

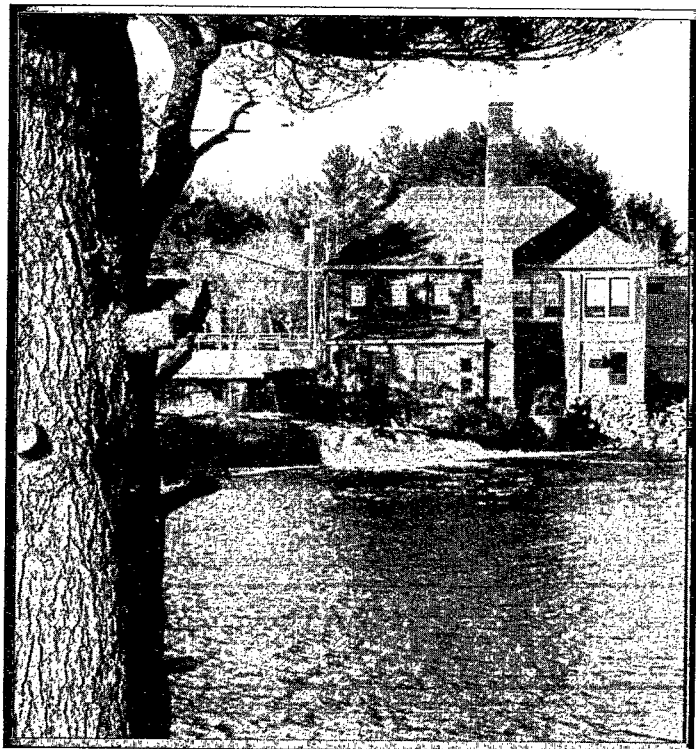
United States
Environmental Protection
Agency

EPA/814-B-94-001
July 1994

Ground Water and Drinking Water



Pocket Sampling Guide for Operators of Small Water Systems: Phases II and V



Notice

This guide has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Pocket Sampling Guide for Operators of Small Water Systems: Phases II and V

Office of Ground Water and
Drinking Water
U.S. Environmental
Protection Agency
Cincinnati, OH 45268

July 1994



Printed on Recycled Paper

Acknowledgments

This sampling guide was developed by the U.S. Environmental Protection Agency (EPA) Office of Ground Water and Drinking Water, Cincinnati, Ohio. Jim Walasek, Technical Support Division (TSD), developed the text for the guide and provided overall project management. Susan Richmond, Paula Murphy, and Jenny Helmick of Eastern Research Group, Inc. (ERG) Lexington, Massachusetts, edited and coordinated production of the guide. David Cheda, ERG, designed, illustrated, and desktop published the document.

The cover photograph was taken by Jim Walasek. Other photography was provided by Tim Daley, Jim Walasek, and Michele Bolyard, TSD. Special thanks are extended to Dick Reding and Mike Muse for their regulatory insights and to other TSD staff members and Regional EPA personnel who reviewed the guide. EPA also would like to acknowledge David Walker, P.E., Joyce Hammer, and the staff of the Town of Newmarket Water Works, Newmarket, New Hampshire, for the use of their facilities and assistance in coordinating photography of sampling procedures.

Contents

Introduction	1
Background	1
How to Use This Guide	2
Standardized Monitoring Framework	2
General Sampling and Procedures	3
Phase II and Phase V Rules	4
Standardized Monitoring Framework	9
Summary	9
Terms Introduced in This Section	9
Framework Application	9
Framework Structure	10
Standardized Monitoring Requirements	11
Grandfathering	11
Waiver	12
Public Notification Requirements	12
General Sampling and Procedures	15
Introduction	15
Terms Introduced in This Section	15
Drinking Water Laboratory Certification Considerations	15
Sampling Containers	15
Representative Sampling	16
Sampling Points	16
Compositing	17
Procedures	19
Asbestos	29
Summary	30
Terms Introduced in This Section	30
Status	30
MCL	30
Monitoring Requirements	31
Systems Affected	31
Sampling Plan and Schedule	31

Trigger Level for Increased Monitoring	31
Initial/Repeat Sampling Requirements	31
Increased Sampling	34
Confirmation Sample	34
Waivers	34
Sampling	36
Sampling Containers	36
Procedures	36
Nitrite and Nitrate	39
Summary	40
Terms Introduced in This Section	40
Status	40
MCLs	40
Monitoring Requirements	41
Systems Affected	41
Sampling Plan and Schedule	41
Trigger Level for Increased Monitoring	41
Nitrite	42
Initial/Repeat Sampling Requirements	42
Increased Sampling Requirements	44
Nitrate	45
Initial Sampling Requirements	45
Repeat Sampling Requirements for CWSs and NTNCWSs	47
Increased Sampling Requirements for CWSs and NTNCWSs	47
Confirmation Sample	47
Sampling	50
Sampling Containers	50
Procedures	50
Inorganic Compounds (IOCs)	53
Summary	54
Terms Introduced in This Section	55
Status	55
MCLs	56
Monitoring Requirements	57
Systems Affected	57

Sampling Plan and Schedule	57
Trigger Level for Increased Monitoring	57
Initial Sampling Requirements	57
Repeat Sampling Requirements	59
Increased Sampling	59
Confirmation Sample	61
Compositing	63
Waivers	63
Sampling	63
Sampling Containers	63
Procedures	64
Volatile Organic Compounds (VOCs)	67
Summary	68
Terms Introduced in This Section	68
Status	69
MCLs	69
Monitoring Requirements	69
Systems Affected	69
Sampling Plan and Schedule	69
Trigger Level for Increased Monitoring	72
Initial Sampling Requirements	72
Repeat Sampling Requirements	73
Increased Sampling	75
Confirmation Sample	75
Compositing	75
Waivers	75
Sampling	78
Sampling Containers	78
Procedures	78
Synthetic Organic Chemicals (SOCs)	83
Summary	84
Terms Introduced in This Section	84
Status	85
MCLs	85
Monitoring Requirements	85
Systems Affected	85
Sampling Plan and Schedule	88

Trigger Level for Increased Monitoring	88
Initial Sampling Requirements	88
Repeat Sampling Requirements	91
Increased Sampling Requirements	91
Confirmation Sample	94
Compositing	94
Waivers	94
Sampling	95
Sampling Containers	95
Procedures	96
Other Requirements	101
Unregulated Contaminants	101
Organics	101
Inorganics	101
Treatment Technique Requirements for Acrylamide and Epichlorohydrin	102
Glossary	103
Bibliography	109

Introduction

Background

This guide is intended to help operators of small water systems understand and comply with the monitoring requirements of the 1986 Amendments to the Safe Drinking Water Act (**SDWA**). The guide addresses operators of community water systems serving 3,300 people or fewer, or so-called small systems.

The 1986 amendments outlined a schedule for the U.S. Environmental Protection Agency (EPA) to set enforceable standards, known as Maximum Contaminant Levels (**MCLs**) or treatment techniques for 83 contaminants. It also set a schedule for EPA to set nonenforceable Maximum Contaminant Level Goals (**MCLGs**), which are levels at which there are no known or anticipated adverse health effects. MCLs are set as close to the MCLGs as is technically and economically feasible.

This guide will cover the monitoring and sampling requirements for the new regulations **promulgated** under the Phase II Rule (for 38 volatile organic chemicals, pesticides, and inorganic chemicals) and Phase V Rule (for 23 additional contaminants). Contaminant classes covered include:

- Asbestos
- Nitrite and Nitrate
- Inorganic Compounds
- Volatile Organic Compounds (VOCs)
- Synthetic Organic Chemicals (SOCs)

Sampling procedures for the Phase I Volatile Organic Chemicals (VOCs) Rule, the new Total Coliform Rule (TCR), the Surface Water Treatment Rule (SWTR), and the Lead and Copper Regulation have been described in the April 1992 *Pocket Sampling Guide for Operators of Small Water Systems* (EPA/814-B-92-001). The monitoring requirements for the eight VOCs regulated by the Phase I VOC Rule (1987), however, were revised in the Phase II rule. Therefore, the Phase II monitoring requirements for

VOCs discussed in this Phase II/V pocket sampling guide now apply to all Phase I regulated VOCs.



The guidelines described in this sampling guide are federal. States that have primacy may have set more stringent requirements. The representative of your state drinking water program will have information on these specific requirements.

How to Use This Guide

The purpose of this guide is to provide quick reference information, as well as detailed sampling instructions, for complying with the monitoring requirements of the SDWA.



Throughout the guide, tables and figures are used to present information about monitoring requirements. These tables do not stand alone; make sure that you read the accompanying text to obtain all the necessary information.

The guide is composed of the parts outlined in the following pages and in Figure 1-1.

Standardized Monitoring Framework

The first unit gives an overview of the Standardized Monitoring Framework. This framework standardizes monitoring requirements and synchronizes monitoring schedules across rules and contaminant groups. The application of the Standardized Monitoring Framework to requirements for each chemical group is described in the corresponding sections. The overview defines and describes the following topics and terms:

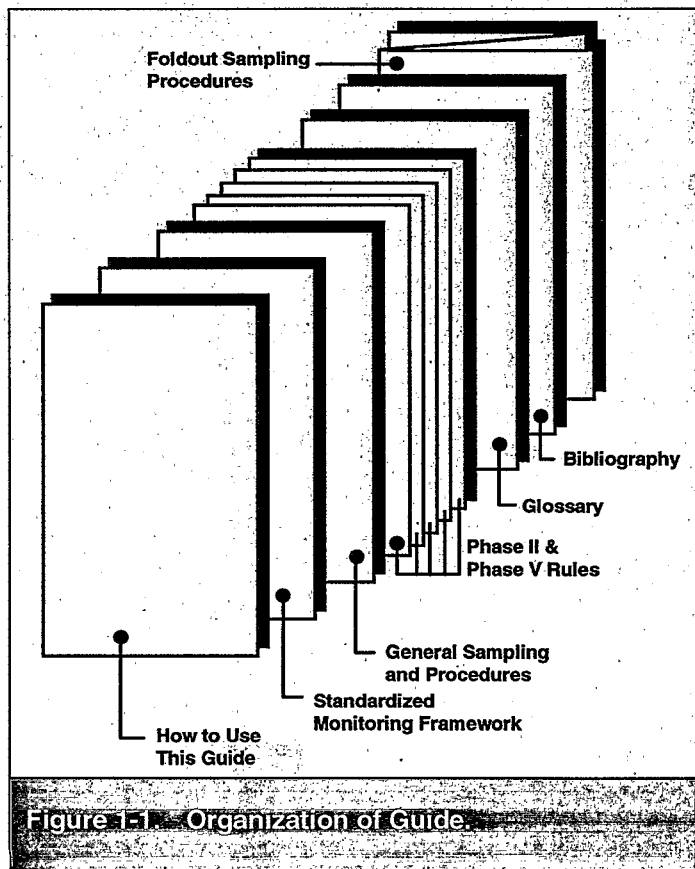
- Framework Application
- Framework Structure
- Standardized Monitoring Requirements
- Grandfathering

