SOUTH PIERSON PRELIMINARY WATERFLOOD STUDY

LOWER AMARANTH POOL

HOME OIL COMPANY LIMITED
SCURRY-RAINBOW OIL LIMITED

by
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EXECUTIVE SUMMARY

The primary and waterflood performance for the South Pierson field have been analyzed.

The South Pierson field currently has fifty-nine (59) wells of which forty-seven (47) are producing (forty-four (44) wihtin the "Project" or study area), nine (9) are suspended and three (3) are recently drilled and completed. The wells are presently on 32 hectare spacing.

The cumulative production to date from the wells within the study area is 148,000 m^3 and the estimated recoverable oil under primary depletion is 504,600 m^3. This is approximately 7.2% of the estimated Original Oil in Place for the study area of 7,000,000 m^3. Average oil production rates are 2.5 m^3/d/well and are declining at an average rate of 22% per year. The average reservoir pressure is currently estimated to be just above the bubble point of 4550 kPa.

The waterflood scheme is based on a 5-spot pattern with 16 hectare well spacing and would cover an area of approximately 2,750 hectares. The oil production is not expected to increase during the waterflood, however, the production decline will dampen to less than 1% per year. Recoverable oil production from waterflooding is estimated at 2,240,000 m^3 which is 32% of the O.O.I.P. and results in an incremental recovery of 25% or 1,735,400 m^3.

The waterflood should be initiated within the next two (2) to three (3) years so as to maintain the average reservoir pressure above the bubble point.

The expected capital expenditures required to implement the waterflood scheme are 30 MM$ which would be spent over a five (5) to six (6) year period. The waterflood economics are favorable but marginal with a 28% aftertax rate of return and a seven (7) year payout.

A pilot project will be implemented in the summer of 1992 which will provide the necessary information over the subsequent six (6) to twelve (12) months to finalize the waterflood scheme and file an official application to the Manitoba crown. Unitization of the South Pierson waterflood area will also be required in the near term.

INTRODUCTION

The purpose of this report is to address the waterflood potential of the Lower Amaranth (Spearfish) in the South Pierson field. Low primary recovery and sharp declines in the field warrant evaluation of the feasibility of waterflooding the Lower Amaranth formation. In order to properly evaluate the incremental recovery of a waterflood scheme, the primary depletion mechanism for this field was also evaluated and the results included.

The South Pierson field is a shallow oil play (approximately 1000 m) located in the south-west corner of Manitoba. The play was discovered in 1985 and the the field is currently under primary production from approximately forty-seven (47) producing wells of which forty-four (44) are within the "Project" or study area. Oil production in the area was around 120 m3/day in 1991 with gas oil ratios of approximately 60 m3/m3 and very diverse water cuts. The reservoir is undersaturated and is primarily under the expansion phase of solution gas drive as the majority of pressures are above the bubble point. Recent production data has indicated that a few scattered wells may be exhibiting formation gas breakout in the near wellbore vicinity. These wells appear to be isolated and the general data suggest an average reservoir pressure above the bubble point. Although accurate pressure data is limited it is predicted that the remaining wells will continue to reach bubble point conditions over the next one (1) to three (3) years should present depletion strategies continue.

Primary production scenarios were evaluated for the South Pierson field using decline analysis, material balance, and theoretical programs. The estimated recoverable oil from the "Project Area" is approximately 504,600 m^3 which equates to a recovery of 7.2% based on an estimated O.O.I.P. for the "Project Area" of 7,000,000 m^3. It is expected that approximately 28% of this production may be attributed to the underlying Mississippian brought into communication with the Lower Amaranth through induced fractures. The average reservoir pressure is near the bubble point with some wells already experiencing increasing gas/oil ratios indicative of near wellbore formation pressure below the bubble point and subsequent gas breakout. Further pressure work is needed to confirm primary depletion models.

Data for the waterflood study was primarily extracted from two reports; "Advanced Core Analysis Study - Home Scurry S. Pierson 12-19-002-29 W1M" and "Reservoir Fluid Study - Home Scurry S. Pierson 06-19-002-29 1M". More detailed discussion of this data and it's effects on potential waterflooding can be found in the body of this report.

A field "Project Area" and a "Waterflood Area" were selected based on well control and known economic production.

The waterflood potential for the Amaranth was evaluated using the "Craig et al" monogram series and indicates significant promise in secondary recovery. Predicted recoveries under waterflood suggest an incremental recovery of 30% over primary and an ultimate of almost 40% which is over 2,000,000 m3 of oil. Waterflooding the South Pierson "Project Area" with a 5-spot pattern and 16 hectare well spacing would take around forty (40) years with little or no economic production expected after breakthrough. The model predicts an areal sweep efficiency of 84%. Most of the results of the evaluation closely resemble the report data generated by operators in the Waskada field. The main concerns of waterflooding the Lower Amaranth are poor injectivity, reservoir heterogeneity, water quality, primary production below the bubble point, slow waterflood response, early capital requirements, and Mississippian thief zones.

CONCLUSIONS / RECOMMENDATIONS

1) Predicted primary recovery in the South Pierson field from decline analysis is 7.2% of which an estimated 2.0% is direct Mississippian MC3 contribution. Tracy-Tarner predictions for Lower Amaranth primary recovery are 2.1% before bubble point and 9.3% total which is considered to be optimistic.

2) Average reservoir pressure is still above the bubble point, but certain wells exhibit reservoir gas breakout in the immediate wellbore vicinity.

3) Waterflood predictions indicate an ultimate recovery of 32% OOIP, with an incremental recovery over primary depletion of 25% OOIP. These numbers includes a reduction of 20% from the models to account for flood inefficiencies. The incremental waterflood recovery is realized by a reduction in the decline rate caused by pressure maintenance and oil bank sweep.

4) The waterflood model predicts areal sweep efficiency of approximately 84% at breakthrough with very little economic production expected after breakthrough.

5) A pilot project should be implemented immediately to properly evaluate injectivity and thereby determine pattern requirements for a waterflood. Both vertical and horizontal well injectors should be evaluated. In addition, some small scale modelling of the reservoir should be done once infill drilling has generated better pressure data.

6) The waterflood predictions are very sensistive to the average permeability of the Lower Amaranth formation. Although the ultimate recovery will remain the same the time to breakthrough for a 5-spot with 16 hectare well spacing can vary from 59.1 to 32.8 years with an average reservoir permeability increase from 2.5 to 4.5 md.

7) In order to maximize injectivity the injection pressure should be maintained as high as possible with out exceeding the bottom hole fracture pressure of 17,000 kPa.

8) Injection of water into the Mississippian (MC3) should be minimized within operational constraints to preclude reduced efficiency of waterflooding the Lower Amaranth.

GEOLOGICAL SUMMARY

Regional Setting and Stratigraphy

The South Pierson Lower Amaranth Oil Pool is located in the southwestern portion of Manitoba, six miles north of the United States border and adjacent to the Saskatchewan border.

This area is located within the northeastern part of the Williston Basin which during Lower Amaranth deposition formed a northeasterly trending sub-basin which extended from northern Wyoming and South Dakota into southwestern Manitoba. The sediments of the Lower Amaranth were deposited in a shallow relatively flat basin with minor undulations due to differential erosion of the underlying strata. The Lower Amaranth reservoir is contained within Jurassic redbeds which unconformably overlieS Mississippian carbonates and anhydrites within the Alida Beds of the Mission Canyon Formation. The Lower Amaranth clastics are conformably overlain by Middle Jurassic evaporites of the Upper Amaranth.

Structure

The structure of the Lower Amaranth in the Pierson area is fairly regular, dipping to the southwest at about 4.0 meters per kilometer. This is an expression of the regional subsidence of the Williston basin since the deposition of the Lower Amaranth. There is a broad structural nose in the heart of the Pierson pool but there is no closure. Some minor structural undulations are present as a result of differential compaction and perhaps some post-Amaranth movement from salt solution and collapse within the Paleozoic.

Lithology

The reservoir is comprised of dolomitic siltstone to fine grained sandstone which is intercalated with argillaceous siltstone and shales and coarse anhydritic sandstone. The interbedding is not in discreet parallel laminations but rather, discontinuous and irregular with sharp contacts. Three correlatable reservoir units (A,B and C) have been selected from core and logs. A fourth sand unit (D Sand) is present locally and is not considered to contribute largely to production. It appears that the siltstone reservoir within each unit has good lateral continuity. The cemented sandstone and siltstone occur as discontinuous and irregular laminae within this siltstone and may impede but does not break lateral reservoir continuity.

Depositional Environment

The Lower Amaranth sediments in this area were deposited in an arid climate with variable energy . While there is some evidence of a playa lake or lacustrine environment, most of the observations support a tidal flat depositional environment.

Trapping Mechanism

The lack of any structural closure provides evidence for a stratigraphic trapping mechanism. A permeability pinchout caused by an increase in anhydritic cementation along with an increase in argillaceous shale and siltstone content at the expense of dolomitic siltstone. This pinchout is usually gradual causing the pool limits to be economically rather that geologically defined.

Oil Migration and Accumulation

The oil contained within the Lower Amaranth has been identified as Mississippian oil which has migrated long distance from the basin center, laterally through the Mississippian carbonates and locally from underlying Mississippian oil accumulations. Initially the oil was trapped within Mississippian stratigraphic traps. The top of the Mississippian has a diagenetic caprock of variable thickness. This anhydrite and anyhdritic dolomite caprock can vary in effectiveness due to fracturing. A thin (< 5 m) redbed zone normally separates the Mississippian and the Lower Amaranth reservoir units. Once a large enough column of oil was trapped within the Mississippian, oil could leak through the caprock and redbeds into the Lower Amaranth reservoir units. Once the oil had entered this reservoir, it was free to migrate laterally until the permeability reduction was encountered. Only one Mississippian trap would have been necessary to create an entry point of oil into the overlying beds. Indeed most of the underlying Mississippian contains wet reservoir. Only a few wells in the Pierson are can be identified as having Mississippian pay. We are presently attempting to quantify the Mississippian oil contribution through geological mapping.

PRIMARY PRODUCTION EVALUATION

In order to fully understand the benefits of secondary recovery in the South Pierson field an in-depth evaluation of the primary depletion mechanism was conducted. Decline analysis and theoretical models were used to determine a production forecast under primary recovery. Both individual well and field production trends were evaluated to ensure a representative forecast.

Primary Production Prediction Method

Production decline curves were assembled for all the South Pierson wells with more than six (6) months of production data. From this data an area was selected within an interim pool boundary for decline analysis and designated the "Project Area" (Figure 1.0). Composite field and individual well decline curves were generated using exponential decline methods on Rate versus Cumulative Production and Rate versus Time plots as shown in Figures 2.0, 3.0, and 4.0. The composite summary data (Table 2.0) runs from December of 1985 to March of 1992 with a maximum of 44 producing wells. The Lower Amaranth reservoir is a very tight siltstone/sandstone with high transient effects and limited drainage area. In evaluating the Rate versus Time semi-log plots an initial unstabilized production region was evident in most wells. This unstabilized production zone, if present, ranged in length from one (1) to six (6) months and was eliminated from the linear regression used to interpret the decline rates. This provides for a reasonably good regression with low residuals effectively generating a decline percentage for each well within the "Project Area". All the production plots are included in the appendix.

The individual well Rate vs Time plots indicate yearly declines ranging from as low as 2% to as high as 87%. Approximately fifty (50) producing wells were analyzed for both decline, initial stabilized production and net pay then mapped in order to assign estimated production trends for undrilled locations. Combined with the continued production decline of the existing wells and assuming an arbitrary infill drilling schedule a 15 year primary production forecast for the field was fabricated as shown in Table 1.0. The recoverable oil under primary depletion of the existing producing wells is estimated at 286,041 m^3 and the additional recoverable oil under primary depletion from infill drilling is estimated at 218,571 m^3. This results in a total estimated recoverable oil volume under primary depletion of 504,612 m^3 which equates to approximately 7.2% recovery based on an O.O.I.P value of 7,000,000 m^3 for the area. The composite Rate vs Cumulative Production plot yields a value of 278,000 m^3 for the existing wells which closely matches the individual well analysis. Table 3.0 summarizes both the Rate versus Time and Rate versus Cumulative Production estimated recoveries for each well with production. The individual Rate vs Cumulative Production varies from the Rate vs Time, however, the overall total difference of about 8% is acceptable.

Tracy-Tarner calculations were performed to evaluate expected primary recovery from the Lower Amaranth before and after bubble point conditions. The data used in the program is explained in detail in the "Waterflood Prediction Method" section of this report and the results are shown in Table 4.0. The predicted recovery down to the bubble point based on expansion drive is approximately 2.1% which is quite low due to low pressures and compressibility. The model predicts total recovery under primary depletion to be about 9% based on a downhole abandonment pressure of around 1200 kPa (175 psi). It is believed that the Tracy-Tarner estimate of post bubble point production is optimistic due to the transient nature of the gas breakout in the reservoir. Since the expected recovery factor under primary depletion from decline analysis is 7.2% and that the Mississippian MC3 contribution is estimated at 2.0%, the resulting estimated recovery factor for the Lower Amaranth is 5.2%.

The next step in evaluating primary production was to determine the pool's current state of depletion. Although pressure data is poor due to long build-up times, calculations show that the average reservoir pressure is near the bubble point. Some wells have exhibited an increase in the gas-oil ratio indicative of gas breakout in the formation. This gas breakout is limited to the immediate wellbore vicinity and is caused by the overall poor reservoir transmissibility. Recent RFT testing on 32 hectare infill drilling locations indicates some pressure depletion in the more permeable "C" zone of the Lower Amaranth, demonstrating reservoir continuity and confirming undersaturated conditions remote from the producing wells.

With an average reservoir pressure near the bubble point the expected production from the field to date should be approximately 94,318 m^3 based on the calculated O.O.I.P for the producing wells and the predicted recovery to bubble point of

2.1% from the Tracy-Tarner calculations. The actual recovery from these wells, at the time of the analysis, is about 130,787 m^3 which is substantially higher than the predicted value. It is believed that hydraulic fracture communication with the underlying Mississippian (MC3) formation is responsible for this disparity. The Mississippian (MC3) is primarily wet however, small oil pockets do exist and appear to be under a water drive which may or may not be limited. Although it is very difficult to quantify, it is assumed that the ratio of actual to predicted recovery is a reasonable assessment of the Mississippian contribution. This would suggest that about 28% of the oil production or 36,360 m^3 in the field is Mississippian.

The Mississippian drive mechanism appears to be water drive dominated, so it is difficult to predict future production trends for this additional contribution. Therefore, well decline analysis was considered the best means of estimating future primary production.

Combining all of the above a primary production forecast was generated for the "Project Area" breaking out Lower Amaranth and Mississippian contribution as shown in Table 5.0. The primary production has a life of approximately 15 years down to an economic field oil rate of 8 m^3/d and with ultimate recovery of just over 500,000 m^3 of oil.

WATERFLOOD PREDICTION METHOD

General Methodology

Evaluation of the primary depletion mechanism for the field suggested that there is substantial influx of Mississippian production, both oil and water, in many of the South Pierson wells. Since the Mississippian is thought to have a natural aquifer and that Mississippian oil-bearing strata are difficult to identify or develop, the Lower Amaranth was exclusively evaluated for waterflood potential.

Due to a lack of definitive pressure data throughout the field, and difficulties generating reasonable models in the past, conventional waterflood analysis was chosen over simulation modelling to develop waterflood performance predictions. The "Craig et al" monogram series was the primary resource used in this evaluation. The predictions are based on a 5-spot injection pattern.

Study Area

The study area is designated as the "Project Area" outlined in Figure 1.0. This area was chosen based on the well control and known production.

Data Acquisition

The prime data sources for the waterflood study were as follows:
"Reservoir Fluid Study - Home Scurry S. Pierson 06-19-002-29 W1M"
"Advanced Core Analysis Study - Home Scurry S. Pierson 12-19-002-29 W1M"

Formation Data

Home Oil has analyzed all log and core data in the study area in order to generate net pay and permeability values. These values are summarized in Table 1.0 and were used in the waterflood model.

Permeabilities vary greatly within the pay zones as well as from well to well. A range of rock permeabilities from 2.5 to 4.5 millidarcies was used with the average of 3.5 millidarcies for the final model.

Net Pay for all the wells was determined using the method developed by John S. Murray and Glen D. Lawrence of Home Oil and submitted to the Manitoba Energy and Mines in 1991 entitled "South Pierson - Lower Amaranth Porosity Determination". This method essentially translates into a 12% porosity (1 millidarcies) cut off using the Density log. The net pay average of 4.3 meters was then used for all the waterflood predictions models.

Porosities ranged from 12 to 20% over the study area with an average of 15% which was used in the waterflood prediction model.

Rock Compressibilities derived from a 1987 test performed on core from four (4) wells in the South Pierson field ranged from 2.90 X 10^{-7} 1/kPa to 1.74 X 10^{-6} 1/kPa with a weighted average of approximately 0.87 X 10^{-6} 1/kPa. The computer simulations conducted on the analogous Waskada field by CMG produced a rock compressibility of 1.34 X 10^{-6} 1/kPa in order to match actual pressure decline. Although this number is somewhat high it is within acceptable ranges and did match pressure declines and was therefore used in this model.

Fluid Saturation Data

Fluid saturations endpoints were determined from the steady-state water-oil relative permeability work conducted on two separate plugs (4A and 4B) from the Advanced Core Analysis. The results from both plugs were very consistent yielding a connate water saturation of 41% and residual oil saturation of 29%. The average initial water saturations of 45% from the logs was not used in this study due to the large scatter of data in the log analysis. Therefore, it was assumed that the initial water stauration was equal to connate saturation. The residual oil saturation agrees with the fractional flow curves developed for plug 4A which shows a residual oil saturation of 31%. In addition, a waterflood test was conducted on plug 1B which provided a residual oil saturation of 30%. A value of 31% for residual oil saturation was then used for the waterflood prediction model.

The fractional flow curves for sample plug 4B also showed a water saturation for the stabilized zone of 67% which was used in the waterflood prediction model.

Fluid Data

As noted in the Primary Depletion section the Lower Amaranth reservoir is an undersaturated, solution gas drive system with a bubble point of 4550 kPa and a reservoir temperature of 40 ^{o} C. Initial reservoir pressure is 10,500 kPa and the current average reservoir pressure is uncertain due to a lack of good pressure data in the field and the large pressure/time variance associated with a tight reservoir rock. It is again assumed for the purpose of this study that the pressure is near the bubble point.

Formation Volume Factor and viscosity for the oil was extracted from the Reservoir Fluid Study. The initial Bo is 1.169 @ 10,500 kPa and the Bo at the bubble Point is 1.178. The viscosity of the oil at the initial pressure is approximately 1.35 mPa.S and at the bubble point pressure it is 1.24 mPa.S. An average of 1.3 mPa.S was used for the waterflood prediction model.

Water viscosity was derived from a temperature / salinity chart and is estimated to be 0.865 mPa.S.

Oil compressibility used in the model are 10.83 X 10^{-7} 1/kPa and are from the Reservoir Fluid Study. Water compressibility is estimated from correlations to be 4.86 X 10^{-7} 1/kPa.

Relative Permeability

The relative permeability data was obtained from the oil based core analysis of the 12-19-002-29 W1M well and the resulting curves from both sample plugs 4A and 4B are shown in the Advanced Core Analysis. Unsteady-state gas-oil and steady-state water-oil relative permeability testing was conducted on both sample plugs.

The water-oil relative permeability data was used to generate fractional flow curves and dfw/dSw plots for both sample plugs as shown in the appendix.

The data from sample plug 4A closely matched the results from the waterflood test and was therefore selected for the waterflood prediction model

The permeability to oil at connate water saturation of 41% is 1.00 millidarcies and the permeability to water at water breakthrough saturation of 69% is 0.22 millidarcies. The resulting Mobility Ratio for sample plug 4A is 0.331.

WATERFLOOD CHARACTERISTICS

Recovery

The 5-spot waterflood model predicts an areal efficiency of 84% with little or no economic production after breakthrough. This equates to an ultimate recovery from waterflooding of 39.9% which is approximately 30% incremental to primary production. Although the recovery is high there is no expected increase in the oil production from the field , rather a dampening of the severe primary decline. Flood Performance was derated to 32% recovery factor for the production forecast to account for flood inefficiencies (heterogeneity, thief zones and reduced injectivity). This compares favorably with the 29% average recovery factor expected in the Waskada field.

Production Forecasts

Production forecasts for the waterflood scheme were based on decline analysis derived from the results of the model (Figure 5.0). It was assumed that the injectivity required by the model could be achieved along with the injection pressure difference across the sandface for the injectors of about 10,000 kPa.

The 16 hectare spacing (32 hectare flood area), 3.5 millidarcies average permeability model was used for the production forecast. It was assumed that the waterflood scheme would be implemented in time to prevent injection in the post bubble point fill-up stage and that there would be no economic production after breakthrough. The estimated production trend shows a very shallow decline of 0.88% starting at an average rate of 4.4 m3/d (27 bbls/d) and tapering off to a rate of 2.2 m3/d (14 bbls/d) at breakthrough.

Pattern Selection

The production model is based on a 5-spot pattern which pairs one injector with one producer. Although patterns in Waskada use 7 and 9 spot patterns they also employ high voidage replacement ratios. This may be attributed to the loss of water injection into the Mississippian since most of the wells are fracture stimulated and therefore, injection measurements may not be a true measure of the injectivity into the Lower Amaranth. Since it is Home Oil's intention to ensure that water injection is directed to the Lower Amaranth it is expected that the injectivity will be reduced. Therefore, a one to one injector to producer ratio is necessary to match expected injectivity to voidage. A pilot project / injectivity test scheduled for the middle of 1992 will provide the required data to finalize pattern selection.

Breakthrough Production

Although the theoretical models show continued production after breakthrough this production is less than 1 m3/d per producer and spread out over a significant time period. Oil production after breakthrough was therefore currently eliminated from the production forecast for the waterflood.

Mississippian Production

As noted in the "Primary Depletion" section of this report, Mississippian (MC3) oil and water influx through required hydraulic fractures exists to varying degrees throughout the field. Since the Mississippian (MC3) is already under water drive, and the lateral extent of the oil-bearing Mississippian MC3 is questionable, there is little benefit to injecting water into the Mississippian, in fact, the Mississippian is likely to act as a thief zone preventing water from effectively flooding the Lower Amaranth. It is desirable, however, to produce the Mississippian concurrent with the Lower Amaranth. Ideally, a system which would continue to co-produce the Lower Amaranth and Mississippian and inject exclusively into the Lower Amaranth would yield the best results.

Home Oil is proposing a pilot horizontal injection well to see if sufficient Lower Amaranth injectivity can be established without requiring fracture stimulation. If this is successful, water placement objectives can be accomplished with voidage replacement ratios between 1.0 and 2.0. If water injection through vertical fractured wells is required, then a Waskada-type injection scheme with high voidage replacement ratios will be implemented.

Analogous Waskada Waterflood

Many similarities exist between the Waskada and South Pierson fields. The different operators of Waskada have seen general success with the implementation of secondary recovery schemes and are still working towards improved efficiency and higher ultimate recovery. South Pierson's production trends and theoretical models very much resemble the results generated by model studies conducted for the various operators in Waskada. There may be a slight difference in reservoir quality with South Pierson being marginally less permeable on average than Waskada and with a slightly thinner pay zone. Generally, however, the projected success of the Waskada waterfloods encourage secondary recovery in South Pierson.

Waterflood history in Waskada has revealed three significant operating concerns associated with development as follows:

1) Re-injection of gas to maintain pressure and conserve gas is detrimental to oil production. The reduced relative permeability to oil at elevated gas levels leads to premature gas breakthrough which appears difficult to recover from.

2) Water quality is very important since injectivity is already limited in a tight reservoir. Scale, solids content, bacteria, and oil carry-over have significantly reduced injectivity in some wells.

3) Maintenance of as high a reservoir pressure as possible (below fracture pressure) is desirable to maximize production and minimize response time.

WATERFLOOD OPERATIONS

Water Quality

The expected injectivity for the South Pierson field is low as the Lower Amaranth formation consists primarily of tight siltstone/sandstone. In order to preclude escalated costs and further injection problems high quality water is required.

The source water for the injection will come from produced water and from water wells completed in the Mississippian. Water analysis has been performed on samples from the Lower Amaranth and the Mississippian and found to be virtually identical eliminating the need for further compatibility studies. The water should be carefully screened for dissolved and suspended solids, oil carrying and emulsion potential, bacterial and sulphate content, and scale potential. Facilities will be designed to deal with the aforementioned problems as well as the corrosive nature of the water system. Experience in Waskada has shown that efforts directed at improved water quality realize positive benefits by way of increased injectivity at reduced operating costs.

Pilot Project

To finalize the waterflood prediction models it is necessary to implement a pilot or injectivity test in the South Pierson field in the summer of 1992. Although no waterflood response is expected at the 32 hectare spaced producing wells within the pilot test period of one (1) year, injectivity will be measured at differing injection pressures for both horizontal and vertical wells to determine maximum and minimum injection profiles. Water disposal facilities currently in use at the existing central battery site can be modified to accommodate the pilot project requirements. A formal application will be submitted to the crown following this report outlining the exact details and the associated timing of the pilot project.

Facility Implementation

The results derived from the installation and monitoring of the pilot project in the summer of 1992 will largely dictate the ultimate design of the water injection scheme. Central water injection facilities should begin construction in 1993 and the water injection pipeline network should be directed first to the areas of greatest pressure depletion. Installation of producing and injection lines, infill drilling, well conversions, and surface facility upgrades will be on-going for approximately six (6) years. High pressure equipment will be required as the desired wellhead injection pressures will be in the order of 6,000 kPa (870 psi) in order to maximize injectivity.

Unitization

Although the design of a full scale waterflood hinges on the success of the pilot project, implementation appears certain and efforts towards unitization of the field should be undertaken immediately. Complicated issues such as merging freehold and crown land, overriding royalty interests and technical concerns of the working interest owners will take some time to resolve resulting in delays which are not technically acceptable for ultimate reservoir performance.

WATERFLOOD ECONOMICS

The waterlood economics were based on the waterflood area as designated in Figure 1.0. This waterflood area was selected from within the "Project Area" to include all reasonably continuous reservoir quality. There are approximately 150 well locations on 16 hectare spacing available within the "Waterflood Area" of which forty-seven (47) have been drilled to date.

The economics were based on the following assumptions and costs:

1) Production is based on a 16 hectare well spaced, 5-spot pattern using the waterflood production forecast generated in Table 5.0.
2) The land is approximately 33% crown and 67% freehold.
3) No crown incentives other than "new" oil are included.
4) No overrriding royalties are included.
5) Infill drilling and producer to injector conversions will take place over a five (5) year period resulting in 75 producers and 75 injection wells by 1996.
6) Drilling,completion and tie-in costs are 260M$ (45M$ Tang / 225M$ Intang) per well.
7) Waterflood capital costs are based on the cost estimate included in the appendix. These costs were extrapolated since the current "Waterflood Area" is larger than the area originally outlined for cost estimating.
8) Waterflood central facilities and the bulk of the distribution system are installed in 1993 and 1994 with some minor pipeline work required in susbsequent years.
9) Production operating costs are set at $1000/well/month plus $10/m3 variable for a producer and $500/well/month for an injector. The producing cost includes central battery facility upkeep.
10) Waterplant operating costs are set at $75,000 year.
11) All costs incurred to date are considered sunk costs.

The incremental economic indicators using the above data and Home Oil's proprietary price forecast, show an aftertax rate of return of 28%, aftertax net present value of 24.6 MM$ at 12% discount, payout of 6.7 years, and an expected monetary value of 17.9 MM$ using a probability of success of 80%.

FIGURES

South Pierson Waterflood Report

FIGURES

Figure 1.0

SOUTH PIERSON AREA

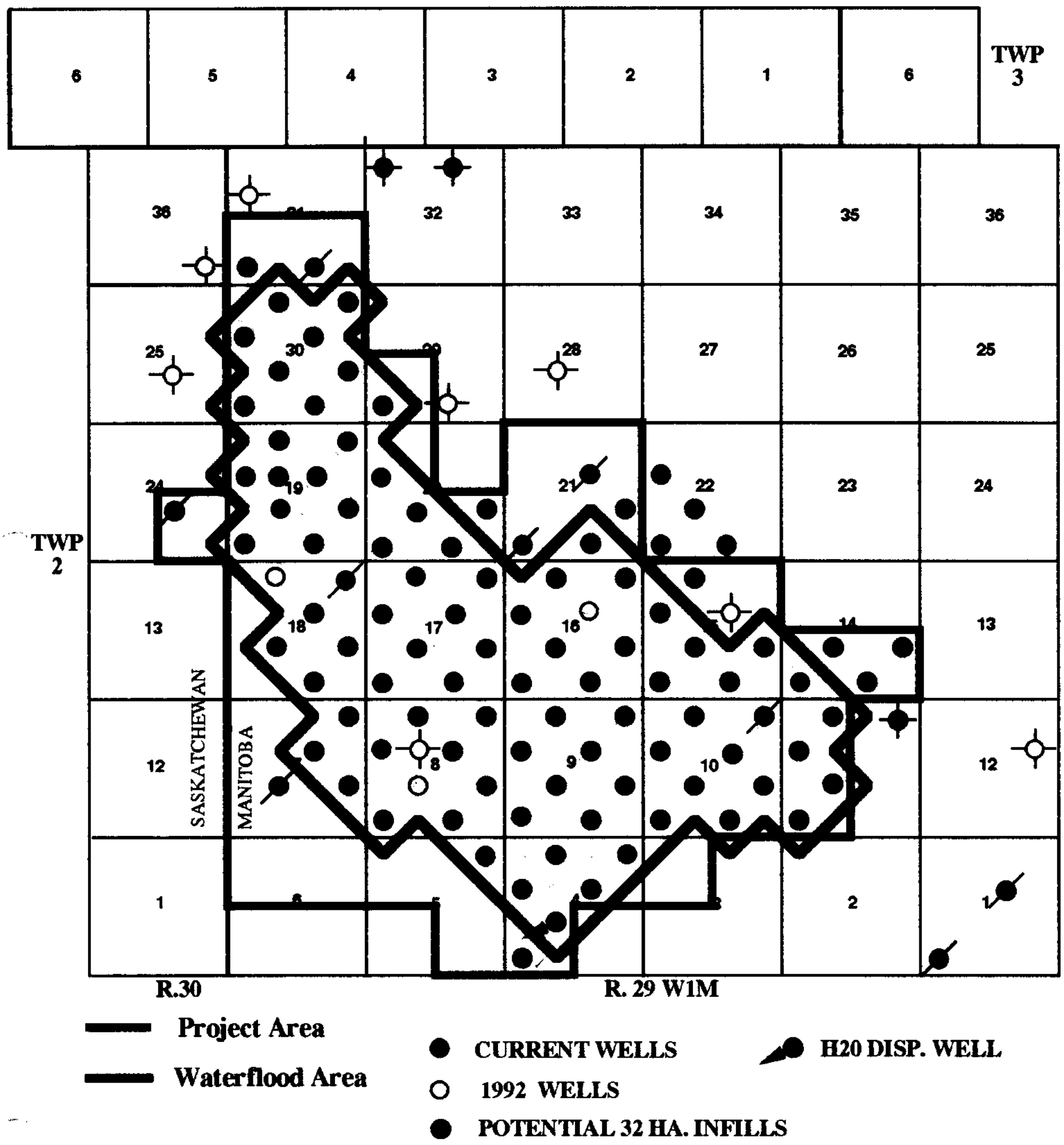


Figure 2.0

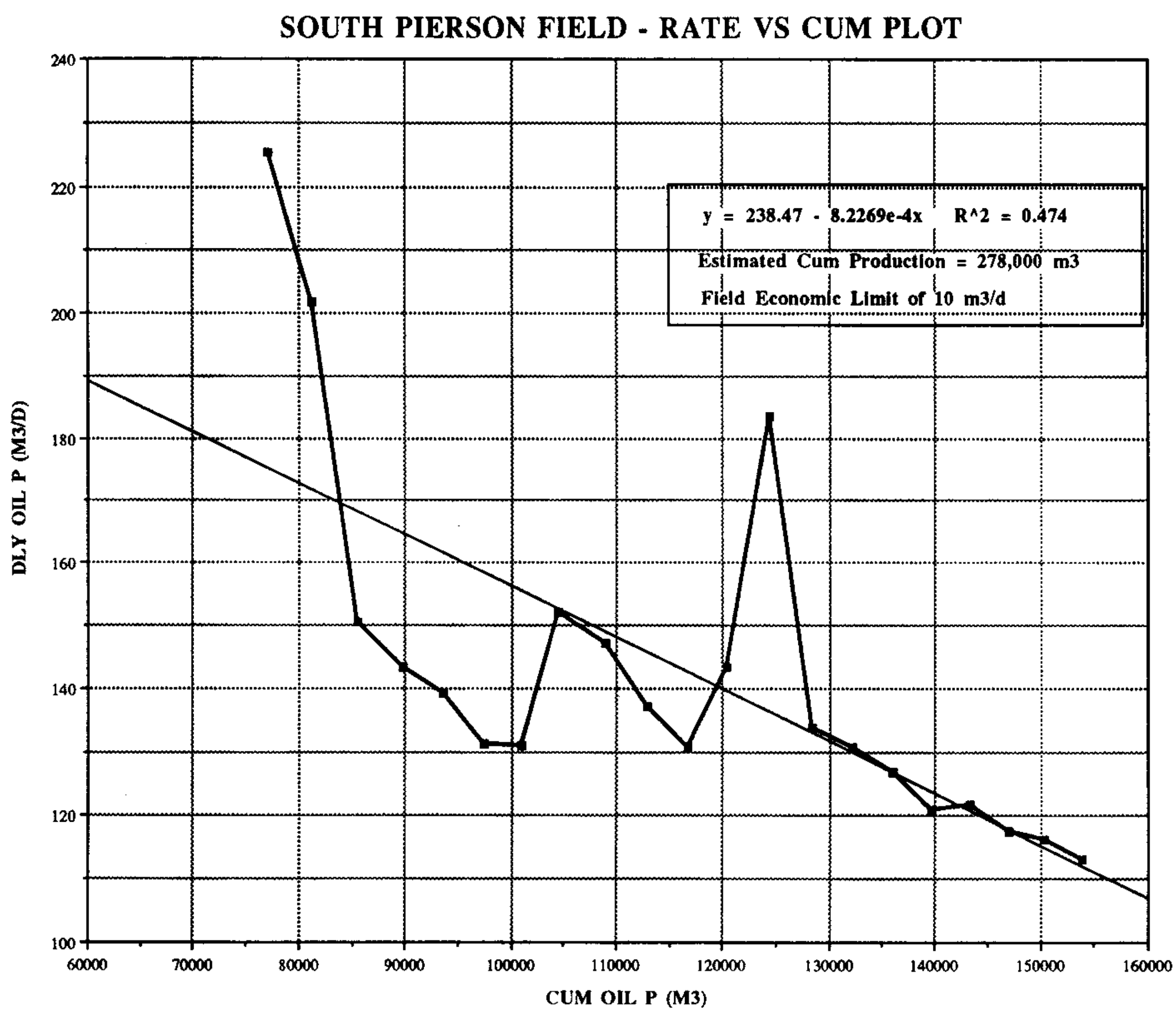

SOUTH PIERSON FIELD - RATE VS CUM PLOT
y = 238.47 - 8.2269e-4x R^2 = 0.474
Estimated Cum Production = 278,000 m3
Field Economic Limit of 10 m3/d
DLY OIL P (M3/D)
240
220
200
180
160
140
120
100
60000
70000
80000
90000
100000
110000
120000
130000
140000
150000
160000
CUM OIL P (M3)

Figure 3.0

SOUTH PIERSON FIELD - RATE VS TIME PLOT

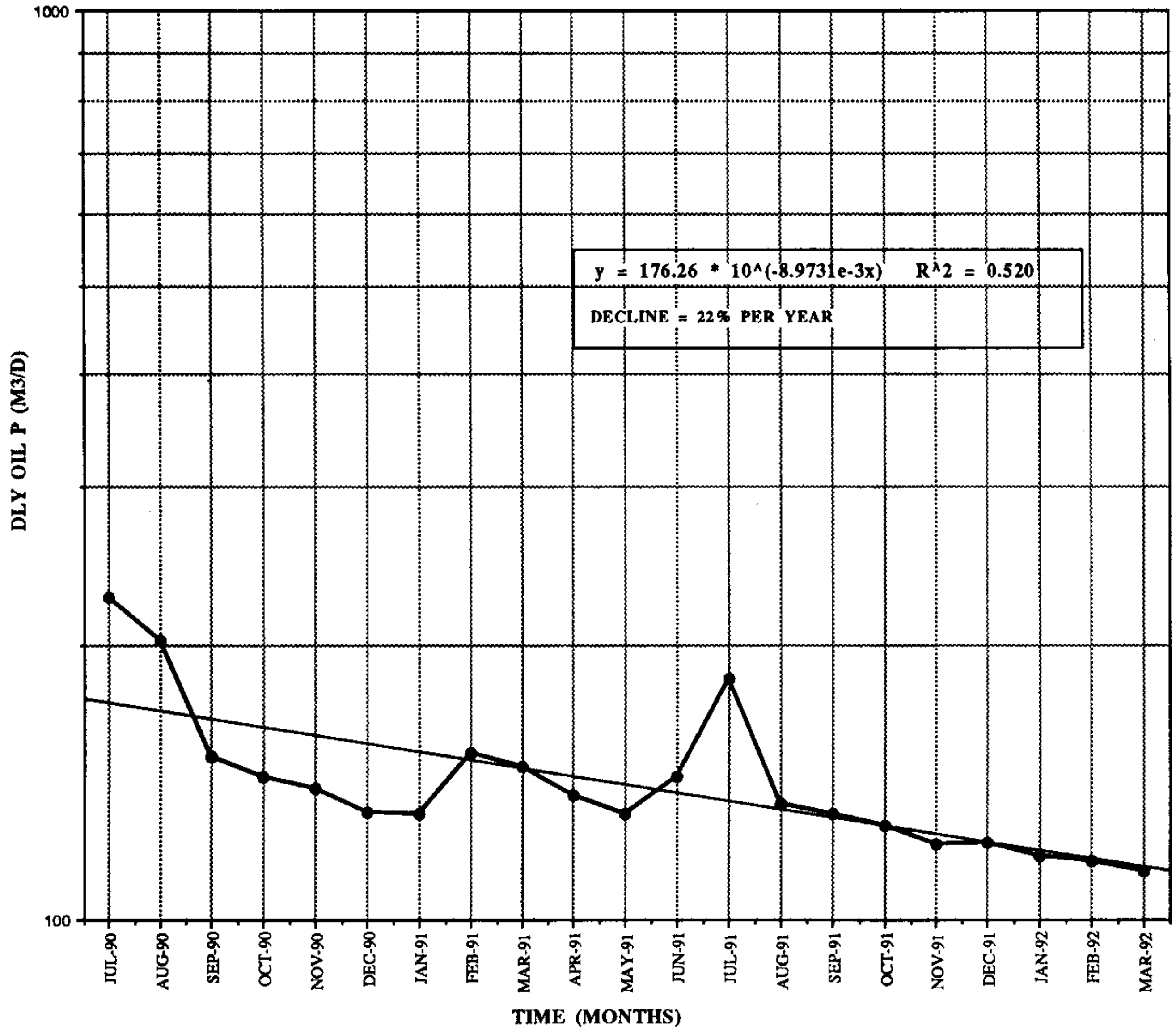


Figure 4.0

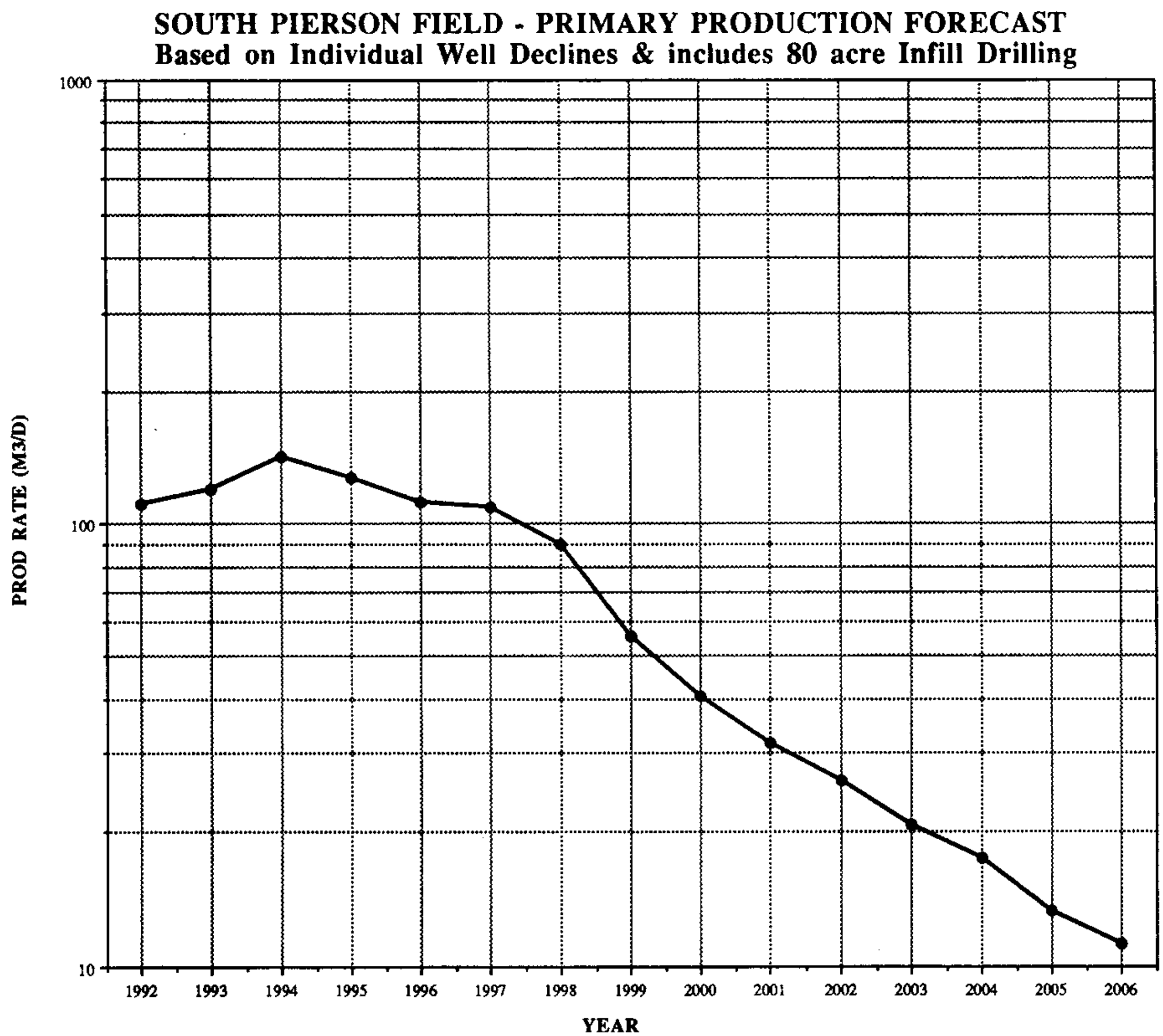
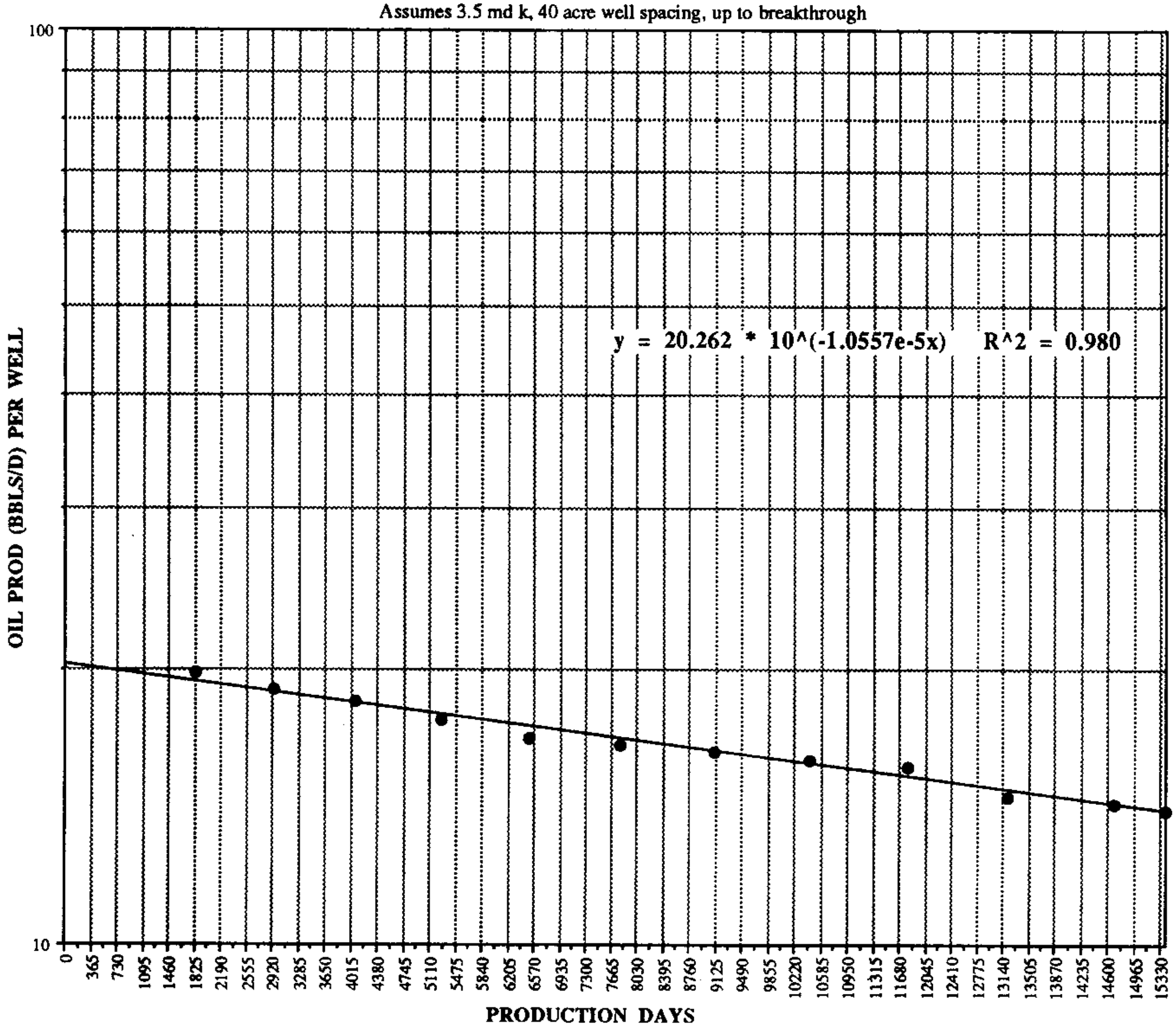

SOUTH PIERSON FIELD - PRIMARY PRODUCTION FORECAST
Based on Individual Well Declines & includes 80 acre Infill Drilling
PROD RATE (M3/D)
1000
100
10
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
YEAR

Figure 5.0

SOUTH PIERSON WATERFLOOD PRODUCTION FORECAST

Assumes 3.5 md k, 40 acre well spacing, up to breakthrough



TABLES

South Pierson Waterflood Report

TABLES

Table 1.0
SOUTH PIERSON PRODUCTION FORECAST

Locations with "KH" < 6 md.m are omitted

[shaded] = CURRENT PRODUCTION

Economic Rate of 0.3 m3/d

LOCATION	STATUS	LAND	"KH" (MD.M)	NET PAY (M)	MTHLY DEC (%)	YRLY DEC (%)	CUM PROD (103 M3)	LAST PROD (M3/D)	PRODUCTION FORECAST (M3/D) YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR 11	YR 12	YR 13	YR 14	YR 15	CUR. EST CUM (M3)	FUTURE EST CUM (M3)	R.O.I.P. (9%,80 A) (M3)	R.O.I.P. (12%,80 A) (M3)	EST. PERCENT RECOVERY OF R.O.I.P. (%)
04-04-002-29 W1	LOC	FREE	10		6.0	52		3.0				3.0	1.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
06-04-002-29 W1	WAT DISP	FREE	38.7	7.50	4.0	39	115																	115		15266	20355	1
10-04-002-29 W1	LOC	CROWN	25		5.0	46		4.0				4.0	2.2	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2906			
12-04-002-29 W1	LOC	CROWN	20		2.0	22		5.8		5.8	4.6	3.6	2.8	2.2	1.7	1.4	1.1	0.8	0.7	0.5	0.4	0.0	0.0		9297			
14-04-002-29 W1	PROD	CROWN	23	4.20	1.6	18	5271	3.8	3.5	2.9	2.4	1.9	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.0	0.0	0.0	11755		8519	11358	103
16-04-002-29 W1	PROD	CROWN	10	4.00	7.4	60	1648	1.7	1.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2254		7354	9805	23
02-05-002-29 W1	LOC	FREE	0			0																			0			
08-05-002-29 W1	LOC	FREE	5			0																			0			
10-05-002-29 W1	LOC	FREE	3			0																			0			
12-05-002-29 W1	LOC	FREE	3			0																			0			
14-05-002-29 W1	LOC	FREE	7			0																			0			
16-05-002-29 W1	PROD	FREE	8	5.00	2.0	22	8885	3.1	2.8	2.2	1.7	1.3	1.0	0.8	0.6	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	13046		10107	13476	97
10-06-002-29 W1	LOC	FREE	2			0																			0			
12-06-002-29 W1	LOC	CROWN	0			0																			0			
14-06-002-29 W1	LOC	CROWN	9		7.0	58		1.8						1.8	0.8	0.0	0.0	0.0	0.0	0.0					932			
16-06-002-29 W1	LOC	FREE	7			0																			0			
02-07-002-29 W1	LOC	FREE	20		7.0	58		4.5				4.5	1.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2618			
04-07-002-29 W1	LOC	FREE	23		8.5	66		0.5							0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		183			
06-07-002-29 W1	SUSP	FREE	50	11.30	8.2	64	42		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42				
08-07-002-29 W1	LOC	FREE	45		6.0	52		4.5				4.5	2.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2973			
10-07-002-29 W1	LOC	FREE	50		7.0	58		3.0					3.0	1.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1745			
12-07-002-29 W1	LOC	FREE	10		9.0	68		0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0			
14-07-002-29 W1	LOC	FREE	5			0																			0			
16-07-002-29 W1	LOC	FREE	15		8.0	63		4.0				4.0	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2194			
02-08-002-29 W1	LOC	CROWN	10		2.5	26		7.2		7.2	5.3	3.9	2.9	2.1	1.6	1.2	0.9	0.6	0.5	0.0	0.0	0.0	0.0		9550			
04-08-002-29 W1	LOC	CROWN	15		4.0	39		6.0		6.0	3.7	2.3	1.4	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		5355			
06-08-002-29 W1	LOC	CROWN	30		4.5	42		6.5	6.5	3.7	2.2	1.2	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		5386			
08-08-002-29 W1	PROD	FREE	33	4.40	0.8	9	8875	5.1	4.9	4.4	4.0	3.6	3.3	3.0	2.7	2.5	2.3	2.0	1.9	1.7	1.5	1.4	1.3	23650		9155	12207	194
10-08-002-29 W1	LOC	FREE	50		2.5	26		6.0		6.0	4.4	3.3	2.4	1.8	1.3	1.0	0.7	0.5	0.4	0.0	0.0	0.0	0.0		7958			
12-08-002-29 W1	PROD	FREE	50	3.80	3.7	51	825	3.0	2.2	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2248		9563	12750	18
14-08-002-29 W1	LOC	FREE	30		7.5	61		5.8	5.8	2.3	0.9	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3401			
16-08-002-29 W1	PROD	FREE	16	5.00	0.9	10	8084	2.3	2.2	2.0	1.8	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.5	0.5	14308		9146	12195	117
02-09-002-29 W1	LOC	FREE	15		5.5	49		6.1		6.1	3.1	1.6	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		4366			
04-09-002-29 W1	PROD	FREE	8	2.90	1.6	18	4667	2.8	2.6	2.1	1.7	1.4	1.2	1.0	0.8	0.7	0.5	0.4	0.4	0.0	0.0	0.0	0.0	9334		6035	8046	116
06-09-002-29 W1	LOC	FREE	17		1.5	17		7.8		7.8	6.5	5.4	4.5	3.8	3.1	2.6	2.2	1.8	1.5	1.3	1.1	0.9	0.7		15809			
08-09-002-29 W1	PROD	FREE	18	1.75	2.0	22	542	2.3	2.1	1.6	1.3	1.0	0.8	0.6	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3521		4529	6038	58
10-09-002-29 W1	LOC	FREE	19		1.5	17		10.0		10.0	8.3	7.0	5.8	4.8	4.0	3.4	2.8	2.3	2.0	1.6	1.4	1.1	0.9		20268			
12-09-002-29 W1	PROD	FREE	47	5.00	3.3	33	8411	4.5	3.8	2.5	1.7	1.1	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12176		9284	12378	98
14-09-002-29 W1	PROD	FREE	33	3.00	1.3	15	6342	4.0	3.7	3.2	2.7	2.3	2.0	1.7	1.4	1.2	1.1	0.9	0.8	0.7	0.6	0.5	0.4	14815		6833	9110	163
16-09-002-29 W1	PROD	FREE	12	2.50	0.2	2	31835	7.4	7.3	7.1	7.0	6.8	6.6	6.5	6.3	6.2	6.0	5.9	5.8	5.6	5.5	5.4	5.2	45855		5316	7088	647
02-10-002-29 W1	LOC	FREE	12		2.0	22		3.5				3.5	2.7	2.2	1.7	1.3	1.0	0.8	0.6	0.5	0.4	0.0	0.0		5409			
04-10-002-29 W1	LOC	FREE	12		4.0	39		5.0			5.0	3.1	1.9	1.2	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		4463			
06-10-002-29 W1	PROD	FREE	15	3.16	0.8	9	4915	3.5	3.3	3.0	2.8	2.5	2.3	2.1	1.9	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	15055		6488	8651	174
08-10-002-29 W1	PROD	FREE	15	7.50	1.8	20	3829	3.5	3.2	2.5	2.0	1.6	1.3	1.1	0.9	0.7	0.6	0.4	0.4	0.0	0.0	0.0	0.0	9178		14008	18677	49
10-10-002-29 W1	PROD	CROWN	20	3.20	5.0	46	910	1.6	1.2	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1734		6585	8780	20
12-10-002-29 W1	LOC	FREE	12		2.0	22		7.6			7.6	6.0	4.7	3.7	2.9	2.3	1.8	1.4	1.1	0.9	0.7	0.5	0.0		12183			
14-10-002-29 W1	PROD	FREE	15	2.40	7.9	63	3391	4.6	3.2	1.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5132		3698	4930	104
16-10-002-29 W1	SUSP	CROWN	25	8.40	3.5	35	0	0.0																0				
04-11-002-29 W1	LOC	CROWN	10		2.2	23		2.6						2.6	2.0	1.5	1.2	0.9	0.7	0.5	0.4	0.0	0.0		3572			
[illegible]	[illegible]	CROWN	5	1.80	3.8	29	[illegible]	1.2	1.0	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1494		2992	4022	37
12-11-002-29 W1	LOC	CROWN	22		1.5	17		3.0					3.0	2.5	2.1	1.7	1.5	1.2	1.0	0.8	0.7	0.6	0.5		5704			
[illegible]	[illegible]	[illegible]	22		[illegible]	[illegible]	210	0.7	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	496		3650	3506	14
02-14-002-29 W1	LOC	CROWN	19		3.0	31		0.2							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0			
[illegible]	PROD	CROWN	22	3.20	1.8	20	3350	5.8	5.2	4.2	3.4	2.7	2.2	1.8	1.4	1.1	0.8	0.7	0.6	0.5	0.4	0.0	0.0	12528		6761	9015	139
06-14-002-29 W1	LOC	CROWN	21		1.5	17		8.0			8.0	6.7	5.6	4.6	3.9	3.2	2.7	2.2	1.9	1.6	1.3	1.1	0.9		15938			
08-14-002-29 W1	LOC	CROWN	20		3.0	31		2.0							2.0	1.4	1.0	0.7	0.5	0.0	0.0	0.0	0.0		2001			
02-15-002-29 W1	LOC	FREE	24		3.7	36		8.2			8.2	5.2	3.3	2.1	1.3	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0		7878			
04-15-002-29 W1	PROD	FREE	19	5.50	1.7	19	10999	4.8	4.4	3.5	2.9	2.3	1.9	1.6	1.3	1.0	0.8	0.7	0.6	0.5	0.4	0.0	0.0	18955		12186	16248	117
06-15-002-29 W1	LOC	FREE	20		5.0	46		5.0				5.0	2.7	1.5	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3788			

Table 1.0

SOUTH PIERSON PRODUCTION FORECAST

Locations with "KH" < 6 md.m are omitted

[shaded] = CURRENT PRODUCTION

Economic Rate of 0.3 m3/d

LOCATION	STATUS	LAND	"KH" (MD.M)	NET PAY (M)	MTHLY DEC (%)	YRLY DEC (%)	CUM PROD (103 M3)	LAST PROD (M3/D)	PRODUCTION FORECAST (M3/D) YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR 11	YR 12	YR 13	YR 14	YR 15	CUR. EST CUM (M3)	FUTURE EST CUM (M3)	R.O.I.P. (9%,80 A) (M3)	R.O.I.P. (12%,80 A) (M3)	EST. PERCENT RECOVERY OF R.O.I.P. (%)
12-30-002-29 W1	LOC	FREE	30		11.0	75		4.0						4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1821			
14-30-002-29 W1	LOC	FREE	30		11.0	75		3.5						3.5	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1593			
16-30-002-29 W1	LOC	FREE	12		8.0	63		0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0			
02-31-002-29 W1	SUSP	FREE	5	1.90		0	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20				
04-31-002-29 W1	PROD	FREE	28	3.20	12.5	80	731	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1170		12005	16012	7
06-31-002-29 W1	LOC	FREE	20		14.0	84		0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
08-31-002-29 W1	LOC	FREE	0			0																						
02-24-002-30 W1	LOC	CROWN	2			0																						
07-24-002-30 W1	SUSP	CROWN	2			0																						
TOTAL							130787		111.2	120.0	142.5	127.7	112.4	109.2	89.6	55.4	40.5	31.7	26.1	20.8	17.5	13.3	11.3	286041	218571	378158	504210	43

Table 1.0

SOUTH PIERSON PRODUCTION FORECAST

Locations with "KH" < 6 md.m are omitted

▒▒▒ = CURRENT PRODUCTION

LOCATION	STATUS	LAND	"KH" (MD.M)	NET PAY (M)	MTHLY DEC (%)	YRLY DEC (%)	CUM PROD (103 M3)	LAST PROD (M3/D)	Economic Rate of 0.3 m3/d PRODUCTION FORECAST (M3/D) YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	YR 11	YR 12	YR 13	YR 14	YR 15	CUR. EST CUM (M3)	FUTURE EST CUM (M3)	R.O.I.P. (9%,80 A) (M3)	R.O.I.P. (12%,80 A) (M3)	EST. PERCENT RECOVERY OF R.O.I.P. (%)
08-15-002-29 W1	LOC	FREE	20		2.5	26		9.4			9.4	6.9	5.1	3.8	2.8	2.1	1.5	1.1	0.8	0.6	0.5	0.0	0.0		12632			
10-15-002-29 W1	D&A	FREE	5			0																		0				
12-15-002-29 W1	LOC	FREE	7		7.0	58		6.0			6.0	2.5	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3651			
14-15-002-29 W1	LOC	FREE	7		7.0	58		7.3			7.3	3.1	1.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		4442			
16-15-002-29 W1	LOC	FREE	0			0																						
02-16-002-29 W1	PROD	CROWN	10	3.10	4.6	43	3464	4.3	3.4	1.9	1.1	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5146		6337	8449	61
04-16-002-29 W1	PROD	CROWN	13	2.70	6.9	58	3788	4.2	3.0	1.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5539		5297	7063	78
06-16-002-29 W1	PROD	CROWN	11	4.50	4.4	42	3170	4.3	3.2	1.9	1.1	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5818		9230	12306	47
08-16-002-29 W1	PROD	CROWN	12	3.00	6.3	54	859	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	859		4620	6160	14
10-16-002-29 W1	LOC	CROWN	21		7.2	59		2.0	2.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1028			
12-16-002-29 W1	PROD	CROWN	10	3.30	4.6	43	1210	2.1	1.6	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2347		10907	14543	16
14-16-002-29 W1	LOC	CROWN	8		9.1	68		2.0	1.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		634			
16-16-002-29 W1	LOC	CROWN	18		9.0	68		4.0					4.0	1.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2083			
02-17-002-29 W1	PROD	FREE	10	5.50	6.4	55	3456	3.4	2.3	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3949		12142	16189	24
04-17-002-29 W1	PROD	FREE	15	2.90	9.2	69	760	2.6	1.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1579		5968	7957	20
06-17-002-29 W1	PROD	FREE	11	4.20	5.2	47	1483	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1650		9014	12019	14
08-17-002-29 W1	PROD	FREE	2	2.20	4.4	42	1082	1.6	1.3	0.7	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1970		4789	6385	31
10-17-002-29 W1	PROD	FREE	13	3.80	4.5	42	635	1.7	1.5	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1567		6505	8671	18
12-17-002-29 W1	PROD	FREE	11	1.70	6.4	55	575	1.7	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1229		2799	3732	33
14-17-002-29 W1	PROD	FREE	20		8.5	66		3.3					3.3	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1762		6000	8000	22
16-17-002-29 W1	LOC	FREE	15		8.5	66		3.0					3.0	1.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1602			
02-18-002-29 W1	LOC	CROWN	10		7.2	59		4.0					4.0	1.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2299			
04-18-002-29 W1	LOC	FREE	3			0																						
06-18-002-29 W1	PROD	FREE	2	4.50	8.8	67	539	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	539		9590	12786	4
08-18-002-29 W1	PROD	CROWN	8	3.40	8.1	64	1375	1.9	1.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2019		7573	10096	20
10-18-002-29 W1	LOC	FREE	8		8.2	64		2.4							2.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1190			
12-18-002-29 W1	LOC	CROWN	10		9.5	70		1.0							1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		365			
14-18-002-29 W1	LOC	CROWN	30		8.8	67		3.0					3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1458			
16-18-002-29 W1	SUSP	FREE	9	1.00	7.2	59	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9				
02-19-002-29 W1	LOC	FREE	20		7.6	61		2.5							2.5	1.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0		1403			
04-19-002-29 W1	LOC	FREE	60		9.0	68		2.2							2.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1062			
06-19-002-29 W1	PROD	FREE	99	5.13	6.6	56	6864	2.8	2.0	0.9	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8064		11960	15947	51
08-19-002-29 W1	LOC	FREE	35		6.0	52		4.5							4.5	2.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0		2973			
10-19-002-29 W1	PROD			4.90	5.0	46	511	5.0	3.8	2.1	1.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5308		8234	10965	30
11-19-002-29 W1	PROD	FREE	30	3.42	3.3	33	1035	1.3	1.1	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1893		7908	10544	18
12-19-002-29 W1	PROD	FREE	2	1.90	10.3	73	341	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	527		4188	5584	9
14-19-002-29 W1	LOC	FREE	20		6.5	55		5.0			5.0	2.2	1.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		3166			
16-19-002-29 W1	PROD	FREE	28	4.20	15.5	87	1213	2.9	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1812		8643	11524	16
02-20-002-29 W1	PROD	CROWN	20	4.80	15.6	87	123	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	123		8856	11808	1
04-20-002-29 W1	PROD	CROWN	26	6.20	7.3	60	933	1.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1240		13439	17919	7
06-20-002-29 W1	PROD	CROWN	20	4.10	13.9	83	296	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	296		8438	11250	3
08-20-002-29 W1	LOC	CROWN	13		10.0	72		1.5							1.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		702			
12-20-002-29 W1	PROD	CROWN	15	5.40	1.1	12	1534	2.1	2.0	1.7	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.0	6415		10693	14257	45
14-20-002-29 W1	LOC	CROWN	14		2.0	22		1.4							1.4	1.1	0.9	0.7	0.5	0.4	0.0	0.0	0.0		1819			
02-21-002-29 W1	LOC	FREE	18		11.0	75		3.0						3.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1365			
04-21-002-29 W1	PROD	FREE	17	7.30	11.4	77	345	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	345		14535	19407	2
06-21-002-29 W1	LOC	FREE	17		13.0	81		0.7							0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		256			
08-21-002-29 W1	LOC	FREE	12		13.0	81		2.0							2.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		867			
10-21-002-29 W1	SUSP	FREE	16	8.00	15.8	87	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0				
12-21-002-29 W1	LOC	FREE	15		13.0	81		0.0																				
14-21-002-29 W1	LOC	FREE	10		15.0	86		0.0																				
16-21-002-29 W1	LOC	FREE	5		15.0	86																						
04-29-002-29 W1	LOC	CROWN	15		2.0	22		1.8							1.8	1.4	1.1	0.9	0.7	0.5	0.4	0.0	0.0		2493			
06-29-002-29 W1	LOC	CROWN	13		2.0	22		0.3							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0			
02-30-002-29 W1	PROD	FREE	93	5.60	2.3	34	2567	3.8	3.3	2.5	1.9	1.4	1.1	0.8	0.6	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	6961		11627	15502	45
04-30-002-29 W1	LOC	FREE	20		10.0	72		3.7						3.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1732			
06-30-002-29 W1	LOC	FREE	40		6.0	52		6.0						6.0	2.9	1.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0		3964			
08-30-002-29 W1	LOC	FREE	25		4.0	39		3.8						3.8	2.3	1.4	0.9	0.5	0.0	0.0	0.0	0.0	0.0		3272			
10-30-002-29 W1	LOC	FREE	25		7.5	61		5.0						5.0	2.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2822			

Table 2.0

South Pierson
Composite Production Summary

"PHD: 92/ 4/29 08:34"

PRODUCTION HISTORY JAN 1985 to MAR 1992

PIERSON COMPOSITE SUMMARY
COMPOSITE SUMMARY

DATE	OIL PRODUCTION m3	DAILY OIL m3/ODAY	CUMULATIVE OIL m3	GAS PRODUCTION E3m3	CUMULATIVE GAS E3m3	GOR m3/m3	WATER PRODUCTION m3	CUMULATIVE WATER m3	WOR m3/m3	GAS well mths	PROD DAYS ON	OIL well mths
CUM PRIOR	0	0	0	0	0	0	0	0	0	0	0	0
Jan-85	0	0	0	0	0	0	0	0	0	0	0	0
Feb-85	0	0	0	0	0	0	0	0	0	0	0	0
Mar-85	0	0	0	0	0	0	0	0	0	0	0	0
Apr-85	0	0	0	0	0	0	0	0	0	0	0	0
May-85	0	0	0	0	0	0	0	0	0	0	0	0
Jun-85	0	0	0	0	0	0	0	0	0	0	0	0
Jul-85	0	0	0	0	0	0	0	0	0	0	0	0
Aug-85	0	0	0	0	0	0	0	0	0	0	0	0
Sep-85	0	0	0	0	0	0	0	0	0	0	0	0
Oct-85	0	0	0	0	0	0	0	0	0	0	0	0
Nov-85	0	0	0	0	0	0	0	0	0	0	0	0
Dec-85	70.3	5.9	70	0	0	0	133.9	134	1.9	0	12	1
Jan-86	240	8	310	10.6	11	44	142.2	276	0.59	1	30	1
Feb-86	218.7	9.5	529	2.5	13	11	123.5	400	0.56	1	23	1
Mar-86	117.5	7.3	647	7.2	20	61	38	438	0.32	1	16	1
Apr-86	215.7	12	862	8	28	37	72.4	510	0.34	1	18	1
May-86	575.5	26	1438	41.7	70	72	309.5	819	0.54	3	70.2	3
Jun-86	691.7	27.2	2129	30.8	101	45	297.7	1117	0.43	3	78.5	3
Jul-86	652	22.8	2781	41.8	143	64	276.4	1394	0.42	3	85.7	3
Aug-86	679.8	24.1	3461	57	200	84	285	1679	0.42	3	86.5	3
Sep-86	564.7	20.7	4026	54.6	254	97	488.4	2167	0.86	3	83.3	3
Oct-86	534	24.6	4560	39.9	294	75	589.6	2757	1.1	2	104.2	3
Nov-86	412.5	21.7	4972	41.7	336	101	453.1	3210	1.1	2	102.4	3
Dec-86	461.6	22.4	5434	28	364	61	324.3	3534	0.7	5	121.3	4
Jan-87	698.9	23.2	6133	53.6	417	77	368.1	3902	0.53	5	129.5	4
Feb-87	580.8	20.7	6714	56.6	474	97	416.6	4319	0.72	4	99.8	3
Mar-87	685.8	36.6	7400	63.2	537	92	409.2	4728	0.6	4	124.1	5
Apr-87	636.5	21.6	8036	56.9	594	89	361.3	5089	0.57	5	147.5	5
May-87	616.7	24.1	8653	35.7	630	58	414.7	5504	0.67	5	147	4
Jun-87	736.9	30.9	9390	62.9	693	85	521.8	6026	0.71	7	159.6	6
Jul-87	826.1	27	10216	70.4	763	85	616.9	6643	0.75	6	183.3	6
Aug-87	786.4	25.5	11002	71.1	834	90	644.5	7287	0.82	6	185	6

Sep-87	756.8	29.2	11759	69.7	904	92	589.8	7877	0.78	6	149.1	6
Oct-87	681.1	46	12440	68.1	972	100	304.9	8182	0.45	4	129.5	5
Nov-87	809.7	38.4	13250	66.3	1038	82	671.8	8854	0.83	6	154.4	6
Dec-87	1024.4	55.3	14274	72.6	1111	71	821.5	9675	0.8	6	181.5	7
Jan-88	921.6	34.4	15196	60.8	1172	66	853.2	10528	0.93	7	176.6	7
Feb-88	910.9	35.9	16107	67.9	1240	75	1456.9	11985	1.6	8	201.8	8
Mar-88	1319.2	45.8	17426	85.4	1325	65	2742.3	14727	2.08	9	264.4	9
Apr-88	1340.9	44.9	18767	89.3	1414	67	2813.4	17541	2.1	9	265.4	9
May-88	1247.6	75.3	20014	78.2	1492	63	2533.5	20074	2.03	9	251.7	10
Jun-88	1417.6	58.3	21432	86.8	1579	61	2413.3	22488	1.7	12	292.4	13
Jul-88	1811.7	63.8	23244	102.4	1682	57	2678	25166	1.48	12	350.6	12
Aug-88	1772.8	103.1	25016	109.2	1791	62	2453.9	27620	1.38	14	359.1	15
Sep-88	1954.7	70.6	26971	117	1908	60	3226.4	30846	1.65	15	414.3	15
Oct-88	2485	90.3	29456	127.7	2036	51	4714.7	35561	1.9	16	451.7	16
Nov-88	2160.8	80.5	31617	92.2	2128	43	4009.1	39570	1.86	16	434.4	16
Dec-88	2343.7	79.8	33961	135.9	2264	58	4516.6	44086	1.93	16	471.7	16
Jan-89	2172.2	79.3	36133	140	2404	64	4355.5	48442	2.01	16	443.2	16
Feb-89	1966.9	78.2	38100	122.6	2526	62	4346.1	52788	2.21	15	395.5	16
Mar-89	2277.3	82.5	40377	154.2	2680	68	4895.2	57683	2.15	17	471	16
Apr-89	2146.1	81.7	42523	130.2	2811	61	4845.9	62529	2.26	17	461.1	16
May-89	2156.2	79.4	44679	148.2	2959	69	4833.9	67363	2.24	16	462.9	16
Jun-89	2135.4	79.5	46815	159.7	3119	75	4660.2	72023	2.18	16	457.4	16
Jul-89	1846.8	72.6	48662	147.2	3266	80	4168.6	76192	2.26	16	415.5	16
Aug-89	2100.6	76.2	50762	155.3	3421	74	4802.9	80995	2.29	16	466.8	16
Sep-89	1842.2	69.8	52604	128.6	3550	70	4180.1	85175	2.27	16	440.3	16
Oct-89	2005.6	75.1	54610	136.7	3686	68	5010.9	90186	2.5	17	479.5	17
Nov-89	2096.5	76.7	56706	125.1	3811	60	4849.8	95035	2.31	17	488.7	17
Dec-89	2132.1	74.5	58838	121.3	3933	57	4827.2	99863	2.26	17	491.5	17
Jan-90	2029.1	76.8	60868	128.7	4061	63	4646.1	104509	2.29	17	462.2	17
Feb-90	2038	78	62906	128.7	4190	63	4504	109013	2.21	17	449.2	17
Mar-90	2267.5	87.5	65173	145.6	4336	64	5001.9	114015	2.21	18	477.3	18
Apr-90	1945.4	95.4	67119	114.3	4450	59	3575.2	117590	1.84	20	400.4	20
May-90	2965.3	117.6	70084	139.4	4589	47	5402.4	122992	1.82	23	568.2	23
Jun-90	3351.7	129.8	73436	217.1	4807	65	6315.8	129308	1.88	26	704.3	27
Jul-90	3722.2	225.4	77158	228.2	5035	61	6525.7	135834	1.75	29	810.2	33
Aug-90	4101.3	201.9	81259	263.5	5298	64	6385.4	142219	1.56	37	926.1	37
Sep-90	4270.8	150.6	85530	279	5577	65	6394.9	148614	1.5	36	1031.9	36
Oct-90	4231.6	143.4	89761	261	5838	62	6705.5	155320	1.58	35	1055.4	36
Nov-90	3870	139.1	93631	204	6042	53	6434	161754	1.66	36	1009	36
Dec-90	3755.3	131.2	97387	208.7	6251	56	6879.9	168633	1.83	36	1043.1	36
Jan-91	3519.6	130.9	100906	207.1	6458	59	6420.8	175054	1.82	36	975.8	36
Feb-91	3530.2	152.1	104437	218.3	6676	62	6744.8	181799	1.91	42	976.9	42
Mar-91	4482.5	147.1	108919	277.4	6954	62	7990.3	189789	1.78	42	1243	41
Apr-91	4051	137	112970	267.4	7221	66	6895.5	196685	1.7	41	1205.2	41
May-91	3743.1	130.8	116713	238.3	7459	64	5537	202222	1.48	41	1157.2	41
Jun-91	3699.2	143.2	120412	256.4	7716	69	5528.9	207751	1.49	42	1134.2	42
Jul-91	4003	183.6	124415	283.6	7999	71	5617.8	213369	1.4	42	1183.5	43

Aug-91	3869.7	133.9	128285	263	8262	68	5402.5	218771	1.4	42	1240.5	42
Sep-91	3856.5	130.7	132142	258.7	8521	67	5422	224193	1.41	42	1249.9	42
Oct-91	3846.5	126.9	135988	248.7	8770	65	5505.2	229698	1.43	42	1279.6	43
Nov-91	3613.3	120.8	139601	230	9000	64	5298.6	234997	1.47	42	1256.3	42
Dec-91	3763.3	121.7	143365	236.5	9236	63	5470.5	240467	1.45	43	1329	43
Jan-92	3617.5	117.6	146982	232.4	9469	64	5551.8	246019	1.53	44	1349	44
Feb-92	3332.4	116.2	150315	204.6	9673	61	5054.1	251073	1.52	44	1263.1	44
Mar-92	3495.7	113.1	153810	211.2	9885	60	5441.2	256514	1.56	44	1360.9	44

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Well Index"
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Well Identifier	Factor	Status	Field	Pool	Oper	Unit	Well #	Welltile #	Page #"
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"Composite Summary - - 1"
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Table 3.0

SOUTH PIERSON - INDIVIDUAL WELL DECLINE ANALYSIS
LOWER AMARANTH

WELL LOCATION	STATUS	NET PAY (M)	O.O.I.P.** (10M3)	RATE/CUM ESTIMATED * CUM PROD(M3)	RATE/TIME ESTIMATED * CUM PROD(M3)	DIFFERENCE	RATE/CUM ESTIMATED * RECOVERY	RATE/TIME ESTIMATED * RECOVERY	EXPECTED BUBBLE PT RECOVERY (M3)	ACTUAL RECOVERY TO DATE (M3)	MC 3 PROD?	MC 3 OIL ??? (>200%)	LAST WATER CUT	WATER CUT TREND
06-04-002-29 W1M	SUSP	7.5	184	115	115	0	0.1%	0.1%	3900	115	Y	N	74%	FLAT
14-04-002-29 W1M	PROD	4.2	103	16292	11755	4537	15.8%	11.4%	2184	5659	Y	Y	13%	DEC
16-04-002-29 W1M	PROD	4.0	98	2964	2254	710	3.0%	2.3%	2080	1844	N	N	1%	DEC
16-05-002-29 W1M	PROD	5.0	129	21410	13046	8364	17.5%	10.6%	2600	9273	Y	Y	57%	INC
08-08-002-29 W1M	PROD	4.4	108	16092	23650	-7558	14.9%	21.9%	2288	9531	Y	Y	70%	DEC
12-08-002-29 W1M	PROD	3.8	93	2254	2248	6	2.4%	2.4%	1976	1170	N	N	17%	DEC
16-08-002-29 W1M	PROD	5.0	123	10606	14308	-3702	8.6%	11.7%	2600	8361	Y	Y	3%	DEC
04-09-002-29 W1M	PROD	2.9	71	7915	9334	-1419	11.1%	13.1%	1508	4985	Y	Y	72%	FLAT
08-09-002-29 W1M	PROD (LA)	1.5	37	2000	3521	-1521	5.4%	9.6%	780	807	Y	N	91%	INC
12-09-002-29 W1M	PROD	5.0	123	21080	12176	8904	17.2%	9.9%	2600	9017	Y	Y	10%	FLAT
14-09-002-29 W1M	PROD	3.0	74	15704	14815	889	21.3%	20.1%	1560	6827	Y	Y	93%	INC
16-09-002-29 W1M	PROD	2.5	61	18033	45855	-27822	29.4%	74.8%	1300	12675	Y	Y	10%	DEC
06-10-002-29 W1M	PROD	3.2	78	12217	15055	-2838	15.6%	19.2%	1664	5302	Y	Y	89%	INC
08-10-002-29 W1M	PROD	7.5	184	11429	9178	2251	6.2%	5.0%	3900	4162	Y	N	95%	INC
10-10-002-29 W1M	PROD	3.2	78	7947	1734	6213	10.1%	2.2%	1664	1095	Y	N	84%	FLAT
14-10-002-29 W1M	PROD (LA)	2.4	59	16000	5132	10868	27.2%	8.7%	1248	3915	Y	Y	33%	INC
16-10-002-29 W1M	SUSP	0.0	0	0	0	0			0	0	Y	N	100%	FLAT
06-11-002-29 W1M	PROD	1.8	44	2542	1684	858	5.8%	3.8%	936	1125	N	N	11%	DEC
14-11-002-29 W1M	PROD	2.3	56	192	496	-304	0.3%	0.9%	1196	154	Y	N	60%	FLAT
04-14-002-29 W1M	PROD	3.2	78	12500	12528	-28	15.9%	16.0%	1664	4018	Y	Y	5%	DEC
04-15-002-29 W1M	PROD	5.5	135	21707	18955	2752	16.1%	14.1%	2860	11574	Y	Y	4%	DEC
02-16-002-29 W1M	PROD	3.1	76	6293	5146	1147	8.3%	6.8%	1612	2946	N	N	1%	FLAT
04-16-002-29 W1M	PROD	2.7	66	7642	5539	2103	11.5%	8.4%	1404	4272	Y	Y	1%	DEC
06-16-002-29 W1M	PROD	4.5	110	8243	5818	2425	7.5%	5.3%	2340	3642	N	N	3%	FLAT
08-16-002-29 W1M	PROD (LA)	1.6	39	2447	859	1588	6.2%	2.2%	832	858	N	N	8%	DEC
12-16-002-29 W1M	PROD	5.3	130	2720	2347	373	2.1%	1.8%	2756	1442	N	N	3%	FLAT
02-17-002-29 W1M	PROD	5.9	145	5217	3949	1268	3.6%	2.7%	3068	2839	N	N	1%	DEC
04-17-002-29 W1M	PROD	2.9	71	6648	1579	5069	9.3%	2.2%	1508	1040	N	N	6%	DEC
06-17-002-29 W1M	PROD	4.2	103	1760	1650	110	1.7%	1.6%	2184	1552	Y	N	83%	INC
08-17-002-29 W1M	PROD	2.2	54	2260	1970	290	4.2%	3.7%	1144	1269	N	N	4%	FLAT
10-17-002-29 W1M	PROD	3.6	88	2100	1567	533	2.4%	1.8%	1872	830	N	N	4%	DEC
12-17-002-29 W1M	PROD	1.7	42	2833	1229	1604	6.8%	2.9%	884	779	N	N	2%	DEC
06-18-002-29 W1M	PROD	4.5	110	644	539	105	0.6%	0.5%	2340	591	Y	N	47%	FLAT
08-18-002-29 W1M	PROD	3.4	83	2167	2019	148	2.6%	2.4%	1768	1589	N	N	7%	DEC

Table 3.0

SOUTH PIERSON - INDIVIDUAL WELL DECLINE ANALYSIS
LOWER AMARANTH

WELL LOCATION	STATUS	NET PAY (M)	O.O.I.P.** (10M3)	RATE/CUM ESTIMATED * CUM PROD(M3)	RATE/TIME ESTIMATED * CUM PROD(M3)	DIFFERENCE	RATE/CUM ESTIMATED * RECOVERY	RATE/TIME ESTIMATED * RECOVERY	EXPECTED BUBBLE PT RECOVERY (M3)	ACTUAL RECOVERY TO DATE (M3)	MC 3 PROD?	MC 3 OIL ??? (>200%)	LAST WATER CUT	WATER CUT TREND
16-18-002-29 W1M	SUSP	0.0	0	9	9	0			0	0	Y	N	100%	FLAT
06-19-002-29 W1M	PROD	5.1	125	8723	8068	655	7.0%	6.4%	2652	7212	Y	Y	2%	FLAT
10-19-002-29 W1M	PROD	4.9	120	1830	3308	-1478	1.5%	2.8%	2548	984	Y	N	40%	DEC
11-19-002-29 W1M	PROD	3.4	83	9337	1892	7445	11.2%	2.3%	1768	5126	Y	Y	1%	DEC
12-19-002-29 W1M	PROD	1.9	47	910	527	383	2.0%	1.1%	988	450	Y	N	96%	INC
16-19-002-29 W1M	PROD	4.2	103	3868	1812	2056	3.8%	1.8%	2184	1561	Y	N	62%	DEC
02-20-002-29 W1M	PROD	4.6	113	150	123	27	0.1%	0.1%	2392	123	Y	N	86%	FLAT
04-20-002-29 W1M	PROD	6.2	152	2371	1240	1131	1.6%	0.8%	3224	1084	N	N	11%	DEC
06-20-002-29 W1M	PROD	4.1	101	457	296	161	0.5%	0.3%	2132	357	N	N	18%	DEC
12-20-002-29 W1M	PROD	5.4	132	3667	6415	-2748	2.8%	4.8%	2806	1778	N	N	11%	DEC
04-21-002-29 W1M	PROD	7.3	179	416	345	71	0.2%	0.2%	3796	345	Y	N	99%	FLAT
10-21-002-29 W1M	SUSP	0.0	0	0	0	0			0	0	Y	N	100%	FLAT
02-30-002-29 W1M	PROD	5.6	137	6067	6961	-894	4.4%	5.1%	2912	2825	N	N	2%	DEC
02-31-002-29 W1M	SUSP	0.0	0	20	20	0			0	20	Y	N	95%	INC
04-31-002-29 W1M	PROD	5.2	128	1677	1170	507	1.3%	0.9%	2704	921	N	N	7%	FLAT
TOTAL		3.7	4449	309475	284236	25239	7.1%	6.7%	94329	148044				

* NOTE: Economic Production Rate of 0.3 m3/d used.
** NOTE: Based on 32.4 Ha, 15% Porosity, 59% So, and 1.169 Bo.

Table 4.0

South Pierson
Tracy-Tarner Primary Depletion Prediction for
Solution Gas Drive Reservoir

PREDICTION OF FUTURE PERFORMANCE FOR SOLUTION DRIVE RESERVOIR
BASIC DATA

INITIAL RESERVOIR PRESSURE, PSIA	=	1525.0
BUBBLE POINT PRESSURE, PSIA	=	675.0
RESERVOIR TEMPERATURE, DEGEES F	=	105.00
CONNATE WATER SATURATION, FRACTION	=	0.4100
OIL COMPRESSIBILITY, 1/PSI	=	7.47 E-6
WATER COMPRESSIBILITY, 1/PSI	=	3.35 E-6
FORMATION COMPRESSIBILITY, 1/PSI	=	9.00 E-6
GAS CAP FACTOR, M (MATERIAL BALANCE)	=	0.000
PRESSURE DIFFERENCE BETWEEN STEPS, PSI	=	10.00
NO. OF PRESSURE VALUES IN THE FLUID PVT TABLE	=	8
NO. OF SAT. POINTS IN THE REL. PERM. TABLE	=	19

Core Sample No. 4B

ø = 20.2%

Ka = 3.89 md

12-19-002-29 W1M

FLUID PROPERTY TABLE

PRESSURE PSIA	RESERVOIR VOLUME FACTOR (Bo) DIM	SOLUTION GAS-OIL RATIO MCF/STB	Z-FACTOR RATIO	OIL VISCOSITY CPS	GAS VISCOSITY CPS
675.0	1.1780	0.2820	0.92400	1.2390	0.01170
575.0	1.1730	0.2650	0.92600	1.2680	0.01160
455.0	1.1650	0.2440	0.92800	1.3240	0.01130
365.0	1.1570	0.2250	0.93000	1.3790	0.01110
265.0	1.1460	0.2000	0.93400	1.4390	0.01080
162.0	1.1310	0.1640	0.93900	1.5680	0.01040
107.0	1.1190	0.1410	0.94700	1.7520	0.01000
15.0	1.0220	0.0000	1.00000	2.9390	0.00820

RELATIVE PERMEABILITY VS GAS SATURATION

GAS SATURATION FRACTION	Kg/Ko RATIO
0.00000	0.0000
0.02800	0.0700
0.03400	0.0980
0.04300	0.1540
0.05000	0.2220
0.05700	0.3010
0.06200	0.3940
0.06700	0.5110
0.07200	0.6460
0.07500	0.7710
0.07700	0.8580
0.08300	1.0800
0.09900	2.2200
0.11000	3.7100
0.12000	5.6200
0.13500	9.6800
0.15700	20.6000
0.17300	34.3000
0.18800	51.7000

RECOVERY PREDICTIONS FOR A SOLUTION GAS DRIVE RESERVOIR
ORIGINAL OIL-IN-PLACE = 1.0 STB AT INITIAL PRESSURE CONDITIONS

PRESSURE PSIA	OIL PROD. STB	GAS PROD. MCF	GAS-OIL RATIO(CUM) MCF/BBL	GAS-OIL RATIO(INST) MCF/BBL
675.0	0.02116	0.00597	0.28200	0.28200
665.0	0.02631	0.00742	0.28185	0.28042
655.0	0.03161	0.00890	0.28149	0.27907
645.0	0.03704	0.01041	0.28112	0.27878
635.0	0.04256	0.01196	0.28108	0.28289
625.0	0.04797	0.01355	0.28248	0.30407
615.0	0.05275	0.01518	0.28770	0.37614
605.0	0.05637	0.01683	0.29862	0.53958
595.0	0.05887	0.01851	0.31442	0.80089
585.0	0.06061	0.02020	0.33329	1.14270
575.0	0.06187	0.02190	0.35397	1.54996
565.0	0.06282	0.02362	0.37601	2.07236
555.0	0.06363	0.02535	0.39844	2.24101
545.0	0.06439	0.02709	0.42069	2.30058
535.0	0.06514	0.02883	0.44266	2.36014
525.0	0.06587	0.03059	0.46436	2.41961
515.0	0.06659	0.03235	0.48582	2.47890
505.0	0.06730	0.03412	0.50705	2.53793
495.0	0.06799	0.03590	0.52806	2.59659
485.0	0.06867	0.03769	0.54886	2.65479
475.0	0.06935	0.03949	0.56946	2.70387
465.0	0.07001	0.04129	0.58985	2.75046
455.0	0.07066	0.04311	0.61005	2.79609
445.0	0.07141	0.04523	0.63341	2.86397
435.0	0.07215	0.04737	0.65654	2.93111
425.0	0.07287	0.04951	0.67945	2.99736
415.0	0.07358	0.05167	0.70216	3.06256
405.0	0.07428	0.05383	0.72467	3.12657
395.0	0.07497	0.05600	0.74700	3.18918
385.0	0.07565	0.05818	0.76914	3.25022
375.0	0.07632	0.06037	0.79110	3.30946
365.0	0.07697	0.06257	0.81290	3.37029
355.0	0.07772	0.06512	0.83788	3.45741
345.0	0.07845	0.06768	0.86268	3.54266
335.0	0.07917	0.07025	0.88730	3.62571
325.0	0.07987	0.07282	0.91176	3.70622
315.0	0.08056	0.07541	0.93605	3.78381
305.0	0.08124	0.07800	0.96017	3.85811
295.0	0.08191	0.08061	0.98413	3.92547
285.0	0.08257	0.08322	1.00789	3.96226
275.0	0.08323	0.08585	1.03143	3.99431
265.0	0.08389	0.08848	1.05475	4.02121
255.0	0.08476	0.09203	1.08571	4.11012
245.0	0.08562	0.09558	1.11635	4.19304
235.0	0.08646	0.09914	1.14670	4.26916
225.0	0.08729	0.10272	1.17676	4.35998
215.0	0.08810	0.10630	1.20659	4.47010
205.0	0.08889	0.10989	1.23622	4.57093
195.0	0.08967	0.11349	1.26563	4.66108
185.0	0.09044	0.11711	1.29482	4.73829
175.0	0.09120	0.12073	1.32375	4.79272
165.0	0.09196	0.12436	1.35239	4.83132
155.0	0.09279	0.12843	1.38412	4.97017
145.0	0.09363	0.13269	1.41714	5.13535
135.0	0.09445	0.13696	1.45001	5.24293
125.0	0.09526	0.14124	1.48262	5.32047

105.0	0.09720	0.15184	[illegible]	[illegible]	
95.0	0.09935	0.16609	1.67176	7.44613	*
85.0	0.10107	0.18033	1.78414	9.07190	*
75.0	0.10249	0.19458	1.89844	10.98904	*
65.0	0.10369	0.20885	2.01426	12.96370	*
55.0	0.10471	0.22315	2.13109	14.91678	*
45.0	0.10562	0.23749	2.24844	16.55935	*
35.0	0.10648	0.25186	2.36542	17.13436	*
25.0	0.10734	0.26627	2.48057	16.07211	*
15.0	0.10836	0.28072	2.59072	12.42924	*

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RELATIVE PERMEABILITY VS GAS SATURATION

PRESSURE PSIA	GAS SATURATION FRACTION	KG/KO RATIO
675.0	0.000000	0.000000
665.0	0.003356	0.000004
655.0	0.006795	0.000015
645.0	0.010314	0.000061
635.0	0.013882	0.000252
625.0	0.017380	0.001017
615.0	0.020496	0.003520
605.0	0.022912	0.009219
595.0	0.024657	0.018475
585.0	0.025942	0.030836
575.0	0.026941	0.045903
565.0	0.027831	0.065437
555.0	0.028631	0.072522
545.0	0.029409	0.075755
535.0	0.030177	0.079089
525.0	0.030935	0.082525
515.0	0.031684	0.086066
505.0	0.032425	0.089716
495.0	0.033158	0.093478
485.0	0.033882	0.097354
475.0	0.034600	0.100998
465.0	0.035312	0.104675
455.0	0.036019	0.108457
445.0	0.036889	0.113303
435.0	0.037750	0.118310
425.0	0.038603	0.123484
415.0	0.039447	0.128831
405.0	0.040283	0.134359
395.0	0.041112	0.140072
385.0	0.041935	0.145978
375.0	0.042751	0.152083
365.0	0.043560	0.158576
355.0	0.044521	0.166741
345.0	0.045472	0.175235
335.0	0.046414	0.184071
325.0	0.047347	0.193264
315.0	0.048272	0.202831
305.0	0.049189	0.212789
295.0	0.050100	0.222964
285.0	0.051006	0.231927
275.0	0.051909	0.241222
265.0	0.052811	0.250866
255.0	0.054004	0.264226
245.0	0.055186	0.278171
235.0	0.056360	0.292734
225.0	0.057524	0.309609
215.0	0.058677	0.329440
205.0	0.059819	0.350334
195.0	0.060951	0.372365
185.0	0.062076	0.395554
175.0	0.063194	0.419244
165.0	0.064308	0.444254
155.0	0.065701	0.477609
145.0	0.067199	0.515799
135.0	0.068685	0.553010
125.0	0.070162	0.592660

105.0	[illegible]	[illegible]
95.0	0.080150	0.968157
85.0	0.085975	1.234844
75.0	0.091614	1.591801
65.0	0.097111	2.038932
55.0	0.102505	2.614646
45.0	0.107826	3.351925
35.0	0.113106	4.220850
25.0	0.118385	5.255502
15.0	0.123731	6.433960

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Table 5.0

SOUTH PIERSON - PREDICTED PRODUCTION FORECAST

BASED ON IND. WELL DECLINE ANALYSIS & INCLUDES INFILL 80 ACRE DRILLING

CUM PROD TO DATE: 150000
LAST PROD RATE: 115.00
WATERFLOOD DECLINE RATE: 0.88%

YEAR	ACTUAL (PREDICTED) PRIMARY FROM DECLINE ANALYSIS			VOLUMETRIC (PREDICTED) PRIMARY FROM SPEARFISH			MISSION CANYON (PREDICTED) PRIMARY FROM DECLINE ANALYSIS			WATERFLOOD CASE FROM MODEL		
	RATE (M3/D)	PROD (M3)	CUM PROD	RATE (M3/D)	PROD (M3)	CUM PROD	RATE (M3/D)	PROD (M3)	CUM PROD	RATE (M3/D)	PROD (M3/D)	CUM PROD
1	111.20	40588.00	190588	[illegible]	29723.34	137223	31.14	11364.64	53365	111.20	92.80	190588
2	120.00	43800.00	234388	86.40	31536.00	168759	33.60	12264.00	65629	120.00	92.00	234388
3	142.50	52012.50	286401	102.60	37449.60	206208	39.90	14563.50	80192	142.50	91.20	286401
4	127.70	46610.50	333011	91.94	33559.56	239768	35.76	13050.94	93243	170.00	90.40	348451
5	112.40	41026.00	374037	80.93	29538.72	269307	31.47	11487.28	104730	180.00	89.60	414151
6	109.20	39858.00	413895	78.62	28697.76	298004	30.58	11160.24	115891	178.42	88.80	479272
7	89.60	32704.00	446599	64.51	23546.88	321551	25.09	9157.12	125048	176.85	88.00	543821
8	55.40	20221.00	466820	39.89	14559.12	336110	15.51	5661.88	130710	175.29	87.20	607802
9	40.50	14782.50	481603	29.16	10643.40	346754	11.34	4139.10	134849	173.75	86.50	671220
10	31.70	11570.50	493173	22.82	8330.76	355085	8.88	3239.74	138088	172.22	85.70	734079
11	26.10	9526.50	502700	18.79	6859.08	361944	7.31	2667.42	140756	170.70	84.90	796386
12	20.80	7592.00	510292	14.98	5466.24	367410	5.82	2125.76	142882	169.20	84.20	858144
13	17.50	6387.50	516679	12.60	4599.00	372009	4.90	1788.50	144670	167.71	83.50	919359
14	13.30	4854.50	521534	9.58	3495.24	375504	3.72	1359.26	146029	166.24	82.70	980035
15	11.30	4124.50	525658	8.14	2969.64	378474	3.16	1154.86	147184	164.77	82.00	1040177
16	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	163.32	81.30	1099789
17	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	161.89	80.60	1158878
18	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	160.46	79.90	1217446
19	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	159.05	79.20	1275499
20	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	157.65	78.50	1333041
21	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	156.26	77.80	1390076
22	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	154.89	77.10	1446610
23	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	153.52	76.40	1502646
24	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	152.17	76.40	1558189
25	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	150.83	76.40	1613244
26	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	149.51	76.40	1667813
27	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	148.19	76.40	1721903
28	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	146.89	76.40	1775517
29	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	145.59	76.40	1828658
30	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	144.31	76.40	1881333
31	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	143.04	76.40	1933543
32	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	141.78	76.40	1985294
33	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	140.54	76.40	2036590
34	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	139.30	76.40	2087435
35	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	138.07	76.40	2137831
36	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	136.86	76.40	2187785
37	0.00	0.00	525658	0.00	0.00	378474	0.00	0.00	147184	135.65	75.70	2237299

(shaded) - BEFORE BUBBLE POINT PRODUCTION

REVISED: 5/7/92

Table 6.0

SOUTH PIERSON WATERFLOOD STUDY

Determination of "a" and "b" values:

Sample: 4A from 12-19-003-29 W1M (k = 2.64 md)

ko/kw = a*e^{-bSw}

Relative Permeability Data: 1) ko/kw = 0.1236 @ Sw = .671
2) ko/kw = 9.0900 @ Sw = .578

Solving Simultaneous Equations:

$(ko/kw)' / (e^{-bSw'}) = (ko/kw)'' / (e^{-bSw''})$

$(.1236) / (e^{-(b)(.671)}) = (9.0900) / (e^{-(b)(.578)})$

b = 46.2 * from Sample 4A

Sample: 4B from 12-19-003-29 W1M (k = 4.52)

ko/kw = a*e^{-bSw}

Relative Permeability Data: 1) ko/kw = 0.1217 @ Sw = .585
2) ko/kw = 12.350 @ Sw = .487

Solving Simultaneous Equations:

$(ko/kw)' / (e^{-bSw'}) = (ko/kw)'' / (e^{-bSw''})$

$(.1217) / (e^{-(b)(.585)}) = (12.350) / (e^{-(b)(.487)})$

b = 47.1 * from Sample 4B

Note: b = 47 - from Rel Perm vs Sw graph.

