

# OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

May 3, 1966

20-28-18F

K-K Drilling Company  
P.O. Box 556  
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Converse Lease, Well No. CT-2, Neosho County, Kansas, and submitted to our laboratory, on April 29, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

*Benjamin R. Pearman*  
Benjamin R. Pearman

BRP:rf

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CONVERSE CT-2

# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company K-K Drilling Company Lease Converse Well No. CT-2

Location \_\_\_\_\_

Section 20 Twp. 28S Rge. 18E County Neosho State Kansas

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 762.0

Bottom of Core - - - - - 824.0

Top of Sand - - - - - 762.8

Bottom of Sand - - - - - 805.6

Total Feet of Permeable Sand - - - - - 12.3

Total Feet of Floodable Sand - - - - - 6.4

**Distribution of Permeable Sand:**

| Permeability Range<br>Millidarcys | Feet | Cum. Ft. |
|-----------------------------------|------|----------|
| 1 - 10                            | 2.9  | 2.9      |
| 10 - 20                           | 2.8  | 5.7      |
| 20 - 50                           | 2.8  | 8.5      |
| 50 - 100                          | 2.8  | 11.3     |
| 100 & above                       | 1.0  | 12.3     |

Average Permeability Millidarcys - - - - - 32.0

Average Percent Porosity - - - - - 16.0

Average Percent Oil Saturation - - - - - 28.7

Average Percent Water Saturation - - - - - 46.1

Average Oil Content, Bbls./A. Ft. - - - - - 355.

Total Oil Content, Bbls./Acre - - - - - 5,791.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 5.4

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 74.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 472.

Total Calculated Oil Recovery, Bbls./Acre - (Primary & Secondary) - - - - - 1,860.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

A. P. I. Gravity, degrees @ 60 °F - - - - -

Elevation, Feet - - - - -

Fresh water mud was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in plastic bags by a representative of Oilfield Research Laboratories. The well was drilled in non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

| <u>Depth Interval,</u><br><u>Feet</u> | <u>Description</u>                     |
|---------------------------------------|--|
| 762.0 - 762.8                         | Dark, laminated sandstone and shale.   |
| 762.8 - 767.8                         | Grayish, light brown, shaly sandstone. |
| 767.8 - 770.6                         | Brown shaly sandstone.                 |
| 770.6 - 788.8                         | Gray, laminated sandstone and shale.   |
| 788.8 - 792.4                         | Brown, laminated, shaly sandstone.     |
| 792.4 - 793.8                         | Dark carbonaceous sandstone.           |
| 793.8 - 795.3                         | Dark, laminated sandstone and shale.   |
| 795.3 - 796.0                         | Light brown sandstone.                 |
| 796.0 - 802.0                         | Black shale.                           |
| 802.0 - 805.6                         | Grayish, light brown, shaly sandstone. |
| 805.6 - 813.0                         | Sandy shale.                           |
| 813.0 - 815.0                         | Coal.                                  |
| 815.0 - 824.0                         | Shale.                                 |

Coring was started at a depth of 762.0 feet in sandstone and shale and completed at 824.0 feet in shale. For the most part, the pay is made up of brown, shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 47.0, 14.7 and 0.0 millidarcys respectively; the overall average being 32.0 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a rather irregular permeability profile. The permeability of the sand varies from impermeable to a maximum of 107. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 28.7. The weighted average percent oil saturation of the upper, middle and lower sections is 24.0, 34.2 and 28.8 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 52.2, 33.6 and 54.3 respectively; the overall average being 46.1 (See Table III). This gives an overall weighted average total fluid saturation of 74.8 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which was probably oil.

The weighted average oil content of the upper, middle and lower sections is 323, 422 and 314 barrels per acre foot respectively; the overall average being 355. The total oil content, as shown by this core, is 5,791 barrels per acre of which 2,714 barrels are in the floodable pay sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as

a total recovery of 472 barrels of oil per acre was obtained from 6.4 feet of sand. The weighted average percent oil saturation was reduced from 31.9 to 26.5, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 1.46 millidarcys, while the average initial fluid production pressure is 25.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 11 produced water and 7 oil. This indicates that approximately 41 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide variation in effective permeability to water.

