



# OILFIELD RESEARCH LABORATORIES

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

June 28, 1966

Cora Oil Company  
Box 636  
Independence, Kansas

Gentlemen:

Enclosed herewith is a report of the analysis of the Rotary core taken from the Catlett Lease, Well No. 0-25, Montgomery County, Kansas and submitted to our laboratory on June 23, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:cm

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# Oilfield Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Cora Oil Company Lease Catlett Well No. 0-25

Location 450' South of NW Corner on West Line

Section 8<sup>2</sup> Twp. 33S Rge. 16E County Montgomery State Kansas

|                               |                     |       |
|-------------------------------|---------------------|-------|
| Name of Sand                  | - - - - -           | Peru  |
| Top of Core                   | - - - - -           | 460.0 |
| Bottom of Core                | - - - - -           | 486.0 |
| Top of Sand                   | - - - (Cored) - - - | 460.0 |
| Bottom of <sup>Pay</sup> Sand | - - - - -           | 481.6 |
| Total Feet of Permeable Sand  | - - - - -           | 25.5  |
| Total Feet of Floodable Sand  | - - - - -           | 19.5  |

### Distribution of Permeable Sand: Permeability Range Millidarcys

|            | Feet | Cum. Ft. |
|------------|------|----------|
| 0 - 10     | 2.5  | 2.5      |
| 10 - 25    | 4.6  | 7.1      |
| 25 - 50    | 10.0 | 17.1     |
| 50 & above | 8.4  | 25.5     |

|                                                                 |           |        |
|-----------------------------------------------------------------|-----------|--------|
| Average Permeability Millidarcys                                | - - - - - | 28.1   |
| Average Percent Porosity                                        | - - - - - | 18.4   |
| Average Percent Oil Saturation                                  | - - - - - | 23.5   |
| Average Percent Water Saturation                                | - - - - - | 51.8   |
| Average Oil Content, Bbls./A. Ft.                               | - - - - - | 337.   |
| Total Oil Content, Bbls./Acre                                   | - - - - - | 8,583. |
| Average Percent Oil Recovery by Laboratory Flooding Tests       | - - - - - | 2.6    |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | - - - - - | 38.    |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre     | - - - - - | 735.   |
| Total Calculated Oil Recovery, Bbls./Acre                       | - - - - - | 3,217. |
| Packer Setting, Feet                                            | - - - - - |        |
| Viscosity, Centipoises @                                        | - - - - - |        |
| A. P. I. Gravity, degrees @ 60 °F                               | - - - - - |        |
| Elevation, Feet                                                 | - - - - - |        |

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. The core was sampled and submitted to our laboratory by the client.

#### FORMATION CORED

The detailed log of the formation cored is as follows:

| Depth Interval, Description |
|-----------------------------|
| <u>Feet</u>                 |

|                                                 |
|-------------------------------------------------|
| 460.0 - 482.6 - Brown slightly shaly sandstone. |
|-------------------------------------------------|

|                                                       |
|-------------------------------------------------------|
| 482.6 - 486.0 - Light brown slightly shaly sandstone. |
|-------------------------------------------------------|

Coring was started at a depth of 460.0 feet in brown slightly shaly sandstone and completed at 486.0 feet in light brown slightly shaly sandstone. This core shows a total of 26.0 feet of sandstone. The pay is made up of brown fine grained slightly shaley 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 19.6, 44.6 and 64.2 millidarcys respectively; the overall average being 38.1 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a somewhat irregular permeability profile. The permeability of the sand varies from 3.3 to a maximum of 84 millidarcys.

In order to get some idea of the vertical effective permeability, 2 samples were taken at depths of 480.9 and 482.9 feet and tested (See Table 4). The tests show the vertical permeability to be much lower than the horizontal.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a low weighted average percent oil saturation, namely, 23.5. The weighted average percent oil saturation of the upper, middle and lower sections is 26.3, 24.3 and 15.2 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 50.3, 50.3 and 58.2 respectively; the overall average being 51.8 (See Table III). This gives an overall weighted average total fluid saturation of 75.3 percent. This low total fluid saturation indicates considerable fluid was lost during coring which was probably oil.