Solving for "a":

$a = (ko/kw) / (e^{-(Sw)(b)}) = (.1236) / (e^{-(.671)(46)})$
a = 3.14 X 10^{12} (Sample 4A)

$a = (ko/kw) / (e^{-(Sw)(b)}) = (.1217) / (e^{-(.585)(47)})$
a = 1.07 X 10^{11} (Sample 4B)

Table 7.0

SOUTH PIERSON WATERFLOOD STUDY

Determination of Mobility Ratio (M):

M = krw/uw * uo/kro

Sample: 4A from 12-19-003-29 W1M (k = 2.64 md)

Viscosity Data:	1)	uw= 0.865
	2)	uo = 1.300
Relative Permeability Data:	1)	krw = 0.22 @ Sw = 0.690
	2)	kro =1.00 @ Swc

M = (0.22)/(0.865) * (1.300) / (1.000)

M = 0.331

Sample: 4B from 12-19-003-29 W1M (k = 4.52 md)

Viscosity Data:	1)	uw= 0.865
	2)	uo = 1.300
Relative Permeability Data:	1)	krw = 0.15 @ Sw = 0.590
	2)	kro =1.00 @ Swc

M = (0.15)/(0.865) * (1.300) / (1.000)

M = 0.225

Table 8.0

WATERFLOOD PEFORMANCE PREDICTION

CASE SUMMARY

BASED ON 5-SPOT PATTERN (1 - 1 INJECTION)
PER PATTERN

Flood (Acre)	Area (Ha)	Well Spacing (Acre)	Well Spacing (Ha)	K (md)	Initial Water Injection (B/D)	Initial Water Injection (m3/D)	Initial Oil Production (B/D)	Initial Oil Production (m3/D)	Percent Recovery @ 15 yrs	Time to Breakthru (Yrs)
40	16	20	8	2.5	22.3	3.5	20.8	3.3	23	28.3
40	16	20	8	3.5	31.2	5.0	29.2	4.6	31	20.2
40	16	20	8	4.5	40.1	6.4	37.5	6.0	38	15.7
80	32	40	16	2.5	21.3	3.4	19.9	3.2	12	59.1
80	32	40	16	3.5	29.9	4.8	27.9	4.4	16	42.2
80	32	40	16	4.5	38.4	6.1	35.9	5.7	20	32.8

APPENDIX

South Pierson Waterflood Report

APPENDIX

South Pierson

Reservoir Fluid Study
South Pierson 06-19-002-29 W1M

Reservoir Fluid Study

for

Home Oil Company Limited

Home Scurry S Pierson 6-19-2-29 (W1M)

South Pierson Field, Manitoba

File: 55377-87-258

Date: 1987 11 17

CORE LABORATORIES

TABLE OF CONTENTS

SECTION I

Tabular Data

COMPANY	Home Oil Company Limited	PAGE	1 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

VOLUMETRIC DATA OF RESERVOIR FLUID SAMPLE

1. Saturation pressure (P_s) (bubble point) 4551 kPa (gauge) at 42.0 °C.

2. Thermal expansion (β_o) of reservoir fluid: $\frac{\text{Volume @ 42.0°C}}{\text{Volume @ 22.2°C}}$

   At 34474 kPa (Gauge) = 1.01732

3. Compressibility (C_o) of reservoir fluid @ reservoir temperature: Vol/Vol/kPa:

   From 34474 kPa to 27579 kPa = 8.66×10^{-7}

   From 27579 kPa to 20684 kPa = 9.06×10^{-7}

   From 20684 kPa to 13790 kPa = 10.03×10^{-7}

   From 13790 kPa to 6895 kPa = 10.83×10^{-7}

   From 6895 kPa to 4551 kPa = 11.98×10^{-7}

COMPANY	Home Oil Company Limited	PAGE	2 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

PRESSURE VOLUME RELATIONS AT 42.0°C

	PRESSURE kPa (Gauge)	RELATIVE VOLUME V/Vsat (1)	Y FUNCTION (2)	OIL DENSITY kg/m^3
	34474	0.9711		798.2
	27579	0.9769		793.5
	20684	0.9830		788.6
	13790	0.9898		783.2
	6895	0.9972		777.4
	6205	0.9980		776.8
	5516	0.9989		776.1
Ps	4551	1.0000		775.2
	4378	1.0117	3.307	
	4089	1.0349	3.156	
	3709	1.0744	2.971	
	3296	1.1338	2.761	
	2910	1.2127	2.562	
	2517	1.3292	2.360	
	2172	1.4783	2.188	
	1841	1.6883	2.027	
	1572	1.9380	1.898	

(1) Cubic metres at indicated pressure and temperature per cubic metre of saturated oil.

(2) $$Y = \frac{(Psat-P)}{(P + 101.325)(Relative\ Volume - 1)}$$

COMPANY	Home Oil Company Limited	PAGE	3 of 25
WELL	Home Scurry S Pierson 6-19-2-19 (W1M)	FILE	55377-87-258

DIFFERENTIAL VAPORIZATION AT 42.2°C

OIL PROPERTIES

	PRESSURE kPa (GAUGE)	OIL DENSITY kg/m³ C_o	RELATIVE OIL VOLUME (1) B_o	RELATIVE TOTAL VOLUME (2) B_t	SOLUTION GAS-OIL RATIO (3) R_s	LIBERATED GAS-OIL RATIO R_1
P_s	4551	775.2	1.196	1.196	53.67	0.00
	3861	775.7	1.191	1.268	50.69	2.98
	3034	777.9	1.183	1.409	46.78	6.89
	2413	779.8	1.175	1.597	43.40	10.27
	1724	782.7	1.164	2.011	38.77	14.90
	1014	787.3	1.148	3.139	32.37	21.30
	634	791.0	1.136	4.793	28.10	25.57
	0	824.7	1.022	59.838	0.00	53.67

Gravity of Residual Oil = 36.3° API @ 15.6°C

Density of Residual Oil = 842.4 kg/m³ @ 15.6°C

(1) Cubic metres of oil at indicated pressure and temperature per cubic metre of residual oil at 15.0°C.

(2) Cubic metres of oil plus liberated gas at indicated pressure and temperature per cubic metre of residual oil at 15.0°C.

(3) Cubic metres of gas at 101.325 kPa (absolute) and 15.0°C per cubic metre of residual oil at 15.0°C.

COMPANY	Home Oil Company Limited	PAGE	4 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

DIFFERENTIAL VAPORIZATION AT 42.0°C

GAS PROPERTIES

PRESSURE kPa (Gauge)	INCREMENTAL GAS RELATIVE DENSITY (1)	CUMULATIVE GAS RELATIVE DENSITY (1)	INCREMENTAL DEVIATION FACTOR (Z)	GAS FORMATION VOLUME FACTOR (2) B_g	GAS EXPANSION FACTOR (3) $1/B_g$
P_s 4551					
3861	0.891	0.891	0.926	0.02595	38.54
3034	0.860	0.873	0.928	0.03287	30.42
2413	0.868	0.872	0.930	0.04107	24.35
1724	0.893	0.878	0.934	0.05682	17.60
1014	0.956	0.902	0.939	0.09349	10.70
634	1.049	0.926	0.947	0.14301	6.99
0	1.607	1.284	1.000	1.09589	0.91

(1) AIR = 1.000

(2) Cubic metres of gas at indicated pressure and temperature per cubic metre at 101.325 kPa (absolute) at 15.0°C.

(3) Cubic metres of gas at 101.325 kPa (absolute) and 15.0°C per cubic metre at indicated pressure and temperature.

COMPANY	Home Oil Company Limited	PAGE	5 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

RESERVOIR FLUID VISCOSITY AT 42.0°C

PRESSURE kPa (Gauge)	OIL VISCOSITY mPa.S	GAS VISCOSITY mPa.S (1)	OIL/GAS VISCOSITY RATIO
34474	1.783		
31026	1.720		
27579	1.657		
24132	1.596		
20684	1.533		
17237	1.470		
13790	1.407		
10342	1.345		
6895	1.282		
4551	1.239		
3861	1.268	0.0116	109.31
3034	1.324	0.0113	117.17
2413	1.379	0.0111	124.23
1724	1.439	0.0108	133.24
1014	1.568	0.0104	150.77
634	1.752	0.0100	175.20
0	2.939	0.0082	358.41

(1) Calculated from the correlation by Lee, Eakin and Gonzalez: "The Viscosity of Natural Gases". August 1966 - Journal of Petroleum Technology.

COMPANY	Home Oil Company Limited	PAGE	6 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

FLASH TEST OF TREATER OIL SAMPLE

STOCK TANK PRESSURE kPa (Gauge)	STOCK TANK TEMPERATURE °C	GAS-OIL RATIO R_1 (1)	GAS-OIL RATIO R_1 (2)	STOCK TANK OIL GRAVITY ° API @ 15.6°C	SEPARATOR VOLUME FACTOR B_o (3)	STOCK TANK VOLUME FACTOR (4)	RELATIVE DENSITY OF LIBERATED GAS (5)
131							
to							
0	15.0	-	3.11	38.4	1.041	-	0.976
		TOTAL	3.11				

This data was used to develop the recombined reservoir fluid; i.e., the treater gas and oil were physically recombined to the specified gas-oil ratio of 44.44 m^3/m^3 stock tank liquid.

(1) Cubic metres of gas @ 101.325 kPa (absolute) and 15.0°C per cubic metre of oil @ indicated pressure and temperature.
(2) Cubic metres of gas @ 101.325 kPa (absolute) and 15.0°C per cubic metre of stock tank oil @ 15.0°C.
(3) Cubic metres of saturated oil @ 131 kPa (gauge) and 54.4°C per cubic metre of stock tank oil @ 15.0°C.
(4) Cubic metres of oil @ indicated pressure and temperature per cubic metre of stock tank oil @ 15.0°C.
(5) AIR = 1.000.

COMPANY	Home Oil Company Limited	PAGE	7 of 25
WELL	Home Scurry S Pierson 6-19-2-29 (W1M)	FILE	55377-87-258

SEPARATOR TEST OF RESERVOIR FLUID SAMPLE

SEPARATOR PRESSURE kPa (Gauge)	SEPARATOR TEMPERATURE °C	GAS-OIL RATIO R_1 (1)	GAS-OIL RATIO R_1 (2)	STOCK TANK OIL GRAVITY ° API @ 15.6°C	FORMATION VOLUME FACTOR B_o (3)	SEPARATOR VOLUME FACTOR (4)	RELATIVE DENSITY OF LIBERATED GAS (5)
4551							
to							
131	54.4	45.82	47.20			1.030	1.184
to							
0	26.7	3.05	3.08	37.6	1.178	1.009	N/M
		TOTAL	50.28				

N/M - Not measured due to insufficient liberated gas.

(1) Cubic metres of gas @ 101.325 kPa (absolute) and 15.0°C per cubic metre of oil @ indicated pressure and temperature.
(2) Cubic metres of gas @ 101.325 kPa (absolute) and 15.0°C per cubic metre of stock tank oil @ 15.0°C.
(3) Cubic metres of saturated oil @ 4551 kPa (gauge) and 42.0°C per cubic metre of stock tank oil @ 15.0°C.
(4) Cubic metres of oil @ indicated pressure and temperature per cubic metre of stock tank oil @ 15.0°C.
(5) AIR = 1.000.

CORE LABORATORIES

HYDROCARBON LIQUID ANALYSIS

B327
CONTAINER IDENTITY

55377-87-258
LABORATORY NUMBER

Home Oil Company Limited
OPERATOR

LSD 6-19-2-29 W1M
LOCATION

Home Scurry S Pierson 6-19-2-29
WELL OR SAMPLE LOCATION NAME

KB ELEV. (m) GR ELEV. (m)

South Pierson, Manitoba
FIELD OR AREA

POOL OR ZONE

SAMPLER

TEST TYPE & NO.

TEST RECOVERY

Recombined Reservoir Fluid
POINT OF SAMPLE

AMT. & TYPE CUSHION

@ °C
MUD RESISTIVITY

PUMPING FLOWING GAS LIFT SWAB

TEST INTERVALS (metres)

WATER m³/d OIL m³/d GAS m³/d

PRESSURES, kPa (gauge): SEPARATOR; RESERVOIR 4551; CONTAINER WHEN SAMPLED @ °C; CONTAINER WHEN RECEIVED @ °C

TEMPERATURES, °C: SEPARATOR; 42.0

DATE SAMPLED (Y/M/D)

DATE RECEIVED (Y/M/D)

87 11 01
DATE ANALYZED (Y/M/D)

DW
ANALYST

REMARKS

COMPONENT	MOLE FRACTION	MASS FRACTION	LIQUID VOLUME FRACTION
N_2	0.0125	0.0026	0.0025
O_2	0.0001	0.0000	0.0000
H_2S	0.0000	0.0000	0.0000
C_1	0.1058	0.0125	0.0323
C_2	0.0787	0.0174	0.0379
C_3	0.0943	0.0306	0.0468
iC_4	0.0182	0.0078	0.0107
C_4	0.0603	0.0258	0.0342
iC_5	0.0246	0.0131	0.0163
C_5	0.0356	0.0189	0.0232
C_6+	0.5699	0.8713	0.7961
TOTAL	1.0000	1.0000	1.0000

OBSERVED PROPERTIES OF C_6+ RESIDUE (15/15°C)

849.9 kg/m³ DENSITY

0.8507 RELATIVE DENSITY

34.9 API @ 15.5° C

208 RELATIVE MOLECULAR MASS

CALCULATED PROPERTIES OF TOTAL SAMPLE (15/15°C)

776.5 kg/m³ DENSITY

0.7772 RELATIVE DENSITY

50.6 API @ 15.5° C

135.99 RELATIVE MOLECULAR MASS

REMARKS

Refer to page 9 of 25 for extended analysis of hexanes plus.

CORE LABORATORIES

HYDROCARBON LIQUID ANALYSIS

OPERATOR	Home Oil Company Limited	PAGE	9 of 25
WELL	Home Scurry S Pierson 6-19-2-29	FILE	55377-87-258
SAMPLE POINT	Recombined Reservoir Fluid	DATE	87 11 01

Analysis of C_6+ Fraction

Boiling Point Range (°C)	Component	Carbon Number	Mole Fraction	Mass Fraction
36.1- 68.9	Hexanes	C_6	0.0472	0.0339
68.9- 98.3	Heptanes	C_7	0.0466	0.0388
98.3-125.6	Octanes	C_8	0.0426	0.0405
125.6-150.6	Nonanes	C_9	0.0325	0.0346
150.6-173.9	Decanes	C_{10}	0.0385	0.0455
173.9-196.1	Undecanes	C_{11}	0.0328	0.0426
196.1-215.0	Dodecanes	C_{12}	0.0268	0.0379
215.0-235.0	Tridecanes	C_{13}	0.0257	0.0393
235.0-252.2	Tetradecanes	C_{14}	0.0226	0.0373
252.2-270.6	Pentadecanes	C_{15}	0.0183	0.0324
270.6-287.8	Hexadecanes	C_{16}	0.0167	0.0315
287.8-302.8	Heptadecanes	C_{17}	0.0135	0.0269
302.8-317.2	Octadecanes	C_{18}	0.0124	0.0263
317.2-330.0	Nonadecanes	C_{19}	0.0124	0.0278
330.0-344.4	Eicosanes	C_{20}	0.0094	0.0220
344.4-357.2	Heneicosanes	C_{21}	0.0090	0.0222
357.2-369.4	Docosanes	C_{22}	0.0075	0.0194
369.4-380,0	Tricosanes	C_{23}	0.0069	0.0186
380.0-391.1	Tetracosanes	C_{24}	0.0065	0.0184
391.1-401.7	Pentacosanes	C_{25}	0.0058	0.0171
401.7-412.2	Hexacosanes	C_{26}	0.0047	0.0144
412.2-422.2	Heptacosanes	C_{27}	0.0045	0.0143
422.2-431.7	Octacosanes	C_{28}	0.0042	0.0137
431.7-441.1	Nonacosanes	C_{29}	0.0039	0.0131
441.1 PLUS	Triacontanes Plus	$C_{30}+$	0.0259	0.1292
80.0	Benzene	C_6H_6	0.0043	0.0028
110.6	Toluene	C_7H_8	0.0170	0.0131
136.1-138.9	Ethylbenzene, p + m-Xylene	C_8H_{10}	0.0164	0.0145
144.4	o-Xylene	C_8H_{10}	0.0055	0.0048
168.9	1,2,4 Trimethylbenzene	C_9H_{12}	0.0065	0.0065
48.9	Cyclopentane	C_5H_{10}	0.0010	0.0006
72.2	Methylcyclopentane	C_6H_{12}	0.0126	0.0088
81.1	Cyclohexane	C_6H_{12}	0.0142	0.0099
101.1	Methylcyclohexane	C_7H_{14}	0.0155	0.0126
	TOTAL		0.5699	0.8713
68.9 PLUS	Mole Fraction of C_7+			0.5217
68.9 PLUS	Mass Fraction of C_7+			0.8368
68.9 PLUS	Calculated Relative Molecular Mass of C_7+			219
68.9 PLUS	Calculated Relative Density of C_7+			0.8605
68.9 PLUS	Calculated Density of C_7+ (kg/m^3)			859.8

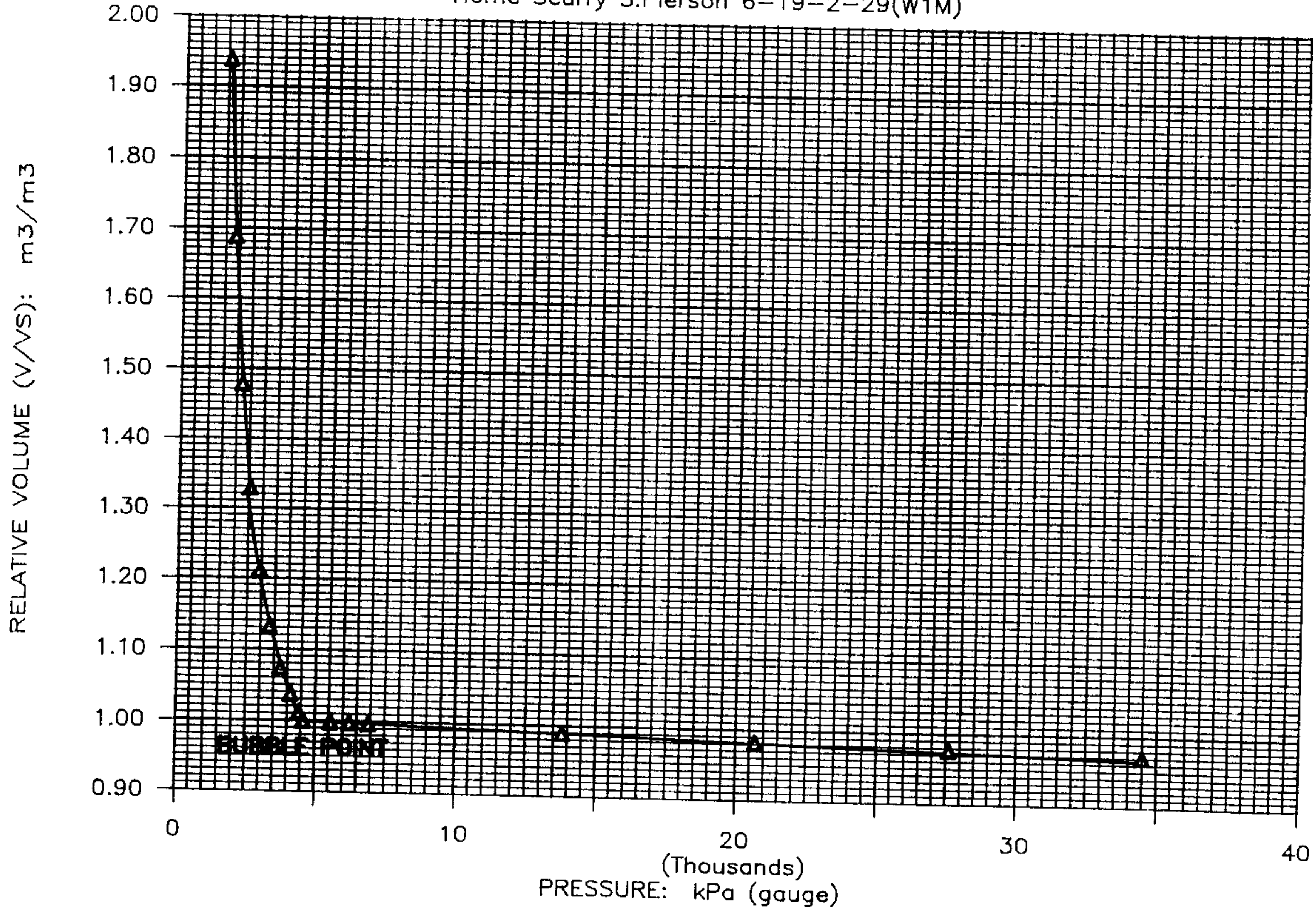
The above hexanes plus values are based upon a measured mass fraction and a calculated mole fraction, and assume a total hydrocarbon recovery from the chromatographic system.

SECTION II

Illustrations

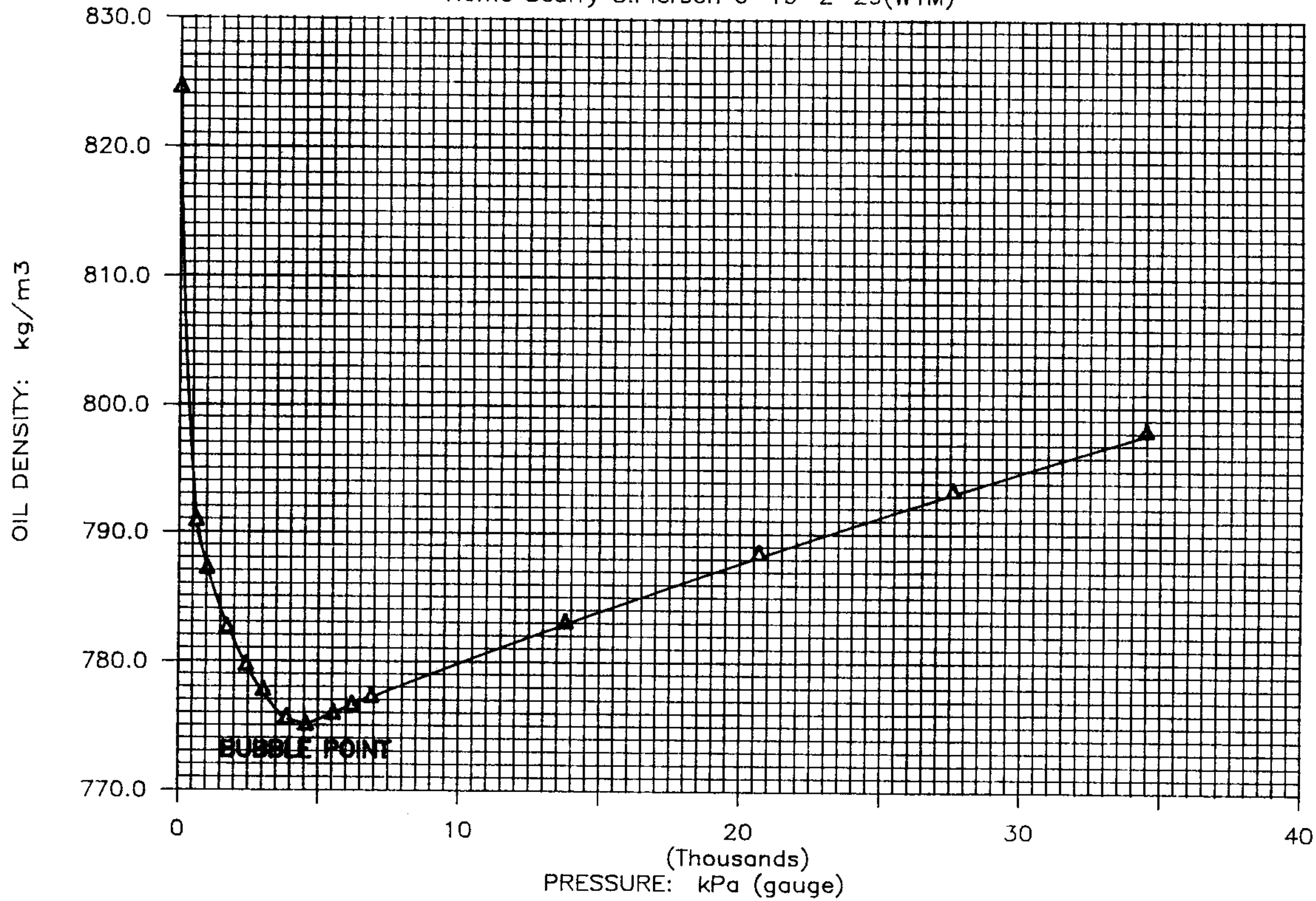
RELATIVE VOLUME (V/VS)

Home Scurry S.Pierson 6-19-2-29(W1M)



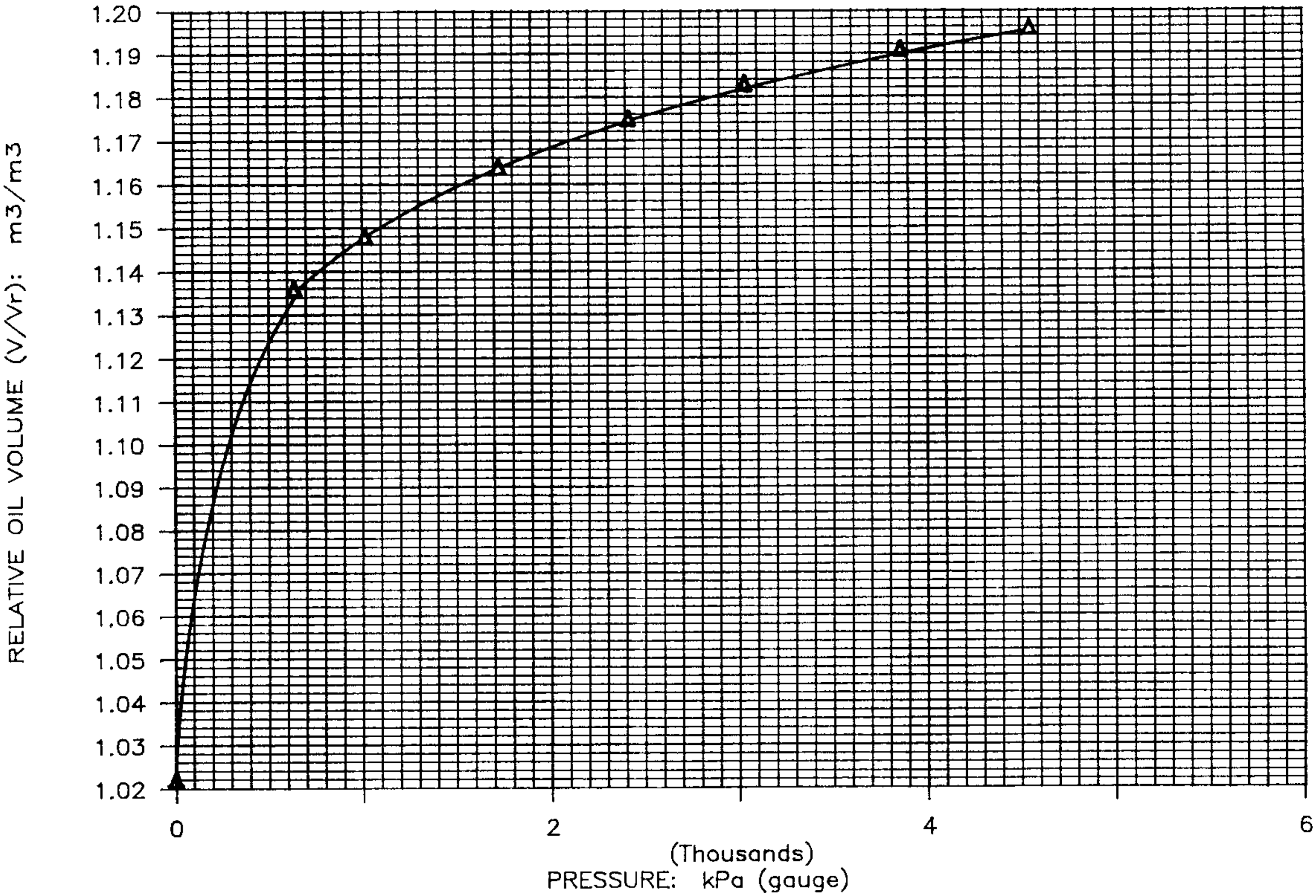
OIL DENSITY

Home Scurry S.Pierson 6-19-2-29(W1M)



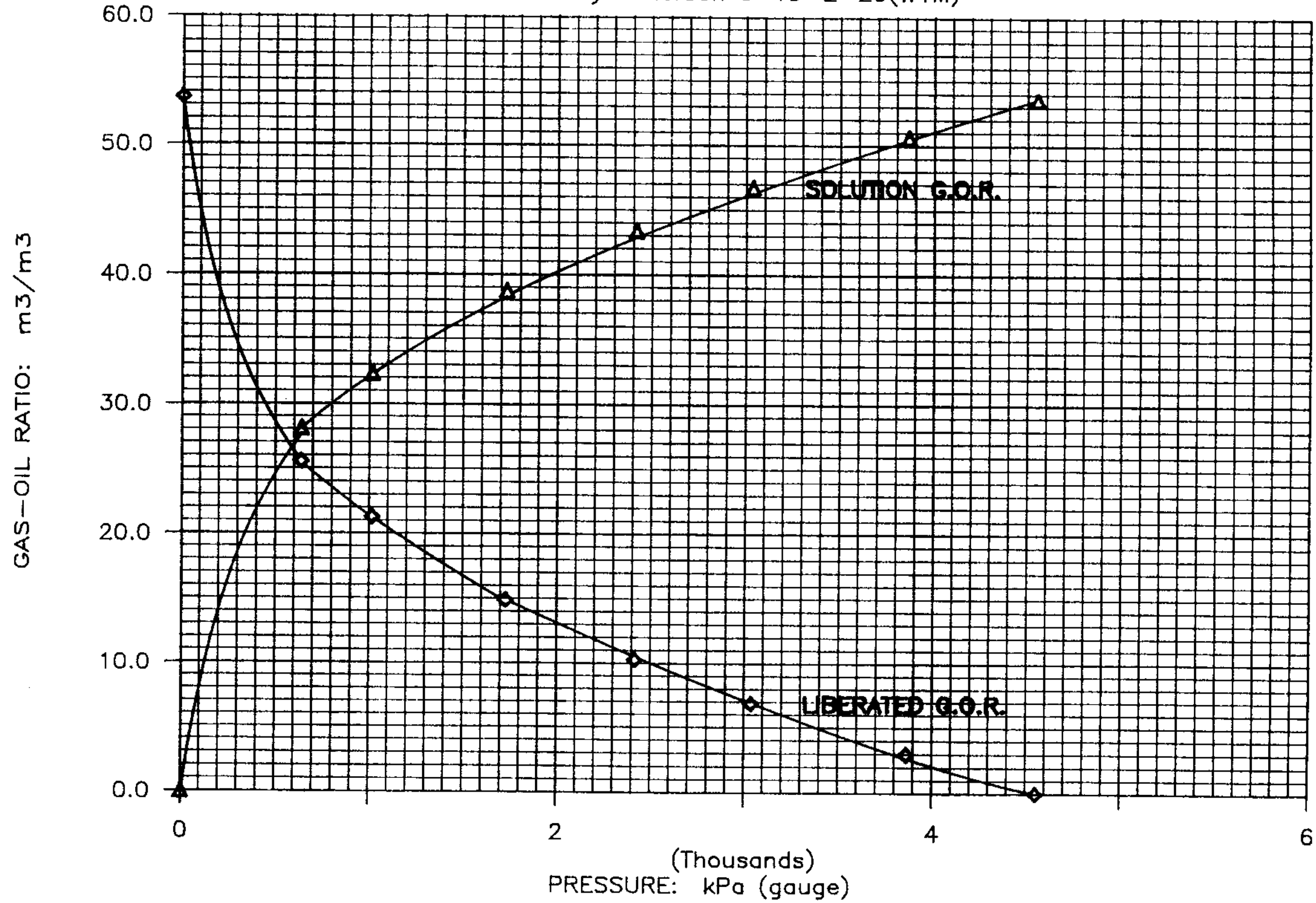
RELATIVE OIL VOLUME (V/Vr)

Home Scurry S.Pierson 6–19–2–29(W1M)



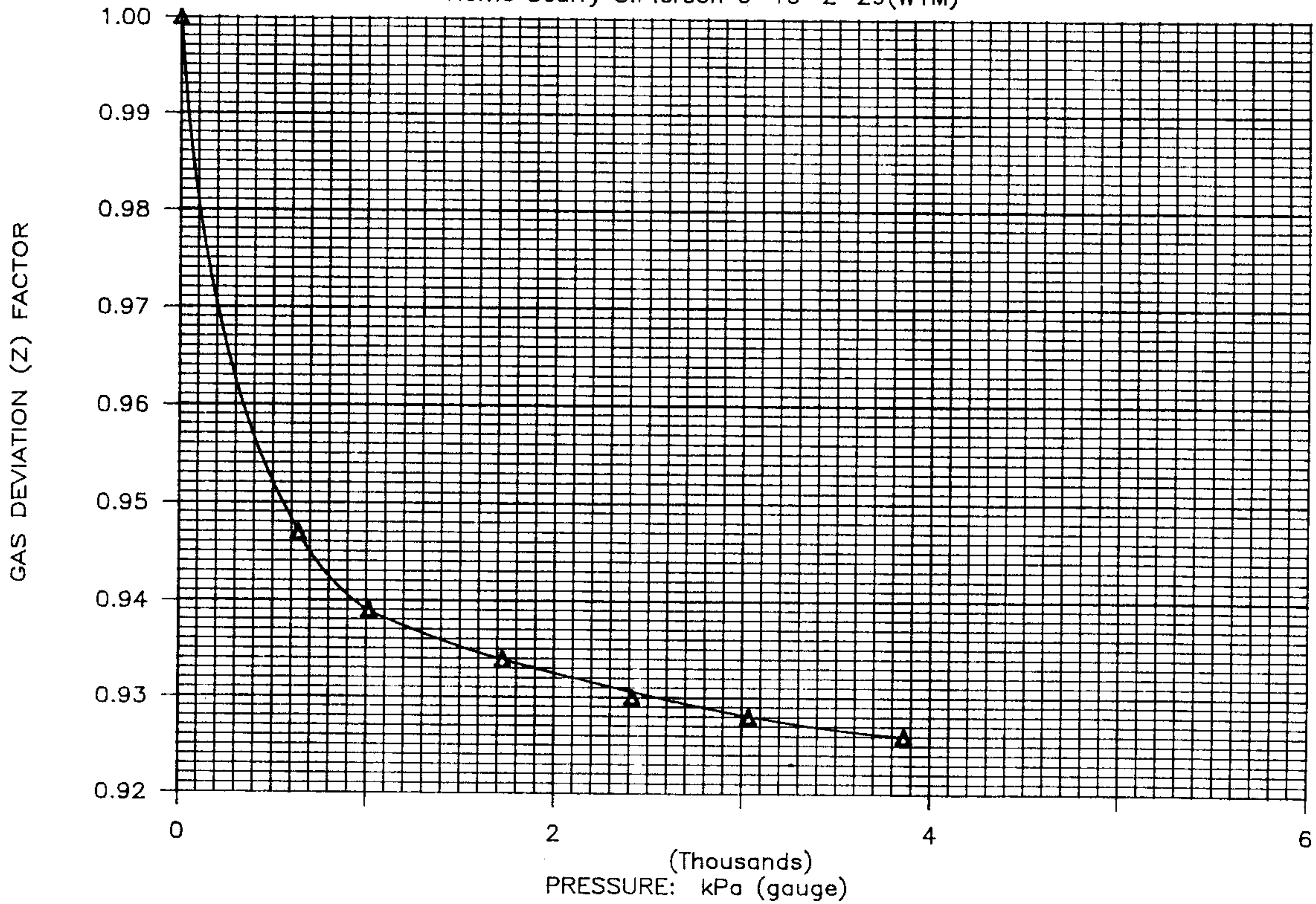
GAS—OIL RATIO

Home Scurry S.Pierson 6-19-2-29(W1M)



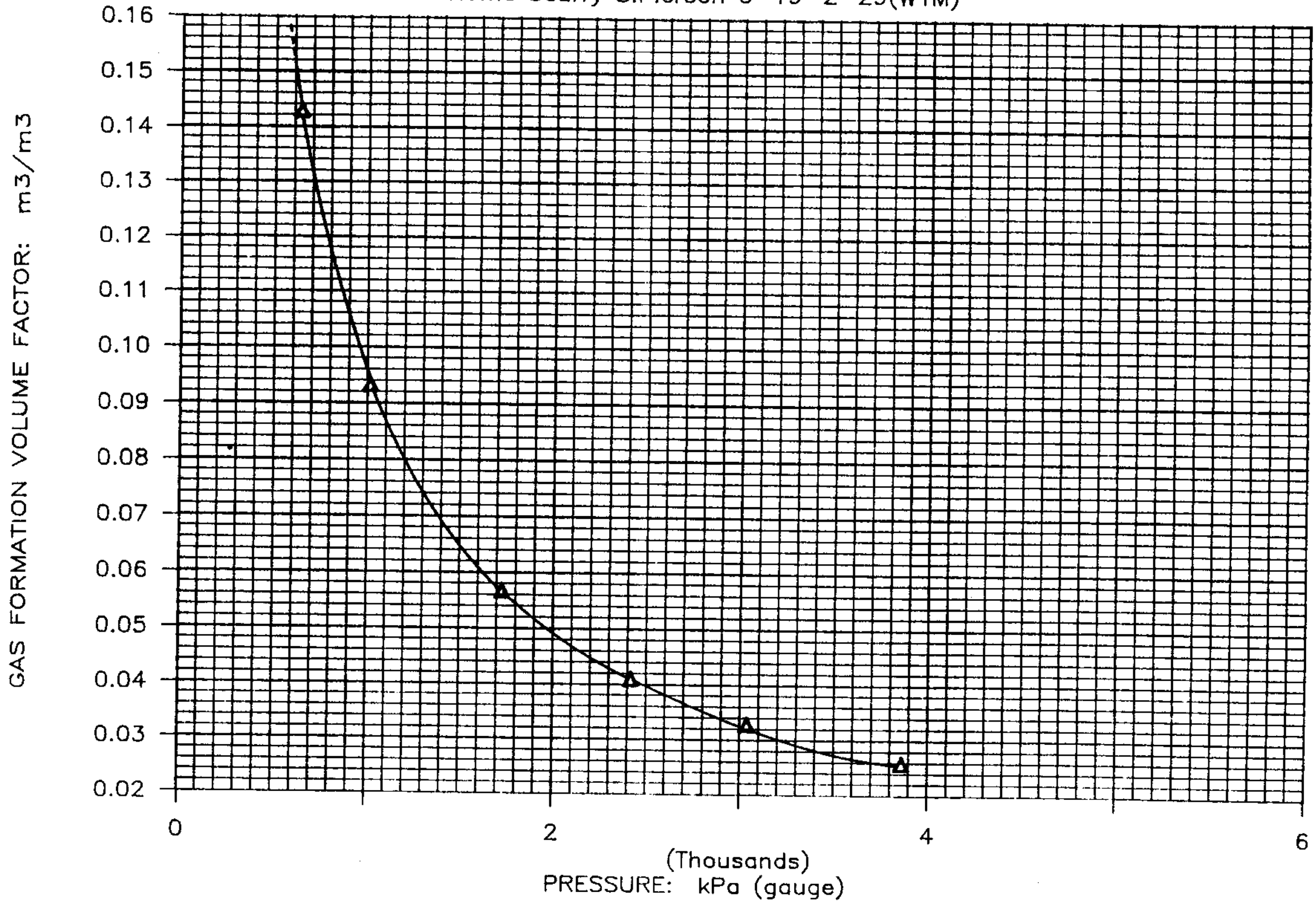
GAS DEVIATION (Z) FACTOR

Home Scurry S.Pierson 6-19-2-29(W1M)



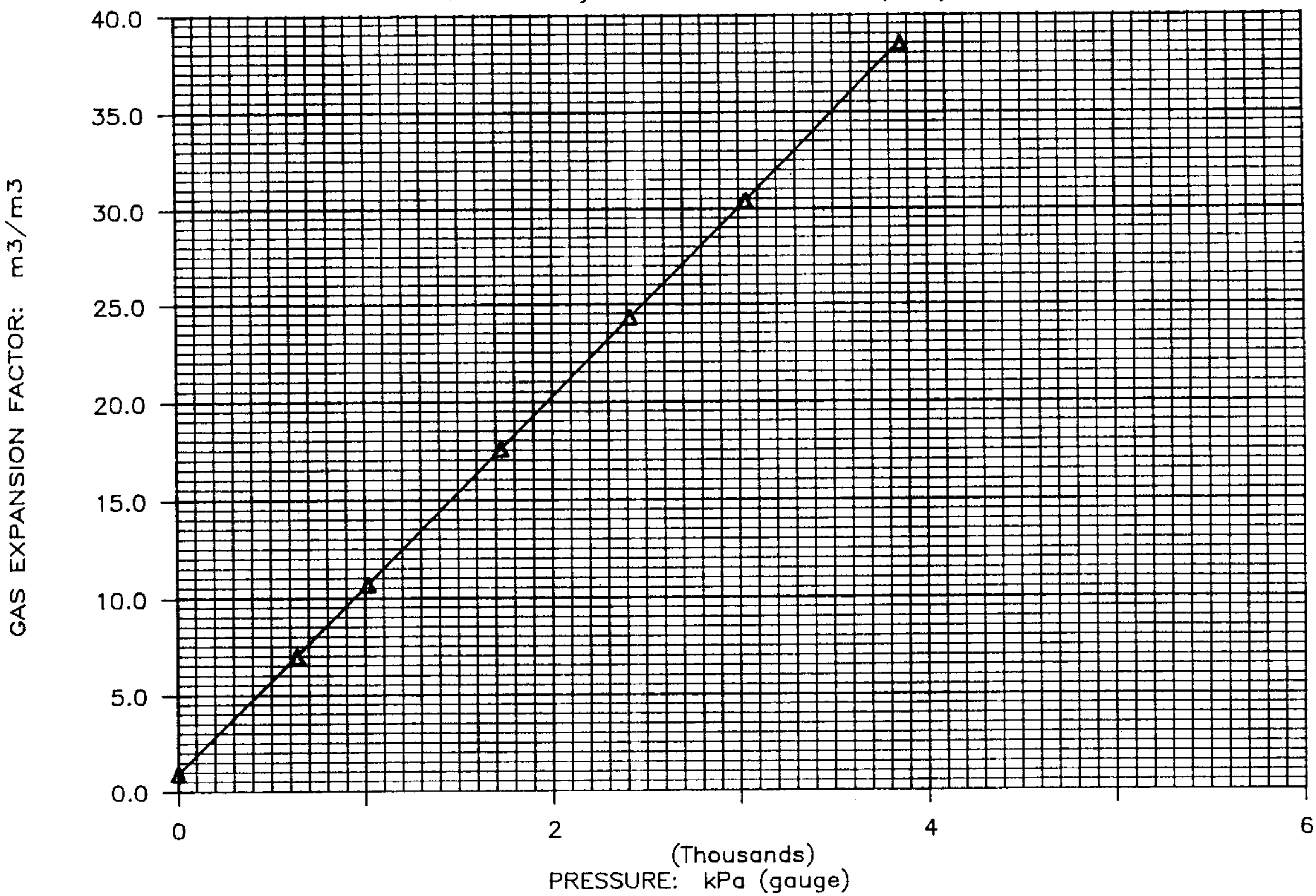
GAS FORMATION VOLUME FACTOR

Home Scurry S.Pierson 6-19-2-29(W1M)



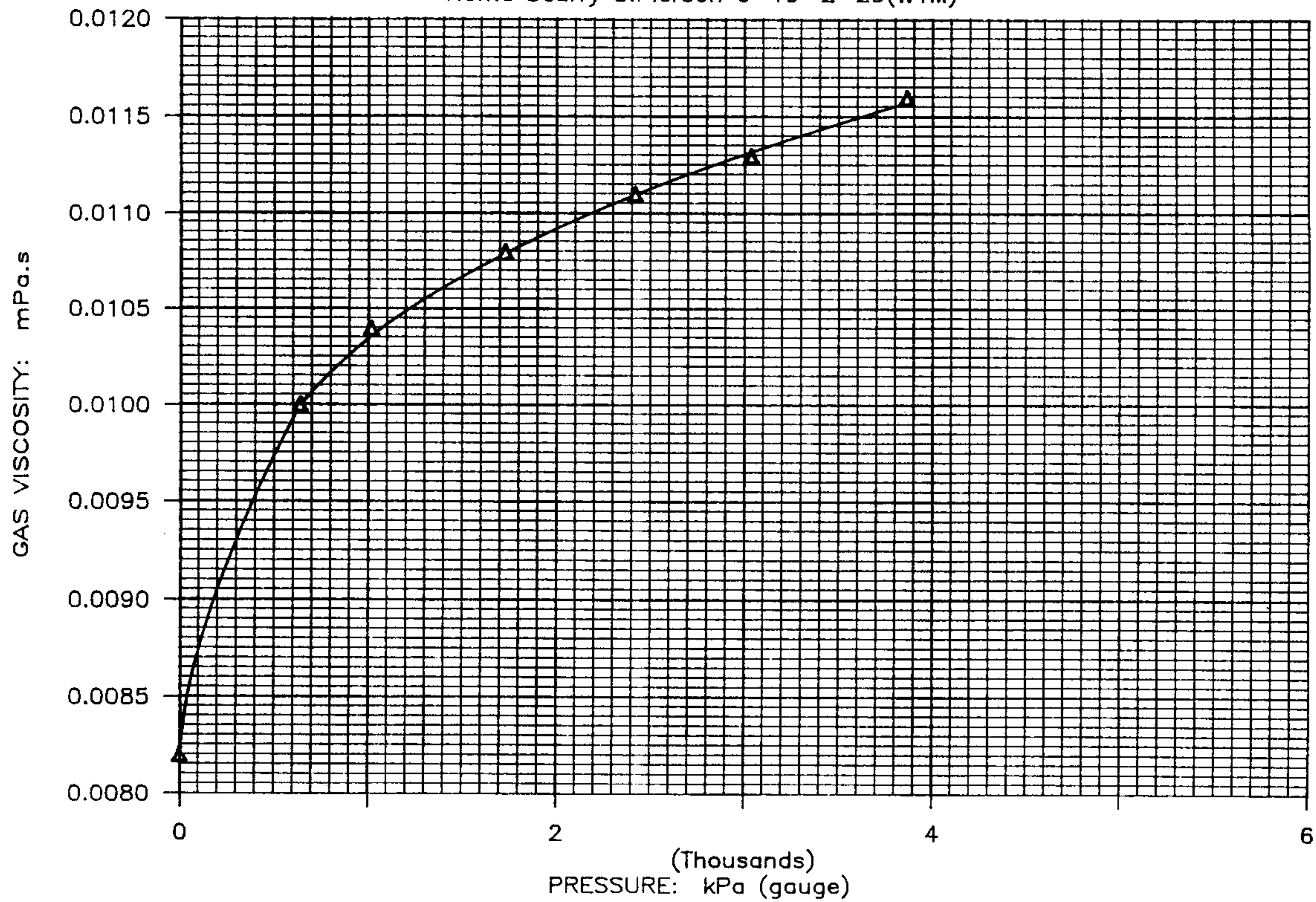
GAS EXPANSION FACTOR

Home Scurry S.Pierson 6-19-2-29(W1M)



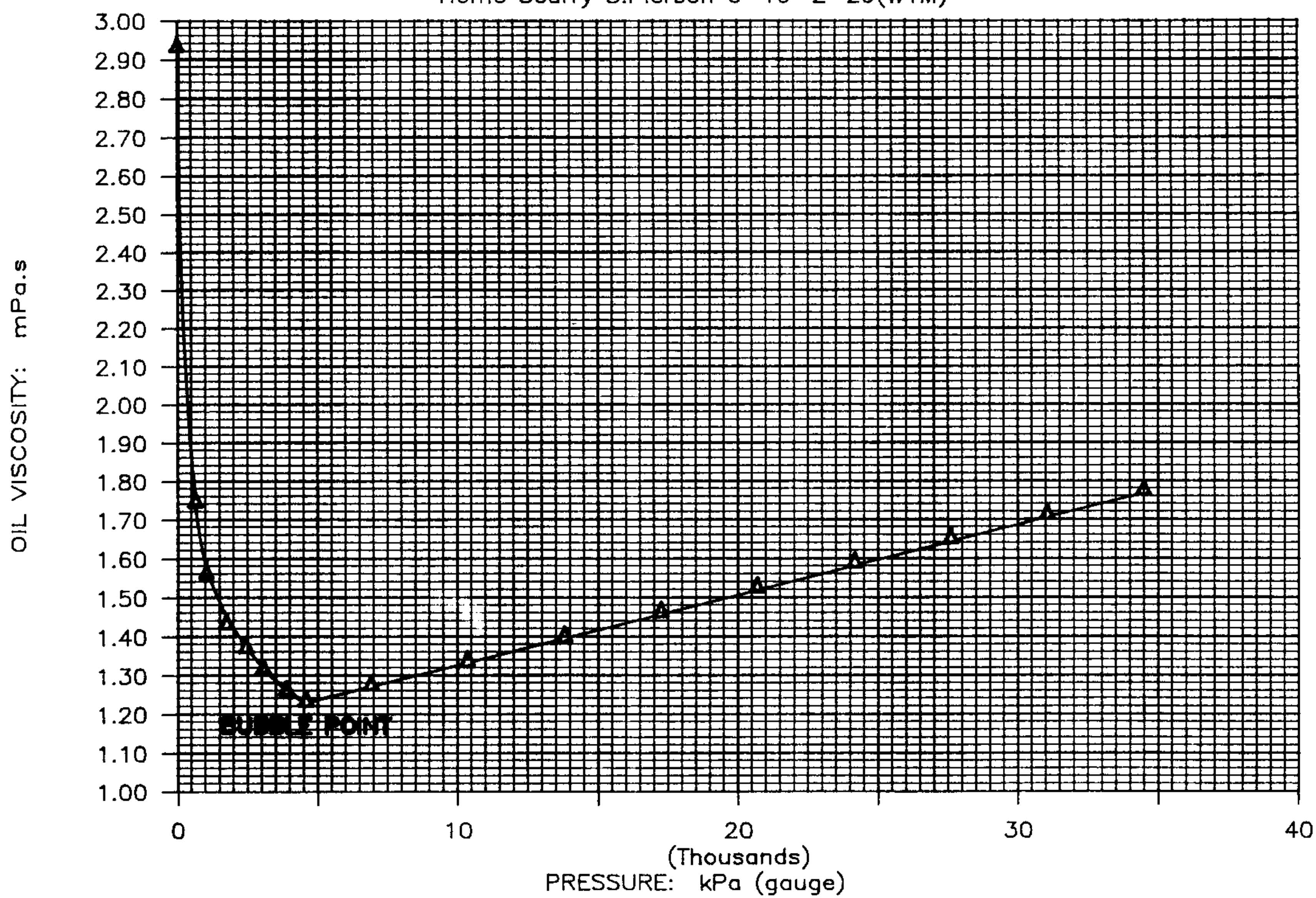
GAS VISCOSITY

Home Scurry S.Pierson 6-19-2-29(W1M)



OIL VISCOSITY

Home Scurry S.Pierson 6-19-2-29(W1M)



SECTION III

Data Adjustment

INTRODUCTION TO DATA ADJUSTMENT

Reservoir fluids, while being produced, simultaneously undergo two different thermodynamic processes. One is the flash separation process which occurs in surface separation facilities, and the second is insitu reservoir fluid expansion ultimately resulting in differential equilibrium separation of gas and oil in the reservoir during reservoir pressure decline.

Flash separation data are referenced to reservoir fluid volumes at saturation pressure (bubble point). The data are usable only at the specific instant when the reservoir pressure is equal to the saturation pressure as determined in the PVT study.

It is therefore necessary to adjust flash separation data to account for the insitu changes in reservoir fluid properties that will occur during primary pressure depletion. Both the flash solution gas-oil ratio data (R_s) and the flash formation volume factor data (B_o) requires adjustment for pressures above and below the saturation pressure.

The methods by which these adjustments are made are as follows:

A. Solution Gas-Oil Ratio (R_s)

Pressures above P_s: No correction is required as no gas will escape from solution at pressures above the saturation pressure. Therefore, R_s is equal to flash R_s at all pressures in excess of P_s.

Pressures below P_s: Due to insitu differential equilibrium separator of gas and oil, flash separation data must be corrected as follows:

$$R_s = R_sfb - (R_sdb - R_sd)\,\frac{B_ofb}{B_odb}$$

R_s = Adjusted Solution Gas-Oil Ratio

R_sfb = Total Gas-Oil Ratio from Flash at Saturation Pressure

R_sdb = Gas-Oil Ratio from Differential Liberation at Saturation Pressure

R_sd = Gas-Oil Ratio from Differential Liberation at Pressure less than Saturation Pressure

B_ofb = Formation Volume Factor from Flash at Saturation Pressure

B_odb = Relative Oil Volume from Differential Liberation at Saturation Pressure

This correction must be made for all D.V. gas-oil ratio data points below saturation pressure.

B. Formation Volume Factor (B_o)

Pressures above P_s: Because flash formation volume factors are referenced to a volume at saturation pressure, B_o at pressures above saturation pressure must be corrected to account for oil compressibility. The adjustment is:

Adjusted B_o = B_ofb x V/Vsat

Adjusted B_o = Flash Formation Volume Factor for Pressures above Saturation Pressure

B_ofb = Formation Volume Factor from Flash at Saturation Pressure

V/Vsat = Relative Volume from Pressure Volume Relations at Pressure above Saturation Pressure

CORE
LABORATORIES

COMPANY	Home Oil Company Limited	PAGE	21 of 25
WELL	Home Scurry S Pierson 6-19-2-29	FILE	55377-87-258

Pressures below P_s: Because insitu oil shrinkage occurs due to differential gas liberation at pressures below the saturation pressure (P_s), flash formation volume factors which are referenced to a volume at saturation pressure must be corrected to reflect insitu reservoir fluid shrinkage. The adjustment is as follows:

$$\text{Adjusted } B_o = B_od \frac{B_ofb}{B_odb}$$

Adjusted B_o = Flash Formation Volume Factors for Pressure below Saturation Pressure

B_od = Relative Oil Volume from Differential Liberation at Pressure below Saturation Pressure

B_ofb = Formation Volume Factor from Flash at Saturation Pressure

B_odb = Relative Oil Volume from Differential Liberation at Saturation Pressure

This adjustment must be made for all D.V. relative oil volumes below the saturation pressure.

The above adjustments have been made on your behalf and are reported on the following pages.

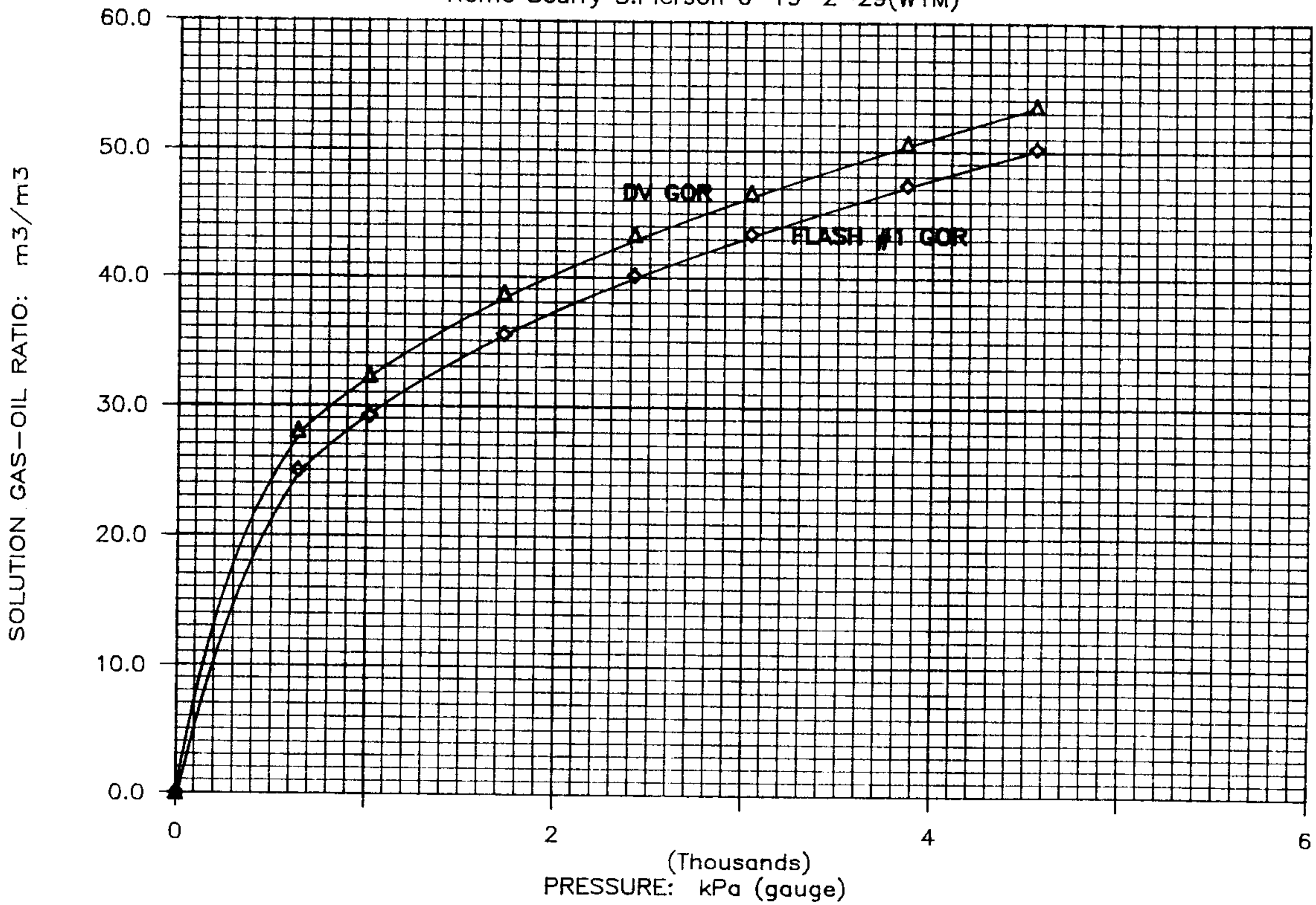
COMPANY	Home Oil Company Limited	PAGE	22 of 25
WELL	Home Scurry S Pierson 6-19-2-29	FILE	55377-87-258

ADJUSTED SOLUTION GAS-OIL RATIOS

PRESSURE kPa (Gauge)	DV GOR R_S	FLASH GOR R_S
34474	53.67	50.28
27579	53.67	50.28
20684	53.67	50.28
13790	53.67	50.28
6895	53.67	50.28
6205	53.67	50.28
5516	53.67	50.28
4551	53.67	50.28
3861	50.69	47.34
3034	46.78	43.49
2413	43.40	40.16
1724	38.77	35.60
1014	32.37	29.30
634	28.10	25.09
0	0.00	0.00

ADJUSTED SOLUTION GAS—OIL RATIOS

Home Scurry S.Pierson 6—19—2—29(W1M)



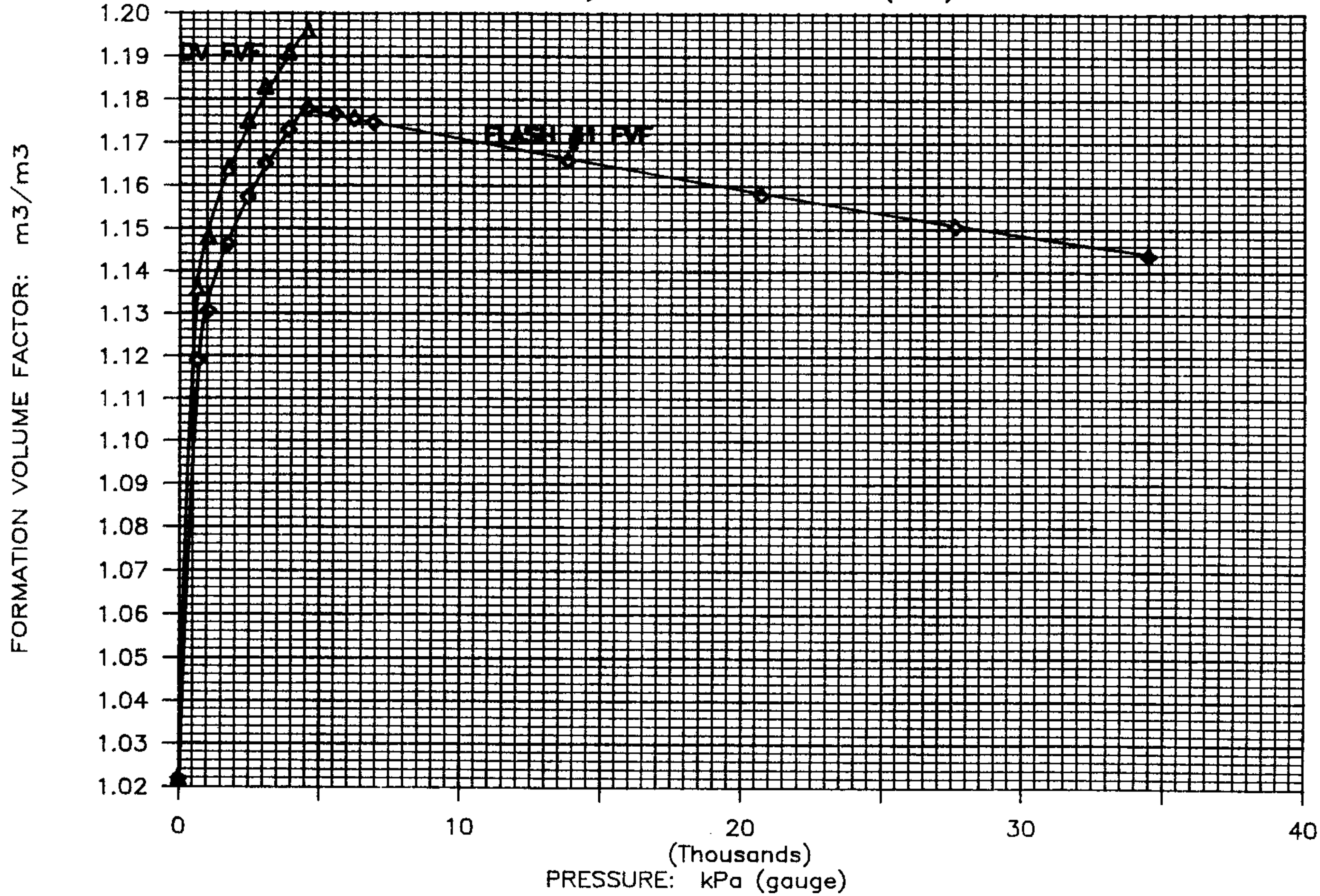
COMPANY	Home Oil Company Limited	PAGE	24 of 25
WELL	Home Scurry S Pierson 6-19-2-29	FILE	55377-87-258

ADJUSTED SOLUTION GAS-OIL RATIOS

PRESSURE kPa (Gauge)	DV FVF B_o	FLASH FVF B_o
34474		1.144
27579		1.151
20684		1.158
13790		1.166
6895		1.175
6205		1.176
5516		1.177
4551	1.196	1.178
3861	1.191	1.173
3034	1.183	1.165
2413	1.175	1.157
1724	1.164	1.146
1014	1.148	1.131
634	1.136	1.119
0	1.022	1.022

ADJUSTED FORMATION VOLUME FACTORS

Home Scurry S.Pierson 6-19-2-29(W1M)



South Pierson

Advanced Core Analysis Study
South Pierson 12-19-002-29 W1M

ADVANCED CORE ANALYSIS STUDY

FOR

HOME OIL COMPANY LIMITED

Home Scurry S. Pierson 12-19-2-29 W1M
Home SRO S. Pierson Prov. 12-20-2-29 W1M
Spearfish Formation
Manitoba

FILE NUMBER: 52132-90-92

DATE: 1991 01 16

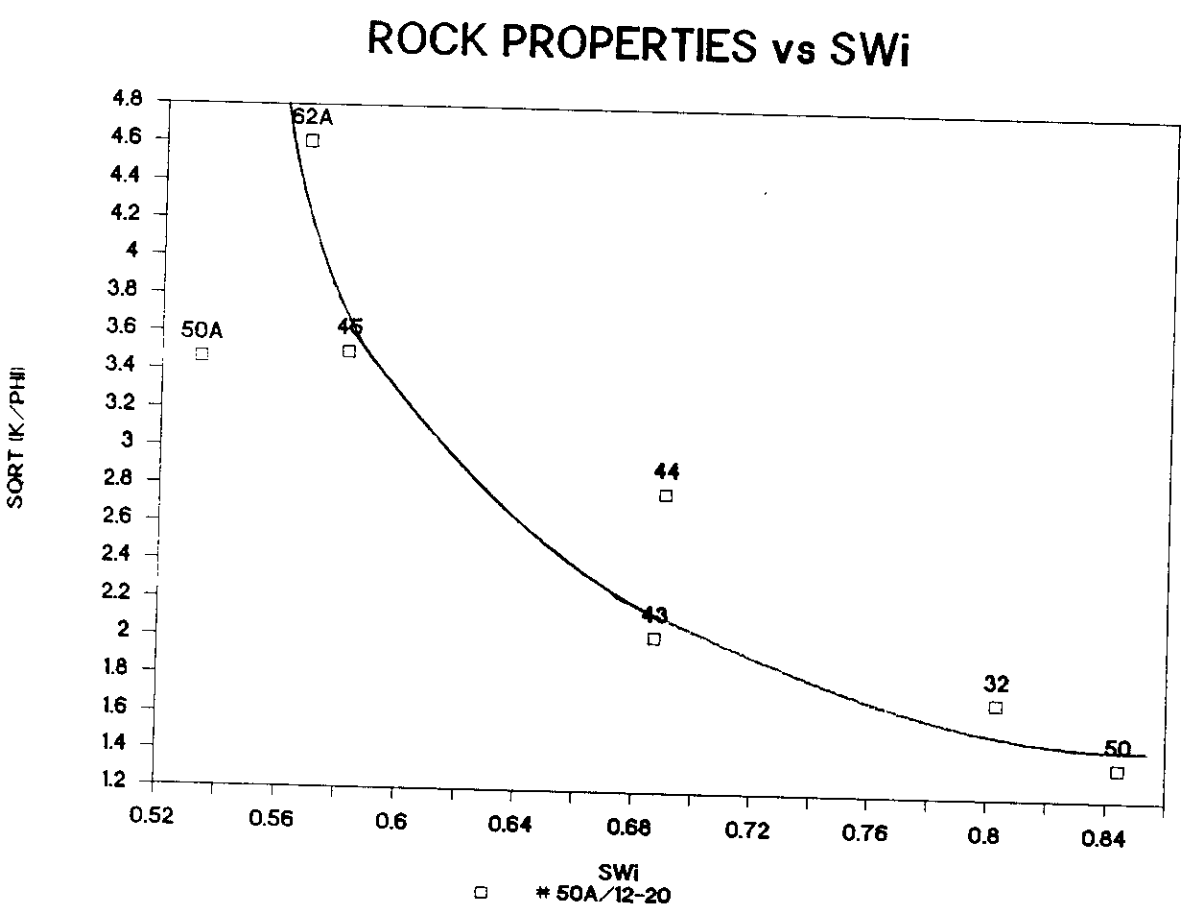
EXECUTIVE SUMMARY

Permeability to Oil at NOB

Fresh state samples (with initial water saturation present) run at equivalent reservoir net overburden pressure give a representative measurement of actual reservoir permeabilities. The results show that even the best rock in the 12-19-2-29 W1M well has only .66 mD permeability. Insufficient samples were run to determine an algorithm relating conventional oven dried permeability to reservoir permeability.

Capillary Pressure Curves

The capillary pressure curves show irreducible water saturations at 1 000 kPa to range from 53.3% to 84.4%. These relatively high initial water saturations reduce the hydrocarbon pore volume potential in the reservoir. The data correlate well with rock properties, giving the expected hyperbolic curve when irreducible water saturation at 1 000 kPa is plotted versus $\sqrt{K/\phi}$. (see graph)



The irreducible water saturations from capillary pressure curves are higher than saturations seen from Dean Stark analysis of the oil base core.

Home Scurry S. Pierson 12-19-2-29 W1M
Oil Base Core

SAMPLE	Sw_i FROM Pc @ 1 000 kPa	Sw_i FROM DEAN STARK
43	.687	.389
44	.690	.448
45	.582	.404
50	.844	.700

This is possible if the pressure differential during drilling exceeded 1 000 kPa (145 psi), thereby flushing brine from the core and replacing it with oil. Additionally, the core saturations may be lower due to evaporation. If the amount of regional closure exceeds the pressure equivalent of 1 000 kPa used in capillary pressure studies, reservoir saturations may be lower than that shown by the capillary pressure data. 1 000 kPa in an air-brine system corresponds to approximately 160 m of closure.

Laboratory capillary pressure can be converted into height above free water level using the following equation:

$$h = \frac{Pc_{Lab} \dfrac{T\cos\theta res}{T\cos\theta lab}}{\rho_{water} - \rho_{hydrocarbon}}$$

h - *height, feet*
Pc_{Lab} - *laboratory capillary pressure, psi*
$T\cos\theta$ - *interfacial tension x cosine of contact angle*
$\rho w/hc$ - *density gradient of water/hydrocarbon, psi/ft*

With the following assumptions:

$T\cos\theta_{Lab}$ = 72
$T\cos\theta_{res}$ = 26
ρ_{water} = .433 *psi/ft*
ρ_{oil} = .33 *psi/ft*

Relative Permeability

Gas-Oil

Gas-oil relative permeability shows poor primary recovery. Sample 4B, the best quality rock, shows better recovery than 4A.

SAMPLE	K_a	ϕ	Ko AT 10% Sg
4A	2.64	.173	.015
4B	4.52	.204	.064

Water-Oil

The basic flood and two steady state relative permeabilities show an average residual oil saturation of 30%. Residual oil saturation does not trend with rock quality in the three samples tested. Additional samples would be required to develop this type of relationship.

ADVANCED CORE ANALYSIS PROCEDURES

Sample Preparation

Core samples representing two South Pierson wells in the Spearfish Formation were selected for Advanced Core Analysis tests. The Home Scurry S. Pierson 12-19-2-29 W1M full diameter material was preserved in oil and the test plugs were drilled using oil as the bit lubricant and coolant. The 31 mm diameter samples chosen for Basic Waterflood and Relative Permeability tests were immersed in oil to preserve their native-state condition until testing could commence. The additional plugs selected for Air-Brine Capillary Pressure tests were cleaned prior to analysis and the routine petrophysical properties were measured. Petrophysical values for the preserved samples were determined upon completion of their respective testing, cleaning and drying processes.

The Home SRO S. Pierson Prov. 12-20-2-29 W1M well was a water-base core and not preserved. Tests plugs from this well were used for Air-Brine Capillary Pressure tests. The 38 mm diameter plugs were drilled with water, extracted with toluene and methanol, and oven dried at 85°C. Permeability to air, Boyle's Law porosity and grain density values were then measured.

Net Overburden Pressure

The Basic Waterflood and Gas-Oil Relative Permeability tests were performed at a hydrostatic net overburden (NOB) pressure of 7 230 kPa which is equivalent to the reservoir NOB pressure of 12 750 kPa. This is because laboratory confinement is hydrostatic (tri-axial) which results in more stress than typical reservoir loading conditions.

Hydrostatic Overburden is calculated by:

$$\frac{1}{3}\,[Depth\ (Pressure\ Gradient) - Pressure] +$$

$$\frac{2}{3}\left(\frac{PR}{1-PR}\right)[Depth\ (Pressure\ Gradient) - Pressure]$$

$$PR = Poisson's\ Ratio\ (assumed\ to\ be\ .26)$$

$$Pressure\ Gradient = 22.68\ \frac{kPa}{m}\ or\ 1.0\ psi/ft$$

Effective Permeability to Brine

To facilitate sample selection for the native state relative permeability tests, a suite of 8 samples were tested to evaluate permeability. Effective permeability was measured at an equivalent reservoir net overburden pressure of 12 750 kPa. 4 of the 8 samples were permeable. The remaining 4 samples had no flow after a 24 hour period with a pressure drop of 12 000 kPa applied.

Air-Brine Porous Plate Capillary Pressure

Air-Brine Capillary Pressure tests were performed on seven samples using the porous plate method. Each sample was evacuated and pressure-saturated with a simulated formation brine containing approximately 160 000 ppm total dissolved solids (T.D.S.). The brine was prepared from a submitted water analysis of the Home Scurry S. Pierson 8-8-2-29 W1M well. The water analysis and simulated brine composition are included in this report.

The saturated samples were placed in a closed cell with one end face in capillary contact with a porous plate that had been saturated with brine. Humidified air was applied to the samples at seven incrementally increasing pressures ranging from 5 kPa to 1 000 kPa. Sufficient time was allowed at each pressure for saturation equilibrium to be established within the plugs. At each equilibrium saturation, the samples were removed from the cell and weighed individually to gravimetrically determine the water saturation. Tests results are presented in tabular and graphical form. A Thin Section photograph and a brief description have also been included for each test sample.

Basic Waterflood

A Basic Waterflood test was performed on sample 1B/12-19 at NOB pressure using simulated formation brine and a refined mineral oil mixture having a viscosity of approximately 1.96 mPa.s. The test fluids were selected to approximate the oil-water viscosity ratio in the reservoir.

The native-state plug was initially flushed to immobile water saturation using a refined mineral oil with a viscosity of approximately 20 mPa.s. The 20 mPa.s oil was displaced with the 1.96 mPa.s oil mixture and an effective permeability was measured. The sample was then flooded to a 99.95% water cut with simulated formation brine. An effective permeability to water at residual oil saturation was determined. After testing, residual fluid saturations were determined by Dean Stark toluene extraction. The plug was leached of salt with methanol and oven dried, after which the petrophysical properties were measured at room and overburden conditions. The overburden values are reported with the Basic Waterflood data.

Unsteady-State Gas-Oil Relative Permeability

Native-state samples 4A/12-19 and 4B/12-19 were chosen for Gas-Oil Relative Permeability tests at the equivalent reservoir NOB pressure of 12 750 kPa. The tests fluids included simulated formation brine and 20 mPa.s refined mineral oil.

An immobile water saturation was confirmed for each sample by flushing with refined mineral oil and effective permeabilities were determined.

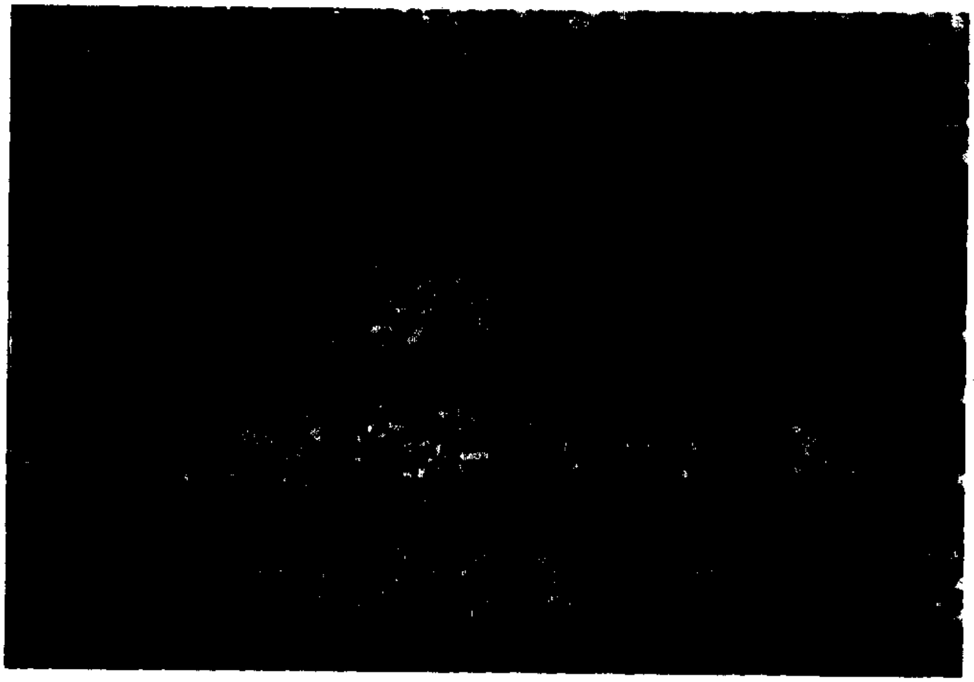
The oil was then displaced with humidified nitrogen gas and incremental volumes of oil and gas production were measured as a function of time. Production data were used to calculate the gas-oil relative permeability characteristics.

Steady-State Water-Oil Relative Permeability

Native state samples 4A/12-19 and 4B/12-19 were also used for steady state water-oil relative permeability tests. After the Gas-Oil Relative Permeability tests, the plugs were subjected to Water-Oil Relative Permeability tests using the steady-state method. The tests were performed at ambient conditions using mineral oil (1.7 mPa.s) and simulated brine.

At the conclusion of the gas-oil tests, the plugs were flushed with Isopar mineral oil (1.7 mPa.s) and effective permeabilities were measured. The plugs were placed in the steady-state apparatus and the tests were performed using several water-oil ratios in the imbibition, water saturation increasing, direction. During testing, the oil and water flow rates were monitored and subsequently used to calculate the relative permeability data.

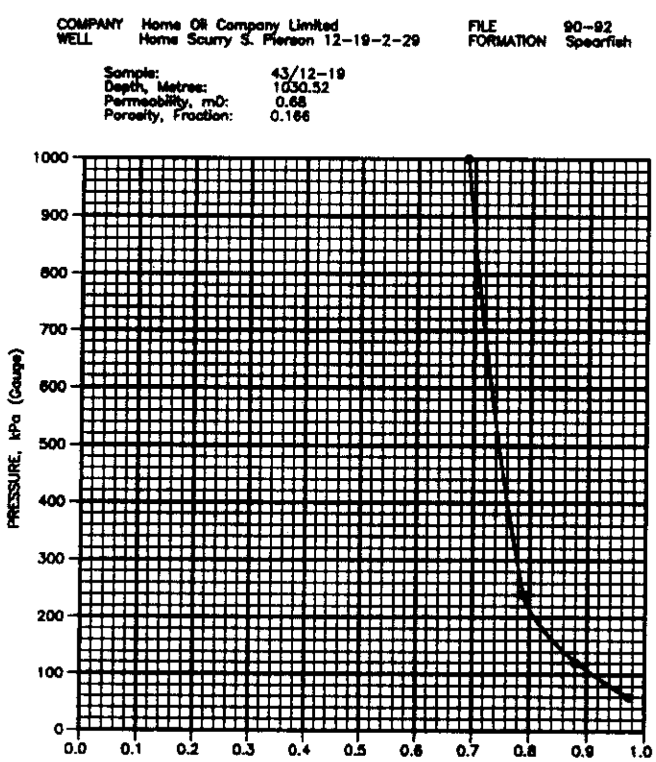
After testing, the plugs were extracted with toluene in the Dean Stark apparatus to determine residual fluid saturations. Permeability to air and Boyle's Law porosity were measured at ambient and overburden conditions. The ambient values are reported with the water-oil test results and the overburden values are reported with the unsteady-state gas-oil relative permeability data.

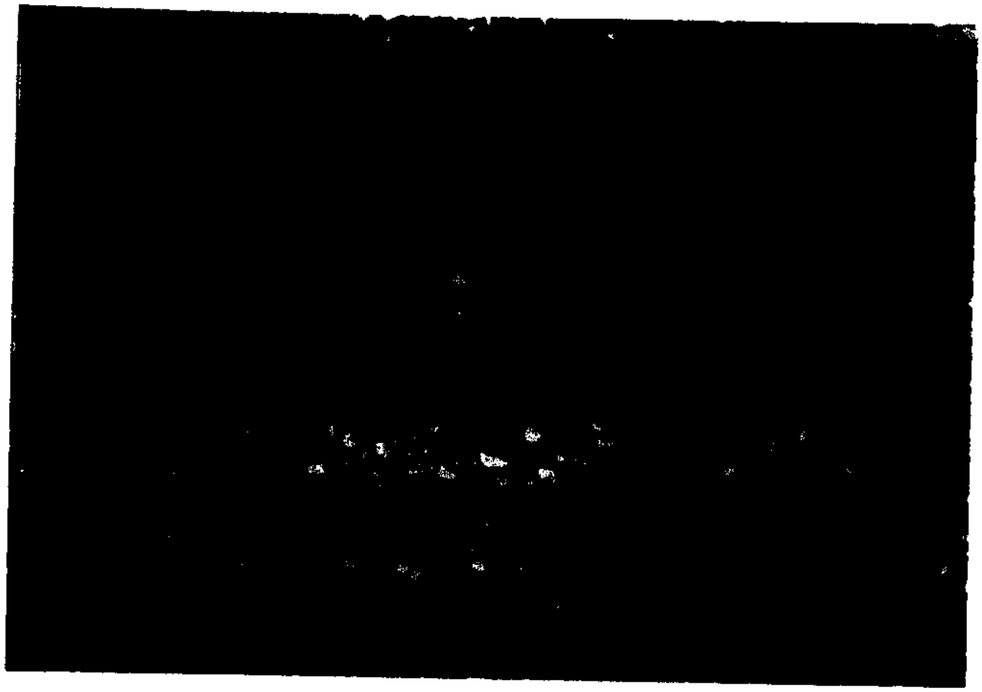


<u>**Sample Number: SP43**</u>

This low magnification overview shows a moderately lithified, moderately, sorted siltstone which has a visual effective porosity of 12%. Primary intergranular porosity is the main pore type with minor microporosity associated with the authigenic and detrital matrix clays. The mean pore size is 0.04 mm and pore interconnectedness is poor. Cements are dominated by poikilotopic anhydrite (white areas) with local ferroan dolomite (dark turquoise mineral). Blue epoxy represents porosity. (50x, plane polarized light)

AIR-BRINE CAPILLARY PRESSURE





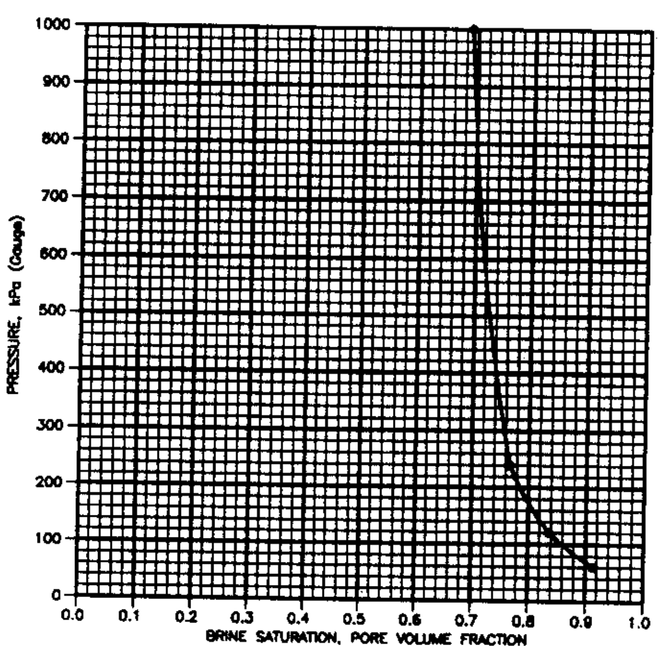
<u>Sample Number: SP44</u>

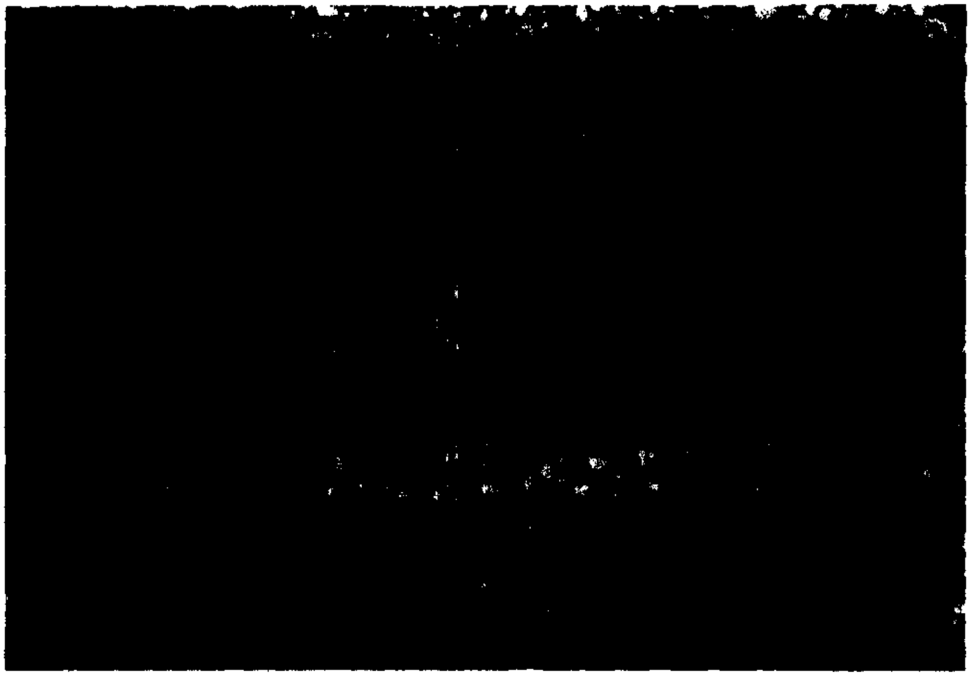
This low magnification overview shows a moderately lithified, moderate, sorted siltstone which has a visual effective porosity of 14%. Poikilotopic anhydrite (middle right) is the main cement with minor (1-2%) amounts of dolomite and calcite (not shown) and authigenic pyrite (opaque minerals). The mean pore size is 0.04 mm and the pore interconnectedness is poor to moderate. Blue epoxy represents porosity (50x, plane polarized light)

AIR-BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited   FILE 90-92
WELL Home Sourry S. Pierson 12-19-2-29   FORMATION Spearfish

Sample:	44/12-19
Depth, Metres:	1031.34
Permeability, mD:	1.40
Porosity, Fraction:	0.181





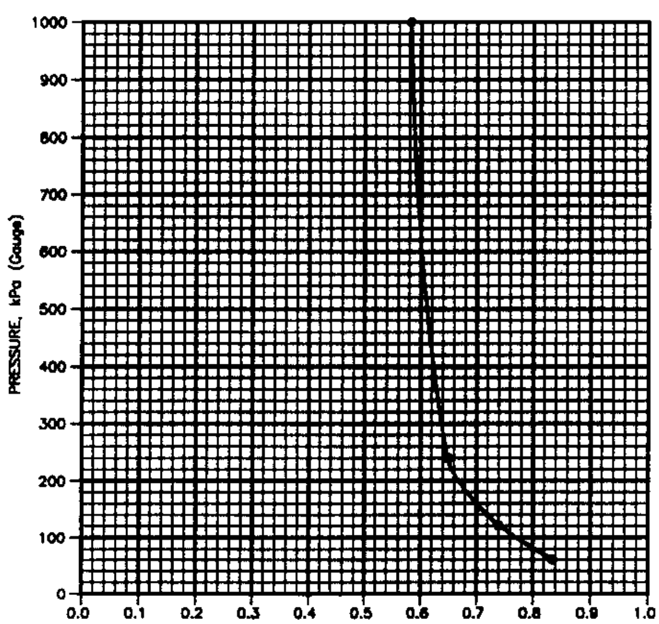
Sample Number: SP45

This is a low magnification overview of a moderately lithified, moderately sorted siltstone which has a visual effective porosity of 11%. Detrital constituents are dominated by monocrystalline quartz with common alkali feldspar (yellow stained mineral) and trace to minor amounts of polycrystalline quartz, plagioclase feldspar, chert, sedimentary rock fragments, muscovite, biotite, chlorite and heavy minerals. Common microporosity is associated with the dolomitic matrix clays (brown areas) which comprise 15% of the bulk sample composition. The mean pore size is 0.04 mm and the pore interconnectedness is poor to moderate. Blue epoxy represents porosity. (50x, plane polarized light)

AIR-BRINE CAPILLARY PRESSURE

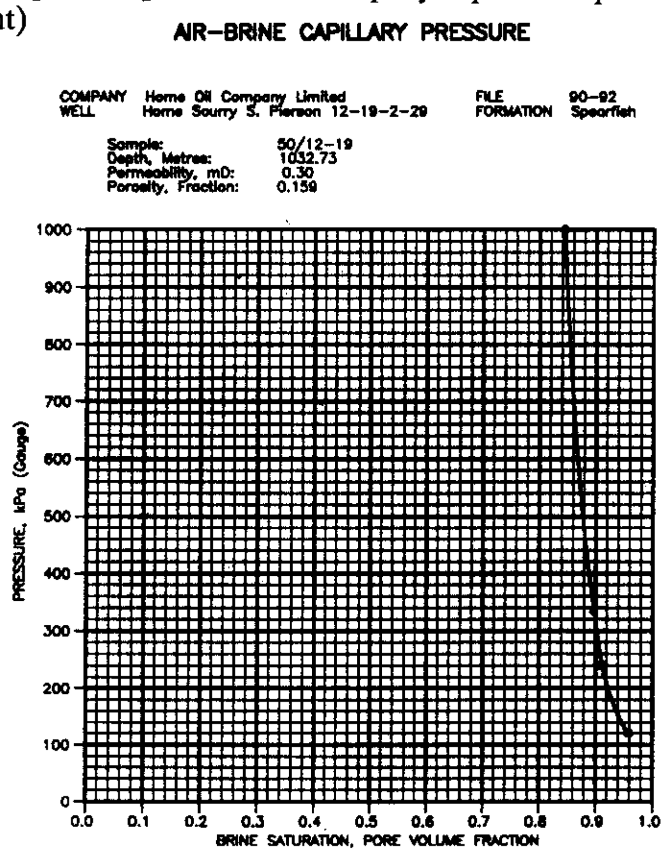
COMPANY	Home Oil Company Limited	FILE	90-92
WELL	Home Scurry S. Pierson 12-19-2-29	FORMATION	Spearfish

Sample:	45/12-19
Depth, Metres:	1031.55
Permeability, mD:	2.39
Porosity, Fraction:	0.195



Sample Number: SP50

This low magnification overview shows a moderately lithified, moderately sorted siltstone which has a visual effective porosity of 3%. Microporosity associated with the dolomitic matrix clays and ferroan dolomite cement (dark turquoise stained mineral) is the main pore type. The mean pore size associated with primary intergranular porosity is 0.03 mm and pore interconnectedness is very poor. Note the anhydrite cement (middle) and calcite cement (red stained mineral) which comprises 7% and 2% respectively of the bulk sample composition. Blue epoxy represents porosity. (50x, plane polarized light)



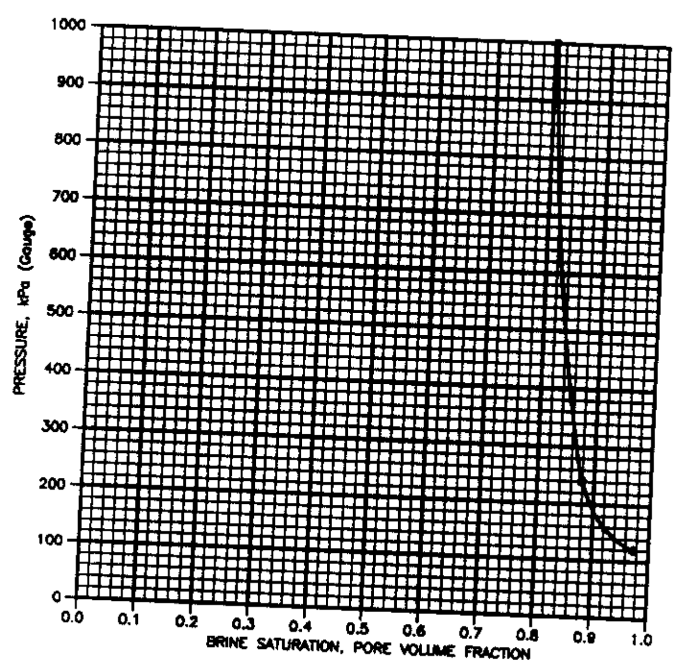
Sample Number: SP32

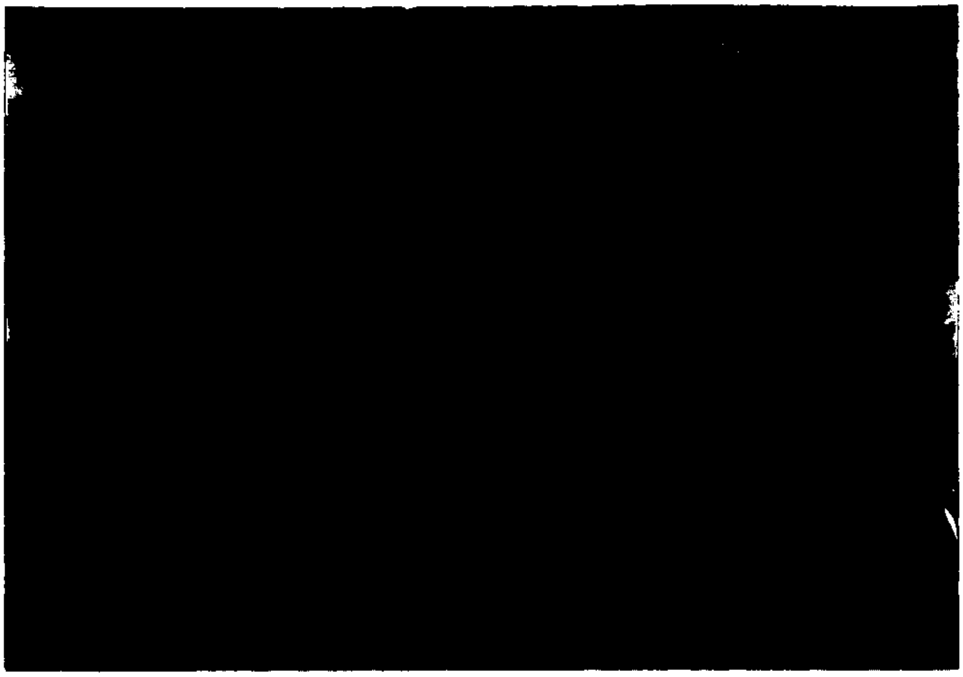
This photo shows a low magnification overview of a moderately lithified, moderately sorted, lower very fine grained, silty sandstone which is described under Folk's classification as a subarkose. Visual effective porosity is 10% and pore interconnectedness is poor. The mean pore size ranges from 0.02 mm to 0.06 mm. Anhydrite cement (lower right) comprises 7% of the sample composition. Blue epoxy represents porosity. (50x, plane polarized light).

AIR–BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited
WELL Home SRO S. Pierson Prov. 12–20–2–29
FILE 90–92
FORMATION Spearfish

Sample: 32/12–20
Depth, Metres: 1017.70
Permeability, mD: 0.42
Porosity, Fraction: 0.144





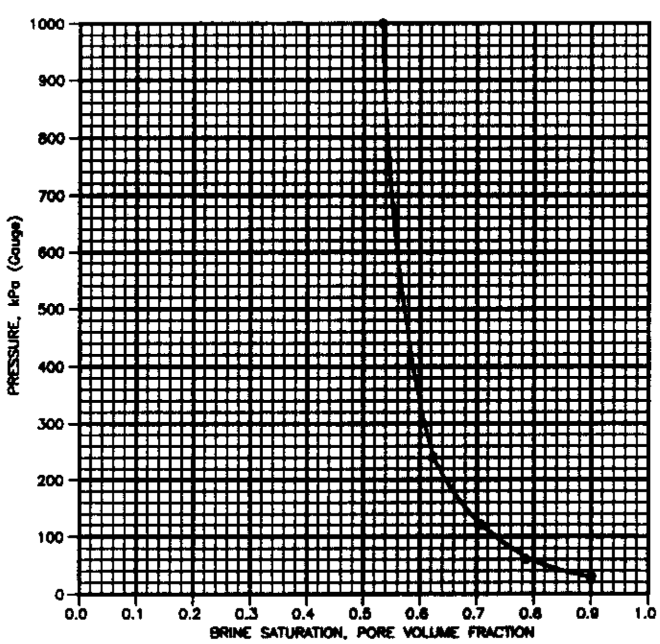
Sample Number: SP50

This photo shows a low magnification overview of a moderately lithified, moderately sorted, lower very fine grained, laminated, silty sandstone which is described under Folk's classification as a subarkose. Visual effective porosity is 12% and pore interconnectedness is poor to moderate. The mean pore size ranges from 0.02 mm to 0.06 mm. Primary intergranular porosity is the main pore type with common microporosity associated with the dolomitic matrix clay (brown areas). The yellow stained mineral is alkali feldspar. Blue epoxy represents porosity. (50x, plane polarized light)

AIR–BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited FILE 90–92
WELL Home SRO S. Pierson Prov. 12–20–2–29 FORMATION Spearfish

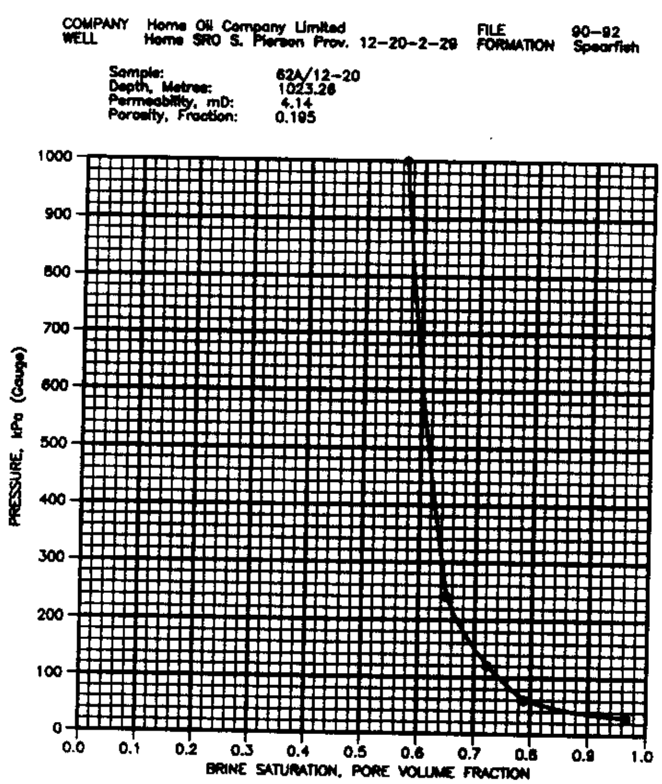
Sample: 50/12–20
Depth, Metres: 1021.20
Permeability, mD: 2.26
Porosity, Fraction: 0.188



Sample Number: SP62

This photo shows a low magnification overview of a moderately lithified, moderately sorted, lower very fine grained sandstone which is described under Folk's classification as a subarkose. Monocrystalline quartz is the main detrital constituent with common alkali feldspar and trace to minor amounts of polycrystalline quartz, plagioclase feldspar, chert, sedimentary rock fragments, muscovite, biotite, chlorite, heavy minerals and glauconite. Visual effective porosity is 16% and pore interconnectedness is poor to moderate. The mean pore size is 0.06 mm. Blue epoxy represents porosity (50x, plane polarized light)

AIR-BRINE CAPILLARY PRESSURE



CORE LABORATORIES

FILE 52132-90-92

COMPANY Home Oil Company Limited
WELL
LOCATION

FORMATION Spearfish
FIELD South Pierson
PROVINCE Manitoba

IDENTIFICATION OF SAMPLES

Home Scurry S. Pierson 12-19-2-29 W1M

SAMPLE NUMBER	DEPTH, METRES	PERMEABILITY TO AIR, MILLIDARCYS	POROSITY, FRACTION	GRAIN DENSITY kg/m³	LITHOLOGICAL DESCRIPTION
1A/12-19	1030.36	0.79	0.125	2660	SST: gn, vf gr, mod srt, wl lith, arg, dol cmt
1B/12-19	1030.41	2.46	0.160	2720	SST: gn, vf gr, mod srt, wl lith, dol cmt, mnr anhy
43/12-19	1030.52	0.68	0.166	2730	SLTST: gn, mod srt, mod lith, slily aren, anhy & dol cmt
44/12-19	1031.34	1.40	0.181	2720	SLTST: gn, mod srt, mod lith, slily aren, anhy & dol cmt
45/12-19	1031.55	2.39	0.195	2720	SLTST: gn, mod srt, mod lith, slily aren, anhy & dol cmt
4A/12-29	1032.04	2.64	0.173	2690	SST: gn, vf gr, mod srt, wl lith, dol cmt, mnr anhy
4B/12-19	1032.09	4.52	0.204	2680	SST: gn, vf gr, mod srt, wl lith, dol cmt
50/12-19	1032.73	0.30	0.159	2740	SLTST: gn-rd, mod srt, mod lith, com anhy, dol & mnr calc cmt, pyr

FILE 52132-90-92

COMPANY	Home Oil Company Limited	**FORMATION**	Spearfish
WELL		**FIELD**	South Pierson
LOCATION		**PROVINCE**	Manitoba

IDENTIFICATION OF SAMPLES

SAMPLE NUMBER	DEPTH, METRES	PERMEABILITY TO AIR, MILLIDARCYS	POROSITY, FRACTION	GRAIN DENSITY kg/m^3	LITHOLOGICAL DESCRIPTION
Home SRO S. Pierson Prov. 12-20-2-29 W1M					
32/12-20	1017.70	0.42	0.144	2730	SST: gn, l vf gr, mod srt, mod lith, slty, anhy & dol cmt
41/12-20	1019.43	1.40	0.176	2690	SLTST: gn-rd, mod srt, mod lith, slily aren, anhy, dol & mnr calc cmt, lam
41A/12-20	1019.43	1.87	0.182	2700	SLTST: gn-rd, mod srt, mod lith, slily aren, anhy, dol & mnr calc cmt, lam
50/12-20	1021.20	2.26	0.188	2720	SST: gn, l vf gr, mod srt, mod lith, slty, anhy & dol cmt, lam
62/12-20	1023.26	3.04	0.196	2710	SST: gn, l vf gr, mod srt, mod lith, slty, dol & anhy cmt
62A/12-20	1023.26	4.14	0.195	2730	SST: gn, l vf gr, mod srt, mod lith, slty, dol & anhy cmt, pyr

SIMULATED BRINE COMPOSITION

CONSTITUENTS	CONCENTRATION, mg/L
Sodium Chloride (NaCl)	139 269
Potassium Chloride (KCl)	1 316
Calcium Chloride ($CaCl_2 \cdot 2H_2O$)	13 953
Magnesium Chloride ($MgCl_2 \cdot 6H_2O$)	9 143
Sodium Bicarbonate ($NaHCO_3$)	252
Sodium Sulphate (Na_2SO_4)	4 405

The brine composition was prepared from the following analysis:

COMPANY	Home Oil Company Limited	FORMATION	Spearfish
WELL	Home Scurry S. Pierson 8-8-2-29	FIELD	South Pierson
LOCATION	LSD 8-8-2-29 W1M	PROVINCE	Manitoba

CONSTITUENT	CONCENTRATION mg/L	CONSTITUENT	CONCENTRATION mg/L
Sodium	56 280	Chloride	106 000
Potassium	690	Bicarbonate	183
Calcium	3 804	Sulphate	2 979
Magnesium	1 093		

CORE
LABORATORIES

FILE 52132-90-92

COMPANY Home Oil Company Limited
WELL
LOCATION

FORMATION Spearfish
FIELD South Pierson
PROVINCE Manitoba

PERMEABILITY TO OIL AT NOB ON FRESH STATE SAMPLES

SAMPLE	DEPTH (m)	PERMEABILITY TO AIR, MILLIDARCYS	PERMEABILITY TO OIL @ NOB, MILLIDARCYS
1A/12-19	1030.36	.79	.12
1B/12-19	1030.41	2.46	.16
2A/12-19	1031.04	-	Too tight for flow
2B/12-19	1031.09	-	Too tight for flow
3A/12-19	1031.48	-	Too tight for flow
3B/12-19	1031.52	-	Too tight for flow
4A/12-19	1032.04	2.64	.66
4B/12-19	1032.09	4.52	.56

* Equivalent reservoir net overburden pressure of 12 750 kPa.

