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URBANA

ILLINOIS PETROLEUM NO. 66

ILLINOIS OIL-FIELD BRINES
THEIR GEOLOGIC OCCURRENCE AND CHEMICAL COMPOSITION

BY
WAYNE F. MEENTS, ALFRED H. BELL,
O. W. REES, AND W. G. TILBURY



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THEIR GEOLOGIC OCCURRENCE AND CHEMICAL COMPOSITION

BY

WAYNE F. MEENTS, ALFRED H. BELL,
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I. INTRODUCTION

Studies of the chemical composition of natural brines have been carried on extensively in many areas. Brine composition was found to vary widely with the stratigraphic position of the containing rock and with depth below the surface for brines occurring at different geographic locations in the same formation.

Brine composition has been important in the determination of the source of brine in oil wells which may have

leaking casings. Recently, chemical data have been used increasingly in the quantitative interpretation of electric well logs. The data contained in this report will be of use to oil men concerned with the interpretation of electric logs in Illinois and in water flooding for oil recovery.

The cooperation of the oil companies from whose wells brine samples were obtained is gratefully acknowledged.

II. COLLECTION OF BRINE SAMPLES

BY
WAYNE F. MEENTS and ALFRED H. BELL

METHODS OF COLLECTING SAMPLES OF OIL-FIELD BRINE FOR ANALYSIS

Whenever possible, brine samples were collected from the bleeder valve on the well head. However, for wells which produce practically all oil, this was impossible. Many wells produce only a few gallons of brine to hundreds of barrels of crude oil, and in this situation it is necessary to collect the brine sample from the storage, flow, or heater tanks.

Storage-tank samples are satisfactory provided enough brine is produced each day. For the purpose of this report samples were collected only from storage tanks which received at least one-half barrel of brine per day.

Flow-tank samples are very good when one barrel or more of brine flows through the system a day.

Heater-tank samples were avoided where excessive heat was applied and a small amount of brine was present. Where a large volume of brine passes through the system, the samples were considered good for analysis even though the temperature exceeded 140° F.

To avoid contamination with acid-spent water, no samples were collected immediately after acidization of wells. Brine samples from acidized wells were not used unless the wells had produced 100 barrels or more of brine.

Drill-stem test samples were avoided because they are usually contaminated with water from drilling-mud invasion.

A few brine samples from cable-tool wells are included. So far as possible these are samples from wells which had been cased down to the producing formation, and which were filled with enough water from formation pressure to flush out any drilling mud used in drilling the producing formation.

III. METHODS OF BRINE ANALYSIS

BY

O. W. REES and W. G. TILBURY

Because brines change in composition during standing, certain examinations and determinations are made as soon as the samples reach the laboratory. General examinations made immediately include those for color, odor, turbidity, presence or absence of oil, necessity of filtering, and the type of container in which the sample is submitted.

Immediate analytical determinations include those for total solids, alkalinity, iron, ammonia nitrogen, nitrate nitrogen, and pH. Odor, turbidity, presence of oil, and necessity of filtering are determined on the unfiltered sample. Iron is determined on both unfiltered and filtered samples. Total solids, ammonia nitrogen, nitrate nitrogen, and pH are determined on the filtered sample. The sample is filtered, if necessary, as soon as the observations and determinations on the unfiltered sample have been made. The filtered sample is then used for the more complete analysis of the brine.

In addition to these immediate determinations, the brines are analyzed for silica, manganese, calcium, magnesium, sodium and potassium combined (by difference), sulfate, and chloride.

CONDITION OF THE SAMPLE

1. The apparent color of the sample is recorded as clear, reddish, blackish, etc.
2. The odor of the unfiltered sample is recorded as oily, musty, or like hydrogen sulfide, etc.
3. The turbidity is reported as absent, slight, heavy, etc.
4. The presence or absence of oil is recorded.
5. If the sample contains oil or suspended matter, the necessity for filtering is recorded.
6. The type of container in which the sample is submitted is recorded.

CHEMICAL ANALYSIS

1. *pH*. — pH is determined by electric pH meter.
2. *Total solids*. — Total solids are determined gravimetrically: 50 ml. of brine is evaporated in a weighed Pyrex dish, dried at a constant temperature of 180° C. for one hour, cooled in a desiccator, and weighed. This residue is weighed immediately as it picks up moisture from the atmosphere. The weight of the residue in milligrams multiplied by 20 gives p.p.m. of total dissolved solids.

3. *Alkalinity, volumetric*. — 50 ml. of the brine is titrated with N/50 H₂SO₄ to a phenolphthalein end-point if the addition of the indicator produces a red color. Methyl orange is added to the same portion of sample and titration continued to the methyl orange end-point. The methyl orange titration in p.p.m. CaCO₃ is equal to the number of ml. N/50 H₂SO₄ multiplied by 20. This value is the total alkalinity expressed as CaCO₃. The phenolphthalein titration gives one-half the normal carbonate and all the hydroxide present. Titration to the methyl orange end-point gives total hydroxide, normal carbonate, and bi-

carbonate. The results are expressed as p.p.m. CaCO₃ for the purpose of making hypothetical combinations and are also expressed as p.p.m. of hydroxide, normal carbonate, and bicarbonate in the ionic report. The ionic results are calculated from the alkaline titrations. If the phenolphthalein alkalinity is greater than one-half the methyl orange alkalinity, normal carbonate and hydroxide are present; if exactly equal to one-half the methyl orange alkalinity, normal carbonate; if less than one-half, normal carbonate and bicarbonate. On the basis of these considerations, therefore, p.p.m. of hydroxide, carbonate, and bicarbonate are calculated by determining the equivalents of each and multiplying by the equivalent weights of each ion.

4. *Iron, colorimetric*. — Iron is determined on a 50 ml. sample or adequate dilution thereof. The iron is completely oxidized to the trivalent state in HCl solution by the addition of potassium permanganate, and potassium thiocyanate is added to produce a brownish-red color which is compared with appropriate standards made up in the same way from a standard iron solution. P.p.m. of iron as Fe are calculated by using the formula:

$$\text{ml. reading} \times \text{mg. Fe/ml. standard} \times \frac{\text{total vol.}}{\text{vol. read}} \times \frac{1000}{\text{original vol.}}$$

To obtain this value as iron oxide (Fe₂O₃), the value is multiplied by the factor 1.4297.

5. *Ammonia nitrogen, colorimetric*. — 50 ml. of the sample diluted to 500 ml. is distilled with sodium hydroxide and 200 ml. of the distillate collected. Aliquot portions of the distillate are pipetted into Nessler tubes and nesslerized. Comparison is made in a comparator with a standard NH₄-Cl solution, which is made up in terms of mg. N, and the formula

$$\text{ml. reading} \times \text{mg. N/ml. standard} \times \frac{\text{total vol.}}{\text{vol. read}} \times \frac{1000}{50}$$

is used to calculate p.p.m. of ammonia nitrogen.

6. *Nitrate nitrogen, reduction method*. — A 50 ml. sample is concentrated by boiling with NaOH to dispel ammonia. The nitrate present is reduced with aluminum metal. The solution is transferred to a Kjeldahl distilling flask, diluted to approximately 300 ml. and distilled, 200 ml. of the distillate being collected. Aliquot portions of the distillate are pipetted into Nessler tubes and nesslerized as in the ammonia nitrogen determination.

7. *Chlorides*. — Chlorides are determined both gravimetrically and volumetrically. They are determined by the Volhard method by precipitation with standard silver nitrate solution, filtration, drying, and weighing of precipitated silver chloride and titration of excess silver nitrate with standard potassium thiocyanate. Volumetric and gravimetric results should check to 0.4 percent or less.

Chloride values for oil-field brines run approximately 60 percent of the total solids value in p.p.m. This figure is used in estimating the appropriate dilution of sample to be made for the determination. A sample portion is used which yields approximately 0.3 g. of AgCl. The following dilutions are used:

| <i>Approximate Cl p.p.m.</i> | <i>Dilution ml:ml</i> | <i>For Analysis ml.</i> | <i>Multiplier</i> |
|----------------------------------|---------------------------|-----------------------------|-------------------|
| up to 1600 | none | 50 | 20 |
| 1700 - 3200 | none | 25 | 40 |
| 3300 - 8000 | 100 - 500 | 50 | 100 |
| 9000 - 16000 | 50 - 500 | 50 | 200 |
| 17000 - 32000 | 50 - 1000 | 50 | 400 |
| 33000 - 64000 | 50 - 1000 | 25 | 800 |
| 65000 - 120000 | 50 - 1000 | 25 | 800 |

8. *Complete minerals, general.* — The analysis for complete minerals includes the determination of silica, ferric and aluminum oxides, calcium, magnesium, and sulfate. Silica is determined gravimetrically in two 50 ml. portions of sample. The silica in both portions is dehydrated by evaporation to dryness with HCl in platinum dishes. The dehydrated residue is taken up in hot 1:1 HCl, and washed by decantation with hot 1:1 HCl, until only the silica remains. This is transferred to the filter paper and washed well with hot water. The two portions are ignited together in a platinum crucible and weighed. The ignited residue is treated with HF and H₂SO₄, reignited, and the weight of silica is obtained by loss in weight.

Ferric and aluminum oxides (R₂O₃) are determined gravimetrically in the filtrates from the silica determination after oxidation of the iron to the trivalent state with bromine water. The solutions are made alkaline to methyl red with NH₄OH, allowed to digest hot for a few minutes and filtered. The R₂O₃ precipitates are washed well with hot water and ignited together. The residue is weighed and then treated with HF and H₂SO₄ to volatilize the silica which escaped the first separation. The filtrates from the R₂O₃ determination serve different purposes from this point on. One is used for the gravimetric determinations of calcium and magnesium, the other for the gravimetric determination of sulfate. One is made alkaline with NH₄-OH

and the calcium precipitated as the oxalate. A double precipitation is carried out to minimize the error introduced by the occlusion of magnesium oxalate in the precipitate. The calcium oxalate is ignited to the oxide and weighed.

Magnesium is determined on the total filtrate from the calcium determination by precipitating it as magnesium ammonium phosphate in the usual way. Here, too, a double precipitation is carried out. The precipitate is filtered, washed with 1:20 NH₄OH, ignited to the pyrophosphate and weighed.

The sulfate determination is made on the other filtrate from the R₂O₃ determination. Sulfate is determined in the usual way by precipitation as BaSO₄ which is ignited and weighed.

9. *Manganese, colorimetric.* — 50 ml. of the sample is evaporated to dryness with 15 ml. of conc. H₂SO₄ to remove the chlorides as HCl. A few ml. of HNO₃ is added at this point if any carbon is present. The residue is taken up with distilled water and filtered, the salts being leached several times with hot water. 1 ml. of conc. HNO₃ is added to the filtrate, which is heated almost to boiling. A 1 ml. excess of AgNO₃ solution and approximately 0.5 g. (NH₄)₂S₂O₈ (ammonium persulfate) is added. The solution is heated almost to boiling and kept hot for 10 minutes to produce the full permanganate color. The color is compared with appropriate standards made up from a standard manganese solution and treated exactly like the unknown. Comparisons are made in 50 ml. Nessler tubes in a comparator. Using a 50 ml. sample, the standard reading multiplied by 20 gives p.p.m. Mn. The factor for converting Mn to MnO is 1.2912.

10. *Sodium calculation.* — Upon completion of these determinations the positive ion values expressed as milliequivalents are summed up, also the negative ion values expressed as milliequivalents. The sum of the negative milliequivalents minus the sum of the positive milliequivalents gives a value which is reported as milliequivalents of sodium (combined sodium and potassium). This multiplied by the equivalent weight of sodium gives p.p.m. of sodium and potassium expressed as sodium.

IV. BRINE COMPOSITION IN RELATION TO GEOLOGIC OCCURRENCE

BY

ALFRED H. BELL and WAYNE F. MEENTS

The results of chemical analyses of Illinois oil-field brines are given in Part V. They are arranged by formations (see figure 1 for generalized geologic column) from the top down and under each formation alphabetically by counties and numerically by townships. So far as possible, all analyses have been omitted which later work indicated to be unrepresentative of the brine in the formation.

The samples from formations from the Pennsylvanian down to the Silurian are nearly all from oil-producing wells. Oil-producing areas in Illinois are shown in figure 3. All the brine samples from nonproducing areas are from cable-tool wells, as it is generally impossible to collect good brine samples from rotary wildcat wells during drilling.

Isocon maps, or contour maps of total dissolved minerals, are shown by formations in figures 4, 5, 6, 7, 8, 9, 11, 12, and 13. Most of these show similar patterns of variations which conform rather closely with the basin structure (fig. 2), the lower concentrations being on the margins, and the

higher concentrations being in the deeper part of the basin. For most formations, the highest brine concentrations are to the west of the structurally lowest part of the basin. The most abundant data are for the Ste. Genevieve formation (fig. 9).

The concentration of sulfate ion in Ste. Genevieve brines is shown by contours in figure 10. Here the pattern of variation is less distinct than for total solids, but there seems to be some relationship with the basin structure.

Because the thirty analyses of brine from the Pennsylvanian system given in Part V are from scattered areas in southern Illinois and from several different sandstone beds, an isocon map of Pennsylvanian brines is not included. Total solids vary from a low of 11,626 p.p.m. in Clark County to a high of 55,300 p.p.m. in Wabash County.

Analyses of brine from the *Degonia* and *Palestine* formations in the Chester series are too few and scattered to permit the preparation of isocon maps.

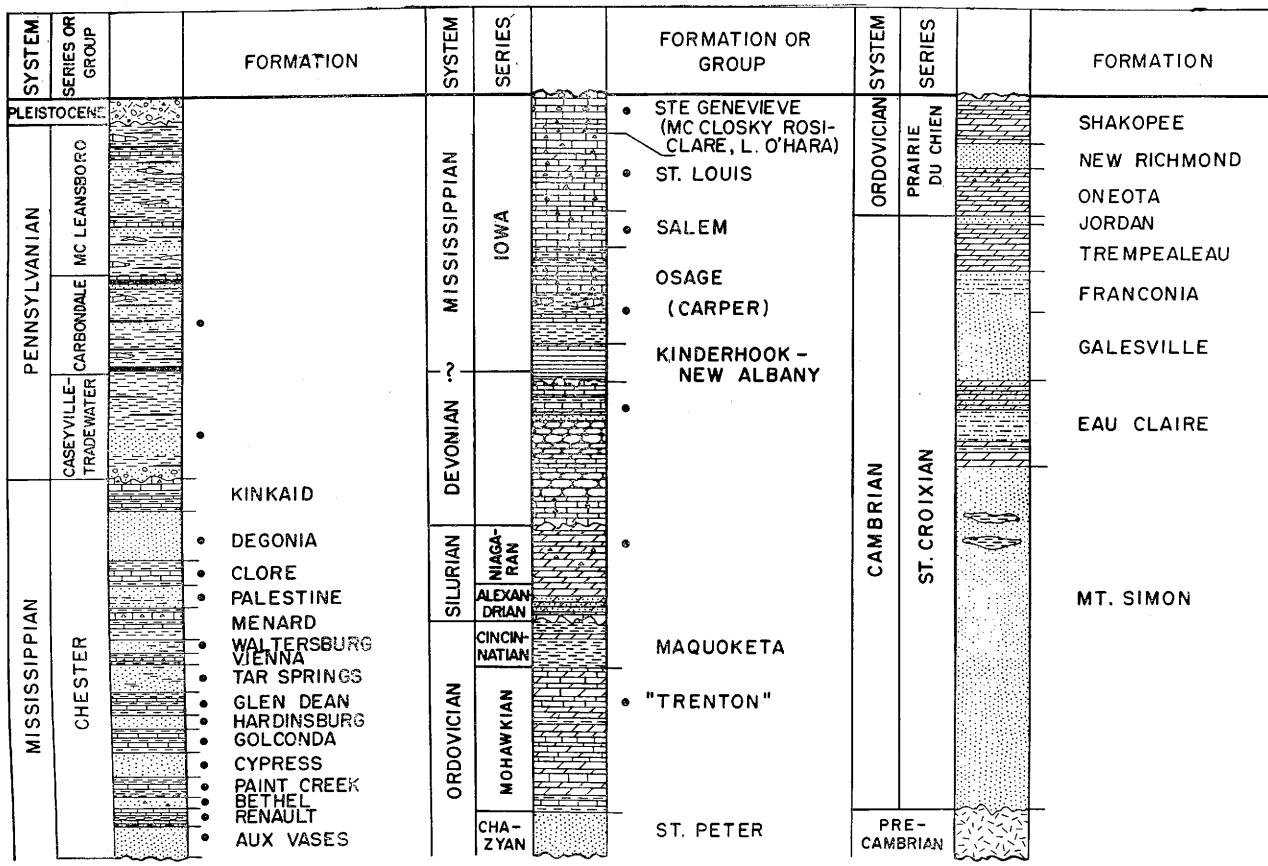


FIG. 1.—Generalized geologic column for southern Illinois oil region. Black dots indicate principal oil- and gas-producing strata. (Same as fig. 3 in Illinois Petroleum 62.)

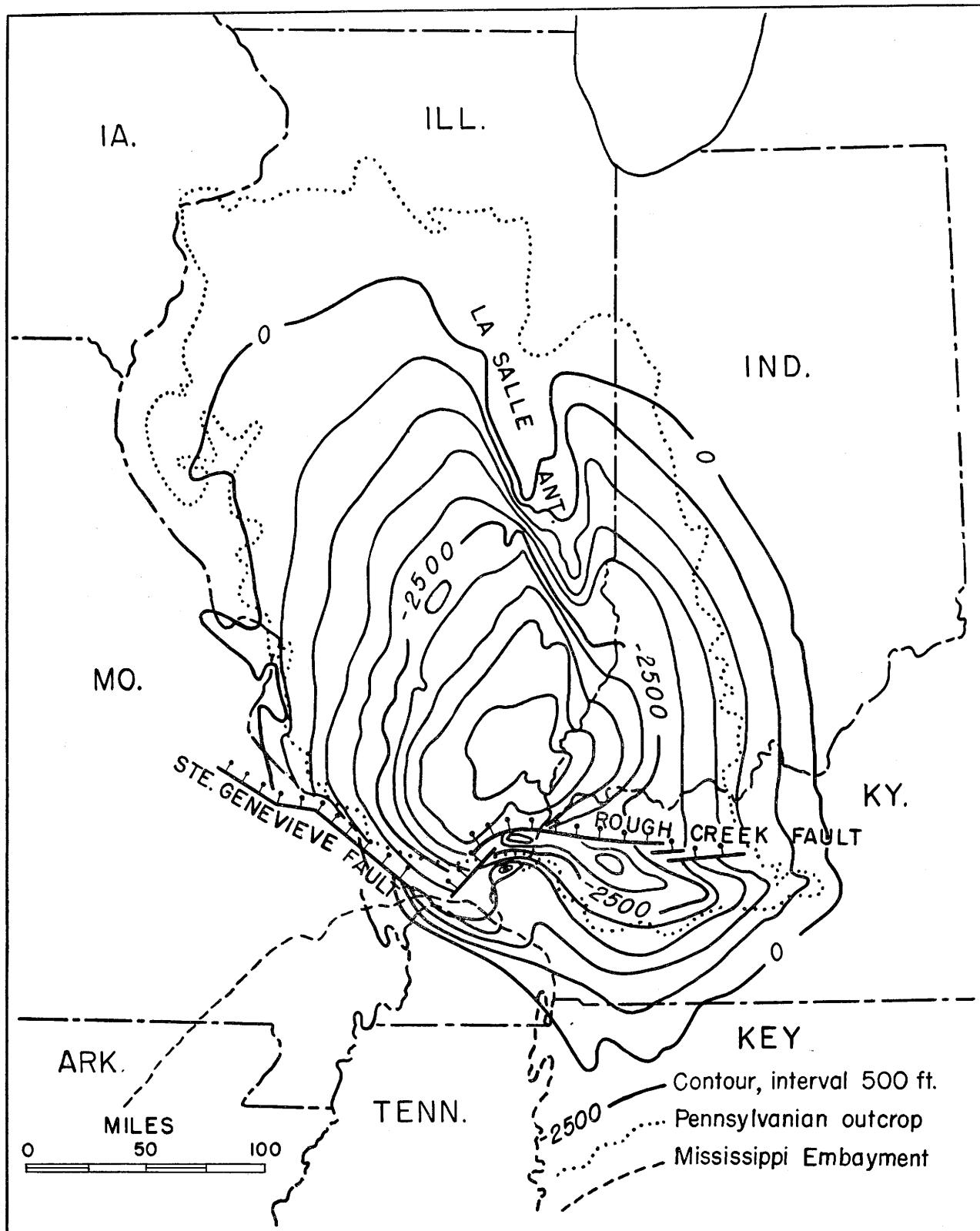


FIG. 2.—Geologic structure of Eastern Interior basin drawn on base of New Albany black shale (top of Devonian limestone or older beds). (Fig. 146, p. 487, Illinois Geol. Survey Circ. 169, and Bull. A.A.P.G., Feb. 1951.)

