# DEVELOPMENT OF A PRIMER ON WELL WATER SAMPLING FOR VOLATILE ORGANIC SUBSTANCES

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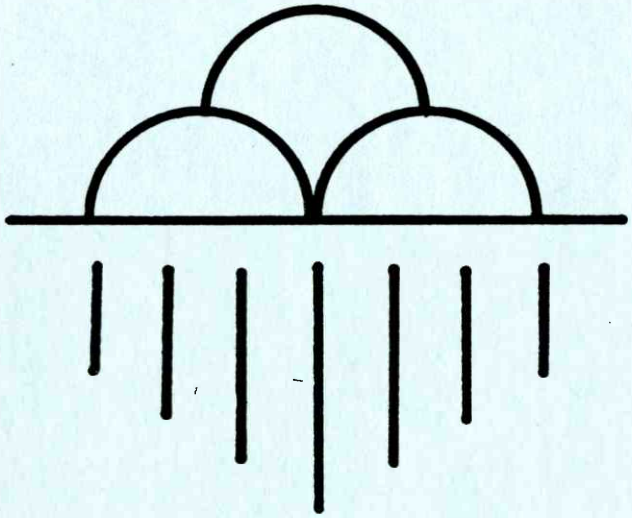

Research Project Technical Completion Report
Project No. G828-24
Prepared for the
U. S. Department of the Interior

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## ABSTRACT

With the growing problem of ground water contamination by volatile organic substances, drinking water sampling programs are being initiated throughout the United States. A need was recognized for a manual on well water sampling that would bridge the gap between highly technical documents and over-simplified reviews. A primer was therefore developed on establishing and implementing a sampling program. Current information was collected by means of both library research and extensive contact with public agency employees and practicing hydrologists.

Portions of a sampling program that required explanation included selection of priority wells, proper sampling at the well head, sample preservation and shipment, chain of custody procedures, laboratory selection, quality assurance and data evaluation. Explanation of these steps is intended to help ensure the legal defensibility of any collected data.

# INTRODUCTION

Toxic organic substances, particularly the volatile organcics (VOC's), have been appearing regularly in ground water supplies throughout the United States. Responsive public health agencies and concerned citizens in some localities are aware of the need to begin programs that will determine the presence and distribution of VOC's in well water supplies. A primer (included in Appendix B) was written to assist these groups.

The developed primer provides information and guidelines needed to establish a well water sampling program for VOC'S. The purpose of the manual is to offer a general description of ground water contamination from VOC'S as well as a detailed explanation of the steps required to collect samples. The steps emphasized include the physical act of collecting well samples, selecting priority wells, sample preservation and shipment, choosing a certified laboratory, conducting chain of custody procedures, and analyzing and evaluating data. Use of the primer should ensure collection of reliable and legally defensible data.

The following report first describes related documents. Procedures taken to both research and write the primer are then presented. Significant findings and conclusions follow. The primer itself is included in Appendix B.

# RELATED RESEARCH

Several documents are already available to assist trained ground water hydrologists in sampling. Everett et al. (1976) reviewed the general processes for setting up a sampling program. Scalf et al. (1981) prepared the "Manual of Ground-water Sampling Procedures" with detailed, technical descriptions of each stage of a sampling program. The Arizona Department of Health Services (1983) issued a document on procedures for acquiring and managing ground water quality data in Arizona. Gibb, Schuller and Griffin (1981) developed and presented recommendations for well water monitoring of specific constituents. Fenn et al. (1977) developed a manual of procedures for ground water monitoring at solid waste disposal facilities. Wood (1975) reviewed field techniques for determining the concentrations of unstable constituents in ground water supplies. Chain of custody procedures were described in detail by Huibregtse and Moser (1976). Methods for preserving water samples during shipment to a laboratory are prescribed by EPA (1979). Keith et al. (1983) described techniques for selecting an analytical laboratory with the goal of obtaining accurate, defensible ground water quality data. "Standard Methods", by the American Public

Health Association et al. (1975), includes specifications on quality assurance and quality control aspects of laboratory analyses.

A few documents are available with more simple descriptions on how to collect, preserve, and ship water samples to a laboratory (eg. Lehr et al., 1980; Koniecko, 1982). However, these documents do not address the rationale for each stage in the sampling process and omit the critical step of how to assess and select a reliable laboratory capable of delivering accurate results.

## METHODS AND PROCEDURES

The procedures used for development of this primer included 1) library research, 2) technical writing assistance and 3) contact with consulting hydrologists and with local, state and federal agencies. Personnel in state and local government agencies not only provided information, but offered suggestions on field sampling. A list of those who contributed appears in Appendix A.

