

OIL FIELD RESEARCH LABORATORIES
CHANUTE, KANSAS

July 6, 1951

Goering & Branine
P. O. Box 172
Newton, Kansas

Attention: Mr. A. L. Goering

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" Rotary core taken from the Lilystrand & Dunne Lease, Well No. O-1, Butler County, Kansas, and submitted to our laboratory on June 20, 1951.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Clayton A. Nattier

CAN:pmd
7 c.c.

GOERING & BRANINE
CORE ANALYSIS REPORT
LILYSTRAND & DUNNE LEASE
WELL NO. 0-1
BUTLER COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

JULY 6, 1951

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0-1
 Location 200' North of South Line & 375' West of East Line, S $\frac{1}{2}$ of NE $\frac{1}{4}$.
 Section 9 Twp. 26 S Rge. 8 E County Butler State Kansas

| | |
|----------------|--------------|
| Name of Sand | Bartlesville |
| Top of Core | 2411.00 |
| Bottom of Core | 2465.00 |
| Top of Sand | 2411.55 |
| Bottom of Sand | 2455.35 |

| | |
|------------------------------|-------|
| Total Feet of Permeable Sand | 18.50 |
| Total Feet of Floodable Sand | 14.67 |

| Distribution of Permeable Sand: Permeability Range Millidarcys | Feet | Cum. Ft. |
|----------------------------------------------------------------------|------|----------|
| 0 - 4 | 4.33 | 4.33 |
| 4 - 8 | 2.20 | 6.53 |
| 8 - 12 | 1.20 | 7.73 |
| 12 - 24 | 3.30 | 11.03 |
| 24 - 48 | 3.60 | 14.63 |
| 48 & above | 3.87 | 18.50 |

| | |
|-----------------------------------------------------------------|--------|
| Average Permeability Millidarcys | 23.74 |
| Average Percent Porosity | 17.64 |
| Average Percent Oil Saturation | 27.13 |
| Average Percent Water Saturation | 56.56 |
| Average Oil Content, Bbls./A. Ft. | 377. |
| Total Oil Content, Bbls./Acre | 7,235. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 7.16 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 108. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 1,272. |
| Total Calculated Oil Recovery, Bbls./Acre | 2,400. |
| Casing Point, Packer Setting, Feet | 2414.0 |
| Viscosity, Centipoises @ | |
| A. P. I. Gravity, degrees @ 60 °F | |

The above averages are for that part of the cored section extending from the top of the sand to the top of the cement plug.

Fresh water was used as a circulating fluid in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

| <u>Depth Interval, Feet</u> | <u>Description</u> |
|---------------------------------|---------------------------------------------------------------------------|
| 2411.00 - 2411.40 | - Cuttings. |
| 2411.40 - 2411.55 | - Gray sandy shale. |
| 2411.55 - 2411.85 | - Light brown fine grained laminated micaceous shaley sandstone. |
| 2411.85 - 2416.95 | - Laminated sandy shale containing a vertical fracture. |
| 2416.95 - 2417.70 | - Laminated sandstone and shale. |
| 2417.70 - 2417.80 | - Brown fine grained micaceous sandstone. |
| 2417.80 - 2418.55 | - Laminated sandstone and shale. |
| 2418.55 - 2418.85 | - Brown fine grained slightly laminated micaceous shaley sandstone. |
| 2418.85 - 2419.23 | - Brown fine grained slightly laminated micaceous carbonaceous sandstone. |
| 2419.23 - 2420.90 | - Gray sandy shale. |
| 2420.90 - 2421.05 | - Conglomeratic sandstone. |
| 2421.05 - 2421.95 | - Laminated sandy shale. |
| 2421.95 - 2422.10 | - Brown fine grained micaceous sandstone. |
| 2422.10 - 2422.95 | - Laminated sandy shale. |
| 2422.95 - 2423.10 | - Brown fine grained slightly laminated micaceous carbonaceous sandstone. |
| 2423.10 - 2423.70 | - Laminated sandy shale. |
| 2423.70 - 2424.00 | - Sandy conglomerate. |
| 2424.00 - 2424.20 | - Conglomeratic sandstone. |
| 2424.20 - 2425.45 | - Gray sandy shale. |
| 2425.45 - 2426.00 | - Laminated sandstone and shale. |

