U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
CAPITAL AREA GROUND WATER CONSERVATION COMMISSION

SCIENTIFIC INVESTIGATIONS MAP 2872 (Sheet 1 of 2)
Tomaszewski, D.J., and Accardo, Darren, 2004, Louisiana Ground-Water Map No. 20:
Potentiometric surface of the "2,000-foot" sand of the Baton Rouge area, Louisiana, May 2002

INTRODUCTION

The "2,000-foot" sand is a major source of water in the Baton Rouge area and surrounding parishes. In 2002, about 25.8 Mgal/d[1] was pumped from the "2,000-foot" sand in the five-parish study area (East and West Baton Rouge, Pointe Coupee, and East and West Feliciana Parishes). Nearly 88 percent of withdrawals from the "2,000-foot" sand (22.7 Mgal/d in 2002) were in East Baton Rouge Parish, mostly in the industrial district (fig. 1). Most withdrawals from the "2,000-foot" sand in 2002 were in the study area for industry (40 percent), power generation (26 percent), and public supply (33 percent).

Withdrawals from the "2,000-foot" sand in the study area (particularly from East Baton Rouge Parish) have caused declines in water levels as far away as Livingston and Tangipahoa Parishes (Nyman and Fayard, 1978, p. 47). Concerns about declining water levels in the "2,000-foot" sand include (1) the rate of decline, (2) the effect on saltwater[2] encroachment in the Baton Rouge area, and (3) the effect on land-surface subsidence in the Baton Rouge area.

Additional knowledge about ground-water flow and effects of withdrawals on the "2,000-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, began a study in 2001 to measure and document the current (2002) water levels in wells screened in the "2,000-foot" sand in the Baton Rouge area, to construct a potentiometric-surface (water-level) map, and to evaluate changes in the potentiometric surface. This report documents the results and findings of this study. Water-level data collected in May 2002, maps showing the 2002 potentiometric surface, and generalized location of major withdrawals (2002) are presented. Hydrographs for four wells show water-level trends in the "2,000-foot" sand.

[1]Water-use data 2002 are modified from records provided by the Capital Area Ground Water Conservation Commission to the USGS.

[2]Saltwater in this report is defined as water that contains chloride at concentrations of more than 250 mg/L. Concentrations of chloride greater than 250 mg/L exceed the Secondary Maximum Contaminant Level (SMCL) for drinking water (U.S. Environmental Protection Agency, 1977, 1992). SMCL's are established for contaminants that can adversely affect the aesthetic quality of drinking water. At high concentrations or values, health implications as well as aesthetic degradation also may exist. SMCL's are not federally enforceable, but are intended as guidelines for the states.

During this study, hydrogeologic data were used to refine water withdrawal estimates for the "2,000-foot" sand. Approximately 10 Mgal/d were subtracted from the reported total withdrawal (2002) and distributed into overlying aquifers. For this report, historical withdrawal data (data prior to 2002) also were modified. Withdrawal data shown in figure 3 supersede earlier reports.

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 withdrawal data for the study.

GENERAL HYDROGEOLOGY

The "2,000-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 (Whiteman, 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 "2,000-foot" sand north of the fault with the "1,500-foot" and "1,700-foot" sands south of the fault (Torak and Whiteman, 1982, p. 15). In the Baton Rouge area, the "2,000-foot" sand mostly contains freshwater north of the Baton Rouge fault. South of the fault, the "2,000-foot" sand and overlying and underlying aquifers contain mostly saltwater.

Precipitation enters the aquifer as recharge in the outcrop area, located in southwestern Mississippi, and moves downdip toward coastal areas in Louisiana (Morgan, 1963, plate 1). Prior to large withdrawals (in the early 1900's), ground-water flow was from north to south in the study area (Rollo, 1969, p. 8). 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 seeps and springs (Rollo, 1969, p. 9). Some freshwater from the "2,000-foot" sand leaked southward across the fault creating localized freshwater areas south of the fault in the downthrown "1,500-foot" and "1,700-foot" sands. Also, small amounts of freshwater from the "2,400-foot" sand (north of the fault) leaked across the fault to create local freshwater areas in the "2,000-foot" sand south of the fault.