#### CONCLUSION

The results of the laboratory tests indicate that efficient primary and secondary operations in the vicinity of this well should recover approximately 1,860 barrels of oil per acre or an average of 291 barrels per acre foot from the 6.4 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

|  |      |
|--|------|
| Original formation volume factor       | 1.06 |
| Reservoir water saturation, percent    | 27.0 |
| Average porosity, percent              | 17.1 |
| Oil saturation after flooding, percent | 26.5 |
| Performance factor, percent            | 50.0 |
| Net floodable pay sand, feet           | 6.4  |

This core shows a pay sand section having a good oil saturation, a moderate water saturation and a wide variation in effective permea-

bility to water.

Any primary oil already recovered from the area represented by this core should be subtracted from the above recovery values.

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**RESULTS OF SATURATION & PERMEABILITY TESTS**

**TABLE 1-B**

Company K-K Drilling Company Lease Converse Well No. CT-2

| 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. |                   |                          |
| 1          | 763.1       | 17.3                       | 19                 | 42    | 61    | 254                       | 8.3          | 0.8          | 0.8      | 203               | 6.64                     |
| 2          | 764.1       | 20.7                       | 16                 | 77    | 93    | 257                       | 107.         | 1.0          | 1.8      | 257               | 107.00                   |
| 3          | 765.1       | 18.3                       | 10                 | 70    | 80    | 142                       | 52.          | 1.0          | 2.8      | 142               | 52.00                    |
| 4          | 766.1       | 12.7                       | 21                 | 74    | 95    | 207                       | 17.          | 1.0          | 3.8      | 207               | 17.00                    |
| 5          | 768.1       | 15.2                       | 27                 | 37    | 64    | 318                       | 52.          | 0.8          | 4.6      | 254               | 41.60                    |
| 6          | 769.1       | 17.7                       | 35                 | 33    | 68    | 481                       | 62.          | 1.0          | 5.6      | 481               | 62.00                    |
| 7          | 770.1       | 19.0                       | 40                 | 27    | 67    | 589                       | 24.          | 1.0          | 6.6      | 589               | 24.00                    |
| 8          | 789.1       | 14.8                       | 25                 | 46    | 71    | 287                       | 12.          | 0.8          | 7.4      | 230               | 9.60                     |
| 9          | 790.1       | 17.4                       | 33                 | 33    | 66    | 444                       | 22.          | 1.0          | 8.4      | 444               | 22.00                    |
| 10         | 791.1       | 17.3                       | 30                 | 34    | 64    | 402                       | 11.          | 1.0          | 9.4      | 402               | 11.00                    |
| 11         | 792.1       | 18.2                       | 30                 | 33    | 63    | 423                       | 38.          | 0.8          | 10.2     | 338               | 30.40                    |
| 12         | 793.1       | 14.9                       | 46                 | 25    | 71    | 531                       | 6.9          | 1.4          | 11.6     | 744               | 9.66                     |
| 13         | 795.6       | 13.6                       | 33                 | 36    | 69    | 348                       | 1.4          | 0.7          | 12.3     | 244               | 0.98                     |
| 14         | 803.1       | 13.0                       | 26                 | 62    | 88    | 262                       | Imp.         | 1.0          | 13.3     | 262               | 0.00                     |
| 15         | 804.1       | 14.3                       | 30                 | 50    | 80    | 332                       | Imp.         | 1.0          | 14.3     | 332               | 0.00                     |
| 16         | 805.1       | 14.9                       | 36                 | 40    | 76    | 416                       | Imp.         | 1.0          | 15.3     | 416               | 0.00                     |
| 17         | 806.1       | 13.8                       | 23                 | 65    | 88    | 246                       | Imp.         | 1.0          | 16.3     | 246               | 0.00                     |
|            |             |                            |                    |       |       |                           |              | Total        | -----    | 5,791             |                          |

