Computer Inventoried

**Oilfield Research Laboratories**

**GENERAL INFORMATION & SUMMARY**

Company Lancer Oil, Inc. Lease Glades Well No. 9-W

Location

Section 9 Twp. 24S Rge. 16E County Woodson State Kansas

| | |
|---|---|
| Elevation, Feet | |
| Name of Sand | Lower Squirrel |
| Top of Core | 1001.0 |
| Bottom of Core | 1018.0 |
| Top of Sand (Tested) | 1002.0 |
| Bottom of Sand (Tested) | 1012.3 |
| Total Feet of Permeable Sand | 10.1 |
| Total Feet of Floodable Sand | 2.0 |

| Distribution of Permeable Sand: Permeability Range Millidarcys | Feet | Cum. Ft. |
|---|---|---|
| 0 - 2 | 4.3 | 4.3 |
| 2 - 3 | 2.2 | 6.5 |
| 15 - 20 | 1.0 | 7.5 |
| 24 & above | 2.6 | 10.1 |

| | |
|---|---|
| Average Permeability Millidarcys | 9.2 |
| Average Percent Porosity | 17.1 |
| Average Percent Oil Saturation | 54.3 |
| Average Percent Water Saturation | 35.9 |
| Average Oil Content, Bbls./A. Ft. | 732. |
| Total Oil Content, Bbls./Acre | 7,389. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 3.5 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 52. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 103. |
| Total Calculated Oil Recovery, Bbls./Acre | See "Calculated Recovery" Section |

The cores were sampled and the samples sealed in plastic bags by a representative of the client.

## FORMATION CORED

The detailed log of the formation cored is as follows:

| Depth Interval, Feet | Description |
|---|---|
| | UPPER SQUIRREL SANDSTONE |
| 952.0 - 953.0 | Sandstone, light grayish brown, very shaly, slightly calcareous with scattered light gray shaly sandstone streaks. |
| 953.0 - 953.3 | Shale, gray, calcareous. |
| 953.3 - 954.5 | Limestone, light gray, shaly. |
| 954.5 - 955.0 | Shale, gray, calcareous. |
| 955.0 - 956.0 | Sandstone, grayish brown, very shaly. |
| 956.0 - 957.4 | Sandstone, light grayish brown, very shaly with widely scattered shale and mica inclusions. |
| 957.4 - 960.0 | Sandstone, brown with widely scattered shale and mica inclusions. |
| 960.0 - 961.3 | Sandstone, brown. |
| 961.3 - 962.0 | Sandstone, brown with widely scattered shale and mica partings and inclusions. |
| 962.0 - 963.0 | Sandstone, brown, slightly shaly with scattered shale partings. |
| 963.0 - 964.0 | Sandstone, brown. |
| 964.0 - 965.0 | Sandstone, brown with scattered shale partings. |
| 965.0 - 967.0 | Shale, gray with widely scattered shale partings. |

## LOWER SQUIRREL SANDSTONE

| | |
|---|---|
| 1001.0 - 1001.7 | Limestone, gray, shaly, fossiliferous. |
| 1001.7 - 1002.0 | Sandstone, brown, shaly, calcareous, fossiliferous. |
| 1002.0 - 1005.2 | Sandstone, light grayish brown, very shaly with widely scattered shale and mica inclusions. |
| 1005.2 - 1006.2 | Sandstone, brown, shaly with widely scattered shale and mica inclusions. |
| 1006.2 - 1008.8 | Sandstone, brown with widely scattered shale and mica partings and inclusions. |
| 1008.8 - 1009.0 | Shale, gray. |
| 1009.0 - 1010.0 | Sandstone, dark brown, slightly calcareous with widely scattered shale and mica partings and inclusions. |
| 1010.0 - 1012.3 | Sandstone, brownish black, shaly, carbonaceous with scattered shale and mica partings and inclusions. |
| 1012.3 - 1013.0 | Sandstone, grayish black, shaly, carbonaceous, with scattered shale and mica partings and inclusions. |
| 1013.0 - 1018.0 | Shale, (Discarded at well site). |