The weighted average oil content of the upper, middle and lower sections is 362, 356 and 230 barrels per acre foot respectively; the overall average being 337. The total oil content, as shown by this core, is 8,583 barrels per acre of which 7,570 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

When taking into consideration that the sand in the core has a low oil saturation, one would expect very little oil to be recovered from the samples by flood-pot tests. However, a total recovery of 735 barrels of oil per acre was obtained from 19.5 feet of sand. The weighted average percent oil saturation was reduced from 25.6 to 23.0, or represents an average recovery of 2.6 percent. The weighted average effective permeability of the samples is 2.53 millidarcys, while the average initial fluid production pressure is 20.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 23 samples tested, all produced water and 20 oil. This indicates that approximately 87 percent of the sand represented by these samples is floodable pay sand.

#### CONCLUSION

From a study of the above data, we estimate that approximately 3,217 barrels of oil per acre or an average of 165 barrels per acre foot can be recovered from the area, represented by this core, by efficient waterflooding. The following data and assumptions were used in calculating the above oil recovery value:

|                                        |      |
|----------------------------------------|------|
| Original formation volume factor       | 1.04 |
| Present formation volume factor        | 1.01 |
| Reservoir water saturation, percent    | 45.0 |
| Primary recovery, estimated, percent   | 7.0  |
| Present oil saturation, percent        | 46.4 |
| Average porosity, percent              | 18.4 |
| Oil saturation after flooding, percent | 23.0 |
| Performance factor                     | 0.50 |
| Net floodable pay sand, feet           | 19.5 |

This core shows a fairly clean sand section having a low oil saturation, a rather high water saturation and a wide variation in permeability. It is apparent that the part of the sand section extending from a depth of 481.6 to 486.0 feet (bottom of core) is not oil productive.

# Oilfield Research Laboratories

## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

| 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          | 460.1       | 15.9                       | 32                 | 54    | 86    | 396                       | 15.          | 0.6          | 0.6      | 238               | 9.00                     |
| 2          | 461.1       | 16.2                       | 27                 | 47    | 74    | 340                       | 12.          | 1.0          | 1.6      | 340               | 12.00                    |
| 3          | 462.1       | 18.2                       | 30                 | 46    | 76    | 424                       | 25.          | 1.0          | 2.6      | 424               | 25.00                    |
| 4          | 463.1       | 16.4                       | 24                 | 52    | 76    | 306                       | 5.4          | 1.0          | 3.6      | 306               | 5.40                     |
| 5          | 464.1       | 15.6                       | 23                 | 55    | 78    | 279                       | 3.3          | 1.0          | 4.6      | 279               | 3.30                     |
| 6          | 465.1       | 18.6                       | 24                 | 45    | 69    | 346                       | 14.          | 1.0          | 5.6      | 346               | 14.00                    |
| 7          | 466.1       | 19.7                       | 23                 | 51    | 74    | 352                       | 35.          | 1.0          | 6.6      | 352               | 35.00                    |
| 8          | 467.1       | 20.5                       | 26                 | 51    | 77    | 415                       | 32.          | 1.0          | 7.6      | 415               | 32.00                    |
| P-9        | 468.0       | -                          | -                  | -     | -     | -                         | 5.6          | 0.5          | 8.1      | -                 | 2.80                     |
| 9          | 468.2       | 18.6                       | 31                 | 49    | 80    | 448                       | -            | 0.5          | 8.6      | 224               | -                        |
| 10         | 469.1       | 16.4                       | 28                 | 54    | 82    | 357                       | 14.          | 1.0          | 9.6      | 357               | 14.00                    |
| 11         | 470.1       | 18.7                       | 26                 | 48    | 74    | 378                       | 46.          | 1.0          | 10.6     | 378               | 46.00                    |
| 12         | 471.1       | 18.1                       | 23                 | 53    | 76    | 324                       | 57.          | 1.0          | 11.6     | 324               | 57.00                    |
| 13         | 472.1       | 18.2                       | 22                 | 51    | 73    | 311                       | 45.          | 1.0          | 12.6     | 311               | 45.00                    |
| 14         | 473.1       | 18.6                       | 23                 | 50    | 73    | 332                       | 38.          | 1.0          | 13.6     | 332               | 38.00                    |
| 15         | 474.1       | 18.2                       | 23                 | 49    | 72    | 325                       | 48.          | 1.0          | 14.6     | 325               | 48.00                    |
| 16         | 475.1       | 17.7                       | 22                 | 52    | 74    | 302                       | 34.          | 1.0          | 15.6     | 302               | 34.00                    |
| 17         | 476.1       | 18.5                       | 29                 | 47    | 76    | 417                       | 57.          | 1.0          | 16.6     | 417               | 57.00                    |
| 18         | 477.1       | 18.7                       | 24                 | 48    | 72    | 348                       | 36.          | 1.0          | 17.6     | 348               | 36.00                    |
| 19         | 478.1       | 20.4                       | 28                 | 47    | 75    | 444                       | 54.          | 1.0          | 18.6     | 444               | 54.00                    |
| 20         | 479.1       | 20.1                       | 26                 | 50    | 76    | 406                       | 76.          | 1.0          | 19.6     | 406               | 76.00                    |
| 21         | 480.1       | 20.1                       | 24                 | 54    | 78    | 375                       | 27.          | 1.0          | 20.6     | 375               | 27.00                    |
| 22         | 481.1       | 18.3                       | 23                 | 52    | 75    | 327                       | 19.          | 1.0          | 21.6     | 327               | 19.00                    |
| 23         | 482.1       | 20.2                       | 20                 | 51    | 71    | 314                       | 60.          | 1.0          | 22.6     | 314               | 60.00                    |
| 24         | 483.1       | 18.7                       | 17                 | 56    | 73    | 247                       | 56.          | 1.0          | 23.6     | 247               | 56.00                    |
| 25         | 484.1       | 19.2                       | 13                 | 62    | 75    | 194                       | 84.          | 1.0          | 24.6     | 194               | 84.00                    |
| 26         | 485.1       | 19.7                       | 12                 | 62    | 74    | 184                       | 59.          | 1.4          | 26.0     | 258               | 82.60                    |