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### SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company K-K Drilling Company Lease Converse Well No. CT-2

| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. |
|-------------------------|--------------------------|---|---------------------------------------|
| 762.0 - 770.6           | 6.6                      | 47.0                                    | 310.24                                |
| 788.8 - 796.0           | 5.7                      | 14.7                                    | 83.64                                 |
| 802.6 - 806.6           | 0.0                      | 0.0                                     | 0.00                                  |
| 762.0 - 806.6           | 12.3                     | 32.0                                    | 393.88                                |

| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Percent<br>Porosity | Average<br>Percent Oil<br>Saturation | Average<br>Percent Water<br>Saturation | Average<br>Oil Content<br>Bbl./A. Ft. | Total Oil<br>Content<br>Bbls./Acre |
|-------------------------|--------------------------|--------------------------------|--------------------------------------|--|---------------------------------------|------------------------------------|
| 762.0 - 770.6           | 6.6                      | 17.4                           | 24.0                                 | 52.2                                   | 323                                   | 2,133                              |
| 788.8 - 796.0           | 5.7                      | 16.0                           | 34.2                                 | 33.6                                   | 422                                   | 2,402                              |
| 802.6 - 806.6           | 4.0                      | 14.0                           | 28.8                                 | 54.3                                   | 314                                   | 1,256                              |
| 762.0 - 806.6           | 16.3                     | 16.0                           | 28.7                                 | 46.1                                   | 355                                   | 5,791                              |

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## RESULTS OF LABORATORY FLOODING TESTS

**TABLE IV**

Company K-K Drilling Company Lease Converse Well No. CT-2

| 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. |                               |                                      |  |
| 1          | 763.1       | 16.8                       | 18                      | 234          | 0            | 0            | 18                  | 70      | 234          | 36                            | 1.00                                 | 20   |
| 2          | 764.1       | 20.4                       | 18                      | 284          | 0            | 0            | 18                  | 76      | 284          | 476                           | 25.50                                | 10   |
| 3          | 765.1       | 18.5                       | 12                      | 172          | 0            | 0            | 12                  | 79      | 172          | 353                           | 15.00                                | 10   |
| 4          | 766.1       | 13.2                       | 21                      | 215          | 0            | 0            | 21                  | 67      | 215          | 77                            | 1.80                                 | 20   |
| 5          | 768.1       | 15.5                       | 27                      | 324          | 3            | 36           | 24                  | 69      | 288          | 62                            | 1.60                                 | 20   |
| 6          | 769.1       | 17.3                       | 35                      | 469          | 8            | 107          | 27                  | 63      | 362          | 80                            | 2.20                                 | 20   |
| 7          | 770.1       | 18.5                       | 40                      | 574          | 14           | 201          | 26                  | 65      | 373          | 73                            | 1.70                                 | 30   |
| 8          | 789.1       | 15.2                       | 25                      | 294          | 2            | 24           | 23                  | 65      | 270          | 32                            | 0.800                                | 30   |
| 9          | 790.1       | 17.7                       | 33                      | 452          | 3            | 41           | 30                  | 57      | 411          | 35                            | 1.00                                 | 30   |
| 10         | 791.1       | 17.0                       | 30                      | 395          | 4            | 53           | 26                  | 56      | 342          | 27                            | 0.700                                | 30   |
| 11         | 792.1       | 17.7                       | 30                      | 411          | 2            | 27           | 28                  | 54      | 384          | 92                            | 2.30                                 | 20   |
| 12         | 793.1       | 15.0                       | 46                      | 534          | 0            | 0            | 46                  | 24      | 534          | 0                             | Imp.                                 | -  |
| 13         | 795.6       | 13.8                       | 34                      | 364          | 0            | 0            | 34                  | 37      | 364          | 0                             | Imp.                                 | -  |
| 14         | 803.1       | 13.1                       | 26                      | 264          | 0            | 0            | 26                  | 63      | 264          | 0                             | Imp.                                 | -  |
| 15         | 804.1       | 14.5                       | 31                      | 348          | 0            | 0            | 31                  | 50      | 348          | 0                             | Imp.                                 | -  |
| 16         | 805.1       | 14.7                       | 37                      | 421          | 0            | 0            | 37                  | 42      | 421          | 0                             | Imp.                                 | -  |
| 17         | 806.1       | 14.2                       | 23                      | 253          | 0            | 0            | 23                  | 67      | 253          | 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.

