

POTENTIOMETRIC SURFACE

The generalized potentiometric surface of the Sparta aquifer, October 1996 (fig. 9), was constructed using water-level measurements from 55 wells (table 1) completed in the middle or lower part of the aquifer. The altitude of water-level contours ranged from about 220 ft above sea level in the outcrop area to about 220 ft below sea level in Ouachita Parish (fig. 9). Water levels are lowest (cones of depression) in areas affected by major pumping centers. Flow lines show ground-water movement is toward major pumping centers that include West Monroe (21 Mgal/d) and Hodge (10 Mgal/d) (fig. 9) in Louisiana. The Sparta aquifer also is affected by pumpage in the Ruston (6.9 Mgal/d), Minden (2.6 Mgal/d), and Winnfield (2.4 Mgal/d) areas of Louisiana, as well as pumpage near El Dorado, Arkansas (5.8 Mgal/d) (T.W. Holland, U.S. Geological Survey, oral commun., 2002). Water-level data collected subsequent to the data used for this potentiometric-surface map indicate the presence of a cone of depression in the Ruston area.

In the outcrop area in Webster Parish, well Wb-399 (fig. 10) shows only seasonal fluctuations in water levels for the period of record from 1979 to 2000 and no net increase or decrease. This well is typical of wells located in the outcrop area of the Sparta aquifer. Well Wb-399 is screened between a depth of 288 and 298 ft.

Declines in water levels in the Sparta aquifer are shown at well Cl-149 (fig. 11), located in Claiborne Parish near the Louisiana-Arkansas State line, and well L-26 (fig. 12), located north of Ruston in Lincoln Parish. For the periods of record, water levels in wells Cl-149 and L-26 have declined approximately 1.5 and 2.0 ft/yr, respectively. These declines are a result of long-term withdrawals from the aquifer.

Regional decline of water levels in the Sparta aquifer in Ouachita Parish and adjacent parishes occurs due to pumpage in West Monroe. Wells Ou-443, 444, and 445, located near West Monroe, are completed at different depths and monitor water levels in the West Monroe and surrounding areas. All three wells have shown an average water-level decline of about 2.0 ft/yr for the period of record shown. Hydrographs for these wells indicate water levels undergo very similar fluctuations (fig. 13). Water levels in these wells indicate that hydraulic connection exists among sands in the Sparta aquifer.

SUMMARY AND CONCLUSIONS

The Sparta aquifer is the principal source of ground water for Bienville, Claiborne, Jackson, Lincoln, Morehouse, Ouachita, Union, Webster, and Winn Parishes. Water levels throughout much of the aquifer have declined steadily since the early 1920's when water withdrawals for industrial purposes began. In 2000, the aquifer provided a total of 68 million gallons per day for public supply, industry, power generation, rural domestic supply, livestock, irrigation, and aquaculture. From 1990 to 2000, withdrawals from the aquifer increased 6 percent.

The Sparta aquifer framework consists of imperfectly connected sands with interbedded clays which may act as separate hydraulic units for short periods of time, but due to the depositional nature of the aquifer, act as one unit regionally over longer periods of time. Pumping from the massive sands in the lower part of the aquifer may affect water levels in the upper sands.

For most of the Sparta aquifer, the altitude of the top ranges from approximately 200 feet above sea level near the outcrop area to approximately 400 feet below sea level near the downdip limit of freshwater, and the top of the aquifer generally dips east and southeast at a rate of 5 to 25 feet per mile. The altitude of the base of the aquifer ranges from approximately 150 feet above sea level in the outcrop area to approximately 1,000 feet below sea level near the downdip limit of freshwater, and the base of the aquifer dips east and southeast at a rate of 25 to 50 feet per mile.

Five hydrogeologic sections, oriented west-to-east or north-to-south, show the spatial extent of sands within the Sparta aquifer. Along the sections, the aquifer ranges in thickness from approximately 200 feet adjacent to the outcrop areas to approximately 725 feet near the downdip limit of freshwater.

The potentiometric surface in October 1996 shows that water levels in the Sparta aquifer generally have declined, except in the outcrop area where water levels have remained relatively constant. Altitude of water levels, which range from about 220 feet above sea level to about 220 feet below sea level, are highest in the western outcrop area and lowest in areas affected by major pumping centers.