- Waivers
- Public Notification Requirements

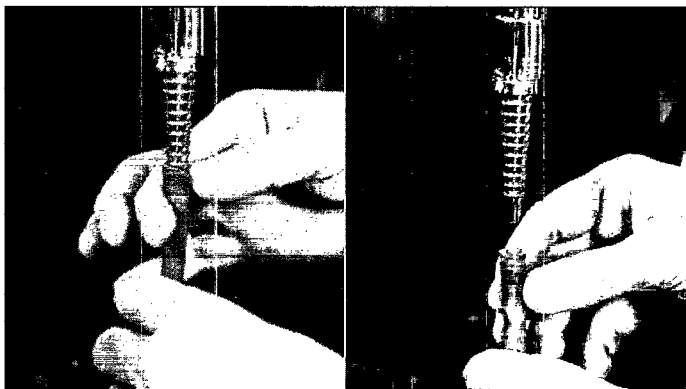
General Sampling and Procedures

The second unit presents general sampling considerations for all contaminants regulated under Phase II and Phase V. Topics covered include:

- Sampling Containers
- Representative Sampling
- Sampling Points
- Compositing
- Procedures Including Recording and Reporting Results, and Transportation



A photograph illustrates each step of the general procedures. In some cases, two photographs side by side are used to show details of a single step of the procedure or to show a step being performed using two different types of equipment.



Side-by-side photos showing details of a single step of a procedure.

These general procedures are repeated later in the guide (in abbreviated form, without photographs) in each unit dealing with specific contaminant classes. Unique procedures for contaminant classes that differ from the general procedures are marked with the following symbol:



Photographs are used in the units on contaminant classes only to illustrate unique procedures.

For your convenience in the field, these same illustrated sampling procedures (somewhat reduced in size) are reproduced on durable foldout pages, tucked into the back pocket of the guide.

Phase II and Phase V Rules

The main body of the guide is divided into five units that summarize the monitoring and sampling procedures for each of the following contaminant classes under Phase II:

- Asbestos
- Nitrite and Nitrate

and each of the following contaminant classes under Phase II and Phase V:

- Inorganic Compounds (IOCs)
- Volatile Organic Compounds (VOCs)
- Synthetic Organic Chemicals (SOCs)

In the latter three units, requirements specific to Phase II or Phase V are presented separately. Two special icons,



and , indicate material that is specific to Phase II or Phase V requirements. When these icons are presented together, the material is applicable under both Phase II and Phase V.

Monitoring requirements for unregulated contaminants and nonmonitoring requirements for acrylamide and epichlorohydrin are discussed briefly on pages 101 and 102.

Each unit on a specific contaminant class has the following components:

Unit Opener

An illustrated cover page with a short colored bar at the bottom marks the beginning of the unit. The bar, on which the abbreviated name of the contaminant class (e.g., VOCs) is written, allows you to quickly find the appropriate unit by thumbing through the guide. This bar is repeated, in a lighter color, at the top of all even-numbered pages and the bottom of all odd-numbered pages throughout the unit.

Summary

The summary presents typical sources of the contaminants, their potential health effects, and a brief overview of the regulations pertaining to that contaminant class.

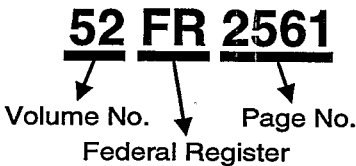
List of Terms

Important terms, including acronyms, introduced in the section are listed. These terms are printed in boldface type where they are introduced in the text, and they are defined in the Glossary at the back of the guide.

Status

The promulgation and effective dates for the final rule are listed here. The status of the regulation includes the appropriate *Federal Register* citations, where you will find the published proposed and/or final rule, and any

modifications. These citations are abbreviated and are read as follows:



The volume number refers to the year of publication. In the above example, 52 refers to 1992. The volume number for 1993 is 53. The page numbers run consecutively throughout that entire year, beginning with page 1 on January 2. The Federal Register is published every day excluding holidays and can be obtained from your local library. Figure 1-2 shows a detail of a Federal Register.

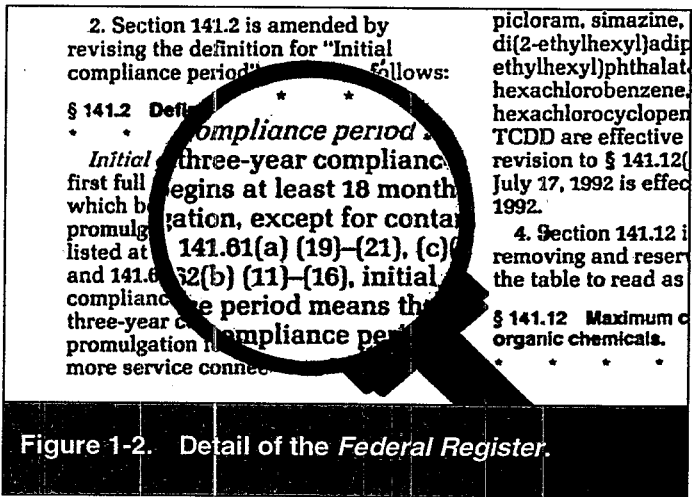


Figure 1-2. Detail of the *Federal Register*.

Maximum Contaminant Level (MCL)

The MCL is the enforceable standard set by the rule that specifies the maximum permissible level of a contaminant in water.

Monitoring Requirements

A brief description of the monitoring requirements for the rule is presented. Information contained under this heading may vary, but includes systems affected by the rule, sampling plan and schedule, initial base sampling, repeat

base sampling, increased/decreased sampling requirements and the trigger for such requirements, grandfathering, confirmation sampling, compositing, waivers from sampling, and analytical methods used. This section includes tables to help you better understand these sampling requirements, including the applicable Standardized Monitoring Framework. A series of detailed flowcharts outlining monitoring requirements complement the text. Included on each of these flowcharts, for your convenience, is a legend outlining the symbols used in each flowchart and their meaning. See below for a complete list of the symbols outlined in these legends throughout the guide.

Legend:

Symbol	Meaning
>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to

Sampling Procedures

This section contains detailed information about sampling equipment and procedures. It opens with a brief description of containers that can be used to collect samples in the field. The pages that follow describe step-by-step procedures for proper sampling. Sampling techniques that differ from the general sampling procedures outlined in the second unit will be accompanied by a photograph.

Additional Tools

Following the sections on specific contaminant classes are some additional tools to assist you in system monitoring:

- **Glossary.** A complete glossary provides definitions of acronyms and terms used throughout the guide. These terms appear in boldface type where they are introduced in the text.
- **Bibliography.** Publications cited throughout the guide that contain more detailed information on specific contaminants, monitoring requirements, or sampling procedures are listed.
- **Contacts and Notes.** Several blank pages are included for your use in keeping important phone

numbers such as those of state contacts and laboratories, and for jotting down notes about your own specific sampling needs.

- **Foldout Sampling Procedures and Pocket.** The illustrated sampling procedures from the guide are reproduced on durable foldout pages and conveniently stored in a pocket in the inside back cover of the guide.
- **EPA Regional Offices.** On the back cover of the guide are the addresses and phone numbers of EPA Regional offices, along with a map of the Regions. They are supplied for your quick reference.

Specific questions regarding monitoring requirements of the SDWA regulations or the actual sampling techniques should be directed to your state drinking water representative or to the laboratory that will be analyzing the samples. You should always check with your state representative before conducting any sampling.

As regulations are finalized for other contaminants or current regulations are revised, additional or revised guidebooks will become available. For information concerning these updates, write or call:

Jim Walasek
Office of Ground Water and Drinking Water
Technical Support Division
U.S. Environmental Protection Agency
26 West Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7919



In addition, you may call the EPA Safe Drinking Water Hotline at 1-800-426-4791 for assistance in understanding drinking water regulations and programs developed by EPA. The Hotline is available Monday through Friday, 8:30 a.m. to 5:00 p.m. Eastern Time.

Standardized Monitoring Framework

Summary

The primary objective of the Standardized Monitoring Framework is to reduce the variability and complexity of drinking water monitoring requirements. For this purpose, monitoring requirements have been standardized and schedules synchronized across rules and contaminant groups.

Terms Introduced in This Section

Compliance Cycle, Compliance Period, Detection Limit, Entry Point, Grandfathering, Increased Sampling, Initial Base Sampling, Reliably and Consistently, Repeat Sampling, Trigger Level, Waiver

Framework Application

This framework was promulgated under the EPA Phase II Rule and is applicable to the chemicals regulated under the Phase II and Phase V Rules, as well as the eight volatile organic chemicals originally regulated under the Phase I rule. It will eventually apply to most source-related contaminants and all kinds of water systems. The framework gives states the flexibility to establish their own sampling schedules for water systems. States can choose to require a percentage of the required systems to monitor during each year of the 3-year **compliance period** (e.g., states can require one-third of their systems to monitor in 1993, one-third in 1994, and one-third in 1995).

Framework Structure

To standardize monitoring requirements across rules and contaminant groups, the framework is composed of 9-year **compliance cycles**, each consisting of three 3-year compliance periods. These compliance cycles and periods all start on January 1. The first compliance cycle started on January 1, 1993, and extends through three 3-year compliance periods ending on December 31, 2001. The second compliance cycle starts in 2002 and extends through 2010. Table 2-1 illustrates the structure of the framework.

Table 2-1

Compliance Cycle for Standardized Monitoring Framework

Year		
1993	Initial Monitoring	} First 3-Year Period
1994		
1995		
Year		
1996	Repeat Monitoring	} Second 3-Year Period
1997		
1998		
Year		
1999	Repeat Monitoring	} Third 3-Year Period
2000		
2001		

Standardized Monitoring Requirements

Specific standardized monitoring requirements may vary for different contaminants. In general, the requirements are as follows:

- All systems must perform **initial sampling**. In some cases, this may be satisfied by using previous (**grandfathered**) sampling results. (See *grandfathering* section.)
- **Repeat sampling** requirements are based on the results of the initial sampling. The requirements for repeat monitoring are minimized if certain **trigger levels** are not exceeded. These trigger levels are defined separately for each contaminant or group of contaminants at the MCL, 50 percent of the MCL, or a specified **detection limit**.
- All systems that detect a contaminant in concentrations above the specified trigger level must conduct **increased sampling**. This involves quarterly sampling beginning in the next quarter, until the state determines that the analytical results are **reliably and consistently** below the MCL. Once this occurs, the system may switch to less frequent monitoring than quarterly.