FILE 52132-90-92

COMPANY	Home Oil Company Limited	FORMATION	Spearfish
WELL		FIELD	South Pierson
LOCATION		PROVINCE	Manitoba

AIR-BRINE CAPILLARY PRESSURE DATA

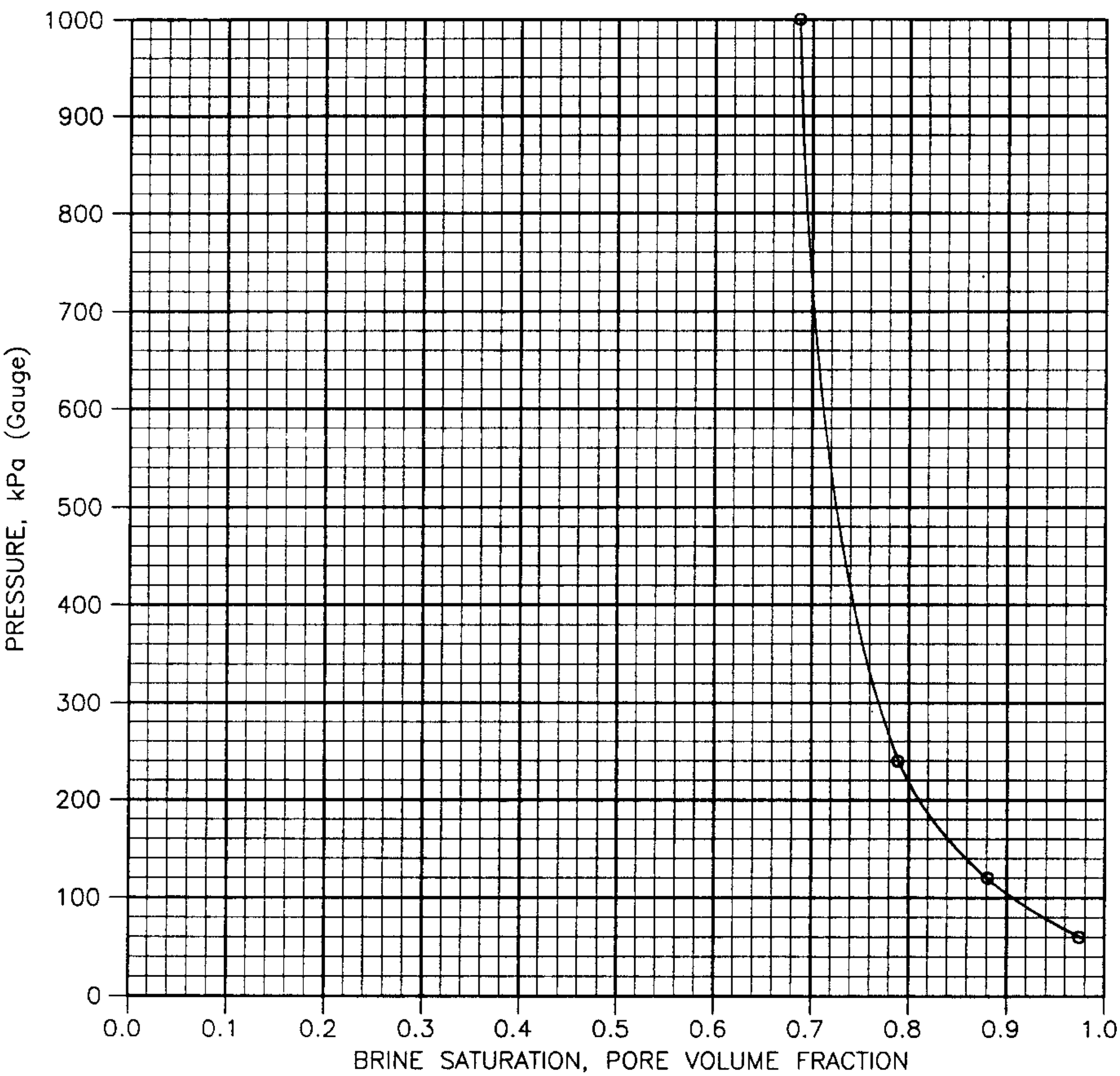
PRESSURE, kPa (gauge)				5	15	30	60	120	240	1 000
SAMPLE NUMBER	DEPTH, METRES	PERMEABILITY TO AIR, MILLIDARCYS	POROSITY FRACTION	WETTING PHASE SATURATION, PORE VOLUME FRACTION						
Home Scurry S. Pierson 12-19-2-29 W1M										
43/12-19	1030.52	0.68	0.166	1.000	1.000	1.000	0.974	0.881	0.789	0.687
44/12-19	1031.34	1.40	0.181	1.000	1.000	1.000	0.914	0.837	0.767	0.690
45/12-19	1031.55	2.39	0.195	1.000	1.000	1.000	0.835	0.740	0.649	0.582
50/12-19	1032.73	0.30	0.159	1.000	1.000	1.000	1.000	0.959	0.911	0.844
Home SRO S. Pierson Prov. 12-20-2-29 W1M										
32/12-20	1017.70 A	0.42	0.144	1.000	1.000	1.000	1.000	0.974	0.879	0.803
50/12-20	1021.20 F	2.26	0.188	1.000	1.000	0.901	0.786	0.707	0.623	0.533
62A/12-20	1023.26 C	4.14	0.195	1.000	1.000	0.967	0.788	0.723	0.649	0.568

AIR–BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited
WELL Home Scurry S. Pierson 12–19–2–29

FILE 90–92
FORMATION Spearfish

Sample: 43/12–19
Depth, Metres: 1030.52
Permeability, mD: 0.68
Porosity, Fraction: 0.166

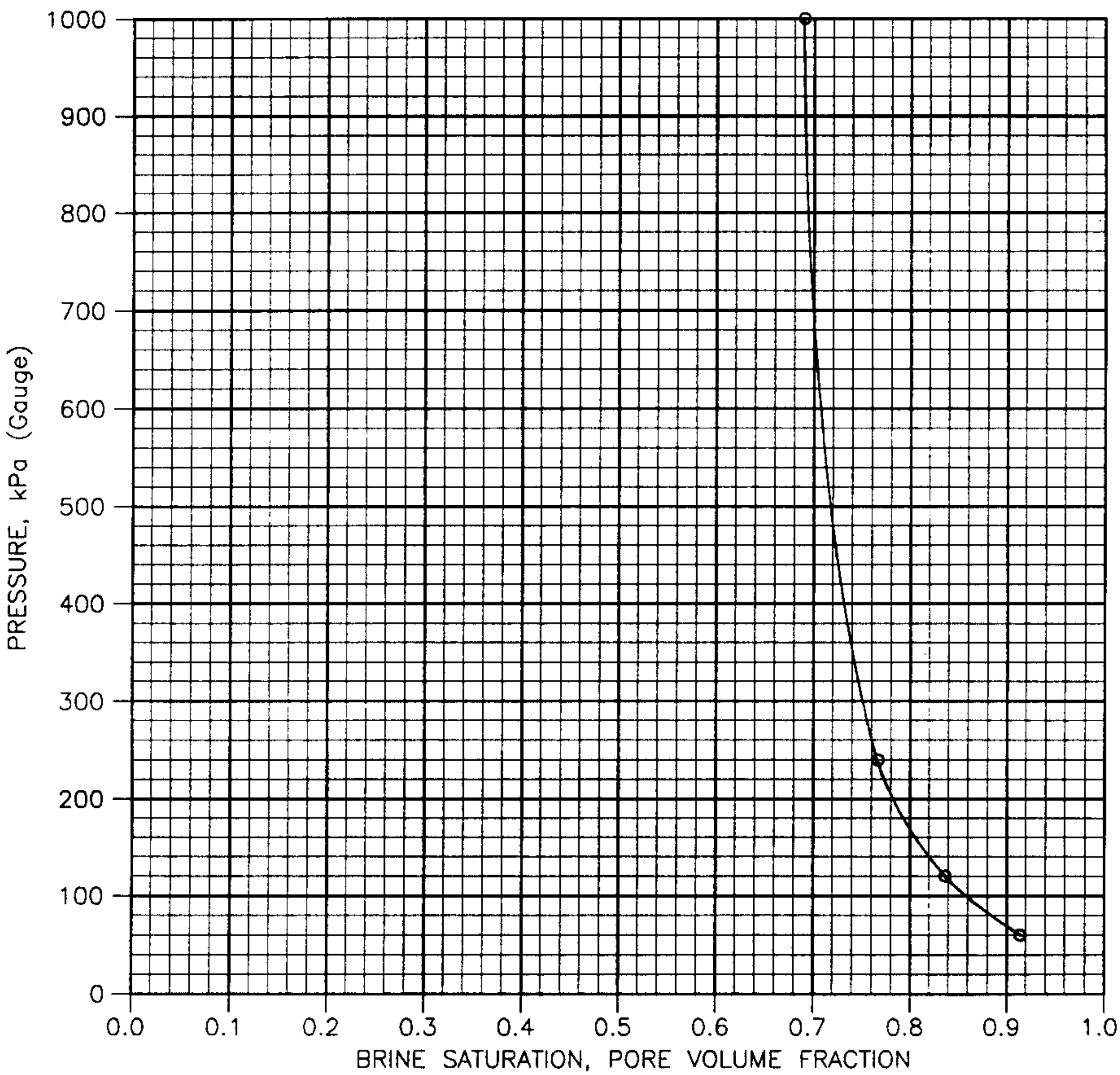


AIR-BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited
WELL Home Scurry S. Pierson 12-19-2-29

FILE 90-92
FORMATION Spearfish

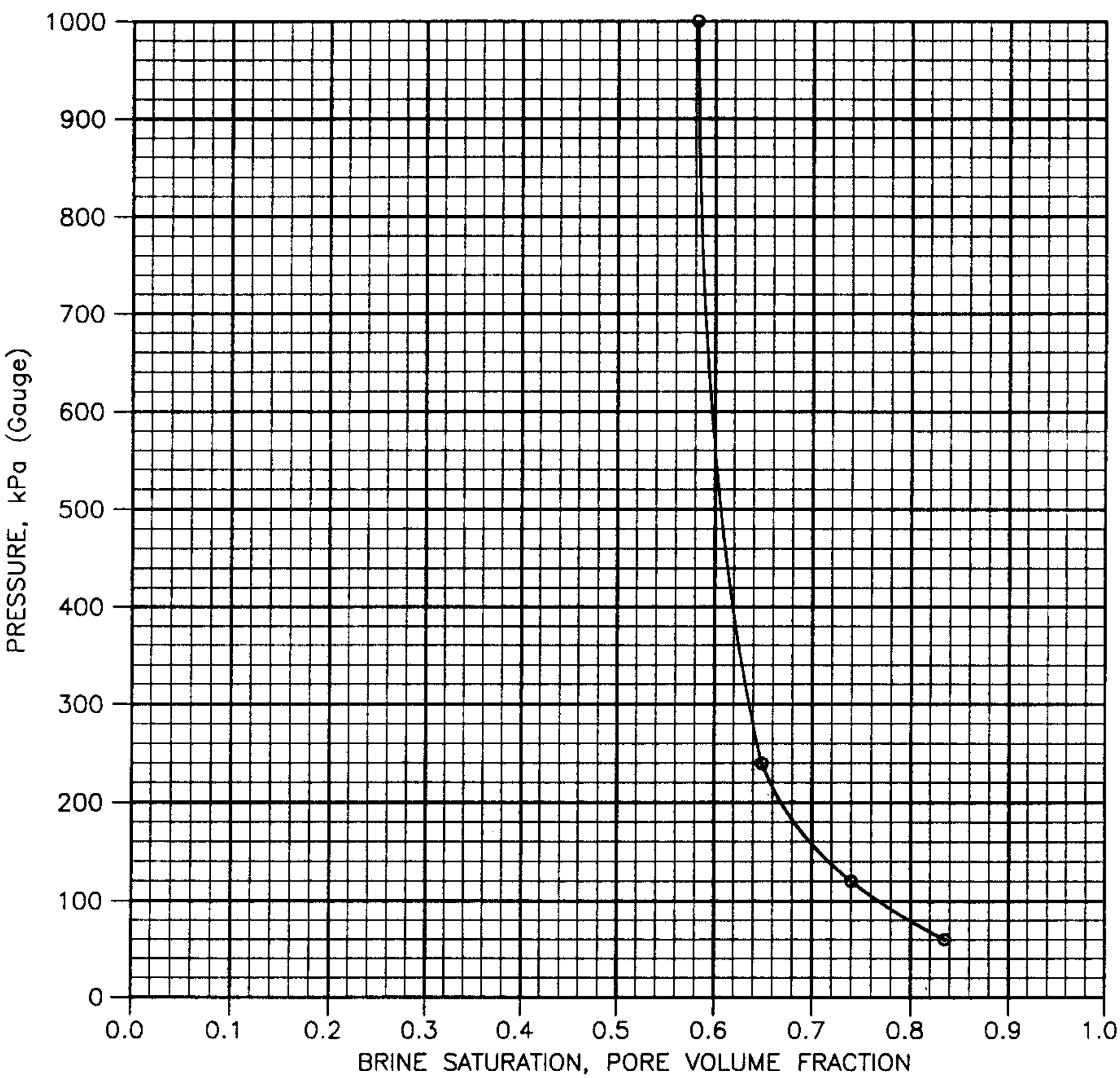
Sample: 44/12-19
Depth, Metres: 1031.34
Permeability, mD: 1.40
Porosity, Fraction: 0.181



AIR–BRINE CAPILLARY PRESSURE

COMPANY	Home Oil Company Limited	FILE	90–92
WELL	Home Scurry S. Pierson 12–19–2–29	FORMATION	Spearfish

Sample:	45/12–19
Depth, Metres:	1031.55
Permeability, mD:	2.39
Porosity, Fraction:	0.195

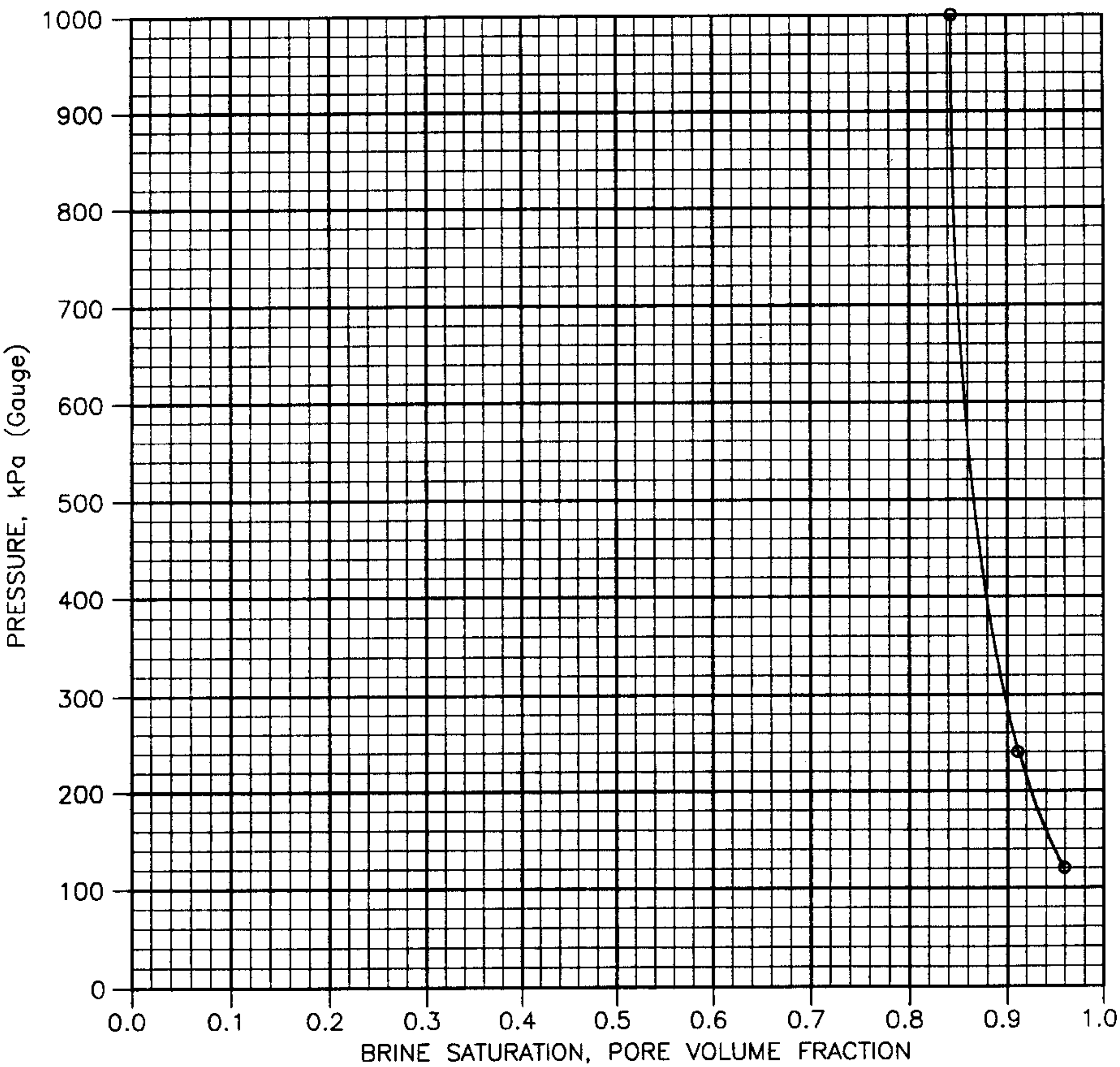


AIR–BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited
WELL Home Scurry S. Pierson 12–19–2–29

FILE 90–92
FORMATION Spearfish

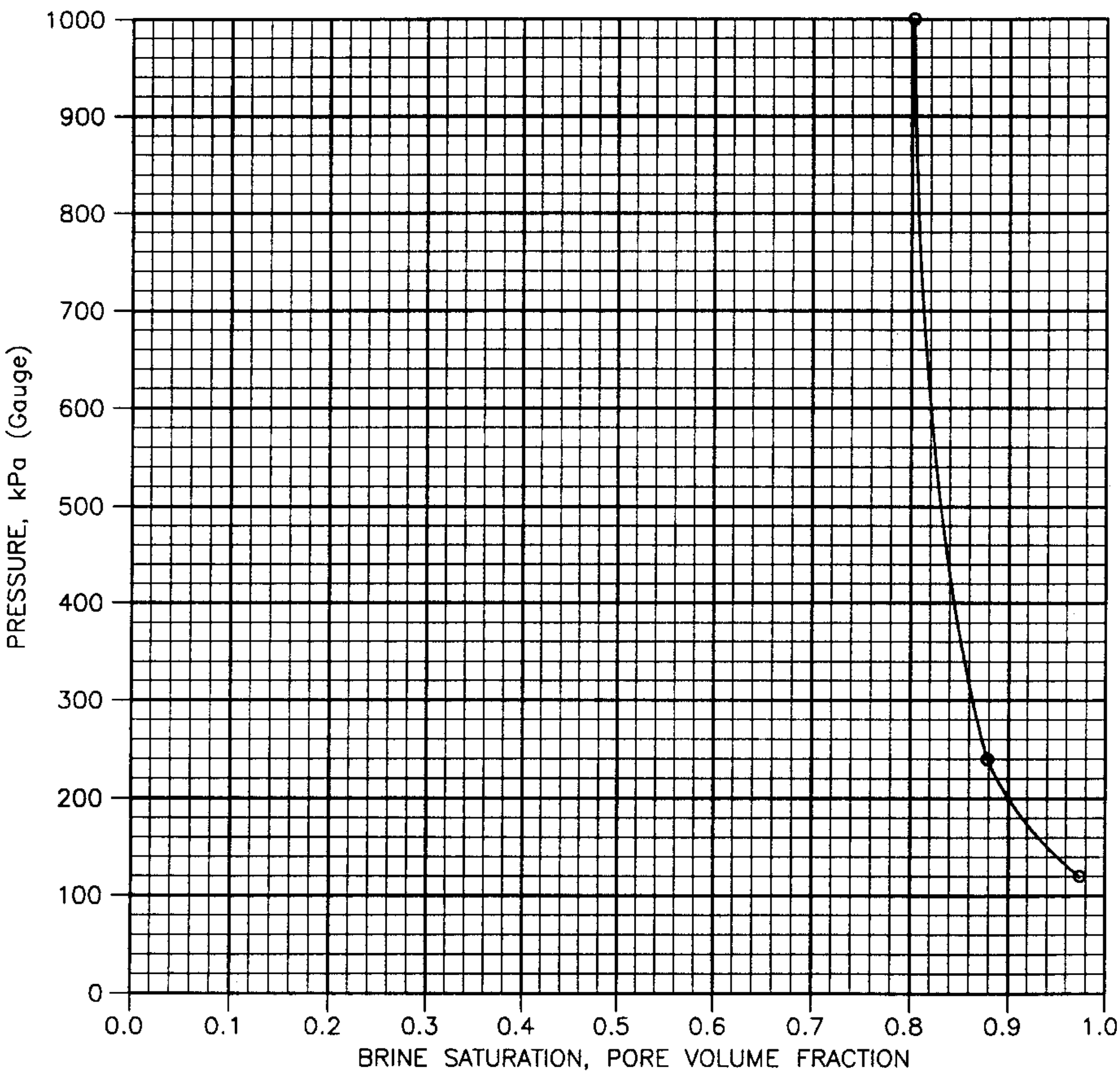
Sample: 50/12–19
Depth, Metres: 1032.73
Permeability, mD: 0.30
Porosity, Fraction: 0.159



AIR-BRINE CAPILLARY PRESSURE

COMPANY	Home Oil Company Limited	FILE	90-92
WELL	Home SRO S. Pierson Prov. 12-20-2-29	FORMATION	Spearfish

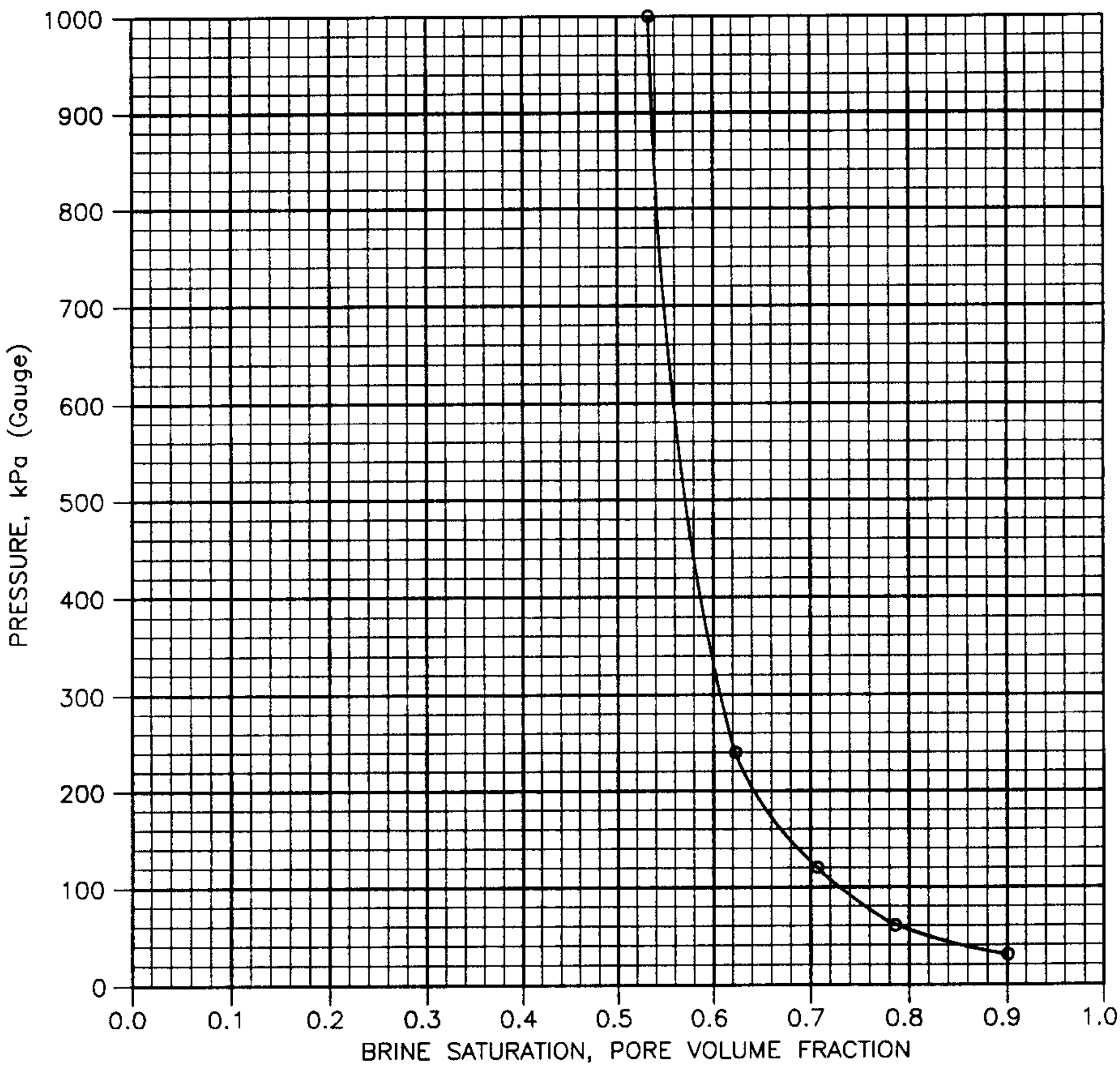
Sample:	32/12-20
Depth, Metres:	1017.70
Permeability, mD:	0.42
Porosity, Fraction:	0.144



AIR-BRINE CAPILLARY PRESSURE

COMPANY Home Oil Company Limited
WELL Home SRO S. Pierson Prov. 12-20-2-29
FILE 90-92
FORMATION Spearfish

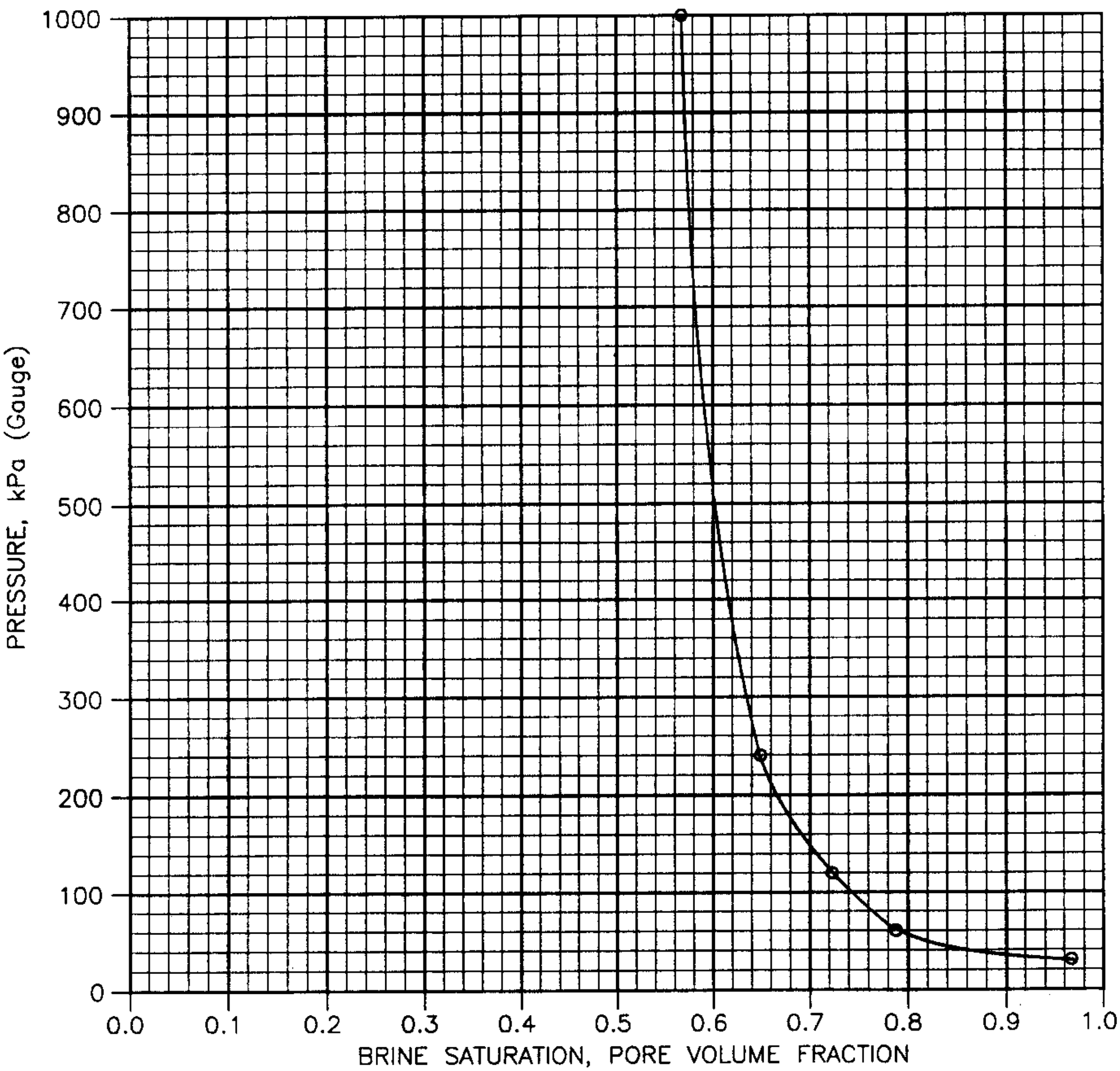
Sample: 50/12-20
Depth, Metres: 1021.20
Permeability, mD: 2.26
Porosity, Fraction: 0.188



AIR–BRINE CAPILLARY PRESSURE

COMPANY	Home Oil Company Limited	FILE	90–92
WELL	Home SRO S. Pierson Prov. 12–20–2–29	FORMATION	Spearfish

Sample:	62A/12–20
Depth, Metres:	1023.26
Permeability, mD:	4.14
Porosity, Fraction:	0.195



CORE
LABORATORIES

FILE 52132-90-92

COMPANY	Home Oil Company Limited	FORMATION	Spearfish C
WELL	Home Scurry S. Pierson 12-19-2-29	FIELD	South Pierson
LOCATION	LSD 12-19-2-29 W1M	PROVINCE	Manitoba

UNSTEADY-STATE GAS-OIL RELATIVE PERMEABILITY DATA

SAMPLE NUMBER: 4A/12-19

INITIAL WATER SATURATION, FRACTION PORE SPACE: 0.433 @ NOB

PERMEABILITY TO AIR: 2.11 @ NOB

POROSITY, FRACTION: 0.167 @ NOB

PERMEABILITY TO OIL AT INITIAL WATER SATURATION, mD: 0.624 @ NOB

S_g GAS SATURATION FRACTION PORE SPACE	k_{rg}/k_{ro} GAS-OIL RELATIVE PERMEABILITY RATIO	k_{rgw} RELATIVE PERMEABILITY TO GAS* FRACTION	k_{row} RELATIVE PERMEABILITY TO OIL* FRACTION
0.000	0.000	0.000	1.000
0.016	0.063	0.023	0.365
0.018	0.089	0.029	0.329
0.022	0.121	0.035	0.289
0.025	0.154	0.040	0.261
0.029	0.191	0.045	0.235
0.032	0.234	0.049	0.211
0.035	0.281	0.053	0.190
0.038	0.335	0.057	0.171
0.043	0.473	0.065	0.137
0.054	0.949	0.081	0.085
0.061	1.55	0.098	0.063
0.065	2.04	0.114	0.056
0.072	3.15	0.136	0.043
0.083	5.79	0.165	0.029
0.093	10.6	0.200	0.019
0.104	19.1	0.240	0.013
0.119	48.7	0.282	0.0058

S_{Lr} : .8810
S_{wi} : = .433
S_{org} : .4480

* Relative to Permeability to Oil at Initial Water Saturation.

CORE LABORATORIES

FILE 52132-90-92

COMPANY	Home Oil Company Limited	**FORMATION**	Spearfish C
WELL	Home Scurry S. Pierson 12-19-2-29	**FIELD**	South Pierson
LOCATION	LSD 12-19-2-29 W1M	**PROVINCE**	Manitoba

UNSTEADY-STATE GAS-OIL RELATIVE PERMEABILITY DATA

SAMPLE NUMBER: 4B/12-19

PERMEABILITY TO AIR: 3.84 @ NOB

PERMEABILITY TO OIL AT INITIAL WATER SATURATION, mD: 0.568 @ NOB

INITIAL WATER SATURATION, FRACTION PORE SPACE: 0.417 @ NOB

POROSITY, FRACTION: 0.202 @ NOB

GAS SATURATION FRACTION PORE SPACE	GAS-OIL RELATIVE PERMEABILITY RATIO	RELATIVE PERMEABILITY TO GAS* FRACTION	RELATIVE PERMEABILITY TO OIL* FRACTION
0.000	0.000	0.000	1.000
0.028	0.070	0.028	0.400
0.034	0.098	0.038	0.385
0.043	0.154	0.047	0.304
0.050	0.222	0.055	0.250
0.057	0.301	0.063	0.210
0.062	0.394	0.070	0.179
0.067	0.511	0.077	0.151
0.072	0.646	0.083	0.129
0.075	0.771	0.090	0.116
0.077	0.858	0.096	0.112
0.083	1.08	0.112	0.104
0.099	2.22	0.141	0.064
0.110	3.71	0.172	0.046
0.120	5.62	0.213	0.038
0.135	9.68	0.258	0.027
0.157	20.6	0.311	0.015
0.173	34.3	0.370	0.011
0.188	51.7	0.406	0.0078

S_{Le} : .8120

S_{wi} : .417

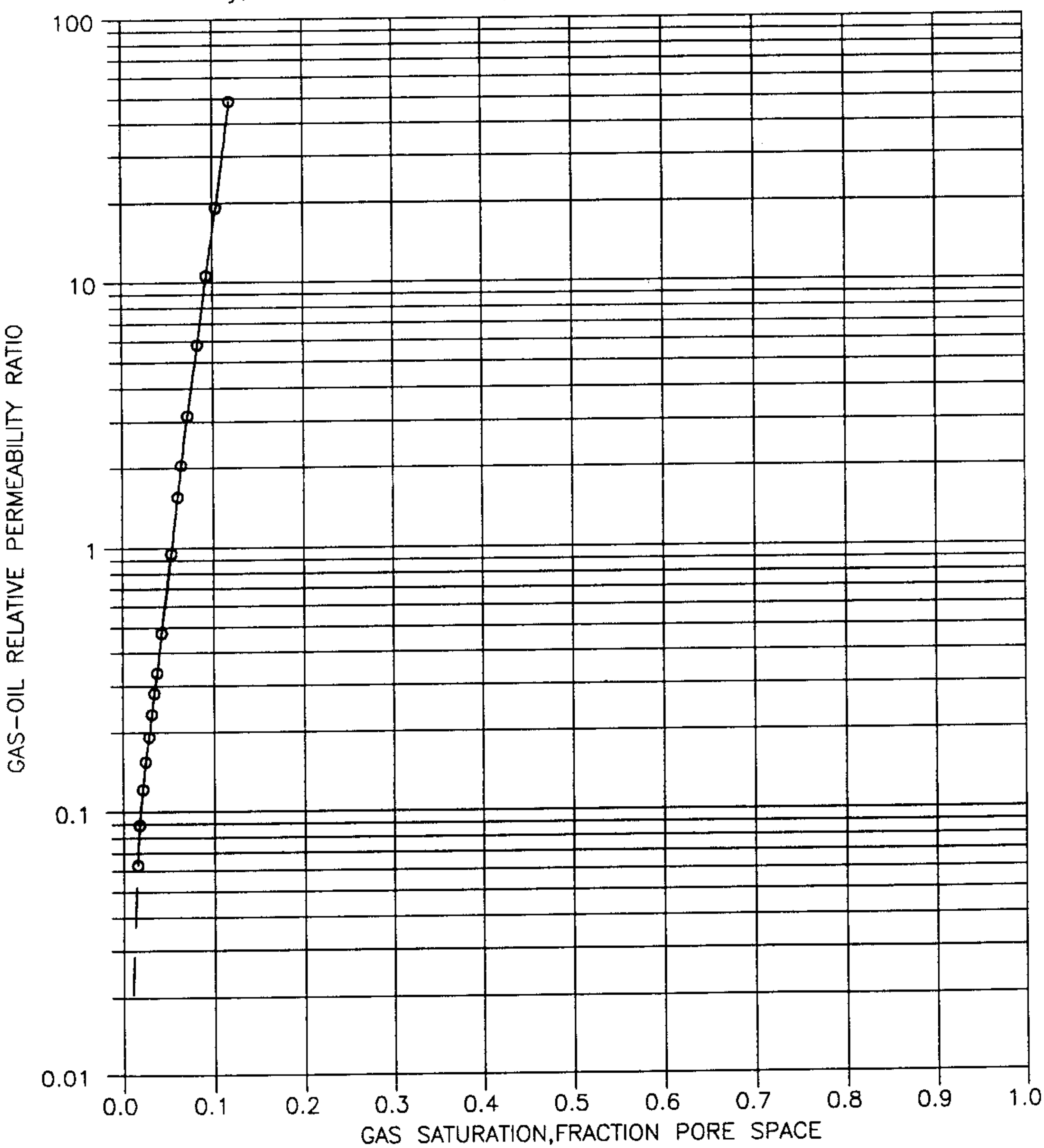
S_{org} : .3950

* Relative to Permeability to Oil at Initial Water Saturation.

RELATIVE PERMEABILITY RATIO

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12-19-2-29
FILE 90-92
FORMATION Spearfish C

Sample: 4A/12-19
Depth, Metres: 1032.04
Permeability, mD: 2.11 (OB)
Porosity, Fraction: 0.167 (OB)

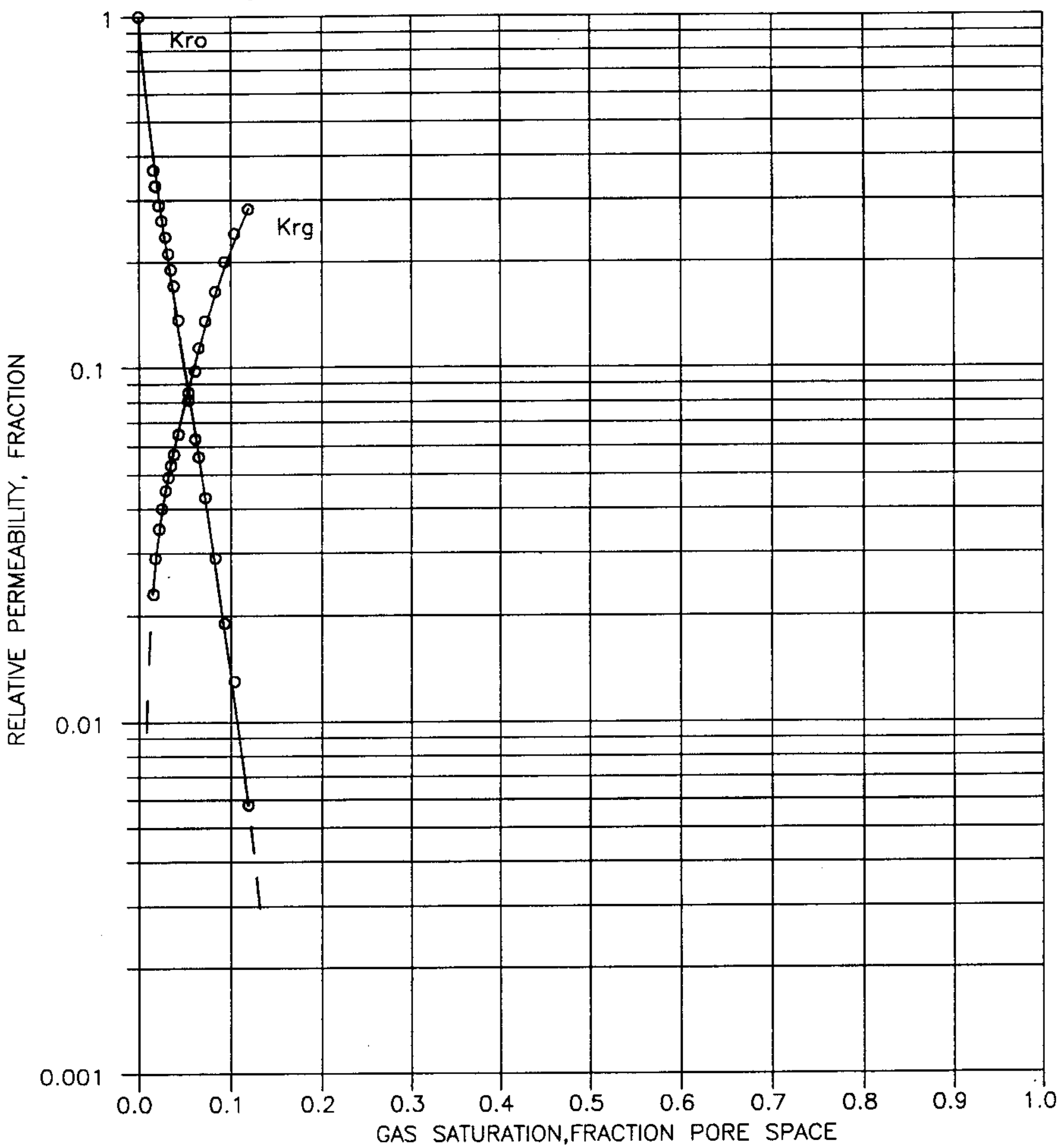


GAS-OIL RELATIVE PERMEABILITY

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12-19-2-29

FILE 90-92
FORMATION Spearfish C

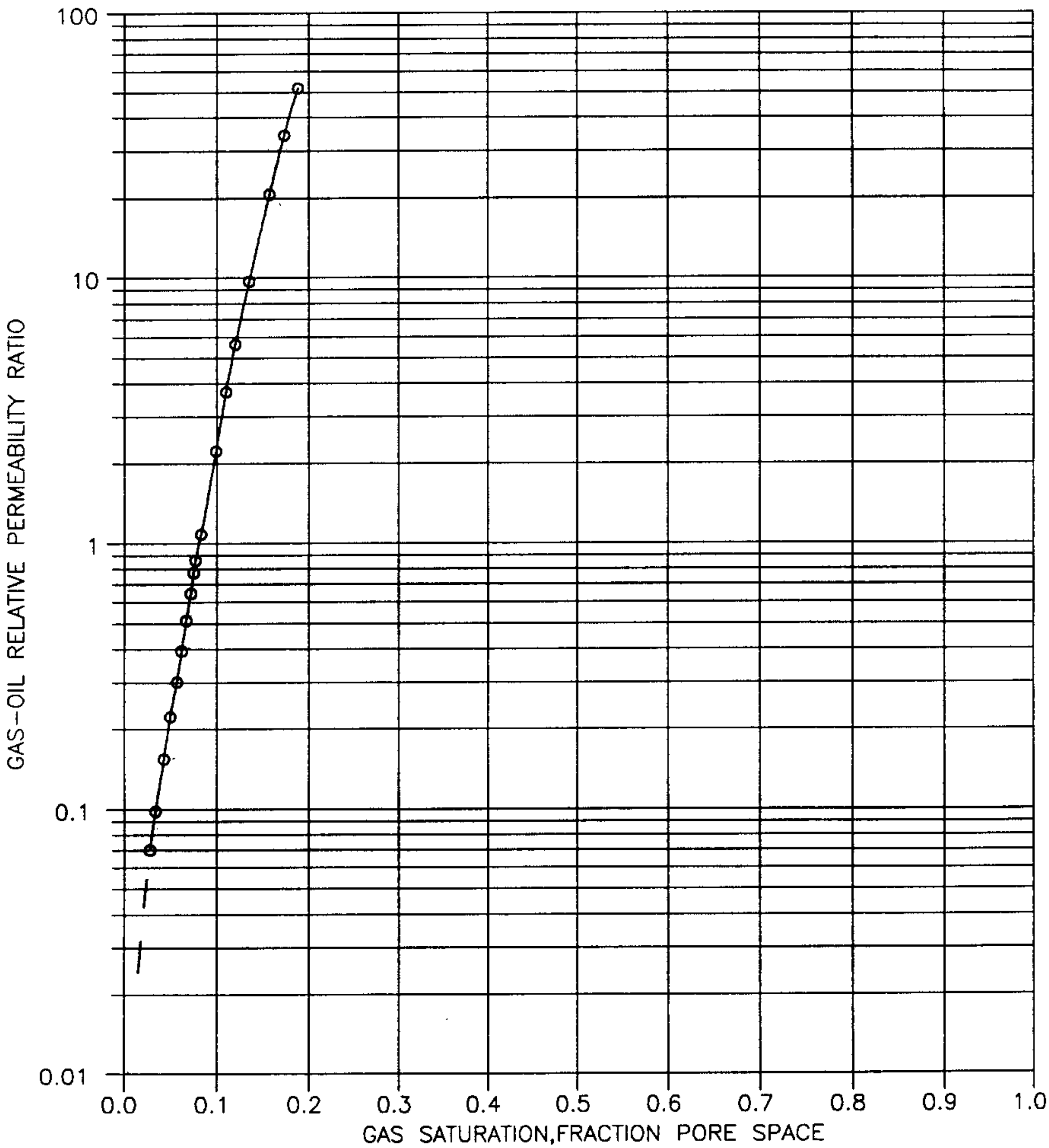
Sample: 4A/12-19
Depth, Metres: 1032.04
Permeability, mD: 2.11 (OB)
Porosity, Fraction: 0.167 (OB)



RELATIVE PERMEABILITY RATIO

COMPANY	Home Oil Company Limited	FILE	90-92
WELL	Home Scurry S.Pierson 12-19-2-29	FORMATION	Spearfish C

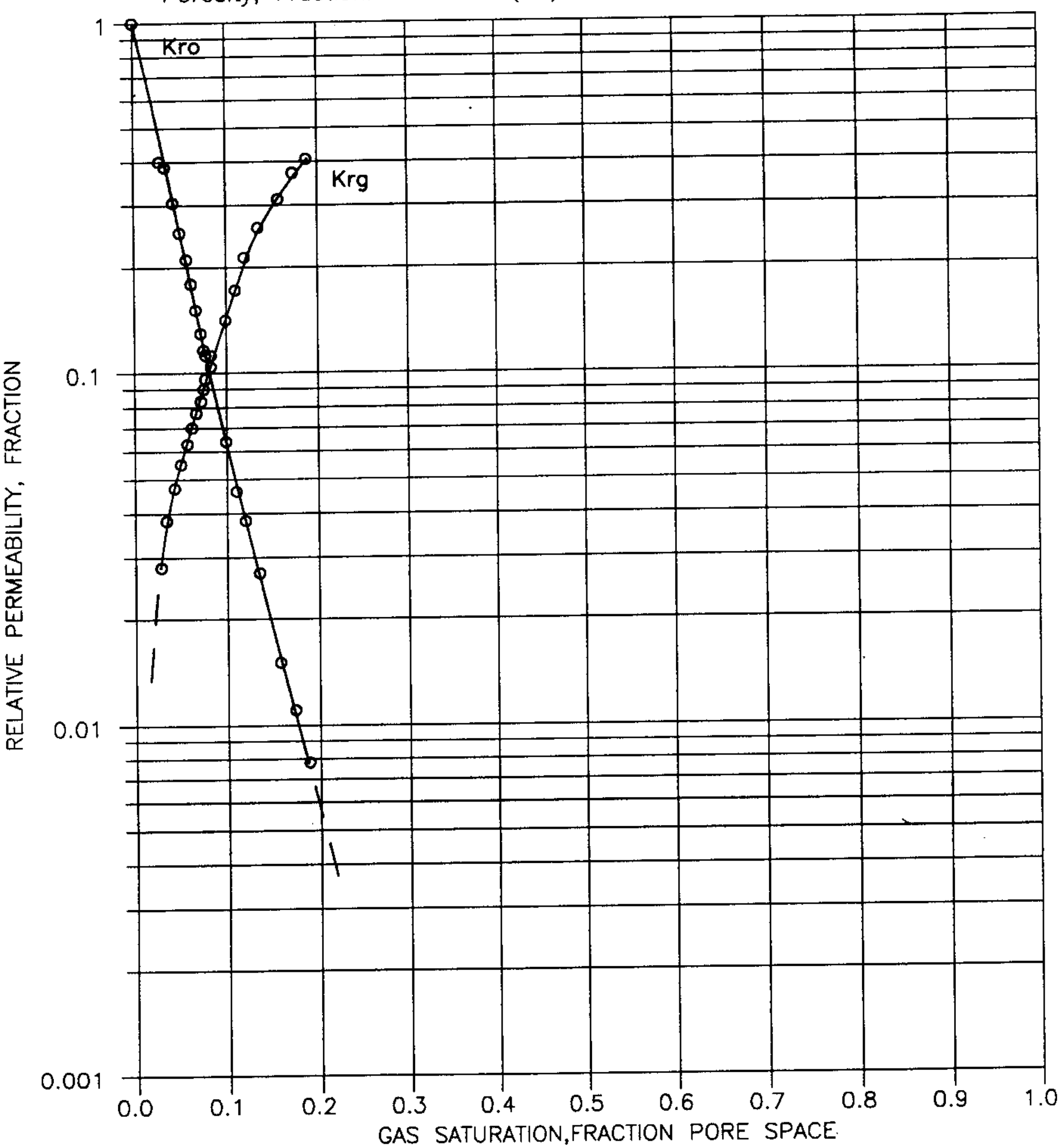
Sample:	4B/12-19
Depth, Metres:	1032.09
Permeability, mD:	3.84 (OB)
Porosity, Fraction:	0.202 (OB)



GAS-OIL RELATIVE PERMEABILITY

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12-19-2-29
FILE 90-92
FORMATION Spearfish C

Sample: 4B/12-19
Depth, Metres: 1032.09
Permeability, mD: 3.84 (OB)
Porosity, Fraction: 0.202 (OB)



COMPANY	Home Oil Company Limited	**FILE**	52132-90-92
WELL	Home Scurry S. Pierson 12-19-2-29	**FORMATION**	Spearfish C
LOCATION	LSD 12-19-2-29 W1M	**FIELD**	South Pierson
		PROVINCE	Manitoba

*SUMMARY OF BASIC WATERFLOOD TEST RESULTS

				INITIAL CONDITIONS		TERMINAL CONDITIONS		OIL RECOVERED	
SAMPLE NUMBER	DEPTH, METRES	PERMEABILITY TO AIR,* MILLIDARCYS	POROSITY,* FRACTION	WATER SATURATION, FRACTION PORE SPACE	PERMEABILITY TO OIL, MILLIDARCYS	OIL SATURATION, FRACTION PORE SPACE	PERMEABILITY TO WATER, MILLIDARCYS	FRACTION PORE SPACE	FRACTION OIL IN PLACE
1B/12-19	1030.41	1.29	0.157	0.333	0.170	0.299	0.119	0.368	0.552

* Test performed at the equivalent reservoir net overburden pressure of 12 750 kPa.

FILE 52132-90-92

COMPANY Home Oil Company Limited
WELL Home Scurry S. Pierson 12-19-2-29
LOCATION LSD 12-19-2-29 W1M

FORMATION Spearfish C
FIELD South Pierson
PROVINCE Manitoba

SUMMARY OF ROOM CONDITION WATER-OIL RELATIVE PERMEABILITY TEST RESULTS

				INITIAL CONDITIONS		TERMINAL CONDITIONS		OIL RECOVERED	
SAMPLE NUMBER	DEPTH, METRES	PERMEABILITY TO AIR, MILLIDARCYS	POROSITY, FRACTION	WATER SATURATION, FRACTION PORE SPACE	PERMEABILITY TO OIL, MILLIDARCYS	OIL SATURATION, FRACTION PORE SPACE	PERMEABILITY TO WATER, MILLIDARCYS	FRACTION PORE SPACE	FRACTION OIL IN PLACE
4A/12-19	1032.04	2.64	0.173	0.419	0.375	0.261	0.245	0.320	0.551
4B/12-19	1032.09	4.52	0.204	0.410	0.543	0.320	0.281	0.270	0.458

CORE
LABORATORIES

FILE 52132-90-92

COMPANY	Home Oil Company Limited	FORMATION	Spearfish C
WELL	Home Scurry S. Pierson 12-19-2-29	FIELD	South Pierson
LOCATION	LSD 12-19-2-29 W1M	PROVINCE	Manitoba

STEADY-STATE WATER-OIL RELATIVE PERMEABILITY DATA

SAMPLE NUMBER: 4A/12-19

PERMEABILITY TO AIR: 2.64

PERMEABILITY TO OIL AT INITIAL WATER SATURATION, mD: 0.375

INITIAL WATER SATURATION, FRACTION PORE SPACE: 0.419

POROSITY, FRACTION: 0.173

WATER SATURATION FRACTION PORE SPACE	WATER-OIL RELATIVE PERMEABILITY RATIO	RELATIVE PERMEABILITY TO WATER* FRACTION	RELATIVE PERMEABILITY TO OIL* FRACTION
0.419	0.000	0.000	1.000
0.553	0.043	0.013	0.296
0.578	0.110	0.020	0.181
0.626	0.886	0.074	0.084
0.657	3.99	0.102	0.026
0.671	8.09	0.149	0.018
0.739		0.653	

S_{wi} = .419

S_{oe} = .2610

* Relative to Permeability to Oil at Initial Water Saturation.

CORE LABORATORIES

FILE 52132-90-92

COMPANY	Home Oil Company Limited	**FORMATION**	Spearfish C
WELL	Home Scurry S. Pierson 12-19-2-29	**FIELD**	South Pierson
LOCATION	LSD 12-19-2-29 W1M	**PROVINCE**	Manitoba

STEADY-STATE WATER-OIL RELATIVE PERMEABILITY DATA

SAMPLE NUMBER: 4B/12-19

PERMEABILITY TO AIR: 4.52

PERMEABILITY TO OIL AT INITIAL WATER SATURATION, mD: 0.543

INITIAL WATER SATURATION, FRACTION PORE SPACE: 0.410

POROSITY, FRACTION: 0.204

WATER SATURATION FRACTION PORE SPACE	WATER-OIL RELATIVE PERMEABILITY RATIO	RELATIVE PERMEABILITY TO WATER* FRACTION	RELATIVE PERMEABILITY TO OIL* FRACTION
0.410	0.000	0.000	1.000
0.487	0.081	0.013	0.158
0.510	0.214	0.026	0.120
0.530	0.625	0.046	0.074
0.564	3.95	0.104	0.026
0.585	8.22	0.123	0.015
0.680		0.517	

S_{wi} = .410

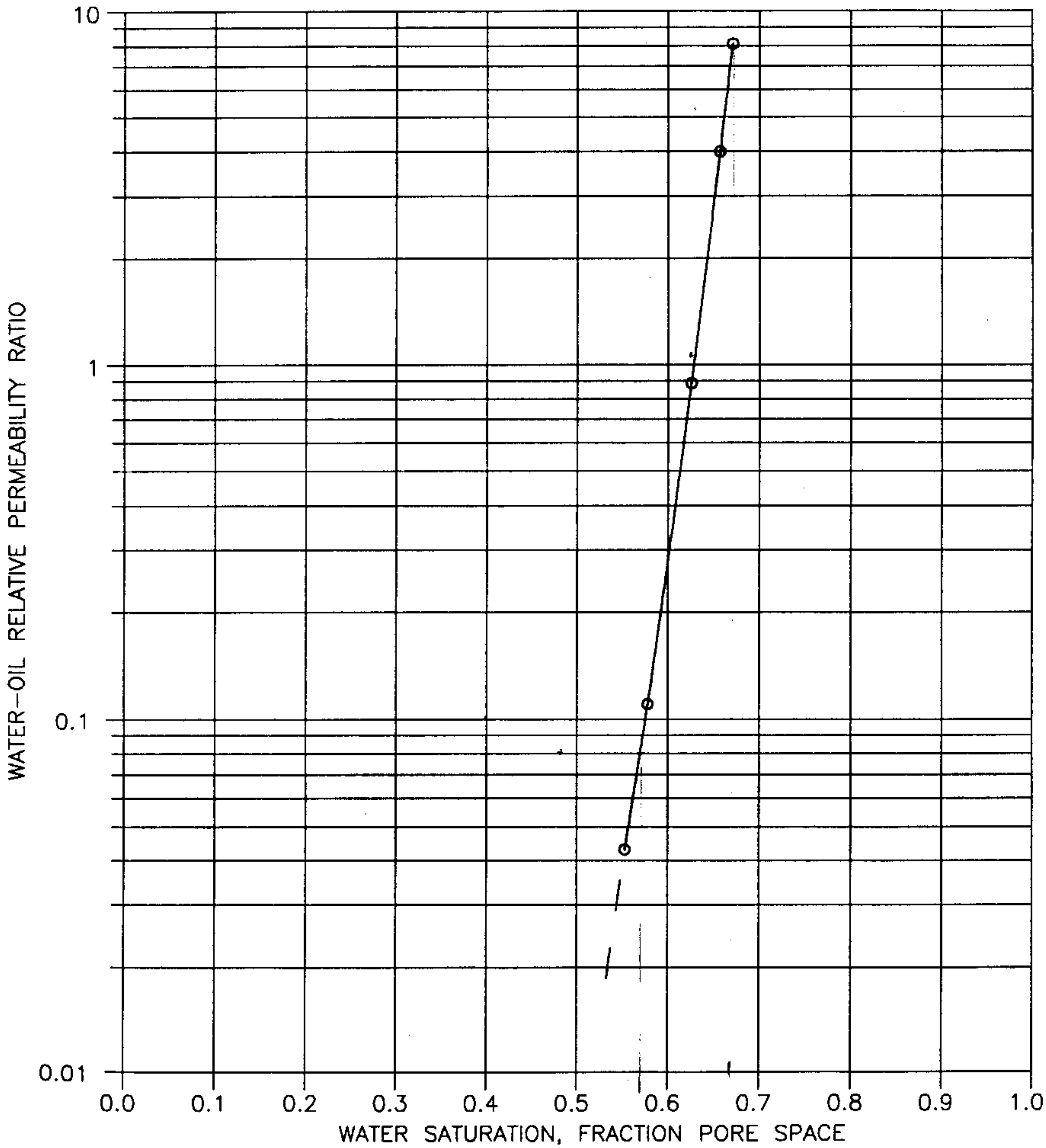
S_{or} = .320

* Relative to Permeability to Oil at Initial Water Saturation.

RELATIVE PERMEABILITY RATIO

COMPANY	Home Oil Company Limited	FILE	90-92
WELL	Home Scurry S.Pierson 12-19-2-29	FORMATION	Spearfish C

Sample: 4A/12-19
Depth, Metres: 1032.04
Permeability, mD: 2.64
Porosity, Fraction: 0.173

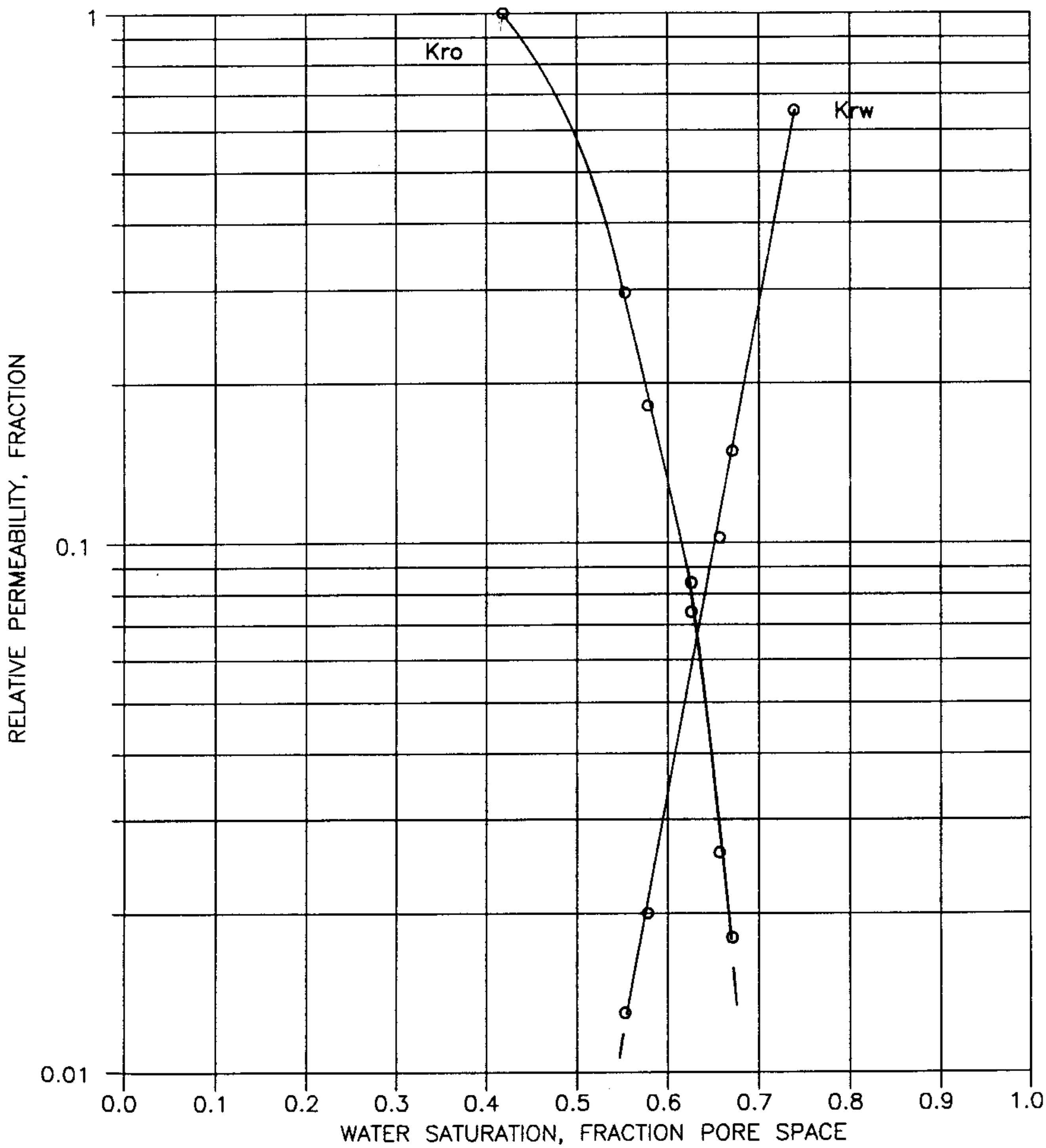


WATER–OIL RELATIVE PERMEABILITY

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12–19–2–29

FILE 90–92
FORMATION Spearfish C

Sample: 4A/12–19
Depth, Metres: 1032.04
Permeability, mD: 2.64
Porosity, Fraction: 0.173

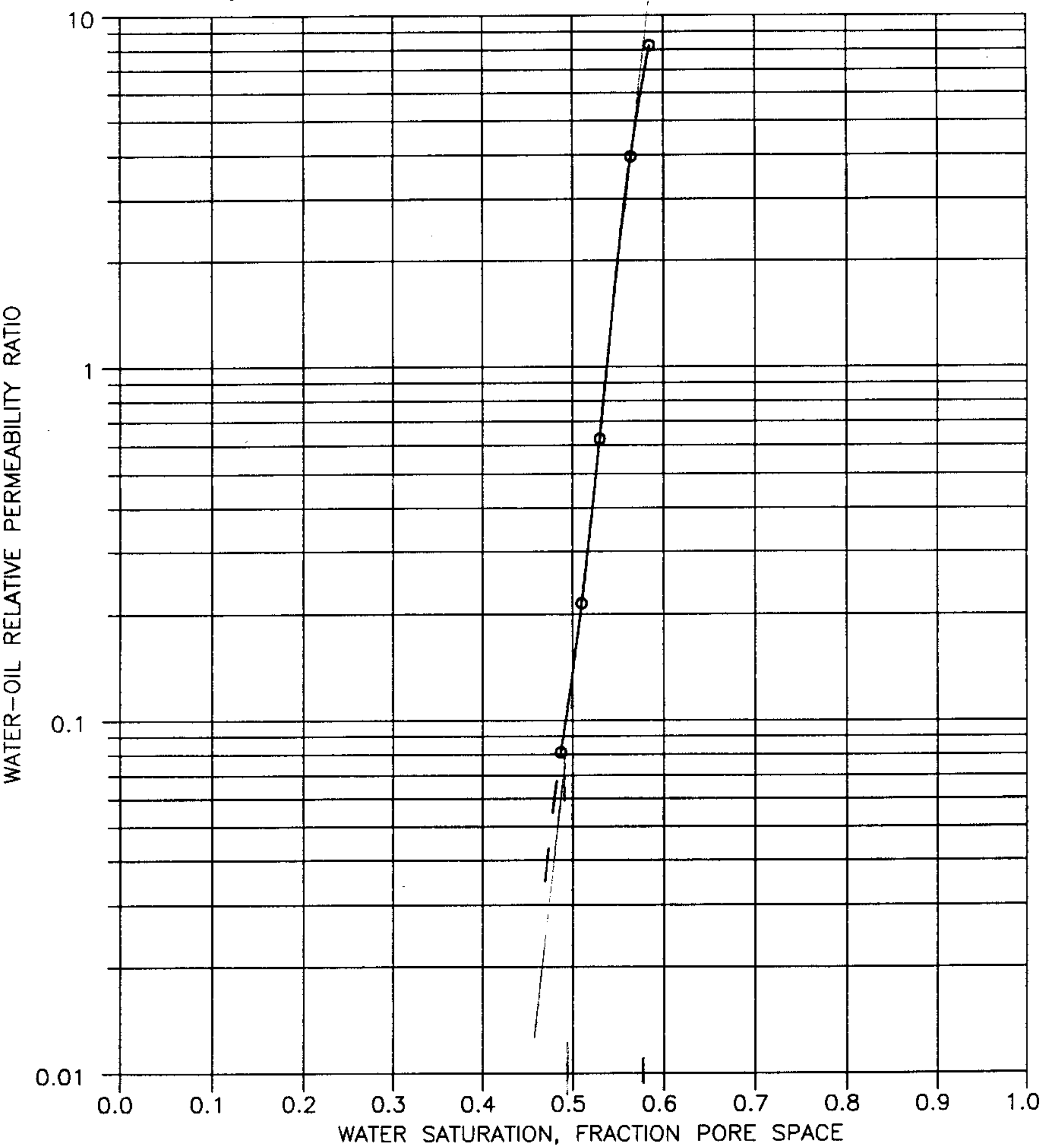


RELATIVE PERMEABILITY RATIO

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12-19-2-29

FILE 90-92
FORMATION Spearfish C

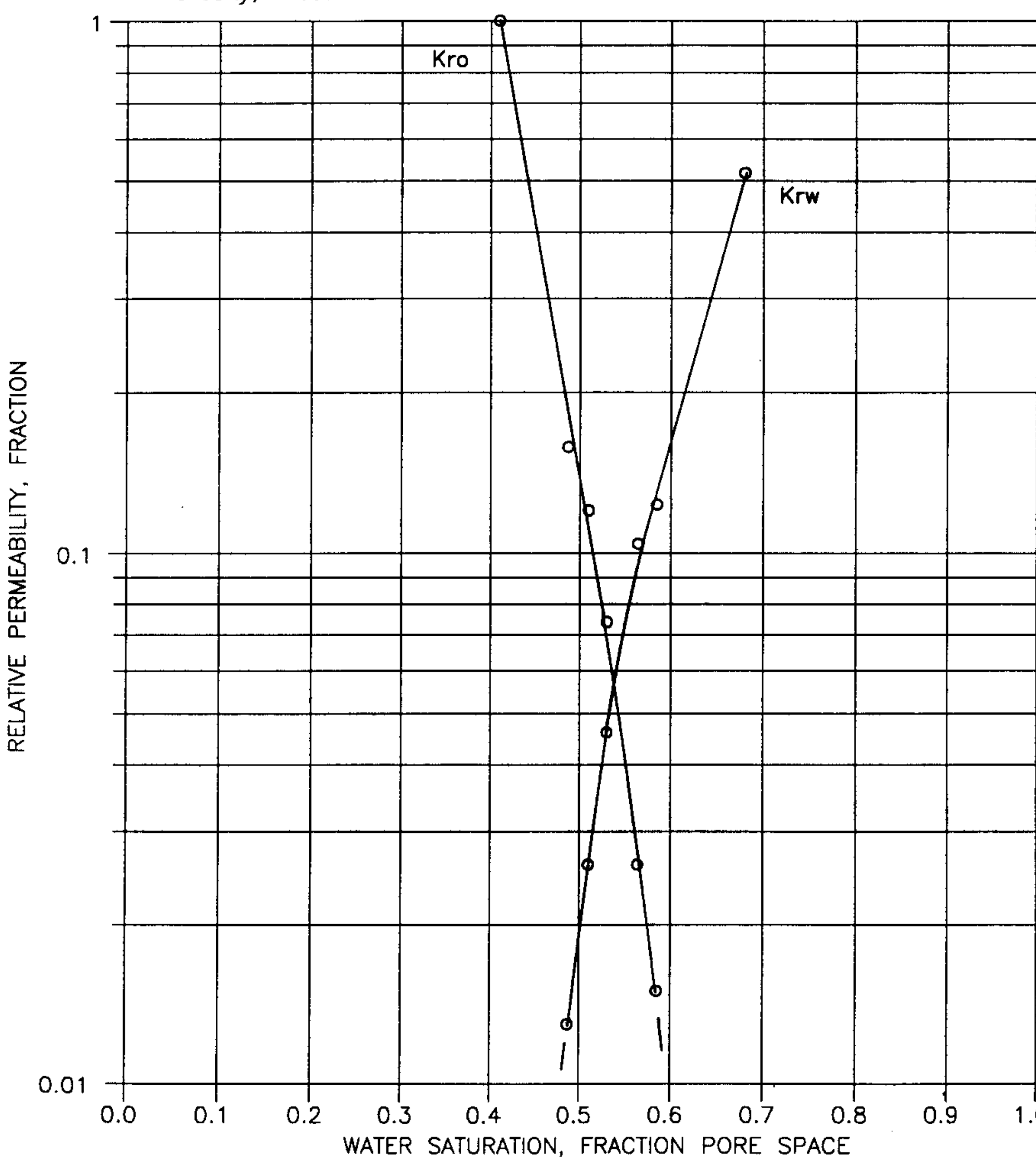
Sample: 4B/12-19
Depth, Metres: 1032.09
Permeability, mD: 4.52
Porosity, Fraction: 0.204



WATER-OIL RELATIVE PERMEABILITY

COMPANY Home Oil Company Limited
WELL Home Scurry S.Pierson 12-19-2-29
FILE 90-92
FORMATION Spearfish C

Sample: 4B/12-19
Depth, Metres: 1032.09
Permeability, mD: 4.52
Porosity, Fraction: 0.204



South Pierson

Formation Analysis Report
South Pierson 06-19-002-29 W1M

DOWELL SCHLUMBERGER
CANADA

Laboratory report

FORMATION ANALYSIS REPORT

HOME OIL CO. LTD.
HOME SCURRY S. PIERSON
06-19-02-29-WIM
SPEARFISH

STEVE BURNYIUK
TECHNICAL REPRESENTATIVE

S.W. GRAY
GEOLOGIST

CALGARY LABORATORY
C.L. NO.: 87-233

DATE: AUGUST 17/87

FORMATION ANALYSIS REPORT
FOR
HOME OIL CO. LTD.

WELL DATA:

WELL NAME: HOME SCURRY S. PIERSON
LOCATION: 06-19-02-WIM
FORMATION: SPEARFISH

BOTTOM HOLE CONDITIONS:

B.H.S.T. 37^{O}C

TYPE OF SAMPLE SUBMITTED:

Core Plug	Depth
4	1,022.35 metres
13.5	1,023.7 metres
31.5	1,026.5 metres
48	1,028.4 metres
67.5	1,030.5 metres
76.5	1,032.25 metres

TESTS PERFORMED:

Solubility tests.
Porosity determination.
Flow Tests:

A) Saturate core to formation brine.
B) Base permeability to diesel.
C) Treat core with 1) MSR 100 + 0.4% A200 + 1.0% DSC Experimental Demulsifier + 5% U66
2) MSR 123 + 0.4% A200 + 1.0% DSC Experimental Demulsifier
D) Re-perm to diesel.

.../3

FORMATION ANALYSIS REPORT
FOR
HOME OIL CO. LTD.

SOLUBILITY TEST

The core Plug(s) were dried for 24 hours before any tests were performed. A portion of each was ground up into a fine powder, weighed and placed in 15% HCl, and 12-3 Mud Acid. These solutions were then placed in a 66°C hot bath for one hour, after which time they were filtered, dried, re-weighed and the solubilities calculated:

Core Plug No.	Solubility in 15% HCl	Solubility in 12-3 Mud Acid
4	22%	62%
13.5	22%	65%
31.5	38%	46%
48	21%	60%
67.5	22%	62%
76.5	34%	70%

FLOW TESTS

These tests were performed on a Formation Response Tester. The core plugs were cut perpendicular to the vertical axis of the formation. Liquid permeability was measured in one direction, and observed for signs of fines migration and/or relative changes in permeability.

Procedure

1. Once inch diameter core plugs (up to 3 inches in length) are saturated in prescribed fluid. (formation brine)

2. The saturated core plug is placed in a HASSLER Sleeve and loaded into the Formation Response Tester, where a confining pressure, back pressure and formation temperature are applied.

3. The initial permeability of the core to the prescribed fluid is determined (in one direction - D1).

.../4

FORMATION ANALYSIS REPORT
FOR
HOME OIL CO. LTD.

Procedure

4. The core plug is treated with one or more predetermined acid systems. The permeability is allowed to stabilize or a predetermined pore volume is passed through the core plug. The acid is forced through the core plug in a reverse direction (D2).

5. The final permeability of the core plug is determined using the prescribed fluid (in direction D1).

SUMMARY RESULTS

PLUG 13.5A: This core plug fractured along a siltstone lamination when saturated to formation brine.

PLUG 13.5B: On this plug, no flow rate could be established.

PLUG 31.5: No flow rate established.

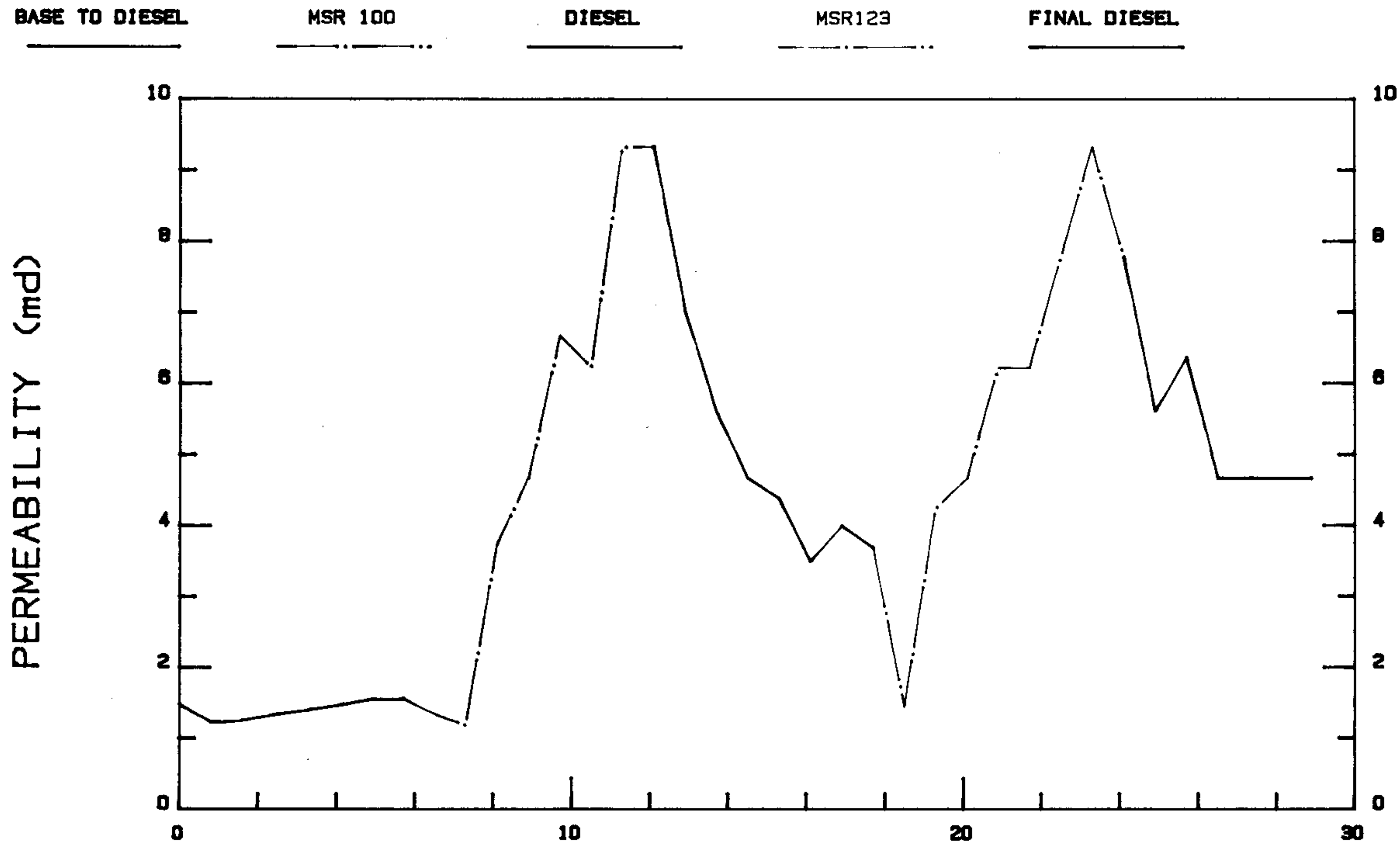
PLUG 66.5: The initial permeability of around 1.55 ml was increased to approximately 3.6 ml after MSR100, and to approximately 4.55 ml after the MSR123. This gives an overall permeability increase of 193%.

PLUG 67.5: This core plug was accidently fractured when loaded into the Hassler Sleeve, making it unusable.

PLUG 76.5: In this plug, the initial permeability of around .17 ml was increased to .53 ml after the MSR 100, and fell back to .28 ml after the MSR123. The core plug appears to have plugged off from fines migration and pore plugging.

S.W. GRAY
(403) 250-7891

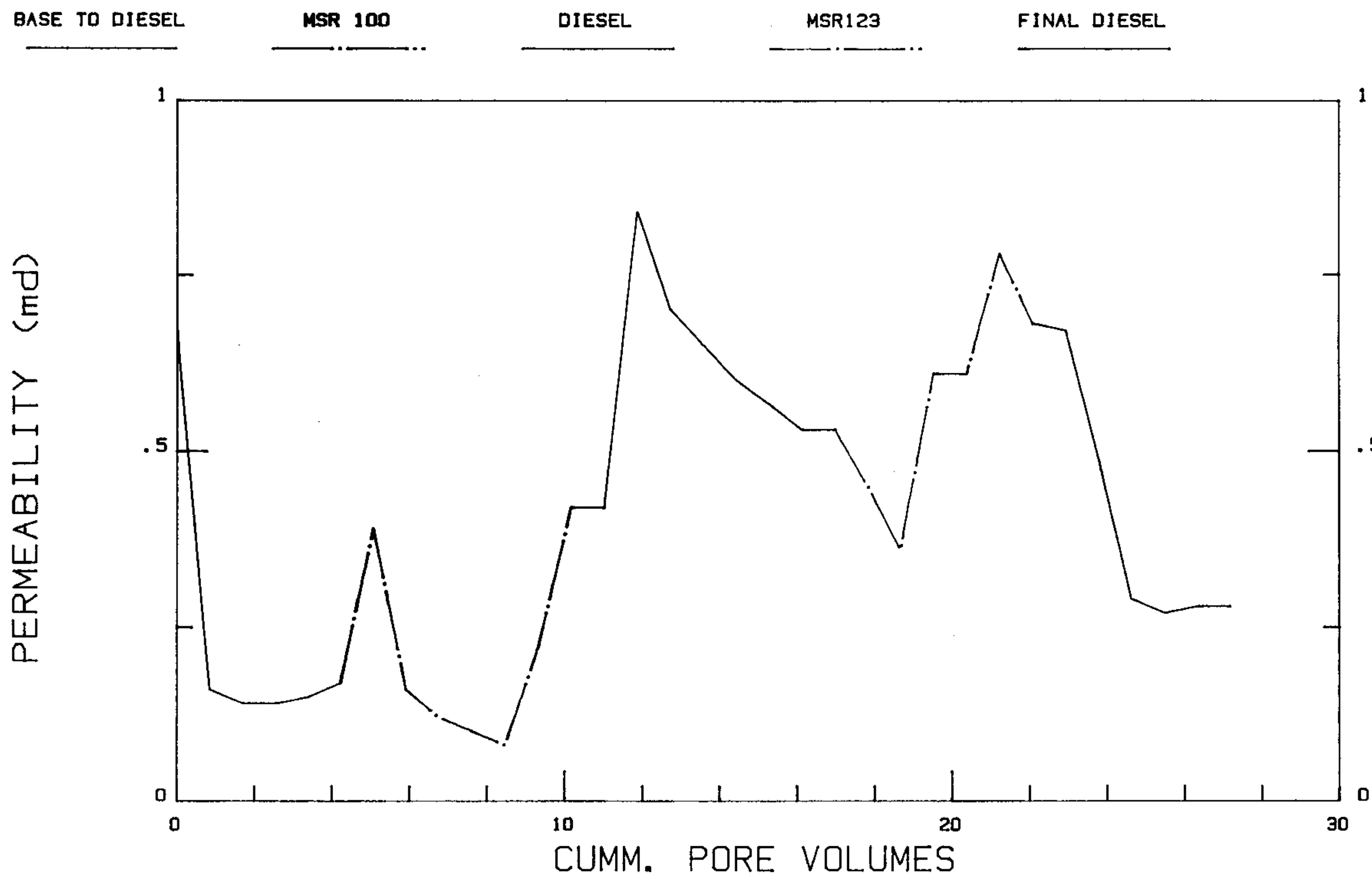
CORE PLUG 66.5
TREATED TO MSR100 +0.4%A200 +5%U66 and MSR123 +0.4%A200



BHT=37degC CONF. PRESS=500PSI BACK PRESS=100PSI
FLOW RATE=0.3cc/min. POROSITY=24.1%

CORE PLUG 76.5

TREATED TO MSR100 +0.4%A200 +5%U66 and MSR123 +0.4%A200



BHT=37degC CONF.PRESS=500PSI BACK PRESS=100PSI
FLOW RATE=0.2cc/min. POROSITY=18.8%

South Pierson Waterflood Prediction Models

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - AFTER BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLODD - TEST CASE 1
DATE: 17/12/91

DATA INPUT

Flood Area (acres): 80
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 3.5
Dis (I to P in ft): 1320
Rw(ft): 0.2
T (fillup to BT): 15402

FROM TABLES

Eabt: 0.85

CALCULATED

Qibt: 0.28
Vp: 1325066.4
ibase: 32.6

Wi	Wi/Wibt	Ea (FIG E.8)	Qi/Qibt (TAB E.9)	Qi	(dfw/dSw)Sw2	Sw2 (FIG E.2)	fo2 (FIG E.1)	Sw(avg)
311656	0.99	0.850	1.000	0.280	3.571	0.668	0.100	0.696
350000	1.11	0.875	1.100	0.308	3.247	0.670	0.090	0.698
400000	1.27	0.920	1.270	0.356	2.812	0.675	0.080	0.703
450000	1.43	0.950	1.400	0.392	2.551	0.680	0.055	0.702
500000	1.59	0.975	1.640	0.459	2.178	0.680	0.035	0.696
550000	1.74	1.000	1.730	0.484	2.064	0.680	0.035	0.697
600000	1.90	1.000	1.730	0.484	2.064	0.680	0.035	0.697
650000	2.06	1.000	1.730	0.484	2.064	0.680	0.035	0.697
700000	2.22	1.000	1.730	0.484	2.064	0.680	0.035	0.697
750000	2.38	1.000	1.730	0.484	2.064	0.680	0.035	0.697
800000	2.54	1.000	1.730	0.484	2.064	0.680	0.035	0.697
900000	2.85	1.000	1.730	0.484	2.064	0.680	0.035	0.697
0	0.00	1.000	1.730	0.484	2.064	0.680	0.035	0.697
0	0.00	1.000	1.730	0.484	2.064	0.680	0.035	0.697

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - AFTER BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLODD - TEST CASE 1
DATE: 17/12/91

Lambda (L=0 @ Ea=1)	dNpu	1 - dNpu	dNps	dNpu + dNps	WORu	WOR	Sw(avg) - Swc	frac PV
0.278	0.3039	0.6961	0.0696	0.3735	1.677	1.961	0.286	0.2431
0.248	0.2706	0.7294	0.0656	0.3362	1.974	2.308	0.288	0.2518
0.217	0.2368	0.7632	0.0611	0.2978	2.358	2.756	0.293	0.2700
0.193	0.2105	0.7895	0.0434	0.2539	2.939	3.435	0.292	0.2770
0.173	0.1894	0.8106	0.0284	0.2178	3.592	4.199	0.286	0.2789
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870
0.000	0.0000	1.0000	0.0350	0.0350	27.571	32.231	0.287	0.2870

Recovery frac OIP	Recovery BBLS	Krw@Sw(avg) (REL PERM)	M	COND (FIG E.5)	Iw	Iw(avg)	dWI	dT(days)	days	Qo
0.4120	275555	0.220	0.331	0.500	16.325				15402	5.22
0.4267	285365	0.220	0.331	0.505	16.488	16.406	38344	2337.14	17739.1	4.74
0.4576	306015	0.220	0.331	0.454	14.823	15.655	50000	3193.78	20932.9	3.78
0.4695	313960	0.220	0.331	0.390	12.733	13.778	50000	3628.95	24561.9	2.77
0.4727	316157	0.220	0.331	0.350	11.427	12.080	50000	4138.96	28700.8	2.13
0.4864	325264	0.220	0.331	0.331	10.807	11.117	50000	4497.55	33198.4	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	50000	4626.63	37825.0	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	50000	4626.63	42451.6	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	50000	4626.63	47078.3	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	50000	4626.63	51704.9	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	50000	4626.63	56331.5	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	100000	9253.26	65584.8	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	-900000	-83279.37	-17694.6	0.32
0.4864	325264	0.220	0.331	0.331	10.807	10.807	0	0.00	-17694.6	0.32

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 40
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 2.5
Dis (I to P in ft): 933
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 662533.2
ibase: 24.4
Wif: 0
Wibt: 155828
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	iw	iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	24.355			0	20.8	0	0	0.00%
12500	0.067	0.830	20.214	22.28	560.93	561	17.3	12500	10693	3.20%
25000	0.135	0.710	17.292	18.75	666.56	1227	14.8	25000	21386	6.40%
37500	0.202	0.680	16.561	16.93	738.49	1966	14.2	37500	32079	9.59%
50000	0.270	0.660	16.074	16.32	766.04	2732	13.8	50000	42772	12.79%
62500	0.337	0.630	15.343	15.71	795.73	3528	13.1	62500	53464	15.99%
75000	0.404	0.600	14.613	14.98	834.55	4362	12.5	75000	64157	19.19%
87500	0.472	0.590	14.369	14.49	862.60	5225	12.3	87500	74850	22.38%
100000	0.539	0.580	14.126	14.25	877.35	6102	12.1	100000	85543	25.58%
112500	0.606	0.570	13.882	14.00	892.60	6995	11.9	112500	96236	28.78%
125000	0.674	0.560	13.639	13.76	908.40	7903	11.7	125000	106929	31.98%
137500	0.741	0.520	12.664	13.15	950.46	8854	10.8	137500	117622	35.18%
150000	0.809	0.510	12.421	12.54	996.60	9850	10.6	150000	128315	38.37%
155828	0.840	0.500	12.177	12.30	473.85	10324	10.4	155828	133300	39.86%

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 40
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 3.5
Dis (I to P in ft): 933
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 662533.2
ibase: 34.1
Wif: 0
Wibt: 155828
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	iw	iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	34.097			0	29.2	0	0	0.00%
12500	0.067	0.830	28.300	31.20	400.66	401	24.2	12500	10693	3.20%
25000	0.135	0.710	24.209	26.25	476.11	877	20.7	25000	21386	6.40%
37500	0.202	0.680	23.186	23.70	527.49	1404	19.8	37500	32079	9.59%
50000	0.270	0.660	22.504	22.84	547.17	1951	19.3	50000	42772	12.79%
62500	0.337	0.630	21.481	21.99	568.38	2520	18.4	62500	53464	15.99%
75000	0.404	0.600	20.458	20.97	596.11	3116	17.5	75000	64157	19.19%
87500	0.472	0.590	20.117	20.29	616.14	3732	17.2	87500	74850	22.38%
100000	0.539	0.580	19.776	19.95	626.68	4359	16.9	100000	85543	25.58%
112500	0.606	0.570	19.435	19.61	637.57	4996	16.6	112500	96236	28.78%
125000	0.674	0.560	19.094	19.26	648.86	5645	16.3	125000	106929	31.98%
137500	0.741	0.520	17.730	18.41	678.90	6324	15.2	137500	117622	35.18%
150000	0.809	0.510	17.389	17.56	711.86	7036	14.9	150000	128315	38.37%
155828	0.840	0.500	17.048	17.22	338.47	7374	14.6	155828	133300	39.86%

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 40
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 4.5
Dis (I to P in ft): 933
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 662533.2
ibase: 43.8
Wif: 0
Wibt: 155828
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	iw	iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	43.838			0	37.5	0	0	0.00%
12500	0.067	0.830	36.386	40.11	311.63	312	31.1	12500	10693	3.20%
25000	0.135	0.710	31.125	33.76	370.31	682	26.6	25000	21386	6.40%
37500	0.202	0.680	29.810	30.47	410.27	1092	25.5	37500	32079	9.59%
50000	0.270	0.660	28.933	29.37	425.58	1518	24.8	50000	42772	12.79%
62500	0.337	0.630	27.618	28.28	442.07	1960	23.6	62500	53464	15.99%
75000	0.404	0.600	26.303	26.96	463.64	2423	22.5	75000	64157	19.19%
87500	0.472	0.590	25.865	26.08	479.22	2903	22.1	87500	74850	22.38%
100000	0.539	0.580	25.426	25.65	487.41	3390	21.8	100000	85543	25.58%
112500	0.606	0.570	24.988	25.21	495.89	3886	21.4	112500	96236	28.78%
125000	0.674	0.560	24.550	24.77	504.67	4391	21.0	125000	106929	31.98%
137500	0.741	0.520	22.796	23.67	528.03	4919	19.5	137500	117622	35.18%
150000	0.809	0.510	22.358	22.58	553.67	5472	19.1	150000	128315	38.37%
155828	0.840	0.500	21.919	22.14	263.25	5736	18.8	155828	133300	39.86%

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 80
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 2.5
Dis (I to P in ft): 1320
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 1325066.4
ibase: 23.3
Wif: 0
Wibt: 311656
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	iw	iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	23.321			0	19.9	0	0	0.00%
25000	0.067	0.830	19.357	21.34	1171.57	1172	16.6	25000	21386	3.20%
50000	0.135	0.710	16.558	17.96	1392.20	2564	14.2	50000	42772	6.40%
75000	0.202	0.680	15.858	16.21	1542.43	4106	13.6	75000	64157	9.59%
100000	0.270	0.660	15.392	15.63	1599.99	5706	13.2	100000	85543	12.79%
125000	0.337	0.630	14.692	15.04	1662.00	7368	12.6	125000	106929	15.99%
150000	0.404	0.600	13.993	14.34	1743.07	9111	12.0	150000	128315	19.19%
175000	0.472	0.590	13.759	13.88	1801.66	10913	11.8	175000	149701	22.38%
200000	0.539	0.580	13.526	13.64	1832.46	12745	11.6	200000	171086	25.58%
225000	0.606	0.570	13.293	13.41	1864.33	14610	11.4	225000	192472	28.78%
250000	0.674	0.560	13.060	13.18	1897.33	16507	11.2	250000	213858	31.98%
275000	0.741	0.520	12.127	12.59	1985.17	18492	10.4	275000	235244	35.18%
300000	0.809	0.510	11.894	12.01	2081.54	20574	10.2	300000	256630	38.37%
311656	0.840	0.500	11.661	11.78	989.71	21563	10.0	311656	266601	39.86%

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 80
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 3.5
Dis (I to P in ft): 1320
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 1325066.4
ibase: 32.6
Wif: 0
Wibt: 311656
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	Iw	Iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	32.650			0	27.9	0	0	0.00%
25000	0.067	0.830	27.099	29.87	836.84	837	23.2	25000	21386	3.20%
50000	0.135	0.710	23.181	25.14	994.43	1831	19.8	50000	42772	6.40%
75000	0.202	0.680	22.202	22.69	1101.74	2933	19.0	75000	64157	9.59%
100000	0.270	0.660	21.549	21.88	1142.85	4076	18.4	100000	85543	12.79%
125000	0.337	0.630	20.569	21.06	1187.14	5263	17.6	125000	106929	15.99%
150000	0.404	0.600	19.590	20.08	1245.05	6508	16.8	150000	128315	19.19%
175000	0.472	0.590	19.263	19.43	1286.90	7795	16.5	175000	149701	22.38%
200000	0.539	0.580	18.937	19.10	1308.90	9104	16.2	200000	171086	25.58%
225000	0.606	0.570	18.610	18.77	1331.67	10436	15.9	225000	192472	28.78%
250000	0.674	0.560	18.284	18.45	1355.23	11791	15.6	250000	213858	31.98%
275000	0.741	0.520	16.978	17.63	1417.98	13209	14.5	275000	235244	35.18%
300000	0.809	0.510	16.651	16.81	1486.81	14696	14.2	300000	256630	38.37%
311656	0.840	0.500	16.325	16.49	706.94	15402	14.0	311656	266601	39.86%

WATERFLOOD PERFORMANCE PREDICTION (FIVE SPOT PATTERN) - FILLUP TO BREAKTHROUGH

FIELD: SOUTH PIERSON WATERFLOOD - TEST CASE 1
DATE: 6/1/92

DATA INPUT

Flood Area (acres): 80
Net Pay Thickness (feet): 14.00
Porosity (fraction): 0.15
Soi: 0.59
Boi: 1.17
Swc: 0.41
Swbt: 0.69
Kro @ Scw: 1.00
Krw @ Swbt: 0.22
Viscosity of Oil (cp): 1.30
Viscosity of Water (cp): 0.87
Swsz: 0.67
Sgi: 0.00
Delta P (psi): 2000
K(md): 4.5
Dis (I to P in ft): 1320
Rw(ft): 0.2
Time to Fillup: 0

FROM TABLES

Eabt: 0.84

CALCULATED

Qibt: 0.28
Vp: 1325066.4
ibase: 42.0
Wif: 0
Wibt: 311656
M: 0.331

Wi	Ea (FRAC)	COND (FIG E.5)	iw	iw (avg)	dT (days)	T (days)	Qo	Wi - Wif	Np (bbls)	Np (%)
0	0.000	1.000	41.978			0	35.9	0	0	0.00%
25000	0.067	0.830	34.842	38.41	650.87	651	29.8	25000	21386	3.20%
50000	0.135	0.710	29.804	32.32	773.44	1424	25.5	50000	42772	6.40%
75000	0.202	0.680	28.545	29.17	856.91	2281	24.4	75000	64157	9.59%
100000	0.270	0.660	27.705	28.13	888.88	3170	23.7	100000	85543	12.79%
125000	0.337	0.630	26.446	27.08	923.33	4093	22.6	125000	106929	15.99%
150000	0.404	0.600	25.187	25.82	968.37	5062	21.5	150000	128315	19.19%
175000	0.472	0.590	24.767	24.98	1000.92	6063	21.2	175000	149701	22.38%
200000	0.539	0.580	24.347	24.56	1018.03	7081	20.8	200000	171086	25.58%
225000	0.606	0.570	23.927	24.14	1035.74	8117	20.5	225000	192472	28.78%
250000	0.674	0.560	23.508	23.72	1054.07	9171	20.1	250000	213858	31.98%
275000	0.741	0.520	21.829	22.67	1102.87	10273	18.7	275000	235244	35.18%
300000	0.809	0.510	21.409	21.62	1156.41	11430	18.3	300000	256630	38.37%
311656	0.840	0.500	20.989	21.20	549.84	11980	18.0	311656	266601	39.86%

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 9A

AREA BEING FLOODED (PER INJECTOR), ACRES	=	40.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.690
FORMATION PERMEABILITY, MD.	=	2.64
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.220
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.331
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	664.688E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.865