## LABORATORY FLOODING TESTS

### UPPER SQUIRREL SANDSTONE

The Upper Squirrel Sand in this core responded to laboratory flooding tests, as a total recovery of 427 barrels of oil per acre was obtained from 5.9 feet of sand. The weighted average percent oil saturation was reduced from 38.4 to 33.4, or represents an average recovery of 5.0 percent. The weighted average effective permeability of the samples is 4.84 millidarcys, while the average initial fluid production pressure is 22.5 pounds per

square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, 6 produced water and oil, and 1 produced water only. This indicates that approximately 60 percent of the sand represented by these samples is floodable pay sand.

## LABORATORY FLOODING TESTS

### LOWER SQUIRREL SANDSTONE

The Lower Squirrel Sand in this core responded to laboratory flooding tests, as a total recovery of 103 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 53.5 to 50.0, or represents an average recovery of 3.5 percent. The weighted average effective permeability of the samples is 0.43 millidarcys, while the average initial fluid production pressure is 35.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 2 produced water and oil and 3 produced water only. This indicates that approximately 22 percent of the sand represented by these samples is floodable pay sand.

## CALCULATED RECOVERY

### UPPER SQUIRREL SANDSTONE

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well

should recover approximately 1,257 barrels of oil per acre. This is an average recovery of 213 barrels per acre foot from 5.9 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

| | |
|---|---|
| Original formation volume factor, estimated | 1.06 |
| Reservoir water saturation, percent, estimated | 30.0 |
| Average porosity, percent | 18.7 |
| Oil saturation after flooding, percent | 33.4 |
| Performance factor, percent, estimated | 45.0 |
| Net floodable sand, feet | 5.9 |

## CALCULATED RECOVERY

## LOWER SQUIRREL SANDSTONE

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 273 barrels of oil per acre. This is an average recovery 137 barrels per acre foot from 2.0 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

| | |
|---|---|
| Original formation volume factor, estimated | 1.05 |
| Reservoir water saturation, percent, estimated | 30.0 |
| Average porosity, percent | 19.2 |

| | |
|---|---|
| Oil saturation after flooding, percent | 50.0 |
| Performance factor, percent, estimated | 55.0 |
| Net floodable sand, feet | 2.0 |

The results expressed herein are the best professional opinion of the personnel of Oilfield Research Laboratories based on the rock properties determined from this core by generally accepted laboratory practices. We assume no responsibility or liability for the use of these data for purposes other than intended by the analysis of this core or circumstances over which we have no control. This report has been prepared for the exclusive use of our client.

