

National Water-Quality Assessment Program

# QUALITY OF WATER FROM SHALLOW WELLS IN URBAN RESIDENTIAL AND LIGHT COMMERCIAL AREAS IN LAFAYETTE PARISH, LOUISIANA, 2001 THROUGH 2002

Water-Resources Investigations Report 03-4118





Front cover: Drilling operations in urban residential and light commercial settings in Lafayette, Louisiana

Background and lower left photographs by Roland W. Tollett, U.S. Geological Survey

Lower right photograph by Robert B. Fendick, Jr., U.S. Geological Survey

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RESIDENTIAL AND LIGHT COMMERCIAL AREAS IN  
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By Robert B. Fendick, Jr., and Roland W. Tollett

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**U.S. GEOLOGICAL SURVEY**

**Water-Resources Investigations Report 03-4118**

**NATIONAL WATER-QUALITY ASSESSMENT PROGRAM**

**Baton Rouge, Louisiana**

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U.S. DEPARTMENT OF THE INTERIOR  
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY  
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<http://water.usgs.gov/nawqa>

## FOREWORD

The U.S. Geological Survey (USGS) is committed to serve the Nation with accurate and timely scientific information that helps enhance and protect the overall quality of life and facilitates effective management of water, biological, energy, and mineral resources. Information on the quality of the Nation's water resources is of critical interest to the USGS because it is so integrally linked to the long-term availability of water that is clean and safe for drinking and recreation and that is suitable for industry, irrigation, and habitat for fish and wildlife. Escalating population growth and increasing demands for the multiple water uses make water availability, now measured in terms of quantity *and* quality, even more critical to the long-term sustainability of our communities and ecosystems.

The USGS implemented the National Water-Quality Assessment (NAWQA) Program to support national, regional, and local information needs and decisions related to water-quality management and policy. Shaped by and coordinated with ongoing efforts of other Federal, State, and local agencies, the NAWQA Program is designed to answer: What is the condition of our Nation's streams and ground water? How are the conditions changing over time? How do natural features and human activities affect the quality of streams and ground water, and where are those effects most pronounced? By combining information on water chemistry, physical characteristics, stream habitat, and aquatic life, the NAWQA Program aims to provide science-based insights for current and emerging water issues. NAWQA results can contribute to informed decisions that result in practical and effective water-resource management and strategies that protect and restore water quality.

Since 1991, the NAWQA Program has implemented interdisciplinary assessments in more than 50 of the Nation's most important river basins and aquifers, referred to as Study Units. Collectively, these Study Units account for more than 60 percent of the overall water use and population served by public water supply and are representative of the Nation's major hydrologic landscapes, priority ecological resources, and agricultural, urban, and natural sources of contamination.

Each assessment is guided by a nationally consistent study design and methods of sampling and analysis. The assessments thereby build local knowledge about water-quality issues and trends in a particular stream or aquifer while providing an understanding of how and why water quality varies regionally and nationally. The consistent, multi-scale approach helps to determine if certain types of water-quality issues are isolated or pervasive and allows direct comparisons of how human activities and natural processes affect water quality and ecological health in the Nation's diverse geographic and environmental settings. Comprehensive assessments on pesticides, nutrients, volatile organic compounds, trace metals, and aquatic ecology are developed at the national scale through comparative analysis of the Study-Unit findings.

The USGS places high value on the communication and dissemination of credible, timely, and relevant science so that the most recent and available knowledge about water resources can be applied in management and policy decisions. We hope this NAWQA publication will provide you the needed insights and information to meet your needs and thereby foster increased awareness and involvement in the protection and restoration of our Nation's waters.

The NAWQA Program recognizes that a national assessment by a single program cannot address all water-resource issues of interest. External coordination at all levels is critical for a fully integrated understanding of watersheds and for cost-effective management, regulation, and conservation of our Nation's water resources. The Program, therefore, depends extensively on the advice, cooperation, and information from other Federal, State, interstate, Tribal, and local agencies, non-government organizations, industry, academia, and other stakeholder groups. The assistance and suggestions of all are greatly appreciated.

Robert M. Hirsch  
Associate Director for Water



# CONTENTS

|  |     |
|--|-----|
| Foreword .....   | iii |
| Abstract .....   | 1   |
| Introduction .....   | 2   |
| Purpose and Scope .....  | 2   |
| Acknowledgments .....  | 4   |
| Description and Climate of Lafayette Parish .....  | 4   |
| Hydrogeologic Setting .....  | 4   |
| Land Use, Water Use, and Population .....  | 5   |
| Methods .....  | 5   |
| Well-Site Selection .....  | 5   |
| Well Installation, Well Construction, and Water Levels .....   | 5   |
| Ground-Water Sample Collection and Processing .....  | 5   |
| Quality-Control Data Analysis .....  | 8   |
| Quality of Water from Shallow Wells in Urban Residential and Light Commercial Areas .....  | 9   |
| General Ground-Water Properties .....  | 9   |
| Dissolved Solids and Major Inorganic Ions .....  | 11  |
| Trace Elements .....   | 12  |
| Nutrients .....  | 13  |
| Dissolved Organic Carbon .....   | 13  |
| Radon .....  | 13  |
| Chlorofluorocarbons and Stable Isotopes .....  | 15  |
| Pesticides and Pesticide Degradation Products .....  | 15  |
| Volatile Organic Compounds .....   | 15  |
| Statistical Analyses of Water-Quality Data .....   | 15  |
| Statistical Techniques .....   | 15  |
| Correlations Between Selected Physical Properties and Chemical Constituents Using<br>Spearman Rank Correlation Test .....  | 19  |
| Comparison of Depth to Top of Screened Interval and Selected Physical-Property and<br>Chemical-Constituent Data Using Mann-Whitney Rank-Sum Test .....   | 21  |
| Summary and Conclusions .....  | 21  |
| Selected References .....  | 24  |
| Appendixes .....   | 29  |
| 1. General ground-water properties of water from selected shallow wells in urban residential and<br>light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....                               | 30  |
| 2. Dissolved solids and major inorganic ion concentrations in water from selected shallow wells in<br>urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....       | 32  |
| 3. Trace-element concentrations in water from selected shallow wells in urban residential and<br>light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....                                  | 34  |
| 4. Nutrients and dissolved organic carbon concentrations in water from selected shallow wells<br>in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....         | 37  |
| 5. Radon, chlorofluorocarbons, and stable isotope concentrations in water from selected shallow<br>wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 ..... | 38  |
| 6. Pesticide concentrations in water from selected shallow wells in urban residential and<br>light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....                                      | 39  |
| 7. Concentrations of pesticide degradation products in water from selected shallow wells<br>in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....              | 48  |
| 8. Concentrations of volatile organic compounds in water from selected shallow wells in urban<br>residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 .....                  | 50  |

## FIGURES

|  |    |
|--|----|
| 1. Map showing study area and well locations in urban residential and light commercial areas in Lafayette Parish, Louisiana . . . . .  | 3  |
| 2. Diagram showing partial column of hydrogeologic units in Lafayette Parish, Louisiana . . . . .  | 4  |
| 3. Map showing major land-use types in Lafayette Parish, Louisiana . . . . .   | 6  |
| 4. Piper diagram showing percentages of major inorganic ions in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . .  | 12 |
| 5-8. Maps showing:   |    |
| 5. Radon concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . .   | 14 |
| 6. Apparent ages of water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . .  | 16 |
| 7. Number of pesticides, degradation products, and volatile organic compounds detected in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . .  | 17 |
| 8. Well locations in southwestern Louisiana for land-use studies and subunit survey study in the Acadian-Pontchartrain Study Unit. . . . .   | 20 |
| 9. Graph showing comparison of depth to top of screened interval and selected general ground-water properties and water-quality constituents between wells in southwestern Louisiana for land-use studies and subunit survey study in the Acadian-Pontchartrain Study Unit . . . . . | 22 |

## TABLES

|  |    |
|--|----|
| 1. Site and construction information for selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . .  | 7  |
| 2. Methods used to analyze ground-water samples from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana . . . . .   | 8  |
| 3. Summary statistics and Federal guidelines and standards for general ground-water properties and selected water-quality data from shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02. . . . .         | 10 |
| 4. Summary statistics and Federal guidelines for pesticides and degradation products and volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02 . . . . . | 18 |
| 5. Results of Spearman rank correlation test for selected physical properties and chemical constituents in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02. . . . .              | 19 |



## CONVERSION FACTORS, DATUMS, ABBREVIATED WATER-QUALITY UNITS, AND ACRONYMS

|  | Multiply                         | By     | To obtain                                |
|--|----------------------------------|--------|--|
|  | inch (in.)                       | 25.4   | millimeter (mm)                          |
|  | inch per year (in/yr)            | 25.4   | millimeter per year (mm/yr)              |
|  | foot (ft)                        | 0.3048 | meter (m)                                |
|  | mile (mi)                        | 1.609  | kilometer (km)                           |
|  | million gallons per day (Mgal/d) | 3,785  | cubic meters per day (m <sup>3</sup> /d) |

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**Temperature** in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows: °C = (°F - 32)/1.8.

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**Horizontal coordinate information** in this report is referenced to the North American Datum of 1983.

**Vertical coordinate information** in this report is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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### Abbreviated water-quality units:

micrograms per liter (µg/L)  
microsiemens per centimeter at 25 degrees Celsius (µS/cm)  
milligrams per liter (mg/L)  
millimeters (mm)  
nephelometric turbidity units (NTU)  
picocuries per liter (pCi/L)  
picograms per kilogram (pg/kg)  
standard units (S.U.)

### Acronyms:

ACAD, Acadian-Pontchartrain (Study Unit)  
DOC, dissolved organic carbon  
DOTD, Louisiana Department of Transportation and Development  
HA, Health Advisory  
MCL, Maximum Contaminant Level  
MCLG, Maximum Contaminant Level Goal  
MDL, Method Detection Limit  
MMM, Multimedia Mitigation (Program)  
NAWQA, National Water-Quality Assessment (Program)  
SMCL, Secondary Maximum Contaminant Level  
USEPA, U.S. Environmental Protection Agency  
USGS, U.S. Geological Survey  
VOC, volatile organic compound



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## ABSTRACT

In 2001-02, the U.S. Geological Survey installed and sampled 28 shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, for a land-use study in the Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment (NAWQA) Program. The wells were installed in the Chicot aquifer system, the primary source of water for irrigation and public-water supplies in southwestern Louisiana. The purpose of this report is to describe the quality of water from the 28 shallow wells and to relate that water quality to natural factors and to human activities. Ground-water samples were analyzed for general ground-water properties and about 240 water-quality constituents, including dissolved solids, major inorganic ions, trace elements, nutrients, dissolved organic carbon (DOC), radon, chlorofluorocarbons, selected stable isotopes, pesticides, pesticide degradation products, and volatile organic compounds (VOC's).

Dissolved-solids concentrations for two wells exceeded the U.S. Environmental Protection Agency Secondary Maximum Contaminant Level of 500 mg/L (milligrams per liter). Concentrations for major inorganic ions, trace elements, pesticides, degradation products, and VOC's were less than the Maximum Contaminant Levels for drinking water. Manganese concentrations for 18 wells exceeded the Secondary Maximum Contaminant Level of 50 micrograms per liter. Arsenic concentrations increased with depth and with increased pH, bicarbonate, calcium, and magnesium concentrations. Six pesticides and three degradation products were detected in the ground-water samples. Ten VOC's also were detected in the ground-water samples. One nutrient concentration (that for nitrite plus nitrate) was greater than 2 mg/L, a level that might indicate contamination from human activities, and was greater than the Maximum Contaminant Level of 10 mg/L. The median DOC concentration was an estimated 0.3 mg/L, which indicated naturally-occurring DOC conditions in the shallow ground water in Lafayette Parish. Quality-control samples

indicated no bias in ground-water data from collection or analysis.

Radon concentrations for 19 of 20 wells sampled were greater than the U.S. Environmental Protection Agency Maximum Contaminant Level of 300 picocuries per liter (pCi/L). Radon concentrations ranged from 280 to 2,220 pCi/L and had a median of 389 pCi/L. Radon concentrations were correlated moderately and inversely to the depth to the top of the screened interval. Chlorofluorocarbons indicated the apparent age of the ground water varied with water level and ranged from about 12 to 50 years.

The Mann-Whitney rank-sum test was used to compare water-quality data in the Chicot aquifer system between four groups of wells from three NAWQA studies. The means for most constituents were less for the urban wells than for wells in the rice-growing areas. The larger dissolved-solids concentrations, particularly sodium and chloride, for samples from wells in the rice-growing areas might be a result of heavy irrigation pumpage in southwestern Louisiana that causes movement of the constituents from deeper ground-water sources. The means for most constituents were greater for the urban wells than for wells in the outcrop area of the Chicot aquifer system and less for the urban wells than for wells south of the outcrop area. Because concentrations of dissolved solids and other chemical constituents generally increase along ground-water flow paths, concentrations of many of the selected chemical constituents were expected to be larger for samples from the urban wells than from wells in the outcrop area. The larger concentrations for samples from the wells south of the outcrop area compared to those for the urban wells might be explained similarly. The wells south of the outcrop area are deeper than the urban wells, thus increasing the time the water has to react with aquifer sediments. The lack of correlation between the four groups of wells suggests that spatial distribution of wells and the depth to the top of the screened interval affected the quality of water in shallow wells in southwestern Louisiana.

## INTRODUCTION

Ground water is one of the Nation's most important resources and is the source of drinking water for about 50 percent of the population, or about 130 million United States residents (U.S. Geological Survey, 1999b). Therefore, in 1991, the U.S. Geological Survey (USGS) began full implementation of the National Water-Quality Assessment (NAWQA) Program to describe the status and trends in the quality of the Nation's surface- and ground-water resources and to determine the natural and human-related factors that affect water quality (Hirsch and others, 1988; Gilliom and others, 1995). More than 50 major river basins or aquifer systems, referred to as Study Units, have been identified for investigation as part of the NAWQA Program. Together, these basins and aquifer systems include water resources available to more than 60 percent of the population and encompass about one-half of the land area in the conterminous United States. Knowledge of the quality of the Nation's surface- and ground-water resources is important for the protection of human and aquatic health and for the management of land and water resources and the conservation and regulation of those resources.

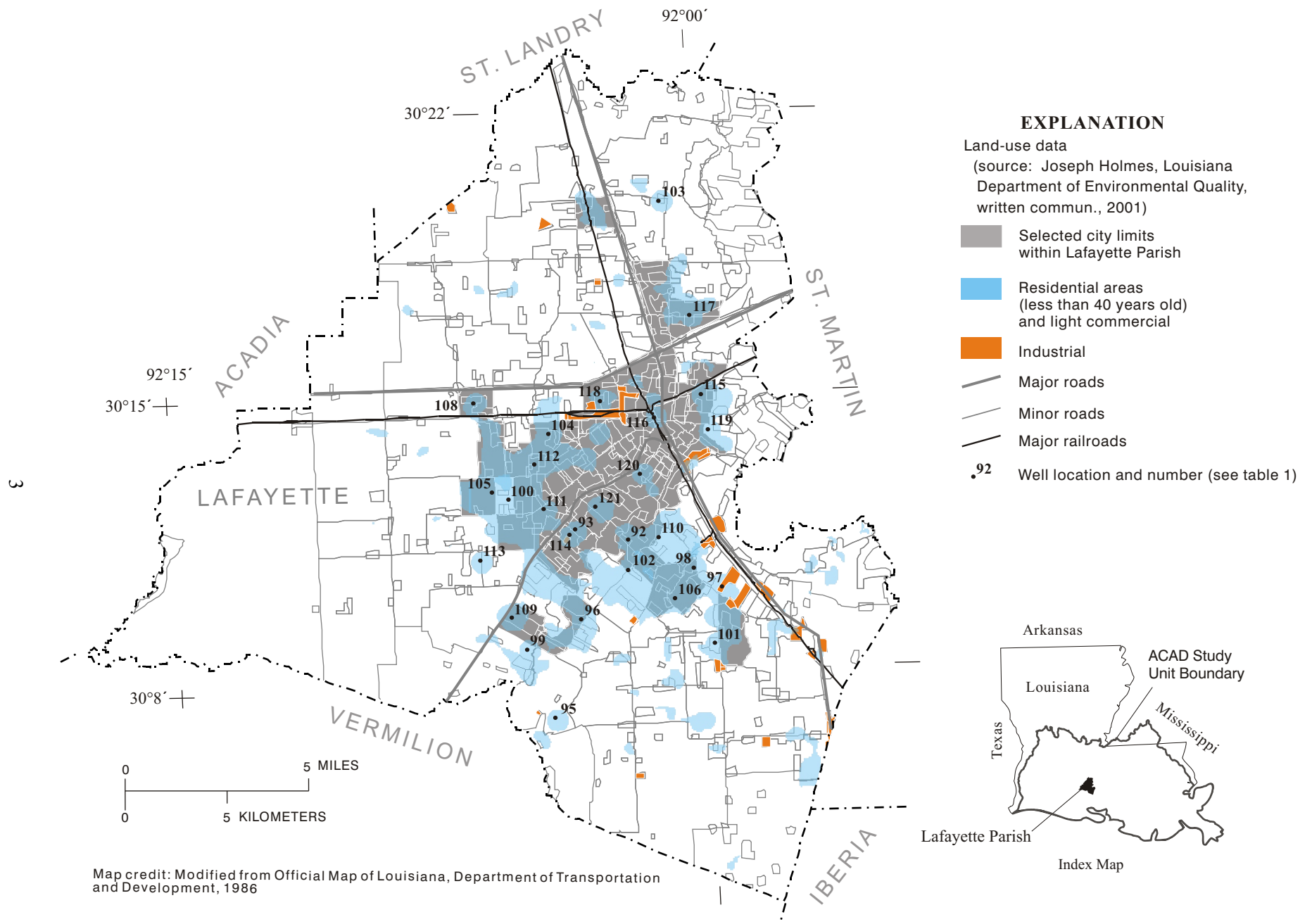
Ground-water studies in the NAWQA Program include (1) subunit surveys, which are designed to assess the water quality of major aquifer systems within a Study Unit; and (2) land-use studies, which are designed to assess the quality of recently recharged ground water associated with regionally extensive combinations of land use and hydrogeologic conditions (Gilliom and others, 1995). During 1997-2002, two subunit surveys (one for the Chicot aquifer system and one for the Chicot equivalent aquifer system) and two land-use studies (an agriculture study and an urban study) were completed for the Acadian-Pontchartrain (ACAD) Study Unit of the NAWQA Program. The ACAD Study Unit encompasses most of southern Louisiana and a small part of southwestern Mississippi (fig. 1).

A land-use study was begun in 2001 for urban residential and light commercial areas in Lafayette Parish, Louisiana. Objectives of the study were to assess the occurrence and distribution of water-quality constituents in recently recharged ground water (generally less than 20- to 30-years old) associated with urban land use in the study area and to gain an understanding of the natural and human-related factors that affect ground-water quality. Data from the study can be compared to data from similar studies throughout the United States to assess the quality of the Nation's water resources, to determine any long-term changes in water quality, and to identify the natural and human-related factors that might affect water quality (Gilliom and others, 1998).

Lafayette Parish was selected for the urban land-use study because the city of Lafayette is the seventh fastest growing city in Louisiana (U.S. Census Bureau, 2002) and because the urban residential and light commercial areas of Lafayette Parish overlie the Chicot aquifer system. The Chicot aquifer system is the primary source of water for irrigation and public-water supplies in southwestern Louisiana, including Lafayette Parish, and, in 1988, was declared a Sole Source Aquifer by the U.S. Environmental Protection Agency (USEPA) (U.S. Environmental Protection Agency, 2002d). This designation recognizes that the aquifer system is the sole or principal source of drinking water for the area and also recognizes that no alternative sources of drinking water are reasonably available should the aquifer system become contaminated. Water in the Chicot aquifer system is vulnerable to the effects of land-surface activities in many areas of Lafayette Parish because of shallow depths to ground water. Vertical leakage through the surficial confining unit that overlies the aquifer system and large ground-water withdrawals for public supply and irrigation near pumping centers might contribute to the potential for downward migration of contaminants.

## Purpose and Scope

The purpose of this report is to describe the quality of water from 28 shallow wells in urban residential and light commercial areas in Lafayette Parish and to relate that water quality to natural factors, such as depth to ground water, and to human activities, such as pesticide and fertilizer use. Ground-water samples from the wells were analyzed for 6 general ground-water properties, dissolved solids, 10 major inorganic ions, 23 trace elements, 6 nutrients, dissolved organic carbon (DOC), radon, chlorofluorocarbons (CFC's), selected stable isotopes, 102 pesticides and pesticide degradation products, and 85 volatile organic compounds (VOC's). The Spearman rank correlation test was used to determine whether significant correlations existed between selected physical properties and chemical constituents and the number of pesticides and VOC's detected, and the Mann-Whitney rank-sum test was used to compare the quality of water in the Chicot aquifer system in urban areas to the quality of water in the Chicot aquifer system in agricultural (rice-growing) and rural areas. Although the shallow wells sampled for this report are not used as a drinking-water source, many of the constituents in the water are regulated in public drinking-water supplies by the USEPA. These standards can be used as a frame of reference to evaluate the water quality. The 28 shallow wells are referred to as urban (URB) wells in discussion of selected statistical results.



**Figure 1.** Study area and well locations in urban residential and light commercial areas in Lafayette Parish, Louisiana.

## Acknowledgments

The authors express appreciation to Ms. Hazel D. Myers, Mayor of Scott, and to landowners in the study area for allowing the USGS to install and sample wells located on their property. The authors also thank Terry Huval (Lafayette Utilities System, Director of Utilities) and Don Broussard (Lafayette Utilities System, Water Operations Manager) for their cooperation and participation in the installation of the wells.

## DESCRIPTION AND CLIMATE OF LAFAYETTE PARISH

Lafayette Parish is located in southwestern Louisiana (fig. 1). Land-surface elevations in the parish range from about 15 to 80 feet above NGVD 29. Lafayette Parish is drained primarily by the Vermilion River.

The climate in southwestern Louisiana is humid and subtropical. Annual rainfall at the Lafayette Regional Airport averaged 62.2 inches for 1971-2000 (Elizabeth Mons, Louisiana State Office of Climatology, written commun., 2000). Total rainfall at the airport for 2001 was 75.6 inches, which is 13.4 inches greater than the 30-year normal for 1971-2000, and total rainfall at the airport for January through October 2002 was 65.6 inches, which also is greater than the 30-year normal for 1971-2000. The average temperature at the airport for 2001 was 67.9° F, which is 0.4° F less than the 30-year normal for 1971-2000.

## Hydrogeologic Setting

The Chicot aquifer system is a thick sequence of interbedded clays, silts, sands, and gravels and underlies most of southwestern Louisiana, including Lafayette Parish, and parts of eastern Texas. The sediments, deposited in deltaic and near-shore marine environments during the Pleistocene Epoch, dip and thicken southward to the Gulf Coast (Lovelace, 1999) and are characterized by massive beds of coarse sand and gravel separated by beds of clay. The sands generally are several hundred feet thick and are separated in places by thick discontinuous clays (Nyman and others, 1990). Recharge to the Chicot aquifer system occurs (1) from downward percolation of water in the outcrop area, which is about 40 miles northwest of Lafayette Parish; (2) through the Atchafalaya aquifer east of Lafayette Parish (fig. 2); (3) from vertical leakage through surficial clay units; and (4) to a lesser extent, from upward leakage from the underlying Evangeline aquifer (Lovelace, 1999).