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0132
16.1	0.086	0.749	0.0099
32.2	0.173	0.694	0.0092
48.3	0.259	0.676	0.0089
64.4	0.346	0.655	0.0087
80.5	0.432	0.634	0.0084
96.6	0.519	0.612	0.0081
112.6	0.605	0.590	0.0078
128.7	0.692	0.569	0.0075
144.8	0.778	0.541	0.0072
160.9	0.865	0.512	0.0068
FROM WATER BREAKTHROUGH TO FLOODOUT			
160.9	0.865	0.512	0.0068
171.2	0.882	0.506	0.0067
181.4	0.898	0.501	0.0066
191.6	0.913	0.479	0.0063
201.9	0.927	0.454	0.0060
212.1	0.941	0.431	0.0057
222.3	0.954	0.409	0.0054
232.6	0.966	0.388	0.0051
242.8	0.978	0.368	0.0049
253.0	0.989	0.349	0.0046
263.3	1.000	0.331	0.0044

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 9A

AREA BEING FLOODED (PER INJECTOR), ACRES	=	40.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.690
FORMATION PERMEABILITY, MD.	=	5.00
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.220
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.331
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	664.688E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.865

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0251
16.1	0.086	0.749	0.0188
32.2	0.173	0.694	0.0174
48.3	0.259	0.676	0.0169
64.4	0.346	0.655	0.0164
80.5	0.432	0.634	0.0159
96.6	0.519	0.612	0.0153
112.6	0.605	0.590	0.0148
128.7	0.692	0.569	0.0143
144.8	0.778	0.541	0.0136
160.9	0.865	0.512	0.0128
FROM WATER BREAKTHROUGH TO FLOODOUT			
160.9	0.865	0.512	0.0128
171.2	0.882	0.506	0.0127
181.4	0.898	0.501	0.0126
191.6	0.913	0.479	0.0120
201.9	0.927	0.454	0.0114
212.1	0.941	0.431	0.0108
222.3	0.954	0.409	0.0103
232.6	0.966	0.388	0.0097
242.8	0.978	0.368	0.0092
253.0	0.989	0.349	0.0087
263.3	1.000	0.331	0.0083

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 4A

AREA BEING FLOODED (PER INJECTOR), ACRES	=	80.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.690
FORMATION PERMEABILITY, MD.	=	2.64
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.220
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.331
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	1329.375E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.865

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0127
32.2	0.086	0.749	0.0095
64.4	0.173	0.694	0.0088
96.6	0.259	0.676	0.0085
128.7	0.346	0.655	0.0083
160.9	0.432	0.634	0.0080
193.1	0.519	0.612	0.0077
225.3	0.605	0.590	0.0075
257.5	0.692	0.569	0.0072
289.7	0.778	0.541	0.0068
321.9	0.865	0.512	0.0065
FROM WATER BREAKTHROUGH TO FLOODOUT			
321.9	0.865	0.512	0.0065
342.3	0.882	0.506	0.0064
362.8	0.898	0.501	0.0063
383.3	0.913	0.479	0.0061
403.7	0.927	0.454	0.0058
424.2	0.941	0.431	0.0055
444.7	0.954	0.409	0.0052
465.1	0.966	0.388	0.0049
485.6	0.978	0.368	0.0047
506.1	0.989	0.349	0.0044
526.5	1.000	0.331	0.0042

Based on Core Sample 9A

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

AREA BEING FLOODED (PER INJECTOR), ACRES	=	[illegible]
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.690
FORMATION PERMEABILITY, MD.	=	5.00
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.220
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.331
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	1329.375E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.865

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0240
32.2	0.086	0.749	0.0180
64.4	0.173	0.694	0.0166
96.6	0.259	0.676	0.0162
128.7	0.346	0.655	0.0157
160.9	0.432	0.634	0.0152
193.1	0.519	0.612	0.0147
225.3	0.605	0.590	0.0142
257.5	0.692	0.569	0.0136
289.7	0.778	0.541	0.0130
321.9	0.865	0.512	0.0123
FROM WATER BREAKTHROUGH TO FLOODOUT			
321.9	0.865	0.512	0.0123
342.3	0.882	0.506	0.0121
362.8	0.898	0.501	0.0120
383.3	0.913	0.479	0.0115
403.7	0.927	0.454	0.0109
424.2	0.941	0.431	0.0103
444.7	0.954	0.409	0.0098
465.1	0.966	0.388	0.0093
485.6	0.978	0.368	0.0088
506.1	0.989	0.349	0.0084
526.5	1.000	0.331	0.0079

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 9B

AREA BEING FLOODED (PER INJECTOR), ACRES	=	40.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.590
FORMATION PERMEABILITY, MD.	=	4.52
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.150
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.225
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	664.688E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.940

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0227
11.2	0.094	0.571	0.0129
22.5	0.188	0.527	0.0119
33.7	0.282	0.510	0.0116
45.0	0.376	0.494	0.0112
56.2	0.470	0.477	0.0108
67.5	0.564	0.458	0.0104
78.7	0.658	0.438	0.0099
89.9	0.752	0.416	0.0094
101.2	0.846	0.393	0.0089
112.4	0.940	0.318	0.0072
FROM WATER BREAKTHROUGH TO FLOODOUT			
112.4	0.940	0.318	0.0072
115.2	0.946	0.308	0.0070
117.9	0.953	0.298	0.0068
120.7	0.959	0.288	0.0065
123.5	0.965	0.279	0.0063
126.2	0.971	0.269	0.0061
129.0	0.977	0.260	0.0059
131.7	0.983	0.251	0.0057
134.5	0.989	0.242	0.0055
137.3	0.995	0.234	0.0053
140.0	1.000	0.225	0.0051

Based on Core Sample 4B

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

AREA BEING FLOODED (PER INJECTOR), ACRES	=	40.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.590
FORMATION PERMEABILITY, MD.	=	2.50
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.150
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.225
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	664.688E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.940

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0125
11.2	0.094	0.571	0.0072
22.5	0.188	0.527	0.0066
33.7	0.282	0.510	0.0064
45.0	0.376	0.494	0.0062
56.2	0.470	0.477	0.0060
67.5	0.564	0.458	0.0057
78.7	0.658	0.438	0.0055
89.9	0.752	0.416	0.0052
101.2	0.846	0.393	0.0049
112.4	0.940	0.318	0.0040
FROM WATER BREAKTHROUGH TO FLOODOUT			
112.4	0.940	0.318	0.0040
115.2	0.946	0.308	0.0039
117.9	0.953	0.298	0.0037
120.7	0.959	0.288	0.0036
123.5	0.965	0.279	0.0035
126.2	0.971	0.269	0.0034
129.0	0.977	0.260	0.0033
131.7	0.983	0.251	0.0031
134.5	0.989	0.242	0.0030
137.3	0.995	0.234	0.0029
140.0	1.000	0.225	0.0028

BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 9B

AREA BEING FLOODED (PER INJECTOR), ACRES	=	80.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.590
FORMATION PERMEABILITY, MD.	=	4.52
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.150
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

MOBILITY RATIO	=	0.225
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	1329.375E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.940

CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0217
22.5	0.094	0.571	0.0124
45.0	0.188	0.527	0.0114
67.5	0.282	0.510	0.0111
89.9	0.376	0.494	0.0107
112.4	0.470	0.477	0.0103
134.9	0.564	0.458	0.0099
157.4	0.658	0.438	0.0095
179.9	0.752	0.416	0.0090
202.4	0.846	0.393	0.0085
224.8	0.940	0.318	0.0069
FROM WATER BREAKTHROUGH TO FLOODOUT			
224.8	0.940	0.318	0.0069
230.4	0.946	0.308	0.0067
235.9	0.953	0.298	0.0065
241.4	0.959	0.288	0.0062
246.9	0.965	0.279	0.0060
252.4	0.971	0.269	0.0058
258.0	0.977	0.260	0.0056
263.5	0.983	0.251	0.0054
269.0	0.989	0.242	0.0053
274.5	0.995	0.234	0.0051
280.0	1.000	0.225	0.0049

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BASIC DATA FOR WATER INJECTIVITY CALCULATIONS

Based on Core Sample 4B

AREA BEING FLOODED (PER INJECTOR), ACRES	=	80.0
AVERAGE NET PAY THICKNESS, FEET	=	14.0
FORMATION POROSITY, FRACTION	=	0.153
INITIAL GAS SATURATION, FRACTION	=	0.000
OIL ZONE CONNATE WATER SATURATION, FRACTION	=	0.410
WATER BANK AVG. Sw (UP TO BREAKTHRU), FRAC.	=	0.590
FORMATION PERMEABILITY, MD.	=	2.50
OIL BANK REL. PERM. TO OIL (Kro), FRACTION	=	1.000
WATER BANK REL. PERM. TO WATER (Krw), FRACTION	=	0.150
OIL VISCOSITY, CP.	=	1.30
WATER VISCOSITY, CP.	=	0.87
WELLBORE RADIUS, FEET	=	0.250

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MOBILITY RATIO	=	0.225
PATTERN PORE VOLUME (PER INJECTOR), BARRELS	=	1329.375E+3
AREAL SWEEP EFFICIENCY AT BREAKTHROUGH, FRAC.	=	0.940

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CUMULATIVE WATER INJECTION VOLUME VERSUS WATER INJECTIVITY

WATER INJECTION MBBLS	AREAL SWEEP EFFICIENCY FRACTION	RELATIVE CONDUCTANCE RATIO	INJECTIVITY INDEX B/D/PSI
FROM START TO WATER BREAKTHROUGH			
0.0	0.000	1.000	0.0120
22.5	0.094	0.571	0.0068
45.0	0.188	0.527	0.0063
67.5	0.282	0.510	0.0061
89.9	0.376	0.494	0.0059
112.4	0.470	0.477	0.0057
134.9	0.564	0.458	0.0055
157.4	0.658	0.438	0.0053
179.9	0.752	0.416	0.0050
202.4	0.846	0.393	0.0047
224.8	0.940	0.318	0.0038
FROM WATER BREAKTHROUGH TO FLOODOUT			
224.8	0.940	0.318	0.0038
230.4	0.946	0.308	0.0037
235.9	0.953	0.298	0.0036
241.4	0.959	0.288	0.0035
246.9	0.965	0.279	0.0033
252.4	0.971	0.269	0.0032
258.0	0.977	0.260	0.0031
263.5	0.983	0.251	0.0030
269.0	0.989	0.242	0.0029
274.5	0.995	0.234	0.0028
280.0	1.000	0.225	0.0027

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Fractional Flow Data

South Pierson Field
Sample # 4b

12-Dec-91

a:	1.07E+11
b:	47

Sw	Kro	Krw	Kro/Krw	Uo	Uw	fw	dfw/dSw
0.410	1.000	0.000	#DIV/0!	1.3	0.865	#DIV/0!	#DIV/0!
0.487	0.158	0.013	12.154	1.3	0.865	0.110	4.603
0.510	0.120	0.026	4.615	1.3	0.865	0.246	8.709
0.530	0.074	0.046	1.609	1.3	0.865	0.483	11.736
0.564	0.026	0.104	0.250	1.3	0.865	0.857	5.747
0.585	0.015	0.123	0.122	1.3	0.865	0.925	3.263
0.680	0.000	0.517	0.000	1.3	0.865	1.000	0.000

Fractional Flow Data

South Pierson Field

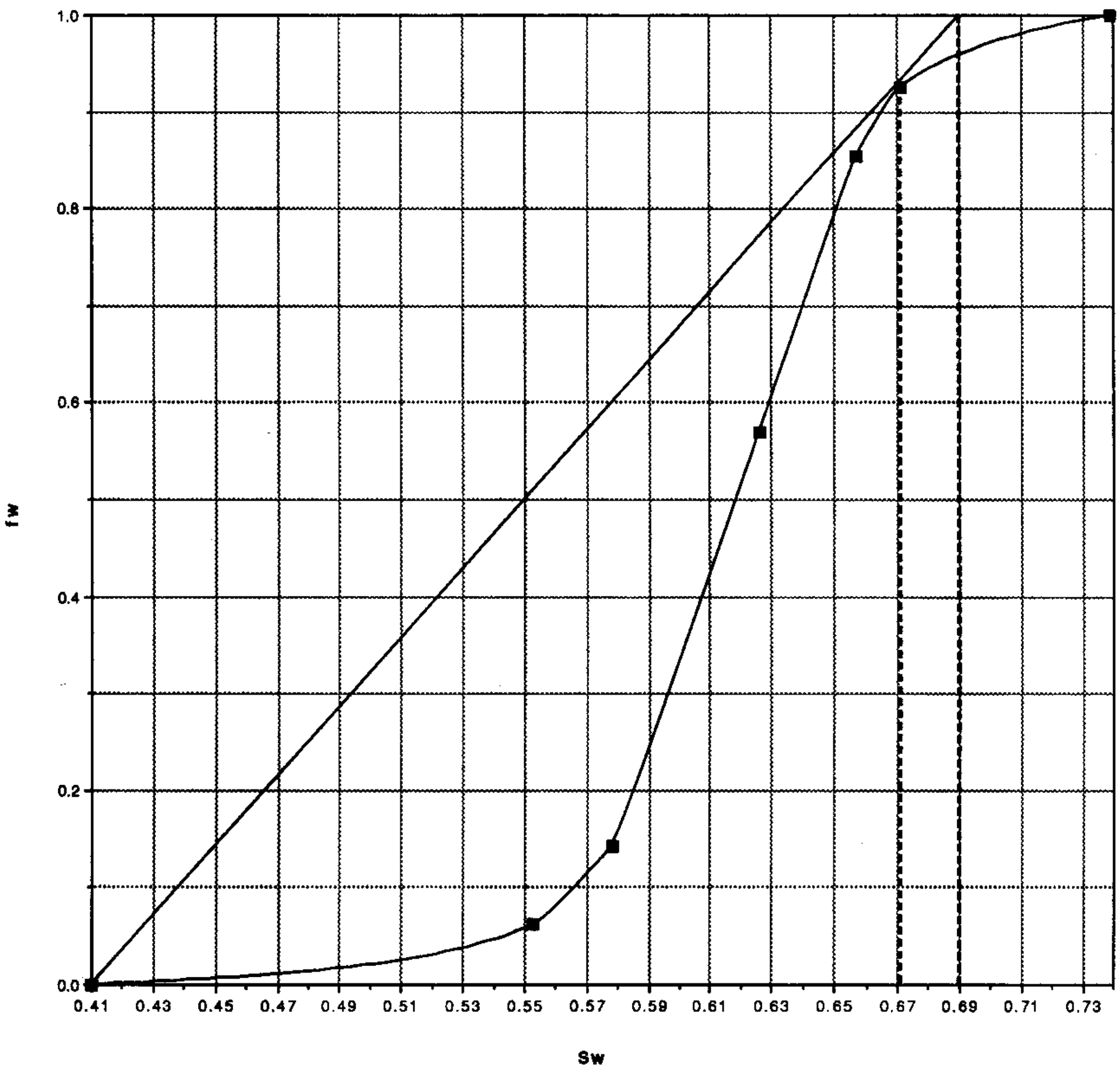
Sample # 4a

12-Dec-91

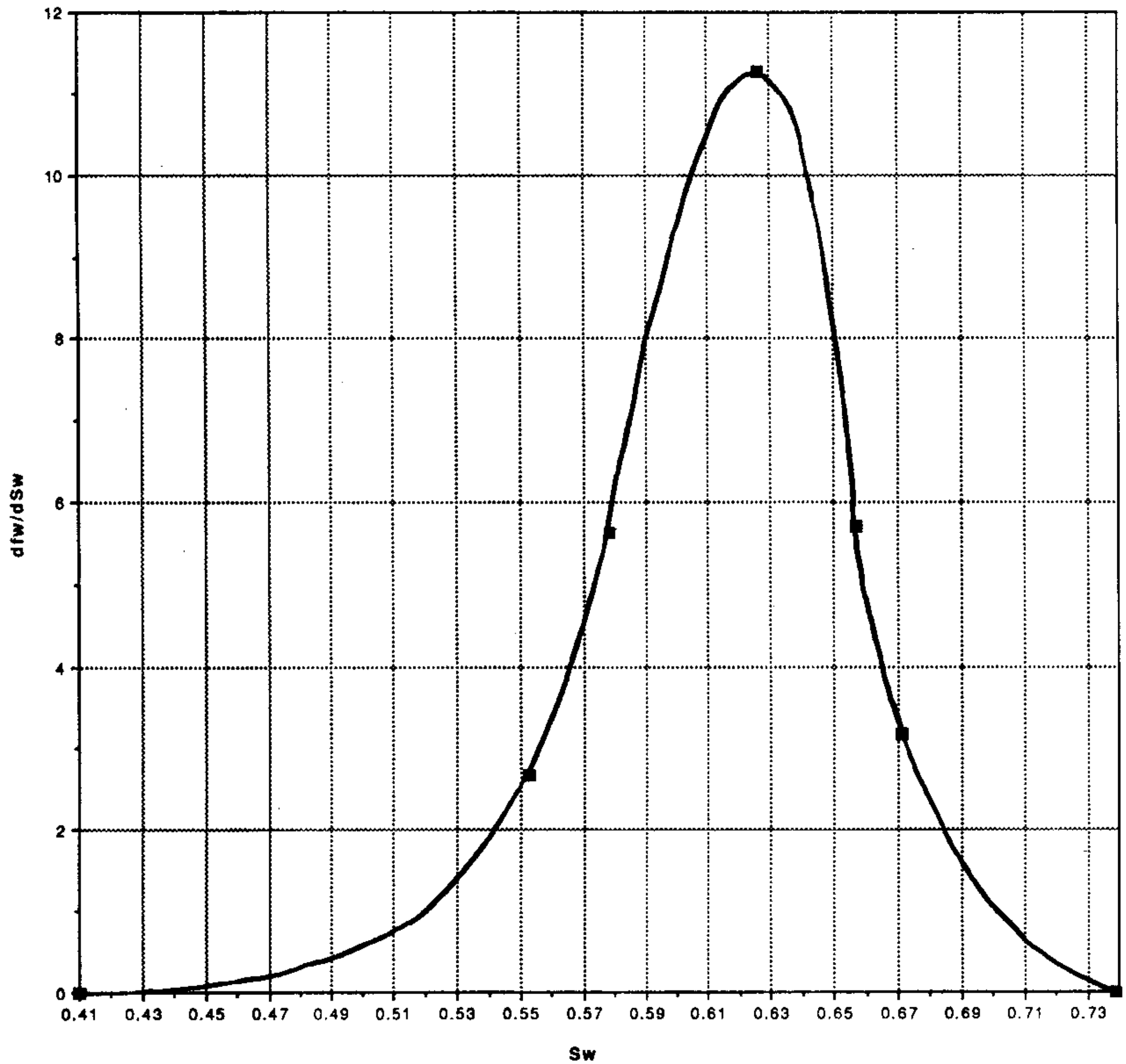
a:	3.20E+12
b:	46

Sw	Kro	Krw	Kro/Krw	Uo	Uw	fw	dfw/dSw
0.410	1.000	0.000	#DIV/0!	1.3	0.865	#DIV/0!	#DIV/0!
0.553	0.296	0.013	22.769	1.3	0.865	0.062	2.672
0.578	0.181	0.020	9.050	1.3	0.865	0.142	5.618
0.626	0.084	0.074	1.135	1.3	0.865	0.570	11.277
0.657	0.026	0.102	0.255	1.3	0.865	0.855	5.703
0.671	0.018	0.149	0.121	1.3	0.865	0.926	3.168
0.739	0.000	0.653	0.000	1.3	0.865	1.000	0.000

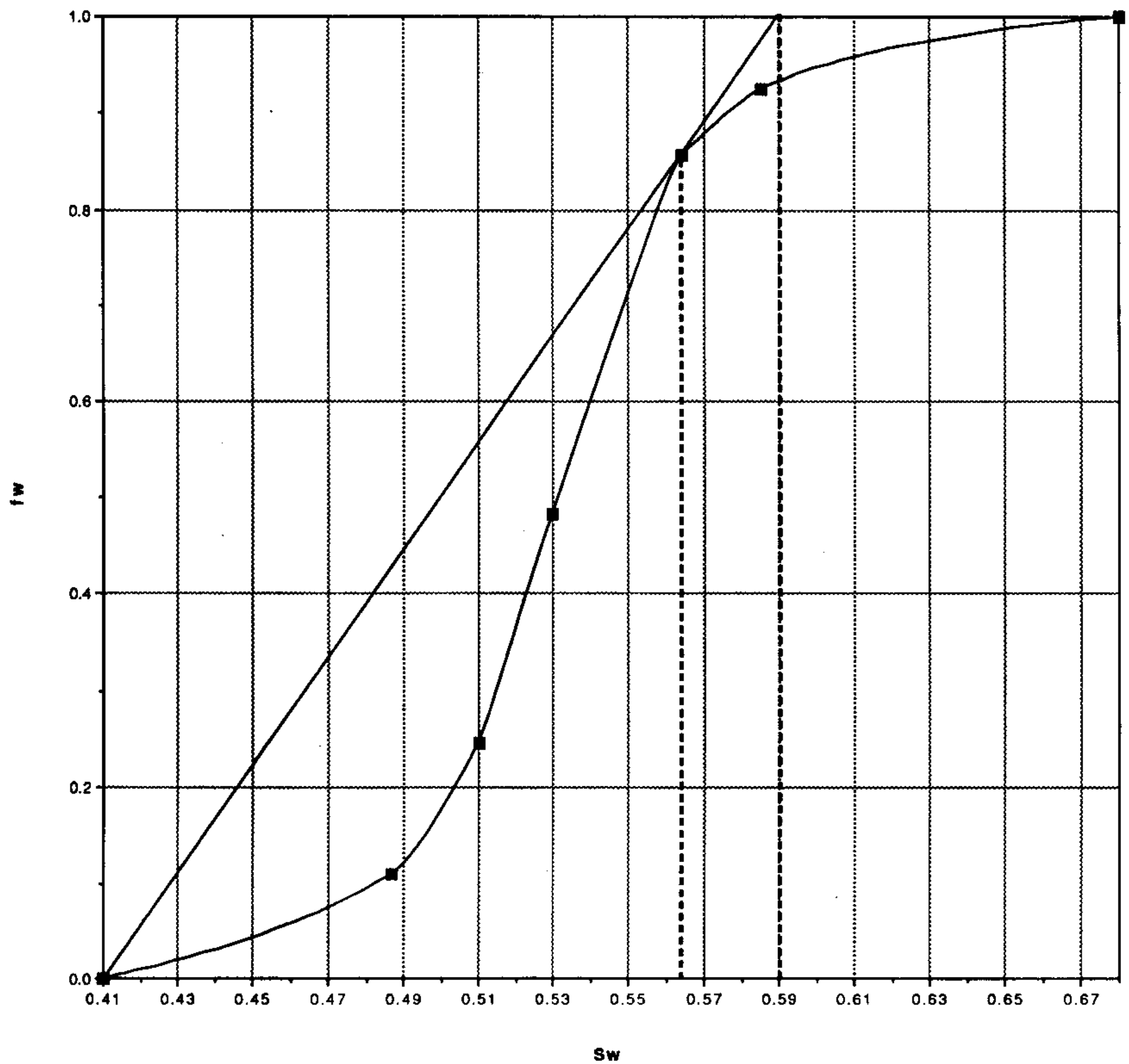
SOUTH PIERSON - FRACTIONAL FLOW CURVE
Sample 4A



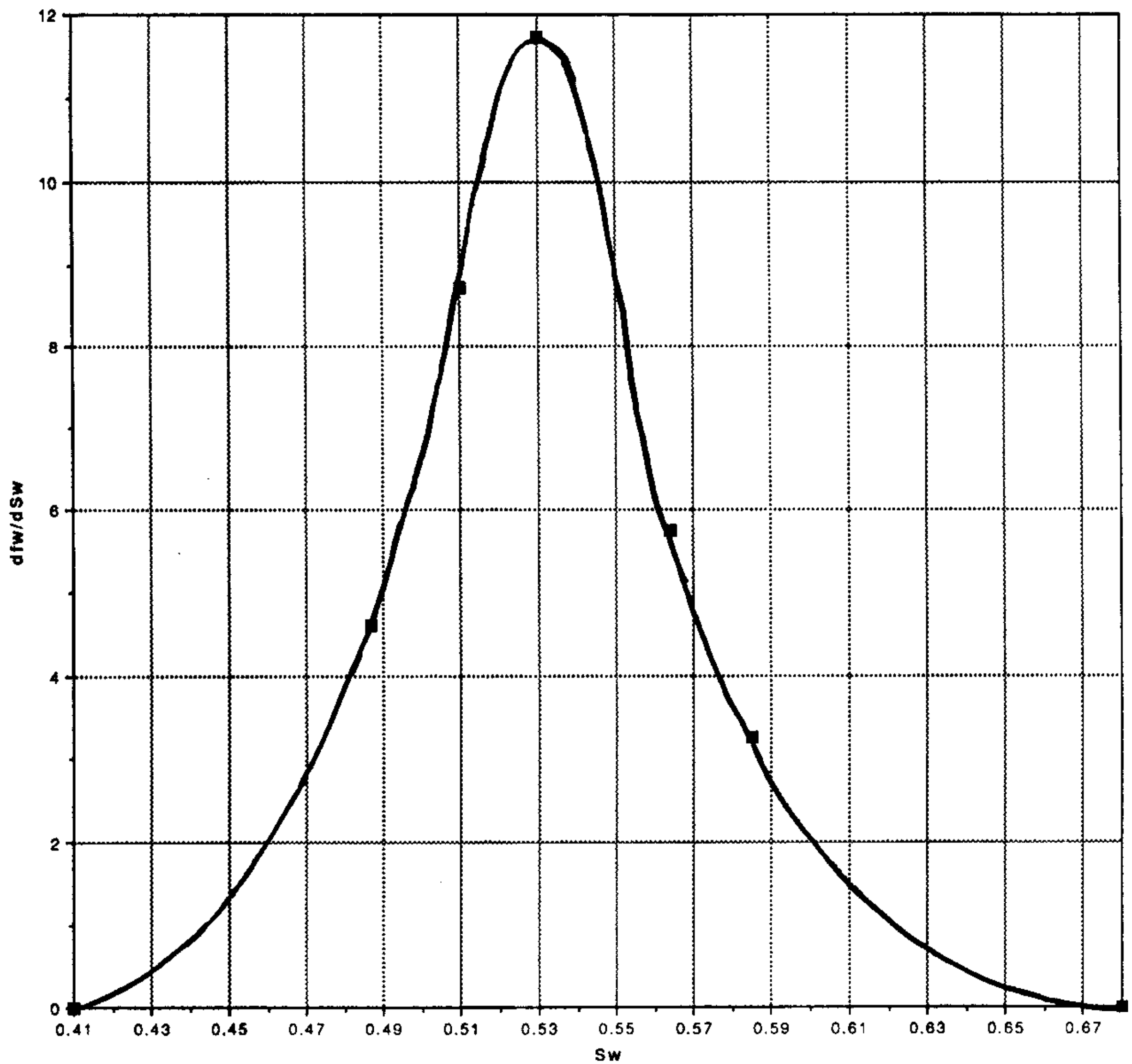
SOUTH PIERSON - dfw/dSw PLOT
Sample 4A



SOUTH PIERSON - FRACTIONAL FLOW CURVE
Sample 4B

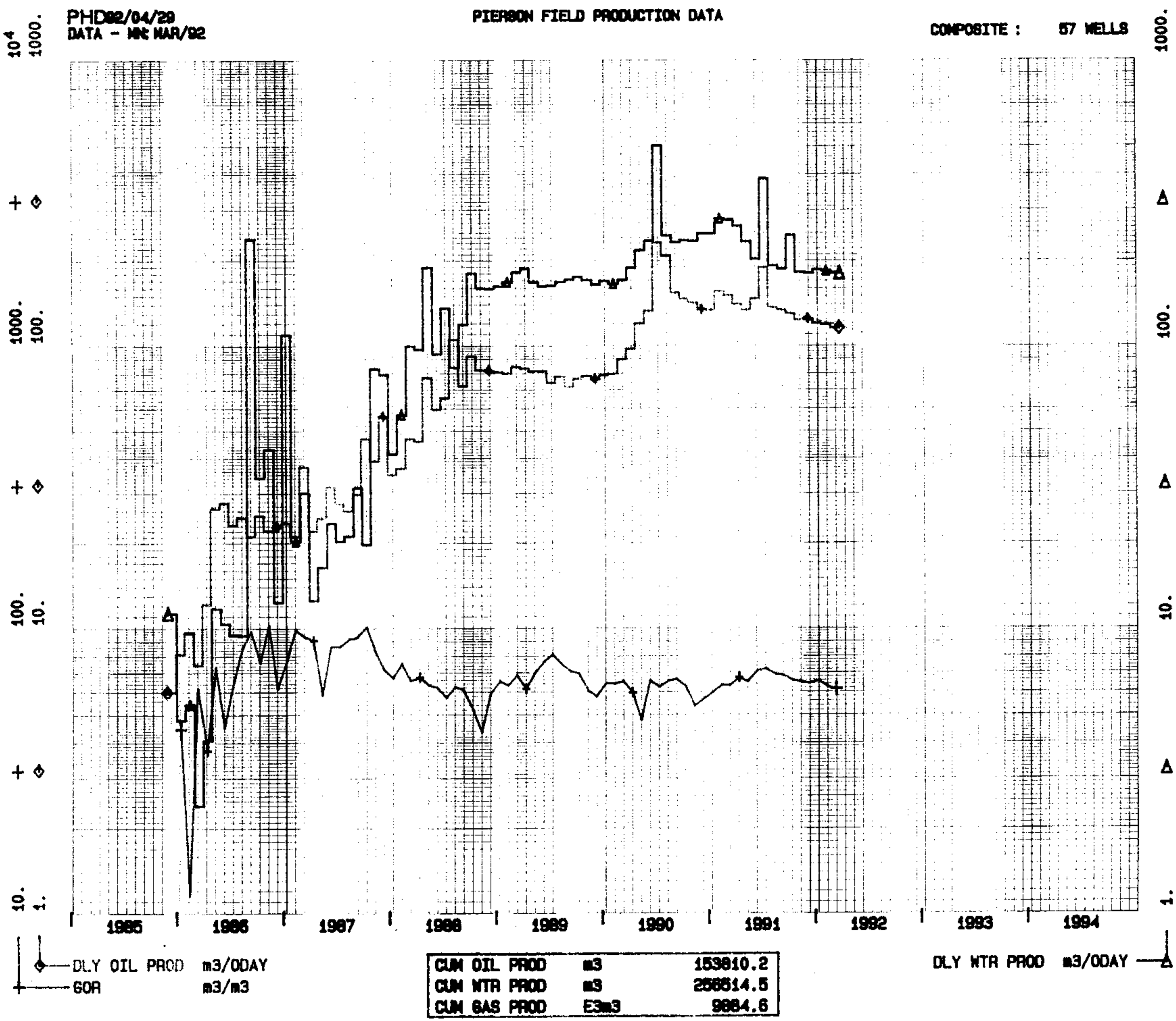


SOUTH PIERSON - dfw/dSw PLOT
Sample 4B



South Pierson

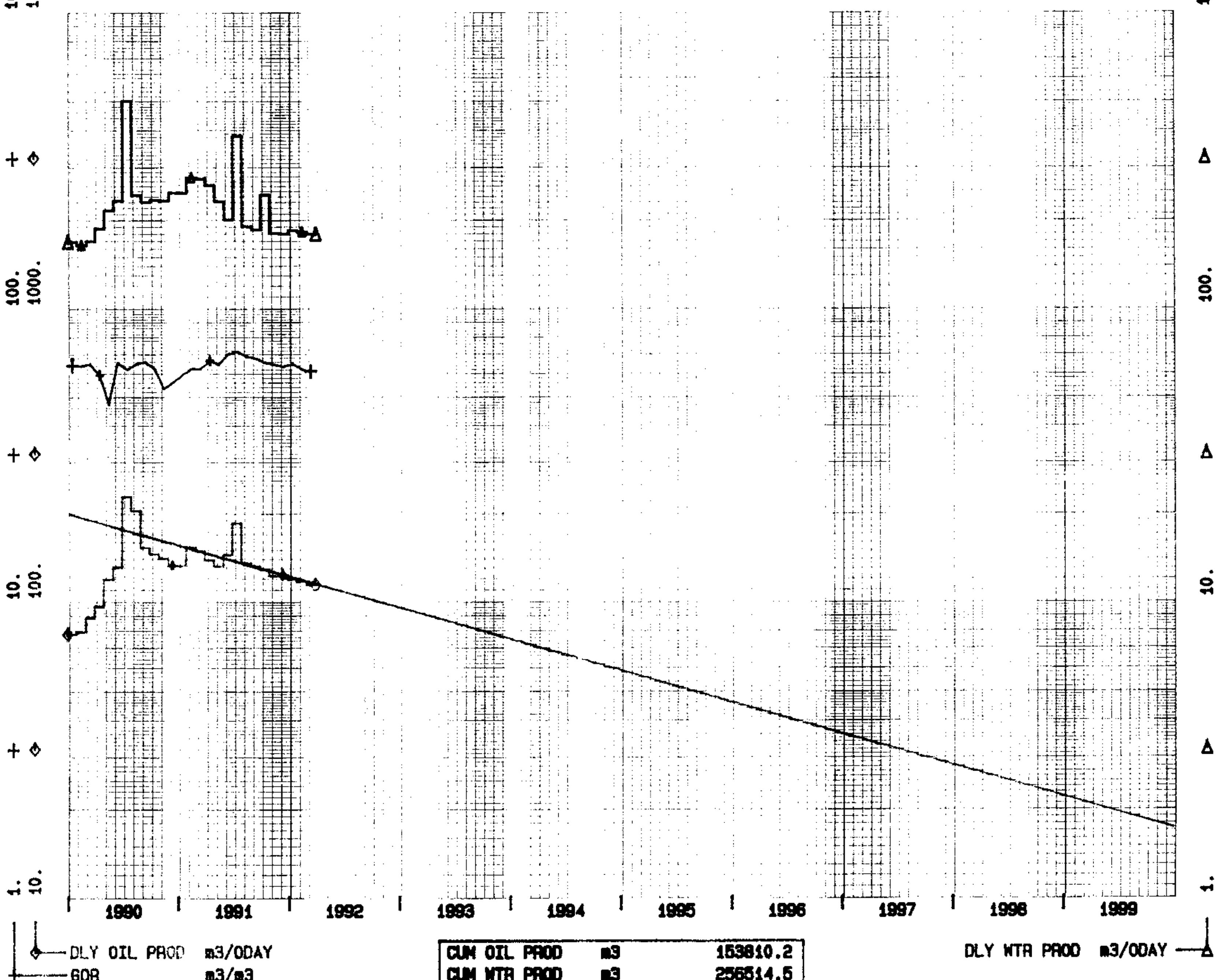
Composite Rate versus Time Plot


PHD92/04/29
DATA - NN MAR/92
PIERSON FIELD PRODUCTION DATA
COMPOSITE : 57 WELLS
10⁴ 1000.
1000. 100.
100. 10.
10. 1.
1000.
100.
10.
1.
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 153810.2
CUM WTR PROD m3 256514.5
CUM GAS PROD E3m3 9884.6
DLY WTR PROD m3/ODAY

PHD92/04/29
DATA - MR MAR/92

PIERSON FIELD PRODUCTION DATA

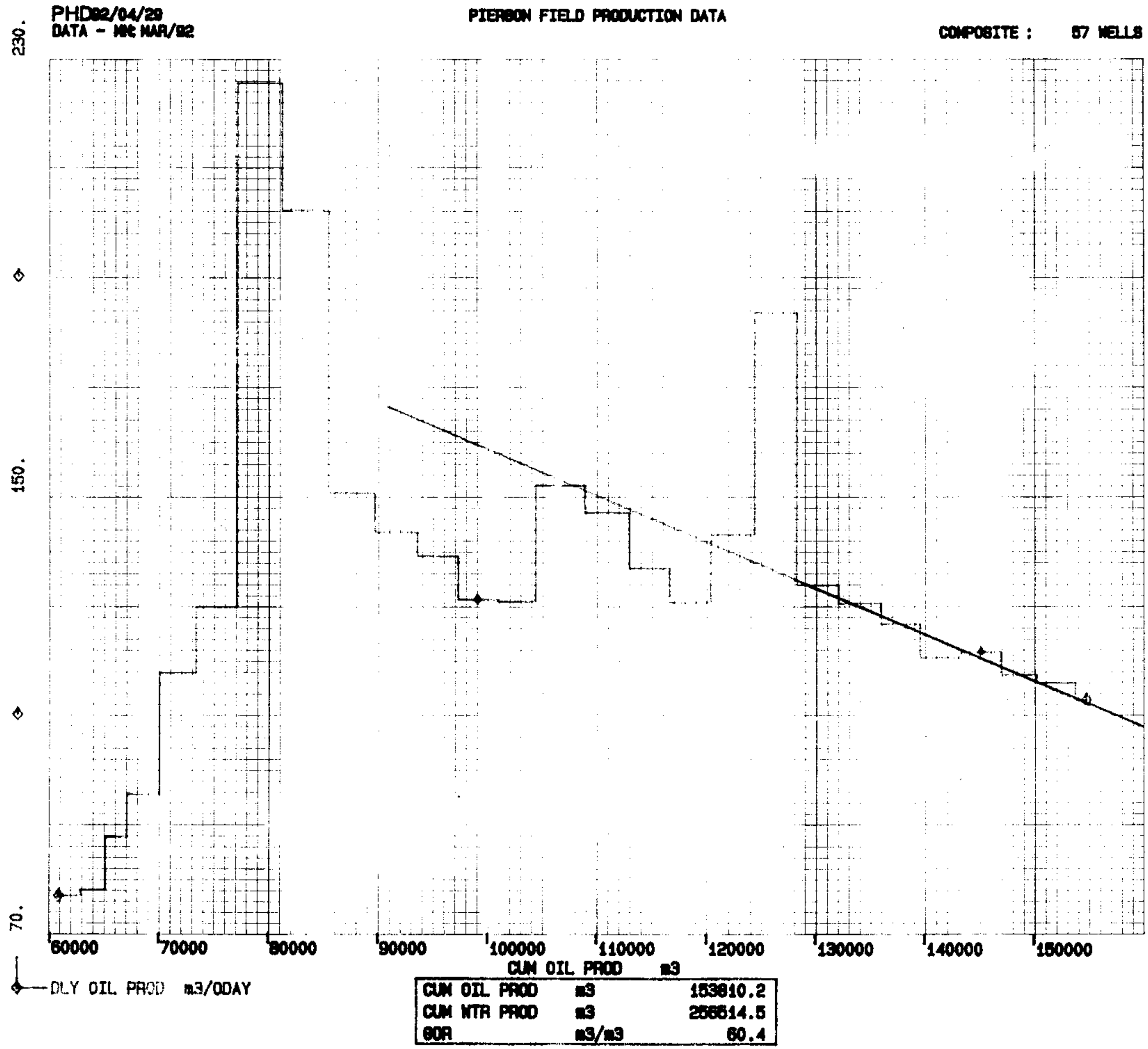
COMPOSITE : 57 WELLS



CUM OIL PROD	m3	153810.2
CUM WTR PROD	m3	256514.5
CUM GAS PROD	E3m3	9884.6

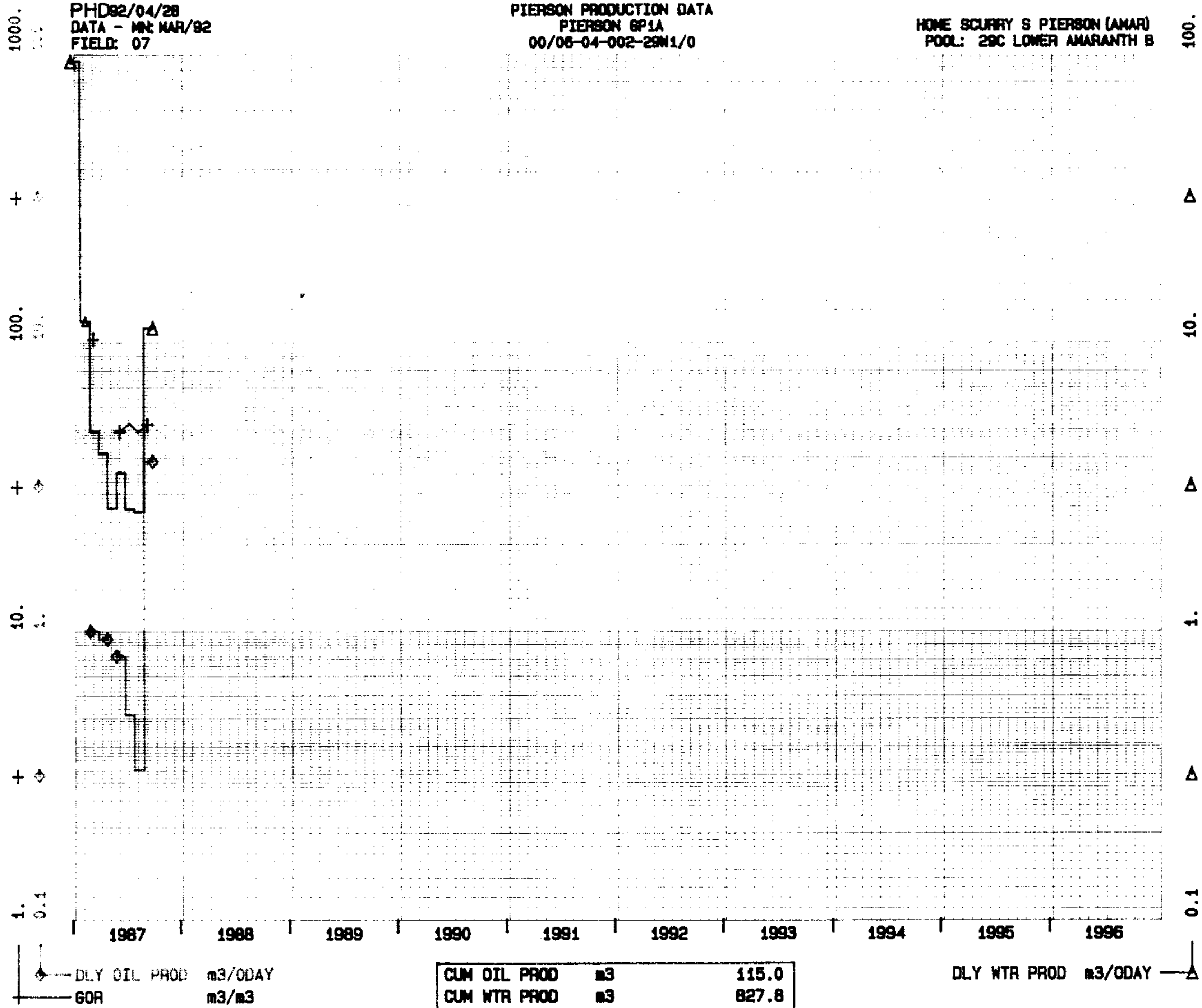
South Pierson

Composite Rate versus Cumulative Production Plot


PHD92/04/29
DATA - MNt MAR/92
PIERSON FIELD PRODUCTION DATA
COMPOSITE : 57 WELLS
230.
150.
70.
60000
70000
80000
90000
100000
110000
120000
130000
140000
150000
CUM OIL PROD m3
DLY OIL PROD m3/ODAY
CUM OIL PROD m3 153810.2
CUM WTR PROD m3 258614.5
GOR m3/m3 60.4

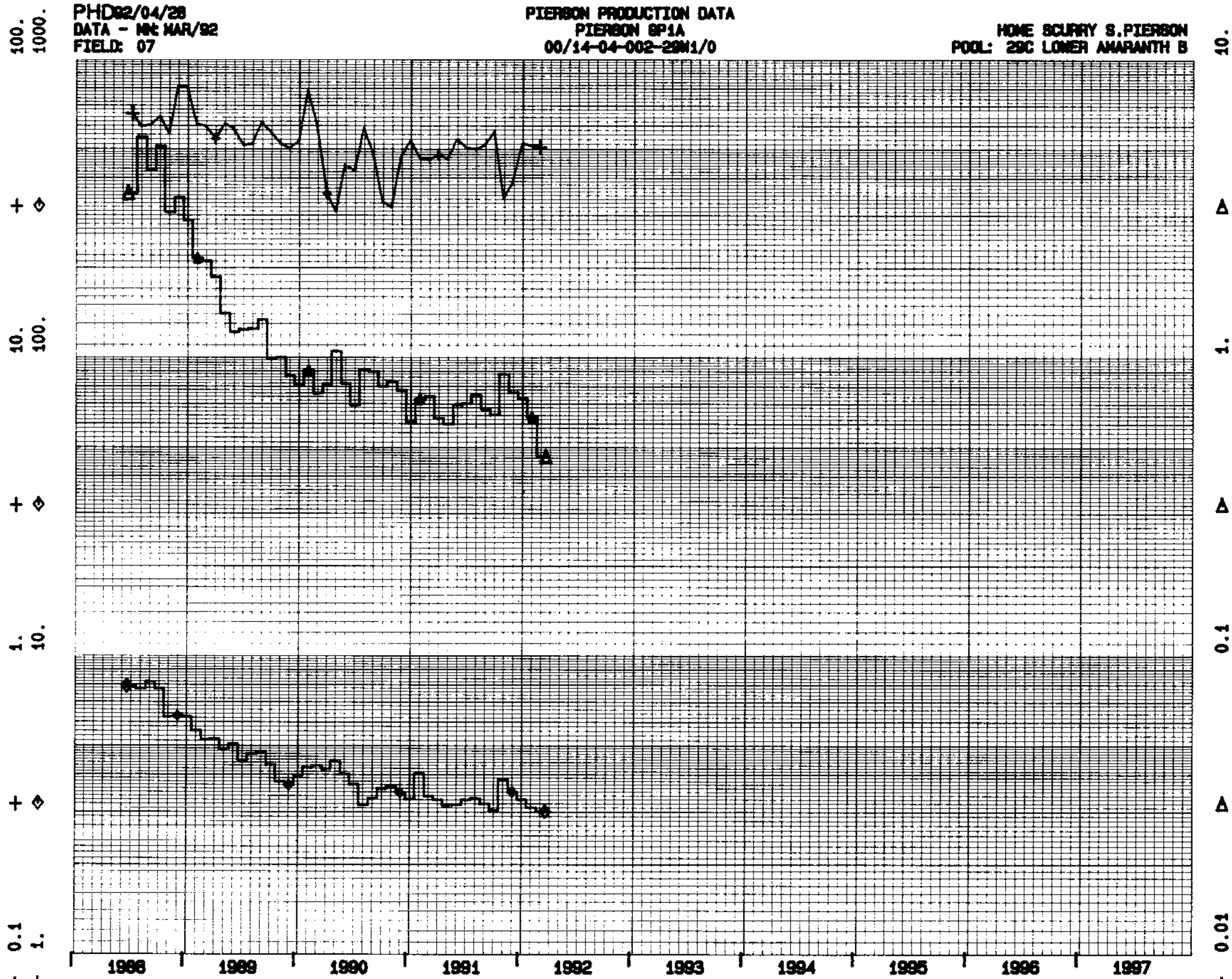
South Pierson

PHD Individual Well Plots



CUM OIL PROD	m3	115.0
CUM WTR PROD	m3	827.8
CUM GAS PROD	E3m3	11.8

(4)
84 84/02



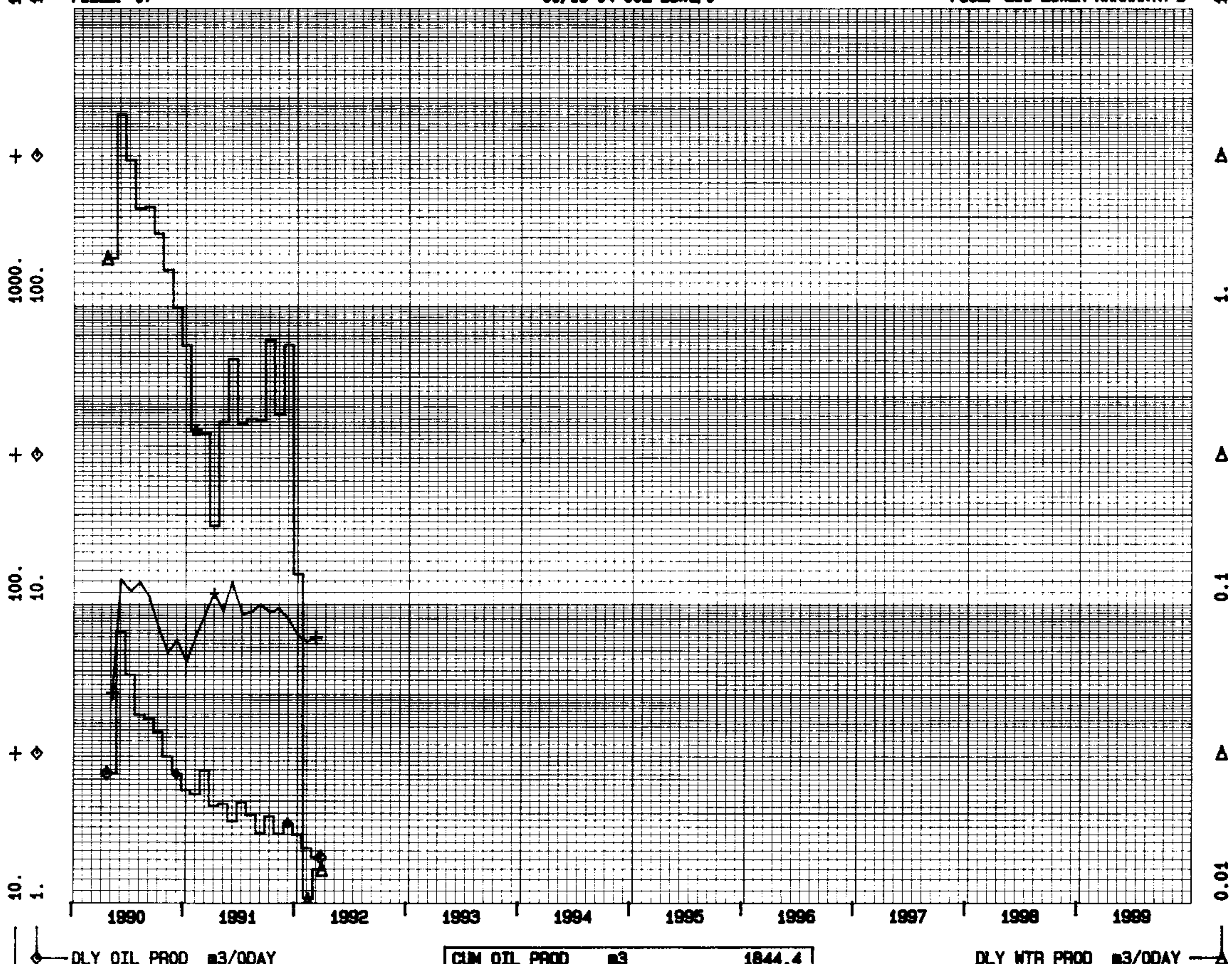
CUM OIL PROD	m3	5668.9
CUM WTR PROD	m3	1807.7
CUM GAS PROD	E3m3	305.9

(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA
PIERSON GP1A
00/16-04-002-29W1/0

HOME SRO S PIERSON PROV 16-4-2-29
POOL: 29C LOWER AMARANTH B



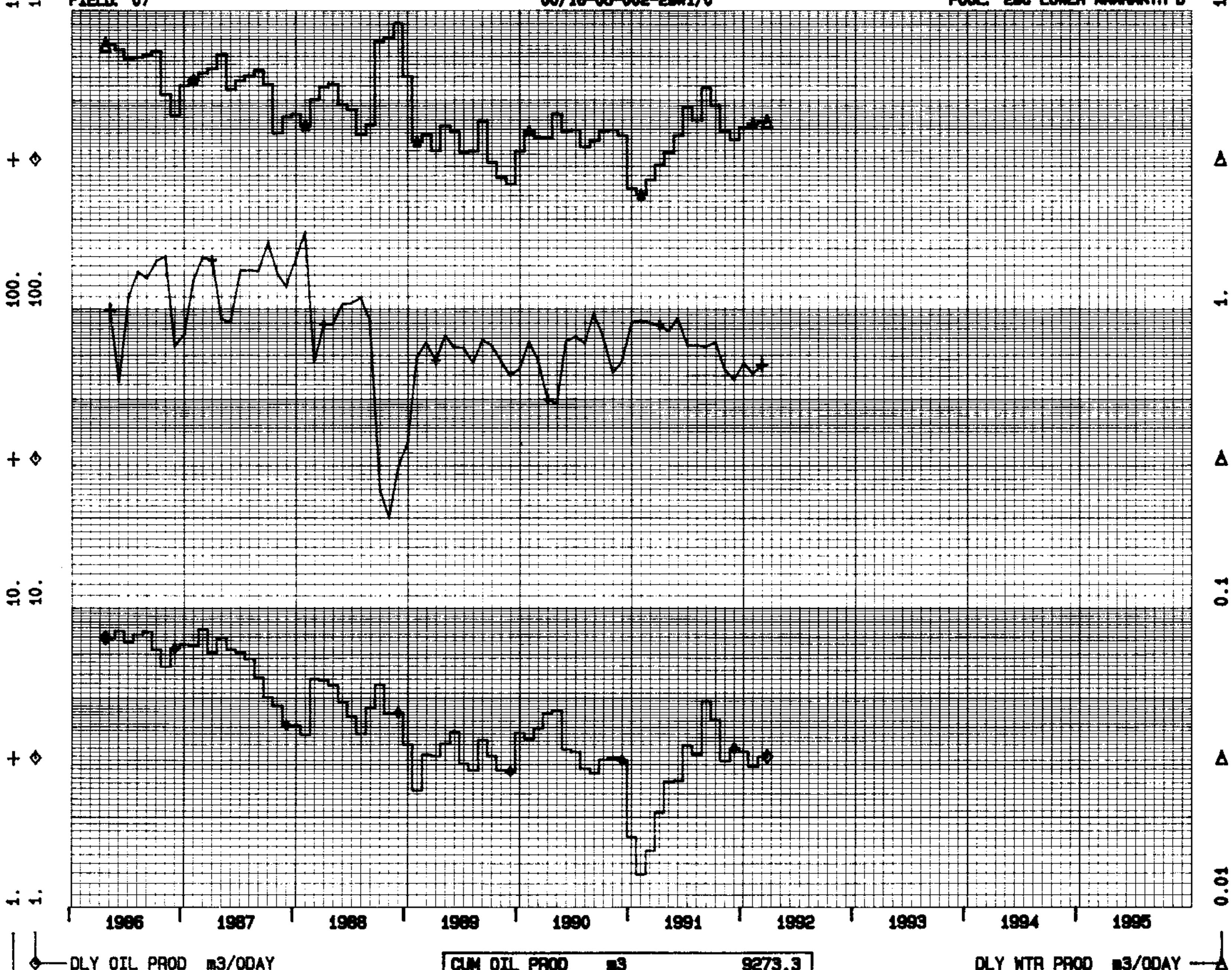
CUM OIL PROD	m3	1844.4
CUM WTR PROD	m3	656.2
CUM GAS PROD	E3m3	178.0

(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

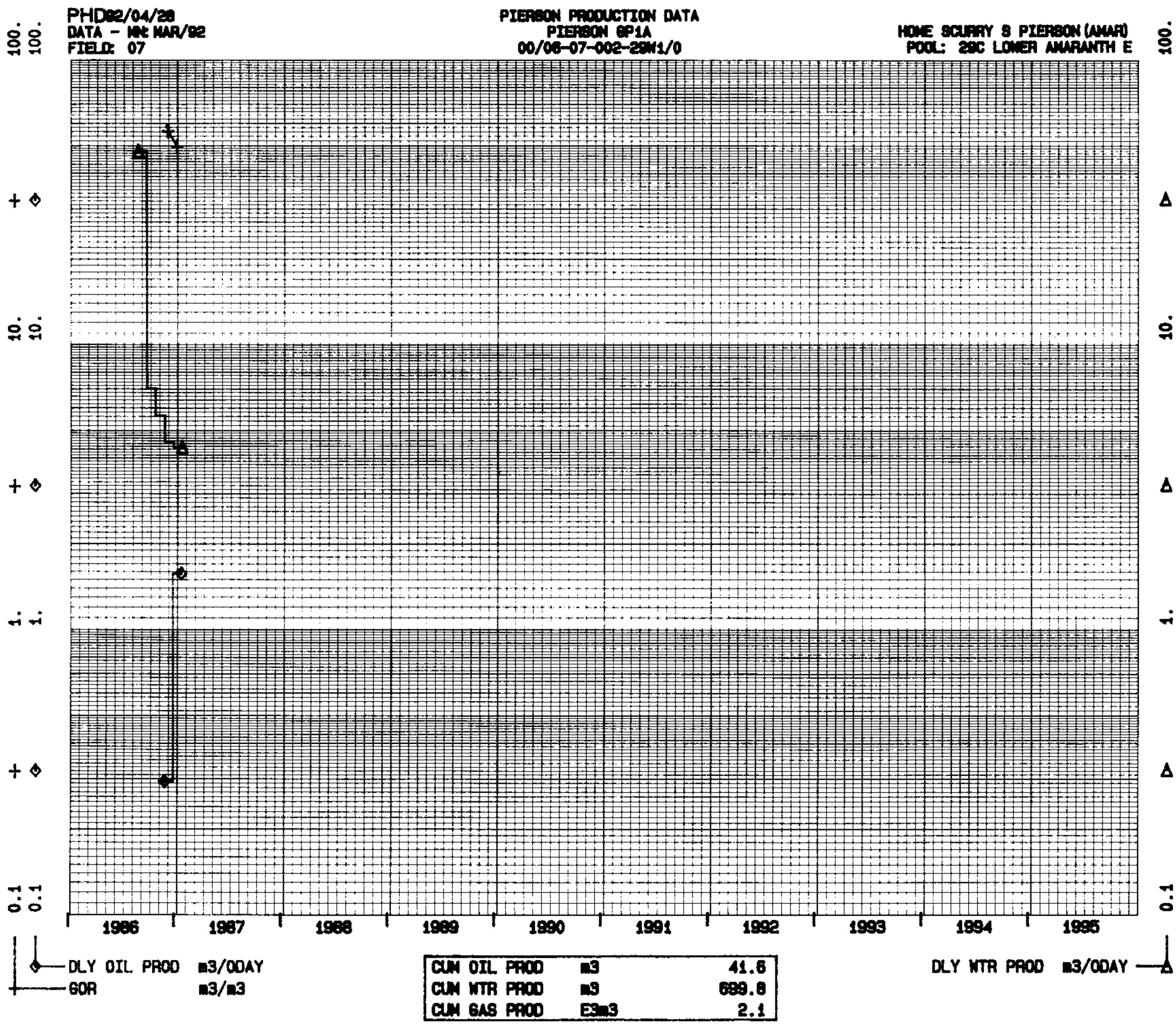
PIERSON PRODUCTION DATA
PIERSON GP1A
00/16-05-002-29W1/0

HOME SRO S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B

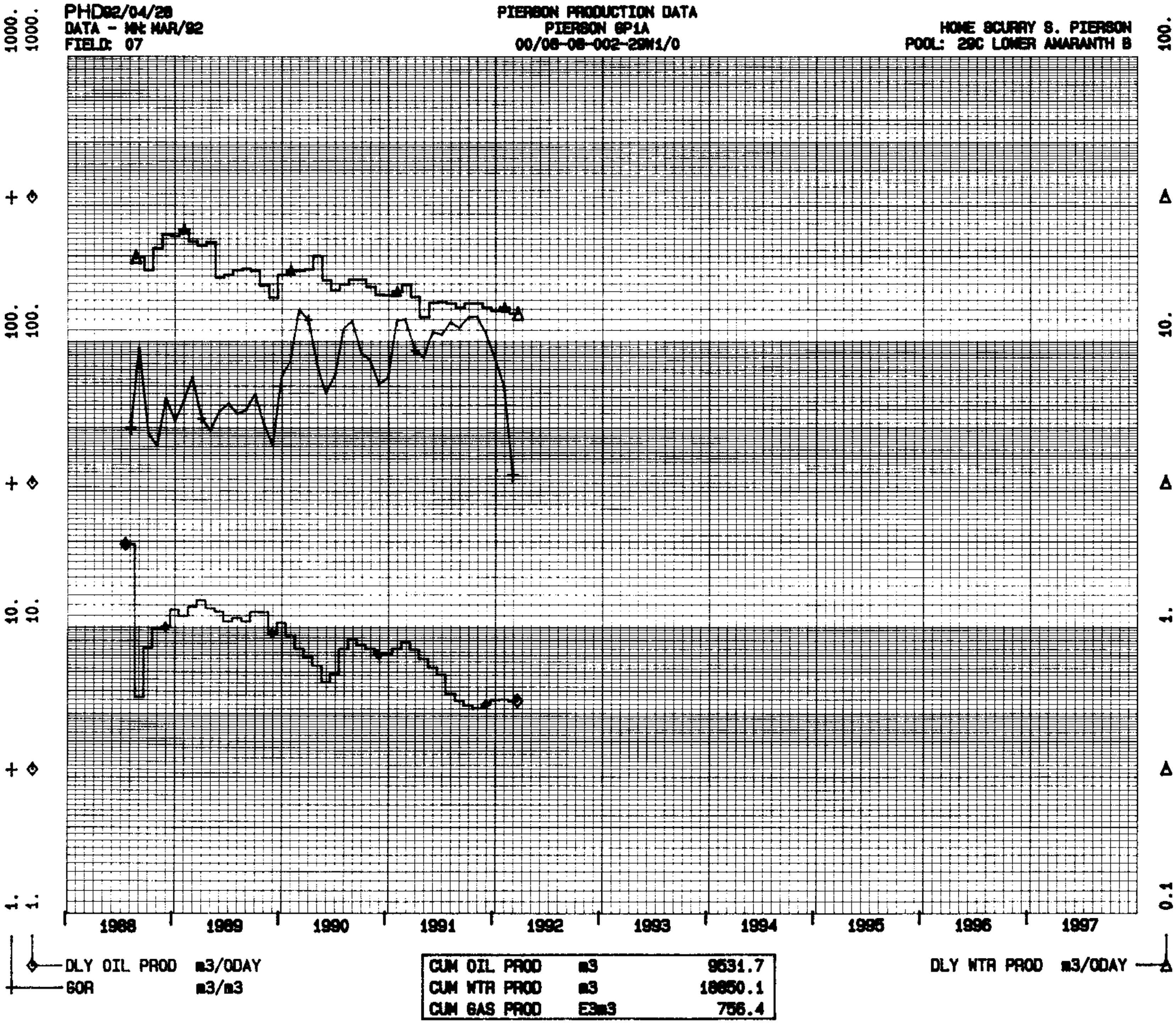


CUM OIL PROD	m3	9273.3
CUM WTR PROD	m3	9742.7
CUM GAS PROD	E3m3	873.9

(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
PIERSON 8P1A
00/06-07-002-29W1/0
HOME SCURRY S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH E
100.
10.
1.
0.1
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 41.6
CUM WTR PROD m3 699.8
CUM GAS PROD E3m3 2.1
DLY WTR PROD m3/ODAY

(4)
1184 84/02



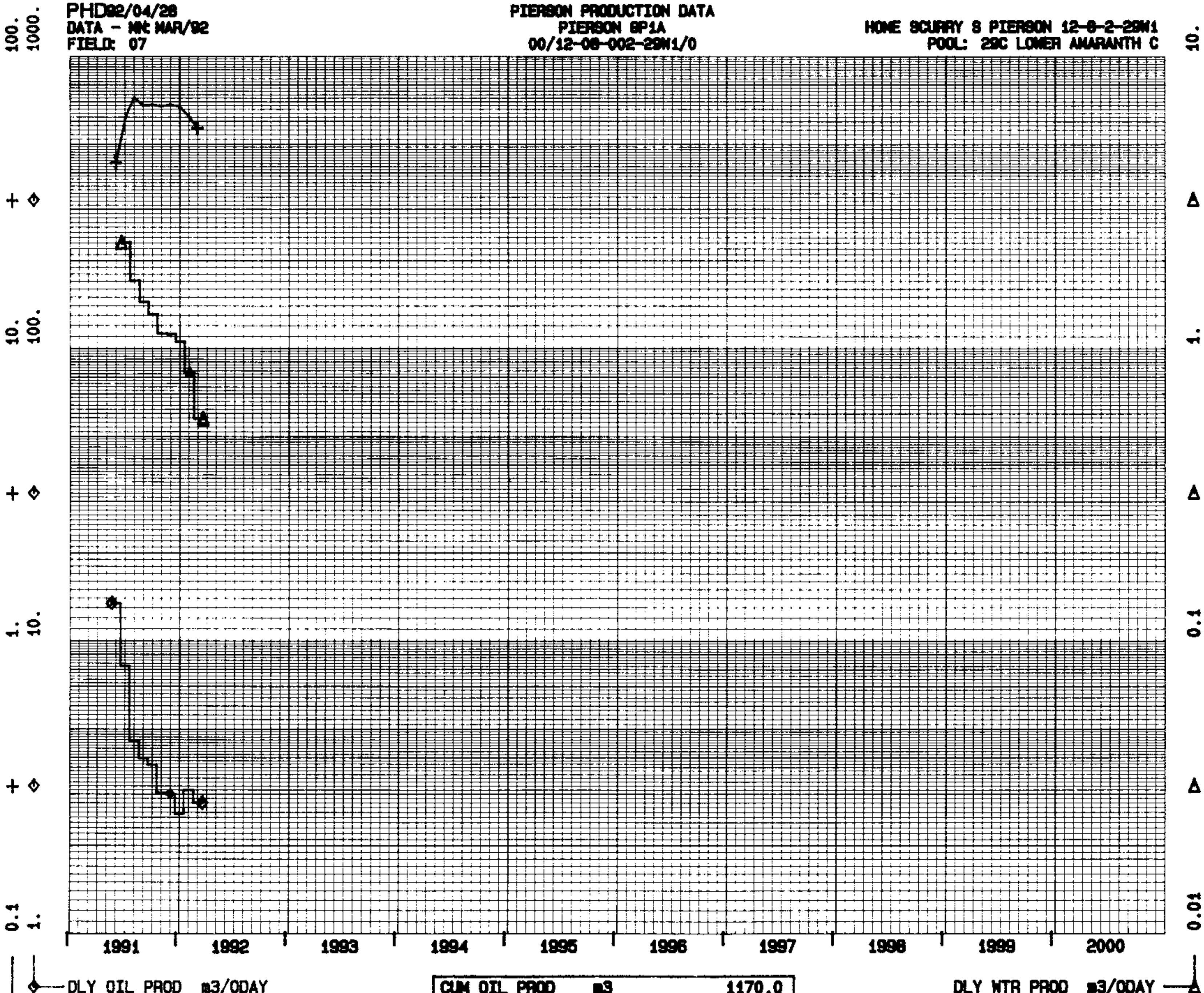
PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
PIERSON 6P1A
00/08-08-002-29W1/0
HOME SCURRY S. PIERSON
POOL: 29C LOWER AMARANTH B
1000.
1000.
100.
100.
10.
10.
1.
1.
100.
10.
1.
0.1
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 9631.7
CUM WTR PROD m3 18850.1
CUM GAS PROD E3m3 756.4
DLY WTR PROD m3/ODAY

(4)
1184 84/02

PHD92/04/28
DATA - NN: MAR/92
FIELD: 07

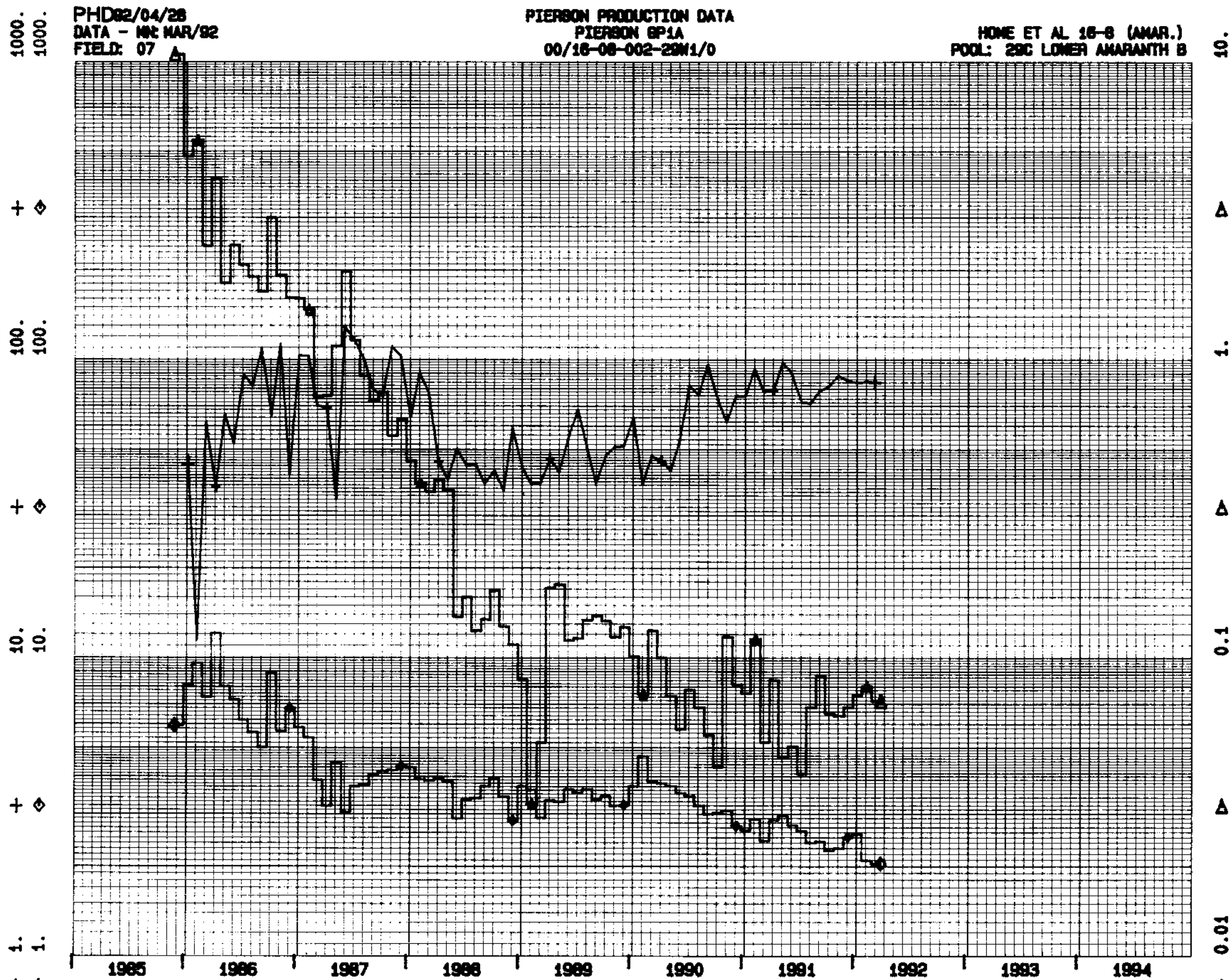
PIERSON PRODUCTION DATA
PIERSON 8P1A
00/12-08-002-29W1/0

HOME SCURRY S PIERSON 12-8-2-29W1
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	1170.0
CUM WTR PROD	m3	346.5
CUM GAS PROD	E3m3	73.3

(4)
1184 84/02



CUM OIL PROD	m3	8361.6
CUM WTR PROD	m3	1450.3
CUM GAS PROD	E3m3	543.2

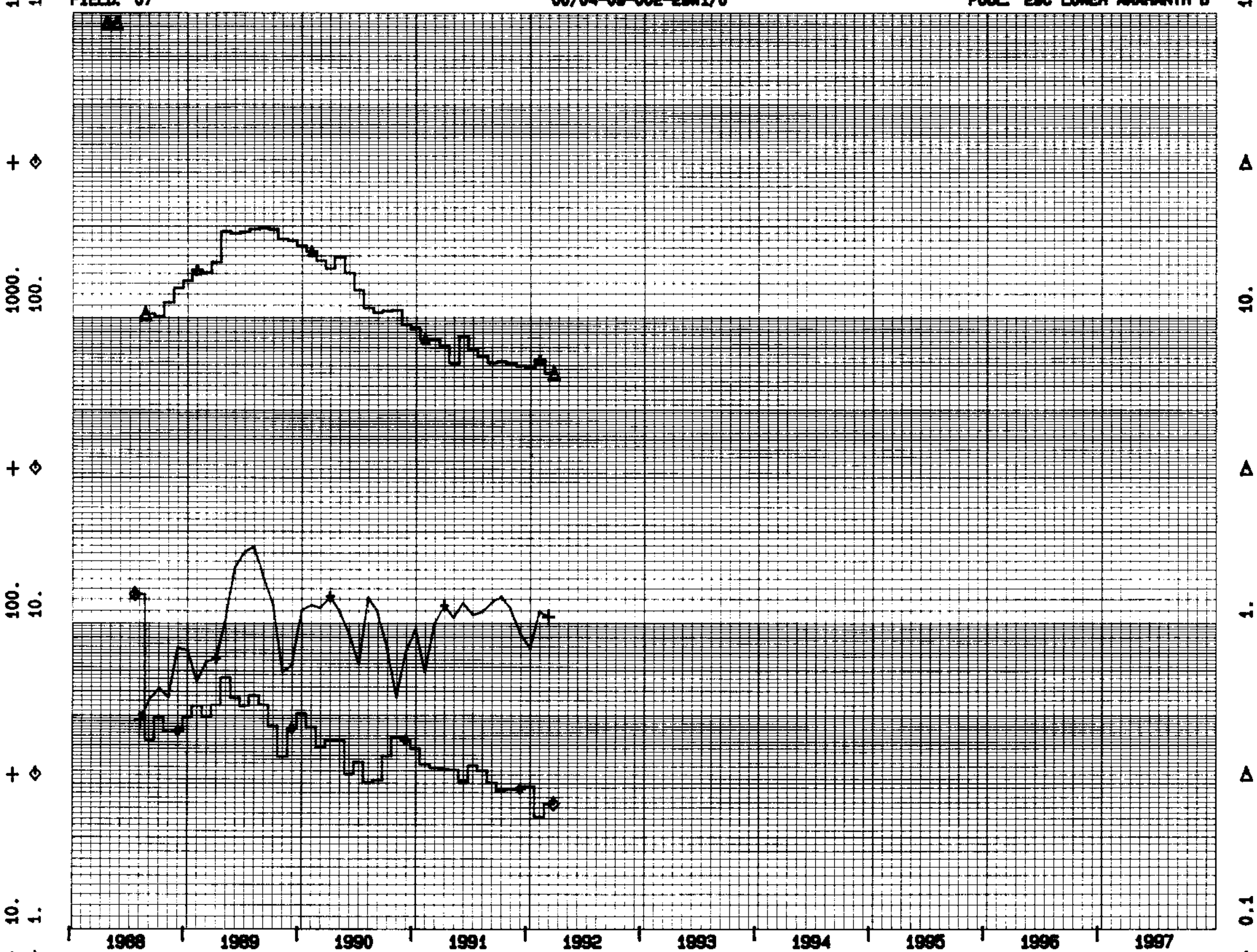
(4)
1184 84/02

PHD92/04/28
DATA - WN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

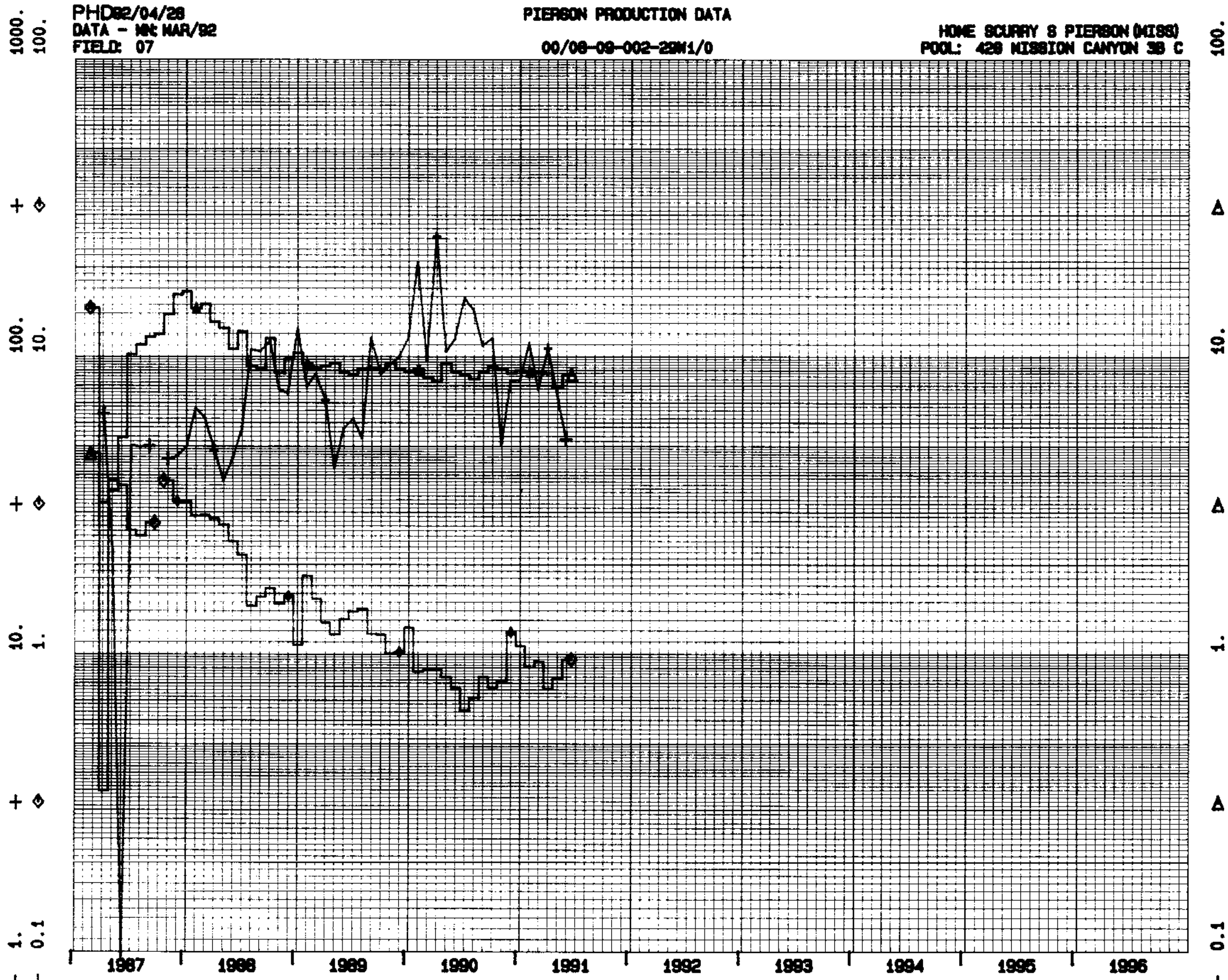
00/04-09-002-29W1/0

HOME ET AL S. PIERSON
POOL: 29C LOWER AMARANTH B



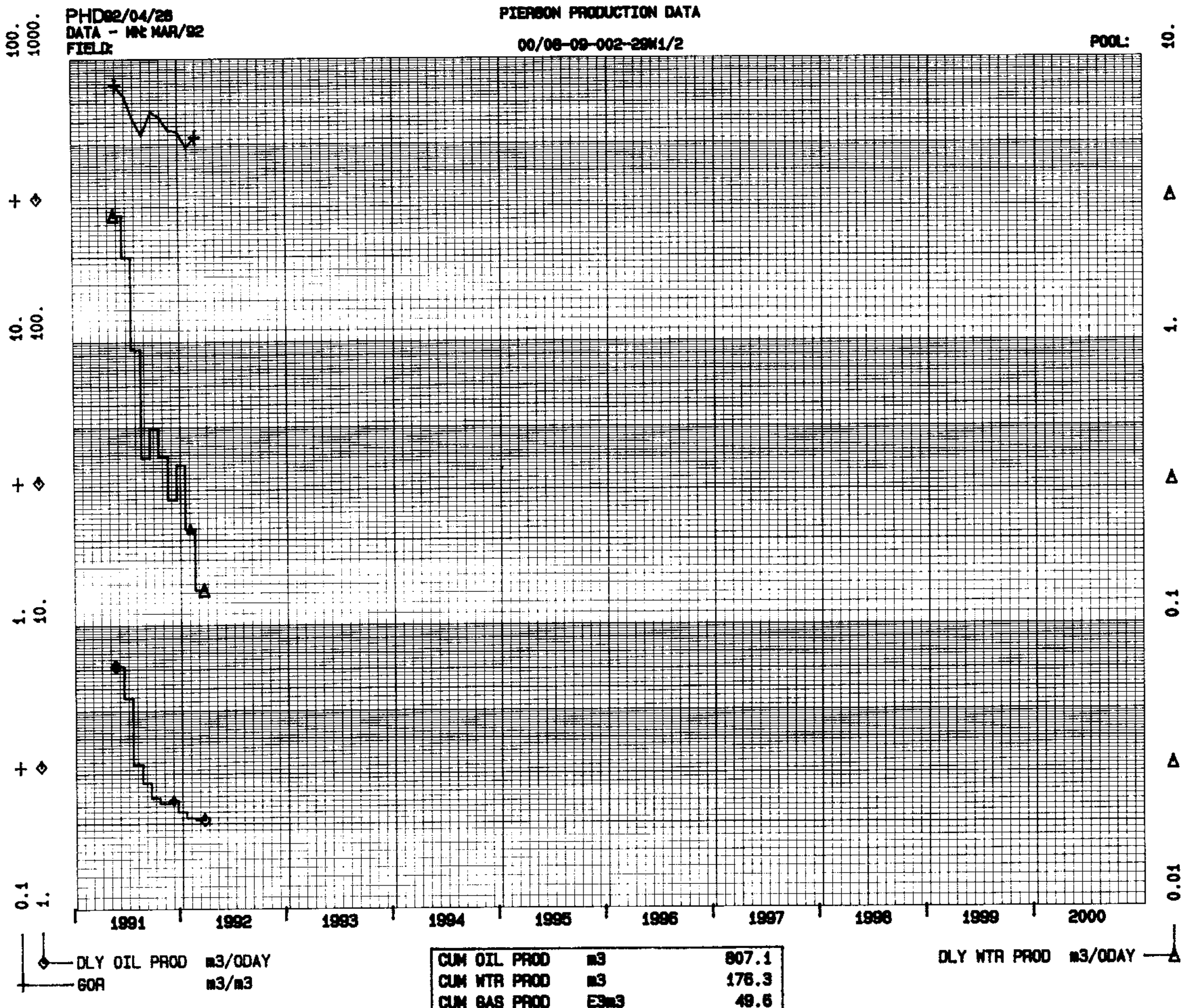
CUM OIL PROD	m3	4985.5
CUM WTR PROD	m3	15003.9
CUM GAS PROD	E3m3	494.8

(4)
1184 84/02



CUM OIL PROD	m3	2400.9
CUM WTR PROD	m3	13708.8
CUM GAS PROD	E3m3	162.7

(4)
1184 84/02


PHD92/04/28
DATA - WN: MAR/92
FIELD:
PIERSON PRODUCTION DATA
00/08-09-002-29W1/2
POOL:
1000.
100.
10.
1.
0.1
10.
1.
0.1
0.01
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 807.1
CUM WTR PROD m3 176.3
CUM GAS PROD E3m3 49.6
DLY WTR PROD m3/ODAY

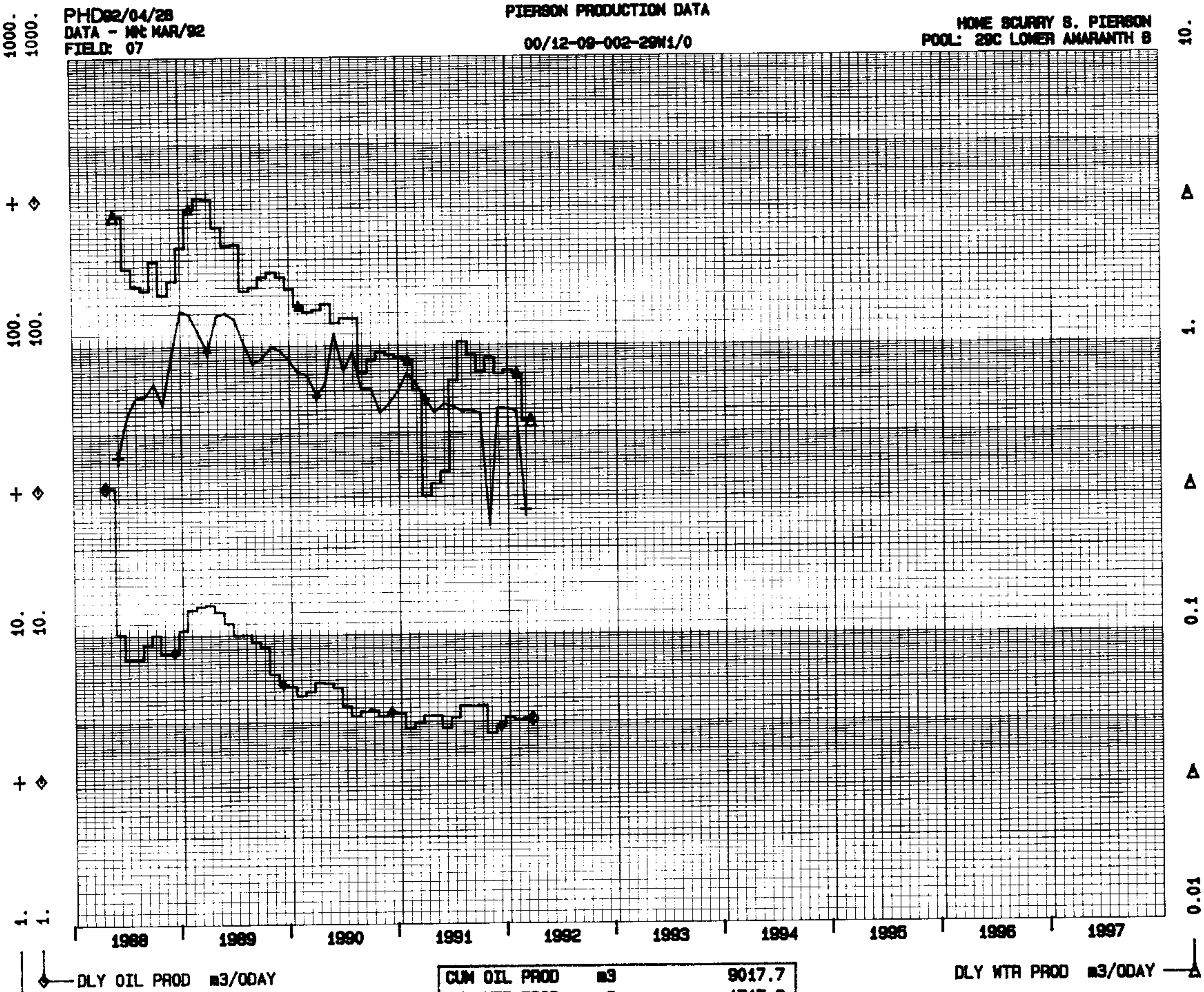
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/12-09-002-29W1/0

HOME SCURRY S. PIERSON
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	9017.7
CUM WTR PROD	m3	1717.2
CUM GAS PROD	E3m3	731.9

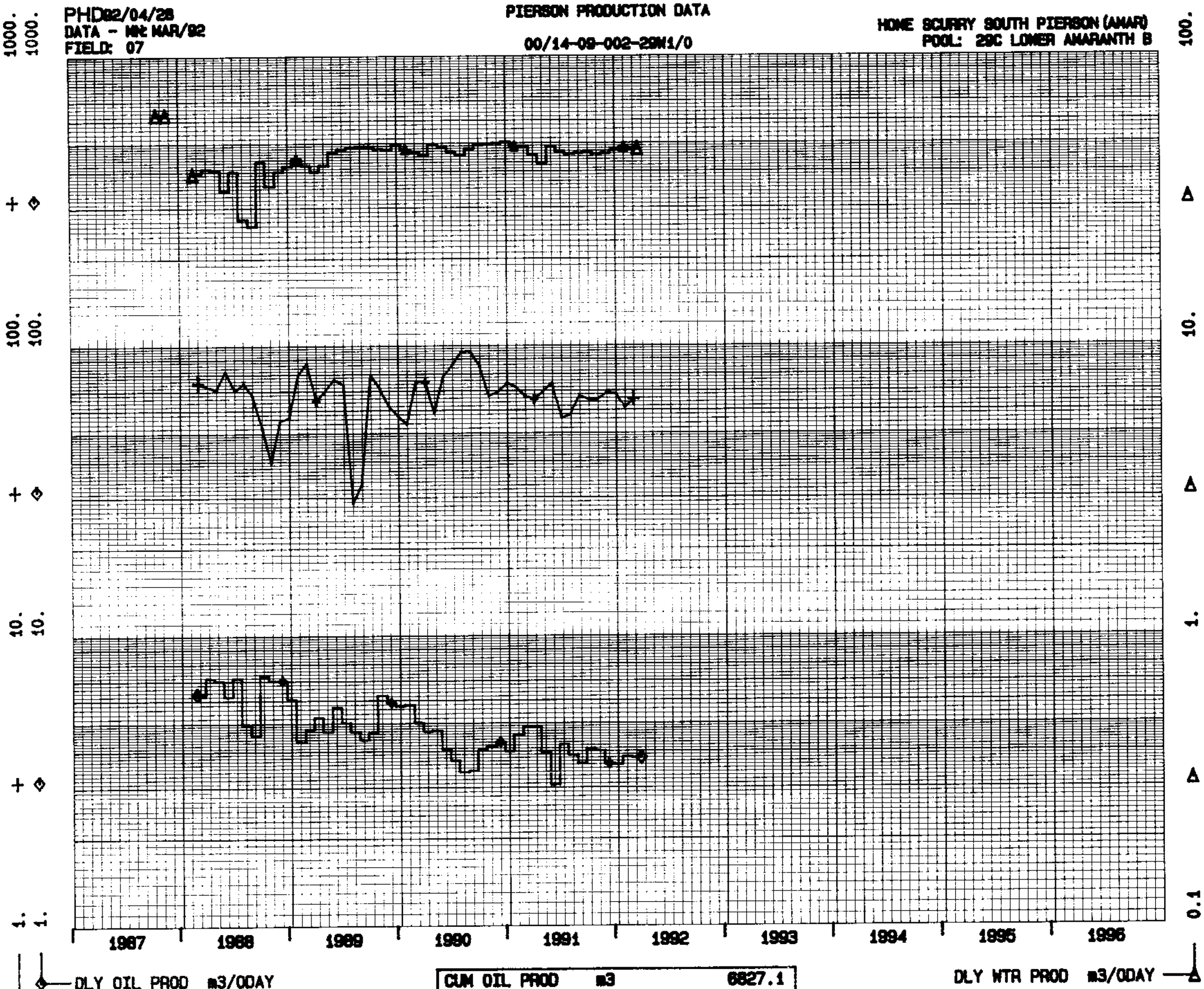
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

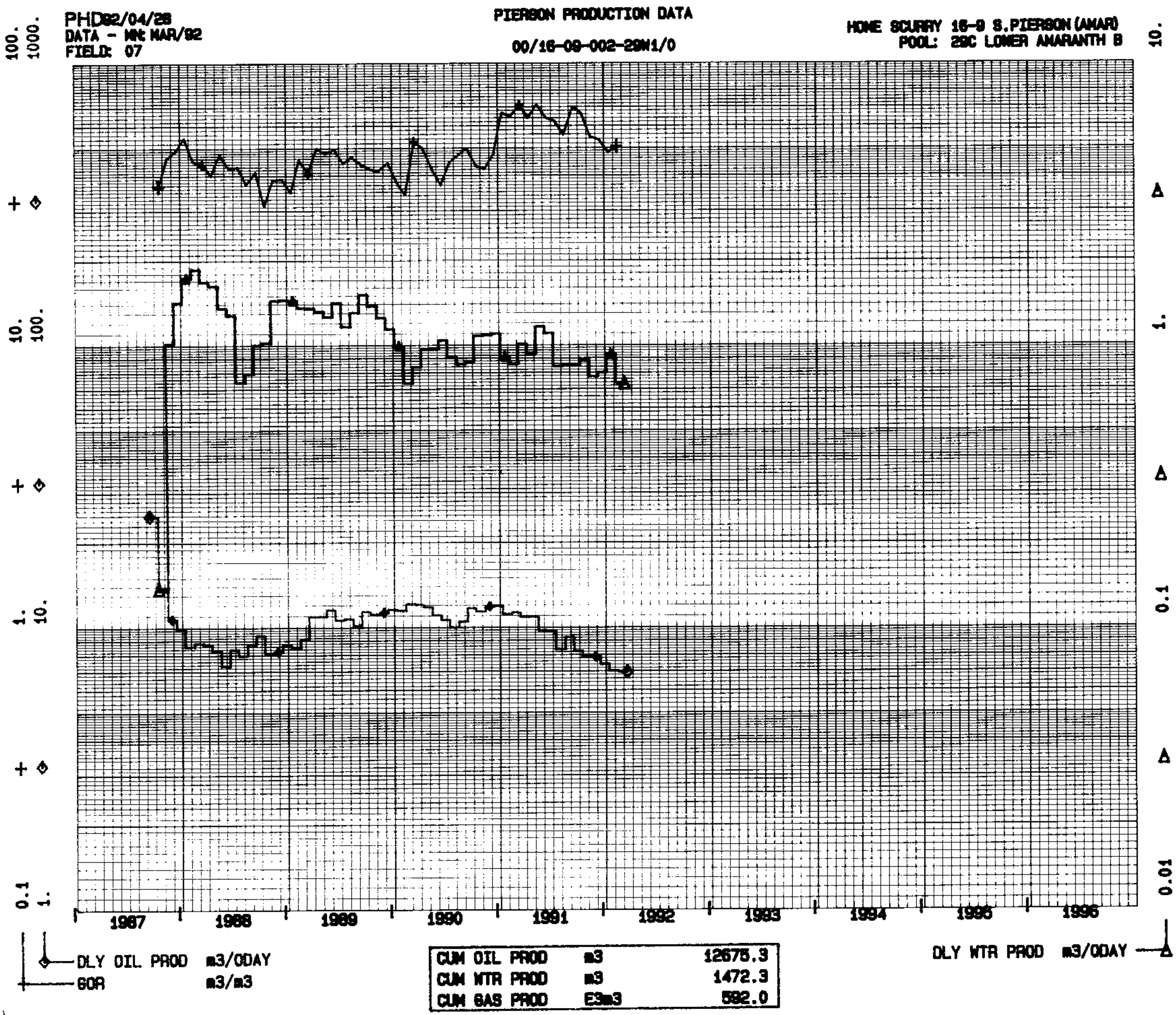
00/14-09-002-29W1/0

HOME SCURRY SOUTH PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B

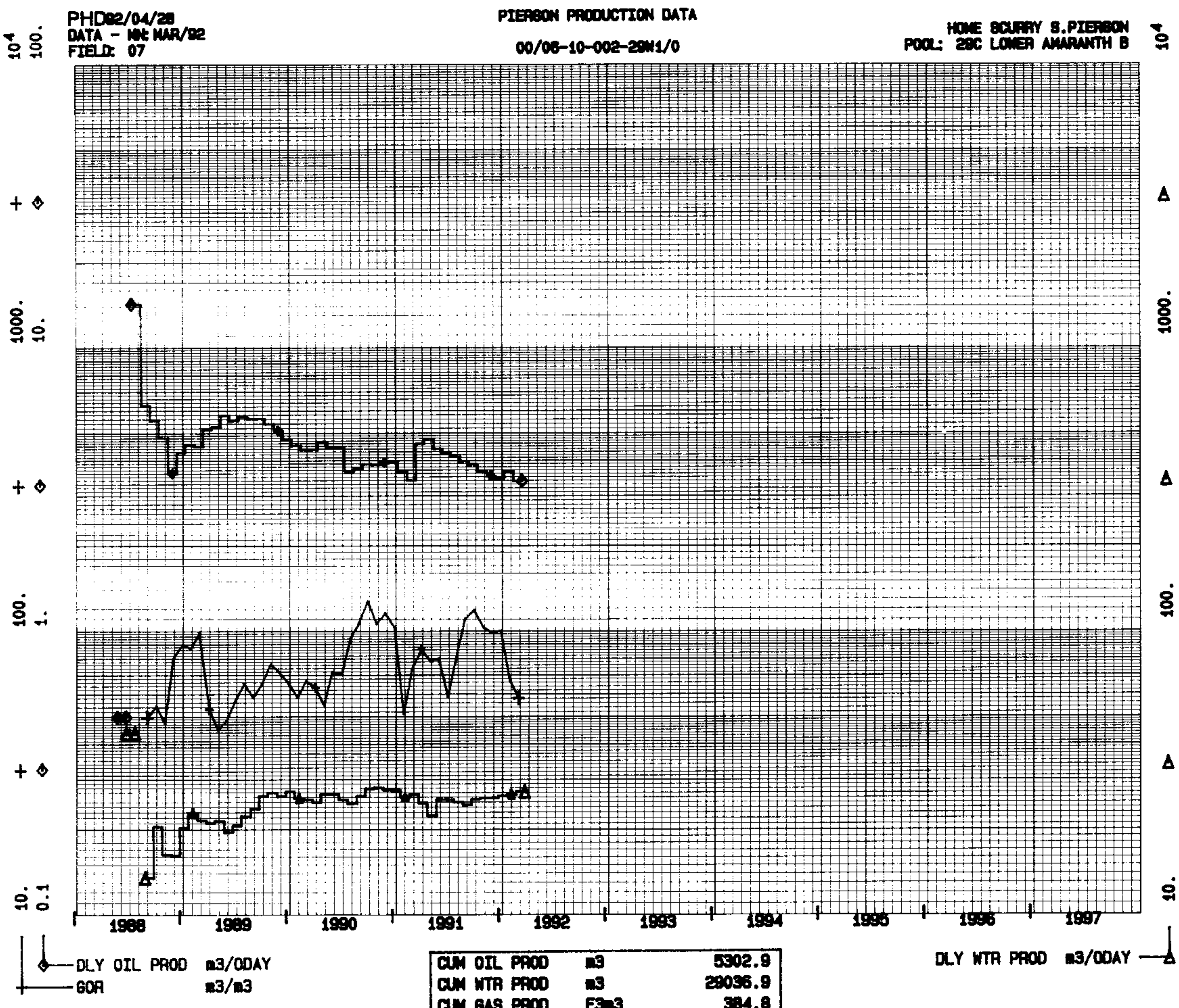


CUM OIL PROD	m3	6827.1
CUM WTR PROD	m3	63034.1
CUM GAS PROD	E3m3	461.6

(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/16-09-002-29W1/0
HOME SCURRY 16-9 S.PIERSON(AMAR)
POOL: 29C LOWER AMARANTH B
100. 1000.
10. 100.
1. 10.
0.1 1.
10.
1.
0.1
0.01
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
DLY OIL PROD m3/ODAY
GOR m3/m3
DLY WTR PROD m3/ODAY
CUM OIL PROD m3 12675.3
CUM WTR PROD m3 1472.3
CUM GAS PROD E3m3 592.0

(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/06-10-002-29W1/0
HOME SCURRY S.PIERSON
POOL: 29C LOWER AMARANTH B
10⁴ 100.
1000. 10.
100. 1.
10. 0.1
10⁴
1000.
100.
10.
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
DLY OIL PROD m3/ODAY
GOR m3/m3
DLY WTR PROD m3/ODAY
CUM OIL PROD m3 5302.9
CUM WTR PROD m3 29036.9
CUM GAS PROD E3m3 384.8