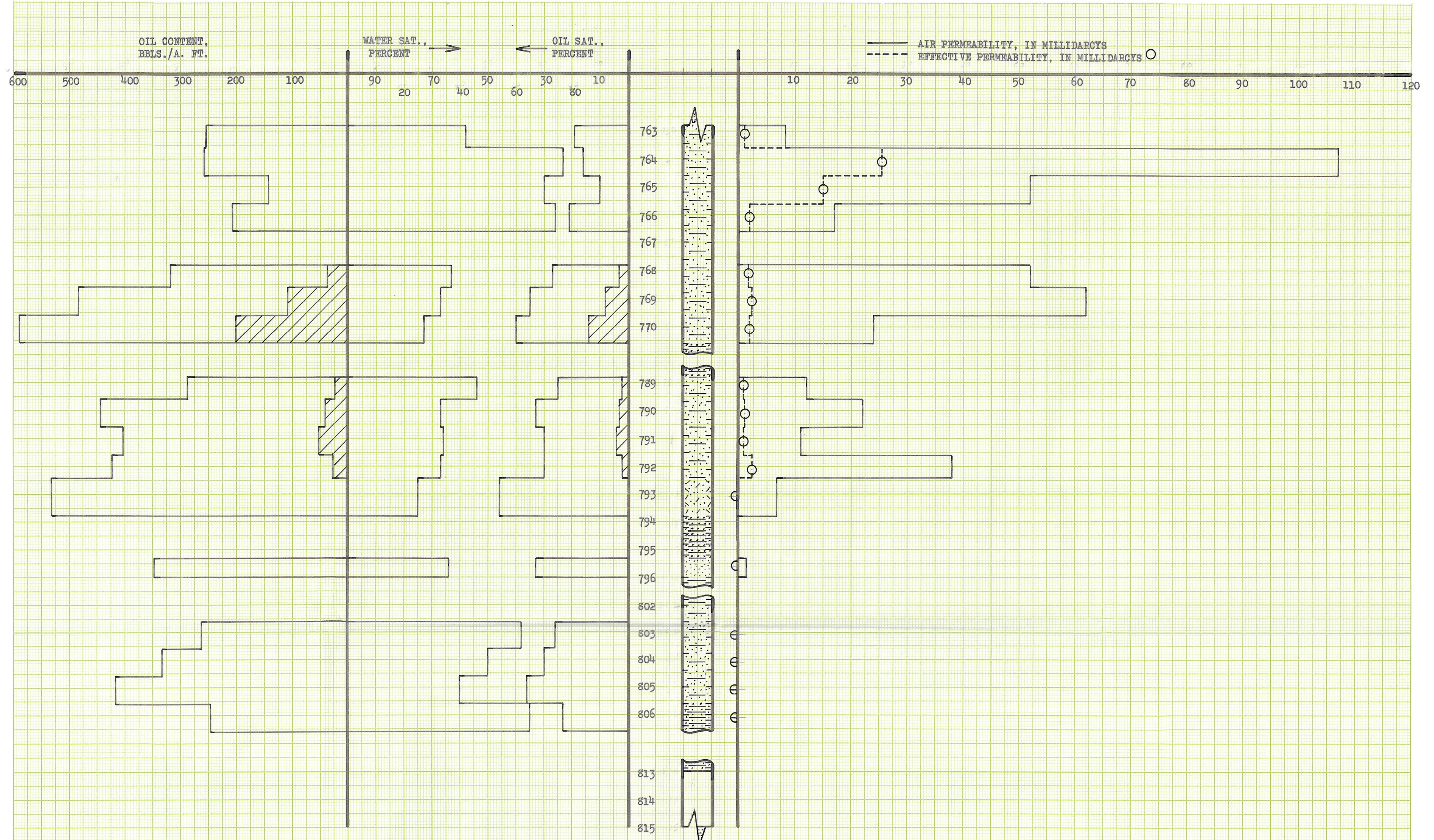
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### SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