"Reliably and consistently" below the MCL means that although a system detects contaminants in its water supply, the state has sufficient knowledge of the source or extent of the contamination to predict that the MCL would not be exceeded in the future.

Grandfathering

States may allow systems to use sampling data taken within 3 years prior to the initial compliance period to satisfy the initial base sampling requirements. If a system's data for a source are grandfathered and below the trigger levels, the system may sample for that contaminant at frequencies that are generally lower than initial frequencies.

Waiver

Under federal regulations, states are allowed to develop **waiver** programs that reduce or eliminate a system's monitoring requirements. In most cases waivers of sampling requirements are based upon analytical results of previous sampling and a vulnerability assessment. The state makes waiver determinations on a contaminant-specific basis. There are two types of waivers:

- **Waiver for Inorganic Compounds:** A system must be determined by the state to be predictably under the MCL based on at least three analytical results.
- **Waiver by Vulnerability Assessment:** This type of waiver involves two steps:

Step 1 — Use Waiver: A determination is made whether a given contaminant was used, manufactured, and/or stored in a system area (an area that possibly would affect the water quality). If the determination is positive or unknown, the system cannot be granted a "use waiver."

Step 2 — Susceptibility Waiver: If a "use waiver" cannot be granted, a system may conduct a thorough vulnerability assessment of the water source to determine the system's "susceptibility" to contamination. A "susceptibility waiver" may be granted for sources with no known "susceptibility" to contamination (based on an assessment of a number of factors). If "susceptibility" cannot be determined, a system must sample at the required sampling frequency.

Public Notification Requirements

If a public water system becomes aware, based on sampling results, that it has exceeded an MCL or otherwise violated requirements for compliance with a rule, it must inform the public as soon as possible. There are two types of violations:

- **Tier 1 Violations** — Violations of an MCL, or variance or exemption schedule. These violations may be either

acute, involving an immediate risk to human health, or nonacute, involving no immediate risk to human health.

- **Tier 2 Violations** — Violations of monitoring requirements or testing procedures, or when a variance or exemption is issued. (Operating under a variance or exemption is not a regulatory violation, but public notification of such a condition is required.)

Each type of violation requires different notification procedures. Tier 1 violations involving nitrite and nitrate are defined as acute violations; Tier 1 violations of all other compounds promulgated in Phase II and Phase V are defined as nonacute violations. Notification procedures for community water systems are summarized in Table 2-2.

A public notice must include the following information:

- A clear and understandable explanation of the violation.
- Information about any potential adverse health effects.
- Information about whether particular members of the service population, such as infants or senior citizens, are particularly susceptible to problems that may result from the violation.
- Steps being taken to correct the problem.
- Whether it is necessary to seek alternative water supplies.
- Any preventive measures that should be taken until the problem is corrected.

In addition, the notice must be clear and conspicuous and written in easy-to-understand language. The notice also should include a phone number of someone at the public water system who can be contacted for further information. If a large percentage of the service population does not speak English, the notice must be written in the appropriate language as well as in English. For more detailed information on public notification requirements, see *Public Notification Handbook for Public Water Systems* (EPA 570/9-89-002), Office of Water, U.S. EPA, 1989, or contact your state drinking water representative.

Table 2-2: Summary of Public Notification Requirements

		Days After Violation				
		3	7	14	45	90
TIER 1¹						
Acute Violations						
TV and Radio ²		No Repeat				
Newspaper ²		No Repeat				
Mail or Hand Delivery ³		Quarterly Report				
Nonacute Violations						
Newspaper		No Repeat				
Mail or Hand Delivery ³		Quarterly Report				
TIER 2⁴						
Newspaper ²		Quarterly Report by Mail or Hand Delivery				

- 1 Mandatory health information is required for all Tier 1 violations of MCL, treatment technique, or variance or exemption schedule.
- 2 If no newspaper of general circulation is available, posting or hand delivery is required.
- 3 May be waived.
- 4 Mandatory health information is required for Tier 2 violations only when a variance or exemption has been issued.
- 5 For monitoring violations, less frequent notice (but no less than annual) may be required.

General Sampling and Procedures

Introduction

The general sampling procedures for monitoring the regulated chemicals in Phase II and Phase V are presented below. Detailed sampling information for specific compounds can be found in the guide sections for each type of compound.

Terms Introduced in This Section

Compliance Monitoring Sample, Field Trip Blank, Laboratory Trip Blank, Replicate Sampling, Septum (Septa)

Drinking Water Laboratory Certification Considerations

Local utility and commercial laboratories are certified by the state in which they reside, or by another state in which they wish to be considered certified, to be allowed to generate data for compliance monitoring purposes. Laboratories are normally certified by analyte, not by group or method, although this varies by state.

Once certified, the laboratory must maintain this classification on a yearly basis. Before a sample is sent to a new or different laboratory, the sampler must verify with his or her state certification personnel that the laboratory in question is still considered certified for the contaminant(s) of interest.

Sampling Containers

Generally, an EPA- or state-certified laboratory will supply the required containers for sampling. Kits may vary widely among laboratories. The kit should be inspected for all the required materials. Generally, the laboratory will supply

detailed sampling instructions keyed to its particular sampling kit (e.g., color-coded bottles and labels).

The laboratory also will normally add preservatives to the containers if required, before shipping them to the utility. Many laboratories maintain files on their utility clients and automatically send out the proper kit prior to the date when compliance sampling is required. It is the system's responsibility, however, to comply with the monitoring provisions of the rule. Coolers or insulated packing boxes for shipping samples are also usually provided by the laboratory for the operator's convenience.

Before sampling, it is necessary to make sure all containers, caps, and **septa** (generally, TFE-fluorocarbon lined) are clean. The laboratory supplying the containers will have cleaned them according to the recommended procedures.



For more information on the analytical methods used for the regulated contaminants, and the preservatives and holding times used in these methods, refer to EPA's *LabCert Bulletin* (Office of Ground Water and Drinking Water, September 1992, EPA-814-K-92-002).

Representative Sampling

The result of any laboratory analysis is only as good as the sample collected. The objective of sampling is to obtain a sample that "represents" the true character of the water being tested. To achieve this, samples should be collected at a specific location, using consistent methods. This representative sample also must receive proper handling (preservation, transport, storage, etc.) after it has been collected, so its composition will not be altered before being analyzed.

Sampling Points

Samples must be collected in the proper number, at the appropriate time and location, and of the proper volume in order to satisfy the requirements of the Phase II and

Phase V Rules. Samples that fulfill these criteria are called **compliance monitoring samples**.

The Phase II and Phase V Rules require that samples for most contaminants be taken at each **entry point** to the distribution system. There is an exception, however, for systems that are vulnerable to asbestos contamination, either due to asbestos-cement piping and/or the corrosivity of the water and source water conditions. These systems must take one sample at a tap served by asbestos-cement piping and under conditions where asbestos contamination is most likely to occur. If asbestos occurs in the source water, however, sampling must be conducted at each entry point in the distribution system as is the case for other contaminants.

All samples must be *representative of the source water after treatment* (see Figure 3-1). Systems that draw water from more than one source and that combine these sources prior to distribution must sample during periods of normal operating conditions. Samples must be collected at the same sampling point each cycle unless conditions make another sampling point more representative. If any sampling point in a system violates an MCL, the entire system is in violation of the MCL. For any questions regarding sampling locations, contact your state drinking water program.

Compositing

States may choose to allow up to five samples to be composited, a process by which equal quantities of several samples are combined to produce one sample. By allowing compositing (as well as vulnerability waivers and grandfathering discussed earlier), EPA has provided the states with flexibility that will help reduce the monitoring costs for many small systems.

Compositing must be done *in a certified laboratory*, the method of analysis must have a detection limit less than one fifth of the MCL, and analysis must be conducted within 14 days of sample collection. If any contaminant is detected in the composites at levels greater than one-fifth of the MCL, followup sampling must be conducted at each site included in the composite. Duplicates of the original samples may be used for followup sampling; however, the

W = Well



= Distribution System



= Sample



= Surface Water Source

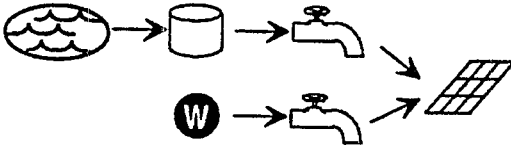


= Blending Point

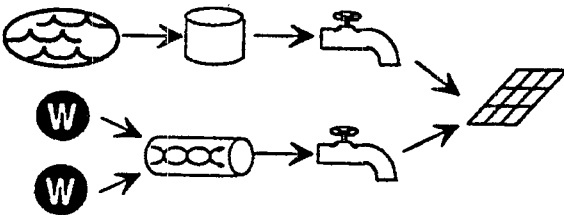


= Treatment Plant

1. Two sources are not blended; collect two samples.



2. Three sources of which two are blended; collect two samples.



3. Four sources are not blended prior to entry into the distribution system; collect four samples.

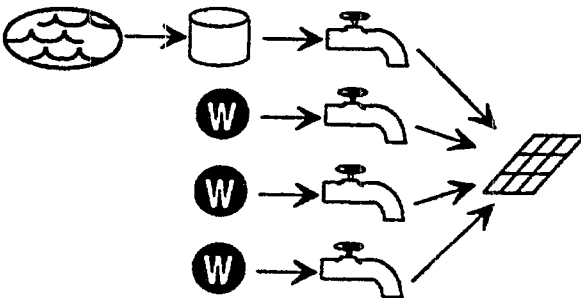


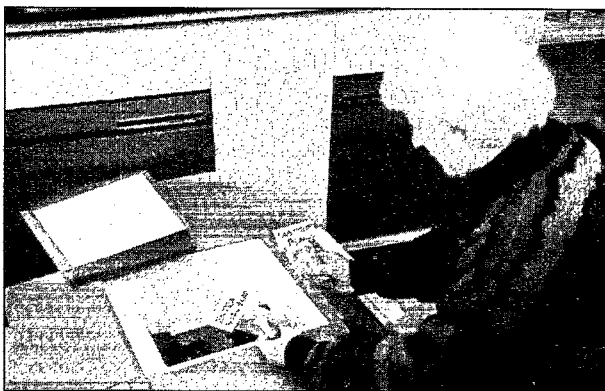
Figure 3-1. Examples for Determining Sampling Locations and Numbers of Required Samples (Applies to All Phase II/V Contaminants Except Asbestos Tap Sampling and Acrylamide/Epichlorohydrin).

samples must be analyzed within 14 days of the collection date. For small systems (those serving 3,300 or fewer persons), your state may allow compositing among different systems. Contact your state drinking water program to find out about compositing requirements in your state.

Procedures

Water treatment plant operators should follow these general procedures for quality sampling. Laboratories may recommend procedures for sampling and addition of preservatives for specific contaminants.