Company Cora Oil Company

Lease

Catlett

Well No.

0-25

**Oilfield Research Laboratories**  
**SUMMARY OF PERMEABILITY & SATURATION TESTS**

**TABLE III**

| Company | Cora Oil Company        |                          | Lease                                   | Catlett                               |                                        | Well No.                              | 0-25                               |
|---------|-------------------------|--------------------------|-----------------------------------------|---------------------------------------|----------------------------------------|---------------------------------------|------------------------------------|
|         | Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. |                                        |                                       |                                    |
|         | 460.0 - 470.6           | 10.1                     | 19.6                                    | 198.50                                |                                        |                                       |                                    |
|         | 470.6 - 481.6           | 11.0                     | 44.6                                    | 491.00                                |                                        |                                       |                                    |
|         | 481.6 - 486.0           | 4.4                      | 64.2                                    | 282.60                                |                                        |                                       |                                    |
|         | 460.0 - 486.0           | 25.5                     | 38.1                                    | 972.10                                |                                        |                                       |                                    |
|         |                         |                          |                                         |                                       |                                        |                                       |                                    |
|         | Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Percent 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 |
|         | 460.0 - 470.6           | 10.1                     | 17.6                                    | 26.3                                  | 50.3                                   | 362.                                  | 3,659                              |
|         | 470.6 - 481.6           | 11.0                     | 18.8                                    | 24.3                                  | 50.3                                   | 356                                   | 3,911                              |
|         | 481.6 - 486.0           | 4.4                      | 19.5                                    | 15.2                                  | 58.2                                   | 230                                   | 1,013                              |
|         | 460.0 - 486.0           | 25.5                     | 18.4                                    | 23.5                                  | 51.8                                   | 337                                   | 8,583                              |