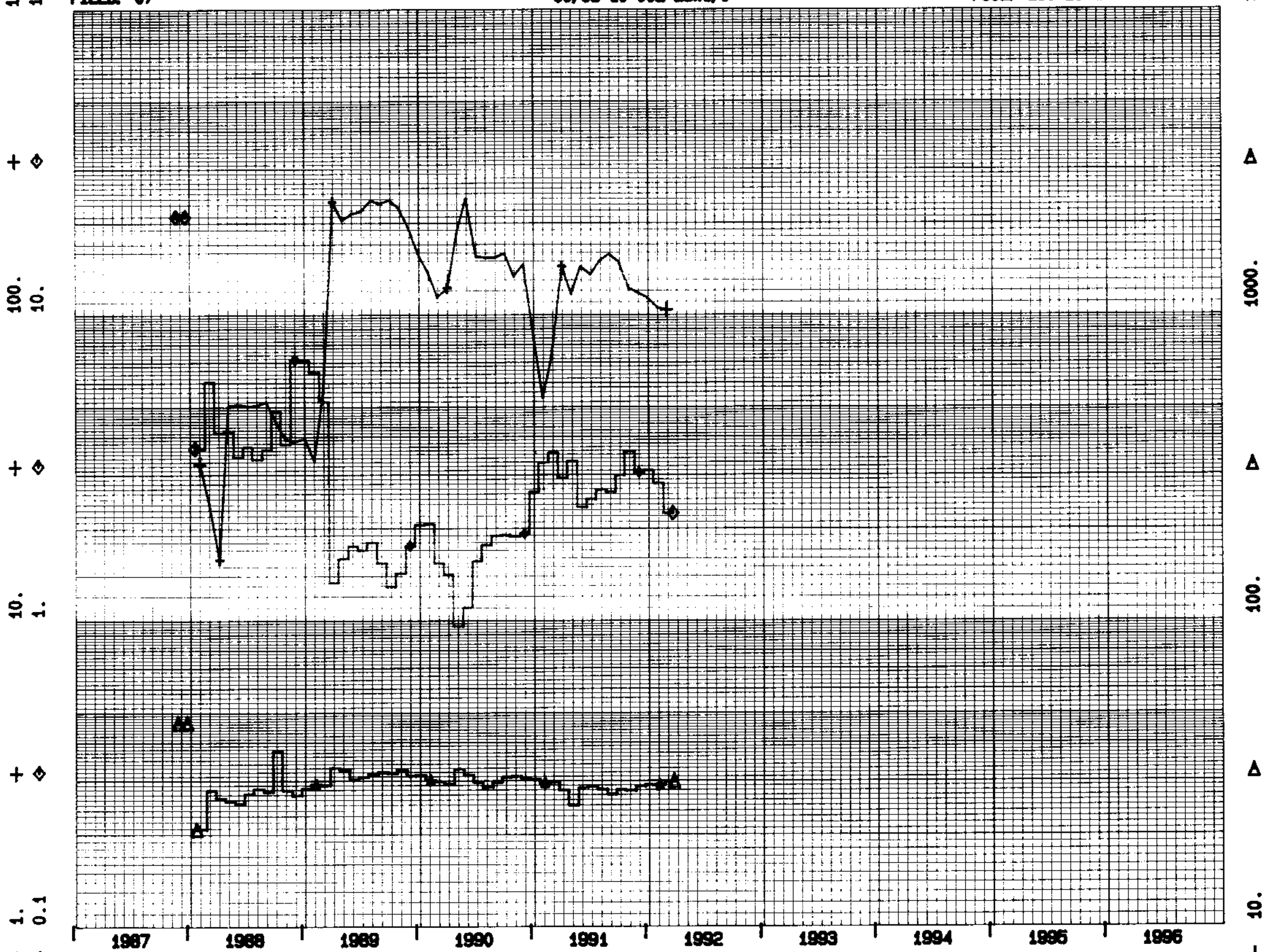
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/08-10-002-29W1/0

HOME SCURRY S PIERSON (AMARANTH)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4162.5
CUM WTR PROD	m3	42055.7
CUM GAS PROD	E3m3	396.4

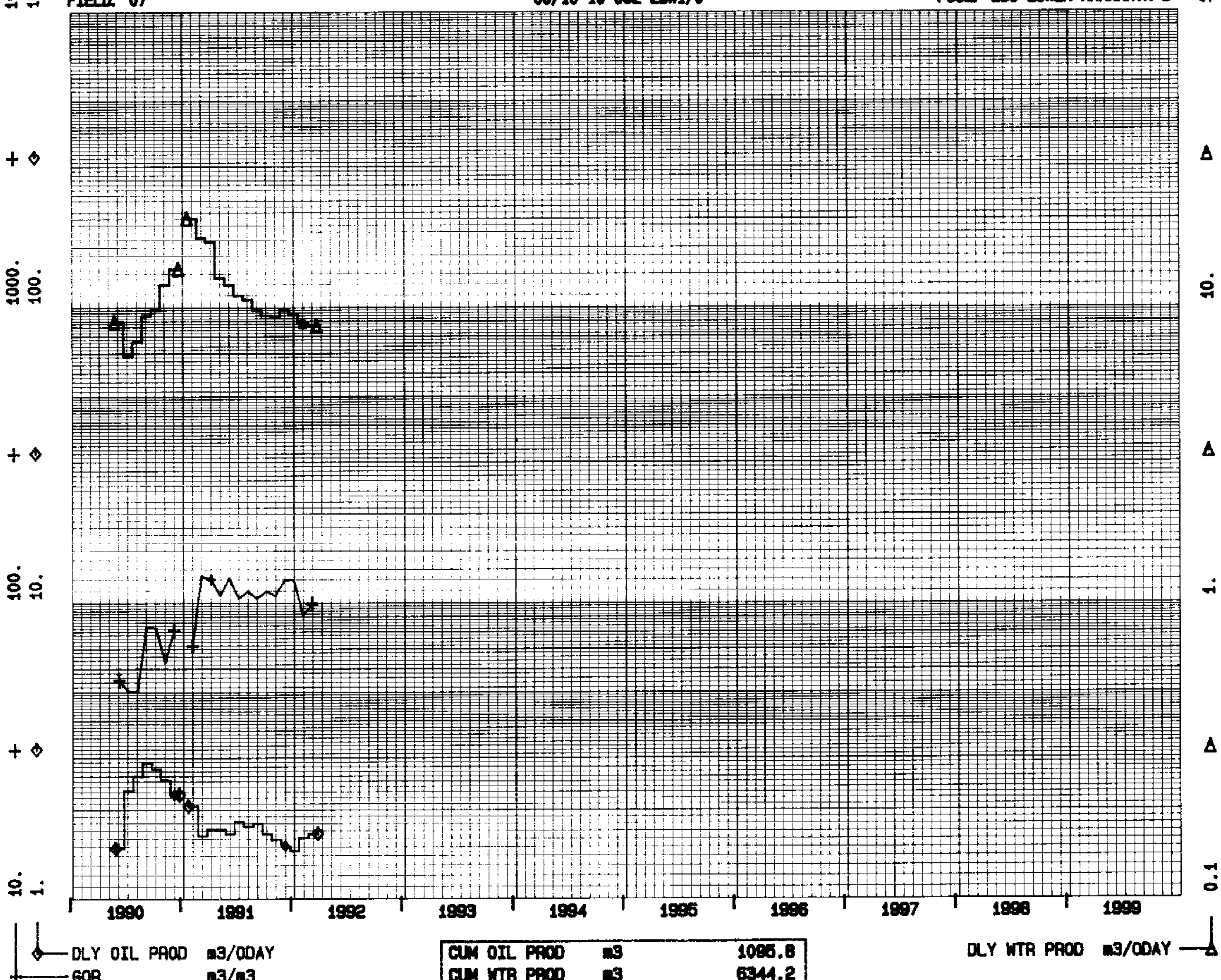
(4)
1184 84/02

PHD92/04/28
DATA - MN MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/10-10-002-29W1/0

HOME SRO S PIERSON PROV 10-10-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1095.8
CUM WTR PROD	m3	6344.2
CUM GAS PROD	E3m3	100.7

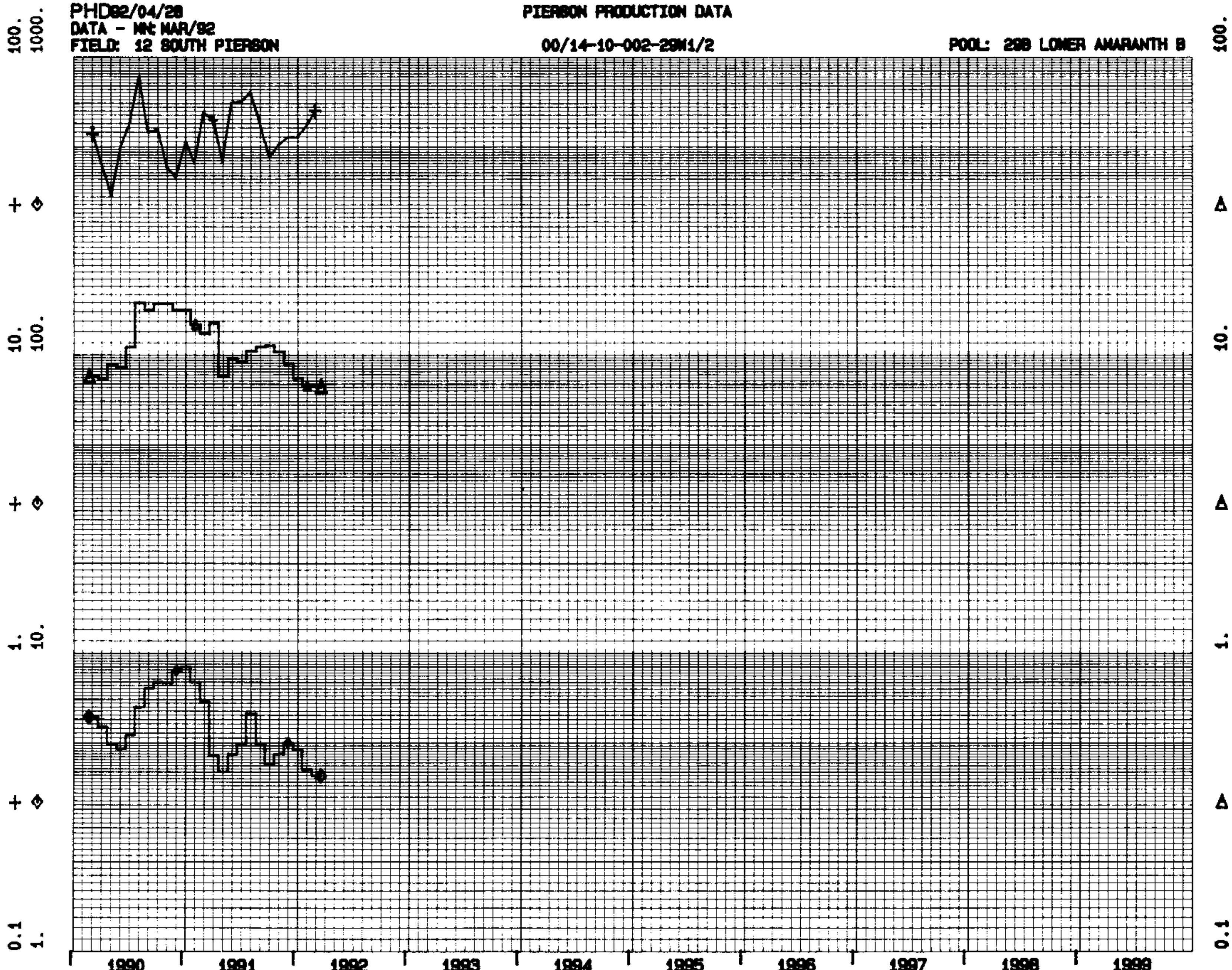
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 12 SOUTH PIERSON

PIERSON PRODUCTION DATA

00/14-10-002-29W1/2

POOL: 298 LOWER AMARANTH B



DLY OIL PROD m3/ODAY
GOR m3/m3

DLY WTR PROD m3/ODAY

CUM OIL PROD	m3	3915.7
CUM WTR PROD	m3	7427.0
CUM GAS PROD	E3m3	215.0

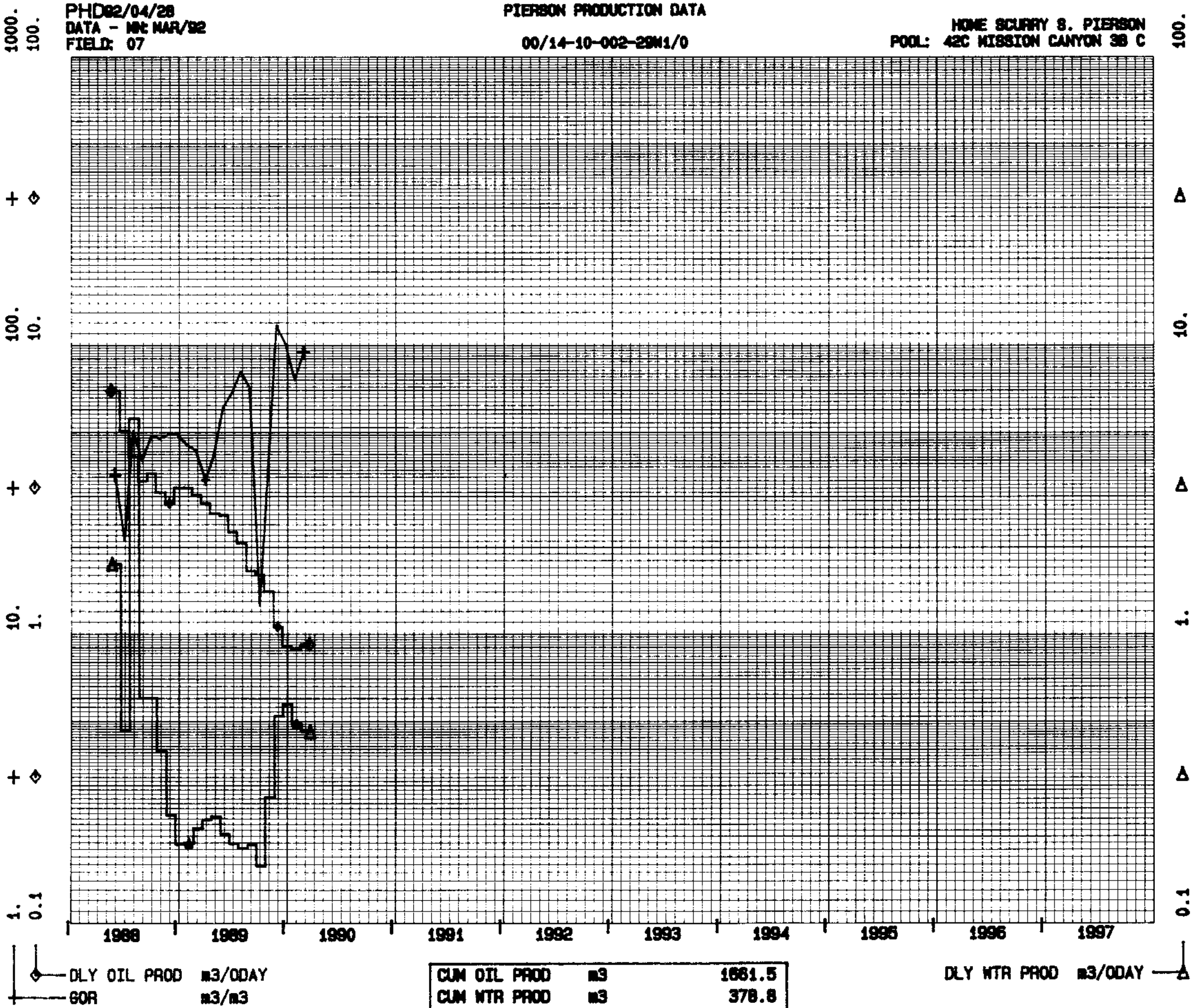
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/14-10-002-29W1/0

HOME SCURRY S. PIERSON
POOL: 42C MISSION CANYON 38 C



CUM OIL PROD	m3	1661.5
CUM WTR PROD	m3	376.8
CUM GAS PROD	E3m3	77.8

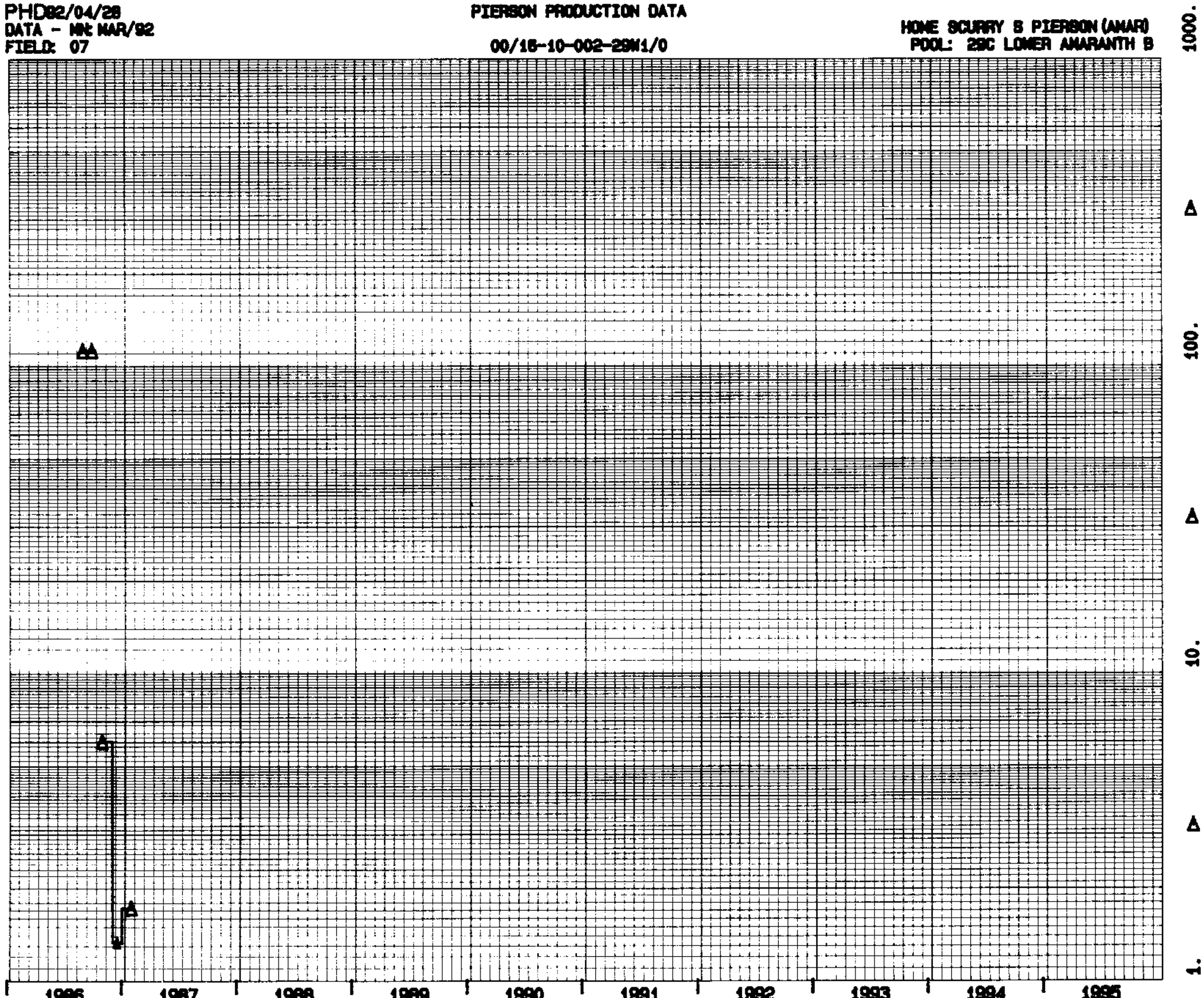
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/16-10-002-29W1/0

HOME SCURRY S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



DLY OIL PROD m3/ODAY No Data
GOR m3/m3 No Data

CUM OIL PROD	m3	0.0
CUM WTR PROD	m3	251.1
CUM GAS PROD	E3m3	2.2

DLY WTR PROD m3/ODAY —Δ

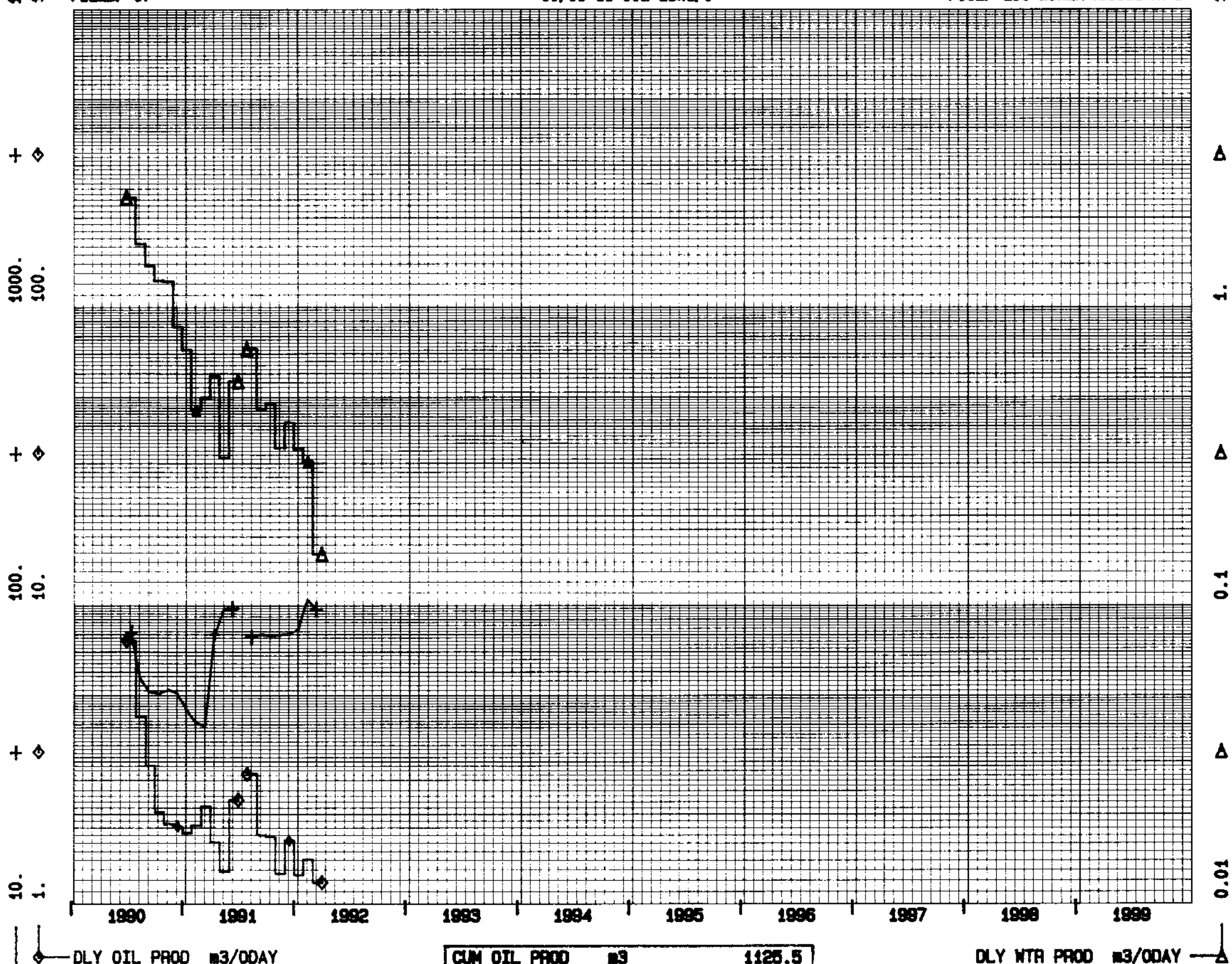
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C[C[C[C[C[DPIERSON PRODUCTION DATA

00/06-11-002-29W1/0

HOME SCURRY S PIERSON PROV 6-11-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1125.5
CUM WTR PROD	m3	367.2
CUM GAS PROD	E3m3	75.6

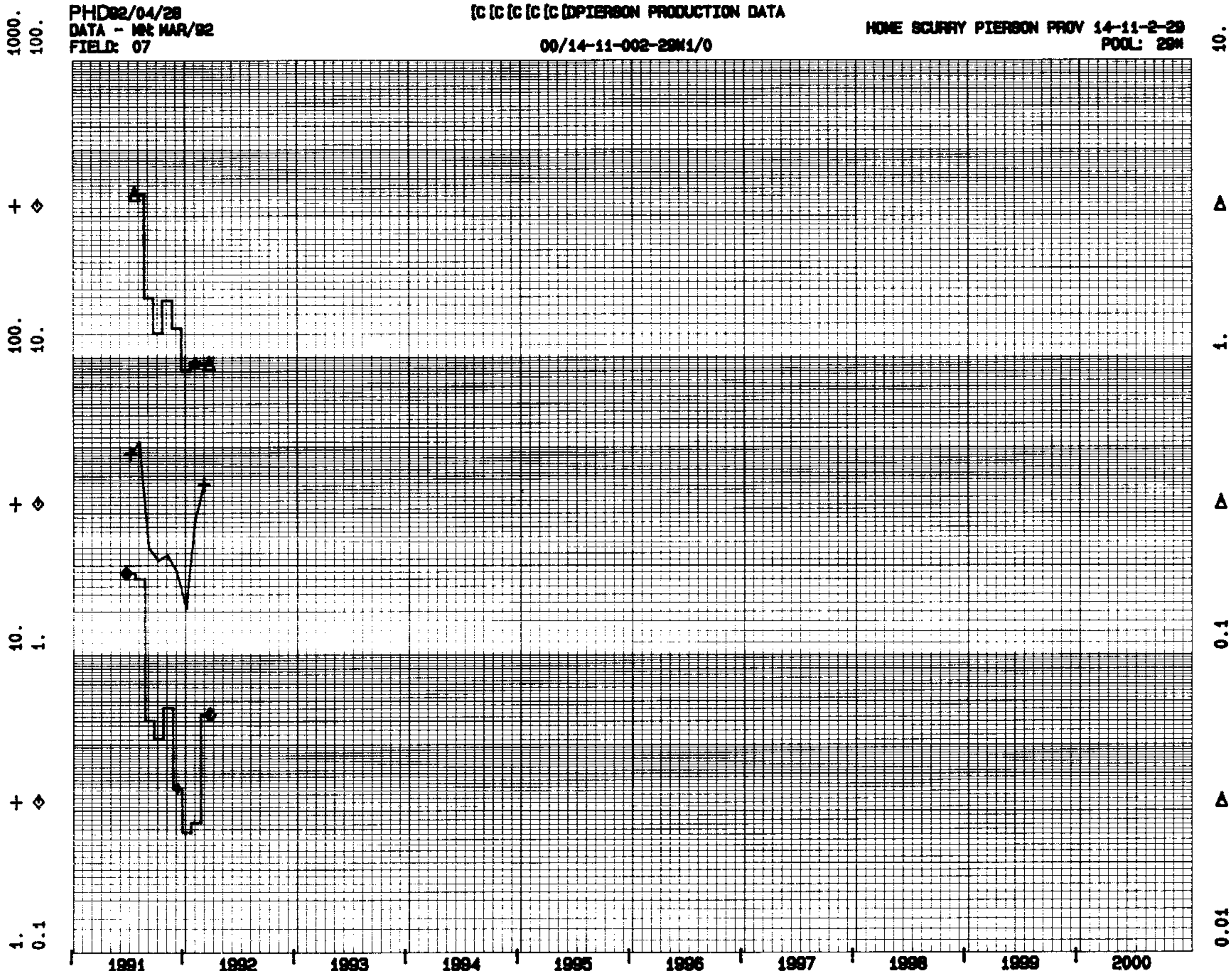
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C[C[C[C[C]PIERSON PRODUCTION DATA

00/14-11-002-29W1/0

HOME SCURRY PIERSON PROV 14-11-2-29
POOL: 29M



DLY OIL PROD m3/ODAY
GOR m3/m3

CUM OIL PROD	m3	154.2
CUM WTR PROD	m3	348.3
CUM GAS PROD	E3m3	5.3

DLY WTR PROD m3/ODAY

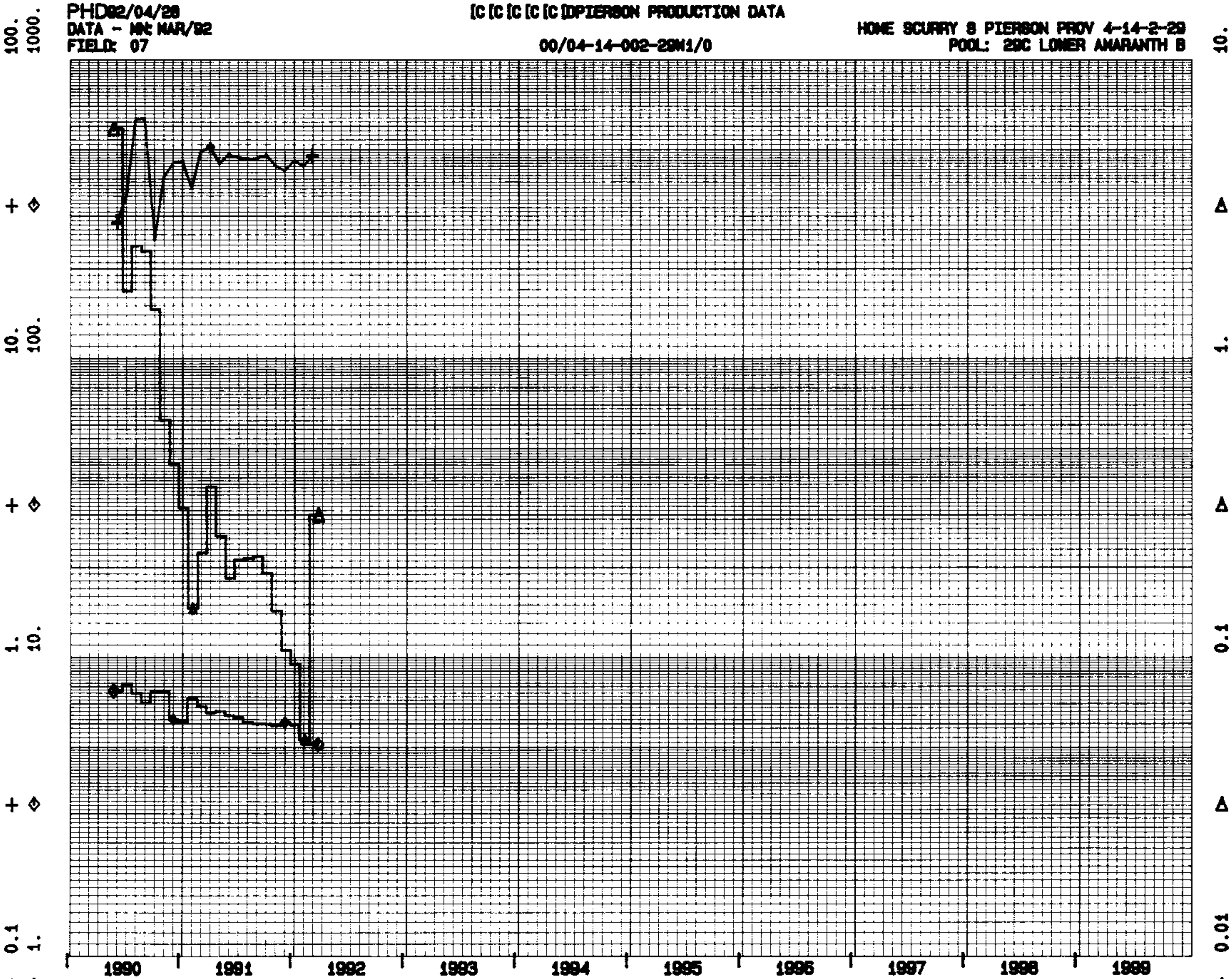
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C[C[C[C[C]PIERSON PRODUCTION DATA

00/04-14-002-29W1/0

HOME SCURRY 8 PIERSON PROV 4-14-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4018.8
CUM WTR PROD	m3	384.4
CUM GAS PROD	E3m3	178.1

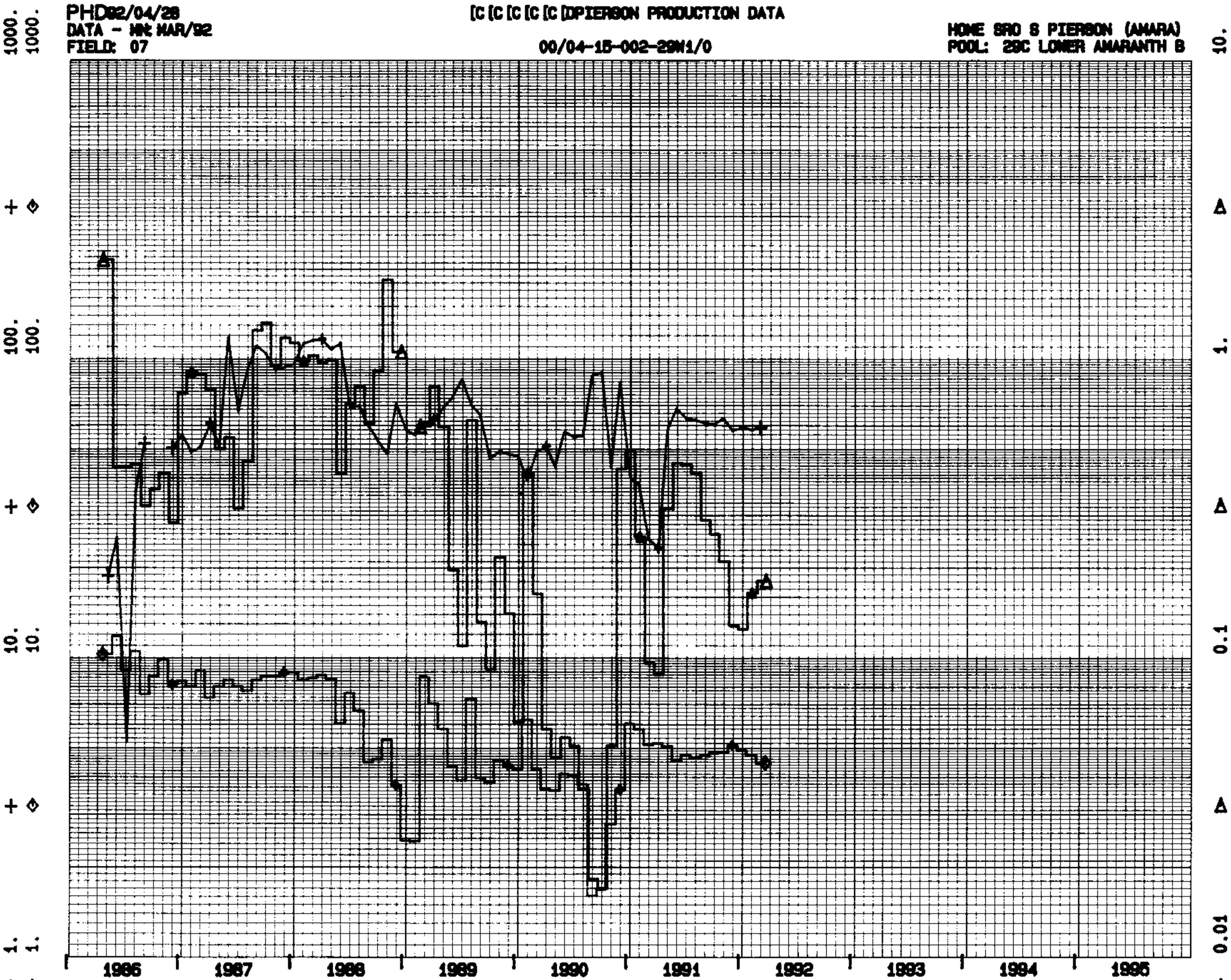
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C [C [C [C [C [DPIERSON PRODUCTION DATA

00/04-15-002-29W1/0

HOME SRO S PIERSON (AMARA)
POOL: 28C LOWER AMARANTH B



CUM OIL PROD	m3	11574.0
CUM WTR PROD	m3	934.5
CUM GAS PROD	E3m3	736.1

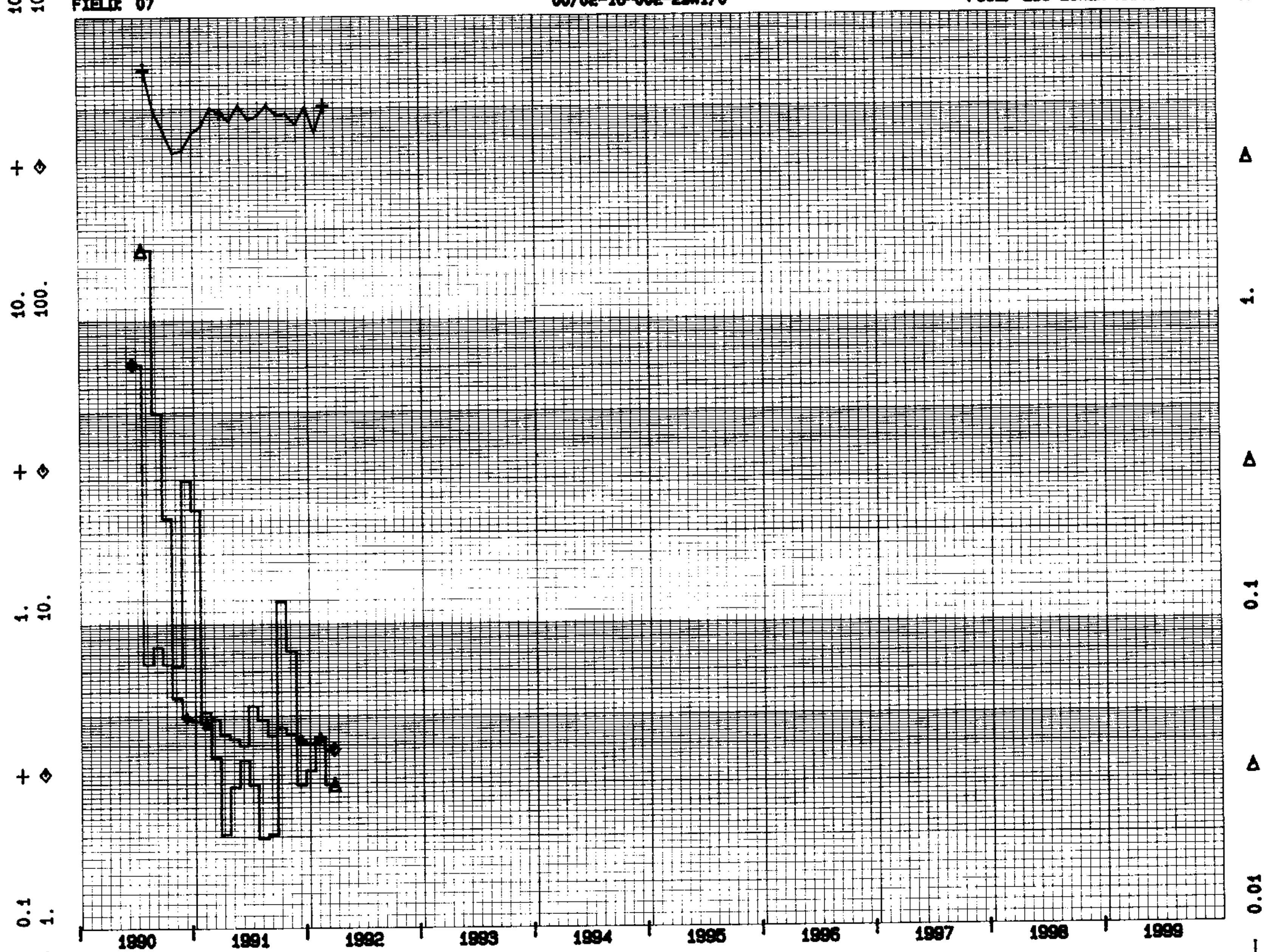
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C [C [C [C [C [DPIERSON PRODUCTION DATA

00/02-16-002-29W1/0

HOME SCURRY S PIERSON PROV 2-16-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	2946.8
CUM WTR PROD	m3	106.7
CUM GAS PROD	E3m3	135.0

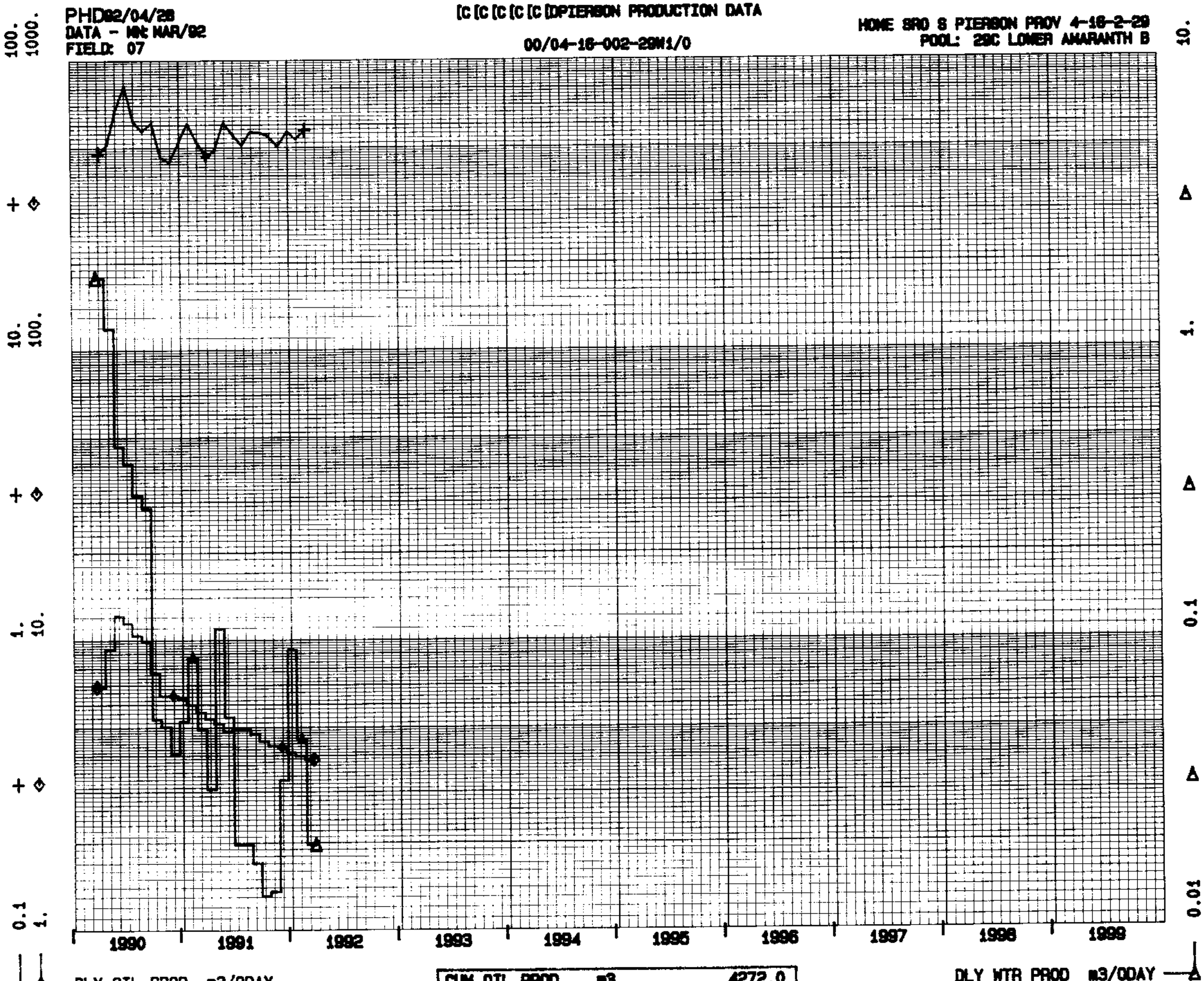
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

[C [C [C [C [C [DPIERSON PRODUCTION DATA

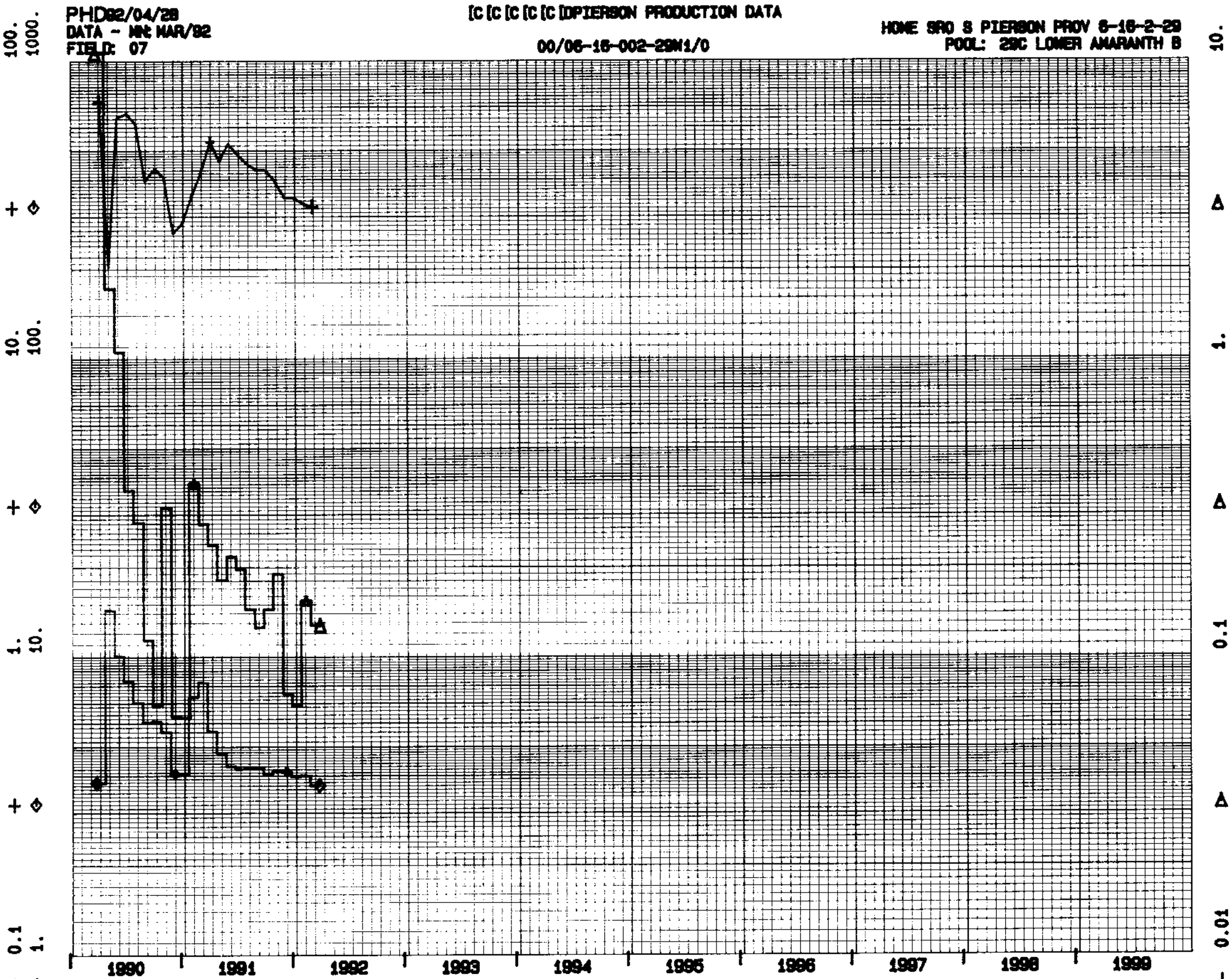
00/04-16-002-29W1/0

HOME SRO S PIERSON PROV 4-16-2-29
POOL: 29C LOWER AMARANTH B



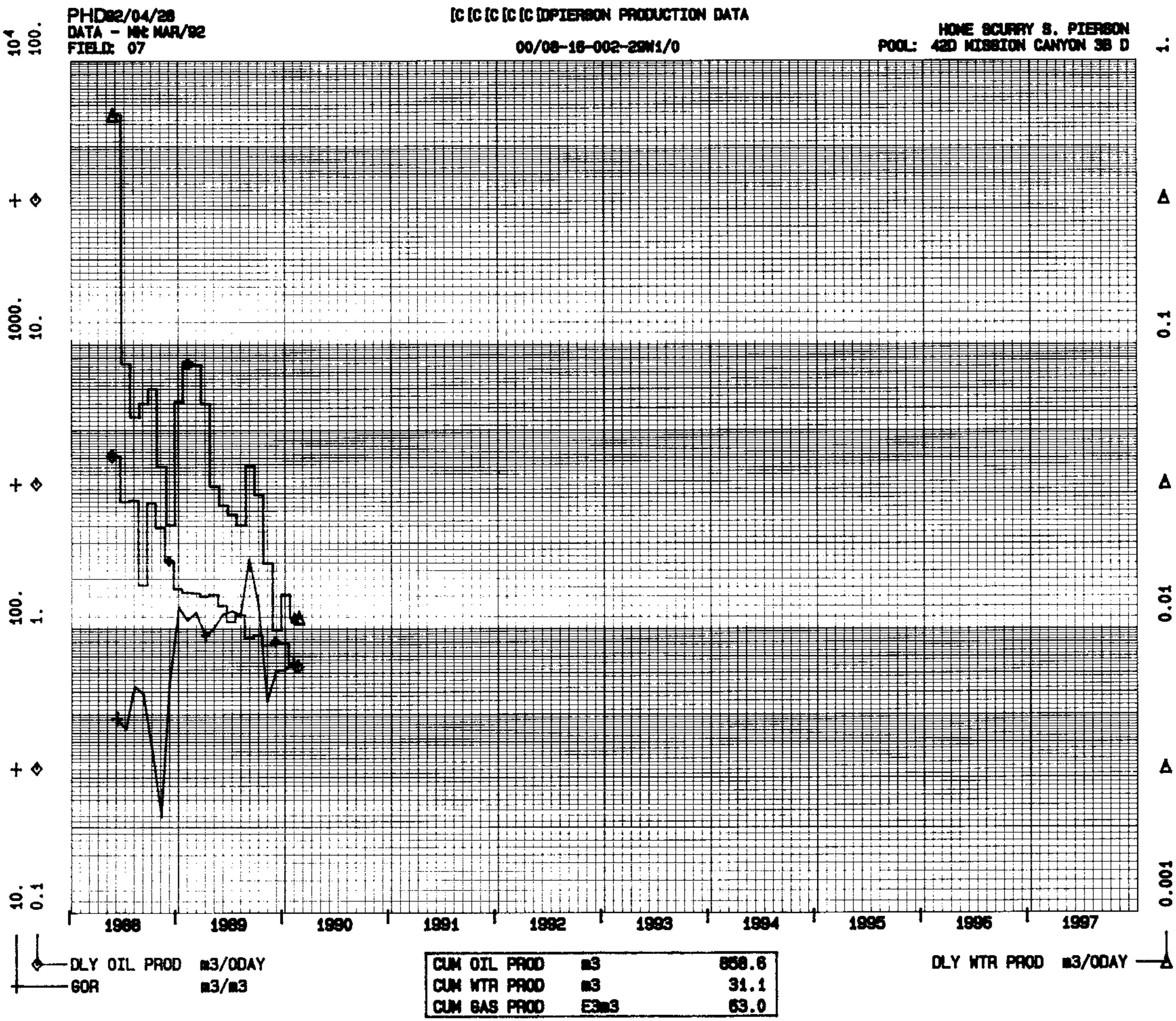
CUM OIL PROD	m3	4272.0
CUM WTR PROD	m3	121.6
CUM GAS PROD	E3m3	238.4

(4)
1184 84/02

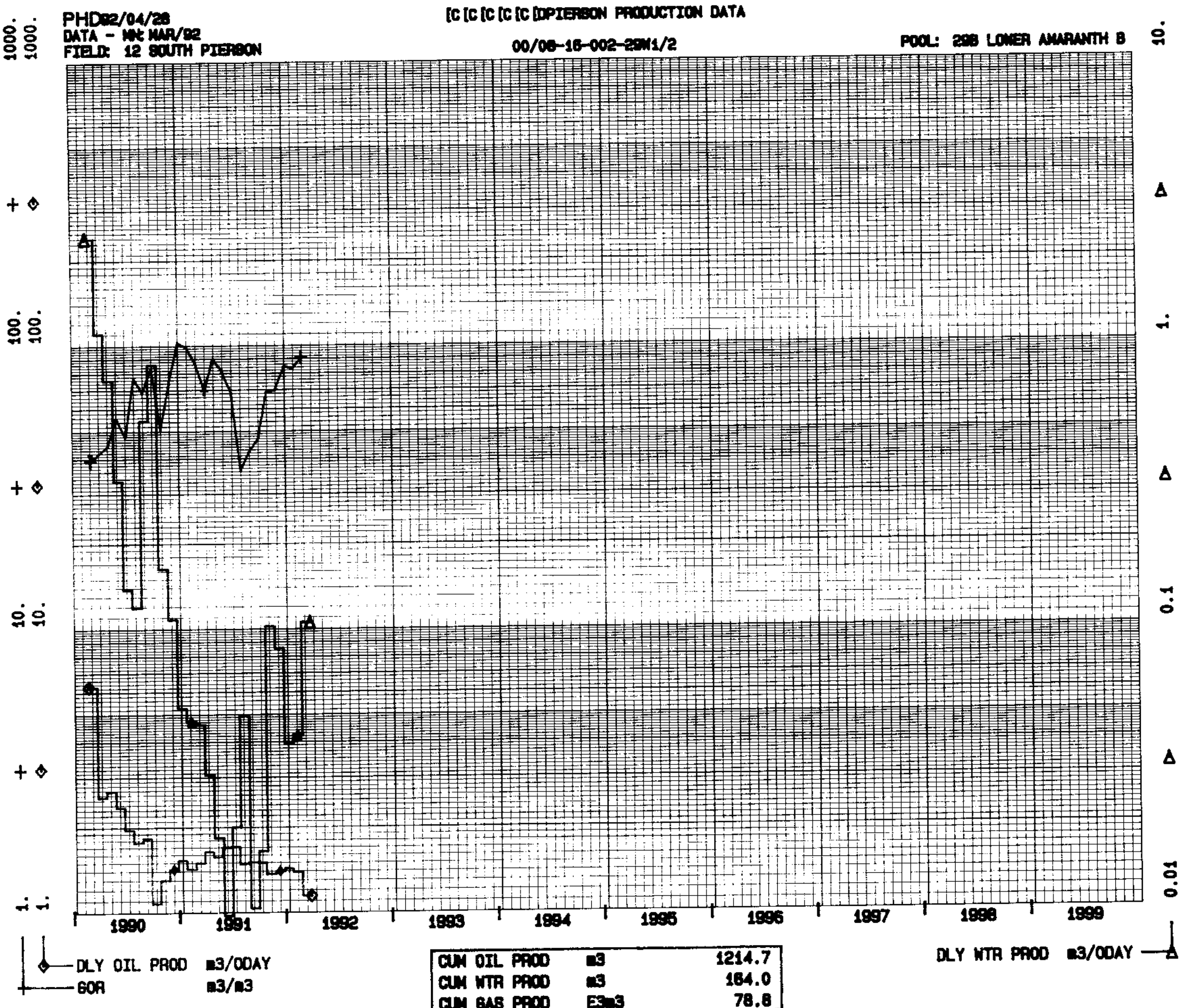


CUM OIL PROD	m3	3642.0
CUM WTR PROD	m3	324.5
CUM GAS PROD	E3m3	159.3

(4)
1184 84/02

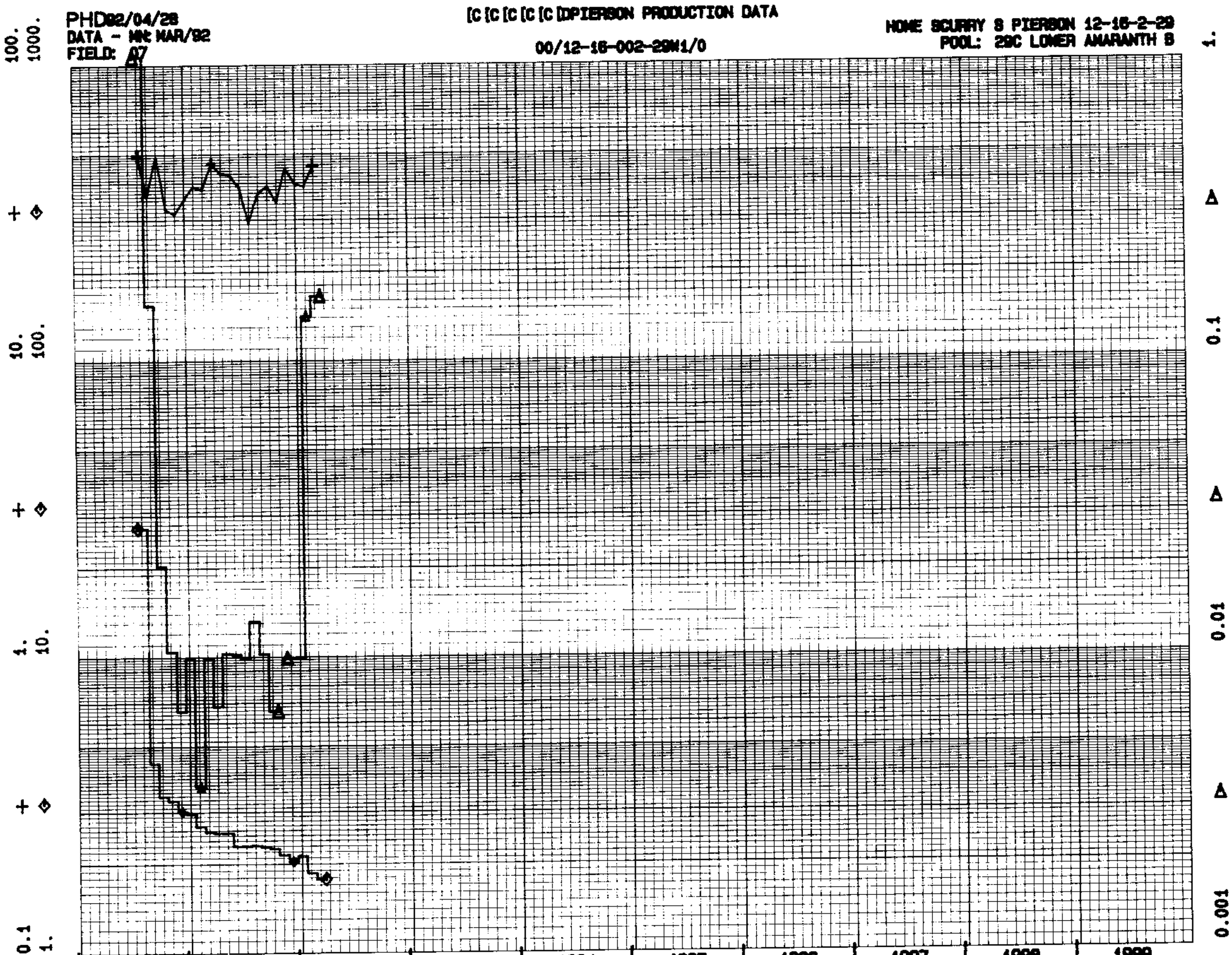

PHD92/04/28
DATA - MN MAR/92
FIELD: 07
[C [C [C [C [C]PIERSON PRODUCTION DATA
00/08-16-002-29W1/0
HOME SCURRY S. PIERSON
POOL: 42D MISSION CANYON 3B D
10⁴ 100.
1000. 10.
100. 1.
10. 0.1
1.
0.1
0.01
0.001
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997
DLY OIL PROD m3/ODAY
GOR m3/m3
DLY WTR PROD m3/ODAY
CUM OIL PROD m3 858.6
CUM WTR PROD m3 31.1
CUM GAS PROD E3m3 63.0

(4)
1184 84/02



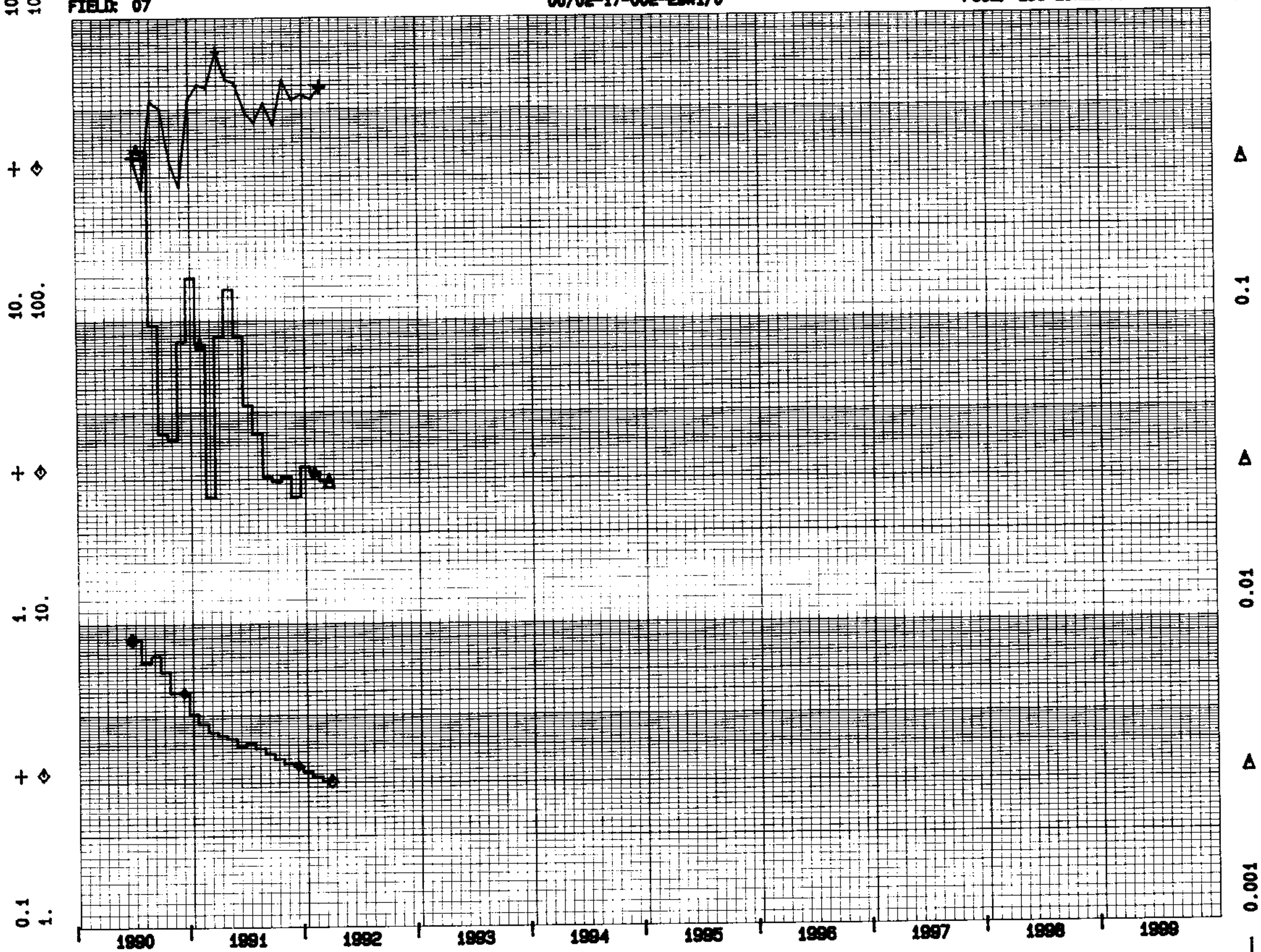
PHD92/04/28
DATA - MN: MAR/92
FIELD: 12 SOUTH PIERSON
[C[C[C[C[C[DPIERSON PRODUCTION DATA
00/08-16-002-29W1/2
POOL: 298 LOWER AMARANTH B
1000.
100.
10.
1.
10.
1.
0.1
0.01
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
DLY OIL PROD m3/ODAY
GOR m3/m3
DLY WTR PROD m3/ODAY
CUM OIL PROD m3 1214.7
CUM WTR PROD m3 164.0
CUM GAS PROD E3m3 78.8

(4)
1184 84/02



CUM OIL PROD	m3	1442.9
CUM WTR PROD	m3	24.5
CUM GAS PROD	E3m3	54.8

(4)
1184 84/02



CUM OIL PROD	m3	2838.9
CUM WTR PROD	m3	43.3
CUM GAS PROD	E3m3	136.0

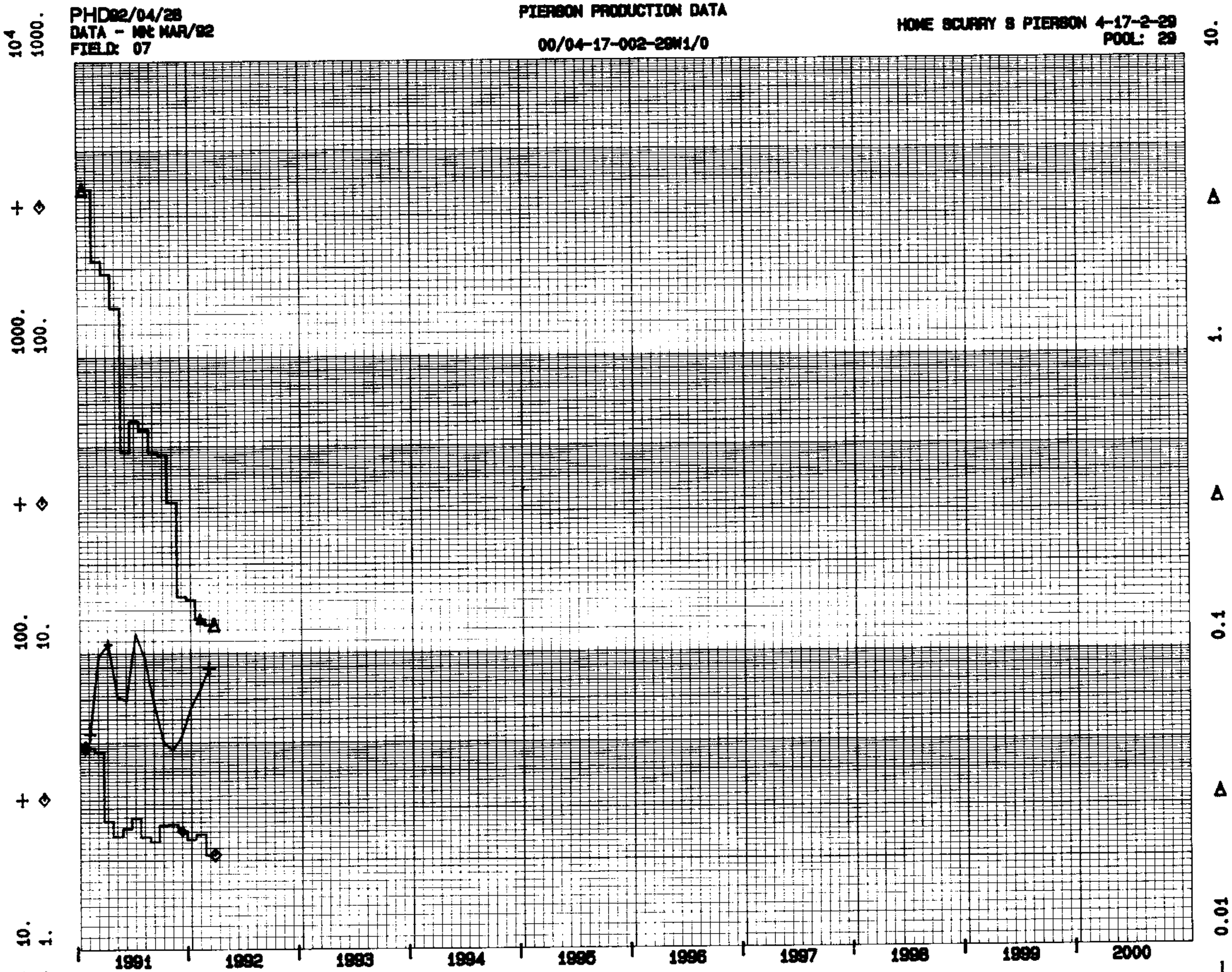
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/04-17-002-29W1/0

HOME SCURRY S PIERSON 4-17-2-29
POOL: 29



CUM OIL PROD	m3	1040.0
CUM WTR PROD	m3	277.2
CUM GAS PROD	E3m3	79.9

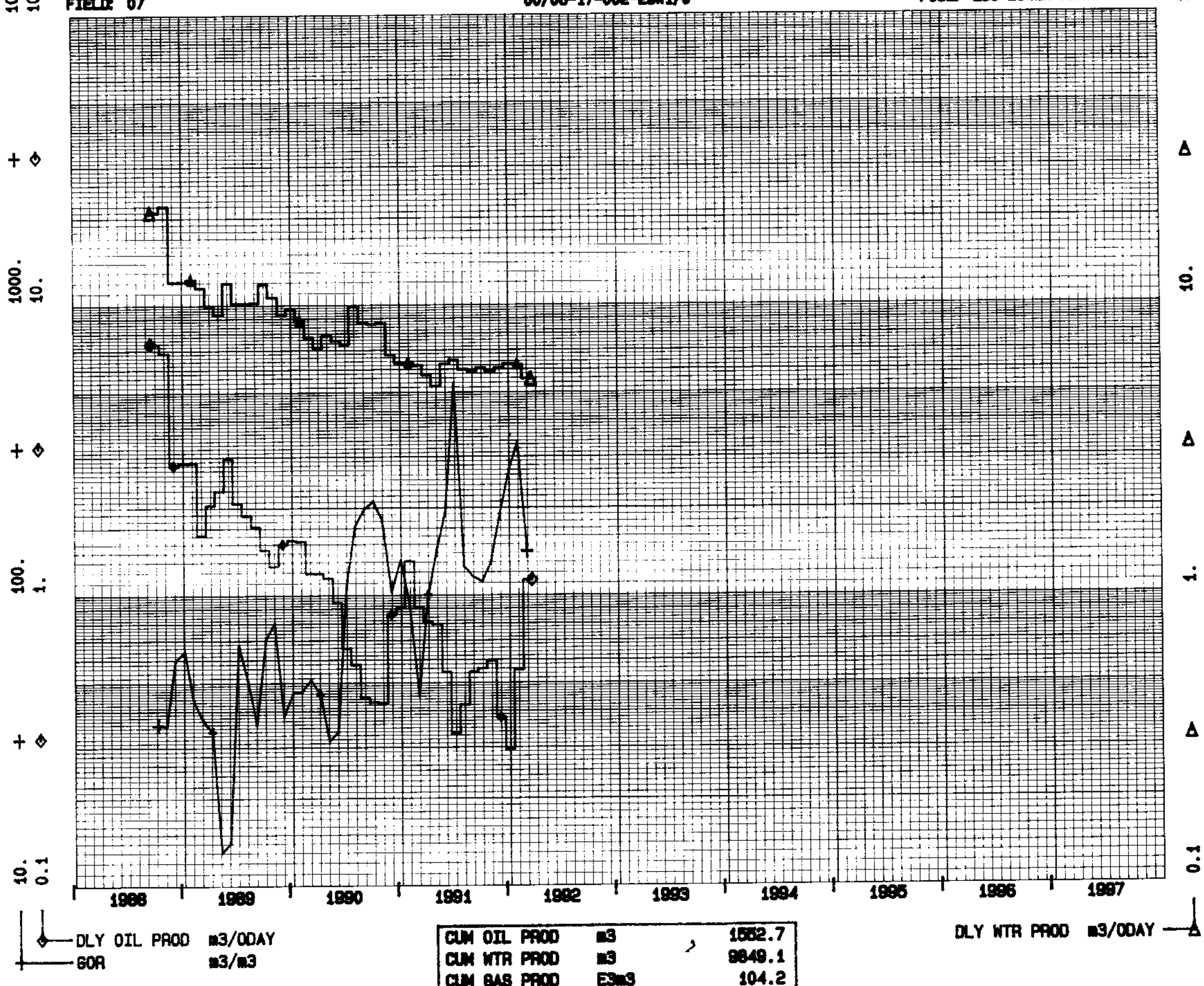
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

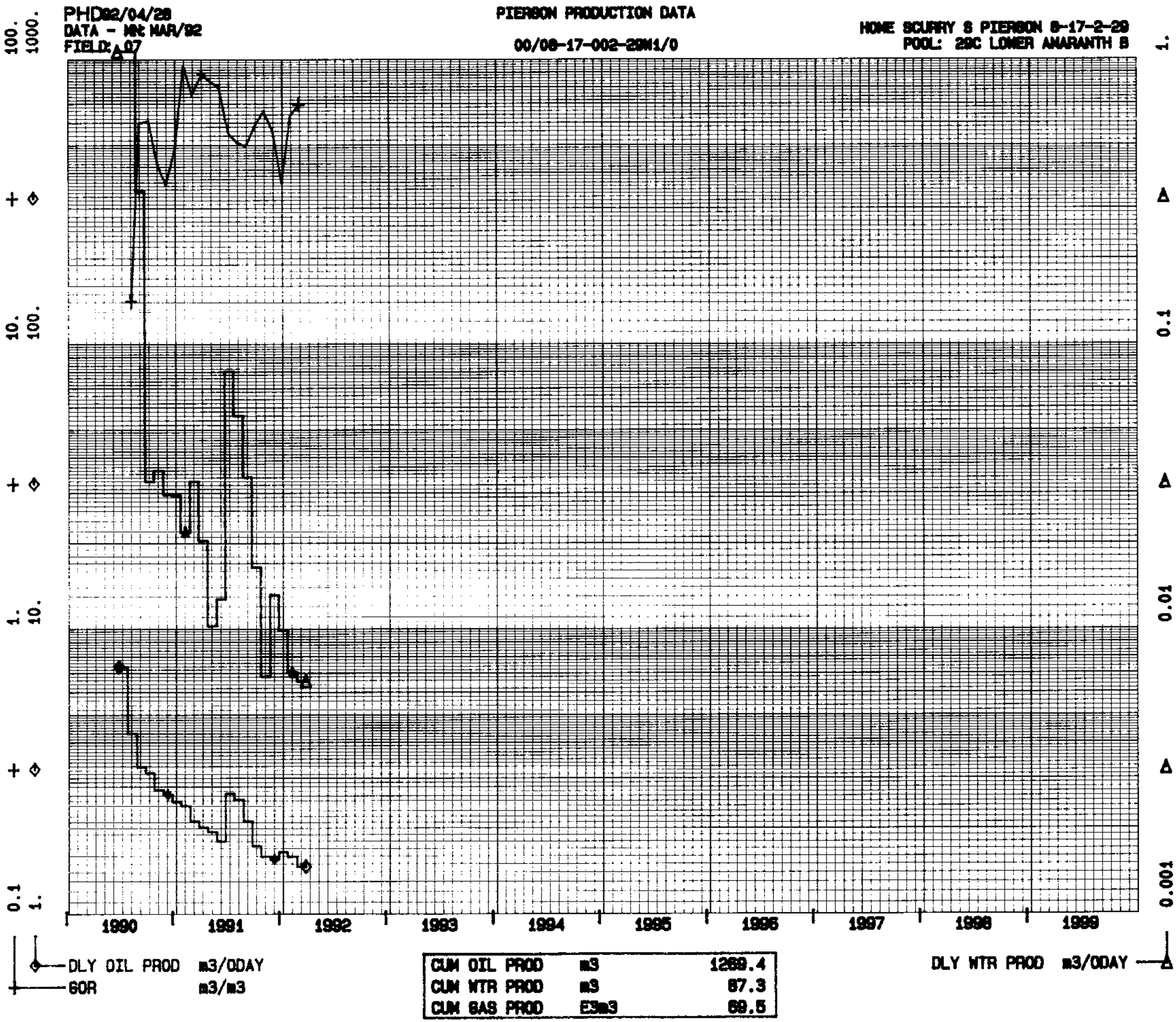
00/06-17-002-29W1/0

HOME SCURRY S.PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1562.7
CUM WTR PROD	m3	9649.1
CUM GAS PROD	E3m3	104.2

(4)
1184 84/02


PHD92/04/28
DATA - WN MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/08-17-002-29W1/0
HOME SCURRY S PIERSON 8-17-2-29
POOL: 29C LOWER AMARANTH B
100. 1000.
10. 100.
1. 10.
0.1 1.
1.
0.1
0.01
0.001
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 1269.4
CUM WTR PROD m3 87.3
CUM GAS PROD E3m3 69.5
DLY WTR PROD m3/ODAY

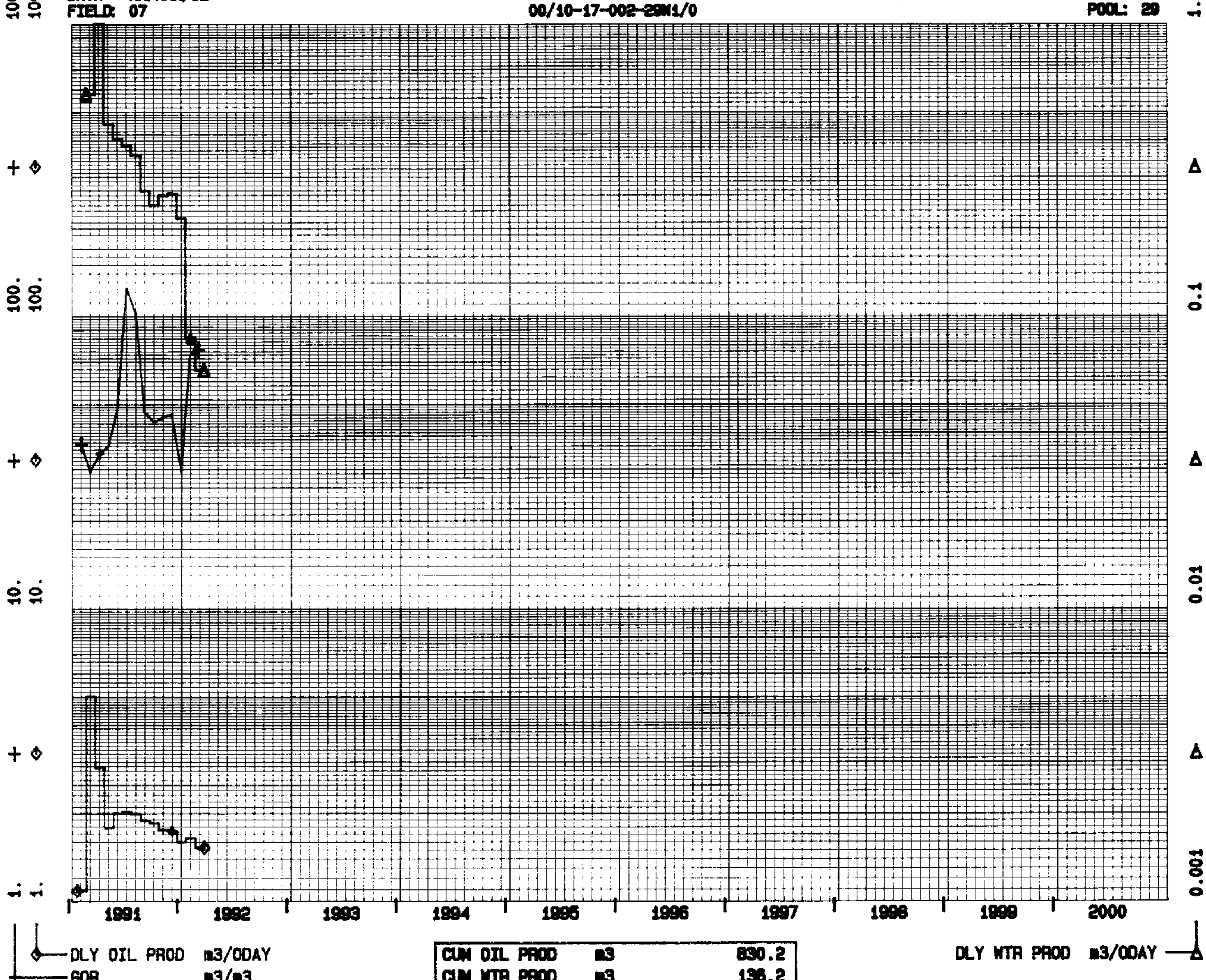
(4)
1184 84/02

PHD92/04/28
DATA - MN MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/10-17-002-29W1/0

HOME ET AL S PIERSON 10-17-2-29
POOL: 29



CUM OIL PROD	m3	830.2
CUM WTR PROD	m3	136.2
CUM GAS PROD	E3m3	43.6

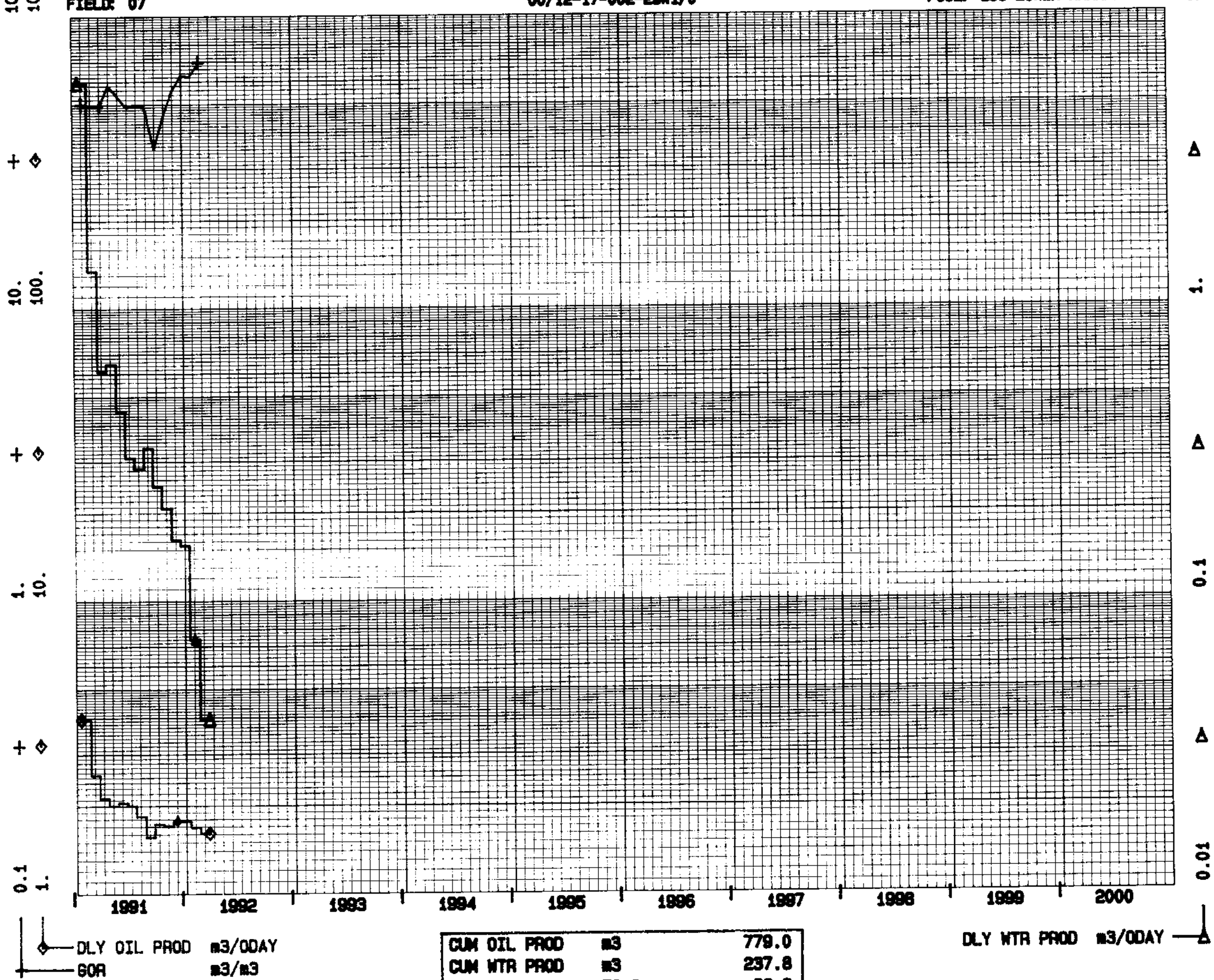
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/12-17-002-29W1/0

HOME SCURRY 8 PIERSON 12-17-2-29
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	779.0
CUM WTR PROD	m3	237.8
CUM GAS PROD	E3m3	39.8

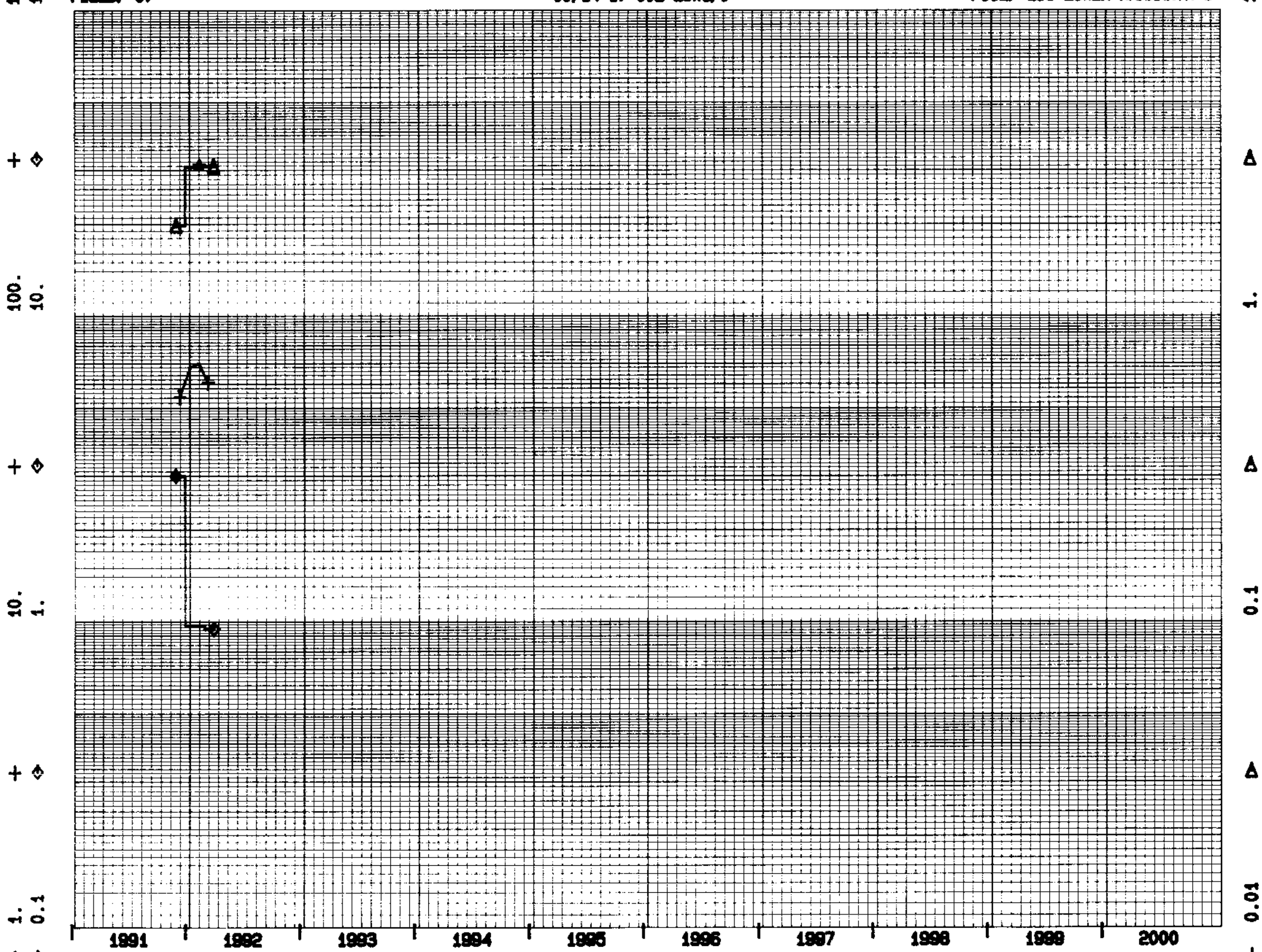
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/14-17-002-29W1/0

TUNDRA S. PIERSON 14-17-2-29
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	166.6
CUM WTR PROD	m3	318.7
CUM GAS PROD	E3m3	9.8

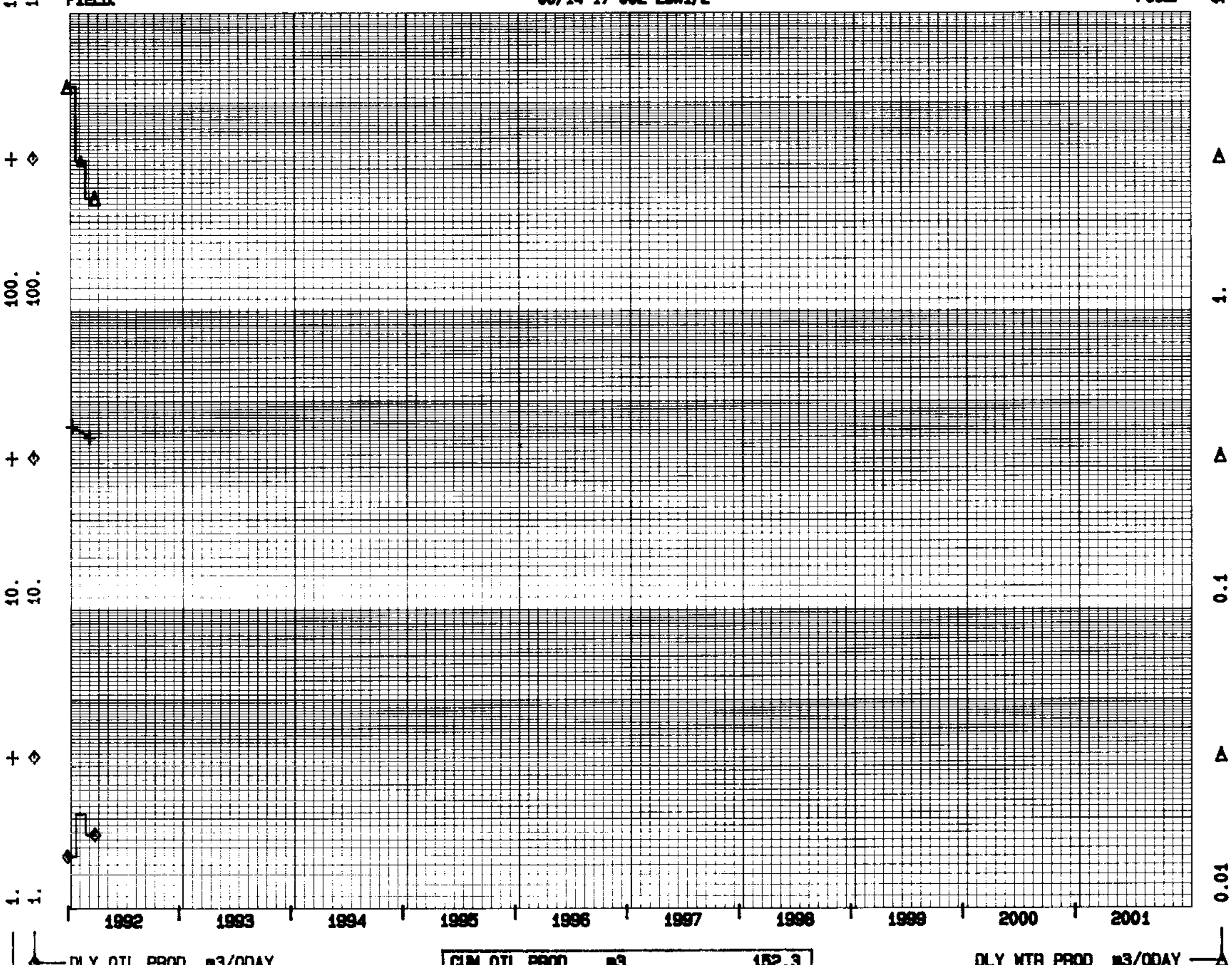
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD:

PIERSON PRODUCTION DATA

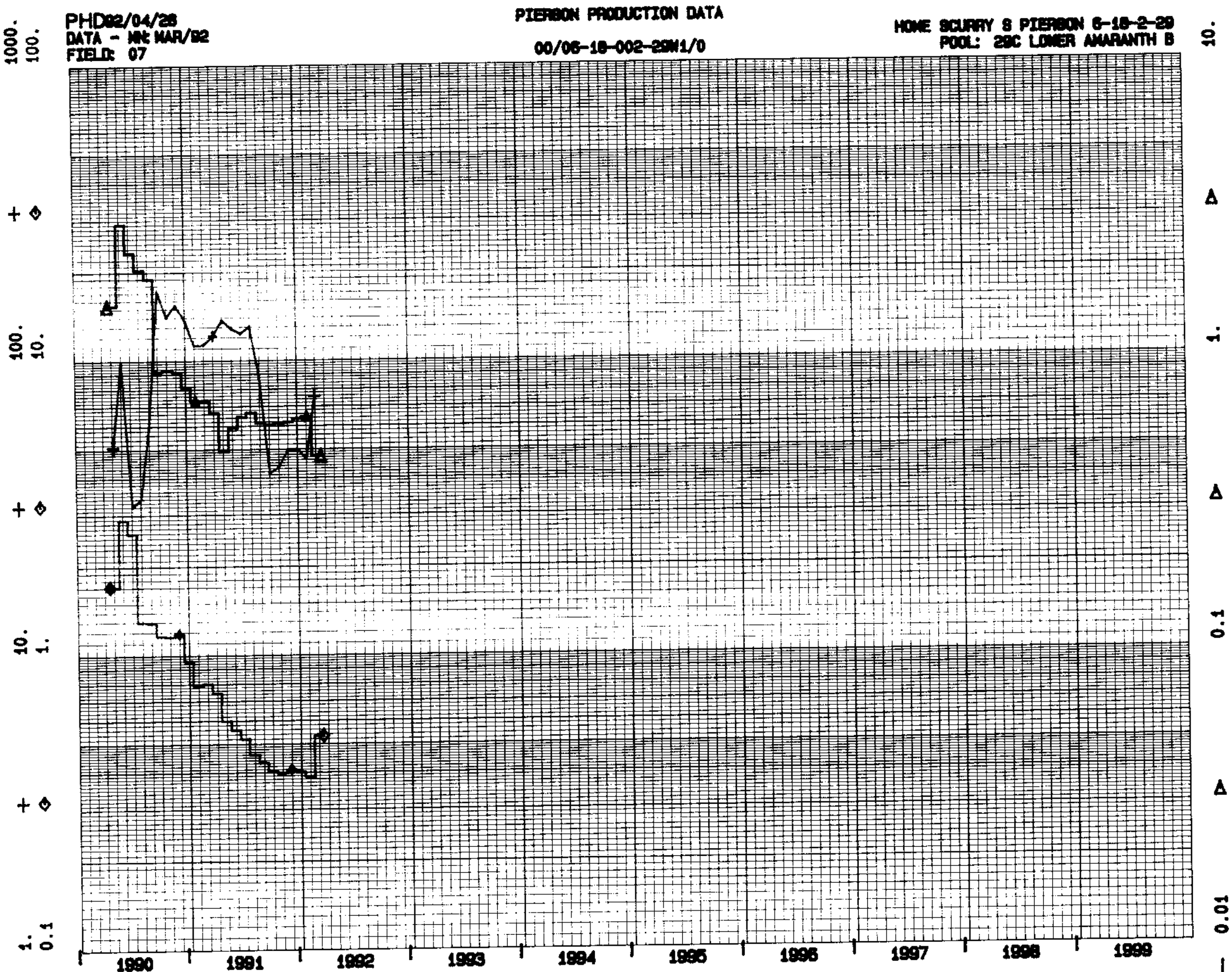
00/14-17-002-29W1/2

POOL:



CUM OIL PROD	m3	152.3
CUM WTR PROD	m3	312.1
CUM GAS PROD	E3m3	5.9

(4)
1184 84/02



CUM OIL PROD	m3	591.1
CUM WTR PROD	m3	636.2
CUM GAS PROD	E3m3	54.7

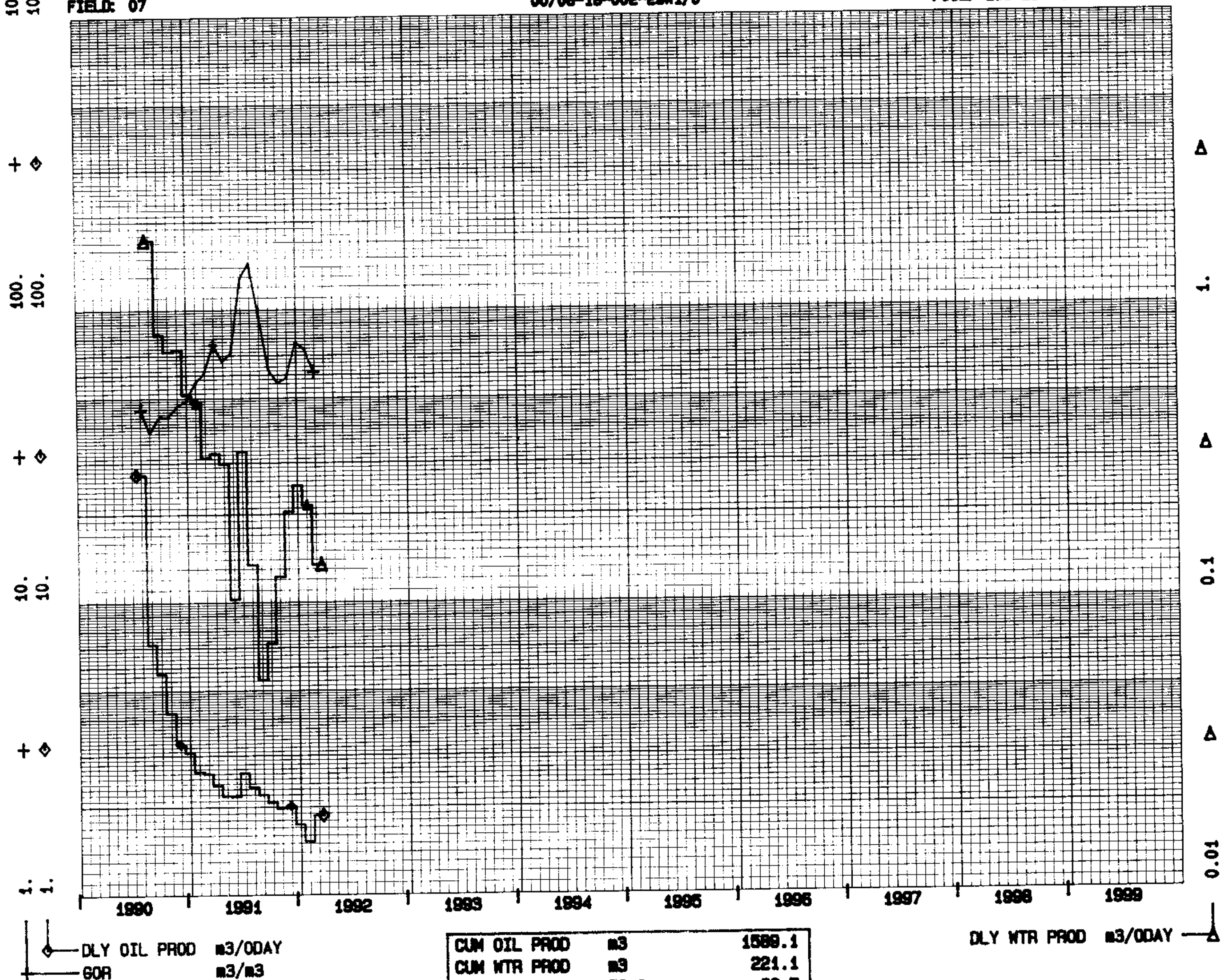
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