SELECTED REFERENCES

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Table 1: Water-level data used to construct the potentiometric surface of the Sparta aquifer in Louisiana, October 1996

| Well number             | Well depth (feet below land surface) | Water level (feet below land surface) | Water level (feet above or below sea level) | Date measured |
|-------------------------|--------------------------------------|---------------------------------------|---|---------------|
| <b>Bienville Parish</b> |                                      |                                       |   |               |
| Bi-76                   | 110                                  | 50.46                                 | 229.54                                      | 10-01-96      |
| Bi-100                  | 90                                   | 33.21                                 | 186.79                                      | 10-16-96      |
| Bi-112                  | 348                                  | 115.82                                | 99.18                                       | 10-01-96      |
| Bi-144                  | 630                                  | 236.42                                | 83.58                                       | 10-01-96      |
| Bi-166                  | 472                                  | 181.43                                | 78.57                                       | 10-01-96      |
| Bi-186                  | 216                                  | 41.97                                 | 138.03                                      | 10-16-96      |
| Bi-192                  | 153                                  | 74.49                                 | 210.51                                      | 10-16-96      |
| Bi-216                  | 300                                  | 16.70                                 | 183.30                                      | 10-01-96      |
| <b>Caldwell Parish</b>  |                                      |                                       |   |               |
| Ca-86B                  | 545                                  | 79.28                                 | 80.72                                       | 10-01-96      |
| <b>Claiborne Parish</b> |                                      |                                       |   |               |
| Cl-9                    | 670                                  | 270.01                                | 89.99                                       | 10-09-96      |
| Cl-58                   | 488                                  | 140.01                                | 109.99                                      | 10-09-96      |
| Cl-111                  | 570                                  | 255.46                                | 44.54                                       | 10-08-96      |
| Cl-116                  | 684                                  | 259.73                                | -14.73                                      | 10-10-96      |
| Cl-148                  | 625                                  | 196.80                                | -6.80                                       | 10-10-96      |
| Cl-149                  | 736                                  | 294.36                                | -64.36                                      | 10-10-96      |
| <b>Jackson Parish</b>   |                                      |                                       |   |               |
| Ja-49                   | 570                                  | 201.19                                | -41.19                                      | 10-02-96      |
| Ja-147                  | 703                                  | 246.47                                | -26.47                                      | 10-16-96      |
| Ja-148                  | 578                                  | 225.15                                | 19.85                                       | 10-02-96      |
| <b>Lincoln Parish</b>   |                                      |                                       |   |               |
| L-26                    | 686                                  | 180.27                                | -25.27                                      | 10-10-96      |
| L-68                    | 770                                  | 249.60                                | -69.60                                      | 10-10-96      |
| L-113                   | 750                                  | 317.56                                | 37.44                                       | 10-02-96      |
| L-117                   | 551                                  | 137.85                                | -51.85                                      | 10-15-96      |
| <b>Morehouse Parish</b> |                                      |                                       |   |               |
| Mo-5                    | 860                                  | 153.52                                | -36.08                                      | 10-04-96      |
| Mo-342                  | 620                                  | 89.85                                 | -1.51                                       | 10-03-96      |
| Mo-350                  | 740                                  | 105.56                                | 6.52  | 10-03-96      |