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## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

| Company    |             | Cora Oil Company           |                         | Lease        |              | Catlett      |                     | Well No. |                                           | 0-25                                       |                                                |
|------------|-------------|----------------------------|-------------------------|--------------|--------------|--------------|---------------------|----------|-------------------------------------------|--------------------------------------------|------------------------------------------------|
| Sample No. | Depth, Feet | Effective Porosity Percent | Original Oil Saturation |              | Oil Recovery |              | Residual Saturation |          | Volume of Water Recovered cc <sup>a</sup> | Effective Permeability mDarcy <sup>a</sup> | Initial Fluid Production Pressure Lbs./Sq./In. |
|            |             |                            | %                       | Bbls./A. Ft. | %            | Bbls./A. Ft. | % Oil               | % Water  |                                           |                                            |                                                |
| 1          | 460.1       | 15.4                       | 32                      | 383          | 2            | 24           | 30                  | 68       | 19                                        | 0.416                                      | 30                                             |
| 2          | 461.1       | 16.5                       | 27                      | 346          | 1            | 13           | 26                  | 66       | 21                                        | 0.462                                      | 40                                             |
| 3          | 462.1       | 18.1                       | 30                      | 421          | 6            | 84           | 24                  | 73       | 107                                       | 2.00                                       | 20                                             |
| 4          | 463.1       | 16.3                       | 22                      | 278          | 0            | 0            | 22                  | 67       | 5                                         | 0.083                                      | 50                                             |
| 5          | 464.1       | 15.2                       | 20                      | 236          | 0            | 0            | 20                  | 67       | 5                                         | 0.250                                      | 50                                             |
| 6          | 465.1       | 18.7                       | 24                      | 348          | 2            | 29           | 22                  | 74       | 31                                        | 0.500                                      | 10                                             |
| 7          | 466.1       | 20.0                       | 23                      | 357          | 2            | 31           | 21                  | 70       | 72                                        | 1.46                                       | 20                                             |
| 8          | 467.1       | 20.8                       | 26                      | 420          | 5            | 81           | 21                  | 74       | 253                                       | 6.25                                       | 10                                             |
| 9          | 468.2       | 18.3                       | 31                      | 440          | 7            | 99           | 24                  | 66       | 75                                        | 1.25                                       | 20                                             |
| 10         | 469.1       | 16.7                       | 28                      | 363          | 2            | 26           | 26                  | 70       | 76                                        | 1.33                                       | 20                                             |
| 11         | 470.1       | 18.4                       | 26                      | 371          | 3            | 43           | 23                  | 77       | 101                                       | 1.83                                       | 20                                             |
| 12         | 471.1       | 18.5                       | 23                      | 331          | 2            | 29           | 21                  | 74       | 158                                       | 4.00                                       | 20                                             |
| 13         | 472.1       | 17.8                       | 22                      | 304          | 1            | 14           | 21                  | 70       | 82                                        | 1.66                                       | 20                                             |
| 14         | 473.1       | 18.5                       | 23                      | 331          | 2            | 29           | 21                  | 75       | 213                                       | 4.50                                       | 20                                             |
| 15         | 474.1       | 17.8                       | 23                      | 318          | 1            | 14           | 22                  | 73       | 151                                       | 3.16                                       | 20                                             |
| 16         | 475.1       | 17.8                       | 22                      | 304          | 1            | 14           | 21                  | 70       | 57                                        | 0.915                                      | 20                                             |
| 17         | 476.1       | 18.1                       | 29                      | 407          | 4            | 56           | 25                  | 74       | 75                                        | 1.33                                       | 20                                             |
| 18         | 477.1       | 18.9                       | 24                      | 352          | 3            | 44           | 21                  | 73       | 318                                       | 5.90                                       | 20                                             |
| 19         | 478.1       | 19.9                       | 28                      | 433          | 4            | 62           | 24                  | 67       | 118                                       | 1.75                                       | 20                                             |
| 20         | 479.1       | 20.4                       | 26                      | 431          | 3            | 47           | 23                  | 74       | 255                                       | 5.58                                       | 20                                             |
| 21         | 480.1       | 19.8                       | 24                      | 369          | 2            | 31           | 22                  | 77       | 131                                       | 2.33                                       | 20                                             |
| 22         | 481.1       | 18.7                       | 23                      | 334          | 1            | 15           | 22                  | 75       | 176                                       | 3.33                                       | 20                                             |
| 23         | 482.1       | 20.2                       | 21                      | 329          | 0            | 0            | 21                  | 78       | 283                                       | 5.90                                       | 20                                             |
| P-22       | 480.9       | -                          | -                       | -            | -            | -            | -                   | -        | -                                         | 1.20                                       | -                                              |
| P-24       | 482.9       | -                          | -                       | -            | -            | -            | -                   | -        | -                                         | 0.90                                       | -                                              |

Notes: cc—cubic centimeter.