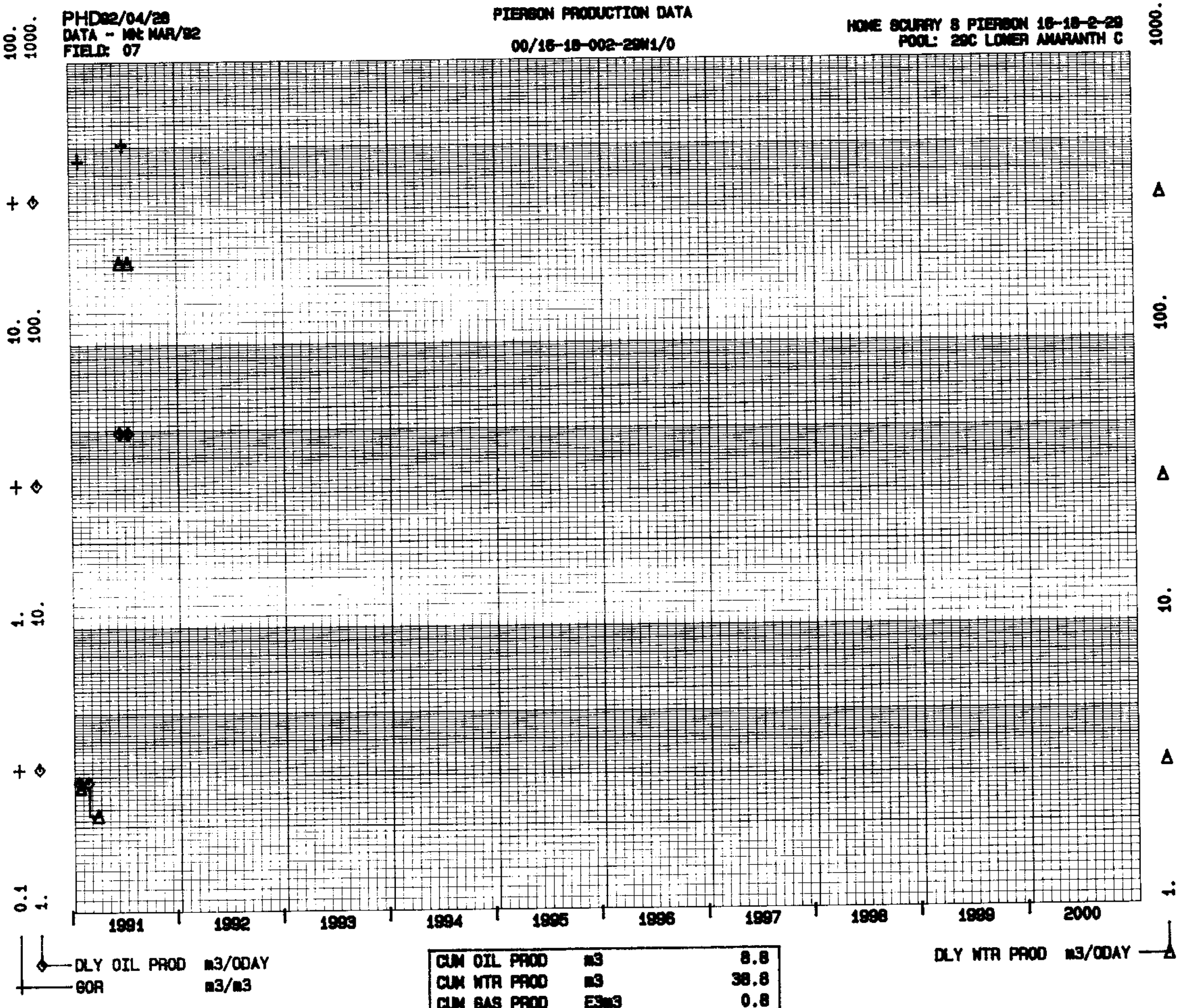
00/06-18-002-29W1/0

HOME SCURRY S PIERSON 6-18-2-29
POOL: 29C LOWER AMARANTH B

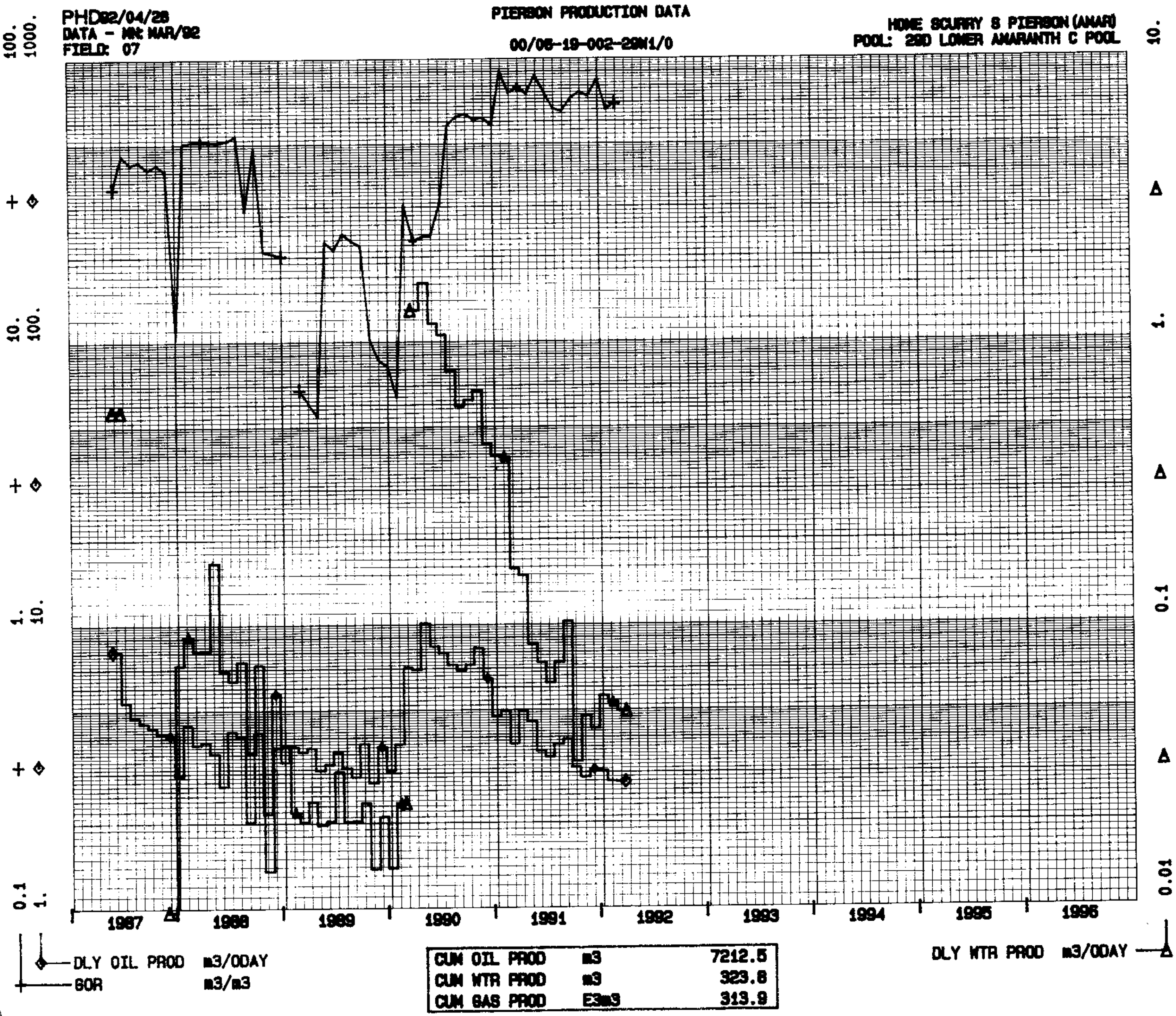


CUM OIL PROD	m3	1589.1
CUM WTR PROD	m3	221.1
CUM GAS PROD	E3m3	96.7

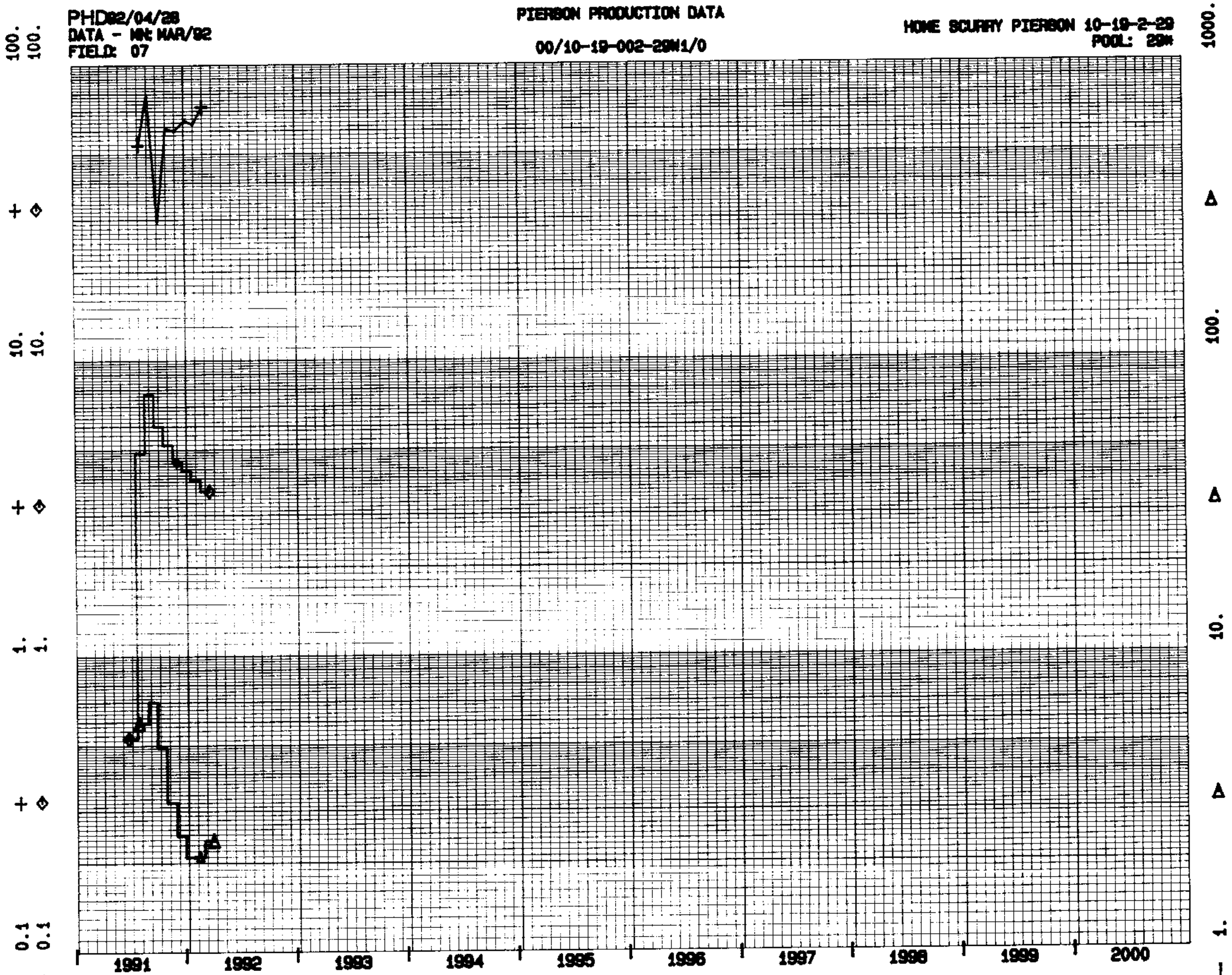
(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/16-18-002-29W1/0
HOME SCURRY S PIERSON 16-18-2-29
POOL: 29C LOWER AMARANTH C
100. 1000.
10. 100.
1. 10.
0.1 1.
1000.
100.
10.
1.
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 8.8
CUM WTR PROD m3 38.8
CUM GAS PROD E3m3 0.8
DLY WTR PROD m3/ODAY

(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/06-19-002-29W1/0
HOME SCURRY S PIERSON (AMAR)
POOL: 29D LOWER AMARANTH C POOL
100.
1000.
10.
100.
1.
10.
0.1
1.
10.
1.
0.1
0.01
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 7212.5
CUM WTR PROD m3 323.8
CUM GAS PROD E3m3 313.9
DLY WTR PROD m3/ODAY

(4)
1184 84/02



CUM OIL PROD	m3	983.8
CUM WTR PROD	m3	677.8
CUM GAS PROD	E3m3	57.8

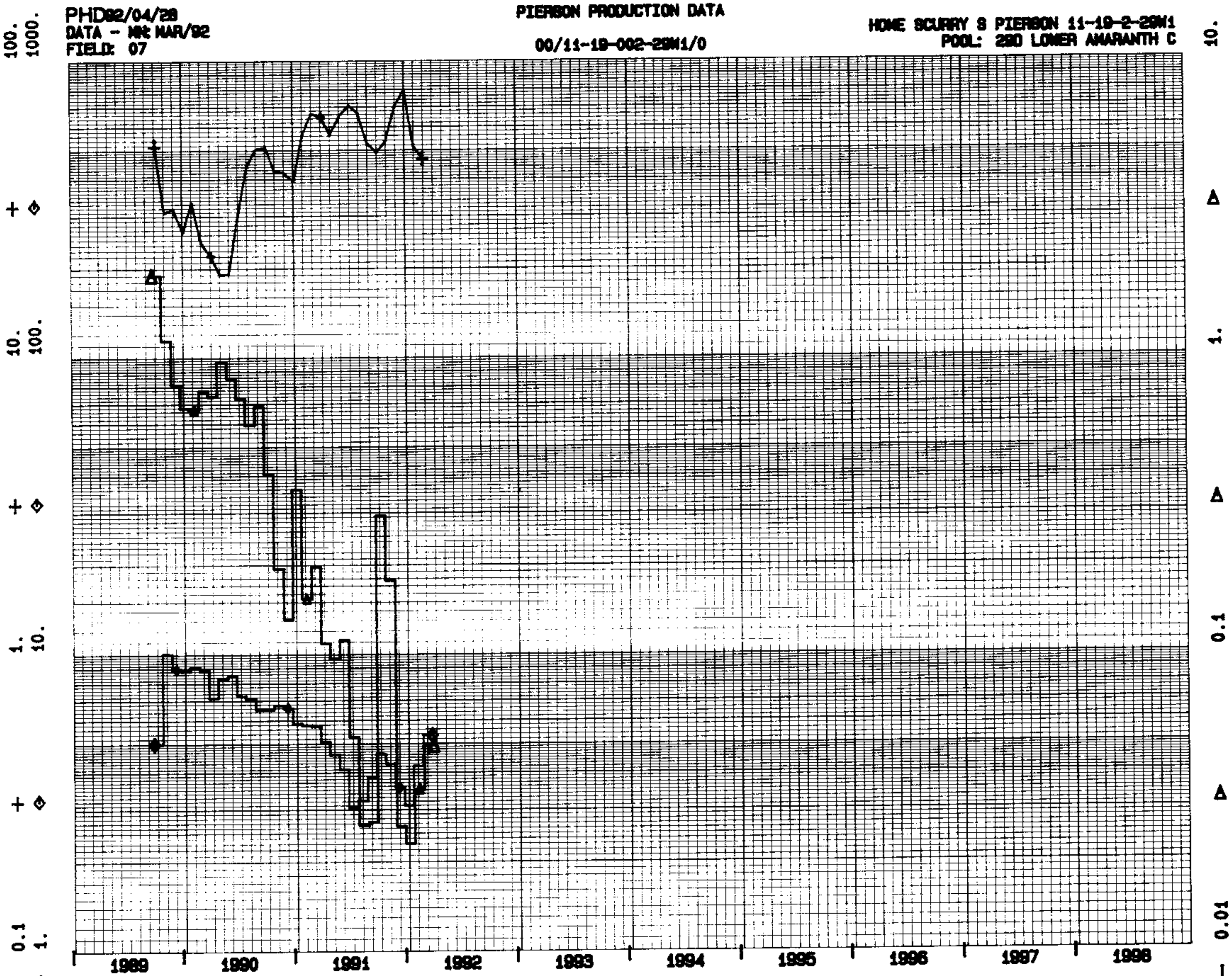
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/11-19-002-29W1/0

HOME SCURRY S PIERSON 11-19-2-29W1
POOL: 29D LOWER AMARANTH C



CUM OIL PROD	m3	5126.9
CUM WTR PROD	m3	326.3
CUM GAS PROD	E3m3	212.3

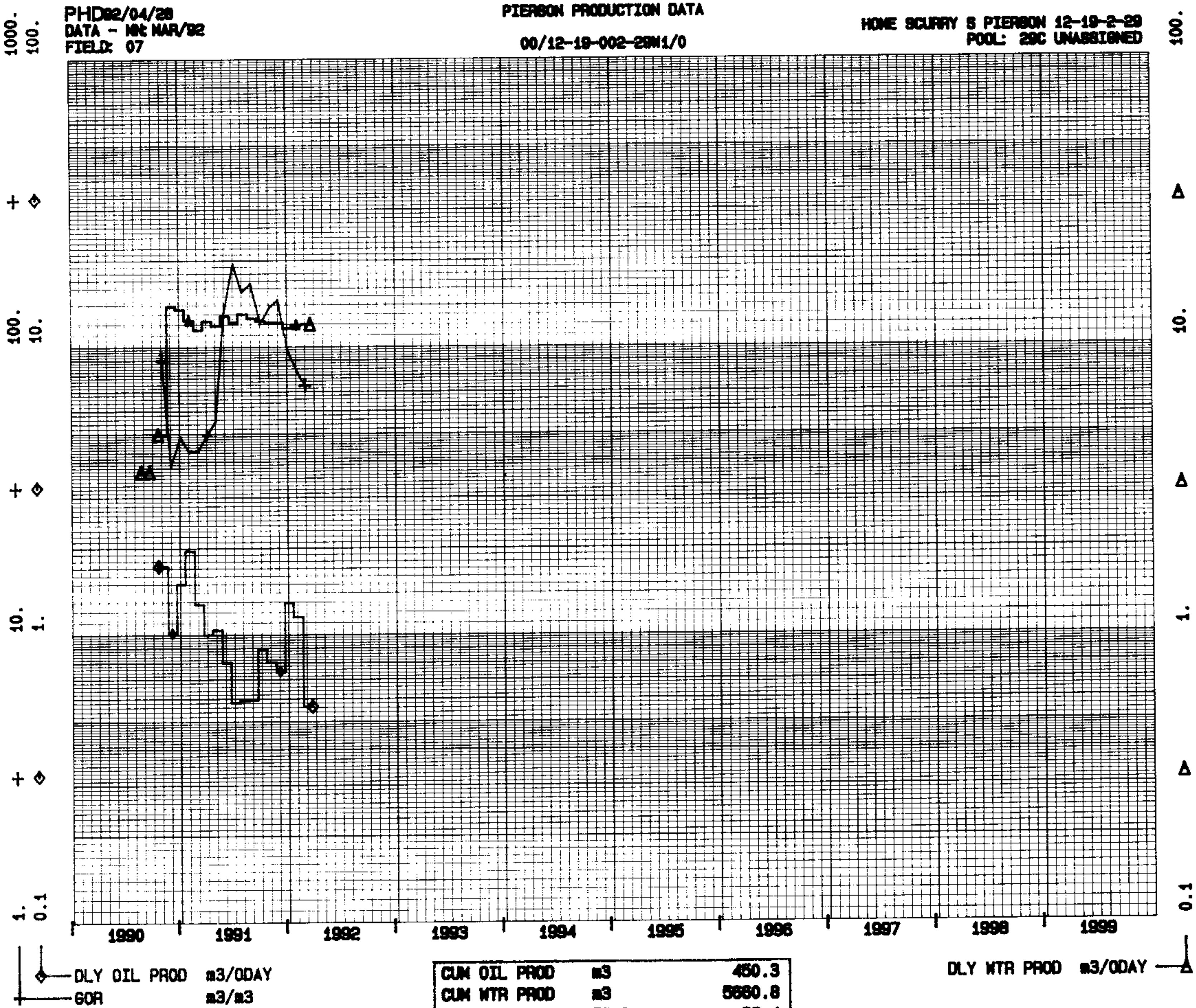
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

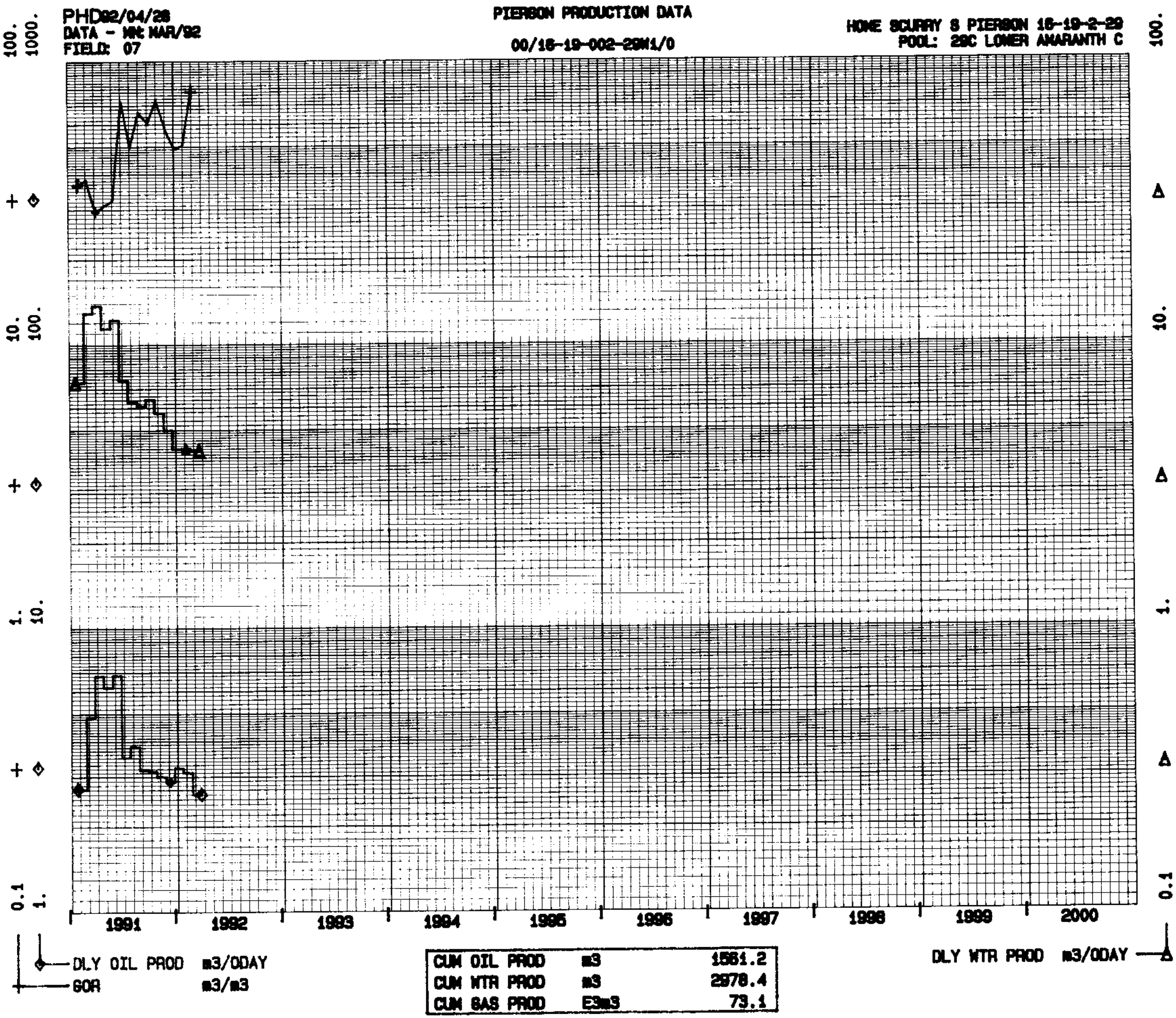
00/12-19-002-29W1/0

HOME SCURRY S PIERSON 12-19-2-29
POOL: 29C UNASSIGNED



CUM OIL PROD	m3	450.3
CUM WTR PROD	m3	5660.8
CUM GAS PROD	E3m3	30.4

(4)
1184 84/02



CUM OIL PROD	m3	1561.2
CUM WTR PROD	m3	2978.4
CUM GAS PROD	E3m3	73.1

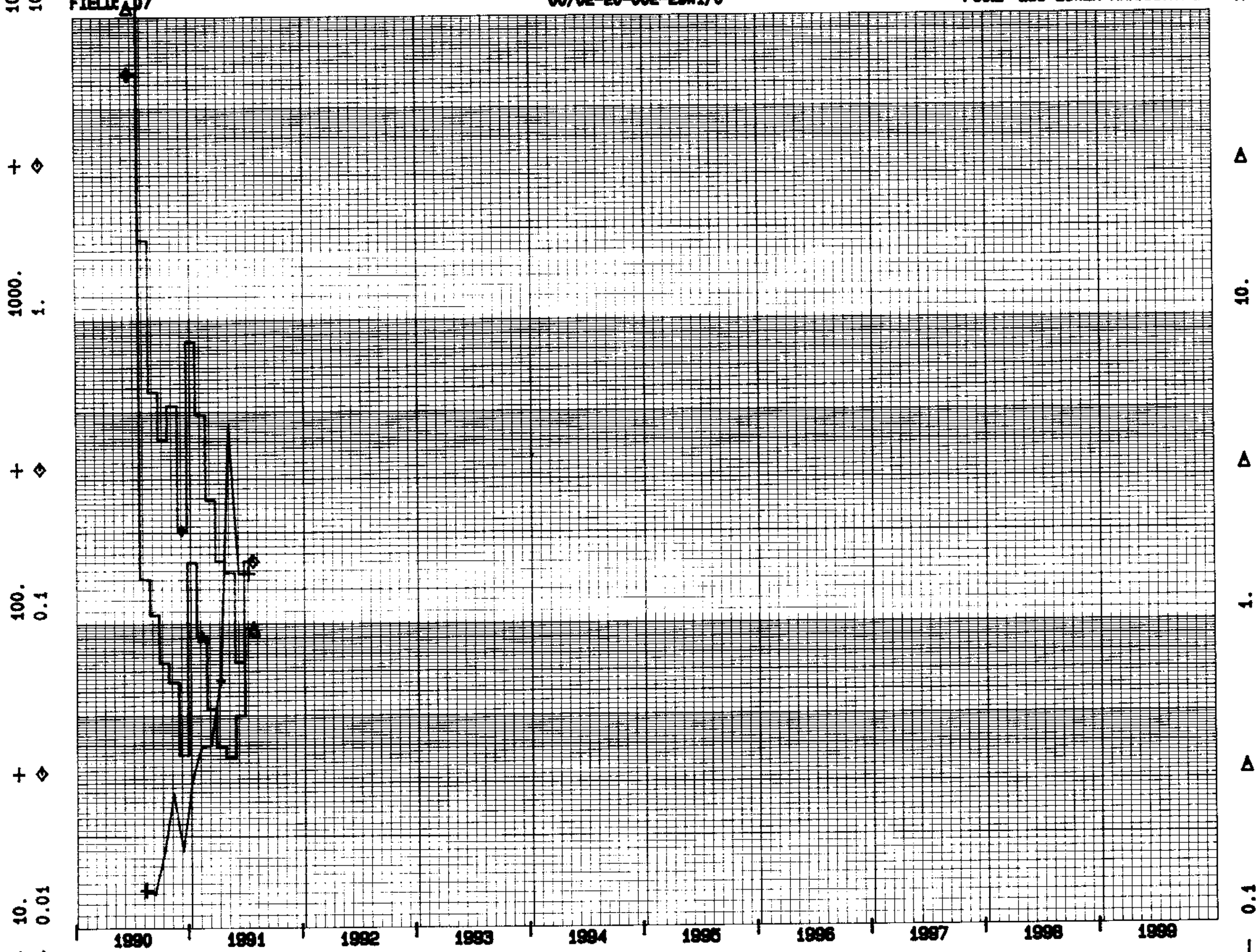
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

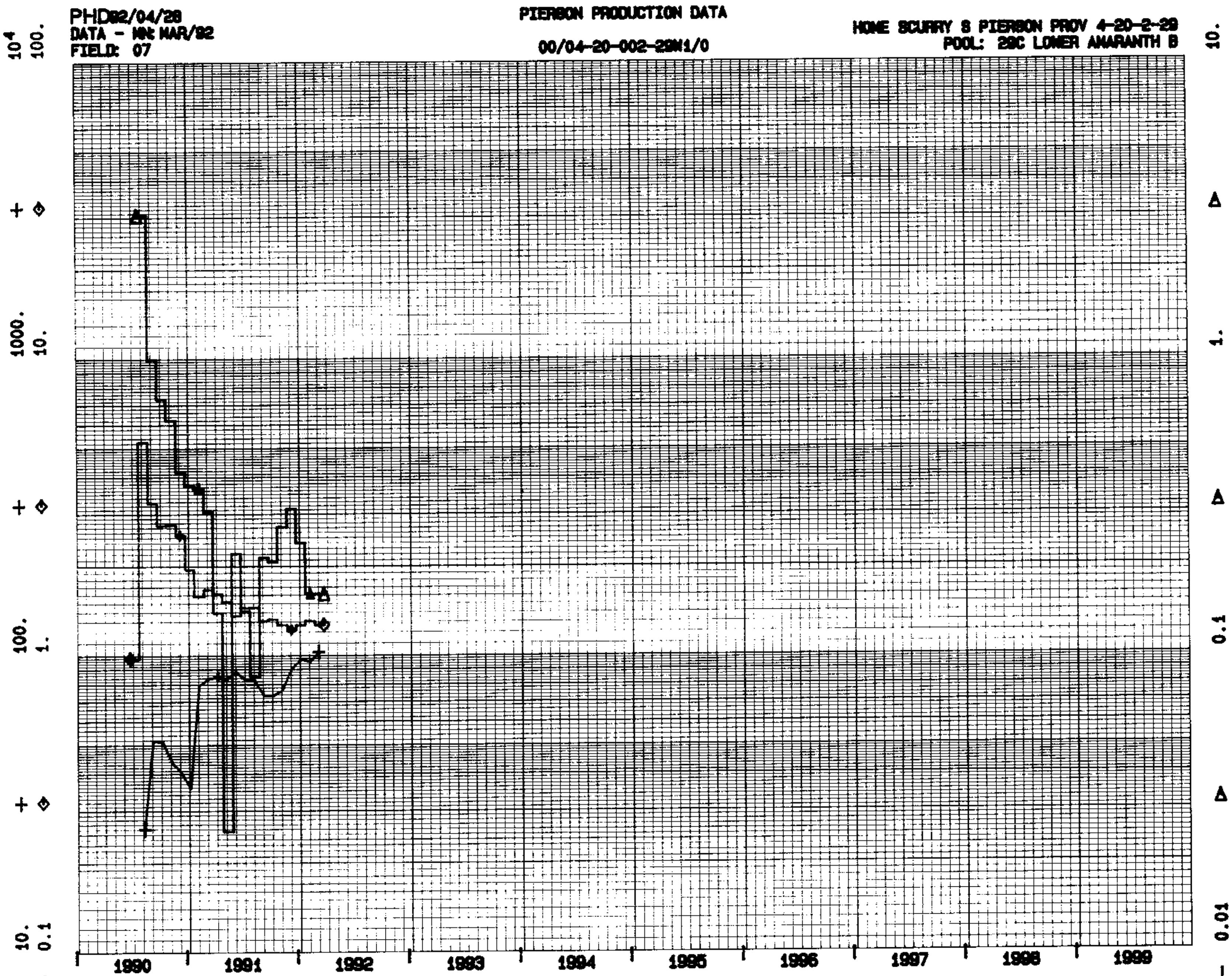
00/02-20-002-29W1/0

HOME SCURRY S PIERSON PROV 2-20-2-29
POOL: 29C LOWER AMARANTH B



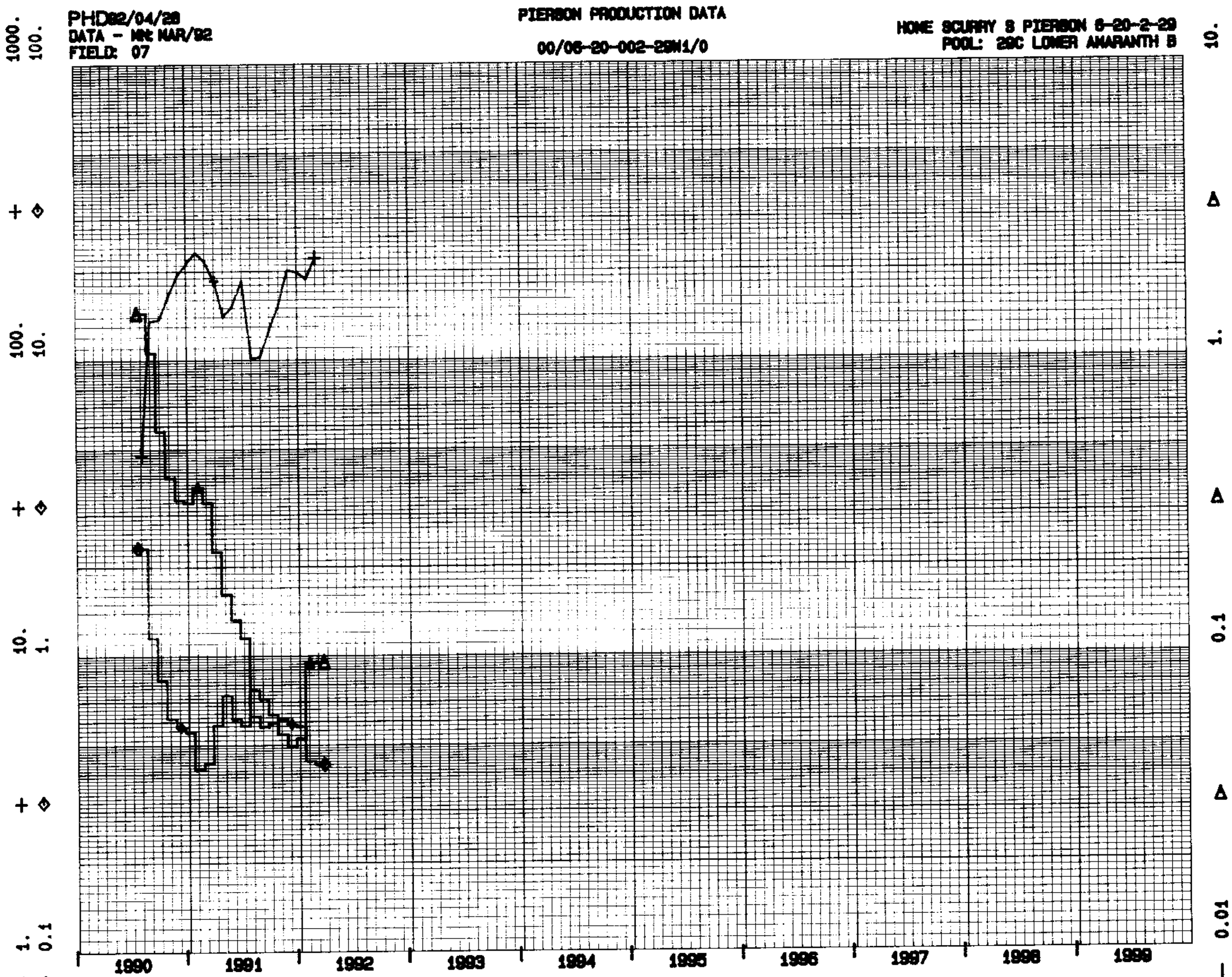
CUM OIL PROD	m3	122.6
CUM WTR PROD	m3	226.0
CUM GAS PROD	E3m3	5.1

(4)
1184 84/02



CUM OIL PROD	m3	1084.2
CUM WTR PROD	m3	241.3
CUM GAS PROD	E3m3	69.1

(4)
1184 84/02



CUM OIL PROD	m3	356.7
CUM WTR PROD	m3	138.5
CUM GAS PROD	E3m3	56.4

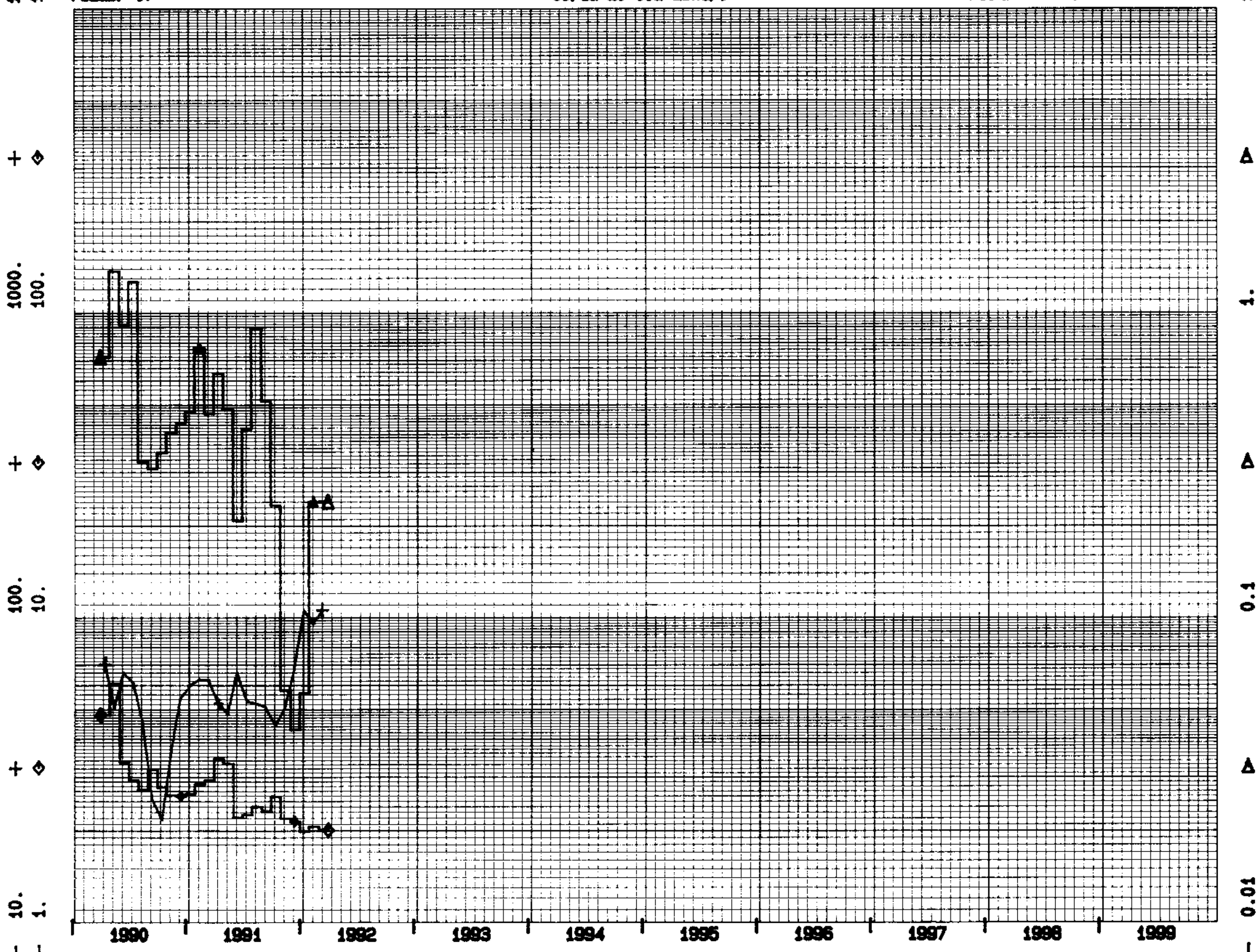
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/12-20-002-29W1/0

HOME SRO 8 PIERSON PROV 12-20-2-29
POOL: 29C LOWER AMARANTH B



DLY OIL PROD m3/ODAY
GOR m3/m3

DLY WTR PROD m3/ODAY

CUM OIL PROD	m3	1777.9
CUM WTR PROD	m3	306.1
CUM GAS PROD	E3m3	99.8

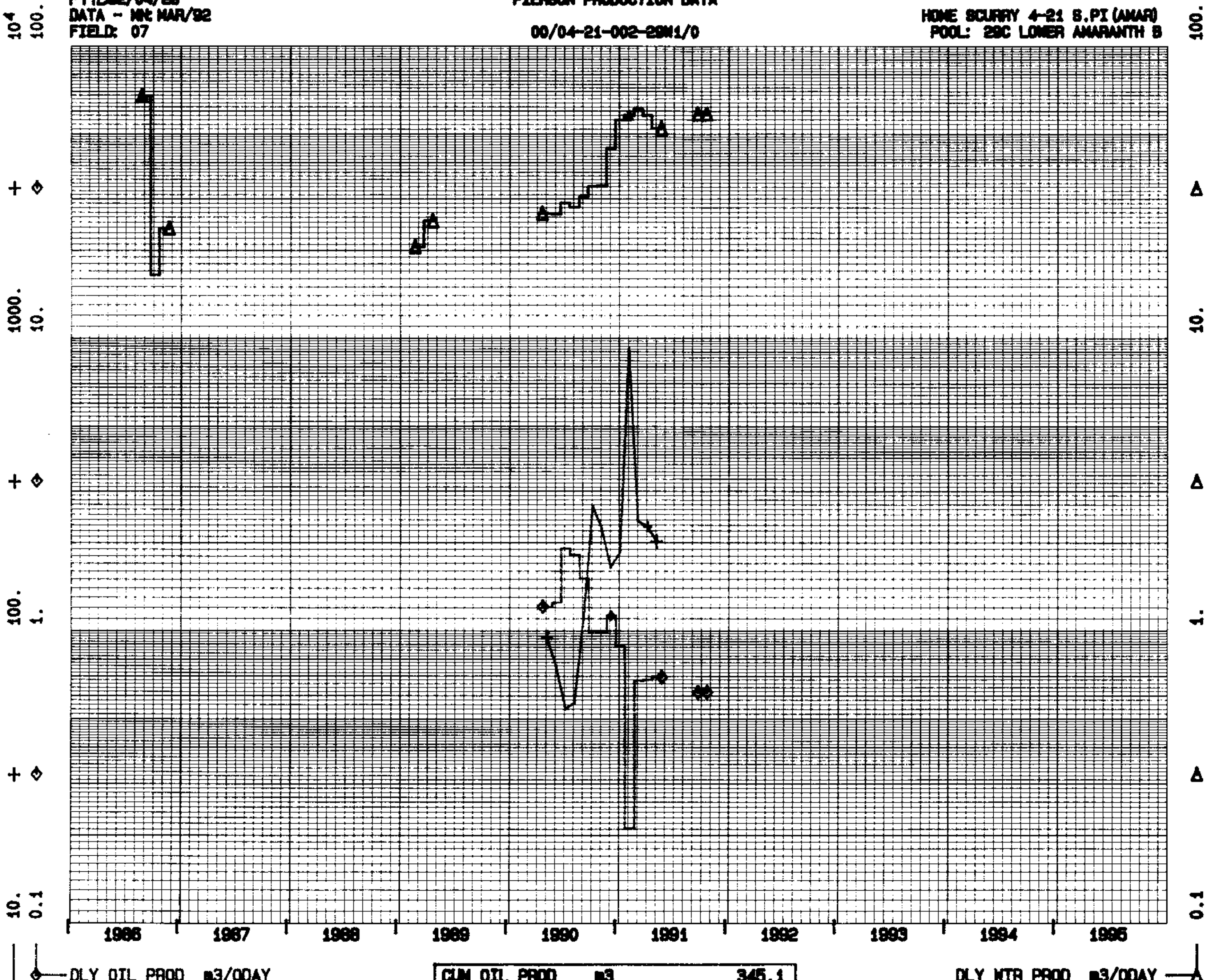
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/04-21-002-29W1/0

HOME SCURRY 4-21 S.PI (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	345.1
CUM WTR PROD	m3	13355.4
CUM GAS PROD	E3m3	49.6

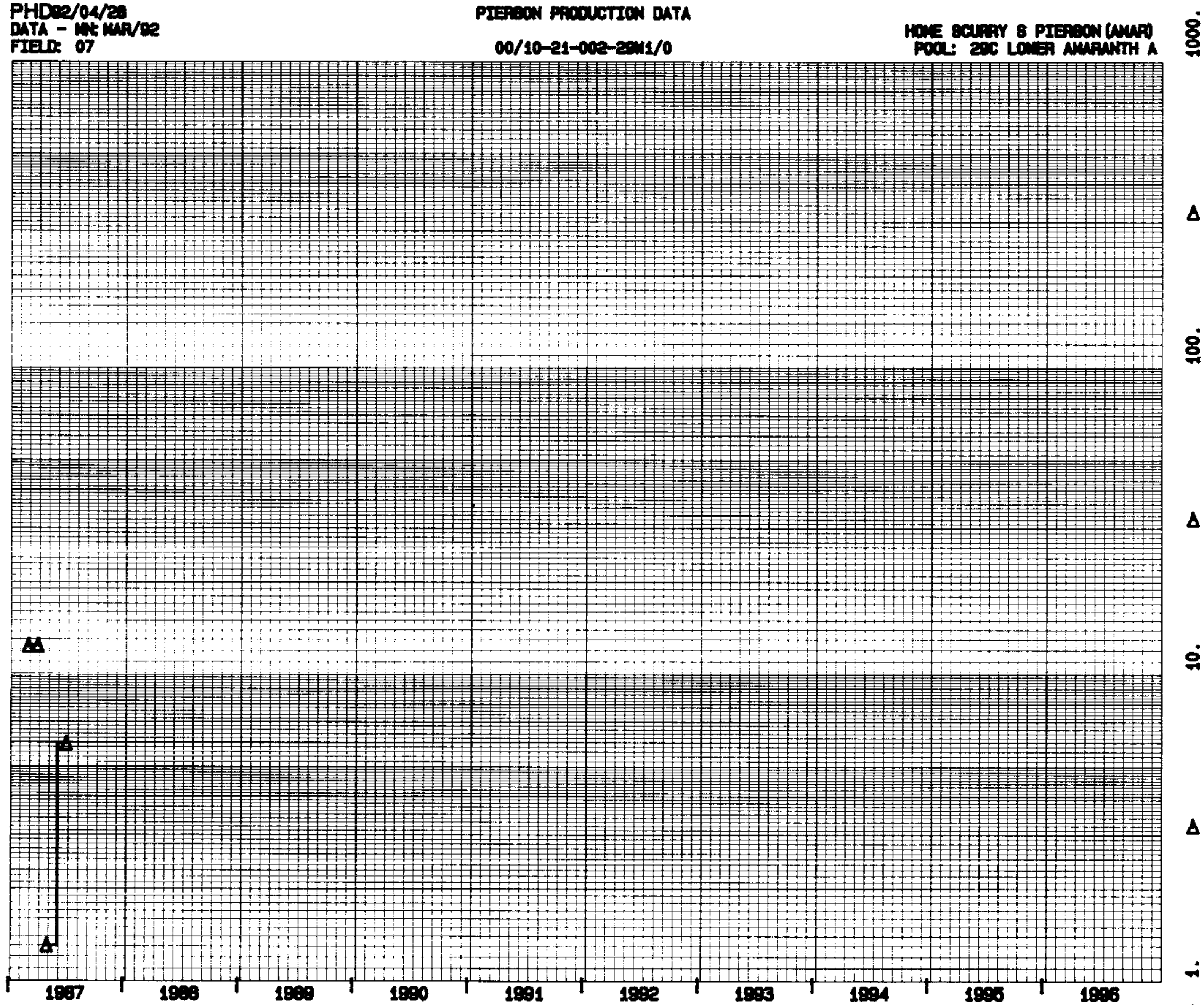
(4)
1184 84/02

PHD92/04/28
DATA - MN: MAR/92
FIELD: 07

PIERSON PRODUCTION DATA

00/10-21-002-29W1/0

HOME SCURRY S PIERSON(AMAR)
POOL: 29C LOWER AMARANTH A

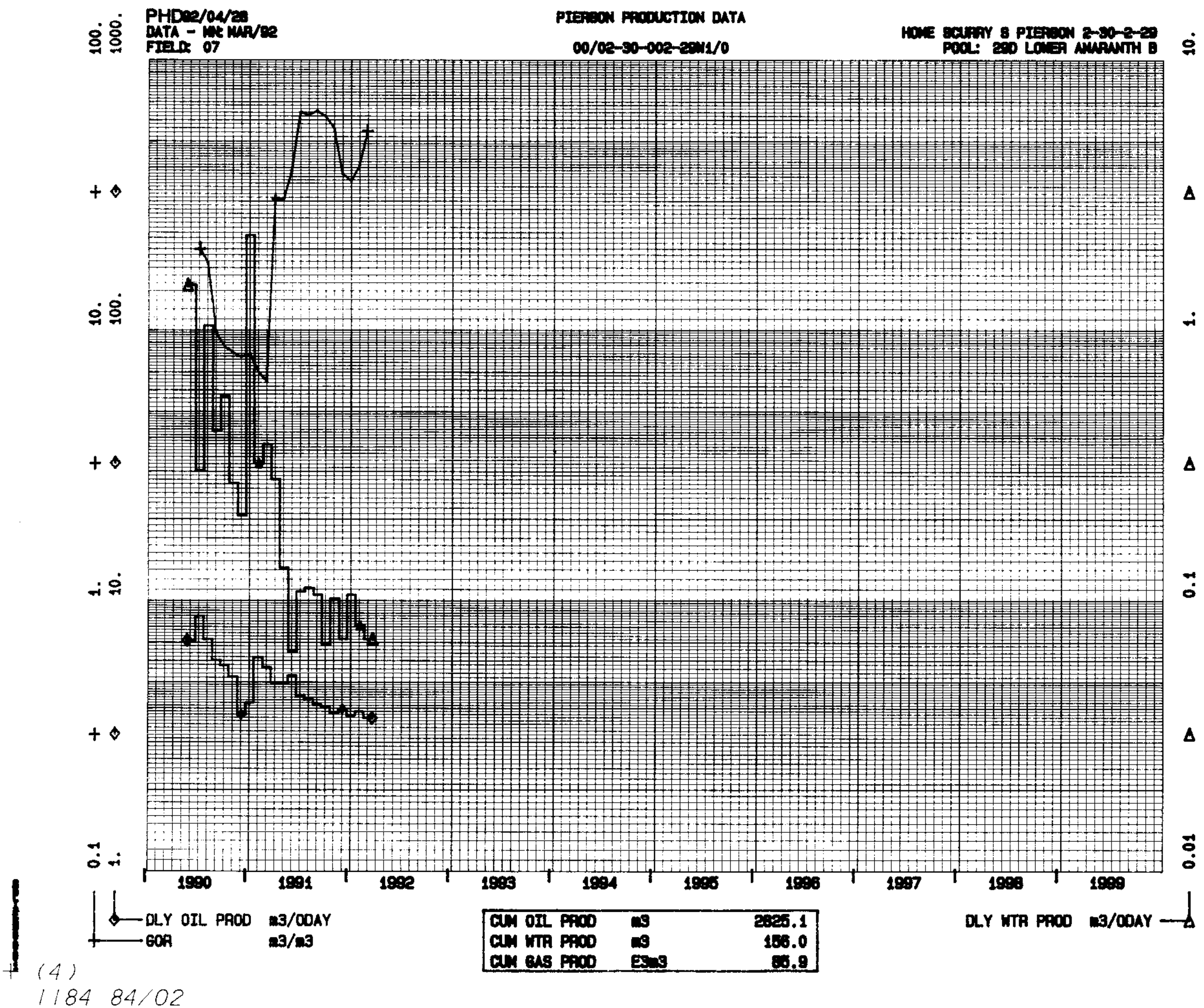


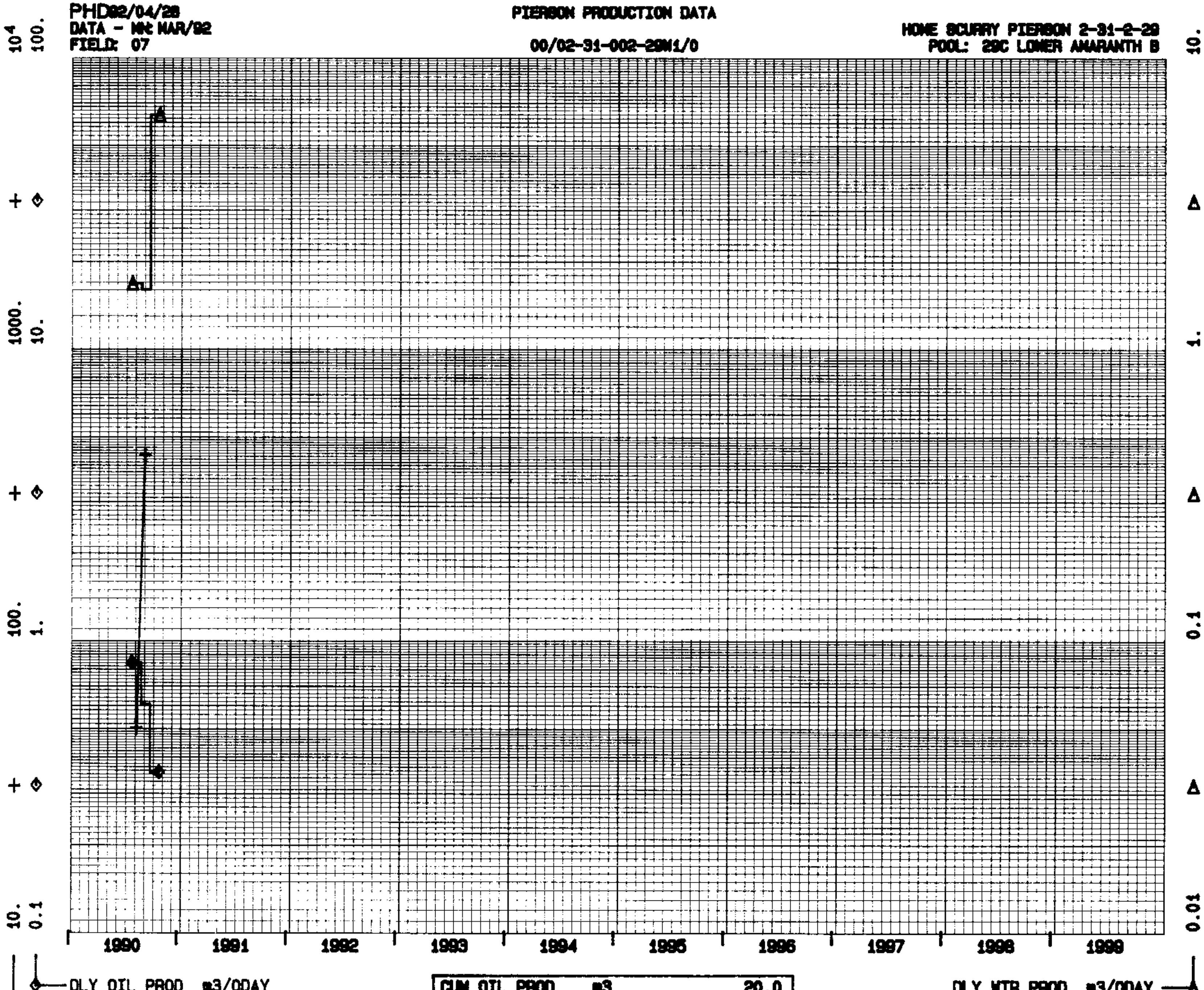
DLY OIL PROD m3/ODAY No Data
GOR m3/m3 No Data

CUM OIL PROD	m3	0.0
CUM WTR PROD	m3	62.4
CUM GAS PROD	E3m3	0.3

DLY WTR PROD m3/ODAY

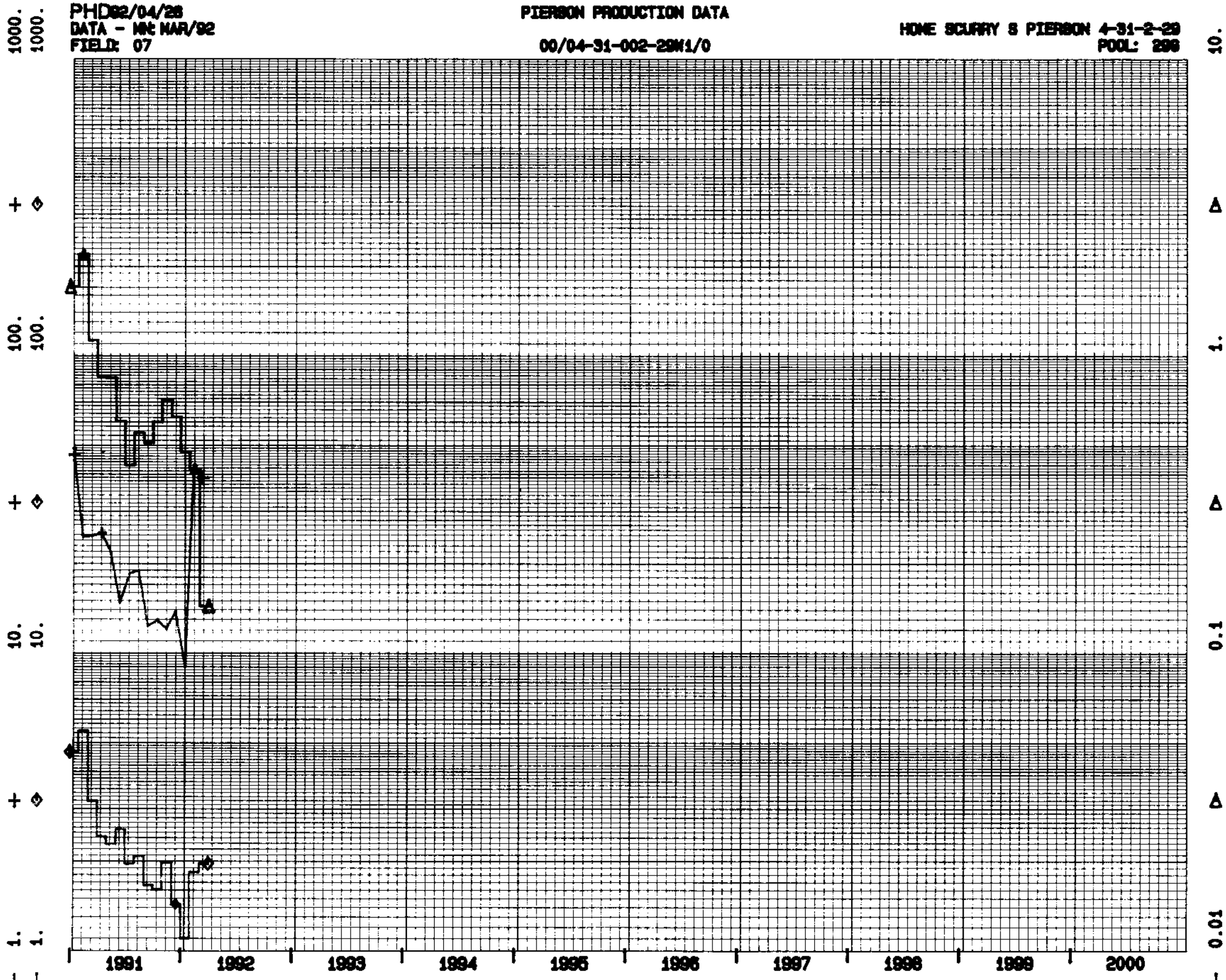
(4)
1184 84/02


PHD92/04/28
DATA - MN: MAR/92
FIELD: 07
PIERSON PRODUCTION DATA
00/02-30-002-29W1/0
HOME SCURRY S PIERSON 2-30-2-29
POOL: 29D LOWER AMARANTH B
100. 1000.
10. 100.
1. 10.
0.1 1.
10.
1.
0.1
0.01
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
DLY OIL PROD m3/ODAY
GOR m3/m3
CUM OIL PROD m3 2825.1
CUM WTR PROD m3 156.0
CUM GAS PROD E3m3 85.9
DLY WTR PROD m3/ODAY
(4)
1184 84/02



CUM OIL PROD	m3	20.0
CUM WTR PROD	m3	62.1
CUM GAS PROD	E3m3	7.5

(4)
1184 84/02



CUM OIL PROD	m3	921.0
CUM WTR PROD	m3	292.2
CUM GAS PROD	E3m3	20.0

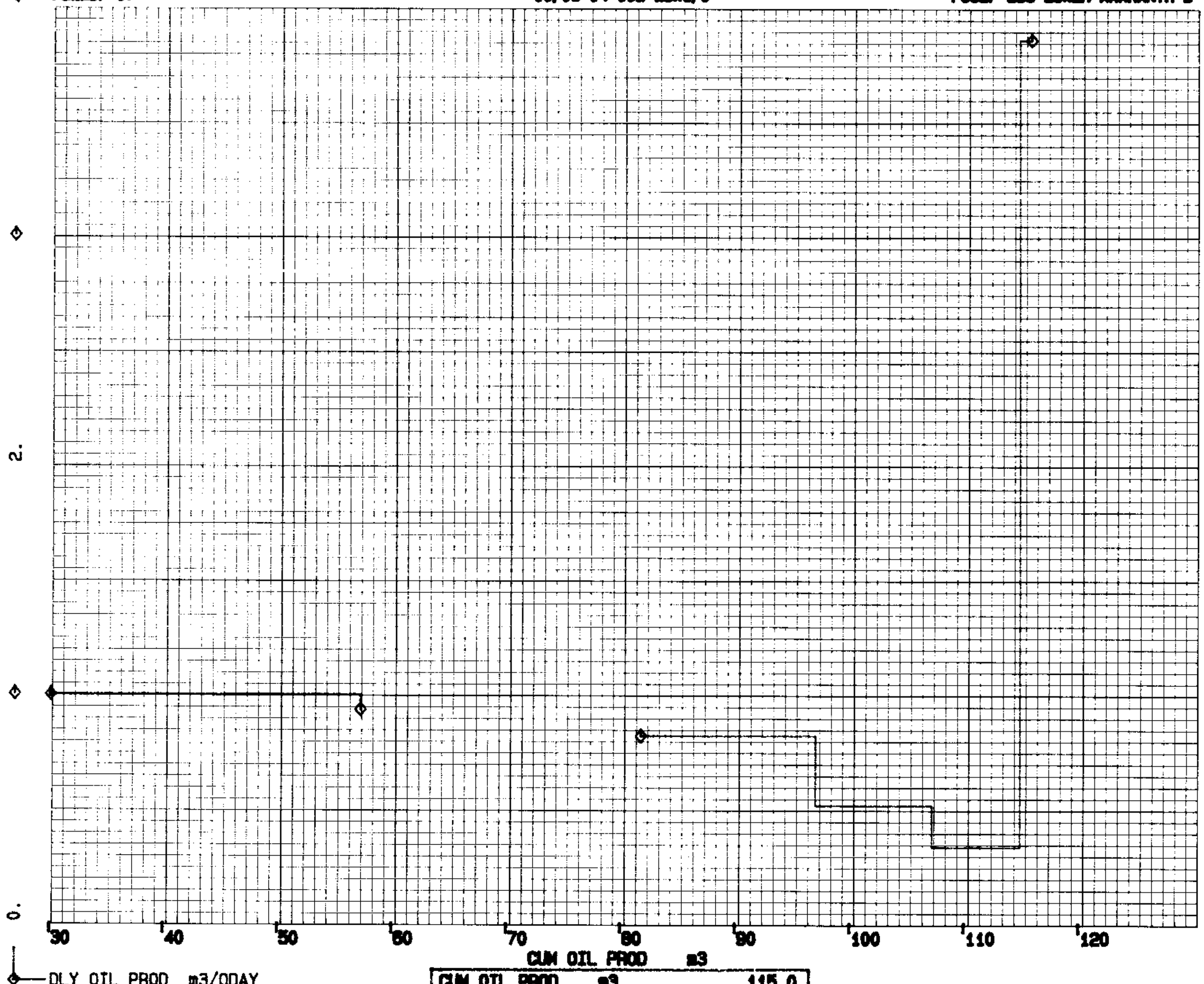
(4)
1184 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/08-04-002-29W1/0

HOME SCURRY S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	115.0
CUM WTR PROD	m3	827.8
GOR	m3/m3	51.9

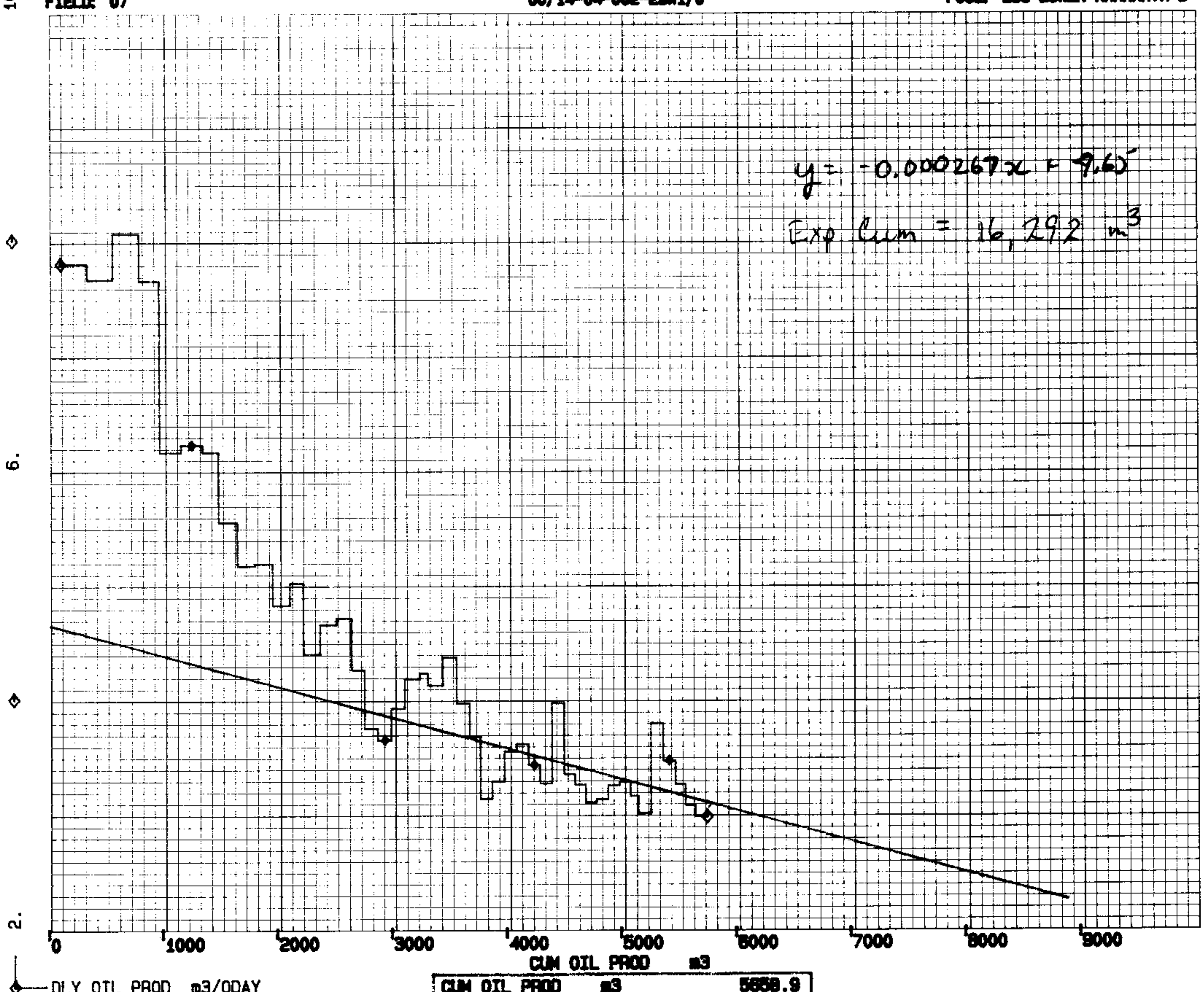
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/14-04-002-29W1/0

HOME SCURRY S.PIERSON
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	5658.9
CUM WTR PROD	m3	1807.7
GOR	m3/m3	50.1

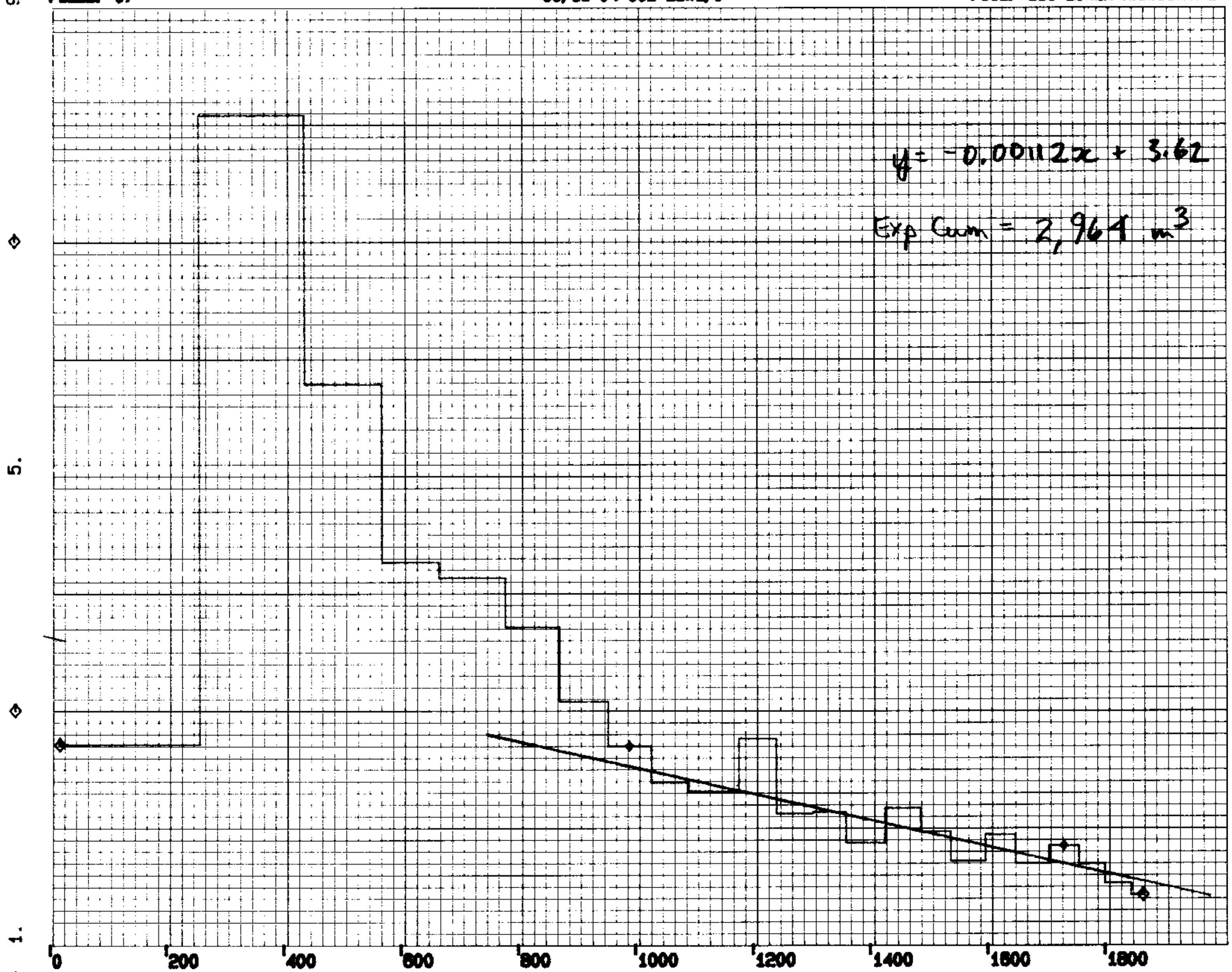
(5)
1185 84/02

PHD92/04/24
DATA - NN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-04-002-29W1/0

HOME SRO S PIERSON PROV 16-4-2-29
POOL: 29C LOWER AMARANTH B



DLY OIL PROD m3/0DAY

CUM OIL PROD	m3	1844.4
CUM WTR PROD	m3	666.2
GOR	m3/m3	77.4

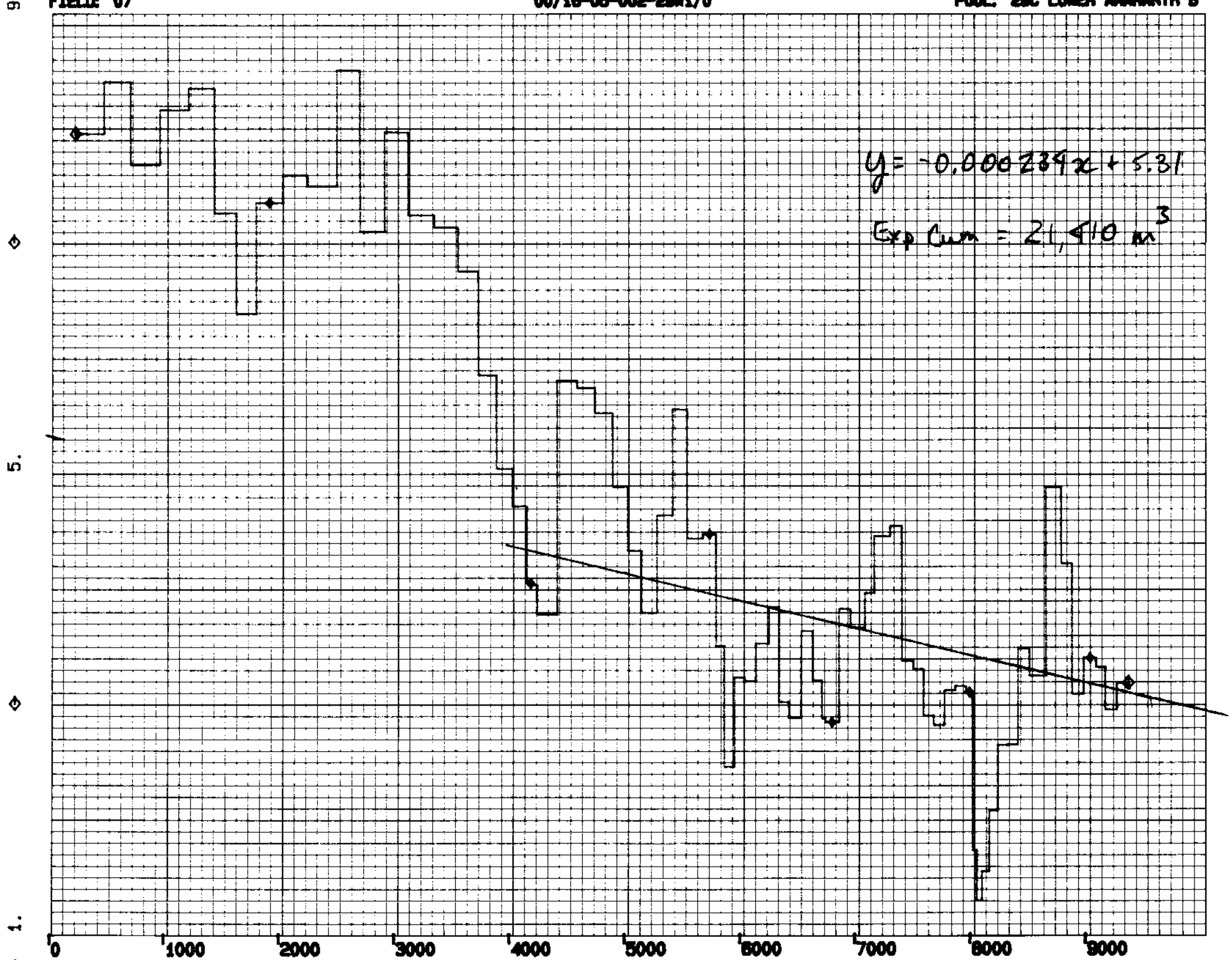
(5)
1185 84/02

PHD92/04/24
DATA - NN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-05-002-29W1/0

HOME SRO S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	9273.3
CUM WTR PROD	m3	9742.7
GOR	m3/m3	65.2

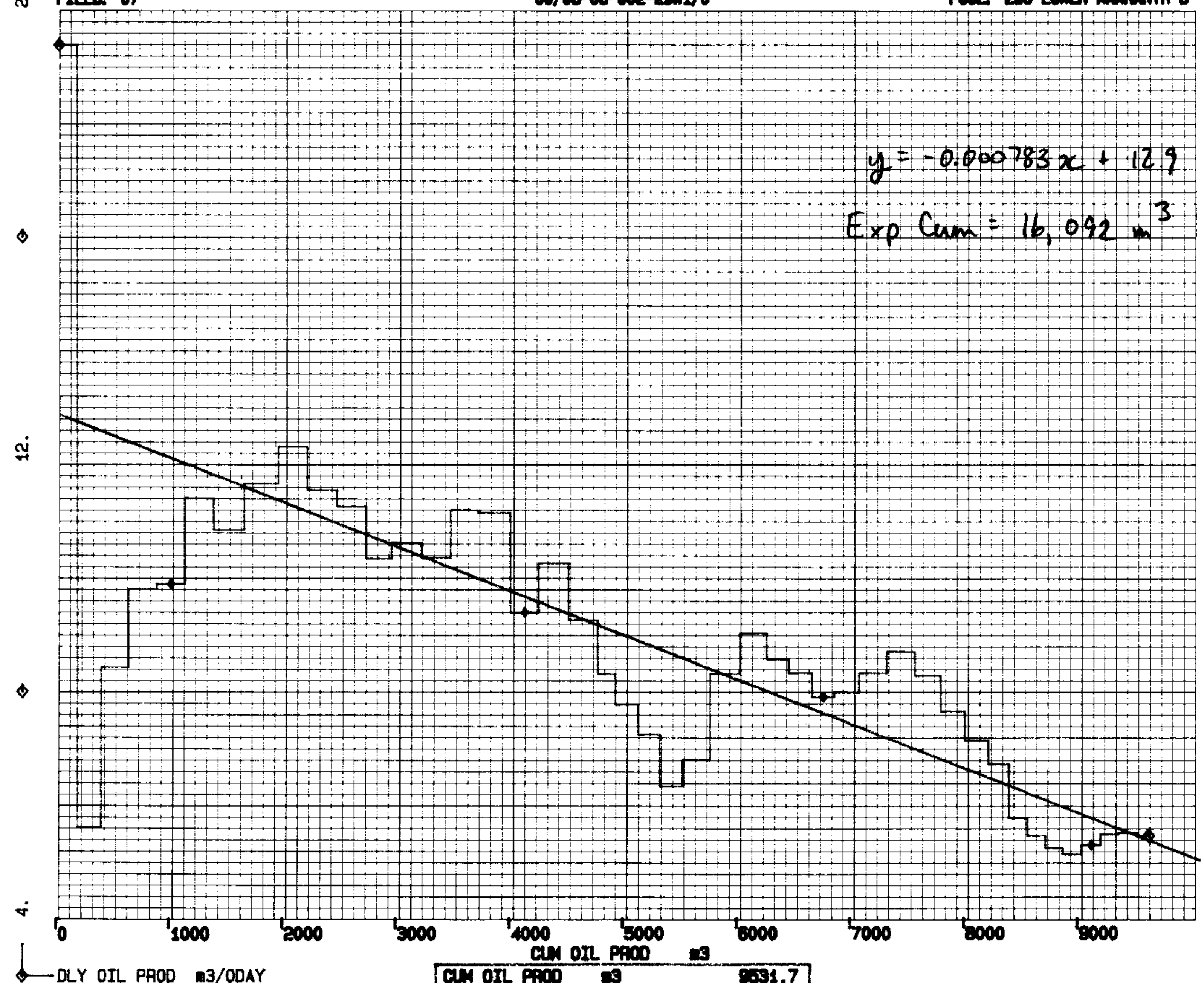
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/08-08-002-29W1/0

HOME SCURRY S. PIERSON
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	9531.7
CUM WTR PROD	m3	18850.1
GOR	m3/m3	33.8

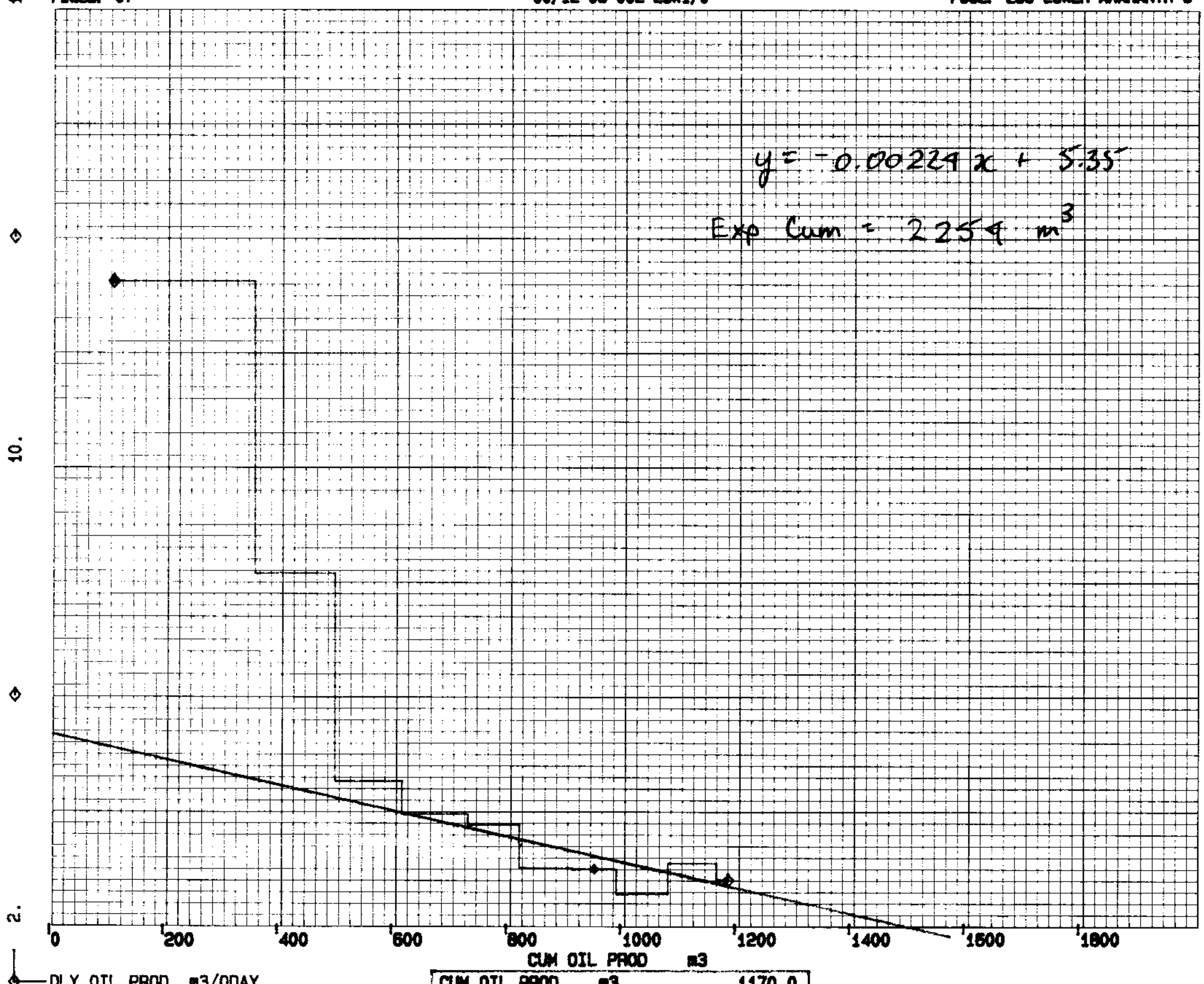
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/12-08-002-29W1/0

HOME SCURRY S PIERSON 12-8-2-29W1
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	1170.0
CUM WTR PROD	m3	346.5
GOR	m3/m3	56.1

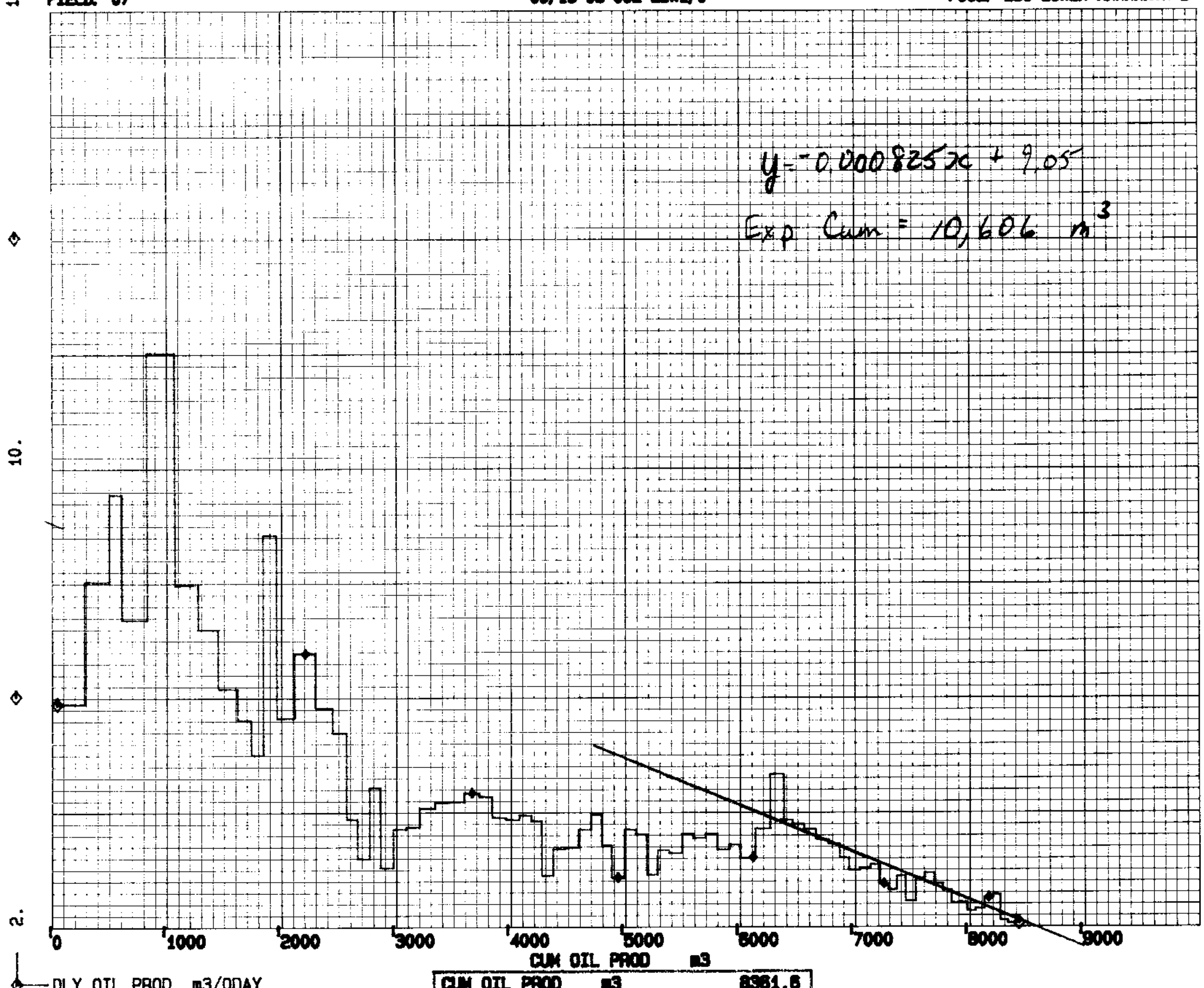
(5)
1185 84/02

PHD92/04/24
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-08-002-29W1/0

HOME ET AL 16-8 (AMAR.)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	8361.6
CUM WTR PROD	m3	1450.3
GOR	m3/m3	83.1

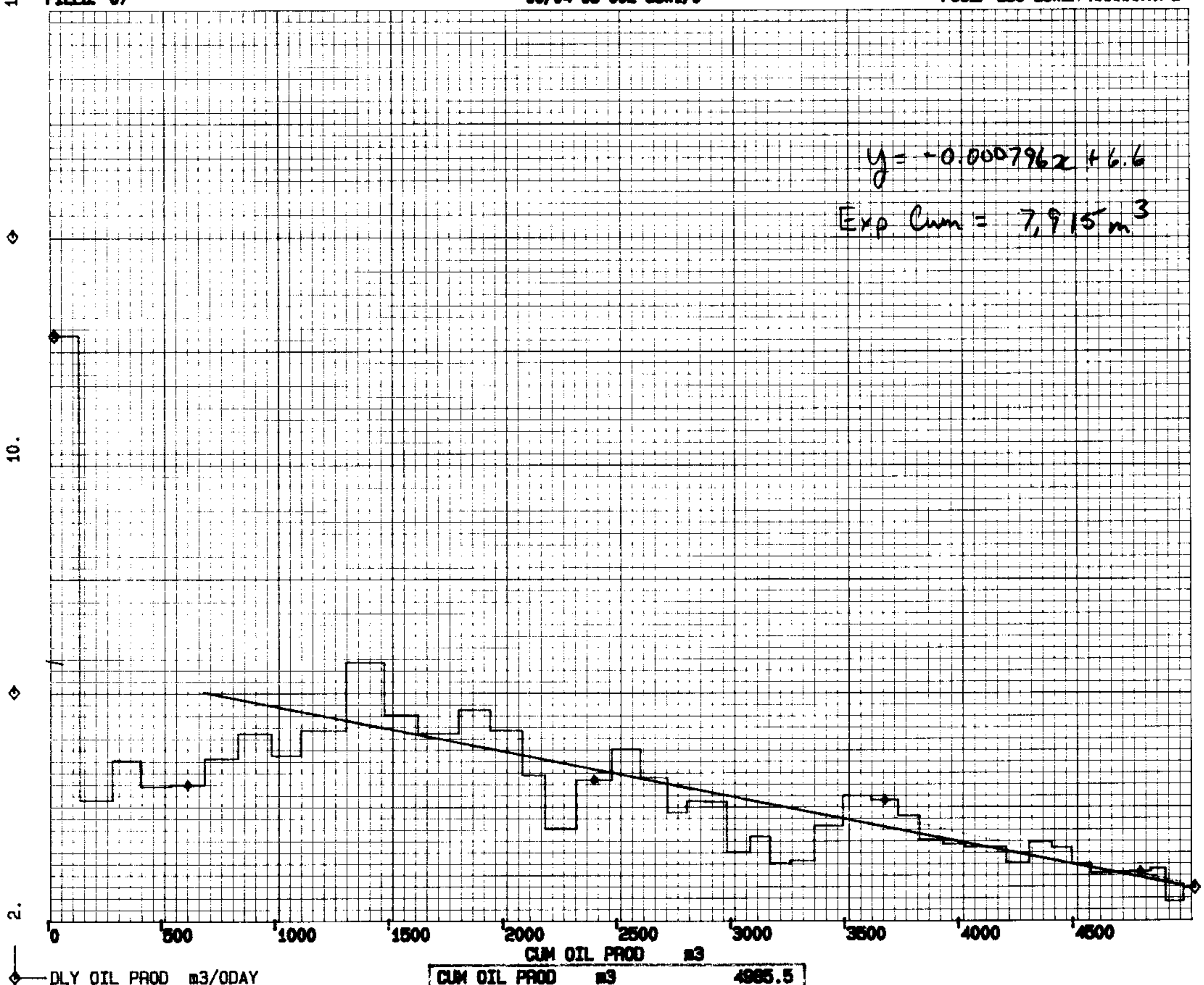
(5)
1185 84/02

PHD92/04/24
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/04-09-002-29W1/0

HOME ET AL S. PIERSON
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4985.5
CUM WTR PROD	m3	15003.9
GOR	m3/m3	103.6

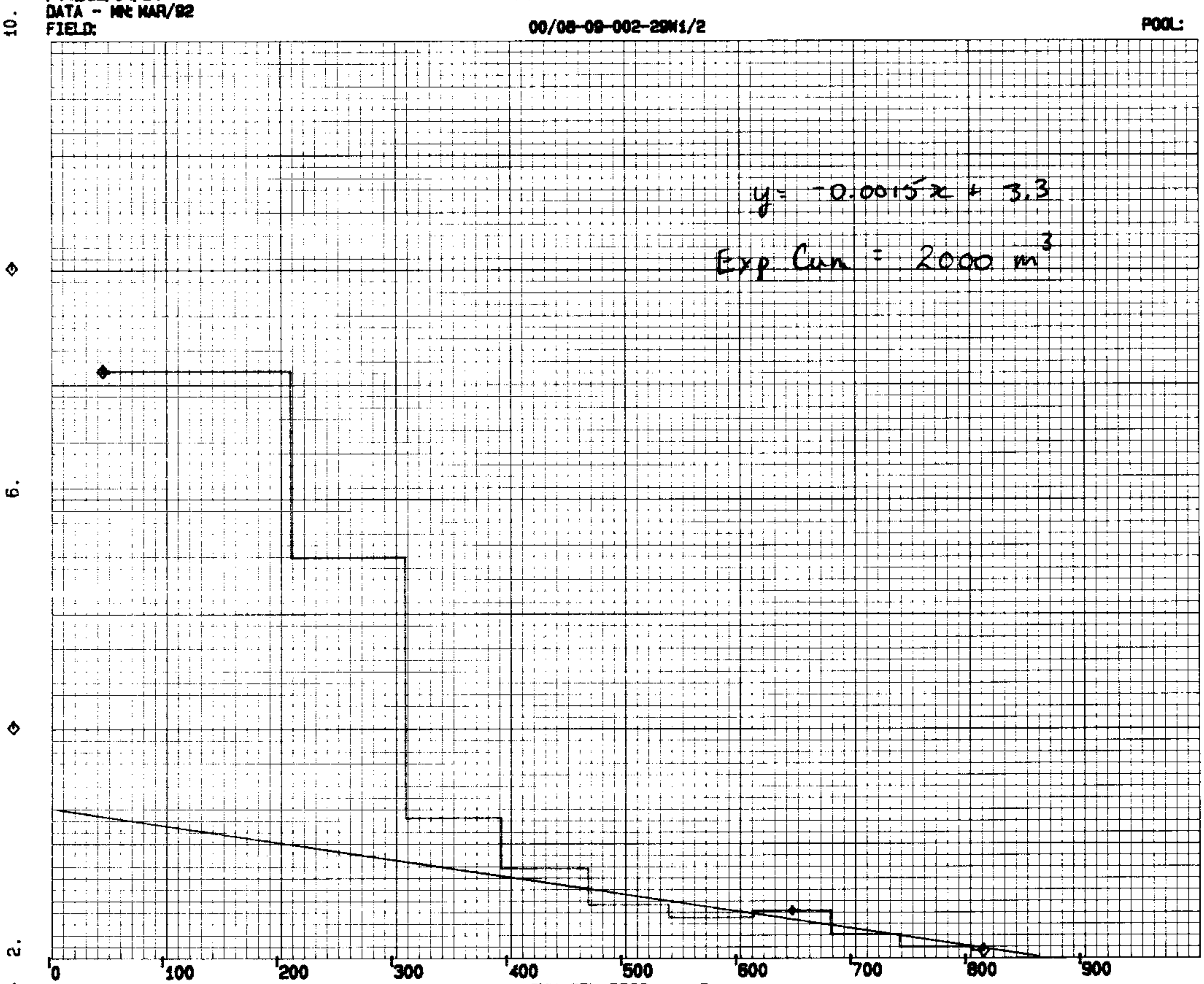
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD:

PIERSON RATE CUM PLOTS

00/08-09-002-29W1/2

POOL:



CUM OIL PROD	m3	807.1
CUM WTR PROD	m3	176.3
GOR	m3/m3	52.2

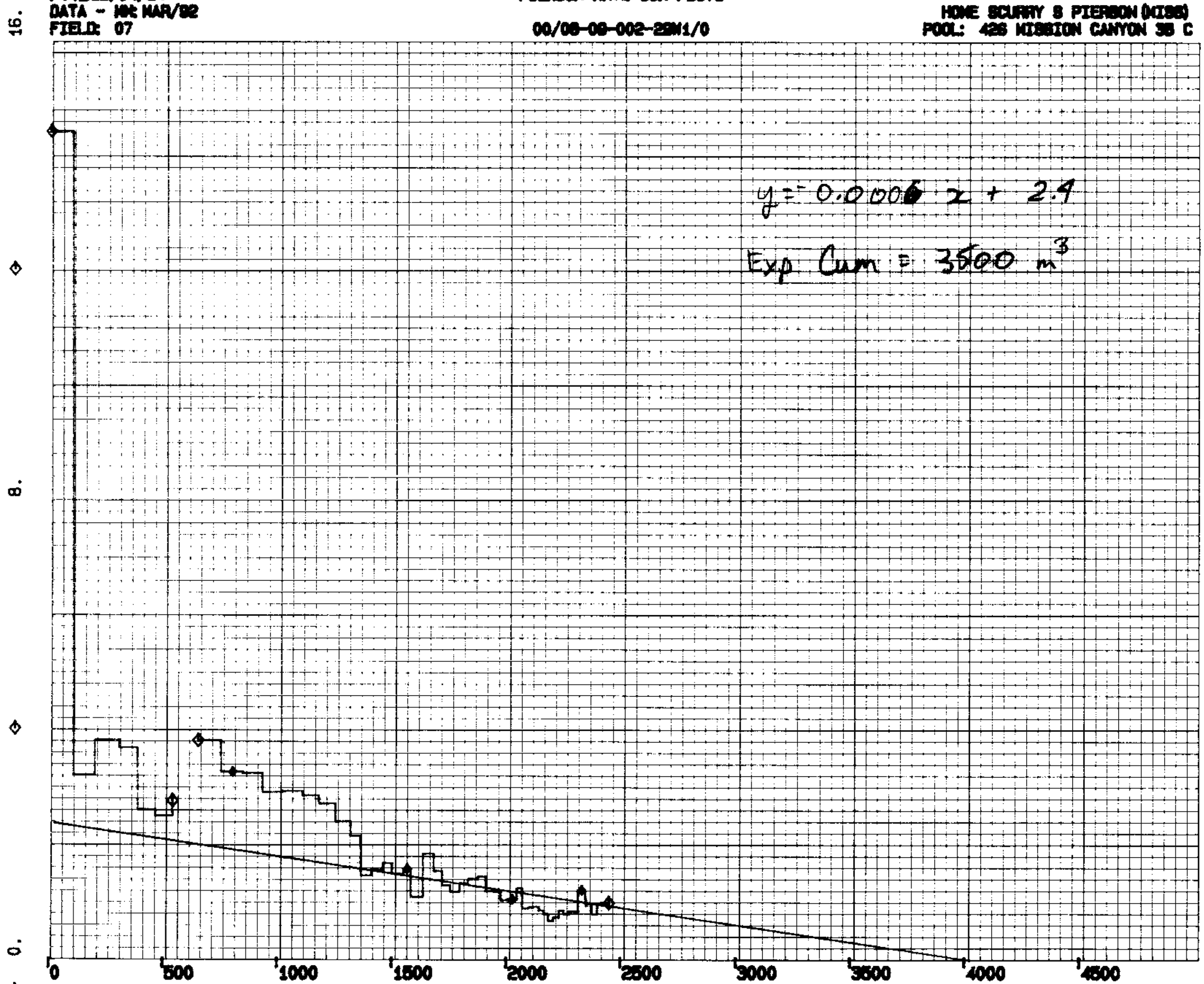
(5)
1185 84/02

PHD92/04/24
DATA - MM: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

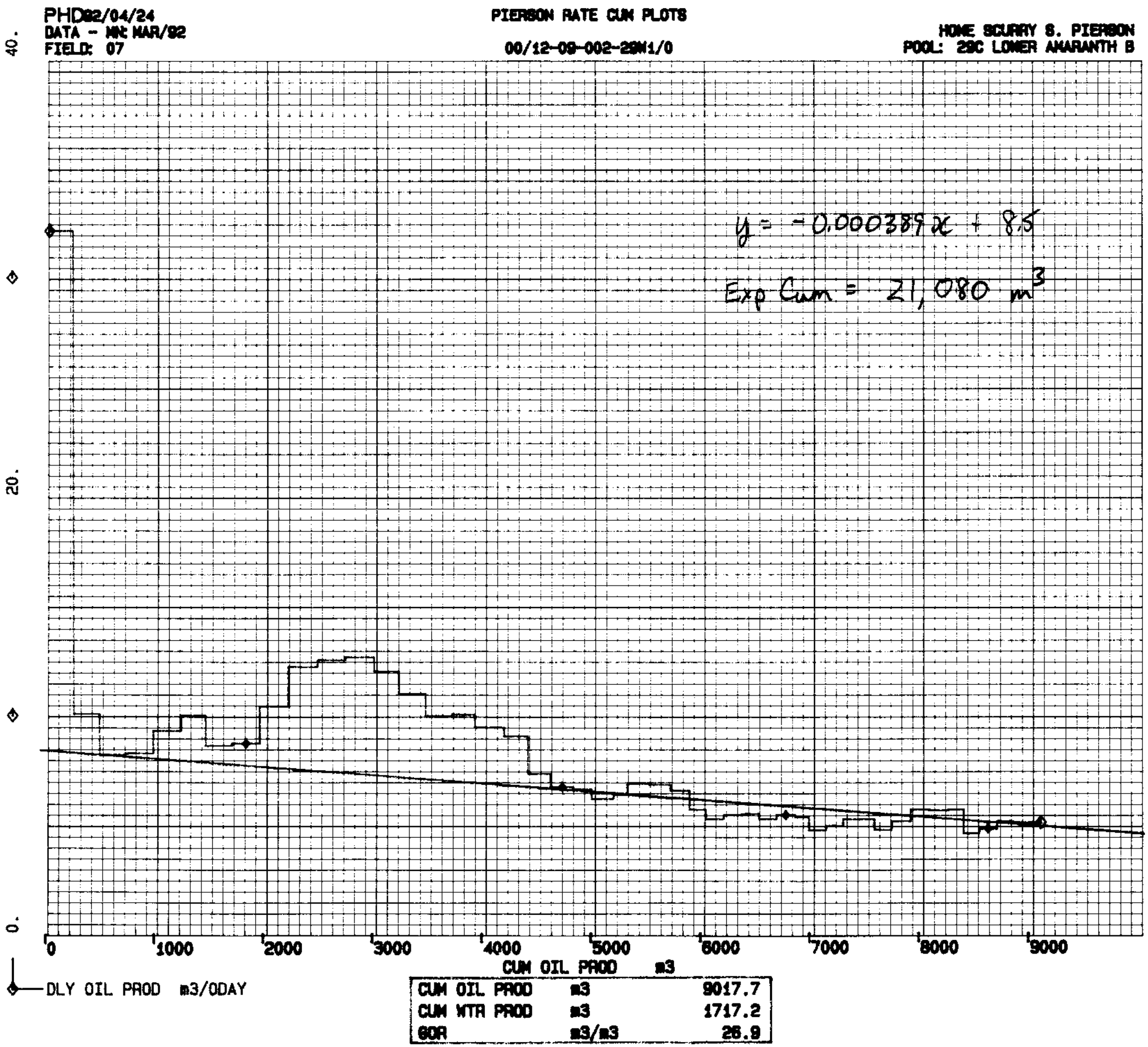
00/08-08-002-29W1/0

HOME SCURRY S PIERSON (MISS)
POOL: 426 MISSION CANYON 3B C



CUM OIL PROD	m3	2400.9
CUM WTR PROD	m3	13708.8
GOR	m3/m3	52.6

(5)
1185 84/02


PHD92/04/24
DATA - MN: MAR/92
FIELD: 07
PIERSON RATE CUM PLOTS
00/12-09-002-29W1/0
HOME SCURRY S. PIERSON
POOL: 29C LOWER AMARANTH B
y = -0.000389x + 8.5
Exp Cum = 21,080 m3
40.
20.
0.
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
CUM OIL PROD m3
DLY OIL PROD m3/ODAY
CUM OIL PROD m3 9017.7
CUM WTR PROD m3 1717.2
GOR m3/m3 26.9