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- 2426.00 - 2426.70 - Light brown fine grained laminated micaceous shaley sandstone containing a vertical laminations.
- 2426.70 - 2426.80 - Finely laminated sandy shale.
- 2426.80 - 2426.95 - Laminated sandy shale.
- 2426.95 - 2427.10 - Brown fine grained micaceous sandstone.
- 2427.10 - 2427.48 - Finely laminated sandstone and shale.
- 2427.48 - 2427.70 - Brown fine grained micaceous shaley sandstone.
- 2427.70 - 2428.00 - Brown fine grained finely laminated micaceous carbonaceous sandstone.
- 2428.00 - 2429.35 - Brown fine grained micaceous sandstone.
- 2429.35 - 2430.75 - Gray sandy shale.
- 2430.75 - 2431.60 - Laminated sandy shale.
- 2431.60 - 2431.75 - Brown fine grained micaceous sandstone.
- 2431.75 - 2434.10 - Laminated sandy shale.
- 2434.10 - 2435.28 - Brown fine grained micaceous slightly conglomeratic sandstone.
- 2435.28 - 2435.45 - Sandy conglomerate.
- 2435.45 - 2435.65 - Gray shale.
- 2435.65 - 2436.45 - Brown fine grained micaceous conglomeratic sandstone.
- 2436.45 - 2436.65 - Gray shale
- 2436.65 - 2436.80 - Gray sandy shale.
- 2436.80 - 2437.70 - Brown fine grained micaceous conglomeratic sandstone.
- 2437.70 - 2439.00 - Brown fine grained micaceous slightly shaley sandstone.
- 2439.00 - 2439.85 - Brown fine grained micaceous slightly conglomeratic sandstone.
- 2439.85 - 2440.75 - Conglomeratic sandstone.
- 2440.75 - 2441.10 - Brown fine grained micaceous sandstone.
- 2441.10 - 2442.00 - Brown fine grained micaceous conglomeratic sandstone.
- 2442.00 - 2442.70 - Brown fine grained micaceous sandstone.
- 2442.70 - 2443.80 - Brown fine grained micaceous conglomeratic sandstone.

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- 2443.80 - 2444.10 - Brown fine grained micaceous slightly shaley sandstone.
2444.10 - 2445.50 - Brown fine grained micaceous sandstone.
2445.50 - 2445.70 - Sandy conglomerate.
2445.70 - 2445.85 - Brown fine grained micaceous sandstone.
2445.85 - 2446.00 - Gray shale.
2446.00 - 2447.00 - Loss.
2447.00 - 2447.35 - Soft gray shale.
2447.35 - 2447.95 - Laminated sandy shale.
2447.95 - 2448.10 - Sandy conglomerate.
2448.10 - 2448.56 - Laminated sandy shale.
2448.56 - 2449.70 - Brown fine grained micaceous conglomeratic sandstone.
2449.70 - 2451.55 - Conglomeratic sandstone containing a gray shale streak.
2451.55 - 2452.30 - Gray shale containing a vertical fracture.
2452.30 - 2452.85 - Sandy conglomerate.
2452.85 - 2453.00 - Brown fine grained micaceous conglomeratic sandstone.
2453.00 - 2453.75 - Sandy conglomerate.
2453.75 - 2453.90 - Conglomeratic sandstone.
2453.90 - 2455.35 - Sandy conglomerate.
2455.35 - 2459.95 - Gray shale.
2459.95 - 2461.60 - According to log, gray shale, (Discarded at well).
2461.60 - 2462.10 - According to log, black shale, (Discarded at well).
2462.10 - 2465.00 - According to log, gray shale, (Discarded at well).