<sup>a</sup>—Volume of water recovered at the time of maximum oil recovery.

<sup>a</sup>—Determined by passing water through sample which still contains residual oil.

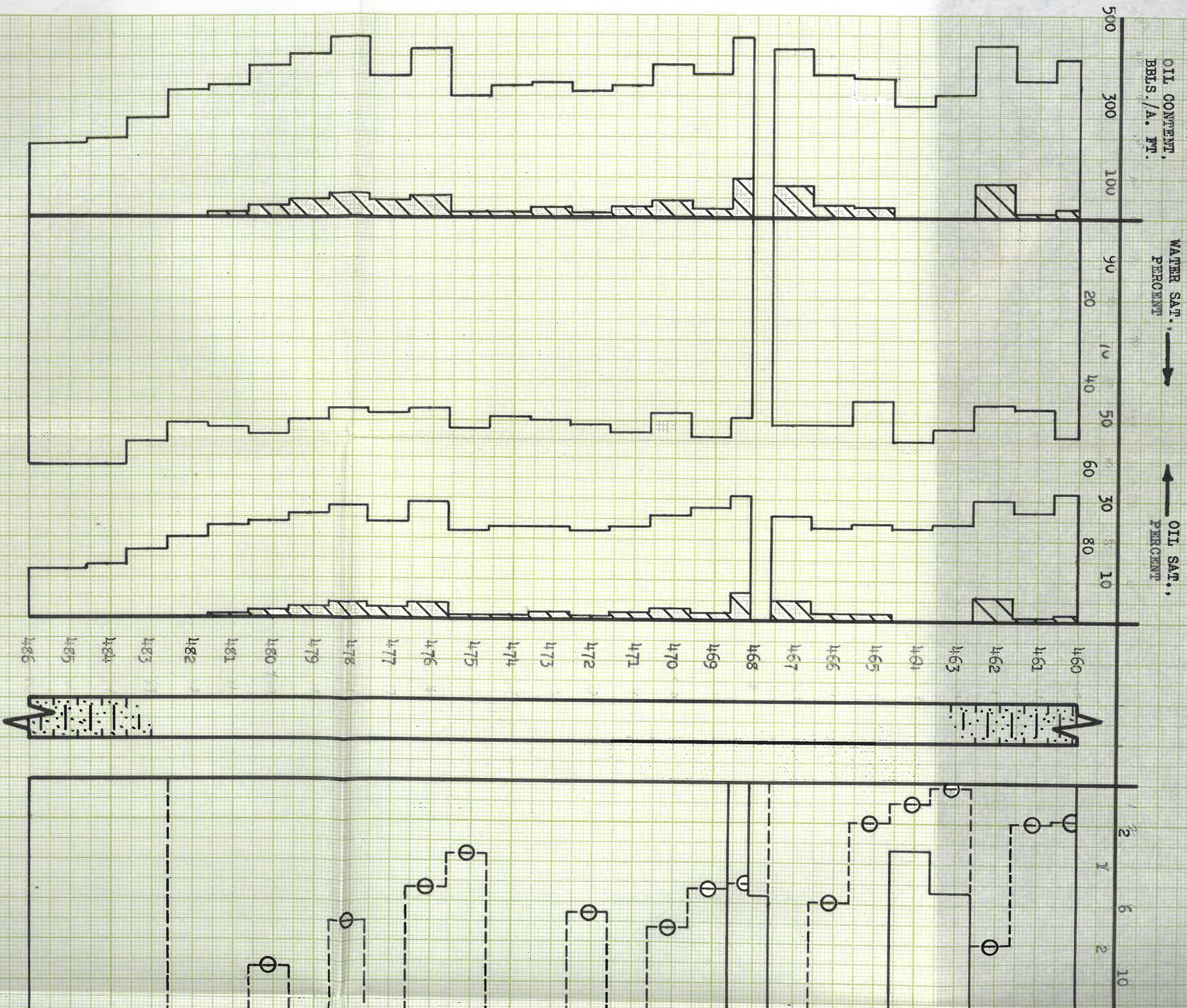
# Oilfield Research Laboratories

## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

| Company                                           | Cora Oil Company | Lease         | Catlett       | Well No.      | 0-25          |
|---------------------------------------------------|------------------|---------------|---------------|---------------|---------------|
| Depth Interval, Feet                              | 460.0 - 470.6    | 470.6 - 481.6 | 481.6 - 492.2 | 492.2 - 503.0 | 503.0 - 513.6 |
| Feet of Core Analyzed                             | 8.5              | 11.0          | 19.5          | 18.4          | 18.4          |
| Average Percent Porosity                          | 18.1             | 18.7          | 18.4          | 18.4          | 18.4          |
| Average Percent Original Oil Saturation           | 27.2             | 24.3          | 25.6          | 25.6          | 25.6          |
| Average Percent Oil Recovery                      | 3.1              | 2.2           | 2.6           | 2.6           | 2.6           |
| Average Percent Residual Oil Saturation           | 24.1             | 22.1          | 23.0          | 23.0          | 23.0          |
