9	0	2.5	0
9/ 1/80	0.2	6.9	7.1	0.0	400	15538	15938	0.000	2.3	0	2.5	0
10/ 1/80	0.1	8.2	8.3	0.0	405	15745	16150	0.000	1.8	0	2.5	0
11/ 1/80	0.1	7.6	7.7	0.0	409	15989	16408	0.000	1.7	0	2.5	0
11/30/80	0.0	0.0	0.0	0.0	412	16143	16555	0.000	0.0	0	2.5	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-96

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.1	47.3	47.4	0.0	0	0	0	0.000	0.3	0	0.0	0
7/ 1/77	0.1	39.4	39.5	0.0	4	1419	1423	0.000	0.2	0	0.3	0
8/ 1/77	0.1	33.4	33.5	0.0	6	2640	2646	0.000	0.2	0	0.2	0
9/ 1/77	0.1	33.4	33.5	0.0	8	3675	3684	0.000	0.3	0	0.2	0
9/13/77	0.1	33.4	33.5	0.0	10	4076	4086	0.000	0.3	0	0.2	0
10/ 1/77	0.6	15.0	15.6	0.0	12	4677	4689	0.000	3.5	0	0.3	0
11/ 1/77	0.0	12.6	12.6	0.0	29	5142	5172	0.000	0.0	0	0.6	0
12/ 1/77	0.0	13.2	13.2	0.0	29	5520	5550	0.000	0.0	0	0.5	0
1/ 1/78	0.2	11.3	11.5	0.0	29	5931	5960	0.000	1.7	0	0.5	0
2/ 1/78	0.2	12.5	12.7	0.0	36	6280	6316	0.000	1.6	0	0.6	0
2/11/78	0.2	12.5	12.7	0.0	40	6430	6519	0.000	1.6	0	0.6	0
2/28/78	0.2	12.5	12.7	0.0	42	6617	6660	0.000	1.6	0	0.6	0
3/ 1/78	0.0	11.7	11.7	0.0	42	6630	6672	0.000	0.0	0	0.6	0
3/10/78	0.0	11.7	11.7	0.0	42	6735	6777	0.000	0.0	0	0.6	0
4/ 1/78	0.0	12.6	12.6	0.0	42	6991	7033	0.000	0.0	0	0.6	0
4/ 9/78	0.0	12.6	12.6	0.0	42	7092	7134	0.000	0.0	0	0.6	0
4/10/78	0.0	12.6	12.6	0.0	42	7105	7147	0.000	0.0	0	0.6	0
4/11/78	0.0	12.6	12.6	0.0	42	7117	7159	0.000	0.0	0	0.6	0
5/ 1/78	0.0	10.7	10.7	0.0	42	7369	7411	0.000	0.0	0	0.6	0
6/ 1/78	0.0	7.0	7.0	0.0	42	7701	7743	0.000	0.0	0	0.5	0
7/ 1/78	0.0	10.1	10.1	0.0	42	7911	7953	0.000	0.0	0	0.5	0
8/ 1/78	0.0	10.3	10.3	0.0	42	8224	8266	0.000	0.0	0	0.5	0
9/ 1/78	0.0	13.8	13.8	0.0	42	8543	8585	0.000	0.0	0	0.5	0
10/ 1/78	0.0	12.6	12.6	0.0	42	8958	9000	0.000	0.0	0	0.5	0
11/ 1/78	0.6	11.3	11.9	0.0	42	9348	9390	0.000	5.0	0	0.5	0
12/ 1/78	0.3	13.6	14.2	0.0	60	9638	9746	0.000	2.3	0	0.6	0
1/ 1/79	0.6	10.9	11.5	0.0	70	10116	10187	0.000	4.9	0	0.7	0
2/ 1/79	0.4	10.6	11.0	0.0	88	10455	10542	0.000	3.3	0	0.8	0
3/ 1/79	0.3	9.4	9.7	0.0	98	10752	10850	0.000	3.0	0	0.9	0
4/ 1/79	0.3	12.6	12.9	0.0	107	11045	11152	0.000	2.1	0	1.0	0
5/ 1/79	0.3	11.0	11.3	0.0	115	11424	11539	0.000	2.7	0	1.0	0
6/ 1/79	0.3	10.7	11.0	0.0	124	11766	11890	0.000	2.5	0	1.0	0
7/ 1/79	0.6	8.8	9.4	0.0	133	12087	12220	0.000	6.1	0	1.1	0
8/ 1/79	0.6	8.8	9.4	0.0	150	12361	12511	0.000	6.6	0	1.2	0
9/ 1/79	0.3	8.2	8.5	0.0	170	12632	12805	0.000	3.9	0	1.3	0
10/ 1/79	0.3	10.4	10.7	0.0	180	12877	13057	0.000	3.0	0	1.4	0
11/ 1/79	0.4	7.5	7.9	0.0	190	13198	13388	0.000	4.5	0	1.4	0
12/ 1/79	0.3	9.4	9.7	0.0	201	13423	13624	0.000	3.4	0	1.5	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-96

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	6.8	7.2	0.0	221	13715	13926	0.000	5.2	0	1.5	0
2/ 1/80	0.4	7.5	7.9	0.0	222	13927	14150	0.000	5.0	0	1.6	0
3/ 1/80	0.4	7.2	7.5	0.0	234	14144	14377	0.000	4.9	0	1.6	0
4/ 1/80	0.2	6.9	7.1	0.0	245	14366	14611	0.000	2.3	0	1.7	0
5/ 1/80	0.1	7.6	7.7	0.0	250	14573	14825	0.000	1.9	0	1.7	0
6/ 1/80	0.0	7.6	7.6	0.0	255	14807	15062	0.000	0.0	0	1.7	0
7/ 1/80	0.2	6.6	6.8	0.0	255	15034	15288	0.000	2.3	0	1.7	0
8/ 1/80	0.2	5.7	5.9	0.0	259	15239	15498	0.000	2.7	0	1.7	0
9/ 1/80	0.2	6.9	7.1	0.0	264	15414	15678	0.000	2.3	0	1.7	0
10/ 1/80	0.1	6.9	7.1	0.0	269	15621	15890	0.000	2.1	0	1.7	0
11/ 1/80	0.1	6.5	6.4	0.0	274	15836	16109	0.000	2.0	0	1.7	0
11/20/80	0.0	0.0	0.0	0.0	276	15956	16232	0.000	0.0	0	1.7	0

TABLE 37

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-35

LARRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.5	51.6	52.1	0.0	0	0	0	0.000	1.0	0	0.0	0
7/ 1/77	0.3	43.1	43.4	0.0	15	1543	1563	0.000	0.8	0	1.0	0
8/ 1/77	0.3	36.5	36.8	0.0	26	2883	2906	0.000	0.6	0	0.9	0
9/ 1/77	0.2	37.8	38.1	0.0	35	4015	4050	0.000	0.6	0	0.9	0
9/15/77	0.2	37.8	38.1	0.0	38	4469	4507	0.000	0.6	0	0.8	0
10/ 1/77	0.0	15.1	15.1	0.0	42	5151	5193	0.000	0.0	0	0.8	0
11/ 1/77	0.0	13.9	13.9	0.0	42	5619	5662	0.000	0.0	0	0.7	0
12/ 1/77	0.1	15.2	15.3	0.0	42	6035	6077	0.000	0.8	0	0.7	0
1/ 1/78	0.9	12.9	13.8	0.0	46	6504	6550	0.000	6.4	0	0.7	0
2/ 1/78	0.0	13.6	13.6	0.0	74	6905	6979	0.000	0.0	0	1.1	0
2/1/78	0.0	13.6	13.6	0.0	74	7122	7195	0.000	0.0	0	1.0	0
2/28/78	0.0	13.6	13.6	0.0	74	7271	7344	0.000	0.0	0	1.0	0
3/ 1/78	0.4	12.5	12.9	0.0	74	7284	7358	0.000	3.0	0	1.0	0
3/10/78	0.4	12.5	12.9	0.0	77	7397	7474	0.000	3.0	0	1.0	0
4/ 1/78	0.0	16.4	16.4	0.0	86	7672	7758	0.000	0.0	0	1.1	0
4/ 9/78	0.0	16.4	16.4	0.0	86	7803	7889	0.000	0.0	0	1.1	0
4/10/78	0.0	16.4	16.4	0.0	86	7819	7905	0.000	0.0	0	1.1	0
4/11/78	0.0	16.4	16.4	0.0	86	7836	7921	0.000	0.0	0	1.1	0
5/ 1/78	0.0	12.0	12.0	0.0	86	8163	8249	0.000	0.0	0	1.0	0
6/ 1/78	0.0	13.9	13.9	0.0	86	8534	8620	0.000	0.0	0	1.0	0
7/ 1/78	0.0	12.6	12.6	0.0	86	8950	9036	0.000	0.0	0	0.9	0
8/ 1/78	0.0	10.7	10.7	0.0	86	9341	9426	0.000	0.0	0	0.9	0
9/ 1/78	0.3	11.9	12.1	0.0	86	9673	9758	0.000	2.2	0	0.9	0
10/ 1/78	0.1	13.9	14.0	0.0	93	10028	10122	0.000	1.0	0	0.9	0
11/ 1/78	0.0	11.4	11.4	0.0	98	10458	10556	0.000	0.0	0	0.9	0
12/ 1/78	0.3	15.2	15.5	0.0	98	10799	10897	0.000	2.1	0	0.9	0
1/ 1/79	0.2	10.7	10.9	0.0	108	11270	11377	0.000	1.6	0	0.9	0
2/ 1/79	0.2	10.7	10.9	0.0	113	11600	11714	0.000	1.6	0	1.0	0
3/ 1/79	0.3	15.2	15.4	0.0	118	11899	12017	0.000	1.9	0	1.0	0
4/ 1/79	0.1	11.4	11.5	0.0	127	12368	12495	0.000	1.1	0	1.0	0
5/ 1/79	0.1	10.2	10.2	0.0	131	12708	12840	0.000	1.4	0	1.0	0
6/ 1/79	0.1	8.8	9.0	0.0	136	13021	13156	0.000	1.5	0	1.0	0
7/ 1/79	0.0	8.8	8.8	0.0	140	13236	13425	0.000	0.0	0	1.0	0
8/ 1/79	0.2	9.4	9.6	0.0	140	13559	13699	0.000	1.6	0	1.0	0
9/ 1/79	0.2	9.2	9.3	0.0	144	13852	13996	0.000	1.7	0	1.0	0
10/ 1/79	0.2	9.4	9.6	0.0	149	14125	14274	0.000	1.6	0	1.0	0
11/ 1/79	0.0	10.7	10.7	0.0	154	14418	14572	0.000	0.0	0	1.1	0
12/ 1/79	0.0	8.8	8.8	0.0	154	14739	14893	0.000	0.0	0	1.0	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-35

LARRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.2	8.8	9.0	0.0	154	15012	15166	0.000	2.0	0	1.0	0
2/ 1/80	0.2	9.2	9.3	0.0	160	15284	15444	0.000	2.0	0	1.0	0
3/ 1/80	0.2	16.3	16.5	0.0	165	15548	15713	0.000	1.1	0	1.1	0
4/ 1/80	0.2	10.2	10.2	0.0	171	16055	16225	0.000	1.6	0	1.1	0
5/ 1/80	0.1	10.2	10.2	0.0	175	16356	16532	0.000	1.4	0	1.1	0
6/ 1/80	0.1	10.2	10.2	0.0	180	16669	16849	0.000	1.3	0	1.1	0
7/ 1/80	0.2	9.8	9.9	0.0	184	16972	17155	0.000	1.5	0	1.1	0
8/ 1/80	0.2	10.2	10.2	0.0	189	17274	17463	0.000	1.6	0	1.1	0
9/ 1/80	0.2	10.4	10.4	0.0	193	17586	17780	0.000	1.5	0	1.1	0
10/ 1/80	0.2	12.6	12.8	0.0	198	17907	18105	0.000	1.2	0	1.1	0
11/ 1/80	0.2	9.7	9.9	0.0	203	18297	18500	0.000	2.1	0	1.1	0
11/20/80	0.0	0.0	0.0	0.0	207	18482	18689	0.000	0.0	0	1.1	0

TABLE 38

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: F-97

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.4	58.0	58.4	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.2	48.3	48.5	0.0	11	1740	1751	0.000	0.5	0	0.6	0
8/ 1/77	0.2	40.9	41.2	0.0	19	3236	3255	0.000	0.5	0	0.6	0
9/ 1/77	0.7	66.3	67.0	0.0	25	4505	4531	0.000	1.1	0	0.6	0
9/13/77	0.7	65.3	67.0	0.0	34	5301	5335	0.000	1.1	0	0.6	0
10/ 1/77	0.1	16.4	16.5	0.0	47	6494	6541	0.000	0.7	0	0.7	0
11/ 1/77	0.3	13.9	14.2	0.0	51	7003	7053	0.000	2.1	0	0.7	0
12/ 1/77	0.2	14.5	14.8	0.0	60	7419	7476	0.000	1.7	0	0.8	0
1/ 1/78	0.4	15.0	15.4	0.0	67	7869	7936	0.000	2.9	0	0.8	0
2/ 1/78	1.0	16.6	17.6	0.0	81	8333	8414	0.000	5.5	0	1.0	0
2/15/78	1.0	16.6	17.6	0.0	97	8599	8695	0.000	5.5	0	1.1	0
2/28/78	1.0	16.6	17.6	0.0	107	8781	8869	0.000	5.5	0	1.2	0
3/ 1/78	0.4	18.8	19.2	0.0	108	8778	8906	0.000	2.0	0	1.2	0
3/10/78	0.4	18.8	19.2	0.0	112	8967	9079	0.000	2.0	0	1.2	0
4/ 1/78	0.4	16.9	17.3	0.0	120	9381	9501	0.000	2.3	0	1.3	0
4/ 9/78	0.4	16.9	17.3	0.0	123	9516	9639	0.000	2.3	0	1.3	0
4/10/78	0.4	16.9	17.3	0.0	124	9533	9657	0.000	2.3	0	1.3	0
4/11/78	0.4	16.9	17.3	0.0	124	9550	9674	0.000	2.3	0	1.3	0
5/ 1/78	0.9	19.0	20.0	0.0	132	9888	10020	0.000	4.7	0	1.3	0
6/ 1/78	0.7	22.6	23.3	0.0	162	10477	10638	0.000	2.9	0	1.5	0
7/ 1/78	1.2	18.0	19.3	0.0	182	11154	11336	0.000	6.0	0	1.6	0
8/ 1/78	0.7	27.0	27.7	0.0	219	11730	11949	0.000	2.6	0	1.8	0
9/ 1/78	1.0	14.7	15.7	0.0	241	12566	12807	0.000	6.7	0	1.9	0
10/ 1/78	0.9	15.4	16.3	0.0	272	13006	13278	0.000	5.6	0	2.0	0
11/ 1/78	1.0	12.6	13.6	0.0	300	13483	13783	0.000	7.7	0	2.2	0
12/ 1/78	1.0	7.5	8.5	0.0	332	13860	14192	0.000	11.3	0	2.3	0
1/ 1/79	1.1	16.8	17.9	0.0	362	14093	14455	0.000	6.2	0	2.5	0
2/ 1/79	0.9	13.7	14.6	0.0	398	14614	15009	0.000	6.2	0	2.6	0
3/ 1/79	1.0	11.6	12.7	0.0	421	14996	15418	0.000	8.1	0	2.7	0
4/ 1/79	0.6	10.8	11.6	0.0	453	15358	15811	0.000	6.8	0	2.9	0
5/ 1/79	0.9	10.7	11.6	0.0	477	15681	16158	0.000	7.6	0	3.0	0
6/ 1/79	1.0	10.1	11.1	0.0	505	16012	16517	0.000	8.8	0	3.1	0
7/ 1/79	0.8	15.4	16.2	0.0	534	16316	16850	0.000	4.9	0	3.2	0
8/ 1/79	0.6	18.2	19.0	0.0	559	16794	17353	0.000	4.2	0	3.2	0
9/ 1/79	0.7	16.9	17.6	0.0	583	17359	17942	0.000	3.8	0	3.3	0
10/ 1/79	0.6	13.8	14.4	0.0	603	17866	18470	0.000	4.4	0	3.3	0
11/ 1/79	0.7	12.5	13.2	0.0	623	18294	18917	0.000	5.3	0	3.3	0
12/ 1/79	0.7	9.7	10.4	0.0	644	18669	19313	0.000	6.4	0	3.3	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: F-97

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.7	9.9	10.7	0.0	665	18969	19633	0.000	7.0	0	3.4	0
2/ 1/80	0.6	9.3	9.9	0.0	688	19276	19964	0.000	5.9	0	3.4	0
3/ 1/80	0.4	10.0	10.4	0.0	705	19546	20250	0.000	3.6	0	3.5	0
4/ 1/80	0.5	9.8	9.3	0.0	716	19856	20572	0.000	5.4	0	3.5	0
5/ 1/80	0.2	9.8	10.0	0.0	731	20118	20849	0.000	2.3	0	3.5	0
6/ 1/80	0.3	8.2	8.5	0.0	738	20421	21159	0.000	3.4	0	3.5	0
7/ 1/80	0.3	10.7	11.0	0.0	748	20668	21414	0.000	2.9	0	3.5	0
8/ 1/80	0.3	8.2	8.5	0.0	758	20999	21755	0.000	3.9	0	3.5	0
9/ 1/80	0.2	9.8	9.9	0.0	768	21252	22016	0.000	1.8	0	3.5	0
10/ 1/80	0.1	9.8	9.9	0.0	771	21544	22315	0.000	1.8	0	3.5	0
11/ 1/80	0.1	9.8	9.9	0.0	776	21818	22593	0.000	1.5	0	3.4	0
11/20/80	1.0	0.0	0.0	0.0	778	21985	22763	0.000	0.0	0	3.4	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-98

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	2.3	71.4	73.7	0.0	0	0	0	0.000	3.1	0	0.0	0
7/ 1/77	1.5	59.9	61.4	0.0	69	2142	2211	0.000	2.4	0	3.1	0
8/ 1/77	1.3	51.0	52.9	0.0	116	3999	4115	0.000	2.4	0	2.8	0
9/ 1/77	0.7	41.1	41.8	0.0	155	5599	5754	0.000	1.7	0	2.7	0
9/13/77	0.7	41.1	41.8	0.0	164	6092	6256	0.000	1.7	0	2.6	0
10/ 1/77	1.2	21.5	21.7	0.0	177	6832	7009	0.000	0.8	0	2.5	0
11/ 1/77	0.6	13.9	14.5	0.0	182	7498	7680	0.000	3.1	0	2.4	0
12/ 1/77	0.5	18.4	18.9	0.0	200	8065	8265	0.000	2.6	0	2.4	0
1/ 1/78	0.4	18.7	19.2	0.0	215	8634	8849	0.000	2.3	0	2.4	0
2/ 1/78	0.5	16.2	16.7	0.0	229	9215	9444	0.000	2.9	0	2.4	0
2/1/78	0.5	16.2	16.7	0.0	237	9474	9711	0.000	2.9	0	2.4	0
2/28/78	0.5	15.2	16.7	0.0	242	9652	9894	0.000	2.9	0	2.4	0
3/ 1/78	0.6	15.8	16.3	0.0	243	9668	9911	0.000	4.7	0	2.5	0
3/10/78	0.8	15.8	16.3	0.0	250	9808	10058	0.000	4.7	0	2.5	0
4/ 1/78	0.2	18.2	18.4	0.0	267	10150	10417	0.000	1.1	0	2.6	0
4/ 9/78	0.2	18.2	18.4	0.0	268	10296	10564	0.000	1.1	0	2.5	0
4/10/78	0.2	18.2	18.4	0.0	269	10314	10583	0.000	1.1	0	2.5	0
4/11/78	0.2	18.2	18.4	0.0	269	10332	10602	0.000	1.1	0	2.5	0
5/ 1/78	0.9	14.2	15.1	0.0	273	10697	10970	0.000	6.3	0	2.5	0
6/ 1/78	1.3	13.7	15.0	0.0	302	11135	11438	0.000	8.9	0	2.6	0
7/ 1/78	1.2	12.3	13.5	0.0	342	11546	11888	0.000	8.8	0	2.9	0
8/ 1/78	0.7	21.3	22.0	0.0	379	11927	12306	0.000	3.3	0	3.1	0
9/ 1/78	1.6	11.3	12.9	0.0	402	12526	12928	0.000	12.3	0	3.1	0
10/ 1/78	0.8	11.3	11.9	0.0	449	12925	13374	0.000	5.1	0	3.4	0
11/ 1/78	0.6	10.7	11.3	0.0	468	13275	13743	0.000	5.3	0	3.4	0
12/ 1/78	0.6	8.8	9.4	0.0	486	13596	14082	0.000	6.8	0	3.5	0
1/ 1/79	0.5	8.1	8.6	0.0	506	13867	14373	0.000	6.3	0	3.5	0
2/ 1/79	0.7	8.0	8.8	0.0	523	14119	14641	0.000	8.4	0	3.6	0
3/ 1/79	0.6	9.4	10.0	0.0	543	14343	14886	0.000	5.8	0	3.6	0
4/ 1/79	0.5	8.2	8.8	0.0	561	14636	15197	0.000	6.0	0	3.7	0
5/ 1/79	0.0	10.1	10.1	0.0	577	14883	15460	0.000	0.0	0	3.7	0
6/ 1/79	0.3	8.8	9.1	0.0	577	15195	15773	0.000	3.1	0	3.7	0
7/ 1/79	0.1	7.3	7.4	0.0	588	15460	16048	0.000	1.9	0	3.7	0
8/ 1/79	0.0	7.6	7.6	0.0	590	15685	16275	0.000	0.0	0	3.6	0
9/ 1/79	0.0	7.5	7.5	0.0	590	15919	16509	0.000	0.0	0	3.6	0
10/ 1/79	0.0	6.9	6.9	0.0	590	16145	16735	0.000	0.0	0	3.5	0
11/ 1/79	0.0	5.7	5.7	0.0	590	16360	16950	0.000	0.0	0	3.5	0
12/ 1/79	0.5	8.5	9.0	0.0	590	16530	17120	0.000	5.6	0	3.4	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-98

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	8.7	9.1	0.0	606	16795	17400	0.000	4.1	0	3.5	0
2/ 1/80	0.4	7.5	7.9	0.0	617	17065	17683	0.000	5.0	0	3.5	0
3/ 1/80	0.4	8.7	9.1	0.0	629	17282	17910	0.000	4.0	0	3.5	0
4/ 1/80	0.5	7.5	8.0	0.0	640	17553	18193	0.000	6.2	0	3.5	0
5/ 1/80	0.2	6.9	7.2	0.0	655	17777	18432	0.000	3.2	0	3.6	0
6/ 1/80	0.1	6.3	6.4	0.0	662	17992	18654	0.000	2.0	0	3.5	0
7/ 1/80	0.3	6.3	6.6	0.0	666	18181	18847	0.000	4.8	0	3.5	0
8/ 1/80	0.2	6.3	6.4	0.0	678	18376	19054	0.000	2.5	0	3.5	0
9/ 1/80	0.2	6.3	6.4	0.0	681	18570	19254	0.000	2.5	0	3.5	0
10/ 1/80	0.1	5.7	5.8	0.0	685	18759	19444	0.000	2.5	0	3.5	0
11/ 1/80	0.1	5.0	5.2	0.0	690	18934	19624	0.000	2.5	0	3.5	0
11/30/80	0.0	0.0	0.0	0.0	693	19030	19723	0.000	0.0	0	3.5	0

TABLE 40

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-99

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	1.5	74.4	75.9	0.0	0	0	0	0.000	2.0	0	0.0	0
7/ 1/77	1.0	62.3	63.3	0.0	46	2232	2278	0.000	1.6	0	2.0	0
8/ 1/77	0.9	52.9	53.8	0.0	77	4162	4239	0.000	1.7	0	1.8	0
9/ 1/77	0.7	53.2	53.9	0.0	105	5802	5907	0.000	1.3	0	1.8	0
9/13/77	0.7	53.1	53.8	0.0	1.4	6438	6552	0.000	1.3	0	1.7	0
10/ 1/77	0.6	23.2	23.8	0.0	127	7394	7520	0.000	2.4	0	1.7	0
11/ 1/77	0.7	21.4	22.1	0.0	145	8113	8257	0.000	3.4	0	1.8	0
12/ 1/77	0.1	20.2	20.3	0.0	167	8755	8922	0.000	0.6	0	1.9	0
1/ 1/78	0.4	21.9	22.3	0.0	171	9380	9551	0.000	2.0	0	1.8	0
2/ 1/78	0.5	20.9	21.4	0.0	184	10059	10243	0.000	2.3	0	1.8	0
2/17/78	0.5	20.9	21.4	0.0	192	10393	10586	0.000	2.3	0	1.8	0
2/28/78	0.5	20.9	21.4	0.0	197	10623	10821	0.000	2.3	0	1.8	0
3/ 1/78	0.4	24.5	24.9	0.0	198	10644	10842	0.000	1.6	0	1.8	0
3/10/78	0.4	24.5	24.9	0.0	201	10865	11066	0.000	1.6	0	1.8	0
4/ 1/78	0.2	21.4	21.6	0.0	210	11403	11613	0.000	0.9	0	1.8	0
4/ 9/78	0.2	21.4	21.6	0.0	211	11574	11785	0.000	0.9	0	1.8	0
4/10/78	0.2	21.4	21.6	0.0	212	11595	11807	0.000	0.9	0	1.8	0
4/11/78	0.2	21.4	21.6	0.0	212	11617	11829	0.000	0.9	0	1.8	0
5/ 1/78	0.2	20.1	20.3	0.0	216	12044	12260	0.000	0.9	0	1.8	0
6/ 1/78	0.0	19.5	19.5	0.0	221	12668	12889	0.000	0.0	0	1.7	0
7/ 1/78	0.6	26.3	26.9	0.0	221	13254	13475	0.000	2.2	0	1.6	0
8/ 1/78	0.2	24.5	24.7	0.0	240	14069	14309	0.000	0.7	0	1.7	0
9/ 1/78	0.5	19.9	20.4	0.0	245	14829	15075	0.000	2.6	0	1.6	0
10/ 1/78	0.1	17.0	17.1	0.0	261	15427	15688	0.000	0.9	0	1.7	0
11/ 1/78	0.3	17.3	17.6	0.0	266	15954	16220	0.000	1.7	0	1.6	0
12/ 1/78	0.3	18.2	18.5	0.0	275	16474	16749	0.000	1.7	0	1.6	0
1/ 1/79	0.7	15.6	16.3	0.0	285	17040	17324	0.000	4.5	0	1.6	0
2/ 1/79	0.7	15.0	15.7	0.0	307	17523	17830	0.000	4.7	0	1.7	0
3/ 1/79	0.0	17.6	17.6	0.0	328	17942	18270	0.000	0.0	0	1.8	0
4/ 1/79	0.1	15.0	15.1	0.0	328	18489	18817	0.000	0.7	0	1.7	0
5/ 1/79	0.3	15.4	16.7	0.0	332	19028	19360	0.000	1.8	0	1.7	0
6/ 1/79	0.3	15.1	15.4	0.0	341	19536	19877	0.000	1.8	0	1.7	0
7/ 1/79	0.3	16.4	16.7	0.0	349	19990	20339	0.000	1.7	0	1.7	0
8/ 1/79	0.3	15.7	16.0	0.0	358	20497	20856	0.000	2.0	0	1.7	0
9/ 1/79	0.1	16.1	16.1	0.0	368	20985	21353	0.000	0.5	0	1.7	0
10/ 1/79	0.3	15.7	16.0	0.0	371	21467	21837	0.000	2.0	0	1.7	0
11/ 1/79	0.4	0.0	0.4	0.0	380	21954	22334	0.000	100.0	0	1.7	0
12/ 1/79	0.0	15.1	15.1	0.0	391	21954	22345	0.000	0.0	0	1.7	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-99

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.2	15.7	15.9	0.0	391	22423	22814	0.000	1.1	0	1.7	0
2/ 1/80	0.5	15.9	16.4	0.0	397	22910	23306	0.000	2.9	0	1.7	0
3/ 1/80	0.5	15.0	15.6	0.0	411	23372	23782	0.000	3.5	0	1.7	0
4/ 1/80	0.5	16.9	17.4	0.0	428	23837	24264	0.000	2.9	0	1.8	0
5/ 1/80	0.6	15.7	16.3	0.0	443	24345	24788	0.000	3.7	0	1.8	0
6/ 1/80	0.2	16.4	16.6	0.0	461	24833	25294	0.000	1.2	0	1.8	0
7/ 1/80	0.3	13.8	14.2	0.0	467	25325	25792	0.000	2.2	0	1.8	0
8/ 1/80	0.3	9.4	9.7	0.0	477	25753	26231	0.000	3.4	0	1.8	0
9/ 1/80	0.2	15.1	15.3	0.0	487	26045	26533	0.000	1.0	0	1.8	0
10/ 1/80	0.2	15.1	15.3	0.0	492	26517	27009	0.000	1.0	0	1.8	0
11/ 1/80	0.3	14.2	14.5	0.0	497	26986	27483	0.000	1.9	0	1.8	0
11/30/80	0.0	0.0	0.0	0.0	502	27255	27758	0.000	0.0	0	1.8	0

TABLE 41

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-100

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.1	56.2	56.4	0.0	0	0	0	0.000	0.2	0	0.0	0
7/ 1/77	0.1	46.8	46.9	0.0	4	1687	1691	0.000	0.2	0	0.2	0
8/ 1/77	0.1	39.7	39.8	0.0	6	3138	3144	0.000	0.2	0	0.2	0
9/ 1/77	0.2	24.1	24.2	0.0	8	4368	4377	0.000	0.8	0	0.2	0
9/13/77	0.2	24.1	24.2	0.0	11	4657	4667	0.000	0.8	0	0.2	0
10/ 1/77	0.2	24.1	24.3	0.0	14	5090	5104	0.000	0.7	0	0.3	0
11/ 1/77	0.1	13.9	14.0	0.0	19	5837	5856	0.000	1.0	0	0.3	0
12/ 1/77	0.6	13.0	13.6	0.0	24	6253	6278	0.000	4.4	0	0.4	0
1/ 1/78	0.2	18.3	18.5	0.0	42	6656	6698	0.000	1.2	0	0.6	0
2/ 1/78	0.2	8.7	9.0	0.0	49	7223	7272	0.000	2.6	0	0.7	0
2/13/78	0.2	8.7	9.0	0.0	53	7362	7415	0.000	2.6	0	0.7	0
2/28/78	0.2	8.7	9.0	0.0	55	7458	7513	0.000	2.6	0	0.7	0
3/ 1/78	0.2	15.1	15.3	0.0	55	7467	7522	0.000	1.2	0	0.7	0
3/10/78	0.2	15.1	15.3	0.0	57	7603	7660	0.000	1.2	0	0.7	0
4/ 1/78	0.2	18.8	19.0	0.0	61	7934	7995	0.000	1.0	0	0.8	0
4/ 9/78	0.2	18.8	19.0	0.0	63	8085	8148	0.000	1.0	0	0.8	0
4/10/78	0.2	18.8	19.0	0.0	63	8104	8167	0.000	1.0	0	0.8	0
4/11/78	0.2	18.8	19.0	0.0	63	8123	8186	0.000	1.0	0	0.8	0
5/ 1/78	0.1	11.4	11.5	0.0	67	8507	8567	0.000	0.8	0	0.8	0
6/ 1/78	0.3	6.3	6.6	0.0	70	8853	8923	0.000	5.1	0	0.8	0
7/ 1/78	0.0	12.6	12.6	0.0	80	9040	9120	0.000	0.0	0	0.9	0
8/ 1/78	0.0	11.3	11.3	0.0	80	9431	9511	0.000	0.0	0	0.8	0
9/ 1/78	0.0	12.0	12.0	0.0	80	9783	9862	0.000	0.0	0	0.8	0
10/ 1/78	0.0	12.3	12.3	0.0	80	10142	10221	0.000	0.0	0	0.8	0
11/ 1/78	0.1	12.6	12.7	0.0	80	10522	10602	0.000	1.1	0	0.8	0
12/ 1/78	0.2	9.4	9.6	0.0	84	10900	10984	0.000	1.6	0	0.8	0
1/ 1/79	0.4	10.5	10.9	0.0	89	11193	11282	0.000	3.4	0	0.8	0
2/ 1/79	0.4	9.4	9.7	0.0	100	11519	11620	0.000	3.8	0	0.9	0
3/ 1/79	0.1	8.8	9.0	0.0	111	11782	11892	0.000	1.6	0	0.9	0
4/ 1/79	0.3	8.8	9.1	0.0	115	12055	12170	0.000	2.9	0	0.9	0
5/ 1/79	0.0	0.0	0.0	0.0	123	12320	12443	0.000	0.0	0	1.0	0
6/ 1/79	0.3	9.5	9.7	0.0	123	12320	12443	0.000	2.9	0	1.0	0
7/ 1/79	0.3	9.8	10.1	0.0	131	12604	12736	0.000	2.9	0	1.0	0
8/ 1/79	0.0	10.1	10.1	0.0	140	12907	13047	0.000	0.0	0	1.1	0
9/ 1/79	0.3	10.0	10.4	0.0	140	13220	13360	0.000	3.2	0	1.0	0
10/ 1/79	0.3	9.4	9.7	0.0	150	13521	13671	0.000	3.3	0	1.1	0
11/ 1/79	0.1	11.3	11.4	0.0	160	13813	13973	0.000	0.7	0	1.1	0
12/ 1/79	0.2	7.5	7.7	0.0	163	14151	14314	0.000	2.1	0	1.1	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-100

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.2	12.6	12.7	0.0	168	14385	14553	0.000	1.4	0	1.2	0
2/ 1/80	0.2	8.8	9.0	0.0	173	14774	14946	0.000	2.1	0	1.2	0
3/ 1/80	0.5	7.4	8.0	0.0	179	15029	15207	0.000	6.8	0	1.2	0
4/ 1/80	0.3	8.2	8.4	0.0	196	15260	15455	0.000	3.0	0	1.3	0
5/ 1/80	0.3	26.4	26.7	0.0	203	15504	15707	0.000	1.1	0	1.3	0
6/ 1/80	0.3	8.8	9.1	0.0	213	16322	16534	0.000	2.9	0	1.3	0
7/ 1/80	0.2	8.2	8.3	0.0	221	16587	16808	0.000	1.8	0	1.3	0
8/ 1/80	0.2	10.1	10.2	0.0	225	16840	17066	0.000	1.6	0	1.3	0
9/ 1/80	0.2	9.1	9.3	0.0	230	17152	17383	0.000	1.7	0	1.3	0
10/ 1/80	0.1	6.9	7.0	0.0	235	17426	17661	0.000	1.0	0	1.3	0
11/ 1/80	0.1	9.5	9.6	0.0	237	17641	17878	0.000	1.4	0	1.3	0
11/20/80	0.0	0.0	0.0	0.0	240	17820	18060	0.000	0.0	0	1.3	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-101

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	1.0	105.1	106.1	0.0	0	0	0	0.000	1.0	0	0.0	0
7/ 1/77	0.7	87.5	88.2	0.0	31	3152	3182	0.000	0.8	0	1.0	0
8/ 1/77	0.6	74.3	74.9	0.0	61	5865	5916	0.000	0.8	0	0.9	0
9/ 1/77	0.5	45.5	45.9	0.0	70	8158	8228	0.000	1.1	0	0.9	0
9/13/77	0.5	45.5	45.9	0.0	76	8714	8790	0.000	1.1	0	0.9	0
10/ 1/77	0.3	29.7	30.0	0.0	85	9532	9617	0.000	1.1	0	0.9	0
11/ 1/77	0.0	23.6	23.6	0.0	95	10453	10548	0.000	0.0	0	0.9	0
12/ 1/77	0.6	24.4	25.2	0.0	95	11161	11257	0.000	3.2	0	0.8	0
1/ 1/78	0.0	26.6	26.6	0.0	120	11919	12039	0.000	0.0	0	1.0	0
2/ 1/78	0.2	30.2	30.4	0.0	120	12743	12863	0.000	0.8	0	0.9	0
2/17/78	0.2	30.2	30.4	0.0	124	13225	13349	0.000	0.8	0	0.9	0
2/28/78	0.2	30.2	30.4	0.0	126	13556	13683	0.000	0.8	0	0.9	0
3/ 1/78	0.4	27.0	27.4	0.0	127	13587	13715	0.000	1.4	0	0.9	0
3/10/78	0.4	27.0	27.4	0.0	130	13830	13960	0.000	1.4	0	0.9	0
4/ 1/78	0.2	25.2	25.3	0.0	139	14423	14562	0.000	0.8	0	1.0	0
4/ 9/78	0.2	25.2	25.3	0.0	140	14625	14765	0.000	0.8	0	0.9	0
4/10/78	0.2	25.2	25.3	0.0	140	14650	14790	0.000	0.8	0	0.9	0
4/11/78	0.2	25.2	25.3	0.0	141	14675	14815	0.000	0.8	0	0.9	0
5/ 1/78	0.2	22.0	22.2	0.0	144	15178	15322	0.000	0.8	0	0.9	0
6/ 1/78	0.3	21.7	22.0	0.0	150	15860	16010	0.000	1.5	0	0.9	0
7/ 1/78	0.0	16.4	16.4	0.0	160	16511	16671	0.000	0.0	0	1.0	0
8/ 1/78	0.0	24.6	24.6	0.0	160	17019	17179	0.000	0.0	0	0.9	0
9/ 1/78	0.5	22.4	23.0	0.0	160	17780	17940	0.000	2.3	0	0.9	0
10/ 1/78	0.5	12.4	12.9	0.0	176	18454	18630	0.000	4.1	0	0.9	0
11/ 1/78	0.1	16.4	16.5	0.0	192	18836	19029	0.000	0.4	0	1.0	0
12/ 1/78	0.3	13.6	14.2	0.0	194	19329	19525	0.000	2.3	0	1.0	0
1/ 1/79	0.0	13.9	13.9	0.0	204	19757	19962	0.000	0.0	0	1.0	0
2/ 1/79	0.0	13.2	13.2	0.0	204	20187	20392	0.000	0.0	0	1.0	0
3/ 1/79	0.7	18.3	18.9	0.0	204	20558	20762	0.000	3.5	0	1.0	0
4/ 1/79	0.7	15.8	16.5	0.0	225	21124	21349	0.000	4.0	0	1.1	0
5/ 1/79	0.3	15.1	15.4	0.0	245	21598	21843	0.000	2.0	0	1.1	0
6/ 1/79	0.3	16.6	16.9	0.0	254	22067	22321	0.000	1.7	0	1.1	0
7/ 1/79	0.2	15.8	16.0	0.0	262	22564	22827	0.000	1.5	0	1.1	0
8/ 1/79	0.3	17.0	17.3	0.0	270	23053	23322	0.000	1.8	0	1.2	0
9/ 1/79	0.3	15.7	16.0	0.0	280	23579	23859	0.000	2.1	0	1.2	0
10/ 1/79	0.3	15.7	16.0	0.0	290	24050	24340	0.000	2.0	0	1.2	0
11/ 1/79	0.7	13.7	14.4	0.0	300	24538	24837	0.000	4.6	0	1.2	0
12/ 1/79	0.3	11.3	11.6	0.0	321	24950	25270	0.000	2.9	0	1.3	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-101

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	13.1	13.5	0.0	331	25301	25631	0.000	2.8	0	1.3	0
2/ 1/80	0.4	12.5	12.9	0.0	343	25707	26050	0.000	3.0	0	1.3	0
3/ 1/80	0.7	13.1	13.8	0.0	354	26070	26424	0.000	5.3	0	1.3	0
4/ 1/80	0.7	13.1	13.8	0.0	377	26475	26852	0.000	4.9	0	1.4	0
5/ 1/80	0.7	12.9	13.6	0.0	397	26869	27266	0.000	5.0	0	1.5	0
6/ 1/80	0.5	15.2	15.7	0.0	418	27259	27667	0.000	3.4	0	1.5	0
7/ 1/80	0.6	13.2	13.8	0.0	434	27724	28153	0.000	4.6	0	1.5	0
8/ 1/80	0.7	11.3	11.9	0.0	453	28133	28586	0.000	5.5	0	1.6	0
9/ 1/80	1.0	10.0	11.0	0.0	474	28482	28956	0.000	9.1	0	1.6	0
10/ 1/80	0.8	13.2	14.0	0.0	504	28780	29284	0.000	5.5	0	1.7	0
11/ 1/80	0.7	15.8	16.5	0.0	527	29189	29717	0.000	4.0	0	1.8	0
11/20/80	0.0	0.0	0.0	0.0	540	29489	30029	0.000	0.0	0	1.8	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-102

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	2.8	62.8	65.6	0.0	0	0	0	0.000	3.3	0	0.0	0
7/ 1/77	1.8	69.6	71.4	0.0	85	2483	2568	0.000	2.6	0	3.3	0
8/ 1/77	1.7	59.2	60.8	0.0	142	4640	4782	0.000	2.7	0	3.0	0
9/ 1/77	1.4	34.7	35.1	0.0	193	6473	6667	0.000	1.0	0	2.9	0
9/13/77	0.4	34.7	35.1	0.0	198	6890	7088	0.000	1.0	0	2.8	0
10/ 1/77	1.3	21.8	23.1	0.0	204	7515	7719	0.000	5.4	0	2.6	0
11/ 1/77	1.5	17.6	19.1	0.0	243	8191	8434	0.000	7.8	0	2.9	0
12/ 1/77	0.4	17.0	17.4	0.0	268	8739	9007	0.000	2.1	0	3.2	0
1/ 1/78	0.4	16.0	16.4	0.0	299	9248	9547	0.000	2.7	0	3.1	0
2/ 1/78	0.2	16.9	17.1	0.0	313	9743	10056	0.000	1.4	0	3.1	0
2/17/78	0.2	16.9	17.1	0.0	317	10013	10330	0.000	1.4	0	3.1	0
2/28/78	0.2	16.9	17.1	0.0	319	10200	10519	0.000	1.4	0	3.0	0
3/ 1/78	0.4	17.5	17.9	0.0	320	10216	10536	0.000	2.2	0	3.0	0
3/10/78	0.4	17.5	17.9	0.0	323	10374	10695	0.000	2.2	0	3.0	0
4/ 1/78	1.2	19.8	21.0	0.0	332	10760	11092	0.000	5.7	0	3.0	0
4/ 9/78	1.2	19.8	21.0	0.0	341	10919	11260	0.000	5.7	0	3.0	0
4/10/78	1.2	19.8	21.0	0.0	342	10939	11282	0.000	5.7	0	3.0	0
4/11/78	1.2	19.8	21.0	0.0	344	10959	11302	0.000	5.7	0	3.0	0
5/ 1/78	0.2	18.9	19.0	0.0	368	11355	11723	0.000	1.0	0	3.1	0
6/ 1/78	0.5	21.0	21.5	0.0	373	11940	12313	0.000	2.3	0	3.0	0
7/ 1/78	1.6	22.3	23.8	0.0	388	12570	12958	0.000	6.7	0	3.0	0
8/ 1/78	2.5	26.0	28.5	0.0	437	13259	13697	0.000	8.8	0	3.2	0
9/ 1/78	1.6	29.0	30.5	0.0	515	14065	14580	0.000	5.1	0	3.5	0
10/ 1/78	2.1	22.3	24.4	0.0	562	14934	15496	0.000	8.7	0	3.6	0
11/ 1/78	1.8	18.8	20.6	0.0	622	15624	16252	0.000	8.7	0	3.9	0
12/ 1/78	1.0	18.8	19.8	0.0	682	16190	16872	0.000	4.9	0	4.0	0
1/ 1/79	1.1	17.4	18.5	0.0	712	16772	17484	0.000	5.9	0	4.1	0
2/ 1/79	1.5	18.6	20.1	0.0	746	17312	18058	0.000	7.3	0	4.1	0
3/ 1/79	1.5	17.6	19.1	0.0	787	17833	18620	0.000	7.7	0	4.2	0
4/ 1/79	2.1	22.9	25.0	0.0	832	18379	19212	0.000	8.5	0	4.3	0
5/ 1/79	2.1	15.7	17.8	0.0	896	19066	19962	0.000	11.8	0	4.5	0
6/ 1/79	2.0	17.7	19.7	0.0	961	19552	20513	0.000	10.0	0	4.7	0
7/ 1/79	2.0	17.0	19.0	0.0	1020	20083	21103	0.000	10.6	0	4.8	0
8/ 1/79	2.1	15.8	17.9	0.0	1082	20611	21693	0.000	11.8	0	5.0	0
9/ 1/79	2.7	14.8	17.4	0.0	1147	21100	22247	0.000	15.3	0	5.2	0
10/ 1/79	1.9	13.6	15.5	0.0	1227	21543	22770	0.000	12.3	0	5.4	0
11/ 1/79	1.4	17.4	18.8	0.0	1286	21956	23252	0.000	7.4	0	5.5	0
12/ 1/79	1.3	17.5	18.8	0.0	1328	22488	23816	0.000	7.1	0	5.6	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-102

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.9	13.0	14.0	0.0	1369	23030	24399	0.000	6.6	0	5.6	0
2/ 1/80	0.8	16.2	17.0	0.0	1398	23433	24831	0.000	4.6	0	5.6	0
3/ 1/80	1.1	16.8	17.9	0.0	1420	23902	25323	0.000	6.2	0	5.6	0
4/ 1/80	1.3	14.9	16.3	0.0	1455	24422	25877	0.000	8.3	0	5.6	0
5/ 1/80	1.2	13.2	14.4	0.0	1495	24870	26366	0.000	8.4	0	5.7	0
6/ 1/80	1.2	13.3	14.5	0.0	1533	25279	26812	0.000	8.2	0	5.7	0
7/ 1/80	1.4	13.7	15.2	0.0	1568	25679	27246	0.000	9.3	0	5.8	0
8/ 1/80	1.0	11.8	12.8	0.0	1612	26105	27718	0.000	7.7	0	5.8	0
9/ 1/80	0.3	13.9	14.2	0.0	1643	26473	28116	0.000	2.3	0	5.8	0
10/ 1/80	1.2	11.3	12.5	0.0	1653	26887	29540	0.000	9.7	0	5.8	0
11/ 1/80	1.2	10.2	11.4	0.0	1691	27237	30928	0.000	10.7	0	5.8	0
11/20/80	0.0	0.0	0.0	0.0	1714	27430	29144	0.000	0.0	0	5.9	0

TABLE 44

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-103

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	45.6	45.6	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	37.9	37.9	0.0	0	1368	1368	0.000	0.0	0	0.0	0
8/ 1/77	0.0	52.0	52.0	0.0	0	2543	2543	0.000	0.0	0	0.0	0
9/ 1/77	0.0	32.1	32.1	0.0	0	4155	4155	0.000	0.0	0	0.0	0
9/13/77	0.0	32.1	32.1	0.0	0	4540	4540	0.000	0.0	0	0.0	0
10/ 1/77	0.2	18.3	18.5	0.0	0	5119	5119	0.000	1.2	0	0.0	0
11/ 1/77	0.0	17.6	17.6	0.0	7	5686	5693	0.000	0.0	0	0.1	0
12/ 1/77	0.4	17.1	17.5	0.0	7	6215	6222	0.000	2.2	0	0.1	0
1/ 1/78	0.6	16.5	17.0	0.0	19	6745	6763	0.000	3.2	0	0.3	0
2/ 1/78	1.0	20.4	21.4	0.0	36	7256	7292	0.000	4.5	0	0.5	0
2/17/78	1.0	20.4	21.4	0.0	51	7582	7633	0.000	4.5	0	0.7	0
2/28/78	1.0	20.4	21.4	0.0	62	7806	7869	0.000	4.5	0	0.8	0
3/ 1/78	0.2	18.9	19.0	0.0	63	7827	7890	0.000	1.0	0	0.8	0
3/10/78	0.2	18.9	19.0	0.0	65	7997	8062	0.000	1.0	0	0.8	0
4/ 1/78	0.0	15.8	15.8	0.0	69	8411	8480	0.000	0.0	0	0.8	0
4/ 9/78	0.0	15.8	15.8	0.0	69	8537	8606	0.000	0.0	0	0.8	0
4/10/78	0.0	15.8	15.8	0.0	69	8553	8622	0.000	0.0	0	0.8	0
4/11/78	0.0	15.8	15.8	0.0	69	8569	8638	0.000	0.0	0	0.8	0
5/ 1/78	0.1	15.9	16.0	0.0	69	8884	8953	0.000	0.7	0	0.8	0
6/ 1/78	0.2	14.5	14.6	0.0	73	9376	9449	0.000	1.1	0	0.8	0
7/ 1/78	0.4	11.9	12.3	0.0	77	9811	9888	0.000	3.2	0	0.8	0
8/ 1/78	0.4	10.6	11.0	0.0	90	10178	10268	0.000	3.3	0	0.9	0
9/ 1/78	0.5	17.3	17.8	0.0	101	10508	10609	0.000	2.9	0	0.9	0
10/ 1/78	0.6	10.7	11.3	0.0	116	11027	11144	0.000	5.4	0	1.0	0
11/ 1/78	0.9	8.8	9.7	0.0	135	11359	11494	0.000	9.3	0	1.2	0
12/ 1/78	0.7	11.3	12.0	0.0	162	11622	11785	0.000	5.6	0	1.4	0
1/ 1/79	1.1	10.5	11.6	0.0	164	11972	12156	0.000	9.5	0	1.5	0
2/ 1/79	0.7	8.7	9.4	0.0	216	12297	12515	0.000	7.6	0	1.7	0
3/ 1/79	1.0	8.2	9.2	0.0	239	12539	12776	0.000	11.2	0	1.9	0
4/ 1/79	1.1	8.4	9.4	0.0	270	12793	13063	0.000	11.2	0	2.1	0
5/ 1/79	0.6	8.2	8.8	0.0	302	13044	13346	0.000	6.9	0	2.3	0
6/ 1/79	0.9	8.2	9.1	0.0	321	13297	13616	0.000	9.5	0	2.4	0
7/ 1/79	0.9	7.6	8.4	0.0	347	13544	13891	0.000	10.3	0	2.5	0
8/ 1/79	1.0	8.4	9.4	0.0	373	13779	14152	0.000	10.2	0	2.6	0
9/ 1/79	0.7	7.5	8.1	0.0	403	14040	14443	0.000	8.2	0	2.8	0
10/ 1/79	0.6	9.4	10.0	0.0	423	14264	14687	0.000	6.3	0	2.9	0
11/ 1/79	0.7	10.6	11.3	0.0	443	14555	14998	0.000	6.2	0	3.0	0
12/ 1/79	1.3	9.0	10.3	0.0	464	14873	15337	0.000	12.9	0	3.0	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-103

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.6	9.3	9.9	0.0	505	15151	15656	0.000	5.6	0	3.2	0
2/ 1/80	0.8	8.6	9.4	0.0	522	15440	15962	0.000	8.3	0	3.3	0
3/ 1/80	1.1	8.6	9.7	0.0	545	15690	16235	0.000	11.4	0	3.4	0
4/ 1/80	0.8	7.4	8.3	0.0	579	15956	16535	0.000	10.1	0	3.5	0
5/ 1/80	0.8	7.2	8.0	0.0	604	16179	16784	0.000	9.4	0	3.6	0
6/ 1/80	0.4	7.0	7.4	0.0	627	16403	17030	0.000	5.4	0	3.7	0
7/ 1/80	0.3	8.2	8.5	0.0	639	16612	17251	0.000	3.7	0	3.7	0
8/ 1/80	0.3	7.6	7.9	0.0	649	16865	17514	0.000	4.2	0	3.7	0
9/ 1/80	0.2	9.4	9.2	0.0	659	17098	17757	0.000	1.7	0	3.7	0
10/ 1/80	0.1	9.4	9.6	0.0	664	17370	18034	0.000	1.5	0	3.7	0
11/ 1/80	0.1	7.6	7.7	0.0	669	17663	18331	0.000	1.7	0	3.6	0
11/20/80	0.0	0.0	0.0	0.0	671	17806	18476	0.000	0.0	0	3.6	0

TABLE 45

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-104

LAMPY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	25.8	26.8	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	22.3	22.3	0.0	0	804	804	0.000	0.0	0	0.0	0
8/ 1/77	0.0	18.9	18.9	0.0	0	1495	1495	0.000	0.0	0	0.0	0
9/ 1/77	0.3	23.4	23.7	0.0	0	2081	2081	0.000	1.3	0	0.0	0
9/13/77	0.3	23.4	23.7	0.0	4	2362	2365	0.000	1.3	0	0.2	0
10/ 1/77	0.5	16.8	17.3	0.0	9	2782	2791	0.000	2.6	0	0.3	0
11/ 1/77	0.7	17.0	17.7	0.0	23	3303	3326	0.000	4.2	0	0.7	0
12/ 1/77	0.4	15.8	16.2	0.0	45	3813	3858	0.000	2.3	0	1.2	0
1/ 1/78	0.9	18.0	18.9	0.0	57	4303	4360	0.000	4.7	0	1.3	0
2/ 1/78	0.5	17.0	17.5	0.0	84	4860	4944	0.000	2.8	0	1.7	0
2/17/78	0.5	17.0	17.5	0.0	92	5132	5224	0.000	2.8	0	1.8	0
2/28/78	0.5	17.0	17.5	0.0	98	5319	5416	0.000	2.8	0	1.8	0
3/ 1/78	0.4	15.0	15.4	0.0	98	5336	5434	0.000	2.5	0	1.8	0
3/10/78	0.4	15.0	15.4	0.0	102	5471	5573	0.000	2.5	0	1.8	0
4/ 1/78	0.0	13.8	13.8	0.0	110	5801	5912	0.000	0.0	0	1.9	0
4/ 9/78	0.0	13.8	13.8	0.0	110	5912	6022	0.000	0.0	0	1.8	0
4/10/78	0.0	13.8	13.8	0.0	110	5926	6036	0.000	0.0	0	1.8	0
4/11/78	0.0	13.8	13.8	0.0	110	5939	6050	0.000	0.0	0	1.8	0
5/ 1/78	1.1	19.3	20.4	0.0	110	6215	6326	0.000	5.5	0	1.7	0
6/ 1/78	0.2	17.6	17.8	0.0	145	6813	6958	0.000	0.9	0	2.1	0
7/ 1/78	0.1	16.7	16.8	0.0	150	7341	7491	0.000	0.6	0	2.0	0
8/ 1/78	0.2	18.9	19.0	0.0	153	7853	8011	0.000	0.9	0	1.9	0
9/ 1/78	0.4	25.0	25.4	0.0	158	8443	8601	0.000	1.4	0	1.8	0
10/ 1/78	0.3	27.1	27.4	0.0	169	9194	9363	0.000	1.1	0	1.8	0
11/ 1/78	1.4	29.6	30.9	0.0	178	10033	10211	0.000	4.4	0	1.7	0
12/ 1/78	1.0	25.4	26.4	0.0	219	10920	11140	0.000	3.7	0	2.0	0
1/ 1/79	1.1	24.3	25.4	0.0	249	11708	11957	0.000	4.3	0	2.1	0
2/ 1/79	0.9	26.3	27.2	0.0	283	12463	12746	0.000	3.3	0	2.2	0
3/ 1/79	1.2	25.2	26.4	0.0	309	13198	13507	0.000	4.4	0	2.3	0
4/ 1/79	0.9	26.6	27.5	0.0	345	13979	14324	0.000	3.4	0	2.4	0
5/ 1/79	0.9	22.6	23.6	0.0	373	14776	15149	0.000	3.8	0	2.5	0
6/ 1/79	0.8	26.5	27.3	0.0	401	15478	15879	0.000	3.1	0	2.5	0
7/ 1/79	0.9	25.8	26.7	0.0	426	16273	16696	0.000	3.2	0	2.6	0
8/ 1/79	1.0	26.4	27.3	0.0	453	17073	17526	0.000	3.5	0	2.6	0
9/ 1/79	1.2	26.3	27.5	0.0	482	17891	18373	0.000	4.3	0	2.6	0
10/ 1/79	1.0	28.3	29.2	0.0	518	18680	19198	0.000	3.3	0	2.7	0
11/ 1/79	0.7	27.6	28.3	0.0	547	19556	20104	0.000	2.5	0	2.7	0
12/ 1/79	0.3	34.6	34.9	0.0	558	20334	20953	0.000	1.0	0	2.7	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-104

LAMPY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.2	10.0	10.2	0.0	578	21457	22036	0.000	2.1	0	2.6	0
2/ 1/80	0.2	30.7	31.5	0.0	585	21768	22353	0.000	2.5	0	2.6	0
3/ 1/80	0.7	31.5	32.1	0.0	608	22657	23265	0.000	2.3	0	2.6	0
4/ 1/80	0.7	30.1	30.8	0.0	631	23629	24259	0.000	2.2	0	2.6	0
5/ 1/80	1.2	32.1	33.3	0.0	651	24533	25184	0.000	3.6	0	2.6	0
6/ 1/80	0.7	35.3	36.0	0.0	688	25528	26216	0.000	1.8	0	2.6	0
7/ 1/80	0.9	34.0	35.0	0.0	708	26588	27296	0.000	2.7	0	2.6	0
8/ 1/80	0.0	30.3	30.3	0.0	738	27643	28381	0.000	0.0	0	2.6	0
9/ 1/80	1.0	33.3	34.3	0.0	738	28581	29319	0.000	2.9	0	2.5	0
10/ 1/80	1.2	31.4	32.7	0.0	787	29579	30347	0.000	3.7	0	2.5	0
11/ 1/80	0.8	35.0	35.8	0.0	805	30554	31359	0.000	2.3	0	2.6	0
11/20/80	0.0	0.0	0.0	0.0	820	31220	32040	0.000	0.0	0	2.6	0