Coring was started at a depth of 2411.00 feet probably in sandy shale and completed at a depth of 2465.00 in gray shale. That part of the cored section extending from 2446.00 to 2447.00 was lost during coring. Shale in the bottom part of the core extending from 2459.95 to 2465.00 was discarded at the well. This core shows a total of 25.24 feet of sand-

stone which is mostly brown fine grained micaceous sandstone and conglomeratic sandstone. The core was badly broken by layers of shale and sandy shale.

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 3.64, 31.30 and 11.85 millidarcys respectively; while that of the pay sand, or that part of the cored section extending from the casing point to the top of the cement plug, is 23.74 millidarcys (See Table II). By observing the data given on the coregraph, it is noticeable that the sand in this well has a very irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a fairly low weighted average percent oil saturation, namely, 27.13. The weighted average percent oil saturation of the upper, middle and lower sections is 23.77, 29.75 and 20.90 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 61.92, 53.39 and 64.83 respectively; while that of the pay sand is 56.56 percent (See Table IV). This gives a weighted average total fluid saturation of the pay sand of 83.69 percent.

In order to get some idea of the degree of flushing of the sand that occurred during coring, each of the saturation samples was analyzed for chloride content. The results of these tests are given in Table VII. The tests indicate that some flushing did occur.

The weighted average oil content of the upper, middle and lower sections is 316, 427 and 263 barrels per acre foot respectively; while that of the pay sand is 377. The total oil content as shown by this core is 7,554 barrels per acre of which 7,235 barrels are in the pay sand section.

LABORATORY FLOODING TESTS

In view of the fact that oil was lost during coring, this core responded well to laboratory flooding tests. A total recovery of 1,272 barrels of oil per acre was obtained from 11.77 feet of sand analyzed. The weighted average percent oil saturation was reduced from 28.47 to 21.31, or represents an average recovery of 7.16 percent. The weighted average effective permeability of the samples is 5.113 millidarcys; while the average initial fluid production pressure is 18.7 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 23 samples tested, 18 produced water and 15 oil. This indicates that most of the sand represented by these samples is floodable. The tests also show that the sand has a wide variation in effective permeability.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 2,400 barrels of oil per acre. This is a recovery of 164 barrels of oil per acre foot from the 14.67 feet of floodable sand. In calculating this recovery, an allowance was made for oil lost during coring, and it was assumed that the true water saturation of the sand is 38 percent.

The vertical laminations in this core indicate that this well is close to the edge of the trend. For this reason, primary production from this area has undoubtedly been lower than the average for the lease. In calculating the above recovery, it was assumed that the primary production is 10 percent. It is possible that primary production has been less than 10 percent, which would increase the ultimate recover by water flooding.

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SHOT RECOMMENDATION

Company Goering & Branine Lease Lilystrand & Dunne Well No. O-1

| <u>Depth Interval, Feet</u> | <u>Feet of Sand</u> | <u>Size of Shell Inches</u> | <u>Qts./Ft.</u> | <u>Total Quarts</u> |
|---------------------------------|-------------------------|---------------------------------|-----------------|---------------------|
| 2429.0 - 2453.0 | 24.0 | 2 $\frac{1}{2}$ | 1.0 | 24.0 |