| Average Percent Residual Water Saturation         | 71.2             | 72.9          | 72.2          | 72.2          | 72.2          |
| Average Percent Total Residual Fluid Saturation   | 95.9             | 95.0          | 95.2          | 95.2          | 95.2          |
| Average Original Oil Content, Bbls./A. Ft.        | 380.             | 355.          | 366.          | 366.          | 366.          |
| Average Oil Recovery, Bbls./A. Ft.                | 45.              | 32.           | 38.           | 38.           | 38.           |
| Average Residual Oil Content, Bbls./A. Ft.        | 335.             | 323.          | 328.          | 328.          | 328.          |
| Total Original Oil Content, Bbls./Acre            | 3,228.           | 3,914.        | 7,142.        | 7,142.        | 7,142.        |
| Total Oil Recovery, Bbls./Acre                    | 380.             | 355.          | 735.          | 735.          | 735.          |
| Total Residual Oil Content, Bbls./Acre            | 2,848.           | 3,559.        | 6,407.        | 6,407.        | 6,407.        |
| Average Effective Permeability, Millidarcys       | 1.75             | 3.13          | 2.53          | 2.53          | 2.53          |
| Average Initial Fluid Production Pressure, p.s.i. | 21.2             | 20.0          | 20.5          | 20.5          | 20.5          |