## Oilfield Research Laboratories

### RESULTS OF SATURATION & PERMEABILITY TESTS

### TABLE 1-B

Company Lancer Oil, Inc. Lease Glades Well No. 9-W

| Sample No. | Depth, Feet | Effective Porosity Percent | Percent Saturation | | | Oil Content Bbls. / A Ft. | Perm., Mill. | Feet of Sand | | Total Oil Content | Perm. Capacity Ft. X md. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Water | Total | | | Ft. | Cum. Ft. | | |
| | | | | | UPPER SQUIRREL SANDSTONE | | | | | | |
| 1 | 955.5 | 15.4 | 49 | 39 | 88 | 585 | 1.0 | 1.0 | 1.0 | 585 | 1.00 |
| 2 | 956.4 | 14.4 | 29 | 50 | 79 | 324 | 0.22 | 1.4 | 2.4 | 454 | 0.31 |
| 3 | 957.5 | 17.7 | 39 | 35 | 74 | 536 | 40. | 0.6 | 3.0 | 322 | 24.00 |
| 4 | 958.5 | 17.4 (18.0) | 38 | 35 | 73 | 513 (523) | 32. | 1.0 | 4.0 | 513 | 32.00 |
| 5 | 959.5 | 18.0 | 36 | 33 (35.5) | 69 | 503 | 46. (45) | 1.0 | 5.0 | 503 | 46.00 |
| 6 | 960.5 | 18.9 | 37 | 39 | 76 | 543 | 61. | 1.3 | 6.3 | 706 | 79.30 |
| 7 | 961.4 | 17.3 | 42 | 38 | 80 | 564 | 43. | 0.7 | 7.0 | 395 | 30.10 |
| 8 | 962.5 | 15.1 | 51 | 36 | 87 | 597 | 5.5 | 1.0 | 8.0 | 597 | 5.50 |
| 9 | 963.5 | 18.5 | 41 | 34 | 75 | 588 | 63. | 1.0 | 9.0 | 588 | 63.00 |
| 10 | 964.5 | 19.7 | 40 | 30 | 70 | 611 | 46. | 1.0 | 10.0 | 611 | 46.00 |
| | | | | | LOWER SQUIRREL SANDSTONE | | | | | | |
| 11 | 1002.7 | 14.6 | 40 | 45 | 85 | 453 | 1.6 | 1.0 | 11.0 | 453 | 1.60 |
| 12 | 1003.6 | 13.6 | 37 | 52 | 89 | 390 | 0.15 | 1.0 | 12.0 | 390 | 0.15 |
| 13 | 1004.4 | 15.4 | 38 | 50 | 88 | 454 | 2.5 | 1.2 | 13.2 | 545 | 3.00 |
| 14 | 1005.8 | 17.0 | 73 | 25 | 98 | 963 | 2.3 | 1.0 | 14.2 | 963 | 2.30 |
| 15 | 1006.7 | 18.5 (19.1) | 56 | 32 (34) | 88 | 804 (791) | 16. (22) | 1.0 | 15.2 | 804 | 16.00 |
| 16 | 1007.6 | 19.7 | 51 | 36 | 87 | 779 | 28. | 1.0 | 16.2 | 779 | 28.00 |
| 17 | 1008.4 | 17.6 | 54 | 32 | 86 | 737 | 24. | 0.6 | 16.8 | 442 | 14.40 |
| 18 | 1009.3 | 17.1 | 52 | 38 | 90 | 690 | 24. | 1.0 | 17.8 | 690 | 24.00 |
| 19 | 1010.4 | 18.6 | 70 | 24 | 94 | 1010 | 1.4 | 2.3 | 20.1 | 2323 | 3.22 |

## Oilfield Research Laboratories

### SUMMARY OF PERMEABILITY & SATURATION TESTS

### TABLE III

Company Lancer Oil, Inc. Lease Glades Well No. 9-W

| Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity Ft. x Md. |
|---|---|---|---|
| | UPPER SQUIRREL SANDSTONE | | |
| 955.0 - 957.4 | 2.4 | 0.55 | 1.31 |
| 957.4 - 965.0 | 7.6 | 42.9 | 325.90 |
| 955.0 - 965.0 | 10.0 | 32.7 | 327.21 |
| | LOWER SQUIRREL SANDSTONE | | |
| 1002.0 - 1005.2 | 3.2 | 1.5 | 4.75 |
| 1005.2 - 1012.3 | 6.9 | 12.7 | 87.92 |
| 1002.0 - 1012.3 | 10.1 | 9.2 | 92.67 |