Overlying the Chicot aquifer system is a layer of clay that acts as a surficial confining unit. The confining unit is areally extensive throughout most of southwestern Louisiana and generally averages about 100 feet in thickness. In Lafayette Parish, the surficial confining unit ranges from less than 40 feet to about 160 feet in thickness and generally is less than 80 feet thick beneath the city of Lafayette (B.P. Sargent, USGS, written commun., 2002). The confining unit once was thought to be an impermeable layer, but ground-water model results indicate that as much as 6 inches per year of water, primarily infiltration from the surface, recharges the Chicot aquifer system near major pumping centers (Nyman and others, 1990, p. 33).

| System     | Series            | Hydrogeologic units                               |   |                                    |                                       |
|------------|-------------------|---|---|------------------------------------|---------------------------------------|
|            |                   | Aquifer system or confining unit                  | Aquifer or confining unit   | Aquifer or aquifer system          | Aquifer                               |
|            |                   |   | Southwestern Louisiana (rice-growing area) and western Lafayette Parish |                                    | Eastern Lafayette Parish (urban area) |
| Quaternary | Pleistocene       | Chicot aquifer system or surficial confining unit | Chicot surficial confining unit or shallow sand                         | Mississippi River alluvial aquifer | Atchafalaya aquifer                   |
|            |                   |   | Upper sand  | Chicot aquifer system              | Upper sand                            |
|            |                   |   | Lower sand  |                                    | Lower sand                            |
| Tertiary   | Pliocene<br>— ? — | Evangeline aquifer                                |   |                                    |                                       |
|            | Miocene           |   |   |                                    |                                       |

**Figure 2.** Partial column of hydrogeologic units in Lafayette Parish, Louisiana (modified from Nyman, 1989; Lovelace, 1999).



## Land Use, Water Use, and Population

Soybean and rice agriculture combined is the major land use in Lafayette Parish. That land use is followed by urban land use in amount of area (fig. 3). During 1999-2000, ground water in Lafayette Parish was used primarily for public supply and rice irrigation. The Chicot aquifer system supplied about 38 Mgal/d of ground water to the parish (Sargent, 2002). Of that, more than 21 Mgal/d was used for public supply and almost 9 Mgal/d was used for rice irrigation. In 2001, the city of Lafayette had a population of 116,000 and Lafayette Parish had a population of about 190,000 (U.S. Census Bureau, 2002).

## METHODS

NAWQA guidelines used to design the land-use study discussed in this report are described in USGS Circular 1112 (Gilliom and others, 1995). NAWQA ground-water protocols (Lapham and others, 1997; Koterba, 1998) were followed during data collection. Standardization of the data-collection protocols was intended to produce a nationally consistent data base for statistically valid interpretations. However, because of local conditions, modification of the national protocols sometimes was necessary. The following sections describe how the protocols were applied and, when necessary, how they were modified.

### Well-Site Selection

Well-site selection criteria followed the criteria published in Squillace and Price (1996). The criteria originally required that the sites be located (1) where the shallow aquifer in Lafayette Parish is used as a source of drinking water and (2) where urban residential and light commercial areas (fig. 1) were developed between 1970 and the 1990's. The second criterion later was modified to include urban residential areas developed between 1960 and 1998 because a larger geographic area was needed to space the required number of wells. After the urban residential and light commercial area boundaries were determined, a computer-generated program (Scott, 1990) was used to divide the total area selected into 30 equal-area cells. The program then randomly selected locations in each of the 30 cells. A field inventory of the potential sites was performed to determine the approximate percentage of urban residential and light commercial area within a 1,640 foot radius of each site. In a few instances, permission was not obtained to drill a well near the selected point and the search was expanded to nearby areas within the cell. A total of 28 wells

were drilled in the urban residential and light commercial areas in Lafayette Parish (fig. 1).

### Well Installation, Well Construction, and Water Levels

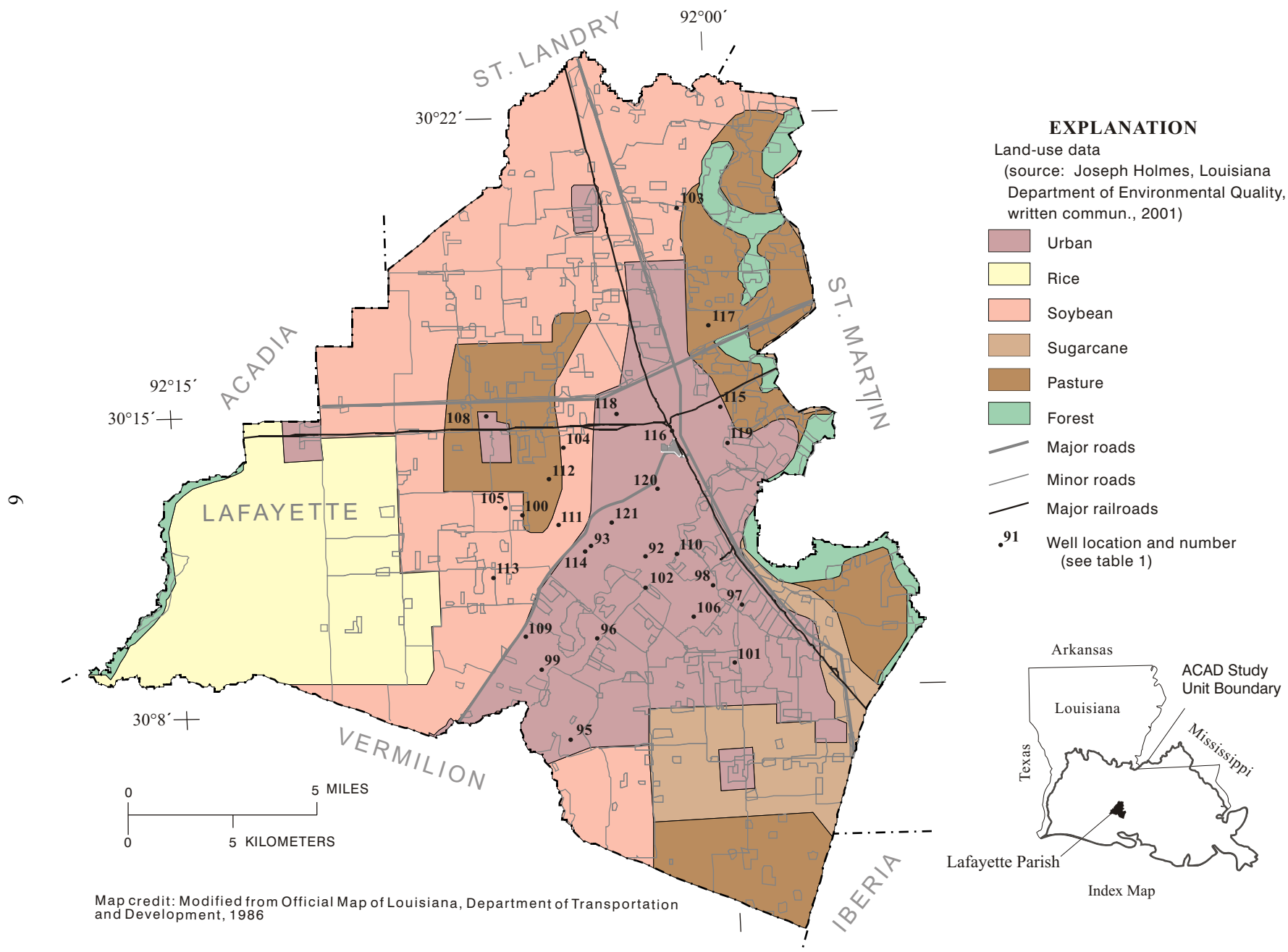
The shallow wells were drilled between May and November 2001. The wells were drilled by USGS personnel using hollow-stem augers and a truck-mounted drill rig. All wells were constructed according to NAWQA guidelines (Lapham and others, 1997) and according to Louisiana State regulations (Louisiana Department of Environmental Quality and Louisiana Department of Transportation and Development, 2000). Wells were constructed using 2-inch outside-diameter polyvinyl chloride (PVC) flush threaded casing and screens. Annular spaces around the well screens were sand packed, and then the annular spaces above the screened intervals were sealed with bentonite and cemented to land surface to prevent downward migration of surficial fluids. Cuttings brought to the surface during drilling were visually inspected to describe the lithology at each drill site. Drilling equipment was pressure washed and steam cleaned before being moved to the next drill site to prevent potential cross contamination between wells.

All wells were developed using a combination of pumping and surging to remove as much sediment as possible. The developing tools consisted of an electrically operated pump, 5/8-inch outside-diameter high-density polyethylene tubing, a PVC foot valve, and a PVC surge block. The tubing, foot valve, and surge block were dedicated to individual wells to prevent possible cross contamination. Wells were developed until discharging water cleared. Development times ranged from about 2 hours to as many as 15 hours per well.

The wells ranged in depth from 11 to 79 feet below land surface and had a median depth of 58.5 feet (table 1). Water levels ranged from 2.50 to 61.55 feet below land surface. Borehole lithology was determined from inspection of drill cuttings obtained from above the screened water-bearing sediment. Interlayering and changes in sediment size occurred on scales ranging from inches to tens of feet. Sediment sizes consisted of clay, silt, sand, and some gravel.

### Ground-Water Sample Collection and Processing

All wells were sampled from December 2001 through March 2002. Wells were purged and sampled using a portable, stainless steel submersible



**Figure 3.** Major land-use types in Lafayette Parish, Louisiana.

**Table 1.** Site and construction information for selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All wells were constructed of 2-inch polyvinyl chloride casings and screen; ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; NGVD 29, National Geodetic Vertical Datum of 1929]

| ACAD well number (fig. 1) | DOTD local well number | USGS site identification number | Water-level measurement and sample date | Date well constructed | Land-surface elevation above NGVD 29 (feet) | Well depth (feet below land surface) | Water level (feet below land surface) | Depth to top of screen (feet below land surface) | Depth to bottom of screen (feet below land surface) | Sample depth (feet below land surface) | ACAD well number (fig. 1) |
|---------------------------|------------------------|---------------------------------|---|-----------------------|---|--------------------------------------|---------------------------------------|--|---|--|---------------------------|
| 92                        | Lf-9913Z               | 301058092015001                 | 2/06/02                                 | 5/15/01               | 32  | 11                                   | 2.50                                  | 6  | 11  | 5                                      | 92                        |
| 93                        | Lf-9914Z               | 301114092031901                 | 12/20/01                                | 5/23/01               | 30  | 50                                   | 42.01                                 | 40   | 50  | 45                                     | 93                        |
| 95                        | Lf-9968Z               | 300643092040301                 | 12/04/01                                | 7/30/01               | 20  | 45                                   | 33.63                                 | 35   | 45  | 37                                     | 95                        |
| 96                        | Lf-9969Z               | 300906092031301                 | 12/05/01                                | 7/31/01               | 26  | 54                                   | 37.35                                 | 44   | 54  | 43                                     | 96                        |
| 97                        | Lf-9973Z               | 300946091591601                 | 1/208/02                                | 8/03/01               | 38  | 49                                   | 39.57                                 | 39   | 49  | 43                                     | 97                        |
| 98                        | Lf-9974Z               | 301014092000102                 | 2/06/02                                 | 9/05/01               | 36  | 21                                   | 5.70                                  | 11   | 21  | 10                                     | 98                        |
| 99                        | Lf-9998Z               | 300825092044501                 | 12/05/01                                | 8/14/01               | 25  | 59                                   | 41.51                                 | 49   | 59  | 48                                     | 99                        |
| 100                       | Lf-9975Z               | 301202092050501                 | 12/04/01                                | 8/20/01               | 29  | 67                                   | 45.90                                 | 57   | 67  | 56                                     | 100                       |
| 101                       | Lf-9976Z               | 300824091593201                 | 1/23/02                                 | 8/21/01               | 34  | 51                                   | 36.16                                 | 41   | 51  | 40                                     | 101                       |
| 102                       | Lf-9999Z               | 301015092015001                 | 3/14/02                                 | 8/22/01               | 31  | 59                                   | 37.64                                 | 49   | 59  | 48                                     | 102                       |
| 103                       | Lf-10000Z              | 301907092003401                 | 2/07/02                                 | 8/28/01               | 56  | 79                                   | 61.55                                 | 69   | 79  | 68                                     | 103                       |
| 104                       | Lf-10001Z              | 301336092035401                 | 12/03/01                                | 9/12/01               | 32  | 63                                   | 47.95                                 | 53   | 63  | 52                                     | 104                       |
| 105                       | Lf-10009Z              | 301213092053501                 | 1/30/02                                 | 9/13/01               | 29  | 57                                   | 47.91                                 | 47   | 57  | 50                                     | 105                       |
| 106                       | Lf-10010Z              | 300932092003701                 | 2/04/02                                 | 9/25/01               | 33  | 51                                   | 38.52                                 | 41   | 51  | 40                                     | 106                       |
| 108                       | Lf-10012Z              | 301424092055801                 | 12/06/01                                | 10/01/01              | 36  | 74                                   | 54.63                                 | 64   | 74  | 63                                     | 108                       |
| 109                       | Lf-10013Z              | 300916092051901                 | 2/11/02                                 | 10/09/01              | 27  | 56                                   | 42.39                                 | 46   | 56  | 45                                     | 109                       |
| 110                       | Lf-10014Z              | 301100092005801                 | 1/22/02                                 | 10/10/01              | 26  | 45                                   | 34.59                                 | 35   | 45  | 38                                     | 110                       |
| 111                       | Lf-10015Z              | 301147092040701                 | 1/29/02                                 | 10/22/01              | 31  | 62                                   | 45.00                                 | 52   | 62  | 51                                     | 111                       |
| 112                       | Lf-10016Z              | 301253092042001                 | 12/19/01                                | 10/23/01              | 31  | 76                                   | 48.30                                 | 66   | 76  | 65                                     | 112                       |
| 113                       | Lf-10017Z              | 301035092055801                 | 1/29/02                                 | 10/24/01              | 25  | 66                                   | 45.00                                 | 56   | 66  | 55                                     | 113                       |
| 114                       | Lf-10180Z              | 301107092033001                 | 12/19/01                                | 10/25/01              | 28  | 64                                   | 42.50                                 | 54   | 64  | 53                                     | 114                       |
| 115                       | Lf-10181Z              | 301425091593901                 | 1/30/02                                 | 10/25/01              | 42  | 58                                   | 43.29                                 | 48   | 58  | 47                                     | 115                       |
| 116                       | Lf-10026Z              | 301355092005601                 | 2/14/02                                 | 10/29/01              | 39  | 65                                   | 45.96                                 | 55   | 65  | 54                                     | 116                       |
| 117                       | Lf-10027Z              | 301619091595301                 | 12/11/01                                | 11/05/01              | 25  | 44                                   | 28.54                                 | 34   | 44  | 33                                     | 117                       |
| 118                       | Lf-10028Z              | 301421092022901                 | 2/07/02                                 | 11/05/01              | 39  | 67                                   | 49.81                                 | 57   | 67  | 56                                     | 118                       |
| 119                       | Lf-10029Z              | 301332091593001                 | 2/04/02                                 | 10/31/01              | 37  | 60                                   | 48.29                                 | 50   | 60  | 51                                     | 119                       |
| 120                       | Lf-10030Z              | 301234092012401                 | 12/11/01                                | 11/10/01              | 30  | 56                                   | 44.95                                 | 46   | 56  | 48                                     | 120                       |
| 121                       | Lf-10031Z              | 301148092024101                 | 2/13/02                                 | 11/10/01              | 32  | 61                                   | 43.77                                 | 51   | 61  | 50                                     | 121                       |

pump attached to a Teflon discharge line and Teflon-coated power lines with stainless steel fittings. Before sample collection, the wells were purged of three casing volumes to remove stagnant water. Specific conductance, pH, temperature, and dissolved oxygen were measured about every 5 minutes in a flow-through chamber until stable readings were obtained. Turbidity also was measured at this time using a portable turbidity meter. After stable readings were obtained for the physical properties, water was redirected to the clean sampling chamber where samples were collected immediately. Ground-water samples were collected and processed according to protocols described in Koterba and others (1995). To minimize the risk of sample contamination, all sample collection and preservation took place in dedicated environmental sampling chambers that consisted of clear polyethylene bags supported by a PVC frame. Polyethylene bags that formed the sample-collection and -preservation chambers were replaced between each sample-collection site. After all samples were collected at a well, sampling equipment was cleaned with a nonphosphate detergent wash followed by a tap-water rinse and deionized-water rinses. A final methanol rinse was used to clean the pesticide sampling equipment. All sampling equipment was stored in clean plastic bags or containers for transport between sample-collection sites.

Most ground-water samples were chilled and shipped to the National Water Quality Laboratory

(NWQL) in Lakewood, Colorado, for analysis. Constituents, analytical methods, and references are listed in table 2.

### Quality-Control Data Analysis

Quality-control (QC) data were collected to insure sample-collection, sample-processing, and laboratory-analysis procedures did not introduce bias into results and to determine the variability associated with collection and analysis of samples. QC samples collected included field-blank samples, replicate environmental samples, and field- and laboratory-spike samples (Mueller and others, 1997). Field-blank samples were collected to verify that decontamination procedures were sufficient and that collection and analysis procedures did not contaminate the samples. Replicate environmental samples were collected to assess the effects of sample collection and laboratory analysis on measurement variability. The spike samples (field and laboratory) were environmental samples to which known concentrations of the analytes of interest were added to determine the accuracy and precision of organic analyses, the stability of analytes during typical holding times, and whether characteristics of the environmental sample might interfere with the analysis.

Field-blank samples were collected and analyzed at two sites for concentrations of major inorganic ions, trace elements, nutrients, DOC,

**Table 2.** Methods used to analyze ground-water samples from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana

[AA, atomic absorption spectrometry; ICP, inductively coupled plasma; MS, mass spectrometry; UV, ultraviolet; <sup>2</sup>H, deuterium; <sup>1</sup>H, hydrogen; <sup>18</sup>O, oxygen-18; <sup>16</sup>O, oxygen-16; C, carbon]

| Constituent                                   | Analytical method   | Reference   |
|---|---|---|
| Major inorganic ions                          | AA, colorimetry, or ICP   | Fishman and Friedman (1989) and Fishman (1993)  |
| Trace elements                                | AA or ICP-MS  | Faires (1993), McLain (1993), and Garbarino (1999)  |
| Nutrients                                     | Colorimetry   | Fishman (1993), U.S. Environmental Protection Agency (1993), and Patton and Truitt (2000) |
| Dissolved organic carbon                      | UV-persulfate oxidation and infrared spectrometry   | Brenton and Arnett (1993)   |
| Radon   | Liquid scintillation  | American Society for Testing and Materials (1996)   |
| Chlorofluorocarbons                           | Gas chromatography with electron capture device   | Busenberg and Plummer (1992)  |
| <sup>2</sup> H/ <sup>1</sup> H                | Hydrogen equilibrium and mass spectrometry  | Coplen and others (1991)  |
| <sup>18</sup> O/ <sup>16</sup> O              | Carbon dioxide equilibrium and mass spectrometry  | Epstein and Mayeda (1953)   |
| Pesticides and pesticide degradation products | Solid-phase extraction using a C-18 cartridge and gas chromatography/mass spectrometry  | Zaugg and others (1995)   |
|   | Determination of low concentrations of acetochlor in water by automated solid-phase extraction and gas chromatography with mass selective detection | Lindley and others (1996)   |
|   | Graphitized carbon-based solid-phase extraction and high-performance liquid chromatography/mass spectrometry  | Furlong and others (2001)   |
| Volatile organic compounds                    | Purge and trap capillary gas chromatography/mass spectrometry   | Rose and Schroeder (1995)   |

pesticides, and VOC's. Few water-quality constituents analyzed for were detected in the field-blank samples. Major inorganic ion and DOC concentrations were less than the analytical reporting limits, and most trace-element concentrations were at or less than the analytical reporting limits. The copper concentration in one field-blank sample was 3.4 µg/L, slightly greater than the analytical reporting limit and less than the concentrations in most of the environmental samples. No nutrients, pesticides, or VOC's were detected in the field-blank samples. The results of the field-blank sample analyses indicated decontamination procedures were adequate to prevent contamination of samples.

Replicate environmental samples were collected at three sites for concentrations of all constituents. The relative percent difference between the environmental sample and the corresponding replicate sample was calculated by multiplying 100 by the absolute value of the difference between the environmental and replicate concentrations divided by the summation of the environmental and replicate concentrations. The relative percent difference between the environmental samples and the corresponding replicate samples typically was less than 5 percent. One value for cobalt (11 percent), two values for copper (11 and 14 percent), and one value for nickel (20 percent) exceeded 10 percent. Results of the replicate environmental sample analyses indicated an acceptable degree of laboratory precision and reproducibility.

Field- and laboratory-spike samples were collected from two wells. Spike solutions that contained known amounts of pesticides were added to two environmental samples in the field and to two replicate environmental samples at the NWQL. VOC samples were spiked using the same procedure. Mean recovery of pesticides and VOC's from the field-spike and field-spike replicate samples ranged from 61 to 119 percent. Mean recovery of pesticides and VOC's from the laboratory-spike samples was within the NWQL control limits. Results of the spike-sample analyses indicated sampling and analysis procedures adequately detected the compounds analyzed for and no major matrix interferences existed.

## **QUALITY OF WATER FROM SHALLOW WELLS IN URBAN RESIDENTIAL AND LIGHT COMMERCIAL AREAS**

The quality of water from the 28 shallow wells screened in the Chicot aquifer system or surficial confining unit in the urban residential and light

commercial areas is discussed in the following sections in relation to USEPA water-quality standards established for public-supply drinking water (U.S. Environmental Protection Agency, 2002b). Water-quality standards were determined by USEPA for physical properties and chemical constituents that might have adverse effects on human health or affect the odor, appearance, or desirability of water. Although the shallow wells installed for the land-use study are not used for a drinking-water source, concentrations of selected constituents in the water were compared to the USEPA Maximum Contaminant Levels (MCL's), Secondary Maximum Contaminant Levels (SMCL's), and Health Advisories (HA's) to provide a frame of reference. An MCL is the maximum permissible level for a contaminant in drinking water that is delivered to any user of a public-water system, and an SMCL is a nonenforceable Federal guideline regarding aesthetic effects (taste or odor) or cosmetic effects (tooth or skin coloration) of drinking water. An HA is a nonenforceable guideline that serves as an estimate of acceptable concentrations of a chemical constituent on the basis of health-effects information and provides technical guidance for Federal, State, and local officials.

### **General Ground-Water Properties**

Data for six general ground-water properties (specific conductance, pH, water temperature, turbidity, dissolved oxygen, and alkalinity) were collected from the shallow wells. Measurements of the properties were made at the time of sample collection. A statistical summary for the general ground-water properties is listed in table 3 with applicable water-quality standards. The median value for specific conductance (field) was 281 µS/cm, and values ranged from 93 to 956 µS/cm. The median value for pH (field) was 6.5 standard units. The SMCL for pH is 6.5 to 8.5 standard units (U.S. Environmental Protection Agency, 2002b). Values for 10 of the 28 wells sampled were less than 6.5 standard units. The median value for turbidity was 1.8 nephelometric turbidity units (NTU), and water from nine wells had concentrations that exceeded the MCL of 5.0 NTU (U.S. Environmental Protection Agency, 2002b). Dissolved oxygen concentrations were less than 1.0 mg/L in water from 15 of the 25 wells sampled and ranged from 0.3 to 6.6 mg/L (appendix 1). The alkalinity (field), as CaCO<sub>3</sub>, ranged from 35 to 390 mg/L. Values for specific conductance, pH, and alkalinity were typical for the Chicot aquifer system (Nyman, 1989). General ground-water properties for the 28 wells sampled are listed in appendix 1.