TABLE 46

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-105

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	1.4	67.7	68.1	0.0	0	0	0	0.000	0.5	0	0.0	0
7/ 1/77	0.2	56.4	56.6	0.0	11	2032	2043	0.000	0.4	0	0.5	0
8/ 1/77	0.2	47.9	48.1	0.0	19	3730	3798	0.000	0.5	0	0.5	0
9/ 1/77	0.2	46.0	46.3	0.0	25	5264	5289	0.000	0.5	0	0.5	0
9/13/77	0.2	46.0	46.3	0.0	28	5816	5844	0.000	0.5	0	0.5	0
10/ 1/77	0.2	20.2	20.4	0.0	33	6645	6677	0.000	0.8	0	0.5	0
11/ 1/77	0.3	18.2	18.5	0.0	38	7271	7309	0.000	1.6	0	0.5	0
12/ 1/77	0.2	16.4	16.6	0.0	47	7816	7863	0.000	1.3	0	0.6	0
1/ 1/78	0.2	12.0	12.2	0.0	54	8325	8378	0.000	1.8	0	0.6	0
2/ 1/78	0.2	11.9	12.1	0.0	60	8696	8757	0.000	1.9	0	0.7	0
2/17/78	0.2	11.9	12.1	0.0	64	8886	8950	0.000	1.9	0	0.7	0
2/28/78	0.2	11.9	12.1	0.0	67	9017	9084	0.000	1.9	0	0.7	0
3/ 1/78	0.4	15.0	15.4	0.0	67	9029	9096	0.000	2.5	0	0.7	0
3/10/78	0.4	15.0	15.4	0.0	70	9164	9234	0.000	2.5	0	0.8	0
4/ 1/78	0.2	15.1	15.3	0.0	79	9495	9573	0.000	1.3	0	0.8	0
4/ 9/78	0.2	15.1	15.3	0.0	80	9615	9693	0.000	1.3	0	0.8	0
4/10/78	0.2	15.1	15.3	0.0	81	9630	9711	0.000	1.3	0	0.8	0
4/11/78	0.2	15.1	15.3	0.0	81	9645	9726	0.000	1.3	0	0.8	0
5/ 1/78	0.2	13.2	13.4	0.0	85	9947	10031	0.000	1.4	0	0.8	0
6/ 1/78	0.0	12.6	12.6	0.0	90	10355	10446	0.000	0.0	0	0.9	0
7/ 1/78	0.2	13.2	13.4	0.0	90	10733	10824	0.000	1.4	0	0.8	0
8/ 1/78	0.2	11.9	12.1	0.0	96	11142	11238	0.000	1.4	0	0.9	0
9/ 1/78	0.3	12.1	12.4	0.0	102	11512	11613	0.000	2.0	0	0.9	0
10/ 1/78	0.1	12.0	12.1	0.0	109	11877	11986	0.000	1.2	0	0.9	0
11/ 1/78	0.1	10.7	10.8	0.0	114	12248	12362	0.000	1.3	0	0.9	0
12/ 1/78	0.6	9.0	9.7	0.0	118	12569	12687	0.000	6.7	0	0.9	0
1/ 1/79	0.4	11.3	11.6	0.0	138	12849	12987	0.000	3.2	0	1.1	0
2/ 1/79	0.4	10.9	11.3	0.0	149	13198	13347	0.000	3.2	0	1.1	0
3/ 1/79	0.4	10.7	11.1	0.0	160	13504	13663	0.000	3.9	0	1.2	0
4/ 1/79	0.3	10.7	11.0	0.0	173	13836	14009	0.000	2.4	0	1.2	0
5/ 1/79	0.3	10.7	11.0	0.0	181	14158	14339	0.000	2.7	0	1.3	0
6/ 1/79	0.1	11.3	11.5	0.0	190	14489	14680	0.000	1.2	0	1.3	0
7/ 1/79	0.3	16.4	16.7	0.0	194	14829	15024	0.000	1.7	0	1.3	0
8/ 1/79	0.6	13.2	13.8	0.0	203	15337	15540	0.000	4.6	0	1.3	0
9/ 1/79	0.7	15.0	15.7	0.0	223	15745	15968	0.000	4.3	0	1.4	0
10/ 1/79	0.6	15.1	15.7	0.0	243	16196	16439	0.000	4.0	0	1.5	0
11/ 1/79	0.4	11.9	12.3	0.0	263	16663	16926	0.000	2.9	0	1.6	0
12/ 1/79	0.3	11.9	12.3	0.0	273	17021	17294	0.000	2.7	0	1.6	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 12/ 1/80 PAGE 2

WELL: H-105

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	12.5	12.9	0.0	284	17390	17674	0.000	2.9	0	1.6	0
2/ 1/80	0.4	11.9	12.3	0.0	295	17778	18074	0.000	3.2	0	1.6	0
3/ 1/80	0.2	20.1	20.3	0.0	307	18123	18429	0.000	0.9	0	1.7	0
4/ 1/80	0.3	16.3	16.7	0.0	312	18746	19058	0.000	2.0	0	1.6	0
5/ 1/80	0.6	22.7	23.3	0.0	322	19236	19559	0.000	2.6	0	1.6	0
6/ 1/80	0.3	15.1	15.4	0.0	341	19939	20280	0.000	1.7	0	1.7	0
7/ 1/80	0.9	25.8	26.7	0.0	349	20393	20742	0.000	3.5	0	1.7	0
8/ 1/80	0.3	17.6	17.9	0.0	378	21191	21570	0.000	1.8	0	1.8	0
9/ 1/80	1.0	25.1	26.1	0.0	328	21737	22125	0.000	3.8	0	1.8	0
10/ 1/80	1.2	26.4	27.6	0.0	418	22489	22906	0.000	4.4	0	1.8	0
11/ 1/80	0.8	27.8	28.5	0.0	456	23308	23764	0.000	2.7	0	1.9	0
12/20/80	0.0	0.0	0.0	0.0	470	23836	24306	0.000	0.0	0	1.9	0

TABLE 47

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-106

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.0	75.9	75.9	0.0	0	0	0	0.000	0.0	0	0.0	0
7/ 1/77	0.0	63.1	63.1	0.0	0	2277	2277	0.000	0.0	0	0.0	0
8/ 1/77	0.0	60.2	60.2	0.0	0	4233	4233	0.000	0.0	0	0.0	0
9/ 1/77	0.0	45.4	45.4	0.0	0	6099	6099	0.000	0.0	0	0.0	0
9/13/77	0.0	45.4	45.4	0.0	0	6644	6644	0.000	0.0	0	0.0	0
10/ 1/77	0.0	28.4	28.4	0.0	0	7460	7460	0.000	0.0	0	0.0	0
11/ 1/77	0.0	24.6	24.6	0.0	0	8339	8339	0.000	0.0	0	0.0	0
12/ 1/77	0.0	23.3	23.3	0.0	0	9076	9076	0.000	0.0	0	0.0	0
1/ 1/78	0.2	21.3	21.6	0.0	0	9799	9799	0.000	1.1	0	0.0	0
2/ 1/78	0.2	22.6	22.8	0.0	7	10460	10467	0.000	1.0	0	0.1	0
2/17/78	0.2	22.6	22.8	0.0	11	10822	10832	0.000	1.0	0	0.1	0
2/28/78	0.2	22.6	22.8	0.0	13	11070	11083	0.000	1.0	0	0.1	0
3/ 1/78	0.2	28.2	28.4	0.0	14	11093	11106	0.000	0.7	0	0.1	0
3/10/78	0.2	28.2	28.4	0.0	15	11346	11362	0.000	0.7	0	0.1	0
4/ 1/78	0.0	17.0	17.0	0.0	19	11967	11986	0.000	0.0	0	0.2	0
4/ 9/78	0.0	17.0	17.0	0.0	19	12103	12122	0.000	0.0	0	0.2	0
4/10/78	0.0	17.0	17.0	0.0	19	12120	12139	0.000	0.0	0	0.2	0
4/11/78	0.0	17.0	17.0	0.0	19	12137	12156	0.000	0.0	0	0.2	0
5/ 1/78	0.4	24.5	24.9	0.0	19	12477	12497	0.000	1.5	0	0.2	0
6/ 1/78	0.3	26.7	27.0	0.0	31	13236	13267	0.000	1.2	0	0.2	0
7/ 1/78	0.2	35.9	36.1	0.0	41	14038	14079	0.000	0.5	0	0.3	0
8/ 1/78	0.3	32.7	33.0	0.0	47	15149	15196	0.000	1.0	0	0.3	0
9/ 1/78	0.5	31.8	32.3	0.0	58	16163	16221	0.000	1.6	0	0.4	0
10/ 1/78	0.3	30.2	30.5	0.0	74	17116	17189	0.000	1.0	0	0.4	0
11/ 1/78	0.3	30.2	30.5	0.0	83	18053	18136	0.000	1.0	0	0.5	0
12/ 1/78	0.3	28.9	29.3	0.0	92	18959	19050	0.000	1.1	0	0.5	0
1/ 1/79	0.4	34.4	34.7	0.0	102	19856	19958	0.000	1.1	0	0.5	0
2/ 1/79	0.2	34.0	34.2	0.0	113	20921	21034	0.000	0.5	0	0.5	0
3/ 1/79	0.3	34.6	34.9	0.0	118	21872	21991	0.000	0.8	0	0.5	0
4/ 1/79	0.8	42.0	42.8	0.0	127	22946	23074	0.000	1.9	0	0.6	0
5/ 1/79	1.2	34.0	35.2	0.0	151	24206	24357	0.000	3.4	0	0.6	0
6/ 1/79	1.1	36.0	37.1	0.0	188	25259	25447	0.000	3.0	0	0.7	0
7/ 1/79	1.2	39.7	40.9	0.0	222	26338	26560	0.000	2.8	0	0.8	0
8/ 1/79	0.8	35.8	36.6	0.0	258	27568	27826	0.000	2.2	0	0.9	0
9/ 1/79	1.0	31.4	32.4	0.0	283	28679	28962	0.000	3.1	0	1.0	0
10/ 1/79	1.0	33.9	34.9	0.0	313	29620	29933	0.000	2.7	0	1.0	0
11/ 1/79	0.7	32.0	32.7	0.0	342	30672	31014	0.000	2.1	0	1.1	0
12/ 1/79	0.8	42.7	43.6	0.0	363	31633	31996	0.000	1.9	0	1.1	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-106

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.9	24.4	25.3	0.0	389	32957	33346	0.000	3.7	0	1.2	0
2/ 1/80	0.6	18.8	19.3	0.0	418	33713	34130	0.000	3.0	0	1.2	0
3/ 1/80	0.7	22.5	23.3	0.0	434	34256	34691	0.000	3.2	0	1.3	0
4/ 1/80	0.7	25.1	25.8	0.0	457	34955	35412	0.000	2.6	0	1.3	0
5/ 1/80	1.1	23.3	24.3	0.0	477	35708	36185	0.000	4.3	0	1.3	0
6/ 1/80	0.9	22.8	23.7	0.0	510	36429	36939	0.000	4.0	0	1.4	0
7/ 1/80	0.9	23.2	24.2	0.0	538	37112	37650	0.000	3.9	0	1.4	0
8/ 1/80	1.3	22.8	24.1	0.0	568	37832	38399	0.000	5.5	0	1.5	0
9/ 1/80	1.7	22.5	24.1	0.0	608	38539	39148	0.000	6.8	0	1.6	0
10/ 1/80	1.4	22.6	24.0	0.0	658	39214	39872	0.000	5.7	0	1.7	0
11/ 1/80	0.7	24.6	25.3	0.0	701	39915	40616	0.000	2.7	0	1.7	0
11/30/80	0.0	0.0	0.0	0.0	713	40383	41096	0.000	0.0	0	1.7	0

TABLE 48

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-107

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.5	32.9	83.4	0.0	0	0	0	0.000	0.6	0	0.0	0
7/ 1/77	0.3	67.4	69.4	0.0	15	2486	2502	0.000	0.5	0	0.6	0
8/ 1/77	0.5	70.4	70.9	0.0	26	4627	4653	0.000	0.7	0	0.6	0
9/ 1/77	0.7	47.4	48.1	0.0	42	6809	6851	0.000	1.5	0	0.6	0
9/13/77	0.7	47.4	48.1	0.0	51	7378	7428	0.000	1.5	0	0.7	0
10/ 1/77	0.1	38.5	28.6	0.0	64	8231	8295	0.000	0.4	0	0.8	0
11/ 1/77	0.0	23.3	23.3	0.0	67	9052	9119	0.000	0.0	0	0.7	0
12/ 1/77	0.6	22.2	22.8	0.0	67	9751	9819	0.000	2.7	0	0.7	0
1/ 1/78	0.1	18.2	18.3	0.0	86	10438	10525	0.000	0.6	0	0.8	0
2/ 1/78	0.0	15.1	15.1	0.0	90	11003	11093	0.000	0.0	0	0.8	0
2/17/78	0.0	15.1	15.1	0.0	90	11245	11335	0.000	0.0	0	0.8	0
2/28/78	0.0	15.1	15.1	0.0	90	11412	11502	0.000	0.0	0	0.8	0
3/ 1/78	0.0	22.6	22.6	0.0	90	11427	11517	0.000	0.0	0	0.8	0
3/10/78	0.0	22.6	22.6	0.0	90	11630	11720	0.000	0.0	0	0.8	0
4/ 1/78	0.2	18.2	18.4	0.0	90	12127	12217	0.000	1.0	0	0.7	0
4/ 9/78	0.2	18.2	18.4	0.0	91	12272	12364	0.000	1.0	0	0.7	0
4/10/78	0.2	18.2	18.4	0.0	92	12291	12382	0.000	1.0	0	0.7	0
4/11/78	0.2	18.2	18.4	0.0	92	12309	12401	0.000	1.0	0	0.7	0
5/ 1/78	0.0	21.4	21.4	0.0	96	12673	12769	0.000	0.0	0	0.7	0
6/ 1/78	0.3	17.6	17.9	0.0	96	13337	13433	0.000	1.4	0	0.7	0
7/ 1/78	0.8	21.2	22.0	0.0	103	13865	13969	0.000	3.6	0	0.7	0
8/ 1/78	0.0	19.3	19.3	0.0	128	14523	14651	0.000	0.0	0	0.9	0
9/ 1/78	0.3	16.6	17.0	0.0	128	15122	15250	0.000	1.5	0	0.8	0
10/ 1/78	0.3	18.9	19.2	0.0	135	15626	15761	0.000	1.6	0	0.9	0
11/ 1/78	0.3	14.4	14.7	0.0	145	16212	16356	0.000	2.0	0	0.9	0
12/ 1/78	0.3	12.6	12.9	0.0	154	16643	16797	0.000	2.5	0	0.9	0
1/ 1/79	0.4	12.5	12.9	0.0	164	17033	17197	0.000	2.8	0	1.0	0
2/ 1/79	0.2	11.3	11.5	0.0	175	17421	17596	0.000	1.5	0	1.0	0
3/ 1/79	0.1	11.3	11.5	0.0	180	17738	17918	0.000	1.2	0	1.0	0
4/ 1/79	0.3	14.5	14.8	0.0	184	18089	18273	0.000	1.8	0	1.0	0
5/ 1/79	0.3	15.1	15.4	0.0	192	18524	18717	0.000	2.0	0	1.0	0
6/ 1/79	0.6	12.3	12.9	0.0	202	18993	19195	0.000	4.3	0	1.1	0
7/ 1/79	0.3	12.6	12.9	0.0	219	19362	19581	0.000	2.2	0	1.1	0
8/ 1/79	0.0	12.0	12.0	0.0	227	19753	19980	0.000	0.0	0	1.1	0
9/ 1/79	0.0	10.1	10.1	0.0	227	20124	20351	0.000	0.0	0	1.1	0
10/ 1/79	0.0	10.7	10.7	0.0	227	20426	20654	0.000	0.0	0	1.1	0
11/ 1/79	0.2	9.7	9.9	0.0	227	20758	20986	0.000	1.7	0	1.1	0
12/ 1/79	0.3	10.7	11.0	0.0	233	21050	21282	0.000	3.0	0	1.1	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-107

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.6	8.7	9.3	0.0	243	21381	21623	0.000	6.0	0	1.1	0
2/ 1/80	0.6	9.3	9.9	0.0	260	21650	21910	0.000	5.9	0	1.2	0
3/ 1/80	0.4	8.4	8.5	0.0	277	21920	22197	0.000	4.3	0	1.2	0
4/ 1/80	0.3	11.3	11.7	0.0	288	22171	22460	0.000	2.9	0	1.3	0
5/ 1/80	0.1	8.8	9.0	0.0	298	22511	22809	0.000	1.6	0	1.3	0
6/ 1/80	0.3	8.5	8.8	0.0	303	22784	23087	0.000	3.0	0	1.3	0
7/ 1/80	0.3	7.6	7.9	0.0	311	23040	23351	0.000	4.0	0	1.3	0
8/ 1/80	0.3	12.6	12.9	0.0	321	23274	23594	0.000	2.6	0	1.4	0
9/ 1/80	0.3	9.0	9.4	0.0	331	23663	23994	0.000	3.5	0	1.4	0
10/ 1/80	0.1	6.3	6.4	0.0	341	23934	24275	0.000	1.2	0	1.4	0
11/ 1/80	0.1	7.6	7.7	0.0	343	24129	24472	0.000	1.7	0	1.4	0
11/20/80	0.0	0.0	0.0	0.0	348	24273	24619	0.000	0.0	0	1.4	0

TABLE 49

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-108

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.1	52.6	52.7	0.0	0	0	0	0.000	0.2	0	0.0	0
7/ 1/77	0.1	43.8	43.9	0.0	4	1578	1582	0.000	0.2	0	0.2	0
8/ 1/77	0.1	37.2	37.2	0.0	6	2935	2942	0.000	0.2	0	0.2	0
9/ 1/77	0.2	44.8	44.9	0.0	8	4088	4096	0.000	0.4	0	0.2	0
9/13/77	0.2	44.8	44.9	0.0	11	4625	4635	0.000	0.4	0	0.2	0
10/ 1/77	0.1	24.2	24.3	0.0	14	5431	5444	0.000	0.6	0	0.3	0
11/ 1/77	0.0	22.1	22.1	0.0	18	6181	6199	0.000	0.0	0	0.3	0
12/ 1/77	0.1	21.4	21.6	0.0	18	6842	6860	0.000	0.6	0	0.3	0
1/ 1/78	0.2	21.8	22.1	0.0	22	7507	7529	0.000	1.0	0	0.3	0
2/ 1/78	0.2	18.2	18.4	0.0	28	8194	8213	0.000	1.3	0	0.3	0
2/17/78	0.2	18.2	18.4	0.0	32	8475	8507	0.000	1.3	0	0.4	0
2/28/78	0.2	18.2	18.4	0.0	35	8675	8710	0.000	1.3	0	0.4	0
3/ 1/78	0.1	21.4	21.5	0.0	35	8693	8728	0.000	0.4	0	0.4	0
3/10/78	0.1	21.4	21.5	0.0	36	8886	8921	0.000	0.4	0	0.4	0
4/ 1/78	0.2	20.2	20.3	0.0	38	9356	9394	0.000	1.0	0	0.4	0
4/ 9/78	0.2	20.2	20.3	0.0	39	9517	9557	0.000	1.0	0	0.4	0
4/10/78	0.2	20.2	20.3	0.0	40	9537	9577	0.000	1.0	0	0.4	0
4/11/78	0.2	20.2	20.3	0.0	40	9557	9597	0.000	1.0	0	0.4	0
5/ 1/78	0.4	25.7	26.1	0.0	44	9960	10003	0.000	1.4	0	0.4	0
6/ 1/78	1.0	26.3	27.3	0.0	55	10758	10815	0.000	3.7	0	0.5	0
7/ 1/78	0.8	23.1	23.9	0.0	85	11547	11633	0.000	3.3	0	0.7	0
8/ 1/78	1.2	23.1	24.3	0.0	110	12263	12373	0.000	5.1	0	0.9	0
9/ 1/78	0.5	25.6	26.1	0.0	149	12979	13127	0.000	2.0	0	1.1	0
10/ 1/78	0.9	23.9	24.8	0.0	164	13747	13911	0.000	3.7	0	1.2	0
11/ 1/78	0.7	18.9	19.6	0.0	193	14487	14680	0.000	3.8	0	1.3	0
12/ 1/78	1.3	19.4	20.7	0.0	215	15054	15269	0.000	6.2	0	1.4	0
1/ 1/79	0.4	18.8	19.2	0.0	255	15655	15910	0.000	1.9	0	1.6	0
2/ 1/79	0.4	18.2	18.6	0.0	266	16239	16505	0.000	2.0	0	1.6	0
3/ 1/79	0.9	17.6	18.5	0.0	278	16748	17025	0.000	4.7	0	1.6	0
4/ 1/79	0.8	27.8	28.6	0.0	304	17295	17598	0.000	2.8	0	1.7	0
5/ 1/79	0.9	18.9	19.8	0.0	328	18129	18456	0.000	4.6	0	1.8	0
6/ 1/79	0.8	17.0	17.9	0.0	355	18714	19069	0.000	4.7	0	1.9	0
7/ 1/79	0.9	17.0	17.9	0.0	381	19225	19605	0.000	4.8	0	1.9	0
8/ 1/79	1.0	11.3	12.2	0.0	407	19752	20160	0.000	7.8	0	2.0	0
9/ 1/79	0.8	17.5	18.4	0.0	437	20101	20538	0.000	4.5	0	2.1	0
10/ 1/79	0.8	14.4	15.2	0.0	462	20627	21089	0.000	5.2	0	2.2	0
11/ 1/79	0.7	13.7	14.4	0.0	487	21074	21561	0.000	4.8	0	2.3	0
12/ 1/79	0.7	15.0	15.7	0.0	508	21486	21994	0.000	4.2	0	2.3	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-108

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	15.0	15.4	0.0	528	21952	22481	0.000	2.4	0	2.4	0
2/ 1/80	0.4	15.7	16.0	0.0	540	22418	22958	0.000	2.4	0	2.4	0
3/ 1/80	0.6	15.3	15.9	0.0	551	22872	23424	0.000	4.0	0	2.4	0
4/ 1/80	0.7	15.7	16.3	0.0	571	23347	23918	0.000	4.1	0	2.4	0
5/ 1/80	0.6	15.1	15.7	0.0	591	23816	24406	0.000	3.9	0	2.4	0
6/ 1/80	0.5	15.2	15.7	0.0	610	24284	24894	0.000	3.4	0	2.5	0
7/ 1/80	0.3	16.4	16.7	0.0	628	24739	25365	0.000	1.9	0	2.5	0
8/ 1/80	0.7	15.7	16.3	0.0	636	25246	25882	0.000	4.0	0	2.5	0
9/ 1/80	0.3	15.1	15.4	0.0	656	25732	26388	0.000	2.1	0	2.5	0
10/ 1/80	0.1	15.1	15.3	0.0	666	26185	26851	0.000	1.0	0	2.5	0
11/ 1/80	0.3	15.1	15.4	0.0	671	26653	27324	0.000	1.8	0	2.5	0
11/20/80	0.0	0.0	0.0	0.0	676	26941	27616	0.000	0.0	0	2.4	0

TABLE 50

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/77 PAGE 1

WELL: H-109

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.2	44.6	44.8	0.0	0	0	0	0.000	0.5	0	0.0	0
7/ 1/77	0.2	37.1	37.2	0.0	7	1338	1345	0.000	0.4	0	0.5	0
8/ 1/77	0.1	31.5	31.6	0.0	12	2487	2500	0.000	0.5	0	0.5	0
9/ 1/77	0.1	60.5	60.6	0.0	17	3464	3480	0.000	0.2	0	0.5	0
9/13/77	0.1	60.5	60.6	0.0	18	4190	4208	0.000	0.2	0	0.4	0
10/ 1/77	0.2	20.2	20.4	0.0	21	5279	5299	0.000	1.1	0	0.4	0
11/ 1/77	0.3	17.6	17.9	0.0	28	5905	5933	0.000	1.7	0	0.5	0
12/ 1/77	0.2	16.7	16.9	0.0	37	6434	6471	0.000	1.1	0	0.6	0
1/ 1/78	0.4	16.9	17.3	0.0	43	6953	6995	0.000	2.6	0	0.6	0
2/ 1/78	0.2	15.0	15.3	0.0	56	7475	7531	0.000	1.5	0	0.7	0
2/17/78	0.2	15.0	15.3	0.0	60	7715	7776	0.000	1.5	0	0.8	0
2/28/78	0.2	15.0	15.3	0.0	63	7881	7943	0.000	1.5	0	0.8	0
3/ 1/78	0.4	18.8	19.2	0.0	63	7896	7959	0.000	2.0	0	0.8	0
3/10/78	0.4	18.8	19.2	0.0	66	8065	8131	0.000	2.0	0	0.8	0
4/ 1/78	0.0	17.6	17.6	0.0	75	8479	8554	0.000	0.0	0	0.9	0
4/ 9/78	0.0	17.6	17.6	0.0	75	8620	8695	0.000	0.0	0	0.9	0
4/10/78	0.0	17.6	17.6	0.0	75	8637	8712	0.000	0.0	0	0.9	0
4/11/78	0.0	17.6	17.6	0.0	75	8655	8730	0.000	0.0	0	0.9	0
5/ 1/78	0.2	13.8	14.0	0.0	75	9008	9083	0.000	1.3	0	0.8	0
6/ 1/78	0.0	13.2	13.2	0.0	81	9436	9517	0.000	0.0	0	0.8	0
7/ 1/78	0.0	12.0	12.0	0.0	81	9833	9914	0.000	0.0	0	0.8	0
8/ 1/78	0.2	12.5	12.7	0.0	81	10204	10285	0.000	1.4	0	0.8	0
9/ 1/78	0.0	13.5	13.5	0.0	86	10594	10680	0.000	0.0	0	0.8	0
10/ 1/78	0.2	17.6	17.8	0.0	86	11000	11086	0.000	0.9	0	0.8	0
11/ 1/78	0.3	13.9	14.1	0.0	91	11547	11637	0.000	2.1	0	0.8	0
12/ 1/78	0.3	13.2	13.5	0.0	100	11962	12062	0.000	2.4	0	0.8	0
1/ 1/79	0.0	13.9	13.9	0.0	110	12371	12481	0.000	0.0	0	0.9	0
2/ 1/79	0.5	12.5	13.0	0.0	110	12801	12911	0.000	3.5	0	0.8	0
3/ 1/79	0.4	12.0	12.4	0.0	122	13151	13273	0.000	3.5	0	0.9	0
4/ 1/79	0.3	11.4	11.6	0.0	136	13522	13658	0.000	2.3	0	1.0	0
5/ 1/79	0.6	15.1	15.7	0.0	144	13863	14007	0.000	3.8	0	1.0	0
6/ 1/79	0.6	13.9	14.5	0.0	163	14331	14493	0.000	3.9	0	1.1	0
7/ 1/79	0.6	16.4	17.0	0.0	179	14748	14926	0.000	3.4	0	1.2	0
8/ 1/79	0.5	17.0	17.3	0.0	197	15256	15453	0.000	1.8	0	1.3	0
9/ 1/79	0.0	16.4	16.4	0.0	207	15783	15990	0.000	0.0	0	1.3	0
10/ 1/79	0.3	15.1	15.4	0.0	207	16274	16481	0.000	2.1	0	1.3	0
11/ 1/79	0.4	11.9	12.3	0.0	217	16742	16959	0.000	2.9	0	1.3	0
12/ 1/79	0.7	11.2	12.0	0.0	227	17099	17327	0.000	6.1	0	1.3	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-109

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	11.9	12.3	0.0	250	17448	17698	0.000	3.0	0	1.4	0
2/ 1/80	0.4	11.2	11.6	0.0	262	17816	18078	0.000	3.4	0	1.4	0
3/ 1/80	0.2	10.7	10.9	0.0	273	18142	18415	0.000	1.6	0	1.5	0
4/ 1/80	0.3	11.6	11.9	0.0	279	18473	18752	0.000	2.7	0	1.5	0
5/ 1/80	0.1	11.4	11.5	0.0	288	18821	19110	0.000	1.3	0	1.5	0
6/ 1/80	0.4	12.0	12.4	0.0	293	19174	19467	0.000	3.2	0	1.5	0
7/ 1/80	0.2	10.7	10.9	0.0	305	19534	19839	0.000	1.4	0	1.5	0
8/ 1/80	0.7	15.0	15.7	0.0	309	19866	20175	0.000	4.2	0	1.5	0
9/ 1/80	0.2	10.4	10.5	0.0	330	20332	20662	0.000	1.5	0	1.6	0
10/ 1/80	0.1	8.8	9.0	0.0	335	20643	20978	0.000	1.6	0	1.6	0
11/ 1/80	0.3	10.1	10.4	0.0	339	20916	21258	0.000	2.6	0	1.6	0
11/20/80	0.0	0.0	0.0	0.0	344	21108	21453	0.000	0.0	0	1.6	0

TABLE 51

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-110

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.1	57.2	57.3	0.0	0	0	0	0.000	0.2	0	0.0	0
7/ 1/77	0.1	47.5	47.6	0.0	4	1714	1718	0.000	0.2	0	0.2	0
8/ 1/77	0.1	40.3	40.4	0.0	6	3187	3193	0.000	0.2	0	0.2	0
9/ 1/77	0.6	64.4	65.0	0.0	8	4436	4445	0.000	0.9	0	0.2	0
9/13/77	0.6	64.4	65.0	0.0	18	5209	5225	0.000	0.9	0	0.3	0
10/ 1/77	0.6	18.4	19.0	0.0	26	6368	6394	0.000	2.9	0	0.4	0
11/ 1/77	0.0	14.5	14.5	0.0	44	6938	6982	0.000	0.0	0	0.6	0
12/ 1/77	0.1	16.4	16.5	0.0	44	7373	7416	0.000	0.7	0	0.6	0
1/ 1/78	1.0	14.1	15.1	0.0	47	7881	7929	0.000	6.6	0	0.6	0
2/ 1/78	0.5	17.4	17.9	0.0	78	8320	8398	0.000	2.7	0	0.9	0
2/17/78	0.5	17.4	17.9	0.0	86	8599	8685	0.000	2.7	0	1.0	0
2/28/78	0.5	17.4	17.9	0.0	91	8791	8882	0.000	2.7	0	1.0	0
3/ 1/78	1.2	33.1	34.3	0.0	92	8808	8900	0.000	3.4	0	1.0	0
3/10/78	1.2	33.1	34.3	0.0	102	9106	9208	0.000	3.4	0	1.1	0
4/ 1/78	1.6	31.7	33.3	0.0	128	9834	9962	0.000	4.8	0	1.3	0
4/ 9/78	1.6	31.7	33.3	0.0	141	10088	10228	0.000	4.8	0	1.4	0
4/10/78	1.6	31.7	33.3	0.0	142	10119	10262	0.000	4.8	0	1.4	0
4/11/78	1.6	31.7	33.3	0.0	144	10151	10295	0.000	4.8	0	1.4	0
5/ 1/78	0.8	27.5	28.3	0.0	176	10785	10961	0.000	2.7	0	1.6	0
6/ 1/78	1.0	25.2	26.2	0.0	199	11639	11838	0.000	3.9	0	1.7	0
7/ 1/78	0.0	22.8	22.8	0.0	230	12394	12624	0.000	0.0	0	1.8	0
8/ 1/78	1.4	23.0	24.5	0.0	230	13100	13330	0.000	5.9	0	1.7	0
9/ 1/78	1.6	20.7	22.3	0.0	274	13814	14088	0.000	7.0	0	1.9	0
10/ 1/78	1.5	22.6	24.1	0.0	321	14436	14757	0.000	6.3	0	2.2	0
11/ 1/78	0.3	18.6	18.9	0.0	368	15137	15505	0.000	1.6	0	2.4	0
12/ 1/78	1.0	13.1	14.1	0.0	377	15694	16071	0.000	6.8	0	2.3	0
1/ 1/79	1.1	21.2	22.3	0.0	407	16101	16506	0.000	4.9	0	2.5	0
2/ 1/79	1.1	20.6	21.7	0.0	441	16758	17199	0.000	5.1	0	2.6	0
3/ 1/79	1.0	18.9	19.9	0.0	472	17334	17806	0.000	5.1	0	2.6	0
4/ 1/79	1.1	20.0	21.0	0.0	503	17919	18423	0.000	5.0	0	2.7	0
5/ 1/79	1.0	22.6	23.6	0.0	535	18518	19053	0.000	4.2	0	2.8	0
6/ 1/79	1.1	22.1	23.2	0.0	566	19220	19786	0.000	4.8	0	2.9	0
7/ 1/79	1.2	20.8	22.0	0.0	600	19883	20482	0.000	5.3	0	2.9	0
8/ 1/79	1.1	21.6	22.8	0.0	635	20527	21163	0.000	4.9	0	3.0	0
9/ 1/79	1.3	21.2	22.6	0.0	670	21198	21868	0.000	5.9	0	3.1	0
10/ 1/79	1.6	20.7	22.2	0.0	710	21835	22546	0.000	7.1	0	3.1	0
11/ 1/79	1.4	20.6	22.0	0.0	759	22476	23235	0.000	6.4	0	3.3	0
12/ 1/79	1.3	22.5	23.8	0.0	801	23092	23894	0.000	5.6	0	3.4	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-110

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.7	19.4	20.1	0.0	843	23790	24633	0.000	3.7	0	3.4	0
2/ 1/80	1.2	21.1	22.3	0.0	866	24390	25256	0.000	5.2	0	3.4	0
3/ 1/80	1.1	23.1	24.2	0.0	900	25003	25902	0.000	4.6	0	3.5	0
4/ 1/80	0.7	22.0	22.6	0.0	934	25718	26652	0.000	3.0	0	3.5	0
5/ 1/80	0.6	22.7	23.3	0.0	954	26377	27331	0.000	2.6	0	3.5	0
6/ 1/80	0.9	26.5	27.4	0.0	973	27079	28052	0.000	3.2	0	3.5	0
7/ 1/80	0.9	27.0	28.0	0.0	999	27875	28874	0.000	3.4	0	3.5	0
8/ 1/80	0.7	28.9	29.6	0.0	1028	28712	29741	0.000	2.2	0	3.5	0
9/ 1/80	0.5	18.8	19.3	0.0	1049	29608	30657	0.000	2.5	0	3.4	0
10/ 1/80	0.4	16.4	16.7	0.0	1063	30174	31237	0.000	2.3	0	3.4	0
11/ 1/80	0.7	17.1	17.7	0.0	1075	30681	31756	0.000	3.8	0	3.4	0
11/20/80	0.0	0.0	0.0	0.0	1088	31005	32093	0.000	0.0	0	3.4	0

TABLE 52

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-111

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.6	49.8	50.3	0.0	0	0	0	0.000	1.3	0	0.0	0
7/ 1/77	0.4	41.4	41.9	0.0	19	1489	1508	0.000	1.0	0	1.3	0
8/ 1/77	0.4	40.9	41.3	0.0	32	2774	2805	0.000	0.9	0	1.1	0
9/ 1/77	1.1	50.0	51.1	0.0	44	4043	4086	0.000	2.1	0	1.1	0
9/15/77	1.1	50.0	51.1	0.0	57	4642	4699	0.000	2.1	0	1.2	0
10/ 1/77	0.3	22.8	23.1	0.0	76	5542	5618	0.000	1.5	0	1.4	0
11/ 1/77	0.0	14.5	14.5	0.0	87	6249	6335	0.000	0.0	0	1.4	0
12/ 1/77	0.0	17.0	17.0	0.0	87	6684	6770	0.000	0.0	0	1.3	0
1/ 1/78	0.2	18.2	18.4	0.0	87	7211	7297	0.000	1.2	0	1.2	0
2/ 1/78	0.2	20.7	20.9	0.0	93	7775	7868	0.000	1.1	0	1.2	0
2/17/78	0.2	20.7	20.9	0.0	97	8106	8203	0.000	1.1	0	1.2	0
2/28/78	0.2	20.7	20.9	0.0	100	8334	8433	0.000	1.1	0	1.2	0
3/ 1/78	0.4	22.6	23.0	0.0	100	8354	8454	0.000	1.7	0	1.2	0
3/10/78	0.4	22.6	23.0	0.0	103	8558	8661	0.000	1.7	0	1.2	0
4/ 1/78	0.2	20.1	20.3	0.0	112	9055	9166	0.000	0.9	0	1.2	0
4/ 9/78	0.2	20.1	20.3	0.0	113	9216	9329	0.000	0.9	0	1.2	0
4/10/78	0.2	20.1	20.3	0.0	114	9236	9349	0.000	0.9	0	1.2	0
4/11/78	0.2	20.1	20.3	0.0	114	9256	9370	0.000	0.9	0	1.2	0
5/ 1/78	0.0	28.9	28.9	0.0	118	9659	9777	0.000	0.0	0	1.2	0
6/ 1/78	0.0	19.5	19.5	0.0	118	10556	10674	0.000	0.0	0	1.1	0
7/ 1/78	0.0	20.2	20.2	0.0	118	11142	11260	0.000	0.0	0	1.0	0
8/ 1/78	0.2	21.7	21.9	0.0	118	11767	11885	0.000	0.8	0	1.0	0
9/ 1/78	0.0	22.7	22.7	0.0	123	12440	12562	0.000	0.0	0	1.0	0
10/ 1/78	0.6	21.4	22.0	0.0	123	13120	13243	0.000	2.8	0	0.9	0
11/ 1/78	0.3	17.6	17.9	0.0	142	13783	13925	0.000	1.7	0	1.0	0
12/ 1/78	0.3	16.5	16.7	0.0	151	14312	14463	0.000	1.9	0	1.0	0
1/ 1/79	0.3	19.8	20.1	0.0	161	14819	14980	0.000	1.6	0	1.1	0
2/ 1/79	0.4	15.7	16.0	0.0	171	15432	15605	0.000	2.3	0	1.1	0
3/ 1/79	0.6	15.7	16.3	0.0	181	15871	16052	0.000	3.6	0	1.1	0
4/ 1/79	0.5	17.1	17.6	0.0	199	16359	16556	0.000	3.0	0	1.2	0
5/ 1/79	0.6	17.0	17.6	0.0	215	16871	17086	0.000	3.4	0	1.3	0
6/ 1/79	0.7	17.4	18.1	0.0	233	17393	17631	0.000	3.9	0	1.3	0
7/ 1/79	0.7	16.4	17.1	0.0	255	17918	18173	0.000	4.2	0	1.4	0
8/ 1/79	0.6	17.0	17.6	0.0	277	18426	18703	0.000	3.6	0	1.5	0
9/ 1/79	0.7	16.9	17.6	0.0	297	18952	19248	0.000	3.8	0	1.5	0
10/ 1/79	0.6	17.7	18.3	0.0	317	19459	19776	0.000	3.5	0	1.6	0
11/ 1/79	0.7	15.0	15.7	0.0	337	20008	20344	0.000	4.5	0	1.7	0
12/ 1/79	0.5	18.8	19.4	0.0	358	20453	20815	0.000	2.7	0	1.7	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-111

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.7	16.2	17.0	0.0	374	21041	21415	0.000	4.4	0	1.7	0
2/ 1/80	0.6	16.2	16.8	0.0	397	21544	21941	0.000	3.4	0	1.8	0
3/ 1/80	0.5	12.8	13.4	0.0	414	22015	22428	0.000	4.1	0	1.8	0
4/ 1/80	0.7	12.5	13.2	0.0	430	22412	22842	0.000	5.1	0	1.9	0
5/ 1/80	0.8	11.9	12.5	0.0	451	22787	23237	0.000	4.8	0	1.9	0
6/ 1/80	0.5	12.6	13.2	0.0	469	23157	23627	0.000	4.0	0	2.0	0
7/ 1/80	0.8	13.1	13.7	0.0	485	23537	24022	0.000	4.6	0	2.0	0
8/ 1/80	0.7	11.9	12.5	0.0	505	23943	24443	0.000	5.3	0	2.1	0
9/ 1/80	0.7	15.7	16.3	0.0	525	24311	24837	0.000	4.0	0	2.1	0
10/ 1/80	0.8	15.7	16.3	0.0	545	24782	25327	0.000	3.7	0	2.2	0
11/ 1/80	0.8	15.2	16.0	0.0	564	25269	25833	0.000	5.1	0	2.2	0
11/20/80	0.0	0.0	0.0	0.0	580	25557	26137	0.000	0.0	0	2.2	0

TABLE 53

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-112

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	3.0	62.0	65.0	0.0	0	0	0	0.000	4.6	0	0.0	0
7/ 1/77	1.8	52.4	54.2	0.0	89	1860	1950	0.000	3.4	0	4.6	0
8/ 1/77	1.7	44.5	46.2	0.0	146	3483	3630	0.000	3.6	0	4.0	0
9/ 1/77	0.8	76.4	77.2	0.0	198	4865	5063	0.000	1.1	0	3.9	0
9/13/77	0.8	76.4	77.2	0.0	208	5782	5990	0.000	1.1	0	3.5	0
10/ 1/77	0.6	28.8	29.4	0.0	223	7157	7380	0.000	2.1	0	3.0	0
11/ 1/77	0.9	25.2	26.1	0.0	242	8050	8292	0.000	3.4	0	2.9	0
12/ 1/77	0.2	21.5	21.7	0.0	269	8805	9074	0.000	1.1	0	3.0	0
1/ 1/78	0.2	16.9	17.1	0.0	277	9470	9747	0.000	1.3	0	2.8	0
2/ 1/78	0.2	27.8	27.9	0.0	283	9995	10279	0.000	0.8	0	2.8	0
2/12/78	0.2	27.8	27.9	0.0	287	10437	10725	0.000	0.8	0	2.7	0
2/28/78	0.2	27.8	27.9	0.0	290	10741	11031	0.000	0.8	0	2.6	0
3/ 1/78	0.4	46.5	46.9	0.0	290	10759	11059	0.000	0.8	0	2.6	0
3/10/78	0.4	46.5	46.9	0.0	293	11188	11481	0.000	0.8	0	2.6	0
4/ 1/78	0.3	27.0	27.3	0.0	302	12211	12513	0.000	1.1	0	2.4	0
4/ 9/78	0.3	27.0	27.3	0.0	304	12427	12732	0.000	1.1	0	2.4	0
4/10/78	0.3	27.0	27.3	0.0	305	12454	12759	0.000	1.1	0	2.4	0
4/11/78	0.3	27.0	27.3	0.0	305	12481	12786	0.000	1.1	0	2.4	0
5/ 1/78	1.5	24.2	25.7	0.0	311	13022	13333	0.000	5.9	0	2.3	0
6/ 1/78	0.7	17.5	18.2	0.0	358	13773	14130	0.000	3.7	0	2.5	0
7/ 1/78	0.8	21.2	22.0	0.0	378	14299	14677	0.000	3.6	0	2.6	0
8/ 1/78	0.7	20.0	20.7	0.0	402	14957	15359	0.000	3.5	0	2.6	0
9/ 1/78	0.8	20.4	21.2	0.0	425	15577	16002	0.000	3.7	0	2.7	0
10/ 1/78	0.6	23.9	24.5	0.0	448	16189	16637	0.000	2.5	0	2.7	0
11/ 1/78	0.4	17.6	18.1	0.0	467	16930	17397	0.000	2.5	0	2.7	0
12/ 1/78	0.3	15.1	15.4	0.0	480	17459	17939	0.000	2.1	0	2.7	0
1/ 1/79	0.6	15.3	15.9	0.0	490	17927	18417	0.000	3.5	0	2.7	0
2/ 1/79	0.5	15.8	16.2	0.0	507	18402	18909	0.000	3.4	0	2.7	0
3/ 1/79	0.4	16.4	16.8	0.0	522	18840	19362	0.000	2.6	0	2.7	0
4/ 1/79	0.5	15.8	16.3	0.0	536	19347	19883	0.000	3.2	0	2.7	0
5/ 1/79	0.6	15.1	15.7	0.0	552	19821	20373	0.000	3.8	0	2.7	0
6/ 1/79	0.5	15.1	15.6	0.0	570	20290	20860	0.000	3.1	0	2.7	0
7/ 1/79	0.4	16.4	16.8	0.0	585	20744	21329	0.000	2.5	0	2.7	0
8/ 1/79	0.3	16.4	16.7	0.0	598	21251	21850	0.000	1.9	0	2.7	0
9/ 1/79	0.3	15.1	15.4	0.0	608	21758	22367	0.000	2.2	0	2.7	0
10/ 1/79	0.0	17.0	17.0	0.0	618	22211	22829	0.000	0.0	0	2.7	0
11/ 1/79	0.3	20.1	20.4	0.0	618	22733	23356	0.000	1.3	0	2.6	0
12/ 1/79	0.7	16.3	17.0	0.0	626	23341	23968	0.000	3.9	0	2.6	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-112

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	1.7	15.8	17.6	0.0	647	23847	24493	0.000	4.2	0	2.6	0
2/ 1/80	0.8	16.2	17.0	0.0	670	24369	25039	0.000	4.6	0	2.7	0
3/ 1/80	0.4	15.7	16.1	0.0	693	24838	25531	0.000	2.3	0	2.7	0
4/ 1/80	0.3	16.3	16.6	0.0	704	25324	26028	0.000	1.5	0	2.7	0
5/ 1/80	0.1	13.9	14.0	0.0	712	25814	26526	0.000	1.0	0	2.7	0
6/ 1/80	0.5	18.9	19.5	0.0	718	26244	26960	0.000	2.7	0	2.7	0
7/ 1/80	0.2	14.3	14.6	0.0	732	26812	27544	0.000	1.0	0	2.7	0
8/ 1/80	0.2	12.6	12.7	0.0	737	27261	27998	0.000	1.3	0	2.6	0
9/ 1/80	0.2	12.6	12.7	0.0	742	27651	28393	0.000	1.3	0	2.6	0
10/ 1/80	0.1	11.3	11.5	0.0	747	28028	28775	0.000	1.3	0	2.6	0
11/ 1/80	0.3	11.4	11.6	0.0	751	28379	29131	0.000	2.3	0	2.6	0
11/30/80	0.0	0.0	0.0	0.0	756	28595	29352	0.000	0.0	0	2.6	0

TABLE 54

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-113

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	0.6	49.6	50.3	0.0	0	0	0	0.000	1.3	0	0.0	0
7/ 1/77	0.4	41.4	41.9	0.0	19	1489	1508	0.000	1.0	0	1.3	0
8/ 1/77	0.4	35.2	35.6	0.0	32	2774	2805	0.000	1.1	0	1.1	0
9/ 1/77	0.8	43.6	44.4	0.0	44	3864	3908	0.000	1.8	0	1.1	0
9/13/77	0.8	43.6	44.4	0.0	53	4388	4442	0.000	1.8	0	1.2	0
10/ 1/77	0.7	34.2	34.9	0.0	67	5173	5240	0.000	2.0	0	1.3	0
11/ 1/77	1.0	32.1	33.1	0.0	88	6234	6322	0.000	3.1	0	1.4	0
12/ 1/77	0.9	27.9	28.7	0.0	120	7197	7316	0.000	3.0	0	1.6	0
1/ 1/78	0.7	22.4	23.1	0.0	146	8061	8207	0.000	2.9	0	1.8	0
2/ 1/78	0.2	29.5	29.7	0.0	167	8756	8924	0.000	0.8	0	1.9	0
2/17/78	0.2	29.5	29.7	0.0	171	9229	9400	0.000	0.8	0	1.8	0
2/28/78	0.2	29.5	29.7	0.0	174	9553	9727	0.000	0.8	0	1.8	0
3/ 1/78	0.2	35.2	35.4	0.0	174	9583	9757	0.000	0.5	0	1.8	0
3/10/78	0.2	35.2	35.4	0.0	176	9900	10076	0.000	0.5	0	1.7	0
4/ 1/78	1.3	30.5	31.8	0.0	180	10675	10855	0.000	4.1	0	1.7	0
4/ 9/78	1.3	30.5	31.8	0.0	190	10919	11110	0.000	4.1	0	1.7	0
4/10/78	1.3	30.5	31.8	0.0	191	10950	11141	0.000	4.1	0	1.7	0
4/11/78	1.3	30.5	31.8	0.0	193	10981	11173	0.000	4.1	0	1.7	0
5/ 1/78	0.4	32.0	32.4	0.0	219	11591	11810	0.000	1.2	0	1.9	0
6/ 1/78	0.7	28.9	29.6	0.0	230	12583	12813	0.000	2.3	0	1.8	0
7/ 1/78	1.2	29.9	31.1	0.0	250	13450	13700	0.000	3.8	0	1.8	0
8/ 1/78	1.1	30.7	31.7	0.0	287	14377	14664	0.000	3.4	0	2.0	0
9/ 1/78	0.0	29.6	29.6	0.0	320	15328	15648	0.000	0.0	0	2.0	0
10/ 1/78	0.6	28.3	28.9	0.0	320	16216	16536	0.000	2.1	0	1.9	0
11/ 1/78	0.6	19.8	20.4	0.0	339	17094	17433	0.000	2.9	0	1.9	0
12/ 1/78	0.3	23.9	24.2	0.0	357	17688	18045	0.000	1.3	0	2.0	0
1/ 1/79	0.5	23.8	24.4	0.0	367	18429	18797	0.000	2.1	0	2.0	0
2/ 1/79	0.4	26.4	26.8	0.0	383	19168	19551	0.000	1.4	0	2.0	0
3/ 1/79	0.4	25.8	26.3	0.0	394	19907	20300	0.000	1.7	0	1.9	0
4/ 1/79	0.5	26.5	27.0	0.0	407	20707	21114	0.000	2.0	0	1.9	0
5/ 1/79	0.7	25.8	26.5	0.0	423	21503	21928	0.000	2.8	0	1.9	0
6/ 1/79	0.7	26.5	27.2	0.0	448	22303	22749	0.000	2.6	0	2.0	0
7/ 1/79	0.9	27.7	28.8	0.0	467	23097	23564	0.000	3.0	0	2.0	0
8/ 1/79	1.0	26.4	27.3	0.0	494	23957	24454	0.000	3.5	0	2.0	0
9/ 1/79	0.8	26.4	27.2	0.0	524	24774	25298	0.000	3.1	0	2.1	0
10/ 1/79	1.0	25.7	26.7	0.0	549	25565	26113	0.000	3.6	0	2.1	0
11/ 1/79	0.7	50.5	51.0	0.0	578	26363	26941	0.000	1.4	0	2.1	0
12/ 1/79	0.3	23.9	[illegible]	0.0	599	27871	28470	0.000	1.4	0	2.1	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-113

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.4	25.1	25.5	0.0	609	28612	29222	0.000	1.5	0	2.1	0
2/ 1/80	0.4	25.1	25.5	0.0	621	29391	30012	0.000	1.5	0	2.1	0
3/ 1/80	0.5	25.7	26.2	0.0	632	30119	30751	0.000	1.7	0	2.1	0
4/ 1/80	0.7	25.7	26.4	0.0	648	30916	31563	0.000	2.5	0	2.0	0
5/ 1/80	0.9	23.9	24.8	0.0	667	31689	32355	0.000	3.7	0	2.1	0
6/ 1/80	0.5	27.8	28.3	0.0	695	32430	33124	0.000	1.9	0	2.1	0
7/ 1/80	0.9	27.6	28.6	0.0	711	33263	33973	0.000	3.3	0	2.1	0
8/ 1/80	1.0	25.7	26.7	0.0	740	34119	34860	0.000	3.7	0	2.1	0
9/ 1/80	1.0	23.2	24.2	0.0	771	34916	35687	0.000	4.1	0	2.2	0
10/ 1/80	0.9	23.9	24.8	0.0	801	35612	36413	0.000	3.7	0	2.2	0
11/ 1/80	1.4	21.5	22.9	0.0	829	36353	37182	0.000	5.9	0	2.2	0
11/20/80	0.0	0.0	0.0	0.0	855	36762	37616	0.000	0.0	0	2.3	0

TABLE 55

PRODUCTION DATA FOR PRODUCTION WELL FROM 6/ 1/77 TO 12/ 1/79 PAGE 1

WELL: H-114

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
6/ 1/77	1.8	43.6	45.4	0.0	0	0	0	0.000	3.9	0	0.0	0
7/ 1/77	1.2	36.7	37.9	0.0	53	1309	1362	0.000	3.1	0	3.9	0
8/ 1/77	1.1	21.3	22.3	0.0	90	2448	2538	0.000	4.7	0	3.5	0
9/ 1/77	0.7	39.2	39.9	0.0	122	3107	3229	0.000	1.8	0	3.8	0
9/13/77	0.7	39.2	39.9	0.0	131	3577	3708	0.000	1.8	0	3.5	0
10/ 1/77	0.0	26.5	26.5	0.0	144	4283	4427	0.000	0.0	0	3.3	0
11/ 1/77	0.0	29.6	29.6	0.0	144	5103	5247	0.000	0.0	0	2.7	0
12/ 1/77	1.5	28.6	30.1	0.0	144	5992	6136	0.000	4.9	0	2.3	0
1/ 1/78	0.2	26.4	26.6	0.0	190	6878	7068	0.000	0.8	0	2.7	0
2/ 1/78	0.2	26.4	26.6	0.0	197	7696	7893	0.000	0.9	0	2.5	0
2/17/78	0.2	26.4	26.6	0.0	200	8118	8319	0.000	0.9	0	2.4	0
2/28/78	0.2	26.4	26.6	0.0	203	8408	8611	0.000	0.9	0	2.4	0
3/ 1/78	0.4	27.6	28.0	0.0	203	8434	8636	0.000	1.4	0	2.4	0
3/10/78	0.4	27.6	28.0	0.0	207	8683	8890	0.000	1.4	0	2.3	0
4/ 1/78	0.3	27.3	27.6	0.0	215	9291	9506	0.000	1.1	0	2.3	0
4/ 9/78	0.3	27.3	27.6	0.0	218	9509	9727	0.000	1.1	0	2.2	0
4/10/78	0.3	27.3	27.6	0.0	218	9537	9755	0.000	1.1	0	2.2	0
4/11/78	0.3	27.3	27.6	0.0	218	9564	9782	0.000	1.1	0	2.2	0
5/ 1/78	0.4	27.6	28.0	0.0	224	10110	10335	0.000	1.3	0	2.2	0
6/ 1/78	1.0	27.0	28.0	0.0	236	10967	11203	0.000	3.6	0	2.1	0
7/ 1/78	0.2	24.5	24.7	0.0	266	11776	12042	0.000	0.8	0	2.2	0
8/ 1/78	0.7	22.6	23.3	0.0	272	12536	12808	0.000	3.1	0	2.1	0
9/ 1/78	1.0	26.6	27.7	0.0	294	13235	13529	0.000	3.8	0	2.2	0
10/ 1/78	0.6	23.9	24.5	0.0	326	14034	14359	0.000	2.5	0	2.3	0
11/ 1/78	0.9	27.1	28.0	0.0	344	14775	15119	0.000	3.2	0	2.3	0
12/ 1/78	0.6	25.1	25.8	0.0	371	15587	15958	0.000	2.5	0	2.3	0
1/ 1/79	0.6	25.7	26.3	0.0	391	16366	16757	0.000	2.4	0	2.3	0
2/ 1/79	0.5	25.7	26.3	0.0	411	17163	17574	0.000	2.1	0	2.3	0
3/ 1/79	0.6	20.8	21.4	0.0	427	17883	18309	0.000	2.7	0	2.3	0
4/ 1/79	0.7	21.5	22.1	0.0	445	18529	18974	0.000	3.0	0	2.3	0
5/ 1/79	0.7	22.7	23.4	0.0	464	19173	19636	0.000	3.2	0	2.4	0
6/ 1/79	0.8	24.3	25.1	0.0	488	19876	20363	0.000	3.1	0	2.4	0
7/ 1/79	0.7	23.9	24.7	0.0	511	20604	21115	0.000	2.9	0	2.4	0
8/ 1/79	1.0	23.9	24.8	0.0	533	21346	21879	0.000	3.8	0	2.4	0
9/ 1/79	0.7	23.9	24.5	0.0	563	22086	22648	0.000	2.7	0	2.5	0
10/ 1/79	0.6	23.9	24.5	0.0	583	22802	23384	0.000	2.6	0	2.5	0
11/ 1/79	0.9	22.5	23.4	0.0	602	23542	24144	0.000	3.8	0	2.5	0
12/ 1/79	0.3	20.2	20.5	0.0	629	24218	24847	0.000	1.6	0	2.5	0

PRODUCTION DATA FOR PRODUCTION WELL FROM 1/ 1/80 TO 11/ 1/80 PAGE 2

WELL: H-114

LAWRY-ERDA PROJECT

DATE	ALLOCATED PRODUCTION RATES				CUMULATIVE PRODUCTION				PRODUCING		CUMULATIVE	
	OIL	WATER	TOT.FLUID	GAS	OIL	WATER	TOT.FLUID	GAS	OIL CUT	GAS-OIL RATIO	OIL CUT	GAS-OIL RATIO
MO/DY/YR	BBL/DAY	BBL/DAY	BBL/DAY	MCF/DAY	BBL	BBL	BBL	MMCF	%	SCF/BBL	%	MCF/BBL
1/ 1/80	0.7	23.8	24.5	0.0	639	24841	25480	0.000	3.0	0	2.5	0
2/ 1/80	0.8	23.7	24.5	0.0	662	25578	26241	0.000	3.2	0	2.5	0
3/ 1/80	0.4	24.5	24.9	0.0	685	26267	26952	0.000	1.5	0	2.5	0
4/ 1/80	0.5	23.9	24.4	0.0	696	27026	27722	0.000	2.0	0	2.5	0
5/ 1/80	0.6	24.5	25.1	0.0	711	27742	28453	0.000	2.4	0	2.5	0
6/ 1/80	0.8	24.6	25.4	0.0	730	28503	29233	0.000	3.1	0	2.5	0
7/ 1/80	0.9	22.6	23.6	0.0	754	29242	29996	0.000	4.0	0	2.5	0
8/ 1/80	1.2	21.9	23.1	0.0	783	29943	30726	0.000	5.0	0	2.5	0
9/ 1/80	0.7	13.2	13.9	0.0	819	30622	31441	0.000	4.8	0	2.6	0
10/ 1/80	0.3	22.7	23.0	0.0	839	31019	31856	0.000	1.3	0	2.6	0
11/ 1/80	0.3	22.1	22.3	0.0	848	31722	32570	0.000	1.2	0	2.6	0
11/20/80	0.0	0.0	0.0	0.0	853	32141	32994	0.000	0.0	0	2.6	0

TABLE 56

PRODUCED WATER ANALYSES

pH

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	6.9	7.0	7.2	6.9	7.3	7.3	7.1	7.1	7.2	7.4	7.1	7.2	7.1	7.3	7.3	7.2
8-15	6.7	6.8	6.9	6.8	7.1	6.9	6.9	7.0	6.8	6.9	6.8	6.8	6.8	7.2	6.6	6.6
9-23	6.8	7.1	7.1	7.0	7.2	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	7.5	6.7	7.1
10-22	7.0	7.2	7.1	7.2	7.4	7.2	7.1	7.1	7.0	7.0	7.0	7.1	7.1	7.3	6.5	6.6

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	6.7	7.5	7.4	7.0	7.4	7.6	7.4	7.4	7.6	7.1	7.2
8-15	6.5	7.1	7.3	6.9	7.2	7.2	7.0	7.2	7.4	7.0	7.0
9-23	6.8	7.7	7.3	7.1	7.5	7.5	7.3	7.2	7.6	6.8	7.0
10-22	6.7	7.2	7.0	7.0	7.3	7.1	7.0	7.1	7.3	6.9	6.8

TABLE 57

PRODUCED WATER ANALYSES

Chloride (Cl) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	2880	2920	2960	4480	3640	2760	3480	3480	1880	2640	3480	2640	1720	2520	960	1160
8-15	3120	2840	2920	4520	3760	4600	3440	3960	5200	3040	3600	4000	2520	3640	1240	1120
9-23	3080	2960	2960	4360	3720	4360	3240	3720	5280	3040	3600	3200	2320	3880	1120	800
10-22	3000	3080	3040	4280	3840	4240	3560	3480	5200	3000	3520	3360	2400	3640	1160	1040

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	1320	4920	1960	4840	920	1760	3320	1600	1040	2520	2240
8-15	1600	4800	1880	4800	1400	1760	3240	1680	1040	2800	2320
9-23	1640	5000	2000	4880	1400	1800	3280	1680	1040	2760	2280
10-22	1560	4800	1960	4800	1560	1800	3200	1560	1160	2560	2040

TABLE 58

PRODUCED WATER ANALYSES

Total Hardness ($CaCO_3$) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	900	880	880	1620	1140	840	1420	1340	800	860	1460	1020	760	720	580	600
8-15	1220	840	900	1620	1120	2000	1460	1420	1300	1160	1400	1380	860	900	520	580
9-23	1160	960	940	1560	1060	1840	1440	1380	1400	1160	1460	1120	860	920	540	520
10-22	960	1000	860	1520	960	1740	1320	1240	1520	1300	1420	1160	840	840	500	620

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	860	1520	620	2060	376	540	1140	760	320	860	880
8-15	820	1500	680	2020	840	620	1100	820	340	1060	920
9-23	900	1480	620	1980	540	540	1040	680	360	960	860
10-22	880	1280	560	1980	660	540	1080	740	360	920	860

TABLE 59

PRODUCED WATER ANALYSES

Calcium (Ca) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	264	264	256	424	320	256	408	384	208	264	416	304	224	216	176	168
8-15	392	320	312	536	368	696	512	448	440	432	440	432	288	288	184	192
9-23	410	280	300	460	340	510	420	420	380	370	420	330	310	320	150	170
10-22	344	328	248	456	336	520	400	384	416	336	440	352	288	288	152	152

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	232	472	200	616	128	176	360	232	104	264	256
8-15	296	584	176	696	208	192	360	240	128	344	304
9-23	260	460	160	600	200	190	340	200	90	290	280
10-22	248	488	200	560	168	328	224	144	144	272	256

TABLE 60

PRODUCED WATER ANALYSES

Total Iron (Fe) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	0.68	0.65	0.73	2.46	8.19	0.64	1.15	3.21	13.16	0.61	1.50	8.51	7.82	5.07	0.77	0.64
8-15	1.52	0.68	0.64	23.30	0.80	1.44	1.21	1.52	0.70	0.85	0.90	1.15	0.94	0.56	1.38	0.69
9-23	0.94	0.68	0.86	1.67	0.68	0.97	1.05	0.99	0.61	1.03	0.96	0.75	0.67	0.72	0.68	0.73
10-22	1.05	0.78	0.42	0.89	0.60	0.83	1.04	0.83	1.28	0.64	0.99	0.75	0.83	0.38	0.68	0.58

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	18.40	2.26	0.74	1.08	0.37	0.40	0.82	2.56	0.26	4.14	1.22
8-15	14.40	0.93	1.11	1.56	0.58	0.49	0.88	1.04	0.56	6.48	0.86
9-23	9.47	0.65	0.50	0.96	0.99	0.41	1.22	0.62	0.26	2.77	0.53
10-22	16.10	0.72	0.62	0.78	0.49	0.61	0.64	0.35	0.46	3.32	0.69

TABLE 61

PRODUCED WATER ANALYSES

Methylene Blue Active Substances (MBAS) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
7-16	30	40	25	27	70	28	47	59	102	82	47	97	80	162	21	52
8-15	49	80	30	32	82	43	72	68	108	85	51	62	68	164	21	40
9-23	35	82	30	33	60	51	55	53	188	113	71	78	71	168	12	68
10-22	30	106	20	40	103	47	53	64	210	140	66	83	66	182	14	61

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
7-16	47	60	71	34	199	177	137	44	93	124	69
8-15	37	142	77	34	197	177	104	46	75	95	50
9-23	39	164	84	31	164	173	93	47	95	93	50
10-22	50	151	65	31	186	142	97	62	106	113	66

TABLE 62

PRODUCED WATER ANALYSES

Hydrogen Sulfide (H_2S) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	1.5	2.0	1.6	1.9	1.7	1.6	1.1	1.6	1.7	1.4	1.5	2.2	1.6	2.4	1.4	1.1

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	1.8	2.0	2.2	1.3	1.7	2.5	1.8	1.6	1.6	1.7	2.2

TABLE 63

PRODUCED WATER ANALYSES

Alkalinity to Methyl Orange (as $CaCO_3$) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	384	402	384	414	344	394	390	356	432	434	374	304	408	330	346	298

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	432	382	356	450	268	360	336	274	288	286	336

TABLE 64

PRODUCED WATER ANALYSES

Magnesium (Mg) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	58	10	29	68	49	63	44	73	49	19	73	73	34	44	15	24

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	19	10	58	68	78	34	49	54	5	49	39

TABLE 65

PRODUCED WATER ANALYSES

Sulfate (SO_4) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	0.8	40.0	51.0	13.0	245.0	2.7	2.7	8.0	356.0	29.0	21.0	80.0	24.0	338.0	8.0	21.0

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	2.7	194.0	27.0	<0.1	53.0	51.0	5.3	11.0	29.0	37.0	2.7

TABLE 66

PRODUCED WATER ANALYSES

Manganese (Mn) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	0.60	0.34	0.37	0.97	0.41	0.68	0.77	0.66	0.60	0.44	0.83	0.69	0.35	0.38	0.19	0.30

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	1.68	0.66	0.29	0.80	0.19	0.23	0.42	0.38	0.12	0.77	0.39

TABLE 67

PRODUCED WATER ANALYSES

Total Solids (Dissolved) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	5550	5150	5300	9050	6850	7950	6100	6900	9450	5500	6350	7000	4500	6800	2400	2200

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	3100	8550	3500	8050	2600	3400	5750	3650	2050	4900	4150

TABLE 68

PRODUCED WATER ANALYSES

Specific Gravity (60°F.) /60°F.