| <b>Ouachita Parish</b>  |                                      |                                       |   |               |
| Ou-80                   | 176                                  | 283.76                                | -223.76                                     | 10-10-96      |
| Ou-401A                 | 397                                  | 106.13                                | -43.85                                      | 10-10-96      |
| Ou-402                  | 750                                  | 58.98                                 | 4.32  | 10-10-96      |
| Ou-404                  | 167                                  | 80.32                                 | -19.43                                      | 10-15-96      |
| Ou-406                  | 681                                  | 157.25                                | -90.50                                      | 10-10-96      |
| Ou-444                  | 670                                  | 229.09                                | -111.09                                     | 10-23-96      |
| Ou-488                  | 255                                  | 332.73                                | -52.73                                      | 10-23-96      |
| <b>Union Parish</b>     |                                      |                                       |   |               |
| Un-26                   | 745                                  | 184.00                                | -50.08                                      | 10-04-96      |
| Un-78                   | 727                                  | 208.60                                | -33.60                                      | 10-24-96      |
| Un-79                   | 749                                  | 153.40                                | -35.40                                      | 10-24-96      |
| Un-83                   | 326                                  | 174.00                                | -52.00                                      | 10-16-96      |
| Un-84                   | 696                                  | 248.70                                | -38.70                                      | 10-24-96      |
| Un-86                   | 655                                  | 100.63                                | -10.63                                      | 10-16-96      |
| Un-134                  | 585                                  | 307.13                                | -87.13                                      | 10-23-96      |
| <b>Webster Parish</b>   |                                      |                                       |   |               |
| Wb-127                  | 408                                  | 61.37                                 | 208.63                                      | 10-21-96      |
| Wb-164                  | 769                                  | 64.32                                 | 155.68                                      | 10-07-96      |
| Wb-219                  | 136                                  | 5.17                                  | 184.83                                      | 10-08-96      |
| Wb-271                  | 220                                  | 84.25                                 | 193.75                                      | 10-09-96      |
| Wb-285                  | 608                                  | 180.68                                | 159.32                                      | 10-08-96      |
| Wb-326                  | 470                                  | 114.51                                | 145.49                                      | 10-04-96      |
| Wb-338                  | 425                                  | 94.89                                 | 135.11                                      | 10-04-96      |
| Wb-349                  | 263                                  | 70.38                                 | 109.62                                      | 10-07-96      |
| Wb-359                  | 687                                  | 79.68                                 | 200.32                                      | 10-09-96      |
| Wb-399                  | 298                                  | 45.24                                 | 159.76                                      | 10-04-96      |
| Wb-415                  | 544                                  | 17.20                                 | 142.80                                      | 10-09-96      |
| <b>Winn Parish</b>      |                                      |                                       |   |               |
| W-28                    | 606                                  | 52.14                                 | 52.86                                       | 10-01-96      |
| W-144B                  | 550                                  | 37.55                                 | 102.45                                      | 10-01-96      |
| W-172                   | 655                                  | 91.21                                 | 48.79                                       | 10-01-96      |
| W-177                   | 695                                  | 53.34                                 | 131.66                                      | 10-01-96      |
| W-179                   | 585                                  | 108.70                                | 86.30                                       | 10-01-96      |