**Table 3.** Summary statistics and Federal guidelines and standards for general ground-water properties and selected water-quality data from shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All chemical constituents are dissolved unless otherwise noted. MCL, Maximum Contaminant Level; SMCL, Secondary Maximum Contaminant Level; HA, Health Advisory; USEPA, U.S. Environmental Protection Agency;  $\mu\text{S}/\text{cm}$ , microsiemens per centimeter at 25 degrees Celsius;  $^{\circ}\text{C}$ , degrees Celsius; ---, no value available;  $\text{mg}/\text{L}$ , milligrams per liter; E, estimated;  $\mu\text{g}/\text{L}$ , micrograms per liter; <, less than; ND, not detected;  $\text{pCi}/\text{L}$ , picocuries per liter; AMCL, Alternate Maximum Contaminant Level]

| Property or constituent                            | Number of detections/<br>number of samples | Analytical reporting level | Median of all samples | Minimum detection | Maximum detection | Federal guideline or standard <sup>a</sup> |         |       | Number of wells exceeding USEPA drinking-water standard |
|--|--|----------------------------|-----------------------|-------------------|-------------------|--|---------|-------|---|
|  |  |                            |                       |                   |                   | MCL  | SMCL    | HA    |   |
| General ground-water properties                    |  |                            |                       |                   |                   |  |         |       |   |
| Specific conductance, field, in μS/cm              | 28/28                                      | 1                          | 281                   | 93                | 956               | ---  | ---     | ---   | ---   |
| pH, field, in standard units                       | 28/28                                      | 0.1                        | 6.5                   | 5.8               | 7.4               | ---  | 6.5-8.5 | ---   | <sup>b</sup> 10   |
| Water temperature, in °C                           | 28/28                                      | 0.1                        | 21.3                  | 16.1              | 23.7              | ---  | ---     | ---   | ---   |
| Turbidity, in nephelometric turbidity units (NTU)  | 27/28                                      | 0.1                        | 1.8                   | 0.40              | 120               | 5.0  | ---     | ---   | 9   |
| Dissolved oxygen, in mg/L                          | 25/25                                      | 0.1                        | 0.6                   | 0.3               | 6.6               | ---  | ---     | ---   | ---   |
| Alkalinity as CaCO <sub>3</sub> , field, in mg/L   | 28/28                                      | 1                          | 120                   | 35                | 390               | ---  | ---     | ---   | ---   |
| Dissolved solids and major inorganic ions, in mg/L |  |                            |                       |                   |                   |  |         |       |   |
| Dissolved solids, residue on evaporation, 180° C   | 28/28                                      | 10                         | 184                   | 80                | 588               | ---  | 500     | ---   | 2   |
| Calcium, as Ca                                     | 28/28                                      | 0.01                       | 23                    | 5.8               | 98                | ---  | ---     | ---   | ---   |
| Magnesium, as Mg                                   | 28/28                                      | 0.01                       | 7.6                   | 1.4               | 27                | ---  | ---     | ---   | ---   |
| Sodium, as Na                                      | 28/28                                      | 0.10                       | 21                    | 5.9               | 87                | ---  | ---     | ---   | ---   |
| Potassium, as K                                    | 28/28                                      | 0.1                        | 1.9                   | 1.2               | 12                | ---  | ---     | ---   | ---   |
| Bicarbonate, as HCO <sub>3</sub> (calculated)      | 28/28                                      | 1                          | 140                   | 43                | 480               | ---  | ---     | ---   | ---   |
| Sulfate, as SO <sub>4</sub>                        | 28/28                                      | 0.30                       | 3.0                   | E0.1              | 17                | ---  | 250     | ---   | 0   |
| Chloride, as Cl                                    | 28/28                                      | 0.30                       | 8.6                   | 2.4               | 170               | ---  | 250     | ---   | 0   |
| Fluoride, as F                                     | 28/28                                      | 0.1                        | 0.3                   | E0.1              | 0.5               | 4.0  | 2.0     | ---   | 0   |
| Bromide, as Br                                     | 28/28                                      | 0.03                       | 0.10                  | 0.04              | 0.52              | ---  | ---     | ---   | ---   |
| Trace elements, in μg/L                            |  |                            |                       |                   |                   |  |         |       |   |
| Aluminum, as Al                                    | 11/28                                      | 1.0                        | <1                    | 1                 | 20                | ---  | 50-200  | ---   | 0   |
| Antimony, as Sb                                    | 24/28                                      | 0.048                      | E0.04                 | E0.03             | 0.27              | 6  | ---     | ---   | 0   |
| Arsenic, as As                                     | 28/28                                      | 0.18                       | 1.5                   | 0.3               | 5.7               | 10   | ---     | ---   | 0   |
| Barium, as Ba                                      | 28/28                                      | 1.0                        | 98                    | 30                | 240               | 2,000                                      | ---     | ---   | 0   |
| Beryllium, as Be                                   | 0/28                                       | 0.06                       | <0.06                 | ND                | ND                | 4  | ---     | ---   | 0   |
| Boron, as B  | 28/28                                      | 7.0                        | 30                    | 10                | 60                | ---  | ---     | 600   | 0   |
| Cadmium, as Cd                                     | 23/28                                      | 0.037                      | 0.05                  | E0.02             | 0.40              | 5  | ---     | ---   | 0   |
| Chromium, as Cr                                    | 16/28                                      | 0.8                        | E0.5                  | E0.4              | 20                | <sup>c</sup> 100                           | ---     | ---   | 0   |
| Cobalt, as Co                                      | 28/28                                      | 0.015                      | 0.9                   | 0.1               | 10                | ---  | ---     | ---   | ---   |
| Copper, as Cu                                      | 28/28                                      | 0.23                       | 4                     | E0.2              | 280               | <sup>d</sup> 1,300                         | 1,000   | ---   | 0   |
| Iron, as Fe  | 10/27                                      | 10                         | <10                   | E5.9              | 70                | ---  | 300     | ---   | 0   |
| Lead, as Pb  | 10/28                                      | 0.08                       | <0.08                 | E0.05             | 0.17              | 15   | ---     | ---   | 0   |
| Lithium, as Li                                     | 28/28                                      | 0.30                       | 10                    | 0.8               | 20                | ---  | ---     | ---   | ---   |
| Manganese, as Mn                                   | 27/28                                      | 0.18                       | 160                   | E2                | 1,700             | ---  | 50      | ---   | 18  |
| Molybdenum, as Mo                                  | 27/28                                      | 0.2                        | 0.8                   | E0.1              | 5                 | ---  | ---     | 40    | 0   |
| Nickel, as Ni                                      | 28/28                                      | 0.06                       | 1                     | 0                 | 6                 | ---  | ---     | 100   | 0   |
| Silica, as SiO <sub>2</sub>                        | 28/28                                      | 0.13                       | 37                    | 11                | 60                | ---  | ---     | ---   | ---   |
| Selenium, as Se                                    | 19/28                                      | 0.33                       | E0.2                  | E0.2              | 3                 | 50   | ---     | ---   | 0   |
| Silver, as Ag                                      | 0/28                                       | 1.0                        | <1                    | ND                | ND                | ---  | 100     | ---   | 0   |
| Strontium, as Sr                                   | 28/28                                      | 0.08                       | 120                   | 30                | 410               | ---  | ---     | 4,000 | 0   |
| Thallium, as Tl                                    | 10/28                                      | 0.041                      | <0.04                 | E0.02             | E0.04             | 2  | ---     | 0.5   | 0   |
| Uranium, as U                                      | 23/28                                      | 0.018                      | 0.07                  | E0.01             | 3.2               | <sup>e</sup> 20                            | ---     | ---   | 0   |
| Vanadium, as V                                     | 28/28                                      | 0.21                       | 2.7                   | 0.5               | 6.6               | ---  | ---     | ---   | ---   |



**Table 3.** Summary statistics and Federal guidelines and standards for general ground-water properties and selected water-quality data from shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| Property or constituent                         | Number of detections/<br>number of samples | Analytical reporting level | Median of all samples | Minimum detection | Maximum detection | Federal guideline or standard <sup>a</sup> |      |     | Number of wells exceeding USEPA drinking-water standard |
|---|--|----------------------------|-----------------------|-------------------|-------------------|--|------|-----|---|
|   |  |                            |                       |                   |                   | MCL  | SMCL | HA  |   |
| Nutrients and dissolved organic carbon, in mg/L |  |                            |                       |                   |                   |  |      |     |   |
| Ammonia, as N                                   | 7/28                                       | 0.041                      | <0.04                 | E0.02             | 0.06              | ---  | ---  | 30  | 0   |
| Ammonia plus organic nitrogen, as N             | 12/28                                      | 0.10                       | <0.10                 | E0.05             | E0.10             | ---  | ---  | --- | ---   |
| Nitrite plus nitrate, as N                      | 19/28                                      | 0.060                      | 0.14                  | E0.02             | 22                | 10   | ---  | --- | 1   |
| Nitrite, as N                                   | 5/28                                       | 0.008                      | <0.01                 | E0.01             | 0.05              | 1.0  | ---  | --- | 0   |
| Phosphorus, as P                                | 28/28                                      | 0.0044                     | 0.30                  | 0.04              | 0.58              | ---  | ---  | --- | ---   |
| Orthophosphorus, as P                           | 28/28                                      | 0.018                      | 0.30                  | 0.04              | 0.55              | ---  | ---  | --- | ---   |
| Dissolved organic carbon, as C                  | 25/28                                      | 0.33                       | E0.3                  | E0.2              | 1.6               | ---  | ---  | --- | ---   |
| Radon, in pCi/L                                 |  |                            |                       |                   |                   |  |      |     |   |
| Radon   | 20/20                                      | 1                          | 389                   | 280               | 2,220             | <sup>f</sup> 300 or 4,000 (AMCL)           | ---  | --- | 19 above MCL; 0 above AMCL                              |

<sup>a</sup>U.S. Environmental Protection Agency, 2002b.

<sup>b</sup>Number of values less than 6.5 standard units.

<sup>c</sup>Total concentration.

<sup>d</sup>U.S. Environmental Protection Agency Maximum Contaminant Level Goal (MCLG).

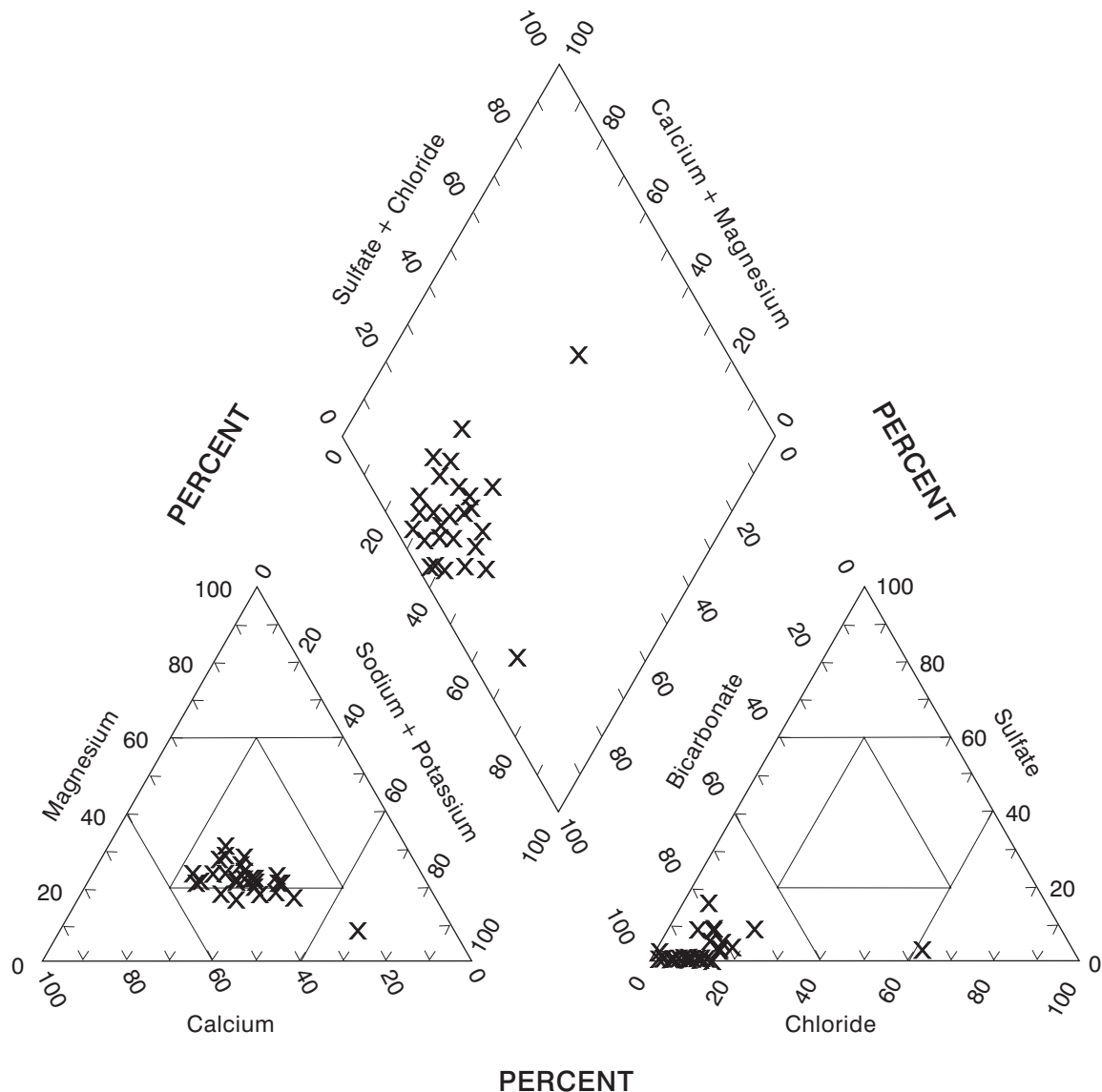
<sup>e</sup>Under review.

<sup>f</sup>The U.S. Environmental Protection Agency has an established Maximum Contaminant Level (MCL) for radon in ground water of 300 picocuries per liter (pCi/L) for states without a Multimedia Mitigation (MMM) program and an Alternate Maximum Contaminant Level (AMCL) of 4,000 pCi/L for states with an MMM program.

## Dissolved Solids and Major Inorganic Ions

Dissolved solids are an important indicator of water quality and, in uncontaminated ground water, are the result of natural dissolution of rocks and sediments. A statistical summary for dissolved solids and major inorganic ions is listed in table 3 with applicable water-quality standards. The dissolved-solids concentrations for the 28 wells sampled ranged from 80 to 588 mg/L and had a median of 184 mg/L, which was less than the 500-mg/L SMCL (U.S. Environmental Protection Agency, 2002b). Water from two wells had dissolved-solids concentrations that were greater than the SMCL. Although ground water containing more than 500 mg/L dissolved solids is undesirable for drinking water and irrigation, it is used in many areas of the country where less-mineralized water is not available. Sulfate, chloride, and fluoride were the only major inorganic ions with established water-quality standards, and all concentrations were less than those standards (table 3) (U.S. Environmental Protection Agency, 2002b). Dissolved solids and major inorganic ion concentrations in water from the 28 wells sampled are listed in appendix 2.

Water types were summarized with a Piper diagram on the basis of the percentages of eight major inorganic ions in water from the 28 wells (fig. 4). The water types were classified as mixed cation bicarbonate (27 wells) and mixed anion chloride (1 well). Mixed cation types had two or more cations for which the percent of each was greater than 20 percent of the total cations. Mixed anion types had two or more anions for which the percent of each was greater than 20 percent of the total anions. Calcium was the highest percentage cation in 21 wells, and sodium was the highest percentage cation in seven wells. Bicarbonate was the highest percentage anion in 27 wells, and chloride was the highest percentage anion in one well. Sulfate concentrations were low in most of the ground-water samples. The percentages of major inorganic ions were similar for all wells except well number 101, which had a higher percentage of sodium than the other wells, and well number 109, which had a higher percentage of chloride than the other wells. Few water types were identified, indicating little to moderate variability in the lithology of the shallow sediments in Lafayette Parish.



**Figure 4.** Piper diagram showing percentages of major inorganic ions in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02.

### Trace Elements

Trace elements generally are present in water at concentrations of less than 1,000 µg/L (Drever, 1988, p. 326), and most trace elements detected in ground water are metals or semi-metallic elements produced from the weathering of minerals. The trace-element concentrations for the 28 wells sampled were less than 1,000 µg/L except for two manganese concentrations. A statistical summary for trace elements is listed in table 3 with applicable

water-quality standards. Of the 23 trace elements analyzed for, 9 were detected in water from all 28 wells sampled and 2 (beryllium and silver) were not detected in any wells (table 3). No trace-element concentrations were greater than the MCL's or HA's, and only one trace element, manganese, had concentrations that were greater than the SMCL. The maximum manganese concentration was 1,700 µg/L, and manganese concentrations for 18 wells exceeded the SMCL of 50 µg/L. Trace-element concentrations in water from the 28 wells sampled are listed in appendix 3.

## Nutrients

Nutrients are nitrogen- or phosphorus-containing compounds that are necessary for plant growth and important for animal nutrition (Mueller and others, 1995). Although these compounds do occur naturally, concentrations in ground or surface water can be increased through human activities such as fertilizer applications, sewerage and septic effluent, and atmospheric deposition from industrial emissions. Nitrate, one of the most widespread contaminants of ground water, is highly soluble, very mobile, and susceptible to leaching through the soil with infiltrating water (Hallberg and Keeney, 1993). Excessive nitrate concentrations may cause adverse human-health effects, such as methemoglobinemia (blue baby syndrome) (Hem, 1985, p. 125), and excessive nitrogen and phosphorus concentrations may cause adverse environmental effects, such as eutrophication of surface-water bodies (Hem, 1985). Nitrate concentrations in uncontaminated water usually are relatively small (generally less than 2 mg/L), and larger concentrations may indicate possible contamination from human activities (Mueller and Helsel, 1996).

A statistical summary for nutrients is listed in table 3 with applicable water-quality standards. The nutrient concentrations for the 28 wells sampled were low except for one nitrite plus nitrate concentration. Ammonia was detected in water from 7 (25 percent) of the 28 wells sampled, and concentrations ranged from an estimated value of 0.02 mg/L to 0.06 mg/L. Ammonia plus organic nitrogen was detected in water from 12 of the 28 wells sampled, and concentrations ranged from an estimated value of 0.05 mg/L to an estimated value of 0.10 mg/L. Nitrite plus nitrate was detected in 19 of the 28 wells sampled, and concentrations ranged from an estimated value of 0.02 mg/L to 22 mg/L and had a median of 0.14 mg/L. The maximum concentration of 22 mg/L from one well, well number 109, was greater than the MCL of 10 mg/L (U.S. Environmental Protection Agency, 2002b) and was the only nutrient concentration that exceeded a water-quality standard. The nitrite concentration for the same well was 0.05 mg/L, so all of the nitrite plus nitrate was assumed to be nitrate. The elevated nitrate concentration might be a result of a hydrologic connection to a nearby urban drainage ditch. Nitrite was detected in five wells, and the maximum concentration was 0.05 mg/L. Phosphorus and orthophosphate concentrations ranged from 0.04 to 0.58 mg/L. Nutrient concentrations in water from the 28 wells sampled are listed in appendix 4.

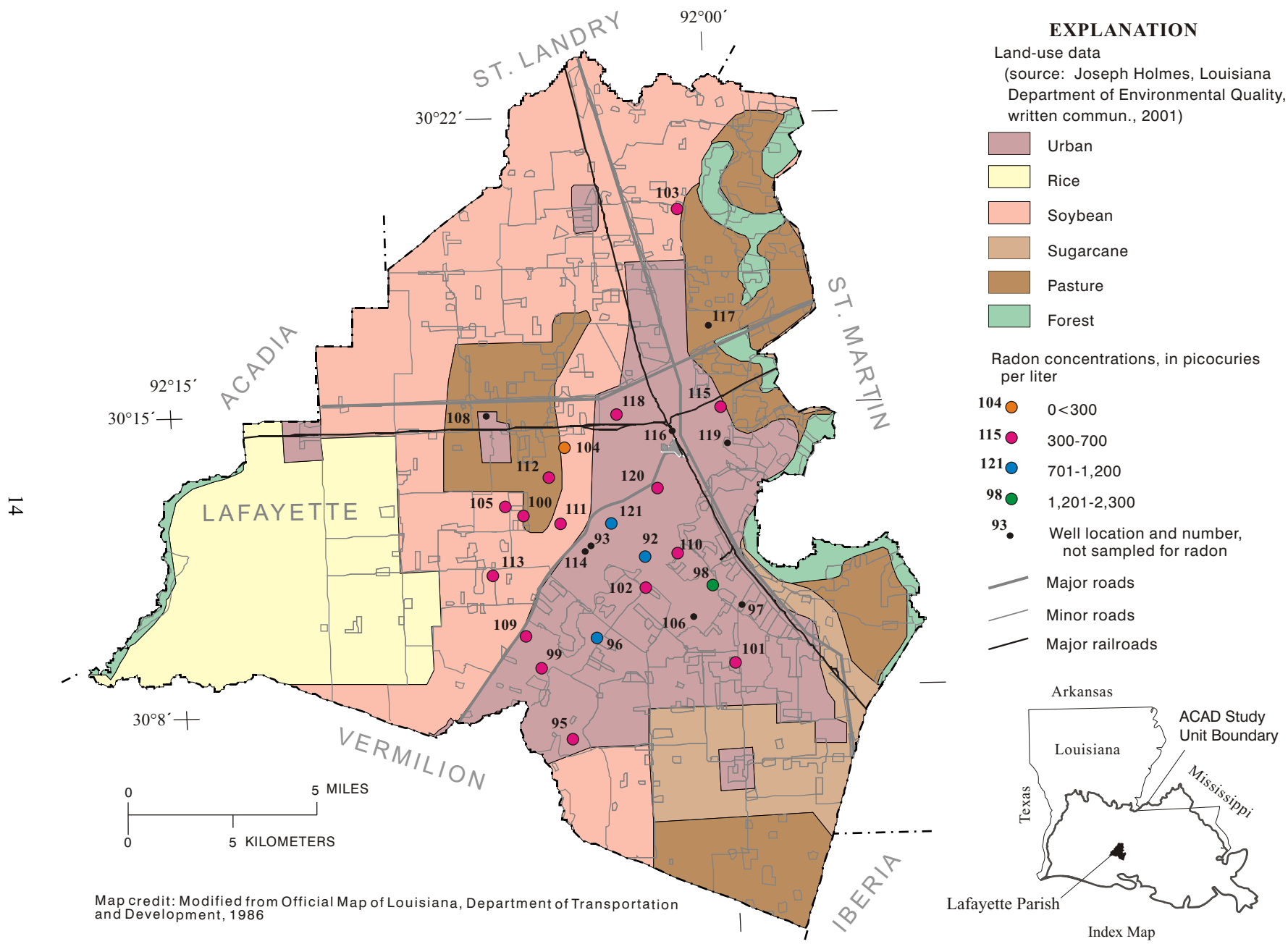
## Dissolved Organic Carbon

The amount of organic carbon present in ground water might have an effect on microbial communities in an aquifer and, in turn, affect the concentration of redox-sensitive constituents such as dissolved oxygen, trace elements, and nutrients (Hem, 1985). DOC was detected in water from 25 of the 28 wells sampled. The maximum concentration was 1.6 mg/L, and the median concentration was an estimated value of 0.3 mg/L (table 3). DOC concentrations of about 0.5 mg/L typically occur naturally in ground water, and concentrations can increase with human activity (Drever, 1997). The median concentration of an estimated 0.3 mg/L in water from the 28 wells sampled indicated naturally-occurring DOC conditions. DOC concentrations in water from the 28 wells sampled are listed in appendix 4.

## Radon

Radon-222 is a gas produced by the natural decay of uranium that is present in small quantities in certain rock and sediment types. Radon gas is soluble in water and is transported in ground water. The USEPA has established an MCL for radon in ground water of 300 pCi/L for states without a Multimedia Mitigation (MMM) program and an Alternate Maximum Contaminant Level (AMCL) of 4,000 pCi/L for states with an MMM program (U.S. Environmental Protection Agency, 2002c). The USEPA recommends treating ground water that has radon concentrations greater than 300 pCi/L. When radon gas is exposed to air, such as when ground water is pumped from an aquifer and used indoors, the radon diffuses into the air where it can be inhaled. About 1 to 2 percent of radon in indoor air comes from drinking water (U.S. Environmental Protection Agency, 2002a). Although the entire State of Louisiana is classified in the lowest national risk zone, Zone 3, for radon, a 1990 survey of Louisiana homes indicated 10 of 1,314 homes had elevated levels (greater than 4 pCi/L) of radon in the indoor air (Louisiana Department of Environmental Quality, 1990).