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103
8-15	1.0050	1.0040	1.0040	1.0060	1.0060	1.0065	1.0050	1.0050	1.0070	1.0050	1.0055	1.0055	1.0045	1.0055

1980	H-104	H-105	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	1.0035	1.0035	1.0025	1.0075	1.0030	1.0070	1.0030	1.0030	1.0050	1.0030	1.0080	1.0045	1.0040

TABLE 69

PRODUCED WATER ANALYSES

Sodium (Na) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	1590	1630	1650	2790	2170	2170	1680	2030	2930	1590	1820	2100	1360	2240	710	610

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	850	2660	1080	2390	660	1040	1670	830	660	1460	1210

TABLE 70

PRODUCED WATER ANALYSES

Resistivity (OHM-Meters) 77° F.

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	0.91	1.00	1.00	0.69	0.83	0.69	0.87	0.77	0.59	1.00	0.83	0.77	1.11	0.77	2.50	2.50

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	1.82	0.63	1.43	0.63	2.00	1.54	0.91	1.67	3.23	1.00	1.18

TABLE 71

PRODUCED WATER ANALYSES

Barium (Ba) ppm

Lawry - Phase II

DATE 1980	H-90	H-91	H-92	H-93	H-94	H-95	H-96	H-97	H-98	H-99	H-100	H-101	H-102	H-103	H-104	H-105
8-15	137	80	96	146	72	204	165	146	74	137	156	122	80	39	39	52

1980	H-106	H-107	H-108	H-109	H-110	H-111	H-112	H-113	H-114	Separator A	Separator B
8-15	63	89	52	276	39	30	222	48	28	61	63

TABLE 72

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CONTRACT NO. DE-AC21-76-ET08002

PLUGGING, ABANDONING & SALVAGE OF THE PROJECT

	TOTAL BUDGET	DEPT. OF ENERGY	PENNZOIL	WITCO	QUAKER STATE
Abandonment Costs	$ 70	$ 35	$ 12	$ 12	$ 11
Salvage of Equipment	(236)	(118)	(40)	(39)	(39)
Credited to Participants	$(166)	$ (83)	$ (28)	$ (27)	$ (28)

(Thousands of Dollars)

TABLE 73

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CONTRACT NO. DE-AC21-76-ET08002

DISTRIBUTION OF PARTICIPANTS

	TOTAL BUDGET	DEPT. OF ENERGY	PENNZOIL	WITCO	QUAKER STATE
Original Budget	$ 4,444	$ 2,222	$ 741	$ 741	$ 740
Supplement	1,622	811	270	270	271
Total Budget	6,066	3,033	1,011	1,011	1,011
Project Cost	4,694	2,347	783	782	782
Uncommitted Portion Deobligated	$ 1,372	$ 686	$ 228	$ 229	$ 229

(Thousands of Dollars)

TABLE 7-1

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CONTRACT NO. DE-AC21-76-ET08002

FORMERLY CONTRACT NO. E(46-1)-8002

SUMMARY OF PHASE I INVOICES ERDA-PENNZOIL

MONTH & YEAR	MONTHLY	ANNUAL CUMULATIVE	PROJECT CUMULATIVE
1974			
December	2,335	2,335	2,335
1975			
January	8,101	8,101	10,436
February	24,315	32,416	34,751
March	22,069	54,485	56,820
April	28,990	83,475	85,810
May	9,447	92,922	95,257
June	10,065	102,987	105,322
July	11,656	114,643	116,978
August	23,945	138,588	140,923
September	17,180	155,768	158,103
October	24,512	180,280	182,615
November	22,338	202,618	204,953
December	16,864	219,482	221,817
1976			
January	12,868	12,868	234,685
February	6,552	19,420	241,237
March	14,133	33,553	255,370
April	11,660	45,213	267,030
May	8,302	53,515	275,332
June	178	53,693	275,510

SUMMARY OF PHASE II INVOICES ERDA-PENNZOIL

May	8,654	62,347	284,164
June	93,689	156,036	377,853
July	167,481	323,517	545,334
August	187,958	511,475	733,292
September	138,052	649,527	871,344
October	139,162	788,689	1,010,506
November	103,271	891,960	1,113,777
December	237,316	1,129,276	1,351,093
1977			
January	88,709	88,709	1,439,802
February	238,973	327,682	1,678,775
March	109,581	437,263	1,788,356
April	135,042	572,305	1,923,398
May	106,358	678,663	2,029,756
June	185,314	863,977	2,215,070
July	88,766	952,743	2,303,836
August	202,550	1,155,293	2,506,386
September	517,678	1,672,971	3,024,064
October	320,097	1,993,068	3,344,161
November	200,573	2,193,641	3,544,734
December	242,480	2,436,121	3,787,214

TABLE 74

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CONTRACT NO. DE-AC21-76ET08002

SUMMARY OF PHASE II INVOICES DOE-PENNZOIL

1978	MONTHLY	ANNUAL CUMULATIVE	PROJECT CUMULATIVE
January	52,508	52,508	3,839,722
February	46,874	99,382	3,886,596
March	35,447	134,829	3,922,043
April	33.448	168,277	3,955,491
May	40,586	208,863	3,996,077
June	16,534	225,397	4,012,611
July	27,617	253,014	4,040,228
August	22,450	275,464	4,062,678
September	16,407	291,871	4,079,085
October	37,292	329,163	4,116,377
November	18,337	347,500	4,134,714
December	32,063	379,563	4,166,777
1979			
January	18,809	18,809	4,185,586
February	13,552	32,361	4,199,138
March	33,212	65,573	4,232,350
April	28,147	93,720	4,260,497
May	19,826	113,546	4,280,323
June	9,388	122,934	4,289,711
July	33,503	156,437	4,323,214
August	10,461	166,898	4,333,675
September	17,730	184,628	4,351,405
October	31,131	215,759	4,382,536
November	35,789	251,548	4,418,325
December	22,520	274,068	4,440,845
1980			
January	16,678	16,678	4,457,523
February	17,589	34,267	4,475,112
March	27,628	61,895	4,502,740
April	12,946	74,841	4,515,686
May	30,742	105,583	4,546,428
June	19,470	125,053	4,565,898
July	11,868	136,921	4,577,766
August	16,098	153,019	4,593,864
September	29,307	182,326	4,623,171
October	13,799	196,125	4,636,970
November	18,133	214,258	4,655,103
December	39,210*	262,372	4,694,313

*Includes Lawry Core Well

TABLE 75

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CALENDARIZED EXPENDITURES

YEAR	WELLS	PLANT	MICELLAR SLUG	MOBILITY BUFFER	OPERATION	CORE	DESIGN & ENGINEERING	ANNUAL	CUMULATIVE	BALAN
Total Budget										$ 4,44
Phase I 1975-76	84	62	7	5	68	**	49	275*	275*	4,16
Phase II 1976	714	155	-	-	44	83	80	1,076*	1,351	3,09
1977	423	522	926	-	309	-	256	2,436*	3,787	65
1978	3	14	14	66	249	-	34	380*	4,167	27
1979	-	-	-	43	201	-	30	274*	4,441	
1980	-	-	-	-	198	30	25	253*	4,694	(25
Total	1,224	753	947	114	1,069	113	474	4,694		
Uncommitted	495	(1)	(10)	40	546	160	142	1,372***	1,372	*** (1,62
Balance	1,719	752	937	154	1,615	273	616	6,066	6,066	

* Actual
** Included under "Wells"
*** This Amount Deobligated to Participants
**** Supplement to Budget
Note: DOE- Penn Grade Contract No. DE-AC21-76-ET08002

(Thousands of Dollars)

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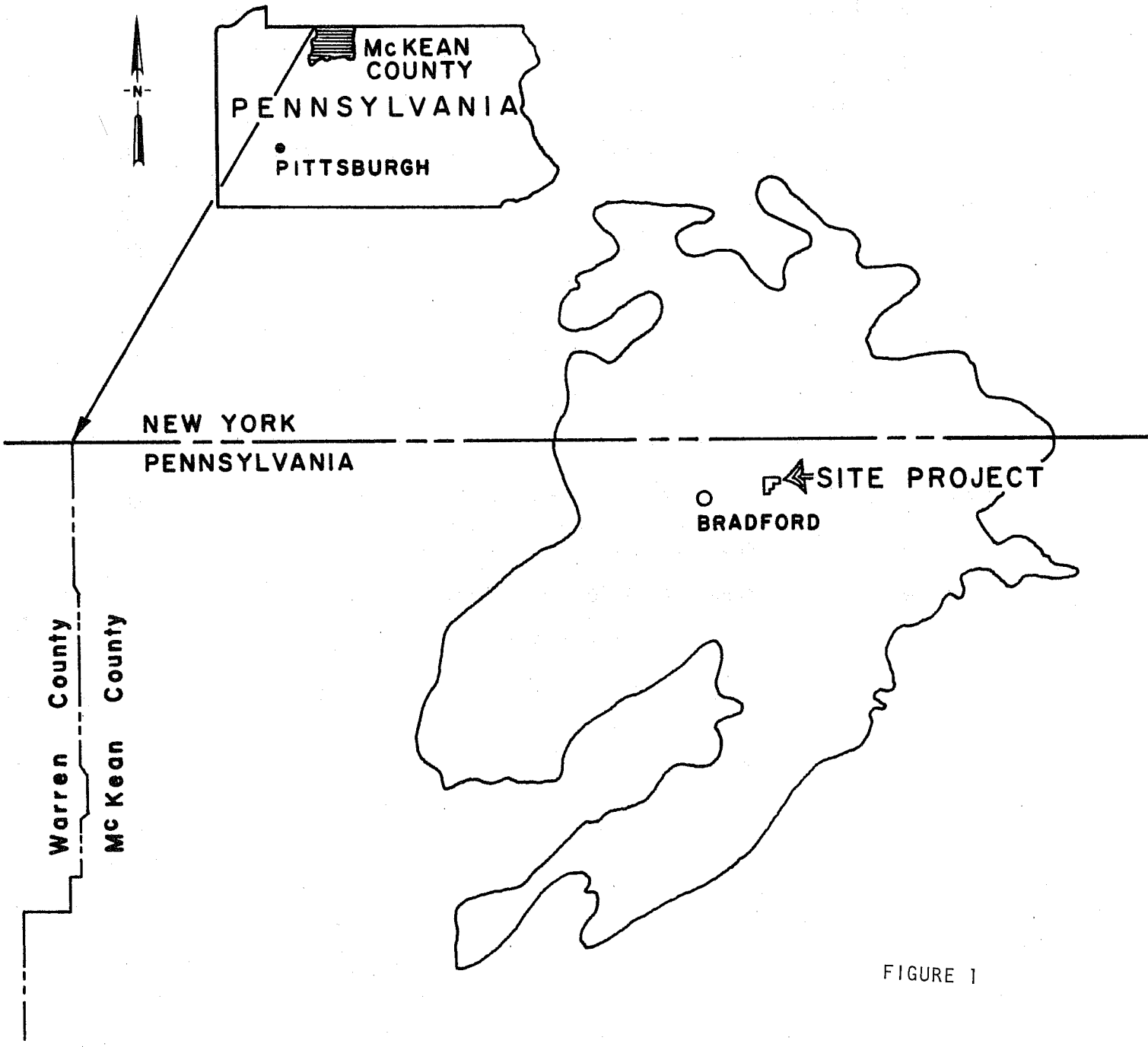

N
McKEAN COUNTY
PENNSYLVANIA
PITTSBURGH
NEW YORK
PENNSYLVANIA
SITE PROJECT
BRADFORD
Warren County
McKean County

FIGURE 1

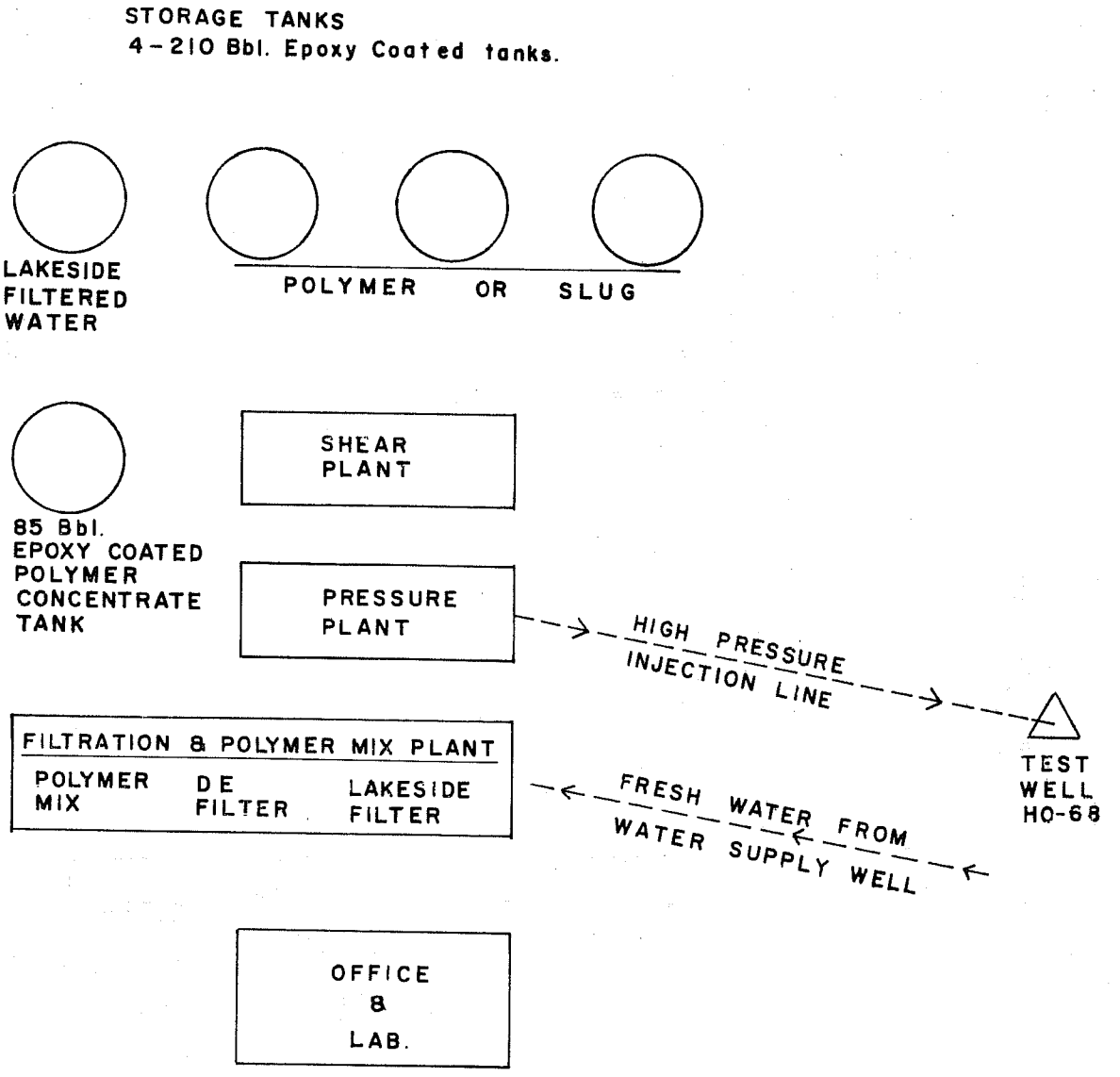
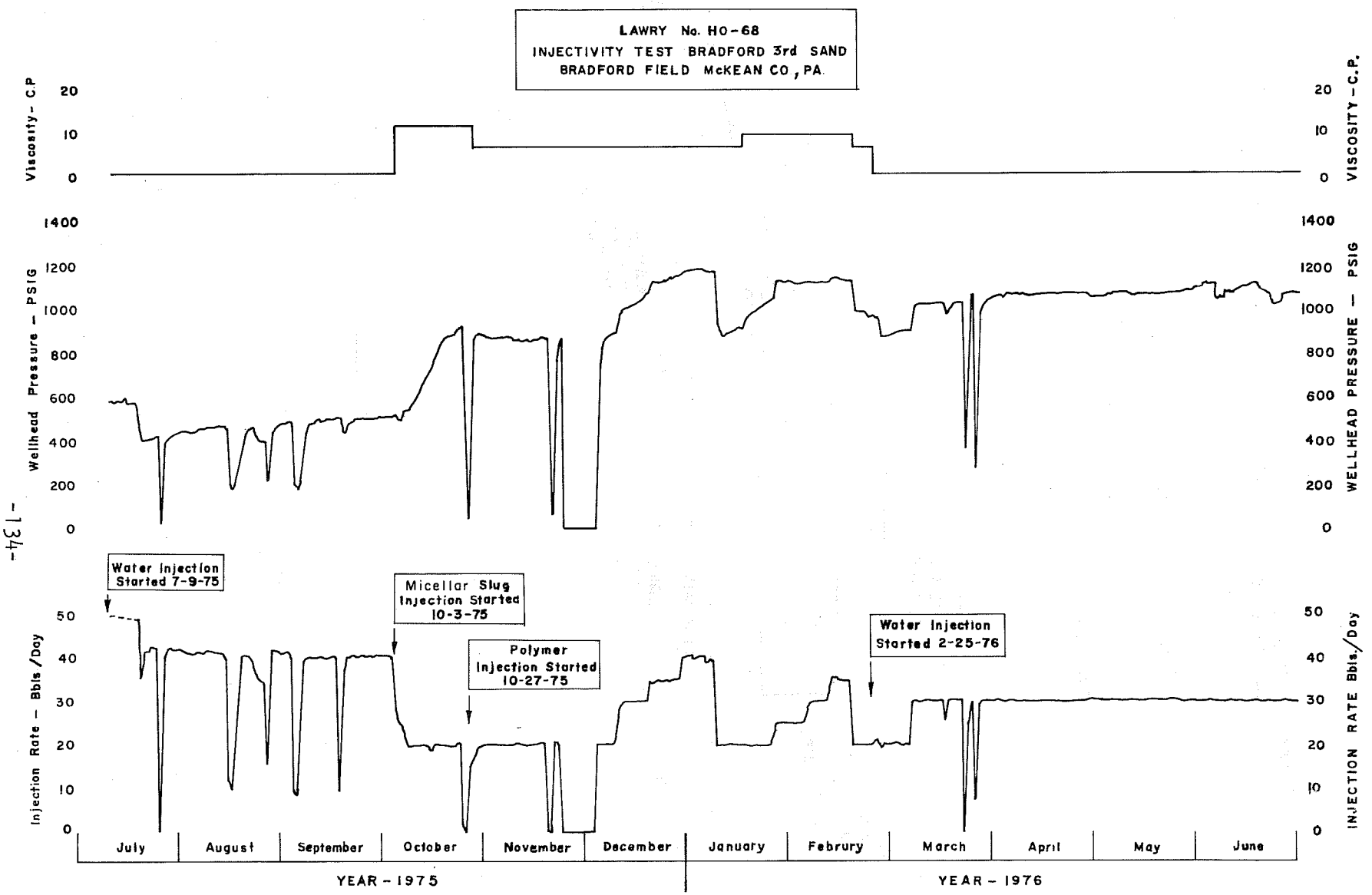


FIGURE 2

FACILITIES SCHEMATIC

LAVRY PROJECT PHASE I

FIGURE 3


LAWRY No. HO-68
INJECTIVITY TEST BRADFORD 3rd SAND
BRADFORD FIELD McKEAN CO, PA.
Viscosity - C.P
VISCOSITY - C.P.
Wellhead Pressure - PSIG
WELLHEAD PRESSURE - PSIG
Injection Rate - Bbls/Day
INJECTION RATE Bbls./Day
Water Injection Started 7-9-75
Micellar Slug Injection Started 10-3-75
Polymer Injection Started 10-27-75
Water Injection Started 2-25-76
July
August
September
October
November
December
January
Februry
March
April
May
June
YEAR - 1975
YEAR - 1976

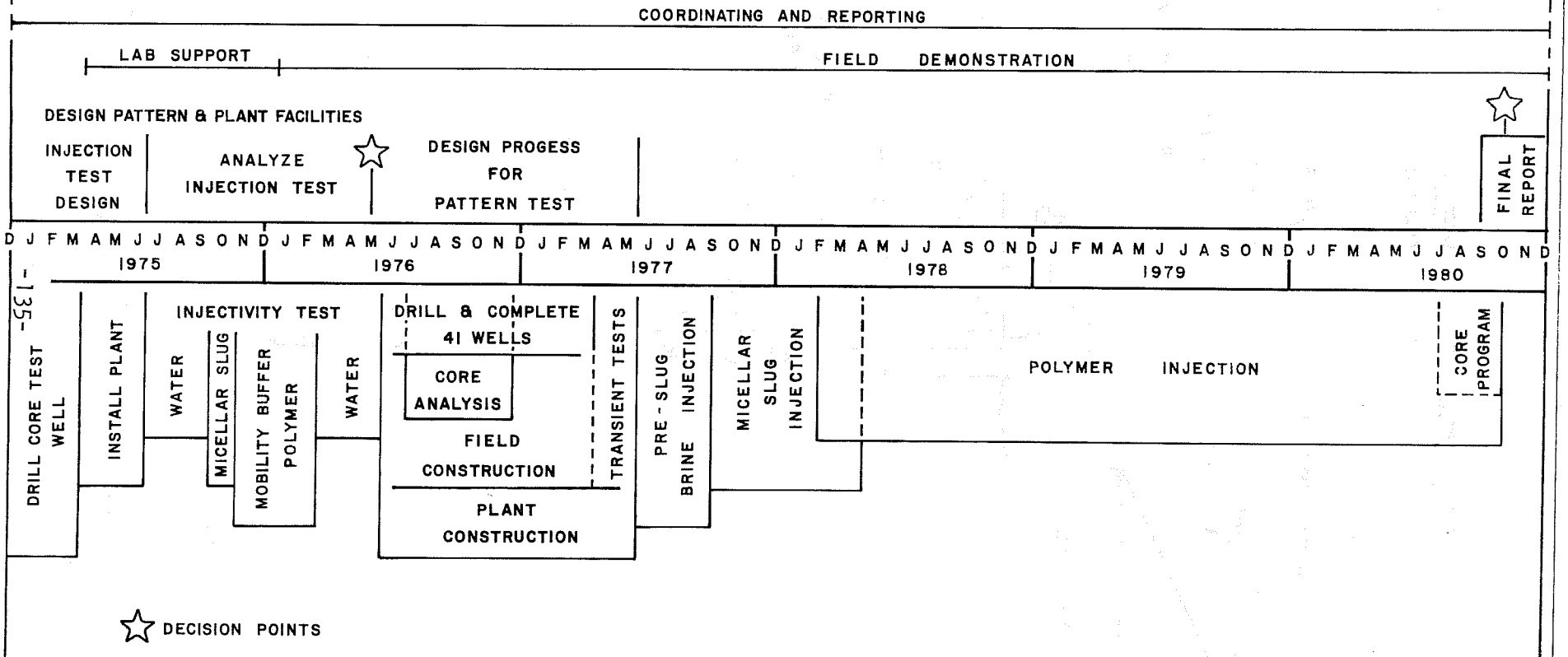
MILESTONE CHART

PENN GRADE MICELLAR DISPLACEMENT PROJECT

CONTRACT DE-AC21-76ET08002

BRADFORD FIELD, PENNSYLVANIA

FIGURE 4



TYPICAL INJECTION WELL COMPLETION
LAWRY PHASE II

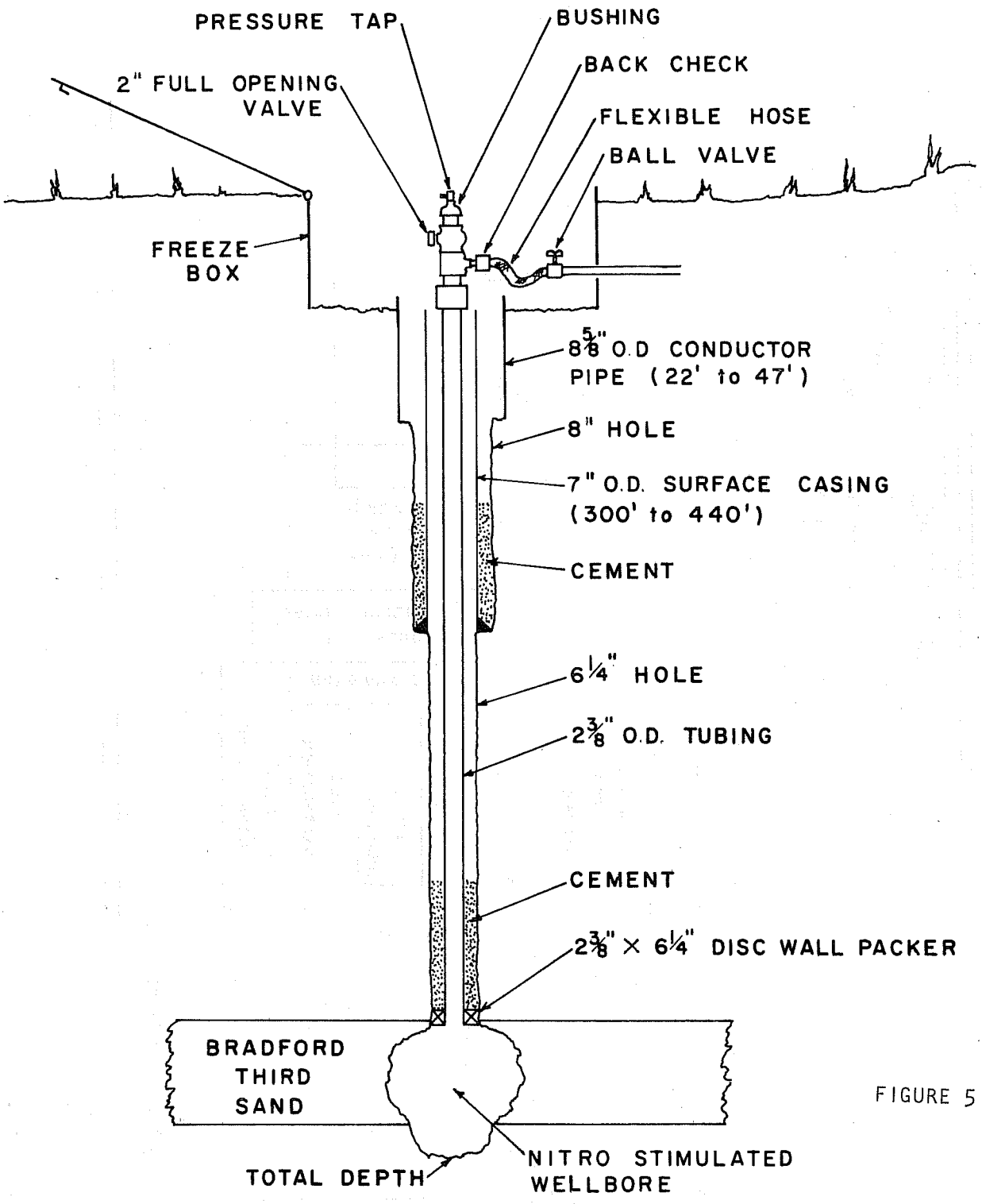


FIGURE 5

TYPICAL PRODUCTION WELL COMPLETION
LAWRY PHASE II

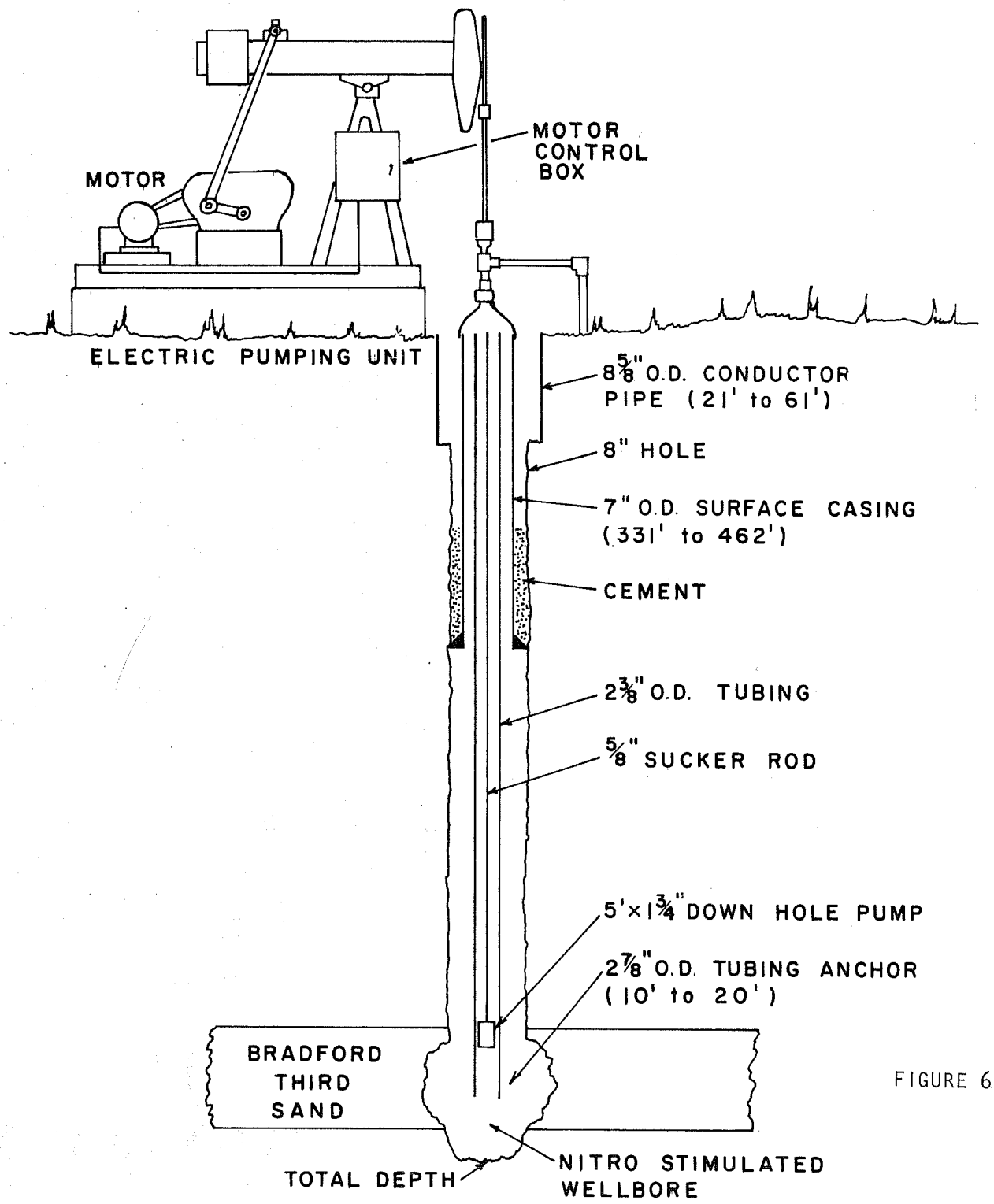


FIGURE 6

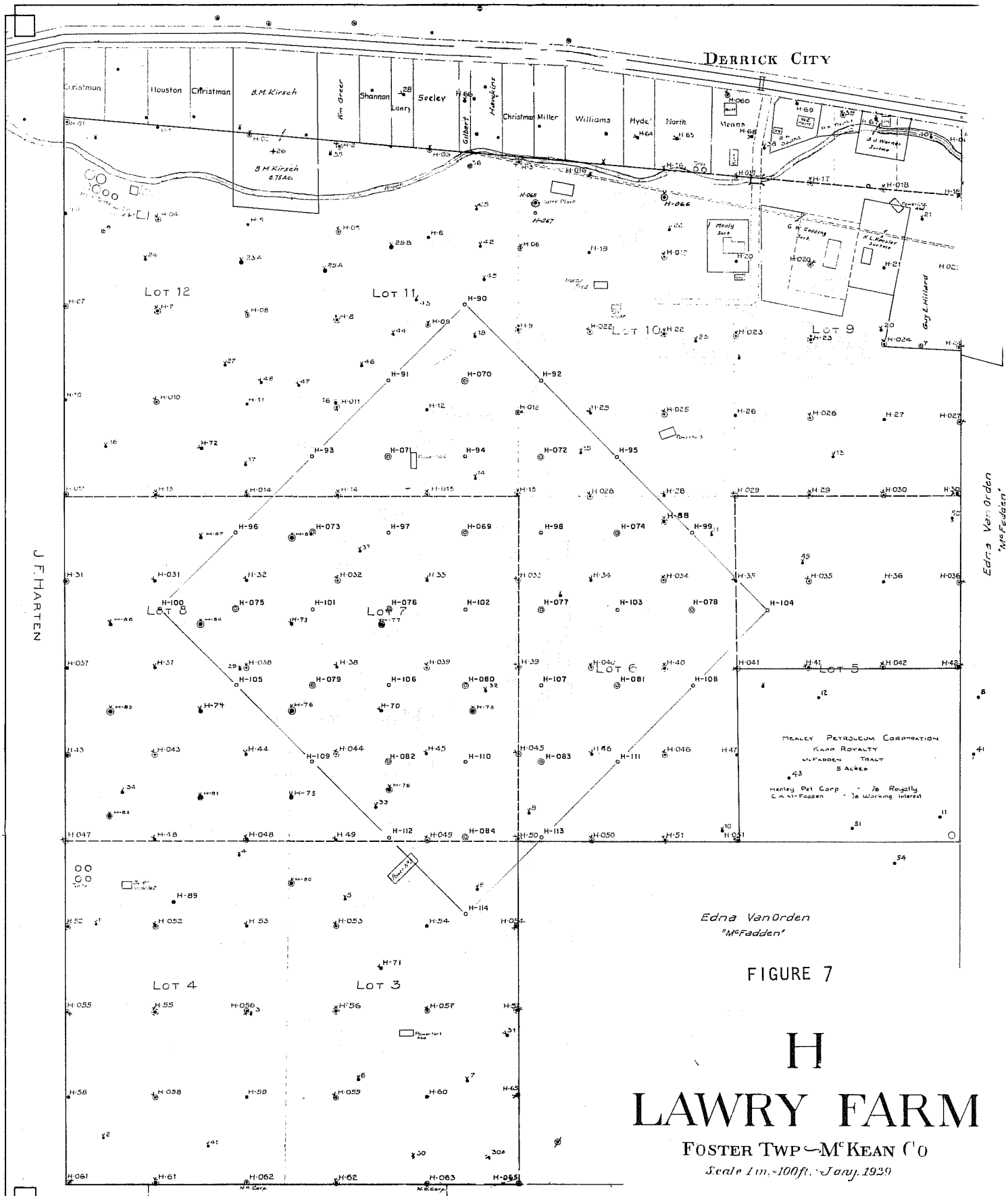


FIGURE 7

H
LAWRY FARM

FOSTER TWP — McKEAN CO

Scale 1 in. = 100 ft. Jany. 1929

32603

FIGURE 8

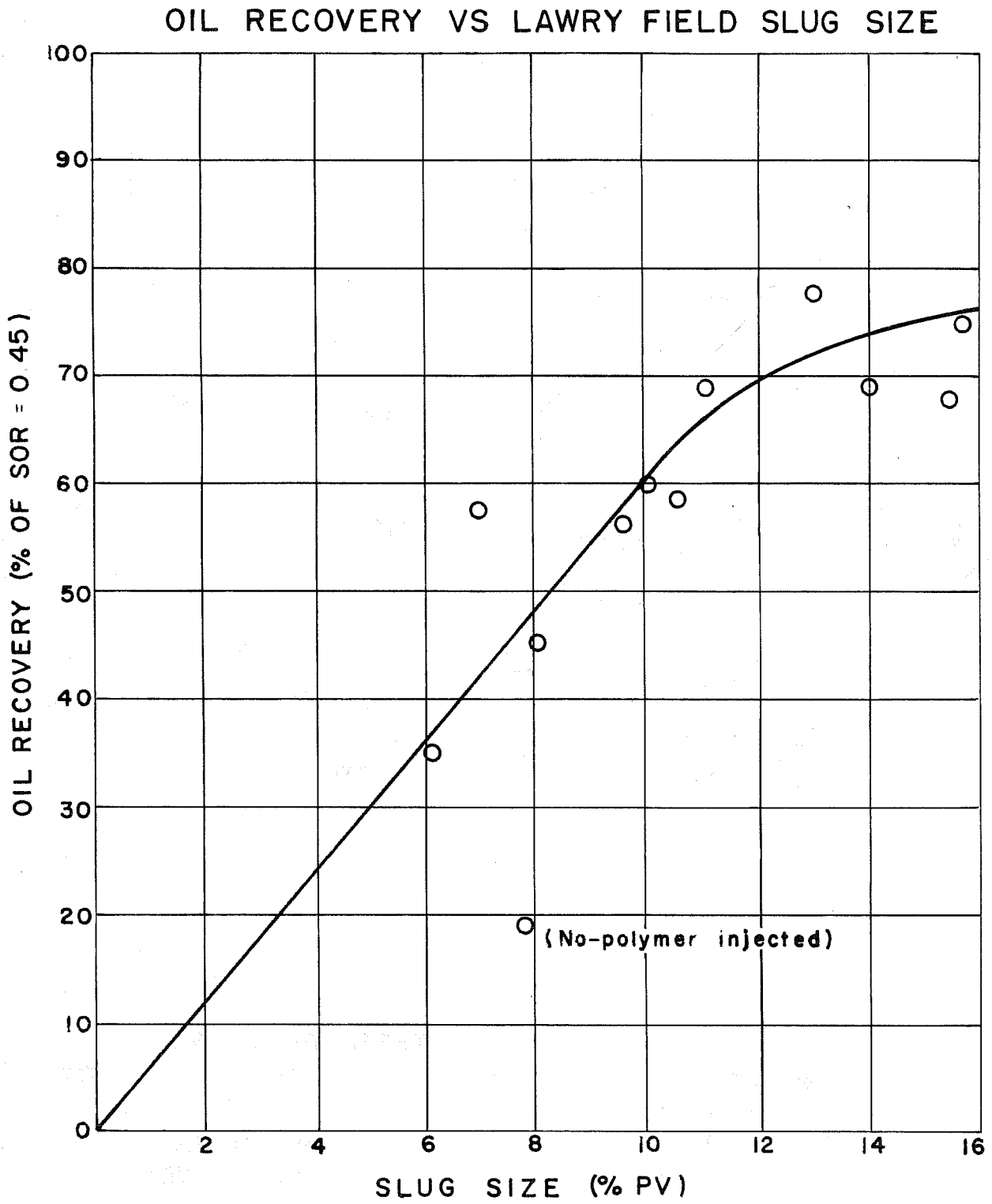
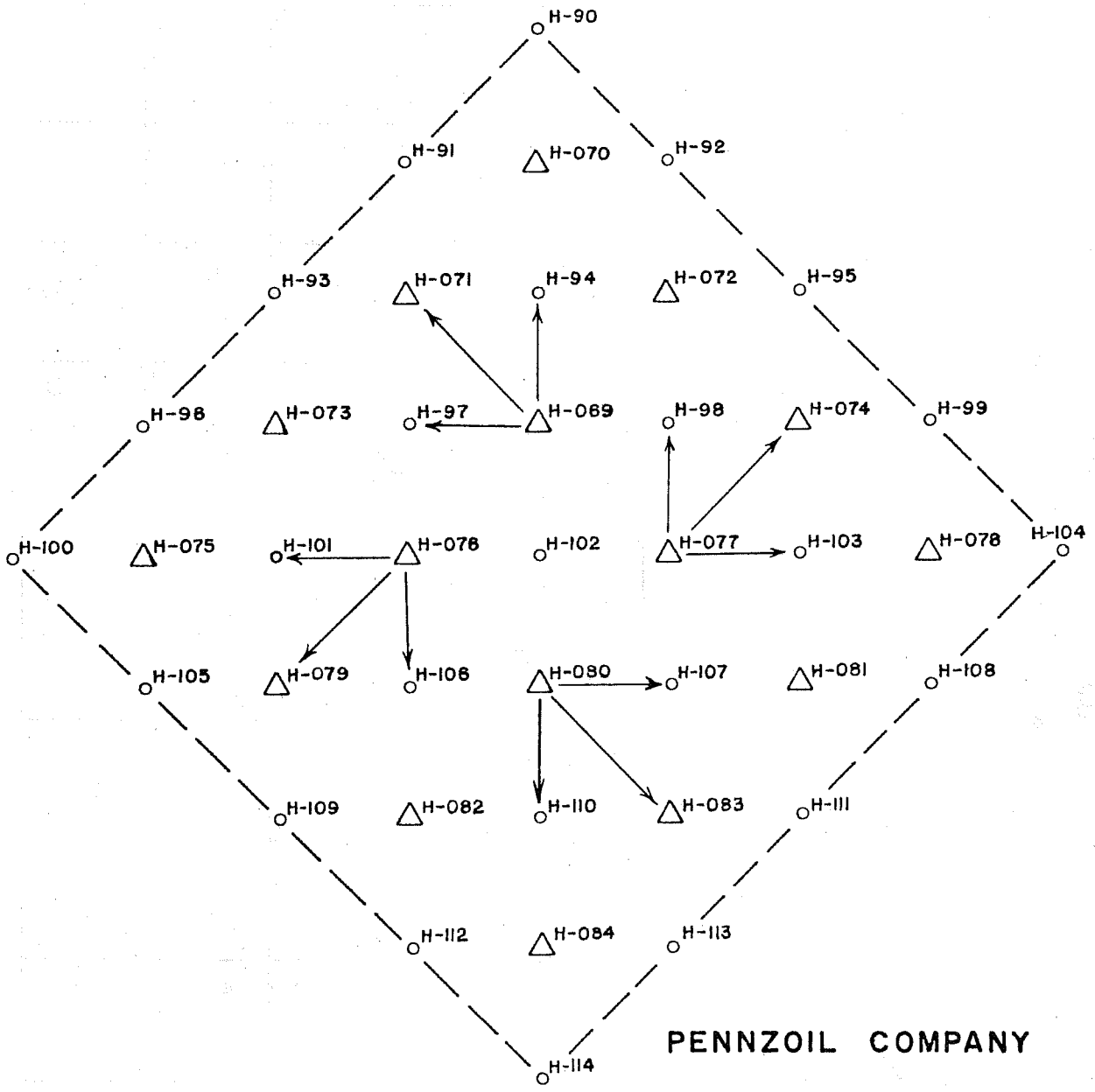

OIL RECOVERY VS LAWRY FIELD SLUG SIZE
OIL RECOVERY (% OF SOR = 0.45)
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
12
14
16
(No-polymer injected)
SLUG SIZE (% PV)

FIGURE 9

DOE-LAWRY TEST
PHASE II



PENNZOIL COMPANY

EASTERN DIVISION

BRADFORD DISTRICT

Transient Testing Program

Phase I - Interference
Test Schedule

(Injection into one well at a time)

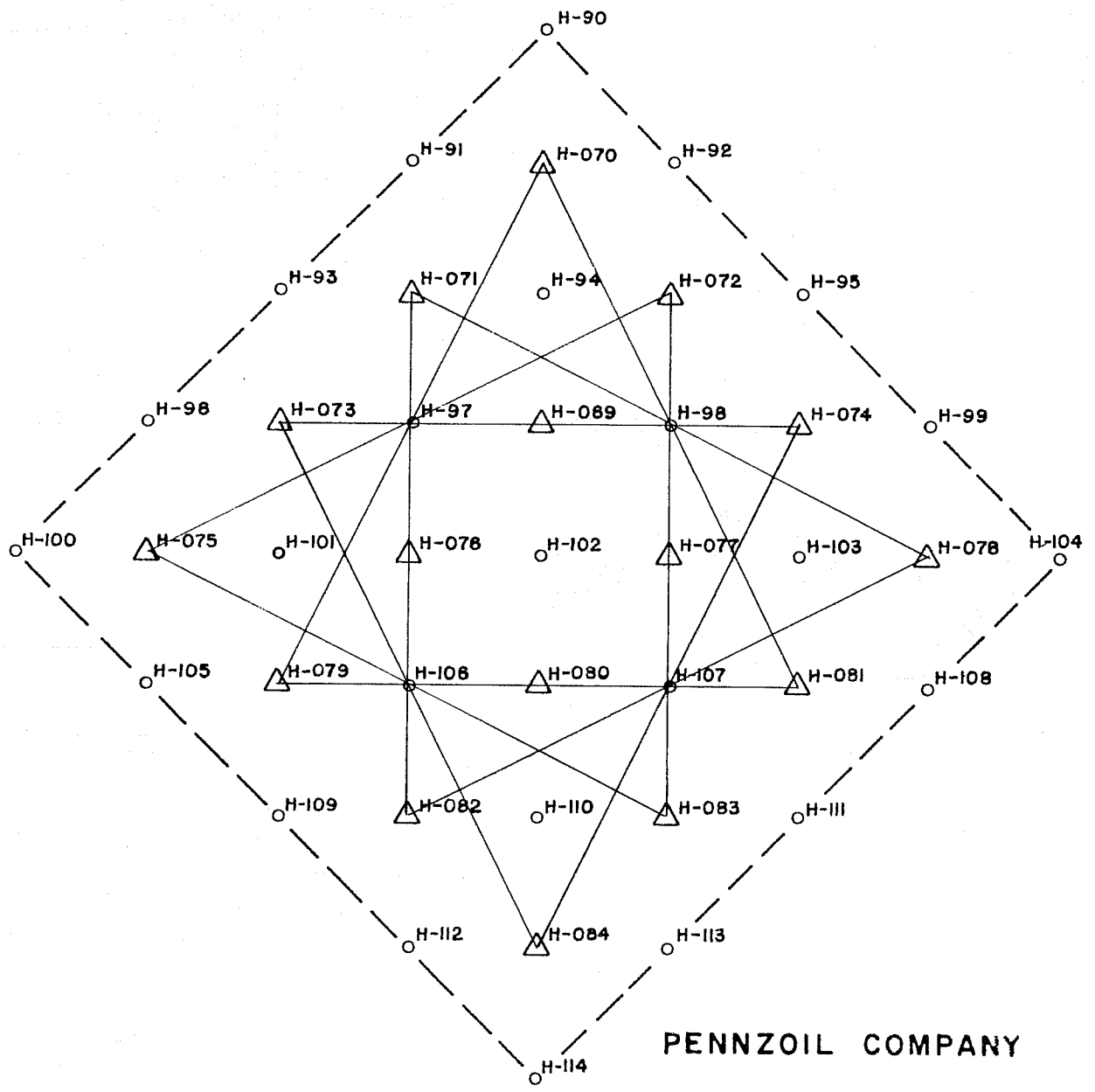
o OIL WELLS

△ INTAKE WELLS

scale 1" = 200'

FIGURE 10

DOE-LAWRY TEST
PHASE II



PENNZOIL COMPANY

EASTERN DIVISION
BRADFORD DISTRICT

Transient Testing Program

Phase II - Fall-off Test Schedule

(Test 3 wells at a time)

○ OIL WELLS
△ INTAKE WELLS

Scale 1" = 200'

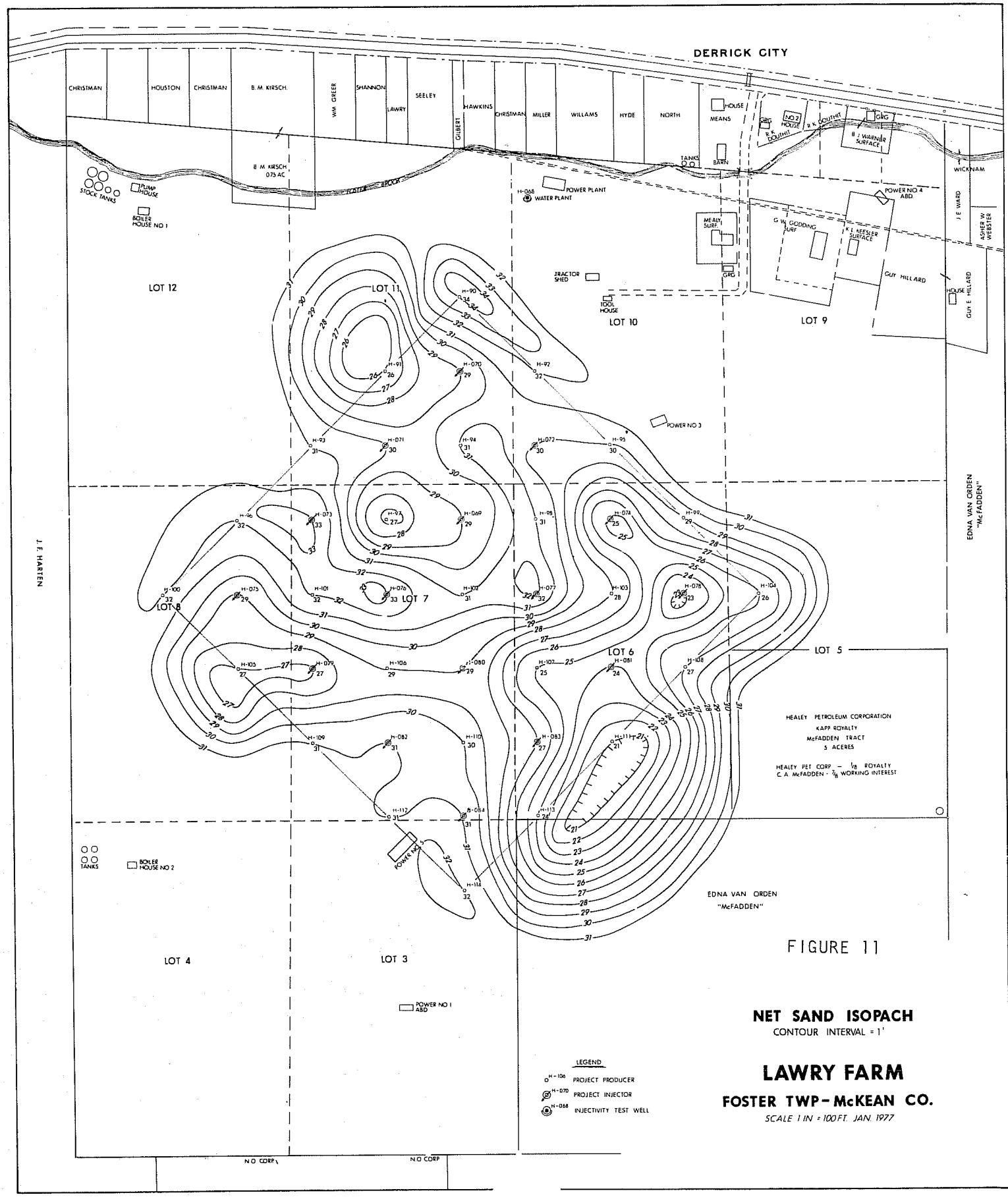


FIGURE 11

NET SAND ISOPACH

CONTOUR INTERVAL = 1'

LAWRY FARM

FOSTER TWP – McKEAN CO.

SCALE 1 IN = 100 FT. JAN. 1977

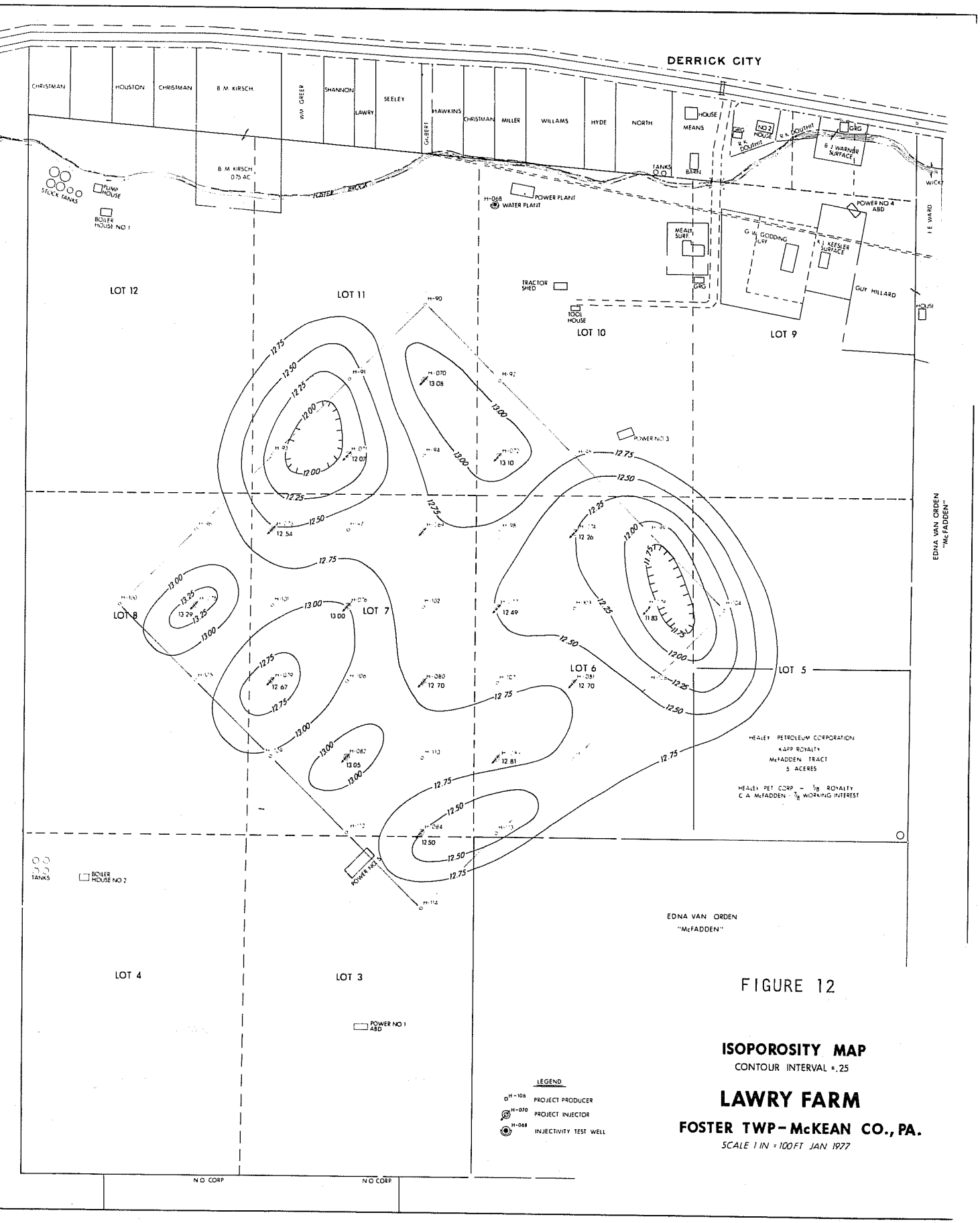


FIGURE 12

ISOPOROSITY MAP

CONTOUR INTERVAL = .25

LAWRY FARM

FOSTER TWP - McKEAN CO., PA.

