INTRODUCTION

The "1,500-foot" sand of the Baton Rouge area is a major source of fresh ground water in a five-parish area which includes East and West Baton Rouge, East and West Feliciana, and Pointe Coupee Parishes (hereinafter referred to as the Baton Rouge area in southeastern Louisiana) (fig. 1). In 2001, the "1,500-foot" sand was the fifth most heavily pumped aquifer of the 14 aquifers (fig. 2) underlying this area. In 2001, about 1.8 Mgal/d was withdrawn from the "1,500-foot" sand in the Baton Rouge area (fig. 3). Of this amount, about 95 percent was used for public supply and about 5 percent for industrial use (D.C. Dial, Capital Area Ground Water Conservation Commission, written commun., 2002). Most of the water, about 14.5 Mgal/d, was withdrawn in East Baton Rouge Parish (U.S. Dial, Capital Area Ground Water Conservation Commission, written commun., 2002). From 1990 to 2001, withdrawals from the "1,500-foot" sand decreased by about 9 percent (from about 19.5 to 17.8 Mgal/d, fig. 3) in the Baton Rouge area.

Pumpage from the "1,500-foot" sand has caused water-level declines in the Baton Rouge area (Meyer and Turcan, 1955, p. 51-57). Also, previous studies have shown that salwa-ter encroachment (horizontal movement) into freshwater areas has occurred in response to pumpage (Tomaszewski, 1996, p. 6; Whitman, 1979, p. 20-35).

Additional knowledge about ground-water flow and effects of withdrawals on the "1,500-foot" sand of the Baton Rouge area is needed to assess ground-water development potential and to protect the resource. To meet this need, the U.S. Geological Survey (USGS), in cooperation with the Capital Area Ground Water Conservation Commission (CAGWCC), began a study in 2002 to monitor and document the current (2001) water levels in wells screened in the "1,500-foot" sand, construct a potentiometric-surface (water-levels) map, and to evaluate changes in the potentiometric surface.

This report presents data and maps that describe the potentiometric surface of the "1,500-foot" sand of the Baton Rouge area during the spring of 2001. Graphs of water levels in selected wells and water withdrawals from the "1,500-foot" sand are presented to show the historical changes in water levels and water use. The potentiometric-surface map illustrates the water levels and ground-water flow directions for the aquifer for spring 2001. Water-level and water-use data are on file at the USGS and CAGWCC offices in Baton Rouge, Louisiana.

Description of Study Area

The study area (fig. 1) extends across about 2,000 mi² and includes East and West Baton Rouge, East and West Feliciana, and Pointe Coupee Parishes (Cabaniss and Fross, 1997, p. 155). The City of Baton Rouge and several industrial facilities are located in the study area along the Mississippi River. The climate is generally warm and temperate with high humidity and frequent rains. At Baton Rouge, the average annual temperature is 69°F, and the average annual rainfall is about 60 in. (National Oceanic and Atmospheric Administration, 1995, p. 5, 6). With the exception of the Baton Rouge metropolitan area, much of the study area is rural and agricultural.

Hydrogeologic Setting

Beneath the study area is a sequence of complexly interbedded, interlaminated, lenticular, sillofied, freshwater-bearing, sandy, and granular gravel units that form a wedge of sediment that dips and thickens in a south-west to south direction. Fourteen freshwater aquifers (fig. 2) in the area are composed of sediment that can contain very fine to coarse sand and peaboblike sands (Meyer and Turcan, 1955, p. 21-47). Thirteen of the aquifers were originally named according to their general depth in the Baton Rouge industrial district (Meyer and Turcan, 1955, p. 12-13). A permanent hydrogeologic feature in the region is the Baton Rouge fault (fig. 1) which extends from the east of the study area through East and West Baton Rouge Parishes to west of the study area (Dobran and Pajokes, 1966; Murray, 1966, p. 160-169; Whitman, 1979, p. 4; McCullough, 1991).