Radon-222 (radon) was sampled from 20 of the 28 wells (table 3). The radon concentrations in the ground-water samples ranged from 280 to 2,220 pCi/L and had a median of 389 pCi/L. Radon concentrations in water from 19 wells were greater than the MCL (fig. 5), and all radon concentrations were less than the AMCL (table 3) (U.S. Environmental Protection Agency, 2002b). Radon concentrations for the 20 wells sampled are listed in appendix 5.



**Figure 5.** Radon concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02.

## Chlorofluorocarbons and Stable Isotopes

Concentrations of CFC's, including CFC-11, CFC-113, and CFC-12 were determined in water from nine wells, and stable isotopes of hydrogen ( $^2\text{H}/^1\text{H}$ ) and oxygen ( $^{18}\text{O}/^{16}\text{O}$ ) were determined in water from six wells. The data for the wells sampled are listed in appendix 5. CFC's were used to estimate the apparent age of water in nine wells. Stable isotopes were collected and analyzed along with CFC's to more accurately determine the apparent age of the ground water. CFC's are stable, synthetic organic compounds developed in the early 1930's to replace ammonia and sulfur dioxide in the refrigeration process (Plummer and Friedman, 1999). Production of dichlorodifluoromethane (CFC-12) began in 1931 and was followed by production of trichlorofluoromethane (CFC-11) in 1936. The presence of measurable concentrations of CFC's in a water sample indicates the sample contains some post-1940 water--water recharged prior to 1940. Chemical processes, such as microbial degradation and sorption during transit, and physical processes, such as mixing with older water, can affect the concentration of CFC's; thus, the term apparent is used to qualify the ground-water age. The determined apparent age of ground water from the nine wells ranged from about 12 to 50 years and had a median of less than 32 years. As shown in figure 6, the age of the ground water varied with water level.

## Pesticides and Pesticide Degradation Products

Pesticides are chemicals used to control unwanted vegetation, insects, and fungi. They are applied primarily to cropland in rural areas but also are used on lawns, gardens, and rights-of-way. The widespread use of pesticides creates the potential for the movement of pesticides or their degradation products into shallow ground water. The presence of pesticides in ground water indicates an effect from human activities on ground-water quality and is a human-health concern for those using ground water as a drinking-water supply.

Pesticides or degradation products were detected in water from 6 of the 28 wells sampled. Three wells had one pesticide detected, one well had two pesticides detected, one well had one pesticide and one degradation product detected, and one well had three degradation products detected (fig. 7). The maximum concentration for the pesticides and degradation products was an estimated value of  $0.06\text{ }\mu\text{g/L}$  (deethyldeisopropylatrazine), and all concentrations were less than the applicable drinking-water standards (table 4) (U.S. Environmental Protection Agency, 2002b). Of the 91 pesticides

analyzed for, 6 were detected in the samples; and, of the 11 degradation products analyzed for, 3 were detected in the samples. One herbicide, atrazine, had a concentration ( $0.008\text{ }\mu\text{g/L}$ ) that was greater than an estimated value. Pesticide concentrations for the wells sampled are listed in appendix 6, and degradation product concentrations are listed in appendix 7.

## Volatile Organic Compounds

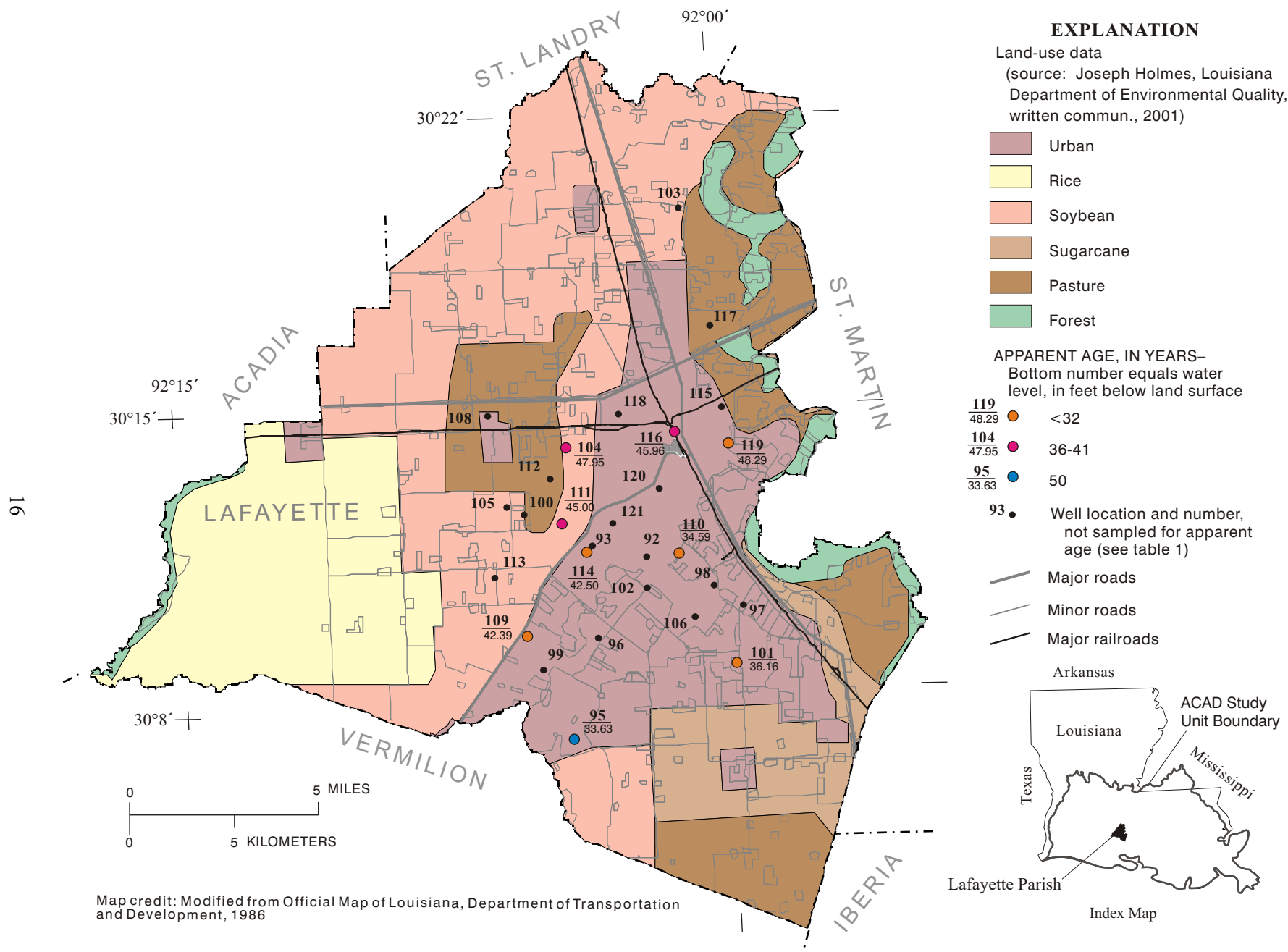
VOC's were detected in water from 18 of the 28 wells sampled. Seven wells had one compound detected, six wells had two compounds detected, two wells had three compounds detected, two wells had four compounds detected, and one well had five compounds detected (fig. 7). The maximum concentration for the VOC's detected was  $0.38\text{ }\mu\text{g/L}$  (chloroform), and all concentrations were less than the applicable drinking-water standards (table 4) (U.S. Environmental Protection Agency, 2002b). Of the 85 VOC's analyzed for, 10 were detected in the samples. Of those 10, seven were detected more than once. Five VOC's had concentrations that were greater than estimated values. Carbon disulfide was the most frequently detected VOC (11 samples) and had a maximum concentration of  $0.22\text{ }\mu\text{g/L}$ . Toluene was the second most frequently detected VOC (10 samples) and had a maximum concentration of  $0.28\text{ }\mu\text{g/L}$ . VOC concentrations for the 28 wells sampled are listed in appendix 8.

## STATISTICAL ANALYSES OF WATER-QUALITY DATA

### Statistical Techniques

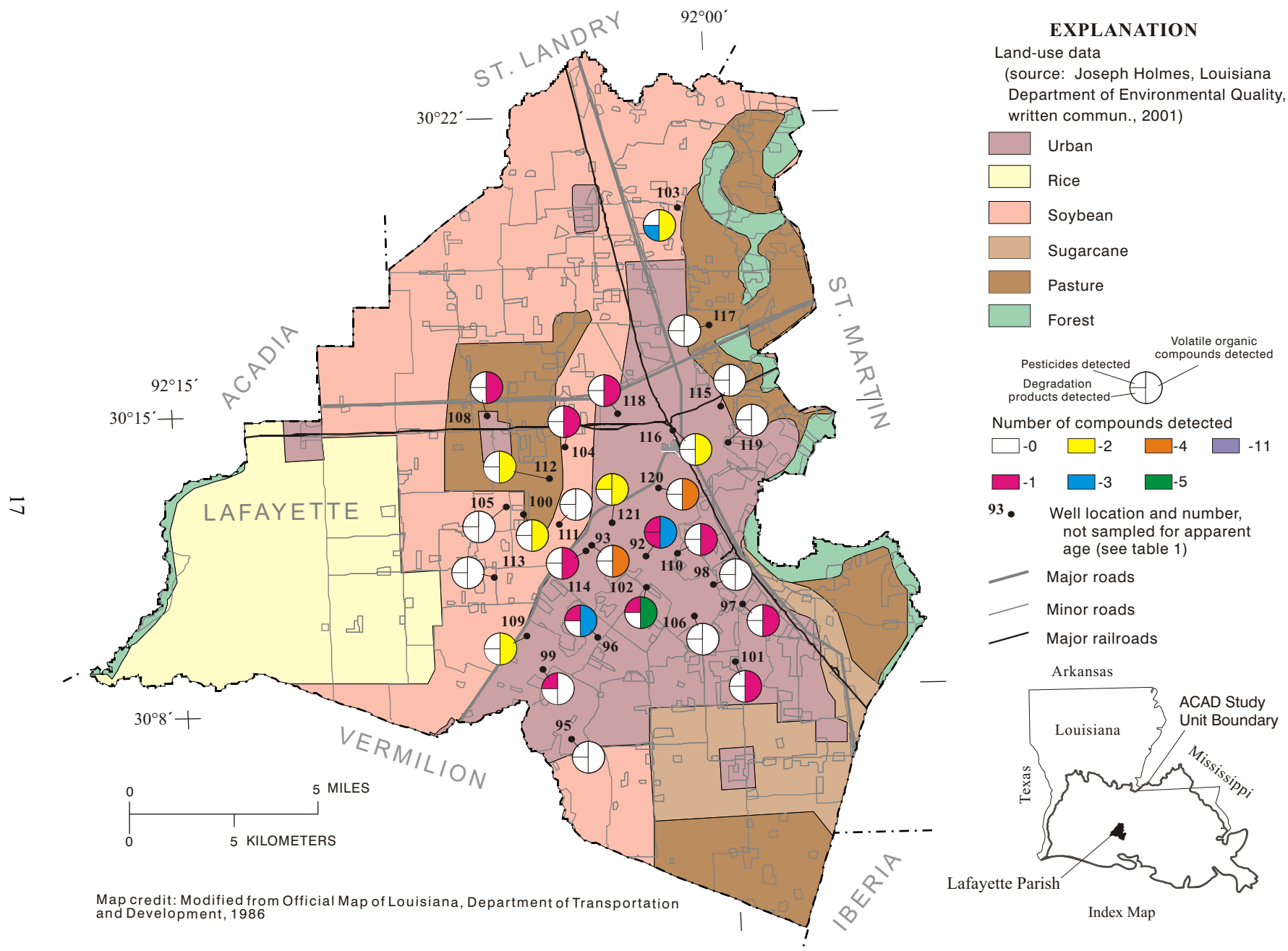
The Spearman rank correlation test (SAS Institute Inc., 1990) was used to determine if a relation existed between selected physical properties and chemical constituents (depth to the top of the screened interval and water level, specific conductance, pH, alkalinity, dissolved solids, calcium, magnesium, bicarbonate, arsenic, uranium, and radon) and the number of pesticides and VOC's detected. Correlation analysis assesses not only the relation between two variables but also the strength of the relation (Helsel and Hirsch, 1993). The Spearman rank correlation test was selected because water-quality data usually are nonparametric and the number of samples was greater than 20 (Helsel and Hirsch, 1993).

The Spearman rank correlation test calculates a probability statistic (p-value) and a correlation coefficient (rho). The probability statistic relates to a



**Figure 6.** Apparent ages of water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02.





**Figure 7.** Number of pesticides, degradation products, and volatile organic compounds detected in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02.

**Table 4.** Summary statistics and Federal guidelines for pesticides and degradation products and volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All concentrations are in micrograms per liter; USEPA, U.S. Environmental Protection Agency; MCL, Maximum Contaminant Level; E, estimated; HA, Health Advisory; ---, no value available; DP, degradation product]

| Constituent                                 | Number of detections/<br>samples | Analytical reporting level | Minimum detection | Maximum detection | Drinking water standard | Type of standard <sup>a</sup> | Number of wells exceeding USEPA drinking-water standard |
|---|----------------------------------|----------------------------|-------------------|-------------------|-------------------------|-------------------------------|---|
| <b>Pesticides</b>                           |                                  |                            |                   |                   |                         |                               |   |
| Atrazine                                    | 1/28                             | 0.009                      | 0.008             | 0.008             | 3                       | MCL                           | 0   |
| Bentazon                                    | 1/28                             | 0.01                       | E0.05             | E0.05             | 200                     | HA                            | 0   |
| Imazaquin                                   | 1/28                             | 0.0261                     | E0.026            | E0.026            | ---                     | ---                           | ---   |
| Imazethapyr                                 | 1/28                             | 0.017                      | E0.005            | E0.005            | ---                     | ---                           | ---   |
| Imidacloprid                                | 1/28                             | 0.0068                     | E0.0095           | E0.0095           | ---                     | ---                           | ---   |
| Prometon                                    | 1/28                             | 0.015                      | E0.012            | E0.012            | 100                     | HA                            | 0   |
| <b>Degradation products</b>                 |                                  |                            |                   |                   |                         |                               |   |
| Deethylatrazine (DP of atrazine)            | 2/28                             | 0.028                      | E0.004            | E0.006            | ---                     | ---                           | ---   |
| Deethyldeisopropylatrazine (DP of atrazine) | 1/28                             | 0.01                       | E0.06             | E0.06             | ---                     | ---                           | ---   |
| Deisopropylatrazine (DP of atrazine)        | 1/28                             | 0.04                       | E0.01             | E0.01             | ---                     | ---                           | ---   |
| <b>Volatile organic compounds</b>           |                                  |                            |                   |                   |                         |                               |   |
| Benzene                                     | 2/28                             | 0.021                      | E0.01             | E0.03             | 5.0                     | MCL                           | 0   |
| Carbon disulfide                            | 11/28                            | 0.07                       | E0.02             | 0.22              | ---                     | ---                           | ---   |
| Chloroform                                  | 4/28                             | 0.02                       | E0.01             | 0.38              | <sup>b</sup> 80.0       | MCL                           | 0   |
| 4-Isopropyl-1-methylbenzene                 | 2/28                             | 0.12                       | E0.01             | E0.04             | ---                     | ---                           | ---   |
| MTBE (Methyl tert-butyl ether)              | 1/28                             | 0.17                       | 0.2               | 0.2               | 40 (taste)<br>20 (odor) | HA                            | 0   |
| Tetrachloroethylene                         | 4/28                             | 0.027                      | E0.007            | E0.10             | 5.0                     | MCL                           | 0   |
| Toluene                                     | 10/28                            | 0.05                       | E0.01             | 0.28              | 1,000                   | MCL, HA                       | 0   |
| Trichloroethylene (TCE)                     | 1/28                             | 0.038                      | E0.03             | E0.03             | 5.0                     | MCL                           | 0   |
| Trichlorofluoromethane                      | 1/28                             | 0.09                       | 1.1               | 1.1               | 2,000                   | HA                            | 0   |
| m- and p-Xylene                             | 2/28                             | 0.06                       | E0.01             | E0.03             | 10,000                  | MCL, HA                       | 0   |

<sup>a</sup>U.S. Environmental Protection Agency, 2002b

<sup>b</sup>Under review

confidence level, and the correlation coefficient describes the strength of the correlation and how the variables (physical properties and chemical constituents) vary. A positive correlation coefficient means that as the value of one variable increases, the values of the other variables also increase. A negative or inverse correlation coefficient means that as the value of one variable increases, the values of the other variables decrease (Helsel and Hirsch, 1993). The 95-percent confidence level used in this report indicated a 95-percent probability (p equal to or less than 0.05) that a correlation was statistically significant. Variables that had correlation coefficients of 0.6 or greater were considered strongly correlated, variables that had correlation coefficients between 0.4 and 0.6 were considered moderately

correlated, and variables that had correlation coefficients of 0.4 or less were considered weakly correlated. Concentrations that were less than the reporting limit were assigned a value of one-half the reporting limit so they would not rank equal to that of a measured value.

The Mann-Whitney rank-sum test (SAS Institute Inc., 1990) with an alpha value of 0.05 was used to compare the depth to the top of the screened interval and selected physical-property and chemical-constituent (specific conductance, pH, dissolved solids, calcium, sodium, bicarbonate, chloride, iron, and radon) data for wells in the urban area to data for wells in other parts of the Chicot aquifer system. Data for the 28 urban wells (URB)

described in this report were compared to data for 27 wells in southwestern Louisiana in rice-growing areas (RIC), data for 9 domestic wells in southwestern Louisiana in the outcrop area of the Chicot aquifer system (SWO), and data for 21 domestic wells in southwestern Louisiana south of the outcrop area of the Chicot aquifer system (SWS) (fig. 8). The nonparametric testing procedure was used to compare means of rank-transformed data for paired groups of wells (URB-RIC, URB-SWO, and URB-SWS). The RIC wells were part of a NAWQA ACAD agriculture land-use study in which rice was the targeted crop (Tollett and Fendick, 2003), and the SWO and SWS wells were part of a NAWQA ACAD subunit survey (Tollett and others, 2003). Well number 32 (fig. 8) was located outside the ACAD Study Unit boundary but, for this report, was considered to be part of the SWO group.

### Correlations Between Selected Physical Properties and Chemical Constituents Using Spearman Rank Correlation Test

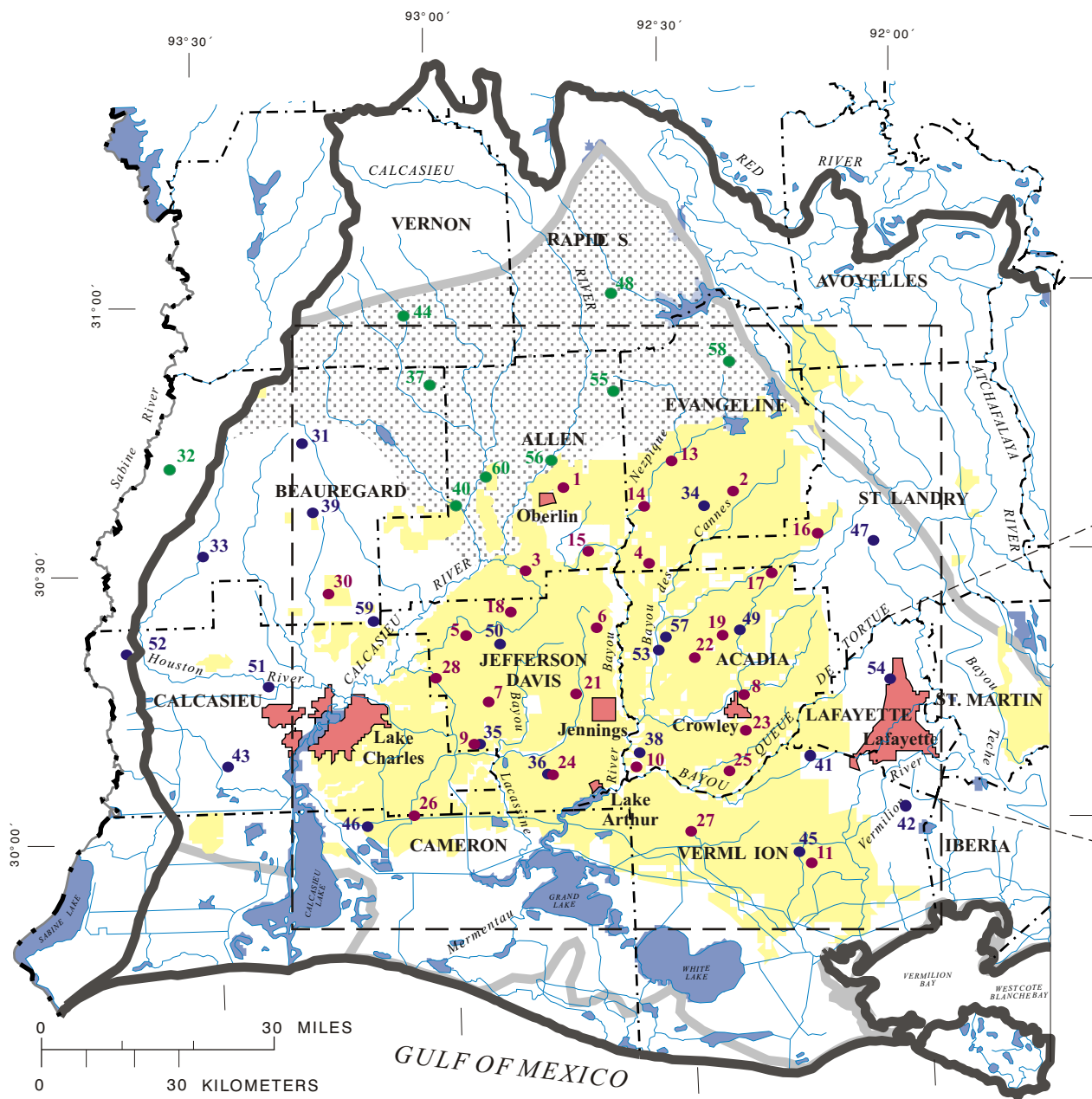
Correlations between selected physical properties and chemical constituents (depth to the top of the screened interval and water level; specific conductance, pH, alkalinity, dissolved solids, calcium, magnesium, bicarbonate, arsenic, uranium,

and radon) and the number of pesticides and VOC's detected in water samples are listed in table 5. The depth to the top of the screened interval was correlated weakly to pH, alkalinity, calcium, magnesium, dissolved solids, and bicarbonate, indicating that the ionic strength of water generally increased with depth. Arsenic concentrations were correlated moderately to the depth to the top of the screened interval, specific conductance, dissolved solids, calcium, and magnesium and strongly to pH and bicarbonate. Arsenic concentrations increased with depth and with pH, bicarbonate, calcium, and magnesium concentrations. Uranium concentrations were correlated weakly to the depth to the top of the screened interval, and radon concentrations were correlated moderately and inversely to the depth to the top of the screened interval. High radon concentrations in the rice-growing areas also were correlated weakly to the depth to the top of the screened interval (Tollett and Fendick, 2003). The number of pesticides detected was correlated moderately to the number of VOC's detected, possibly indicating that shallow ground water in Lafayette Parish is susceptible to contamination by land-surface activities. The number of pesticides and VOC's detected did not show a relation to the depth to the top of the screened interval, indicating that pesticide and VOC detections were not influenced by depth but more likely were influenced by land use near a well and shallow sediment or soil composition.