SCALE 1 IN = 100 FT JAN 1977

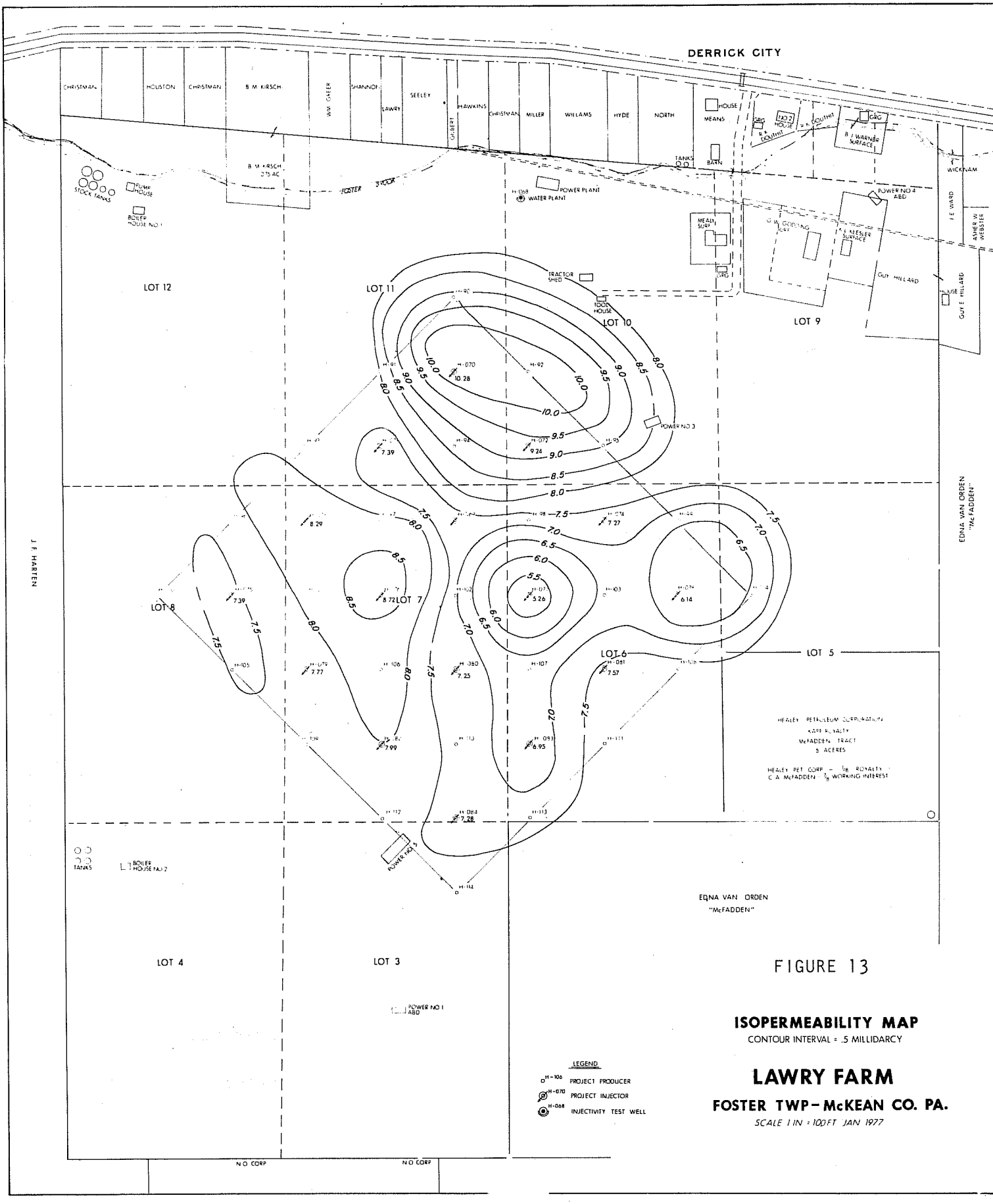


FIGURE 13

ISOPERMEABILITY MAP

CONTOUR INTERVAL = .5 MILLIDARCY

LAWRY FARM

FOSTER TWP – McKEAN CO. PA.

SCALE 1 IN = 100 FT JAN 1977

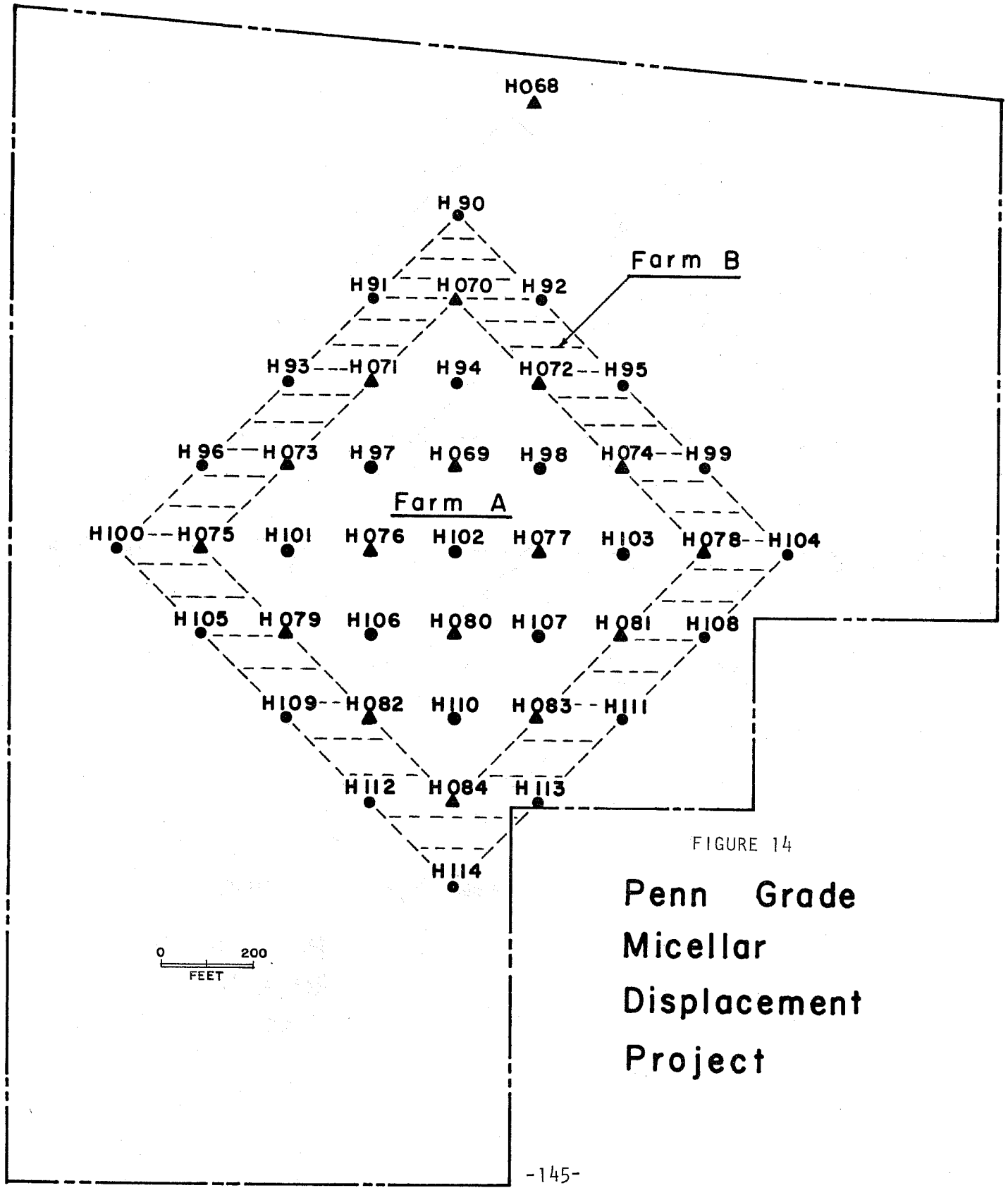


FIGURE 14

Penn Grade Micellar Displacement Project

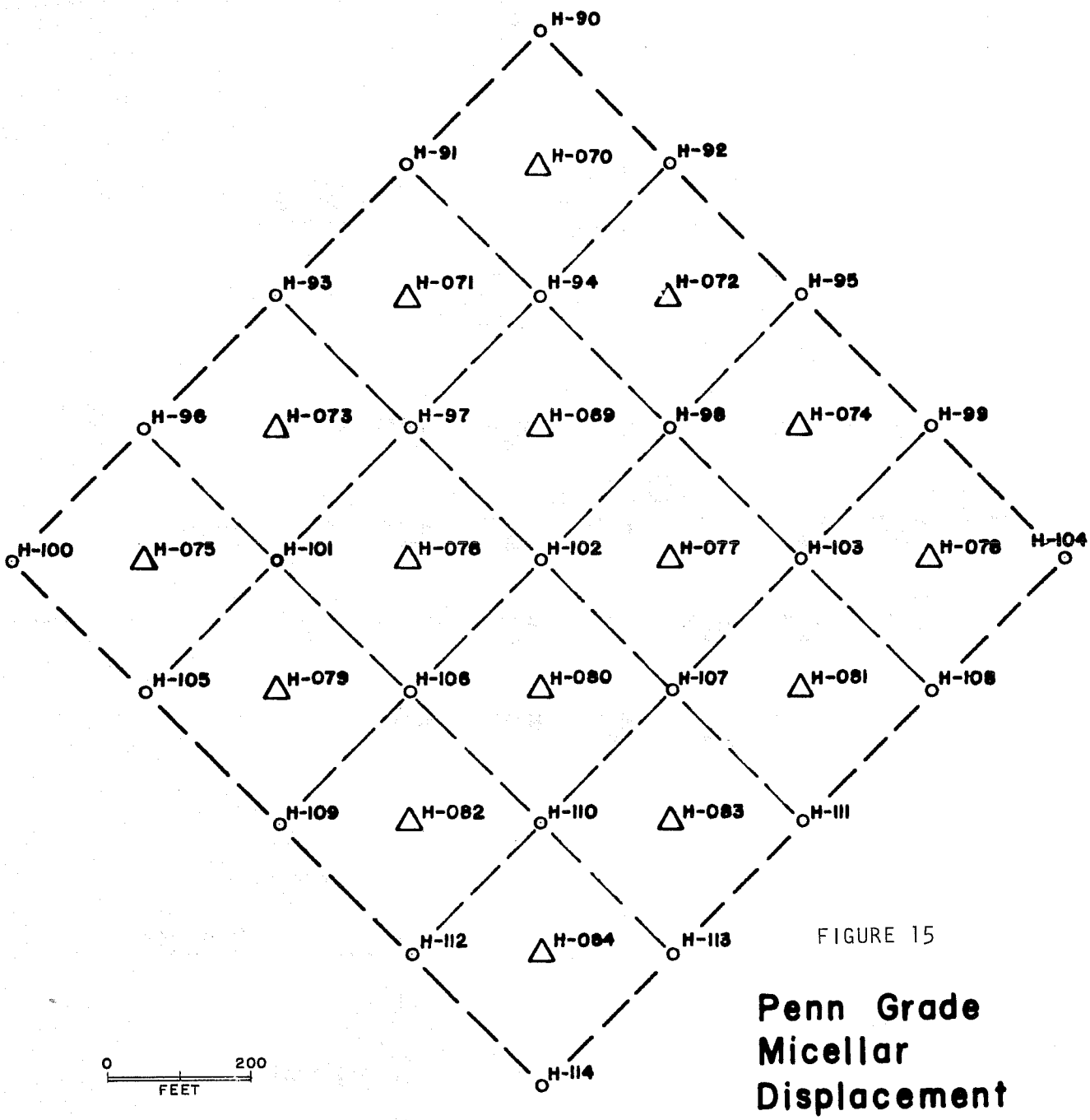
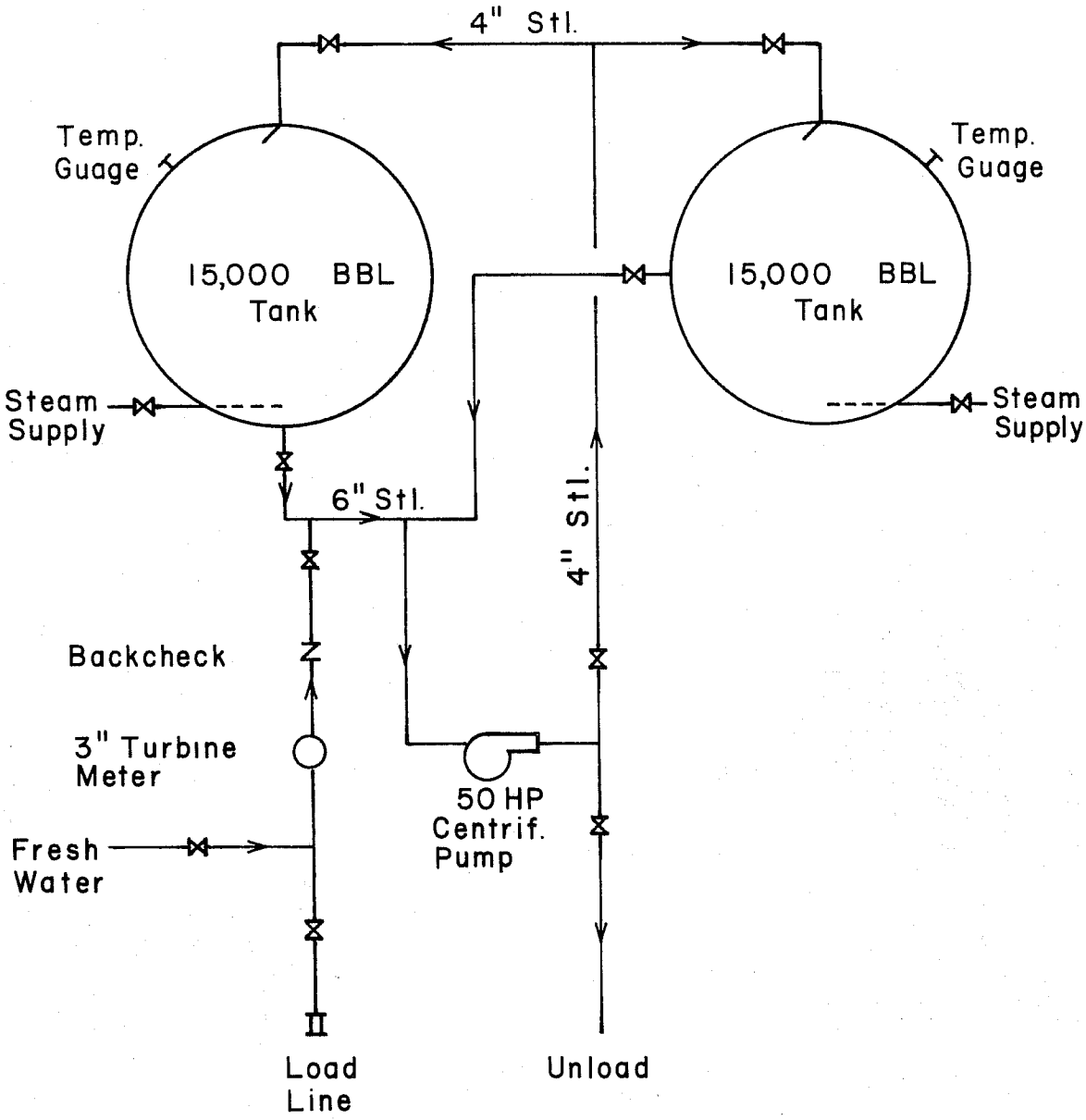


FIGURE 15

Penn Grade Micellar Displacement Project

FIGURE 16

MICELLAR SLUG STOCK MIXING FACILITIES



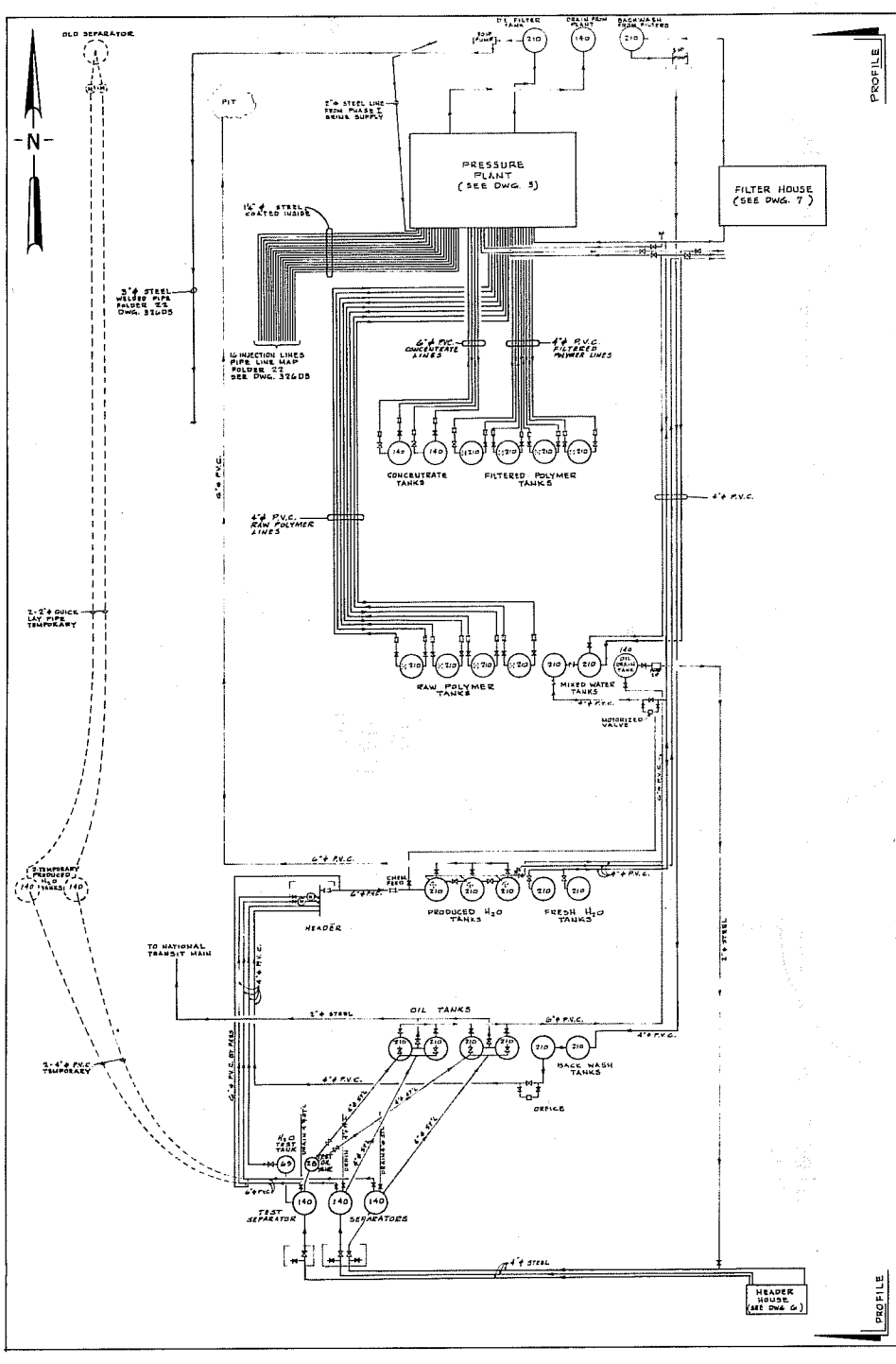


FIGURE 17

DWG. 1

PENNZOIL COMPANY BRADFORD, PA.			
REVISIONS	DATE	SUBJECT SITE PLAN	FILE
		FARM LAWRY	
		WT. 5496	
		SCALE 1" = 20'0	
		DR. LUEY CK. APP.	TRC

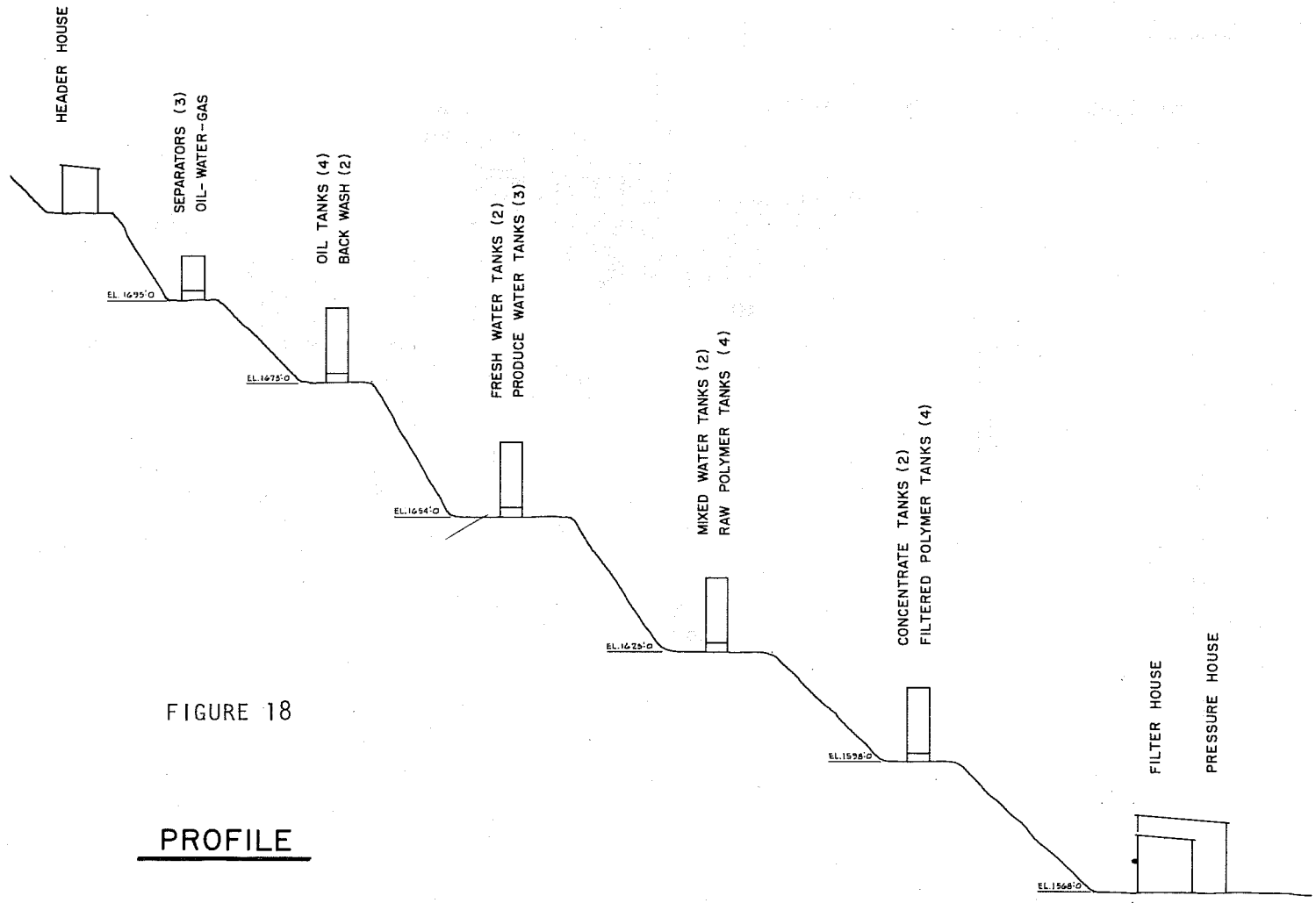


FIGURE 18

PROFILE

NOTE:

DIFFERENCE IN GRADE ELEVATION–

MINIMUM FEET

MAXIMUM FEET

DWG. 2

PENNZOIL COMPANY - BRADFORD, PA.			
REVISIONS	DATE	SUBJECT PROFILE	FILE
		FARM LAWRY	
		WT. 3496	
		SCALE VERT. 1"=10'-0", HORIZ. 1"=20'-0	
		DR. LUEY CK. APP.	TRC

GENERAL NOTES

1. ALL LINE P.V.C. PLASTIC UNLESS NOTED OTHERWISE.
2. ALL LINE NOTED AS STEEL ARE COATED INSIDE.

SYMBOLS

- METER & BY-PASS
- POP VALVE
- SNUBBER & BY-PASS TO SUCTION
- VALVE
- 4" INSIDE DIAMETER OF PIPE LINE
- BACK CHECK VALVE
- SECTIONS, ELEVATIONS, DETAILS – NUMBERS / LETTERS
- DRAWING NUMBER

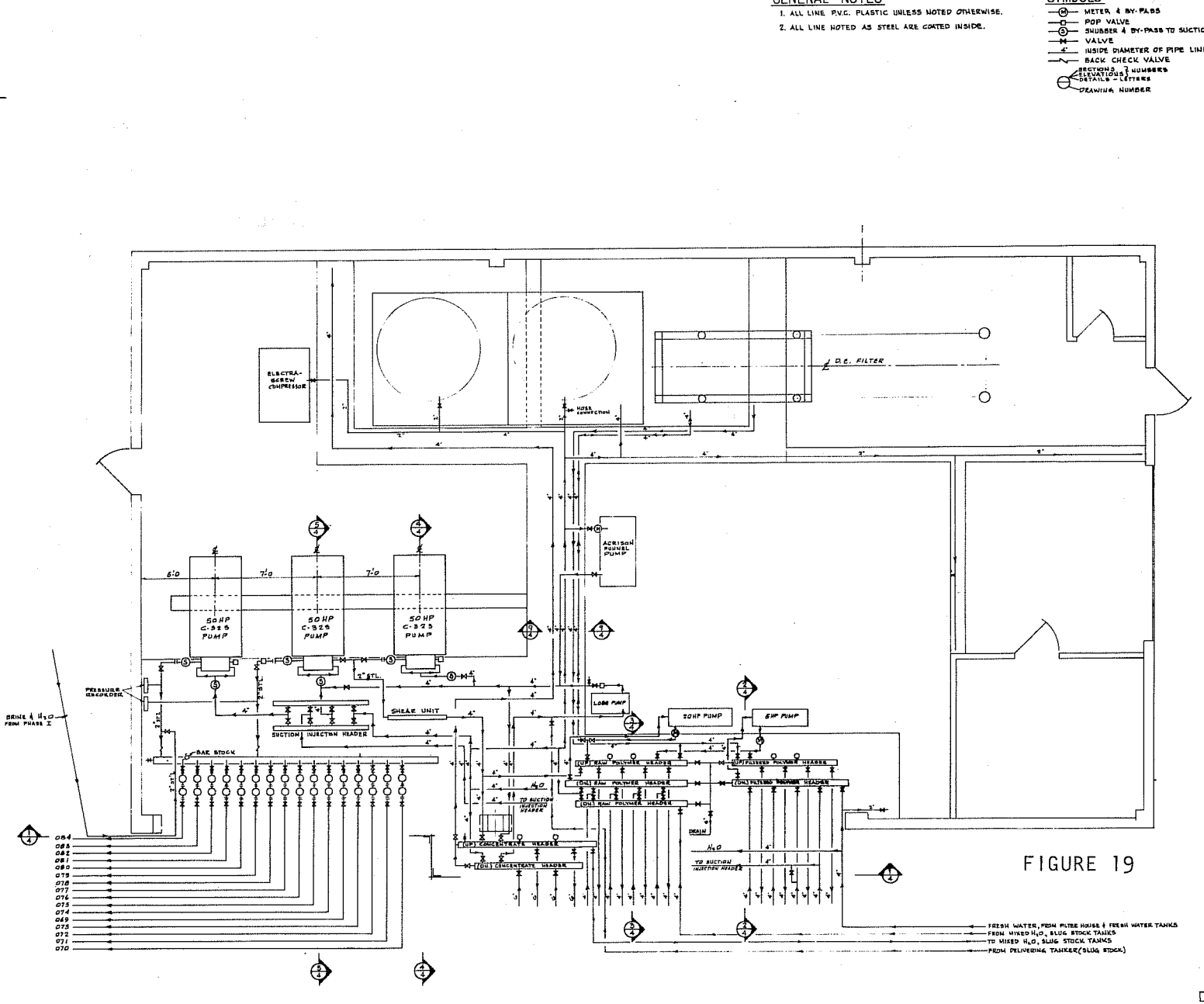


FIGURE 19

DWG. 3

PENNZOIL COMPANY BRADFORD, PA.			
REVISIONS	DATE	SUBJECT PRESSURE HOUSE	FILE
		FARM LAWRY	
		WT. 3496	
		SCALE 3/8"=1'0	
		DR LUEY CK. APP	TRC

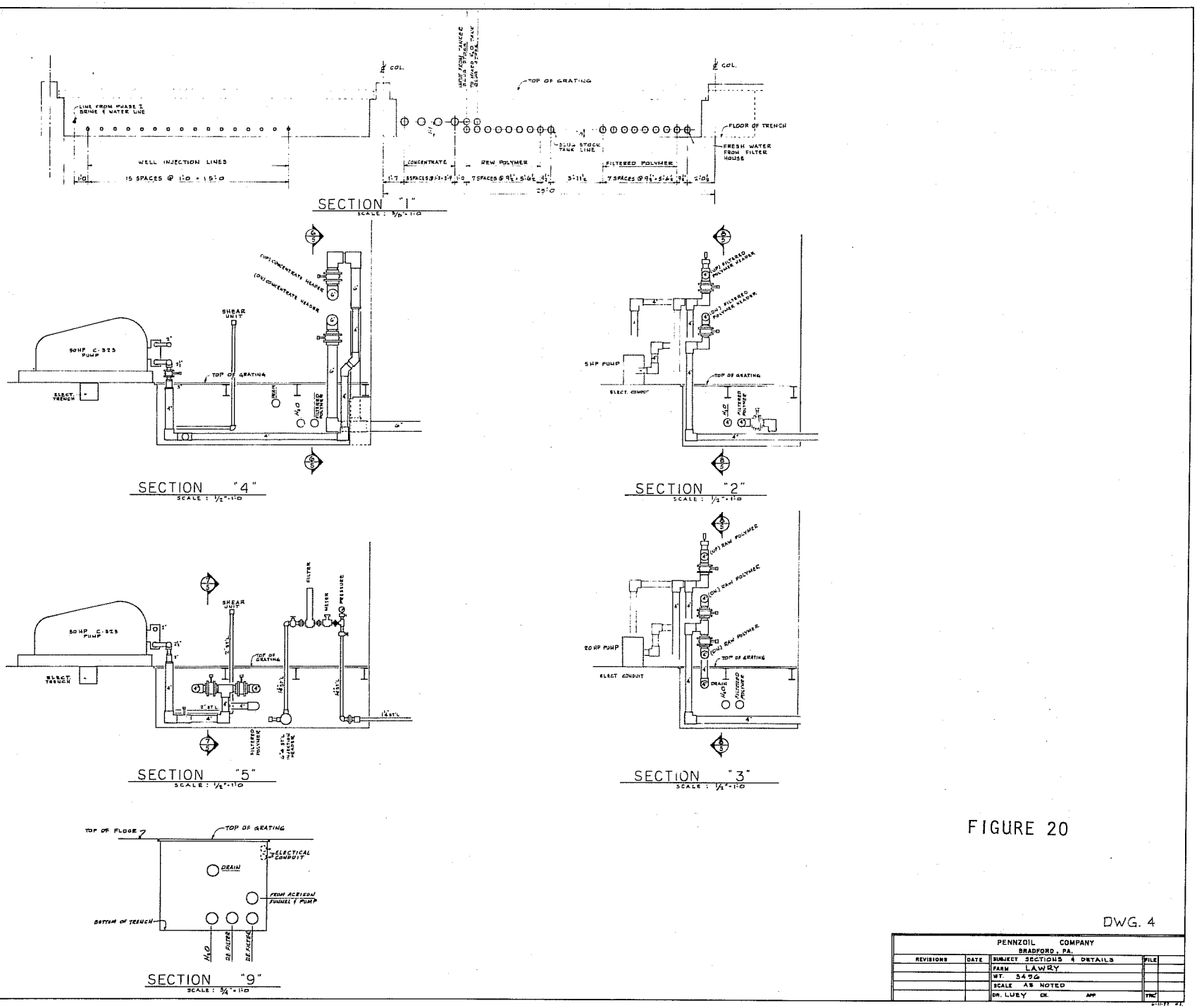
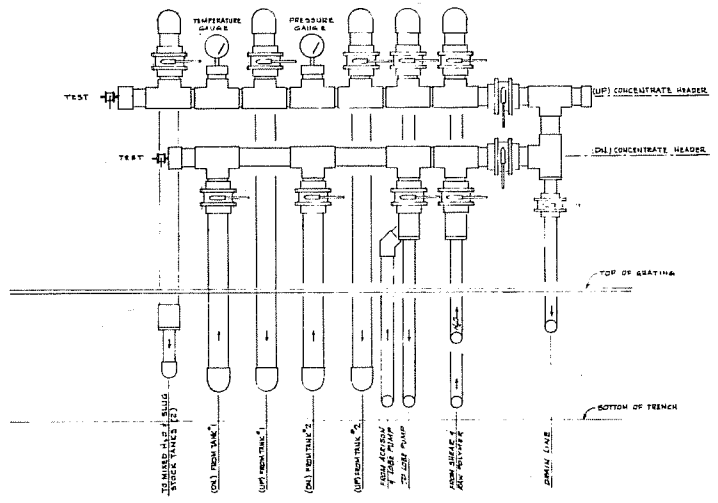
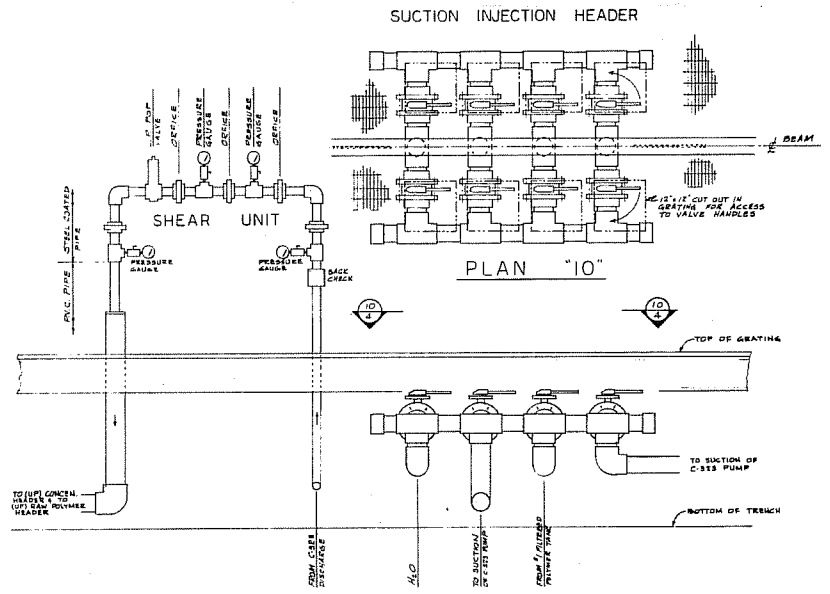


FIGURE 20

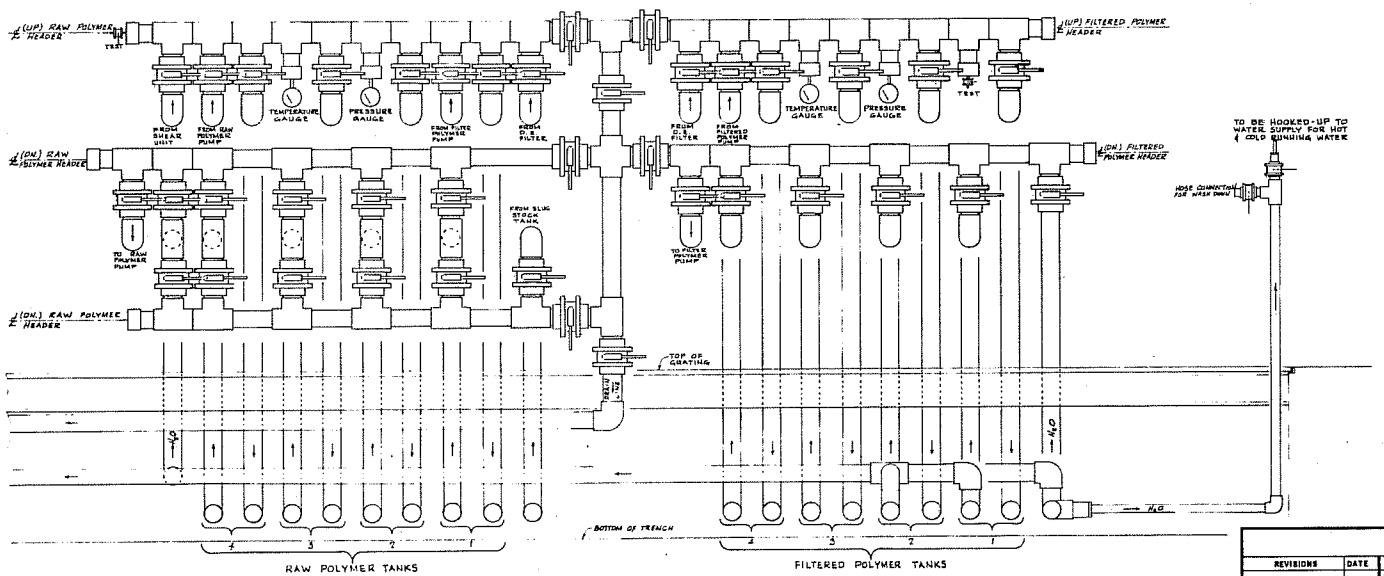
DWG. 4



ELEVATION "6"
CONCENTRATE HEADER
SCALE: 3/4" = 1'-0



ELEVATION "7"
N. T. S.



ELEVATION "8"
SCALE: 1/2" = 1'-0

FIGURE 21

DWG. 5

PENNZOIL COMPANY BRADFORD, PA.			
REVISIONS	DATE	SUBJECT ELEVATIONS	FILE
		FARM LAWRY	
		WT. 5496	
		SCALE AS NOTED	
		DR. LUBY CK. APR	TRC

FIGURE 22

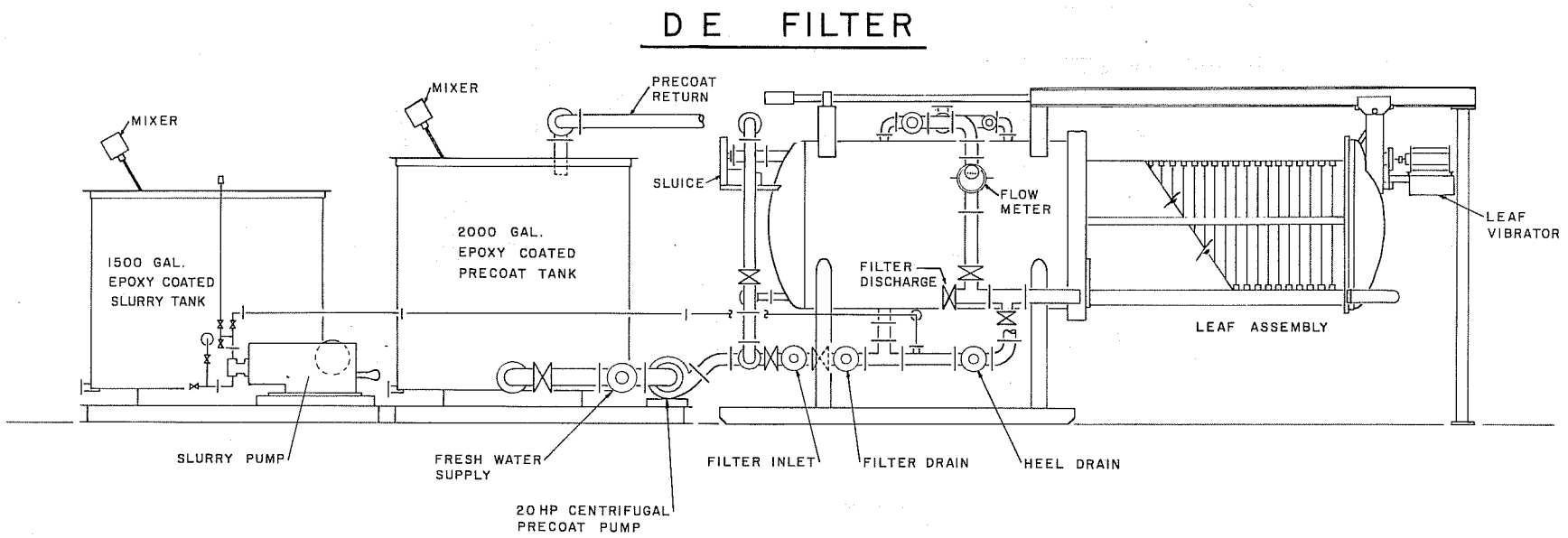
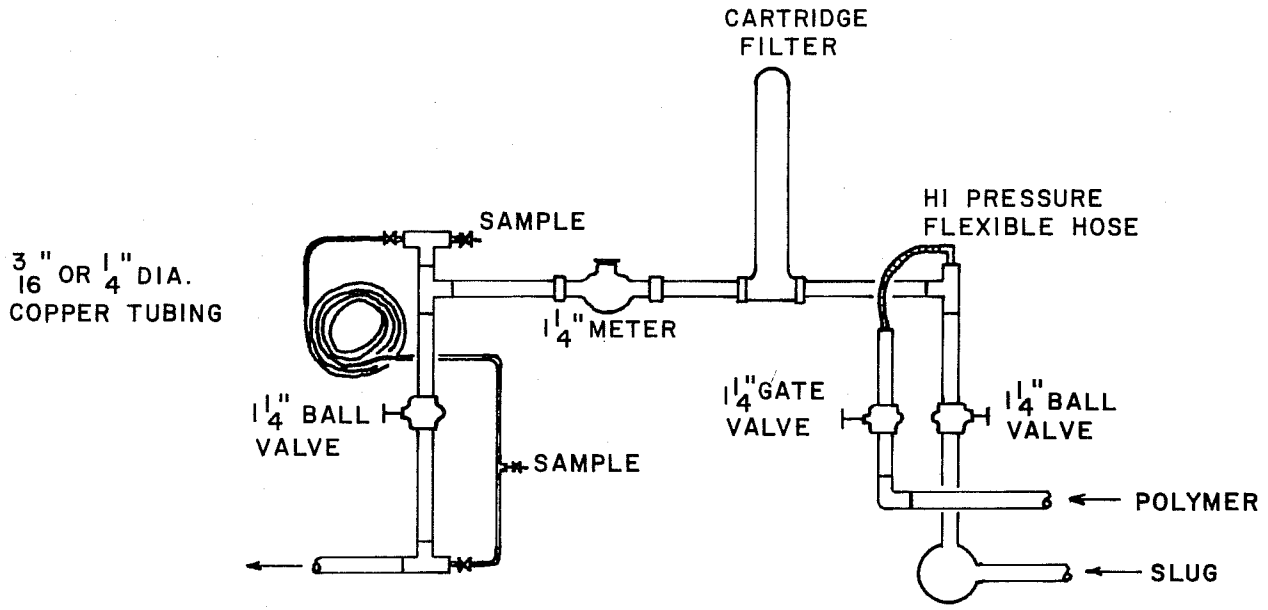

DE FILTER
MIXER
MIXER
PRECOAT RETURN
SLUICE
FLOW METER
LEAF VIBRATOR
1500 GAL. EPOXY COATED SLURRY TANK
2000 GAL. EPOXY COATED PRECOAT TANK
FILTER DISCHARGE
LEAF ASSEMBLY
SLURRY PUMP
FRESH WATER SUPPLY
20 HP CENTRIFUGAL PRECOAT PUMP
FILTER INLET
FILTER DRAIN
HEEL DRAIN

FIGURE 23

INJECTION HEADER SCHEMATIC



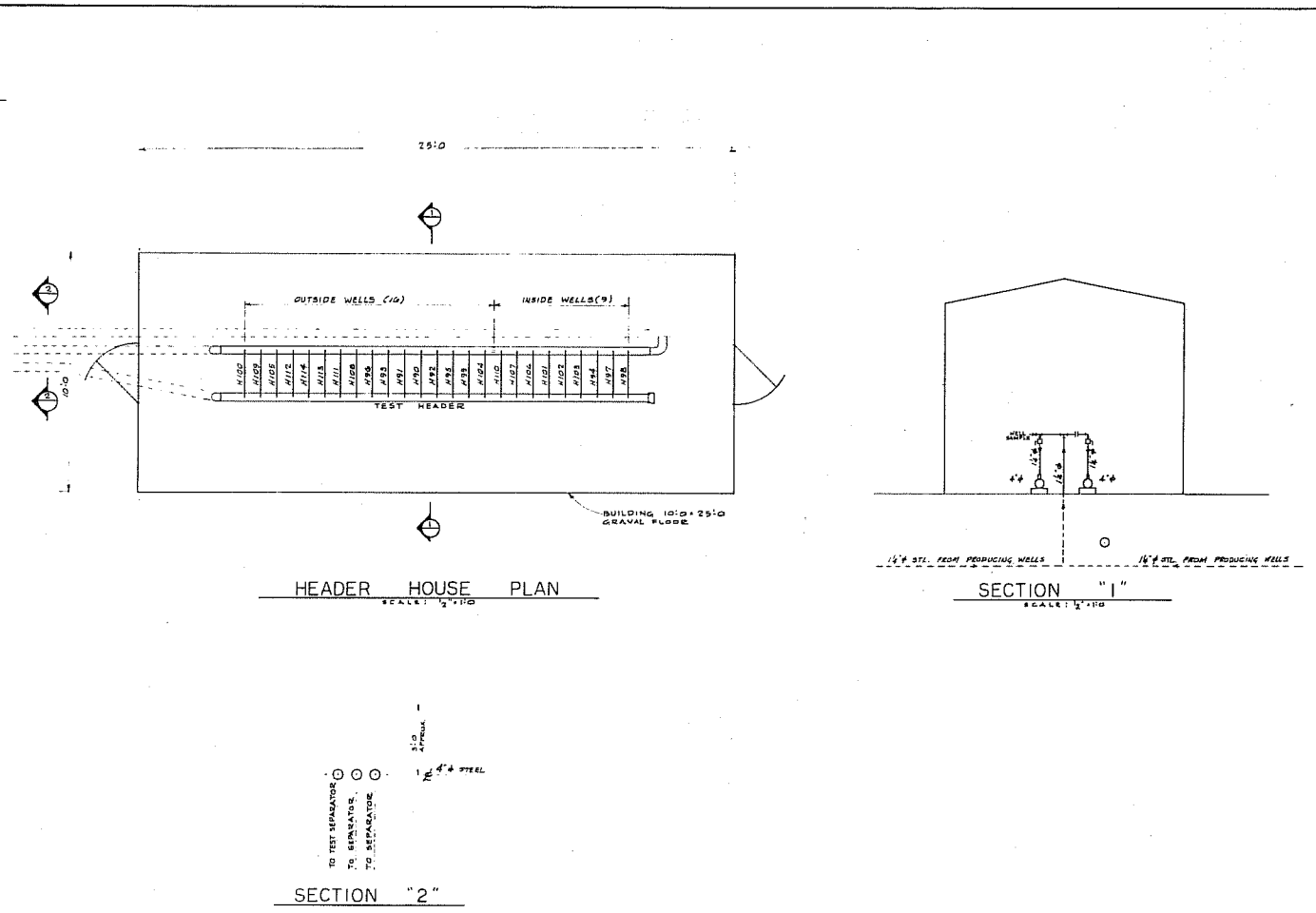
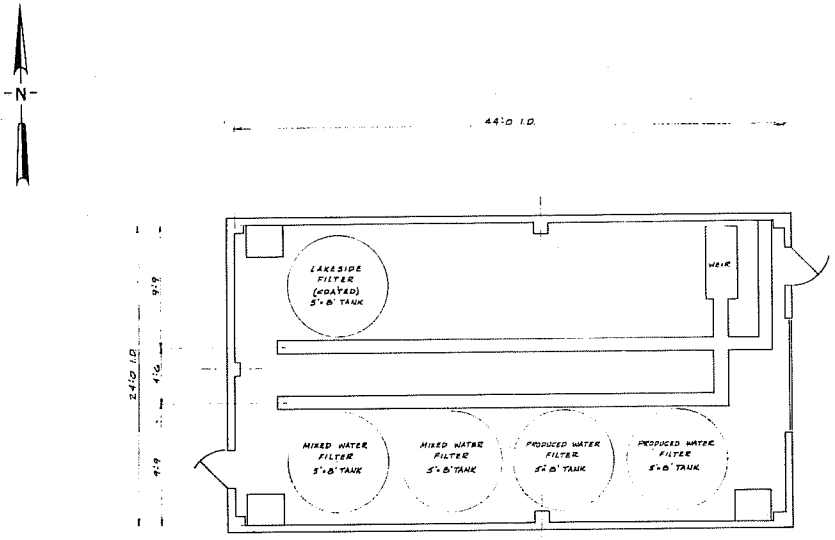


FIGURE 24

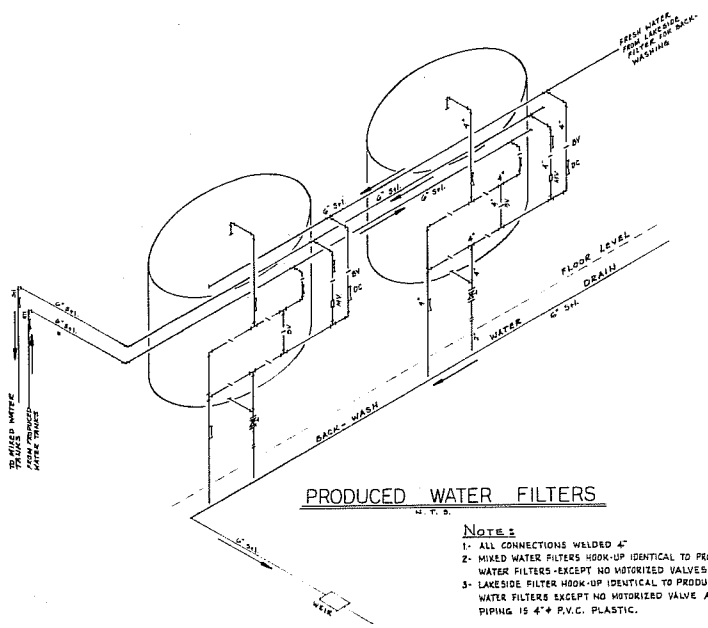
DWG. 6

PENNZOIL COMPANY BRADFORD, PA.			
REVISIONS	DATE	SUBJECT HEADER HOUSE	FILE
		FARM LAWRY	
		WT. 3496	
		SCALE AS NOTED	
		DR. LUEY CK. APP.	TKC



FILTER HOUSE PLAN

SCALE: 1/4"=1'-0



PRODUCED WATER FILTERS

N. T. S.

NOTE:

1- ALL CONNECTIONS WELDED 4"

2- MIXED WATER FILTERS HOOK-UP IDENTICAL TO PRODUCED WATER FILTERS EXCEPT NO MOTORIZED VALVES.

3- LAKESIDE FILTER HOOK-UP IDENTICAL TO PRODUCED WATER FILTERS EXCEPT NO MOTORIZED VALVE AND PIPING IS 4" P.V.C. PLASTIC.