- 1** Collect the samples immediately prior to shipment to the laboratory.
- 2** Read the laboratory's sampling instructions carefully. Sampling containers may contain a preservative. Do not rinse them prior to sample collection. Do not add preservatives to the sample unless specifically instructed to do so by the laboratory. If cold packs will be used, freeze them prior to sample collection.



Inspecting the sampling kit and reading the instructions.



Freezing cold packs for shipment to the lab.

3

Choose the sampling point. The sampling point should be representative of the water *after* treatment. Generally, samples should be taken at the tap on the pipeline before the treated water is sent to the distribution system. Sometimes sampling taps (faucets) are available in the plant laboratory for the water entering the distribution system.



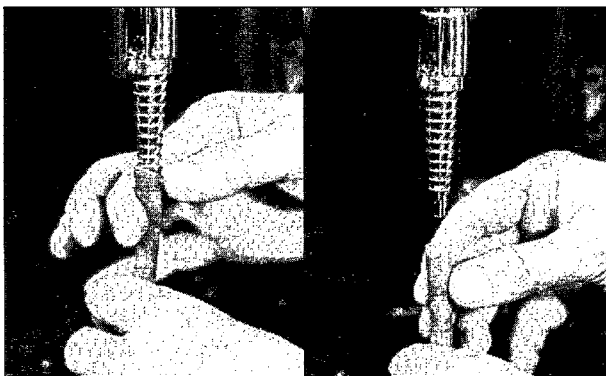
Sampling tap on the pipeline entering the distribution system.



Bottles must NOT be filled near gasoline cans, gasoline-powered motors, paint cans, lighter fluid, paint strippers, pesticide bottles, or exhaust fumes from running engines. Fumes and vapors may contaminate the samples.

4

Remove any attachment (such as a hose, strainer, or aerator) from the tap.



Removing the hose from the tap.

5

Flush the tap for more than 10 minutes or until the water temperature becomes stable. This helps ensure a representative water sample.



Flushing the tap until the water temperature stabilizes.

6

While water is running and before collecting the sample, fill out the label with the following information:

- Entry point ID number (if any)
- Exact location of sampling
- Date and time the sample was taken
- Type of analyses to be conducted

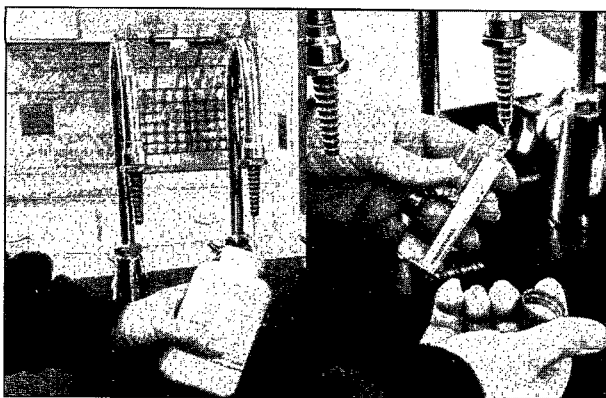
The laboratory that analyzes your samples will usually provide any forms and/or labels required for recording sampling-related information. Make sure that you provide *all* information requested. Often, the sampling results are reported to the state on the same form that the laboratory sends with the sampling containers to the public water system.



Filling out the label.

7

Position the container under the tap and collect the required volume of water (see sections on specific compounds for unique sampling requirements). Introduce the water very gently to reduce agitation and to avoid introducing air bubbles. Fill the bottle so that little or no air space will remain in the bottle after the cap is secured.



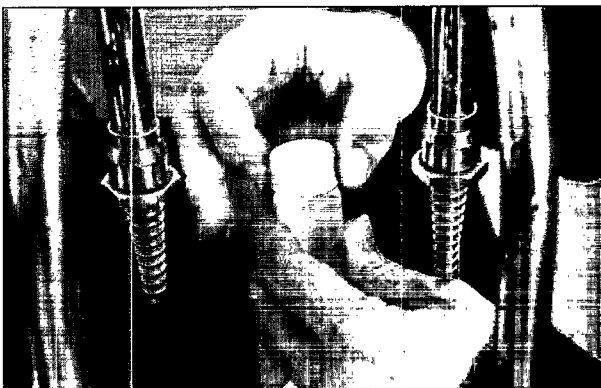
Collecting the sample (different containers shown).

- 8 Follow any instructions provided by the laboratory regarding addition of biocide, acid, and/or preservatives to the container. *Usually, these are added by the laboratory*, however, occasionally the laboratory might include another reagent. For example, some laboratories may supply a dechlorination agent (thiosulphate) to be added to samples that have been disinfected by chlorination.



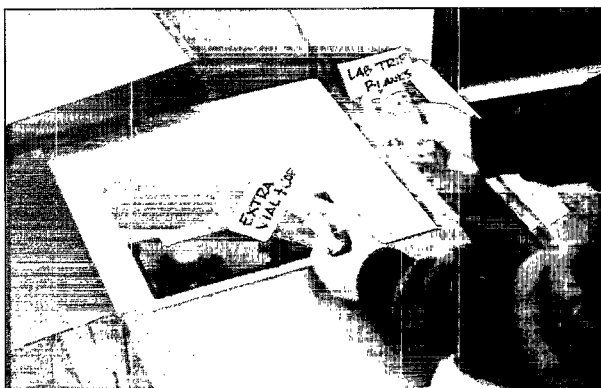
Adding a dechlorination agent to the sample.

- 9 Screw the cap on the container (with the shiny white side of the septum facing toward the sample). *Do not touch the inside of the cap and do not over-tighten.* Use extra caps or septa provided by the laboratory if the originals become contaminated or broken.



Screwing the cap onto the bottle.

- 10** Follow laboratory instructions regarding **replicate samples** (multiple field samples collected under identical circumstances), **field trip blanks**, and **laboratory trip blanks** used by the laboratory for quality control.



Field trip and laboratory blanks.

- 11** Complete any other forms supplied by the testing laboratory with the requested information, such as:
- PWS identification number
 - Sample collection location
 - Sampling time and date

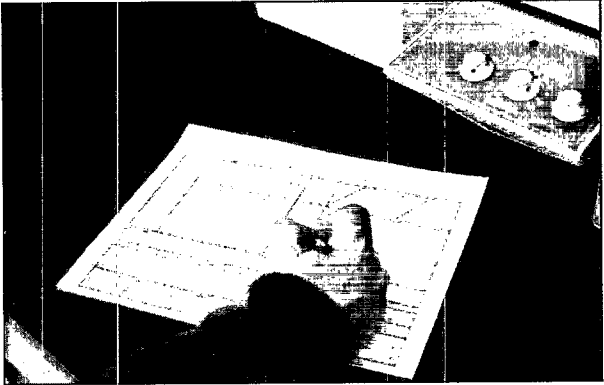
- Sample type (grab or composite, raw, plant tap, entry point or distribution)
- Type of analyses to be conducted

Many states require that "chain-of-custody" procedures be followed for compliance monitoring samples. The typical chain-of-custody form establishes the whereabouts of, and person responsible for, the sample at any point of time. A portion of a sample chain-of-custody record form is shown below (see Figure 3-2). The form must be completed by field personnel at the time that the samples are collected. Use waterproof ink to fill out your form, according to laboratory instructions, as soon as you collect the sample. The information on the

Relinquished by:	Date/Time:	Received by:	Date/Time:
Dispatched by:	Date/Time:	Received for Lab by:	Date/Time:
Method of Shipment _____		Seal Intact: Yes _____	
Sample Lab # Locked in Refrig	Date/Time:	Received by:	Date/Time:
Sample Lab # Locked in Refrig	Date/Time:	Removed from Refrig	Date/Time:
Sample Lab # Locked in Refrig	Date/Time:	Received from Refrig	Date/Time:

Figure 3-2 Chain of Custody Form.

chain-of-custody form must match the information on the container label. Print or write legibly and note any special conditions that could suggest contamination.



Filling out the chain-of-custody form.

- 12** Pack and transport the samples. Pack the containers in the same manner that they were received to avoid breakage. Samples must be kept at/or below the required temperature (but not allowed to freeze). If they need to be refrigerated, cool them with sufficient ice, or prefrozen chemical cold packs (blue ice), to keep them below the proper temperature (4°C). To protect samples from breakage, packing materials (such as bottle holders, cardboard, and polystyrene foam) should be used. Ice should not be used as a packing material, since it will melt and leave space leading to breakage of the bottles during shipping. If the samples are collected within a reasonable driving distance of the laboratory, and refrigeration is required, a picnic cooler may be used as a sample carrying case. Samples shipped by commercial carrier must be cooled to the proper temperature, in addition to being protected against breakage or spillage by a suitable shipping case. As mentioned above, the lab will usually provide these cases.



Packing the sample containers for shipment to the lab.

- 13** Ship or deliver samples to the laboratory (or have them picked up) the same day or by overnight courier. The temperature of the samples must be kept at/or below 4°C during shipping and before analysis.

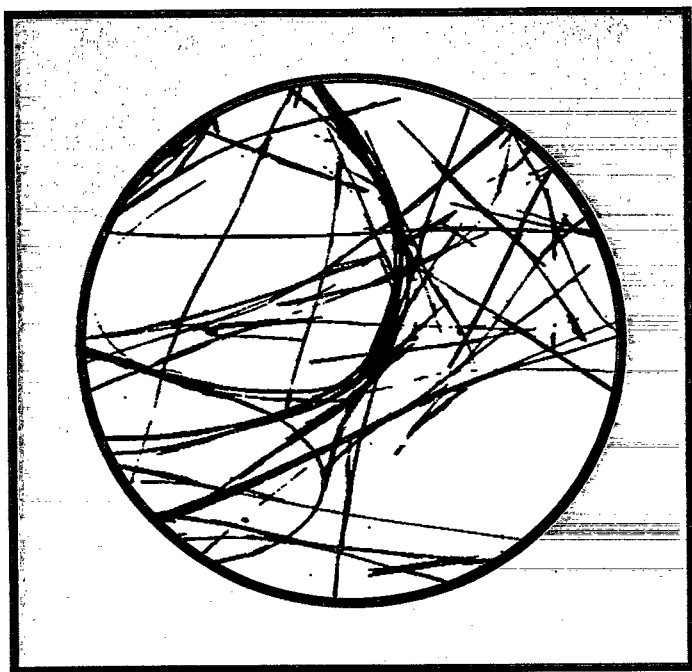


Sample information forms always must accompany the samples and be delivered to the testing laboratory at the same time the samples are delivered.



Delivering the samples to the lab by overnight courier.