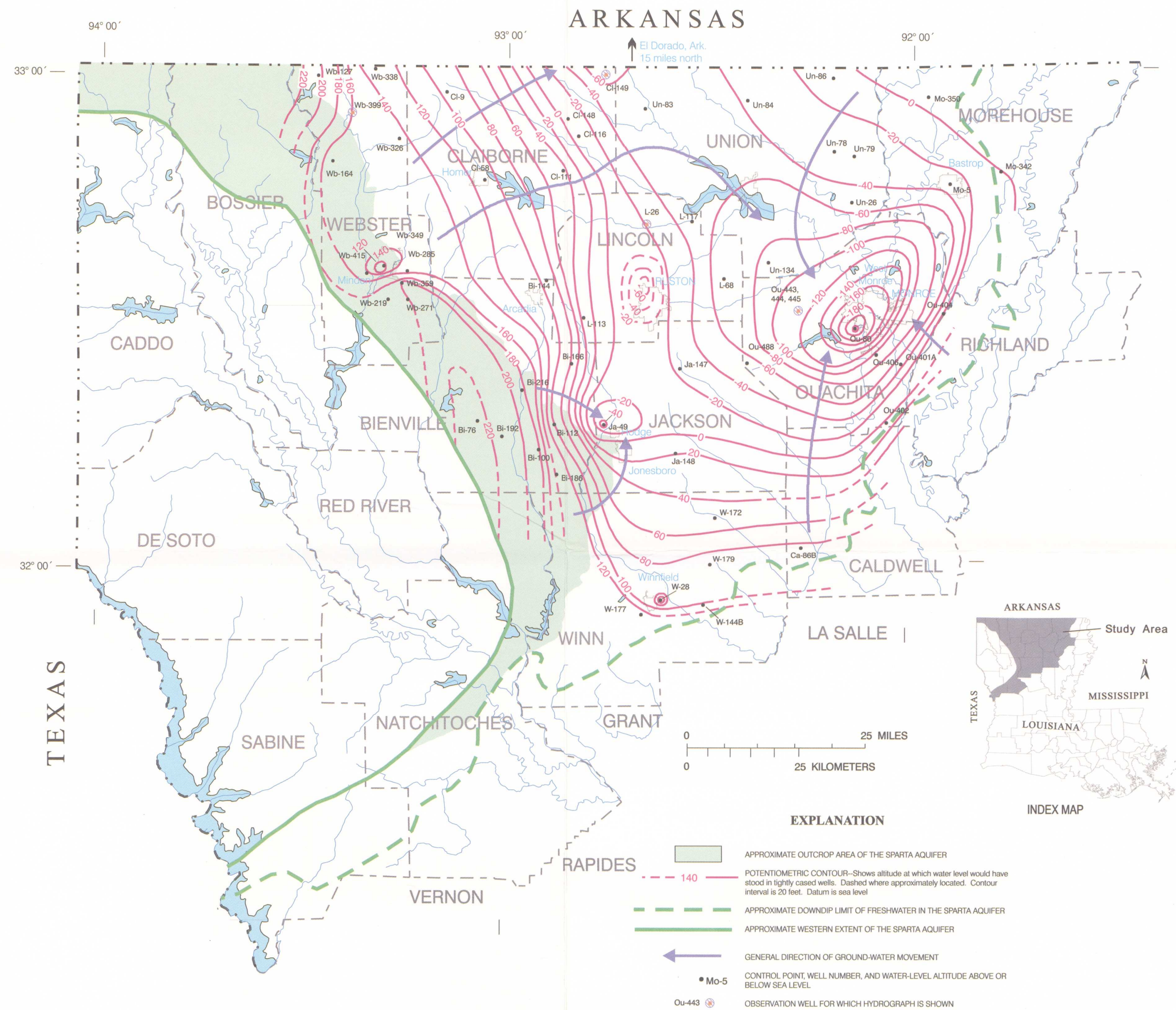


Figure 9. Potentiometric surface of the Sparta aquifer in northern Louisiana, October 1996.

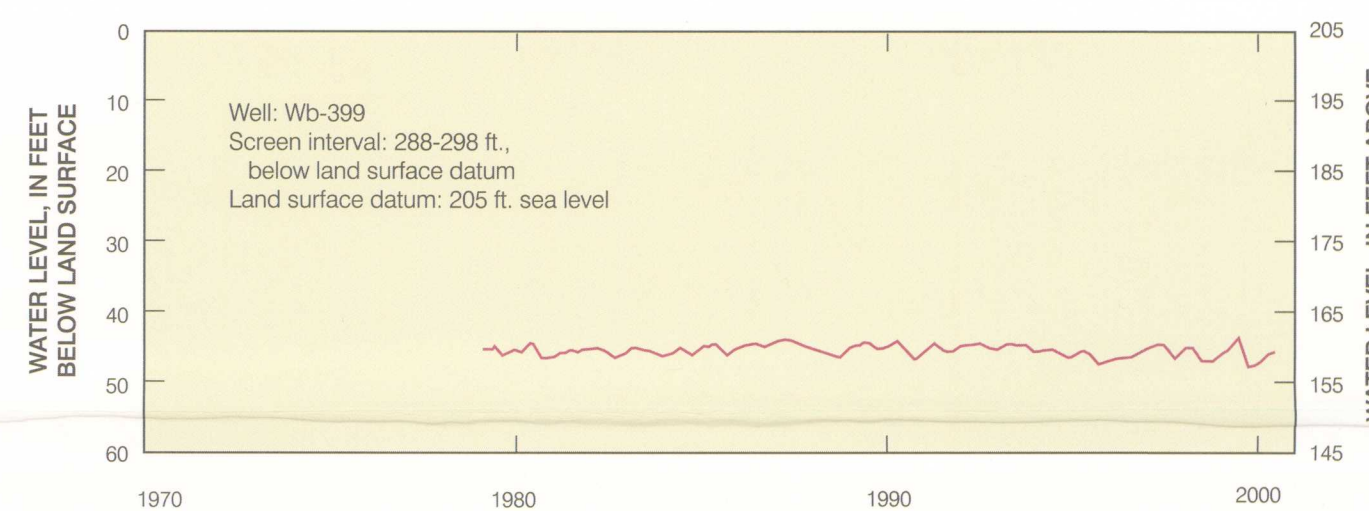


Figure 10. Water level in well Wb-399 (Webster Parish).