FIGURE 25

DWG. 7

PENNZOIL COMPANY BRADFORD, PA.			
REVISIONS	DATE	SUBJECT FILTER HOUSE	FILE
		FARM LAWRY	
		WT. 5456	
		SCALE AS NOTED	
		DR. LUEY CK. APP.	TRC

FIGURE 26

DOE — LAWRY PROJECT
TOTAL INJECTION

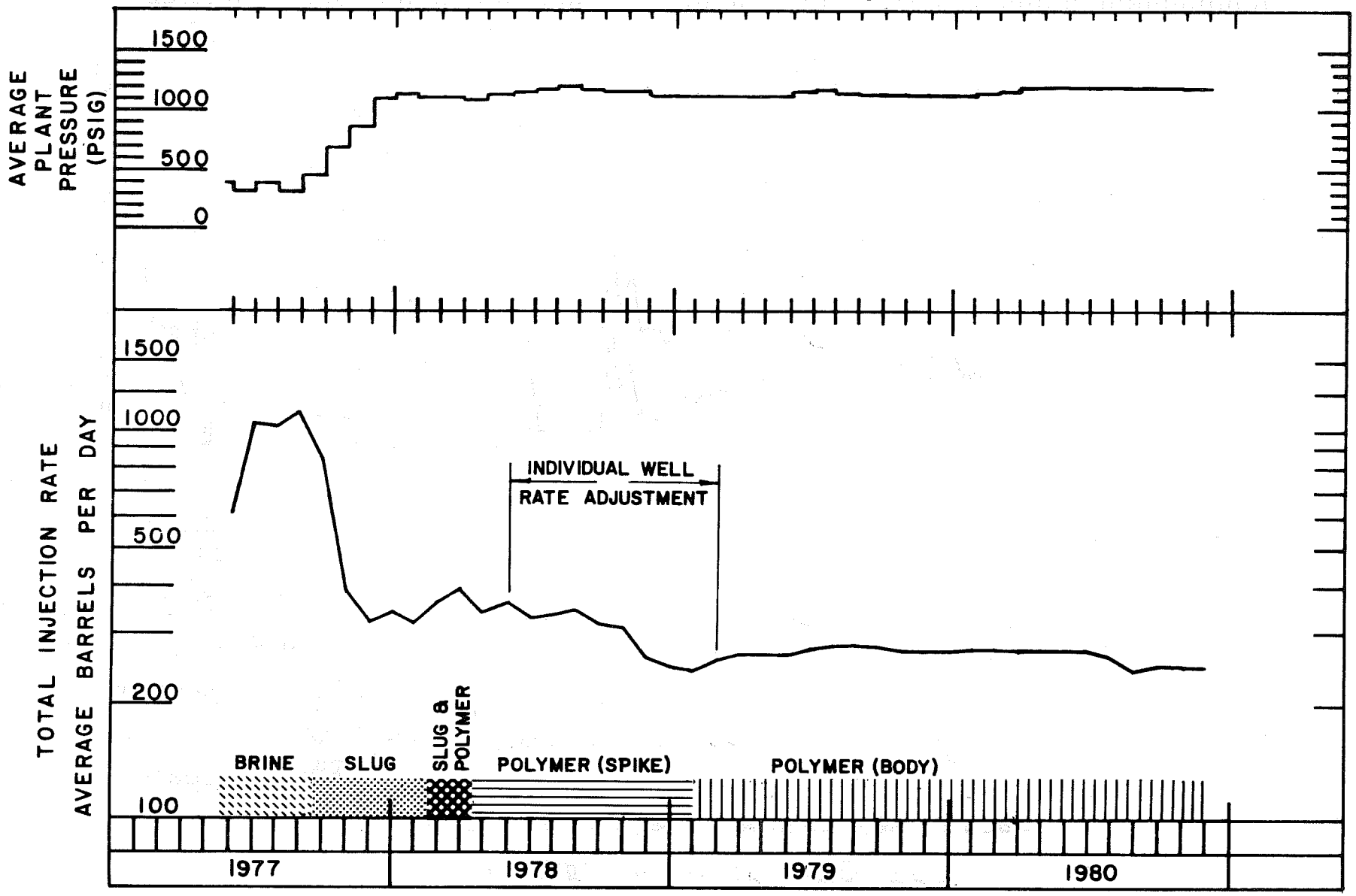


FIGURE 27

ERDA - LAWRY PROJECT

SLUG/POLYMER INJECTION RATES

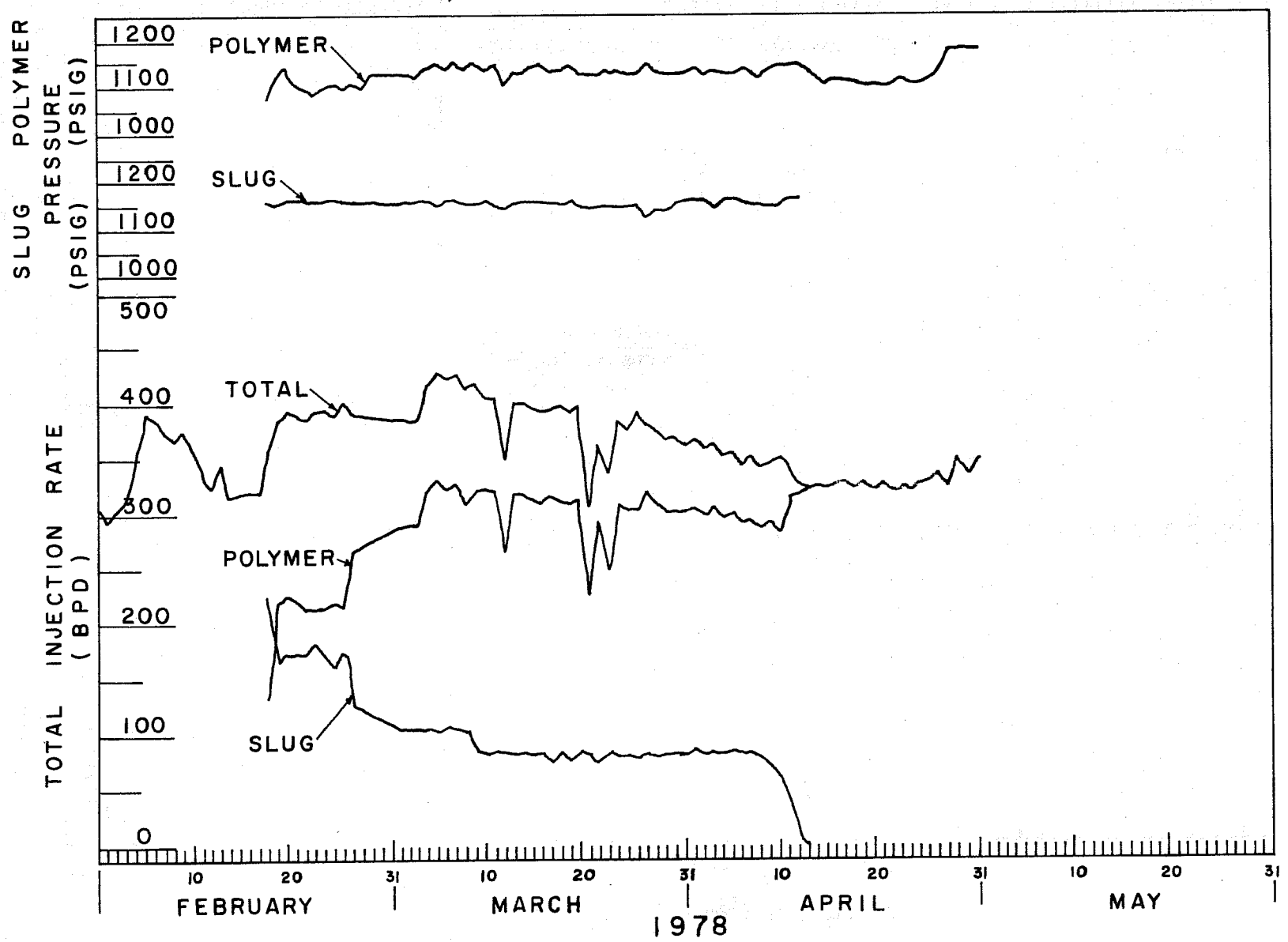


FIGURE 28

SLUG MIXING SCHEMATIC

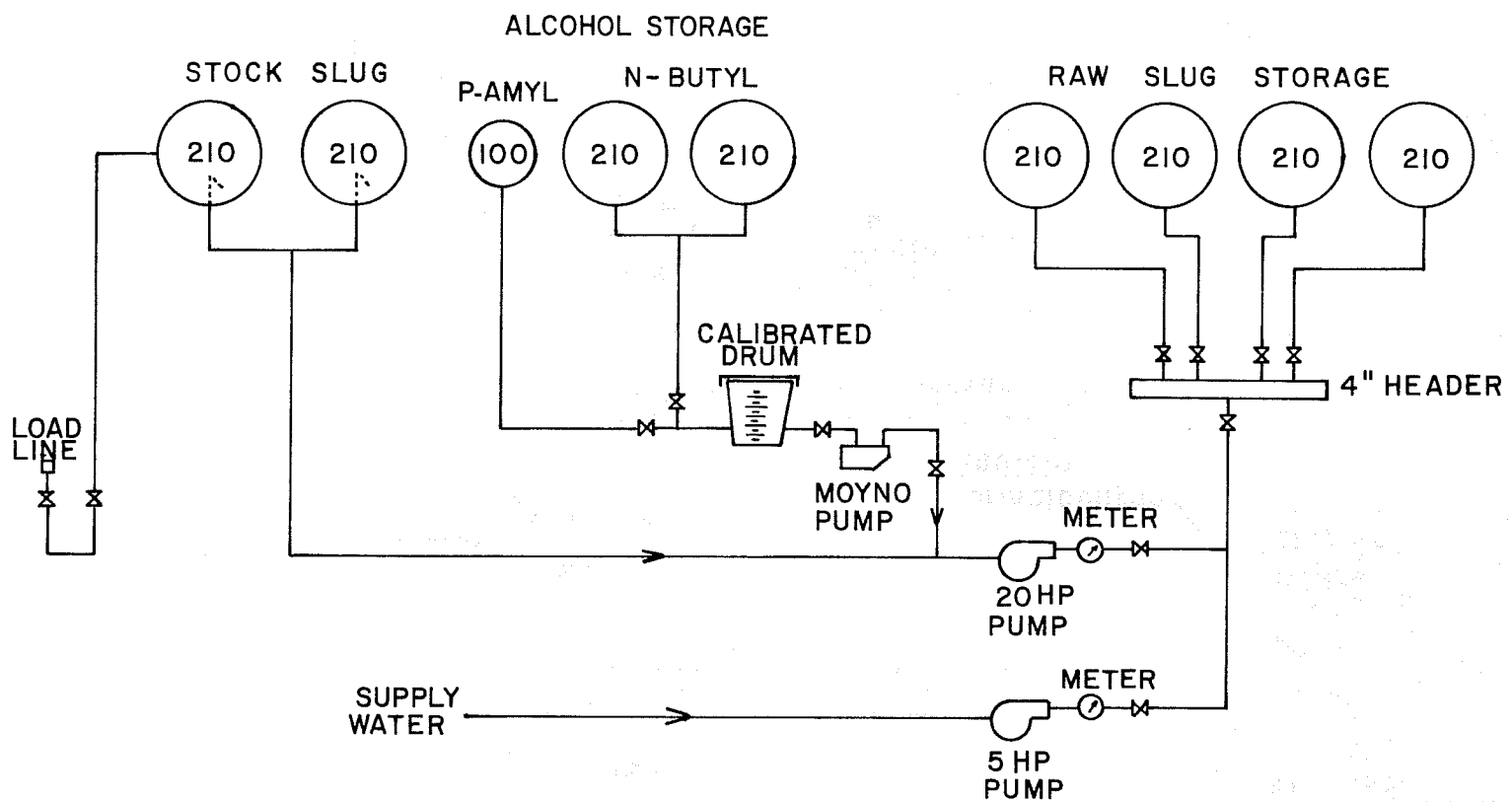


FIGURE 29

Slug/Polymer Injection Schematic

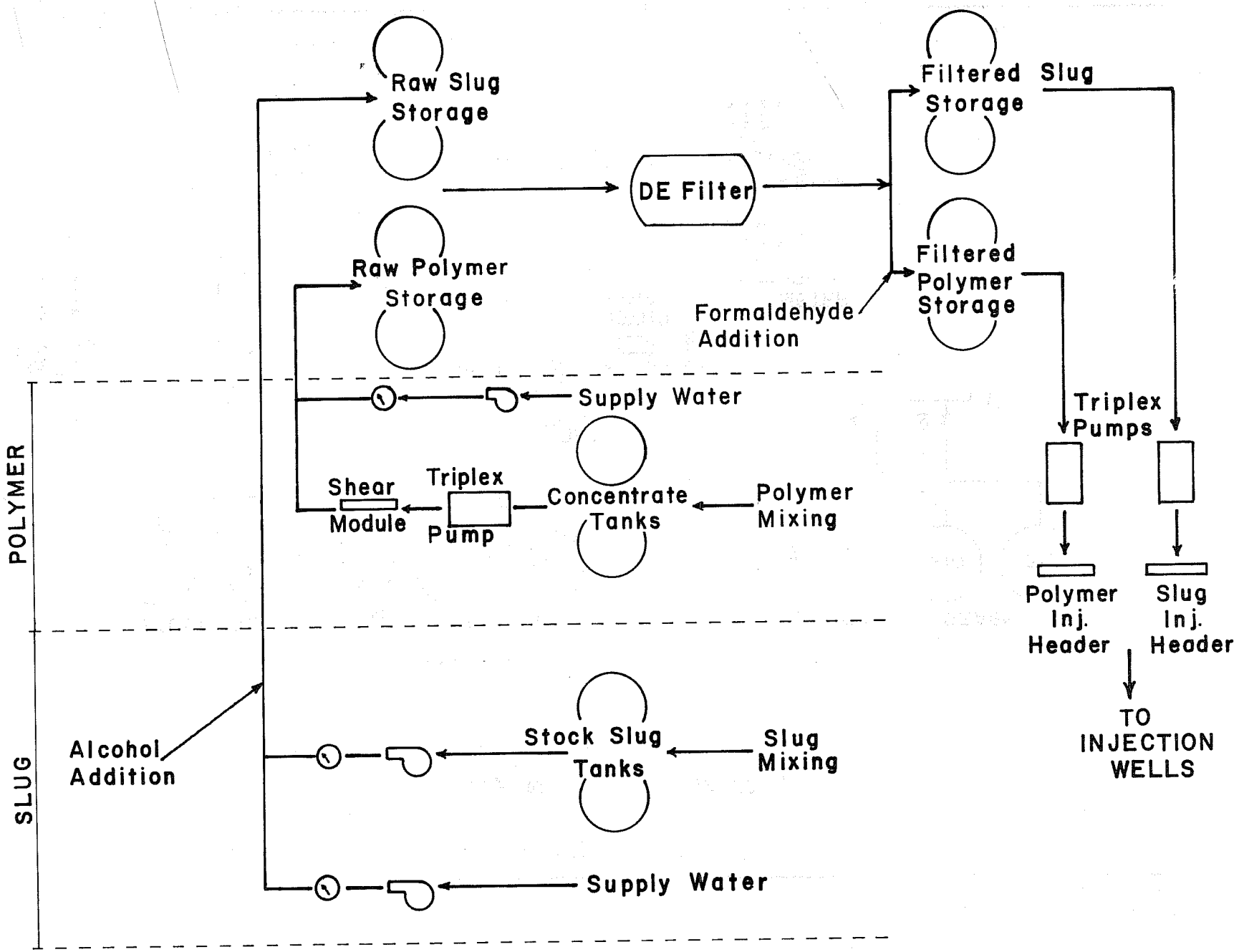


FIGURE 30

POLYMER MIXING SCHEMATIC

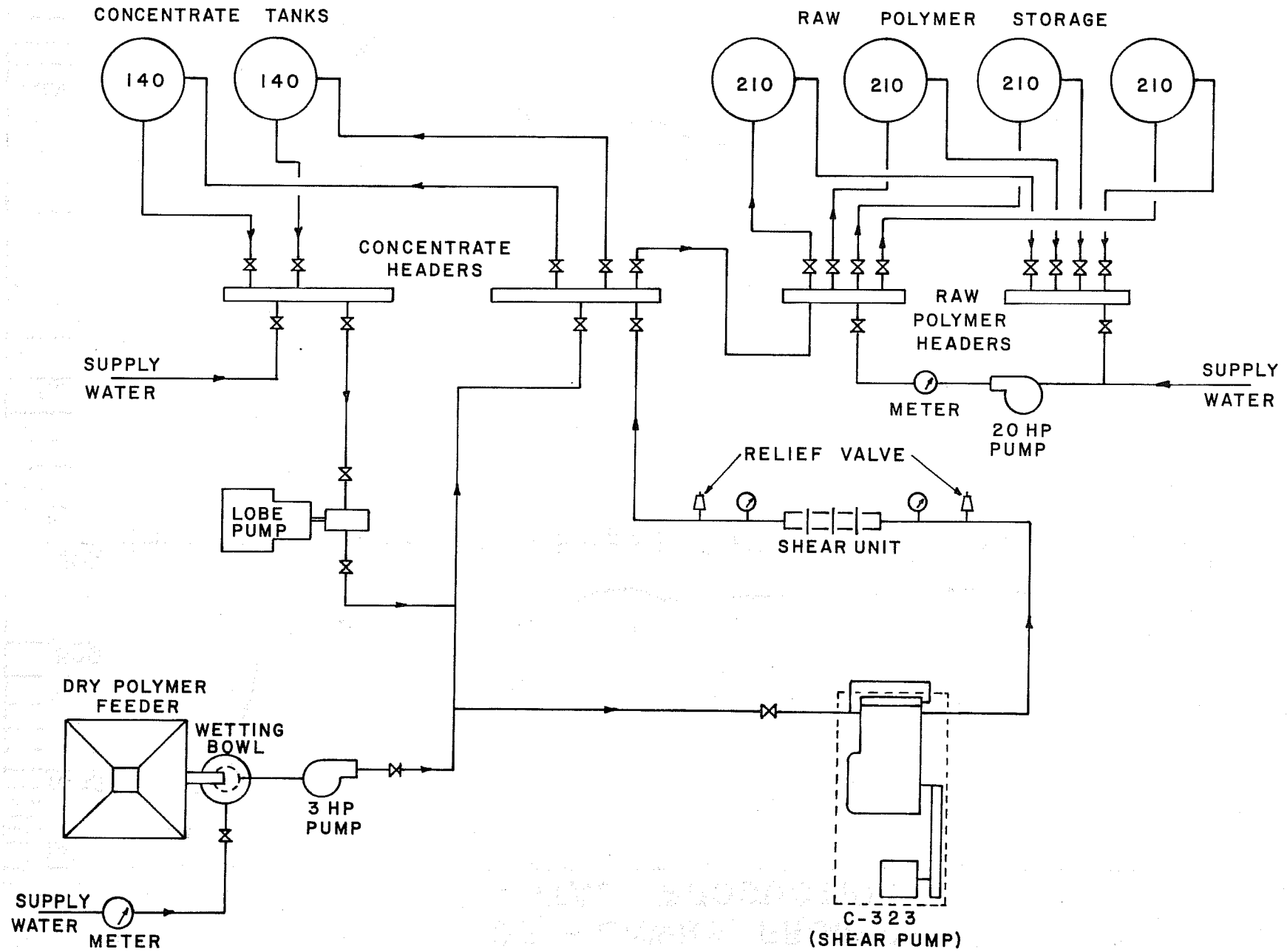


FIGURE 31

DOE — LAWRY PROJECT
TOTAL PRODUCTION

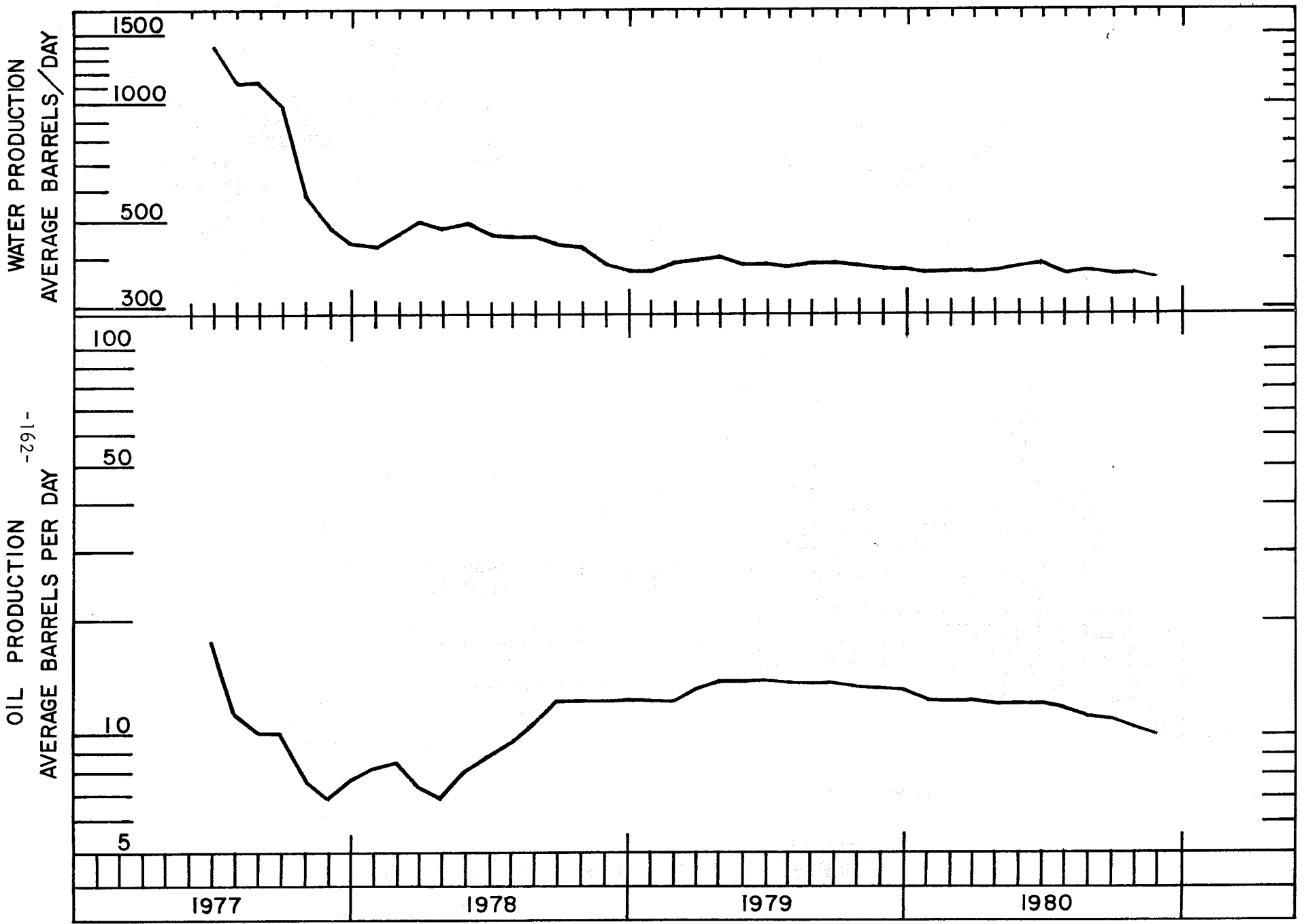


FIGURE 32

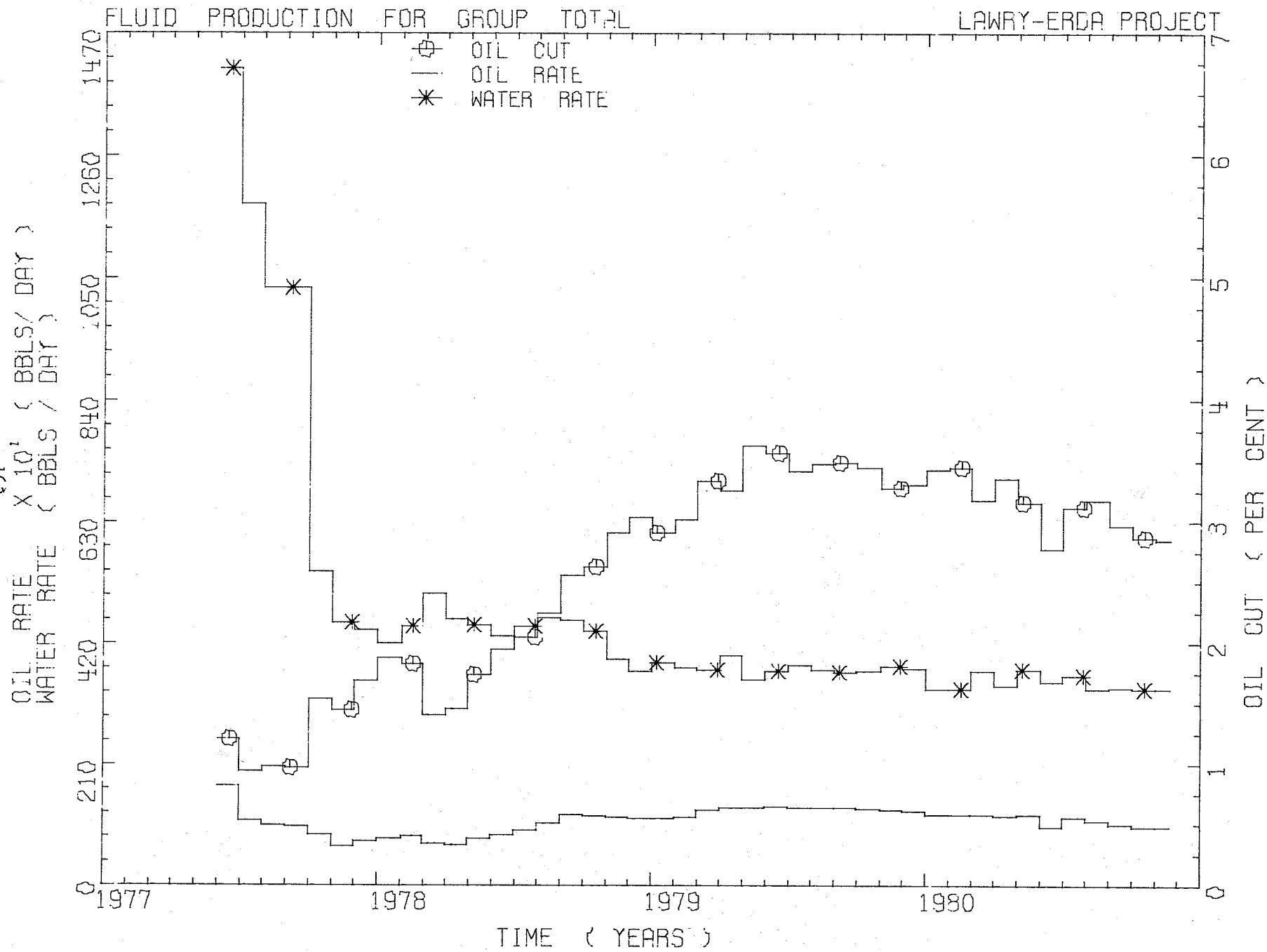

FLUID PRODUCTION FOR GROUP TOTAL
LAWRY-ERDA PROJECT
OIL CUT
OIL RATE
WATER RATE
OIL RATE X 10¹ (BBLS/ DAY)
WATER RATE (BBLS / DAY)
OIL CUT (PER CENT)
TIME (YEARS)
0
210
420
630
840
1050
1260
1470
1977
1978
1979
1980
0
1
2
3
4
5
6
7

FIGURE 33

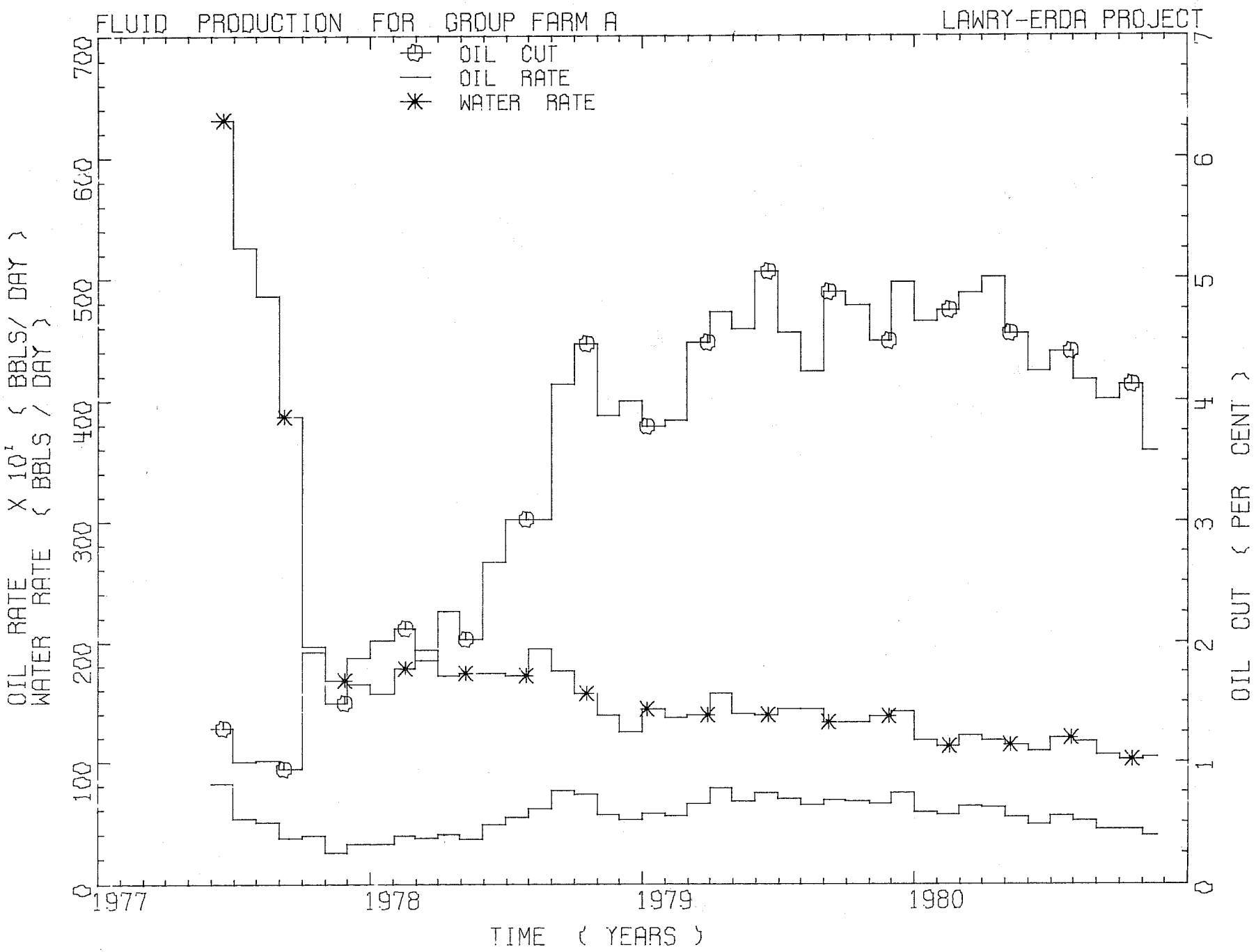
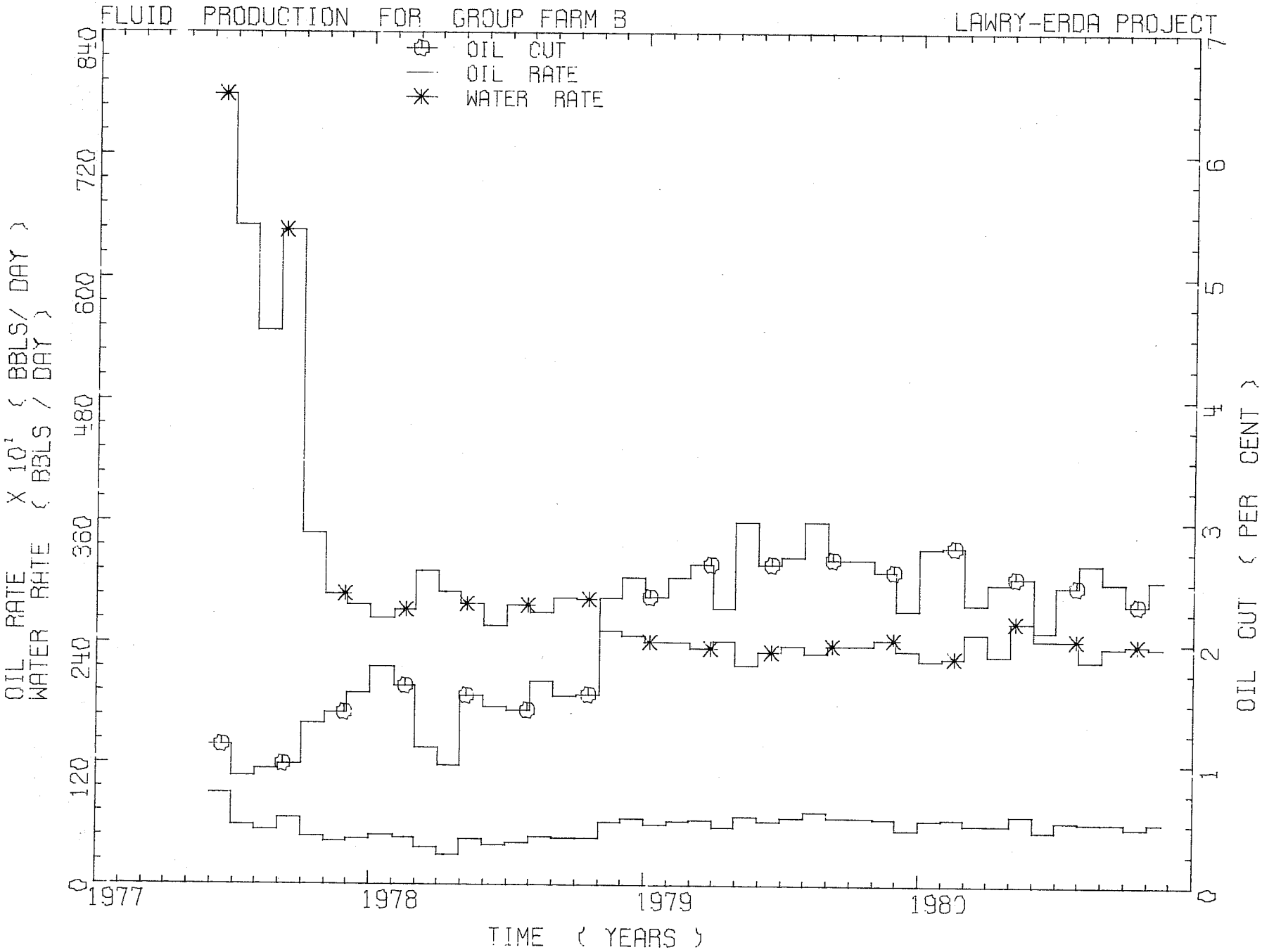

FLUID PRODUCTION FOR GROUP FARM A
LAWRY-ERDA PROJECT
OIL CUT
OIL RATE
WATER RATE
OIL RATE X 10^1 (BBLS/ DAY)
WATER RATE (BBLS / DAY)
OIL CUT (PER CENT)
TIME (YEARS)
0
100
200
300
400
500
600
700
1
2
3
4
5
6
7
1977
1978
1979
1980

FIGURE 34



1551 HRS. 19 JAN 1981

START OF BLOCK 206

FIGURE 35

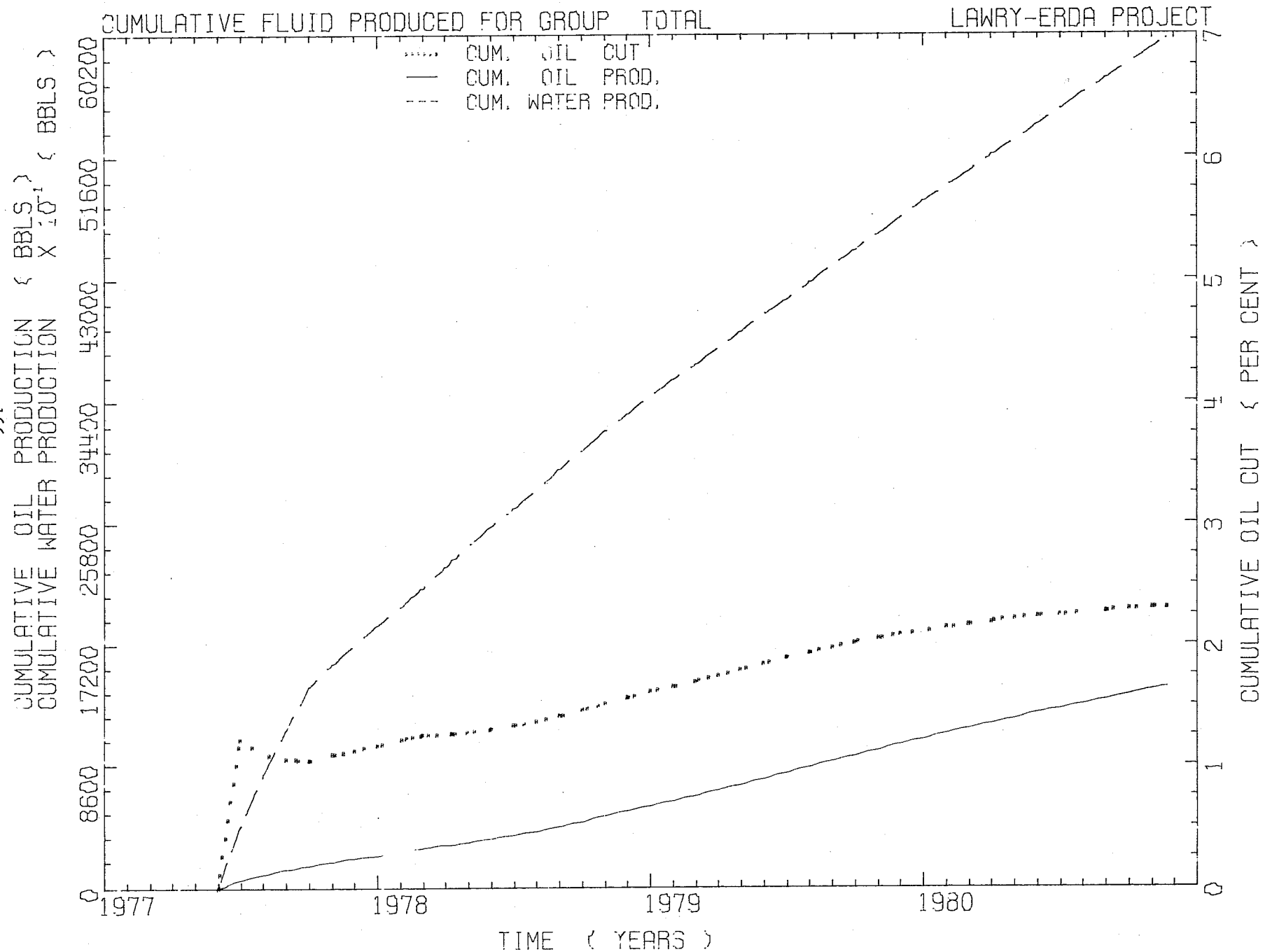

CUMULATIVE FLUID PRODUCED FOR GROUP TOTAL
LAWRY-ERDA PROJECT
CUM. OIL CUT
CUM. OIL PROD.
CUM. WATER PROD.
CUMULATIVE OIL PRODUCTION (BBLS)
CUMULATIVE WATER PRODUCTION X 10^-1 (BBLS)
0
8600
17200
25800
34400
43000
51600
60200
CUMULATIVE OIL CUT (PER CENT)
0
1
2
3
4
5
6
7
1977
1978
1979
1980
TIME (YEARS)

FIGURE 36

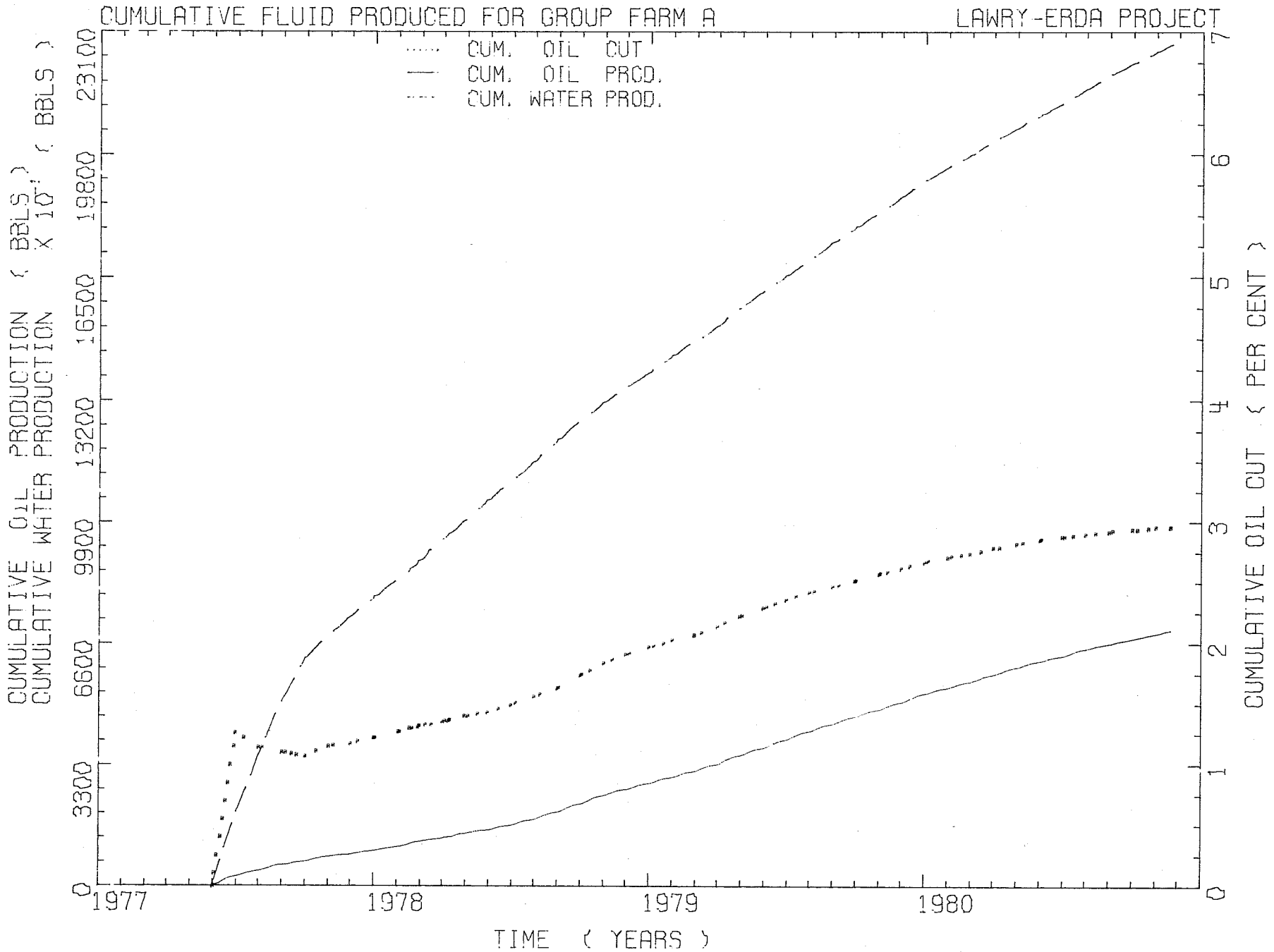

CUMULATIVE FLUID PRODUCED FOR GROUP FARM A
LAWRY-ERDA PROJECT
CUM. OIL CUT
CUM. OIL PROD.
CUM. WATER PROD.
CUMULATIVE OIL PRODUCTION (BBLS)
CUMULATIVE WATER PRODUCTION X 10⁻¹ (BBLS)
0
3300
6600
9900
13200
16500
19800
23100
CUMULATIVE OIL CUT (PER CENT)
0
1
2
3
4
5
6
7
1977
1978
1979
1980
TIME (YEARS)

FIGURE 37

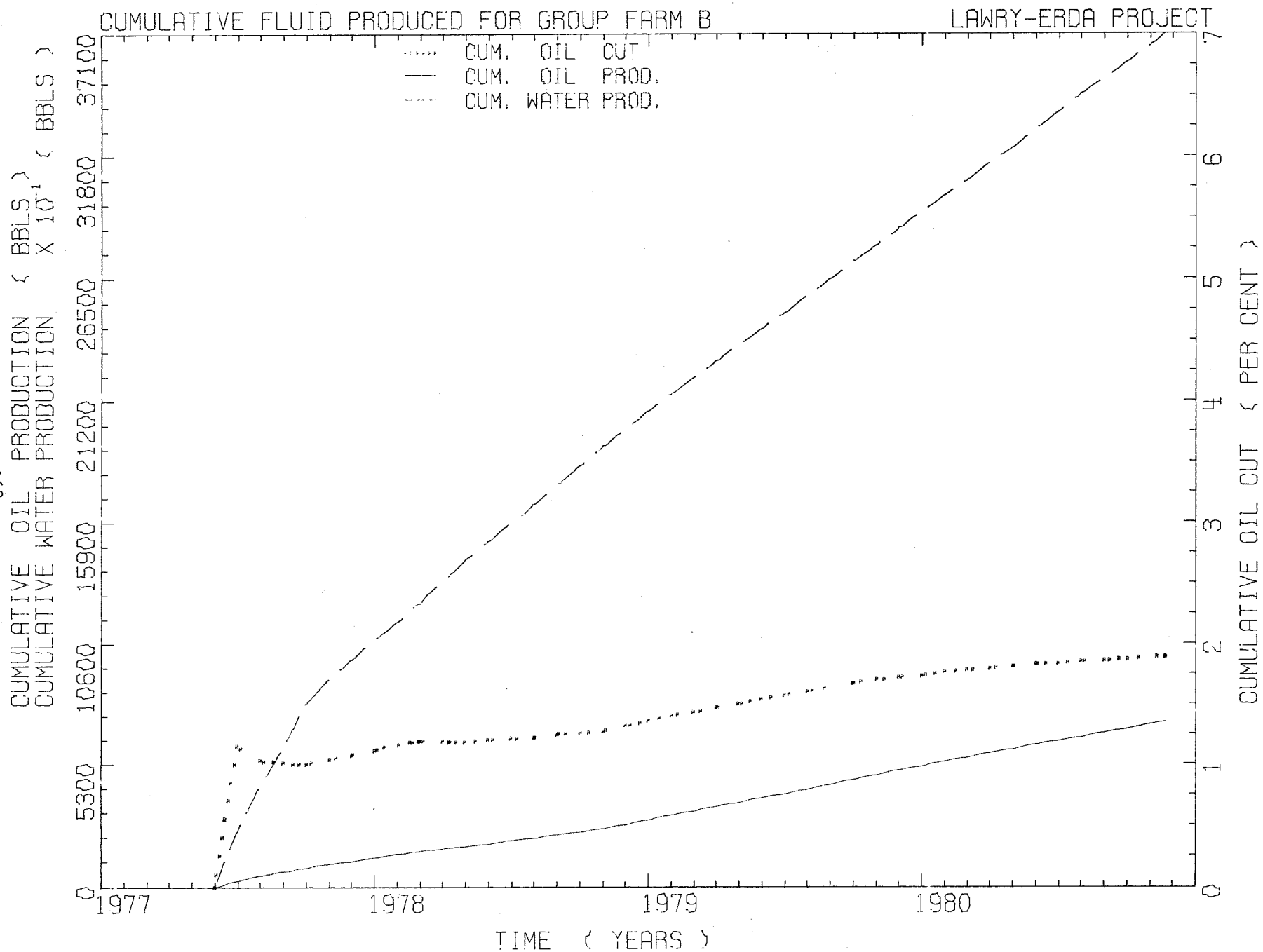

CUMULATIVE FLUID PRODUCED FOR GROUP FARM B
LAWRY-ERDA PROJECT
CUM. OIL CUT
CUM. OIL PROD.
CUM. WATER PROD.
CUMULATIVE OIL PRODUCTION (BBLS)
CUMULATIVE WATER PRODUCTION X 10^-1 (BBLS)
0
5300
10600
15900
21200
26500
31800
37100
CUMULATIVE OIL CUT (PER CENT)
0
1
2
3
4
5
6
7
1977
1978
1979
1980
TIME (YEARS)

FIGURE 38

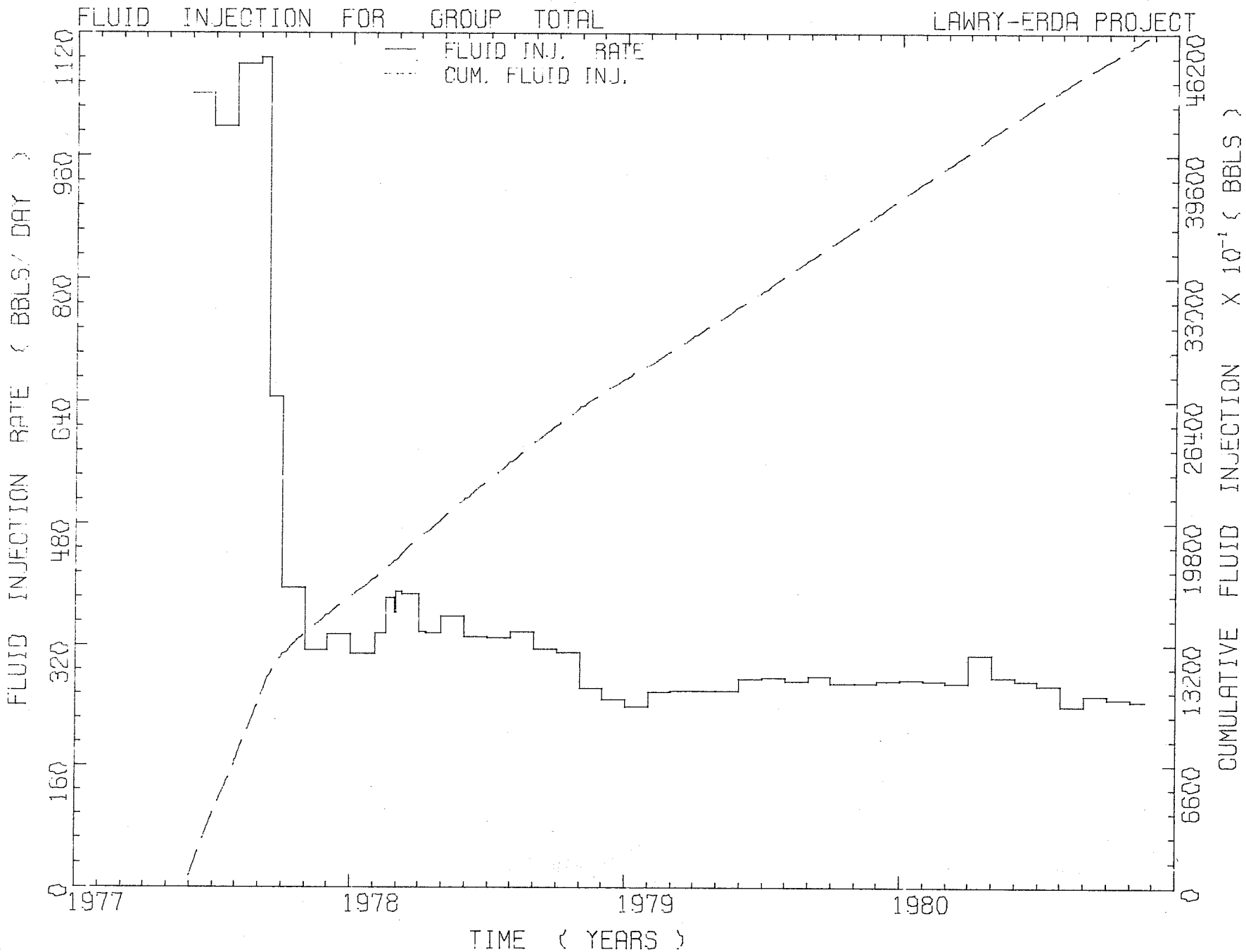

FLUID INJECTION FOR GROUP TOTAL
LAWRY-ERDA PROJECT
FLUID INJ. RATE
CUM. FLUID INJ.
FLUID INJECTION RATE (BBLS/ DAY)
CUMULATIVE FLUID INJECTION X 10⁻¹ (BBLS)
TIME (YEARS)
0
160
320
480
640
800
960
1120
0
6600
13200
19800
26400
33000
39600
46200
1977
1978
1979
1980

FIGURE 39

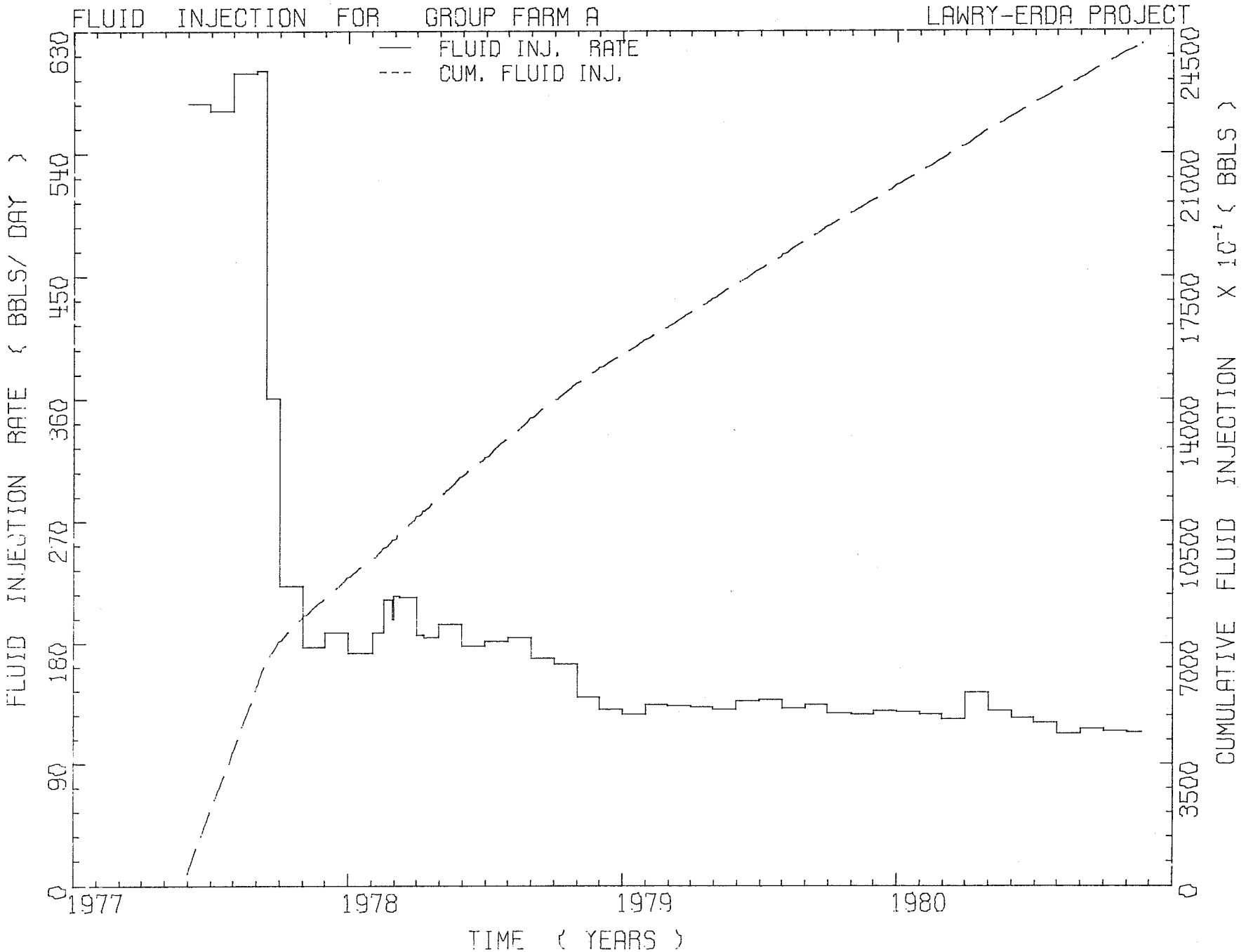

FLUID INJECTION FOR GROUP FARM A
LAWRY-ERDA PROJECT
FLUID INJ. RATE
CUM. FLUID INJ.
FLUID INJECTION RATE (BBLS/ DAY)
CUMULATIVE FLUID INJECTION X 10⁻¹ (BBLS)
TIME (YEARS)
0
90
180
270
360
450
540
630
0
3500
7000
10500
14000
17500
21000
24500
1977
1978
1979
1980

FIGURE 40

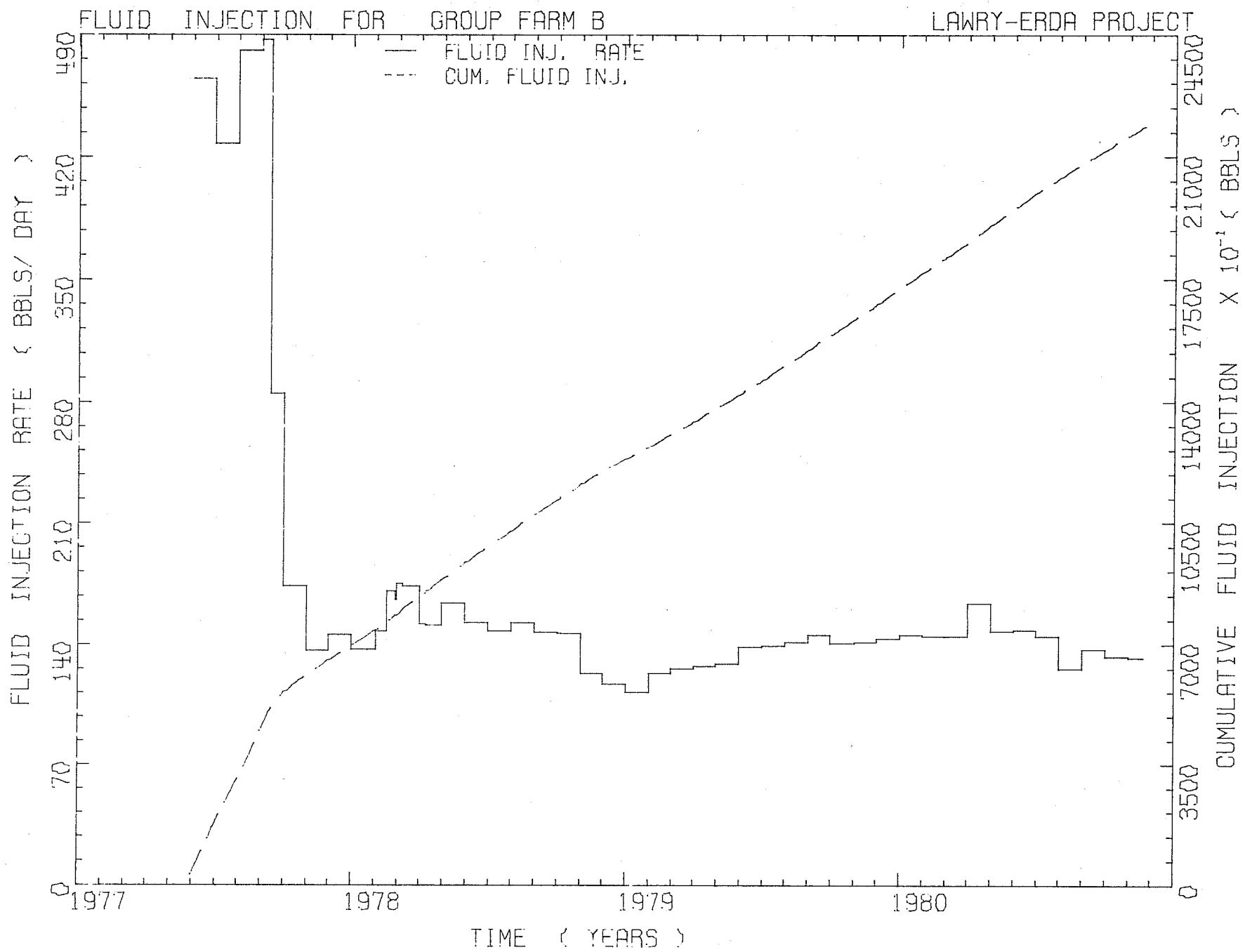

FLUID INJECTION FOR GROUP FARM B
LAWRY-ERDA PROJECT
FLUID INJ. RATE
CUM. FLUID INJ.
FLUID INJECTION RATE (BBLS/ DAY)
CUMULATIVE FLUID INJECTION X 10⁻¹ (BBLS)
TIME (YEARS)
0
70
140
210
280
350
420
490
3500
7000
10500
14000
17500
21000
24500
1977
1978
1979
1980

FIGURE 41

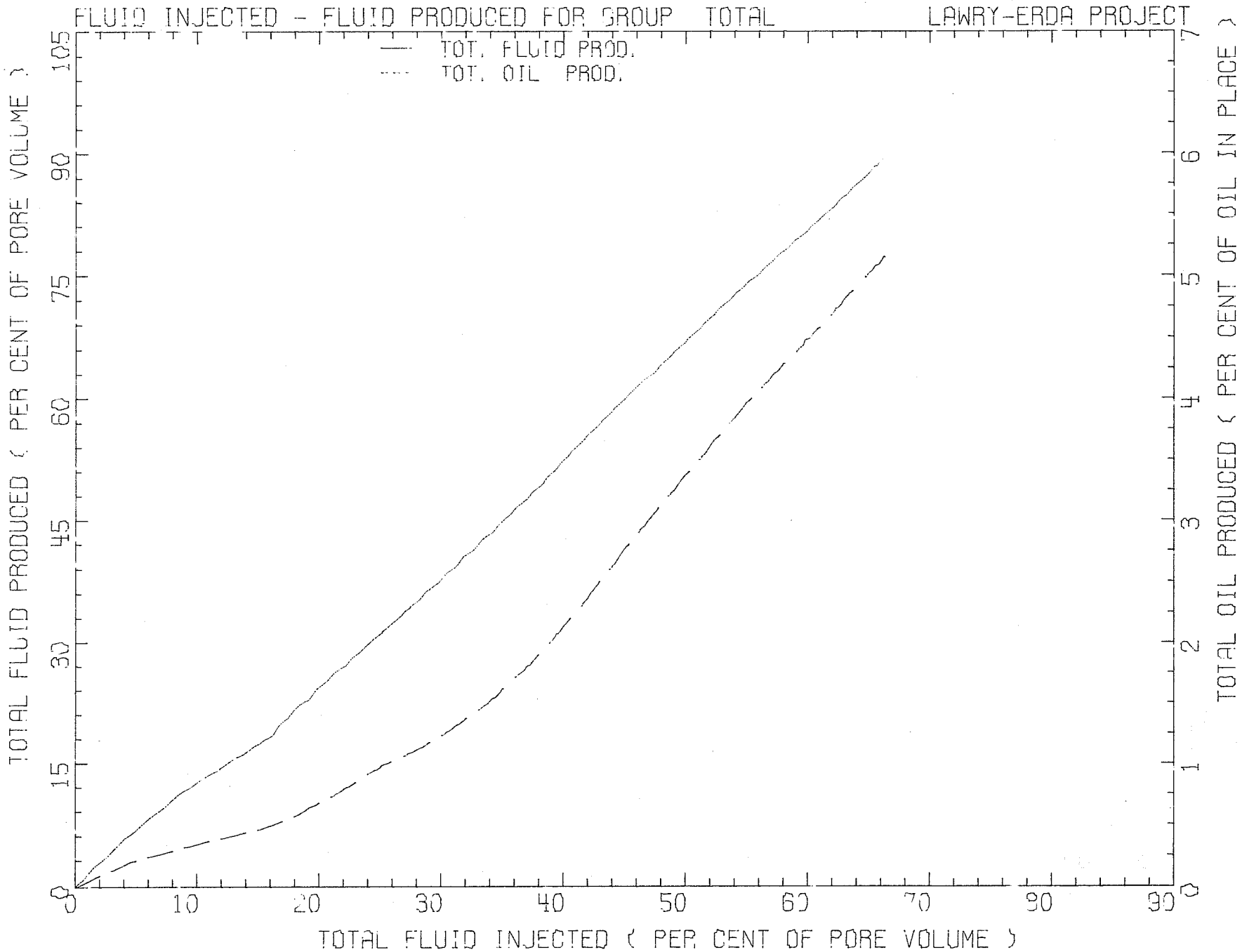
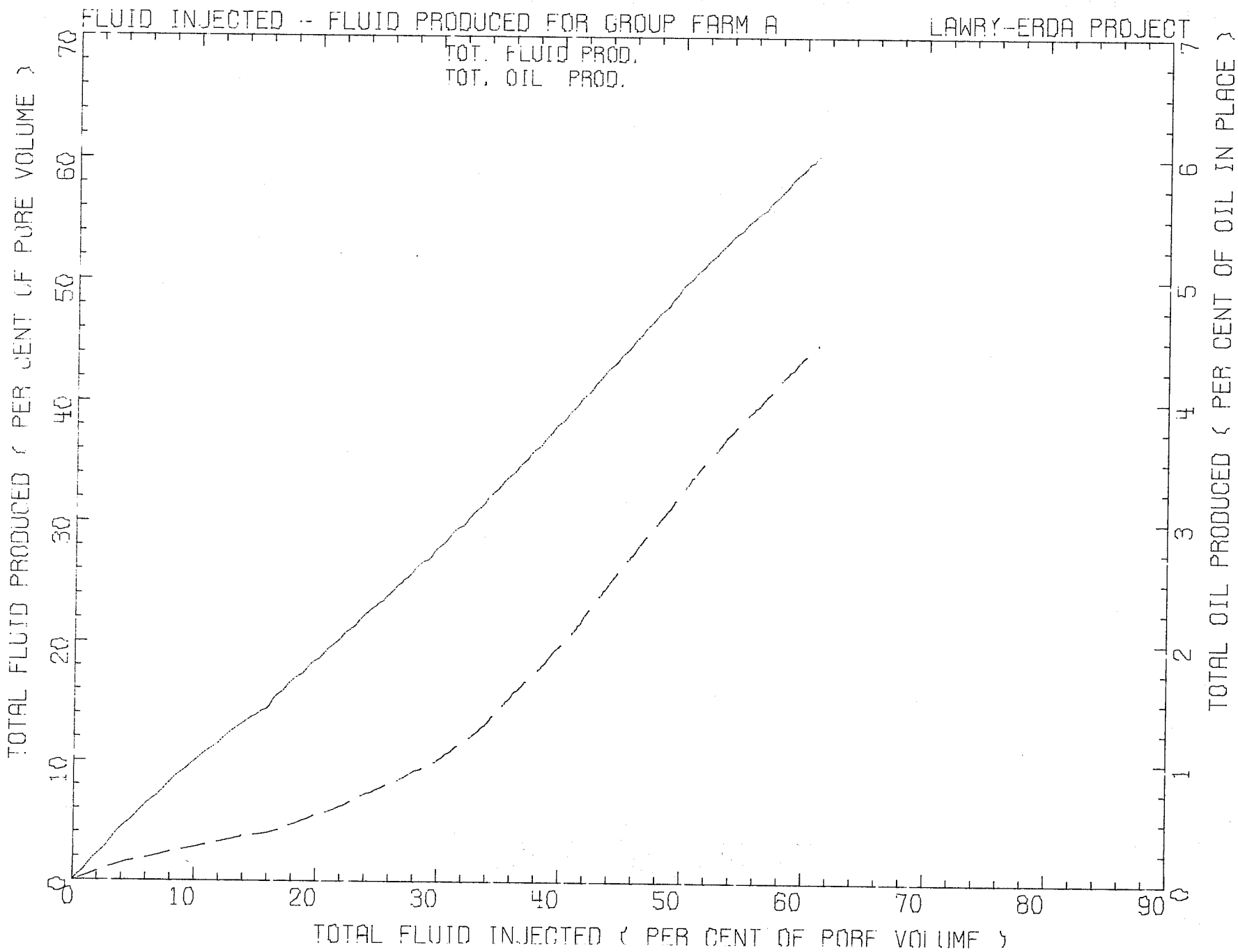