Note: Plug hole back to 2454.0 Feet

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0 - 1

| Sample No. | Depth, Feet | Permeability Millidarcys | Feet of Core | | Permeability Capacity Ft. x Md. |
|------------|-------------|--------------------------|--------------|----------|---------------------------------|
| | | | Ft. | Cum. Ft. | |
| 1 | 2411.74 | 3.2 | 0.30 | 0.30 | 0.96 |
| 2 | 2417.73 | 6.5 | 0.10 | 0.40 | 0.65 |
| 3 | 2419.02 | 1.7 | 0.38 | 0.78 | 0.65 |
| 4 | 2421.22 | 1.5 | 0.90 | 1.68 | 1.35 |
| 5 | 2422.76 | Imp. | 0.85 | 2.53 | 0.00 |
| 6 | 2424.03 | 31. | 0.20 | 2.73 | 6.20 |
| 7 | 2425.74 | Imp. | 0.55 | 3.28 | 0.00 |
| 8 | 2426.05 | 0.82 | 0.70 | 3.98 | 0.58 |
| 9 | 2427.14 | 0.95 | 0.38 | 4.36 | 0.36 |
| 10 | 2427.62 | 3.7 | 0.22 | 4.58 | 0.82 |
| 11 | 2428.06 | 50. | 0.35 | 4.93 | 17.50 |
| 12 | 2428.60 | 50. | 0.50 | 5.43 | 30.00 |
| 13 | 2429.15 | 30. | 0.50 | 5.93 | 15.00 |
| 14 | 2430.22 | Imp. | 0.40 | 6.33 | 0.00 |
| 15 | 2431.85 | Imp. | 0.35 | 6.68 | 0.00 |
| 16 | 2432.33 | Imp. | 0.50 | 7.18 | 0.00 |
| 17 | 2432.85 | 2.1 | 0.50 | 7.68 | 1.05 |
| 18 | 2434.50 | 96. | 0.70 | 8.38 | 67.20 |
| 19 | 2435.06 | 58. | 0.48 | 8.86 | 27.84 |
| 20 | 2436.05 | 25. | 0.55 | 9.41 | 13.75 |
| 21 | 2436.35 | 15. | 0.25 | 9.66 | 3.75 |
| 22 | 2437.34 | 24. | 0.70 | 10.36 | 16.80 |
| 23 | 2437.65 | 59. | 0.20 | 10.56 | 11.80 |
| 24 | 2438.10 | 8.6 | 0.65 | 11.21 | 5.59 |
| 25 | 2438.60 | 5.2 | 0.45 | 11.66 | 2.34 |
| 26 | 2439.05 | 54. | 0.55 | 12.21 | 18.70 |
| 27 | 2439.60 | 78. | 0.50 | 12.71 | 39.00 |
| 28 | 2440.20 | 8.9 | 0.55 | 13.26 | 4.90 |
| 29 | 2440.65 | 19. | 0.35 | 13.61 | 6.65 |
| 30 | 2441.02 | 16. | 0.35 | 13.96 | 5.60 |
| 31 | 2441.60 | 24. | 0.70 | 14.66 | 16.80 |
| 32 | 2442.05 | 5.2 | 0.55 | 15.21 | 2.86 |
| 33 | 2442.62 | 4.8 | 0.35 | 15.56 | 1.68 |
| 34 | 2443.15 | 12. | 0.70 | 16.26 | 8.40 |
| 35 | 2443.70 | 40. | 0.40 | 16.66 | 16.00 |
| 36 | 2444.20 | 60. | 0.35 | 17.01 | 21.00 |
| 37 | 2444.75 | 60. | 0.50 | 17.51 | 30.00 |
| 38 | 2445.15 | 6.8 | 0.55 | 18.06 | 3.74 |
| 39 | 2445.60 | 5.4 | 0.20 | 18.26 | 1.08 |
| 40 | 2447.72 | Imp. | 0.60 | 18.86 | 0.00 |

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0-1

| Sample No. | Depth, Feet | Permeability Millidarcys | Feet of Core | | Permeability Capacity Ft. x Md. |
|------------|-------------|--------------------------|--------------|----------|---------------------------------|
| | | | Ft. | Cum. Ft. | |
| 41 | 2448.63 | 50. | 0.29 | 19.15 | 14.50 |
| 42 | 2449.05 | 12. | 0.50 | 19.65 | 6.00 |
| 43 | 2449.64 | 2.7 | 0.35 | 20.00 | 0.95 |
| 44 | 2450.05 | 3.8 | 0.60 | 20.60 | 2.28 |
| 45 | 2450.54 | 12. | 0.80 | 21.40 | 9.60 |
| 46 | 2451.32 | 15. | 0.35 | 21.75 | 5.25 |
| 47 | 2454.25 | Imp. | 0.60 | 22.35 | 0.00 |
| 48 | 2454.71 | 6.5 | 0.50 | 22.85 | 3.25 |
| 49 | 2455.30 | 7.1 | 0.35 | 23.20 | 2.49 |