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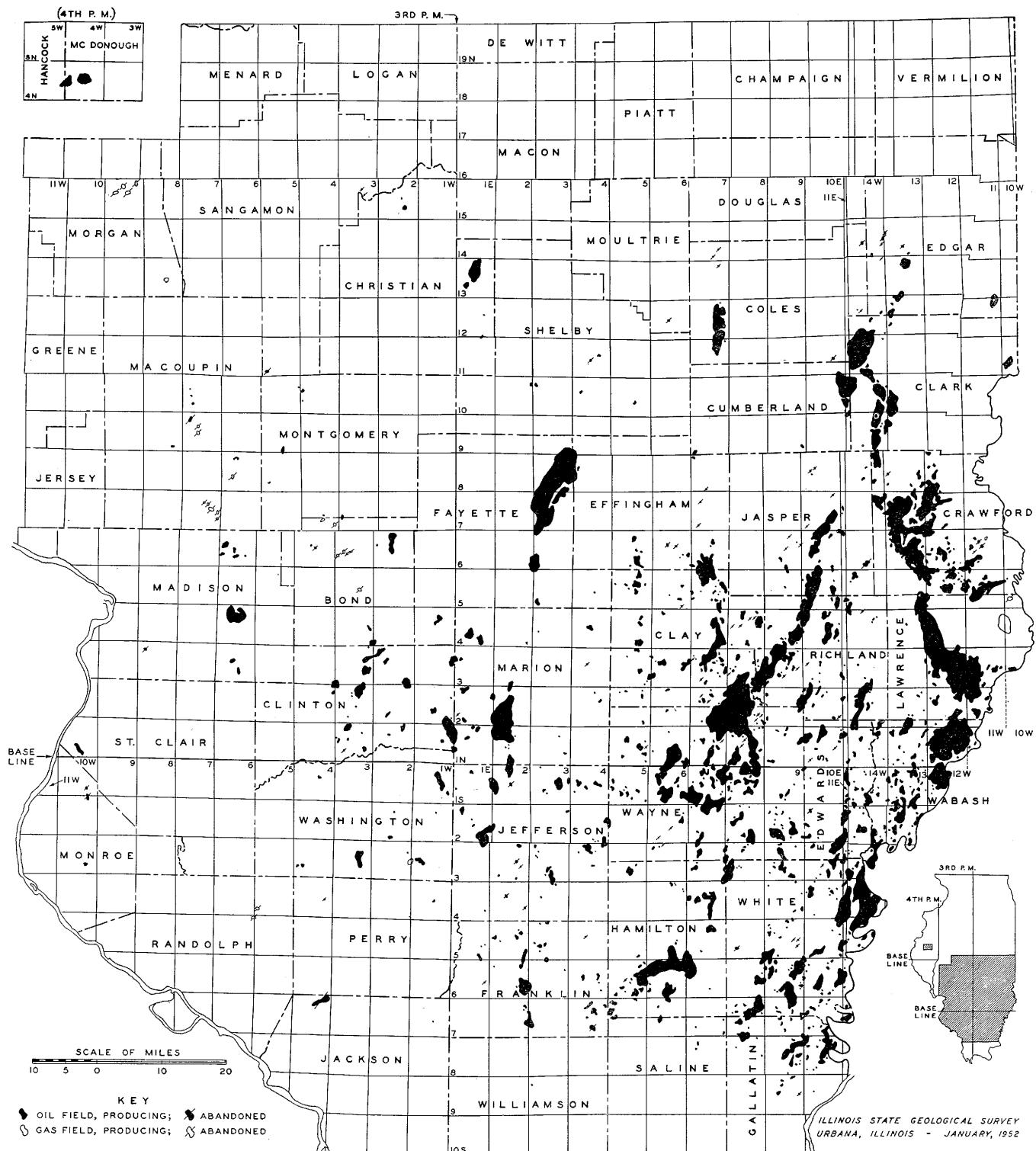


FIG. 3.—Oil- and gas-producing areas in Illinois, Jan. 1952.

BRINE COMPOSITION

11

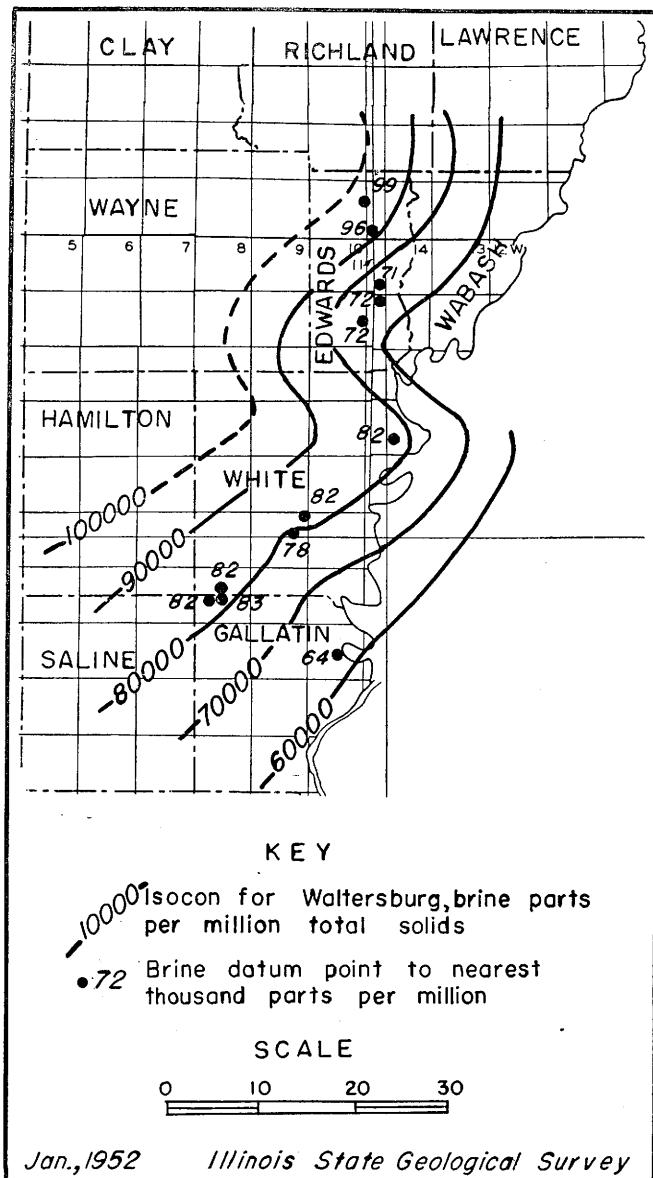


FIG. 4.—Isocon map of Waltersburg brines.

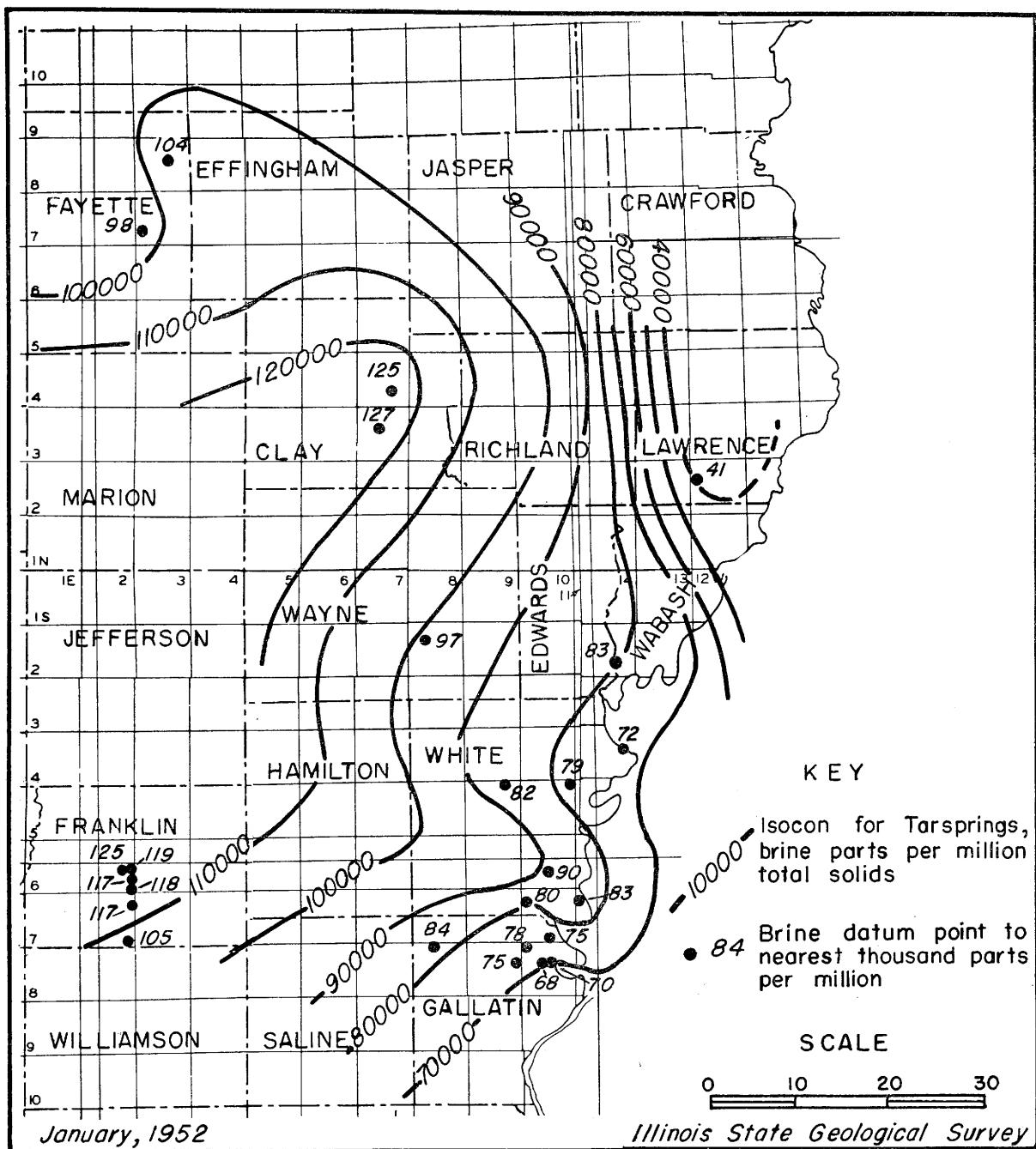


FIG. 5.—Isocon map of Tar Springs brines.

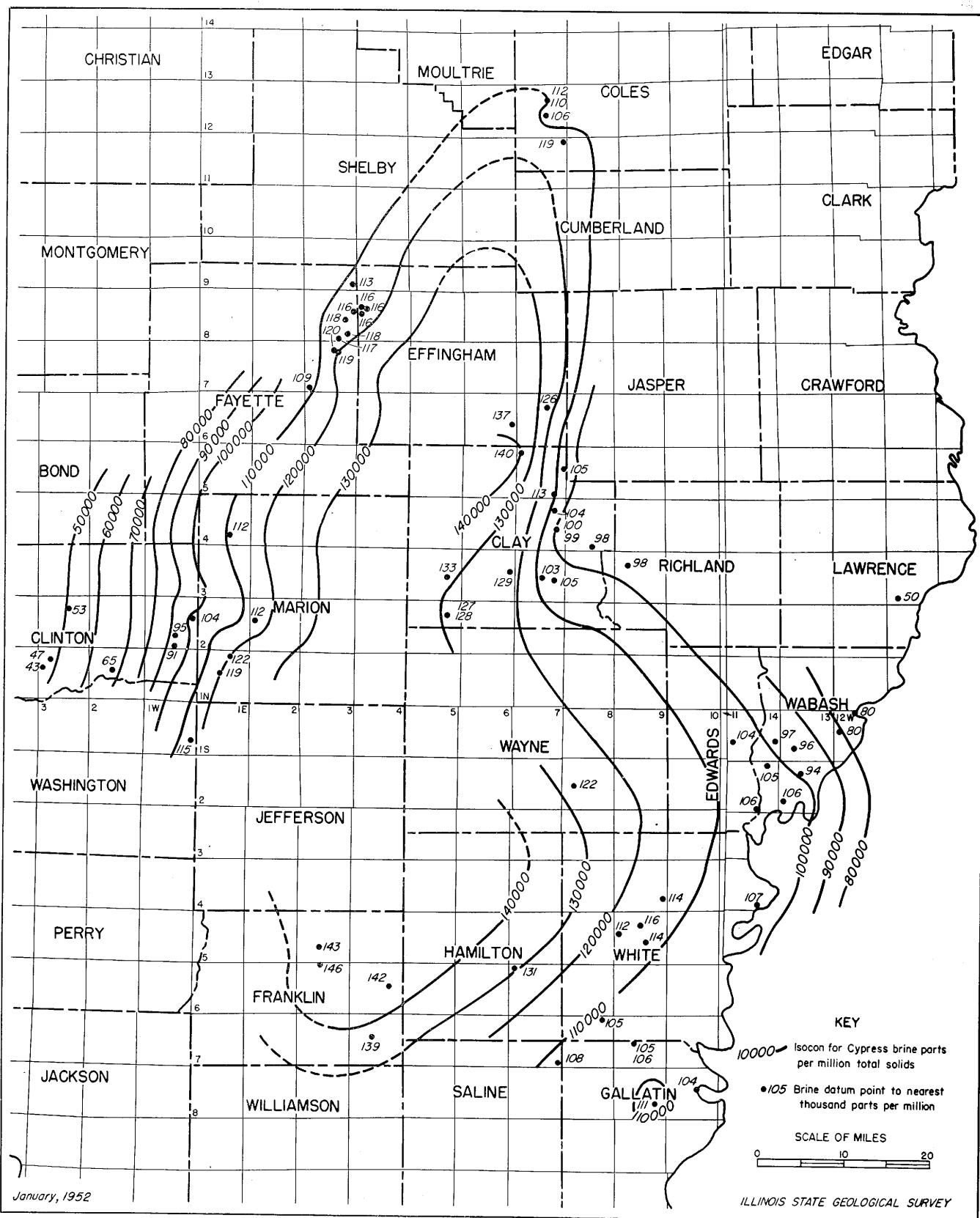


FIG. 6.—Isocon map of Cypress brines.

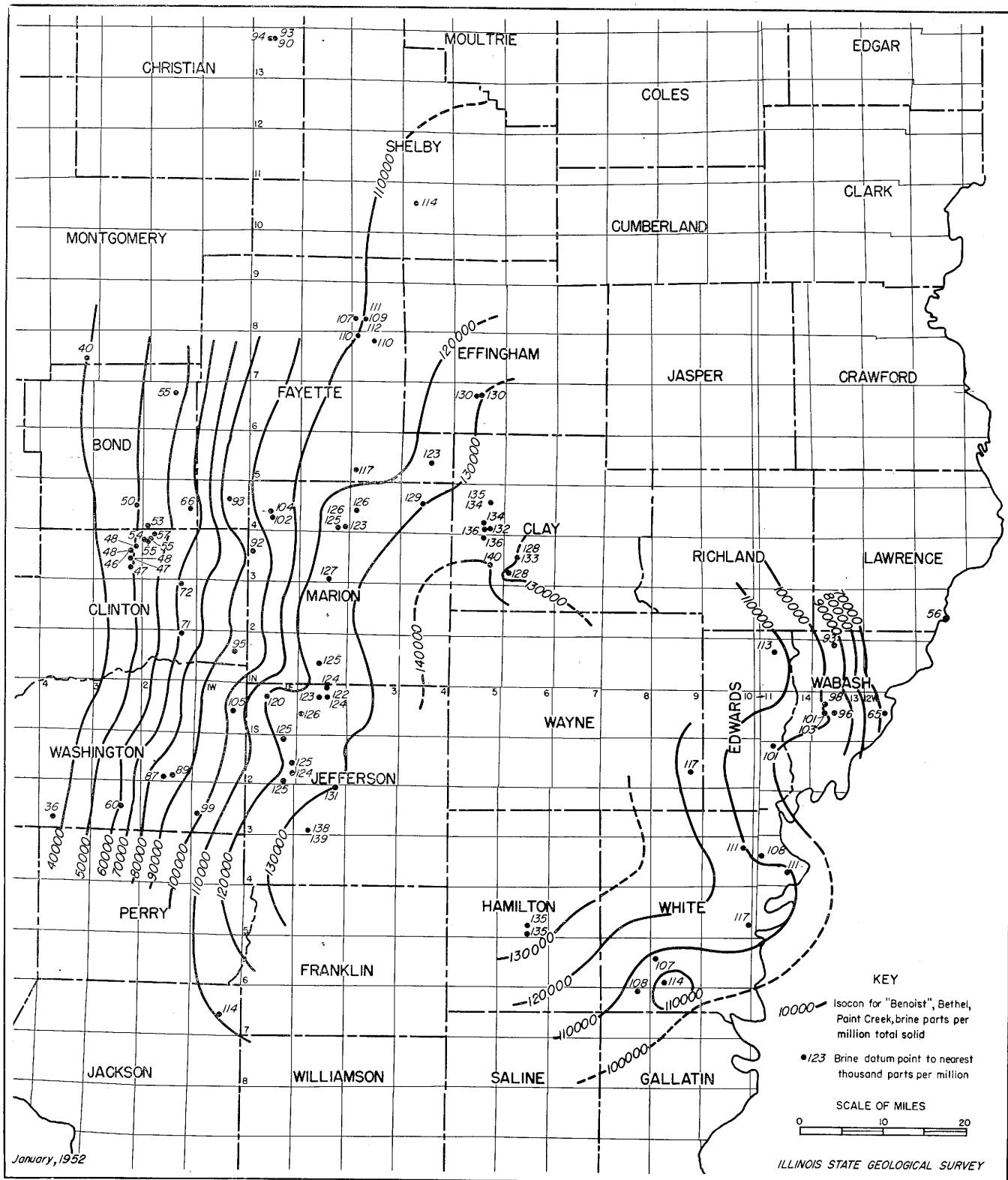


FIG. 7.—Isocon map of “Benoist,” Bethel, and Paint Creek brines.

BRINE COMPOSITION

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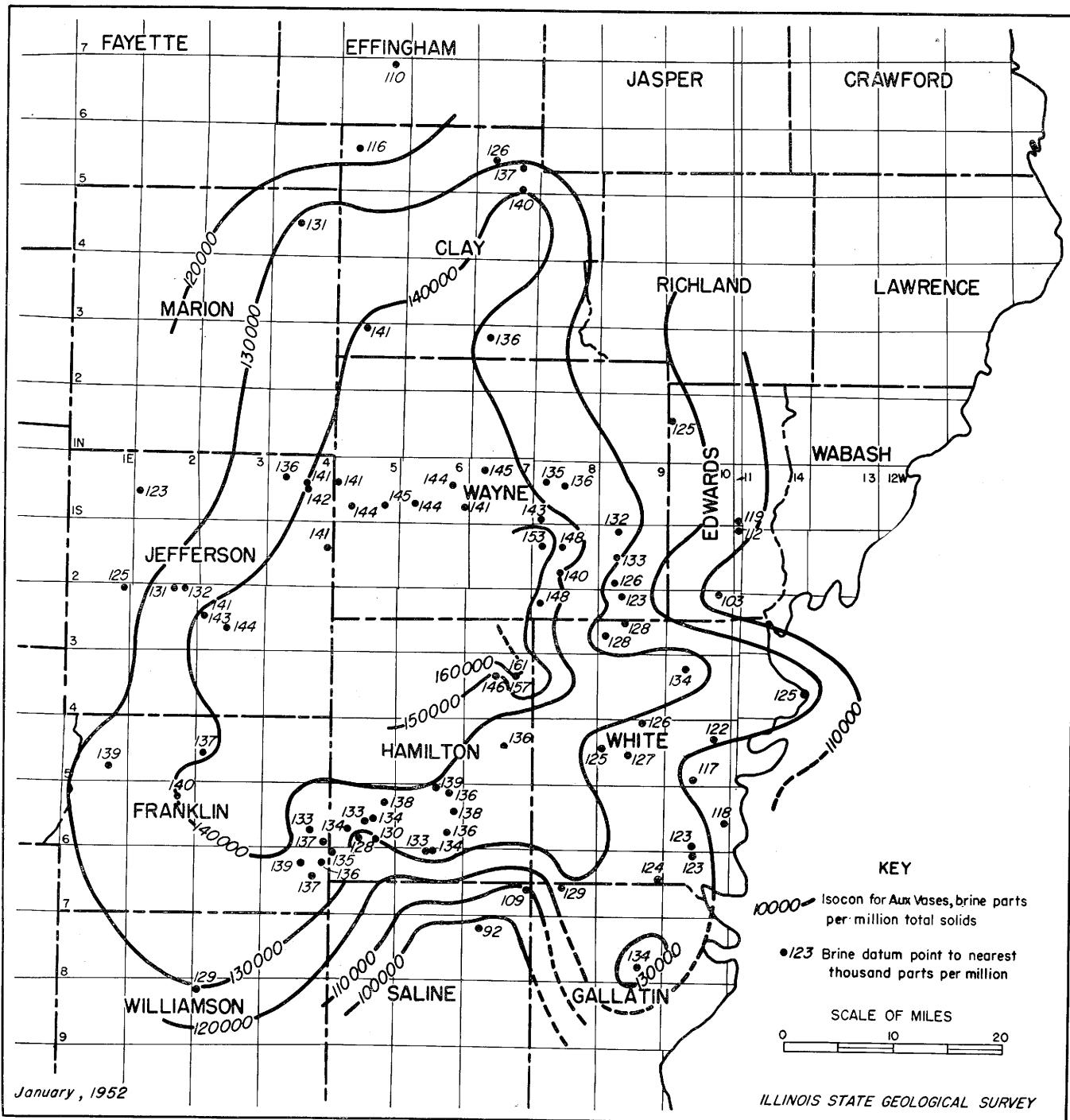


FIG. 8.—Isocon map of Aux Vases brines.