FLUID INJECTED - FLUID PRODUCED FOR GROUP TOTAL
LAWRY-ERDA PROJECT
TOT. FLUID PROD.
TOT. OIL PROD.
TOTAL FLUID PRODUCED (PER CENT OF PORE VOLUME)
TOTAL OIL PRODUCED (PER CENT OF OIL IN PLACE)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
15
30
45
60
75
90
105
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7

FIGURE 42



START OF BLOCK 203

FIGURE 43

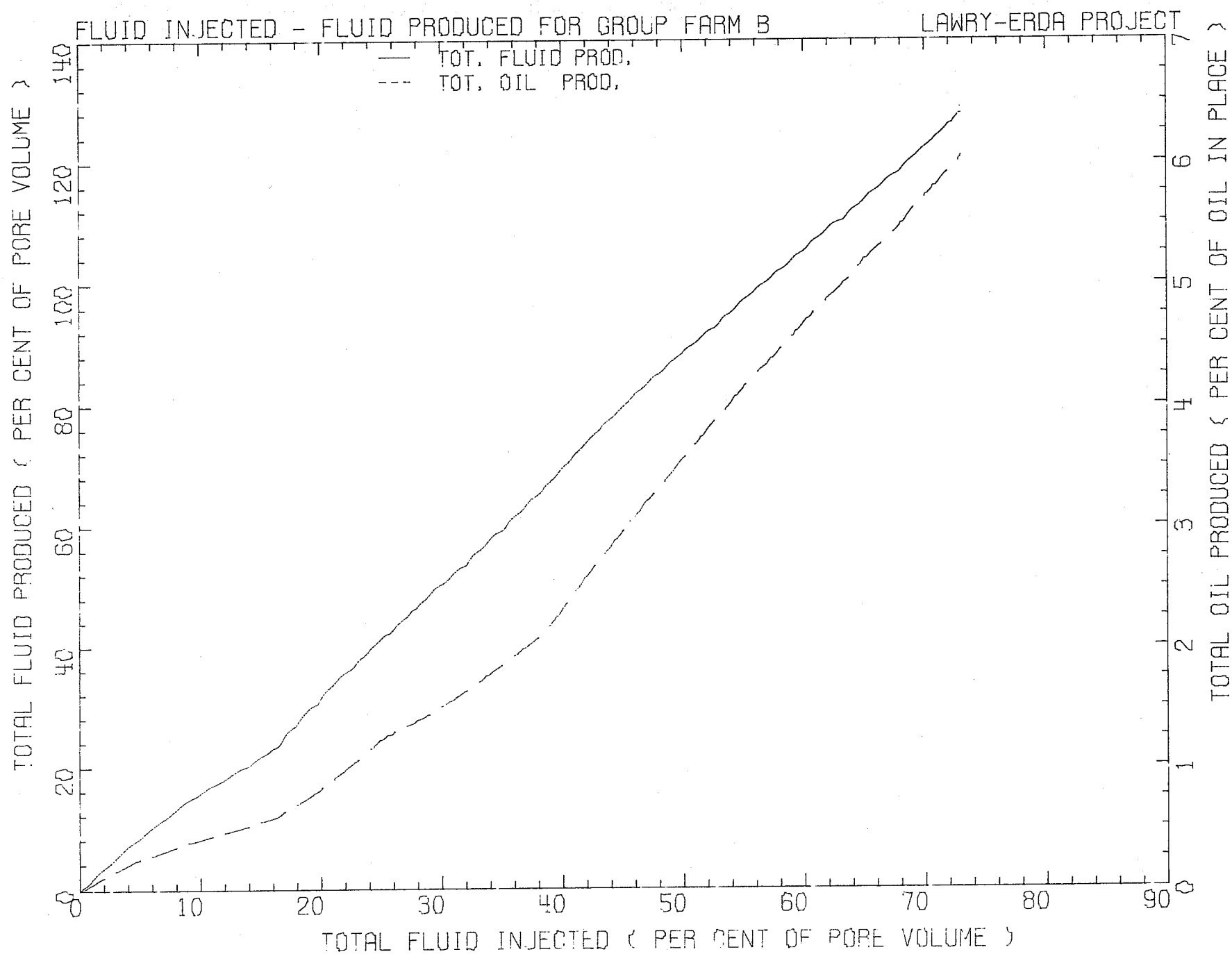

FLUID INJECTED - FLUID PRODUCED FOR GROUP FARM B
LAWRY-ERDA PROJECT
TOT. FLUID PROD.
TOT. OIL PROD.
TOTAL FLUID PRODUCED (PER CENT OF PORE VOLUME)
TOTAL OIL PRODUCED (PER CENT OF OIL IN PLACE)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
20
40
60
80
100
120
140
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4
5
6
7

FIGURE 44

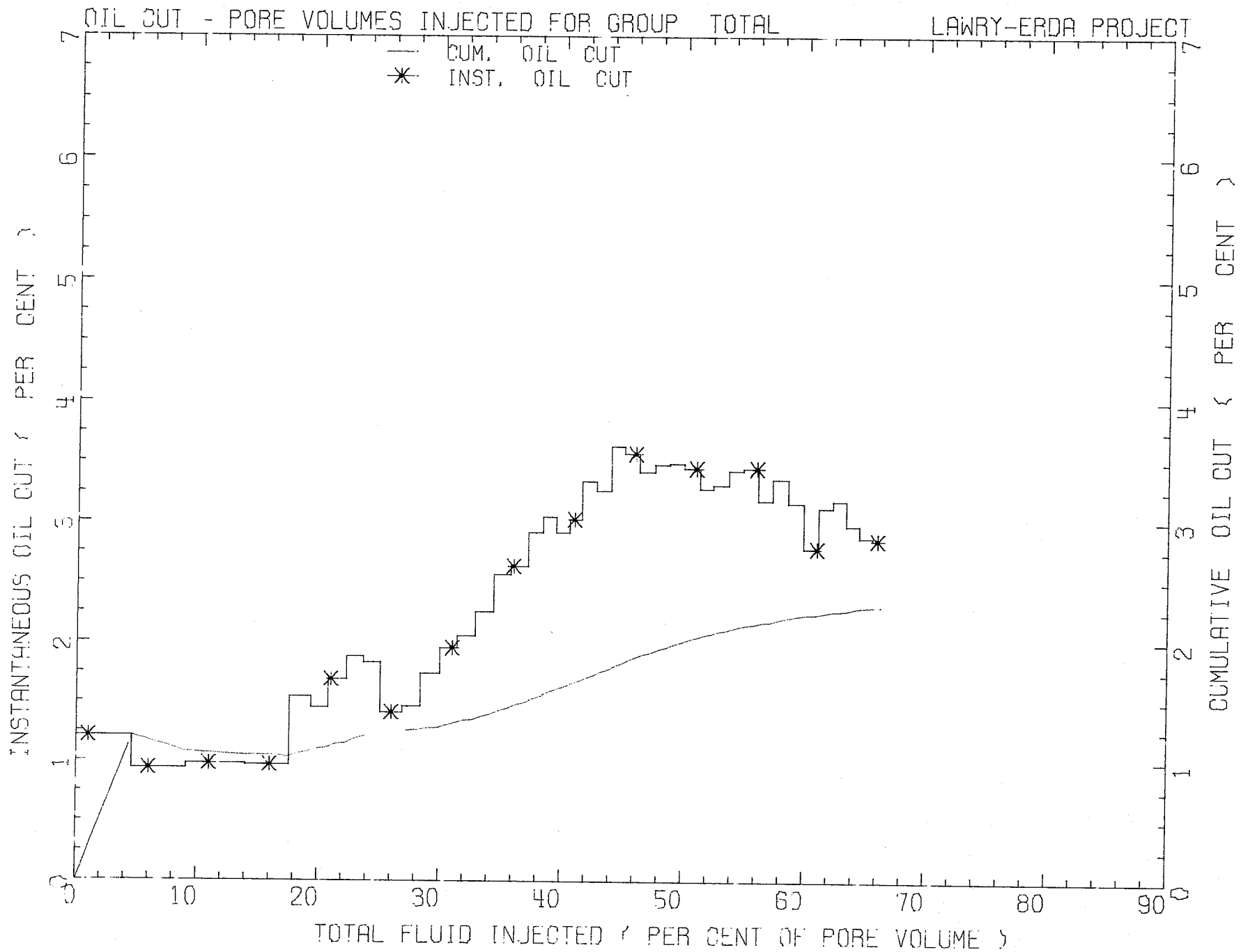

OIL CUT - PORE VOLUMES INJECTED FOR GROUP TOTAL
LAWRY-ERDA PROJECT
CUM. OIL CUT
INST. OIL CUT
INSTANTANEOUS OIL CUT (PER CENT)
CUMULATIVE OIL CUT (PER CENT)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7

FIGURE 45

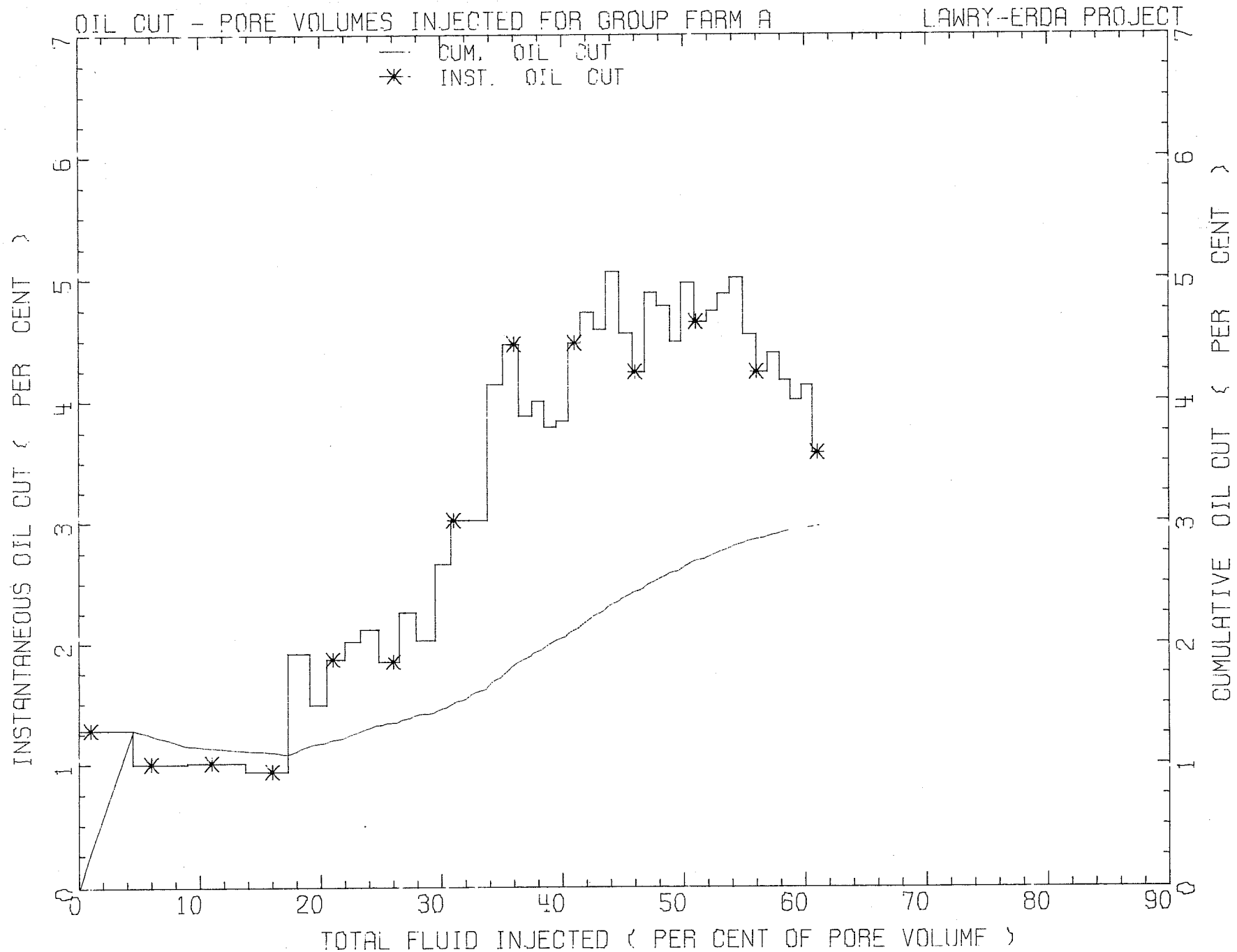

OIL CUT - PORE VOLUMES INJECTED FOR GROUP FARM A
LAWRY-ERDA PROJECT
CUM. OIL CUT
INST. OIL CUT
INSTANTANEOUS OIL CUT (PER CENT)
CUMULATIVE OIL CUT (PER CENT)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
1
2
3
4
5
6
7
10
20
30
40
50
60
70
80
90

FIGURE 46

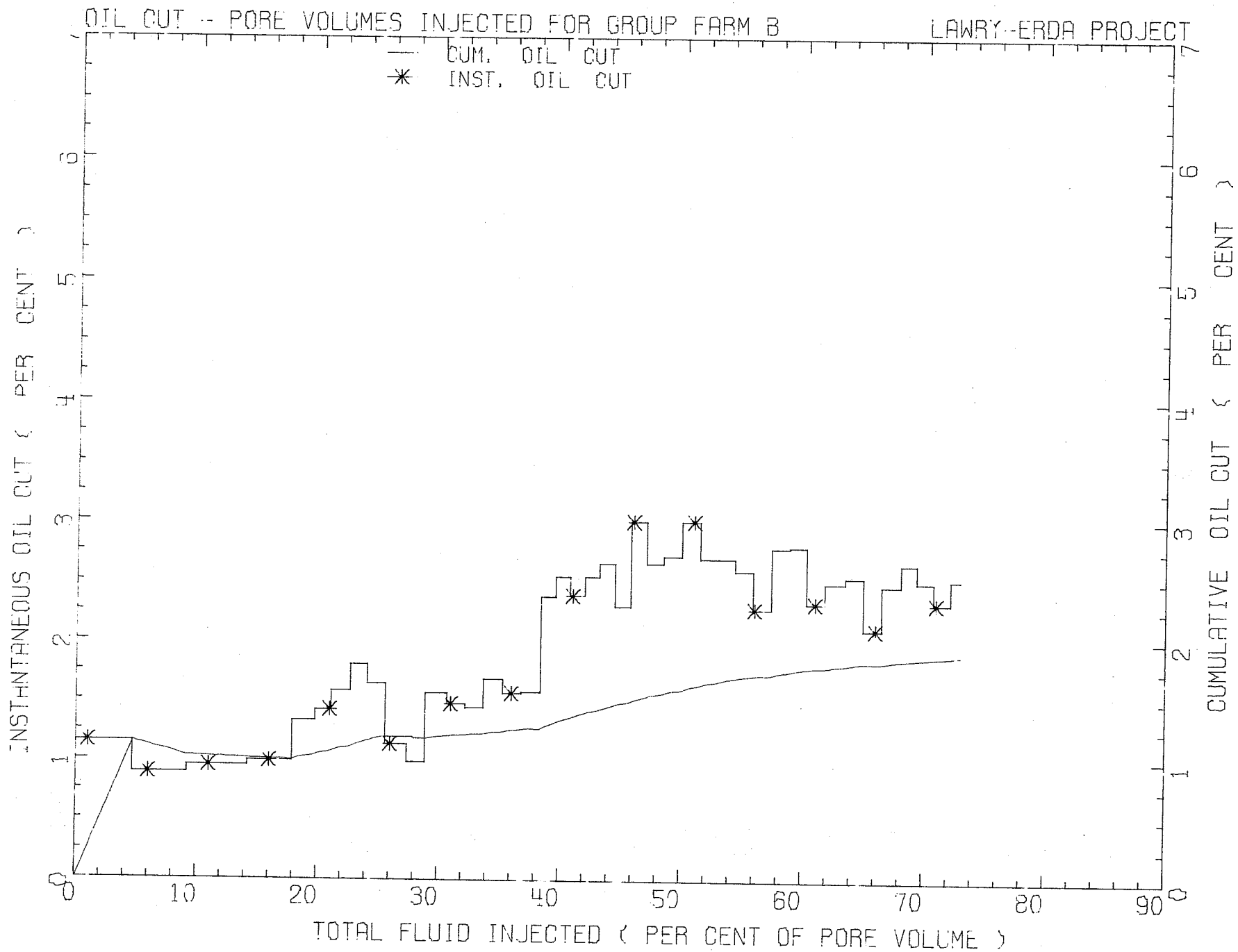

OIL CUT -- PORE VOLUMES INJECTED FOR GROUP FARM B
LAWRY-ERDA PROJECT
CUM. OIL CUT
INST. OIL CUT
INSTANTANEOUS OIL CUT (PER CENT)
CUMULATIVE OIL CUT (PER CENT)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7

FIGURE 47

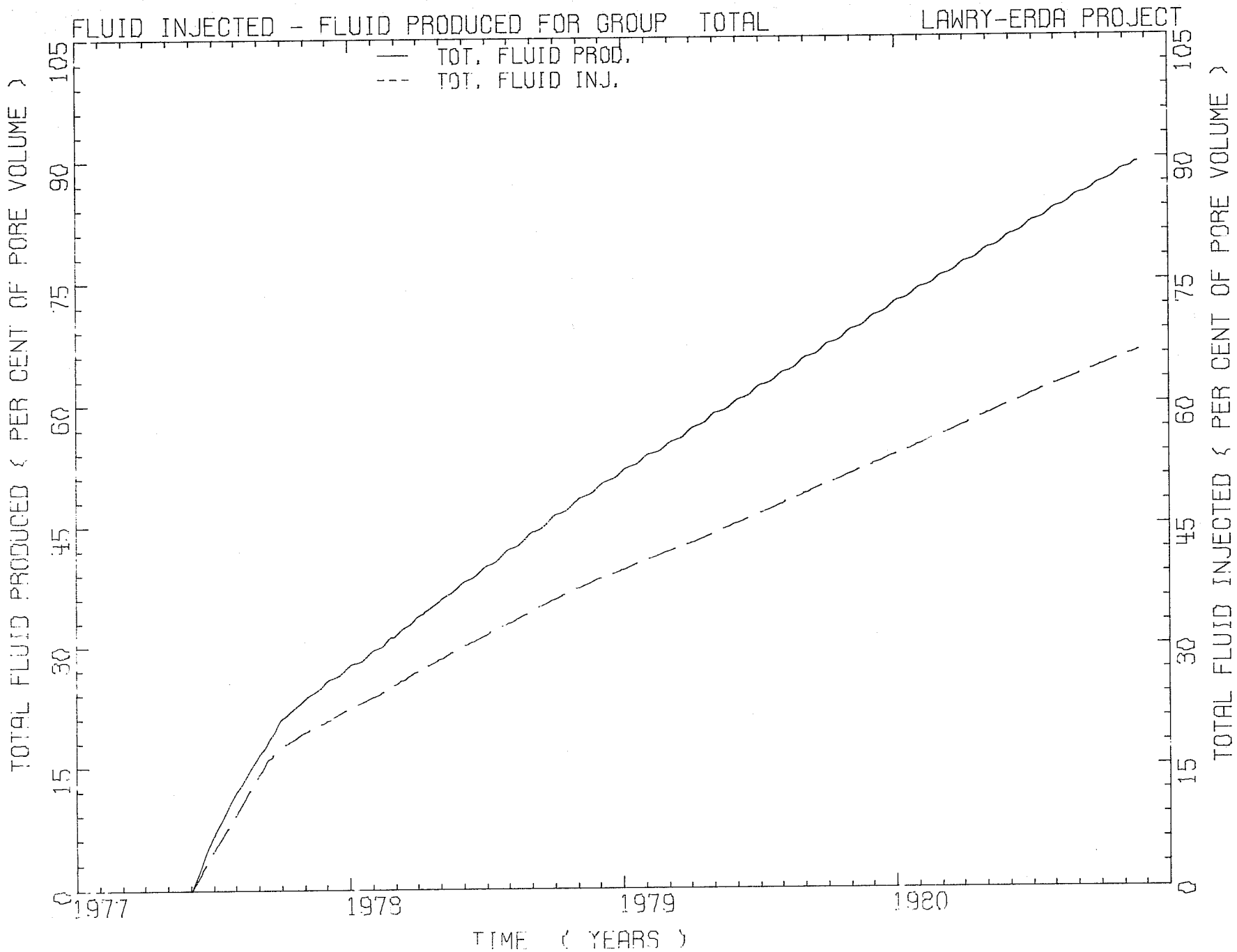

FLUID INJECTED - FLUID PRODUCED FOR GROUP TOTAL
LAWRY-ERDA PROJECT
TOT. FLUID PROD.
TOT. FLUID INJ.
TOTAL FLUID PRODUCED (PER CENT OF PORE VOLUME)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
15
30
45
60
75
90
105
1977
1978
1979
1980
TIME (YEARS)

FIGURE 48

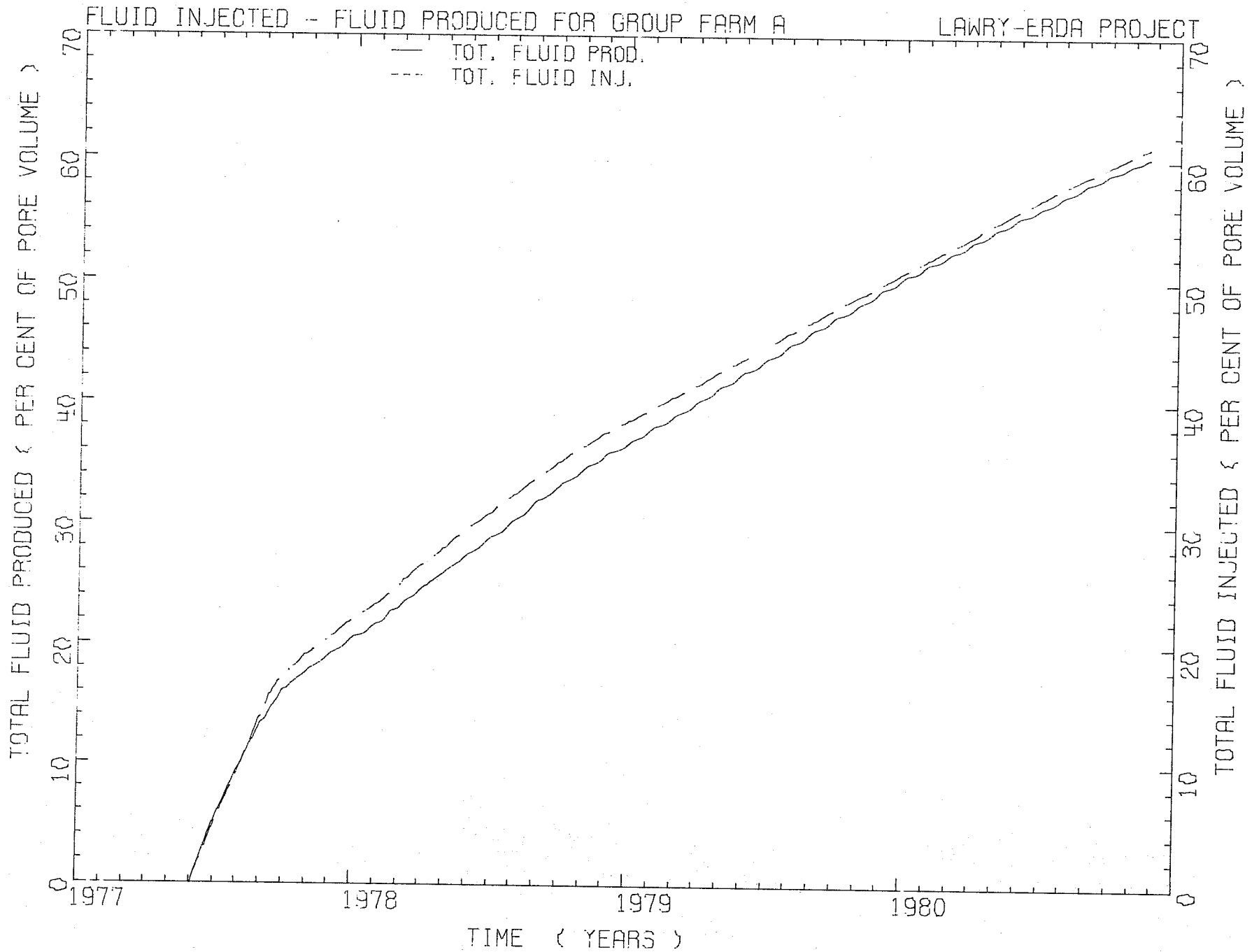
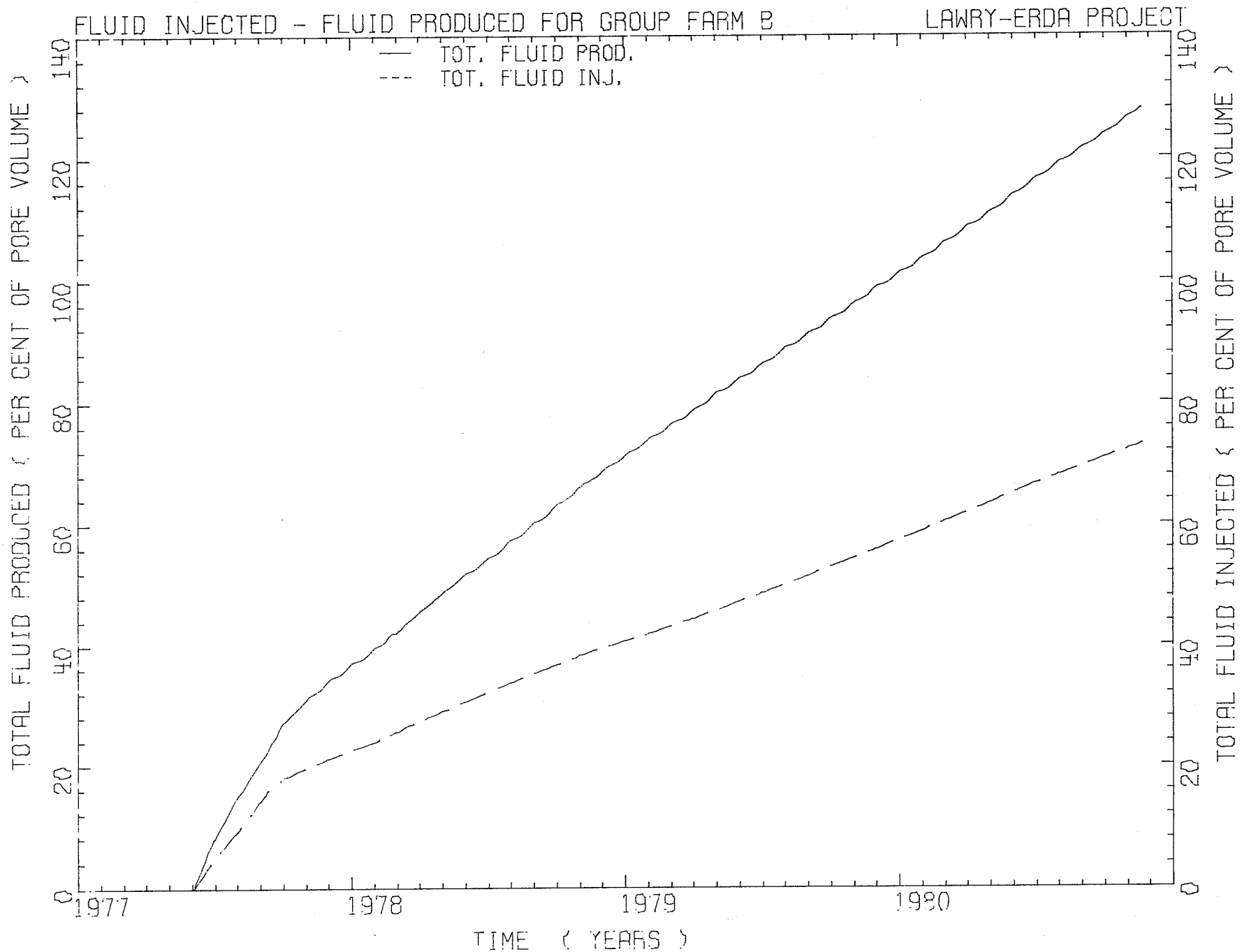

FLUID INJECTED - FLUID PRODUCED FOR GROUP FARM A
LAWRY-ERDA PROJECT
TOT. FLUID PROD.
TOT. FLUID INJ.
TOTAL FLUID PRODUCED (PER CENT OF PORE VOLUME)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
TIME (YEARS)
0
10
20
30
40
50
60
70
1977
1978
1979
1980

FIGURE 49


FLUID INJECTED - FLUID PRODUCED FOR GROUP FARM B
LAWRY-ERDA PROJECT
TOT. FLUID PROD.
TOT. FLUID INJ.
TOTAL FLUID PRODUCED (PER CENT OF PORE VOLUME)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
20
40
60
80
100
120
140
1977
1978
1979
1980
TIME (YEARS)

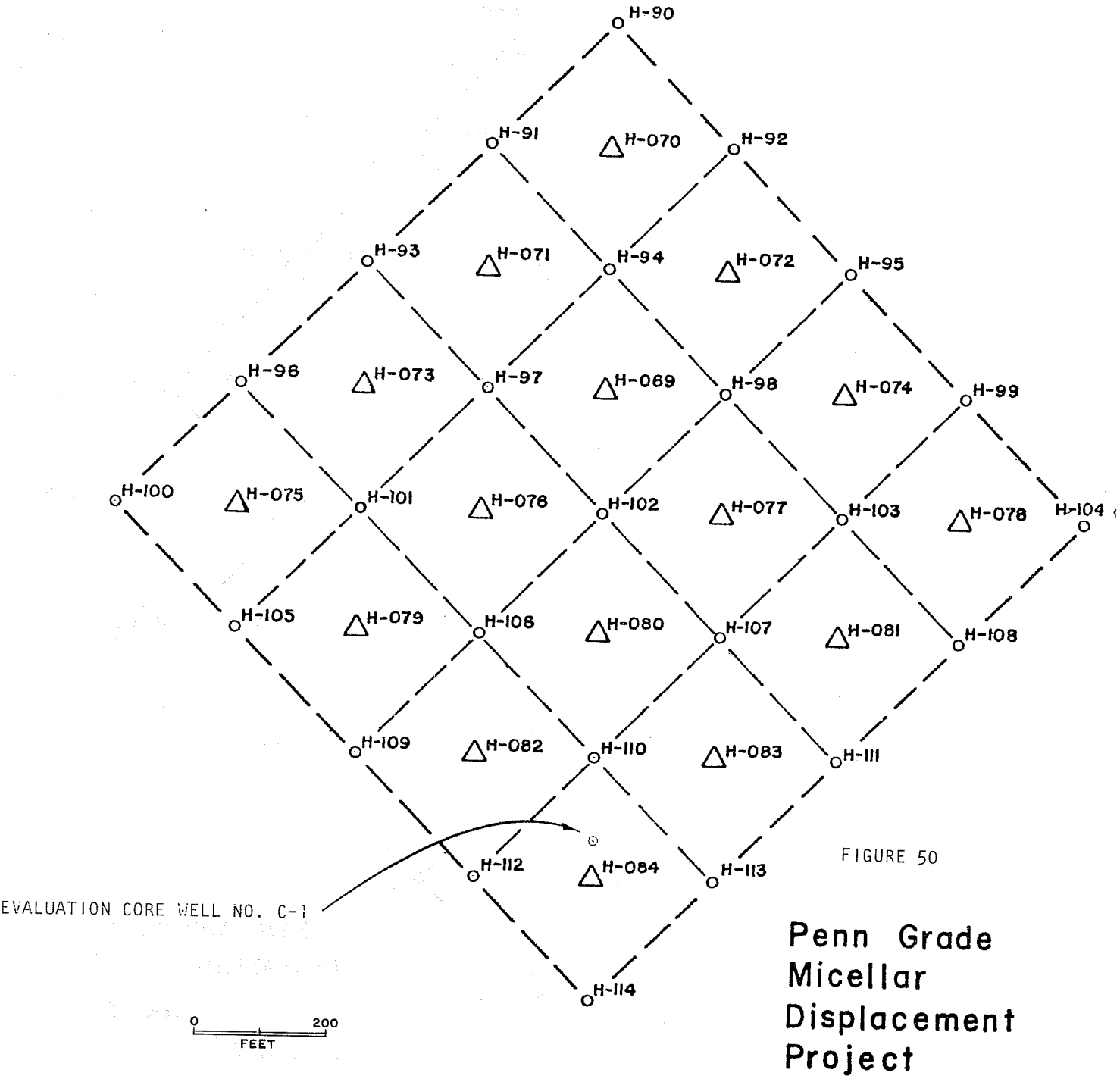


FIGURE 50

Penn Grade Micellar Displacement Project

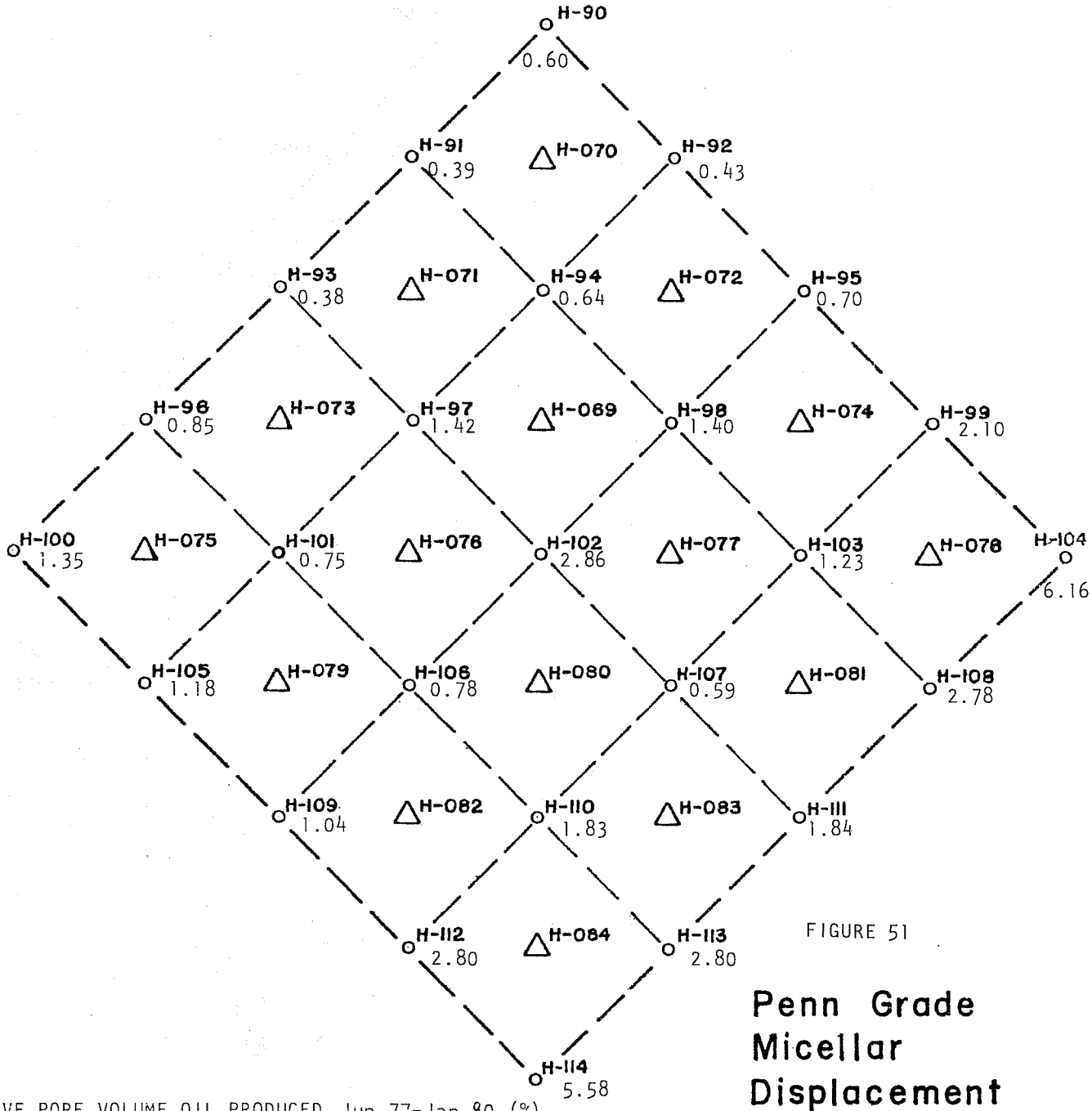


FIGURE 51

Penn Grade Micellar Displacement Project

CUMULATIVE PORE VOLUME OIL PRODUCED Jun 77-Jan 80 (%)

○ Production Well

△ Injection Well

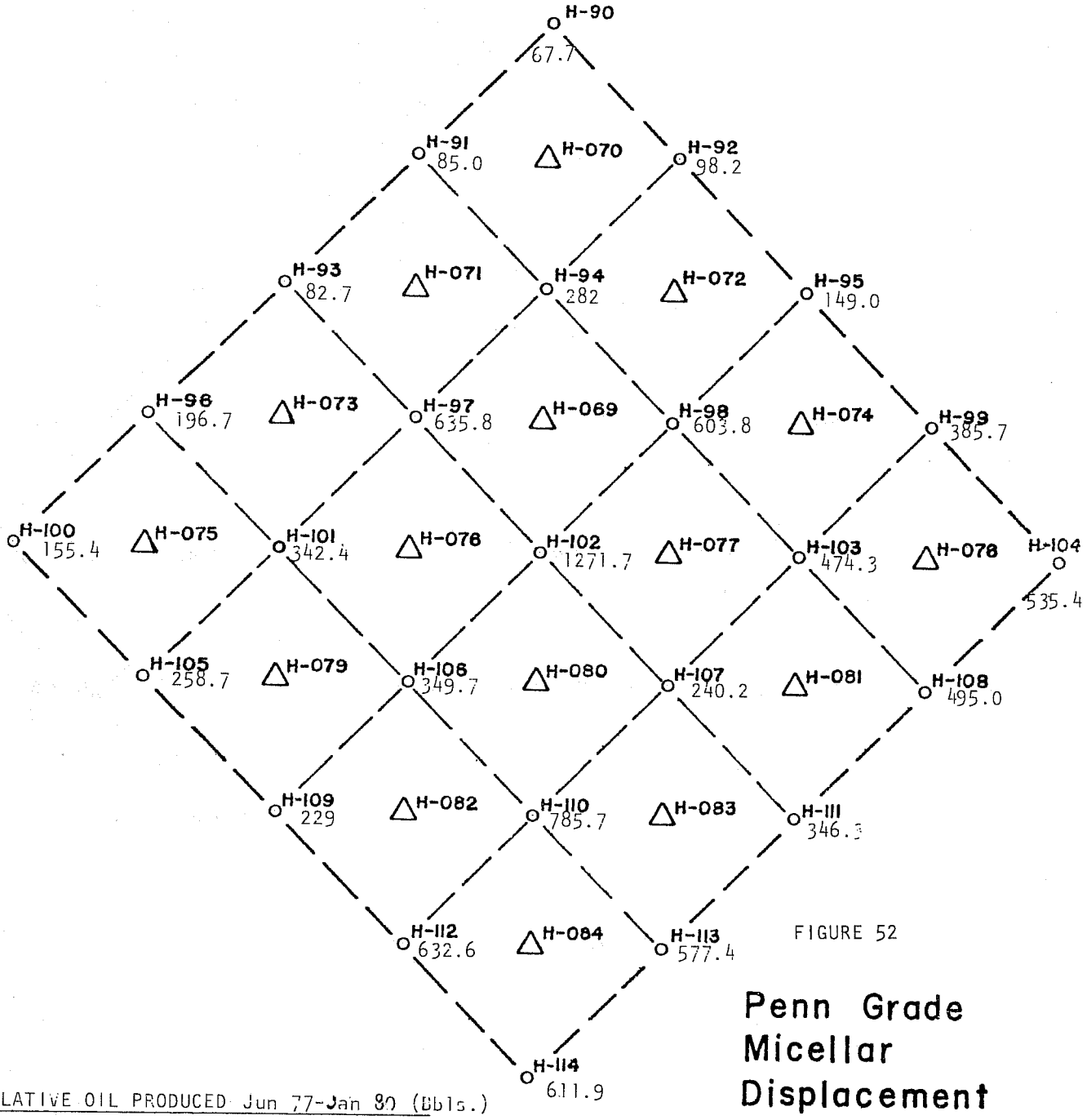


FIGURE 52

Penn Grade Micellar Displacement Project

CUMULATIVE OIL PRODUCED Jun 77-Jan 80 (Bbls.)

○ Production Well

△ Injection Well

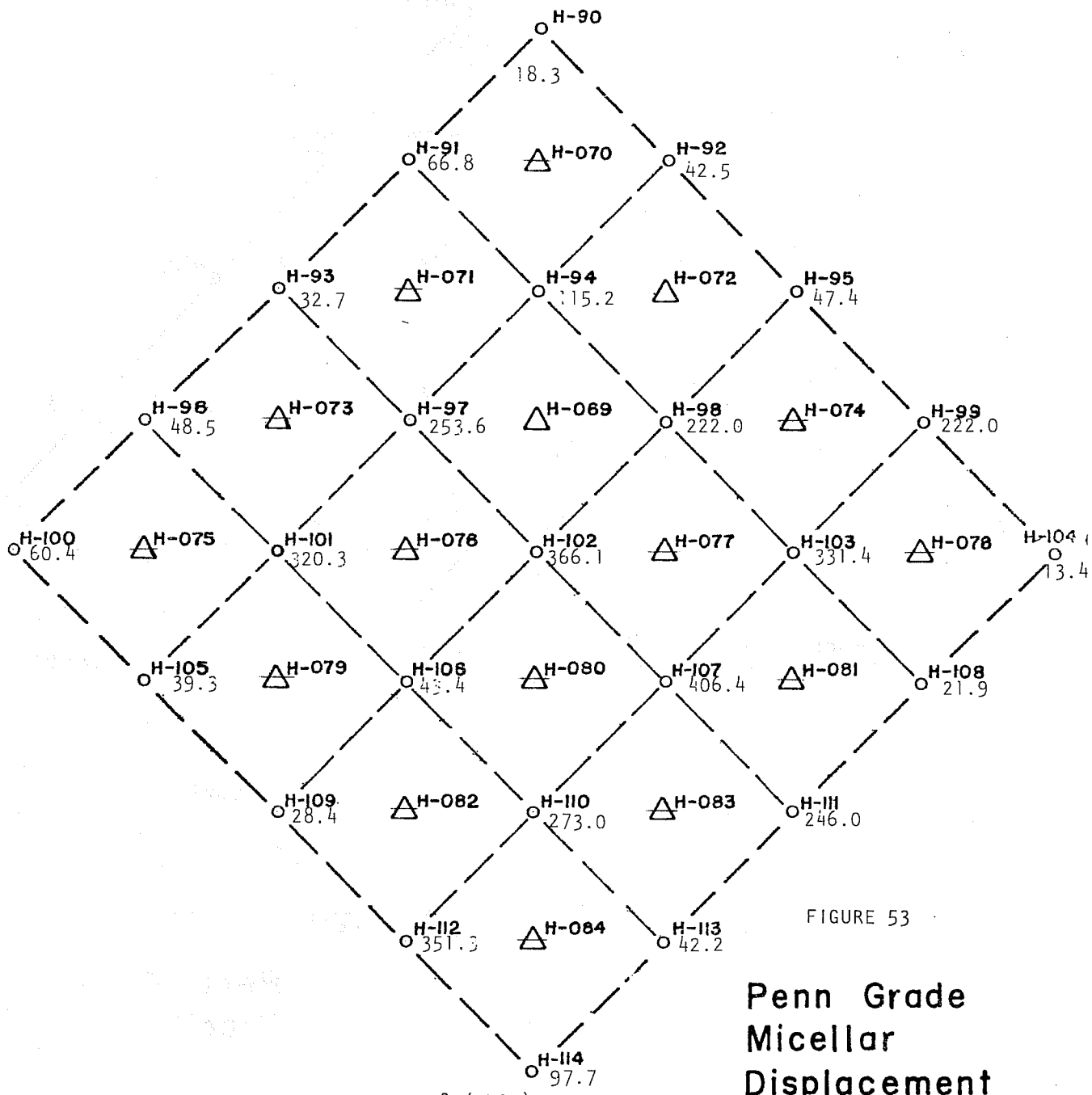


FIGURE 53

Penn Grade Micellar Displacement Project

CUMULATIVE MICELLAR SLUG PRODUCED Jun 77-Jan 80(Bbls)

○ Production Well

△ Injection Well

Injection Well Suspected of Pressure Parting

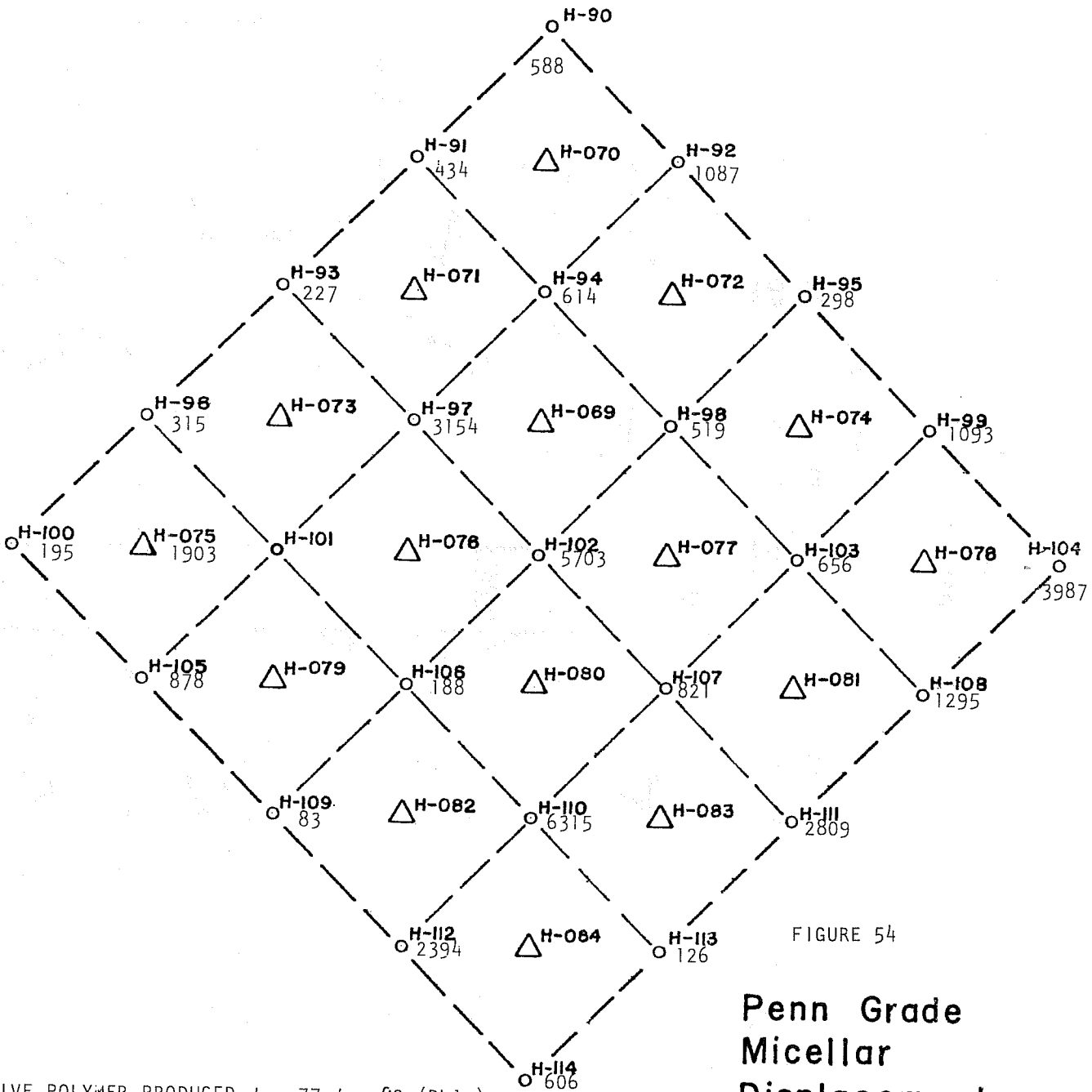


FIGURE 54

Penn Grade Micellar Displacement Project

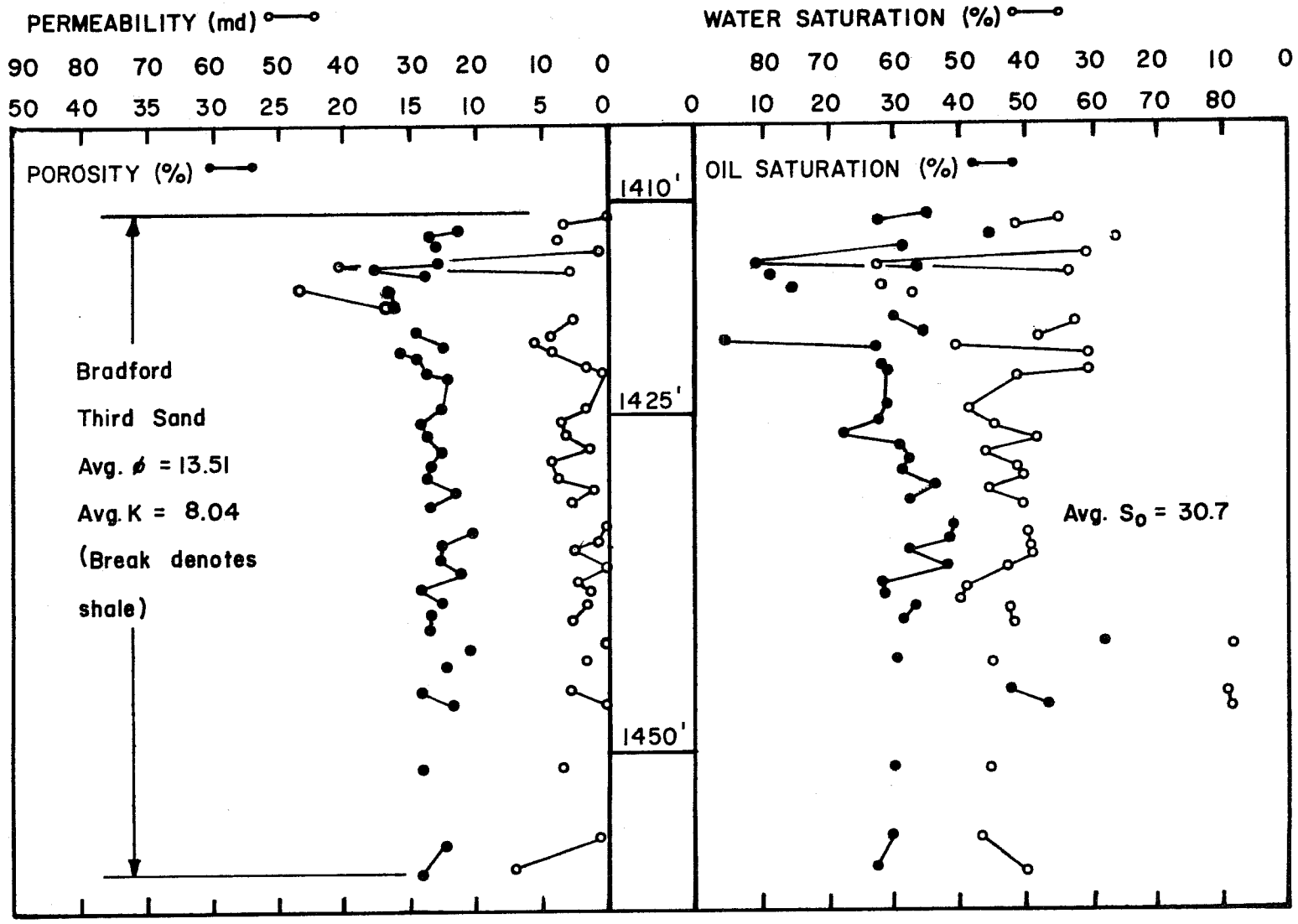
CUMULATIVE POLYMER PRODUCED Jun 77-Jan 80 (Bbls)

○ Production Well

△ Injection Well

FIGURE 55

RESULTS OF CORE TEST WELL NO. C-1
LAWRY PHASE II



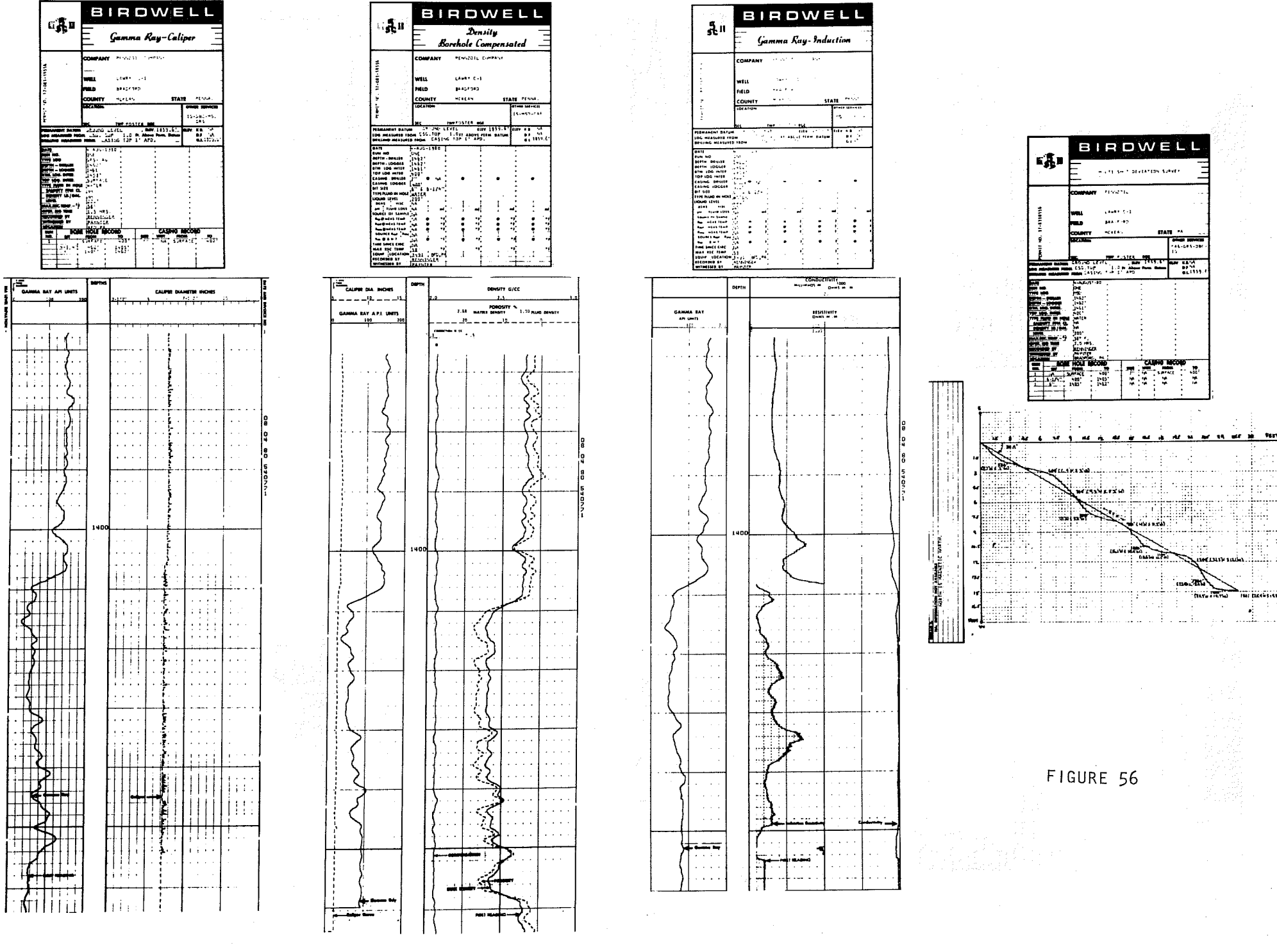

BIRDWELL
Gamma Ray-Caliper
BIRDWELL
Density
Borehole Compensated
BIRDWELL
Gamma Ray-Induction
BIRDWELL
GAMMA RAY API UNITS
DEPTH
CALIPER DIAMETER INCHES
CALIPER DIA. INCHES
GAMMA RAY API UNITS
DENSITY G/CC
POROSITY %
GAMMA RAY
API UNITS
CONDUCTIVITY
RESISTIVITY
1400

FIGURE 56

FIGURE 57

BIRDWELL

Gamma Ray-Induction

PERMIT NO. 37-083-38556

COMPANY PENNZOIL COMPANY

WELL LAWRY C-1

FIELD BRADFORD

COUNTY MCKEAN STATE PA

LOCATION:

SEC. TWP. FOSTER RGE.