**Table 5.** Results of Spearman rank correlation test for selected physical properties and chemical constituents in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[VOC's, volatile organic compounds; <, less than; >, greater than; -, inversely related]

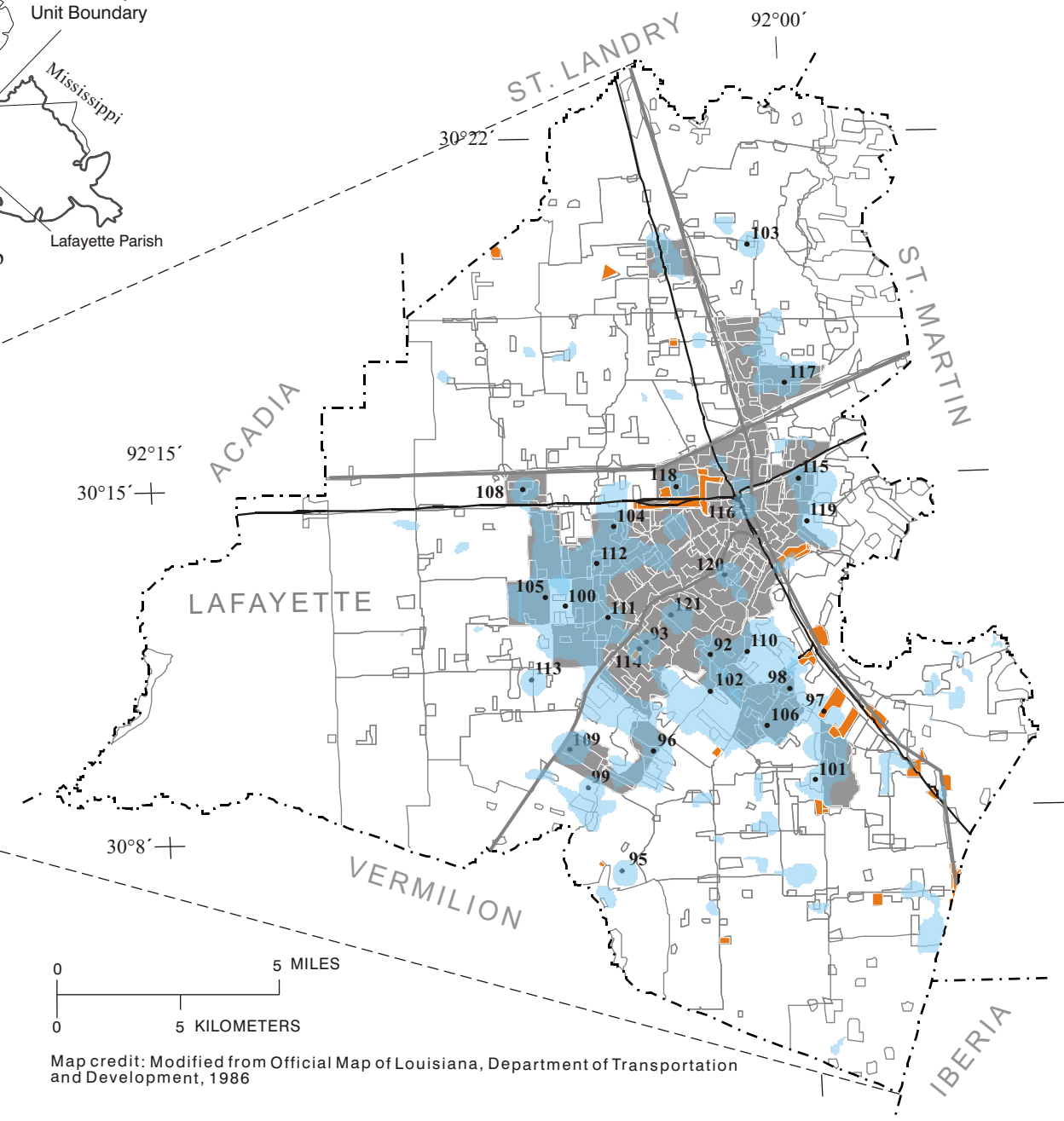
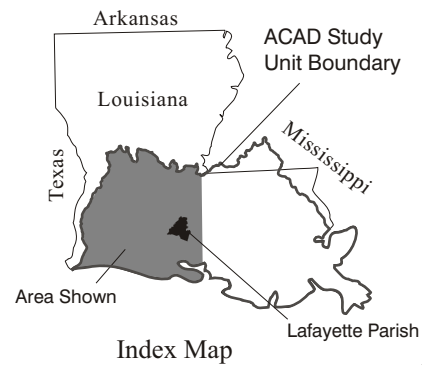
| Variables  | Number of sample pairs | Probability statistic | Correlation coefficient |
|--|------------------------|-----------------------|-------------------------|
| Depth to top of screened interval and pH                                 | 28                     | 0.032                 | 0.40                    |
| Depth to top of screened interval and alkalinity, calcium, and magnesium | 28                     | <.05                  | .38                     |
| Depth to top of screened interval and dissolved solids                   | 28                     | .076                  | .34                     |
| Depth to top of screened interval and bicarbonate                        | 28                     | .065                  | .35                     |
| Arsenic and depth to top of screened interval                            | 28                     | <.001                 | .59                     |
| Arsenic and specific conductance   | 28                     | .002                  | .55                     |
| Arsenic and pH and bicarbonate   | 28                     | <.001                 | >.63                    |
| Arsenic and dissolved solids   | 28                     | .003                  | .54                     |
| Arsenic and calcium  | 28                     | .004                  | .53                     |
| Arsenic and magnesium  | 28                     | .011                  | .47                     |
| Uranium and depth to top of screened interval                            | 28                     | .053                  | .37                     |
| Radon and depth to top of screened interval                              | 20                     | .036                  | -.47                    |
| Radon and water level  | 20                     | .049                  | -.44                    |
| Number of pesticides detected and number of VOC's detected               | 28                     | .029                  | .41                     |
| Depth to top of screened interval and number of pesticides detected      | 28                     | .873                  | .03                     |
| Depth to top of screened interval and number of VOC's detected           | 28                     | .571                  | .11                     |



Map credit: Modified from Official Map of Louisiana, Department of Transportation and Development, 1986

#### EXPLANATION

- |   |   |
|---|---|
| Land-use data<br>(source: Joseph Holmes, Louisiana Department of Environmental Quality, written commun., 2001)  | 24 Rice-growing area study (RIC) well location and number   |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: yellow; border: 1px solid black;"></span> Rice-growing area  | 44 Subunit survey study well, location and number, in the outcrop area (SWO) of the Chicot aquifer system   |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid black;"></span> Water  | 34 Subunit survey study well, location and number, south of the outcrop area (SWS) of the Chicot aquifer system   |
| <span style="display: inline-block; width: 15px; height: 15px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black;"></span> Outcrop area of the Chicot aquifer system in the Acadian-Pontchartrain (ACAD) Study Unit (Nyman, 1984, pl.1) | <span style="display: inline-block; width: 15px; height: 15px; background-color: gray; border: 1px solid black;"></span> Boundary of freshwater in the Chicot aquifer system in the ACAD Study Unit (Smoot, 1986) |
| <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black;"></span> Rice study area  |   |



Map credit: Modified from Official Map of Louisiana, Department of Transportation and Development, 1986

#### EXPLANATION

- |   |  |
|---|--|
| Land-use data<br>(source: Joseph Holmes, Louisiana Department of Environmental Quality, written commun., 2001)  | <span style="display: inline-block; width: 15px; height: 15px; background-color: orange; border: 1px solid black;"></span> Industrial  |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: gray; border: 1px solid black;"></span> Selected city limits within Lafayette Parish | <span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid black;"></span> Residential areas (less than 40 years old) and light commercial |
| <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black;"></span> Major roads  | <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black;"></span> Minor roads   |
| <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black;"></span> Major railroads  | <span style="display: inline-block; width: 15px; height: 15px; border: 1px solid black;"></span> Well location and number (urban-URB)  |

**Figure 8.** Well locations in southwestern Louisiana for land-use studies and subunit survey study in the Acadian-Pontchartrain Study Unit.

### **Comparison of Depth to Top of Screened Interval and Selected Physical-Property and Chemical-Constituent Data Using Mann-Whitney Rank-Sum Test**

Comparison of the depth to the top of the screened interval and selected physical-property and chemical-constituent data (fig. 9) indicated the quality of water in the URB wells was significantly different from the quality of water in the RIC, SWO, and SWS wells for most variables. Except for the depth to the top of the screened interval and iron, the means of the rank-transformed data for all physical properties and chemical constituents were less for the URB wells than for the RIC wells. The means for the depth to the top of the screened interval were greater for the URB wells than for the RIC wells, and the means for iron were not significantly different for the two groups of wells. The larger dissolved-solids values, particularly for sodium and chloride (fig. 9), for the RIC wells might be a result of heavy irrigation pumpage in the rice-growing areas in southwestern Louisiana that causes movement of the constituents from deeper ground-water sources (Nyman, 1984; Lovelace, 1999). The means for all variables except the depth to the top of the screened interval and iron were greater for the URB wells than for the SWO wells, and the means for all variables except radon were less for the URB wells than for the SWS wells. The means for the depth to the top of the screened interval were less for the URB wells than for the SWO wells, and the means for iron for the two groups of wells were not significantly different. Radon concentrations for the URB wells were greater than for the SWS wells. Ground-water movement generally is to the south in southwestern Louisiana (Harder and others, 1967). Thus, because concentrations of dissolved solids and other chemical constituents generally increase along ground-water flow paths (Nyman, 1989), concentrations of many of the selected chemical constituents were expected to be larger for the URB wells than for the SWO wells. As water moves through an aquifer, acidic waters react with aquifer sediments, thus increasing the concentrations of dissolved ions with increasing distance from the recharge area. The larger constituent concentrations for the SWS wells compared to those for the URB wells might be explained similarly. The SWS wells are deeper than the URB wells, thus increasing the time the water has to react with aquifer sediments. The lack of correlation between the four groups of wells suggests that spatial distribution of the wells and the depth to the top of the screened interval affected the quality of water in shallow wells in southwestern Louisiana.

### **SUMMARY AND CONCLUSIONS**

In 2001-02, the U.S. Geological Survey installed and sampled 28 shallow wells in the Chicot aquifer system in urban residential and light commercial areas in Lafayette Parish, Louisiana, for a land-use study in the Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program. The objective of the study was to assess the occurrence and distribution of water-quality constituents in recently recharged ground water associated with urban land use and to gain an understanding of the natural and human-related factors that affect ground-water quality. Lafayette Parish overlies the Chicot aquifer system, which is the primary source of water for irrigation and public-water supplies in southwestern Louisiana and is vulnerable to the effects of land-surface activities because of shallow depths to ground water. Well depths ranged from 11 to 79 feet below land surface, and water levels ranged from 2.50 to 61.55 feet below land surface. The purpose of this report is to describe the quality of water from the 28 shallow wells and to relate that water quality to natural factors and to human activities.

Ground-water samples were analyzed for general ground-water properties and about 240 water-quality constituents, including dissolved solids, major inorganic ions, trace elements, nutrients, dissolved organic carbon (DOC), radon, chlorofluorocarbons, selected stable isotopes, pesticides, pesticide degradation products, and volatile organic compounds (VOC's). Quality-control samples indicated no bias in ground-water data from collection or analysis. Values for the general ground-water properties were typical of those obtained in previous studies of the Chicot aquifer system. Dissolved-solids concentrations for two wells exceeded the U.S. Environmental Protection Agency Secondary Maximum Contaminant Level (SMCL) of 500 milligrams per liter (mg/L). Concentrations of all major inorganic ions were less than the Maximum Contaminant Levels (MCL's) and SMCL's for drinking water.

Concentrations of all trace elements, except manganese, were less than 1,000 micrograms per liter ( $\mu\text{g/L}$ ), and all were less than the MCL's. Manganese concentrations for 18 wells exceeded the SMCL of 50  $\mu\text{g/L}$ . No trace-element concentrations were greater than the health advisory levels.

One nutrient concentration (that for nitrite plus nitrate) was greater than 2 mg/L, a level that might indicate contamination from human activities, and





was greater than the U.S. Environmental Protection Agency MCL of 10 mg/L. The median DOC concentration was an estimated 0.3 mg/L, which indicated naturally-occurring DOC conditions in the shallow ground water in Lafayette Parish. Radon concentrations for 19 of 20 wells sampled were greater than the U.S. Environmental Protection Agency MCL of 300 picocuries per liter (pCi/L), and all were less than the alternate maximum contaminant level of 4,000 pCi/L. Radon concentrations ranged from 280 to 2,220 pCi/L and had a median of 389 pCi/L.

The maximum concentration for pesticides and pesticide degradation products was an estimated value of 0.06 µg/L (deethyldeisopropylatrazine), and all concentrations were less than the drinking-water standards. Of the 91 pesticides analyzed for, 6 were detected in the ground-water samples; and, of the 11 pesticide degradation products analyzed for, 3 were detected in the ground-water samples. One herbicide, atrazine, had a concentration (0.008 µg/L) that was greater than an estimated value. The maximum concentration for the VOC's detected was 0.38 µg/L, and all concentrations were less than the drinking-water standards. Of the 85 VOC's analyzed for, 10 were detected in the ground-water samples. Of those 10, 7 were detected more than once. Five VOC's had concentrations greater than estimated values. Carbon disulfide was the most frequently detected VOC (11 samples) and had a maximum concentration of 0.22 µg/L. Toluene was the second most frequently detected compound (10 samples) and had a maximum concentration of 0.28 µg/L.

The depth to the top of the screened interval was correlated weakly to pH, alkalinity, calcium, magnesium, dissolved solids, and bicarbonate, indicating that the ionic strength of water generally increased with depth. Arsenic concentrations were correlated moderately to the depth to the top of the screened interval, specific conductance, dissolved solids, calcium, and magnesium and strongly to pH and bicarbonate. Arsenic concentrations increased with depth and with pH, bicarbonate, calcium, and magnesium concentrations. Uranium concentrations were correlated weakly to the depth to the top of the screened interval, and radon concentrations were correlated moderately and inversely to the depth to the top of the screened interval. Chloro-fluorocarbons were used to estimate the apparent

age of water in nine wells. The determined apparent age ranged from about 12 to 50 years and had a median of less than 32 years. This indicated the age of the ground water varied with depth and water level. The number of pesticides detected was correlated moderately to the number of VOC's detected, possibly indicating that shallow ground water in Lafayette Parish is susceptible to contamination by land-surface activities. The number of pesticides and VOC's detected did not show a relation to the depth to top of the screened interval.

The Mann-Whitney rank-sum test was used to compare the depth to the top of the screened interval and selected general-property and chemical-constituent (specific conductance, pH, dissolved solids, calcium, sodium, bicarbonate, chloride, iron, and radon) data for urban (URB) wells to data for wells in rice-growing areas (RIC), domestic wells in the outcrop area of the Chicot aquifer system (SWO), and domestic wells south of the outcrop area of the Chicot aquifer system (SWS). Comparisons indicated the quality of water in the URB wells was significantly different from the quality of water in the RIC, SWO, and SWS wells for most variables. The means for all variables were less for the URB wells than for the RIC wells except for the depth to the top of the screened interval and iron. The larger dissolved-solids values, particularly for sodium and chloride, for the RIC wells might be a result of heavy irrigation pumpage in the rice-growing areas in southwestern Louisiana that causes movement of the constituents from deeper ground-water sources. The means for most variables were greater for the URB wells than for the SWO wells and less for the URB wells than for the SWS wells. Because concentrations of dissolved solids and other chemical constituents generally increase along ground-water flow paths, concentrations of many of the selected chemical constituents were expected to be larger for the URB wells than for the SWO wells. The larger concentrations for the SWS wells compared to those for the URB wells might be explained similarly. The SWS wells are deeper than the URB wells, thus increasing the time the water has to react with aquifer sediments. The lack of correlation between the four groups of wells suggests that spatial distribution of wells and the depth to the top of the screened interval affected the quality of water in shallow wells in southwestern Louisiana.

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## APPENDIXES

1. General ground-water properties of water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
2. Dissolved solids and major inorganic ion concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
3. Trace-element concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
4. Nutrients and dissolved organic carbon concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
5. Radon, chlorofluorocarbons, and stable isotope concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
6. Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
7. Concentrations of pesticide degradation products in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02
8. Concentrations of volatile organic compound in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

**Appendix 1.** General ground-water properties of water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey;  $\mu\text{S}/\text{cm}$ , microsiemens per centimeter at 25 degrees Celsius;  $^{\circ}\text{C}$ , degrees Celsius; mm, millimeters; mg/L, milligrams per liter; ---, no data]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification number | Sample<br>date | Specific<br>conductance,<br>field<br>( $\mu\text{S}/\text{cm}$ ) | Specific<br>conductance,<br>laboratory<br>( $\mu\text{S}/\text{cm}$ ) | pH,<br>field<br>(standard<br>units) | pH,<br>laboratory<br>(standard<br>units) | Air<br>temperature<br>( $^{\circ}\text{C}$ ) | Water<br>temperature<br>( $^{\circ}\text{C}$ ) |
|------------------------------------|---------------------------|------------------------------------|----------------|--|---|-------------------------------------|--|--|--|
| 92                                 | Lf-9913Z                  | 301058092015001                    | 2/06/02        | 155  | 181   | 6.4                                 | 6.6                                      | 8.0  | 17.4   |
| 93                                 | Lf-9914Z                  | 301114092031901                    | 12/20/01       | 492  | 493   | 7.3                                 | 7.4                                      | 18.0   | 16.1   |
| 95                                 | Lf-9968Z                  | 300643092040301                    | 12/04/01       | 206  | 214   | 6.5                                 | 6.8                                      | 23.5   | 21.5   |
| 96                                 | Lf-9969Z                  | 300906092031301                    | 12/05/01       | 364  | 368   | 6.5                                 | 6.9                                      | 20.0   | 21.3   |
| 97                                 | Lf-9973Z                  | 300946091591601                    | 1/28/02        | 93   | 96  | 5.9                                 | 6.1                                      | 25.0   | 21.3   |
| 98                                 | Lf-9974Z                  | 301014092000102                    | 2/06/02        | 100  | 107   | 5.8                                 | 6.1                                      | 8.0  | 20.7   |
| 99                                 | Lf-9998Z                  | 300825092044501                    | 12/05/01       | 936  | 940   | 6.8                                 | 7.1                                      | 21.5   | 21.9   |
| 100                                | Lf-9975Z                  | 301202092050501                    | 12/04/01       | 431  | 447   | 6.9                                 | 7.2                                      | 20.5   | 22.9   |
| 101                                | Lf-9976Z                  | 300824091593201                    | 1/23/02        | 170  | 179   | 6.5                                 | 7.0                                      | 22.0   | 22.3   |
| 102                                | Lf-9999Z                  | 301015092015001                    | 3/14/02        | 437  | 445   | 7.4                                 | 7.8                                      | 26.0   | 22.4   |
| 103                                | Lf-10000Z                 | 301907092003401                    | 2/07/02        | 107  | 113   | 6.0                                 | 6.4                                      | 10.0   | 19.2   |
| 104                                | Lf-10001Z                 | 301336092035401                    | 12/3/01        | 311  | 316   | 6.7                                 | 7.1                                      | 24.0   | 20.5   |
| 105                                | Lf-10009Z                 | 301213092053501                    | 1/30/02        | 239  | 247   | 6.5                                 | 6.9                                      | 23.0   | 22.4   |
| 106                                | Lf-10010Z                 | 300932092003701                    | 2/04/02        | 250  | 263   | 6.6                                 | 7.0                                      | 15.0   | 19.9   |
| 108                                | Lf-10012Z                 | 301424092055801                    | 12/06/01       | 375  | 379   | 6.4                                 | 7.0                                      | 21.0   | 22.9   |
| 109                                | Lf-10013Z                 | 300916092051901                    | 2/11/02        | 956  | 1,000   | 6.5                                 | 6.6                                      | 13.0   | 19.2   |
| 110                                | Lf-10014Z                 | 301100092005801                    | 1/22/02        | 316  | 318   | 6.1                                 | 6.2                                      | 18.0   | 21.3   |
| 111                                | Lf-10015Z                 | 301147092040701                    | 1/29/02        | 336  | 345   | 6.6                                 | 6.8                                      | 25.0   | 22.3   |
| 112                                | Lf-10016Z                 | 301253092042001                    | 12/19/01       | 365  | 370   | 7.1                                 | 7.5                                      | 17.0   | 21.5   |
| 113                                | Lf-10017Z                 | 301035092055801                    | 1/29/02        | 471  | 480   | 7.3                                 | 7.5                                      | 25.0   | 22.8   |
| 114                                | Lf-10180Z                 | 301107092033001                    | 12/19/01       | 316  | 328   | 6.6                                 | 6.9                                      | 20.5   | 21.6   |
| 115                                | Lf-10181Z                 | 301425091593901                    | 1/30/02        | 123  | 128   | 5.8                                 | 6.1                                      | 23.0   | 23.2   |
| 116                                | Lf-10026Z                 | 301355092005601                    | 2/14/02        | 216  | 217   | 6.5                                 | 6.5                                      | 15.0   | 20.5   |
| 117                                | Lf-10027Z                 | 301619091595301                    | 12/11/01       | 168  | 171   | 6.1                                 | 6.3                                      | 14.0   | 19.0   |
| 118                                | Lf-10028Z                 | 301421092022901                    | 2/07/02        | 290  | 308   | 6.8                                 | 7.3                                      | 13.0   | 20.2   |
| 119                                | Lf-10029Z                 | 301332091593001                    | 2/04/02        | 143  | 154   | 6.0                                 | 6.3                                      | 15.0   | 20.6   |
| 120                                | Lf-10030Z                 | 301234092012401                    | 12/11/01       | 169  | 171   | 5.8                                 | 6.2                                      | 14.0   | 18.5   |
| 121                                | Lf-10031Z                 | 301148092024101                    | 2/13/02        | 272  | 279   | 6.7                                 | 7.0                                      | 22.0   | 23.7   |



**Appendix 1.** General ground-water properties of water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Air<br>pressure<br>(mm Hg) | Turbidity<br>(nephelometric<br>turbidity units) | Dissolved<br>oxygen<br>(mg/L) | Dissolved<br>oxygen<br>(percent) | Acid neutralizing capacity,<br>fixed end-point<br>titration, field<br>(mg/L as CaCO <sub>3</sub> ) | Alkalinity,<br>incremental titration, field<br>(mg/L as CaCO <sub>3</sub> ) | Alkalinity,<br>fixed end-point titration, laboratory<br>(mg/L as CaCO <sub>3</sub> ) |
|------------------------------------|----------------------------|---|-------------------------------|----------------------------------|--|---|--|
| 92                                 | 761                        | 27  | 0.5                           | 5                                | 57   | 54  | 58   |
| 93                                 | ---                        | 120   | ---                           | ---                              | ---  | 240   | 250  |
| 95                                 | 767                        | .90   | .7                            | 8                                | 92   | 98  | 98   |
| 96                                 | 767                        | 7.2   | .5                            | 6                                | 170  | 160   | 170  |
| 97                                 | 762                        | 24  | 5.8                           | 65                               | 35   | 35  | 38   |
| 98                                 | 761                        | 2.9   | .3                            | 3                                | 40   | 38  | 41   |
| 99                                 | 767                        | .70   | .4                            | 4                                | 400  | 390   | 420  |
| 100                                | 767                        | 1.8   | 1.1                           | 13                               | 190  | 200   | 210  |
| 101                                | 762                        | .40   | 6.6                           | 76                               | 71   | 67  | 79   |
| 102                                | 759                        | 34  | 1.4                           | 16                               | 210  | 200   | 230  |
| 103                                | 765                        | 1.8   | 4.0                           | 43                               | 36   | 38  | 43   |
| 104                                | 767                        | .60   | .5                            | 6                                | 140  | 130   | 150  |
| 105                                | 761                        | .80   | 1.8                           | 21                               | 86   | 92  | 99   |
| 106                                | 770                        | 8.6   | 1.3                           | 14                               | 120  | 120   | 130  |
| 108                                | 767                        | 1.1   | .8                            | 10                               | 160  | 100   | 160  |
| 109                                | 771                        | .60   | .6                            | 6                                | 120  | 120   | 130  |
| 110                                | 764                        | 3.8   | 1.7                           | 19                               | 120  | 120   | 130  |
| 111                                | 763                        | .70   | .4                            | 5                                | 140  | 140   | 160  |
| 112                                | 763                        | .70   | .5                            | 6                                | 170  | 160   | 170  |
| 113                                | 763                        | ---   | .4                            | 4                                | 230  | 240   | 250  |
| 114                                | 763                        | .50   | .5                            | 5                                | 160  | 160   | 160  |
| 115                                | 761                        | 5.3   | 3.5                           | 41                               | 46   | 48  | 51   |
| 116                                | 769                        | 1.8   | .3                            | 4                                | 87   | 85  | ---  |
| 117                                | 763                        | 13  | ---                           | ---                              | 62   | 60  | 62   |
| 118                                | 765                        | 7.2   | .3                            | 3                                | 140  | 140   | 150  |
| 119                                | 770                        | 1.0   | 4.5                           | 50                               | 54   | 57  | 60   |
| 120                                | 764                        | 1.0   | ---                           | ---                              | 69   | 63  | 55   |
| 121                                | 767                        | 4.6   | .4                            | 5                                | 120  | 120   | 130  |