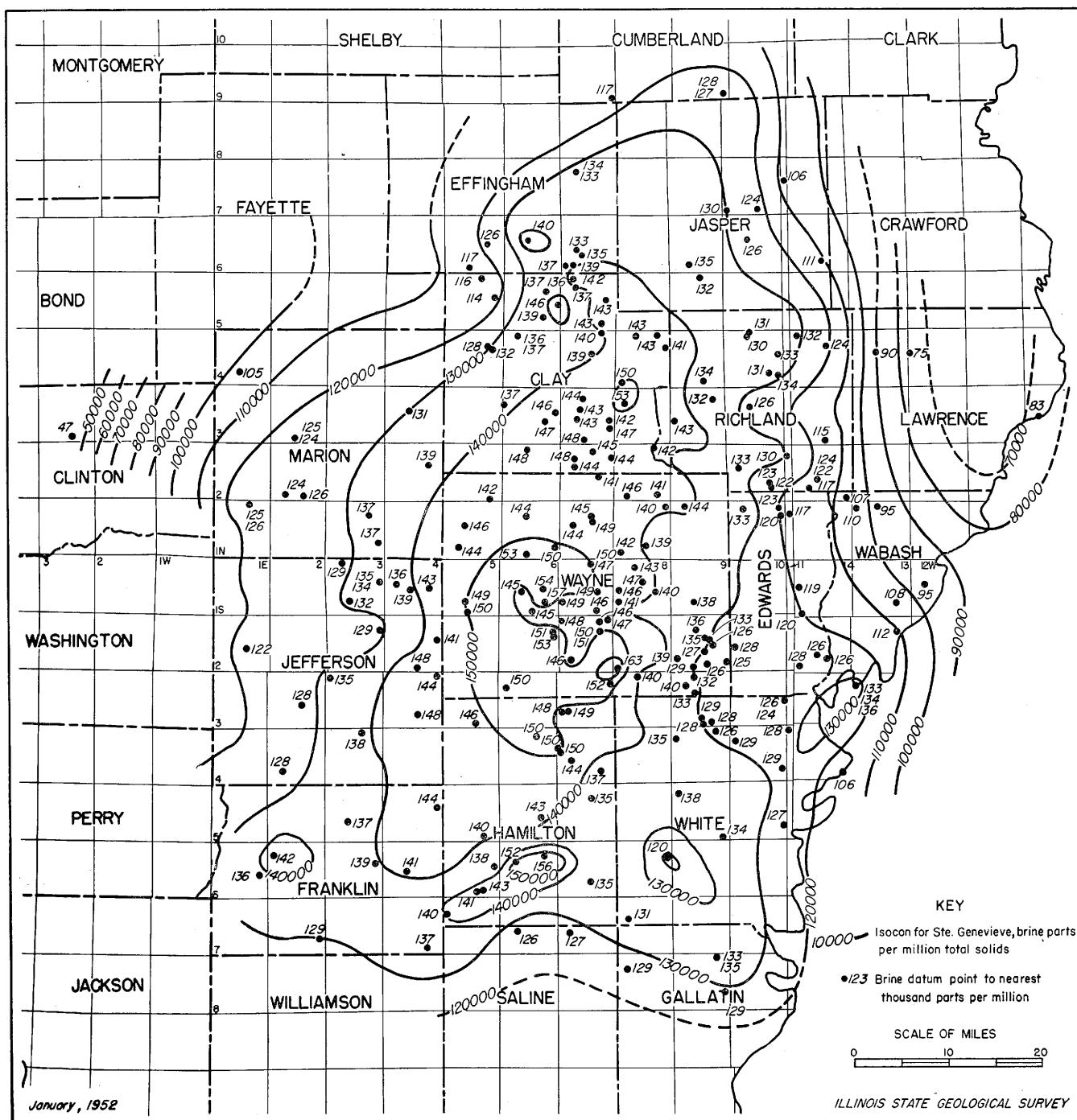


FIG. 9.—Isocon map of Ste. Genevieve brines.

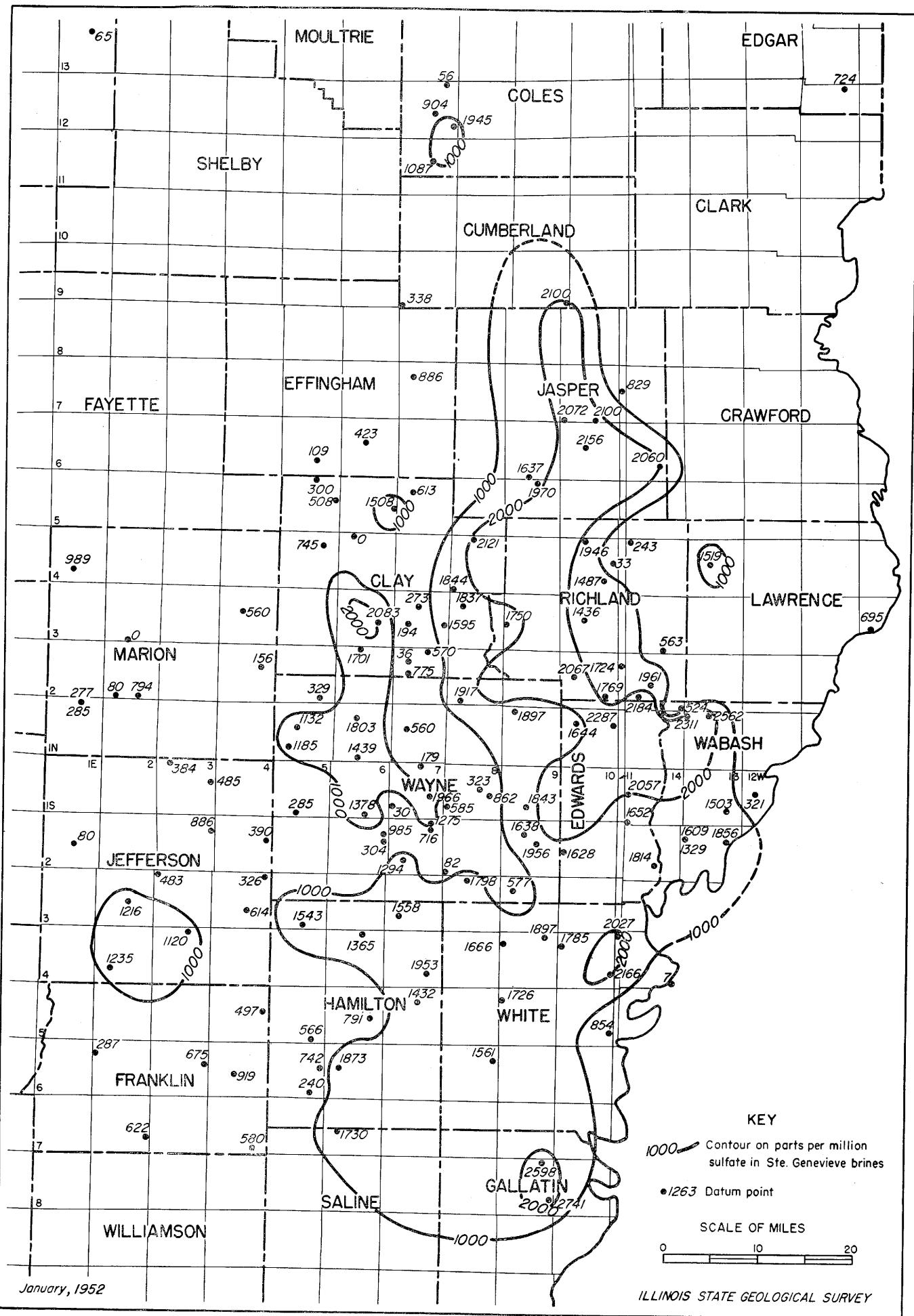


FIG. 10.—Contour map of sulfate concentration in parts per million of Ste. Genevieve brines.

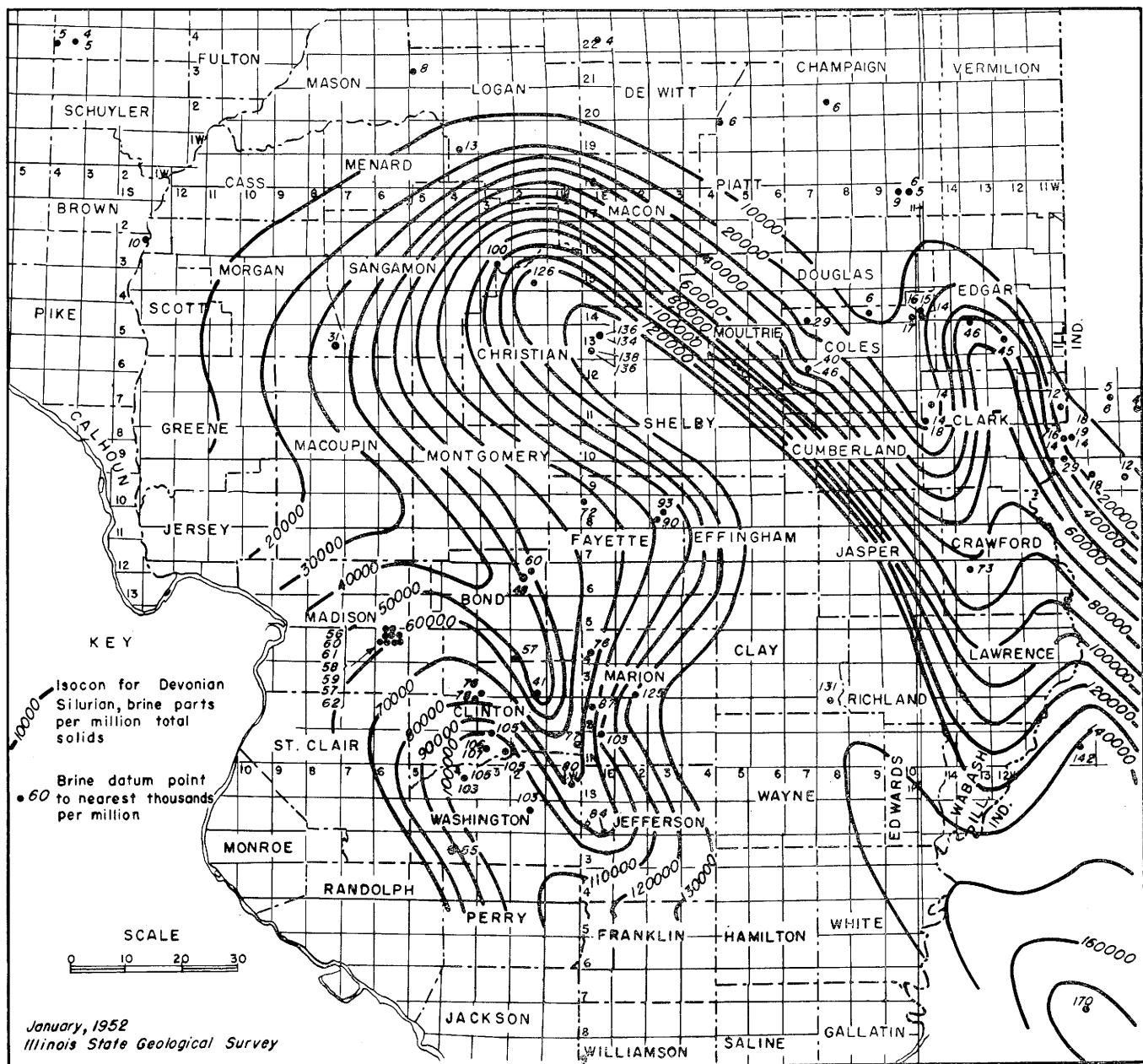


FIG. 11.—Isocon map of Devonian-Silurian brines.

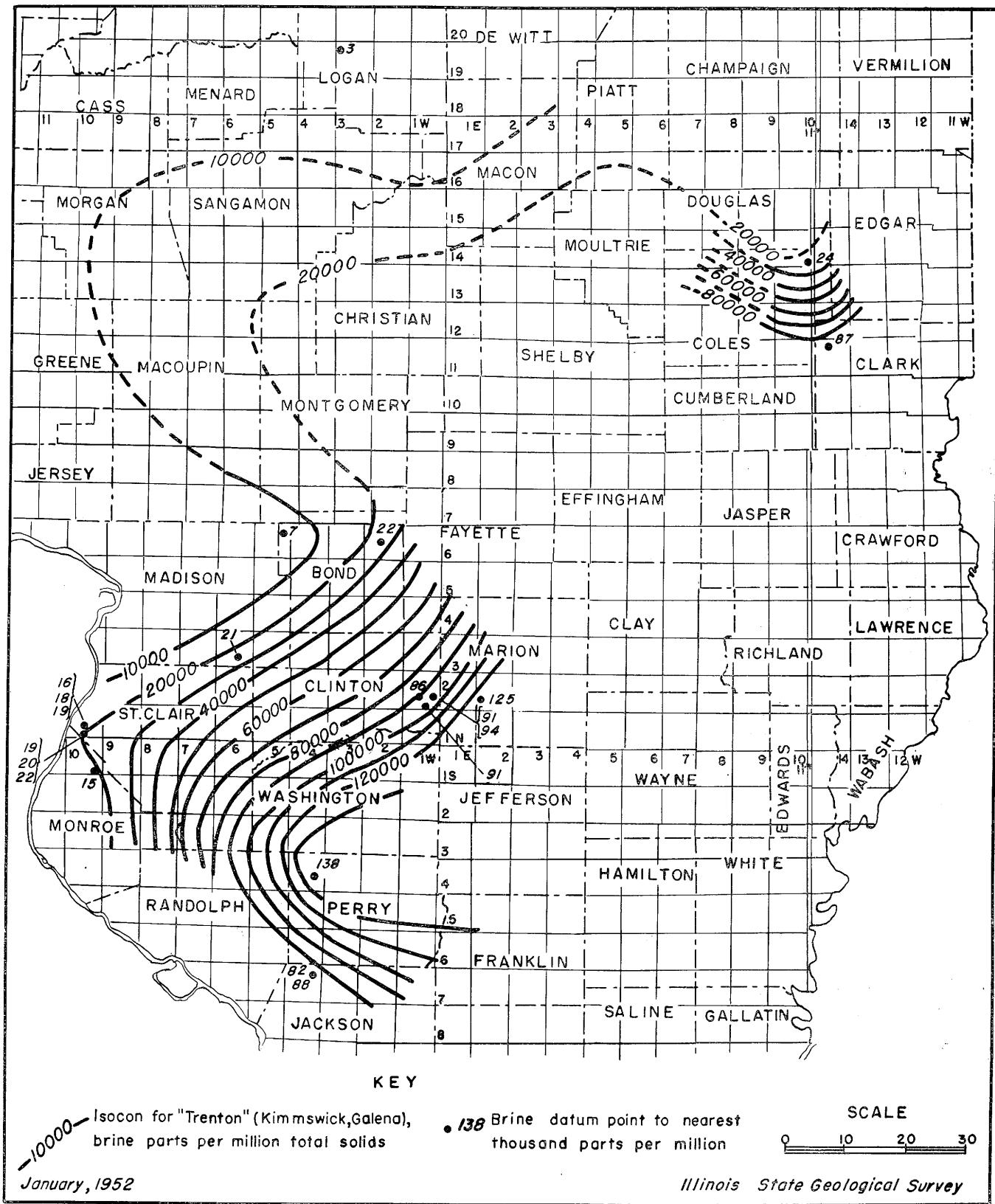


FIG. 12.—Isocon map of "Trenton" (Kimmswick, Galena) brines.

ILLINOIS OIL-FIELD BRINES

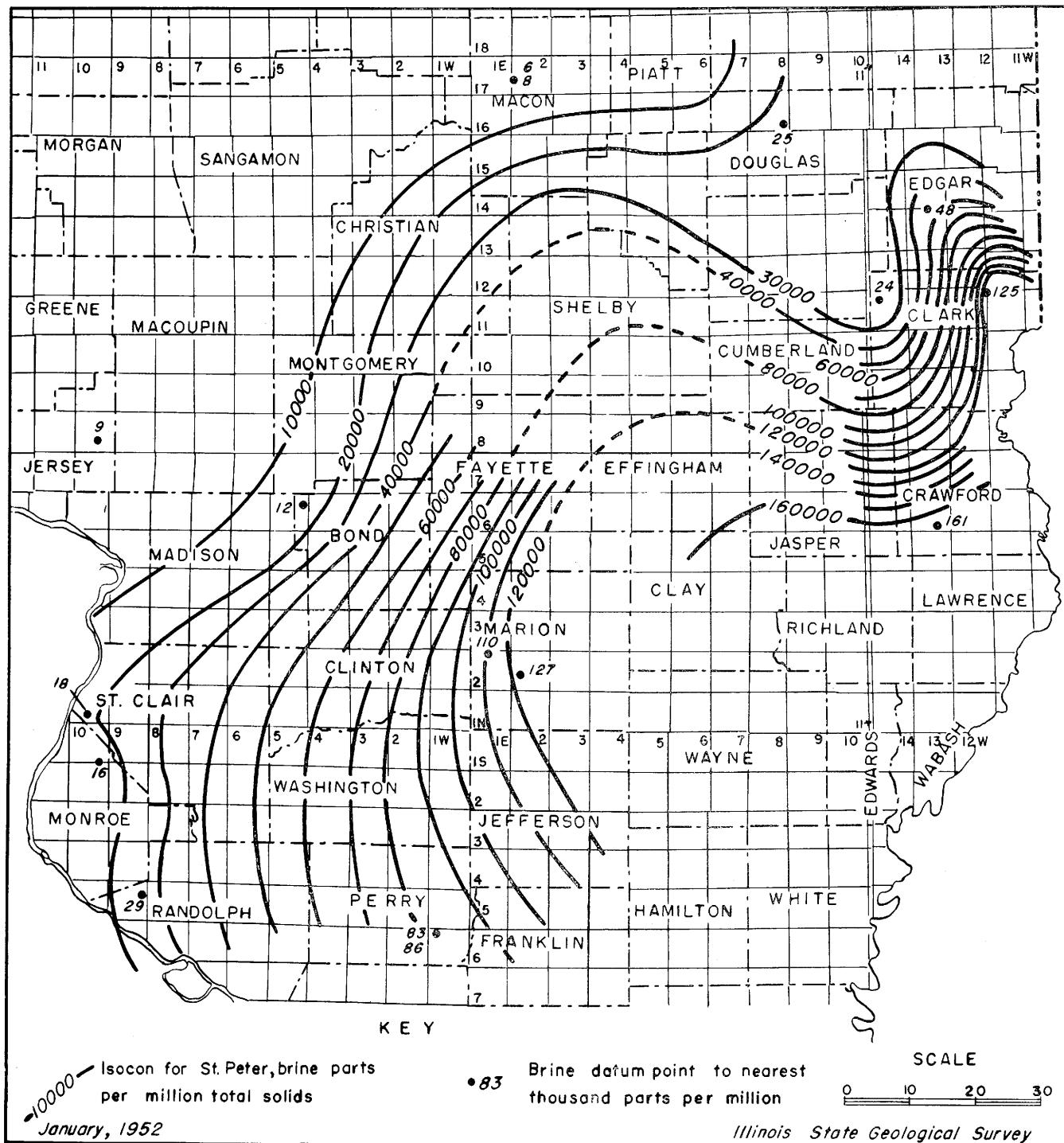


FIG. 13.—Isocon map of St. Peter brines.