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0-1

| <u>Depth Interval Feet</u> | <u>Feet of Core Analyzed</u> | <u>Average Permeability, Millidarcys</u> | <u>Permeability Capacity, Ft. x Md.</u> |
|--------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------|
| 2411.55 - 2423.00 | 3.18 | 3.64 | 11.57 |
| 2428.00 - 2445.85 | 12.43 | 31.30 | 389.03 |
| 2447.95 - 2455.35 | 3.74 | 11.85 | 44.32 |
| 2411.55 - 2454.00 | 18.50 | 23.74 | 439.18 |

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RESULTS OF SATURATION TESTS

TABLE III

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0-1

| Sat. No. | Depth, Feet | Effective Porosity Percent | Percent Saturation | | | Oil Content Bbls./A. Ft. | Feet of Core | | Total Oil Content Bbls./Acre |
|----------|-------------|----------------------------|--------------------|-------|-------|--------------------------|--------------|----------|------------------------------|
| | | | Oil | Water | Total | | Ft. | Cum. Ft. | |
| 1 | 2411.63 | 15.9 | 18.9 | 75.6 | 94.5 | 234 | 0.30 | 0.30 | 70 |
| 6 | 2418.77 | 16.1 | 23.6 | 61.1 | 89.7 | 402 | 0.68 | 0.98 | 273 |
| 7 | 2420.95 | 14.7 | 20.6 | 70.2 | 90.8 | 235 | 0.15 | 1.13 | 35 |
| 8 | 2422.03 | 15.3 | 26.2 | 53.0 | 84.2 | 311 | 0.15 | 1.28 | 47 |
| 9 | 2423.04 | 13.7 | 11.5 | 72.5 | 84.0 | 122 | 0.15 | 1.43 | 18 |
| 10 | 2423.93 | 14.5 | 21.5 | 68.3 | 89.8 | 242 | 0.50 | 1.93 | 121 |
| 12 | 2427.05 | 18.7 | 16.4 | 48.5 | 64.9 | 238 | 0.15 | 2.08 | 36 |
| 13 | 2427.92 | 19.7 | 27.8 | 48.3 | 76.1 | 425 | 0.52 | 2.60 | 221 |
| 14 | 2428.92 | 20.9 | 32.6 | 44.1 | 76.7 | 530 | 1.10 | 3.70 | 583 |
| 15 | 2429.25 | 19.2 | 30.4 | - | - | 453 | 0.25 | 3.95 | 113 |
| 17 | 2431.68 | 18.5 | 29.2 | 51.3 | 80.5 | 420 | 0.15 | 4.10 | 63 |
| 20 | 2434.92 | 21.1 | 28.4 | 47.8 | 76.2 | 455 | 1.18 | 5.28 | 536 |
| 21 | 2435.86 | 15.1 | 22.1 | 70.5 | 92.6 | 259 | 0.30 | 6.08 | 208 |
| 22 | 2436.85 | 16.8 | 30.6 | 66.3 | 96.6 | 446 | 0.90 | 6.98 | 401 |
| 23 | 2437.92 | 19.7 | 32.7 | 48.6 | 81.3 | 498 | 0.65 | 7.63 | 324 |
| 24 | 2438.92 | 19.3 | 31.5 | 46.3 | 77.8 | 472 | 1.50 | 9.13 | 709 |
| 25 | 2440.05 | 16.3 | 25.8 | 55.5 | 86.3 | 326 | 0.90 | 10.03 | 294 |
| 26 | 2440.95 | 20.3 | 33.8 | 36.5 | 70.3 | 553 | 0.35 | 10.38 | 194 |
| 27 | 2441.92 | 17.4 | 31.3 | 61.6 | 92.9 | 423 | 1.60 | 11.98 | 676 |
| 28 | 2442.91 | 15.0 | 34.4 | 57.4 | 91.8 | 400 | 1.10 | 13.08 | 440 |
| 29 | 2444.03 | 18.8 | 25.2 | 50.8 | 76.0 | 368 | 0.30 | 13.38 | 110 |
| 30 | 2445.03 | 19.4 | 27.2 | 48.3 | 75.5 | 410 | 1.40 | 14.78 | 574 |