## Appendix 2. Dissolved solids and major inorganic ion concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; °C, degrees Celsius; mg/L, milligrams per liter; E, estimated]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification number | Sample<br>date | Dissolved solids,<br>residue at 180°C<br>(mg/L)<br>no CAS number | Calcium<br>(mg/L<br>as Ca)<br>7440-70-2 | Magnesium<br>(mg/L<br>as Mg)<br>7439-95-4 |
|------------------------------------|---------------------------|------------------------------------|----------------|--|---|---|
| 92                                 | Lf-9913Z                  | 301058092015001                    | 2/06/02        | 98   | 15                                      | 3.9                                       |
| 93                                 | Lf-9914Z                  | 301114092031901                    | 12/20/01       | 294  | 37                                      | 14  |
| 95                                 | Lf-9968Z                  | 300643092040301                    | 12/04/01       | 160  | 14                                      | 5.4                                       |
| 96                                 | Lf-9969Z                  | 300906092031301                    | 12/05/01       | 226  | 29                                      | 9.0                                       |
| 97                                 | Lf-9973Z                  | 300946091591601                    | 1/28/02        | 86   | 5.8                                     | 2.1                                       |
| 98                                 | Lf-9974Z                  | 301014092000102                    | 2/06/02        | 80   | 8.9                                     | 2.7                                       |
| 99                                 | Lf-9998Z                  | 300825092044501                    | 12/05/01       | 556  | 98                                      | 27  |
| 100                                | Lf-9975Z                  | 301202092050501                    | 12/04/01       | 274  | 38                                      | 12  |
| 101                                | Lf-9976Z                  | 300824091593201                    | 1/23/02        | 148  | 5.9                                     | 1.4                                       |
| 102                                | Lf-9999Z                  | 301015092015001                    | 3/14/02        | 260  | 38                                      | 16  |
| 103                                | Lf-10000Z                 | 301907092003401                    | 2/07/02        | 106  | 7.2                                     | 2.3                                       |
| 104                                | Lf-10001Z                 | 301336092035401                    | 12/03/01       | 202  | 28                                      | 9.3                                       |
| 105                                | Lf-10009Z                 | 301213092053501                    | 1/30/02        | 162  | 18                                      | 6.2                                       |
| 106                                | Lf-10010Z                 | 300932092003701                    | 2/04/02        | 178  | 20                                      | 7.0                                       |
| 108                                | Lf-10012Z                 | 301424092055801                    | 12/06/01       | 230  | 30                                      | 11  |
| 109                                | Lf-10013Z                 | 300916092051901                    | 2/11/02        | 588  | 60                                      | 26  |
| 110                                | Lf-10014Z                 | 301100092005801                    | 1/22/02        | 208  | 24                                      | 8.0                                       |
| 111                                | Lf-10015Z                 | 301147092040701                    | 1/29/02        | 212  | 27                                      | 8.3                                       |
| 112                                | Lf-10016Z                 | 301253092042001                    | 12/19/01       | 206  | 38                                      | 9.3                                       |
| 113                                | Lf-10017Z                 | 301035092055801                    | 1/29/02        | 286  | 49                                      | 11  |
| 114                                | Lf-10180Z                 | 301107092033001                    | 12/19/01       | 192  | 26                                      | 7.3                                       |
| 115                                | Lf-10181Z                 | 301425091593901                    | 1/30/02        | 106  | 9.6                                     | 4.4                                       |
| 116                                | Lf-10026Z                 | 301355092005601                    | 2/14/02        | 156  | 15                                      | 6.0                                       |
| 117                                | Lf-10027Z                 | 301619091595301                    | 12/11/01       | 126  | 14                                      | 3.2                                       |
| 118                                | Lf-10028Z                 | 301421092022901                    | 2/07/02        | 190  | 23                                      | 10  |
| 119                                | Lf-10029Z                 | 301332091593001                    | 2/04/02        | 140  | 9.2                                     | 3.0                                       |
| 120                                | Lf-10030Z                 | 301234092012401                    | 12/11/01       | 146  | 14                                      | 2.9                                       |
| 121                                | Lf-10031Z                 | 301148092024101                    | 2/13/02        | 172  | 25                                      | 9.4                                       |

**Appendix 2.** Dissolved solids and major inorganic ion concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Sodium<br>(mg/L as Na)<br>7440-23-5 | Potassium<br>(mg/L as K)<br>7440-09-7 | Bicarbonate, dissolved (calculated)<br>(mg/L as HCO <sub>3</sub> )<br>no CAS number | Sulfate<br>(mg/L as SO <sub>4</sub> )<br>14808-79-8 | Chloride<br>(mg/L as Cl)<br>16887-00-6 | Fluoride<br>(mg/L as F)<br>16984-48-8 | Bromide<br>(mg/L as Br)<br>24959-67-9 | Silica<br>(mg/L as SiO <sub>2</sub> )<br>7631-86-9 |
|------------------------------------|-------------------------------------|---------------------------------------|---|---|--|---------------------------------------|---------------------------------------|--|
| 92                                 | 8.6                                 | 3.6                                   | 65  | 6.7   | 11                                     | 0.2                                   | 0.05                                  | 11   |
| 93                                 | 42                                  | 2.4                                   | 290   | 7.1   | 4.2                                    | .4                                    | .08                                   | 30   |
| 95                                 | 21                                  | 1.9                                   | 120   | 1.1   | 8.3                                    | .3                                    | .06                                   | 44   |
| 96                                 | 27                                  | 1.2                                   | 200   | 2.8   | 10                                     | .4                                    | .05                                   | 36   |
| 97                                 | 8.5                                 | 2.3                                   | 43  | 3.9   | 3.6                                    | E.1                                   | .04                                   | 38   |
| 98                                 | 5.9                                 | 1.4                                   | 47  | 7.5   | 2.4                                    | .2                                    | .07                                   | 21   |
| 99                                 | 50                                  | 1.8                                   | 480   | 17  | 53                                     | .3                                    | .43                                   | 32   |
| 100                                | 34                                  | 1.8                                   | 240   | E.1   | 19                                     | .4                                    | .10                                   | 36   |
| 101                                | 21                                  | 12                                    | 82  | 1.2   | 5.2                                    | .3                                    | .08                                   | 44   |
| 102                                | 28                                  | 5.8                                   | 250   | 1.2   | 6.4                                    | .3                                    | .07                                   | 26   |
| 103                                | 10                                  | 1.5                                   | 46  | 4.1   | 2.5                                    | .2                                    | .07                                   | 44   |
| 104                                | 22                                  | 1.5                                   | 160   | 1.4   | 11                                     | .3                                    | .08                                   | 38   |
| 105                                | 21                                  | 2.9                                   | 110   | 6.5   | 12                                     | .3                                    | .16                                   | 39   |
| 106                                | 21                                  | 6.2                                   | 150   | 1.6   | 2.4                                    | .2                                    | .04                                   | 41   |
| 108                                | 30                                  | 2.2                                   | 130   | 2.4   | 19                                     | .4                                    | .13                                   | 37   |
| 109                                | 87                                  | 4.0                                   | 140   | 14  | 170                                    | .4                                    | .39                                   | 37   |
| 110                                | 26                                  | 2.7                                   | 140   | 4.5   | 16                                     | .2                                    | .52                                   | 43   |
| 111                                | 30                                  | 2.3                                   | 170   | 1.2   | 14                                     | .3                                    | .10                                   | 37   |
| 112                                | 21                                  | 2.7                                   | 200   | 3.0   | 12                                     | .3                                    | .09                                   | 31   |
| 113                                | 37                                  | 1.7                                   | 290   | .5  | 10                                     | .2                                    | .06                                   | 30   |
| 114                                | 30                                  | 1.6                                   | 190   | 1.1   | 7.2                                    | .3                                    | .06                                   | 36   |
| 115                                | 7.2                                 | 1.7                                   | 59  | 3.6   | 5.0                                    | .2                                    | .09                                   | 44   |
| 116                                | 14                                  | 4.4                                   | 100   | 9.8   | 8.8                                    | .3                                    | .18                                   | 43   |
| 117                                | 13                                  | 1.6                                   | 74  | 3.2   | 9.8                                    | .2                                    | .06                                   | 35   |
| 118                                | 22                                  | 1.7                                   | 170   | .7  | 6.4                                    | .4                                    | .05                                   | 35   |
| 119                                | 16                                  | 1.4                                   | 70  | .4  | 7.5                                    | .2                                    | .05                                   | 60   |
| 120                                | 14                                  | 1.3                                   | 77  | 11  | 7.7                                    | .2                                    | .12                                   | 52   |
| 121                                | 17                                  | 2.0                                   | 150   | 1.1   | 7.1                                    | .5                                    | .07                                   | 34   |

**Appendix 3.** Trace-element concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; µg/L, micrograms per liter; <, less than; E, estimated; ---, no data]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification number | Sample<br>date | Aluminum<br>(µg/L as Al)<br>7429-90-5 | Antimony<br>(µg/L as Sb)<br>7440-36-0 | Arsenic<br>(µg/L as As)<br>7440-38-2 | Barium<br>(µg/L as Ba)<br>7440-39-3 | Beryllium<br>(µg/L as Be)<br>7440-41-7 | Boron<br>(µg/L as B)<br>7440-42-8 |
|------------------------------------|---------------------------|------------------------------------|----------------|---------------------------------------|---------------------------------------|--------------------------------------|-------------------------------------|--|-----------------------------------|
| 92                                 | Lf-9913Z                  | 301058092015001                    | 2/06/02        | 2                                     | 0.06                                  | 0.4                                  | 240                                 | <0.06                                  | 20                                |
| 93                                 | Lf-9914Z                  | 301114092031901                    | 12/20/01       | 2                                     | .22                                   | 1.7                                  | 120                                 | <.06                                   | 40                                |
| 95                                 | Lf-9968Z                  | 300643092040301                    | 12/04/01       | <1                                    | <.05                                  | 1.1                                  | 80                                  | <.06                                   | 30                                |
| 96                                 | Lf-9969Z                  | 300906092031301                    | 12/05/01       | 2                                     | .10                                   | 2.3                                  | 100                                 | <.06                                   | 30                                |
| 97                                 | Lf-9973Z                  | 300946091591601                    | 1/28/02        | <1                                    | E.03                                  | .8                                   | 40                                  | <.06                                   | 10                                |
| 98                                 | Lf-9974Z                  | 301014092000102                    | 2/06/02        | 1                                     | <.05                                  | .3                                   | 100                                 | <.06                                   | 20                                |
| 99                                 | Lf-9998Z                  | 300825092044501                    | 12/05/01       | <1                                    | .08                                   | 1.5                                  | 230                                 | <.06                                   | 50                                |
| 100                                | Lf-9975Z                  | 301202092050501                    | 12/04/01       | <1                                    | .07                                   | 2.1                                  | 110                                 | <.06                                   | 30                                |
| 101                                | Lf-9976Z                  | 300824091593201                    | 1/23/02        | 9                                     | E.03                                  | 1.5                                  | 30                                  | <.06                                   | 20                                |
| 102                                | Lf-9999Z                  | 301015092015001                    | 3/14/02        | <1                                    | .27                                   | 1.7                                  | 130                                 | <.06                                   | 40                                |
| 103                                | Lf-10000Z                 | 301907092003401                    | 2/07/02        | <1                                    | E.03                                  | .6                                   | 34                                  | <.06                                   | 20                                |
| 104                                | Lf-10001Z                 | 301336092035401                    | 12/03/01       | <1                                    | .06                                   | 3.0                                  | 100                                 | <.06                                   | 20                                |
| 105                                | Lf-10009Z                 | 301213092053501                    | 1/30/02        | <1                                    | .06                                   | 1.3                                  | 73                                  | <.06                                   | 30                                |
| 106                                | Lf-10010Z                 | 300932092003701                    | 2/04/02        | 16                                    | .05                                   | 1.4                                  | 100                                 | <.06                                   | 20                                |
| 108                                | Lf-10012Z                 | 301424092055801                    | 12/06/01       | <1                                    | E.04                                  | 1.9                                  | 120                                 | <.06                                   | 30                                |
| 109                                | Lf-10013Z                 | 300916092051901                    | 2/11/02        | <1                                    | E.04                                  | .5                                   | 240                                 | <.06                                   | 40                                |
| 110                                | Lf-10014Z                 | 301100092005801                    | 1/22/02        | 2                                     | E.03                                  | .7                                   | 97                                  | <.06                                   | 30                                |
| 111                                | Lf-10015Z                 | 301147092040701                    | 1/29/02        | <1                                    | .06                                   | 1.5                                  | 100                                 | <.06                                   | 20                                |
| 112                                | Lf-10016Z                 | 301253092042001                    | 12/19/01       | <1                                    | .07                                   | 2.1                                  | 110                                 | <.06                                   | 20                                |
| 113                                | Lf-10017Z                 | 301035092055801                    | 1/29/02        | 2                                     | E.03                                  | 5.6                                  | 140                                 | <.06                                   | 40                                |
| 114                                | Lf-10180Z                 | 301107092033001                    | 12/19/01       | <1                                    | <.05                                  | 1.9                                  | 95                                  | <.06                                   | 50                                |
| 115                                | Lf-10181Z                 | 301425091593901                    | 1/30/02        | 2                                     | <.05                                  | .8                                   | 40                                  | <.06                                   | 20                                |
| 116                                | Lf-10026Z                 | 301355092005601                    | 2/14/02        | <1                                    | E.04                                  | 5.7                                  | 84                                  | <.06                                   | 30                                |
| 117                                | Lf-10027Z                 | 301619091595301                    | 12/11/01       | 1                                     | E.03                                  | .5                                   | 45                                  | <.06                                   | 40                                |
| 118                                | Lf-10028Z                 | 301421092022901                    | 2/07/02        | <1                                    | .05                                   | 1.9                                  | 75                                  | <.06                                   | 30                                |
| 119                                | Lf-10029Z                 | 301332091593001                    | 2/04/02        | 2                                     | E.04                                  | .5                                   | 41                                  | <.06                                   | 20                                |
| 120                                | Lf-10030Z                 | 301234092012401                    | 12/11/01       | <1                                    | E.05                                  | 1.5                                  | 72                                  | <.06                                   | 60                                |
| 121                                | Lf-10031Z                 | 301148092024101                    | 2/13/02        | <1                                    | .05                                   | .8                                   | 96                                  | <.06                                   | 20                                |

**Appendix 3.** Trace-element concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Cadmium<br>(µg/L as Cd)<br>7440-43-9 | Chromium<br>(µg/L as Cr)<br>740-47-3 | Cobalt<br>(µg/L as Co)<br>7440-48-4 | Copper<br>(µg/L as Cu)<br>7440-50-8 | Iron<br>(µg/L as Fe)<br>7439-89-6 | Lead<br>(µg/L as Pb)<br>7439-92-1 | Lithium<br>(µg/L as Li)<br>7439-93-2 | Manganese<br>(µg/L as Mn)<br>7439-96-5 |
|------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|--------------------------------------|--|
| 92                                 | <0.04                                | <0.8                                 | 0.1                                 | 0.6                                 | <10                               | <0.08                             | 0.8                                  | 30                                     |
| 93                                 | .05                                  | <.8                                  | 1.1                                 | .4                                  | <10                               | <.08                              | 20                                   | 730                                    |
| 95                                 | .04                                  | <.8                                  | 1.4                                 | .3                                  | <10                               | <.08                              | 6.0                                  | 110                                    |
| 96                                 | E.03                                 | E.4                                  | 1.6                                 | .4                                  | 30                                | .12                               | 10                                   | 320                                    |
| 97                                 | E.04                                 | 6                                    | .3                                  | 22                                  | <10                               | <.08                              | 8.1                                  | 5                                      |
| 98                                 | .09                                  | <.8                                  | 1.6                                 | .3                                  | E5.9                              | <.08                              | 2.1                                  | 340                                    |
| 99                                 | .19                                  | <.8                                  | 3.1                                 | .6                                  | <10                               | .08                               | 20                                   | 1,700                                  |
| 100                                | .12                                  | E.5                                  | 3.0                                 | .3                                  | <10                               | <.08                              | 10                                   | 580                                    |
| 101                                | <.04                                 | 20                                   | .1                                  | 5                                   | <10                               | <.08                              | 20                                   | <2                                     |
| 102                                | .22                                  | <.8                                  | 10                                  | 280                                 | <10                               | .15                               | 20                                   | 800                                    |
| 103                                | .04                                  | 6                                    | .1                                  | 11                                  | 20                                | <.08                              | 7.4                                  | 7                                      |
| 104                                | .06                                  | E.5                                  | 1.5                                 | .4                                  | <10                               | E.05                              | 7.2                                  | 160                                    |
| 105                                | .05                                  | 1                                    | .6                                  | 26                                  | <10                               | <.08                              | 10                                   | 85                                     |
| 106                                | .18                                  | 2                                    | .5                                  | 2                                   | <10                               | <.08                              | 20                                   | 49                                     |
| 108                                | .12                                  | <.8                                  | 2.5                                 | .4                                  | <10                               | .17                               | 5.4                                  | 160                                    |
| 109                                | .40                                  | E.5                                  | 2.9                                 | 64                                  | E6.8                              | .15                               | 20                                   | 1,100                                  |
| 110                                | .10                                  | 10                                   | .1                                  | 9                                   | E9.0                              | E.05                              | 20                                   | 6                                      |
| 111                                | .08                                  | <.8                                  | 1.2                                 | 12                                  | <10                               | <.08                              | 10                                   | 220                                    |
| 112                                | E.02                                 | E.6                                  | .4                                  | E.2                                 | 40                                | <.08                              | 10                                   | 270                                    |
| 113                                | <.04                                 | <.8                                  | .2                                  | 12                                  | 70                                | <.08                              | 10                                   | 390                                    |
| 114                                | .09                                  | <.8                                  | 1.2                                 | .3                                  | <10                               | <.08                              | 6.9                                  | 170                                    |
| 115                                | .04                                  | 4                                    | .2                                  | 12                                  | <10                               | <.08                              | 10                                   | 12                                     |
| 116                                | <.04                                 | <.8                                  | 1.1                                 | 6                                   | ---                               | E.07                              | 20                                   | 320                                    |
| 117                                | <.04                                 | 8                                    | .1                                  | E.2                                 | <10                               | <.08                              | 8.2                                  | E2                                     |
| 118                                | .05                                  | <.8                                  | 1.2                                 | 8                                   | 30                                | E.05                              | 10                                   | 740                                    |
| 119                                | E.04                                 | 8                                    | .1                                  | 11                                  | 10                                | <.08                              | 10                                   | 7                                      |
| 120                                | .04                                  | 4                                    | .1                                  | .4                                  | <10                               | E.08                              | 20                                   | 4                                      |
| 121                                | .07                                  | E.6                                  | .5                                  | 19                                  | E6.1                              | <.08                              | 8.0                                  | 65                                     |

**Appendix 3.** Trace-element concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Molybdenum<br>(µg/L as Mo)<br>7439-98-7 | Nickel<br>(µg/L as Ni)<br>7440-02-0 | Selenium<br>(µg/L as Se)<br>7782-49-2 | Silver<br>(µg/L as Ag)<br>7440-22-4 | Strontium<br>(µg/L as Sr)<br>7440-24-6 | Thallium<br>(µg/L as Tl)<br>7440-28-0 | Uranium<br>(µg/L as U)<br>7440-61-0 | Vanadium<br>(µg/L as V)<br>7440-62-2 | Zinc<br>(µg/L as Zn)<br>7440-66-6 |
|------------------------------------|---|-------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| 92                                 | 0.2                                     | 1                                   | E0.2                                  | <1                                  | 160                                    | E0.03                                 | E0.02                               | 0.8                                  | <1                                |
| 93                                 | 4                                       | 1                                   | .4                                    | <1                                  | 160                                    | <.04                                  | 1.4                                 | 5.8                                  | 2                                 |
| 95                                 | 1                                       | 1                                   | E.2                                   | <1                                  | 130                                    | <.04                                  | E.01                                | 3.4                                  | <1                                |
| 96                                 | 1                                       | 1                                   | E.2                                   | <1                                  | 90                                     | E.04                                  | .47                                 | 2.6                                  | <1                                |
| 97                                 | E.1                                     | 2                                   | E.3                                   | <1                                  | 40                                     | E.03                                  | E.01                                | 2.0                                  | 1                                 |
| 98                                 | E.1                                     | 3                                   | E.2                                   | <1                                  | 100                                    | <.04                                  | <.02                                | 1.1                                  | 1                                 |
| 99                                 | 1                                       | 1                                   | .4                                    | <1                                  | 280                                    | E.02                                  | 3.2                                 | 2.4                                  | <1                                |
| 100                                | 5                                       | 2                                   | <.3                                   | <1                                  | 160                                    | E.03                                  | .63                                 | 6.5                                  | <1                                |
| 101                                | .5                                      | 1                                   | .5                                    | <1                                  | 120                                    | E.02                                  | .07                                 | 3.9                                  | <1                                |
| 102                                | 4                                       | 3                                   | <.3                                   | <1                                  | 140                                    | <.04                                  | .76                                 | 1.9                                  | 3                                 |
| 103                                | .5                                      | 4                                   | E.2                                   | <1                                  | 30                                     | <.04                                  | E.01                                | 1.7                                  | 2                                 |
| 104                                | .7                                      | 1                                   | <.3                                   | <1                                  | 220                                    | <.04                                  | .11                                 | 2.8                                  | <1                                |
| 105                                | .5                                      | 1                                   | 3                                     | <1                                  | 110                                    | <.04                                  | .03                                 | 3.8                                  | 2                                 |
| 106                                | 1                                       | 6                                   | <.3                                   | <1                                  | 160                                    | <.04                                  | .04                                 | 3.5                                  | <1                                |
| 108                                | 1                                       | 2                                   | 2                                     | <1                                  | 240                                    | <.04                                  | .27                                 | 3.9                                  | <1                                |
| 109                                | .7                                      | 3                                   | 1                                     | <1                                  | 410                                    | <.04                                  | .08                                 | 2.3                                  | 1                                 |
| 110                                | E.2                                     | 2                                   | <.3                                   | <1                                  | 130                                    | <.04                                  | .03                                 | 6.6                                  | <1                                |
| 111                                | .6                                      | 2                                   | 2                                     | <1                                  | 140                                    | E.02                                  | .09                                 | 3.6                                  | 10                                |
| 112                                | 3                                       | 1                                   | E.2                                   | <1                                  | 120                                    | E.03                                  | .25                                 | .8                                   | <1                                |
| 113                                | 2                                       | 0                                   | <.3                                   | <1                                  | 120                                    | <.04                                  | 2.0                                 | 2.6                                  | 1                                 |
| 114                                | .9                                      | 1                                   | 2                                     | <1                                  | 180                                    | <.04                                  | .10                                 | 3.8                                  | <1                                |
| 115                                | E.1                                     | 3                                   | .5                                    | <1                                  | 30                                     | <.04                                  | <.02                                | 4.5                                  | 1                                 |
| 116                                | 2                                       | 1                                   | <.3                                   | <1                                  | 60                                     | <.04                                  | <.02                                | .9                                   | 1                                 |
| 117                                | <.2                                     | 1                                   | .4                                    | <1                                  | 40                                     | <.04                                  | E.01                                | 1.3                                  | <1                                |
| 118                                | 1                                       | 1                                   | <.3                                   | <1                                  | 70                                     | E.02                                  | .07                                 | .5                                   | <1                                |
| 119                                | .3                                      | 4                                   | .6                                    | <1                                  | 30                                     | <.04                                  | <.02                                | 4.4                                  | <1                                |
| 120                                | E.1                                     | 2                                   | 2                                     | <1                                  | 60                                     | E.03                                  | <.02                                | 2.3                                  | 1                                 |
| 121                                | 2                                       | 2                                   | <.3                                   | <1                                  | 130                                    | <.04                                  | .10                                 | 3.5                                  | <1                                |