V. BRINE ANALYSES

ILLINOIS OIL-FIELD BRINES

TABLE 1.—ILLINOIS OIL-FIELD BRINES BY FORMATION
TOTAL SOLIDS AND CONSTITUENTS IN PARTS PER MILLION

| FORMATION COUNTY LOCATION | Lab. No. | Depth ¹ | Total Solids | NH ₄ | Na | Ca | Mg | SiO ₂ | Fe Fil- tered | Fe Unfil- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO ₃ | CO ₃ | HCO ₃ | pH |
|---------------------------------|----------|--------------------|-----------------|-----------------|-------|-------|-----|------------------|---------------------|-----------------------|--------------------------------|-----|-----------------|--------|-----------------|-----------------|------------------|-----|
| PENNSYLVANIAN | | | | | | | | | | | | | | | | | | |
| BOND | B- 267 | 578-593 | 39218 | 16 | 13901 | 552 | 302 | 5.0 | 0.0 | 24 | 11 | 0.6 | 18 | 23274 | 5.7 | | 5.3 | |
| 22-5N-4W | | | | | | | | | | | | | | | | | | |
| CHRISTIAN | 906 | 176 | 44322 | 13 | 14765 | 1026 | 541 | 4.0 | 0.0 | 0.0 | 3.0 | 0.0 | 12 | 26157 | 18 | | 44 | 7.5 |
| 10-13N-1E | | | | | | | | | | | | | | | | | | |
| CLARK | | | | | | | | | | | | | | | | | | |
| 4-10N-14W | 278 | 295-305 | 11626 | 4.6 | 4391 | 72 | 89 | 11 | 20 | 36 | 6.0 | 0.0 | 0 | 5450 | 9.9 | 2940 | 7.2 | |
| 4-10N-14W | 277 | 300-390 | 28376 | 9.3 | 10285 | 319 | 259 | 11 | 1.2 | 5.4 | 6.0 | 0.2 | 282 | 15947 | 11 | 1778 | 7.5 | |
| COLES | | | | | | | | | | | | | | | | | | |
| 22-11N-10E | 137 | 505-538 | 34001 | 5.4 | 12538 | 340 | 178 | 22 | 0.0 | 0.0 | 0.0 | 0.2 | 0 | 20192 | 9.6 | | 459 | |
| 20-14N-10E | 340 | 239-416 | 26640 | 8.2 | 9940 | 214 | 145 | 10 | 0.0 | 4.0 | 11 | 0.2 | 0 | 15632 | 6.2 | | 881 | 7.9 |
| CRAWFORD | | | | | | | | | | | | | | | | | | |
| 15-5N-12W | 56 | 985 | 15260 | 5.8 | 5673 | 5 | 53 | 32 | 6.0 | 5.0 | 5.0 | 0.0 | 1414 | 7096 | 5.3 | 360 | 608 | |
| 2-5N-13W | 54 | 838 | 18782 | 10 | 7023 | 174 | 94 | 12 | 6.0 | 1.0 | 1.0 | 0 | 10372 | 7.1 | | 1839 | | |
| 2-5N-13W | 55 | 898 | 18495 | | 7086 | 59 | 87 | 32 | 0.6 | | 16 | | 0 | 10354 | | 1603 | | |
| 31-6N-11W | 58 | 900 | 14011 | 5.1 | 4572 | 246 | 212 | 14 | 1.8 | | 6.0 | | 2390 | 6153 | | 322 | | |
| 31-6N-11W | 57 | 900 | 14034 | 5.1 | 4505 | 340 | 220 | 46 | 1.6 | | 9.0 | 0.4 | 2346 | 6200 | 3.5 | 458 | | |
| 10-7N-13W | 647 | 940-980 | 41306 | 11 | 14553 | 562 | 283 | 19 | 192 | | 0.0 | 1.0 | 0 | 24106 | 1.2 | | 291 | 6.5 |
| EDGAR | | | | | | | | | | | | | | | | | | |
| 3-13N-13W | 725 | 422-457 | 52100 | 16 | 18078 | 951 | 454 | 18 | 0.0 | 1.2 | 16 | 0.5 | 581 | 30269 | 14 | 3 | 344 | 7.3 |
| EDWARDS | | | | | | | | | | | | | | | | | | |
| 13-3S-10E | 441 | 1974-1983 | 54070 | 26 | 19643 | 648 | 431 | 13 | 0.4 | 2.8 | 19 | 0.8 | 57 | 32349 | | | 600 | 6.5 |
| GALLATIN | | | | | | | | | | | | | | | | | | |
| 15-8S-10E | 488 | 1200 | 28194 | | | | | | | | | | | | | | | |
| 4-9S-9E | 849 | 1155-1164 | 37462 | 13 | 12671 | 895 | 286 | 4.0 | 0.0 | 50 | 12 | 0.4 | 850 | 21106 | 18 | | 396 | 7.3 |
| LAWRENCE | | | | | | | | | | | | | | | | | | |
| 8-2N-12W | 379 | 1508-1531 | 32920 | 257 | 11101 | 612 | 229 | 6.0 | 0.6 | 50 | 10 | 1.2 | 2258 | 17383 | 32 | | 526 | 6.8 |
| MACOUNIN | | | | | | | | | | | | | | | | | | |
| 20-10N-7W | 276 | 460-492 | 15958 | | | | | | | | | | | | | | | |
| MADISON | | | | | | | | | | | | | | | | | | |
| 19-6N-6W | 1017 | 540-549 | 23645 | | | | | | | | | | | | | | | |
| 20-6N-6W | 1016 | 520-566 | 22547 | | | | | | | | | | | | | | | |
| 28-6N-6W | 952 | 515-525 | 22432 | 8 | 7852 | 220 | 287 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 1461 | 12021 | 0.0 | 39 | 346 | 8.3 |
| 29-6N-6W | 954 | 527-545 | 22998 | 8 | 7939 | 422 | 254 | 2.2 | 0.0 | 8.0 | 1.0 | 0.0 | 0 | 153632 | 0.0 | | 193 | 7.9 |
| MONTGOMERY | | | | | | | | | | | | | | | | | | |
| 12-10N-5W | 233 | 578-598 | 32880 | | 12332 | 525 | 284 | 11 | 1.6 | 20 | 11 | 0.2 | 84 | 19718 | | | 422 | |
| 30-10N-4W | 200 | 610-632 | 36190 | 19 | 13165 | 415 | 334 | 16 | 0.8 | 14 | 11 | 0.4 | 71 | 22030 | 15 | | 17 | |
| 31-11N-5W | 299 | 610-624 | 34486 | 18 | 12234 | 517 | 361 | 15 | 8.0 | 12 | 4.0 | 0.0 | 5 | 20449 | 9.9 | | 69 | 6.8 |
| WABASH | | | | | | | | | | | | | | | | | | |
| 22-1N-12W | 65 | 1442-1476 | 36367 | | | | | | | | | | | | | | | |
| 17-1S-12W | 258 | 2053-2072 | 55300 | 13 | 19204 | 1252 | 383 | 11 | 24 | 88 | 6.7 | 2.4 | 1458 | 31845 | 6.4 | 74 | | |
| WHITE | | | | | | | | | | | | | | | | | | |
| 22-3S-10E | 773 | 1958-1966 | 48886 | 18 | 17758 | 693 | 277 | 22 | 1.2 | 8.0 | 4.0 | 0.1 | 8 | 22238 | 18 | | 320 | 7.1 |
| 6-4S-14W | 453 | 1517-1556 | 28890 | 36 | 9540 | 951 | 245 | 7.0 | 4.0 | 30 | 7.3 | 1.6 | 1397 | 16048 | 5.3 | | 164 | 6.4 |
| 27-4S-14W | 484 | 733-747 | 14514 | | | | | | | | | | | | | | | |
| DEGONIA | | | | | | | | | | | | | | | | | | |
| WHITE | | | | | | | | | | | | | | | | | | |
| 19-4S-11E | 436 | 1969-2020 | 54920 | 15 | 19630 | 958 | 440 | 21 | 0.4 | 7.0 | 7.4 | 0.4 | 419 | 32815 | 5.3 | | 252 | 6.8 |
| 32-6S-9E | | | | | | | | | | | | | | | | | | |
| PALESTINE | | | | | | | | | | | | | | | | | | |
| GALLATIN | | | | | | | | | | | | | | | | | | |
| 4-8S-8E | 486 | 1700 | 61288 | | | | | | | | | | | | | | | |
| 33-7S-8E | | 240 | 1700-1722 | 59320 | | 21036 | 765 | 790 | 11 | 0.8 | 2.0 | 11 | 0.0 | 43 | 35733 | | 72 | 471 |

BRINE ANALYSES

| HARDINSBURG | FRANKLIN | 1063 2297-2312 | 126836 | | |
|----------------|----------|----------------|--------|------|---------|
| 20-5S-3E..... | | 1061 2308-2320 | 126162 | | |
| 29-5S-3E..... | | 1062 2303-2320 | 125398 | | |
| HAMILTON | | | | | |
| 16-7S-6E..... | | 1127 2072-2081 | 72992 | | |
| WABASH | | | | | |
| 34-1N-13W..... | | 371 1779-1800 | 66420 | 23 | .22187 |
| 24-6S-10E..... | | | 2174 | 705 | 5.0 |
| 7-6S-11E..... | | | 0.0 | 0.0 | 30 |
| WHITE | | | 0.0 | 0.0 | 16 |
| WALTERSBURG | | | 0.0 | 0.0 | 1.2 |
| EDWARDS | | | 0.0 | 3973 | 37102 |
| 13-1N-10E..... | | | 0.0 | 0.0 | 0.0 |
| 31-1N-11E..... | | | 0.0 | 0.0 | 215 6.6 |
| 31-1S-14W..... | | | 0.0 | 0.0 | 217 7.8 |
| 24-2S-10E..... | | | 0.0 | 0.0 | 217 7.2 |
| 6-2S-14W..... | | | 0.0 | 0.0 | 107 7.0 |
| GALLATIN | | | 0.0 | 0.0 | 217 7.2 |
| 20-7S-8E..... | | | 0.0 | 0.0 | 105 4.2 |
| 21-7S-8E..... | | | 0.0 | 0.0 | 139 6.7 |
| 22-8S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| WHITE | | | 0.0 | 0.0 | 139 6.7 |
| 28-4S-14W..... | | | 0.0 | 0.0 | 139 6.7 |
| 1-6S-9E..... | | | 0.0 | 0.0 | 139 6.7 |
| 14-6S-9E..... | | | 0.0 | 0.0 | 139 6.7 |
| 16-7S-8E..... | | | 0.0 | 0.0 | 139 6.7 |
| TAR SPRINGS | | | 0.0 | 0.0 | 139 6.7 |
| CLAY | | | 0.0 | 0.0 | 139 6.7 |
| 16-3N-7E..... | | | 0.0 | 0.0 | 139 6.7 |
| 26-4N-7E..... | | | 0.0 | 0.0 | 139 6.7 |
| EDWARDS | | | 0.0 | 0.0 | 139 6.7 |
| 27-2S-14W..... | | | 0.0 | 0.0 | 139 6.7 |
| FAYETTE | | | 0.0 | 0.0 | 139 6.7 |
| 31-7N-3E..... | | | 0.0 | 0.0 | 139 6.7 |
| 22-8N-3E..... | | | 0.0 | 0.0 | 139 6.7 |
| FRANKLIN | | | 0.0 | 0.0 | 139 6.7 |
| 23-6S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| 24-6S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| 25-6S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| 36-6S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| 12-7S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| 35-7S-2E..... | | | 0.0 | 0.0 | 139 6.7 |
| GALLATIN | | | 0.0 | 0.0 | 139 6.7 |
| 34-7S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| 4-8S-8E..... | | | 0.0 | 0.0 | 139 6.7 |
| 13-8S-9E..... | | | 0.0 | 0.0 | 139 6.7 |
| 6-8S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| 15-8S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| 16-8S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| LAWRENCE | | | 0.0 | 0.0 | 139 6.7 |
| 18-2N-12W..... | | | 0.0 | 0.0 | 139 6.7 |
| WAYNE | | | 0.0 | 0.0 | 139 6.7 |
| 17-2S-8E..... | | | 0.0 | 0.0 | 139 6.7 |
| WHITE | | | 0.0 | 0.0 | 139 6.7 |
| 14-4S-14W..... | | | 0.0 | 0.0 | 139 6.7 |
| 2-5S-9E..... | | | 0.0 | 0.0 | 139 6.7 |
| 1-5S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| 28-6S-10E..... | | | 0.0 | 0.0 | 139 6.7 |
| 541 2267-2290 | | | 0.0 | 0.0 | 139 6.7 |
| 623 2411 | | | 0.0 | 0.0 | 139 6.7 |
| 245 2109-2126 | | | 0.0 | 0.0 | 139 6.7 |

Where sample was collected from more than one well, denotes one not given

ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Depth | Total Solids | NH ₄ | N _a | C _a | Mg | SiO ₂ | Fe Ferri- tered | Fe Fil- Unfli- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO ₃ | CO ₂ | pH | |
|---|----------|-----------|-----------------|-----------------|----------------|----------------|------|------------------|-----------------------|-------------------------------|--------------------------------|-----|-----------------|-------|-----------------|-----------------|-----|-----|
| WHITE 31-5S-9E..... | 712 | 2622-2666 | 86432 | 16 | 28850 | 2361 | 794 | 14 | 4.0 | 6.4 | 9.0 | 0.8 | 0 | 50902 | 7.1 | 133 | 6.9 | |
| GOLCONDA MONTGOMERY 19-7N-3W..... | 1039 | 708-716 | 37674 | | | | | | | | | | | | | | | |
| CYPRESS CLAY 11-2N-5E..... | | 1197 | 2505-2535 | 126700 | | | | | | | | | | | | | | |
| 11-2N-5E..... | | 1193 | 2538-2548 | 128380 | 46 | 44895 | 3476 | 1190 | 14 | 0.2 | 2.4 | 17 | 58 | 78789 | 4.9 | 160 | 6.5 | |
| 23-3N-5E..... | | 702 | 2575-2590 | 132638 | | | | | | | | | | | | | | |
| 13-3N-6E..... | | 654 | 2607 | 129320 | 34 | 35714 | 2669 | 1150 | 30 | 2.0 | 16 | 12 | 0.4 | 148 | 69966 | 3.5 | 197 | 6.7 |
| 22-3N-7E..... | | 1204 | 2617-2628 | 102824 | 26 | 33826 | 2403 | 1229 | 11 | 5.0 | 10 | 23 | 1.0 | 1081 | 59069 | 35 | 248 | 7.1 |
| 23-3N-7E..... | | 776 | 2700-2750 | 105122 | | | | | | | | | | | | | | |
| 23-4N-7E..... | | 869 | 2598-2614 | 98434 | 13 | 36160 | 2202 | 1084 | 23 | 12 | 2.0 | 40 | 0.4 | 0 | 62655 | 21 | 262 | 6.3 |
| 23-4N-7E..... | | 870 | 2600 | 99520 | | | | | | | | | | | | | | |
| 11-4N-7E..... | | 650 | 2605-2625 | 103802 | 116 | 32967 | 2376 | 1454 | 18 | 0.4 | 4.0 | 7.4 | 1.2 | 374 | 58884 | 11 | 555 | 7.0 |
| 34-4N-8E..... | | 548 | 2695 | 97704 | 39 | 45171 | 5485 | 1348 | 18 | 18 | 28 | 6.0 | 3.0 | 170 | 83171 | 11 | 67 | 6.0 |
| 6-5N-7E..... | | 779 | 2491-2511 | 139792 | | | | | | | | | | | | | | |
| 13-5N-7E..... | | 582 | 2584-2591 | 105326 | | | | | | | | | | | | | | |
| 35-5N-7E..... | | 652 | 2945-2960 | 113226 | 28 | 38578 | 2806 | 1054 | 31 | 12 | 80 | 15 | 1.2 | 973 | 66736 | 5.3 | 141 | 5.9 |
| CLINTON | | | | | | | | | | | | | | | | | | |
| 16-1N-2W..... | | 248 | 1100-1110 | 65290 | 16 | 22133 | 1788 | 765 | 4.0 | 4.0 | 44 | 20 | 1.2 | 58 | 39482 | 8.9 | 32 | |
| 8-1N-3W..... | | 145 | 1032-1065 | 47488 | 26 | 16503 | 1088 | 546 | 11 | 0.0 | 7.0 | 0.4 | 31 | 28897 | 2.1 | 153 | | |
| 18-1N-3W..... | | 603 | 925-976 | 42900 | 18 | 14840 | 875 | 511 | 7.0 | 20 | 55 | 9.0 | 0.8 | 91 | 25841 | 3.5 | 78 | 6.1 |
| 13-2N-1W..... | | 599 | 1417-1423 | 103934 | 34 | 33829 | 3635 | 1501 | 14 | 5.0 | 30 | 27 | 2.2 | 0 | 62988 | 2.5 | 70 | 5.9 |
| 27-2N-1W..... | | 606 | 1279-1288 | 94860 | 34 | 31519 | 3162 | 1290 | 8.0 | 0.6 | 5.0 | 15 | 2.4 | 20 | 57955 | 6.0 | 85 | 6.8 |
| 34-2N-1W..... | | 895 | 1240-1274 | 91492 | 21 | 29815 | 3027 | 1286 | 0.0 | 0.0 | 16 | 23 | 2.0 | 0 | 55052 | 9.0 | 71 | 6.9 |
| 10-2N-3W..... | | 161 | 1035-1068 | 53260 | 31 | 18089 | 842 | 1119 | 10 | 13 | 16 | 0.0 | 5 | 31733 | 6.4 | 1660 | | |
| COLES | | | | | | | | | | | | | | | | | | |
| 2-11N-7E..... | | 758 | 118972 | 31 | | 38298 | 4510 | 1186 | 7.0 | 0.0 | 12 | 9.0 | 1.0 | 1428 | 69313 | 8.0 | 281 | 6.7 |
| 10-12N-7E..... | | 1201 | 110342 | | | | | | | | | | | | | | | |
| 10-12N-7E..... | | 590 | 1766-1822 | 111522 | 18 | 35368 | 5525 | 1339 | 13 | 80 | 90 | 94 | 5.6 | 1691 | 66910 | 2.4 | 150 | 5.2 |
| 22-12N-7E..... | | 757 | 1758-1781 | 105684 | | | | | | | | | | | | | | |
| EDWARDS | | | | | | | | | | | | | | | | | | |
| 19-1S-14W..... | | 667 | 2703-2722 | 103942 | 18 | 34137 | 4365 | 933 | 4.0 | 42 | 54 | 36 | 1.6 | 500 | 62791 | 3.5 | 61 | 6.2 |
| 34-2S-14W..... | | 204 | 2624 | 106170 | 23 | 35380 | 3995 | 1029 | 13 | 0.8 | 9.3 | 6.9 | 2.0 | 43 | 64579 | 5.0 | 85 | |
| EFFINGHAM | | | | | | | | | | | | | | | | | | |
| 24-6N-6E..... | | 848 | 2473-2483 | 136651 | 34 | 44691 | 4751 | 1400 | 5.0 | 23 | 15 | 52 | 2.8 | 67 | 81359 | 8.9 | 44 | 6.4 |
| 10-6N-7E..... | | 645 | 2534-2575 | 125736 | 28 | 40946 | 5034 | 1110 | 9.0 | 8.0 | 20 | 40 | 1.0 | 1170 | 74424 | 4.6 | 59 | 6.2 |
| 7-8N-4E..... | | 929 | 1552-1561 | 115572 | 21 | 38191 | 3976 | 1509 | 8.0 | 24 | 50 | 13 | 1.0 | 72 | 70288 | 0.0 | 12 | 5.1 |
| 18-8N-4E..... | | 928 | 1554-1589 | 116406 | 36 | 38160 | 3734 | 1676 | 12 | 0.0 | 40 | 10 | 2.0 | 287 | 70159 | 0.0 | 49 | 7.3 |
| 18-8N-4E..... | | 927 | 1579-1590 | 115614 | 26 | 37315 | 3881 | 1386 | 12 | 0.0 | 20 | 15 | 1.0 | 23 | 69201 | 0.0 | 44 | 7.8 |
| FAYETTE | | | | | | | | | | | | | | | | | | |
| 922 | | 1564-1570 | | 119470 | 18 | 39606 | 4022 | 1455 | 16 | 16 | 30 | 23 | 2.0 | 0 | 72527 | 0.0 | 41 | 7.0 |
| 10-7N-3E..... | | 923 | 1559-1598 | 120222 | 21 | 38558 | 4548 | 1432 | 7.0 | 0.0 | 20 | 20 | 1.0 | 125 | 71611 | 0.0 | 44 | 7.0 |
| 31-7N-3E..... | | 209 | 1574-1588 | 108940 | 32 | 36756 | 3513 | 1345 | 17 | 1.6 | 17 | 1.7 | 1.4 | 328 | 66593 | 4.2 | 63 | |
| 13-8N-3E..... | | 214 | 1458-1490 | 116430 | 35 | 39092 | 3824 | 1404 | 17 | 52 | 79 | 6.5 | 1.0 | 473 | 70828 | 1.4 | 39 | |
| 23-8N-3E..... | | 211 | 1459-1490 | 118166 | 30 | 39410 | 3844 | 1444 | 12 | 13 | 55 | 11 | 0.6 | 907 | 71137 | 1.4 | 46 | |
| 34-8N-3E..... | | 924 | 1539-1594 | 117350 | 21 | 38519 | 3888 | 1473 | 5.0 | 0.0 | 30 | 14 | 1.0 | 156 | 70307 | 0.0 | 61 | 7.3 |
| 35-8N-3E..... | | 925 | 1582-1612 | 117844 | 26 | 39131 | 3975 | 1523 | 2.0 | 0.0 | 10 | 8.0 | 1.0 | 81 | 71760 | 0.0 | 44 | 7.3 |
| 36-9N-3E..... | | 207 | 1531-1556 | 112730 | 32 | 37480 | 3938 | 1241 | 8.0 | 6.3 | 77 | 10 | 0.6 | 863 | 6781 | 8.9 | 29 | |
| FRANKLIN | | | | | | | | | | | | | | | | | | |
| 28-5S-3E..... | | 1014 | 2555-2559 | 143146 | | | | | | | | | | | | | | |
| 4-6S-3E..... | | 1010 | 2572-2587 | 145689 | | | | | | | | | | | | | | |
| 14-6S-4E..... | | 316 | 2832-2848 | 141672 | 18 | 46471 | 4402 | 1292 | 13 | 0.0 | 1.2 | 8.0 | 2.0 | 382 | 84431 | 5.0 | 156 | 7.0 |
| 16-7S-4E..... | | 749 | 2745-2757 | 138954 | | | | | | | | | | 7 | 83208 | 11 | 9 | 5.1 |