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RESULTS OF SATURATION TESTS

TABLE III

Company Goering & Branine Lease Lillystrand & Duane Well No. 0-1-

| Sat. No. | Depth, Feet | Effective Porosity Percent | Percent Saturation | | | Oil Content Bbls./A. Ft. | Feet of Core | | Total Oil Content Bbls./Acre |
|----------|-------------|----------------------------|--------------------|-------|-------|--------------------------|--------------|----------|------------------------------|
| | | | Oil | Water | Total | | Ft. | Cum. Ft. | |
| F-31 | 2445.75 | 19.2 | 22.2 | - | - | 331 | 0.15 | 14.93 | 50 |
| 32 | 2448.02 | 15.0 | 6.7 | 82.7 | 78 | 78 | 0.15 | 15.08 | 12 |
| 33 | 2448.92 | 16.9 | 22.6 | 90.0 | 296 | 296 | 1.14 | 16.22 | 338 |
| 34 | 2449.92 | 15.9 | 23.1 | 82.7 | 285 | 285 | 0.70 | 16.92 | 200 |
| 35 | 2451.07 | 14.5 | 22.6 | 78.1 | 272 | 272 | 1.05 | 17.97 | 286 |
| F-37 | 2452.92 | 15.4 | 23.3 | - | 279 | 279 | 0.15 | 18.12 | 42 |
| 37 | 2453.05 | 17.1 | 20.0 | 85.3 | 265 | 265 | 0.75 | 18.87 | 199 |
| F-38 | 2453.82 | 16.2 | 21.1 | - | 266 | 266 | 0.15 | 19.02 | 40 |
| 38 | 2453.95 | 16.0 | 17.7 | 89.2 | 220 | 220 | 0.60 | 19.62 | 132 |
| 39 | 2455.05 | 16.1 | 19.7 | 90.2 | 246 | 246 | 0.85 | 20.47 | 209 |
| | | | | | | | Total | - - - - | 7,554 |

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SUMMARY OF SATURATION TESTS

TABLE IV

| Company <u>Goering & Brantine</u> | | Lease <u>Lillystrand & Dunne</u> | | Well No. <u>O-1</u> | | |
|---------------------------------------|--------------------------|--------------------------------------|--------------------------------------|----------------------------------------|---------------------------------------|------------------------------------|
| 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 |
| 2411.55 - 2428.00 | 2.60 | 16.92 | 23.77 | 61.92 | 316 | 821 |
| 2428.00 - 2445.85 | 12.33 | 18.35 | 29.75 | 53.39 | 427 | 5,275 |
| 2447.95 - 2455.35 | 5.54 | 16.01 | 20.90 | 64.83 | 263 | 1,458 |
| 2411.55 - 2454.00 | 19.12 | 17.64 | 27.13 | 56.56 | 377 | 7,235 |