**Appendix 4.** Nutrients and dissolved organic carbon concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; mg/L, milligrams per liter; <, less than; E, estimated]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification number | Sample<br>date | Nitrogen,<br>ammonia,<br>dissolved<br>(mg/L as N)<br>7664-41-7 | Nitrogen,<br>ammonia plus<br>organic,<br>dissolved<br>(mg/L as N)<br>17778-88-0 | Nitrogen,<br>nitrite plus<br>nitrate,<br>dissolved<br>(mg/L as N)<br>N/A | Nitrogen,<br>nitrite<br>(mg/L as N)<br>14797-65-0 | Phosphorus,<br>dissolved<br>(mg/L as P)<br>7732-14-0 | Orthophosphate,<br>dissolved<br>(mg/L as P)<br>14265-44-2 | Carbon,<br>organic,<br>dissolved<br>(mg/L as C)<br>no CAS number |
|------------------------------------|---------------------------|------------------------------------|----------------|--|---|--|---|--|---|--|
| 92                                 | Lf-9913Z                  | 301058092015001                    | 2/06/02        | <0.04  | E0.07   | E0.05  | <0.01   | 0.04   | 0.04  | 1.6  |
| 93                                 | Lf-9914Z                  | 301114092031901                    | 12/20/01       | <.04   | E.09  | .13  | E.01  | .10  | .09   | .7   |
| 95                                 | Lf-9968Z                  | 300643092040301                    | 12/04/01       | <.04   | <.10  | .19  | E.01  | .54  | .55   | <.3  |
| 96                                 | Lf-9969Z                  | 300906092031301                    | 12/05/01       | E.03   | E.10  | <.05   | <.01  | .32  | .32   | .4   |
| 97                                 | Lf-9973Z                  | 300946091591601                    | 1/28/02        | <.04   | <.10  | <.05   | <.01  | .21  | .19   | E.2  |
| 98                                 | Lf-9974Z                  | 301014092000102                    | 2/06/02        | <.04   | E.06  | E.05   | <.01  | .07  | .07   | .4   |
| 99                                 | Lf-9998Z                  | 300825092044501                    | 12/05/01       | E.02   | E.07  | 1.9  | .03   | .31  | .31   | 1.2  |
| 100                                | Lf-9975Z                  | 301202092050501                    | 12/04/01       | <.04   | <.10  | <.05   | <.01  | .31  | .31   | E.2  |
| 101                                | Lf-9976Z                  | 300824091593201                    | 1/23/02        | <.04   | <.10  | .55  | <.01  | .47  | .45   | <.3  |
| 102                                | Lf-9999Z                  | 301015092015001                    | 3/14/02        | .06  | E.10  | <.05   | <.01  | .19  | .17   | .7   |
| 103                                | Lf-10000Z                 | 301907092003401                    | 2/07/02        | <.04   | <.10  | 1.3  | <.01  | .15  | .14   | E.2  |
| 104                                | Lf-10001Z                 | 301336092035401                    | 12/03/01       | <.04   | E.05  | <.05   | <.01  | .49  | .48   | E.2  |
| 105                                | Lf-10009Z                 | 301213092053501                    | 1/30/02        | <.04   | <.10  | .51  | <.01  | .38  | .35   | E.3  |
| 106                                | Lf-10010Z                 | 300932092003701                    | 2/04/02        | <.04   | <.10  | .38  | <.01  | .42  | .43   | .6   |
| 108                                | Lf-10012Z                 | 301424092055801                    | 12/06/01       | <.04   | <.10  | .61  | .03   | .39  | .38   | .4   |
| 109                                | Lf-10013Z                 | 300916092051901                    | 2/11/02        | <.04   | E.07  | 22   | .05   | .25  | .26   | <.3  |
| 110                                | Lf-10014Z                 | 301100092005801                    | 1/22/02        | <.04   | <.10  | .43  | <.01  | .23  | .24   | .5   |
| 111                                | Lf-10015Z                 | 301147092040701                    | 1/29/02        | <.04   | <.10  | .14  | <.01  | .31  | .29   | E.3  |
| 112                                | Lf-10016Z                 | 301253092042001                    | 12/19/01       | <.04   | E.06  | E.02   | <.01  | .20  | .17   | E.3  |
| 113                                | Lf-10017Z                 | 301035092055801                    | 1/29/02        | .06  | E.08  | <.05   | <.01  | .23  | .21   | .7   |
| 114                                | Lf-10180Z                 | 301107092033001                    | 12/19/01       | E.02   | <.10  | .10  | <.01  | .47  | .44   | E.3  |
| 115                                | Lf-10181Z                 | 301425091593901                    | 1/30/02        | <.04   | <.10  | .43  | <.01  | .24  | .22   | E.3  |
| 116                                | Lf-10026Z                 | 301355092005601                    | 2/14/02        | .05  | E.07  | <.05   | <.01  | .58  | .10   | .4   |
| 117                                | Lf-10027Z                 | 301619091595301                    | 12/11/01       | <.04   | <.10  | .86  | <.01  | .09  | .09   | E.2  |
| 118                                | Lf-10028Z                 | 301421092022901                    | 2/07/02        | E.03   | E.06  | <.05   | <.01  | .43  | .44   | E.2  |
| 119                                | Lf-10029Z                 | 301332091593001                    | 2/04/02        | <.04   | <.10  | .30  | <.01  | .30  | .30   | E.3  |
| 120                                | Lf-10030Z                 | 301234092012401                    | 12/11/01       | <.04   | <.10  | .87  | <.01  | .46  | .46   | E.2  |
| 121                                | Lf-10031Z                 | 301148092024101                    | 2/13/02        | <.04   | <.10  | <.05   | <.01  | .28  | E.27  | E.2  |

**Appendix 5.** Radon, chlorofluorocarbons, and stable isotope concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; pCi/L, picocuries per liter; pg/kg, picograms per kilogram; ratio per mil, parts per thousand; ---, no data; <, less than]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification<br>number | Sample<br>date | Radon-222,<br>total<br>(pCi/L)<br>14859-67-7 | Radon-222,<br>2-sigma<br>precision<br>estimate<br>(pCi/L) | CFC-11<br>trichloro-<br>fluoromethane<br>(pg/kg)<br>75-69-4 | CFC-113<br>trichlorotri-<br>fluoroethane<br>(pg/kg)<br>76-13-1 | CFC-12<br>dichlorodi-<br>fluoromethane<br>(pg/kg)<br>75-71-8 | Apparent<br>ground-water<br>age<br>(years) | Hydrogen<br>2/1 ratio<br>(ratio per mil)<br>no CAS number | Oxygen<br>18/16 ratio<br>(ratio per mil)<br>no CAS number |
|------------------------------------|---------------------------|---------------------------------------|----------------|--|---|---|--|--|--|---|---|
| 92                                 | Lf-9913Z                  | 301058092015001                       | 2/06/02        | 1,130  | 36  | ---   | ---  | ---  | ---  | ---   | ---   |
| 95                                 | Lf-9968Z                  | 301114092031901                       | 12/04/01       | 335  | 22  | ---   | ---  | ---  | ---  | ---   | ---   |
| 95                                 | Lf-9968Z                  | 300643092040301                       | 7/17/02        | ---  | ---   | 7.0   | 0  | 5.8  | 50   | -17.1   | -3.51   |
| 96                                 | Lf-9969Z                  | 300906092031301                       | 12/05/01       | 1,080  | 32  | ---   | ---  | ---  | ---  | ---   | ---   |
| 98                                 | Lf-9974Z                  | 300946091591601                       | 2/06/02        | 2,220  | 47  | ---   | ---  | ---  | ---  | ---   | ---   |
| 99                                 | Lf-9998Z                  | 301014092000102                       | 12/05/01       | 307  | 21  | ---   | ---  | ---  | ---  | ---   | ---   |
| 100                                | Lf-9975Z                  | 300825092044501                       | 12/04/01       | 360  | 23  | ---   | ---  | ---  | ---  | ---   | ---   |
| 101                                | Lf-9976Z                  | 301202092050501                       | 1/23/02        | 331  | 23  | ---   | ---  | ---  | ---  | ---   | ---   |
| 101                                | Lf-9976Z                  | 300824091593201                       | 7/16/02        | ---  | ---   | 52  | 4.4  | 340  | <32  | -17.3   | -3.53   |
| 102                                | Lf-9999Z                  | 301015092015001                       | 3/14/02        | 454  | 21  | ---   | ---  | ---  | ---  | ---   | ---   |
| 103                                | Lf-10000Z                 | 301907092003401                       | 2/07/02        | 403  | 28  | ---   | ---  | ---  | ---  | ---   | ---   |
| 104                                | Lf-10001Z                 | 301336092035401                       | 12/03/01       | 280  | 21  | ---   | ---  | ---  | ---  | ---   | ---   |
| 104                                | Lf-10001Z                 | 301213092053501                       | 7/17/02        | ---  | ---   | 9.3   | 0  | 30   | 40   | -19.2   | -3.89   |
| 105                                | Lf-10009Z                 | 300932092003701                       | 1/30/02        | 425  | 26  | ---   | ---  | ---  | ---  | ---   | ---   |
| 109                                | Lf-10013Z                 | 301424092055801                       | 2/11/02        | 699  | 28  | ---   | ---  | ---  | ---  | ---   | ---   |
| 109                                | Lf-10013Z                 | 300916092051901                       | 8/01/02        | ---  | ---   | 10  | 0  | 100  | <25  | ---   | ---   |
| 110                                | Lf-10014Z                 | 301100092005801                       | 1/22/02        | 522  | 28  | ---   | ---  | ---  | ---  | ---   | ---   |
| 110                                | Lf-10014Z                 | 301147092040701                       | 7/17/02        | ---  | ---   | 690   | 15   | 330  | 20   | -18.8   | -3.87   |
| 111                                | Lf-10015Z                 | 301253092042001                       | 1/29/01        | 323  | 22  | ---   | ---  | ---  | ---  | ---   | ---   |
| 111                                | Lf-10015Z                 | 301035092055801                       | 7/12/02        | ---  | ---   | 17.0  | 0  | 38   | 36   | -18.7   | -3.70   |
| 112                                | Lf-10016Z                 | 301107092033001                       | 12/19/01       | 474  | 24  | ---   | ---  | ---  | ---  | ---   | ---   |
| 113                                | Lf-10017Z                 | 301425091593901                       | 1./29/02       | 312  | 22  | ---   | ---  | ---  | ---  | ---   | ---   |
| 114                                | Lf-10180Z                 | 301355092005601                       | 8/01/02        | ---  | ---   | 2.8   | 0  | 195  | 12   | ---   | ---   |
| 115                                | Lf-10181Z                 | 301619091595301                       | 1/30/02        | 375  | 25  | ---   | ---  | ---  | ---  | ---   | ---   |
| 116                                | Lf-10026Z                 | 301421092022901                       | 7/18/02        | ---  | ---   | 9.3   | 0  | 17   | 41   | -19.4   | 3.86  |
| 118                                | Lf-10028Z                 | 301332091593001                       | 2/07/02        | 319  | 26  | ---   | ---  | ---  | ---  | ---   | ---   |
| 119                                | Lf-10029Z                 | 301234092012401                       | 7/18/02        | ---  | ---   | 130   | 4.1  | 230  | <30  | -21.4   | -4.22   |
| 120                                | Lf-10030Z                 | 301148092024101                       | 12/11/01       | 367  | 25  | ---   | ---  | ---  | ---  | ---   | ---   |
| 121                                | Lf-10031Z                 | 301058092015001                       | 2/13/02        | 829  | 30  | ---   | ---  | ---  | ---  | ---   | ---   |



## Appendix 6. Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All concentrations are in micrograms per liter. Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. Detections are shown in bold. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; H, herbicide; I, insecticide; <, less than; F, fungicide; E, estimated; ---, no data]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification<br>number | Sample<br>date | Acetochlor<br>H<br>34256-82-1 | Acifluorfen<br>H<br>50594-66-6 | Alachlor<br>H<br>15972-60-8 | Aldicarb<br>I<br>116-06-3 | Atrazine<br>H<br>1912-24-9 | Azinphos-methyl<br>I<br>86-50-0 | Bendiocarb<br>I<br>22781-23-3 |
|------------------------------------|---------------------------|---------------------------------------|----------------|-------------------------------|--------------------------------|-----------------------------|---------------------------|----------------------------|---------------------------------|-------------------------------|
| 92                                 | Lf-9913Z                  | 301058092015001                       | 2/06/02        | <0.006                        | <0.01                          | <0.004                      | <0.04                     | <0.01                      | <0.050                          | <0.025                        |
| 93                                 | Lf-9914Z                  | 301114092031901                       | 12/20/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 95                                 | Lf-9968Z                  | 300643092040301                       | 12/04/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 96                                 | Lf-9969Z                  | 300906092031301                       | 12/05/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 97                                 | Lf-9973Z                  | 300946091591601                       | 1/28/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 98                                 | Lf-9974Z                  | 301014092000102                       | 2/06/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 99                                 | Lf-9998Z                  | 300825092044501                       | 12/05/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 100                                | Lf-9975Z                  | 301202092050501                       | 12/04/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 101                                | Lf-9976Z                  | 300824091593201                       | 1/23/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 102                                | Lf-9999Z                  | 301015092015001                       | 3/14/02        | <.006                         | <.01                           | <.004                       | <.04                      | <b>.008</b>                | <.050                           | <.025                         |
| 103                                | Lf-10000Z                 | 301907092003401                       | 2/07/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 104                                | Lf-10001Z                 | 301336092035401                       | 12/03/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 105                                | Lf-10009Z                 | 301213092053501                       | 1/30/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 106                                | Lf-10010Z                 | 300932092003701                       | 2/04/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 108                                | Lf-10012Z                 | 301424092055801                       | 12/06/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 109                                | Lf-10013Z                 | 300916092051901                       | 2/11/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 110                                | Lf-10014Z                 | 301100092005801                       | 1/22/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.007                      | <.050                           | <.025                         |
| 111                                | Lf-10015Z                 | 301147092040701                       | 1/29/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 112                                | Lf-10016Z                 | 301253092042001                       | 12/19/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.007                      | <.050                           | <.025                         |
| 113                                | Lf-10017Z                 | 301035092055801                       | 1/29/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 114                                | Lf-10180Z                 | 301107092033001                       | 12/19/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.007                      | <.050                           | <.025                         |
| 115                                | Lf-10181Z                 | 301425091593901                       | 1/30/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 116                                | Lf-10026Z                 | 301355092005601                       | 2/14/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 117                                | Lf-10027Z                 | 301619091595301                       | 12/11/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.007                      | <.050                           | <.025                         |
| 118                                | Lf-10028Z                 | 301421092022901                       | 2/07/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 119                                | Lf-10029Z                 | 301332091593001                       | 2/04/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 120                                | Lf-10030Z                 | 301234092012401                       | 12/11/01       | <.004                         | <.01                           | <.002                       | <.04                      | <.009                      | <.050                           | <.025                         |
| 121                                | Lf-10031Z                 | 301148092024101                       | 2/13/02        | <.006                         | <.01                           | <.004                       | <.04                      | <.009                      | <.050                           | <.025                         |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Benfluralin<br>H<br>1861-40-1 | Benomyl<br>F<br>17804-35-2 | Bensulfuron methyl<br>H<br>83055-99-6 | Bentazon<br>H<br>25057-89-0 | Bromacil<br>H<br>314-40-9 | Bromoxynil<br>H<br>1689-84-5 | Butylate<br>H<br>2008-41-5 | Carbaryl<br>I<br>63-25-2 | Carbofuran<br>I<br>1563-66-2 | Chloramben<br>methyl ester<br>H<br>133-90-4 |
|------------------------------------|-------------------------------|----------------------------|---------------------------------------|-----------------------------|---------------------------|------------------------------|----------------------------|--------------------------|------------------------------|---|
| 92                                 | <0.010                        | <0.004                     | <0.0158                               | <0.01                       | <0.03                     | <0.02                        | <0.002                     | <0.041                   | <0.020                       | <0.02                                       |
| 93                                 | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 95                                 | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 96                                 | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 97                                 | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 98                                 | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 99                                 | <.010                         | <.004                      | <.0158                                | E.05                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 100                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 101                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 102                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 103                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 104                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 105                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 106                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 108                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 109                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 110                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 111                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 112                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 113                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 114                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 115                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 116                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 117                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 118                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 119                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 120                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |
| 121                                | <.010                         | <.004                      | <.0158                                | <.01                        | <.03                      | <.02                         | <.002                      | <.041                    | <.020                        | <.02  |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Chlorimuron<br>H<br>90982-32-4 | Chlorothalonil<br>F<br>1897-45-6 | Chlorpyrifos<br>I<br>2921-88-2 | Clopyralid<br>H<br>1702-17-6 | Cyanazine<br>H<br>21725-46-2 | Cycloate<br>H<br>1134-23-2 | 2,4-D<br>H<br>94-75-7 | Dacthal<br>(DCPA)<br>H<br>1861-32-1 | Dacthal,<br>monoacid<br>H<br>887-54-7 | 2,4-DB<br>H<br>94-82-6 |
|------------------------------------|--------------------------------|----------------------------------|--------------------------------|------------------------------|------------------------------|----------------------------|-----------------------|-------------------------------------|---------------------------------------|------------------------|
| 92                                 | <0.010                         | <0.04                            | <0.005                         | <0.01                        | <0.018                       | <0.01                      | <0.02                 | <0.003                              | <0.01                                 | <0.02                  |
| 93                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 95                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 96                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 97                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 98                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 99                                 | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 100                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 101                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 102                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 103                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 104                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 105                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 106                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 108                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 109                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 110                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 111                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 112                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 113                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 114                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 115                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 116                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 117                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 118                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 119                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 120                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |
| 121                                | <.010                          | <.04                             | <.005                          | <.01                         | <.018                        | <.01                       | <.02                  | <.003                               | <.01                                  | <.02                   |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Diazinon<br>I<br>333-41-5 | Dicamba<br>H<br>1918-00-9 | Dichlorprop<br>H<br>120-36-5 | Dieldrin<br>I<br>60-57-1 | Dinoseb<br>H<br>88-85-7 | Diphenamid<br>H<br>957-51-7 | Disulfoton<br>I<br>298-04-4 | Diuron<br>H<br>330-54-1 | 2,4-D<br>methyl ester<br>H<br>1928-38-7 | EPTC<br>H<br>759-94-4 | Ethalfuralin<br>H<br>55283-68-6 |
|------------------------------------|---------------------------|---------------------------|------------------------------|--------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|---|-----------------------|---------------------------------|
| 92                                 | <0.005                    | <0.01                     | <0.01                        | <0.005                   | <0.01                   | <0.03                       | <0.021                      | <0.01                   | <0.009                                  | <0.002                | <0.009                          |
| 93                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 95                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 96                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 97                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 98                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 99                                 | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 100                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 101                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 102                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 103                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 104                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 105                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 106                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 108                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 109                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 110                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 111                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 112                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 113                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 114                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 115                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 116                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 117                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 118                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 119                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 120                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |
| 121                                | <.005                     | <.01                      | <.01                         | <.005                    | <.01                    | <.03                        | <.021                       | <.01                    | <.009                                   | <.002                 | <.009                           |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number | Ethopros<br>I<br>13194-48-4 | Fenuron<br>H<br>101-42-8 | Flumetsulam<br>H<br>98967-40-9 | Fluometuron<br>H<br>2164-17-2 | Fonofos<br>I<br>944-22-9 | HCH, alpha<br>I<br>319-84-6 | Imazaquin<br>H<br>81335-37-7 | Imazethapyr<br>H<br>81335-77-5 | Imidacloprid<br>I<br>13826-41-3 | Lindane<br>I<br>58-89-9 |
|------------------------|-----------------------------|--------------------------|--------------------------------|-------------------------------|--------------------------|-----------------------------|------------------------------|--------------------------------|---------------------------------|-------------------------|
| 92                     | <0.005                      | <0.03                    | <0.011                         | <0.03                         | <0.003                   | <0.005                      | <0.016                       | <0.017                         | <0.0068                         | <0.004                  |
| 93                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 95                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 96                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | E.026                        | <.017                          | <.0068                          | <.004                   |
| 97                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 98                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 99                     | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 100                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 101                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 102                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 103                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 104                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 105                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 106                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 108                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 109                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 110                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 111                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 112                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 113                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 114                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 115                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 116                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 117                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 118                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 119                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 120                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | <.017                          | <.0068                          | <.004                   |
| 121                    | <.005                       | <.03                     | <.011                          | <.03                          | <.003                    | <.005                       | <.016                        | E.005                          | E.0095                          | <.004                   |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number | Linuron<br>H<br>330-55-2 | Malathion<br>I<br>121-75-5 | MCPA<br>H<br>94-74-6 | MCPB<br>H<br>94-81-5 | Metalaxyl<br>F<br>57837-19-1 | Methiocarb<br>I<br>2032-65-7 | Methomyl<br>I<br>16752-77-5 | Methyl<br>parathion<br>I<br>298-00-0 | Metolachlor<br>H<br>51218-45-2 | Metribuzin<br>H<br>21087-64-9 |
|------------------------|--------------------------|----------------------------|----------------------|----------------------|------------------------------|------------------------------|-----------------------------|--------------------------------------|--------------------------------|-------------------------------|
| 92                     | <0.035                   | <0.027                     | <0.02                | <0.01                | <0.020                       | <0.01                        | <0.0044                     | <0.006                               | <0.013                         | <0.006                        |
| 93                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 95                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 96                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 97                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 98                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 99                     | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 100                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 101                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 102                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 103                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 104                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 105                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 106                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 108                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 109                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 110                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 111                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 112                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 113                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 114                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 115                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 116                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 117                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 118                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 119                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 120                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |
| 121                    | <.035                    | <.027                      | <.02                 | <.01                 | <.020                        | <.01                         | <.0044                      | <.006                                | <.013                          | <.006                         |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number | Metsulfuron<br>methyl<br>H<br>74223-64-6 | Molinate<br>H<br>2212-67-1 | Napropamide<br>H<br>15299-99-7 | Neburon<br>H<br>555-37-3 | Nicosulfuron<br>H<br>111991-09-4 | Norflurazon<br>H<br>27314-13-2 | Oryzalin<br>H<br>19044-88-3 | Oxamyl<br>I<br>23135-22-0 | Parathion<br>I<br>56-38-2 | Pebulate<br>H<br>1114-71-2 |
|------------------------|--|----------------------------|--------------------------------|--------------------------|----------------------------------|--------------------------------|-----------------------------|---------------------------|---------------------------|----------------------------|
| 92                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 93                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 95                     | ---                                      | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 96                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 97                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 98                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 99                     | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 100                    | ---                                      | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 101                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 102                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 103                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 104                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 105                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 106                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 108                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 109                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 110                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 111                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 112                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 113                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 114                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 115                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 116                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 117                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 118                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 119                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |
| 120                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.007                    | <0.002                     |
| 121                    | <0.0250                                  | <0.002                     | <0.007                         | <0.01                    | <0.013                           | <0.02                          | <0.02                       | <0.01                     | <0.010                    | <0.004                     |