Preliminary in the northern part of the study area and north of the study area in Mississippi is the primary source of recharge of freshwater to the "1,500-foot" sand. Because the aquifers in the region are interconnected, some infiltrated precipitation percolates downward and through the sand aquifers in the region to deeper interconnected aquifers, which include the "1,500-foot" sand (Morgan, 1965, p. 11-13). Generally, water moves to disperse down a slope in a subsurface direction through the aquifer toward the Baton Rouge fault at rates that range from a few feet per year to several hundreds of feet per year (Bianco, 1983, p. 24).

The southern limit of freshwater in the "1,500-foot" sand generally is continued to be at or near the Baton Rouge fault (Tomaszewski, 1996, p. 6).

Development of the "1,500-foot" sand began after 1927 (Triank and Whitman, 1962 table 4). From 1940 to 2001 water-level declines of about 160 ft at EB-128 (fig. 3). Well EB-128 is located about 6 mi south of the Baton Rouge Fault. The "1,500-foot" sand at about 1,800 ft underground is the uppermost aquifer in the Baton Rouge southeast of the industrial district (fig. 4). However, from 1955 to 2001 water levels at well PC-39 changed less than 2 ft (fig. 3). All of the water withdrawn from the "1,500-foot" sand, well PC-39 is located near the recharge area and there little or no water withdrawal occurs.

Before development, water entered the "1,500-foot" sand in the recharge area, and flowed generally in a south-southwest to south direction to the discharge area near the Baton Rouge fault (Meyer and Turcan, 1955, p. 51; Morgan, 1965, p. 13; Huntzinger and others, 1985, p. 8). The discharge area, the Baton Rouge Fault can act as a leaky barrier to horizontal groundwater flow (Whitman, 1979, p. 12, 35). Also, water from the recharge area would spread upward (upgradient from the fault) from the "1,500-foot" sand into the "1,500-foot" sand and the "1,500-foot" sand near the Baton Rouge fault (Meyer and Turcan, 1955, p. 51; Huntzinger and others, 1985, p. 8). At the discharge area, the Baton Rouge Fault can act as a leaky barrier to horizontal groundwater flow (Whitman, 1979, p. 12, 35). Also, water from the recharge area would spread upward (upgradient from the fault) from the "1,500-foot" sand into the "1,500-foot" sand and the "1,500-foot" sand near the Baton Rouge fault (Meyer and Turcan, 1955, p. 51; Huntzinger and others, 1985, p. 8).

System Series Stratigraphic unit Aquifer or confining unit
Mio- Pleistocene Unnamed Pleistocene deposits Shallow sands
Pleistocene Unnamed Pleistocene deposits Upper terra cota "1,500-foot" sand
Pleistocene Blounts Creek Member "1,500-foot" sand
Pleistocene Moundville Member "1,500-foot" sand
Pleistocene California Creek Member "1,500-foot" sand
Pleistocene Lakeport Member Unnamed confining unit
Pleistocene Pointe Coupee Member Unnamed confining unit
Pleistocene Pointe Coupee Member Catocha Formation Catocha aquifer

Figure 2. Hydrogeologic units in the Baton Rouge area, southeastern Louisiana (modified from Stuart and others, 1994, fig. 5; Lovelace and Lovelace, 1995, fig. 3).

Acknowledgments
The authors gratefully acknowledge the assistance and cooperation of numerous public water suppliers, industrial facilities, and private well owners who allowed water levels to be measured in their wells. A special thanks is given to Don C. Dial, Director, Capital Area Ground Water Conservation Commission, for his support and assistance during the preparation of this report.