Asbestos



Asbestos

Summary

P_{II} An **MCL** for asbestos was promulgated in the EPA Phase II Rule on January 30, 1991. Asbestos enters drinking water generally either from natural mineral deposits or asbestos-cement pipes that are used for carrying water. Inhalation of asbestos has produced lung tumors in laboratory animals, and ingestion of asbestos fibers more than 10 micrometers long has produced benign tumors in laboratory animals. Chemicals that cause tumors in laboratory animals may increase the risk of cancer in humans exposed over long periods of time. Asbestos can be removed efficiently from drinking water by filtration and corrosion control processes.



This contaminant is regulated under Phase I only.

Terms Introduced in This Section

CWS, MCL, NTNCWS



Status

Promulgation Date

January 30, 1991
(56 FR 3526)

Effective Date

July 30, 1992



MCL

The **MCL** is 7 million fibers/L (longer than 10 micrometers) (see Table 4-1).

Table 4-1. Regulations for Asbestos Under Phase II		
Contaminant	MCL	Trigger Level
Asbestos	7 million fibers per liter (MFL) (longer than 10 micrometers)	7 MFL (longer than 10 micrometers)

Monitoring Requirements

P_{II} Systems Affected

All community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs).



Sampling points for asbestos differ from those for all other classes of contaminants. If asbestos occurs in the source water, samples must be taken at each entry point to the distribution system. Systems that are vulnerable to asbestos contamination, either due to asbestos-cement piping and/or the corrosivity of the water, must take one sample at a tap served by asbestos cement piping and under conditions where asbestos contamination is most likely to occur.

P_{II} Sampling Plan and Schedule

Table 4-2 illustrates the Standardized Monitoring Framework schedule for initial and repeat sampling for asbestos.

P_{II} Trigger Level for Increased Monitoring

MCL (i.e., 7 million fibers [longer than 10 micrometers]).

P_{II} Initial/Repeat Sampling Requirements

For each system, the state determines the year in which the system samples within the compliance period. There are two cases applicable to water systems (see Figure 4-1).

P_{II} Case 1

Grandfathering (1993): States may allow previous sampling data (obtained after January 1, 1990) to satisfy initial

**Table 4-2. Standardized Monitoring Framework:
Asbestos: Phase II
Conditions: Analytical results <MCL**

	Calendar Years	Base Requirements	Waivers
First 9-Year Compliance Cycle	1993—1995 <i>Initial Compliance Period</i>	1 sample during initial 3-year period at each sampling point	Waivers based on vulnerability assessment (no samples required)
	1996—1998 <i>Repeat Compliance Period</i>	No requirements	Not applicable
	1999—2001 <i>Repeat Compliance Period</i>	No requirements	Not applicable
Second 9-Year Compliance Cycle (<i>First Compliance Period</i>)	2002—2004 <i>Repeat Compliance Period</i>	1 sample during 3-year period at each sampling point	Waivers based on vulnerability assessment

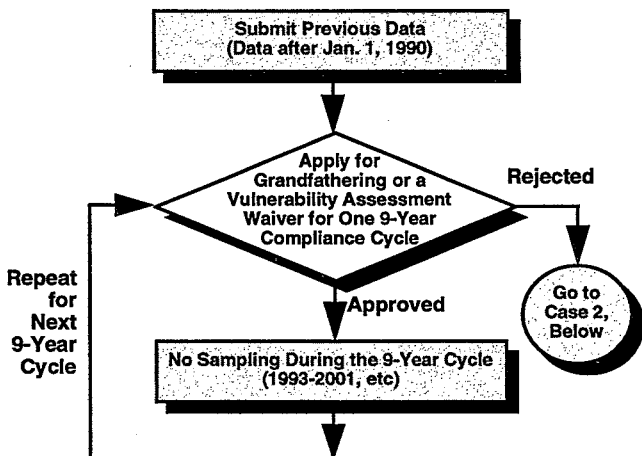
base sampling requirements. If data for a source are grandfathered, the system need not sample during the initial 9-year cycle.

P_{II}

Case 2

Regular Sampling: If a system does not have data to be grandfathered, the system must take one sample during the first period (1993-1995) of the 9-year compliance cycle. If the results of the initial sample do not exceed the MCL for asbestos, then the system is not required to take repeat samples until the first period (2002-2004) of the next 9-year compliance cycle. Once a system has three samples less than the MCL, it may apply for a sampling waiver for the next 9-year cycle.

CASE 1: Grandfathering or Sampling Waiver



CASE 2: Regular Sampling

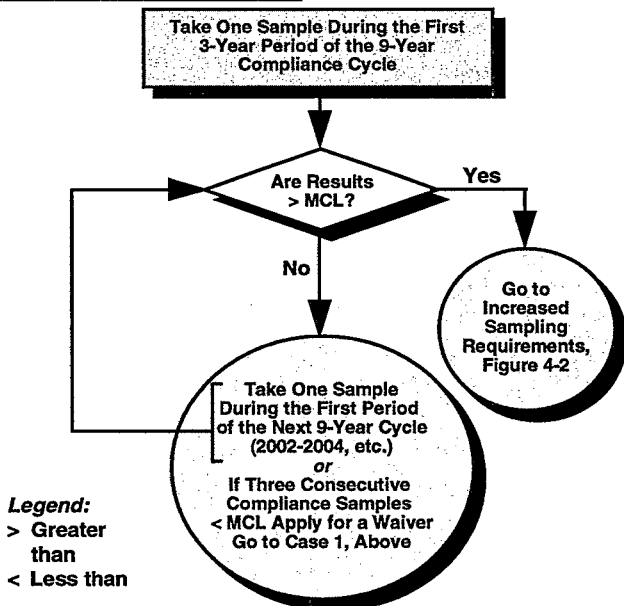


Figure 4-1. Asbestos Initial/Repeat Sampling Requirements Under Phase II.

P_{II} Increased Sampling

If any sample exceeds the trigger level (the MCL) for asbestos at any time, the system must conduct quarterly sampling beginning in the next quarter (Figure 4-2). The quarterly sampling results can only be reduced at the state discretion.

P_{II} Confirmation Sample

States may require a confirmation sample for any sample that exceeds the MCL. The confirmation sampling must be conducted within 2 weeks.

P_{II} Waivers

Waivers may be issued by vulnerability assessment or based on sampling results. If a state grants a waiver, no sampling is required. To obtain a waiver based on sampling data, a system must be determined by the state to be predictably under the MCL based on at least three samples. Waivers are effective for one 9-year compliance cycle.

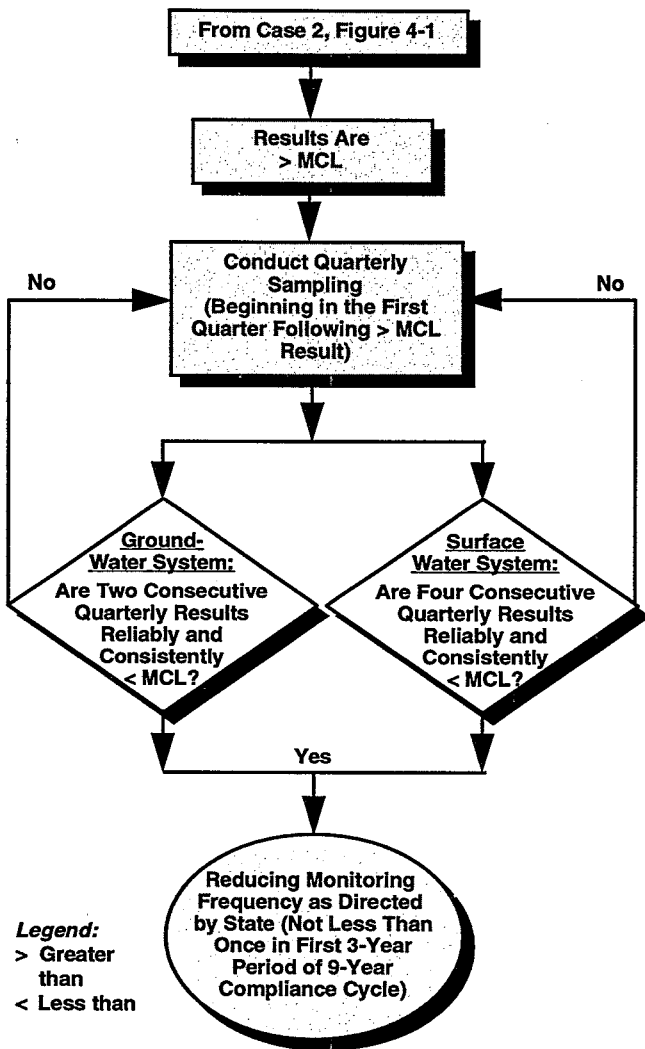
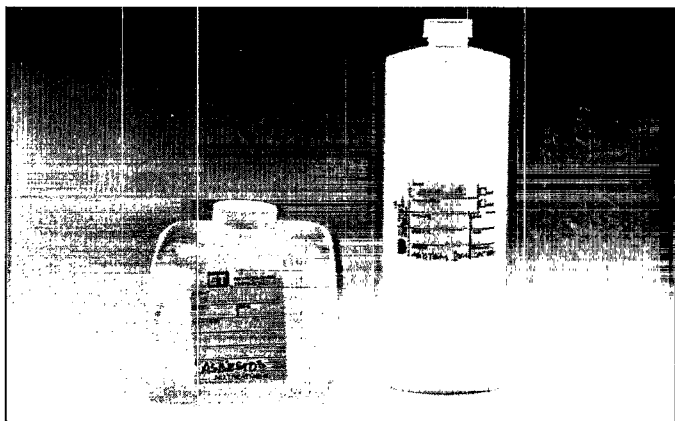


Figure 4-2. Asbestos Increased Sampling Requirements Under Phase II.

Sampling

P_{II} Sampling Containers

Glass or plastic bottles are required for taking samples. The volume depends on the requirements of the testing lab, but must be at least 1 liter.



Typical asbestos sampling containers.

Procedures

P_{II} Follow the procedures recommended by the laboratory (if any) for sampling.



For more information, refer to *Analytical Method for Determination of Asbestos Fibers in Water*, September 1983. (Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, PB83-260471).

The sampling procedures for asbestos are as follows:

- 1** Locate the sampling point or points (see discussion of sampling points on pages 16-17.)

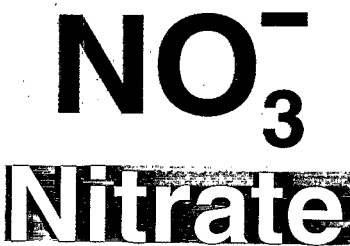
- 2** Remove any attachment from the tap.
- 3** Flush the tap for about 10 minutes or until the water temperature has stabilized.
- 4** While water is running, fill out the label with the required information.



Filling out the label.