BRINE ANALYSES

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| | | | |
|--------------------------------------|------|-----------|--------|
| GALLATIN 21-7S-9E..... | 1191 | 2620-2676 | 105516 |
| 21-7S-9E..... | 1226 | 104592 | |
| 26-8S-9E..... | 1107 | 2466-2486 | 110716 |
| 15-8S-10E..... | 288 | 2423-2447 | 103934 |
| HAMILTON 6-6S-7E..... | 228 | 2714-2746 | 131460 |
| LAWRENCE 32-3N-11W..... | 960 | 1568-1593 | 50202 |
| MARION 3-1N-1E..... | 879 | 1657-1664 | 121858 |
| 3-1N-1E..... | 880 | 1666-1671 | 121688 |
| 3-1N-1E..... | 881 | 121794 | 26 |
| 3-1N-1E..... | 884 | 1650-1663 | 121630 |
| 16-1N-1E..... | 553 | 1661-1674 | 119058 |
| 18-2N-2E..... | 598 | 1737-1762 | 112160 |
| 27-4N-1E..... | 252 | 1346-1362 | 111950 |
| RANDOLPH 30-4S-7W..... | 40 | 267 | 10561 |
| RICHLAND 8-3N-9E..... | 91 | 2930-2992 | 98182 |
| SALINE 36-7S-7E..... | 1097 | 2518-2532 | 108296 |
| WABASH 4-1S-12W..... | 438 | 1990-2065 | 80390 |
| 18-1S-12W..... | 259 | 2082-2100 | 80000 |
| 29-1S-13W..... | 732 | 2549-2570 | 96430 |
| 24-1S-14W..... | 741 | 2562-2566 | 97074 |
| 9-2S-13W..... | 205 | 2416-2433 | 93800 |
| 30-2S-13W..... | 219 | 2467-2492 | 105780 |
| 2-2S-14W..... | 729 | 2560-2570 | 104590 |
| WASHINGTON 25-1S-1W..... | 887 | 1562-1570 | 114896 |
| WAYNE 20-2S-8E..... | 876 | 2967-2974 | 122300 |
| WHITE 25-4S-9E..... | 731 | 2863-2880 | 113640 |
| 34-4S-14W..... | 338 | 2575-2597 | 106645 |
| 18-5S-9E..... | 556 | 2448-2866 | 111812 |
| 10-5S-9E..... | 1222 | 2948-2966 | 116070 |
| 22-5S-9E..... | 133 | 2863-2888 | 114304 |
| 2-7S-8E..... | 563 | 2662-2697 | 104614 |
| BOND 24-4N-2W..... | 110 | 1328-1380 | 66389 |
| 31-4N-2W..... | 328 | 1105-1127 | 53420 |
| 24-4N-3W..... | 855 | 1114-1123 | 49522 |
| 10-6N-2W..... | 227 | 1003-1021 | 55490 |
| CHRISTIAN 9-13N-1E..... | 905 | 1060-1080 | 94124 |
| 10-13N-1E..... | 899 | 1065-1075 | 92602 |
| 10-13N-1E..... | 901 | 1063-1082 | 90444 |
| “BENOIST”-BETHEL-PAINT CREEK CLAY | | | |
| 3-3N-5E..... | 1001 | 2688-2697 | 136140 |
| 23-3N-5E..... | 701 | 2711-2721 | 139964 |
| 17-3N-6E..... | 642 | 2149-2757 | 133032 |
| 17-3N-6E..... | 932 | 2746-2758 | 127834 |
| 30-3N-6E..... | 314 | 2659-2715 | 128270 |
| 14-4N-5E..... | 1042 | 2463-2475 | 134560 |
| 14-4N-5E..... | 1045 | 2473-2481 | 134024 |
| 27-4N-5E..... | 1000 | 2596-2601 | 133750 |
| 34-4N-5E..... | 999 | 2589-2609 | 135712 |
| 35-4N-5E..... | 1003 | 2595-2625 | 131956 |

ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Depth | Total Solids | NH ₄ | N _a | C _a | Mg | SiO ₂ | Fe Fil- Unfil- | Fe tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO ₃ | CO ₃ | HCO ₃ | pH | |
|---------------------------------|----------|-----------|-----------------|-----------------|----------------|----------------|--------|------------------|----------------------|-------------|--------------------------------|--------|-----------------|-------|-----------------|-----------------|------------------|-------|-----|
| CLINTON | | | | | | | | | | | | | | | | | | | |
| 14-1N-1W | 300 | 1430-1440 | 95488 | 43 | 32058 | 2932 | 1191 | 9.0 | 0.8 | 16 | 20 | 0.0 | 28 | 58084 | 16 | 98 | 6.5 | | |
| 2-1N-2W | 191 | 1324-1329 | 70680 | 39 | 24250 | 1796 | 920 | 13 | 2.3 | 12 | 4.7 | 0.2 | 54 | 43196 | 6.4 | 154 | | | |
| 2-2N-2W | 323 | 1226-1234 | 71932 | 14 | 23730 | 1794 | 913 | 8.0 | 0.0 | 16 | 6.0 | 0.4 | 77 | 42320 | 5.3 | 126 | 6.8 | | |
| 5-3N-2W | 854 | 1143-1152 | 57498 | 21 | 19315 | 1289 | 768 | 0.0 | 0.0 | 10 | 1.0 | 0 | 34017 | 4.0 | 537 | 6.8 | | | |
| 7-3N-2W | 607 | 1138-1146 | 54920 | 26 | 18837 | 865 | 911 | 14 | 13 | 10 | 0.0 | 0 | 32686 | 18 | 1005 | 7.2 | | | |
| 7-3N-2W | 856 | 1132-1142 | 53864 | 28 | 18599 | 827 | 860 | 9.0 | 0.0 | 22 | 0.0 | 0 | 32313 | 11 | 664 | | | | |
| 7-3N-2W | 857 | 1141-1145 | 55354 | 16 | 18828 | 949 | 905 | 5.0 | 0.0 | 16 | 0.0 | 0 | 32963 | 11 | 699 | | | | |
| 12-3N-3W | 1029 | 1107-1115 | 47912 | | | | | | | | | | | | | | | | |
| 12-3N-3W | 1030 | 1106-1110 | 47638 | | | | | | | | | | | | | | | | |
| 14-3N-3W | 1027 | | 46482 | | | | | | | | | | | | | | | | |
| 14-3N-3W | 1028 | 1114-1118 | 47660 | | | | | | | | | | | | | | | | |
| 23-3N-3W | 1026 | | 46758 | | | | | | | | | | | | | | | | |
| 23-3N-3W | 1033 | | 48258 | | | | | | | | | | | | | | | | |
| 26-3N-3W | | | 1031 | 1144-1163 | 47478 | | | | | | | | | | | | | | |
| EDWARDS | | | 724 | 2800-2830 | 112512 | 26 | 34276 | 5648 | 1197 | 19 | 4.0 | 8.0 | 58 | 0.8 | 837 | 65724 | 12 | 98 | |
| 8-1N-14W | 518 | 2840-2860 | 100534 | 15 | 17819 | 4940 | 1032 | 15 | 0.0 | 1.0 | 12 | 0.8 | 0.8 | 1178 | 65381 | 3.5 | 190 | | |
| 5-2S-14W | | | | | | | | | | | | | | | | | | | |
| EFFINGHAM | | | | | | | | | | | | | | | | | | | |
| 9-6N-SE | | | | | | | | | | | | | | | | | | | |
| 10-6N-5E | | | | | | | | | | | | | | | | | | | |
| FAYETTE | | | 1049 | 92546 | 40489 | 3021 | 1162 | 9.0 | 0.0 | 1.6 | 17 | 0.0 | 0.0 | 68 | 71111 | 14 | 143 | | |
| 10-4N-1W | | | 298 | 1898-1909 | 117264 | 46 | 40484 | 1498 | 7.0 | 48 | 70 | 0.0 | 0.0 | 2 | 74077 | 7.4 | 38 | | |
| 30-5N-3E | | | 695 | 2327-2347 | 122736 | 62 | 40403 | 4284 | 1375 | 10 | 4.0 | 9.5 | 5.3 | 0.4 | 35 | 67930 | 1.4 | 63 | |
| 22-5N-4E | | | 212 | 1509-1524 | 110460 | 32 | 37243 | 3672 | 1323 | 12 | 10 | 24 | 3.3 | 0.6 | 182 | 67488 | 2.8 | 63 | |
| 6-7N-3E | | | 208 | 1554-1568 | 110030 | 45 | 3733* | 3477 | 1437 | 23 | 1.6 | 28 | 7.7 | 0.6 | 66 | 68320 | 2.1 | 83 | |
| 9-7N-3E | | | 213 | 1458-1542 | 112170 | 41 | 37526 | 3554 | 1437 | | | | | | | | | | |
| 29-8N-3E | | | 131 | 1442-1487 | 110634 | | | | | | | | | | | | | | |
| 29-8N-3E | | | 132 | 1583-1605 | 108656 | | | | | | | | | | | | | | |
| 30-8N-3E | | | 206 | 1562-1569 | 106724 | 93 | 35747 | 3523 | 1278 | 11 | 13 | 44 | 8.0 | 0.6 | 159 | 65102 | 9.2 | 56 | |
| HAMILTON | | | 244 | 2940-2959 | 134670 | 77 | 45836 | 4295 | 1240 | 16 | 4.0 | 32 | 30 | 1.0 | 1134 | 81144 | 8.1 | 96 | |
| 27-5S-6E | | | 226 | 2997-3011 | 135080 | 46 | 46460 | 4191 | 1246 | 31 | 6.4 | 48 | 13 | 1.2 | 472 | 82373 | 2.1 | 88 | |
| 34-5S-6E | | | 348 | 2000-2028 | 114222 | 36 | 36905 | 4344 | 1572 | 9.0 | 6.0 | 14 | 40 | 0.0 | 966 | 68306 | 0.0 | 45 | |
| JACKSON | | | 147 | 2035-2084 | 119752 | 31 | 39102 | 4456 | 1496 | 11 | 0.4 | 20 | 1.0 | 1 | 72584 | 2.8 | 56 | | |
| 22-7S-1W | | | 99 | 1951-1970 | 123665 | | | | | | | | | | 73916 | | | | |
| JEFFERSON | | | 9-1S-1E | | 483 | 1941-1959 | 123386 | 97 | 1963-1983 | 121660 | | | | | 71235 | | | | |
| 3-1S-2E | | | 10-1S-2E | | 98 | 1960-1990 | 123629 | | | 525 | 2039-2051 | 125562 | 77 | 39903 | 5075 | 1771 | 12 | 0.6 | 35 |
| 9-1S-2E | | | 19-1S-2E | | 764 | 1945-1960 | 124870 | 52 | 39757 | 4871 | 1617 | 12 | 10 | 12 | 8.0 | 1.2 | 802 | 74067 | 3.5 |
| 2-2S-1E | | | 24-2S-1E | | 689 | 2029-2038 | 124934 | 39 | 39452 | 5344 | 1465 | 17 | 14 | 20 | 18 | 1.2 | 0 | 74438 | 5.3 |
| 25-2S-1E | | | 25-2S-1E | | 255 | 1977-1990 | 123816 | 1.6 | 39663 | 5174 | 1523 | 7.0 | 4.0 | 20 | 16 | 1.0 | 60 | 74486 | 5.7 |
| 35-2S-1E | | | 264 | 1878-1991 | 124400 | 36 | 39536 | 5216 | 1576 | 4.0 | 16 | 48 | 10 | 0.2 | 8 | 74836 | 5.0 | 16 | |
| 2-3S-2E | | | 934 | 2521-2620 | 130810 | 26 | 41173 | 5520 | 1765 | 6.0 | 8.0 | 24 | 1.0 | 23 | 78389 | 0.0 | 46 | 6.1 | |
| 32-3S-2E | | | 374 | 2466-2490 | 138240 | 41 | 45026 | 5384 | 1445 | 9.0 | 10 | 28 | 15 | 0.0 | 449 | 82878 | 0.0 | 60 | 5.8 |
| 32-3S-2E | | | 716 | 2457-2471 | 138672 | 77 | 44730 | 5440 | 1363 | 15 | 2.0 | 16 | 5.0 | 1.2 | 45 | 82329 | 11 | 60 | 6.0 |
| LAWRENCE | | | 375 | 1744-1772 | 56390 | 25 | 19579 | 1418 | 552 | 17 | 0.4 | 10 | 7.4 | 0.2 | 770 | 33717 | 0.0 | 124 | 7.1 |
| MARIION | | | 644 | 1919-1928 | 125418 | 39 | 39727 | 5029 | 1572 | 6.0 | 4.5 | 12 | 41 | 1.4 | 0 | 74799 | 6.4 | 24 | 5.8 |
| 21-1N-2E | | | 171 | 1422-1439 | 92112 | 44 | 31360 | 2577 | 1171 | 11 | 1.4 | 20 | 0.2 | 10 | 56330 | 15 | 120 | | |
| 18-3N-1E | | | 691 | 1927-1939 | 125560 | 43 | 40255 | 4773 | 1486 | 18 | 12 | 16 | 10 | 1.0 | 0 | 74885 | 5.3 | 58 | 6.1 |

BRINE ANALYSES

27

| | | | | | | | | | | | | | | | | |
|---------------|------------|-----------|--------|-------|-------|------|------|-----|-----|-----|------|-------|-------|--------|---------|--------|
| 21-4N-1E. | 78 | 1376-1418 | 103906 | 1.0 | 34570 | 3513 | 1127 | 120 | 225 | 240 | 4.0 | 198 | 62610 | 8.0 | 125 | |
| 28-4N-1E. | 117 | 1392-1423 | 102435 | 33 | 33921 | 3050 | 1297 | 3.0 | 1.8 | 49 | 1.4 | 187 | 61320 | 1.4 | 156 | |
| 35-4N-2E. | 532 | 1959-1974 | 125598 | | | | | | | | | | | 75042 | | |
| 35-4N-2E. | 533 | 1959-1974 | 124790 | | | | | | | | | | | | | |
| 36-4N-2E. | 301 | 1932-1939 | 128288 | 41 | 40315 | 4467 | 1448 | 13 | 8.0 | 24 | 10 | 1.0 | 8 | 74608 | 20 | |
| 19-4N-3E. | 996 | 1910-1917 | 125754 | | | | | | | | | | | | | |
| 16-4N-4E. | 639 | 2142-2149 | 129218 | 33 | 40625 | 4976 | 1514 | 14 | 3.6 | 20 | 33 | 3.7 | 206 | 75750 | 10 | |
| MONTGOMERY | 1038 | 790-798 | 40168 | | | | | | | | | | | | 50 6.2 | |
| SHELBY | 17-10N-4E. | | | | | | | | | | | | | | | |
| WARASH | 4-1N-13W. | | | | | | | | | | | | | | | |
| 16-1S-12W. | 538 | 2525-2552 | 92584 | 39 | 30137 | 3974 | 970 | 5.0 | 15 | 40 | 30 | 2.0 | 709 | 55756 | 7.0 | |
| 8-1S-13W. | 253 | 2125 | 65116 | 9.3 | 21704 | 2101 | 709 | 30 | 0.0 | 16 | 1.0 | 124 | 39101 | 5.3 | 205 7.1 | |
| 16-1S-13W. | 661 | 2585-2688 | 98150 | 21 | 12194 | 3897 | 985 | 21 | 7.2 | 13 | 17 | 0.8 | 978 | 58305 | 3.0 | |
| 16-1S-13W. | 665 | 2585-2688 | 90638 | 18 | 31630 | 3927 | 850 | 13 | 52 | 70 | 26 | 2.8 | 1476 | 57105 | 3.2 | |
| 666 | 2606-2675 | 102740 | 18 | 38220 | 4320 | 955 | 8.0 | 8.0 | 12 | 16 | 0.6 | 1217 | 61531 | 28 | 92 6.2 | |
| 736 | 2575-2598 | 100626 | 28 | 32315 | 3955 | 932 | 11 | 0.0 | 10 | 12 | 1.3 | 980 | 58798 | 8.9 | 149 6.7 | |
| 17-1S-13W. | | | | | | | | | | | | | | | 122 6.8 | |
| WASHINGTON | 23-1S-1W | | | | | | | | | | | | | | | |
| 229 | 1541-1550 | 105400 | 59 | 35532 | 3536 | 1372 | 12 | 8.8 | 40 | 16 | 1.2 | 41 | 65089 | 2.1 | 67 | |
| 1217 | 1430-1434 | 87370 | | | | | | | | | | | | | | |
| 1218 | 1430-1433 | 88588 | | | | | | | | | | | | | | |
| 195 | 1349-1370 | 98760 | 52 | 32478 | 3087 | 1192 | 9.0 | 4.4 | 11 | 31 | 0.8 | 26 | 59046 | 5.0 | 85 | |
| 143 | 1268-1293 | 60480 | 29 | 20817 | 1553 | 783 | 4.0 | 0.0 | 28 | 0.6 | 395 | 36821 | 3.7 | 119 | | |
| 235 | 1007-1034 | 36350 | | | | | | | | | | | | | 165 | |
| WAYNE | 23-2S-2W | | | | | | | | | | | | | | | |
| WHITE | 34-2S-2W | | | | | | | | | | | | | | | |
| 19-3S-1W | 992 | 2906-2925 | 111500 | 18 | 35421 | 5151 | 1030 | 0.0 | 24 | 32 | 46 | 1.0 | 927 | 66048 | 9.0 | |
| 22-3S-3W | 440 | 2795-2853 | 108400 | 31 | 35847 | 4502 | 1059 | 13 | 30 | 40 | 87 | 4.0 | 1523 | 65197 | 0.0 | |
| 29-3S-4W | 337 | 2680-2725 | 110876 | 31 | 62299 | 4691 | 1040 | 16 | 7.0 | 7.0 | 28* | 0.8 | 968 | 63495 | 6.2 | |
| 367 | 2824-2838 | 116502 | 46 | 39446 | 3432 | 1110 | 0.0 | 6.0 | 20 | 12 | 0.0 | 132 | 70014 | 2.5 | 264 183 | |
| 877 | 2795-2815 | 107498 | 41 | 35889 | 3396 | 1163 | 0.0 | 0.0 | 30 | 1.0 | 437 | 64417 | 9.0 | 98 7.3 | | |
| 1103 | 2876-2899 | 113940 | | | | | | | | | | | | | | |
| 566 | 2789-2804 | 107736 | 52 | 34570 | 4452 | 836 | 27 | 3.4 | 30 | 4.0 | 0.4 | 418 | 63309 | 43 | 104 | |
| 1099 | 3119-3133 | 116734 | | | | | | | | | | | | | | |
| 26-2S-9E. | | | | | | | | | | | | | | | | |
| CLAY | 11-4S-10E. | | | | | | | | | | | | | | | |
| 18-4S-14W. | 992 | 2906-2925 | 111500 | 18 | 35421 | 5151 | 1030 | 0.0 | 24 | 32 | 46 | 1.0 | 927 | 66048 | 9.0 | |
| 28-4S-14W. | 440 | 2795-2853 | 108400 | 31 | 35847 | 4502 | 1059 | 13 | 30 | 40 | 87 | 4.0 | 1523 | 65197 | 0.0 | |
| 36-5S-10E. | 337 | 2680-2725 | 110876 | 31 | 62299 | 4691 | 1040 | 16 | 7.0 | 7.0 | 28* | 0.8 | 968 | 63495 | 6.2 | |
| 44-5S-10E. | 367 | 2824-2838 | 116502 | 46 | 39446 | 3432 | 1110 | 0.0 | 6.0 | 20 | 12 | 0.0 | 132 | 70014 | 2.5 | |
| 877 | 2795-2815 | 107498 | 41 | 35889 | 3396 | 1163 | 0.0 | 0.0 | 30 | 1.0 | 437 | 64417 | 9.0 | 98 7.3 | | |
| 32-6S-9E. | | | | | | | | | | | | | | | | |
| 32-7S-8E. | | | | | | | | | | | | | | | | |
| LOWER RENAULT | 2-7S-8E. | | | | | | | | | | | | | | | |
| GALLATIN | 32-8S-10E. | | | | | | | | | | | | | | | |
| AUX VASES | 743 | 2734-2759 | 127562 | 39 | 43245 | 3980 | 898 | 13 | 8.0 | 32 | 21 | 1.4 | 2877 | 74251 | 11 | |
| CLAY | 4-2N-5E. | | | | | | | | | | | | | | | |
| 8-2N-7E. | 311 | 2770-2806 | 140576 | 103 | 45312 | 5756 | 1533 | 4.0 | 8.0 | 24 | 22 | 0.6 | 1110 | 83832 | 64 | |
| 674 | 2974-2986 | 136040 | 35 | 45217 | 4813 | 1220 | 12 | 48 | 80 | 3.0 | 1.2 | 711 | 81467 | 11 | 62 5.7 | |
| 156 | 2356-2366 | 116074 | 52 | 37896 | 4685 | 1453 | 10 | 16 | 19 | 0.6 | 412 | 70691 | 5.7 | 26 6.0 | | |
| 366 | 2734-2782 | 126124 | 51 | 42953 | 4040 | 1073 | 3.0 | 20 | 40 | 15 | 0.0 | 901 | 75884 | 1.1 | 103 92 | |
| 811 | 2807-2818 | 136666 | | | | | | | | | | | | | | |
| 653 | 2806-2823 | 140344 | 52 | 46670 | 5060 | 1308 | 8.0 | 1.0 | 16 | 14 | 0.4 | 1156 | 83900 | 9.6 | 69 6.0 | |
| 437 | 2012-2024 | 117340 | 36 | 38979 | 4416 | 1195 | 12 | 6.0 | 40 | 26 | 0.4 | 1945 | 63968 | 1.8 | 112 5.7 | |
| 283 | 1822-1842 | 117302 | 49 | 38271 | 3578 | 1942 | 15 | 0.0 | 0.0 | 24 | 0.0 | 629 | 70376 | 25 | 422 7.0 | |
| 372 | 3132-3172 | 125280 | 41 | 40576 | 6005 | 1130 | 0.0 | 0.0 | 14 | 11 | 0.0 | 1909 | 75107 | 5.3 | 78 5.9 | |
| 872 | 2994-3017 | 111762 | | | | | | | | | | | | | | |
| 522 | 3144-3170 | 102804 | 51 | 32526 | 4870 | 1197 | 7.0 | 10 | 41 | 0.6 | 1775 | 60976 | 7.1 | 63 6.1 | | |
| EDWARDS | 25-12N-7E. | | | | | | | | | | | | | | | |
| 18-1N-10E. | 311 | 2734-2754 | 136846 | 36 | 42830 | 6641 | 1443 | 8.0 | 0.0 | 4.0 | 2.0 | 0.4 | 502 | 81598 | 11 | 17 |
| 30-1S-11E. | 1058 | 2734-2754 | 136940 | | | | | | | | | | | | | |
| 6-2S-11E. | 297 | 2717-2726 | 140062 | 39 | 45861 | 5201 | 1672 | 9.0 | 1.6 | 16 | 59 | 0.4 | 579 | 84406 | 11 | 47 5.8 |
| 26-6S-4E. | 531 | 3110-3132 | 132684 | 5.2 | 39536 | 5875 | 1768 | 9.0 | 40 | 40 | 4.8 | 0.8 | 802 | 75582 | 28 | 48 7.0 |
| 36-6S-4E. | 529 | 3105-3156 | 137310 | 103 | 42723 | 6741 | 1929 | 7.0 | 0.0 | 1.0 | 2.0 | 0.2 | 792 | 83019 | 21 | 53 7.0 |
| 10-7S-4E. | 715 | 3100-3115 | 132948 | 29 | 42298 | 6510 | 1645 | 14 | 44 | 95 | 13 | 1.2 | 631 | 81073 | 7.1 | 43 5.4 |
| 971 | 555 | 3113-3147 | 136754 | 52 | 41873 | 6585 | 1772 | 16 | 6.0 | 80 | 19 | 1.0 | 391 | 81156 | 18 | 34 7.0 |

ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Depth | Total Solids | NH ₄ | N _a | C _a | Mg | SiO ₂ | Fe Fil- tered | Fe Unfil- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO ₃ | CO ₃ | HCO ₃ | pH | | |
|---------------------------------|-----------|-----------|-----------------|-----------------|----------------|----------------|-------|------------------|---------------------|-----------------------|--------------------------------|------|-----------------|-------|-----------------|-----------------|------------------|-----|-----|-----|
| GALLATIN | | | | | | | | | | | | | | | | | | | | |
| 21-7S-8E..... | 564 | 2905-2962 | 128920 | 52 | 39327 | 6766 | 1241 | 9.0 | 4.0 | 50 | 4.0 | 0 | 1465 | 75156 | 18 | | 121 | 6.1 | | |
| 27-8S-9E..... | 1096 | 133730 | | | | | | | | | | | | | | | | | | |
| HAMILTON | | | 770 | 157356 | 160712 | 77 | 50418 | 7135 | 1744 | 19 | 9.0 | 40 | 17 | 0.8 | 1149 | 94626 | 18 | 109 | 5.5 | |
| 14-4S-7E..... | | | 782 | 3264-3286 | 961 | 145634 | | | | | | | | | | | | | | |
| 16-4S-7E..... | | | 527 | 3355-3365 | 136258 | 39 | 43864 | 6266 | 1458 | 7.0 | 20 | 50 | 12 | 0.2 | 1089 | 82194 | 8.9 | 73 | 6.9 | |
| 15-5S-7E..... | | | 994 | 3196-3232 | 138096 | | | | | | | | | | | | | | | |
| 11-6S-5E..... | | | 434 | 3145-3185 | 134290 | 90 | 42766 | 6635 | 1662 | 8.0 | 10 | 12 | 16 | 1.2 | 1034 | 81887 | 16 | 73 | 5.7 | |
| 22-6S-5E..... | | | 1126 | 3192-3215 | 132630 | | | | | | | | | | | | | | | |
| 22-6S-5E..... | | | 1129 | 3178-3212 | 132922 | | | | | | | | | | | | | | | |
| 29-6S-5E..... | | | 1128 | 3280-3309 | 134158 | | | | | | | | | | | | | | | |
| 33-6S-5E..... | | | 997 | 3222-3286 | 128490 | | | | | | | | | | | | | | | |
| 34-6S-5E..... | | | 947 | 3316-3340 | 130396 | 26 | 39880 | 6254 | 1802 | 11 | 20 | 20 | 10 | 0.0 | 850 | 77189 | 18 | 49 | 5.7 | |
| 2-6S-6E..... | | | 1189 | 136206 | | | | | | | | | | | | | | | | |
| 2-6S-6E..... | | | 1190 | 3044-3050 | 135506 | | | | | | | | | | | | | | | |
| 3-6S-6E..... | | | 428 | 3029-3055 | 138730 | 41 | 46733 | 4548 | 1368 | 9.0 | 1.0 | 10 | 16 | 0.0 | 908 | 83467 | 3.5 | 59 | 6.1 | |
| 13-6S-6E..... | | | 431 | 3092-3110 | 137990 | 38 | 43297 | 5958 | 1603 | 10 | 16 | 0.0 | 682 | 81509 | 1.8 | 64 | 5.9 | 153 | 6.7 | |
| 26-6S-6E..... | | | 307 | 3057-3074 | 135666 | 98 | 41199 | 5033 | 2800 | 52 | 0.0 | 4.0 | 3.0 | 0.0 | 550 | 80281 | 16 | | | |
| 6-7S-5E..... | | | 970 | 3200-3234 | 135084 | | | | | | | | | | | | | | | |
| 3-7S-5E..... | | | 1123 | 3176-3188 | 13384 | | | | | | | | | | | | | | | |
| 4-7S-6E..... | | | 1119 | 3176-3200 | 133396 | | | | | | | | | | | | | | | |
| 4-7S-6E..... | | | 1121 | 3185-3197 | 132948 | | | | | | | | | | | | | | | |
| JEFFERSON | | | 557 | 2118-2158 | 122312 | | 40227 | 4362 | 1627 | 15 | 0.0 | 3.5 | 8.0 | 1.0 | 112 | 74390 | | 24 | | |
| 19-1S-2E..... | | | 1133 | 2726-2734 | 141192 | | | | | | | | | | | | | | | |
| 15-1S-4E..... | | | 696 | 2678 | 136104 | 31 | 43869 | 5584 | 1373 | 8.0 | 8.0 | 40 | 9.0 | 0.4 | 322 | 81288 | 5.3 | 48 | 6.1 | |
| 17-1S-4E..... | | | 1131 | 2705-2709 | 141710 | | | | | | | | | | | | | | | |
| 22-1S-4E..... | | | 550 | 2938-2956 | 140814 | 103 | 45611 | 4966 | 1652 | 12 | 20 | 14 | 0.4 | 1161 | 83245 | | 29 | 7.0 | | |
| 13-2S-4E..... | | | 766 | 124774 | 39 | 39503 | 4858 | 1566 | 13 | 10 | 12 | 9.0 | 2.4 | 0.2 | 0 | 74085 | 3.5 | 85 | 6.4 | |
| 1-3S-4E..... | | | 806 | 2586-2597 | 132058 | 103 | 40414 | 5119 | 1800 | 19 | 2.4 | 104 | 20 | 1.8 | 3 | 76716 | 25 | | | |
| 2-3S-2E..... | | | 933 | 2595-2603 | 132128 | 15 | 40410 | 5785 | 1785 | 6.0 | 24 | 103 | 22 | 3.0 | 0 | 77729 | 0.0 | 49 | 6.0 | |
| 2-3S-2E..... | | | 868 | 2579 | 131328 | 36 | 41322 | 5065 | 1888 | 10 | 10 | 25 | 36 | 1.0 | 0 | 78207 | 11 | 34 | 6.7 | |
| 3-3S-3E..... | | | 445 | 2665-2693 | 143400 | 31 | 46780 | 5280 | 1532 | 13 | 6.0 | 22 | 0.8 | 525 | 85385 | 0.0 | 42 | 5.7 | | |
| 18-3S-3E..... | | | 718 | 2665-2693 | 141478 | 31 | 45006 | 5480 | 1462 | 11 | 8.0 | 16 | 1.0 | 0.9 | 490 | 82983 | 12 | 56 | 6.0 | |
| 21-3S-3E..... | | | 326 | 2735-2762 | 143576 | 36 | 47055 | 4736 | 1413 | 16 | 12 | 40 | 25 | 2.0 | 0 | 231 | 84914 | 7.1 | 59 | 6.2 |
| MARION | | | 637 | 2200-2212 | 130672 | 45 | 41032 | 5006 | 1522 | 26 | 7.0 | 8.0 | 24 | 3.7 | 292 | 76393 | 39 | 54 | 6.0 | |
| SALINE | | | 1018 | 2934-2951 | 109158 | | | | | | | | | | | | | | | |
| 24-7S-7E..... | | | 289 | 2880-2898 | 91802 | 41 | 29208 | 4339 | 860 | 5.0 | 32 | 64 | 16 | 0.0 | 2040 | 53759 | 11 | 53 | 5.3 | |
| SHELBY | | | 251 | 1725-1735 | 102692 | 2.1 | 35032 | 2763 | 1127 | 14 | 0.0 | 8.0 | 27 | 0.4 | 55 | 62076 | 4.2 | 127 | | |
| 12-10N-2E..... | | | 173 | 1940-1969 | 110930 | 39 | 37110 | 3539 | 1400 | 14 | 11 | 18 | 8.9 | 0.6 | 0 | 67669 | 9.6 | 112 | | |
| 27-10N-5E..... | | | 662 | 1856-1906 | 120624 | 28 | 39683 | 4497 | 1344 | 7.0 | 0.0 | 7.2 | 18 | 0.8 | 45 | 73033 | 3.9 | 55 | 5.9 | |
| 14-11N-4E..... | | | 595 | 1830-1855 | 112500 | 31 | 36846 | 4010 | 1210 | 9.0 | 14 | 20 | 41 | 2.0 | 0 | 8 | 67476 | 1.1 | 27 | 5.4 |
| WAYNE | | | 327 | 2907-2910 | 140640 | 49 | 47530 | 4803 | 1262 | 14 | 8.0 | 24 | 12 | 0.2 | 672 | 85038 | 3.9 | 38 | 6.2 | |
| 18-1S-5E..... | | | 549 | 2980-3013 | 144816 | 39 | 47832 | 5296 | 1284 | 13 | 7.0 | 20 | 12 | 0.8 | 998 | 86177 | 21 | 35 | 7.0 | |
| 26-1S-5E..... | | | 1195 | 141114 | | | | | | | | | | | | | | | | |
| 29-1S-6E..... | | | 361 | 3050-3088 | 143876 | 36 | 46285 | 6578 | 1581 | 8.0 | 4.4 | 20 | 36 | 0.0 | 1203 | 86747 | 5.8 | 74 | 6.1 | |
| 14-11N-4E..... | | | 332 | 3115-3133 | 141444 | 39 | 45649 | 6685 | 1047 | 8.0 | 1.0 | 10 | 8.6 | 1.4 | 1364 | 84274 | 1.4 | 111 | 6.4 | |
| 21-11N-4E..... | | | 1167 | 3030-3044 | 143562 | 51 | 46304 | 6215 | 1518 | 4.0 | 2.8 | 4.0 | 26 | 0.0 | 1542 | 85742 | 9.3 | 60 | 6.9 | |
| 17-1S-8E..... | | | 1211 | 136440 | 145310 | 51 | | | | | | | | | | | | | | |
| 975 | 3098-3129 | 135474 | | | | | | | | | | | | | | | | | | |
| 1037 | 3243-3254 | 143078 | | | | | | | | | | | | | | | | | | |
| 783 | 3240-3270 | 148348 | 103 | 47066 | 6234 | 1661 | 24 | 12 | 28 | 18 | 0.5 | 1308 | 87672 | 18 | 68 | 5.8 | | | | |
| 451 | 3226-3250 | 152740 | 51 | 48105 | 6925 | 2426 | 15 | 0.8 | 8.0 | 12 | 0.2 | 1685 | 92319 | 3.5 | 56 | 6.2 | | | | |

BRINE ANALYSES

ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Total Solids | NH ₄ | N _a | C _a | Mg | SiO ₂ | Fer- til- tered | Fe Unfil- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO _x | HCO ₃ | pH | |
|---------------------------------|----------|-----------------|-----------------|----------------|----------------|------|------------------|-----------------------|-----------------------|--------------------------------|-----|-----------------|------|-----------------|------------------|------------|--------|
| CLINTON 34-3N-3W..... | 128 | 1104-1212 | 47333 | | | | | | | | | | | | 27799 | | |
| COLES | 593 | 1954-2032 | 112080 | 31 | 35552 | 5032 | 1545 | 6.0 | 23 | 45 | 64 | 0.8 | 1087 | 67365 | 5.3 | 205 5.6 | |
| 15-11N-7E..... | 589 | 1930-1957 | 109360 | 26 | 36322 | 3529 | 1568 | 28 | 0.0 | 2.8 | 131 | 0.2 | 56 | 66739 | 5.0 | 146 6.9 | |
| 2-12N-7E..... | 698 | 1928-2010 | 122452 | 93 | 38141 | 4856 | 1626 | 14 | 0.0 | 4.0 | 3.0 | 0.0 | 904 | 71527 | 8.7 | 180 7.0 | |
| 25-12N-7E..... | 437 | 2012-2026 | 117340 | 36 | 38979 | 4416 | 1195 | 12 | 6.0 | 40 | 26 | 0.4 | 1945 | 69968 | 1.8 | 112 5.7 | |
| CUMBERLAND | 723 | 2446-2454 | 117332 | 52 | 37506 | 3897 | 1737 | 19 | 0.0 | 1.6 | 17 | 0.3 | 338 | 69510 | 35 | 136 6.7 | |
| 31-9N-7E..... | 586 | 2640-2662 | 127468 | 36 | 40889 | 5363 | 1505 | 21 | 40 | 50 | 77 | 1.6 | 2100 | 75421 | 8.9 | 140 5.4 | |
| 36-9N-9E..... | 826 | 2648-2662 | 128142 | | | | | | | | | | | | | | |
| EDGAR | 914 | 1000-1011 | 27902 | | | | | | | | | | | | | | |
| 1-12N-11W..... | 913 | 975-998 | 24626 | 5.0 | 8738 | 455 | 272 | 22 | 0.0 | 0.0 | 7.0 | 0.0 | 724 | 14342 | 18 | 336 7.9 | |
| EDWARDS | 964 | 3201-3205 | 123388 | 52 | 39585 | 5625 | 2719 | 37 | 0.0 | 4.0 | 8.0 | 0.0 | 1644 | 77238 | 11 | 46 870 7.9 | |
| 1-1N-10E..... | 793 | 3274-3282 | 133254 | 52 | 36788 | 5041 | 2005 | 5.0 | 0.0 | 0.0 | 49 | 0.0 | 2287 | 69871 | 25 | 62 | |
| 8-1N-10E..... | 537 | 3218-3229 | 120162 | 90 | 36788 | 5041 | 2005 | 5.0 | 0.0 | 0.0 | 49 | 0.0 | 2287 | 69871 | 25 | 62 | |
| 12-1N-10E..... | 851 | 3205-3215 | 116784 | | | | | | | | | | | | | | |
| 7-1N-11E..... | 663 | 3056-3065 | 119196 | 34 | 36836 | 5515 | 2030 | 11 | 0.0 | 2.6 | 16 | 0.0 | 2057 | 70836 | 5.3 | 50 260 7.8 | |
| 18-1S-14W..... | 874 | 3113-3123 | 120388 | 36 | 36686 | 6220 | 2079 | 3.0 | 5.0 | 10 | 28 | 0.0 | 1652 | 72400 | 9.0 | 120 6.7 | |
| 31-1S-14W..... | 250 | 3338-3351 | 127790 | 2.1 | 37859 | 6508 | 2559 | 16 | 0.0 | 0.0 | 21 | 0.0 | 1628 | 76111 | 3.2 | 70 | |
| 19-2S-10E..... | 543 | 2976-2998 | 125960 | 52 | 37558 | 6336 | 2140 | 18 | 0.0 | 0.0 | 49 | 0.4 | 1814 | 74191 | 32 | 16 117 | |
| 27-2S-14W..... | 822 | 3066-3080 | 126274 | | | | | | | | | | | | | | |
| 28-2S-14W..... | 821 | 3126-3190 | 127770 | | | | | | | | | | | | | | |
| EFFINGHAM | 308 | 2490-2508 | 126378 | 59 | 37359 | 7130 | 2222 | 10 | 64 | 64 | 19 | 1.2 | 109 | 76715 | 18 | 15 5.3 | |
| 33-6N-5E..... | 1182 | 2488-2492 | 116674 | | | | | | | | | | | | | | |
| 16-6N-6E..... | 524 | 2556-2573 | 139924 | 141 | 46219 | 4755 | 1888 | 27 | 0.0 | 0.2 | 41 | 0.0 | 423 | 85045 | 52 | 131 | |
| 20-6N-7E..... | 1084 | | 133084 | | | | | | | | | | | | | | |
| 28-6N-7E..... | 1083 | 2861-2869 | 134970 | | | | | | | | | | | | | | |
| 31-6N-7E..... | 1142 | 2844-2962 | 137020 | | | | | | | | | | | | | | |
| 32-6N-7E..... | 1148 | 2853-2861 | 139098 | | | | | | | | | | | | | | |
| 8-7N-7E..... | 722 | 2649-2661 | 133884 | 36 | 43193 | 4807 | 1381 | 18 | 0.2 | 2.0 | 19 | 0.3 | 886 | 78416 | 21 | 168 6.4 | |
| FRANKLIN | 845 | 2652-2663 | 132584 | | | | | | | | | | | | | | |
| 21-5S-3E..... | 1013 | 2911-2945 | 136558 | | | | | | | | | | | | | | |
| 24-6S-1E..... | 1065 | 2675-2685 | 135589 | | | | | | | | | | | | | | |
| 13-5S-4E..... | 705 | 3324-3330 | 143862 | 49 | 43409 | 6451 | 2201 | 22 | 0.0 | 2.8 | 14 | 0.5 | 497 | 84495 | 8.8 | 36 6.5 | |
| 7-6S-2E..... | 365 | 2710-2725 | 141934 | 77 | 45219 | 5165 | 1955 | 3.0 | 10 | 30 | 20 | 0.0 | 287 | 84465 | 2.5 | 54 | |
| 13-6S-3E..... | 429 | 3890-3020 | 139400 | 41 | 41380 | 6716 | 2298 | 17 | 0.6 | 10 | 8.1 | 0.0 | 675 | 84552 | 7.1 | 191 6.2 | |
| 21-6S-4E..... | 748 | 3050-3094 | 141294 | 31 | 45686 | 4961 | 1329 | 21 | 0.4 | 12 | 6.0 | 1.0 | 919 | 82403 | 12 | 99 6.3 | |
| 25-7S-2E..... | 452 | 2756-2790 | 129050 | 46 | 40312 | 5645 | 2015 | 11 | 0.0 | 0.0 | 7.0 | 0.0 | 622 | 77606 | 0.0 | 79 6.8 | |
| 35-7S-4E..... | 234 | 3108-3114 | 137240 | | 38721 | 9845 | 2149 | 23 | 400 | 440 | 11 | 2.0 | 580 | 82599 | | 620 | |
| GALLATIN | 1178 | 2867-2868 | 128752 | | | | | | | | | | | | | | |
| 8-8S-8E..... | 625 | 2716-3020 | 132612 | 82 | 42313 | 6115 | 1168 | 6.0 | 0.2 | 3.2 | 36 | 0.2 | 2598 | 77609 | 15 | 158 6.7 | |
| 2-8S-9E..... | 631 | 2715-3020 | 134660 | 27 | 43065 | 4574 | 1293 | 7.0 | 12 | 21 | 8.5 | 0.2 | 2741 | 76218 | 8.1 | 121 | |
| 25-8S-9E..... | 176 | 2785-3007 | 129064 | | | | | | | | | | | | | | |
| HAMILTON | 239 | 3335-3359 | 145804 | | | | | | | | | | | | | | |
| 34-3S-5E..... | 941 | 3402-3417 | 148982 | 31 | 42784 | 9425 | 2346 | 15 | 32 | 40 | 10 | 0.6 | 1543 | 88283 | | 110 | |
| 29-3S-7E..... | 998 | 3398-3411 | 147676 | | | | | | | | | | 0.0 | 1558 | 86893 | 0.0 | 61 6.2 |
| 30-3S-7E..... | 943 | 3440-3530 | 150286 | 31 | 45489 | 6494 | 2179 | 19 | 0.0 | 16 | 25 | 0.0 | 1365 | 86994 | 9.0 | 46 7.1 | |
| 3-4S-6E..... | 945 | 3440-3530 | 150286 | 31 | 45489 | 6494 | 2179 | 19 | 0.0 | 16 | 25 | 0.0 | 1365 | 86994 | 9.0 | 46 7.1 | |
| 18-4S-7E..... | 1056 | 3432-3475 | 149802 | | | | | | | | | | | | | | |
| 18-4S-7E..... | 1122 | 3397-3428 | 150246 | | | | | | | | | | | | | | |
| 20-4S-7E..... | 890 | 3422-3484 | 144372 | | | | | | | | | | | | | | |
| 26-4S-7E..... | 221 | 3429-3513 | 136820 | 57 | 42339 | 6753 | 2230 | 29 | 32 | 64 | 35 | 1.0 | 1953 | 82378 | 4.3 | 44 7.3 | |
| 35-5S-5E..... | 942 | 3324-3330 | 140040 | 31 | 42145 | 6593 | 2387 | 4.0 | 0.0 | 16 | 2.0 | 0.0 | 556 | 83195 | 9.0 | 78 6.2 | |
| 23-5S-6E..... | 432 | 3300-3322 | 143090 | 46 | 45336 | 6141 | 2150 | 13 | 0.6 | 5.0 | 10 | 0.0 | 0.0 | 791 | 86513 | 3.5 | 43 6.2 |
| 10-5S-7E..... | 752 | 3319-3524 | 134794 | 49 | 41741 | 5769 | 2222 | 13 | 0.0 | 0.0 | 6.0 | 0.0 | 1432 | 80023 | | 46 8.4 | |