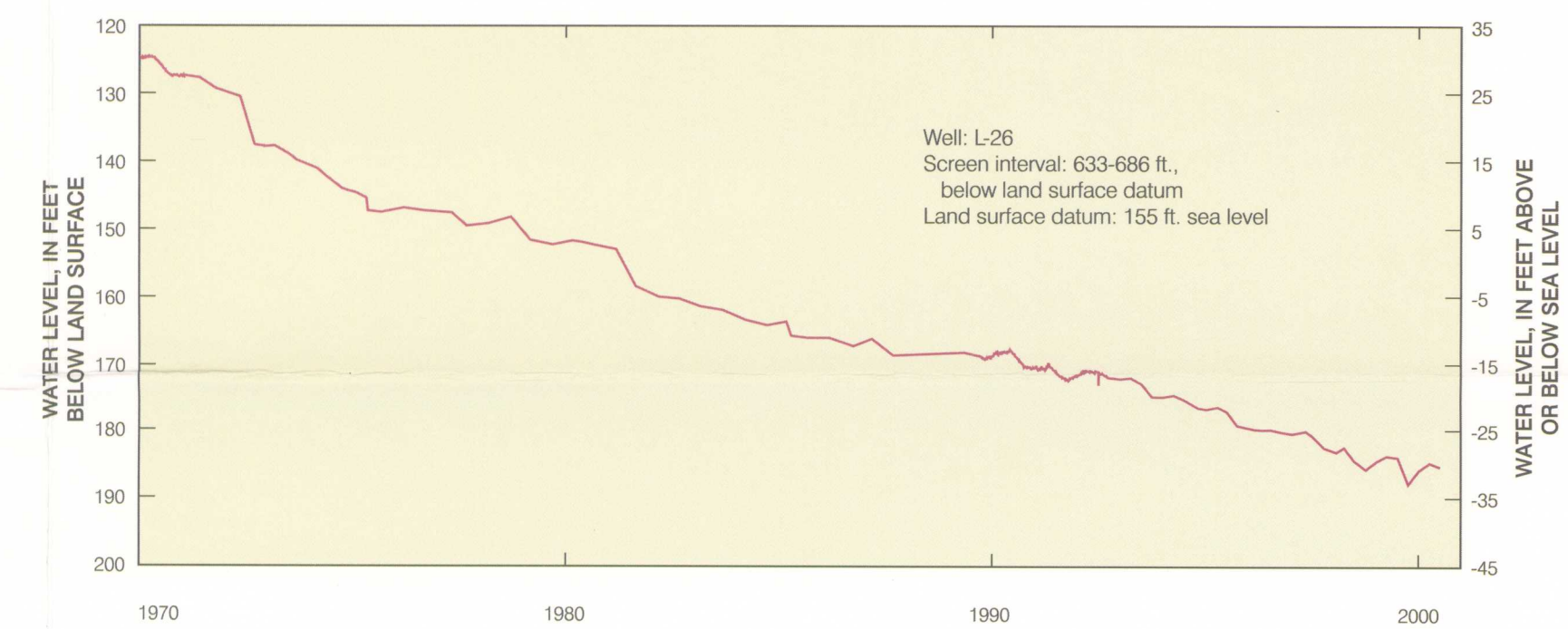


Figure 12. Water level in well L-26 (Lincoln Parish).

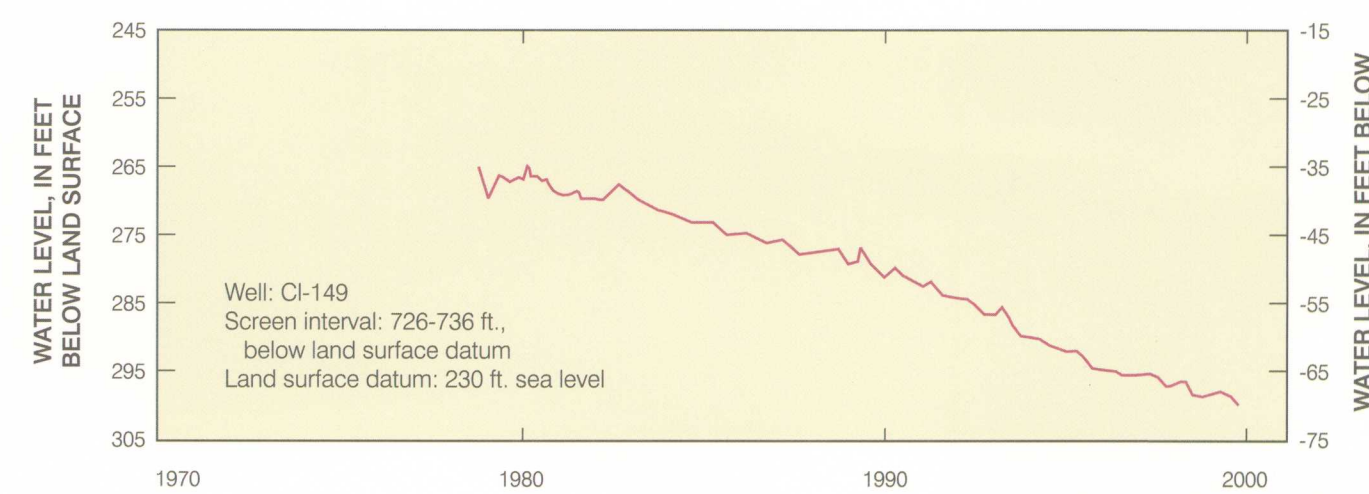


Figure 11. Water level in well Cl-149 (Claiborne Parish).