- 5** Fill the bottle with water to the required volume.
- 6** Screw the cap on the bottle.
- 7** Repeat the above procedures (4-6) for all replicate samples.
- 8** Complete the forms supplied by the testing laboratory with the requested information.
Repeat steps 1-8 at other sampling points (if any).
- 9** Pack the samples in an ice chest.
- 10** Ship or deliver samples to the laboratory the same day or by overnight courier.

Nitrite and Nitrate



Nitrite and Nitrate

Summary

P_{II} On January 30, 1991, MCLs for nitrite and nitrate were promulgated in the EPA Phase II Rule. The existence of these chemicals in drinking water is generally due to natural deposits, agricultural activity, and sewage. Nitrite and nitrate can cause methemoglobinemia, known as "blue-baby syndrome." The best available technologies (BATs) to remove these contaminants are ion exchange and reverse osmosis.



This contaminant is regulated under Phase II only

Terms Introduced in This Section

BATs, TNCWSs



Status

Promulgation Date

January 30, 1991
(56 FR 3526)

Effective Date

July 30, 1992



MCLs

MCLs for nitrate, nitrite, and total nitrate/nitrite are listed in Table 5-1.



Some states may have more stringent monitoring requirements than others; check with your state drinking water representative for exact requirements.

Table 5-1. Regulations for Nitrate and Nitrite Under Phase II

Contaminants	EPA Standard (mg/L) ¹	
	MCL	Trigger Level
Nitrate	10	5 ²
Nitrite	1	0.5
Total Nitrate/Nitrite	10	5

¹As nitrogen.

²Not applicable to TNCWSs.

Monitoring Requirements

P_{II} Systems Affected

CWSs, NTNCWSs, and **transient non-community water systems (TNCWSs)**.

P_{II} Sampling Plan and Schedule

Nitrite and nitrate have different requirements for initial and repeat sampling. Table 5-2 illustrates the Standardized Monitoring Framework for nitrite. TNCWSs, CWSs, and NTNCWSs follow a similar schedule for nitrite sampling. Table 5-3 shows the Standardized Monitoring Framework for nitrate. TNCWSs, CWSs, and NTNCWSs follow different sampling schedules (as shown in Table 5-3) for nitrate sampling.

P_{II} Trigger Level for Increased Monitoring

50 percent of the MCL as shown in Table 5-1 (not applicable to TNCWSs for nitrate monitoring).

Since nitrate and nitrite have different sampling schedules and requirements, the requirements for each chemical will be explained separately.

**Table 5-2 Standardized Monitoring Framework:
Nitrite; Phase II**

	Calendar Years	Base Requirements	Waivers
First 9-Year Compliance Cycle	1993—1995 <i>Initial Compliance Period</i>	1 sample during initial 3-year period at each sampling point	No
	1996—1998 <i>Repeat Compliance Period</i>	If analytical result is <50% of the MCL, sample at state discretion	
	1999—2001 <i>Repeat Compliance Period</i>	If analytical result is <50% of the MCL, sample at state discretion	
Second 9-Year Compliance Cycle (First Compliance Period)	2002—2004 <i>Repeat Compliance Period</i>	If analytical result is <50% of the MCL, sample at state discretion	No



**Grandfathering or the issuance of waivers
is not allowed for nitrite and nitrate.**

Nitrite

P_{II} Initial/Repeat Sampling Requirements

All systems must take one sample at each sampling point during the initial compliance period (1993-1995). The state decides in which year the system should sample. The schedule for regular repeat sampling for the subsequent periods also is decided by the state (Figure 5-1 and Table 5-2).

Table 5-3 Standardized Monitoring Framework: Nitrate, Phase II.

Conditions: Analytical results from all samples are <50% of the MCL

		Base Requirements				Waivers
	Calendar Years	TNCWS	Surface Water CWS and NTNCWS	Ground-Water CWS and NTNCWS		
First 9-Year Compliance Cycle	1993—1995 <i>Initial Compliance Period</i>	1 sample every year	Quarterly samples in 1993 at each sampling. May reduce to annual sampling in 1994 and 1995 at state discretion if all four analytical results are <50% of the MCL	1 sample every year at each sampling point as long as analytical results are <50% of the MCL	No	
	1996—1998 <i>Repeat Compliance Period</i>	1 sample every year at each sampling point	1 sample every year ¹ at each sampling point	1 sample every year at each sampling point		
	1999—2001 <i>Repeat Compliance Period</i>	1 sample every year at each sampling point	1 sample every year ¹ at each sampling point	1 sample every year at each sampling point		
Second 9-Year Compliance Cycle	2002—2004 <i>Repeat Compliance Period</i>	1 sample every year at each sampling point	1 sample every year ¹ at each sampling point	1 sample every year at each sampling point	No	

¹Sample during the quarter that yielded the highest result.

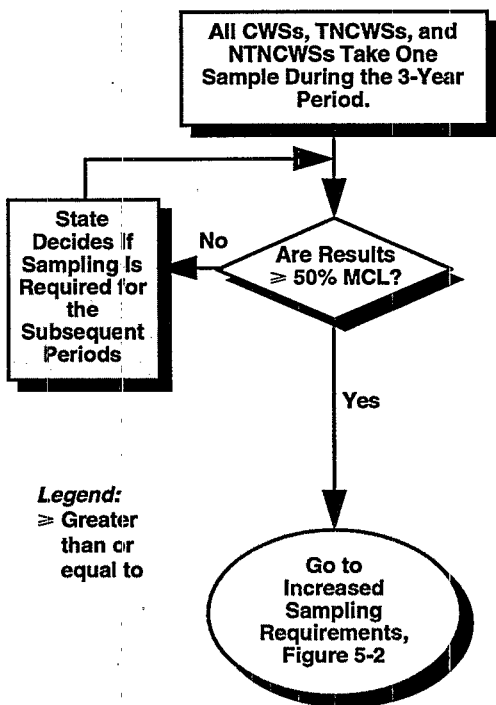
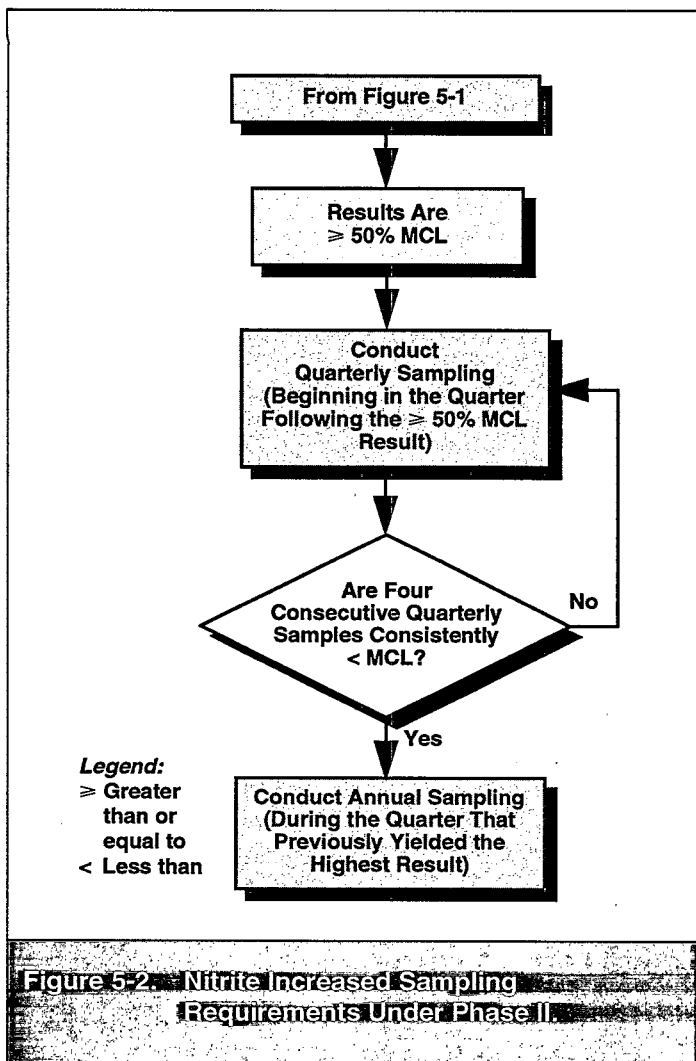


Figure 5-1 Nitrite Initial/Repeat Sampling Requirements Under Phase II.

P.II Increased Sampling Requirements

If any system equals or exceeds the trigger level for nitrite at any time, the system must conduct quarterly sampling beginning in the next quarter. The state may allow a system to reduce the quarterly sampling to annual sampling providing four consecutive quarterly results are “reliably and consistently” below the MCL (Figure 5-2).

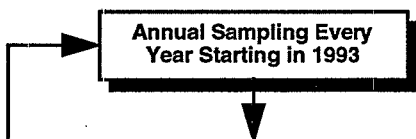


Nitrate

P_{II} Initial Sampling Requirements

All systems must start sampling in the first year of the 1993-1995 compliance period. TNCWSs, CWSs, and NTNCWSs have different sampling requirements (see page 47 and Figure 5-3).

CASE 1: TNCWSS (starting in 1993)



CASE 2: CWSs and NTNCWSS (1993)

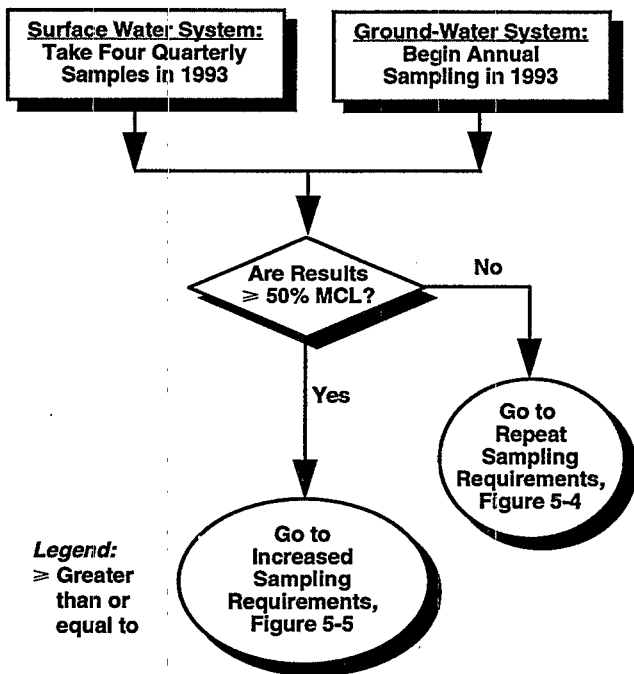


Figure 5-3 Nitrate Initial Sampling Requirements Under Phase II

P_{II} **Case 1**

TNCWSs (1993, etc.): *TNCWSs* must conduct annual sampling in each year of the 9-year cycle, without exception. Repeat sampling requirements for *TNCWSs* and increased sampling requirements for *TNCWSs* are the same as the initial sampling requirements (i.e., annual).