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RESULTS OI

Company Geering & Branine

| Sample No. | Depth, Feet | Effective Porosity Percent | Original Oil Saturation | | Oil Recov | |
|------------|-------------|----------------------------|-------------------------|--------------|-----------|--|
| | | | Percent | Bbls./A. Ft. | Percent | |
| 6 | 2418.62 | 18.3 | 28.2 | 403 | 8.1 | |
| 10 | 2423.75 | 14.2 | 23.1 | 254 | 0.0 | |
| 13 | 2427.76 | 19.4 | 26.9 | 406 | 5.7 | |
| 14 | 2428.75 | 20.5 | 32.4 | 516 | 9.4 | |
| 15 | 2429.25 | 19.2 | 30.4 | 453 | 9.6 | |
| 20 | 2434.75 | 20.8 | 29.3 | 473 | 9.7 | |
| 21 | 2435.72 | 15.7 | 22.6 | 276 | 5.8 | |
| 22A | 2437.05 | 16.7 | 30.0 | 390 | 0.0 | |
| 23 | 2437.75 | 19.3 | 33.8 | 506 | 10.0 | |
| 24 | 2438.75 | 19.2 | 31.9 | 476 | 11.7 | |
| 25 | 2439.92 | 15.7 | 26.5 | 322 | 0.0 | |
| 26 | 2440.82 | 20.3 | 33.1 | 522 | 8.9 | |
| 27 | 2441.75 | 17.7 | 30.8 | 423 | 6.0 | |
| 28 | 2442.75 | 15.4 | 32.8 | 392 | 0.0 | |
| 29 | 2443.85 | 18.6 | 26.5 | 383 | 3.4 | |
| 30 | 2444.89 | 19.4 | 26.6 | 400 | 4.8 | |
| 31 | 2445.75 | 19.2 | 22.2 | 331 | 5.0 | |
| 33 | 2448.75 | 17.1 | 21.8 | 290 | 2.3 | |
| 34 | 2449.77 | 15.3 | 25.3 | 300 | 0.0 | |
| 35 | 2450.92 | 14.7 | 21.5 | 246 | 0.0, | |
| 37 | 2452.93 | 15.4 | 23.3 | 279 | 0.0 | |
| 38 | 2453.82 | 16.2 | 21.1 | 266 | 1.6 | |
| 39 | 2454.92 | 15.8 | 20.5 | 252 | 0.0 | |

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F LABORATORY FLOODING TESTS

TABLE V

Lease Lilystrand & Dunne Well No. 0 - 1

| Core Bbls./A. Ft. | Residual Saturation | | Bbls./A. Ft. | Volume of Water Recovered cc* | Effective Permeability, Millidarcys ** | Initial Fluid Production Pressure Lbs./Sq. In. |
|----------------------|---------------------|---------|--------------|-------------------------------------|----------------------------------------------|------------------------------------------------------|
| | % Oil | % Water | | | | |
| 115 | 20.2 | 77.0 | 288 | 38 | 1.03 | 25 |
| 0 | 23.1 | 71.3 | 254 | 0 | Imp | 50 7 |
| 86 | 21.2 | 73.2 | 320 | 31 | 0.881 | 20 |
| 150 | 23.0 | 70.4 | 366 | 103 | 3.22 | 20 |
| 143 | 20.8 | 69.3 | 310 | 153 | 13.28 | 10 |
| 157 | 19.6 | 71.7 | 316 | 428 | 21.20 | 10 |
| 71 | 16.8 | 79.0 | 205 | 32 | 0.825 | 25 |
| 0 | 30.0 | 67.5 | 390 | 1 | 0.073 | 50 |
| 150 | 23.8 | 75.0 | 356 | 60 | 1.56 | 20 |
| 174 | 20.2 | 71.6 | 302 | 112 | 2.94 | 10 |
| 0 | 26.5 | 66.2 | 322 | 17 | 0.310 | 30 |
| 140 | 24.2 | 74.4 | 382 | 171 | 10.00 | 15 |
| 83 | 24.8 | 69.5 | 340 | 149 | 8.72 | 15 |
| 0 | 32.8 | 62.5 | 392 | 22 | 0.499 | 25 |
| 49 | 23.1 | 73.8 | 334 | 85 | 2.19 | 15 |
| 72 | 21.8 | 72.3 | 328 | 51 | 1.30 | 15 |
| 75 | 17.2 | 77.0 | 256 | 84 | 4.58 | 15 |
| 31 | 19.5 | 71.5 | 259 | 13 | 0.320 | 35 |
| 0 | 25.3 | 72.5 | 300 | 0 | Imp. | 50 7 |
| 0 | 21.5 | 73.6 | 246 | 0 | Imp. | 50 7 |
| 0 | 23.3 | 61.6 | 279 | 0 | Imp. | 50 7 |
| 20 | 19.5 | 78.9 | 246 | 39 | 0.910 | 20 |
| 0 | 20.5 | 70.2 | 252 | 0 | Imp. | 50 7 |

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.
 "A" Sample was taken from core after it was received in the laboratory.