BRINE ANALYSES

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|----------------|------|-----------|--------|-------|-------|-------|------|------|-----|-----|-----|------|-------|-------|-------|-----|--------|--|
| 13-6S-5E..... | 435 | 3250-3260 | 138040 | 36 | 41103 | 6924 | 2505 | 7.0 | 0.4 | 3.0 | 9.4 | 0.0 | 742 | 82408 | 12 | 60 | 6.5 | |
| 34-6S-5E..... | 945 | 3353-3442 | 141066 | 62 | 44544 | 5360 | 2860 | 18 | 0.0 | 0.0 | 37 | 0.0 | 240 | 86349 | 35 | 110 | 7.2 | |
| 35-6S-5E..... | 946 | 3346-3350 | 143042 | | | | | | | | | | | | | | | |
| 11-6S-6E..... | 1238 | 3150-3223 | 155976 | 88 | 48293 | 5692 | 1937 | 19 | 0.0 | 0.0 | 34 | 0.0 | 1873 | 88930 | 27 | 34 | 6.1 | |
| 17-6S-6E..... | 944 | 3212-3220 | 151996 | | | | | | | | | | | | | | | |
| 27-6S-7E..... | 1179 | 3277-3288 | 134708 | | | | | | | | | | | | | | | |
| 7-7S-5E..... | 968 | 3220-3210 | 140082 | | | | | | | | | | | | | | | |
| JASPER | | | | | | | | | | | | | | | | | | |
| 3-5N-9E..... | 545 | 3048-3065 | 132180 | 39 | 41591 | 6529 | 1215 | 17 | 12 | 70 | 129 | 1.6 | 1970 | 77815 | 14 | 10 | | |
| 33-6N-9E..... | 791 | 3098-3160 | 134860 | 90 | 40960 | 7385 | 1690 | 17 | 16 | 54 | 13 | 1.0 | 1637 | 80059 | 11 | 81 | 6.1 | |
| 16-6N-10E..... | 274 | 2788-2820 | 126428 | 41 | 39911 | 5563 | 1670 | 6.0 | 0.4 | 16 | 13 | 0.0 | 2156 | 74693 | 20 | 69 | | |
| 27-6N-14W..... | 948 | 2682-2690 | 111182 | 26 | 33801 | 5034 | 1922 | 28 | 0.0 | 16 | 29 | 0.0 | 2060 | 65069 | 9.0 | 198 | 7.1 | |
| 31-7N-10E..... | 587 | 2835-2863 | 130204 | 52 | 42061 | 5606 | 1677 | 23 | 0.4 | 15 | 39 | 0.2 | 2072 | 78155 | 3.5 | 145 | 6.4 | |
| 34-7N-10E..... | 588 | 2648-2745 | 123972 | 52 | 39743 | 5106 | 1705 | 30 | 11 | 23 | 104 | 1.2 | 2100 | 73798 | 5.0 | 60 | 5.5 | |
| 18-7N-11E..... | 680 | 2425-2469 | 106134 | 20 | 33259 | 3880 | 1367 | 3.0 | 0.2 | 6.0 | 12 | 0.0 | 829 | 61395 | 5.0 | 38 | 5.9 | |
| JEFFERSON | | | | | | | | | | | | | | | | | | |
| 5-1S-3E..... | 320 | 2617-2627 | 129364 | 0.4 | 41014 | 4953 | 2013 | 22 | 0.0 | 0.1 | 14 | 0.2 | 384 | 77518 | 6.4 | 115 | 7.5 | |
| 13-1S-3E..... | 554 | 2778-2835 | 134640 | 26 | 42372 | 6134 | 1506 | 25 | 3.0 | 12 | 9.7 | 1.0 | 485 | 80193 | 46 | 67 | 7.0 | |
| 13-1S-3E..... | 1154 | 2751-2854 | 134090 | | | | | | | | | | | | | | | |
| 28-1S-3E..... | 1011 | 2618-2629 | 132243 | | | | | | | | | | | | | | | |
| 17-1S-4E..... | 1150 | 2734-2821 | 136346 | | | | | | | | | | | | | | | |
| 21-1S-4E..... | 1134 | 2811-2928 | 138634 | | | | | | | | | | | | | | | |
| 23-1S-4E..... | 1135 | 2900-2928 | 142784 | | | | | | | | | | | | | | | |
| 22-2S-1E..... | 198 | 2142-2228 | 122170 | 47 | 40585 | 5145 | 1651 | 21 | 33 | 72 | 15 | 1.0 | 80 | 67469 | 11 | 90 | | |
| 12-2S-3E..... | 694 | 2871-2875 | 129418 | 154 | 41425 | 4441 | 1726 | 11 | 0.0 | 0.2 | 9.0 | 0.0 | 886 | 76193 | 7.7 | 40 | 23.7.4 | |
| 13-2S-4E..... | 552 | 3075-3111 | 141062 | 167 | 44317 | 5719 | 2159 | 24 | 0.6 | 0.8 | 5.1 | 0.8 | 390 | 84752 | 35 | 48 | 7.0 | |
| 34-2S-4E..... | 1231 | 3061-3066 | 147826 | | | | | | | | | | | | | | | |
| 22-3S-2E..... | 199 | 2742-2765 | 127808 | 103 | 43457 | 48188 | 1931 | 12 | 1.3 | 27 | 0.4 | 1216 | 79204 | 7.8 | 242 | | | |
| 6-3S-3E..... | 559 | 2752-2845 | 135294 | 52 | 42144 | 5058 | 2042 | 14 | 0.0 | 0.0 | 10 | 0.6 | 483 | 80553 | 32 | 42 | 7.1 | |
| 1-3S-4E..... | 329 | 3170-3214 | 143800 | 62 | 45762 | 5058 | 3000 | 15 | 0.2 | 16 | 11 | 0.2 | 326 | 88067 | 17 | 106 | 6.7 | |
| 27-3S-4E..... | 677 | 3082-3201 | 147722 | 44 | 46373 | 6716 | 2871 | 10 | 6.4 | 8.8 | 13 | 0.0 | 614 | 88900 | 9.5 | 75 | 6.5 | |
| 29-4S-2E..... | 127 | 2895 | 128383 | 116 | 39390 | 8082 | 25 | 56 | 0.0 | 20 | 0.0 | 0.0 | 1235 | 73866 | 1.3 | 183 | 555 | |
| 3-4S-3E..... | 430 | 2880-2907 | 137640 | 9.0 | 44458 | 4579 | 1851 | 27 | 0.4 | 1.6 | 16 | 2.0 | 1120 | 81358 | 5.3 | 62 | 6.7 | |
| LAWRENCE | | | | | | | | | | | | | | | | | | |
| 20-3N-10W..... | 681 | 1848-1882 | 82758 | 48 | 26643 | 2591 | 1534 | 13 | 0.0 | 0.2 | 14 | 0.0 | 695 | 49426 | 5.3 | 481 | 7.3 | |
| 18-4N-12W..... | 44 | 1565-1588 | 75224 | 90430 | 103 | 25334 | 6590 | 1570 | 8.0 | 0.0 | 1.2 | 41 | 0.2 | 1519 | 54286 | 21 | 146 | |
| 16-4N-13W..... | 542 | 2261-2265 | | | | | | | | | | | | | | | | |
| MARION | | | | | | | | | | | | | | | | | | |
| 3-IN-1E..... | 882 | 1848-1928 | 124490 | | | | | | | | | | | | | | | |
| 3-IN-1E..... | 883 | 1894-1928 | 125658 | 41 | 39830 | 4732 | 1999 | 13 | 0.0 | 0.0 | 33 | 0.0 | 277 | 74852 | 9.0 | 168 | 6.8 | |
| 3-IN-1E..... | 885 | 2715-2735 | 137458 | | | | | | | | | | | | | | | |
| 11-IN-3E..... | 1153 | 2734-2763 | 137352 | | | | | | | | | | | | | | | |
| 25-1N-3E..... | 1152 | 2690-2741 | 136580 | | | | | | | | | | | | | | | |
| 32-2N-2E..... | 144 | 2105-2134 | 124326 | 31 | 40412 | 4981 | 1640 | 17 | 3.6 | 21 | 2.0 | 2.0 | 80 | 75856 | 43 | 41 | | |
| 34-2N-2E..... | 148 | 2105-2134 | 125930 | 64 | 40687 | 4991 | 1987 | 4.0 | 0.0 | 17 | 0.0 | 0.0 | 794 | 76776 | 6.0 | 207 | | |
| 14-2N-4E..... | 638 | 2860-2886 | 138802 | 73 | 43382 | 4202 | 2755 | 18 | 1.6 | 17 | 0.0 | 0.0 | 156 | 82184 | 14 | 138 | 7.2 | |
| 33-3N-2E..... | 166 | 2137-2149 | 123770 | | | | | | | | | | | | | | | |
| 33-3N-2E..... | 167 | 2147-2158 | 125278 | 57 | 42193 | 2769 | 2464 | 18 | 0.8 | 17 | 0.0 | 0.0 | 0 | 77142 | 20 | 164 | | |
| 33-3N-2E..... | 168 | 2140-2146 | 123738 | | | | | | | | | | | | | | | |
| 16-3N-4E..... | 708 | 2868-2520 | 130564 | 77 | 40689 | 4625 | 2073 | 23 | 0.0 | 0.4 | 8.0 | 0.3 | 560 | 76519 | 8.9 | 304 | 5.3 | |
| 28-4N-1E..... | 69 | 1600-1604 | 104810 | | | | | | | | | | | | | | | |
| RICHLAND | | | | | | | | | | | | | | | | | | |
| 2-2N-8E..... | 812 | 2998-3080 | 142082 | | | | | | | | | | | | | | | |
| 17-2N-10E..... | 792 | 3178-3211 | 132722 | 52 | 40038 | 6791 | 2237 | 22 | 0.0 | 0.6 | 15 | 0.0 | 2067 | 78858 | 11 | 89 | 7.1 | |
| 26-2N-10E..... | 521 | 3252-3257 | 122338 | 103 | 32288 | 5495 | 2071 | 13 | 0.0 | 0.0 | 24 | 0.0 | 1769 | 68665 | 12 | 17 | | |
| 7-2N-11E..... | 909 | 3262-3267 | 122948 | | | | | | | | | | | | | | | |
| 21-2N-14W..... | 939 | 3268-3283 | 130470 | 33 | 38136 | 6413 | 2155 | 23 | 0.0 | 0.0 | 50 | 0.0 | 1724 | 75172 | 9.0 | 78 | 6.8 | |
| 21-2N-14W..... | 376 | 3049-3069 | 121670 | 46 | 35233 | 6322 | 2282 | 12 | 0.2 | 2.4 | 11 | 0.0 | 1961 | 70778 | 1.3 | 49 | 6.4 | |
| 21-2N-14W..... | 1229 | 3066-3100 | 124206 | | | | | | | | | | | | | | | |
| 29-2N-14W..... | 271 | 3109-3131 | 116800 | 95 | 35596 | 5603 | 2047 | 10 | 0.0 | 0.0 | 18 | 0.0 | 2184 | 68474 | 12 | 149 | 1175 | |
| 11-3N-9E..... | 1025 | 2975-3020 | 131542 | | | | | | | | | | | | | | | |
| 19-3N-9E..... | 801 | 3095-3103 | 143332 | 72 | 42780 | 6906 | 1989 | 4.0 | 0.0 | 11 | 19 | 0.6 | 1750 | 82820 | 8.9 | 39 | 6.1 | |
| 16-3N-10E..... | 894 | 3095-3103 | 125552 | 31 | 39856 | 4064 | 2494 | 12 | 0.0 | 0.0 | 42 | 0.0 | 1436 | 74646 | 0.0 | 48 | 337 | |
| 34-3N-14W..... | 249 | 3114-3129 | 114934 | 10 | 36740 | 3965 | 2310 | 20 | 0.0 | 0.0 | 19 | 0.0 | 563 | 69585 | 7.1 | 122 | 459 | |

ILLINOIS OIL-FIELD BRINES

BRINE ANALYSES

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ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Depth | Total Solids | NH ₄ | Na | Ca | Mg | SiO ₂ | Fe Fil- tered | Fe Unfil- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO _x | CO ₂ | HCO ₃ | pH |
|---------------------------------|-----------|-----------|-----------------|-----------------|-------|------|------|------------------|---------------------|-----------------------|--------------------------------|-------|-----------------|-------|-----------------|-----------------|------------------|-----|
| DEVONIAN-SILURIAN | | | | | | | | | | | | | | | | | | |
| BOND 31-4N-2W..... | 124 | 2504-2515 | 56952 | 12 | 17561 | 2024 | 877 | 3.0 | 10 | 94 | 2.0 | 42 | 33177 | 2.0 | 36 | | | |
| 10-6N-2W..... | 230 | 2300-2307 | 59814 | 15 | 14782 | 1902 | 844 | 12 | 0.0 | 0.0 | 31 | 0.0 | 0 | 28320 | 9.0 | 223 | 6.9 | |
| 16-6N-2W..... | 897 | 2278-2283 | 48398 | 15 | | | | | | | | | | | | | | |
| CHAMPAIGN 9-17N-10E..... | 90 | 1065 | 8710 | | | | | | | | | | | | | | | |
| 10-17N-10E..... | 119 | 690-1120 | 6265 | | | | | | | | | | | | | | | |
| 10-17N-10E..... | 129 | 1060-1540 | 4824 | | | | | | | | | | | | | | | |
| 20-20N-8E..... | 114 | 322-610 | 5792 | 3 | 1711 | 97 | 23 | 30 | 0.2 | 13 | 0.0 | 38 | 2361 | 11 | 832 | | | |
| 20-20N-8E..... | 125 | 610-655 | 5870 | 1 | 2061 | 66 | 28 | 8.0 | 0.0 | 0.0 | 6.5 | 0.0 | 12 | 3199 | 5.7 | 621 | | |
| CHRISTIAN 15-13N-1E..... | 898 | 2312-2332 | 135796 | 62 | 40993 | 6626 | 2409 | 5.0 | 0.0 | 32 | 33 | 1.0 | 635 | 81545 | 27 | 27 | 5.2 | |
| 15-13N-1E..... | 900 | 2316-2337 | 134124 | | | | | | | | | | | | | | | |
| 15-13N-1E..... | 908 | 2316-2337 | 134020 | | | | | | | | | | | | | | | |
| 29-13N-1E..... | 735 | 2325-2356 | 136100 | 103 | 40814 | 6955 | 2559 | 15 | 6.0 | 20 | 11 | 1.8 | 278 | 81702 | 23 | 127 | 6.6 | |
| 29-13N-1E..... | 756 | 2325-2356 | 138260 | | | | | | | | | | | | | | | |
| 369 | 1884-1905 | 126250 | 129 | 39962 | 5512 | 2110 | 0.0 | 0.6 | 10 | 17 | 0.0 | 107 | 77681 | 12 | 20 | 6.4 | | |
| CLARK 20-11N-10W..... | 911 | 2064-2100 | 11994 | 8.0 | 3763 | 329 | 196 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 193 | 6603 | 44 | 349 | 7.7 | |
| 17-11N-14W..... | 140 | 1207 | 14239 | | | | | | | | | | | | | | | |
| 670 | 1320-1350 | 17976 | 13 | 5966 | 483 | 242 | 21 | 9.6 | 18 | 10 | 0.0 | 0 | 10314 | 5.7 | 764 | 6.9 | | |
| 683 | 1400-1550 | 14288 | 12 | 4775 | 286 | 208 | 2.0 | 88 | 120 | 84 | 2.4 | 140 | 8369 | 5.4 | 35 | 5.9 | | |
| CLAY 4-2N-8E..... | 272 | 4702-4840 | 130776 | 206 | 41857 | 5580 | 1302 | 5.0 | 0.0 | 4.8 | 19 | 0.0 | 1314 | 77553 | 24 | 61 | 11 | |
| CLINTON 13-1N-1W..... | 178 | 2906-2915 | 76668 | 67 | 24478 | 2816 | 1309 | 14 | 2.2 | 6.7 | 14 | 0.0 | 157 | 46453 | 34 | 139 | | |
| 203 | 2406-2432 | 105300 | 58 | 31749 | 5354 | 2089 | 33 | 4.2 | 107 | 32 | 0.6 | 393 | 64300 | 30 | 44 | | | |
| 619 | 2473-2516 | 107300 | 64 | 32726 | 5857 | 1913 | 17 | 0.6 | 9.0 | 0.0 | 413 | 66175 | 13 | 71 | 6.9 | | | |
| 676 | 2470-2478 | 105736 | 64 | 31856 | 5327 | 1982 | 10 | 3.6 | 11 | 4.0 | 0.6 | 296 | 64161 | 7.4 | 61 | 6.6 | | |
| COLES 11-12N-7E..... | 594 | 3153-3165 | 40220 | 21 | 13116 | 1477 | 561 | 20 | 0.0 | 0.2 | 21 | 0.0 | 54 | 24365 | 2.8 | 179 | 6.6 | |
| 709 | 3160-3172 | 40482 | 2.1 | 13800 | 133 | 449 | 23 | 6.4 | 6.4 | 17 | 0.6 | 364 | 22478 | 6.0 | 117 | 5.0 | | |
| 11-12N-7E..... | 710 | 3160-3172 | 45744 | | | | | | | | | | | | | | | |
| 433 | 2940-2964 | 28540 | 20 | 9328 | 889 | 402 | 51 | 0.0 | 0.0 | 10 | 0.2 | 207 | 16915 | 1.8 | 28 | 114 | 8.0 | |
| 331 | 1052-1055 | 5570 | 3.6 | 2112 | 50 | 30 | 17 | 0.0 | 4.8 | 5.0 | 0.0 | 0.0 | 33 | 3012 | 1.4 | 60 | 618 | 8.1 |
| 138 | 1530-1535 | 16531 | 5.9 | 5555 | 376 | 342 | 9.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 169 | 10020 | 9.6 | 156 | | |
| 107 | 948-968 | 15704 | 3.0 | 5083 | 410 | 214 | 57 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15 | 8850 | 8.0 | 570 | | |
| 111 | 948-1038 | 14679 | 1.8 | 4620 | 360 | 246 | 1.0 | 0.8 | 10 | 0.0 | 0.0 | 7 | 8236 | 1.0 | 410 | | | |
| 75 | 1075-1078 | 14432 | 0.3 | 5002 | 466 | 4 | 10 | 0.2 | 8.0 | 0.0 | 52 | 8467 | 7.1 | 11 | 45 | | | |
| CRAWFORD 9-6N-13W..... | 275 | 2795-2965 | 72972 | 72 | 22912 | 2737 | 1192 | 13 | 0.0 | 2.0 | 10 | 0.0 | 3375 | 40966 | 25 | 546 | | |
| EDGAR 22-13N-12W..... | 94 | 2209-2235 | 45456 | | | | | | | | | | | | | | | |
| 966 | 1340-1410 | 46134 | 10 | 15354 | 1261 | 506 | 13 | 8.0 | 640 | 32 | 2.0 | 372 | 27044 | 19 | 129 | 7.6 | | |
| FAYETTE 7-8N-1E..... | 481 | 2788-2814 | 72040 | | | | | | | | | | | | | | | |
| 319 | 3054-3060 | 93118 | 0.0 | 29195 | 3668 | 1544 | 31 | 0.4 | 8.0 | 13 | 0.0 | 120 | 55679 | 5.7 | 401 | 6.6 | | |
| 318 | 3095-3097 | 90180 | 0.0 | 28357 | 3437 | 1564 | 40 | 0.1 | 0.1 | 17 | 0.0 | 67 | 54058 | 4.3 | 437 | 6.8 | | |
| FULTON 19-5N-4E..... | 305 | 760-845 | 3098 | 26 | 1092 | 44 | 24 | 16 | 0.6 | 16 | 1.0 | 0.0 | 214 | 1231 | 17 | 831 | 7.8 | |
| JEFFERSON 35-2S-1E..... | 763 | 3663-3746 | 84480 | 72 | 27223 | 3149 | 1078 | 17 | 0.6 | 1.2 | 7.0 | 0.2 | 78 | 50495 | 11 | 248 | 6.7 | |