System	Series	Stratigraphic unit		Aquifer or confining unit[1]	
Quaternary	Holocene	Mississippi River and other alluvial deposits		Mississippi River alluvial aquifer	
	?				
	Pleistocene	Unnamed Pleistocene deposits		Shallow sands	
				Upland terrace aquifer	"400-foot" sand
					"600-foot" sand
Tertiary	Pliocene	Fleming Formation	Blounts Creek Member	"800-foot" sand	
				"1,000-foot" sand	
	?			"1,200-foot" sand	
	Miocene			"1,500-foot" sand	
				"1,700-foot" sand	
			Castor Creek Member	Unnamed confining unit	
			Williamson Creek Member	"2,000-foot" sand	
			Dough Hills Member	"2,400-foot" sand	
			Carnahan Bayou Member	"2,800-foot" sand	
			Lena Member	Unnamed confining unit	
	?	Catahoula Formation		Catahoula aquifer	
	Oligocene				

[1]Clay units separating aquifers in the Baton Rouge area are discontinuous and unnamed.

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

Large ground-water withdrawals from the "2,000-foot" sand (fig. 1) upgradient (north) of the fault have altered the distribution of hydraulic head such that water no longer discharges at land surface near the fault. Ground water moving southward from the recharge area may now be intercepted by withdrawal sites (fig.1). Large withdrawals from the "2,000-foot" sand north of the fault have reduced hydraulic head in the aquifer and induced vertical leakage of water into the sand from overlying and underlying clays and aquifers. This vertical leakage probably contributes a large portion of present-day recharge to the aquifer (Torak and Whiteman, 1982, p. 45-46). Withdrawals from the "2,000-foot" sand also have induced leakage of saltwater from south of the fault into freshwater areas north of the fault (Torak and Whiteman, 1982, p. 16; Tomaszewski, 1996, p. 22).