| Depth Interval, Feet | Feet of Core Analyzed | Average Percent Porosity | Average Percent Oil Saturation | Average Percent Water Saturation | Average Oil Content Bbl./A. Ft. | Total Oil Content Bbls./Acre |
|---|---|---|---|---|---|---|
| | | UPPER SQUIRREL SANDSTONE | | | | |
| 955.0 - 957.4 | 2.4 | 14.8 | 37.3 | 45.4 | 433 | 1,039 |
| 957.4 - 965.0 | 7.6 | 17.9 | 40.4 | 35.0 | 557 | 4,235 |
| 955.0 - 965.0 | 10.0 | 17.2 | 39.7 | 37.5 | 527 | 5,274 |
| | | LOWER SQUIRREL SANDSTONE | | | | |
| 1002.0 - 1005.2 | 3.2 | 14.6 | 38.3 | 49.1 | 434 | 1,388 |
| 1005.2 - 1012.3 | 6.9 | 18.2 | 61.7 | 29.8 | 870 | 6,001 |
| 1002.0 - 1012.3 | 10.1 | 17.1 | 54.3 | 35.9 | 732 | 7,389 |

# Oilfield Research Laboratories

## RESULTS OF LABORATORY FLOODING TESTS

### TABLE IV

Company Lancer Oil, Inc. Lease Glades Well No. 9-W

| Sample No. | Depth, Feet | Effective Porosity Percent | Original Oil Saturation | | Oil Recovery | | Residual Saturation | | | Volume of Water Recovered cc* | Effective Permeability Millidarcys** | Initial Fluid Production Pressure Lbs./Sq./In. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % | Bbls./A. Ft. | % | Bbls./A. Ft. | % Oil | % Water | Bbls./A. Ft. | | | |
| | | | | | UPPER SQUIRREL SANDSTONE | | | | | | | |
| 1 | 955.5 | 15.1 | 49 | 574 | 0 | 0 | 49 | 39 | 574 | 0 | Imp. | - |
| 2 | 956.4 | 14.6 | 29 | 328 | 0 | 0 | 29 | 51 | 328 | 0 | Imp. | - |
| 3 | 957.5 | 17.5 | 39 | 529 | 6 | 81 | 33 | 64 | 448 | 328 | 6.40 | 20 |
| 4 | 958.5 | 17.9 | 38 | 528 | 7 | 97 | 31 | 67 | 431 | 146 | 2.40 | 30 |
| 5 | 959.5 | 18.3 | 36 | 511 | 2 | 28 | 34 | 62 | 483 | 291 | 5.20 | 20 |
| 6 | 960.5 | 19.2 | 37 | 551 | 6 | 89 | 31 | 67 | 462 | 198 | 4.40 | 25 |
| 7 | 961.4 | 17.3 | 42 | 564 | 0 | 0 | 42 | 55 | 564 | 25 | 0.43 | 45 |
| 8 | 962.5 | 15.1 | 51 | 597 | 0 | 0 | 51 | 36 | 597 | 0 | Imp. | - |
| 9 | 963.5 | 18.7 | 41 | 595 | 2 | 29 | 39 | 58 | 566 | 386 | 1.00 | 20 |
| 10 | 964.5 | 19.9 | 40 | 618 | 7 | 108 | 33 | 64 | 510 | 578 | 10.40 | 20 |
| | | | | | LOWER SQUIRREL SANDSTONE | | | | | | | |
| 11 | 1002.7 | 14.6 | 40 | 453 | 0 | 0 | 40 | 46 | 453 | 0 | Imp. | - |
| 12 | 1003.6 | 13.9 | 37 | 399 | 0 | 0 | 37 | 53 | 399 | 0 | Imp. | - |
| 13 | 1004.4 | 15.1 | 38 | 445 | 0 | 0 | 38 | 52 | 445 | 0 | Imp. | - |
| 14 | 1005.8 | 16.6 | 73 | 940 | 0 | 0 | 73 | 25 | 940 | 13 | 0.07 | 50 |
| 15 | 1006.7 | 18.5 | 56 | 804 | 4 | 57 | 52 | 46 | 747 | 41 | 0.52 | 35 |
| 16 | 1007.6 | 19.8 | 51 | 783 | 3 | 46 | 48 | 49 | 737 | 21 | 0.33 | 35 |
| 17 | 1008.4 | 17.8 | 54 | 746 | 0 | 0 | 54 | 42 | 746 | 11 | 0.13 | 45 |
| 18 | 1009.3 | 17.5 | 52 | 706 | 0 | 0 | 52 | 45 | 706 | 9 | 0.20 | 50 |
| 19 | 1010.4 | 18.3 | 70 | 994 | 0 | 0 | 70 | 24 | 994 | 0 | Imp. | - |