The steps taken in development of the primer are listed below.

1. In lieu of using a review committee, a researcher was hired to contact the specialists needed. These specialists started with employees of Arizona's county health departments. City health and water departments were also interviewed as were hydrologists and engineers in private consulting firms. In addition, health officials in other western states were contacted.

2. The Arizona Department of Health Services (ADHS) provided useful information through administrative, field and laboratory personnel. Project representatives accompanied ADHS personnel on VOC sampling trips in Tucson to observe techniques in the field. The agency's laboratory in Phoenix was visited where VOC analysis was taking place. In addition, a seminar offered by ADHS on VOC sampling was attended in September, 1983.

3. Personnel in federal agencies were also consulted. These agencies included the Environmental Protection Agency and the U. S. Geological Survey.

4. As these contacts were made, the primer's author worked with a technical writer at the University of Arizona. The document's format and style were then developed.

5. As the preceding steps were taken the author also conducted a library search. Periodicals, scientific journals, existing manuals and government documents were studied.

6. An illustrator was hired to develop the figures included in the manual.

7. The completed first draft was reviewed and a technical writer assisted in editing and preparing the final draft.

## PRINCIPAL FINDINGS AND THEIR SIGNIFICANCE

Existing documents on well water sampling were found to be either highly technical and aimed at the trained professional, or overly simplified, without adequate discussion of each sampling step's importance. State-of-the-art information on sampling VOC's was available from public water agencies and consulting hydrologists. But because the problem of organics in drinking water has only been recently recognized, complete information had not been collected into a primer understandable to laypeople. Most public agencies and consulting hydrologists did not know of an appropriate primer on sampling organics. Some of those contacted had limited experience and no established protocol for detecting organics in ground water.

The manual was written to fill the need for an informative document that is thorough but not extremely technical. The necessary emphasis was found to be on techniques of sampling for organics in ground water and on approaches for selecting a certified laboratory. Sections on sample preservation, sample storage, sample shipment, chain of custody and data management were also considered important. The audience most in need of understandable guidelines was found to be water administrators and planners, as well as technicians and those who actually carry out the sampling. The developed manual is directed primarily towards these groups.

## CONCLUSION

A primer on well water sampling for volatile organic substances was developed and is included as part of this report. Toxic organic substances, particularly the VOC's, have been appearing in regular frequency in ground water supplies throughout the United States. A nontechnical but comprehensive primer on detecting VOC's in drinking water was found to be needed. This manual was written primarily to assist water administrators and planners, public health officials and concerned citizen groups in establishing sampling programs; the enclosed document provides guidelines for detecting VOC's in well water.

## LITERATURE CITATIONS


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Wood, W. W. 1976. "Techniques of Water Resources Investigations at the United States Geological Survey". Chapter D2, Book 1, Techniques of Water Resources Investigations.

## APPENDIX A

## LIST OF PEOPLE PROVIDING INFORMATION

City Health and/or Water Departments

Richard Bradford, Mesa, AZ
Quan Chin, Phoenix, AZ
James Gaetjens, Mesa, AZ
Gary Hicks, Tucson, AZ
Nelson Hood, Glendale, AZ
Thomas Jefferson, Tucson, AZ
Harry Myer, Tempe, AZ
Leonard Schwartz, Tempe, AZ

County Health Departments in Arizona

Donald Aldrich, Pima Co.
Donald Conroy, Maricopa Co.
Jack Hensley, Pima Co.
Patricia Nolan, Pima Co.

Pima Association of Governments

Michael Osborn

Arizona Department of Health Services

James Angell
Pamela Beilke
Susan Keith
Jerry McCarty
Edwin Swanson

California Department of Health

Carol Enferadi
Steve Nelson

California Regional Water Quality Board

Dennis Westcot

New Mexico Department of Health and the Environment

Bruce Gallagher

Illinois Water Survey

James Gibb

Environmental Protection Agency

Fred Hoffman, San Francisco, CA
Robert Mandel, San Francisco, CA
Richard Scalf, Oklahoma
Larry Wright, Dallas, TX

U. S. Geological Survey

Bryan Katz, Water Resources Division, N. Y.

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Kenneth D. Schmidt, Groundwater Quality Consultant, Phoenix, AZ

# APPENDIX B

## PRIMER ON WELL WATER SAMPLING

## FOR VOLATILE ORGANIC SUBSTANCES