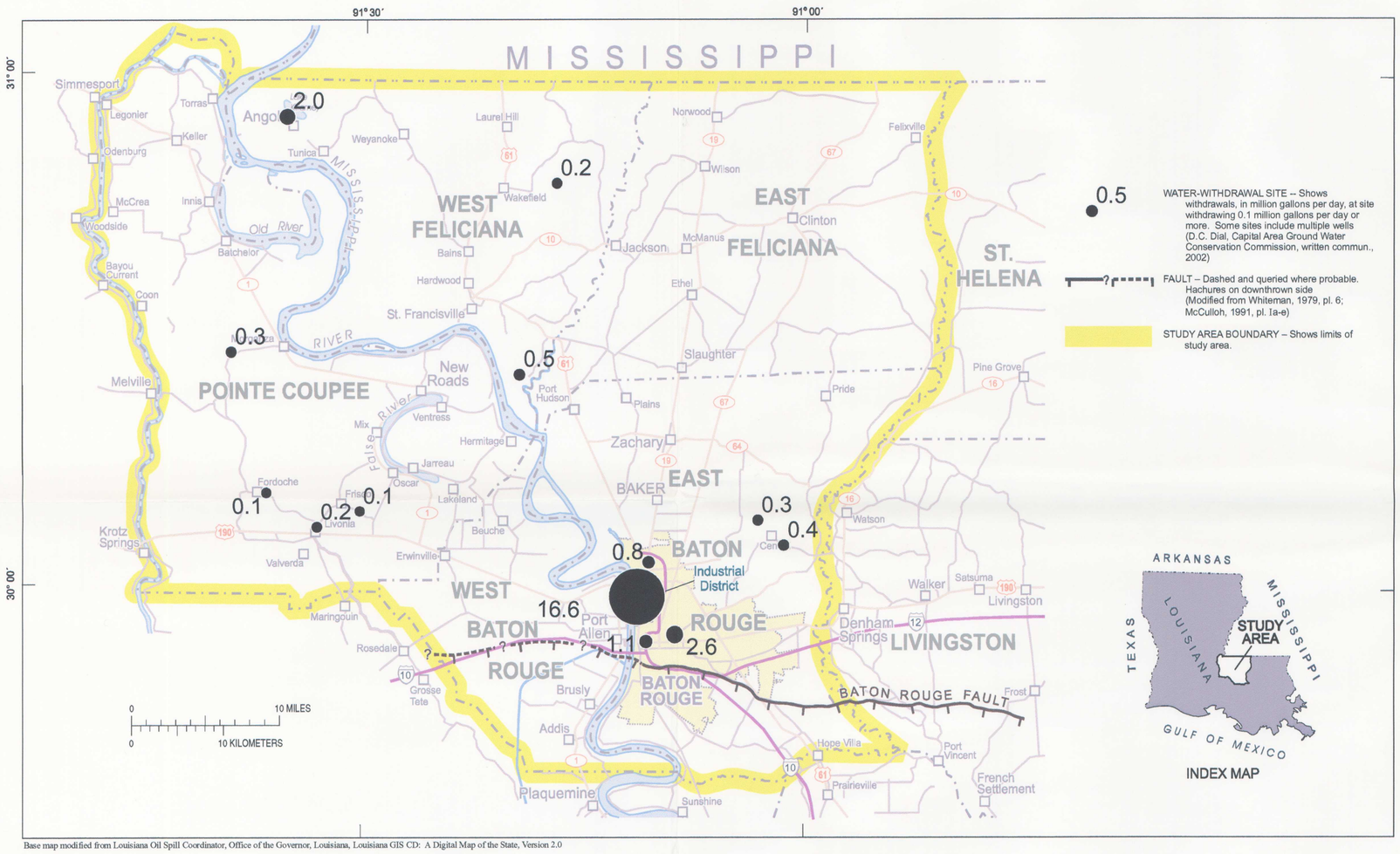
WATER-LEVEL DATA

As withdrawals have increased in the "2,000-foot" sand, water levels in wells have declined. Water levels in the "2,000-foot" sand were about 100 ft above land surface in the industrial district in 1916 (Meyer and Turcan, 1955, p. 58). Water levels are currently (2002) more than 300 ft below land surface in the industrial district.

Water levels in the "2,000-foot" sand at wells EB-90 and PC-66 (fig. 3), show the effects of long-term withdrawals in the Baton Rouge area. Well PC-66 is located in an area where withdrawals are minor. As withdrawals increased in the "2,000-foot" sand and adjacent sands, water levels in wells EB-90 and PC-66 have declined (fig. 3). Water levels were near land surface at well EB-90 in the city of Baton Rouge about 1940. Water-levels declined about 260 ft at well EB-90 from 1942 to 2002.

The hydrograph for well EB-90 shows water levels in the "2,000-foot" sand fluctuate in response to variations in withdrawals (fig. 3). Water levels declined about 9.1 ft/yr in well EB-90 from 1943 to about 1974, as withdrawals from the "2,000-foot" sand increased from 10 to 38 Mgal/d in the study area. Water levels began to recover slightly in about 1982 as withdrawals decreased. Since 1990, two trends are shown. From 1990-96, water levels generally were stable (a slight increase can be noted), and during 1997-2001, water levels declined about 16.6 ft/yr. The same general trends can be noted at well PC-66; however, the declines and recoveries are less in magnitude.

Water-level declines in the "2,000-foot" sand south of the fault were about 1.3 ft/yr at well EB-778 and about 1.1 ft/yr at well WBR-111 for the period of record (fig. 4). Declines south of the fault are minor when compared to water-level declines north of the fault. Declines are small because withdrawals south of the fault are insignificant (no withdrawals have been reported), and movement of water from south (the "2,000-foot" sand) to north (into the "2,400-foot" sand), across the fault, is relatively minor (Tomaszewski, 1996, p. 38).