**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number | Pendimethalin<br>H<br>40487-42-1 | cis-Permethrin<br>I<br>52341-33-0 | Phorate<br>I<br>298-02-2 | Picloram<br>H<br>1918-02-1 | Prometon<br>H<br>1610-18-0 | Pronamide<br>H<br>23950-58-5 | Propachlor<br>H<br>1918-16-7 | Propanil<br>H<br>709-98-8 | Propargite<br>I<br>2312-35-8 | Propham<br>H<br>122-42-9 | Propiconazole<br>F<br>60207-90-1 |
|------------------------|----------------------------------|-----------------------------------|--------------------------|----------------------------|----------------------------|------------------------------|------------------------------|---------------------------|------------------------------|--------------------------|----------------------------------|
| 92                     | <0.022                           | <0.006                            | <0.011                   | <0.02                      | E0.012                     | <0.004                       | <0.010                       | <0.011                    | <0.023                       | <0.01                    | <0.021                           |
| 93                     | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 95                     | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.001                            |
| 96                     | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 97                     | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 98                     | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 99                     | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 100                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 101                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 102                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 103                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 104                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 105                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 106                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 108                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 109                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 110                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 111                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 112                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 113                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 114                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 115                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 116                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 117                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 118                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 119                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 120                    | <.010                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |
| 121                    | <.022                            | <.006                             | <.011                    | <.02                       | <.015                      | <.004                        | <.010                        | <.011                     | <.023                        | <.01                     | <.021                            |



**Appendix 6.** Pesticide concentrations in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number | Propoxur<br>I<br>204-043-8 | Siduron<br>H<br>1982-49-6 | Simazine<br>H<br>122-34-9 | Sulfometuron<br>methyl<br>H<br>74222-97-2 | Tebuthiuron<br>H<br>34014-18-1 | Terbacil<br>H<br>5902-51-2 | Terbufos<br>I<br>13071-79-9 | Thiobencarb<br>H<br>28249-77-6 | Tri-allate<br>H<br>2303-17-5 | Tribenuron<br>methyl<br>H<br>101200-48-0 | Triclopyr<br>H<br>55335-06-3 | Trifluralin<br>H<br>1582-09-8 |
|------------------------|----------------------------|---------------------------|---------------------------|---|--------------------------------|----------------------------|-----------------------------|--------------------------------|------------------------------|--|------------------------------|-------------------------------|
| 92                     | <0.01                      | <0.017                    | <0.005                    | <0.009                                    | <0.006                         | <0.01                      | <0.017                      | <0.005                         | <0.002                       | ---                                      | <0.02                        | <0.009                        |
| 93                     | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 95                     | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 96                     | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | <0.01                                    | <.02                         | <.009                         |
| 97                     | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 98                     | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 99                     | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | <.01                                     | <.02                         | <.009                         |
| 100                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 101                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 102                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.016                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 103                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 104                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | <.01                                     | <.02                         | <.009                         |
| 105                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 106                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 108                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | <.01                                     | <.02                         | <.009                         |
| 109                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 110                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.016                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 111                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 112                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.016                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 113                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 114                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.016                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 115                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 116                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 117                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.016                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 118                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 119                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |
| 120                    | <.01                       | <.017                     | <.011                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | <.01                                     | <.02                         | <.009                         |
| 121                    | <.01                       | <.017                     | <.005                     | <.009                                     | <.006                          | <.01                       | <.017                       | <.005                          | <.002                        | ---                                      | <.02                         | <.009                         |

## Appendix 7. Concentrations of pesticide degradation products in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All concentrations are in micrograms per liter. Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. ACAD, Acadian-Pontchartrain Study Unit of the National Water Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; DP, degradation product; <, less than; E. estimated]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification<br>number | Sample<br>date | Aldicarb sulfone<br>DP (aldicarb)<br>1646-88-4 | Aldicarb sulfoxide<br>DP (aldicarb)<br>1646-87-3 | 3-hydroxy-carbofuran<br>DP (carbofuran)<br>16655-82-6 | DDE, p,p'<br>DP (DDT)<br>72-55-9 | Deethylatrazine<br>DP (atrazine)<br>6190-65-4 |
|------------------------------------|---------------------------|---------------------------------------|----------------|--|--|---|----------------------------------|---|
| 92                                 | Lf-9913Z                  | 301058092015001                       | 2/06/02        | <0.02  | <0.01  | <0.01   | <0.003                           | E0.004  |
| 93                                 | Lf-9914Z                  | 301114092031901                       | 12/20/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 95                                 | Lf-9968Z                  | 300643092040301                       | 12/04/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 96                                 | Lf-9969Z                  | 300906092031301                       | 12/05/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 97                                 | Lf-9973Z                  | 300946091591601                       | 1/28/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 98                                 | Lf-9974Z                  | 301014092000102                       | 2/06/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 99                                 | Lf-9998Z                  | 300825092044501                       | 12/05/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 100                                | Lf-9975Z                  | 301202092050501                       | 12/04/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 101                                | Lf-9976Z                  | 300824091593201                       | 1/23/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 102                                | Lf-9999Z                  | 301015092015001                       | 3/14/02        | <.02   | <.01   | <.01  | <.003                            | <.006   |
| 103                                | Lf-10000Z                 | 301907092003401                       | 2/07/02        | <.02   | <.01   | <.01  | <.003                            | E.006   |
| 104                                | Lf-10001Z                 | 301336092035401                       | 12/03/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 105                                | Lf-10009Z                 | 301213092053501                       | 1/30/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 106                                | Lf-10010Z                 | 300932092003701                       | 2/04/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 108                                | Lf-10012Z                 | 301424092055801                       | 12/06/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 109                                | Lf-10013Z                 | 300916092051901                       | 2/11/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 110                                | Lf-10014Z                 | 301100092005801                       | 1/22/02        | <.02   | <.01   | <.01  | <.003                            | <.006   |
| 111                                | Lf-10015Z                 | 301147092040701                       | 1/29/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 112                                | Lf-10016Z                 | 301253092042001                       | 12/19/01       | <.02   | <.01   | <.01  | <.003                            | <.006   |
| 113                                | Lf-10017Z                 | 301035092055801                       | 1/29/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 114                                | Lf-10180Z                 | 301107092033001                       | 12/19/01       | <.02   | <.01   | <.01  | <.003                            | <.006   |
| 115                                | Lf-10181Z                 | 301425091593901                       | 1/30/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 116                                | Lf-10026Z                 | 301355092005601                       | 2/14/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 117                                | Lf-10027Z                 | 301619091595301                       | 12/11/01       | <.02   | <.01   | <.01  | <.003                            | <.006   |
| 118                                | Lf-10028Z                 | 301421092022901                       | 2/07/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 119                                | Lf-10029Z                 | 301332091593001                       | 2/04/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 120                                | Lf-10030Z                 | 301234092012401                       | 12/11/01       | <.02   | <.01   | <.01  | <.003                            | <.028   |
| 121                                | Lf-10031Z                 | 301148092024101                       | 2/13/02        | <.02   | <.01   | <.01  | <.003                            | <.028   |

**Appendix 7.** Concentrations of pesticide degradation products in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana,

| ACAD<br>well<br>number<br>(fig. 1) | Deethyldeisopropylatrazine<br>DP (atrazine)<br>3397-62-4 | Deisopropylatrazine<br>DP (atrazine)<br>1007-28-9 | 2,6-Diethylaniline<br>DP (alachlor)<br>579-66-8 | 2-Hydroxyatrazine<br>DP (atrazine)<br>2163-68-0 | 3-Ketocarbofuran<br>DP (carbofuran)<br>16709-30-1 | 3 (4-chlorophenyl)-1-methyl urea<br>DP (neburon)<br>5352-88-5 |
|------------------------------------|--|---|---|---|---|---|
| 92                                 | <0.01  | <0.04   | <0.006  | <0.008  | <1.50   | <0.0242   |
| 93                                 | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 95                                 | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 96                                 | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 97                                 | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 98                                 | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 99                                 | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 100                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 101                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 102                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 103                                | E.06   | E.01  | <.006   | <.008   | <1.50   | <.0242  |
| 104                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 105                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 106                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 108                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 109                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 110                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 111                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 112                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 113                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 114                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 115                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 116                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 117                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 118                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 119                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |
| 120                                | <.01   | <.04  | <.002   | <.008   | <1.50   | <.0242  |
| 121                                | <.01   | <.04  | <.006   | <.008   | <1.50   | <.0242  |

# **Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02

[All concentrations are in micrograms per liter. Numbers below the chemical names are the Chemical Abstracts Service (CAS) numbers. Detections are shown in bold. ACAD, Acadian-Pontchartrain Study Unit of the National Water-Quality Assessment Program; DOTD, Louisiana Department of Transportation and Development; USGS, U.S. Geological Survey; <, less than; E, estimated]

| ACAD<br>well<br>number<br>(fig. 1) | DOTD local<br>well number | USGS site<br>identification<br>number | Sample<br>date | Acetone<br>(2-propanone)<br>67-64-1 | Acrylonitrile<br>(2-propenenitrile)<br>107-13-1 | Benzene<br>71-43-2 | Bromobenzene<br>108-86-1 | Bromochloro-<br>methane<br>74-97-5 | Bromodichloro-<br>methane<br>75-27-4 | Bromoethene<br>(Vinyl bromide)<br>593-60-2 |
|------------------------------------|---------------------------|---------------------------------------|----------------|-------------------------------------|---|--------------------|--------------------------|------------------------------------|--------------------------------------|--|
| 92                                 | Lf-9913Z                  | 301058092015001                       | 2/06/02        | <7                                  | <1  | <0.04              | <0.04                    | <0.07                              | <0.05                                | <0.1                                       |
| 93                                 | Lf-9914Z                  | 301114092031901                       | 12/20/01       | <7                                  | <1  | E.01               | <.04                     | <.07                               | <.05                                 | <.1  |
| 95                                 | Lf-9968Z                  | 300643092040301                       | 12/04/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 96                                 | Lf-9969Z                  | 300906092031301                       | 12/05/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 97                                 | Lf-9973Z                  | 300946091591601                       | 1/28/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 98                                 | Lf-9974Z                  | 301014092000102                       | 2/06/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 99                                 | Lf-9998Z                  | 300825092044501                       | 12/05/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 100                                | Lf-9975Z                  | 301202092050501                       | 12/04/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 101                                | Lf-9976Z                  | 300824091593201                       | 1/23/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 102                                | Lf-9999Z                  | 301015092015001                       | 3/14/02        | <7                                  | <1  | E.03               | <.04                     | <.07                               | <.05                                 | <.1  |
| 103                                | Lf-10000Z                 | 301907092003401                       | 2/07/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 104                                | Lf-10001Z                 | 301336092035401                       | 12/03/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 105                                | Lf-10009Z                 | 301213092053501                       | 1/30/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 106                                | Lf-10010Z                 | 300932092003701                       | 2/04/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 108                                | Lf-10012Z                 | 301424092055801                       | 12/06/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 109                                | Lf-10013Z                 | 300916092051901                       | 2/11/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 110                                | Lf-10014Z                 | 301100092005801                       | 1/22/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 111                                | Lf-10015Z                 | 301147092040701                       | 1/29/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 112                                | Lf-10016Z                 | 301253092042001                       | 12/19/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 113                                | Lf-10017Z                 | 301035092055801                       | 1/29/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 114                                | Lf-10180Z                 | 301107092033001                       | 12/19/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 115                                | Lf-10181Z                 | 301425091593901                       | 1/30/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 116                                | Lf-10026Z                 | 301355092005601                       | 2/14/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 117                                | Lf-10027Z                 | 301619091595301                       | 12/11/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 118                                | Lf-10028Z                 | 301421092022901                       | 2/07/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 119                                | Lf-10029Z                 | 301332091593001                       | 2/04/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 120                                | Lf-10030Z                 | 301234092012401                       | 12/11/01       | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |
| 121                                | Lf-10031Z                 | 301148092024101                       | 2/13/02        | <7                                  | <1  | <.04               | <.04                     | <.07                               | <.05                                 | <.1  |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Bromoform<br>75-25-2 | Bromomethane<br>(Methyl bromide)<br>74-83-9 | Butylbenzene<br>104-51-8 | sec-Butylbenzene<br>135-98-8 | tert-Butylbenzene<br>98-06-6 | Carbon<br>disulfide<br>75-15-0 | Chlorobenzene<br>108-90-7 | Chloroethane<br>75-00-3 | Chloroform<br>(Trichloromethane)<br>67-66-3 | Chloromethane<br>(methyl chloride)<br>74-87-3 |
|------------------------------------|----------------------|---|--------------------------|------------------------------|------------------------------|--------------------------------|---------------------------|-------------------------|---|---|
| 92                                 | <0.06                | <0.3  | <0.2                     | <0.03                        | <0.05                        | <0.07                          | <0.03                     | <0.1                    | E0.07                                       | <0.2  |
| 93                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.03                           | <.03                      | <.1                     | <.02  | <.2   |
| 95                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 96                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.04                           | <.03                      | <.1                     | <.02  | <.2   |
| 97                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | E.01  | <.2   |
| 98                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 99                                 | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 100                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <b>.11</b>                     | <.03                      | <.1                     | <.02  | <.2   |
| 101                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.03                           | <.03                      | <.1                     | <.02  | <.2   |
| 102                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.03                           | <.03                      | <.1                     | <.02  | <.2   |
| 103                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | E.02  | <.2   |
| 104                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.06                           | <.03                      | <.1                     | <.02  | <.2   |
| 105                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 106                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 108                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.06                           | <.03                      | <.1                     | <.02  | <.2   |
| 109                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.02                           | <.03                      | <.1                     | <.02  | <.2   |
| 110                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 111                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 112                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <b>.22</b>                     | <.03                      | <.1                     | <.02  | <.2   |
| 113                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 114                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 115                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 116                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 117                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 118                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 119                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <.02  | <.2   |
| 120                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | <.07                           | <.03                      | <.1                     | <b>.38</b>                                  | <.2   |
| 121                                | <.06                 | <.3   | <.2                      | <.03                         | <.05                         | E.02                           | <.03                      | <.1                     | <.02  | <.2   |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | 3-Chloropropene<br>107-05-1 | 2-Chlorotoluene<br>95-49-8 | 4-Chlorotoluene<br>106-43-4 | Dibromo-<br>chloromethane<br>124-48-1 | 1,2-Dibromo-3-<br>chloropropane<br>96-12-8 | 1,2-Dibromo-<br>ethane<br>106-93-4 | Dibromo--<br>methane<br>74-95-3 | 1,2-Dichloro-<br>benzene<br>95-50-1 | 1,3-Dichloro-<br>benzene<br>541-73-1 | 1,4-Dichloro-<br>benzene<br>106-46-7 |
|------------------------------------|-----------------------------|----------------------------|-----------------------------|---------------------------------------|--|------------------------------------|---------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| 92                                 | <0.1                        | <0.03                      | <0.05                       | <0.2                                  | <0.5                                       | <0.04                              | <0.05                           | <0.03                               | <0.03                                | <0.05                                |
| 93                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 95                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 96                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 97                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 98                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 99                                 | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 100                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 101                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 102                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 103                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 104                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 105                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 106                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 108                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 109                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 110                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 111                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 112                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 113                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 114                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 115                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 116                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 117                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 118                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 119                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 120                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |
| 121                                | <.1                         | <.03                       | <.05                        | <.2                                   | <.5  | <.04                               | <.05                            | <.03                                | <.03                                 | <.05                                 |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | trans-1,4-<br>Dichloro-2-<br>butene<br>110-57-6 | Dichlorodifluoro-<br>methane<br>75-71-8 | 1,1-Dichloroethane<br>75-34-3 | 1,2-Dichloroethane<br>107-06-2 | 1,1-Dichloro-<br>ethylene<br>75-35-4 | cis-1,2-Dichloro-<br>ethylene<br>156-59-2 | trans-1,2-Dichloro-<br>ethylene<br>156-60-5 | Dichloromethane<br>(Methylene chloride)<br>75-09-2 | 1,2-Dichloro-<br>propane<br>78-87-5 | 1,3-Dichloro-<br>propane<br>142-28-9 |
|------------------------------------|---|---|-------------------------------|--------------------------------|--------------------------------------|---|---|--|-------------------------------------|--------------------------------------|
| 92                                 | <0.7  | <0.2                                    | <0.04                         | <0.1                           | <0.04                                | <0.04                                     | <0.03                                       | <0.2   | <0.03                               | <0.1                                 |
| 93                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 95                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 96                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 97                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 98                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 99                                 | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 100                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 101                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 102                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 103                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 104                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 105                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 106                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 108                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 109                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 110                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 111                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 112                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 113                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 114                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 115                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 116                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 117                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 118                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 119                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 120                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |
| 121                                | <.7   | <.2                                     | <.04                          | <.1                            | <.04                                 | <.04                                      | <.03  | <.2  | <.03                                | <.1                                  |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | 2,2-Dichloropropane<br>594-20-7 | 1,1-Dichloropropene<br>563-58-6 | cis-1,3-<br>Dichloropropene<br>10061-01-5 | trans-1,3-<br>Dichloropropene<br>10061-02-6 | Diethyl ether<br>60-29-7 | Diisopropyl ether<br>108-20-3 | Ethylbenzene<br>100-41-4 | Ethyl tert-butyl<br>ether<br>(ETBE)<br>637-92-3 | Ethyl<br>methacrylate<br>97-63-2 | O-Ethyl<br>toluene<br>611-14-3 |
|------------------------------------|---------------------------------|---------------------------------|---|---|--------------------------|-------------------------------|--------------------------|---|----------------------------------|--------------------------------|
| 92                                 | <0.05                           | <0.05                           | <0.09                                     | <0.09                                       | <0.2                     | <0.1                          | <0.03                    | <0.05   | <0.2                             | <0.06                          |
| 93                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 95                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 96                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 97                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 98                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 99                                 | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 100                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 101                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 102                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 103                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 104                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 105                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 106                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 108                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 109                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 110                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 111                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 112                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 113                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 114                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 115                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 116                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 117                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 118                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 119                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 120                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |
| 121                                | <.05                            | <.05                            | <.09                                      | <.09  | <.2                      | <.1                           | <.03                     | <.05  | <.2                              | <.06                           |



**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Hexachlorobutadiene<br>87-68-3 | Hexachloroethane<br>67-72-1 | 2-Hexanone<br>591-78-6 | Isopropylbenzene<br>98-82-8 | 4-Isopropyl-1-methyl-benzene<br>(p-Isopropyl toluene)<br>99-87-6 | Methyl<br>acrylate<br>96-33-3 | Methyl<br>acrylonitrile<br>126-98-7 | Methyl tert-Butyl ether<br>(MTBE)<br>1634-04-4 | 2-Butanone<br>(Methyl ethyl ketone)<br>78-93-3 |
|------------------------------------|--------------------------------|-----------------------------|------------------------|-----------------------------|--|-------------------------------|-------------------------------------|--|--|
| 92                                 | <0.1                           | <0.2                        | <0.7                   | <0.06                       | E0.01  | <2                            | <0.6                                | <b>0.2</b>                                     | <5   |
| 93                                 | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 95                                 | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 96                                 | <.1                            | <.2                         | <.7                    | <.06                        | E.04   | <2                            | <.6                                 | <.2  | <5   |
| 97                                 | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 98                                 | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 99                                 | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 100                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 101                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 102                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 103                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 104                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 105                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 106                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 108                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 109                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 110                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 111                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 112                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 113                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 114                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 115                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 116                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 117                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 118                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 119                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 120                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |
| 121                                | <.1                            | <.2                         | <.7                    | <.06                        | <.07   | <2                            | <.6                                 | <.2  | <5   |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Methyl iodide<br>(Iodo-methane)<br>74-88-4 | Methyl<br>methacrylate<br>80-62-6 | 4-Methyl-2-pentanone<br>(Methyl isobutyl ketone)<br>108-10-1 | Naphthalene<br>91-20-3 | tert-Pentyl methyl<br>ether<br>994-05-8 | n-Propylbenzene<br>103-65-1 | Styrene<br>(Ethenylbenzene)<br>100-42-5 | 1,1,1,2-Tetrachloro-<br>ethane<br>630-20-6 | 1,1,2,2-Tetrachloro-<br>ethane<br>79-34-5 | Tetrachloro-<br>ethylene<br>127-18-4 |
|------------------------------------|--|-----------------------------------|--|------------------------|---|-----------------------------|---|--|---|--------------------------------------|
| 92                                 | <0.2                                       | <0.3                              | <0.4   | <0.5                   | <0.1                                    | <0.04                       | <0.04                                   | <0.03                                      | <0.09                                     | <0.027                               |
| 93                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 95                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 96                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 97                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 98                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 99                                 | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 100                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 101                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 102                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | E.012                                |
| 103                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | E.070                                |
| 104                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 105                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 106                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 108                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 109                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 110                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | E.009                                |
| 111                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 112                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 113                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 114                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 115                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 116                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 117                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 118                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 119                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |
| 120                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | E.007                                |
| 121                                | <.2  | <.3                               | <.4  | <.5                    | <.1                                     | <.04                        | <.04                                    | <.03                                       | <.09                                      | <.027                                |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Tetrachloromethane<br>56-23-5 | Tetrahydrofuran<br>109-99-9 | 1,2,3,4-Tetramethylbenzene<br>(Prenitene)<br>488-23-3 | 1,2,3,5-Tetramethylbenzene<br>(Isodurene)<br>527-53-7 | 1,2,3-<br>Trichlorobenzene<br>87-61-6 | 1,2,4-<br>Trichlorobenzene<br>120-82-1 | 1,1,1-<br>Trichloroethane<br>71-55-6 | 1,1,2-<br>Trichloroethane<br>79-00-5 | Trichloroethylene<br>(TCE)<br>79-01-6 |
|------------------------------------|-------------------------------|-----------------------------|---|---|---------------------------------------|--|--------------------------------------|--------------------------------------|---------------------------------------|
| 92                                 | <0.06                         | <2                          | <0.2  | <0.2  | <0.3                                  | <0.1                                   | <0.03                                | <0.06                                | <0.04                                 |
| 93                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | E.03                                  |
| 95                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 96                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 97                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 98                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 99                                 | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 100                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 101                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 102                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 103                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 104                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 105                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 106                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 108                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 109                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 110                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 111                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 112                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 113                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 114                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 115                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 116                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 117                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 118                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 119                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 120                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |
| 121                                | <.06                          | <2                          | <.2   | <.2   | <.3                                   | <.1                                    | <.03                                 | <.06                                 | <.04                                  |

**Appendix 8.** Concentrations of volatile organic compounds in water from selected shallow wells in urban residential and light commercial areas in Lafayette Parish, Louisiana, 2001-02—Continued

| ACAD<br>well<br>number<br>(fig. 1) | Trichlorofluoro-<br>methane<br>75-69-4 | 1,2,3-Trichloro-<br>propane<br>96-18-4 | 1,1,2-Trichlorotrifluoroethane<br>(freon 113)<br>76-13-1 | 1,2,3-Trimethyl-<br>benzene<br>526-73-8 | 1,2,4-Trimethyl-<br>benzene<br>95-63-6 | 1,3,5-Trimethyl-<br>benzene<br>108-67-8 | Toluene<br>108-88-3 | Vinyl chloride<br>75-01-4 | m- and p-Xylene<br>no CAS number | o-Xylene<br>95-47-6 |
|------------------------------------|--|--|--|---|--|---|---------------------|---------------------------|----------------------------------|---------------------|
| 92                                 | <0.09                                  | <0.2                                   | <0.06  | <0.1                                    | <0.06                                  | <0.04                                   | <0.05               | <0.1                      | <0.06                            | <0.07               |
| 93                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | .28                 | <.1                       | <.06                             | <.07                |
| 95                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 96                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.02                | <.1                       | <.06                             | <.07                |
| 97                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 98                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 99                                 | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 100                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.01                | <.1                       | <.06                             | <.07                |
| 101                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 102                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.04                | <.1                       | E.03                             | <.07                |
| 103                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 104                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 105                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 106                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 108                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 109                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.02                | <.1                       | <.06                             | <.07                |
| 110                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 111                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 112                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.01                | <.1                       | <.06                             | <.07                |
| 113                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 114                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.01                | <.1                       | <.06                             | <.07                |
| 115                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 116                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.01                | <.1                       | E.01                             | <.07                |
| 117                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 118                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 119                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | <.05                | <.1                       | <.06                             | <.07                |
| 120                                | <b>1.1</b>                             | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.02                | <.1                       | <.06                             | <.07                |
| 121                                | <.09                                   | <.2                                    | <.06   | <.1                                     | <.06                                   | <.04                                    | E.01                | <.1                       | <.06                             | <.07                |