P_{II} **Case 2**

CWSs and *NTNCWSs* (1993-1995):

- Annual sampling is required for ground-water *CWSs* and *NTNCWSs*.
- Beginning January 1, 1993, quarterly sampling is required for surface water *CWSs* and *NTNCWSs*.

P_{II} **Repeat Sampling Requirements for *CWSs* and *NTNCWSs***

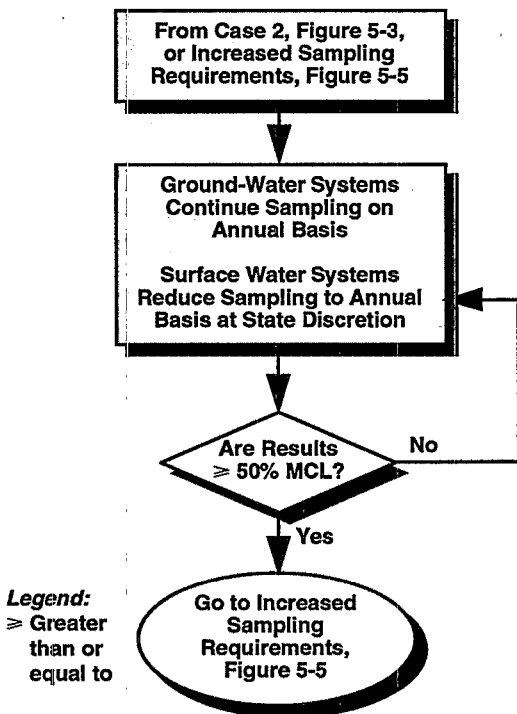
CWSs and *NTNCWSs* must conduct annual sampling during the quarter that previously yielded the highest results (Figure 5-4).

P_{II} **Increased Sampling Requirements for *CWSs* and *NTNCWSs***

If any result from initial or repeat sampling for a *CWS* or a *NTNCWS* is greater than or equal to 50 percent of the MCL, the system must meet increased sampling requirements (Figure 5-5).

P_{II} **Confirmation Sample**

A system must take a confirmation sample for nitrite or nitrate within 24 hours for each result found to be greater than or equal to the trigger (50 percent of the MCL). If the system cannot meet this requirement, it must notify the public (see page 12) and take a confirmation sample within 2 weeks.

CWSs and NTNCWSs (1994, etc.)**Figure 5-4. Nitrate Repeat Sampling Requirements.**

CWSs and NTNCWSs

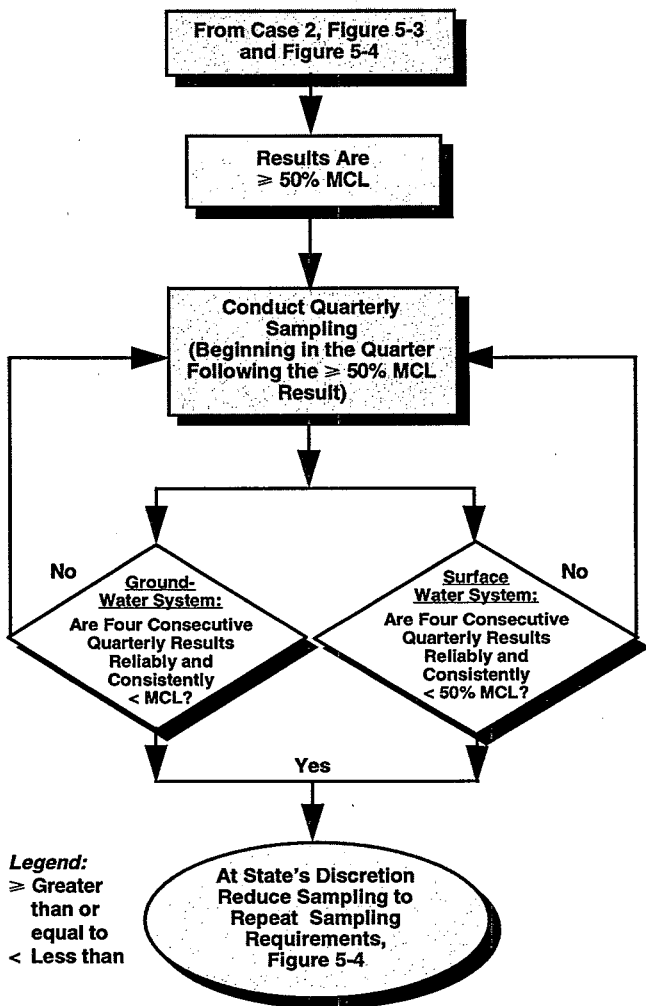
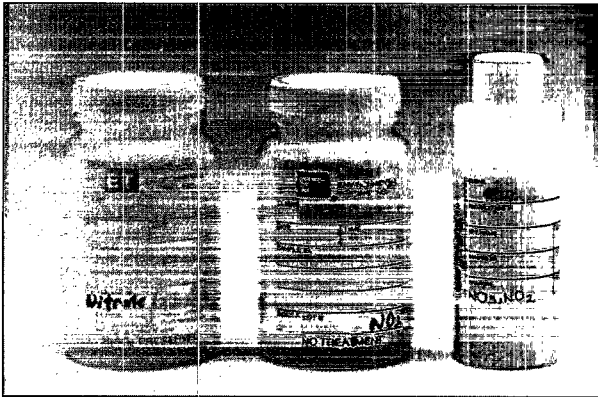


Figure 5-5 Nitrate Increased Sampling Requirements Under Phase II.

Sampling

P_{II} Sampling Containers

The testing laboratory generally will supply containers for sampling. The required volumes are 50 mL and 100 mL for nitrite and nitrate, respectively. The containers may be made of glass or plastic.



Typical nitrite and nitrate sampling containers.

Procedures

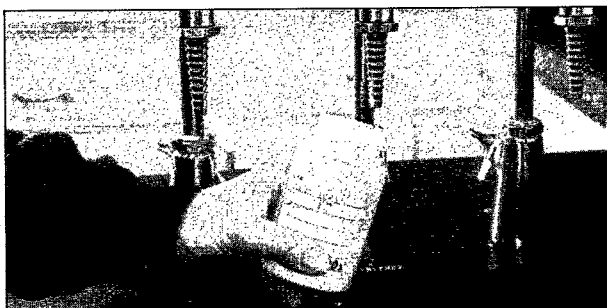
P_{II} Follow the laboratory recommended procedures (if any) for sampling and addition of preservatives.



**For further information, please refer to the
EPA Manual, Method of Chemical Analysis of
Water and Wastes (EPA 600/4-79-020).**

The general sampling procedures for nitrite and nitrate monitoring are as follows (*Steps 6 and 7 are for nitrate samples only*):

- 1 Locate the sampling point(s).
- 2 Remove any attachment from the tap.
- 3 Flush the tap for about 10 minutes or until the water temperature has stabilized.
- 4 While the water is flushing, fill out the label with the required information.
- 5 Fill the bottle with the required volume of water.

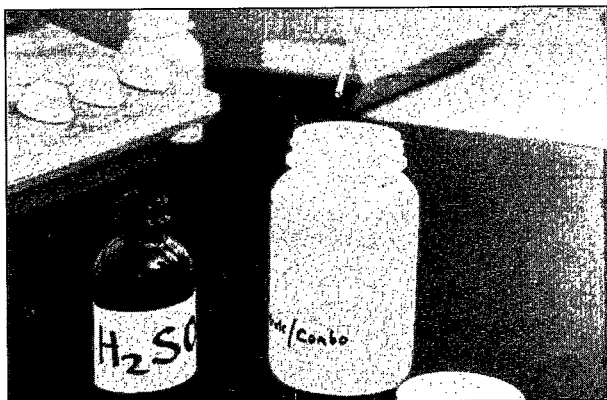


Collecting the sample.

6



FOR NITRATE SAMPLES ONLY: If so instructed by the laboratory, add sulfuric acid to the non-chlorinated samples to adjust the pH to 2 for preservation. (The laboratory usually pre-adds acid to the containers.)

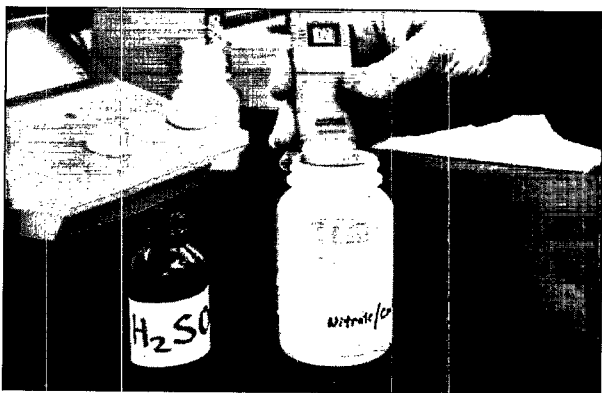


Adding acid to the sample using a pipet.

7



FOR NITRATE SAMPLES ONLY: Use pH paper or a meter to measure pH.



Measuring pH using a pH meter.



Due to the strong toxicity and corrosivity of the acid, take appropriate safety precautions. Wear goggles and a pair of rubber gloves while adding the acid.

8

Screw the cap on the bottle.

9

Repeat the above procedures (4-8) for all replicate samples.

10

Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-10 at other sampling points (if any).

11

Pack the samples in an ice chest.

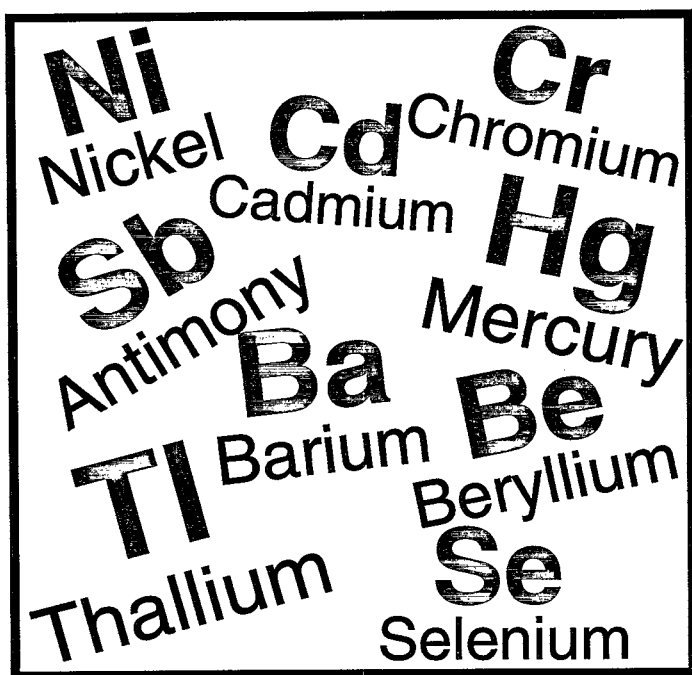
12

Ship samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Inorganic Compounds (IOCs)



Inorganics

Summary

P_{II} The inorganics discussed under Phase II of this section were first regulated for MCLs in the National Interim Primary Drinking Water Regulations on December 24, 1975 (40 FR 59566). New MCLs were promulgated for these inorganics in the Phase II Rule. Contamination sources of these regulated metals (barium, cadmium, chromium, and mercury) and the non-metal selenium are natural mineral deposits and industrial activities such as metal finishing, textile manufacturing, and painting. Cadmium, chromium, and selenium can cause damage to the kidneys, liver, and nervous and circulatory systems of humans. Barium is associated with high blood pressure in laboratory animals, and mercury has been shown to damage the kidneys of these animals. These inorganics can be removed from drinking water by various processes including activated alumina, coagulation/filtration, granular activated carbon (**GAC**), ion exchange, lime softening, reverse osmosis, and electrodialysis.

