UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

REGIONAL GEOHYDROLOGY OF THE NORTHERN LOUISIANA SALT-DOME BASIN, PART II, GEOHYDROLOGIC MAPS OF THE TERTIARY AQUIFERS AND RELATED CONFINING LAYERS

By Gary N. Ryals

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ABSTRACT

This report is the second in a series of reports describing the regional geohydrology of the northern Louisiana salt-dome basin. Regional geohydrologic maps in this report show the altitude of the base, the thickness, and limit of freshwater of the aquifers of Tertiary age and related confining layers in the northern Louisiana salt-dome basin, an area of about 3,000 square miles. Four geologic units of Tertiary age contain regional aquifers. From oldest (deepest) to youngest, the aquifers are in the Wilcox Group, Carrizo Sand, Sparta Sand, and Cockfield Formation. As the Wilcox is hydraulically interconnected with the overlying Carrizo, they are treated as one hydrologic unit, the Wilcox-Carrizo aquifer. The aquifers are separated by confining layers that retard water movement. In the northwestern part of the area, the Wilcox-Carrizo aquifer is separated from the underlying sand facies of the Nacatoch Sand (Cretaceous age) by a confining layer composed of the Midway Group (Tertiary age), the Arkadelphia Marl, and an upper clay and marl facies of the Nacatoch Sand (both of Cretaceous age). In the remainder of the area, the Wilcox-Carrizo aquifer is separated from an underlying Cretaceous aquifer comprised of the Tokio Formation and Brownstown Marl by the Midway Group and several underlying Cretaceous units, which (in order of increasing age) are the Arkadelphia Marl, Nacatoch Sand, Saratoga Chalk, Marlbrook Marl, and Annona Chalk. The Wilcox-Carrizo aquifer is separated from the Sparta aquifer by the Cane River Formation. The Sparta aquifer is separated from the Cockfield aquifer by the overlying Cook Mountain Formation.

INTRODUCTION

In 1976 the U.S. Department of Energy (DOE), formerly the Energy Research and Development Administration, began an expanded waste-management program for both defense and commercially produced radioactive waste. The National Waste Terminal Storage (NWTS) program is an effort by DOE to locate and develop sites in various parts of the United States for disposal of commercially produced radionuclides in deeply buried geologic formations. As part of the program, the Vacherie salt dome in the northern Louisiana salt-dome basin (fig. 1) is being studied to determine its suitability as a repository. In Louisiana, a major part of the U.S. Geological Survey's participation in the NWTS program, in

cooperation with DOE, has been to describe the regional geohydrology of the northern Louisiana salt-dome basin. A series of four reports has been prepared by the Geological Survey; each report focuses on a specific aspect of the regional geohydrology. The first report presented a conceptual ground-water flow model of the basin. This report is the second in the series and presents geohydrologic maps of the northern Louisiana salt-dome basin and vicinity.

The northern Louisiana salt-dome basin has an area of about 3,000 square miles (7,800 square kilometers) and includes all or parts of 11 parishes in north-central and northwestern Louisiana. The area of interest for this report (fig. 1) is considerably larger than the northern Louisiana salt-dome basin, extending into southern Arkansas, because most of the aquifers have regional extent, and ground-water flow within the basin follows regional patterns.

BRIEF DESCRIPTION OF THE TERTIARY AQUIFERS AND RELATED CONFINING LAYERS

Tertiary units of the northern Louisiana salt-dome basin and vicinity consist of alternating marine clays and nonmarine sands that generally dip and thicken to the southeast (pl. 1). In parts of the area, the Tertiary units are overlain by clay, sand, and gravel of Quaternary age that were deposited on an irregular, eroded Tertiary surface. In the salt-dome basin, four geologic units of Tertiary age contain regional aquifers. From oldest (deepest) to youngest, the aquifers are in the Wilcox Group, Carrizo Sand, Sparta Sand, and Cockfield Formation (pl. 1). The Wilcox is hydraulically interconnected with the overlying Carrizo; therefore, the Carrizo and the Wilcox are treated as one hydrologic unit, the Wilcox-Carrizo aquifer. The altitude of the base and the thickness of the aquifers are shown on plates 2-4.