POTENTIOMETRIC SURFACE
Potentiometric-surface maps (figs. 4, 5) were constructed using water-level data from 21 wells completed to the “1,500-foot” sand (table 1). Water levels primarily were measured during April and May 2001; one measurement was made during July 2001. Water levels were measured using steel or electrical tape marked with 0.01-ft graduations. Wells in which water levels were measured were not being pumped at the time the measurements were made. If wells recently were pumped, water levels were measured after an appropriate recovery period. Water levels were not measured south of the Baton Rouge fault where the aquifer is offset and hydraulically separated from its equivalent units north of the fault. Also, flow in well EB-193 is continuous; therefore, the water level in the well probably is not representative of the water level in the “1,500-foot” sand near the well and was not used to construct the potentiometric surface shown in figures 4 and 5.

The highest water level, 325.48 ft above NGVD 29, was measured at well EF-210 in northern East Feliciana Parish (table 1). The lowest water level, 135.23 ft below NGVD 29, was measured at well EB-657 in Baton Rouge (table 1, fig. 5). Water levels were more than 70 ft below NGVD 29 in most of the Baton Rouge metropolitan area. A small cone of depression about 60 ft below NGVD 29 was noted in the vicinity of well EB-863 in southeastern East Baton Rouge Parish (fig. 4). Another small cone of depression about 100 ft below NGVD 29 was noted at well EB-413. The cones and other potentiometric lows in areas where large ground-water withdrawals occurred. A comparison between the 1990 (Tomascikowski, 1996, fig. 9) and the 2001 potentiometric-surface maps of the “1,500-foot” sand indicates water levels in the Baton Rouge metropolitan area have declined by 10 to 20 ft during the 11-year period.

In spring 2001, the flow of water in the “1,500-foot” sand in the Baton Rouge area generally was down gradient from the recharge area toward pumping centers along the Mississippi River and in Baton Rouge (figs. 1, 4, 5). In East and West Feliciana and East Baton Rouge Parishes, flow generally was south to southeast toward areas of large withdrawals in East Baton Rouge Parish along the Mississippi River between wells EB-863 and EB-413. Ground-water flow in Baton Rouge (fig. 5) was toward the vicinity of well EB-867 where the average water-level decline was 5.74 ft in 2001. Because the “1,500-foot” sand is offset at the Baton Rouge fault (Whitman, 1979, p. 12-13), withdrawals south of the fault have little effect on the potentiometric surface north of the fault.

SELECTED REFERENCES
Huntington, T.L., Whitman, C.D., Jr., and Knochenmus, D.D., 1985, Simulation of ground-water movement in the “1,500–foot” sand (U.S. Geological Survey Water-Resources Investigation Report 85-157, figs. 3 and 4, p. 9-15) and the 2001 potentiometric-surface maps of the “1,500-foot” sand indicates water levels in the Baton Rouge metropolitan area have declined by 10 to 20 ft during the 11-year period.
Huntzinger, T.L., Whiteman, C.D., Jr., and Knochenmus, D.D., 1985, Simulation of ground-water movement in the “1,500–foot” sand (U.S. Geological Survey Water-Resources Investigation Report 85-157, figs. 3 and 4, p. 9-15) and the 2001 potentiometric-surface maps of the “1,500-foot” sand indicates water levels in the Baton Rouge metropolitan area have declined by 10 to 20 ft during the 11-year period.

Table 1. Water-level data used to construct the potentiometric-surface map of the “1,500-foot” sand in the Baton Rouge area, southeast Louisiana, spring 2001

<table>
<thead>
<tr>
<th>Well</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Water Level (ft NGVD 29)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB-193</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-355</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-413</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-863</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-867</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-871</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-881</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-891</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
<tr>
<td>EB-901</td>
<td>91° 15´</td>
<td>-91° 10´</td>
<td>-90.87</td>
<td>4-15-01</td>
</tr>
</tbody>
</table>

Louisiana Ground-Water Map No. 16: Potentiometric Surface of the “1,500-Foot” Sand of the Baton Rouge Area, Louisiana, spring 2001

Prepared in cooperation with the Capital Area Ground Water Conservation Commission

Jason M. Griffith and John K. Lovelace

2003