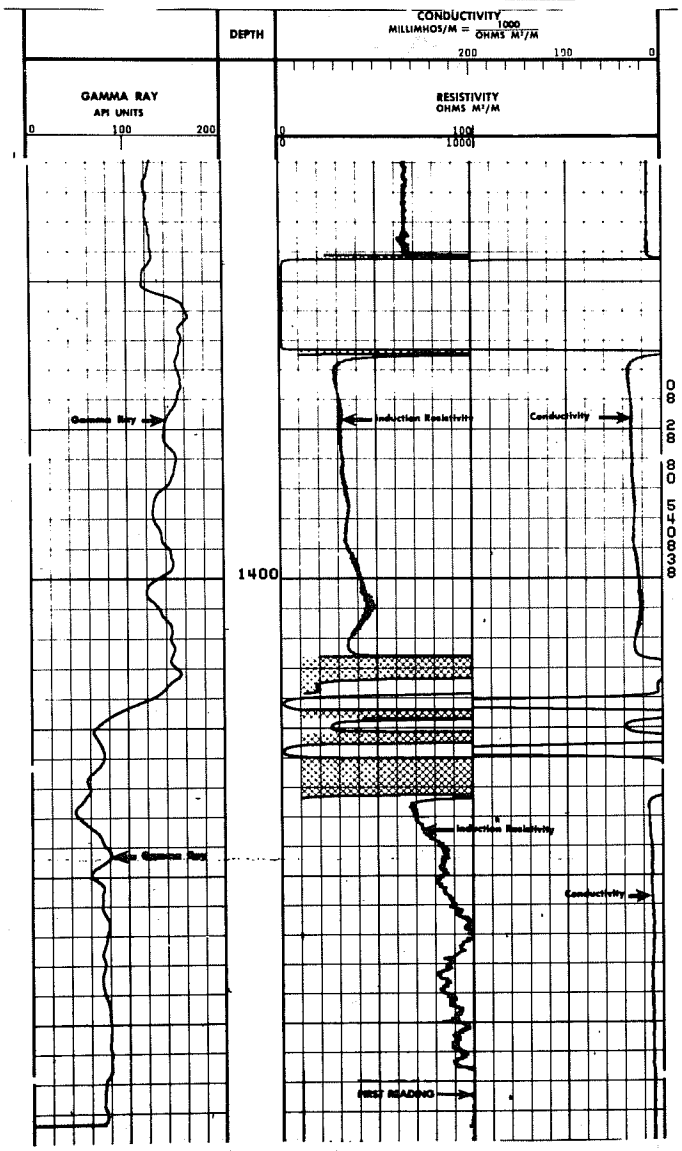
OTHER SERVICES: GR

PERMANENT DATUM GROUND LEVEL ELEV. 1859.6' ELEV. K.B. NA

LOG MEASURED FROM CSG.TOP 1.0 FT. ABOVE PERM. DATUM D.F. NA

DRILLING MEASURED FROM CSG TOP I' APD G.L. 1859.6

DATE	27-AUGUST-80			
RUN NO.	TWO			
DEPTH-DRILLER	1442'			
DEPTH-LOGGER	1441'			
BTM. LOG INTER.	1435'			
TOP LOG INTER.	1380'			
CASING-DRILLER	4-1/2@ 1380'	●	●	●
CASING-LOGGER	1381'			
BIT SIZE	6 66-1/4"			
TYPE FLUID IN HOLE	WATER			
LIQUID LEVEL	NA			
DENS. / VISC.	NA			
pH / FLUID LOSS	NA ml	ml	ml	ml
SOURCE OF SAMPLE	NA			
R_{mf} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
R_{mf} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
R_{mc} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
SOURCE R_{mf} / R_{mc}	NA			
R_m @ B.H.T.	NA ● °F	● °F	● °F	● °F
TIME SINCE CIRC.	NA			
MAX. REC. TEMP.	53° °F	°F	°F	°F
EQUIP. / LOCATION	3438 BFD.PA			
RECORDED BY	HOUSEHOLDER			
WITNESSED BY	DIGEL			



BIRDWELL

Gamma Ray-Induction

PERMIT NO. 37-083-38556

COMPANY PENNZOIL COMPANY

WELL LAWRY C-1

FIELD BRADFORD

COUNTY MCKEAN STATE PA

LOCATION:

SEC. TWP. FOSTER RGE.

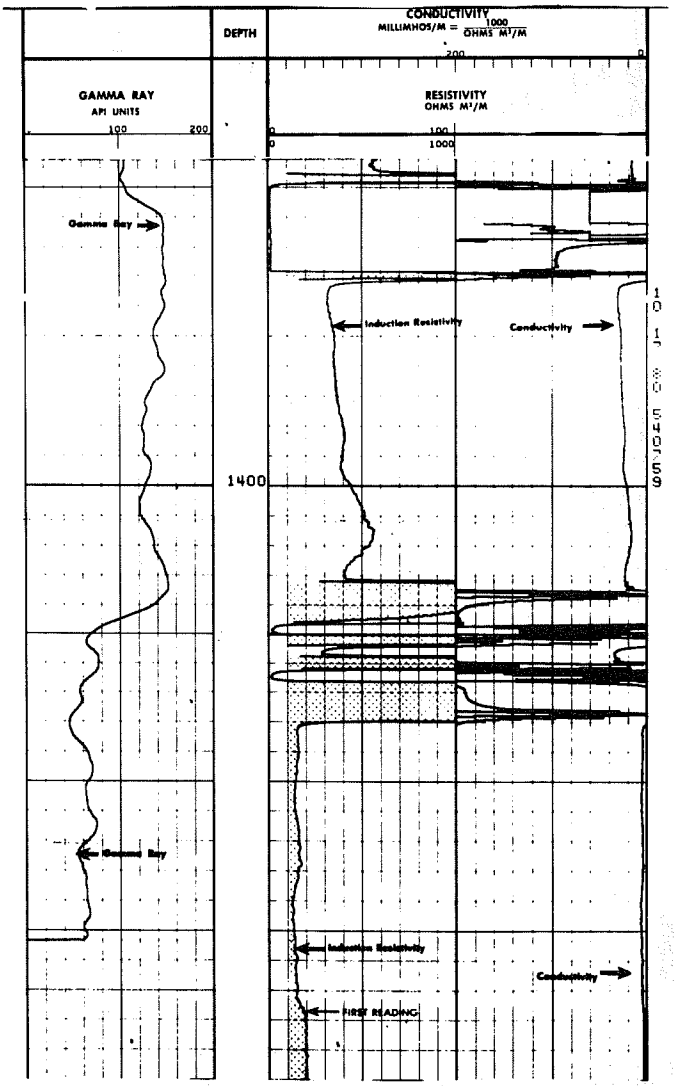
OTHER SERVICES: NONE

PERMANENT DATUM GROUND LEVEL ELEV. 1859.6' ELEV. K.B. NA

LOG MEASURED FROM CSG. TOP 1.0 FT. ABOVE PERM. DATUM D.F. NA

DRILLING MEASURED FROM CASING TOP G.L. 1859.6'

DATE	17-OCT-80			
RUN NO.	ONE			
DEPTH-DRILLER	1442'			
DEPTH-LOGGER	1441'			
BTM. LOG INTER.	1435'			
TOP LOG INTER.	1380'			
CASING-DRILLER	4-1/2@ 1380'	●	●	●
CASING-LOGGER	1381'			
BIT SIZE	6-1/8"			
TYPE FLUID IN HOLE	WATER			
LIQUID LEVEL	NA			
DENS. / VISC.	NA			
pH / FLUID LOSS	NA ml	ml	ml	ml
SOURCE OF SAMPLE	NA			
R_{mf} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
R_{mf} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
R_{mc} @ MEAS.TEMP.	NA ● °F	● °F	● °F	● °F
SOURCE R_{mf} / R_{mc}	NA			
R_m @ B.H.T.	NA ● °F	● °F	● °F	● °F
TIME SINCE CIRC.	NA			
MAX. REC. TEMP.	NA °F	°F	°F	°F
EQUIP. / LOCATION	3491 BFD.PA			
RECORDED BY	ROSE			
WITNESSED BY	PAYNTER			



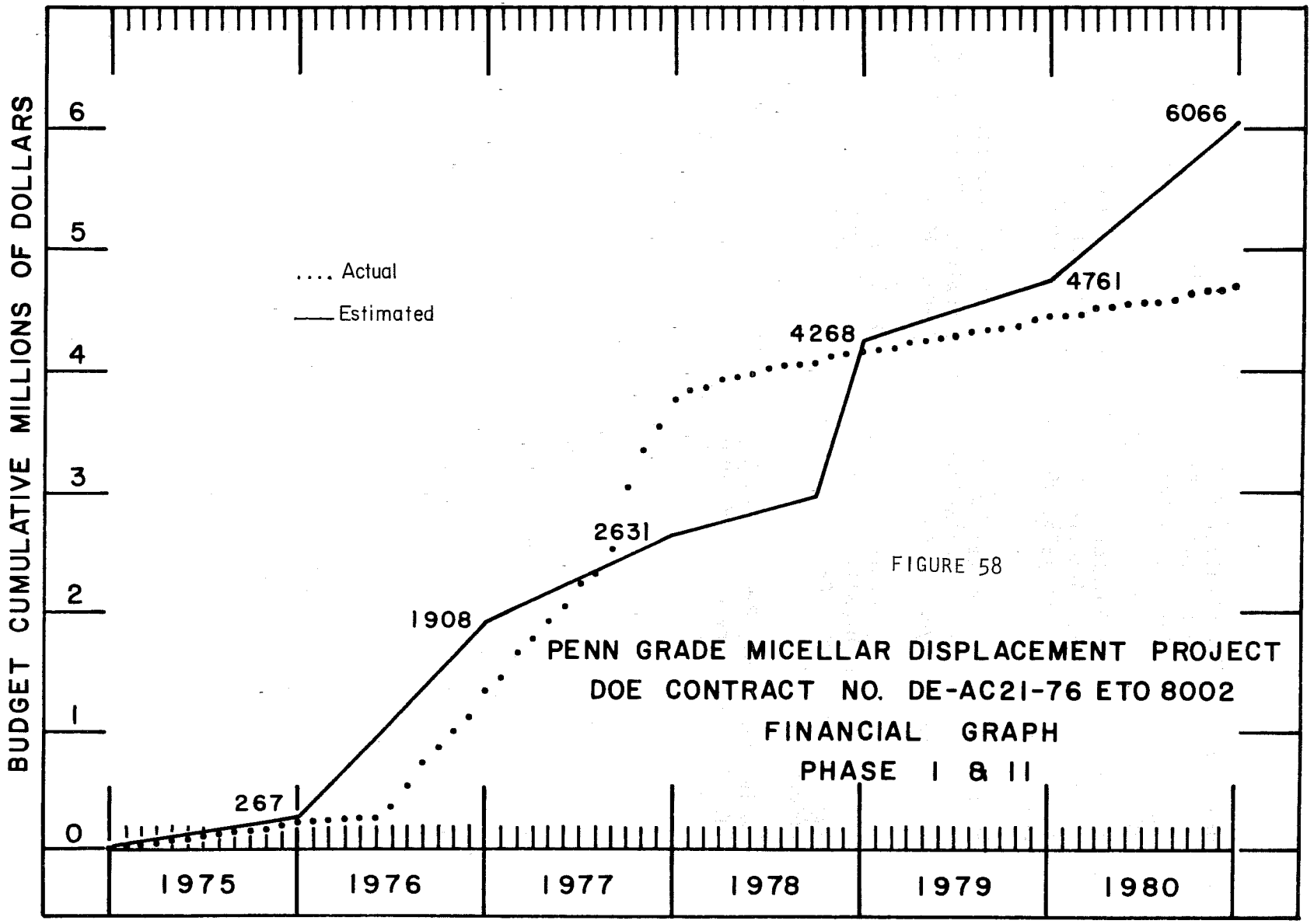


FIGURE 58

PENN GRADE MICELLAR DISPLACEMENT PROJECT
DOE CONTRACT NO. DE-AC21-76 ETO 8002
FINANCIAL GRAPH
PHASE I & II

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2. Danielson, H. H., Paynter, W. T., Ondrusek, P.S., and Finalle, L. L.: "Penn Grade Micellar Displacement Project", Second Annual Report, August 1978, DOE Contract No. EY-76-C-21-8002, METC/CR-78/7.

3. Danielson, H. H., Paynter, W. T., Ondrusek, P. S., and Finalle, L. L.: "Penn Grade Micellar Displacement Project", Third Annual Report, March 1979, DOE Contract No. EY-76-C-21-8002, METC/CR 79/4.

4. Danielson, H. H., Paynter, W. T., Ondrusek, P. S., and Finalle, L. L.: "Penn Grade Micellar Displacement Project", Fourth Annual Report, June 1980, DOE Contract No. DE-AC21-76MC08002, DOE/MC/08002-16.

5. Danielson, H. H., Paynter, W. T., and Milton, H. W. Jr.: "Tertiary Recovery by the Maraflood Process in the Bradford Field", J. Pet. Tech. (February 1976) 129-138.

Appendix A

FINAL EVALUATION OF PENNGRADE MICELLAR DISPLACEMENT PROJECT (LAWRY PROJECT)

A. M. SCHULTZ
MARATHON OIL COMPANY
DENVER RESEARCH CENTER

April 20, 1981

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SUMMARY

The Maraflood[tm] oil recovery process project known as the Lawry Project was carried out in the Bradford Field, McKean County, Pennsylvania from June, 1977, through November, 1980. The formation flooded was the Bradford Third Sand which is located at a depth of approximately 1300 feet in the Lawry Lease. The project included 16 inverted fivespot patterns of 1.5 acre spacing or 24 total acres. The fluid system design consisted of a 50,000 ppm brine pre-flush followed by a 9 cp micellar slug using Witco sulfonates and a mobility buffer of Kelzan biopolymer including "spike", "body", and "tail" portions varying in viscosity from 9 cp to 2 cp.

Fluid injection was halted after the injection of 50.4% PV. This was due to low oil production and low fluid injectivities. The project should be considered a technical failure.

Oil recoveries were:

	Farm A	Farm B	Total
Total Recovery, BBLS	6345	6457	12809
Recovery, % of OIP	4.1	5.5	4.7
(Based on S_{or} = 40%)			

The injection rates encountered in the Lawry Project were so low that it is doubtful that even a technically successful project could be economically justified. Whereas the minimum economic injection rate was calculated to be 1.5 BPD per net foot of pay, the average actual injection rate was approximately 0.65 BPD per net foot of pay.

[tm]Trademark of Marathon Oil Company, Findlay, Ohio

From an operational standpoint the project was conducted without significant difficulty. The biopolymer was injected over a 2.5-year period with no evidence of wellbore plugging and no indication that the low injection rates were caused by improper mixing.

Reservoir heterogeneities and low permeabilities were the primary causes of project failure. Extreme permeability variation in the reservoir resulted in poor vertical conformance, causing unequal distribution of the injected micellar slug. From performance and core data it appears that only 23% of the reservoir containing higher permeabilities (see Table 4, Section A, average 19.4 md) received appreciable amounts of the Maraflood fluids. In addition, data from the test core drilled in August, 1980, showed almost no sulfonate retained in rock with permeabilities less than 10 md. Since the core location was close to an injector, these data indicate either severe reservoir heterogeneities or reservoir plugging. Recoveries based on the reduced pore volume of the higher permeability section (see Figure 7 and Table 6) are:

	Total Recovery, %OIP
ADJUSTED RESERVOIR (S_{or} = 40%)	18.7
ADJUSTED RESERVOIR (S_{or} = 30.66%)	24.7

These figures are more in line with recoveries normally expected in the Bradford Third Sand. Even after adjusting the reservoir pore volume to include only the higher permeability pay, recoveries are still marginal. This raises questions as to the efficiency of the micellar slug.

The relatively constant oil cut observed over considerable time could be due either to the high degree of permeability variation and other physical reservoir problems, or from an inefficient system performance with minimal oil

banking. The latter could be due to lack of mobility control or slug effectiveness.

There was evidence of pressure parting in more than half of the injection wells. Injection pressure was in excess of the known formation parting pressure and rapid shows of high sulfonate and polymer concentration spikes were noted. Although this could have been a serious problem, its effects could not be determined due to the severity of other reservoir problems.

The low permeabilities and significant reservoir heterogeneities encountered in this test are believed to be typical for the majority of the Bradford Third Sand reservoir in this field. The purpose of this test was to ascertain whether use of the Maraflood process could be economically justified in this type of reservoir. The results of this test indicate that it cannot.

INTRODUCTION

The Penngrade Micellar Displacement Project, also known as the Lawry Project, is a tertiary oil recovery test utilizing the Maraflood oil recovery process. The test was located in the Bradford Field of McKean County in North Central Pennsylvania (see Figure 1). Funding was provided under DOE contract EY-76-C-21-8002 (formerly ERDA Contract E-(46-1)-8002). This was a five year cost sharing contract providing $4,444,000, 50% of which was DOE funding; the remaining cost was shared equally by Pennzoil Company, Witco Chemical Corporation and Quaker State Oil Refining Corporation of the Penngrade Crude Oil Association. On September 28, 1978, the contract was revised (DOE Contract Number EE AC 21-76-NCO 8002) increasing the project cost to $6,066,000 and extending the termination date until December 31, 1980.

The Bradford Third Sand is the main pay zone in the field. It is a hard, brown, fine grained sand and in the vicinity of the Lawry Project as in the majority of the Bradford Field, has a permeability averaging 6 to 9 md. The porosities also represent the Bradford Field at about 13.5%.

Pennzoil was chosen as operator for the test with Marathon being a subcontractor for technical services. This involved the fluid system design and supplying Pennzoil with technical assistance concerning reservoir development and operations.

The fluid system design included the formulation of a brine preslug micellar slug and a polymer mobility buffer. This was accomplished through disc foods using rock from the Lawry reservoir saturated with reservoir fluids.

The crude oil used in laboratory testing was obtained from the Lawry lease and is a Penngrade crude with a viscosity of 6.5 cp at the reservoir temperature of 64° F. The water used in the laboratory was synthesized to match ionic concentrations of Lawry produced water.

Reservoir development work included determination of existing post waterflood oil saturations, reservoir pore volume and pattern spacing. Under Phase I of the Lawry Test, an injectivity study was conducted on a single injection well to the north of the actual project location. The purpose of this study was to determine whether the tight Bradford Third Sand could sustain fluid injection rates sufficient for justification of the Lawry Project and to obtain a six inch core for micellar-polymer laboratory work.

The Phase II portion of the test, following completion of Phase I, involved drilling sixteen inverted five-spot patterns on a 24 acre site (see Figure 2). The 1.5 acre spacing was deemed necessary by the low reservoir permeability. All 16 injectors were cored, providing much additional reservoir information. Injection with the preflush brine started in late May, 1977. Subsequent injection followed the design sequence (see Fluid System Design) until November 20, 1980, when the project was shut-in about halfway through the polymer body phase of injection due to poor recoveries.

The Lawry Project is best viewed as an experiment. Penngrade crude is in high demand for production of high grade lubricating oils. Since most Pennsylvania reservoirs of this type have been under production since the late 1800's using both primary and secondary recovery methods, some type of tertiary system is now badly needed. Marathon's Maraflood process has attempted to help

fill this need. Several Maraflood projects have been run in the more permeable sections of the Bradford Field with various degrees of success.

The Lawry Project, however, with a recovery of only 4.7% OIP (based on S_{or} = 40%) must be considered a failure. It was known before the project's initiation that a micellar-polymer flood in a reservoir with such low permeabilities involved substantial risk. This risk could be justified, however, when balanced against the large portion of the Bradford Third Sand with reservoir properties comparable to the Lawry. A thorough evaluation of the data collected during the project, leading to a better understanding of the mechanisms causing such a failure, is therefore justified.

FLUID SYSTEM DESIGN

The micellar-polymer fluid system design for the Lawry Project was completed by J. S. Rhudy (Reference 1). Recommendations and a summary are as follows:

RECOMMENDATIONS

Based on laboratory disc flood design studies, the fluid system recommended for the Lawry test was:

10% PV Preslug;

9% PV Micellar Solution;

10% PV Polymer Spike;

51% PV Polymer Body;

30% PV Polymer Tail;

50% PV Drive Water:

160% PV Total Injection

The recommended preslug contains 50,000 ppm of sodium chloride in Lawry supply water.

The recommended slug contains by weight, 6% active Witco sulfonate (3% each of TRS-40 and TRS-16), 70% water, and platformer charge hydrocarbon. Neodol ethoxysulfate, primary amyl alcohol and normal butyl alcohol were the recommended cosurfactants.

Recommended alcohol-free slug composition was:

	Wt (%)	Vol (%)
TRS-16[1]	4.66	4.20
TRS-40[2]	6.40	5.12
Platformer Charge	21.58	28.67
Lawry Supply Water	67.36	62.01

[1]Based on sulfonate activity of 64.4% (450 equivalent weight).
[2]Based on sulfonate activity of 46.9% (350 equivalent weight).

This composition should be stabilized with Neodol 25-3A or 25-3S, primary amyl alcohol and normal butyl alcohol. The exact amount of alcohol used in the field was determined by using samples of actual field materials. A range for expected alcohol requirements was:

	Wt (%)	Vol (%)
Neodol	0.99	0.90
Primary Amyl Alcohol (PAA)	0.98-1.30	1.42-2.07
Normal Butyl Alcohol (NBA)	0.94-1.56	1.06-1.77

Primary amyl alcohol was added as necessary to meet recommended temperature stability range specifications. To meet recommended viscosity specifications, normal butyl alcohol was added accordingly. Reduced amounts of PAA lowered the temperature stability limits. With lower concentrations of PAA, higher concentrations of NBA are required to meet viscosity specifications. Recommended temperature stability and viscosity specifications were:

Maximum lower temperature stability:	45°F;
Minimum upper temperature stability:	95°F;
Viscosity (6-rpm Brookfield @ 64°F):	7.5-9.0 cp

The minimum recommended slug size is 9% PV. It was recommended that additional disc floods be run to measure oil recovery versus slug size (9 to 12% PV), with the first batch of slug formulated in the field. Pennzoil then selected the final slug size based on these data and appropriate economic considerations.

Specifications for the mobility buffer were:

	Viscosity[1] (cp)	Minimum Polymer Concentration (ppm)
Spike	9.0 ± 0.5	500
Body	5.5 ± 0.5	350
Tail	1.8 ± 0.2	100

[1]Brookfield viscometer with U/L adapter at 6 rpm and 64°F.

The recommended mobility buffer consisted of biopolymer in Lawry supply water. Biopolymer concentration from the source and after field handling procedures selected by Pennzoil was then adjusted to match viscosity specifications shown above. The minimum polymer concentrations satisfy polymer retention requirements. To provide polymer stability, an effective biocide was recommended. Drive water injection was recommended after polymer solution until completion of the project.

Diatomaceous earth (DE) filtration of all injected fluids (to 0.45-) was required.

SUMMARY OF FLUID DESIGN CONSIDERATIONS

A major limitation on fluid system design was that all injected fluids have a maximum viscosity of 10 cp. This limitation was specified by Pennzoil

because of injectivity considerations resulting from low reservoir permeability.

Witco commercial sulfonates were used to formulate the micellar solution (slug). Slug hydrocarbon was limited to a number of refined hydrocarbon streams available from the Kendall Refinery in Bradford, Pennsylvania. Other slug components were Lawry supply water and commercial alcohols.

Biopolymer was the only polymer investigated for the mobility buffer. Low permeability again precluded use of polyacrylamides, which attain mobility control primarily through a permeability reduction mechanism. The mobility buffers investigated were primarily Kelzan in Lawry supply water. Some work was done with crude biopolymer broths.

The best total micellar-polymer system for this reservoir was selected on the basis of oil recovery from disc floods using reservoir rock saturated with reservoir fluids. All tests used reservoir sandstone taken from three 6-inch diameter cores from the Lawry lease (Wells H-068, H-069 and H-102).

Cores were handled to minimize alteration of their natural conditions from the time they were cut in the field until their use in laboratory tests. The cores, shipped and stored in containers under reservoir crude or water, were cut into 2-inch thick discs and trimmed for laboratory flooding, with minimal exposure. Prepared discs were degassed under crude, flushed with fresh crude and waterflooded to tertiary conditions before laboratory experiments. This procedure was used in the majority of floods to minimize changes in wettability characteristics. In a limited number of floods, recycled discs were used. These were cleaned by Soxhlet extraction, saturated with crude (oil-wet) and waterflooded to residual oil saturation prior to micellar-polymer flooding tests.

After injection of micellar-polymer fluids, the discs were cleaned of all fluid by Soxhlet extraction. Water saturation was measured directly; final oil saturation was determined by difference. Oil saturations before and after waterflooding were determined by material balance. The absolute liquid permeability and porosity of dry discs were determined after resaturation with water.

Table 1 shows the average properties of flooded discs by well. Liquid permeabilities and porosities were measured after 100% water saturation. Based on visual homogeneity and gamma-ray-density log analysis, only the best discs were prepared for flooding. Table 1 does not include dozens of discs prepared for flooding that had inadequate permeability (1 md). Higher tap (internal) permeabilities relative to total permeabilities indicated that disc wellbore damage occurred during drilling and/or fluid injection before permeability measurement.

Crude oil for laboratory experiments was obtained from the Lawry lease. The oil is a Penngrade crude with a viscosity of 6.5 cp at the reservoir temperature of 64°F.

A synthetic formation water, based on an average analysis of waters taken from four producing wells, was used in laboratory studies. The ionic content and synthetic formulation of produced water and Lawry supply well water used in laboratory fluid formulations are shown in Table 2.

Flooding experiments were conducted at reservoir temperature. Micellar-polymer fluids were radially displaced from a 1/8-inch wellbore drilled in the center of the discs. To give a median frontal velocity of about 0.3 ft/day, injection rate was constant througout the displacement. In oil recovery tests, about 1.5 PV of total fluid were injected after starting micellar fluid injection.

RESERVOIR DESCRIPTION

The primary pay zone for the Bradford Field is the Bradford Third Sand, found at an average depth of 1,300 feet in the area of the Lawry lease. This historical producing interval is about 100 feet thick including interbedded sand and shale members. The majority of production has come from the top 50 feet which contains the most permeable sand. Using a permeability cutoff of 1 md this top 50 gross feet is reduced to about 30 net feet.

Waterflooding of the 98-acre Lawry lease was initiated in 1929, continuing until 1964, with a waterflood recovery estimated at 9000 barrels of oil per acre. Operation of the lease has continued via stripper production to the present.

The Acadian Oregenic Phase caused uplifting and overthrust of the northern Appalachian Mountains. The erosion of this growing mountain range deposited thick sediment in Western New York and Pennsylvania. The Chemung formation (upper Devonian Age) is a result of this erosion and is made up of interbedded shale, fine grained siltstone and sandstone. Due to these fine grain sediments, what sandstone there is usually has very low permeability.

The average lease reservoir properties calculated from core analysis done by John DePetro (Reference 2) are:

1) Net pay-----28.99 feet
2) Porosity-----12.64%
3) Residual oil saturation-----30.66%

From disc flooding work the reservoir rock was defined as partially oil wet. At reservoir conditions, the produced oil is a sweet 44° API crude.

The low permeabilities of the Lawry reservoir posed the single most serious deterrent to a successful micellar-polymer flood. Injection of Maraflood chemicals into any 7 md reservoir is a difficult problem. The Lawry reservoir provided at least two additional permeability related considerations: 1) degree of vertical permability variation; and 2) continuity of bedding layers throughout the reservoir.

The degree of vertical permeability variation found in the 15 injection well cores deserves attention. Although the average permeability in these 15 cores is 7 md, the actual values might range between 40 md and 1 md. This is the situation found in every core taken from the Lawry. Since the injectivity profile is related to the permeability variation, a distribution such as that found in the Lawry can drastically affect vertical conformance of the injected chemicals in a micellar-polymer flood and, therefore, adversely affect recovery. A discussion of permeability variation and its postulated effect on oil recovery is presented in the Project Evaluation portion of this report.

Another possible problem was apparent from core samples collected prior to the test. It was difficult to correlate sections of constant permeability from well to well, a minimum distance of only 255 feet. Whether this was due to the pinchout of depositional trends or mild cross bedding was not determined. A consistent trend toward higher permeabilities (5-30 md) in the top 10 feet of the pay zone was observed. However, in most cores, their position within this upper portion varied from well to well.

Flow characteristics caused by either of these conditions could affect both vertical conformance and mobility control and, therefore, oil recovery.

There was concern over the possible existence of fractures in the Lawry lease. A transient testing program including several interference tests was conducted by Marathon prior to project start-up. These tests were designed to check for directional permeability trends and fractures. All four interior five-spot patterns were tested and the presence of a natural fracture system was not confirmed. However, a directional preference to the northwest-southeast with a permeability ratio averaging two to one was found. This anisotrophy coincides with the orientation of regional tectonic stresses. These tectonic stresses are evidenced in the formations of the area as a system of vertical joints or fracture planes, which although closed in situ, form a plane of weakness which when exposed to erosion will fracture and weather along this surface. It also follows that, when exposed to excessive wellbore pressures instigating a pressure parting situation, a system of joints provides a location for fracture propagation.

PATTERN SELECTION

After Phase I (the injectivity test) was completed, a meeting of the Miscible Operating Committee for the Penngrade/DOE Lawry Micellar Displacement Project was held. It was decided that the injection rates were adequate and continuation with Phase II of the project was advisable. This meeting was held on May 3, 1976.

Phase II of the Lawry Project, consisting of nine five-spot patterns, required the drilling of 41 new wells, 16 injectors and 25 producers. It was decided to define this pattern as two groups. Farm A consists of the nine regular five-spots totaling 13.5 acres and Farm B the 10.5 acre area enclosed by the 16 additional producers.

Due to a suspected fracture system in the Lawry lease, which is known to exist in other portions of the Bradford Field, the pattern was oriented 45° off North. This system of fractures or joints is prevalent in most of the rock formations of this age in Western Pennsylvania and New York and minimizing any effect they might have would be beneficial to the project.

The small 1-1/2 acre five-spot spacing gave allowance for reasonable response time. Due to low reservoir permeabilities, this small spacing was necessary to be within guidelines of the DOE contract specifying evaluation and appraisal for commercial application in a reasonable time period.

Wells were cased to between 400 and 500 feet, protecting fresh water zones present at those depths. Injection well HO-69 and production well H-102 had 6-inch diamond cut cores taken for laboratory work at the Denver Research Center.

The 15 other injection wells were cored with a 3-1/2 inch diamond barrel with samples sent to John DePetro's Laboratory in Bradford for analysis of reservoir properties.

A waterflood was operated to the southeast of the project throughout its life. Additional sporadic waterflooding was present to the southwest. Except for some extra oil picked up by the southeast row of producers, the waterflood should have had very little effect on the Lawry Project.

OPERATIONS

Brine injection was completed on September 11, 1977, with a cumulative injection of 16.8% PV. Each injection well received at least the recommended 10% PV fillup per related pattern.

During the switch from brine preflush to micellar slug on September 12, 1977, 1,080 barrels of fresh water were injected in the cleanup operations. Slug injection was then began, with slug viscosities varying between 7.8 and 9.0 cp, and the material passing a 0.45 filtration test.

Injection rates and plant pressures during brine injection averaged 1,052 BPD and 220 psi from June through September, 1977. This is an average of 2.3 BPD per net foot of pay over the pattern. When slug injection was started the pressure did not increase. This resulted in an initial injection rate of 646 BPD of slug. This is approximately what was expected considering the more favorable relative permeability to slug displacing oil, combined with the detrimental (to injectivity) effect of the increased viscosity (9 cp for the slug compared to 1.1 cp for the preflush). On October 1, the injection rate had declined to 395 BPD at 595 psi. This was not unreasonable, since, as the formation is invaded by the more viscous slug, pressure gradients near the wellbore are reduced, thus lowering the injection rate and necessitating an increase in injection pressure. As slug injection continued, however, it was necessary to increase the injection pressure until on February 1 with 7.8% PV slug injected, 1,066 psi surface pressure (1618 psi bottom hole) was needed to maintain a rate of 335 BPD (0.72 BPD per net foot of pay). Such low injectivity was unexpected and was indicative of problems that would be experienced throughout the Project. It is also important to note that these rates and pressures, which were to continue for the duration of the Project, occurred prior to the injection

of mobility buffer.

In mid-February, it was noted that several injection wells had received thier allotted 9% PV of slug while others had not. It was decided to initiate polymer injection as soon as six injection wells had received the required slug volume. In order to accomplish this and avoid polymer contamination, a dual injection system was developed. On February 17, injection wells HO-73, HO-74, HO-78, HO-79, HO-81, HO-82 and HO-83 were put on line for polymer injection. Wells HO-75, HO-76 and HO-80 were added on February 27, HO-84 on March 10, HO-72 on April 10, HO-69 on April 11 and finally HO-70 and HO-71 ending the two-fluid injection system on April 12.

Preparation of polymer for injection involved four steps: 1) dispersion of dry polymer in supply water at a concentration of 6000 ppm; 2) high pressure shearing of the polymer concentrate; 3) dilution of the sheared concentrate with water; and 4) DE-filtration. The 10% PV polymer spike had a viscosity of about 9 cp. The 51% PV polymer body had a planned viscosity of 5.5 cp and the 30% PV tail had a viscosity of 1.8 cp. Bacterial degradation of polymer solution was prevented by addition of 250 ppm formaldehyde at the discharge of the DE-filter.

Injection of the polymer spike continued from February, 1978, until February 1, 1979. At this point with 15% PV of slug and polymer injected, the project injection rate was 257 BPD at 1,029 psi surface pressure.

During the year of polymer spike injection, several wells displayed rate increases. In some cases, these rate increases coincided with a sudden show of polymer in the produced water (see Figure 7) of the surrounding production wells. Suspecting pressure parting (see Evaluation), various lengths of copper tubing

were installed at the injection headers. Sizes and lengths of tubing were changed according to need during polymer injection. The reader should reference the third and fourth annual Penngrade Micellar Displacement Project reports for specifics on lengths of tubing and wells affected (Reference 3).

Injection of the mobility buffer body phase began February 1, 1979, continuing until project shut-in on November 20, 1980. When the project was shut-in, a total of 41% PV of spike and body mobility buffer had been injected. During this time, the copper tubing installed at the injection headers was removed due to stable injection rates of lower viscosity, body phase of the polymer sequence. Injected polymer was consistently within specifications and no unusual operating problems were encountered. This was due to the care taken throughout mixing and injection of the mobility buffer. At shut-in, injection rates were about 250 BPD at a surface pressure of about 1,040 psi.

PRODUCTION

The ultimate oil recovery from the Lawry Project was extremely low. There was no serious attempt made to predict what recoveries were to be expected, but estimates ranged from 25-40% OIP. Project parameters are:

TOTAL PROJECT PORE VOLUME	684,577 Bbls.
OFFICIAL PROJECT S_{or}	40% PV
OIL PRODUCED: 9/13/77-11/20/80	12,802 Bbls.
RECOVERY	4.7% OIP
WATER PRODUCED: 9/13/77-11/20/80	475,147 Bbls.

Oil cuts for the project were also much lower than expected, varying from 1.0% at the initiation of slug injection to a high of 3.4 - 3.5% from April, 1979, through February, 1980. Expected peak oil cuts ranged from 10-14%.

Production rates varied from a low of 7 BOPD to a high of 14 BOPD, as shown in Figure 3. Table 3 is a breakdown of production by well and five spot pattern.

Farm A and Farm B exhibited nearly the same performance (see Figures 4 and 5).

Farm A Production:	6,345 bbls. oil
Farm B Production:	6,457 bbls. oil

These similar figures could be misleading since some production from wells H-104, H-108, H-113 and H-114 is probably due to the ongoing waterflood to the southeast of the project. This is demonstrated by slightly higher daily water rates from these wells, 25-30 BPD versus 10-25 BPD in the remainder of the field. The existence of pressure parting in this portion of the reservoir could

also contribute to these increased rates.

Due to the difficulties involved with a micellar-polymer flood in a low permeability reservoir such as the Lawry, careful monitoring of produced fluids takes on new importance. The complicated fluid-fluid and rock-fluid interactions that occur during chemical flooding obviously cannot be viewed in the reservoir. This leaves production and injection data as the only indication of what is actually occurring in situ.

The 25 production wells were tested for daily oil and water production on rotating schedules. Each production well has a separate flow line to the central header where total fluid production is separated into Farm A (the enclosed five spots) and Farm B (peripheral wells). Via this header, any well can be connected to the test separator facilities for flow testing and individual well fluid sampling (see Figures 42-44 in Reference 4).

Teck-Labs of Bradford carried out an extensive produced water analysis (Reference 4, page 29). The primary potions of this analysis were chlorides, total hardness and calcium, magnesium and sodium ions. Marathon Oil Company's Denver Research Center analyzed produced water for slug sulfonate by liquid chromatography and for polymer concentration by colorimetric analysis. The data should be judged on a qualitative basis, useful primarily to evaluate trends and curve shapes.

The primary data used in this evaluation include chlorides, calcium, sulfonate in water, polymer concentration, cumulative oil and water production and oil cut and rate. Chlorides come primarily from the preflush brine. Preflush brine was injected prior to the micellar slug to create a salinity gradient favorable to oil recovery. As this brine moves through the reservoir to the production well,

it disperses with other reservoir fluids and can be absorbed by the reservoir rock. If the reservoir was single layered, one would expect a traditional dispersion curve in the production well as the brine is produced; first at a lower concentration, rapidly increasing then slowly decreasing and eventually reaching a value slightly higher than the supply water used in the slug and polymer solutions. Chloride content of the formation water after 30 to 40 years of waterflooding was approximately 1900 ppm. The Lawry supply well water used to dilute the micellar slug and polymer was fresh (250 ppm TDS, 31 ppm chlorides). Since the fluid system used was a high chloride concentration preflush, then low chloride concentration slug followed by the mobility buffer, high chloride concentrations prior to slug breakthrough were expected. Due to the heterogeneity of the Lawry reservoir and since each production well is receiving fluid from four adjacent wells, the peak of the dispersion curve could be spread out from six months to one to two years.

The source of calcium in the produced water is different from the chlorides. There is very little calcium in any of the injected fluids, however, the rock itself could contain large amounts of this material. Calcium could occur in the matrix cement or in clays growing on the surface of the sand grains. As the concentrated sodium chloride preflush flows through the reservoir, ion exchange occurs, trading the monovalent sodium for the divalent calcium. This means that the calcium dispersion curve would occur with a slight lag behind the chlorides. In about one-half of the 25 production wells, the response for both chlorides and calcium was normal. The concentration increased just prior to sulfonate breakthrough and then gradually decreased as the project matured. In most remaining wells, the calcium concentrations did not decrease as expected. It is difficult to say if these responses are due to the contributions of four separate wells breaking through at different times, reservoir heterogeneities or other problems. It is fairly safe to say, however, that for some of the

Lawry area rather high concentrations of calcium were in solution with the micellar slug. We do not have enough information to evaluate any detrimental effect this might have had on the micellar slug, but the presence of a divalent ion in solution with the slug is noted.

Sulfonate injection began in mid-September, 1977. Given the performance of the brine preflush and the greater viscosity of the micellar slug, breakthrough into the production wells could be expected in mid to late 1978. This is generally what occurred. The normal sulfonate response, again indicative of dispersion, was very low concentrations at first, increasing rapidly to a peak concentration and then decreasing as the project matured and polymer production increased. Accompanying the increased concentration of sulfonate in the produced water should be a noticeable increase in oil cut throughout the project. This also occurred but to a lesser degree than expected. The expected response in the Lawry reservoir would have sulfonate appearing in July or August, 1978, and consistent polymer appearance in January or February, 1979. Unfortunately, this was the exception rather than the rule. In a normal well, sulfonate would appear in July or August, 1978, with consistent polymer appearance in January or February, 1979. The most important anomaly was large concentrations of slug appearing in the produced water during December, 1977, through January, 1978. This is demonstrated in Figure 6. Measured sulfonate concentrations could also be 10-20 times higher than those occurring later in the project, and the duration of the spike would only be one to two months. This type of response could be seen in the polymer data (Figure 7). The cause of these abrupt high concentration shows of sulfonate and polymer in the produced fluids may have been caused by pressure parting. Throughout the fall of 1977, as slug was being injected into the Lawry, rates were found to be decreasing rapidly (Figure 8). To counter this, injection pressure was increased until the parting pressure of the Third Bradford Sand was exceeded. This idea is discussed further in the Evaluation Section.

EVALUATION

There were two major physical problems which brought about the decision to terminate the Lawry Project. The first and more important was the low oil production experienced throughout the project life. The second was the very low injection rates, less than 60% of those expected in the Lawry reservoir. As previously mentioned, the Lawry Project was risky from the beginning. DOE funding and the high price of Penngrade crude provided the incentives necessary to justify the test. Two other Marflood projects (Special Project 7 and Special Project 5) had achieved a degree of success in the "fairway" portion of the Bradford Third Sand. The "Fairway" Section is a very limited area of high permeability in the center of the Bradford Field. However, most of the oil in the Bradford Third Sand lies in areas of extremely low permeability and great heterogeneity, and even a partially successful tertiary flood in these areas could mean a great deal to the Penngrade crude producers. Therefore, the Lawry project became an experiment in attempting recovery in this adverse type of reservoir.

In this evaluation, two physical systems that were felt to be major contributors to project failure will be discussed. First is the reservoir system, which includes the physical parameters of the rock as well as the nature of fluid flow through the rock. In addition, a brief examination of the Maraflood fluid system itself and its possible contributions to the unfavorable results achieved will be presented.

The data available to conduct this evaluation come from three sources. The first source is injection rates and pressures. The second source is production data, including amounts of oil and water produced by well and an analysis of the produced water for various chemical indicators. The third

source is a core test taken in the southern portion of the project, 55 feet due north of injection Well HO-84. This core was analyzed by John DePetro's laboratory in Bradford, Pennsylvania, for saturations, permeabilities, porosities and net sand. Selected samples were also sent to the Denver Research Center for sulfonate analysis. These data are useful in postulating the most probable cause for the low productivity of the Lawry Project.

When discussing the Lawry reservoir, the first thing to consider is the permeability profile of the pay zone. The degree of permeability variation in the Lawry was severe. The Lawry development work was based on a 24-acre pattern and a 30 foot reservoir section with an average permeability of 7 md.

These values elude to a uniform situation where stable flood fronts sweep through the formation banking and producing oil. Some lack of conformance was expected, but an examination of the cores taken from all 16 injection wells showed a significant permeability contrast. Figure 10 shows a typical permeability profile for the Lawry reservoir. The only reason an average value of 7 md could be calculated was due to about six feet of sand (dispersed over the 30 ft. interval) with permeabilities from 10 to 50 md. This degree of variation points toward an extremely non-uniform injectivity profile and, therefore, poor vertical conformance.

A simple schematic of the reservoir was constructed to model the effects of permeability variation. The reservoir was divided into three different sections based on permeability. Section A contained all sand with permeabilities about 10 md; Section B contained sand between 6 and 10 md; and Section C contained sand below 6 md. Porosity, permeability, saturation, thickness and pore volume were calculated for each layer. This was done for all 16 inverted five spots and then combined to model the entire reservoir. Figure 9 and Table 4 demonstrate these results. It is important to understand that this model is only a convenient

analog for the reservoir; no discrete zones of constant permeability actually exist.

Table 5 shows that the distribution of injected fluids is dependent on the permeability variation. Calculations resulting in the injectivities shown in Table 5 were made for Newtonian fluids in accordance with Darcy's Law. At least 60% of all injected fluids will enter Section A, more if plugging or formation damage occurs in the 2.4 md (avg) rock of Section C which comprises 60% of the entire reservoir. In a normal waterflood, this might not constitute a serious problem. But, in a very expensive, short-lived chemical flood, fluid distribution becomes increasingly important.

Section A received 60% of the preflush and most importantly the micellar slug. If wellbore conditions remain constant, the sand with permeability greater than 10 md (about one fourth of the reservoir), receives an amount of slug equivalent to 24% of its pore volume. Section B, about five feet of pay or 17% of the total reservoir pore volume, receives 10.2% of its pore volume in micellar slug. With 78% of the injection taken by 40% of the reservoir, Section C, the remaining 60% of the pore volume, only receives 3.6% of its pore volume in slug, hardly enough to recover significant amounts of oil (see Table 5).

Another consideration is reduced frontal velocities in the lower permeability rock. The effect of having 78% of the injected fluid entering Sections A and B, reduces the frontal velocity of the fluid in Section C. If the slug and mobility buffer behave as power-law fluids, the reciprocal mobility will increase, possibly causing reduced recoveries.

CORE TEST C-1

As part of the Lawry Project evaluation, a four-inch core was taken from a well drilled in the southern end of the project, 55 feet due north of injector HO-84. This site was chosen primarily due to the high recovery of this inverted five spot. All sand sections of the core were sampled by Pennzoil with some adjacent samples collected by Marathon.

Pennzoil's samples were logged, described and delivered to John DePetro's Lab in Bradford for analysis. This included determination of permeabilities, porosities and oil saturations. Marathon's samples were sent to the Denver Research Center where sulfonate content and oil saturations were determined. Permeability profiles of C-1 and HO-84 are shown in Figure 10.

The results of both the Marathon and DePetro analyses showed very little or no reduction of oil saturation with the exception of three or four feet of sand with permeabilities greater than 8.25 md. This is shown in Table 6. These were also the only samples showing any significant sulfonate. With the exception of MS-14, which showed a negligible amount, it appears that no sand with permeability below 8.25 md had been contacted by micellar slug. The location of the core well was set at 60% PV slug size, which should have been close enough for even the tight rock to show evidence of slug. Reasons for its absence could be increased flow impedence due to a local formation heterogeneity or plugging of this low permeability rock due to fluid system problems. Plugging could also have occurred near the wellbore due to formation damage. Without additional core tests, determining the cause for the slug's lack of formation penetration is speculation.

Since the core test represents only one data point, it is risky to extrapolate these results over the entire field. But, considering that it is the

only available postflood view of the reservoir, it demonstrates vertical conformance trends compatible with the ideas discussed thus far.

Both the original injection well permeability profile and the test well C-1 support the idea that the higher permeability rock (K 10 md) accepted most of the injected fluids. The fact that no evidence of sulfonates was found in the lower permeability rock tends to raise doubt if any injected fluids penetrated the low permeability portions of the reservoir.

Assuming that the higher permeability sections were the sole benefactors of the Lawry injected fluids, as was evidenced by core C-1, a new reservoir can be defined with pore volume, thickness and oil-in-place based on Section A of Figure 9. Table 7 shows the official project pore volume and oil-in-place values used in the project design. Table 8 represents the adjusted reservoir based on a permeability cut-off of 10 md as in Section A. The oil-in-place calculations were based on the "official" post-waterflood residual oil saturation of 40% PV. This value was based on the idea that the only source of saturation data, the injection well cores analyzed by DePetro and DRC were inaccurate due to flushing of the cores by the coring fluid. Since the average saturations from the cores (see Table 8) was 30.66%, this would mean a 25% loss of OIP, to drop from 40% to 30%. Table 9 compares recoveries based on both 40% and 30% for the adjusted reservoir based on Section A of the reservoir schematic. Comparing both oil saturation values with both reservoir pore volumes gives:

LAWRY TOTAL PROJECT

Pore Volume = 684,577 (bbls)

Oil-In-Place (S_{or} = 40%) = 273,831 (bbls)

Oil-In-Place (S_{or} = 30.66%) = 209, 891 (bbls)

LAWRY ADJUSTED RESERVOIR (K 10 md)

Pore Volume = 171,769 (bbls)-25% of the design pore volume

Oil-In-Place (S_{or} = 40%) = 68,708 (bbls)

Oil-In-Place (S_{or} = 30.66%) = 52,664 (bbls)

With recovery at 12,809 (bbls) from 9/13/77 - 11/20/80 we get:

	S_{or} = 40.0%	S_{or} = 30.66%
TOTAL RECOVERY	4.7% OIP	6.1% OIP
ADJUSTED RECOVERY	18.6% OIP	24.3% OIP

Experience has shown Maraflood project response to the injected chemicals in the form of an increased oil cut can be expected between 25% and 35% PV of micellar-polymer fluid injected. Figure 11 shows the oil cut response for Farm A and includes the 17% preflush portion of the project. The "zero" point of injection was previously taken to be initiation of micellar slug injection. When interpreting this figure, it will be noted when the 17% PV preflush is subtracted from the values given.

During salt water preflush, the oil cut leveled off at approximately 1% and remained at that value until initiation of micellar slug injection. At that time, it increased to 2% and remained constant until 30% PV injection. Between 30 and 35% PV, an increase in oil cut from 2% to 5% can be seen. After subtracting the 17% preflush, this means an oil response occurred between 12% and 18% PV. This is considerably sooner than the expected response point of 25 to 35% PV. If Maraflood fluids were only entering the portion of the reservoir with permeabilities greater than 10 md (Section A), a new oil cut vs pore volume plot can be made. Figure 12 is such a plot, with injected pore volume reduced to coincide with reduced total pore volume of Farm A due to Section A. The 2% oil cut noted at the start of slug injection continues until about 27% PV of micellar-polymer fluids have been injected. With the reduced pore volume,

the oil response then shows an increase in oil cut from 2% to 4.5% between 30%-50% PV injection. The response in this case agrees with what is normally expected for a Maraflood project.

Assuming that the majority of the response was due to Section A, the next question is why was the later portion of the oil cut relatively constant. Between 35% and 55% PV injected on Figure 11 and between 47% and 90% on Figure 12, the oil cut averaged a bit over 4.5%. This again assumes that the only portion of the reservoir receiving micellar polymer fluids is Section A. The 43% PV duration of this 4.5% oil cut could be considered normal Maraflood response. The problem in this is the very low magnitude of the oil cut, normally expected to be between 10% and 20% in this type of reservoir. One possible explanation is that oil was banked in the high permeability section of the reservoir and produced at a much higher oil cut than 4.5% but was diluted by water being produced from the remaining low permeability section. However, since no sulfonate was found in rock outside of Section A, this raises a question as to if any fluids were flowing through the lower permeability sections. If this was the case elsewhere in the reservoir, the duration and magnitude of the oil cut could be the result of an inefficient immiscibletype displacement where no effective oil bank was formed. The latter could be the result of a number of circumstances including loss of mobility control or slug ineffectiveness.

Loss of mobility control could also be the result of some type of rock-fluid interaction such as absorption in the reservoir. Any severe change in viscosity of the micellar slug in situ could cause loss of the ability to bank oil or to maintain mobility control.

If loss of mobility control or deterioration of slug in the reservoir were to cause poor recovery in the Lawry, one solution would be to inject higher

viscosity fluids. Due to the permeability profile of the Lawry, this would result in even a greater number of reservoir related problems. Injectivity problems alone rule out this solution.

PRESSURE PARTING

There was great concern over the effect of natural fractures or pressure parting on the Lawry Project after an early show of sulfonate was noted in the following wells: H-92, H-93, H-96, H-97, H-99, H-101, H-102, H-105, H-110, H-111 and H-112, which make up 44% of project production wells. The sulfonate shows came over a period from November, 1977, to January, 1978, and were in the form of a "spike" going back to zero or very low concentrations after February, 1978. This sulfonate show coincided with the increase in oil cut from 1 to 2% at initiation of slug injection. This seems to indicate either very high permeability streaks or fractures being opened through pressure parting allowing the slug to momentarily contact oil collected in these areas and sweep it to the production wells. After a similar occurrence upon the initiation of polymer injection in April, 1978, coiled tubing was fitted to the injection headers to control injection rates. In October of 1978, step-rate tests were carried out on all injection wells to determine parting pressures. A summary of these tests is shown in Table 10. These tests proved that the parting pressure of the formation had been substantially exceeded by at least 10 of the 16 injection wells. Unfortunately, due to the very low injectivities, it was necessary to maintain a high injection pressure. Although some sulfonate and polymer were lost to the formation through the fractures created by the pressure parting, it does not appear that these volumes were appreciable when compared to the larger response seen later with 25%-40% PV injected as shown in Figure 13. Due to the orientation of tectonic stresses and the existence of jointing consistent with stress orientation, all formations in this area would be susceptible to this type

behavior. The disruption of areal conformance caused by this type of problem is severe, but due to the numerous other heterogeneities evidenced in the Lawry reservoir, the large scale effects of pressure parting are difficult to distinguish from problems caused by known reservoir conditions.

REFERENCES

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2. Core tests conducted by John DePetro, 1976. John DePetro, Petroleum Engineer - Bradford, Pennsylvania.

3. "Penn Grade Micellar Displacement Project", 3rd Annual Report, June 1977 - June 1978, H. H. Danielson, W. T. Paynter, P. S. Ondrusek, L. L. Finalle, Pennzoil Company, Bradford, Pa., DOE Report METC/CR-79/4.

4. "Penn Grade Micellar Displacement Project", 2nd Annual Report, June 1976 - June 1977, H. H. Danielson, W. T. Paynter, P. S. Ondrusek, L. L. Finalle, Pennzoil Company, Bradford, Pa., DOE Report METC/CR-78/7.