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

## Oilfield Research Laboratories

### SUMMARY OF LABORATORY FLOODING TESTS

### TABLE V

Company Lancer Oil, Inc. Lease Glades Well No. 9-W

| | UPPER SQUIRREL SANDSTONE | LOWER SQUIRREL SANDSTONE |
|---|---|---|
| Depth Interval, Feet | 957.4 - 965.0 | 1005.2 - 1012.3 |
| Feet of Core Analyzed | 5.9 | 2.0 |
| Average Percent Porosity | 18.7 | 19.2 |
| Average Percent Original Oil Saturation | 38.4 | 53.5 |
| Average Percent Oil Recovery | 5.0 | 3.5 |
| Average Percent Residual Oil Saturation | 33.4 | 50.0 |
| Average Percent Residual Water Saturation | 63.8 | 47.5 |
| Average Percent Total Residual Fluid Saturation | 97.2 | 97.5 |
| Average Original Oil Content, Bbls./A. Ft. | 557. | 794. |
| Average Oil Recovery, Bbls./A. Ft. | 72. | 52. |
| Average Residual Oil Content, Bbls./A. Ft. | 485. | 742. |
| Total Original Oil Content, Bbls./Acre | 3,287. | 1,587. |
| Total Oil Recovery, Bbls./Acre | 427. | 103. |
| Total Residual Oil Content, Bbls./Acre | 2,860. | 1,484. |
| Average Effective Permeability, Millidarcys | 4.84 | 0.43 |
| Average Initial Fluid Production Pressure, p.s.i. | 22.5 | 35.0 |

NOTE: Only those samples which recovered oil were used in calculating the above averages.