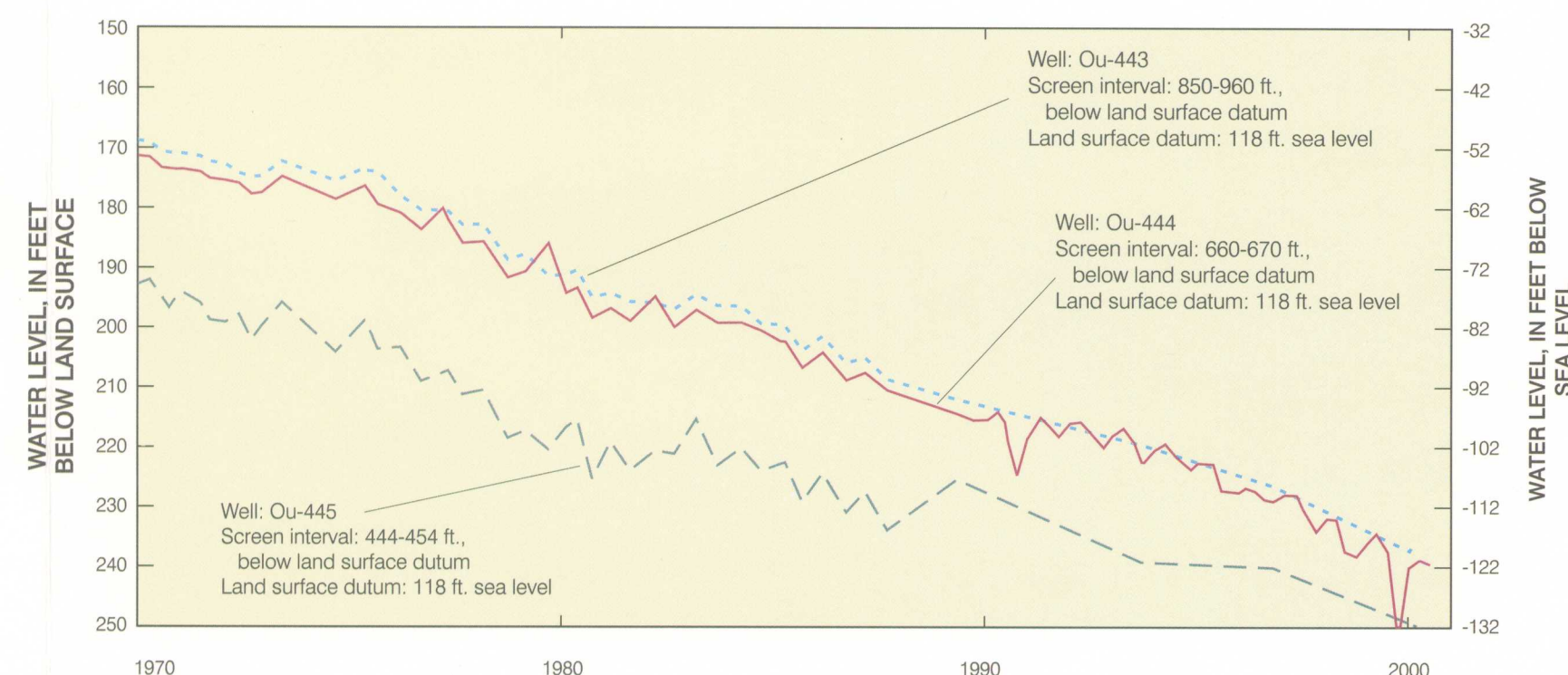


Figure 13. Water level in well Ou-443, Ou-444 and Ou-445 (Ouachita Parish).

Louisiana Ground-Water Map No. 13  
Hydrogeology and Potentiometric Surface, October 1996, of the  
Sparta Aquifer in Northern Louisiana

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