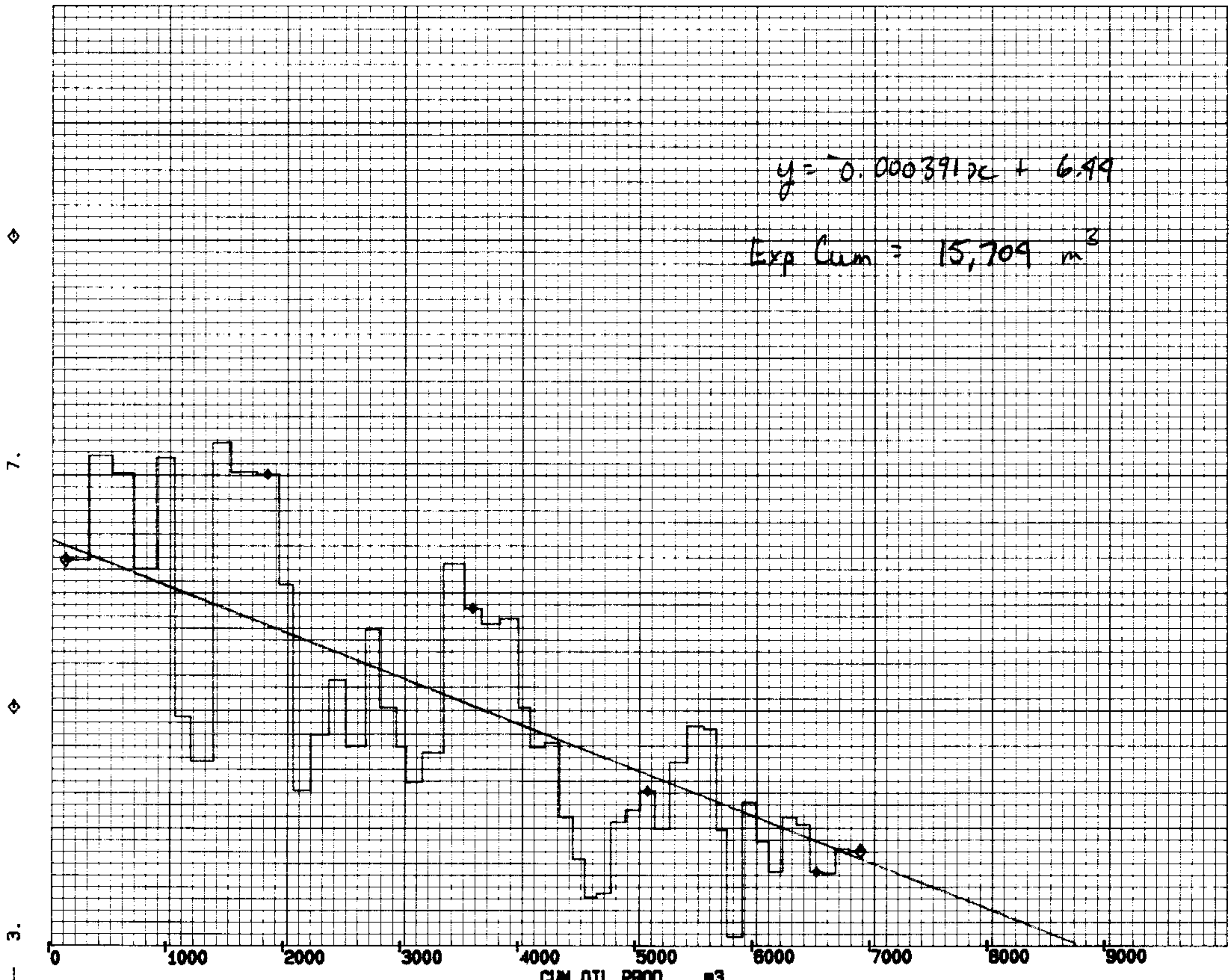
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/14-09-002-29W1/0

HOME SCURRY SOUTH PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	6827.1
CUM WTR PROD	m3	63034.1
GOR	m3/m3	65.2

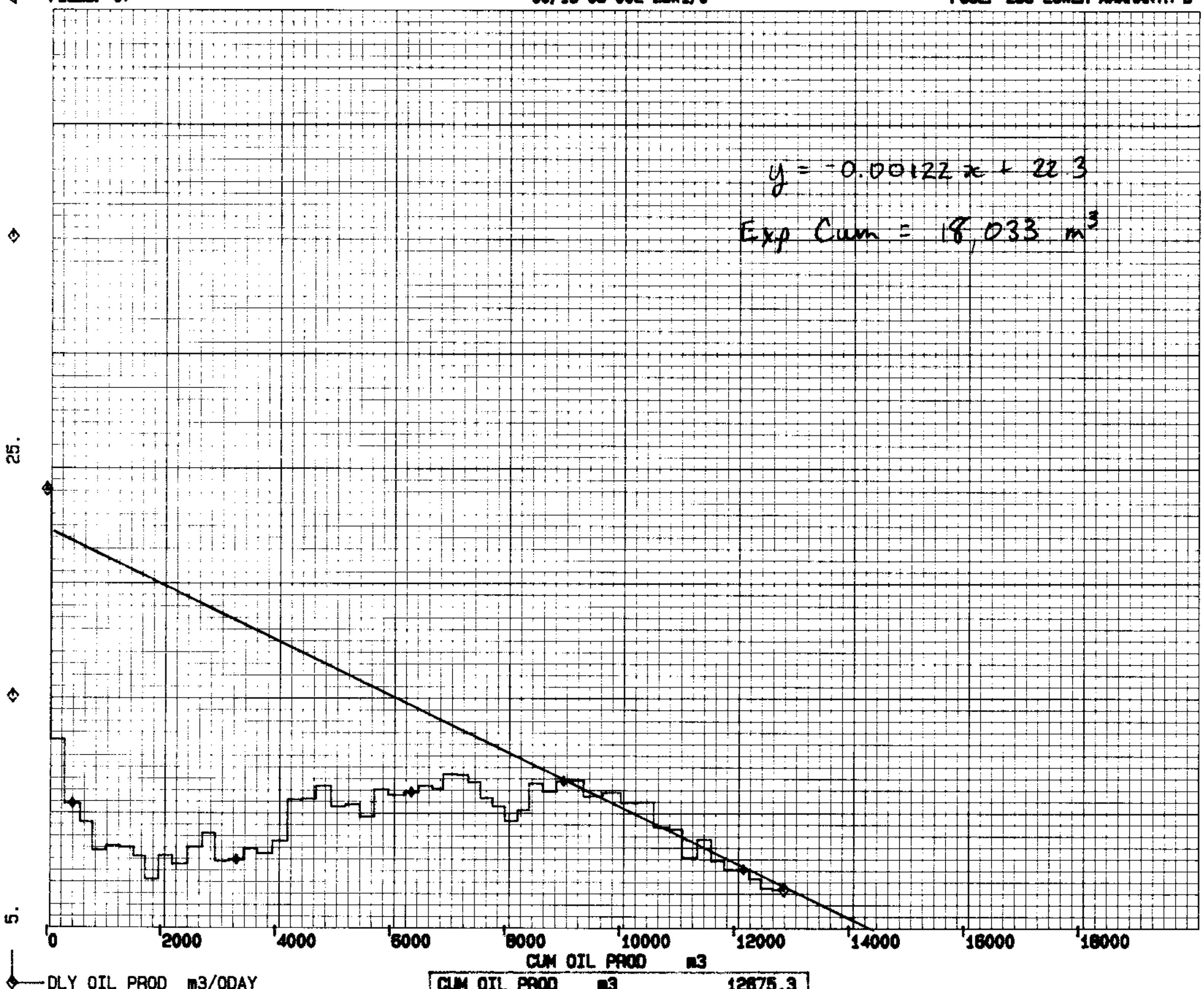
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-09-002-29W1/0

HOME SCURRY 16-9 S.PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	12675.3
CUM WTR PROD	m3	1472.3
GOR	m3/m3	48.1

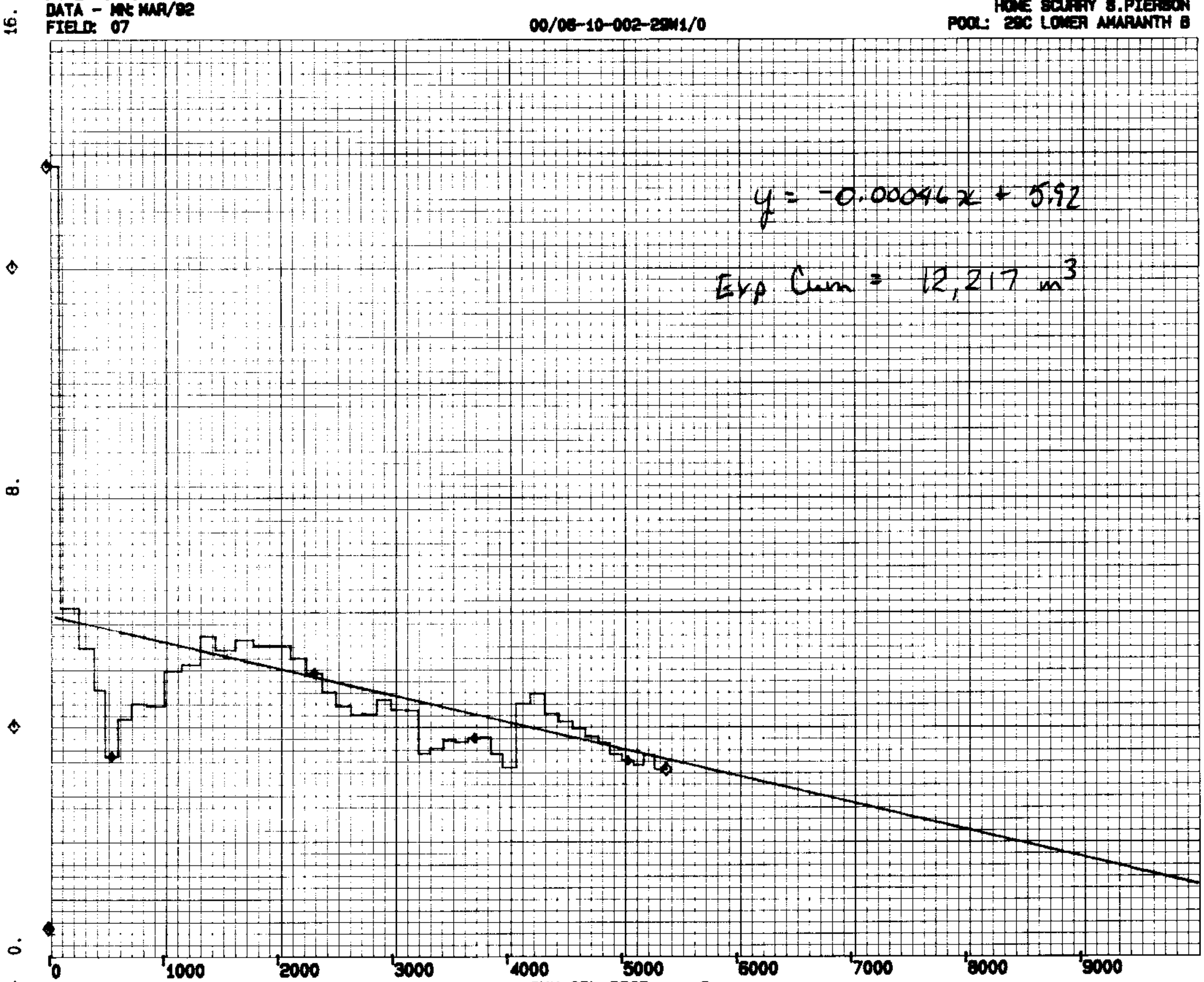
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-10-002-29W1/0

HOME SCURRY S.PIERSON
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	5302.9
CUM WTR PROD	m3	29036.9
GOR	m3/m3	56.3

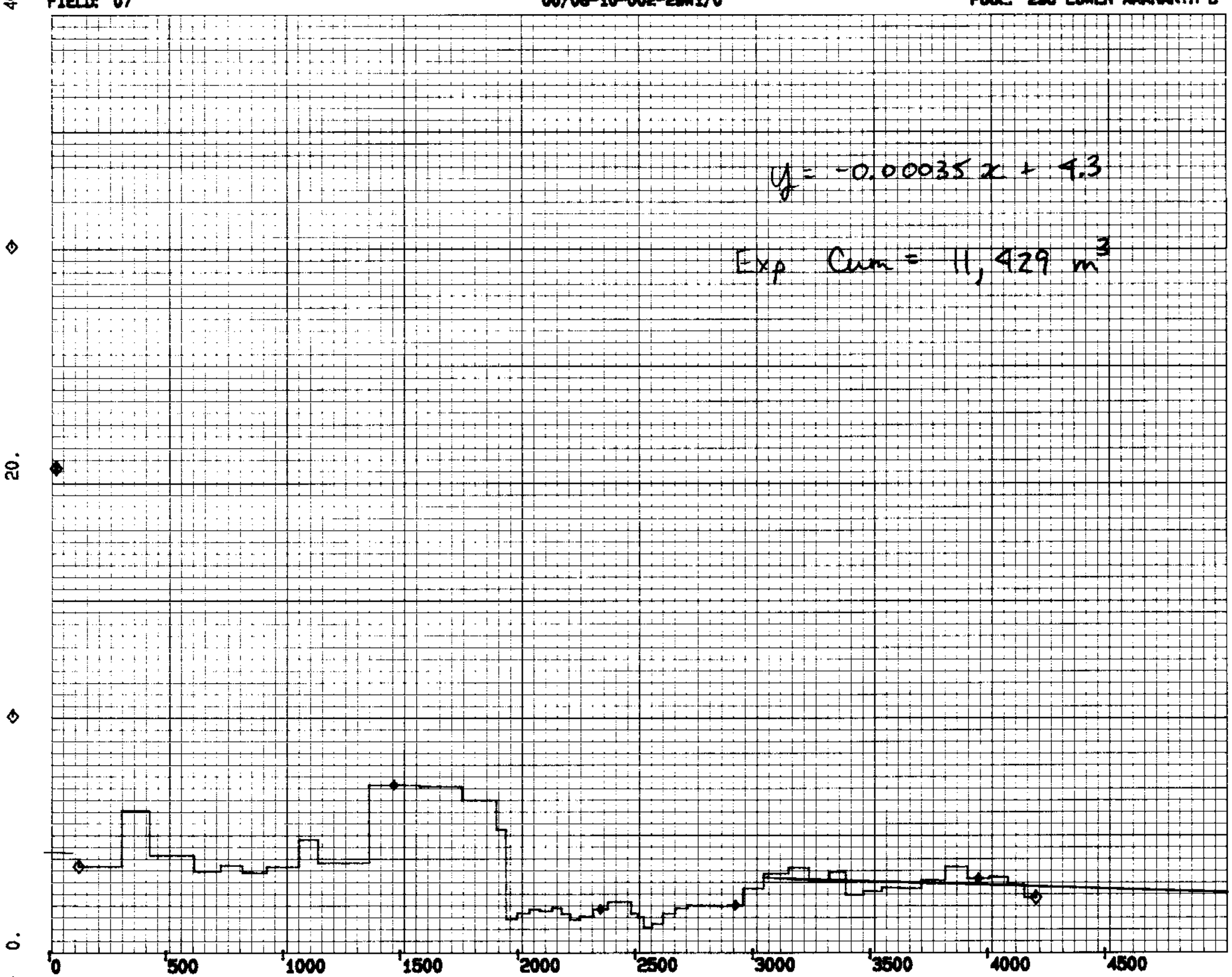
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/08-10-002-29W1/0

HOME SCURRY S PIERSON (AMARANTH)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4162.5
CUM WTR PROD	m3	42055.7
GOR	m3/m3	102.5

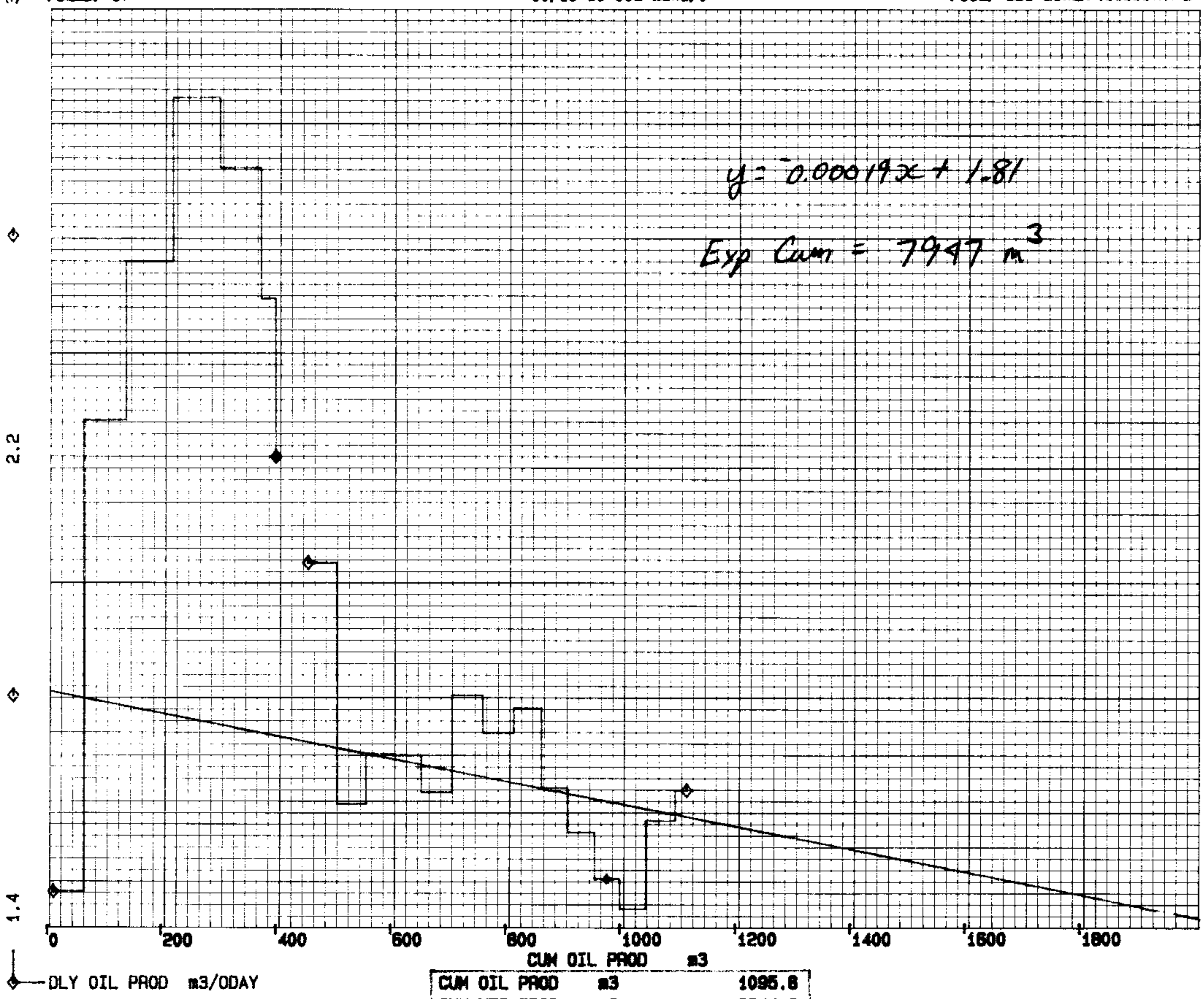
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/10-10-002-29W1/0

HOME SRO S PIERSON PROV 10-10-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1095.8
CUM WTR PROD	m3	6344.2
GOR	m3/m3	98.8

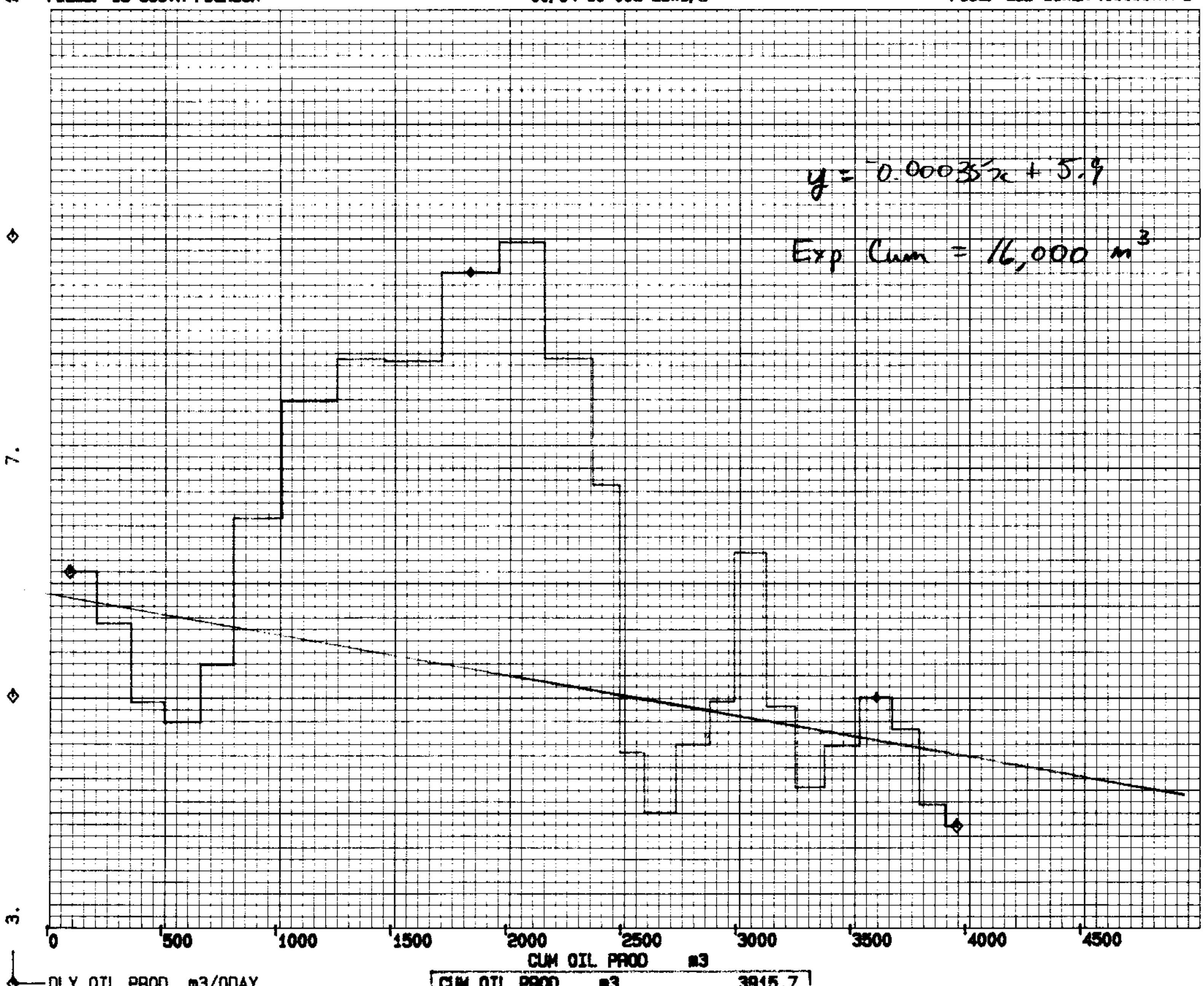
(5)
1185 84/02

PHD92/04/24
DATA - MN MAR/92
FIELD: 12 SOUTH PIERSON

PIERSON RATE CUM PLOTS

00/14-10-002-29W1/2

POOL: 298 LOWER AMARANTH B



CUM OIL PROD	m3	3915.7
CUM WTR PROD	m3	7427.0
GOR	m3/m3	65.8

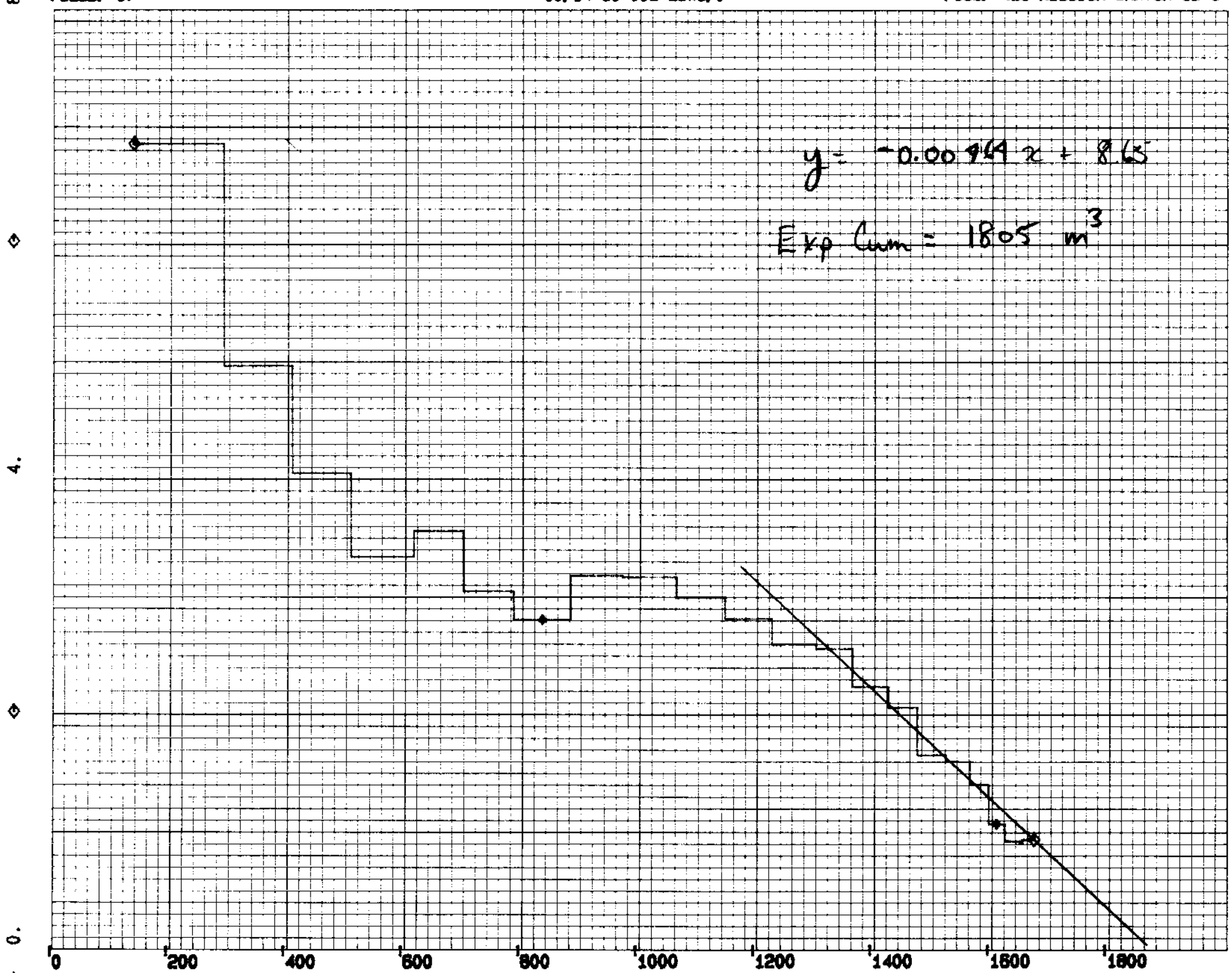
(5)
1185 84/02

PHD92/04/24
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/14-10-002-29W1/0

HOME SCURRY S. PIERSON
POOL: 42C MISSION CANYON 3B C



CUM OIL PROD m3

DLY OIL PROD m3/ODAY

CUM OIL PROD	m3	1681.5
CUM WTR PROD	m3	378.8
GOR	m3/m3	92.6

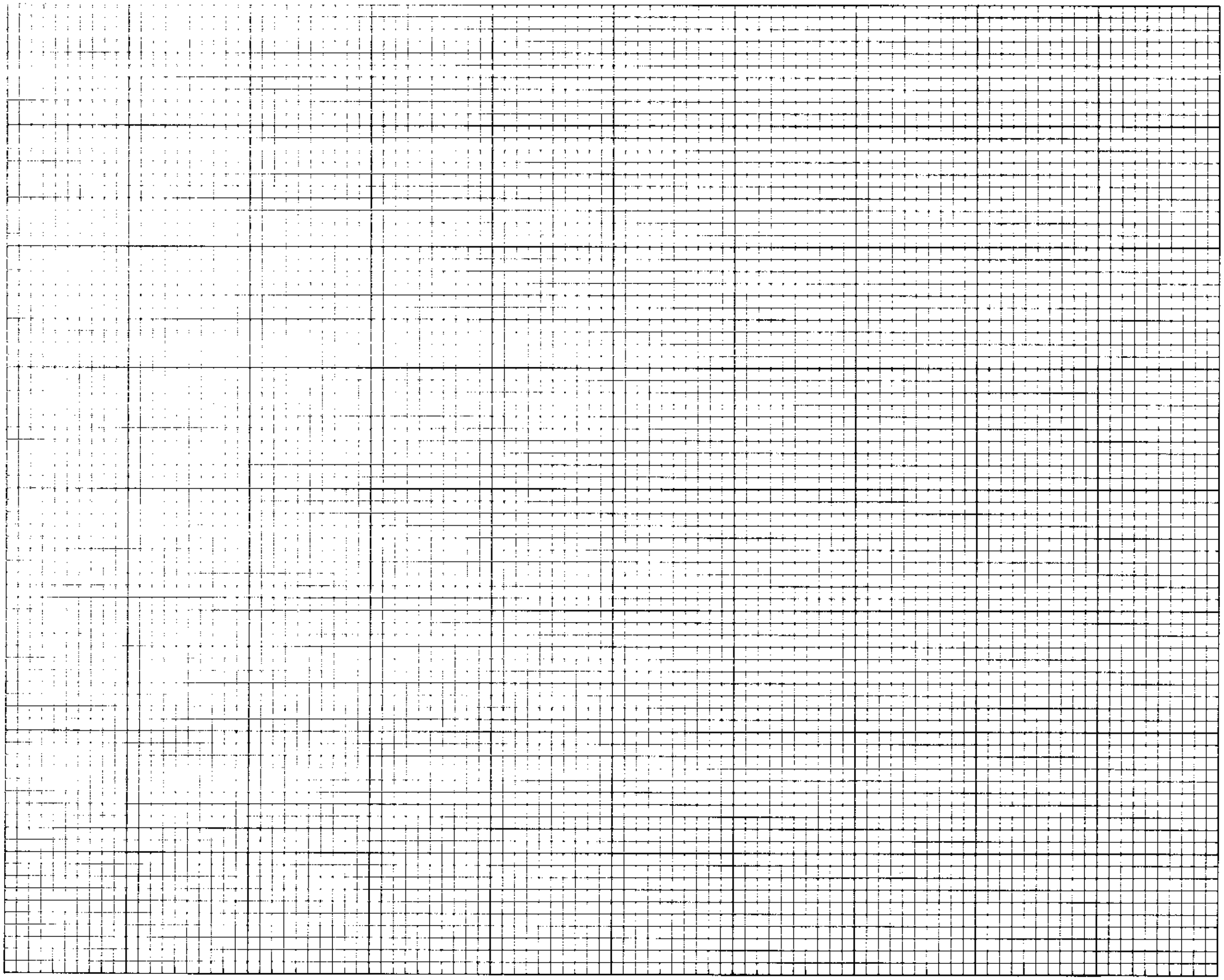
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-10-002-29W1/0

HOME SCURRY S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH B



DLY OIL PROD m3/ODAY No Data

CUM OIL PROD m3 No Data

CUM OIL PROD	m3	0.0
CUM WTR PROD	m3	251.1
GOR	m3/m3	0.0

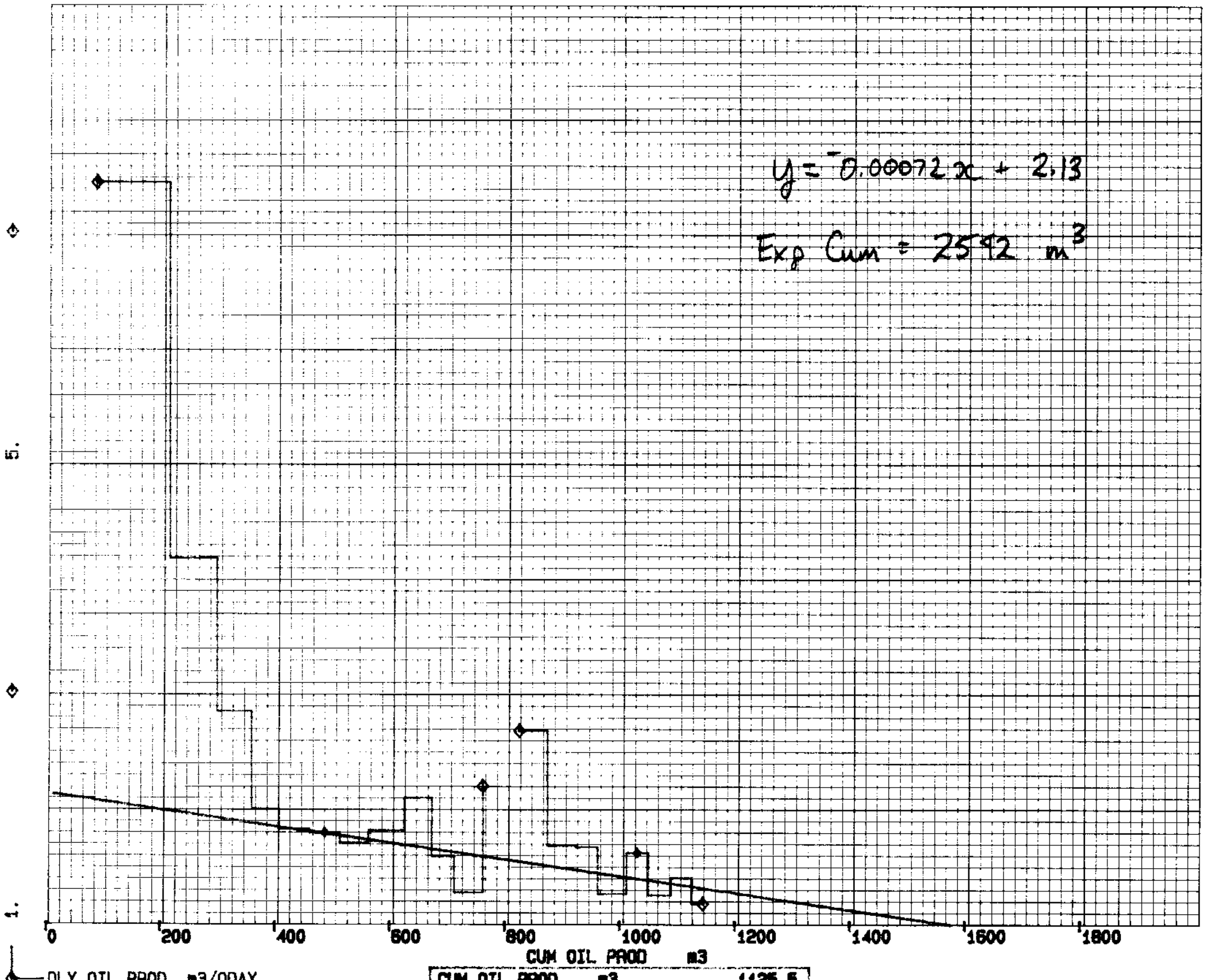
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-11-002-29W1/0

HOME SCURRY S PIERSON PROV 6-11-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1125.5
CUM WTR PROD	m3	387.2
GOR	m3/m3	95.5

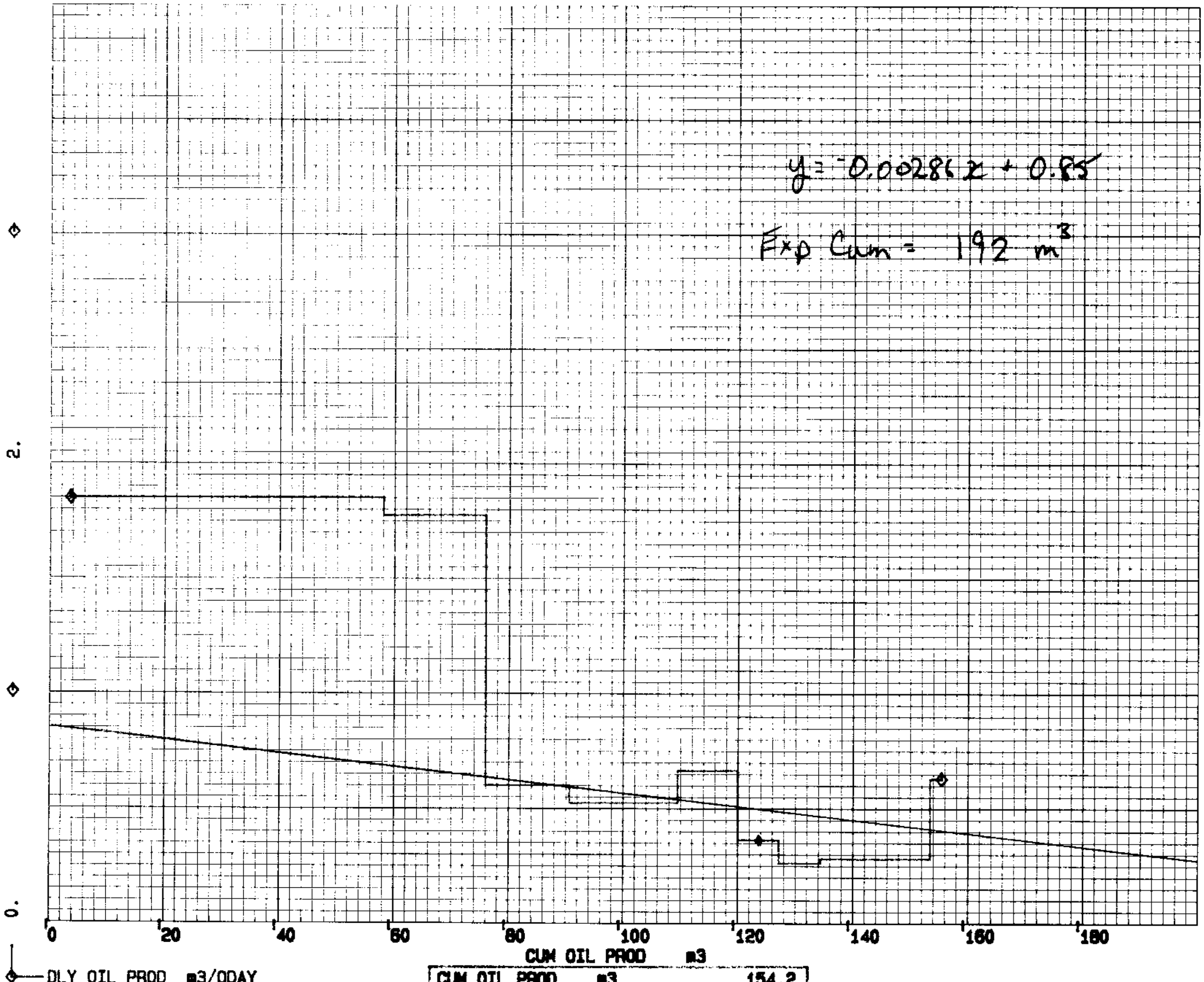
(5)
1185 84/02

PHD92/04/24
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/14-11-002-29W1/0

HOME SCURRY PIERSON PROV 14-11-2-29
POOL: 29*



CUM OIL PROD	m3	154.2
CUM WTR PROD	m3	348.3
GOR	m3/m3	36.6

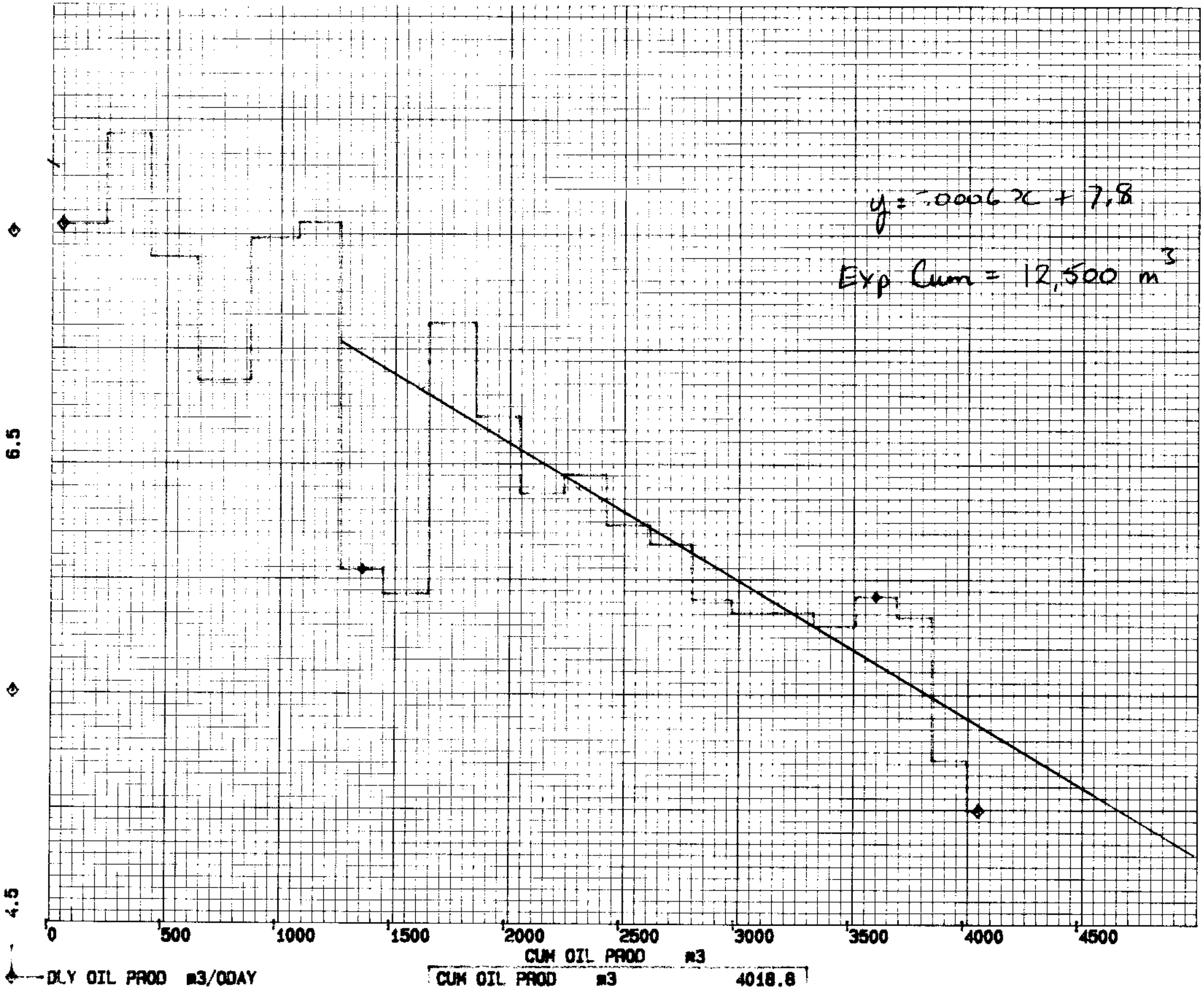
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

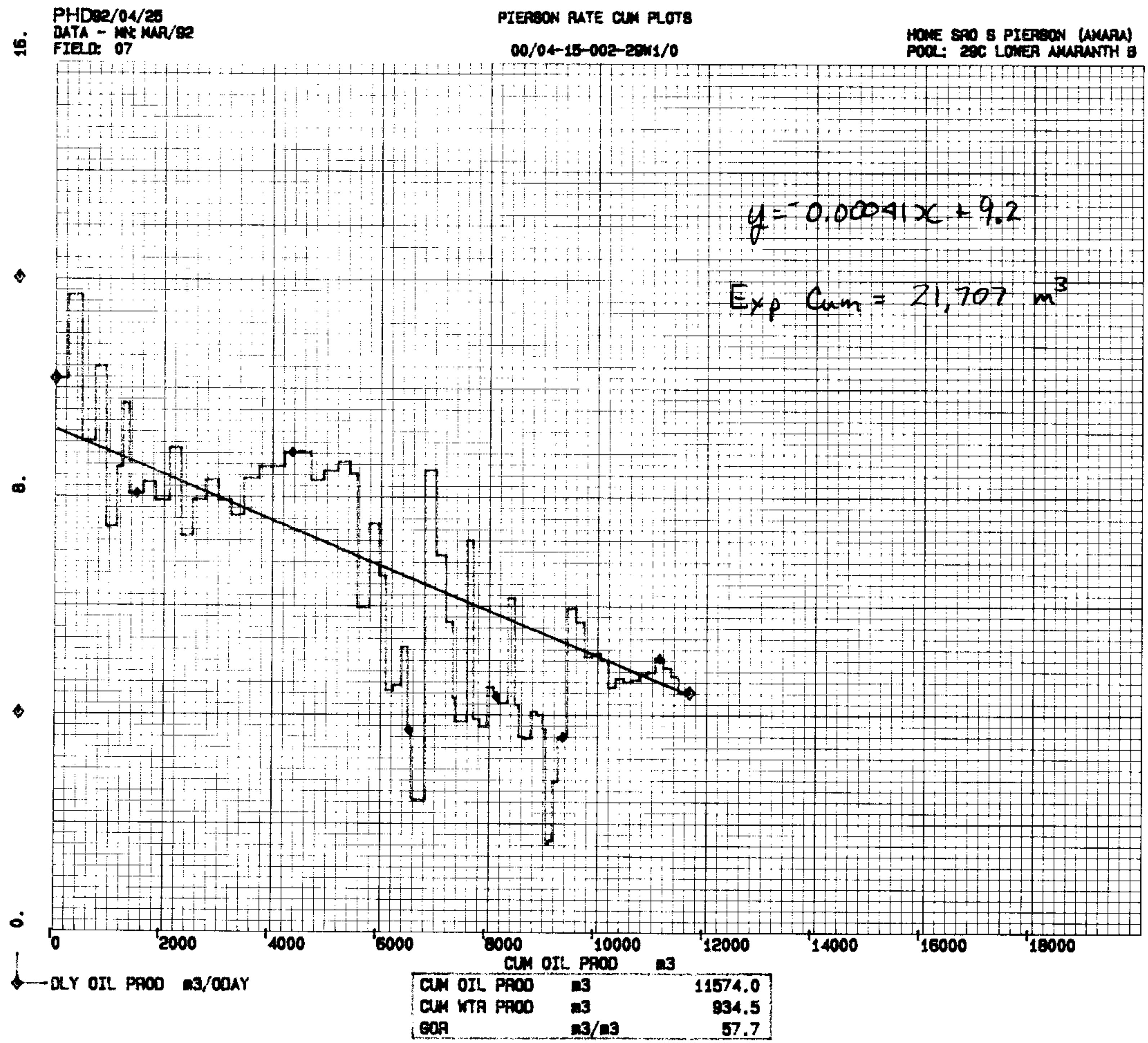
00/04-14-002-29W1/0

HOME SCURRY S PIERSON PROV 4-14-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4018.8
CUM WTR PROD	m3	384.4
GOR	m3/m3	46.6

(5)
1185 84/02


PHD92/04/25
DATA - MN: MAR/92
FIELD: 07
PIERSON RATE CUM PLOTS
00/04-15-002-29W1/0
HOME SRO S PIERSON (AMARA)
POOL: 29C LOWER AMARANTH B
y = -0.00041x + 9.2
Exp Cum = 21,707 m3
16.
8.
0.
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
CUM OIL PROD m3
DLY OIL PROD m3/ODAY
CUM OIL PROD m3 11574.0
CUM WTR PROD m3 934.5
GOR m3/m3 57.7

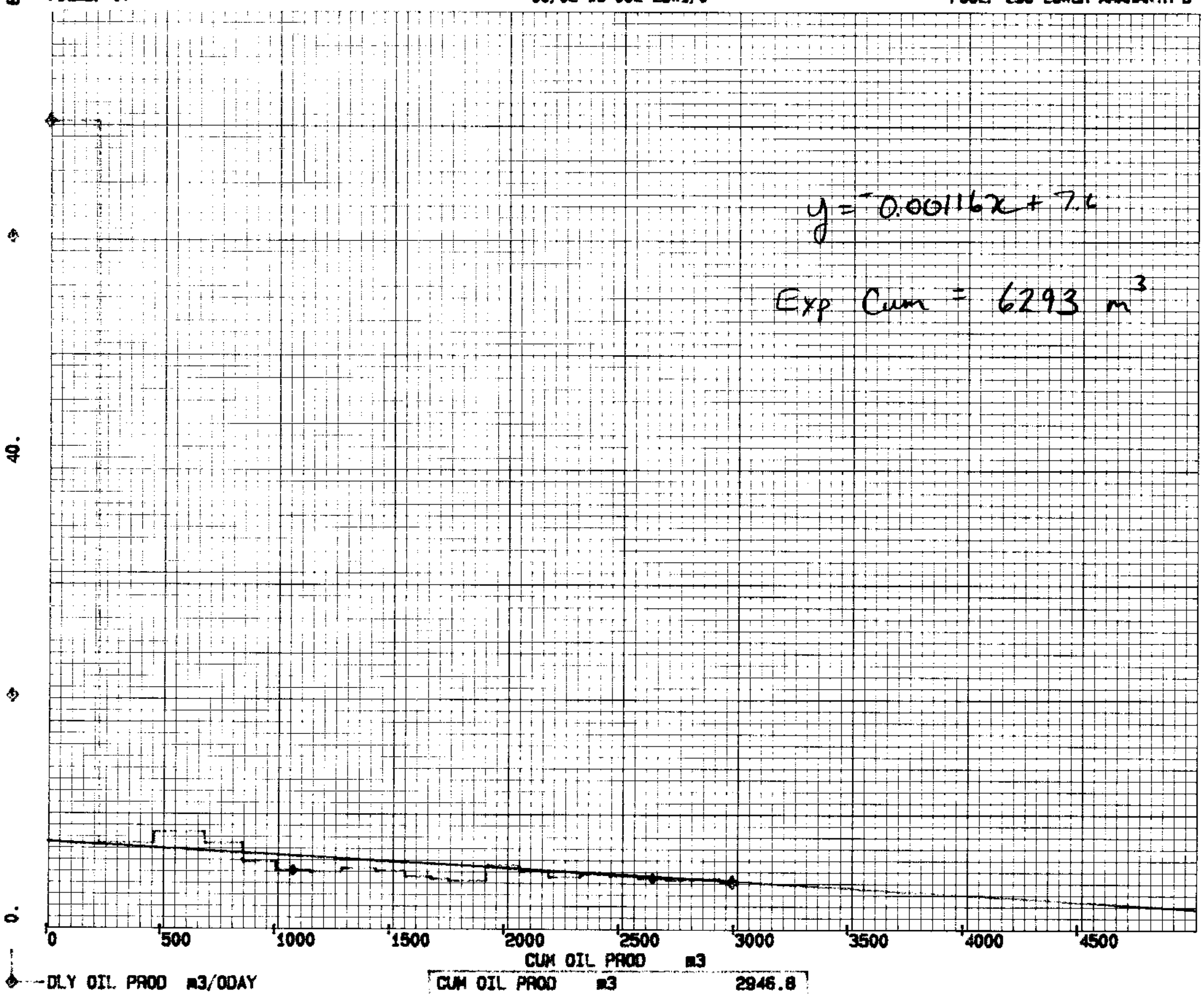
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/02-16-002-29W1/0

HOME SCURRY S PIERSON PROV 2-16-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	2946.8
CUM WTR PROD	m3	106.7
GOR	m3/m3	49.6

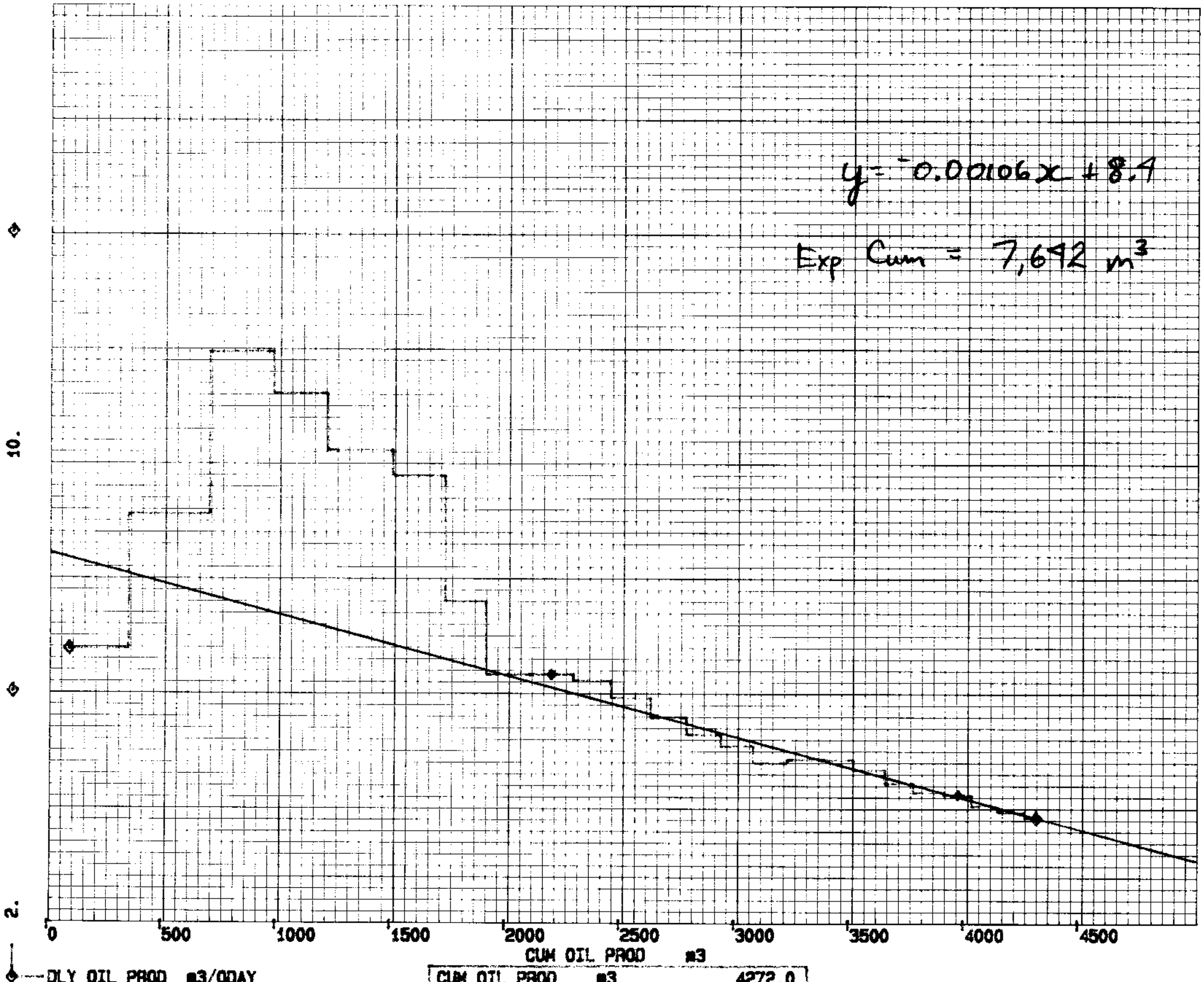
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/04-16-002-29W1/0

HOME SRO S PIERSON PROV 4-16-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	4272.0
CUM WTR PROD	m3	121.6
GOR	m3/m3	56.2

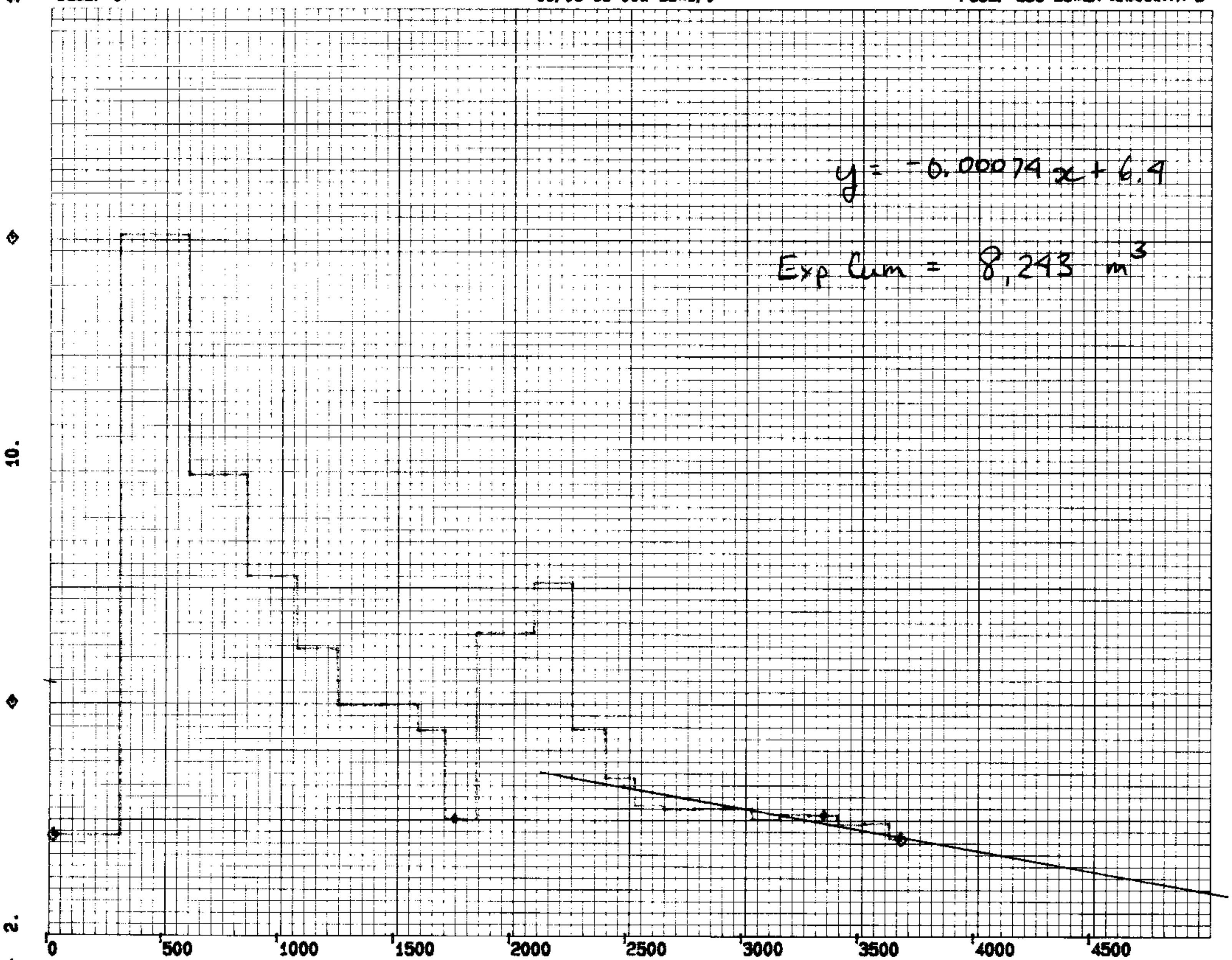
(5)
1185 84/02

PHD92/04/25
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-18-002-29W1/0

HOME SRO S PIERSON PROV 6-18-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	3642.0
CUM WTR PROD	m3	324.5
GOR	m3/m3	31.9

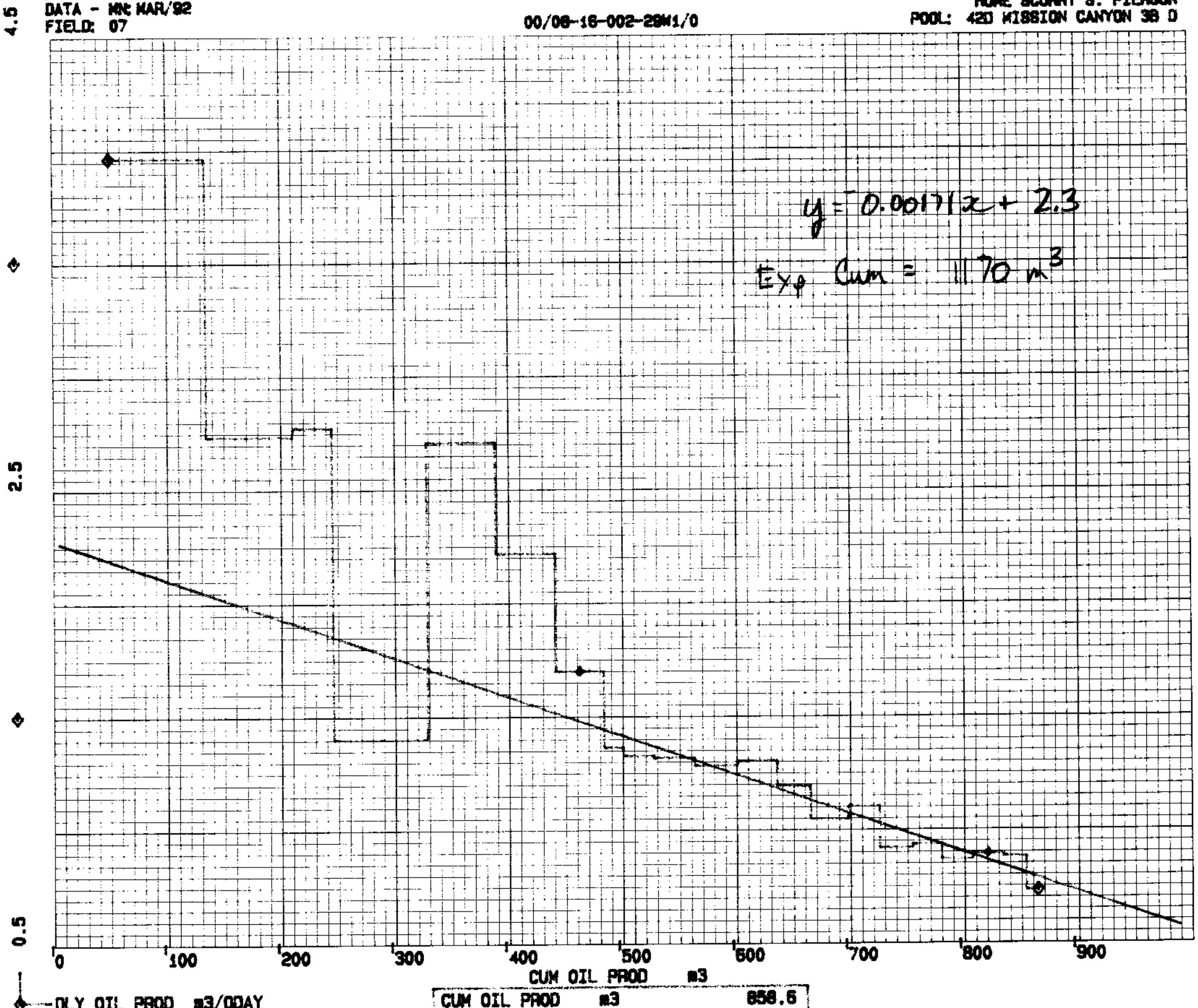
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

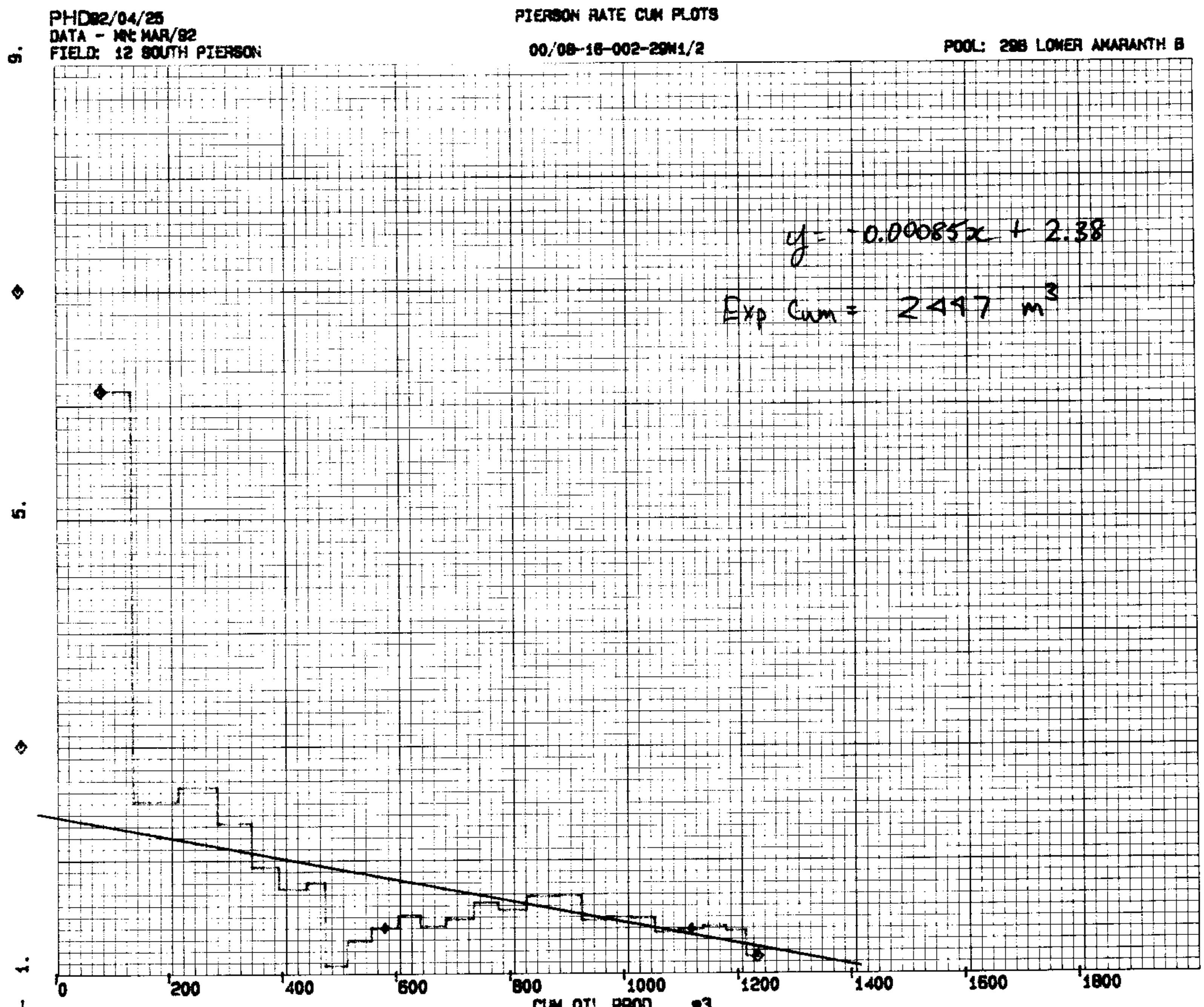
00/08-16-002-29W1/0

HOME SCURRY S. PIERSON
POOL: 420 MISSION CANYON 3B D



CUM OIL PROD	m3	858.6
CUM WTR PROD	m3	31.1
GOR	m3/m3	74.6

(5)
1185 84/02



CUM OIL PROD	m3	1214.7
CUM WTR PROD	m3	164.0
GOR	m3/m3	89.1

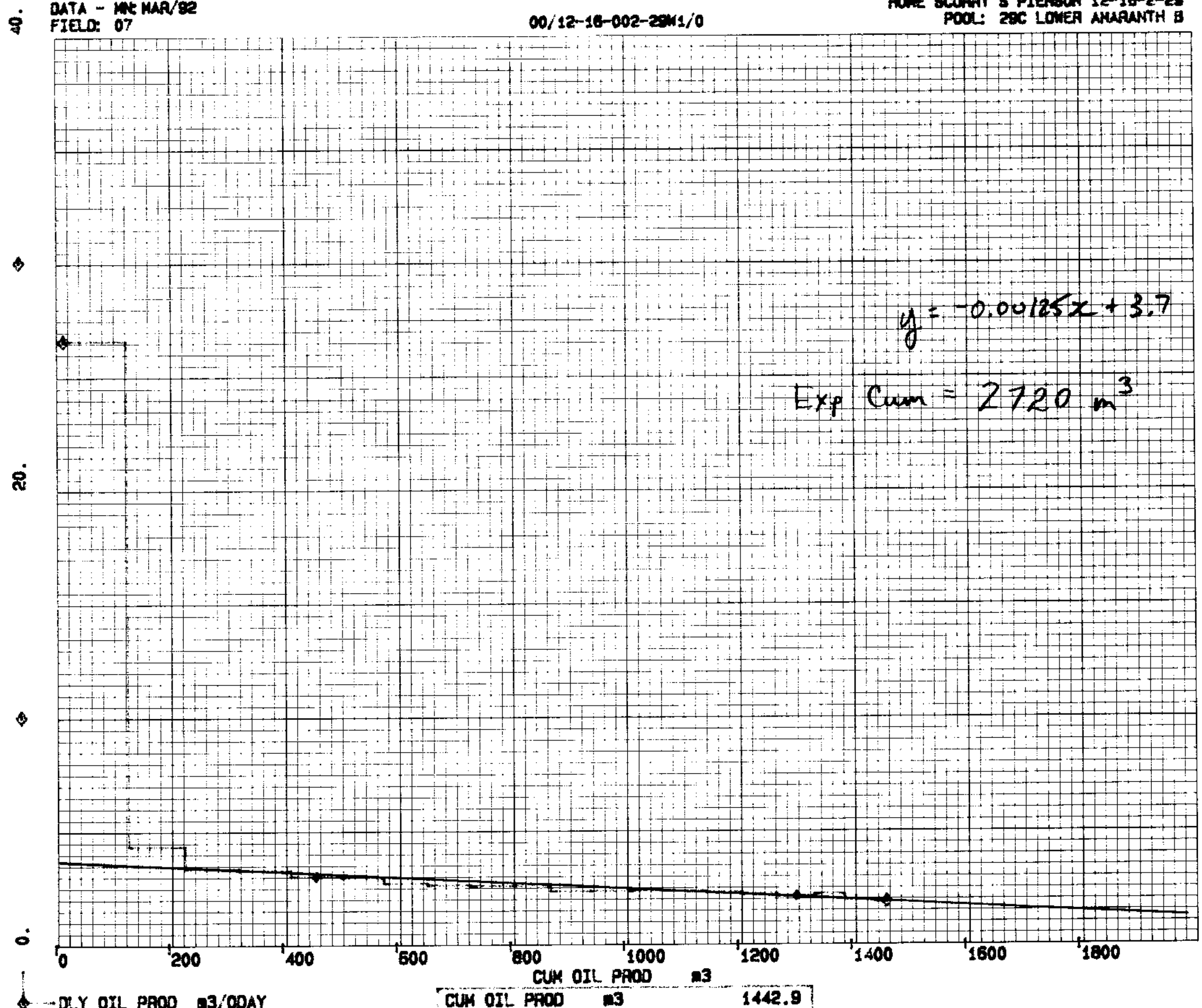
(5)
1185 84/02

PHD92/04/25
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/12-16-002-29W1/0

HOME SCURRY S PIERSON 12-16-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1442.9
CUM WTR PROD	m3	24.5
GOR	m3/m3	44.6

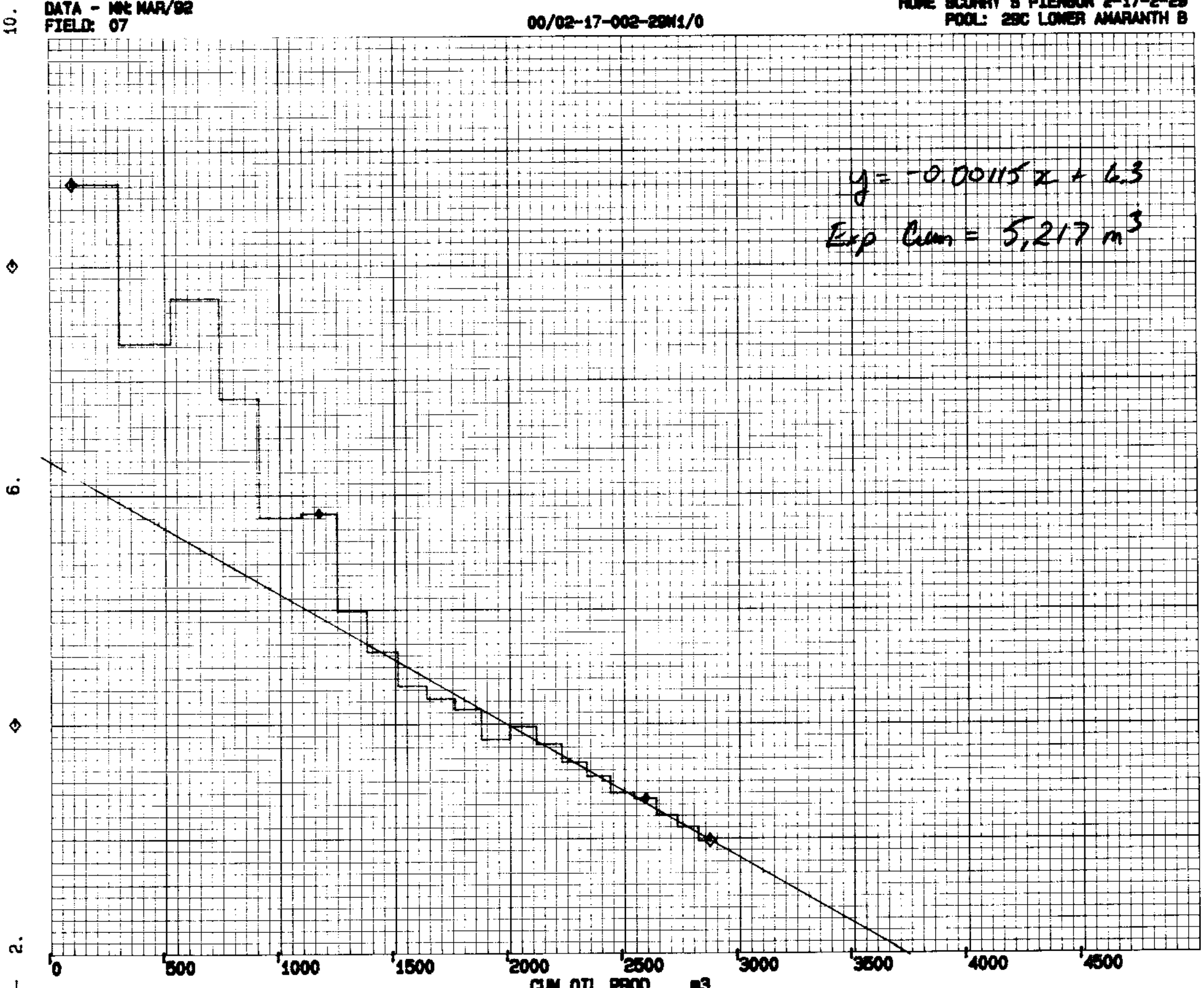
(5)
1185 84/02

PHD92/04/25
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

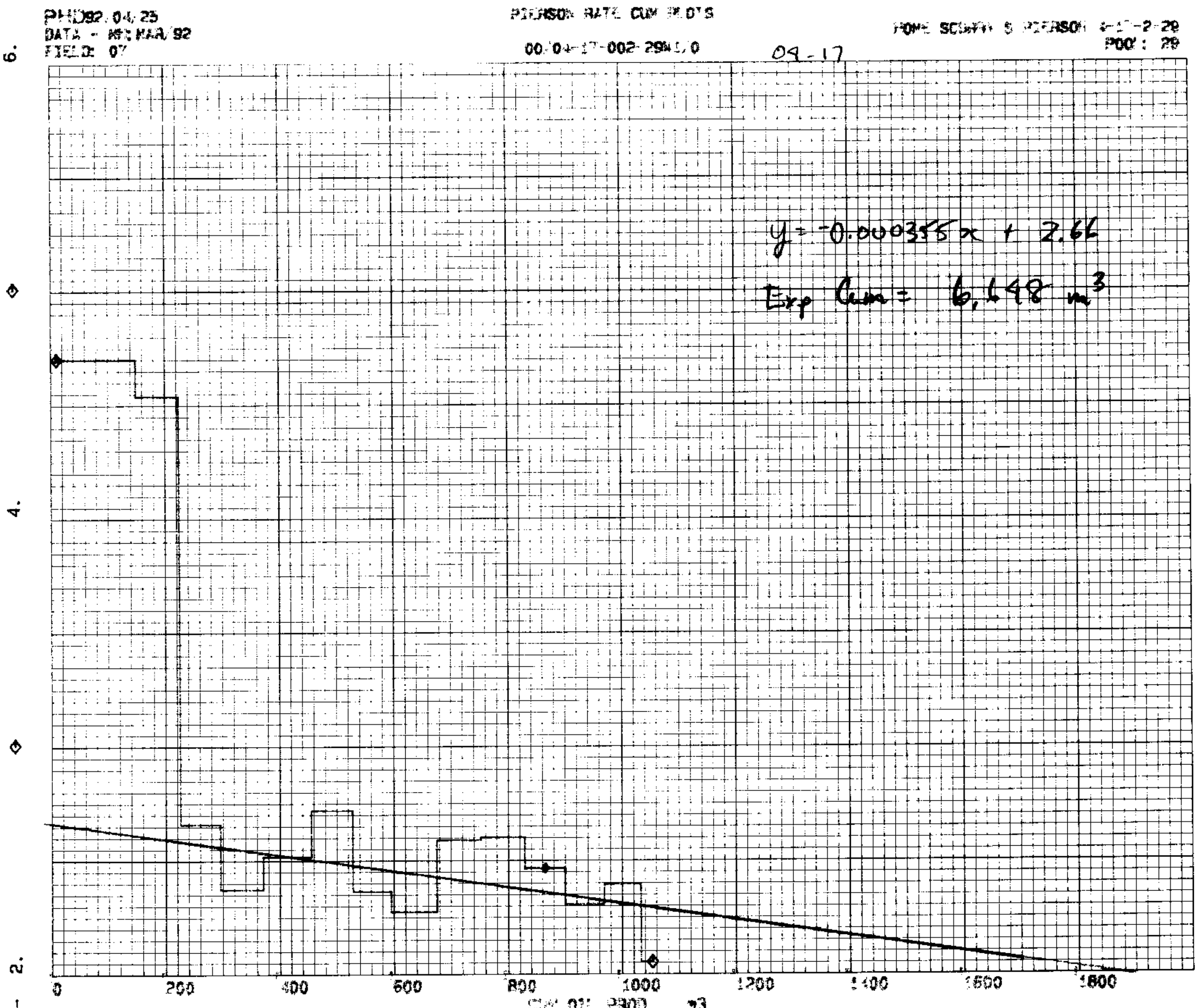
00/02-17-002-29W1/0

HOME SCURRY S PIERSON 2-17-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	2838.9
CUM WTR PROD	m3	43.3
GOR	m3/m3	57.7

(5)
1185 84/02



CUM OIL PROD	m3	1040.0
CUM WTR PROD	m3	277.2
GOR	m3/m3	86.9

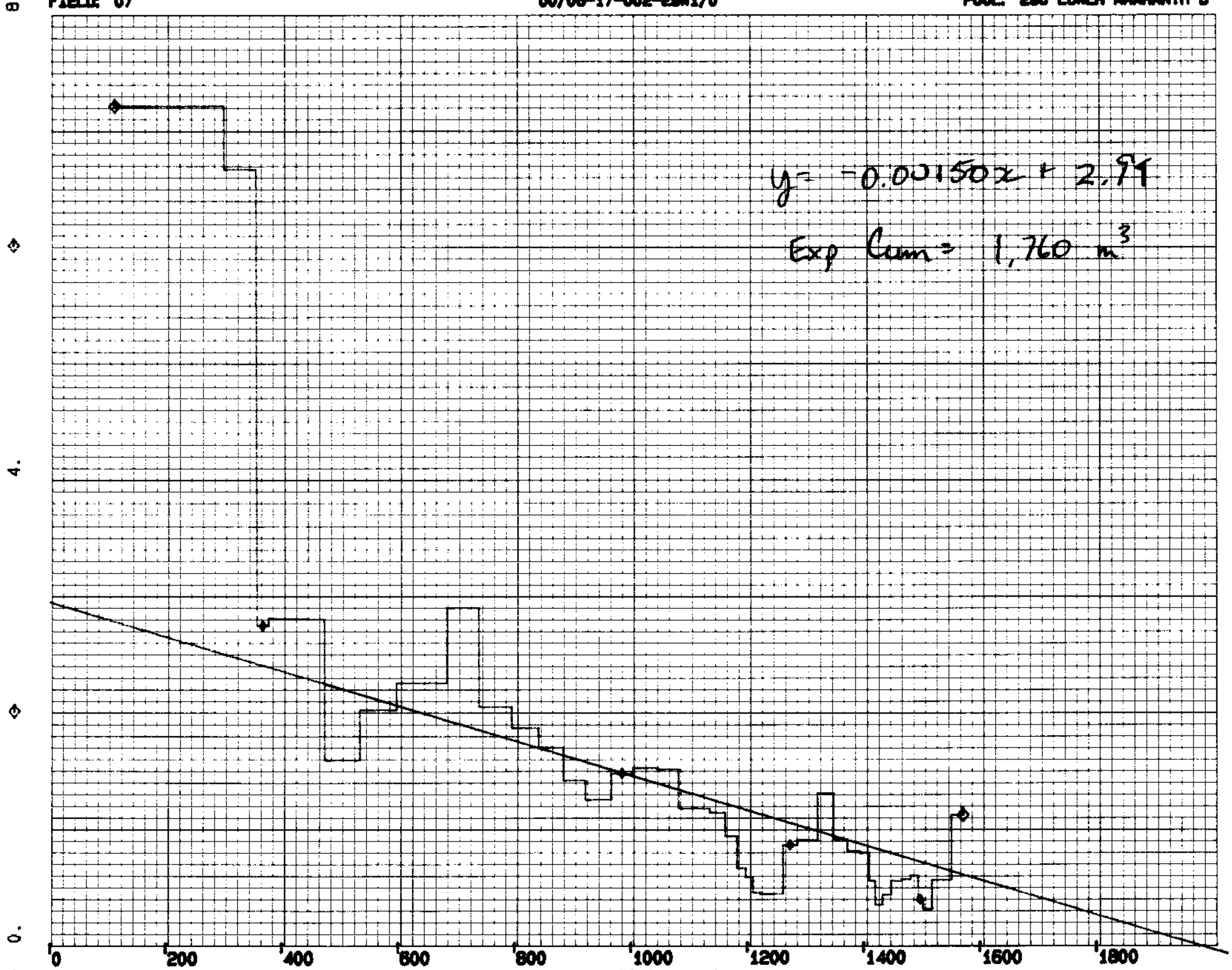
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-17-002-29W1/0

HOME SCURRY S.PIERSON(AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1562.7
CUM WTR PROD	m3	9849.1
GOR	m3/m3	138.2

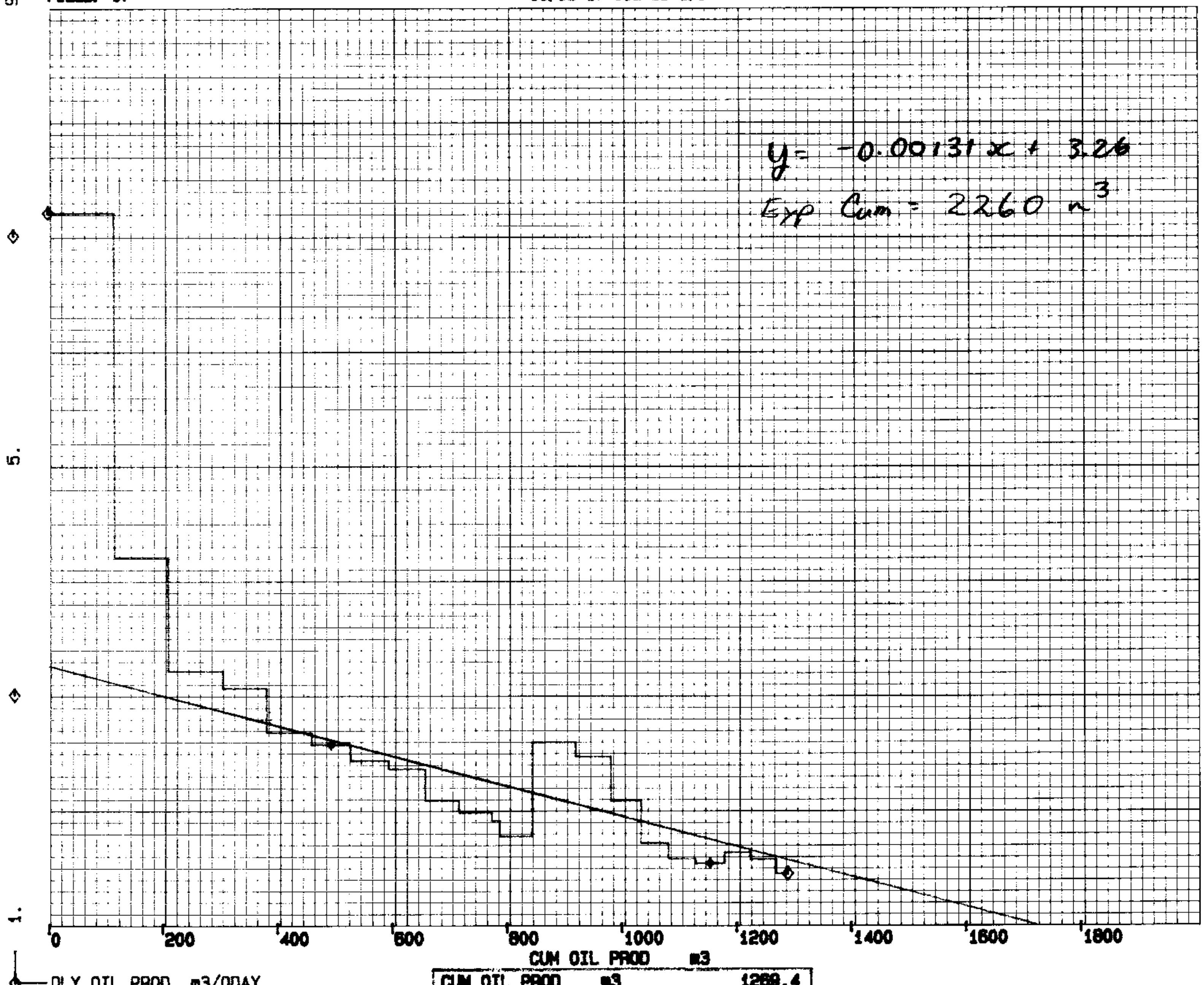
(5)
1185 84/02

PHD92/04/25
DATA - MN MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

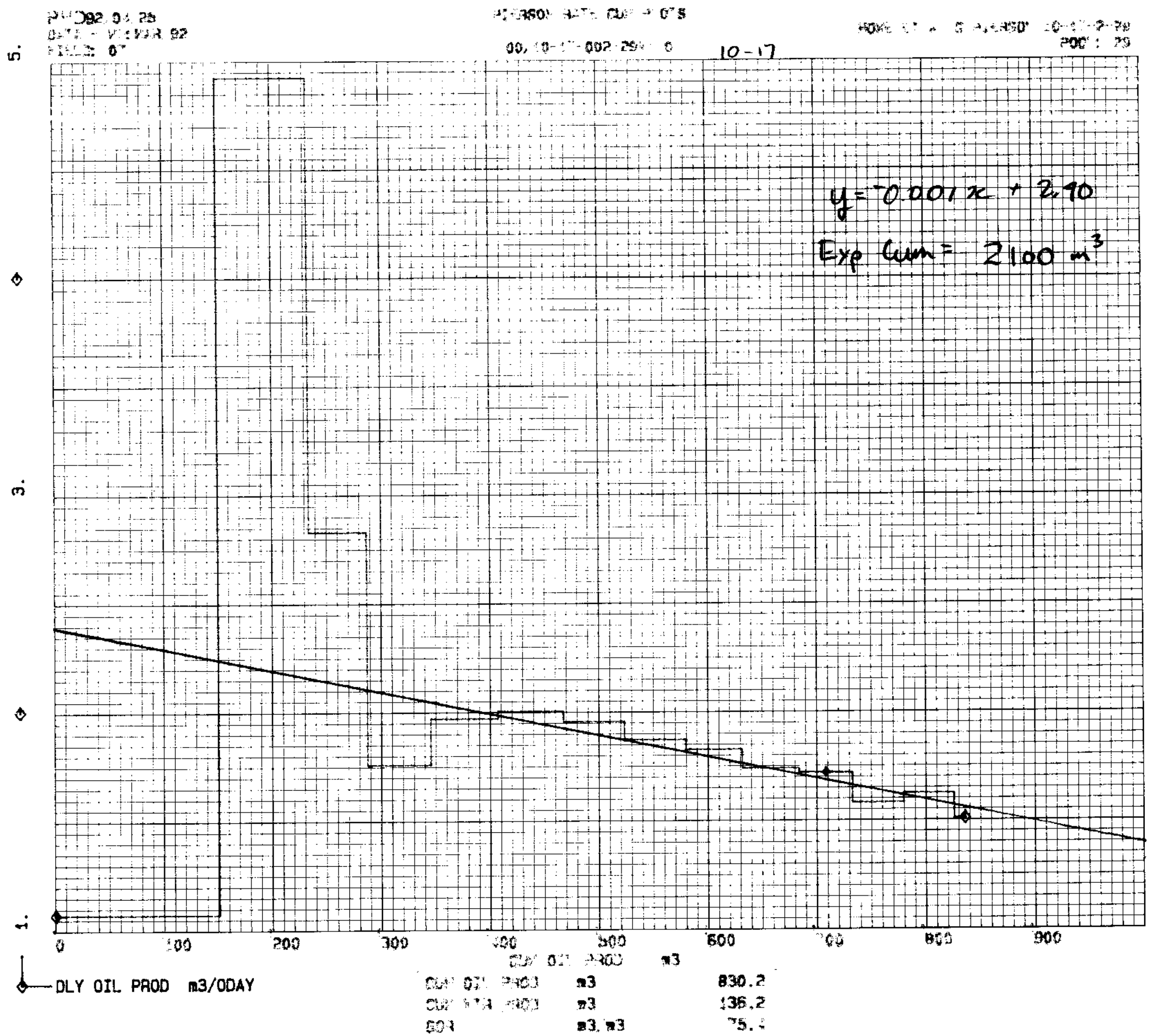
00/08-17-002-29W1/0

HOME SCURRY S PIERSON 8-17-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1269.4
CUM WTR PROD	m3	87.3
GOR	m3/m3	67.6

(5)
1185 84/02



10-17
y = -0.001x + 2.90
Exp Cum = 2100 m3
0
100
200
300
400
500
600
700
800
900
1.
3.
5.
DLY OIL PROD m3/ODAY
CUM OIL PROD m3
CUM OIL PROD m3 830.2
CUM WTR PROD m3 136.2
GOR m3/m3 75.4

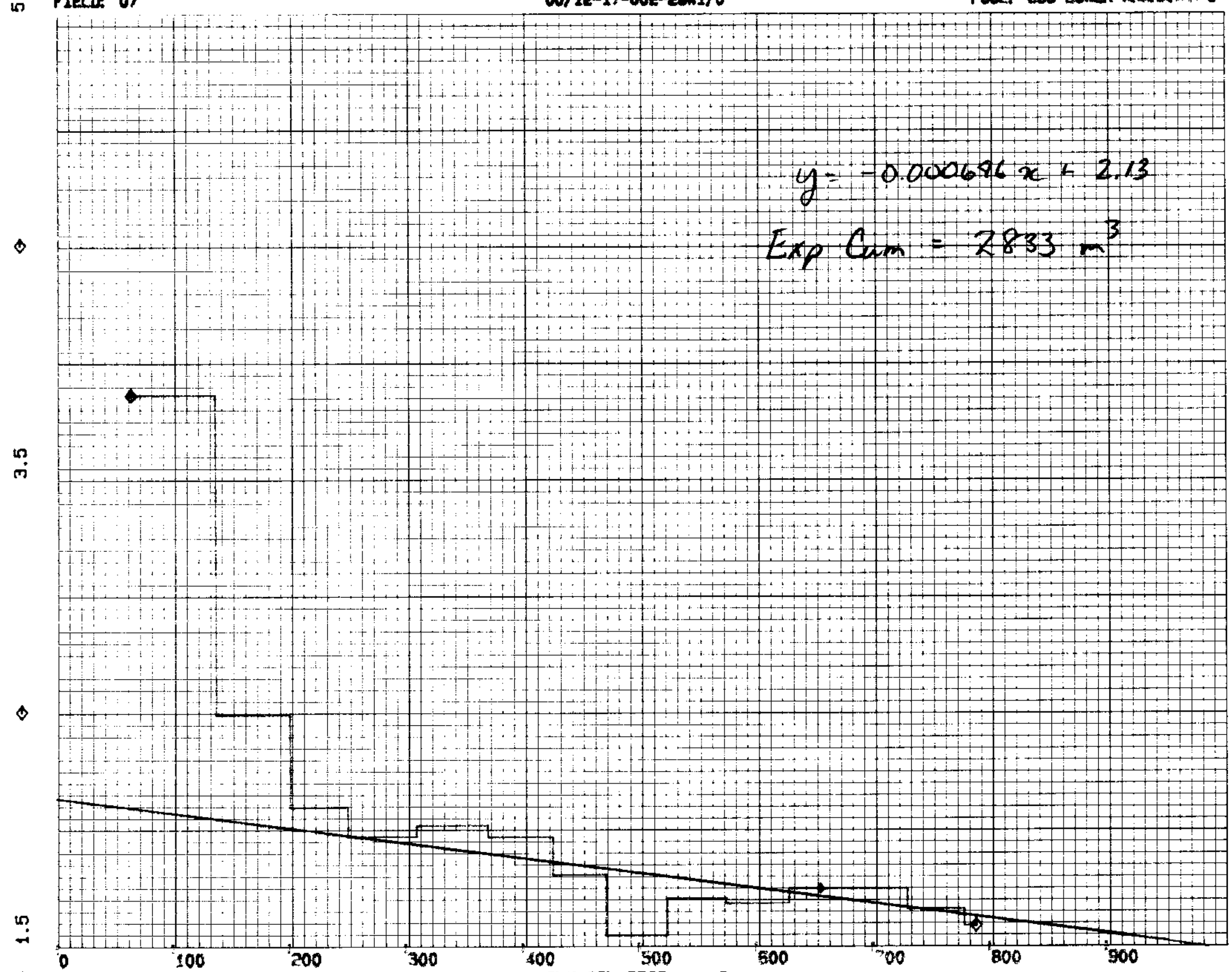
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