— *COREGRAPH* —

# OILFIELD RESEARCH LABORATORIES

## LANCER OIL, INC.

LEASE Glades WELL NO. 9-W

FIELD

COUNTY Woodson STATE Kansas

LOCATION Section 9, T24S, R16E

INTERVAL CORED

DATE RECEIVED March 30, 1992

ELEVATION

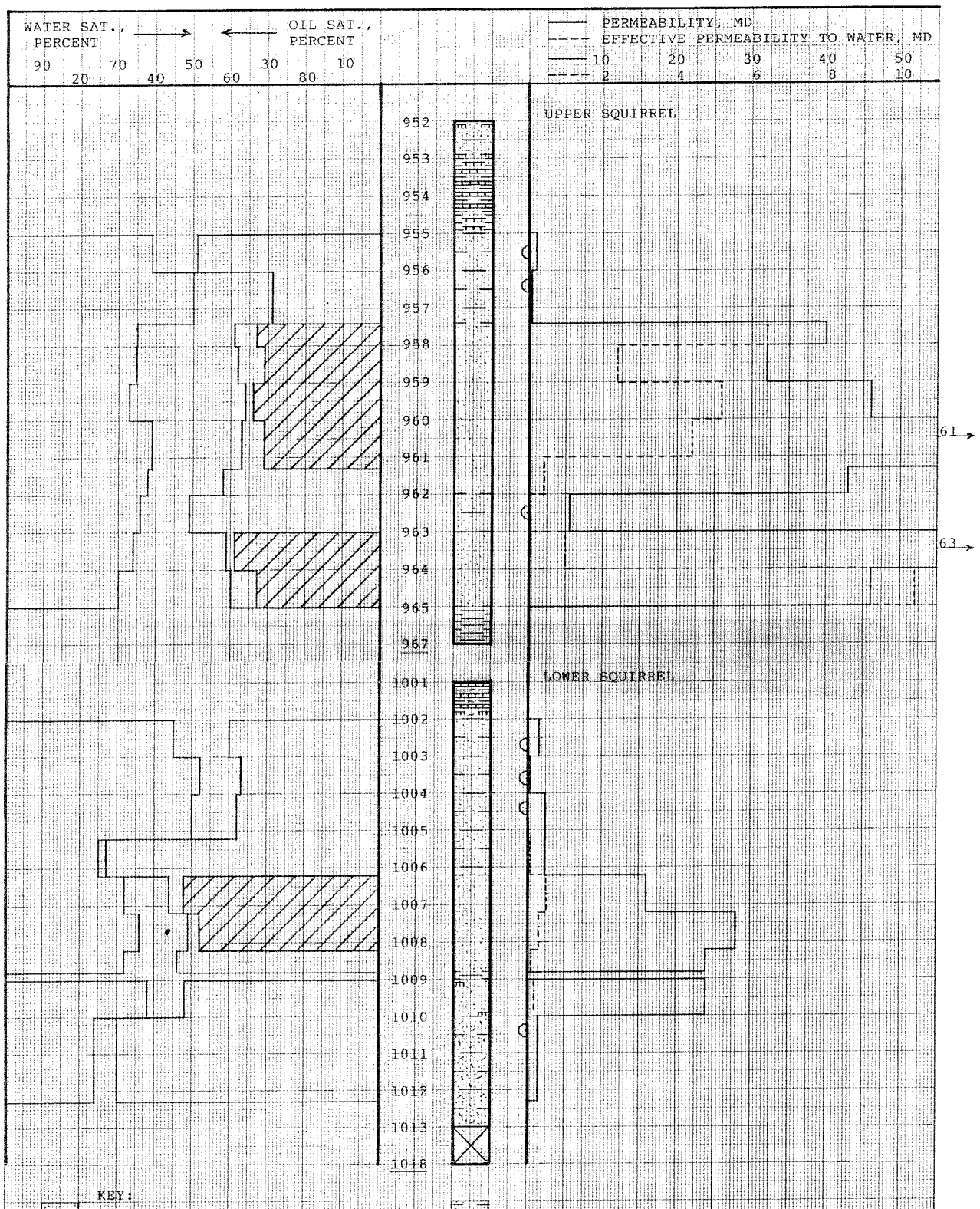
FORMATION Upper and Lower Squirrel

DRILLING FLUID

TYPE OF CORE Rotary

INTERVAL RECEIVED Upper Squirrel 952.0' - 967.0' Lower Squirrel 1001.0' - 1018.0'

NSCO-19890




| DEPTH INTERVAL, FEET | FEET OF CORE ANALYZED | AVERAGE POROSITY PERCENT | AVG. OIL SATURATION PERCENT | AVG. WATER SATURATION PERCENT | AVERAGE PERMEABILITY, MILLIDARCYS | CALCULATED OIL RECOVERY BBLS./ACRE |
|---|---|---|---|---|---|---|
| **UPPER SQUIRREL SANDSTONE** | | | | | | |
| 955.0 - 957.4 | 2.4 | 14.8 | 37.3 | 45.4 | 0.55 | |
| 957.4 - 965.0 | 7.6 | 17.9 | 40.4 | 35.0 | 42.9 | |
| 955.0 - 965.0 | 10.0 | 17.2 | 39.7 | 37.5 | 32.7 | 1,257 |
| **LOWER SQUIRREL SANDSTONE** | | | | | | |
| 1002.0 - 1005.2 | 3.2 | 14.6 | 38.3 | 49.1 | 1.5 | |
| 1005.2 - 1012.3 | 6.9 | 18.2 | 61.7 | 29.8 | 12.7 | |
| 1002.0 - 1012.3 | 10.1 | 17.1 | 54.3 | 35.9 | 9.2 | 273 |
| | | | | | | (PRIMARY & WATERFLOODING) |

CHANUTE, KANSAS
APRIL, 1992 BJL