**INTRODUCTION**

The "2,400-foot" sand (aquifer) is a major source of fresh ground water in the Baton Rouge area and surrounding parishes. In 2002, about 19.7 billion gal (72.8 billion m³) of water was pumped from the "2,400-foot" sand in the five-parish study area (East and West Baton Rouge, Pointe Coupee, and East and West Feliciana Parishes, fig. 1). Most withdrawals in the study area (18 Mgal/d) were in East Baton Rouge Parish. Withdrawals from the "2,400-foot" sand in 2002 were used mostly for public supply (75 percent) and industry (25 percent).

Estimates of total withdrawals from all aquifers of Quaternary and Tertiary age in most of East Baton Rouge Parish and part of West Baton Rouge Parish (fig. 2) were about 12 Mgal/d in 1950 and 12.3 Mgal/d in 1956 (Meyer and Turner, 1957, p. 33). Rapid industrial growth in the Baton Rouge area began about 1950, and by 1957, about 65 Mgal/d were withdrawn from all aquifers in most of East Baton Rouge Parish and part of West Baton Rouge Parish for industry and public supply (Meyer and Turner, 1957, p. 33). Withdrawal data for the "2,400-foot" sand (fig. 3) indicate withdrawals were about 10 Mgal/d or less during the period 1950-60 and increased from about 13 Mgal/d (1960) to about 20 Mgal/d (2002). As withdrawals have increased in the "2,400-foot" sand, water levels have declined.

**Figure 2.** Hydrogeologic units in the Baton Rouge area, Louisiana (modified from Stewart and others, 1994, fig. 5; Lovelace and others, 1995, fig. 1).

In addition to concerns about water-level declines in the "2,400-foot" sand, recent increases in chloride concentrations at well EB-8048 indicate the possibility of salinization encroachment from the fault (fig. 4). Withdrawals have increased near well EB-8048, and chloride concentrations at the well increased from 10 mg/L (prior to 1994) to about 100 mg/L (2001).

Additional knowledge about ground-water flow and effects of withdrawals on the "2,400-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 2001 to measure and document the current (2002) water levels in wells located in the "2,400-foot" sand, construct a potentiometric surface (water-level) map, and evaluate changes in the potentiometric surface. This report documents the results and findings of this study.

The authors gratefully acknowledge the assistance and cooperation of numerous public water suppliers, industrial facilities, and private well owners that allowed site access and collection of water-level data. Don C. Dial, Director, Capital Area Ground Water Conservation Commission, assisted with technical support and provided valuable data for the study.

**GENERAL HYDROGEOLOGY**

The "2,400-foot" sand and other aquifers in the Baton Rouge area (fig. 2) extend throughout the study area, adjacent parishes, and into southwestern Mississippi. Most of the aquifers, which are named according to their approximate depth below land surface in the industrial district, are composed of very fine to coarse sand and may contain gravel. The correlation between aquifers in the Baton Rouge area and regional stratigraphy is shown in figure 2.

The Baton Rouge fault, which has been described as a leaky barrier to ground-water flow ( Whitman, 1979, p. 10), historically has impeded freshwater flushing of saltwater south of the fault and presently impedes saltwater encroachment northward into freshwater areas. Along the Baton Rouge fault, vertical displacement has caused limited hydraulic connection of the "2,400-foot" sand north of the fault with the "2,000-foot" sand south of the fault (Entin and Whitman, 1982, p. 15). In the Baton Rouge area, the "2,400-foot" sand contains freshwater north of the Baton Rouge fault. South of the fault, the "2,400-foot" sand and overlying aquifers contain mostly saltwater.

**Figure 1.** Location of the study area and water withdrawal sites in the "2,400-foot" sand of the Baton Rouge area, Louisiana, 2002.

Precipitation enters the aquifer as recharge in the outcrop area, located in southwestern Mississippi, and moves downward toward coastal areas in Louisiana (Morgan, 1986, p. 11). Prior to large withdrawals, ground-water flow was from north to south in the study area (Rolls, 1969, p. 6). The southward flow of freshwater was impeded at the fault, and ground water moved upward through overlying clays and sands to discharge at land surface as springs and rills (Rolls, 1969, p. 9). Small amounts of freshwater from the "2,400-foot" sand (north of the fault) flowed across the fault to create local freshwater areas in the "2,000-foot" sand south of the fault.

Large ground-water withdrawals from the "2,400-foot" sand (fig. 1) north of the fault have altered the distribution of hydraulic head such that water no longer discharges at land surface near the fault. Much of the ground water moving southward from the recharge area is now intercepted at withdrawal sites (fig. 1). Large withdrawals from the "2,400-foot" sand north of the fault have reduced hydraulic head in the aquifer and can induce vertical leakage of water into the sand from overlying and underlying clays and aquifers. Large withdrawals also may cause encroachment of saltwater from south of the fault into fresh-water areas north of the fault.

**WATER-LEVEL DATA**

Water levels at wells EB-312 and WBB-100B (figs. 4 and 5), screened in the "2,400-foot" sand, show the effects of long-term withdrawals in the Baton Rouge area. Both wells are located near large withdrawal sites. As withdrawals have increased in the "2,400-foot" sand, water levels in wells EB-312 and WBB-100B have declined (fig. 3). Water levels were about 70 ft above land surface at well EB-312 in central East Baton Rouge Parish in 1942. Total water-level decline at well EB-312 has been about 100 ft (1942-2003).

The hydrograph for well EB-312 shows that as withdrawals increase, water levels decline, and during periods of decreased water withdrawals, water levels remain stable (no decline) or recover. Water levels declined about 3.7 ft/year at well EB-312 during the approximate period of 1942-82. Water levels recovered slightly during 1982-92 when withdrawals declined. Water levels were generally stable during 1992-96. Water levels declined about 2.4 ft/year from 1996 to 2000, in response to increased withdrawals from the "2,000-foot" sand. Similar water-level trends can be noted at well WBB-100B although rates of decline and recoveries vary. Seasonal fluctuations in water levels at wells EB-312 and WBB-100B are a result of seasonal demand for water.

**Figure 3.** Water withdrawal from the "2,400-foot" sand and water levels in wells EB-312 and WBB-100B in the Baton Rouge area, Louisiana.