Base map modified from Louisiana Oil Spill Coordinator, Office of the Governor, Louisiana, Louisiana GIS CD: A Digital Map of the State, Version 2.0

Figure 1. Location of the study area and withdrawal sites in the "2,000-foot" sand of the Baton Rouge area, Louisiana, 2002.

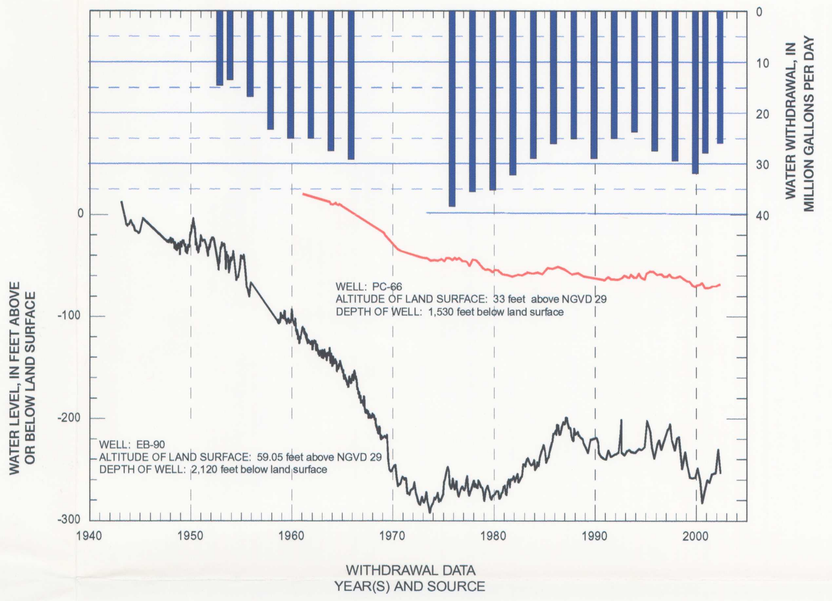


Figure 3. Water withdrawals from the "2,000-foot" sand in the five-parish study area, and water levels in the "2,000-foot" sand at wells EB-90 and PC-66 in the Baton Rouge area, Louisiana.

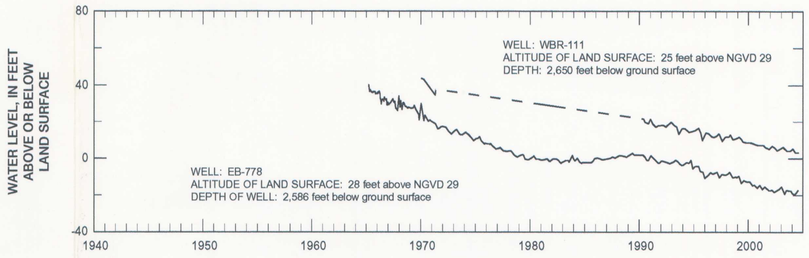


Figure 4. Water levels in the "2,000-foot" sand at wells EB-778 and WBR-111, located south of the fault in the Baton Rouge area, Louisiana.

Louisiana Ground-Water Map No. 20:

Potentiometric Surface of the "2,000-foot" Sand of the Baton Rouge Area, Louisiana, May 2002

By

D.J. Tomaszewski and Darren Accardo

2004

For additional information, contact:

District Chief
U.S. Geological Survey
3535 S. Sherwood Forest Blvd., Suite 120
Baton Rouge, Louisiana 70816
E-mail: dc_la@usgs.gov
Fax: (225) 298-5490
Telephone: (225) 298-5481
Home Page: http://la.water.usgs.gov

Copies of this report can be purchased from:

U.S. Geological Survey
Branch of Information Services
Box 25286
Denver, CO 80225
E-mail: infoservices@usgs.gov
Fax: (303) 202-4188
Telephone (toll free): 1-888-ASK-USGS

USGS science for a changing world

Z:\groundwatermap.20\2000map.sheet1.fm