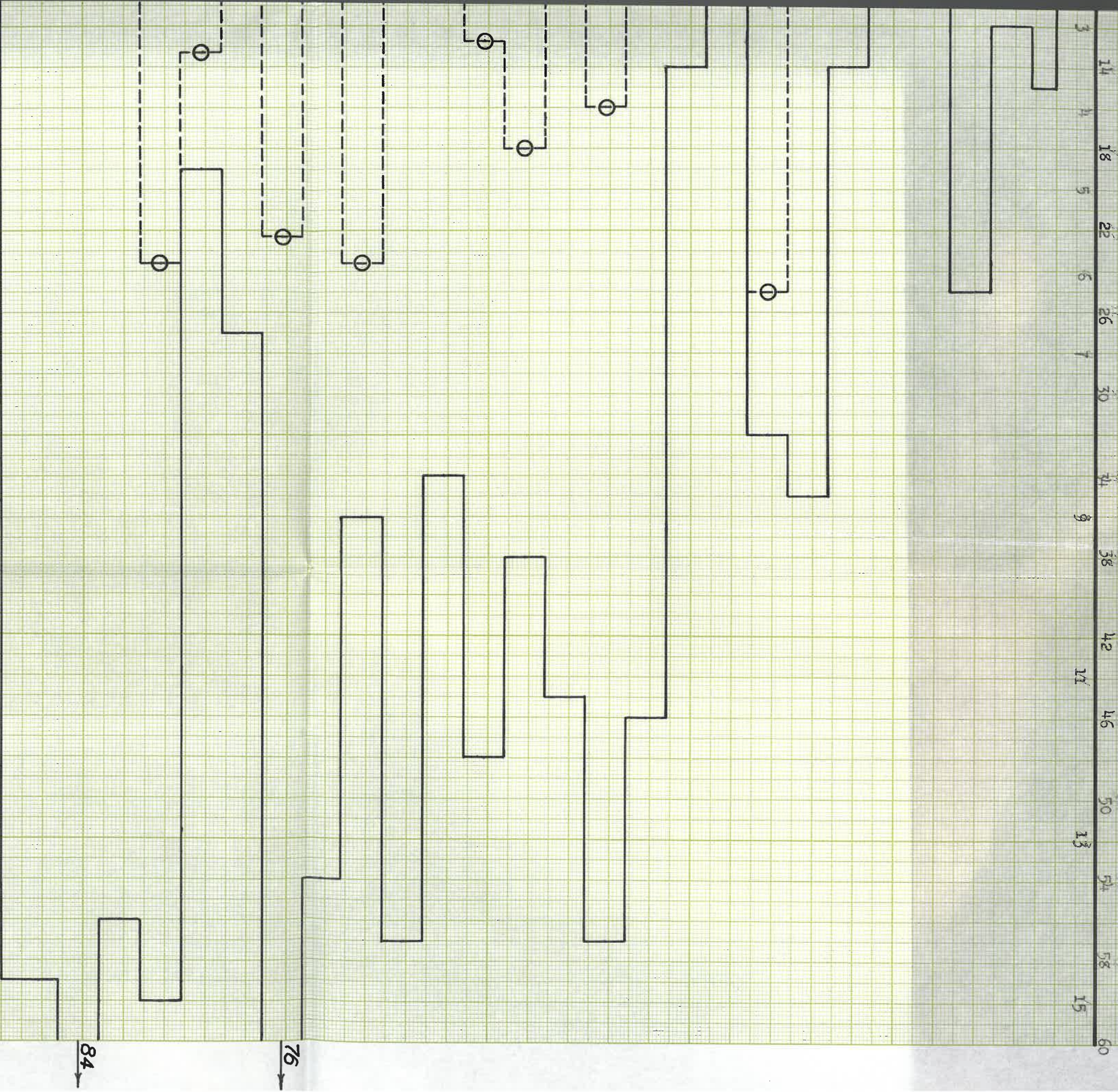
NOTE: Only those samples which recovered oil were used in calculating the above averages.



# CORA OIL

CATLETTS LEASE  
MONTGOMERY CO.

| DEPTH INTERVAL,<br>FEET | FEET OF CORE<br>ANALYZED | AVERAGE<br>POROSITY,<br>PERCENT | AVG. OIL<br>SATURATION<br>PERCENT | AVG. WT<br>SATURAT<br>PRO |
|-------------------------|--------------------------|---------------------------------|-----------------------------------|---------------------------|
| 460.0 - 470.6           | 10.1                     | 17.6                            | 26.3                              | 10.3                      |
| 470.6 - 481.6           | 11.0                     | 18.8                            | 24.3                              | 10.3                      |
| 481.6 - 486.0           | 4.4                      | 19.5                            | 15.2                              | 8.2                       |
| 460.0 - 486.0           | 25.5                     | 18.4                            | 23.5                              | 11.8                      |

EFFECTIVE PERMEABILITY, IN MILLIDARCS  
AIR PERMEABILITY, IN MILLIDARCS

**STATE SANDS TOILET**

**COMPANY**

WELL NO. 0-25

COURT, KANSAS

| WATER<br>URATION<br>PERCENT | AVG. OIL<br>CONTENT<br>BRLS./A. FT. | TOTAL OIL<br>CONTENT<br>BRLS./AC. | AVG. AIR<br>PERMEABILITY,<br>MILLIDARCS | CALCULATED<br>OIL RECOVERY<br>BRLS./ACRE |
|-----------------------------|-------------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------|
| 50.3                        | 362                                 | 3,659                             | 19.6                                    |                                          |
| 50.3                        | 356                                 | 3,917                             | 44.6                                    |                                          |
| 58.8                        | 230                                 | 1,013                             | 64.2                                    |                                          |
| 51.8                        | 337                                 | 8,583                             | 38.1                                    | 3,217                                    |

OILFIELD RESEARCH LABORATORIES  
CHANDLER, KANSAS  
JUNE, 1966