FIGURE 1

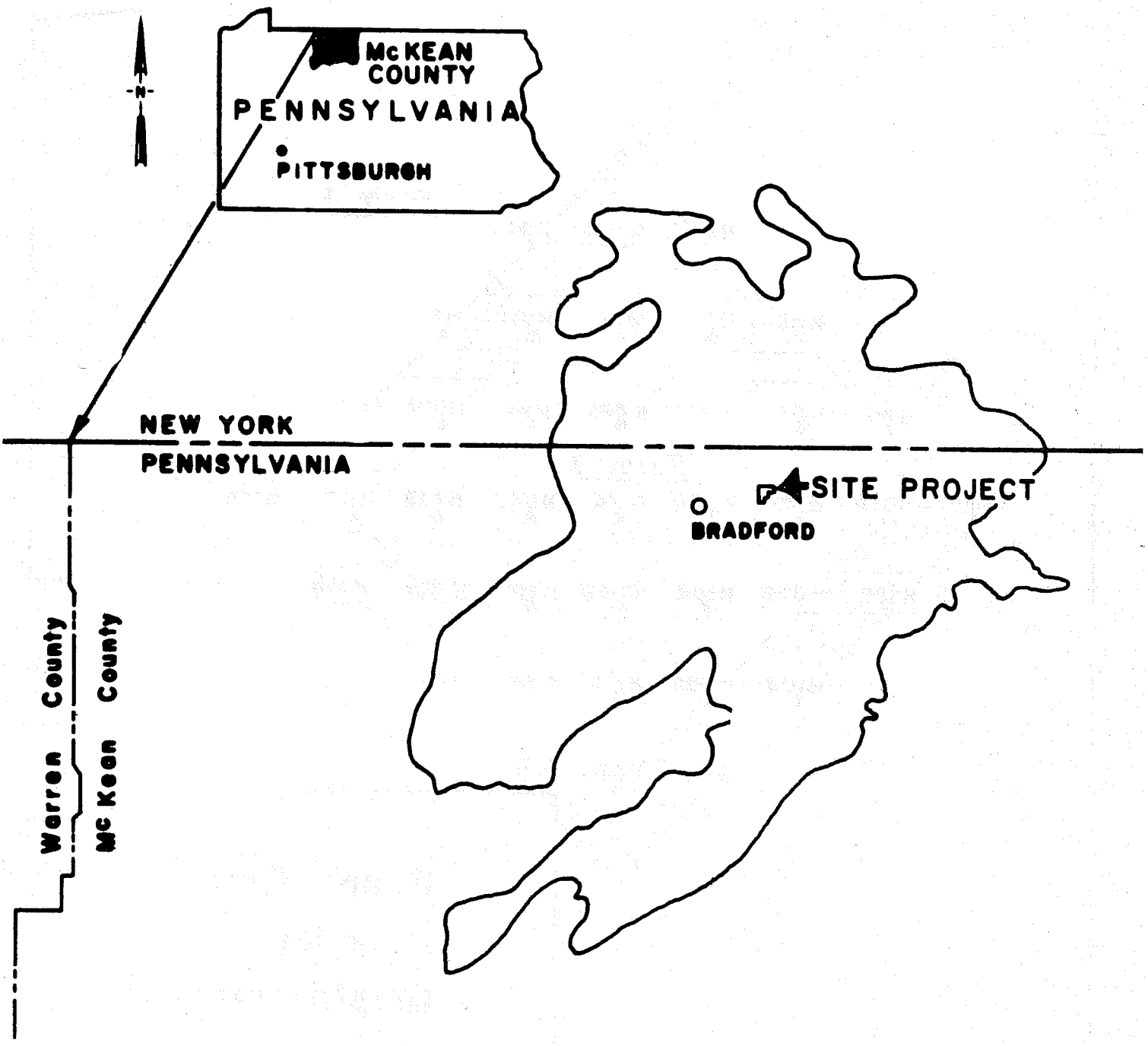
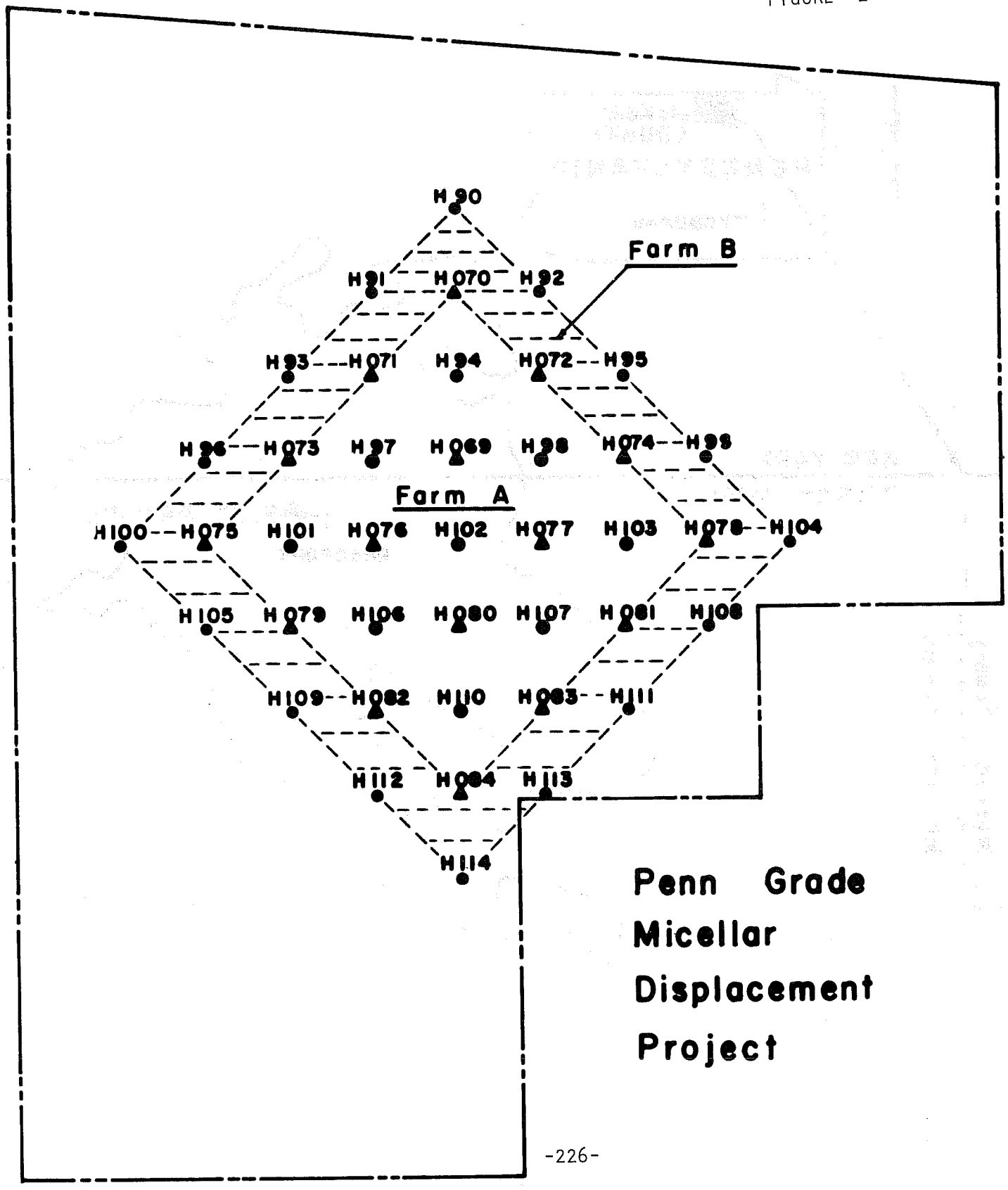
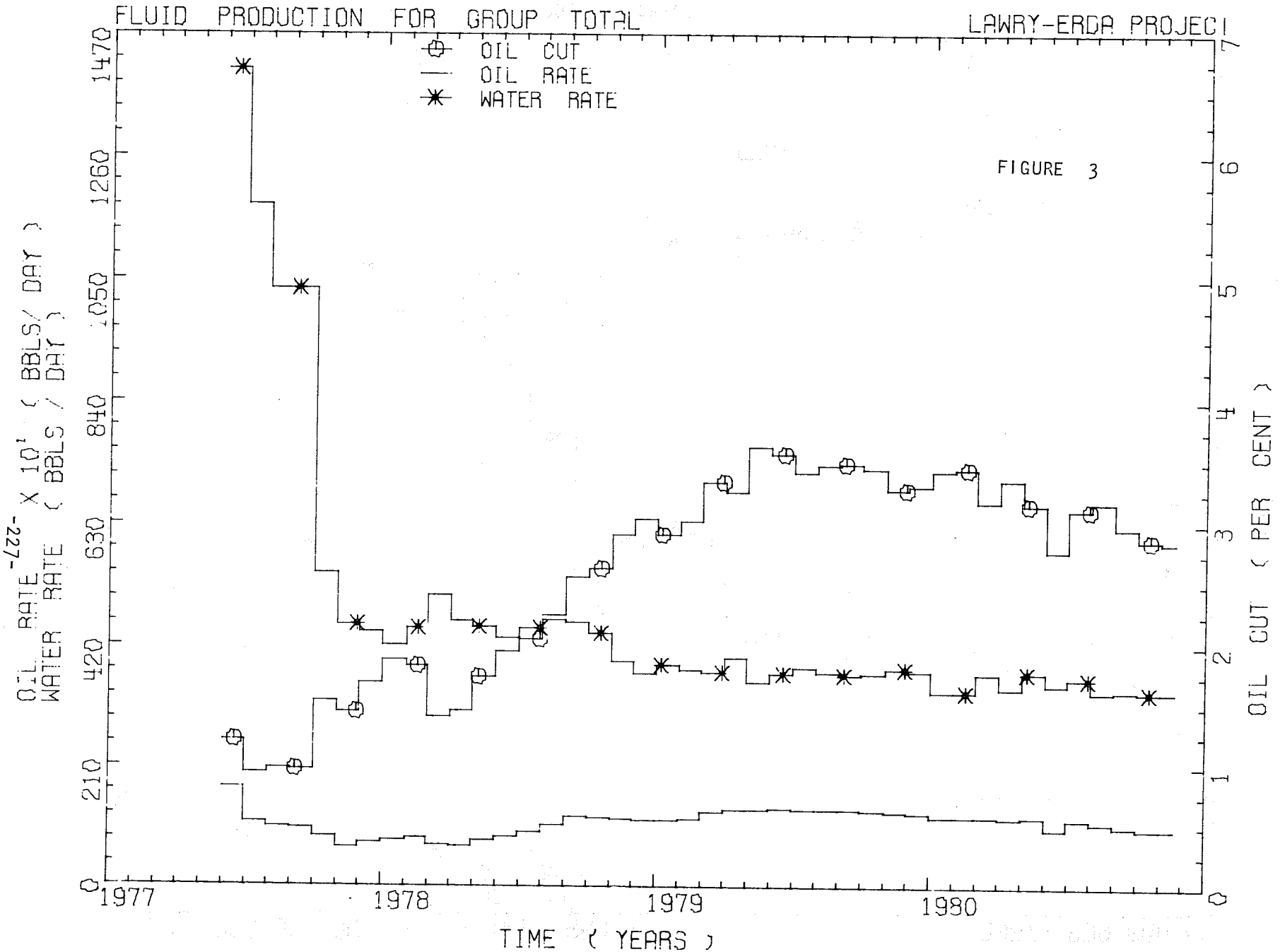
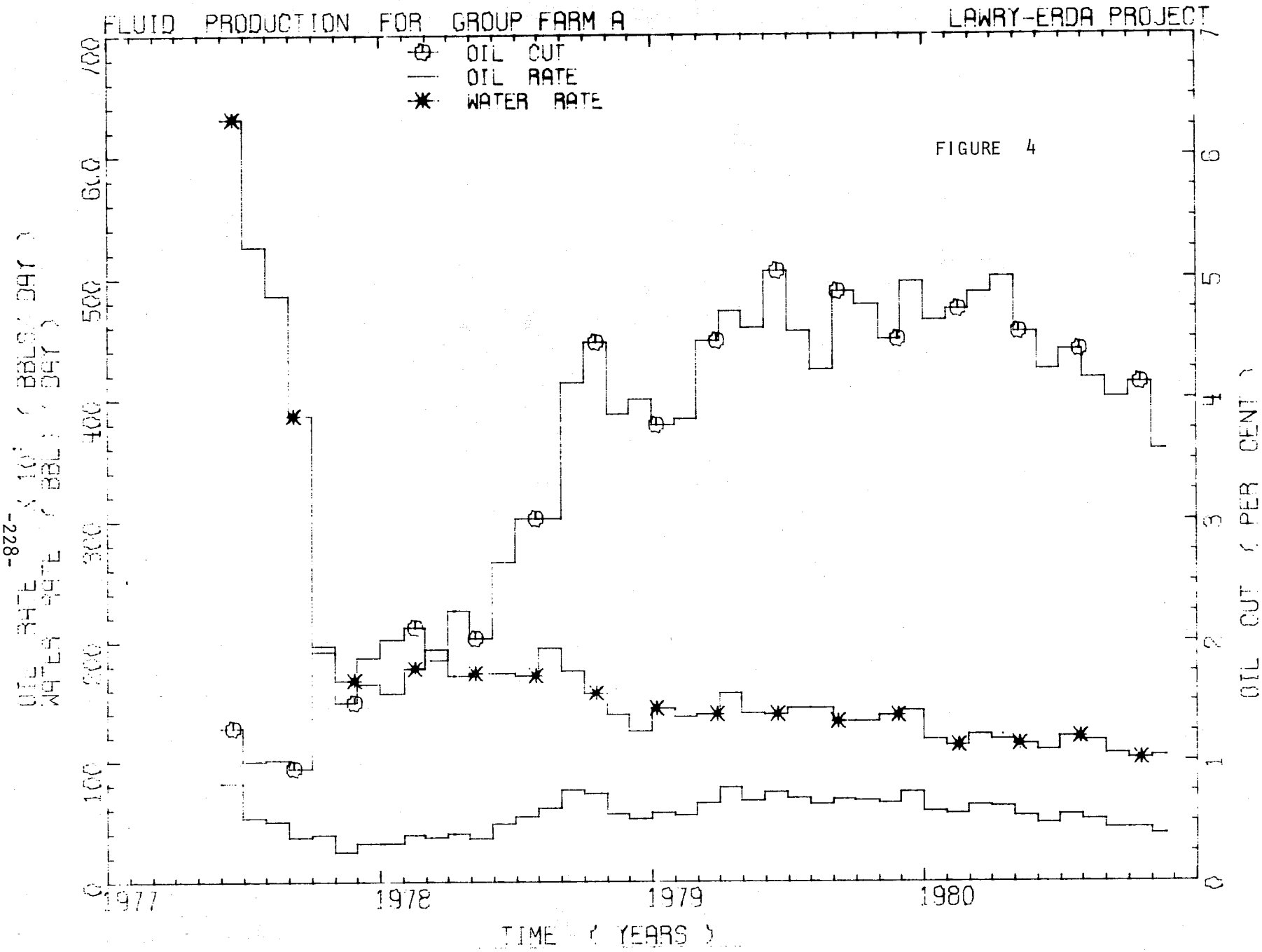

McKEAN COUNTY
PENNSYLVANIA
PITTSBURGH
-N-
NEW YORK
PENNSYLVANIA
SITE PROJECT
BRADFORD
Warren County
McKean County

FIGURE 2



Penn Grade Micellar Displacement Project


FLUID PRODUCTION FOR GROUP TOTAL
LAWRY-ERDA PROJECT
OIL CUT
OIL RATE
WATER RATE
FIGURE 3
OIL RATE X 10¹ (BBLS/ DAY)
WATER RATE (BBLS / DAY)
OIL CUT (PER CENT)
TIME (YEARS)
0
210
420
630
840
1050
1260
1470
1977
1978
1979
1980
1
2
3
4
5
6
7


FLUID PRODUCTION FOR GROUP FARM A
LAWRY-ERDA PROJECT
OIL CUT
OIL RATE
WATER RATE
FIGURE 4
OIL RATE X 10 / BBLS / DAY)
WATER RATE / BBL / DAY)
OIL CUT (PER CENT)
TIME (YEARS)
1977
1978
1979
1980
0
100
200
300
400
500
600
700
1
2
3
4
5
6
7

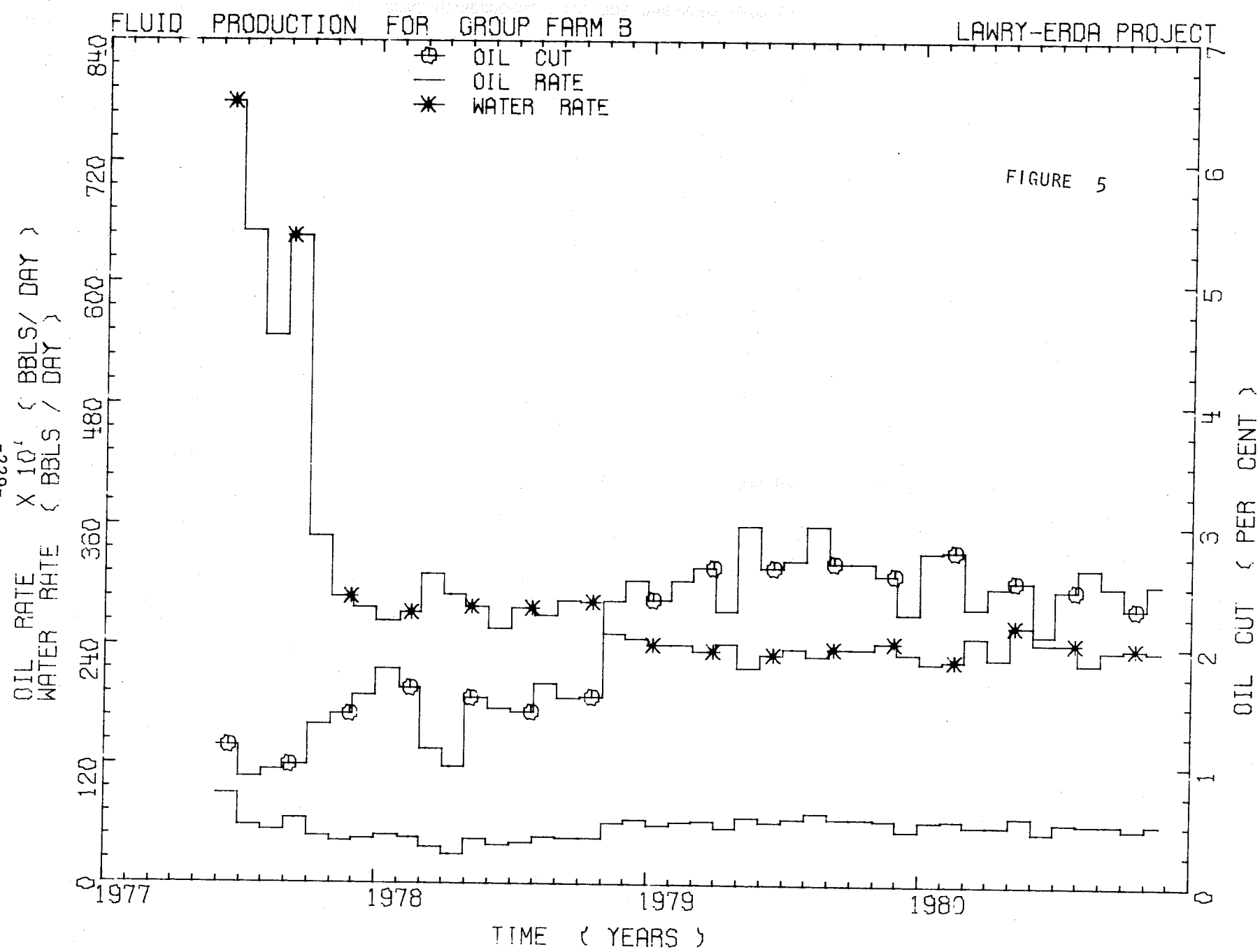
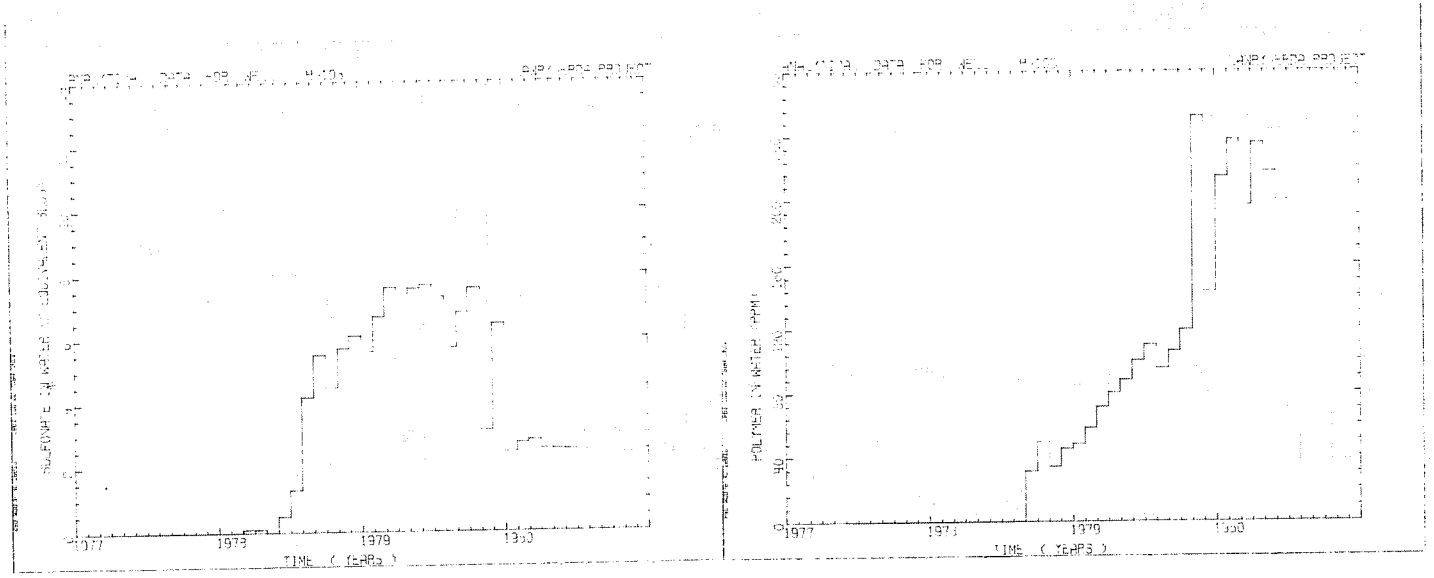
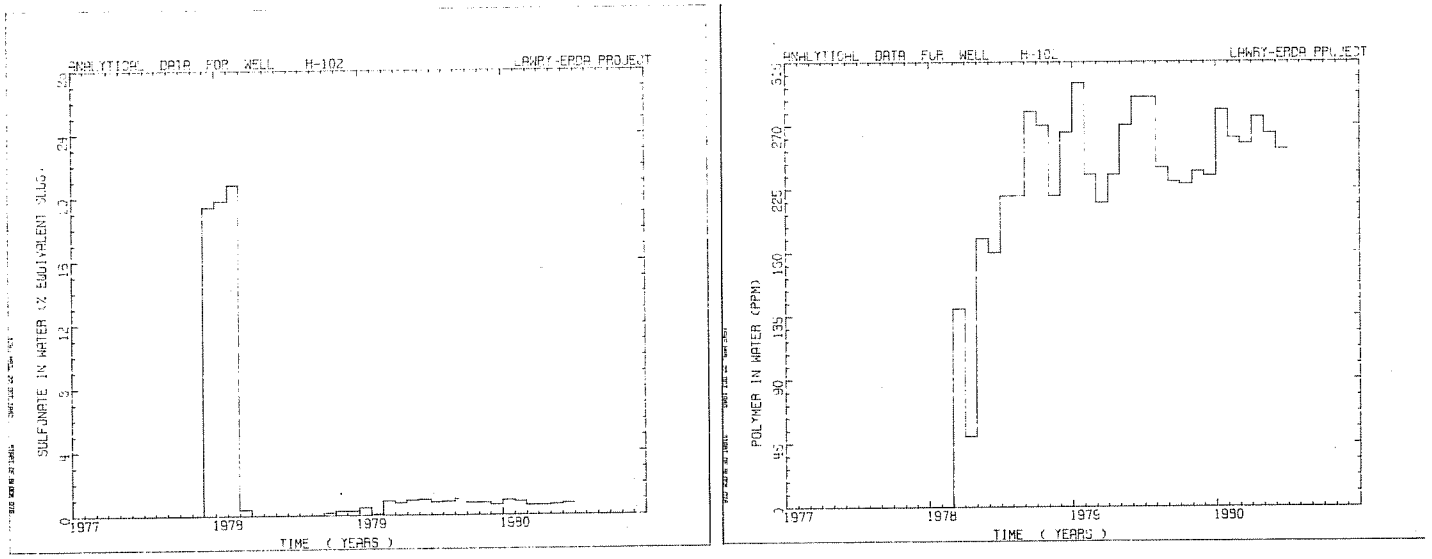

FLUID PRODUCTION FOR GROUP FARM B
LAWRY-ERDA PROJECT
OIL CUT
OIL RATE
WATER RATE
FIGURE 5
OIL RATE X 10' (BBLS/ DAY)
WATER RATE (BBLS / DAY)
OIL CUT (PER CENT)
TIME (YEARS)
0
120
240
360
480
600
720
840
1977
1978
1979
1980
0
1
2
3
4
5
6
7

FIGURE 6

SELECTED POLYMER AND SULFONATE RESPONSES



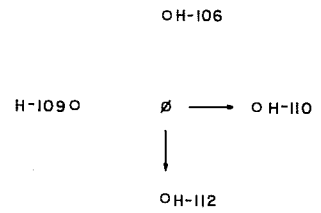
"NORMAL" SULFONATE AND POLYMER RESPONSES

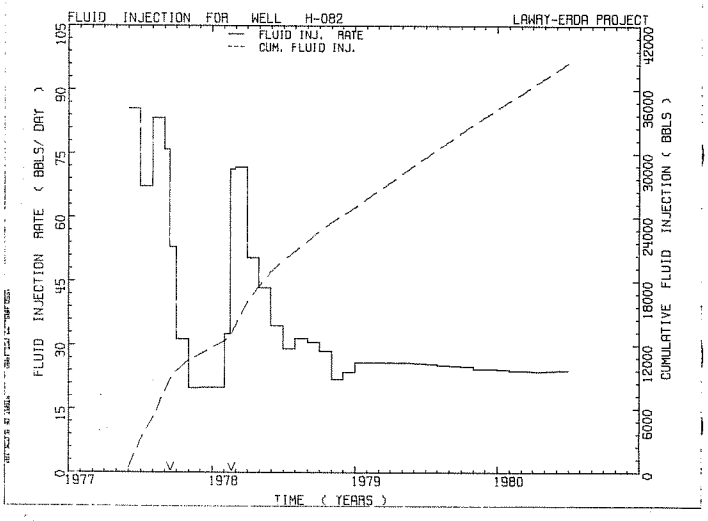


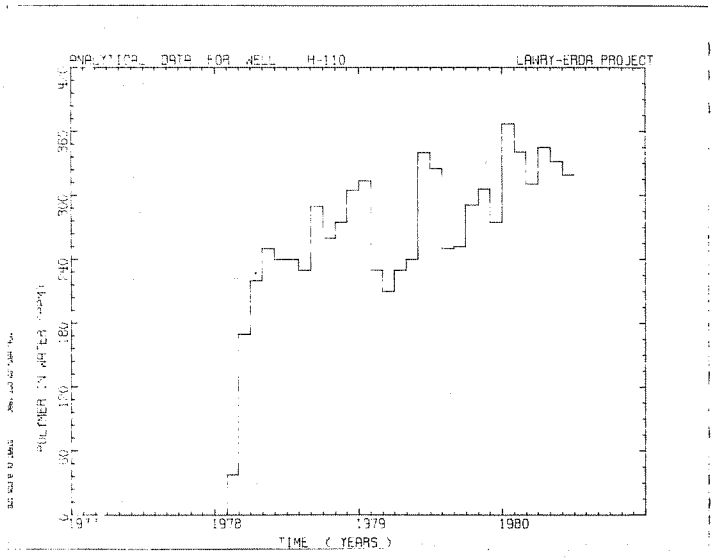
SPIKE IN RESPONSE INDICATING PRESSURE PARTING

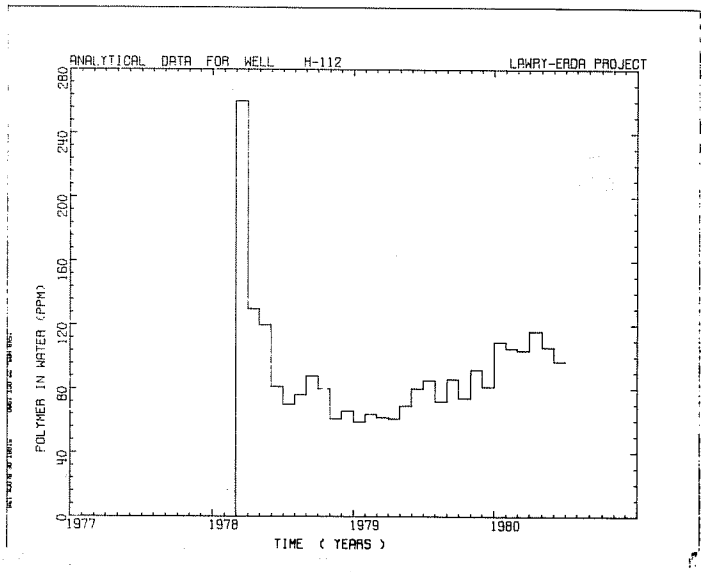
FIGURE 7

PLOTS OF INJECTION FOR WELL HO-82 AND POLYMER PRODUCTION IN ADJACENT PRODUCERS H-110 AND H-112









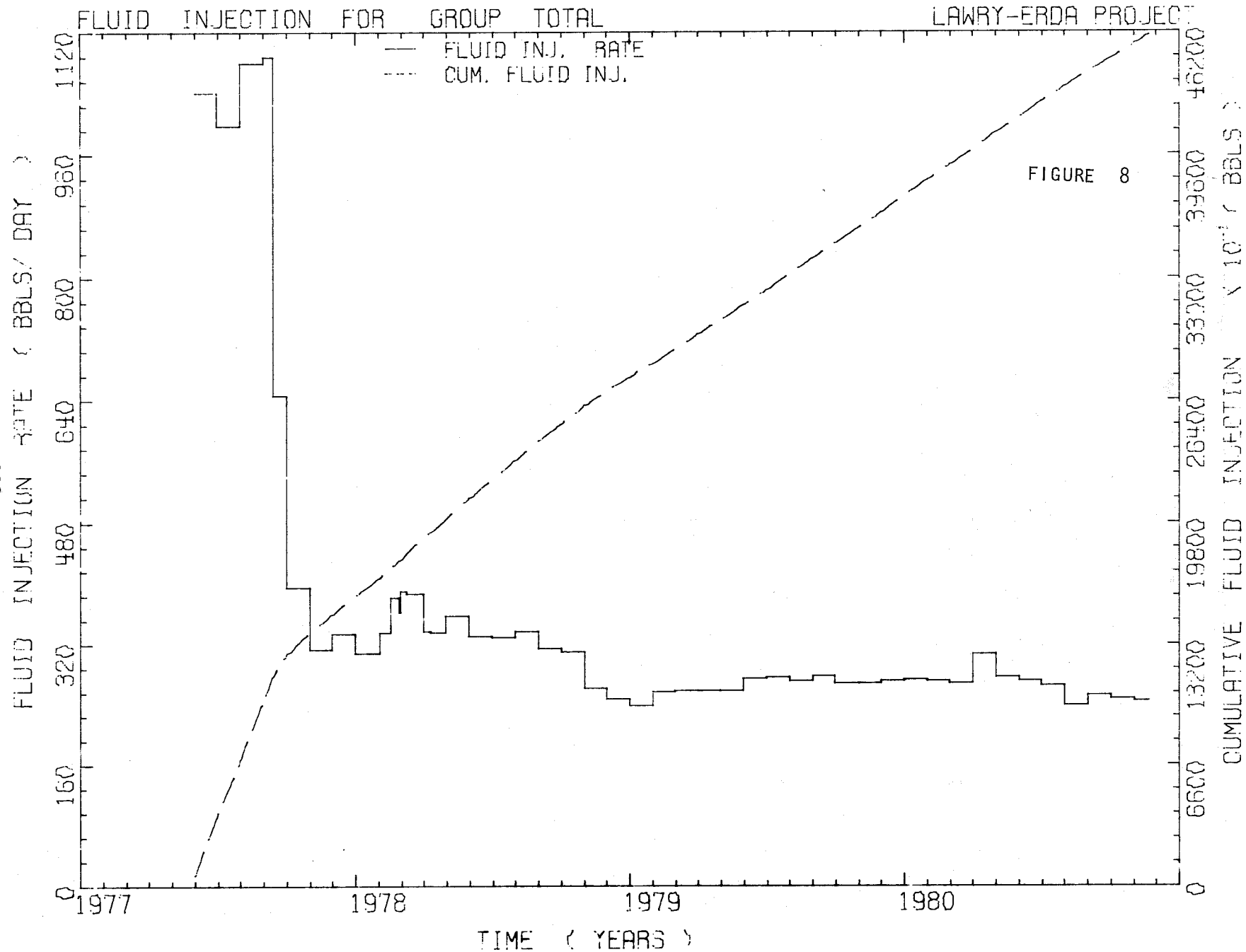
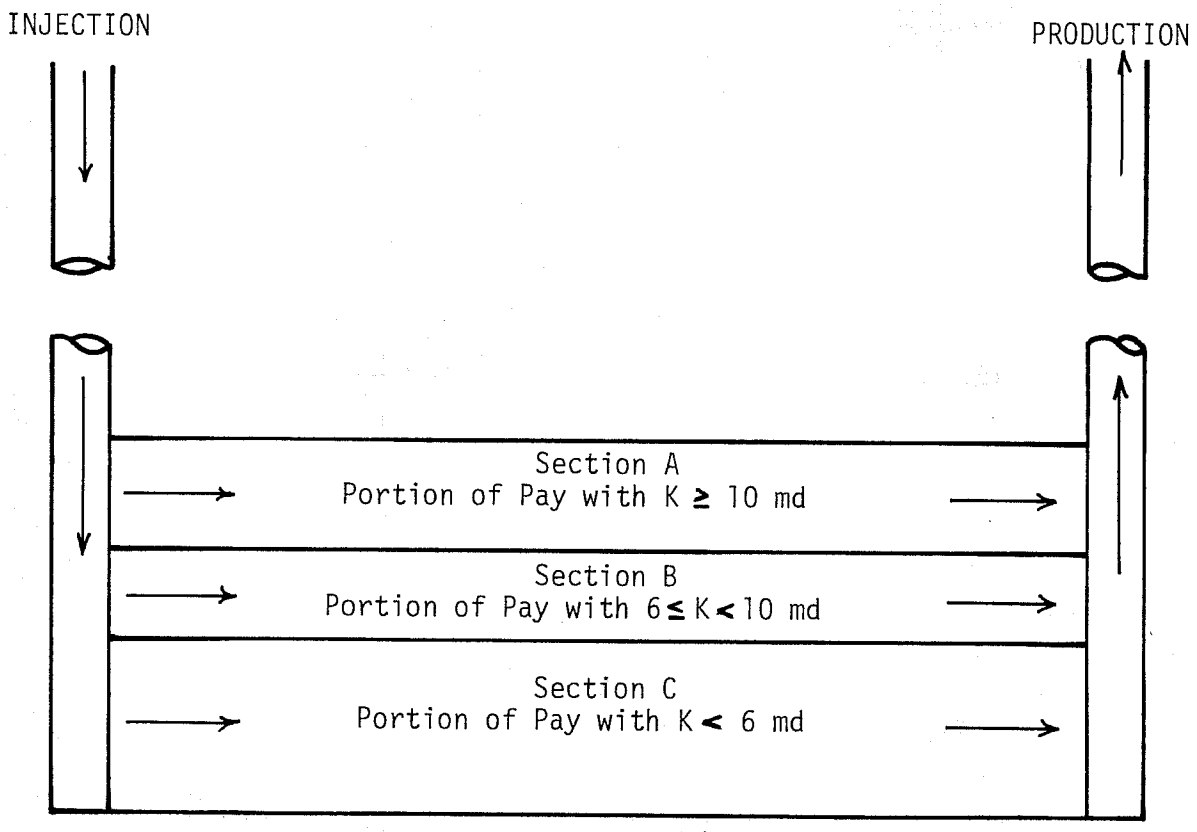

FLUID INJECTION FOR GROUP TOTAL
LAWRY-ERDA PROJECT
FLUID INJ. RATE
CUM. FLUID INJ.
FIGURE 8
FLUID INJECTION RATE (BBLS/ DAY)
CUMULATIVE FLUID INJECTION (10³ BBLS)
TIME (YEARS)
0
160
320
480
640
800
960
1120
6600
13200
19800
26400
33000
39600
46200
1977
1978
1979
1980

FIGURE 9

LAWRY DOE PROJECT - SCHEMATIC OF RESERVOIR



COMPARISON OF PERMEABILITY PROFILES FOR C-1 AND HO-84

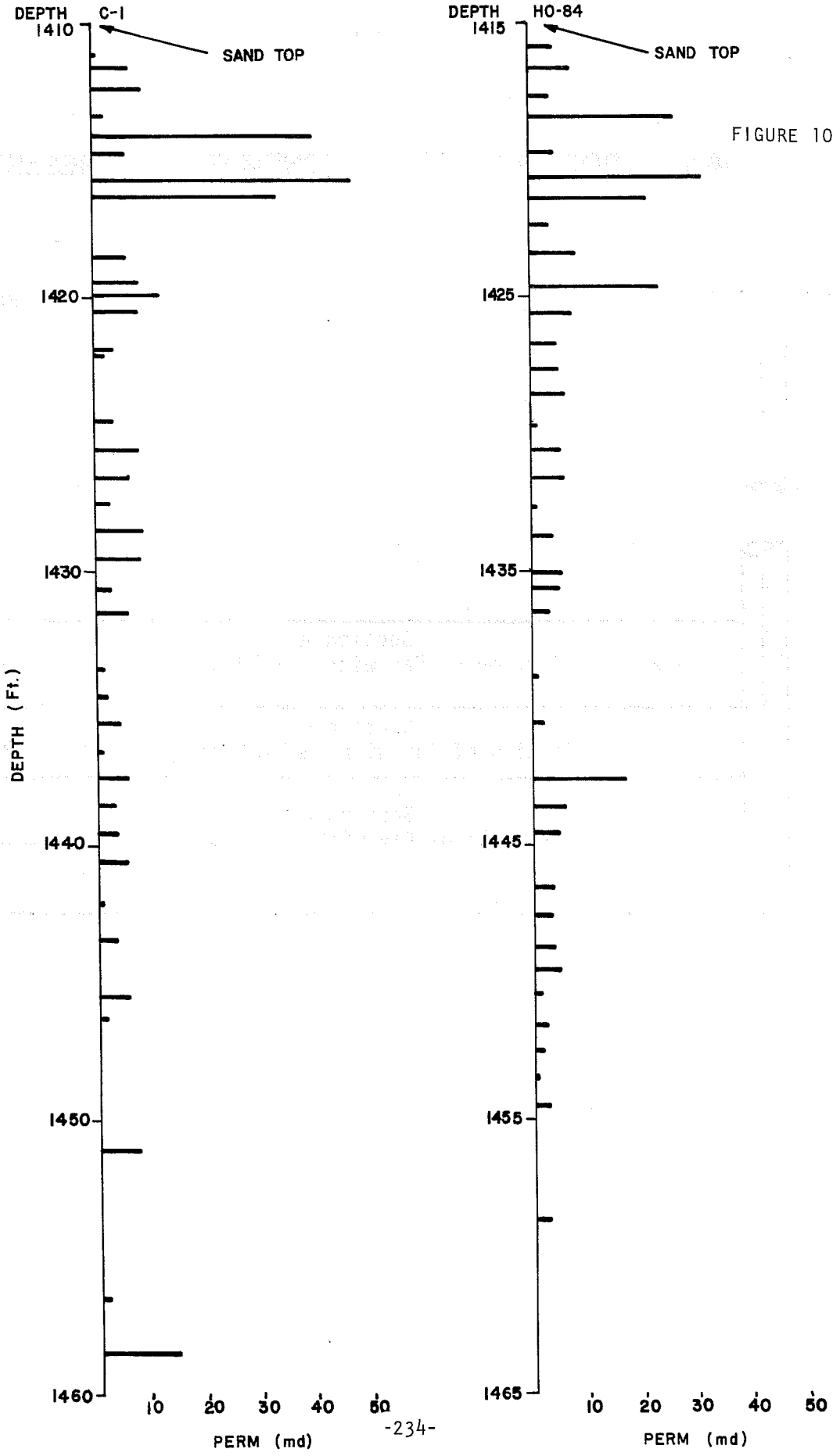


FIGURE 10

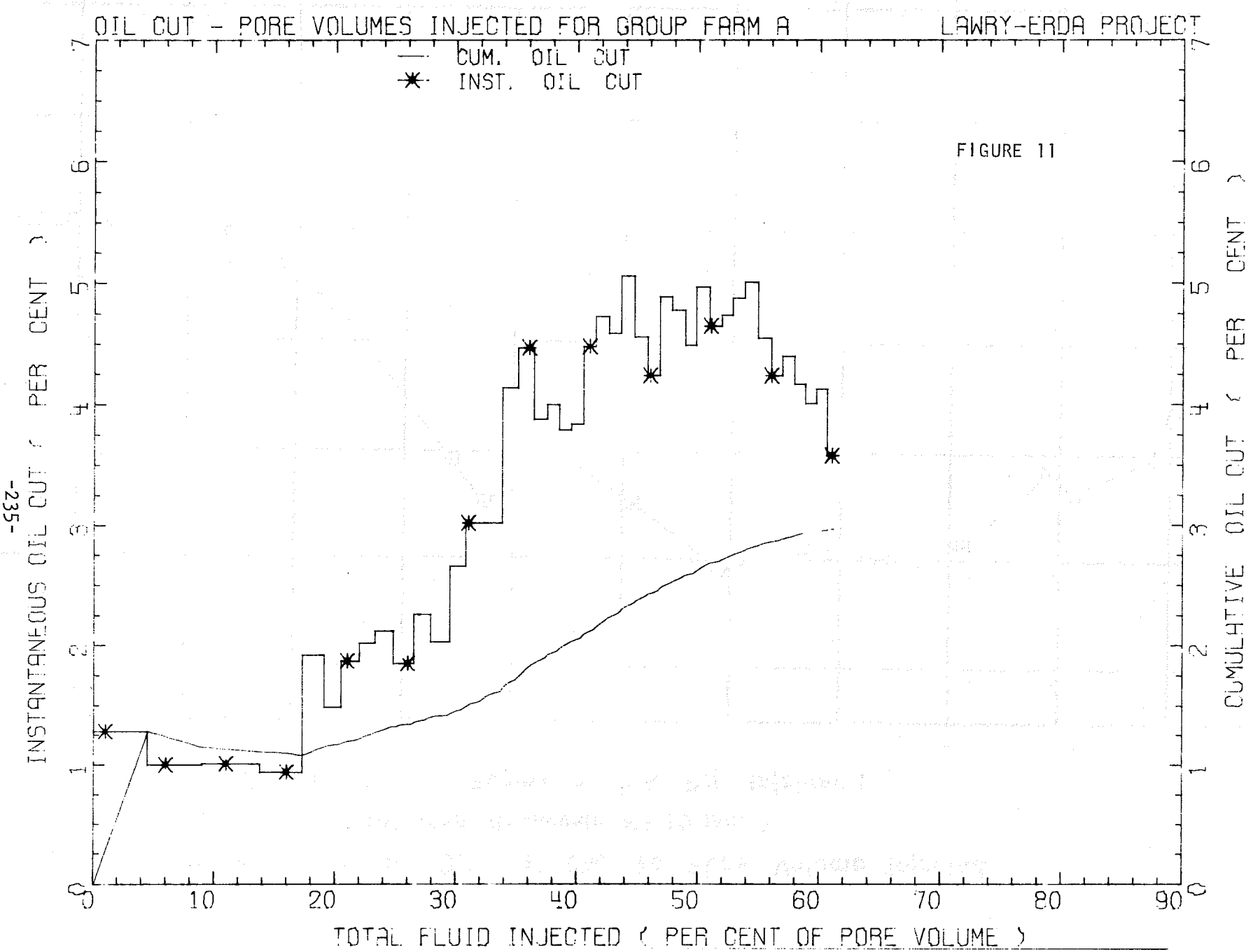

OIL CUT - PORE VOLUMES INJECTED FOR GROUP FARM A
LAWRY-ERDA PROJECT
CUM. OIL CUT
INST. OIL CUT
FIGURE 11
INSTANTANEOUS OIL CUT (PER CENT)
CUMULATIVE OIL CUT (PER CENT)
TOTAL FLUID INJECTED (PER CENT OF PORE VOLUME)
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7

FIGURE 12

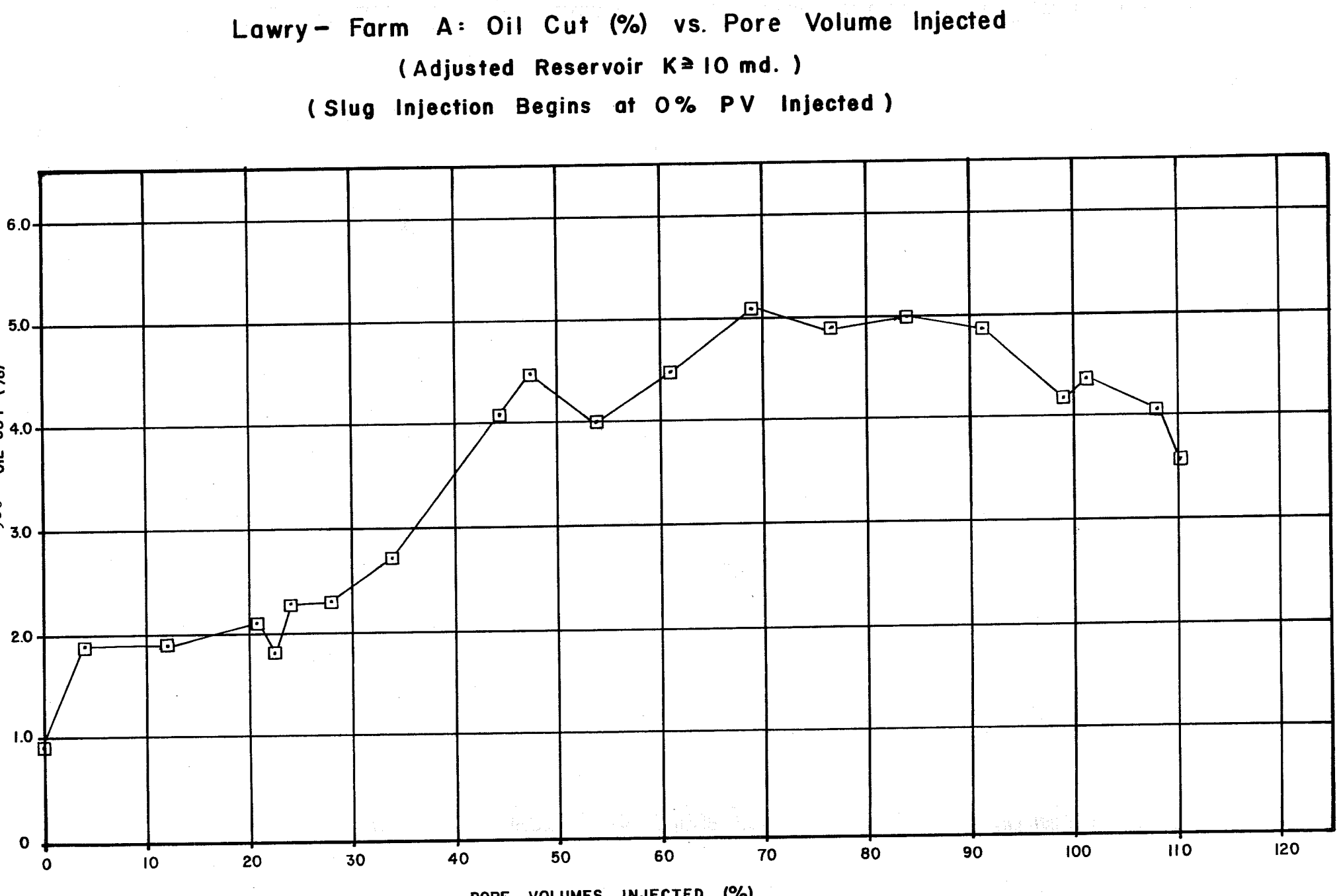

Lawry- Farm A: Oil Cut (%) vs. Pore Volume Injected
(Adjusted Reservoir K≥ 10 md.)
(Slug Injection Begins at 0% PV Injected)
6.0
5.0
4.0
3.0
2.0
1.0
0
0
10
20
30
40
50
60
70
80
90
100
110
120
PORE VOLUMES INJECTED (%)

FIGURE 13

Total Project Sulfonate Concentration (% in Water)
vs.
% Pore Volume Injected

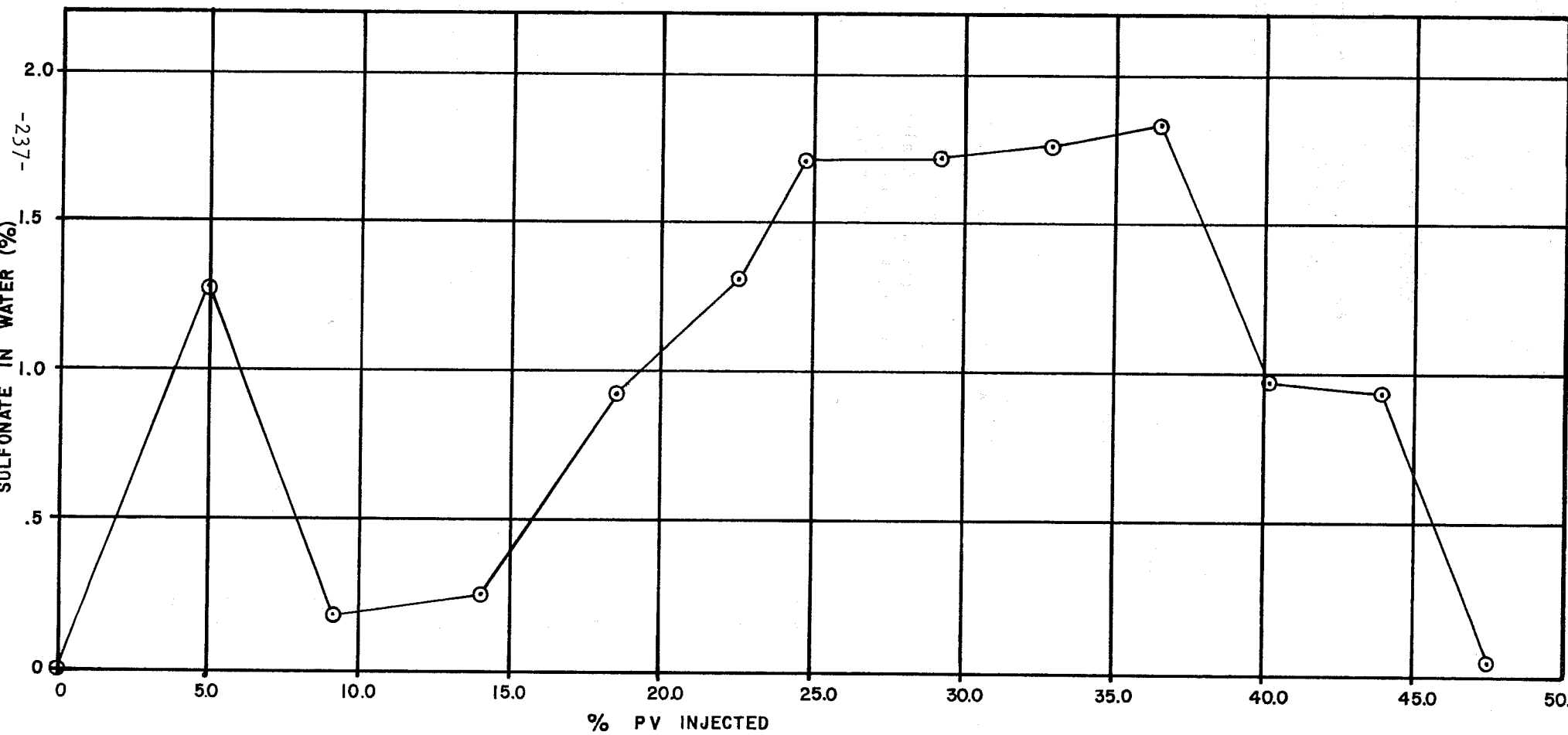


TABLE 1

AVERAGE DISC PROPERTIES

Well No.	No. of Discs	Arithmetic Mean Permeability (md)		Geometric Mean Permeability (md)		Porosity %
		Total	Tap	Total	Tap	
H-068	24	3.3	5.1	2.3	3.8	13.9
H-069	19	7.3	10.3	4.6	8.0	14.7
H-102	28	4.1	7.5	3.0	5.7	14.3

TABLE 2

ANALYSIS OF FORMATION AND SUPPLY WATERS

	Formation Water (Average Analysis of Wells H-11, H-12, H-25, H-26) 8-8-75 (ppm)	Lawry Supply Well Water 4-25-75 (ppm)
Chloride	1880	31
Sulfate	3	0
Sodium		15
Calcium	198	43
Magnesium	48	14
Total Dissolved Solids	3338	250

COMPOSITION OF SYNTHETIC WATERS

	Produced Water (g/l)	Supply Water (g/l)
$CaCl_2$	0.548	0.119
$MgCl_2 \cdot 6H_2O$	0.401	0.117
NaCl	2.602	-----
$NaHCO_3$	-----	0.084

LAWRY PROJECT - OIL PRODUCTION

Total Oil Production by Well
9-13-77 through 11-20-80

Production Well No.	Total Oil Produced, Bbls.
H-90	136
H-91	126
H-92	163
H-93	133
H-94	341
H-95	169
H-96	266
H-97	744
H-98	529
H-99	388
H-100	239
H-101	464
H-102	1,516
H-103	671
H-104	816
H-105	442
H-106	713
H-107	295
H-108	665
H-109	326
H-110	1,072
H-111	523
H-112	548
H-113	802
H-114	722
Total Project	12,809

Oil Produced by Individual
Inverted 5-Spot
9-13-77 through 11-20-80

Injection Well No.	Total Oil Production, Bbls.
HO-70	336
HO-71	401
HO-72	384
HO-73	502
HO-74	579
HO-75	709
HO-76	859
HO-77	753
HO-78	1,511
HO-79	678
HO-80	899
HO-81	837
HO-82	883
HO-83	1,005
HO-84	1,665
HO-69	783
Total Project	12,809

TABLE 4

THREE LAYER MODEL (AVERAGE PROPERTIES FROM 16 FIVE SPOTS)

Layer	Pore Volume (bbls)	Thickness (ft)	Perm. (md)	Percent of Injection Into Layer	Total Amount of Slug Size Layer Received (%PV)
SECTION A: K _ 10 md	9,700	6.50	19.4	61.5	24.0
SECTION B: 6md _ K 10 md	7,250	4.75	7.7	17.83	10.2
SECTION C: K 6 md	25,640	17.70	2.4	20.7	3.6

TABLE 5

PORE VOLUMES OF SLUG INJECTED INTO SECTIONS A, B AND C

BY FIVE SPOT

Injection Well	Slug Injected (% PV)		
	Section A	Section B	Section C
HO-69	NA	NA	NA
HO-70	14.4	6.9	2.1
HO-71	24.6	8.1	2.4
HO-72	20.5	9.4	2.8
HO-73	26.2	15.9	3.2
HO-74	37.0	11.7	3.2
HO-75	20.4	10.9	3.7
HO-76	19.1	8.9	3.4
HO-77	34.4	13.0	5.6
HO-78	24.8	9.6	3.4
HO-79	18.5	10.2	3.6
HO-80	23.8	10.1	3.6
HO-81	23.8	11.1	4.5
HO-82	20.6	8.8	3.1
HO-83	24.1	10.9	4.3
HO-84	31.1	9.1	5.1

TABLE 6

PROPERTIES OF SAMPLES FROM CORE C-1

Sample	Depth (ft)	ø (%)	K (md)	So_r (Mar.)[1]	So_r (J.D.)[2]	Sulfonate Retention mg/g
MS-1	1411.6 - 1411.7	13.55	6.5	32.5	28.8	0.0
MS-2	1413.5 - 1413.6	12.78	1.1	29.4	31.7	0.739
MS-3	1414.1 - 1414.2	17.09	40.3	14.4*	9.8	0.423*
MS-4	1415.6 - 1415.7	16.72	47.1	1.8	11.2	0.362
MS-5	1416.4 - 1416.5	16.16	33.6	7.7	14.6	0.173
MS-6	1420.0 - 1420.1	15.84	11.2	4.0	4.8	0.912
MS-7	1420.6 - 1420.7	14.85	8.2	27.9	30.1	0.0
MS-8	1422.3 - 1422.4	12.88	1.1	33.8	29.9	0.0
MS-9	1424.9 - 1425.0	NA	NA	35.2	NA	0.0
MS-10	1427.6 - 1427.7	12.63	2.9	35.0	32.4	0.0
MS-11	1428.6 - 1428.7	13.65	8.3	25.9*	33.4	1.140*
MS-12	1429.6 - 1429.7	13.74	7.5	35.1	32.8	0.0
MS-13	1430.4 - 1430.5	11.14	2.5	40.6	37.4	0.0
MS-14	1431.6 - 1431.7	13.13	5.5	37.6	33.6	0.023
MS-15	1434.6 - 1434.7	12.68	0.8	52.9	37.5	0.0
MS-16	1435.6 - 1435.7	13.80	4.3	37.3	33.0	0.0
MS-17	1436.6 - 1436.7	11.32	0.3	47.4	39.3	0.0
MS-18	1437.6 - 1437.7	14.02	5.3	34.1	28.6	0.0
MS-19	1440.6 - 1440.7	13.58	5.3	56.5	32.6	0.0
MS-20	1445.3 - 1445.4	14.11	5.5	56.5	47.4	0.0
MS-21	1449.0 - 1449.1	NA	NA	40.1	NA	0.0
MS-22	1451.2 - 1451.3	14.10	7.0	41.77	31.2	0.0
MS-23	1456.6 - 1456.7	12.30	1.4	38.21	30.5	0.0
MS-24	1458.6 - 1458.7	13.73	14.0	34.6	28.1	0.0

[1]Mar. = Marathon
[2]J.D. = John DePetro

*Retention and saturation values may be slightly high due to sample contamination.

TABLE 7

TOTAL PROJECT PORE VOLUME AND OIL IN PLACE

Injection Well	Avg. Net Pay (ft)	Avg. ø (%)	PV (Bbls)	OIP (Bbls)
HO-69	29.50	12.67	43,495	17,398
HO-70	29.88	13.08	45,481	18,192
HO-71	29.38	12.07	41,267	16,507
HO-72	30.50	13.10	46,496	18,598
HO-73	31.75	12.54	46,332	18,533
HO-74	27.25	12.26	38,877	15,551
HO-75	29.88	13.29	46,211	18,484
HO-76	31.38	13.00	47,472	18,989
HO-77	30.38	12.49	44,156	17,662
HO-78	25.25	11.83	34,761	13,904
HO-79	28.38	12.67	41,844	16,738
HO-80	28.88	12.70	42,682	17,073
HO-81	24.63	12.70	36,401	14,560
HO-82	30.63	13.05	46,516	18,606
HO-83	26.00	12.81	38,758	15,503
HO-84	30.13	12.50	43,828	17,533
Total Project	28.99	12.67	684,577	273,831

TABLE 8

TOTAL PROJECT PORE VOLUME AND OIL IN PLACE (ADJUSTED RESERVOIR)

Inj. Well	Avg. Net Pay (ft)	Avg. ø (%)	Pore Volume (bbls)	So_r (%)	Oil In Place (bbls)
HO-69	8.50	14.00	11,000	30.00	3300
HO-70	11.78	14.06	19,181	30.60	5869
HO-71	6.62	13.86	10,625	32.60	3464
HO-72	7.70	14.42	12,858	32.25	4147
HO-73	6.63	14.37	11,033	22.05	2433
HO-74	4.00	13.82	6,402	31.33	2006
HO-75	7.43	14.49	12,417	23.24	2886
HO-76	9.00	14.68	15,300	28.59	4374
HO-77	2.65	14.01	4,299	33.03	1420
HO-78	4.70	13.39	7,288	33.92	2472
HO-79	7.57	14.24	12,484	28.25	3527
HO-80	6.27	14.42	10,470	31,37	3284
HO-81	4.67	14.62	7,907	31.22	2469
HO-82	8.54	14.42	14,261	32.02	4566
HO-83	6.35	13.63	10,023	33.96	3404
HO-84	4.00	13.43	6,221	36.20	2252
Average:	6.65	14.12	10,736	30.66	3242

Total Pore Volume: 171,769 (bbls)

Total Oil In Place: 51,873 (bbls); (Based on average So_r = 30.66)

Total Oil In Place: 68,708 (bbls); (Based on "Official So_r = 40.0" %)

TABLE 9

RECOVERY BASED ON ADJUSTED PORE VOLUME

Inj. Well	(bbls) Pore Volume	(bbls) Oil In Place	(bbls) Actual Recovery	Recovery (% of OIP)*	Slug Size (%)
HO-69	11,000	3300	783	23.7	19.7
HO-70	19,181	5869	366	6.2	14.4
HO-71	10,625	3464	401	11.6	24.6
HO-72	12,858	4147	384	9.3	20.5
HO-73	11,033	2433	502	20.6	23.8
HO-74	6,402	2006	579	28.9	37.0
HO-75	12,417	2886	709	24.6	20.4
HO-76	15,300	4374	859	19.6	19.1
HO-77	4,299	1420	753	53.0	34.4
HO-78	7,288	2472	1511	61.1	24.9
HO-79	12,484	3527	678	19.2	18.5
HO-80	10,470	3284	899	27.4	23.7
HO-81	7,907	2469	837	33.9	23.8
HO-82	14,261	4566	883	19.3	20.6
HO-83	10,023	3404	1005	29.5	24.1
HO-84	6,221	2252	1665	73.9	31.1

*Average recovery based on So_r data from cores injectors: Average recovery = 24.3% of OIP.
Recovery based on "Official" So_r - 40%: 18.6% of OIP.

TABLE 10

PARTING PRESSURE FROM STEP RATE TESTS

Injection Well	Gradient at Fracture (psi/ft depth)	WHP (psi)	BHP (psi)	Actual WHP Averaged From 1/78-1/79 (psi)
HO-69	1.27	1026	1558	1100
HO-70	1.15	826	1322	1100
HO-71	1.21	932	1454	1100
HO-72	NO PARTING NOTED			1116
HO-73*	1.05/1.20	780/960	1325/1505	1078
HO-74	1.18	905	1432	1115
HO-75	0.97	712	1283	1060
HO-76	1.22	1020	1580	1068
HO-77	1.18	956	1511	1097
HO-78	1.10	845	1396	1097
HO-79	1.09	840	1391	1062
HO-80*	.94/1.12	680/918	1261/1489	1057
HO-81	.973	710	1280	985
HO-82*	.884/1.02	623/808	1221/1406	900
HO-83	NO PARTING NOTED			1005
HO-84	.847	568	1163	1022

*Two separate parting pressures seen in test.

☆ U.S. GPO: 1982 - 569-028/33