|   |                       |                      |
|---|-----------------------|----------------------|
| Company <u>K-K Drilling Company</u>               | Lease <u>Converse</u> | Well No. <u>CT-2</u> |
| Depth Interval, Feet                              | 767.8 - 792.4         |                      |
| Feet of Core Analyzed                             | 6.4                   |                      |
| Average Percent Porosity                          | 17.1                  |                      |
| Average Percent Original Oil Saturation           | 31.9                  |                      |
| Average Percent Oil Recovery                      | 5.4                   |                      |
| Average Percent Residual Oil Saturation           | 26.5                  |                      |
| Average Percent Residual Water Saturation         | 61.1                  |                      |
| Average Percent Total Residual Fluid Saturation   | 87.6                  |                      |
| Average Original Oil Content, Bbls./A. Ft.        | 425.                  |                      |
| Average Oil Recovery, Bbls./A. Ft.                | 74.                   |                      |
| Average Residual Oil Content, Bbls./A. Ft.        | 351.                  |                      |
| Total Original Oil Content, Bbls./Acre            | 2,714.                |                      |
| Total Oil Recovery, Bbls./Acre                    | 472.                  |                      |
| Total Residual Oil Content, Bbls./Acre            | 2,242.                |                      |
| Average Effective Permeability, Millidarcys       | 1.46                  |                      |
| Average Initial Fluid Production Pressure, p.s.i. | 25.7                  |                      |

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



- FLOOD POT RECOVERY  
 SANDSTONE
- SHALY SANDSTONE  
 CARBONACEOUS SANDSTONE  
 LAMINATED SANDSTONE & SHALE
- SANDY SHALE  
 SHALE  
 COAL
- IMPERMEABLE TO AIR  
 IMPERMEABLE TO WATER

**K - K DRILLING COMPANY**  
 CONVERSE LEASE                      WELL NO. CT-2  
 NEOSHO COUNTY, KANSAS

| DEPTH INTERVAL,<br>FEET | FEET OF CORE<br>ANALYZED | AVERAGE<br>POROSITY,<br>PERCENT | AVG. OIL<br>SATURATION<br>PERCENT | AVG. WATER<br>SATURATION<br>PERCENT | AVG. OIL<br>CONTENT<br>BBLs./A. FT. | TOTAL OIL<br>CONTENT<br>BBLs./ACRE | AVG. AIR<br>PERMEABILITY,<br>MILLIDARCY | CALCULATED<br>OIL RECOVERY,<br>BBLs./ACRE |
|-------------------------|--------------------------|---------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|------------------------------------|---|---|
| 762.0 - 770.6           | 6.6                      | 17.4                            | 24.0                              | 52.2                                | 323                                 | 2,133                              | 47.0                                    |   |
| 788.8 - 796.0           | 5.7                      | 16.0                            | 34.2                              | 33.6                                | 422                                 | 2,402                              | 14.7                                    |   |
| 802.6 - 806.6           | 4.0                      | 14.0                            | 28.8                              | 54.3                                | 314                                 | 1,256                              | 0.0                                     |   |
| 762.0 - 806.6           | 16.3                     | 16.0                            | 28.7                              | 46.1                                | 355                                 | 5,791                              | 32.0                                    | 1,860 (Primary & Secondary)               |