The aquifers are separated by confining layers that retard water movement. In the northwestern part of the area the Wilcox-Carrizo aquifer is separated from the underlying sand facies of the Nacatoch Sand (Cretaceous age) by a confining layer composed of the Midway Group (Tertiary age), the Arkadelphia Marl (Cretaceous age), and an upper clay and marl facies of the Nacatoch Sand (pl. 1). The altitude of the base and thickness of the confining layer is shown on plate 5. In the remainder of the area the Wilcox-Carrizo aquifer is separated from the underlying Cretaceous aquifer comprised of the Tokio Formation and Brownstown Marl (Austin aquifer in the part I report of the series, Ryals, 1982) by the Midway Group and several Cretaceous units, which (in order of increasing age) are the Arkadelphia Marl, Nacatoch Sand, Saratoga Chalk, Marlbrook Marl, and Annona Chalk (pl. 1). The Wilcox-Carrizo aquifer is separated from the overlying Sparta aquifer by the Cane River Formation (pl. 6). The Sparta is separated from the Cockfield aquifer by the overlying Cook Mountain Formation (pl. 7).

A more detailed description of the regional geohydrologic framework of the northern Louisiana salt-dome basin and vicinity (including descriptions and hydrologic characteristics of the geohydrologic units) was presented in Ryals (1982) and Hosman (1978).

Figure 1.--Location of northern Louisiana salt-dome basin.

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Table 1.--Petroleum-industry wells and test wells used for geologic control on plate 1

Map No.	Location			Well identification
	Sec.	T.	R.	
1	2	22 N.	13 W.	George Belchic, Jr., et al., No. 1 Blanton.
2	10	22 N.	11 W.	W. C. Fazell, Carter No. 1.
3	12	22 N.	9 W.	Magnolia Petroleum Co., No. 1 W. B. Warren.
4	3	22 N.	7 W.	Ohio Oil Co., O. L. Martin, et al., No. 1.
5	5	22 N.	5 W.	Stanolind Oil & Gas Co., Unit Bell No. 1.
6	2	22 N.	3 W.	T. L. James & Co., Inc., No. 1 C. L. Nelson.
7	4	22 N.	1 W.	Sharp & Kemp, I. Thomas No. 1.
8	1	22 N.	2 E.	T. D. Mengledorff, R. L. Edwards No. 1.
9	3	22 N.	4 E.	Columbian Carbon Co., No. B-27 Tensas Delta.
10	5	22 N.	6 E.	Union Prod. Co., Crossett T. & D. Co. No. A-3.
11	4	16 N.	13 W.	Plymouth Oil Co., Webb No. 1.
12	1	16 N.	11 W.	M. A. Halsey, Thigpen Herold No. 1.
13	1	16 N.	9 W.	Franks & Petrofunds, Inc., R. F. Ryan No. 1.
14	6	16 N.	7 W.	Ohio Oil Co., L. L. Brinkly No. 1.
15	14	16 N.	6 W.	Southern Natural Gas Co., D. E. Brown No. 1.
16	26	16 N.	3 W.	Delta Drilling Co., Davis Brothers No. 1.
17	6	16 N.	1 W.	The Texas Co., Tremont Lumber Co. No. 1.
18	12	16 N.	2 E.	Southwest Gas Producing Co., Inc., et al., Olin Mathieson Chemical Corp. No. 1.
19	2	16 N.	4 E.	Duerr & Bolin, Telano No. 1.
20	12	16 N.	6 E.	R. T. Sellars & Kellogg, John Hemler Estate No. 1.
21	4	21 N.	12 W.	M. L. Williams, No. 1 Henderson.
22	32	21 N.	11 W.	Carter Oil Co., No. 1 Crystal Whittington.
23	25	20 N.	11 W.	Dr. R. S. Cherry, Cherry-Lodwick No. 1.
24	12	19 N.	10 W.	James Muslow, Drake No. 1.
25	20	18 N.	8 W.	Harry W. Bass, No. 1 Rickerson Gas Unit.
26	24	17 N.	7 W.	Bomar, Inc., No. 1 E. W. Merritt.
27	5	15 N.	5 W.	Union Producing Co., Allison No. 1.
28	20	14 W.	4 W.	Hodge-Hunt Lbr. Co., No. 1 Continental Can.
29	26	13 N.	3 W.	Sells Petroleum Co., No. 1 D. M. Feazell.
30	30	12 N.	1 W.	Stanolind Oil & Gas Co., No.A-1 Tremont.
31	32	11 N.	1 E.	Magnolia Petr. Co., No. 12-S Urania.
32	31	10 N.	3 E.	Placid Oil Co., No. 151 Louisiana Central.
33	13	8 N.	5 E.	John Franks & R. K. Stoker, et al., Tensas Delta No. 1.
34	19	7 N.	7 E.	Barnett Serio Drilling Co., F. D. Brown No. 1.

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