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| | | | | | | | | | | | | | | | | | |
|------------------------------------|------|-----------|--------|-----|-------|------|------|-----|-----|-----|-----|-----|-------|-------|---------|----------|---------|
| LOGAN 7-19N-3W..... | 896 | 1207-1370 | 12918 | 5.0 | 4757 | 56 | 117 | 6.0 | 0.0 | 0.0 | 7.0 | 0.0 | 0 | 7491 | 9.0 | 28 | 439 8.0 |
| MADISON 3-4N-6W..... | 618 | 1736-1781 | 56240 | 26 | 17983 | 2296 | 955 | 19 | 0.2 | 0.2 | 8.0 | 32 | 3.8 | 256 | 34234 | 3.5 | 343 7.1 |
| 4-4N-6W..... | 604 | 1739-1762 | 56020 | 18 | 17107 | 3144 | 873 | 13 | 11 | 45 | 0.2 | 32 | 3.8 | 403 | 34199 | 3.5 | 343 7.1 |
| 4-4N-6W..... | 608 | 1762-1775 | 59542 | | | | | | | | | | | 35228 | | | 37 4.9 |
| 4-4N-6W..... | 614 | 1741-1800 | 60152 | | | | | | | | | | | 35748 | | | |
| 9-4N-6W..... | 613 | 1677-1690 | 60656 | | | | | | | | | | | 35346 | | | |
| 9-4N-6W..... | 615 | 1747-1791 | 58190 | 23 | 18393 | 2244 | 981 | 51 | 1.0 | 0.0 | 8.0 | 118 | 34926 | 6.0 | | | |
| 10-4N-6W..... | 611 | 1754-1789 | 58012 | | | | | | | | | | | 34209 | | | |
| 11-4N-6W..... | 609 | 1738-1762 | 58960 | | | | | | | | | | | 34737 | | | |
| 14-4N-6W..... | 617 | 1754-1793 | 57330 | 22 | 17620 | 2270 | 998 | 13 | 0.0 | 2.2 | 8.0 | 369 | 33682 | 8.1 | 306 7.1 | | |
| 15-4N-6W..... | 439 | 1736-1802 | 55800 | 26 | 17555 | 2259 | 976 | 18 | 0.0 | 0.6 | 4.0 | 528 | 36055 | 0.0 | 378 7.1 | | |
| 16-4N-6W..... | 610 | 1720-1750 | 61206 | | | | | | | | | | | | | | |
| 16-4N-6W..... | 612 | 1712-1717 | 62116 | | | | | | | | | | | | | | |
| 17-4N-6W..... | 616 | 1706-1710 | 60152 | 44 | 18713 | 2577 | 1064 | 30 | 0.6 | 24 | 9.0 | 0.8 | 757 | 35768 | 18 | 453 7.3 | |
| MARION 3-IN-1E..... | 1213 | 3260-3344 | 103004 | | | | | | | | | | | | | | |
| 8-2N-1E..... | 155 | 2992-2994 | 866680 | 59 | 27674 | 3875 | 1324 | 21 | 0.0 | 19 | 0.0 | 29 | 53279 | 5.7 | | | |
| 34-3N-2E..... | 692 | 3510-3546 | 124618 | 62 | 38471 | 5781 | 1677 | 22 | 0.2 | 6.0 | 22 | 0.4 | 332 | 74218 | 5.3 | 4 89 6.8 | |
| 29-4N-1E..... | 358 | 2879-2908 | 75938 | 61 | 24255 | 3124 | 1141 | 26 | 0.2 | 0.2 | 18 | 1.2 | 50 | 46188 | 96 | 167 7.3 | |
| MASON 19-21N-5W..... | 584 | 1100-1336 | 7772 | | 2786 | 28 | 51 | 8.0 | 0.0 | 4.0 | 0.0 | 0.0 | 231 | 4260 | | 21 382 | |
| McDONOUGH 15-4N-4W..... | 123 | 495 | 4359 | 2.0 | 1618 | 24 | 25 | 27 | 0.0 | 26 | 0.0 | 7 | 2235 | 5.3 | 636 | | |
| 15-4N-4W..... | 186 | 480 | 4640 | 1.8 | 1734 | 56 | 23 | 9.5 | 0.9 | 11 | 0.6 | 1.1 | 23 | 2503 | 0.7 | 551 | |
| 19-4N-4W..... | 120 | 496 | 4701 | 1.8 | 1755 | 19 | 24 | 65 | 0.0 | 3.0 | 0.0 | 10 | 2284 | 5.3 | 894 | | |
| McLEAN 28-22N-1E..... | 236 | 1449-1650 | 4428 | | | | | | | | | | | 2075 | | | |
| MORGAN 22-13N-8W..... | 711 | 1020-1039 | 30584 | 15 | 9801 | 579 | 308 | 18 | 0.0 | 20 | 8.0 | 0.0 | 0 | 16635 | 7.1 | 721 7.3 | |
| PEORIA 17-8N-6E..... | 189 | 981-1000 | 2638 | 1.1 | 934 | 35 | 16 | 51 | 9.2 | 39 | 3.9 | 0.0 | 308 | 935 | 1.4 | 634 | |
| 4-11N-8E..... | 750 | 548-1085 | 2148 | | | | | | | | | | | | | | |
| PIATT 6-19N-5E..... | 1007 | 1206-1382 | 6470 | | | | | | | | | | | | | | |
| PIKE 12-3S-2W..... | 967 | 425-510 | 9764 | 8.0 | 3380 | 107 | 46 | 15 | 0.0 | 16 | 13 | 0.0 | 0 | 5262 | 9.0 | 489 8.4 | |
| SANGAMON 10-15N-3W..... | 953 | 1761-1777 | 99582 | | | | | | | | | | | | | | |
| TAZEWELL 18-25N-3W..... | 136 | 1200-1390 | 3208 | 0.2 | 1208 | 7 | 5 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 109 | 1591 | 3.7 | 372 | |
| WASHINGTON 23-1S-1W..... | 605 | 3116-3150 | 79584 | 44 | 24818 | 4154 | 1139 | 10 | 0.4 | 0.6 | 8.0 | 0.0 | 0 | 742 | 48358 | 6.0 | 192 7.0 |
| 15-1S-4W..... | 1138 | 2348-2386 | 103188 | | | | | | | | | | | | | | |
| 15-1S-4W..... | 1139 | 2308-2335 | 105426 | | | | | | | | | | | | | | |
| 10-2S-2W..... | 1174 | 3047-3080 | 84908 | 35 | 25122 | 4277 | 1553 | 16 | 0.0 | 4.0 | 2.0 | 0.2 | 827 | 50232 | 8.9 | 63 6.5 | |
| 20-3S-4W..... | 737 | 2267-2284 | 84908 | 35 | 42746 | 8952 | 2466 | 4.0 | 0.0 | 58 | 0.0 | 0.0 | 426 | 88562 | 21 | 259 | |
| KNOX, INDIANA 23-1N-10W..... | 118 | 3308-3415 | 142323 | 50 | 42746 | 8952 | 2466 | 4.0 | 0.0 | 58 | 0.0 | 0.0 | 426 | 88562 | 21 | | |
| SULLIVAN, INDIANA 30-9N-8W..... | 746 | 2021-2025 | 11718 | 13 | 3629 | 446 | 203 | 26 | 0.0 | 0.4 | 7.0 | 0.0 | 0.0 | 7 | 6594 | 12 | 678 7.5 |
| 19-2N-9W..... | 759 | 2127-2131 | 18278 | 21 | 5319 | 969 | 323 | 12 | 0.0 | 0.4 | 8.0 | 0.1 | 0.0 | 226 | 10363 | 8.0 | 642 7.3 |
| 5-9N-10W..... | 786 | 2158-2187 | 29142 | 36 | 8847 | 1182 | 528 | 23 | 0.0 | 0.8 | 6.0 | 0.0 | 0.0 | 77 | 17096 | 11 | 305 7.1 |
| VIGO, INDIANA 15-10N-10W..... | 82 | 2115-2168 | 14033 | | | | | | | | | | | | | | |
| 15-10N-10W..... | 86 | 2089 | 18117 | | | | | | | | | | | | | | |
| 15-10N-10W..... | 87 | 2115 | 18686 | | | | | | | | | | | | | | |
| 15-10N-10W..... | 159 | 2022-2171 | 14010 | 13 | 4483 | 500 | 260 | 14 | 0.0 | 0.0 | 10 | 0.0 | 0.0 | 12 | 8241 | 3.2 | 569 |
| 16-10N-10W..... | 68 | 2103-2190 | 13538 | | | | | | | | | | | | | | |
| 16-10N-10W..... | 84 | 2094 | 15898 | | | | | | | | | | | | | | |
| 24-1N-8W..... | 765 | 1621-1641 | 3840 | 10 | 1390 | 51 | 52 | 17 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 25 | 9312 | 3.5 | 631 7.5 |
| 11-1N-9W..... | 760 | 1782-1810 | 4938 | 5.2 | 1706 | 152 | 0 | 30 | 0.0 | 2.8 | 1.0 | 0.0 | 0.0 | 91 | 2773 | 5.5 | 819 7.6 |
| 11-1N-9W..... | 761 | 1681-1704 | 6184 | 62 | 2010 | 224 | 85 | 11 | 0.0 | 4.0 | 0.0 | 4.0 | 0.0 | 4 | 3273 | | |

ILLINOIS OIL-FIELD BRINES

| FORMATION COUNTY LOCATION | Lab. No. | Depth | Total Solids | NH ₄ | Na | Ca | Mg | SiO ₂ | Fe Fil- tered | Fe Unfil- tered | Al ₂ O ₃ | Mn | SO ₄ | Cl | NO ₃ | CO ₂ | HCO ₃ | pH |
|-------------------------------------|----------------|--------|-----------------|-----------------|-------|------|------|------------------|---------------------|-----------------------|--------------------------------|------|-----------------|-------|-----------------|-----------------|------------------|---------|
| HENDERSON, KENTUCKY 22-Q-25 | 126 4290 | 169710 | 27 | 50710 | 8306 | 2271 | 4.0 | 2.0 | 56 | 0.0 | 466100034 | 4.8 | | | | | | 112 |
| "TRENTON" (KIMMICK, GALENA) BOND | | | | 646 3165-3193 | 22276 | 11 | 6207 | 1285 | 454 | 14 | 0.2 | 1.6 | 8.0 | 0.0 | 1353 | 12045 | 2.1 | 241 7.1 |
| 16-6N-2W | 80 3088-3101 | 6917 | 2014 | 328 | 143 | 7.0 | | | | | 2.0 | | 614 | 3464 | | | | 318 |
| 11-6N-5W | 81 2980-3101 | 6891 | 2033 | 343 | 154 | 4.0 | | | | 1.0 | | 512 | 3666 | | | | | 251 |
| 11-6N-5W | | | | | | | | | | | | | | | | | | |
| CLARK | 192 2440-2450 | 866666 | 82 | 25128 | 5123 | 1825 | 12 | 0.0 | 0.8 | 13 | 0.2 | | 38 | 52863 | 177 | | | 519 |
| 9-11N-14W | | | | | | | | | | | | | | | | | | |
| CLINTON | | | | 1143 3994-4073 | 91122 | | | | | | | | | | | | | |
| 26-2N-1W | 1144 39716 | | | | | | | | | | | | | | | | | |
| 26-2N-1W | 747 4007-4071 | 85558 | 67 | 28169 | 2553 | 1286 | 25 | 0.0 | 0.0 | 16 | 0.2 | | 377 | 51244 | 11 | | | 520 7.1 |
| 28-2N-1W | 1146 3983-4063 | 90804 | | | | | | | | | | | | | | | | |
| 34-2N-1W | | | | | | | | | | | | | | | | | | |
| COLES | | | | | | | | | | | | | | | | | | |
| 36-14N-10E | 139 2050-2055 | 23618 | 17 | 7889 | 522 | 438 | 13 | 0.0 | 16 | 0.0 | | 26 | 14268 | 8.0 | | | | 176 |
| FULTON | | | | | | | | | | | | | | | | | | |
| 19-5N-4E. | 306 1097-1105 | 2296 | | | | | | | | | | | | | | | | |
| 17-6N-1E. | 443 666-1130 | 2080 | 0.3 | 567 | 53 | 73 | 22 | 0.0 | 2.0 | 14 | 0.0 | 753 | 452 | 7.1 | | | 290 7.5 | |
| HANCOCK | 43 672-722 | 1387 | 1.5 | 344 | 47 | 40 | 46 | 55 | | 4.2 | 0.1 | 357 | 214 | | | | | 410 |
| 12-4N-9W | 490 3422-3488 | 87748 | | 22301 | 6701 | 1781 | 30 | 10 | 30 | 11 | 0.4 | 1315 | 50197 | | | | 468 7.9 | |
| JACKSON | 491 3432-3350 | 82020 | | | | | | | | | | | | | | | | |
| 11-7S-4W. | | | | | | | | | | | | | | | | | | |
| LOGAN | | | | | | | | | | | | | | | | | | |
| 7-19N-3W | 912 1702-1813 | 3308 | | | | | | | | | | | | | | | | 1790 |
| MADISON | | | | | | | | | | | | | | | | | | |
| 27-3N-6W | 343 2299-2337 | 21254 | 8.2 | 5924 | 1020 | 481 | 12 | 0.6 | 2.0 | 9.1 | 0.0 | 958 | 11440 | 6.2 | | | 17 | |
| MARION | 690 4638 | 124704 | 41 | 40716 | 4351 | 1322 | 20 | 100 | 135 | 7.0 | 3.0 | 293 | 74168 | 12 | | | 15 5.5 | |
| 30-2N-2E | | | | | | | | | | | | | | | | | | |
| McDONOUGH | | | | | | | | | | | | | | | | | | |
| 2-4N-4W | 321 650-782 | 4006 | 2.4 | 1453 | 70 | 45 | 16 | 0.0 | 0.4 | 1.0 | 0.0 | 58 | 1893 | 4.2 | | | 964 7.7 | |
| MONROE | 188 450-480 | 15300 | 4.2 | 4277 | 855 | 358 | 10 | 0.3 | | 8.6 | 0.0 | 863 | 8345 | 2.1 | | | 305 | |
| 35-1S-10W | 1177 463-536 | 14652 | | | | | | | | | | | | | | | | |
| 35-1S-10W | | | | | | | | | | | | | | | | | | |
| PERRY | | | | | | | | | | | | | | | | | | |
| 23-4S-4W. | 949 3623-3735 | 138264 | 46 | 41829 | 7481 | 1830 | 12 | 4.0 | 24 | 0.0 | 1.0 | 971 | 82376 | 9.0 | | | 107 6.2 | |
| PIKE | | | | | | | | | | | | | | | | | | |
| 14-5S-6W. | 335 474-552 | 1088 | | | | | | | | | | | | | | | | |
| ST. CLAIR | | | | | | | | | | | | | | | | | | |
| 28-1N-10W | 45 666-702 | 17784 | | | | | | | | | | | | | | | | |
| 28-1N-10W | 154 397-440 | 18596 | 5.5 | 5217 | 1251 | 431 | 31 | 0.2 | | 11 | 0.0 | 880 | 10687 | 3.9 | | | 320 | |
| 28-1N-10W | 263 385-532 | 16114 | 5.2 | 4283 | 946 | 374 | 11 | 0.0 | 0.0 | 27 | 0.0 | 457 | 8873 | 7.8 | | | 282 | |
| 33-1N-10W | 46 582-644 | 19781 | | | | | | | | | | | | | | | | |
| 33-1N-10W | 47 556-582 | 20260 | | | | | | | | | | | | | | | | |
| 33-1N-10W | 215 638-700 | 18680 | | | | | | | | | | | | | | | | |
| 33-1N-10W | 268 638-700 | 18672 | 4.6 | 5039 | 1104 | 379 | 8.0 | 32 | 80 | 0.0 | 0.6 | 793 | 10099 | 4.2 | | | 259 | |
| 33-1N-10W | 951 650 | 21816 | | | | | | | | | | | | | | | | |
| TAZEWELL | | | | | | | | | | | | | | | | | | |
| 8-23N-6W | 576 1220-1458 | 2404 | | | | | | | | | | | | | | | | |
| ST. PETER | | | | | | | | | | | | | | | | | | |
| ADAMS | | | | | | | | | | | | | | | | | | |
| 11-2S-6W | 294 344-971 | 8210 | 3.6 | 2443 | 319 | 157 | 36 | 0.4 | 1.0 | 11 | 0.0 | 992 | 3876 | 9.6 | | | 10 292 7.4 | |
| 26-2S-8W | 302 666-675 | 12258 | 5.2 | 3715 | 456 | 266 | 22 | 0.8 | 0.8 | 6.0 | 1.3 | 987 | 6398 | 8.1 | | | 328 7.2 | |
| 12-6N-5W | 134 2505-3154 | 12201 | 13 | 3563 | 583 | 260 | 6.0 | 0.0 | 332 | 0.0 | 1614 | 5973 | 32 | | | | 217 | |

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