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

| Company | Lease Lilystrand & Dunne | | Well No. |
|---------------------------------------------------|--------------------------|-----------------|-----------------|
| | | | O-1 |
| Depth, Interval, Feet | 2418.55-2428.00 | 2428.00-2445.85 | 2448.56-2453.90 |
| Feet of Core Analyzed | 1.20 | 9.28 | 1.29 |
| Average Percent Porosity | 18.75 | 19.06 | 16.98 |
| Average Percent Original Oil Saturation | 27.66 | 29.53 | 21.63 |
| Average Percent Oil Recovery | 7.08 | 7.87 | 2.17 |
| Average Percent Residual Oil Saturation | 20.58 | 21.66 | 19.46 |
| Average Percent Residual Water Saturation | 75.42 | 72.24 | 72.33 |
| Average Percent Total Residual Fluid Saturation | 96.00 | 93.90 | 91.79 |
| Average Original Oil Content, Bbls./A. Ft. | 405. | 441. | 286. |
| Average Oil Recovery, Bbls./A. Ft. | 103. | 120. | 29. |
| Average Residual Oil Content, Bbls./A. Ft. | 302. | 321. | 257. |
| Total Original Oil Content, Bbls./Acre | 485. | 4,087. | 370. |
| Total Oil Recovery, Bbls./Acre | 123. | 1,111. | 38. |
| Total Residual Oil Content, Bbls./Acre | 362. | 2,976. | 332. |
| Average Effective Permeability, Millidarcys | 0.965 | 6.307 | 0.388 |
| Average Initial Fluid Production Pressure, p.s.i. | 22.5 | 15.5 | 27.5 |
| | | | 18.7 |

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

Oil Field Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Goering & Branine Lease Lilystrand & Dunne Well No. 0-1

| Sample No. | Depth, Feet | Chloride Content of Brine in Sand ppm | Connate | Percent Water Saturation Drilling & Foreign | Total |
|------------|-------------|---------------------------------------|---------|---------------------------------------------|-------|
| 1 | 2411.63 | 76,500 | | | |
| 6 | 2418.77 | 37,500 | | | |
| 7 | 2420.95 | 64,000 | | | |
| 8 | 2422.03 | 70,600 | | | |
| 9 | 2423.04 | 50,600 | | | |
| 10 | 2423.93 | 63,500 | | | |
| 12 | 2427.05 | 66,300 | | | |
| 13 | 2427.92 | 54,000 | | | |
| 14 | 2428.92 | 13,500 | | | |
| 17 | 2431.68 | 33,400 | | | |
| 20 | 2434.92 | 20,000 | | | |
| 21 | 2435.86 | 50,800 | | | |
| 22 | 2436.85 | 13,000 | | | |
| 23 | 2437.92 | 50,400 | | | |
| 24 | 2438.92 | 57,800 | | | |
| 25 | 2440.05 | 57,700 | | | |
| 26 | 2440.95 | 27,500 | | | |
| 27 | 2441.92 | 47,400 | | | |
| 28 | 2442.91 | 61,100 | | | |
| 29 | 2444.03 | 26,700 | | | |
| 30 | 2445.03 | 28,300 | | | |
| 32 | 2448.02 | 58,100 | | | |
| 33 | 2448.92 | 59,300 | | | |
| 34 | 2449.92 | 61,600 | | | |
| 35 | 2451.07 | 67,000 | | | |
| 37 | 2453.05 | 53,900 | | | |
| 38 | 2453.95 | 47,500 | | | |
| 39 | 2455.05 | 47,500 | | | |

Note: ppm - parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Goering & Branine Lease Lilystand & Dunne Well No. 0-1

| Depth Interval, Feet | Chloride Content of Brine in Sand, ppm | Average Percent Connate Water | Average Percent Drilling & Foreign Water |
|-------------------------|----------------------------------------------|----------------------------------|------------------------------------------------|
| 2411.55-2428.00 | 56,200 | | |
| 2428.00-2445.50 | 34,100 | | |
| 2447.95-2455.35 | 54,000 | | |
| 2411.55-2454.00 | 41,900 | | |

Note: ppm - parts per million