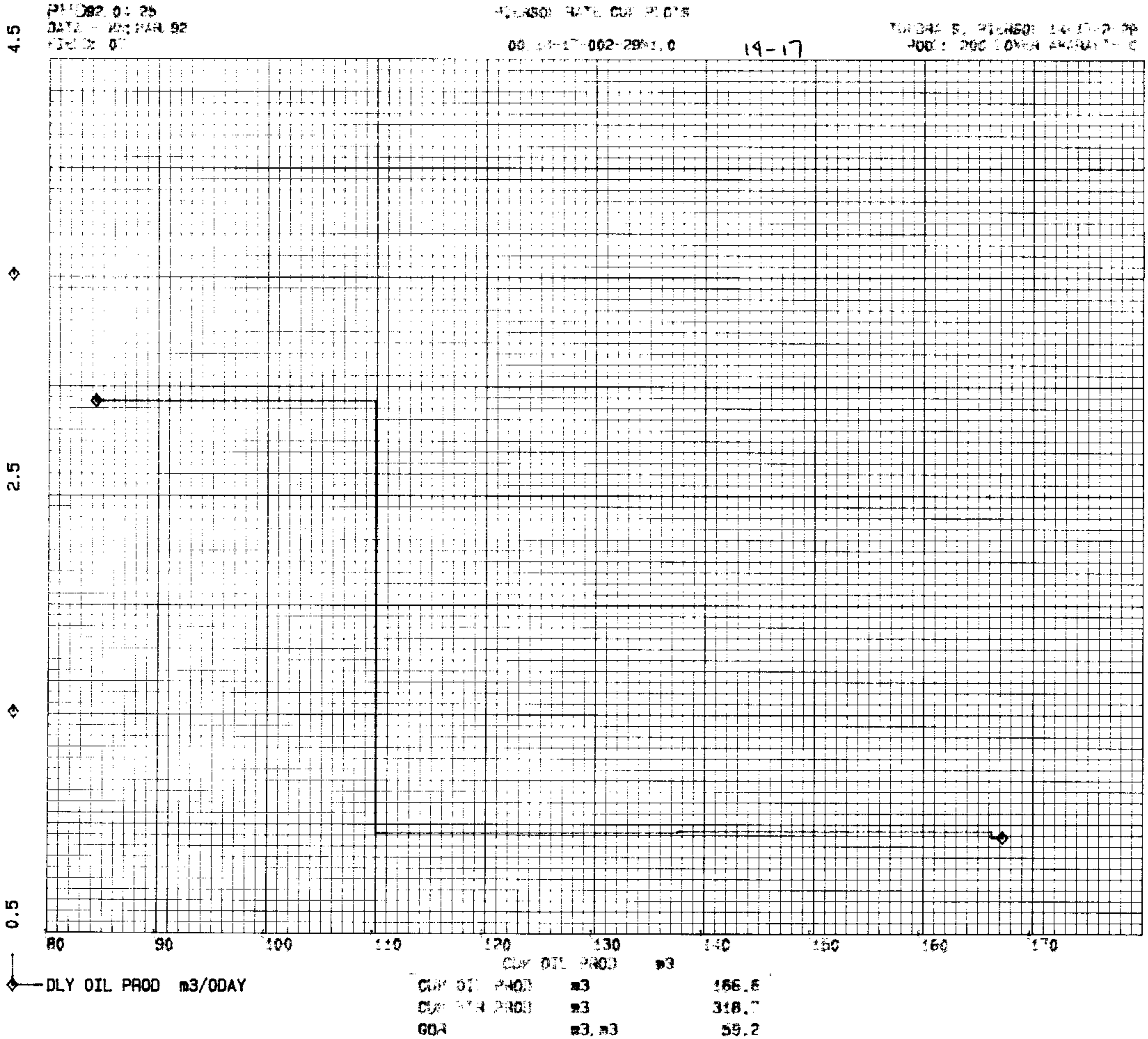
00/12-17-002-29W1/0

HOME SCURRY S PIERSON 12-17-2-29
POOL: 29C LOWER AMARANTH C



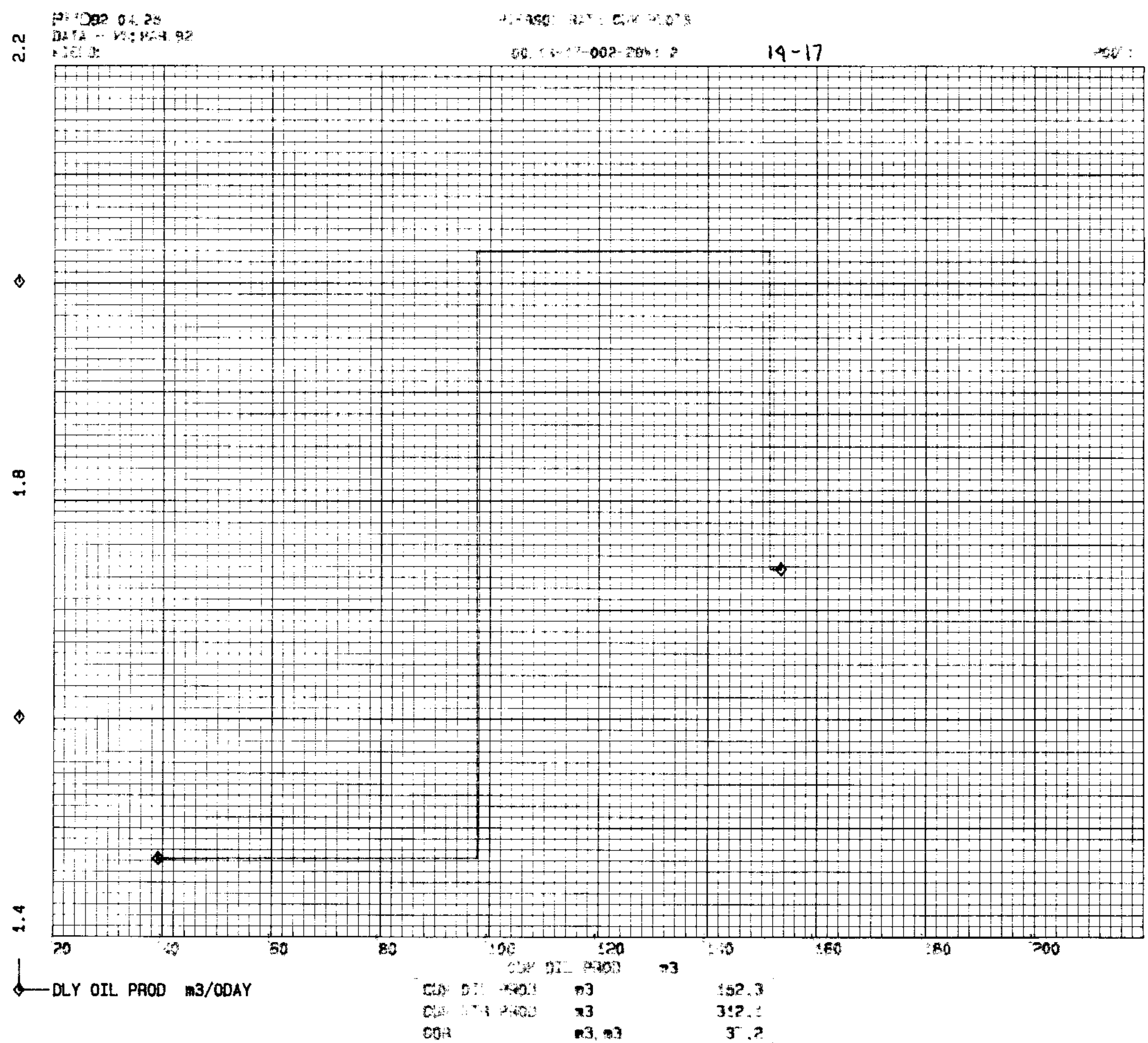
CUM OIL PROD	m3	779.0
CUM WTR PROD	m3	237.8
GOR	m3/m3	67.6

(5)
1185 84/02



14-17
4.5
2.5
0.5
80
90
100
110
120
130
140
150
160
170
CUM OIL PROD m3
DLY OIL PROD m3/ODAY
CUM OIL PROD m3 166.6
CUM WTR PROD m3 318.
GOR m3/m3 59.2

+ (5)
1185 84/02

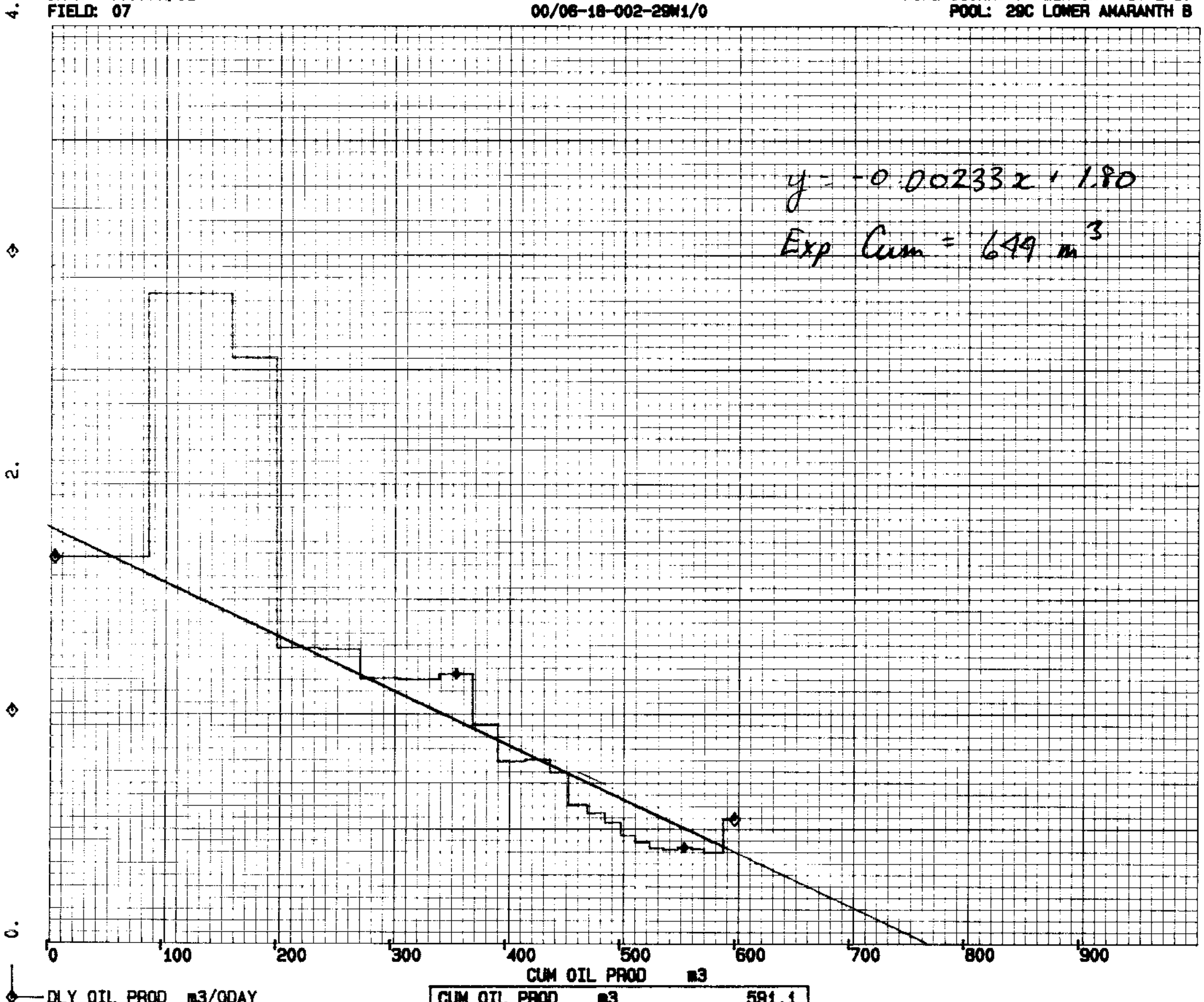

19-17
DLY OIL PROD m3/ODAY
CUM OIL PROD m3
CUM OIL PROD m3 152.3
CUM WTR PROD m3 312.1
GOR m3/m3
2.2
1.8
1.4
20
40
60
80
100
120
140
160
180
200
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-18-002-29W1/0

HOME SCURRY S PIERSON 6-18-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	591.1
CUM WTR PROD	m3	635.2
GOR	m3/m3	74.1

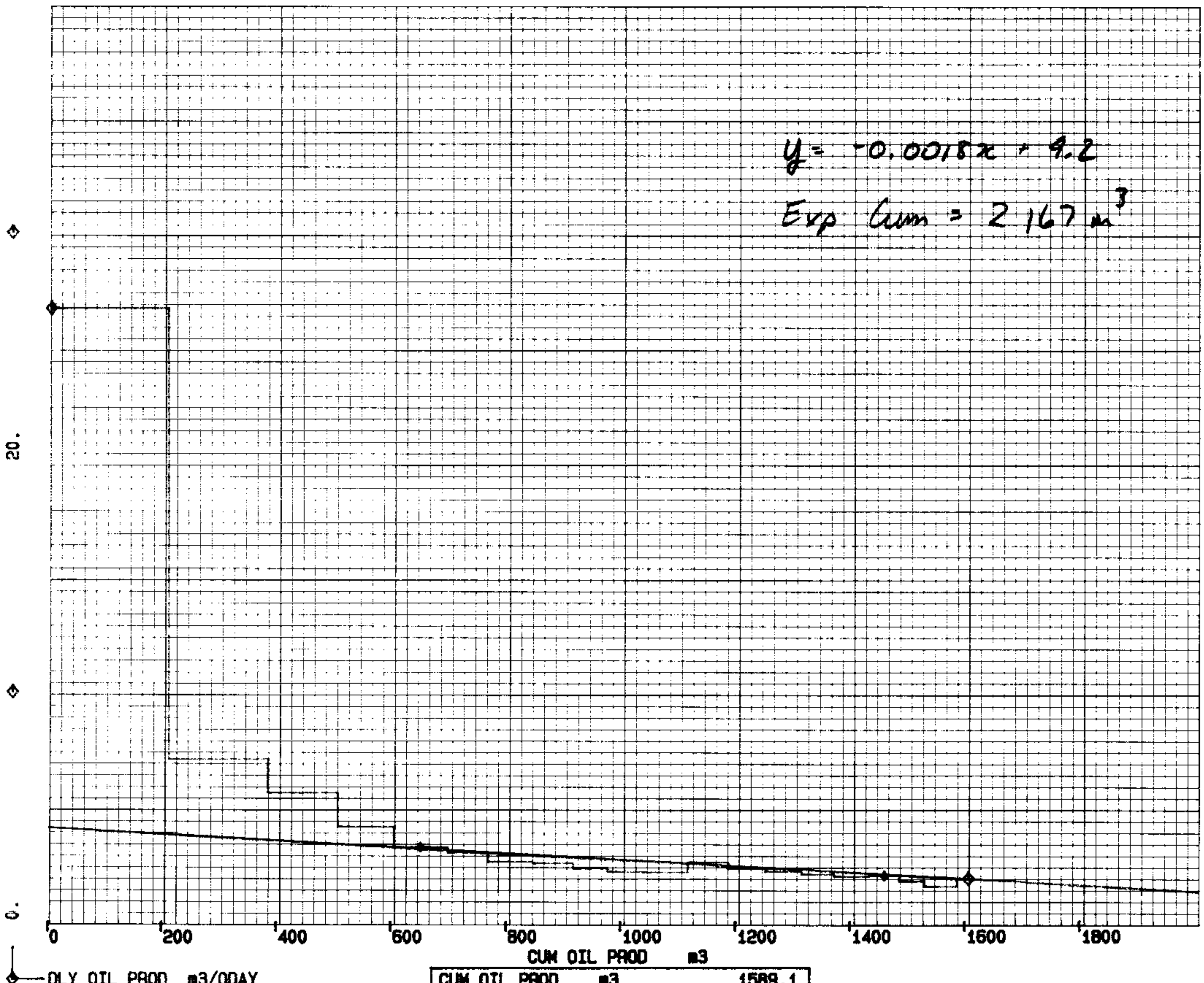
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/08-18-002-29W1/0

HOME SCURRY S PIERSON 8-18-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1589.1
CUM WTR PROD	m3	221.1
GOR	m3/m3	60.0

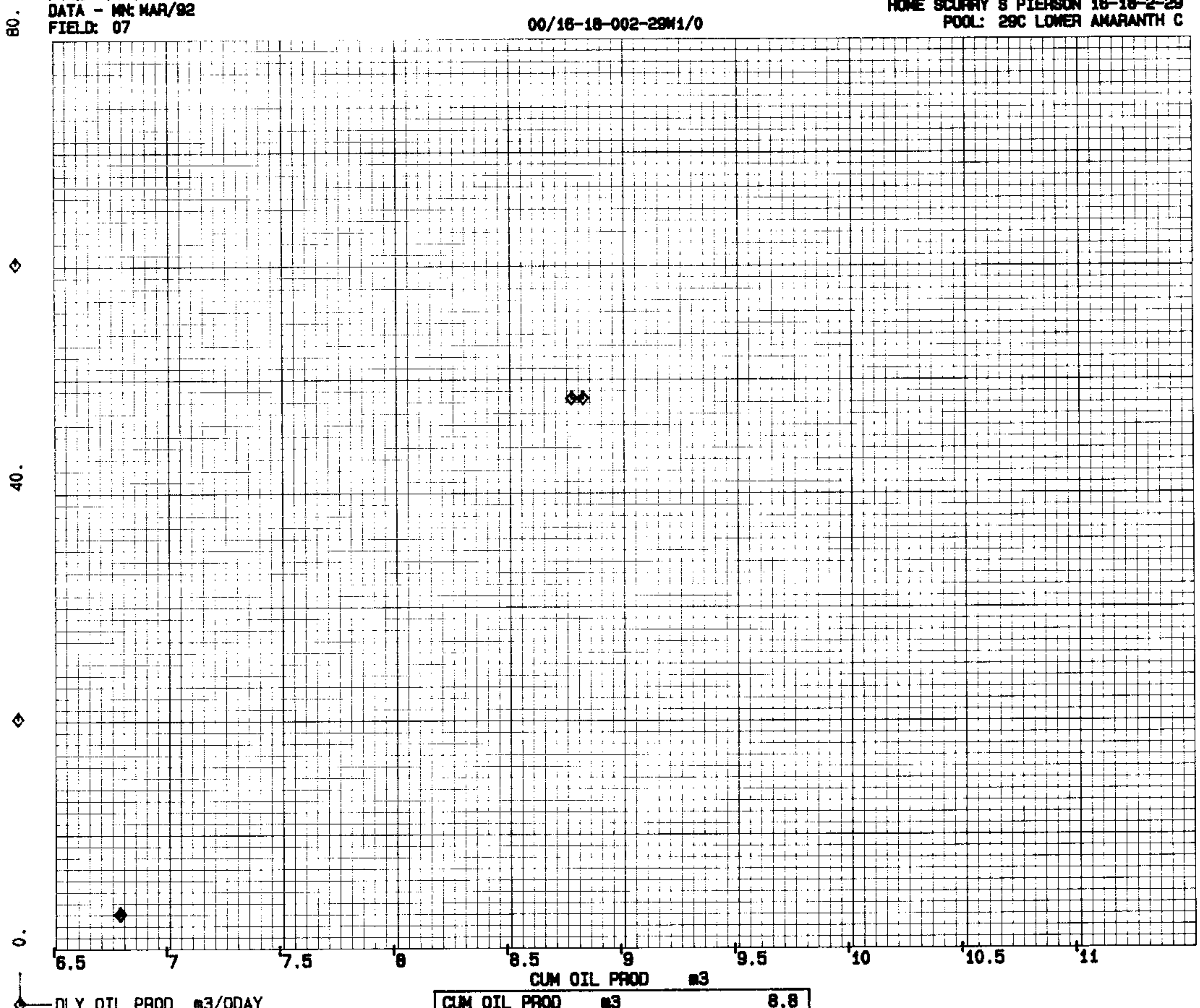
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-18-002-29W1/0

HOME SCURRY S PIERSON 16-18-2-29
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	8.8
CUM WTR PROD	m3	38.8
GOR	m3/m3	50.0

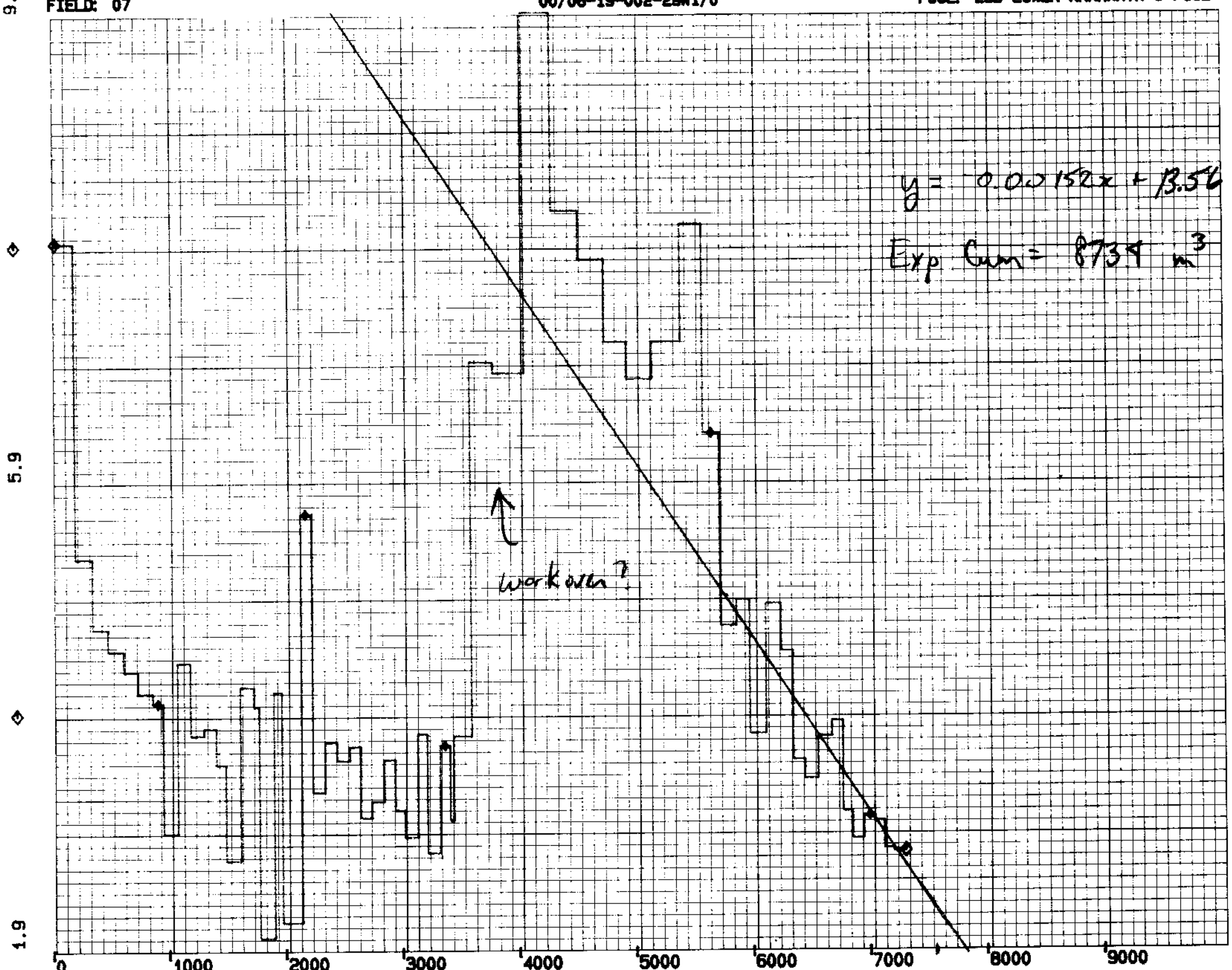
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-19-002-29W1/0

HOME SCURRY S PIERSON (AMAR)
POOL: 29D LOWER AMARANTH C POOL



CUM OIL PROD	m3	7212.5
CUM WTR PROD	m3	323.8
GOR	m3/m3	67.9

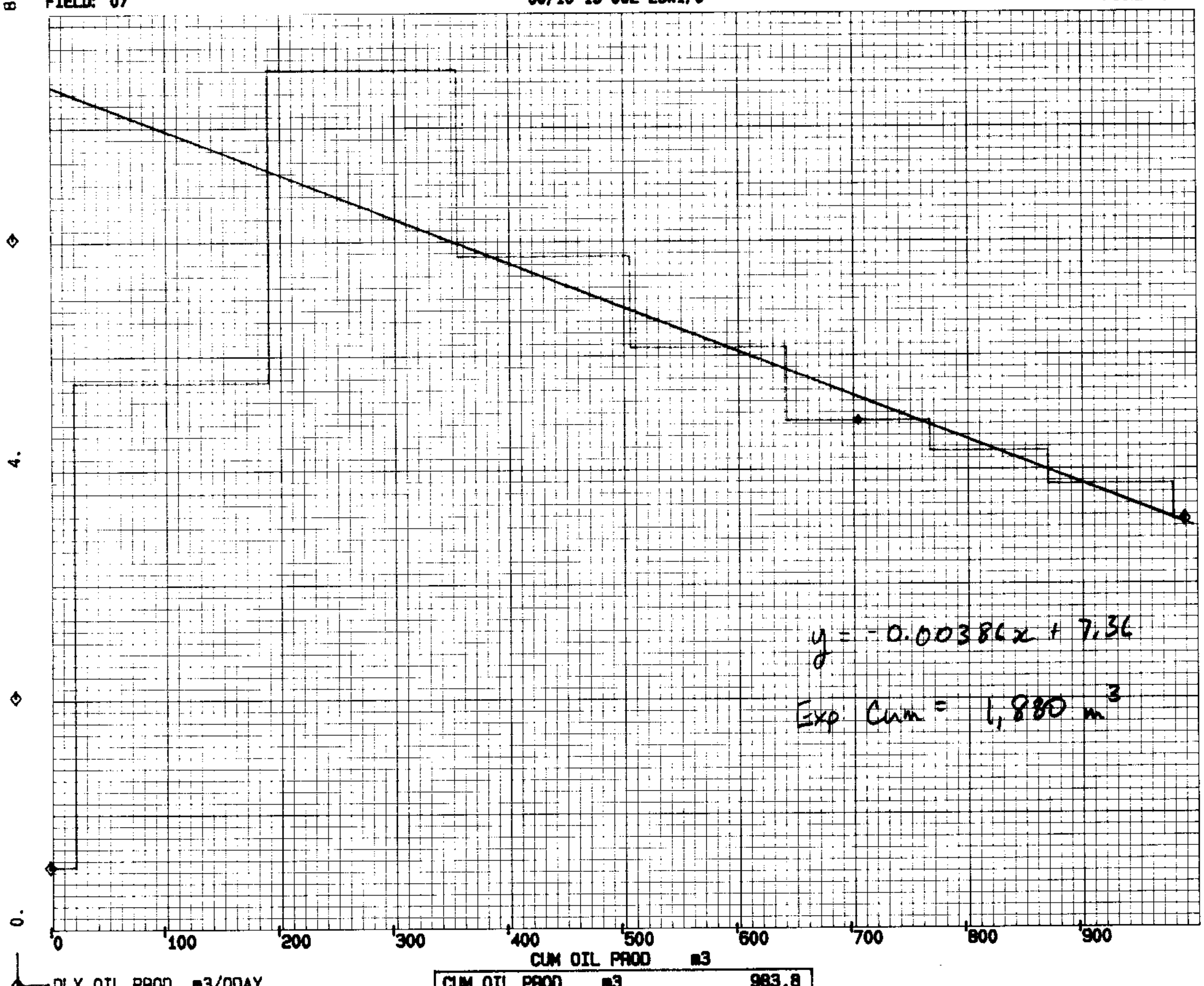
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/10-19-002-29W1/0

HOME SCURRY PIERSON 10-19-2-29
POOL: 29*



CUM OIL PROD	m3	983.8
CUM WTR PROD	m3	677.8
GOR	m3/m3	69.9

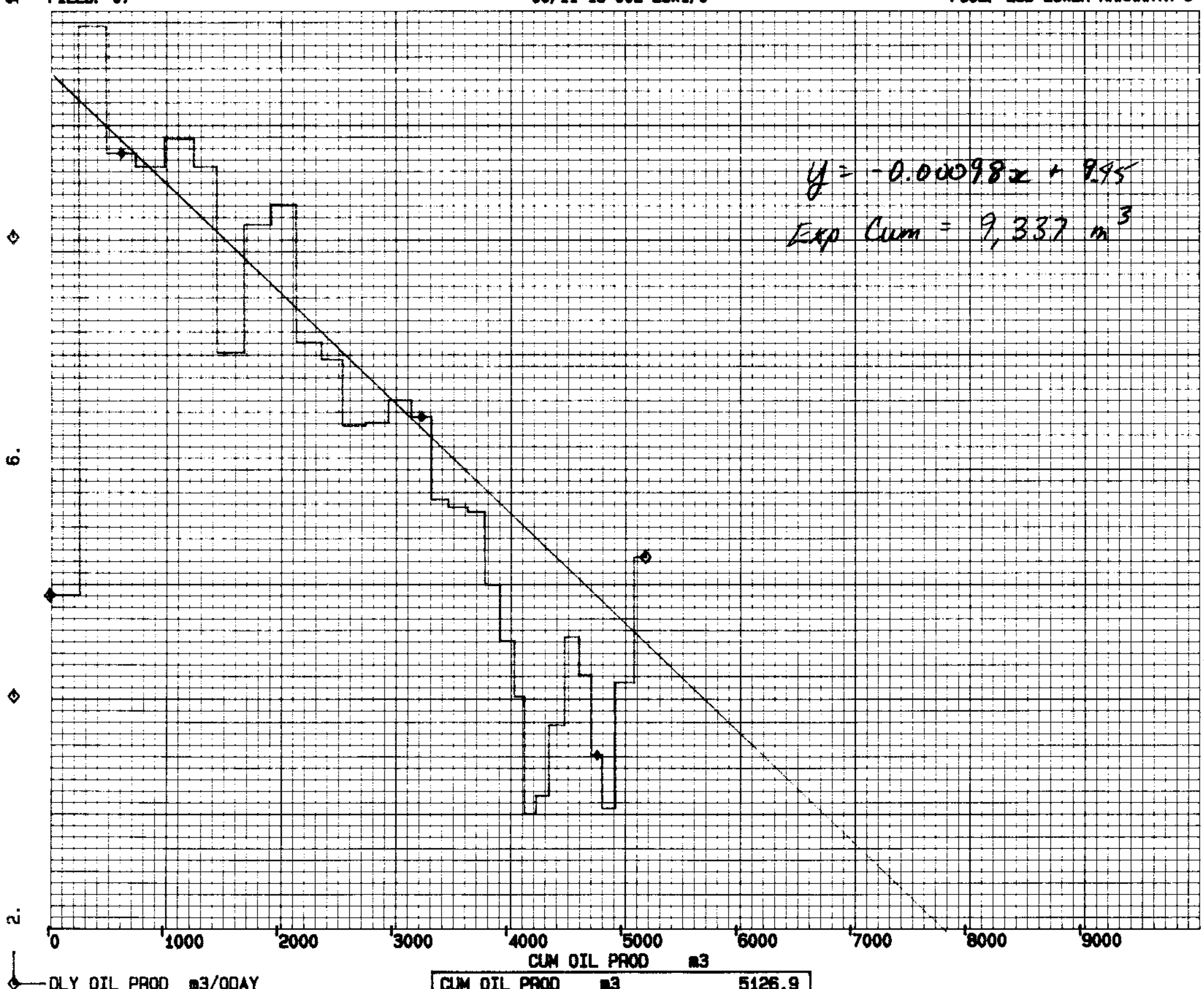
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/11-19-002-29W1/0

HOME SCURRY S PIERSON 11-19-2-29W1
POOL: 29D LOWER AMARANTH C



CUM OIL PROD	m3	5126.9
CUM WTR PROD	m3	326.3
GOR	m3/m3	45.8

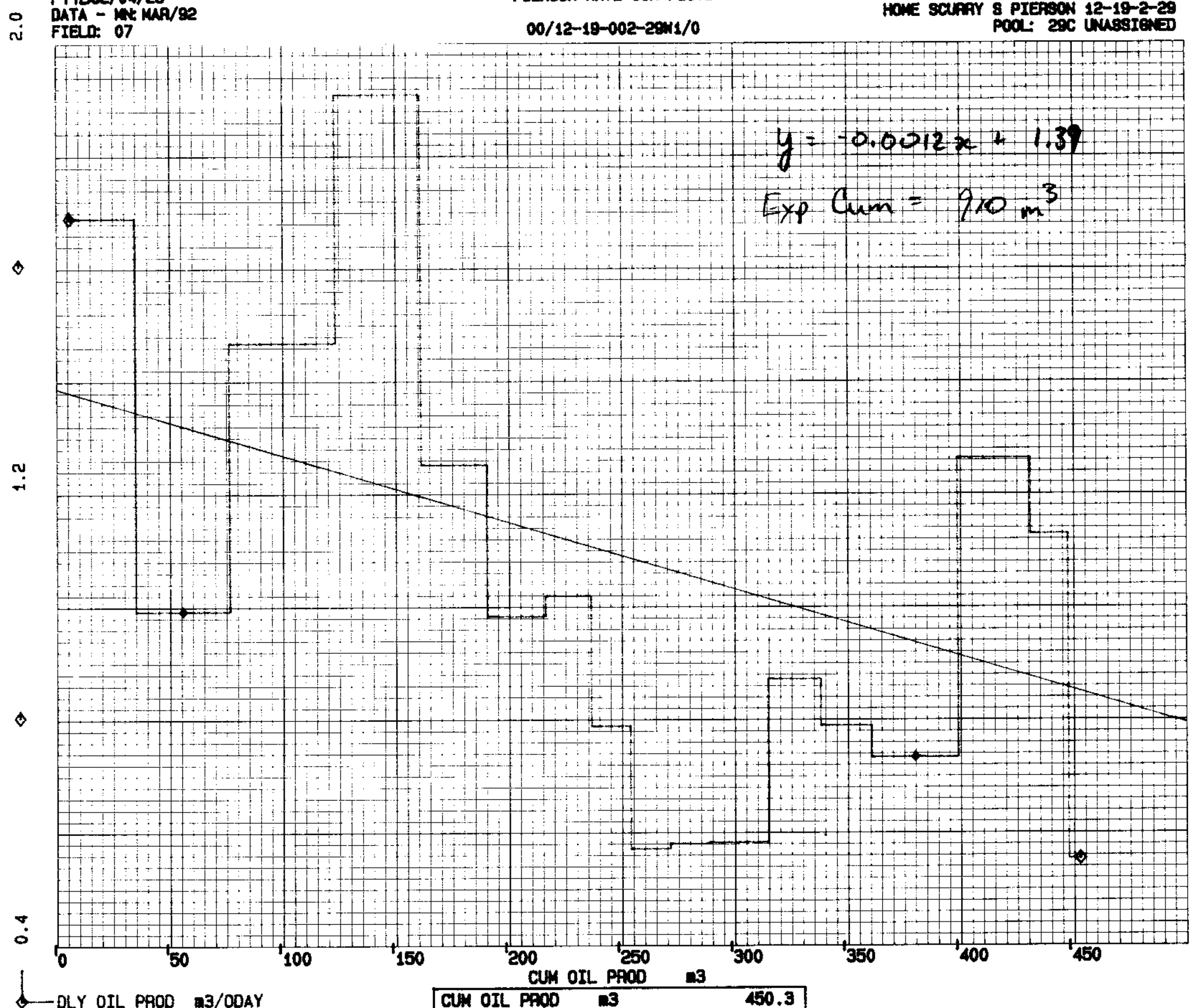
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/12-19-002-29W1/0

HOME SCURRY S PIERSON 12-19-2-29
POOL: 29C UNASSIGNED



CUM OIL PROD	m3	450.3
CUM WTR PROD	m3	5660.8
GOR	m3/m3	71.9

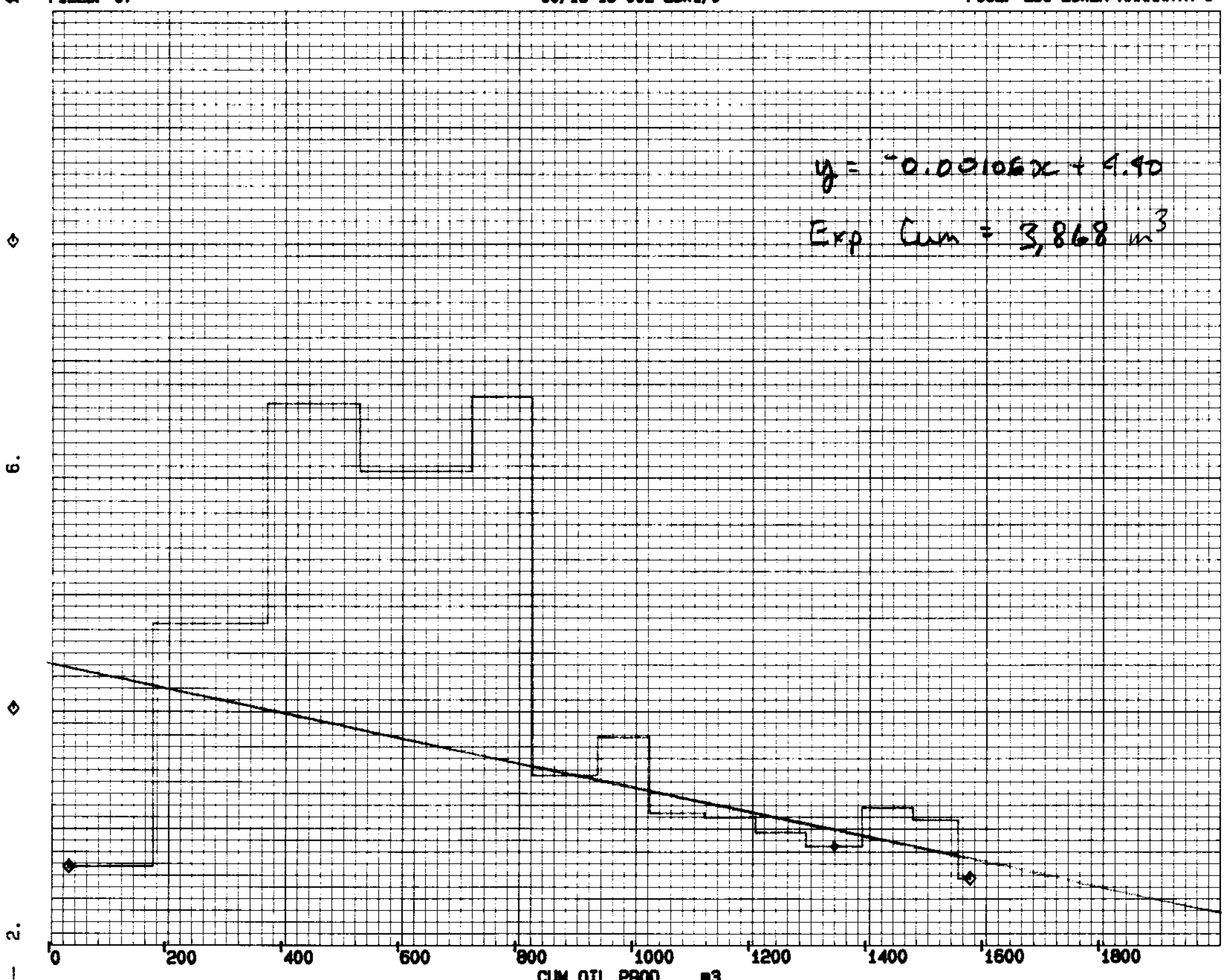
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/16-19-002-29W1/0

HOME SCURRY S PIERSON 16-19-2-29
POOL: 29C LOWER AMARANTH C



CUM OIL PROD	m3	1561.2
CUM WTR PROD	m3	2978.4
GOR	m3/m3	76.1

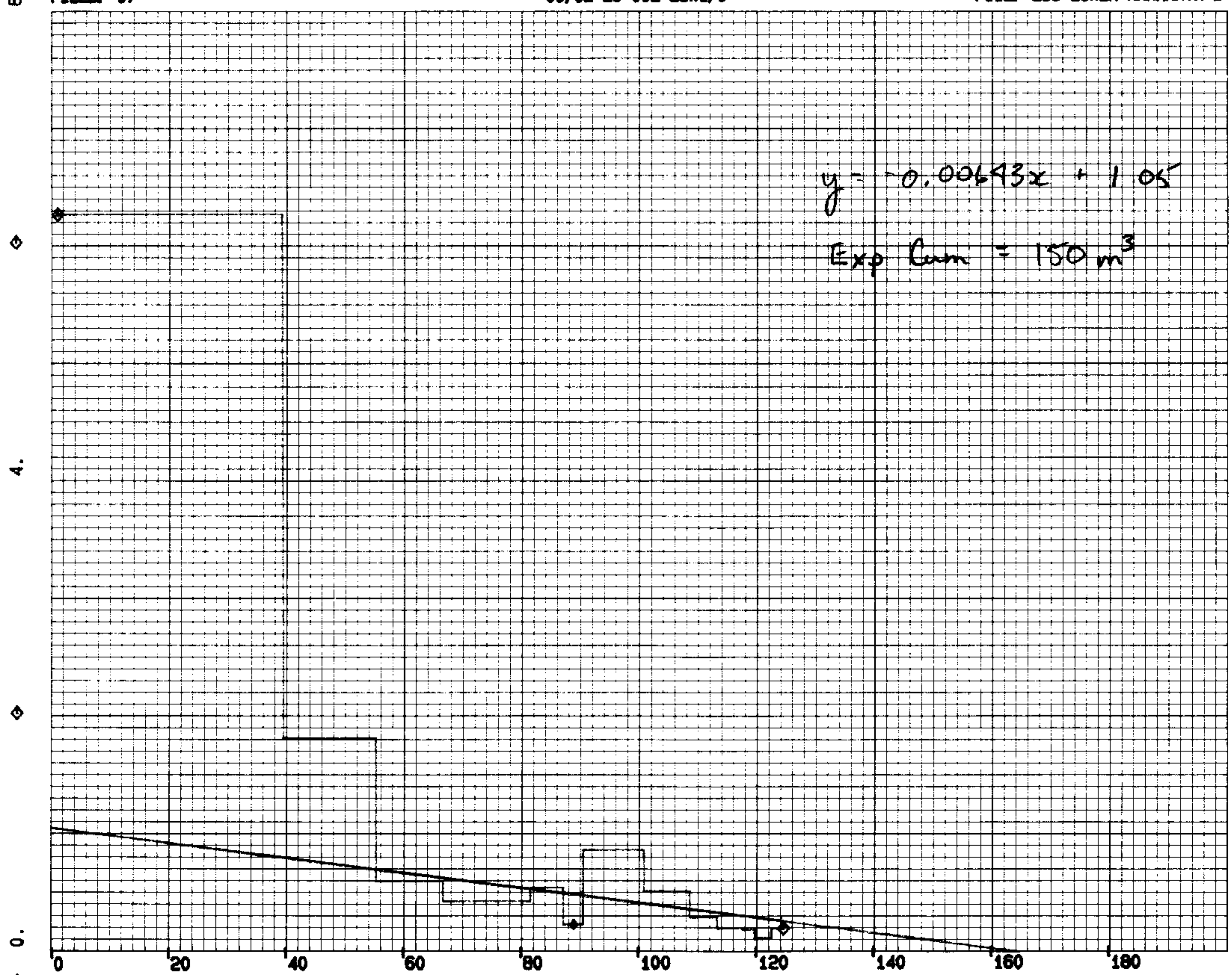
+ (5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/02-20-002-29W1/0

HOME SCURRY S PIERSON PROV 2-20-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	122.6
CUM WTR PROD	m3	226.0
GOR	m3/m3	142.9

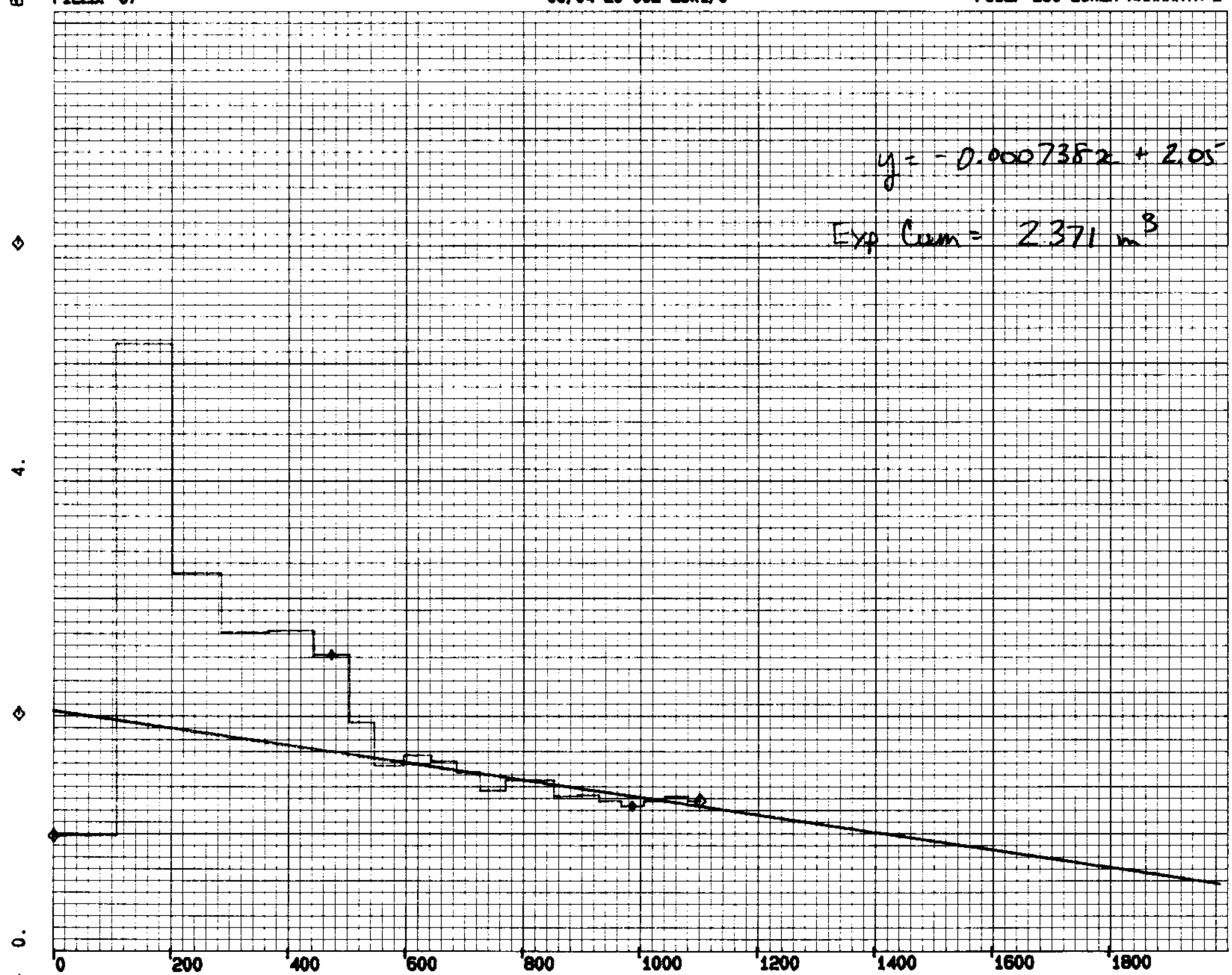
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/04-20-002-29W1/0

HOME SCURRY S PIERSON PROV 4-20-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1084.2
CUM WTR PROD	m3	241.3
GOR	m3/m3	101.3

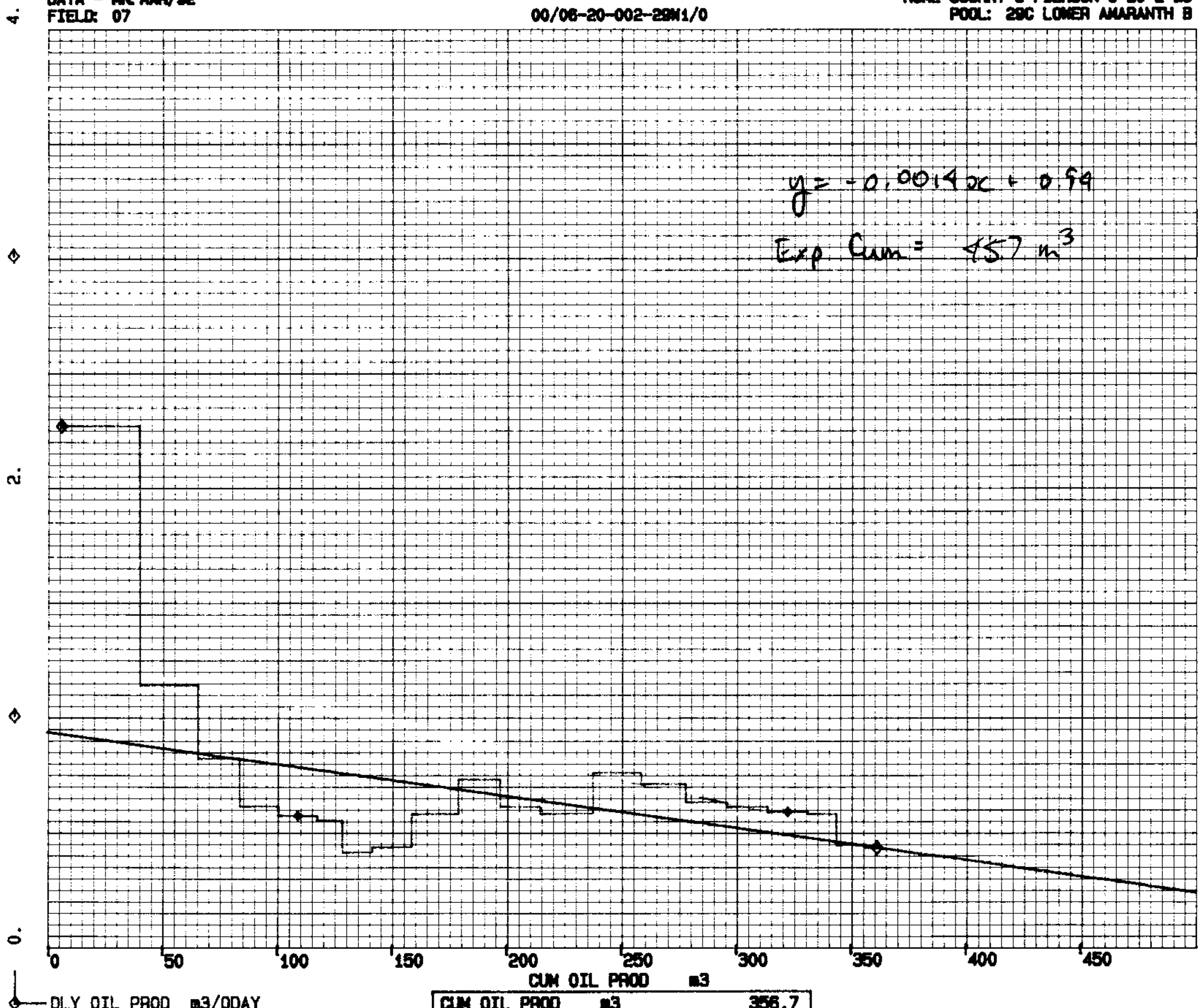
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/06-20-002-29W1/0

HOME SCURRY S PIERSON 6-20-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	356.7
CUM WTR PROD	m3	138.5
GOR	m3/m3	215.4

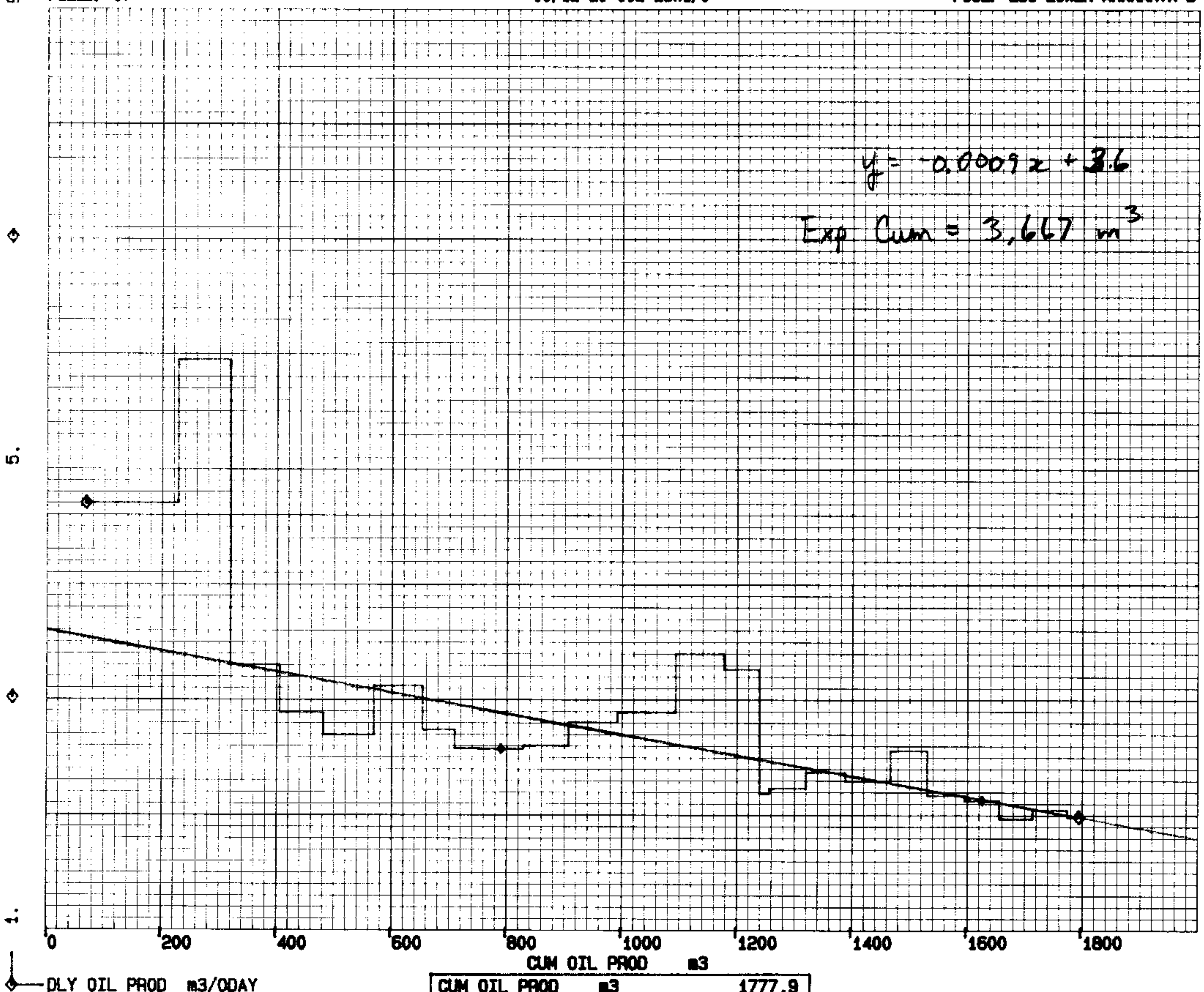
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/12-20-002-29W1/0

HOME SRO S PIERSON PROV 12-20-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	1777.9
CUM WTR PROD	m3	306.1
GOR	m3/m3	103.8

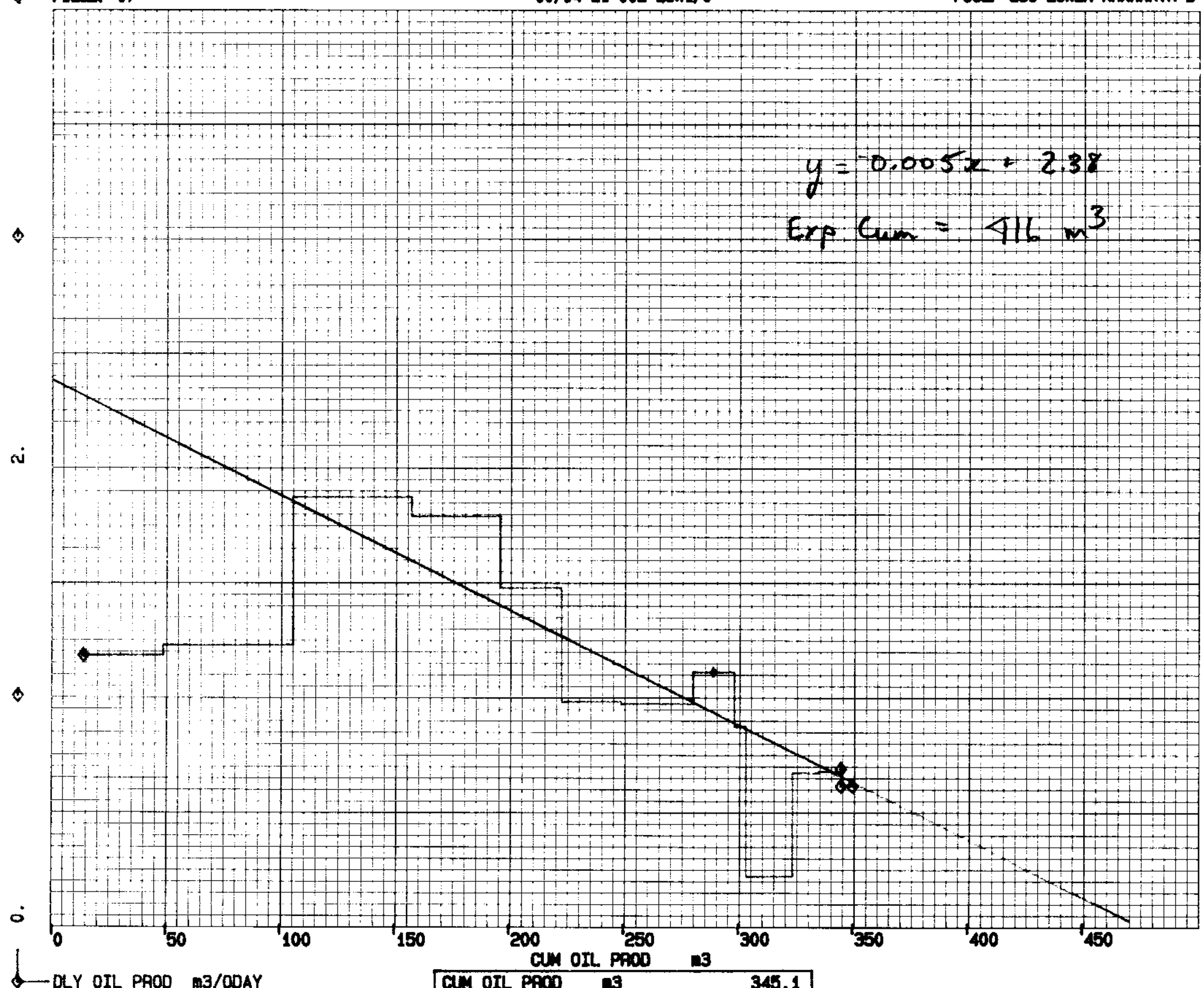
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/04-21-002-29W1/0

HOME SCURRY 4-21 S.PI (AMAR)
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	345.1
CUM WTR PROD	m3	13355.4
GOR	m3/m3	197.9

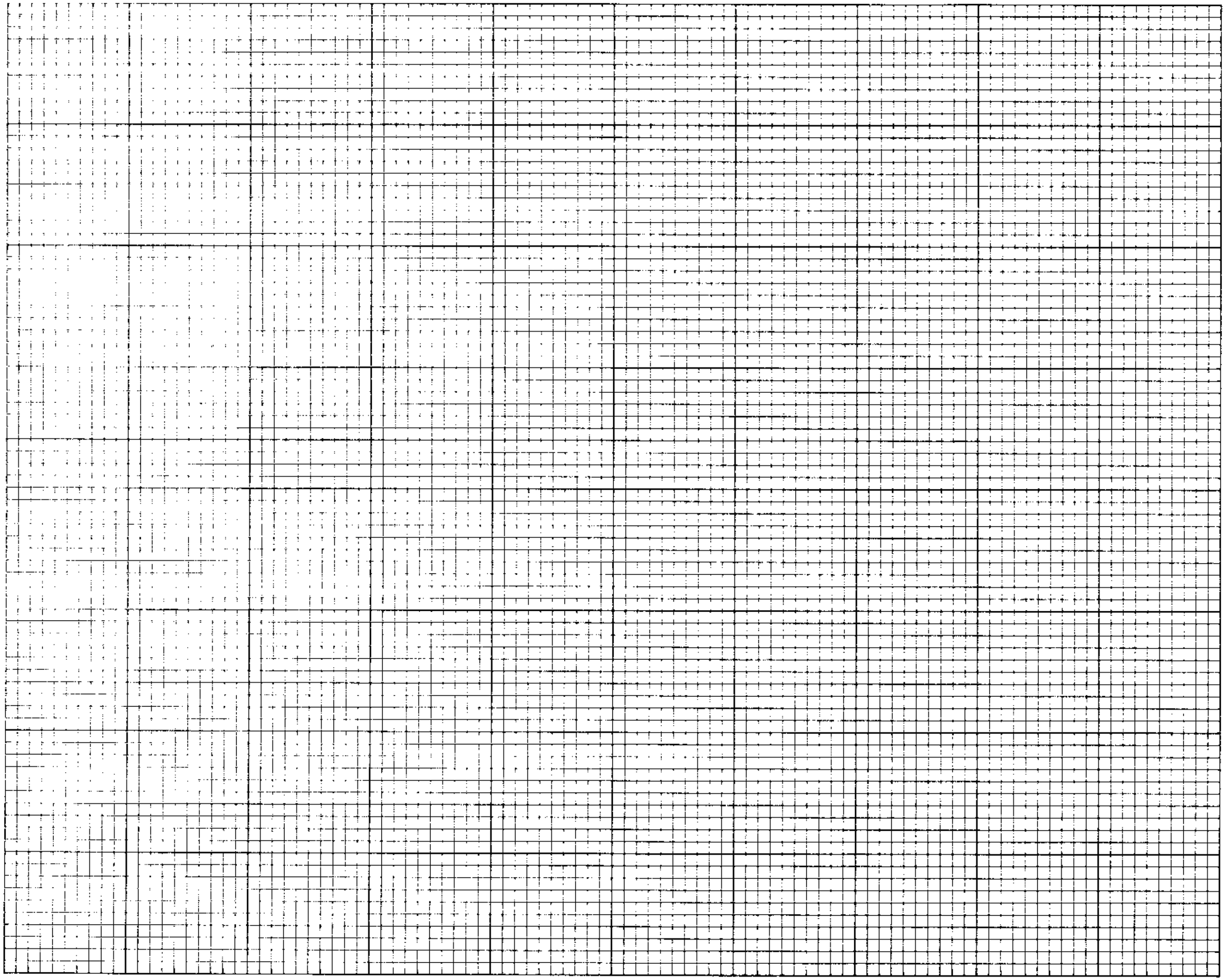
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/10-21-002-29W1/0

HOME SCURRY S PIERSON (AMAR)
POOL: 29C LOWER AMARANTH A



DLY OIL PROD m3/ODAY No Data

CUM OIL PROD m3 No Data

CUM OIL PROD	m3	0.0
CUM WTR PROD	m3	62.4
GOR	m3/m3	0.0

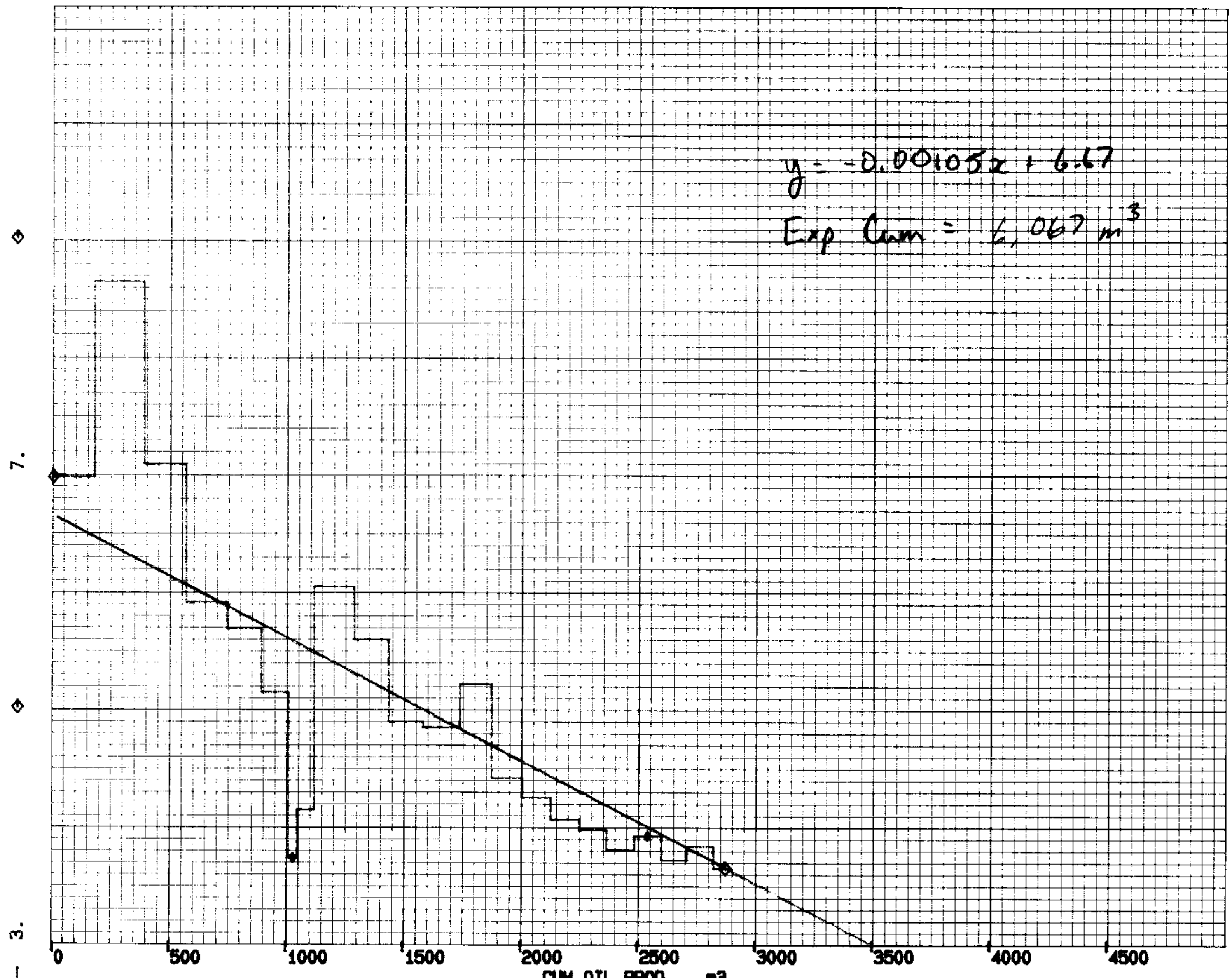
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/02-30-002-29W1/0

HOME SCURRY S PIERSON 2-30-2-29
POOL: 29D LOWER AMARANTH B



CUM OIL PROD	m3	2825.1
CUM WTR PROD	m3	156.0
GOR	m3/m3	53.5

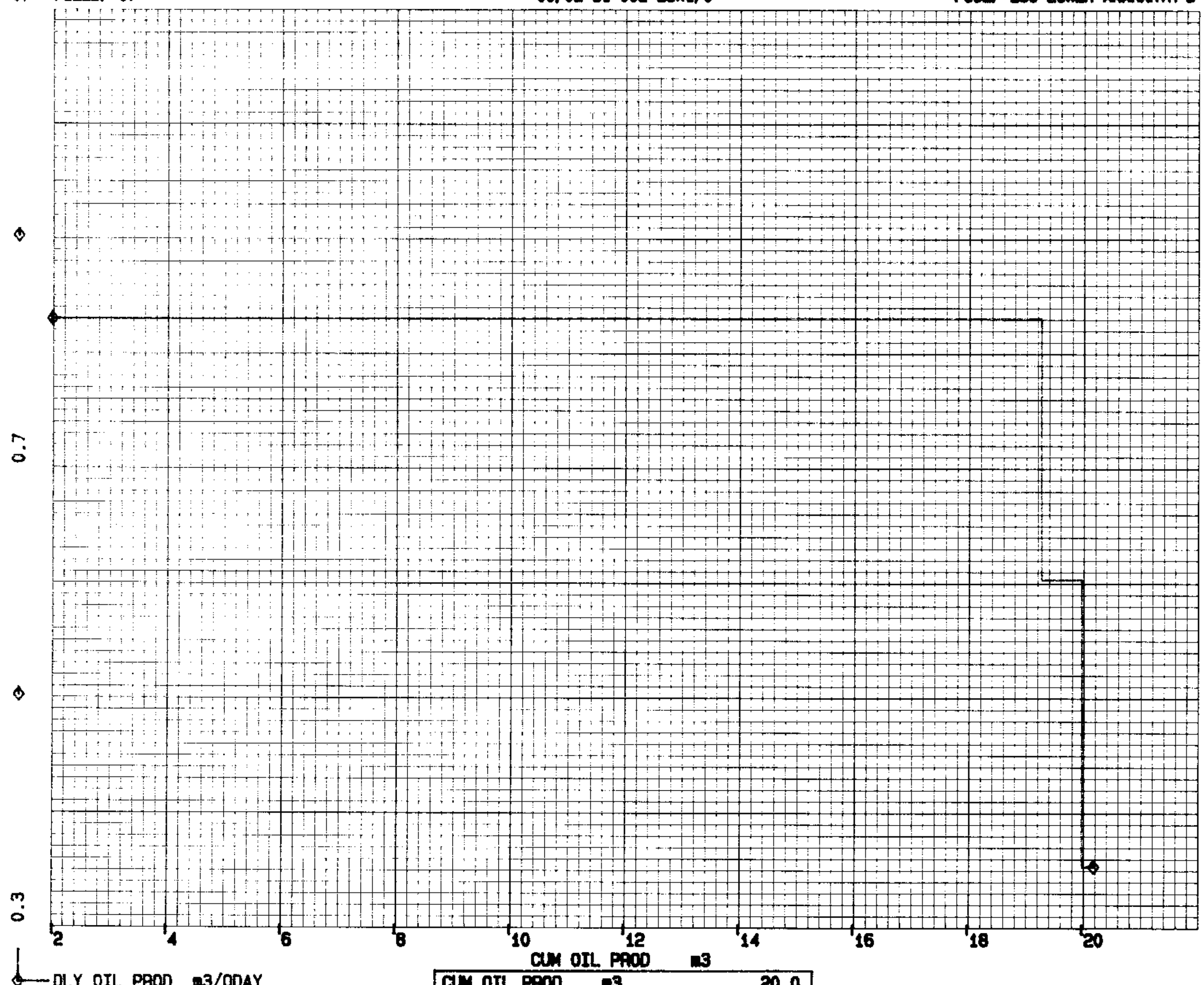
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/02-31-002-29W1/0

HOME SCURRY PIERSON 2-31-2-29
POOL: 29C LOWER AMARANTH B



CUM OIL PROD	m3	20.0
CUM WTR PROD	m3	62.1
GOR	m3/m3	427.7

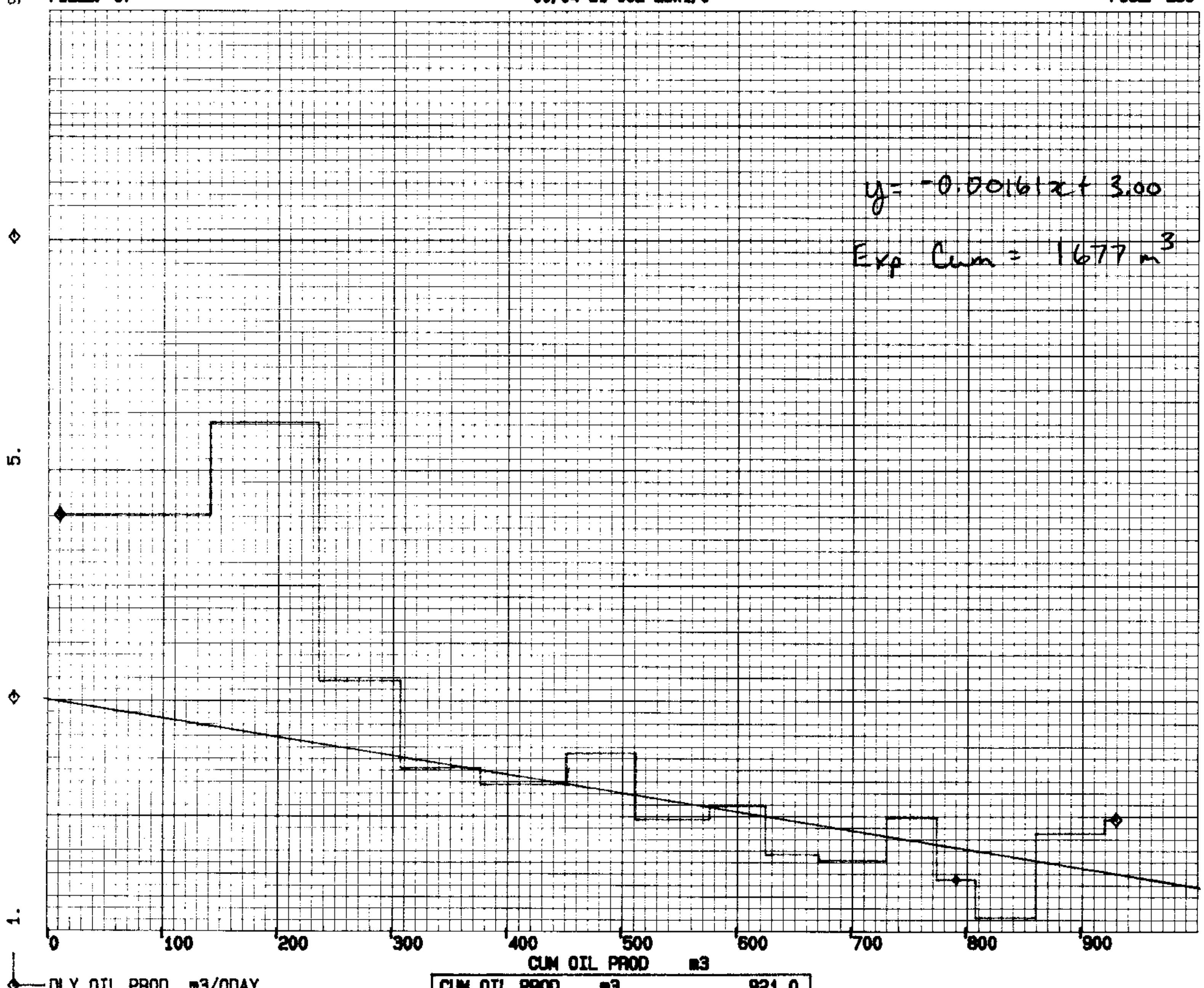
(5)
1185 84/02

PHD92/04/25
DATA - MN: MAR/92
FIELD: 07

PIERSON RATE CUM PLOTS

00/04-31-002-29W1/0

HOME SCURRY S PIERSON 4-31-2-29
POOL: 296



CUM OIL PROD	m3	921.0
CUM WTR PROD	m3	292.2
GOR	m3/m3	38.5

+ (5)
1185 84/02

South Pierson

Waterflood Capital Cost Estimate

Home Oil Company Limited

inter-office memorandum

To: C.W. Labelle

Date: January 14, 1992

From: B.A. Eshleman

File: 92004

Subject: **South Pierson Water Flood Project Cost Estimates**

Cost estimates have been prepared for upgrading the existing water flood facility and construction and tie-in of 31 injection wells for the South Pierson Water Flood Project. It is assumed that both pipeline construction and facility upgrading will occur in the late summer or fall of 1992; if the project is delayed beyond 1992, the costs will have to be adjusted for inflation and/or winter construction. Following are the three options that were reviewed and a brief description of what they entail (Please note that any additional work outside the scope of what has been requested is **not included** within any of the three estimates. ie. additional safety equipment, upgrading the battery, repairing equipment, etc.)

<u>Option 1 ($1,621,000 +/- 20%)</u>

- Construction and tie-in of 31 injection wells
- Upgrade of the existing injection facility at 14-9-2-29W1M
  - Re-Cheave the existing pumps
  - Expand the building
  - Construct a header

<u>Option 2 ($1,784,000 +/- 20%)</u>

- Construction and tie-in of 31 injection wells
- Upgrade of the existing injection facility at 14-9-2-29W1M
  - Re-Cheave the existing pumps
  - Expand the building
  - Construct a header
- Construction and tie-in of a source well at 4-21-2-29W1M
  - Costs **have not been included** for any transfer pumps at 4-21
- It is assumed that the produced water and source water will be compatible

<u>Option 3 ($1,930,000 +/- 20%)</u>

- Construction and tie-in of 31 injection wells
- Upgrade of the existing injection facility at 14-9-2-29W1M
  - Re-Cheave the existing pumps
  - Expand the building
  - Construct a header
- Construction and tie-in of a source well at 4-21-2-29W1M
  - Costs **have not been included** for any transfer pumps at 4-21
- Purchase and installation one new pump, identical to the existing pumps, at the 14-9 injection facility
- It is assumed that the produced water and source water will be compatible

If you have any questions, please contact me at 232-7461.

Brent Eshleman

bae

cc: GHH / Reading File
File 92004.0420

SOUTH PIERSON WATER FLOOD - OPTION 3 - SOURCE WELL & ADDITIONAL PUMP

PROJECT	South Pierson Waterflood Project		
ENGINEER	Brent Eshleman		
CREATION DATE	Jan. 10, 1992		
FDC FILE REFERENCE	92004		
REVISION DATE			
DESIGN DATA:	INJECTION PIPELINES	IINJECTION FACILITY UPGRADE	SOURCE WELL
Start Location	14-9-2-29W1M	14-9-2-29W1M	4-21-2-29W1M
End Location	Wellhead		14-9-2-29W1M
Pipeline Length (m)	22,000		2,300
Design Pressure (kPa)	13,780	13,780	9,920
Fluid	Produced Water	Produced Water	Produced Water
Pipe Outside Diameter (mm)	60.3		88.9
Nominal Pipe Diameter (in.)	2		3
Pipe Wall Thickness (mm)	5.21		7.37
Pipe Material Grade (MPa)	Fiberglass		Fiberglass
Pipe Category (I, II or III)	2500 psi		2500 psi
Sour Service (Y/N)	N		N
Internal Coating (Y/N)	Fiberglass		Fiberglass
Right-of-Way Width (m)	15		15
Crown Land (%)			
Freehold Land (%)	100		100
Winter Construction (Y/N)	N		N

COST ESTIMATE SUMMARY:

SUB ACC	DESCRIPTION	INJECTION PIPELINES	INJECTION FACILITY UPGRADE	SOURCE WELL	SUBTOTAL
020	Contract and Service Work	507,000	74,000	54,000	635,000
030	Company Labour	70,000	24,000	9,000	103,000
070	Unclassified	116,000		16,000	132,000
090	Lease Equip (Controllable)	784,000	141,000	80,000	1,005,000
091	Lease Equip (Non-Controllable	26,000	4,000	2,000	32,000
	Subtotal	1,503,000	243,000	161,000	1,907,000
040	Overhead	Amount	Rate		
	First	50,000	5%		2,500
	Next	100,000	3%		3,000
	Remainder		1%		17,570
	TOTAL PROJECT COST	Accuracy (+ or -)	20%		**1,930,000**
	Variance	**1,544,000**	to	**2,316,000**	

PIPELINES COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Tie-ins				
	Wellheads	lump sum	31	4,500.00	139,500
	14-9 Facility	lump sum	1	5,000.00	5,000
	Ditching and Connecting	metre	22,000	8.00	176,000
	PE Liner Installation	metre	22,000		
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre	22,000	1.50	33,000
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm	metre		2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each		200.00	
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each	11	2,500.00	27,500
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each	10	1,500.00	15,000
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		2,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre	22,000		
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre		2,000.00	
Surveying	kilometre	22.00	2,500.00	55,000
Inspection	day	75	550.00	41,250
Geo-Technical Study	variable			
Other				
Other				
Miscellaneous			3%	14,800
TOTAL CONTRACT AND SERVICE WORK				**507,000**

030 COMPANY LABOUR

Head office company labour	% of direct costs	1,445,000	4%	57,800
Field company labour	man-months	2	6,000.00	12,000
TOTAL COMPANY LABOUR				**70,000**

070 UNCLASSIFIED

Land damages	hectare	33.00	1,500.00	49,500
Easements	hectare	33.00	2,000.00	66,000
TOTAL UNCLASSIFIED				**116,000**

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe-60.3mm	metre	22,000	15.85	348,700
Pipe-88.9mm	metre		26.44	
Internal coating/liner	metre	22,000		
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Buildings	lump sum	31	5,000.00	155,000
Valves				
ball, plug or globe	each	31	2,000.00	62,000
check	each	31	1,500.00	46,500
pigging	each		2,500.00	
Instrumentation				
ESD valve	each		6,000.00	
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each	31	3,000.00	93,000
choke	each	31	1,800.00	55,800
Other				
Miscellaneous			3%	22,830
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**784,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	31	500.00	15,500
Small valves				
ball, plug or globe	each	31	150.00	4,650
check	each	31	100.00	3,100
gauge	each	31	100.00	3,100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				26,000
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		$1,503,000
Cost Per Inch Mile			$55,000	

INJECTION FACILITY COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	**Header Fabrication**				
	14-9-2-29W1M	lump sum	1	12,000.00	12,000
		lump sum		2,000.00	
	Ditching and Welding	metre		33.00	
	PE Liner Installation	metre			
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre		1.50	
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm			2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each	2	200.00	400
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each		2,200.00	
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each		1,500.00	
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		10,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre		0.50	
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre	1.00	2,000.00	2,000
Surveying	kilometre		2,500.00	
Inspection	day	25	500.00	12,500
Installation of New Pump	lump sum	1	25,000.00	25,000
Drafting	lump sum	1	15,000.00	15,000
Re-Cheave Pumps	lump sum	1	4,000.00	4,000
Miscellaneous			4%	2,800
TOTAL CONTRACT AND SERVICE WORK				74,000

030 COMPANY LABOUR

Head office company labour	% of direct costs	231,000	5%	11,550
Field company labour	man-months	2	6,000.00	12,000
TOTAL COMPANY LABOUR				24,000

070 UNCLASSIFIED

Land damages	hectare		300.00	
Easements	hectare		2,500.00	
TOTAL UNCLASSIFIED				

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe	metre		12.50	
External coating	metre		2.50	
Internal coating/liner	metre			
Fired heaters	lump sum			
PLC	lump sum	1	3,000.00	3,000
Starter-MCC	lump sum	1	3,000.00	3,000
Building Extension	lump sum	1	30,000.00	30,000
Valves				
ball, plug or globe	each	9	2,000.00	18,000
check	each	7	1,500.00	10,500
pigging	each		2,500.00	
Instrumentation	lump sum	1	5,000.00	5,000
ESD valve	each	1	6,000.00	6,000
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each		800.00	
Filters	each	2	7,500.00	15,000
Pump & Accessories	each	1	45,000.00	45,000
Miscellaneous			4%	5,420
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				141,000

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	1	4,000.00	4,000
Small valves				
ball, plug or globe	each	1	200.00	200
check	each	1	100.00	100
gauge	each	1	100.00	100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				4,000
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		**$243,000**
Cost Per Inch Mile				

SOURCE WELL COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Tie-ins				
	4-21 Wellhead	lump sum	1	4,000.00	4,000
	14-9 Injection Station	lump sum	1	3,000.00	3,000
	Ditching and Connecting	metre	2,300	10.00	23,000
	PE Liner Installation	metre	2,300		
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre	2,300	1.50	3,450
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm	metre		2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each		200.00	
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each	2	2,200.00	4,400
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each	2	1,500.00	3,000
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		2,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre	2,300		
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre	2.30		
Surveying	kilometre	2.30	2,500.00	5,750
Inspection	day	10	500.00	5,000
Geo-Technical Study	variable			
Other				
Other				
Miscellaneous			4%	2,100
TOTAL CONTRACT AND SERVICE WORK				**54,000**

030 COMPANY LABOUR

Head office company labour	% of direct costs	155,000	4%	6,200
Field company labour	man-months	1	6,000.00	3,000
TOTAL COMPANY LABOUR				**9,000**

070 UNCLASSIFIED

Land damages	hectare	3.45	2,000.00	6,900
Easements	hectare	3.45	2,500.00	8,625
TOTAL UNCLASSIFIED				**16,000**

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe-88.9mm	metre	2,300	26.50	60,950
External coating	metre	2,300		
Internal coating/liner	metre	2,300		
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Wellhead Shack	lump sum	1	5,000.00	5,000
Valves				
ball, plug or globe	each	2	2,000.00	4,000
check	each	1	1,500.00	1,500
pigging	each		2,500.00	
Instrumentation				
ESD valve	each	1	6,000.00	6,000
Pressure or flow contol	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each		800.00	
other	each			
Other				
Miscellaneous			3%	2,324
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**80,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	1	2,000.00	2,000
Small valves				
ball, plug or globe	each	1	200.00	200
check	each	1	100.00	100
gauge	each	1	100.00	100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				2,000
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		**$161,000**
Cost Per Inch Mile			$38,000	

SOUTH PIERSON WATERFLOOD - OPTION 2 - SOURCE WELL

PROJECT	South Pierson Waterflood Project		
ENGINEER	Brent Eshleman		
CREATION DATE	Jan. 10, 1992		
FDC FILE REFERENCE	92004		
REVISION DATE			
DESIGN DATA:	INJECTION PIPELINES	IINJECTION FACILITY UPGRADE	SOURCE WELL
Start Location	14-9-2-29W1M	14-9-2-29W1M	4-21-2-29W1M
End Location	Wellhead		14-9-2-29W1M
Pipeline Length (m)	22,000		2,300
Design Pressure (kPa)	13,780	13,780	9,920
Fluid	Produced Water	Produced Water	Produced Water
Pipe Outside Diameter (mm)	60.3		88.9
Nominal Pipe Diameter (in.)	2		3
Pipe Wall Thickness (mm)	5.21		7.37
Pipe Material Grade (MPa)	Fiberglass		Fiberglass
Pipe Category (I, II or III)	2500 psi		2500 psi
Sour Service (Y/N)	N		N
Internal Coating (Y/N)	Fiberglass		Fiberglass
Right-of-Way Width (m)	15		15
Crown Land (%)			
Freehold Land (%)	100		100
Winter Construction (Y/N)	N		N

COST ESTIMATE SUMMARY:

SUB ACC	DESCRIPTION	INJECTION PIPELINES	INJECTION FACILITY UPGRADE	SOURCE WELL	SUBTOTAL
020	Contract and Service Work	507,000	33,000	54,000	594,000
030	Company Labour	70,000	14,000	9,000	93,000
070	Unclassified	116,000		16,000	132,000
090	Lease Equip (Controllable)	784,000	49,000	80,000	913,000
091	Lease Equip (Non-Controllable	26,000	2,000	2,000	30,000
	Subtotal	1,503,000	98,000	161,000	1,762,000

040	Overhead	Amount	Rate	
	First	50,000	5%	2,500
	Next	100,000	3%	3,000
	Remainder		1%	16,120
	TOTAL PROJECT COST	Accuracy (+ or -)	20%	1,784,000
	Variance	1,427,000	to	2,141,000

PIPELINES COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Tie-ins				
	Wellheads	lump sum	31	4,500.00	139,500
	14-9 Facility	lump sum	1	5,000.00	5,000
	Ditching and Connecting	metre	22,000	8.00	176,000
	PE Liner Installation	metre	22,000		
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre	22,000	1.50	33,000
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm	metre		2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each		200.00	
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each	11	2,500.00	27,500
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each	10	1,500.00	15,000
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		2,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre	22,000		
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre		2,000.00	
Surveying	kilometre	22.00	2,500.00	55,000
Inspection	day	75	550.00	41,250
Geo-Technical Study	variable			
Other				
Other				
Miscellaneous			3%	14,800
TOTAL CONTRACT AND SERVICE WORK				**507,000**

030 COMPANY LABOUR

Head office company labour	% of direct costs	1,445,000	4%	57,800
Field company labour	man-months	2	6,000.00	12,000
TOTAL COMPANY LABOUR				**70,000**

070 UNCLASSIFIED

Land damages	hectare	33.00	1,500.00	49,500
Easements	hectare	33.00	2,000.00	66,000
TOTAL UNCLASSIFIED				**116,000**

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe-60.3mm	metre	22,000	15.85	348,700
Pipe-88.9mm	metre		26.44	
Internal coating/liner	metre	22,000		
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Buildings	lump sum	31	5,000.00	155,000
Valves				
ball, plug or globe	each	31	2,000.00	62,000
check	each	31	1,500.00	46,500
pigging	each		2,500.00	
Instrumentation				
ESD valve	each		6,000.00	
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each	31	3,000.00	93,000
choke	each	31	1,800.00	55,800
Other				
Miscellaneous			3%	22,830
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**784,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	31	500.00	15,500
Small valves				
ball, plug or globe	each	31	150.00	4,650
check	each	31	100.00	3,100
gauge	each	31	100.00	3,100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				**26,000**
TOTAL PIPELINE COST	Accuracy (+ or -)	**20%**		**$1,503,000**
Cost Per Inch Mile			**$55,000**	

INJECTION FACILITY COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Header Fabrication				
	14-9-2-29W1M	lump sum	1	12,000.00	12,000
		lump sum		2,000.00	
	Ditching and Welding	metre		33.00	
	PE Liner Installation	metre			
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre		1.50	
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm			2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each	2	200.00	400
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each		2,200.00	
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each		1,500.00	
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		10,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre		0.50	
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre		2,000.00	
Surveying	kilometre		2,500.00	
Inspection	day	15	500.00	7,500
Geo-Technical Study	variable			
Drafting	lump sum	1	7,500.00	7,500
Re-Cheave Pumps	lump sum	1	4,000.00	4,000
Miscellaneous			4%	1,300
TOTAL CONTRACT AND SERVICE WORK				33,000

030 COMPANY LABOUR

Head office company labour	% of direct costs	93,000	5%	4,650
Field company labour	man-months	2	6,000.00	9,000
TOTAL COMPANY LABOUR				14,000

070 UNCLASSIFIED

Land damages	hectare		300.00	
Easements	hectare		2,500.00	
TOTAL UNCLASSIFIED				

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe	metre		12.50	
External coating	metre		2.50	
Internal coating/liner	metre			
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Building Extension	lump sum	1	18,000.00	18,000
Valves				
ball, plug or globe	each	7	2,000.00	14,000
check	each	6	1,500.00	9,000
pigging	each		2,500.00	
Instrumentation				
ESD valve	each	1	6,000.00	6,000
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each		800.00	
other	each			
Other				
Miscellaneous			4%	1,880
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				49,000

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	1	2,000.00	2,000
Small valves				
ball, plug or globe	each	1	200.00	200
check	each	1	100.00	100
gauge	each	1	100.00	100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				2,000
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		$98,000
Cost Per Inch Mile				

SOURCE WELL COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Tie-ins				
	4-21 Wellhead	lump sum	1	4,000.00	4,000
	14-9 Injection Station	lump sum	1	3,000.00	3,000
	Ditching and Connecting	metre	2,300	10.00	23,000
	PE Liner Installation	metre	2,300		
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre	2,300	1.50	3,450
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm	metre		2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each		200.00	
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each	2	2,200.00	4,400
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each	2	1,500.00	3,000
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		2,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre	2,300		
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre	2.30		
Surveying	kilometre	2.30	2,500.00	5,750
Inspection	day	10	500.00	5,000
Geo-Technical Study	variable			
Other				
Other				
Miscellaneous			4%	2,100
TOTAL CONTRACT AND SERVICE WORK				**54,000**

030 COMPANY LABOUR

Head office company labour	% of direct costs	155,000	4%	6,200
Field company labour	man-months	1	6,000.00	3,000
TOTAL COMPANY LABOUR				**9,000**

070 UNCLASSIFIED

Land damages	hectare	3.45	2,000.00	6,900
Easements	hectare	3.45	2,500.00	8,625
TOTAL UNCLASSIFIED				**16,000**

090 LEASE EQUIPMENT (CONTROLLABLE)

Pipe-88.9mm	metre	2,300	26.50	60,950
External coating	metre	2,300		
Internal coating/liner	metre	2,300		
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Wellhead Shack	lump sum	1	5,000.00	5,000
Valves				
ball, plug or globe	each	2	2,000.00	4,000
check	each	1	1,500.00	1,500
pigging	each		2,500.00	
Instrumentation				
ESD valve	each	1	6,000.00	6,000
Pressure or flow contol	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each		800.00	
other	each			
Other				
Miscellaneous			3%	2,324
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**80,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	1	2,000.00	2,000
Small valves				
ball, plug or globe	each	1	200.00	200
check	each	1	100.00	100
gauge	each	1	100.00	100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				**2,000**
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		**$161,000**
Cost Per Inch Mile			$38,000	

SOUTH PIERSON WATER FLOOD - OPTION 1 - UPGRADE EXISTING FACILITY

PROJECT	South Pierson Waterflood Project	
ENGINEER	Brent Eshleman	
CREATION DATE	Jan. 10, 1992	
FDC FILE REFERENCE	92004	
REVISION DATE		
DESIGN DATA:	PIPELINES	IINJECTION FACILITY UPGRADE
Start Location	14-9-2-29W1M	14-9-2-29W1M
End Location	Wellhead	
Pipeline Length (m)	22,000	
Design Pressure (kPa)	13,780	13,780
Fluid	Produced Water	Produced Water
Pipe Outside Diameter (mm)	60.3	
Nominal Pipe Diameter (in.)	2	
Pipe Wall Thickness (mm)	5.21	
Pipe Material Grade (MPa)	Fiberglass	
Pipe Category (I, II or III)	2500 psi	
Sour Service (Y/N)	N	
Internal Coating (Y/N)	Fiberglass	
Right-of-Way Width (m)	15	
Crown Land (%)		
Freehold Land (%)	100	
Winter Construction (Y/N)	N	

COST ESTIMATE SUMMARY:

SUB ACC	DESCRIPTION	PIPELINE 1			IINJECTION FACILITY UPGRADE	SUBTOTAL
020	Contract and Service Work	507,000			33,000	540,000
030	Company Labour	70,000			14,000	84,000
070	Unclassified	116,000				116,000
090	Lease Equip (Controllable)	784,000			49,000	833,000
091	Lease Equip (Non-Controllable	26,000			2,000	28,000
	Subtotal	1,503,000			98,000	1,601,000
040	Overhead	Amount	Rate			
	First	50,000	5%			2,500
	Next	100,000	3%			3,000
	Remainder		1%			14,510
	TOTAL PROJECT COST	Accuracy (+ or -)		20%		**1,621,000**
	Variance	**1,297,000**	to		**1,945,000**	

PIPELINES COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Tie-ins				
	Wellheads	lump sum	31	4,500.00	139,500
	14-9 Facility	lump sum	1	5,000.00	5,000
	Ditching and Connecting	metre	22,000	8.00	176,000
	PE Liner Installation	metre	22,000		
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre	22,000	1.50	33,000
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm	metre		2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each		200.00	
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each	11	2,500.00	27,500
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each	10	1,500.00	15,000
	pipeline - under several				
	railway	each		2,800.00	
	Water Crossings				
	minor	each		2,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre	22,000		
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre		2,000.00	
Surveying	kilometre	22,00	2,500.00	55,000
Inspection	day	75	550.00	41,250
Geo-Technical Study	variable			
Other				
Other				
Miscellaneous			3%	14,800
TOTAL CONTRACT AND SERVICE WORK				**507,000**
030 COMPANY LABOUR				
Head office company labour	% of direct costs	1,445,000	4%	57,800
Field company labour	man-months	2	6,000.00	12,000
TOTAL COMPANY LABOUR				**70,000**
070 UNCLASSIFIED				
Land damages	hectare	33.00	1,500.00	49,500
Easements	hectare	33.00	2,000.00	66,000
TOTAL UNCLASSIFIED				**116,000**
090 LEASE EQUIPMENT (CONTROLLABLE)				
Pipe-60.3mm	metre	22,000	15.85	348,700
Pipe-88.9mm	metre		26.44	
Internal coating/liner	metre	22,000		
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Wellhead Shacks	lump sum	31	5,000.00	155,000
Valves				
ball, plug or globe	each	31	2,000.00	62,000
check	each	31	1,500.00	46,500
pigging	each		2,500.00	
Instrumentation				
ESD valve	each		6,000.00	
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each	31	3,000.00	93,000
choke	each	31	1,800.00	55,800
Other				
Miscellaneous			3%	22,830
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**784,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	31	500.00	15,500
Small valves				
ball, plug or globe	each	31	150.00	4,650
check	each	31	100.00	3,100
gauge	each	31	100.00	3,100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				26,000
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		$1,503,000
Cost Per Inch Mile			$55,000	

INJECTION FACILITY COST ESTIMATE DETAIL

(Note: Subtotals and the project total estimated cost are rounded to the nearest thousand dollars)

SUB ACC	DESCRIPTION	UNITS	QUANTITY	UNIT COST	COST
020	Header Fabrication				
	14-9-2-29W1M	lump sum	1	12,000.00	12,000
		lump sum		2,000.00	
	Ditching and Welding	metre		33.00	
	PE Liner Installation	metre			
	Timber Salvage	metre		5.00	
	Topsoil Conservation	metre		1.50	
	Extra Cover	metre			
	250 mm	metre		1.00	
	500 mm			2.00	
	750 mm	metre		3.00	
	1000 mm	metre		4.00	
	Welder Qualification Costs	each	2	200.00	400
	Ditch Padding				
	select material	M3		28.00	
	earth filled sacks	each		4.00	
	sand filled sacks	each		5.00	
	Rockshield	metre		4.00	
	Rock Excavation	M3		200.00	
	Concrete Weights				
	saddle weights	each		60.00	
	clamp-on weights	each		90.00	
	Crossings				
	road - open cut	each		1,200.00	
	road - bored, uncased	each		1,800.00	
	road - bored, cased	each		2,200.00	
	cable	each		1,200.00	
	pipeline - over existing	each		1,000.00	
	pipeline - under existing	each		1,500.00	
	pipeline - under several railway	each		2,800.00	
	Water Crossings				
	minor	each		10,000.00	
	major	each		20,000.00	
	Cathodic Protection				
	single pole	each		190.00	
	double pole	each		250.00	
	Frost ripping	metre		0.50	
	Concrete placement	M3		200.00	
	Pipe supports	each		100.00	
	Concrete pipe anchors	each		2,500.00	
	Z-bends	each		900.00	
	Ditch plugs	each		4,000.00	

Diversion berms	each		3,500.00	
Radiography	kilometre		2,000.00	
Surveying	kilometre		2,500.00	
Inspection	day	15	500.00	7,500
Geo-Technical Study	variable			
Drafting	lump sum	1	7,500.00	7,500
Re-Cheave Pumps	lump sum	1	4,000.00	4,000
Miscellaneous			4%	1,300
TOTAL CONTRACT AND SERVICE WORK				**33,000**
030 COMPANY LABOUR				
Head office company labour	% of direct costs	93,000	5%	4,650
Field company labour	man-months	2	6,000.00	9,000
TOTAL COMPANY LABOUR				**14,000**
070 UNCLASSIFIED				
Land damages	hectare		300.00	
Easements	hectare		2,500.00	
TOTAL UNCLASSIFIED				
090 LEASE EQUIPMENT (CONTROLLABLE)				
Pipe	metre		12.50	
External coating	metre		2.50	
Internal coating/liner	metre			
Fired heaters	lump sum			
Tanks	lump sum			
Stacks	lump sum			
Building Extension	lump sum	1	18,000.00	18,000
Valves				
ball, plug or globe	each	7	2,000.00	14,000
check	each	6	1,500.00	9,000
pigging	each		2,500.00	
Instrumentation				
ESD valve	each	1	6,000.00	6,000
Pressure or flow control	each		3,500.00	
meter run c/w recorder	each		3,500.00	
flow meter	each		800.00	
other	each			
Other				
Miscellaneous			4%	1,880
TOTAL LEASE EQUIPMENT (CONTROLLABLE)				**49,000**

091 LEASE EQUIPMENT (NON-CONTROLLABLE)

Pipe, fittings and flanges	lump sum	1	2,000.00	2,000
Small valves				
ball, plug or globe	each	1	200.00	200
check	each	1	100.00	100
gauge	each	1	100.00	100
Other				
Other				
Miscellaneous				
TOTAL LEASE EQUIPMENT (NON-CONTROLLABLE)				**2,000**
TOTAL PIPELINE COST	Accuracy (+ or -)	20%		**$98,000**
Cost Per Inch Mile				