P_V The MCLs for the inorganics discussed under Phase V of this section (antimony, beryllium, cyanide, nickel, and thallium) were promulgated in the EPA Phase V Rule. Contamination sources of these chemicals are natural soils; ground water; and industrial activities such as mining operations, electroplating, steel processing, and the manufacture of fertilizer products, glass, and alloys. These inorganics have been shown to damage the brain, lungs, kidneys, heart, and intestines of laboratory animals. Cyanide can fatally damage the spleen, brain, and liver of humans. These inorganics can be removed from drinking water by various processes including coagulation/filtration, lime softening, reverse osmosis, ion exchange, chlorine oxidation, and activated alumina.



Status of Arsenic and Fluoride

Arsenic: The court-ordered deadline for the proposed Arsenic Rule is September 1994. The promulgation date is scheduled for September 1996. EPA is currently collecting data on this contaminant. The interim MCL for arsenic is 0.05 mg/L as regulated under the Interim Primary Drinking Water Standards.

Fluoride: EPA has decided not to revise fluoride drinking water standards. The current MCL of 4 mg/L for fluoride in drinking water is now a National Revised Primary Drinking Water Regulation.

Terms Introduced in This Section

GAC

Status

Promulgation Dates

Effective Dates

P_{II}

January 30, 1991
(56 FR 3526)

July 30, 1992

July 1, 1991
(56 FR 30266)

January 1, 1993

P_V

July 17, 1992
(57 FR 31838)

August 17, 1992
(monitoring standards)

January 17, 1994
(MCLs)

MCLs

P_{II}

MCLs for Phase II contaminants are listed in Table 6-1.

Table 6-1: Regulated Inorganics Under Phase II		
Contaminant	EPA Standards (mg/L)	
	MCL	Trigger Level
Cadmium	0.005	0.005
Chromium	0.1	0.1
Mercury	0.002	0.002
Selenium	0.05	0.05
Barium	2	2

P_V

Table 6-2 presents MCLs for Phase V contaminants.

Table 6-2: Regulated Inorganics Under Phase V		
Contaminant	EPA Standards (mg/L)	
	MCL	Trigger Level
Antimony	0.006	0.006
Beryllium	0.004	0.004
Cyanide	0.2	0.2
Nickel	0.1	0.1
Thallium	0.002	0.002

Monitoring Requirements



Some states may have more stringent monitoring requirements than others; check with your state drinking water representative for exact requirements.

P_{II} **P_V** Systems Affected

CWSs and NTNCWSs.

P_{II} **P_V** Sampling Plan and Schedule

The Standardized Monitoring Framework shows the schedule of initial sampling and repeat sampling for surface and ground-water systems (Table 6-3).

P_{II} **P_V** Trigger Level for Increased Monitoring

MCLs for single samples.

P_{II} **P_V** Initial Sampling Requirements

For each system, the state determines the quarters and year of initial sampling in the compliance period. There are two cases applicable to water systems (see Figure 6-1).



P_V Systems with 150 or more service connections must begin monitoring for Phase V contaminants in the compliance period that begins January 1, 1993. States may schedule systems with fewer than 150 service connections to delay monitoring for Phase V contaminants in the compliance period that begins January 1, 1996. Check with your state drinking water representative for your Phase V initial compliance period.

Table 6-3: Standardized Monitoring Framework: Inorganics, Phase II and Phase V Conditions: Analytical monitoring results <MCL

	Calendar Years	Sampling Requirements		Waivers
		SW	GW	
First 9-Year Compliance Cycle	1993—1995 <i>Initial Compliance Period¹</i>	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	If a waiver is granted—1 sample at each sampling point during each 9-year compliance cycle
	1996—1998 <i>Repeat Compliance Period²</i>	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	
	1999—2001 <i>Repeat Compliance Period</i>	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	
Second 9-Year Compliance Cycle (First Compliance Period)	2002—2004 <i>Repeat Compliance Period</i>	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	

¹Initial Phase V compliance period for water systems with 150 or more service connections.

P_{II} **P_V** **Case 1**

Grandfathering (1993-2001): If a system has data results from three previous samplings with one sample collected after January 1, 1990, states may issue waivers based on these data provided that all analytical results are, and can be predicted to remain, below the MCL. Under Phase II, the other two samples could be taken at any time after June 24, 1977, when monitoring for inorganics started. Under Phase V, the other two samples could be taken at any time after January 1, 1988. If a waiver is issued for a source, the system must take one sample in the current 9-year cycle (Figure 6-1).

P_{II} **P_V** **Case 2**

Regular Sampling: If a system does not have data to be grandfathered, it must conduct initial base sampling. Surface and ground-water systems have different requirements (Figure 6-1):

- Surface water systems must take one sample every year at each sampling point.
- Ground-water systems must take one sample every 3-year period at each sampling point.

P_{II} **P_V** **Repeat Sampling Requirements**

Surface water systems continue taking one sample annually and ground-water systems continue taking one sample every 3-year period at each sampling point. Once a system has three samples below the MCL, the system may apply for a waiver for the next 9-year cycle or for the remainder of the current 9-year cycle (Figure 6-2).

P_{II} **P_V** **Increased Sampling**

A system must begin quarterly sampling immediately if at any time the contaminant concentrations exceed the MCLs (Figure 6-3). Systems must take a minimum of two samples for a ground-water source, and a minimum of four samples for a surface water source to establish a baseline, before the state may reduce the monitoring

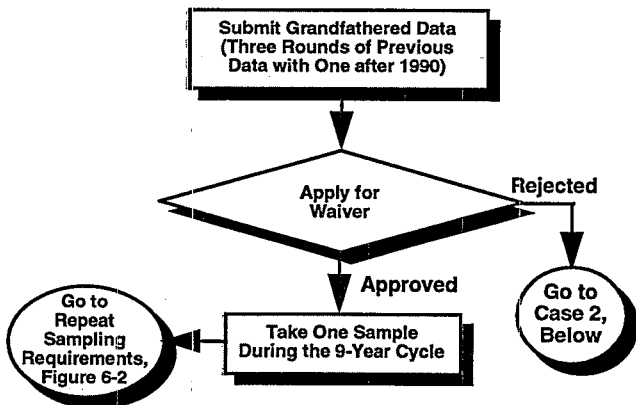
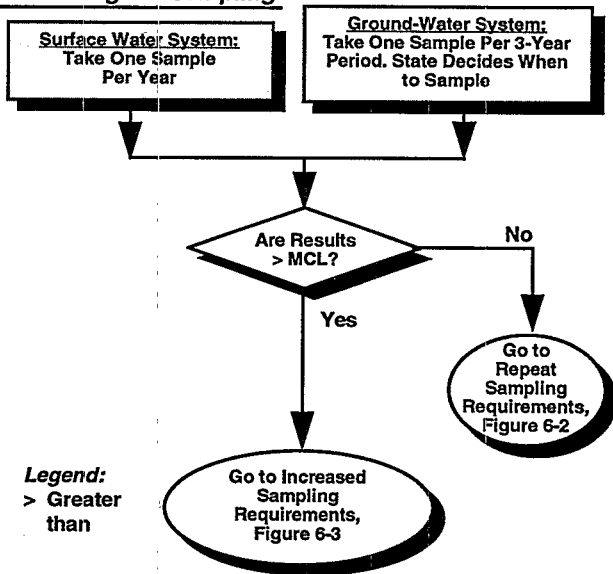
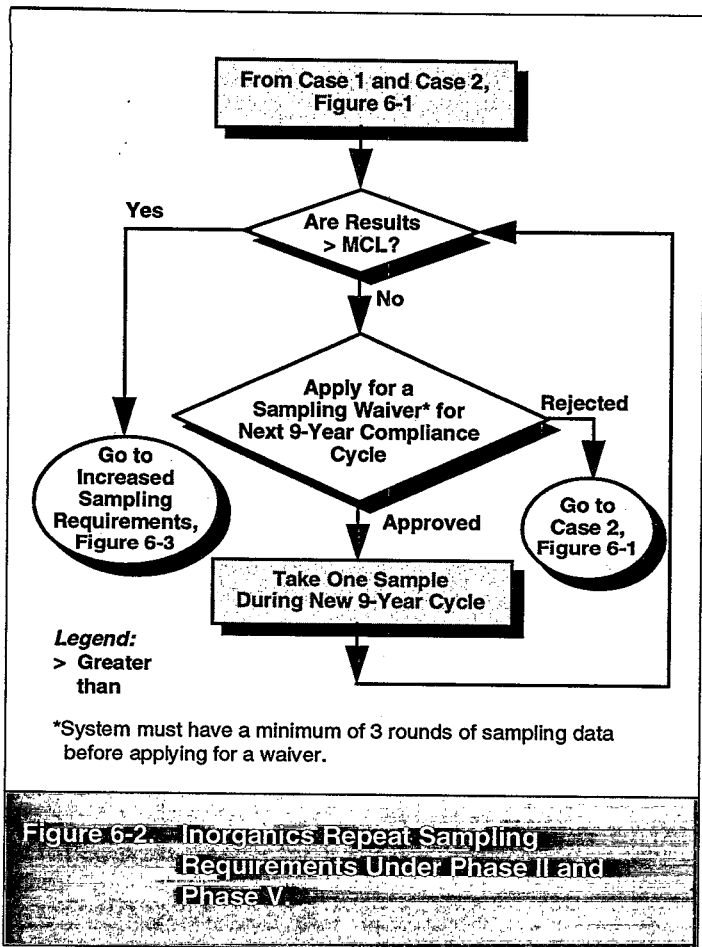
CASE 1: Grandfathering (1993-2001)**CASE 2: Regular Sampling**

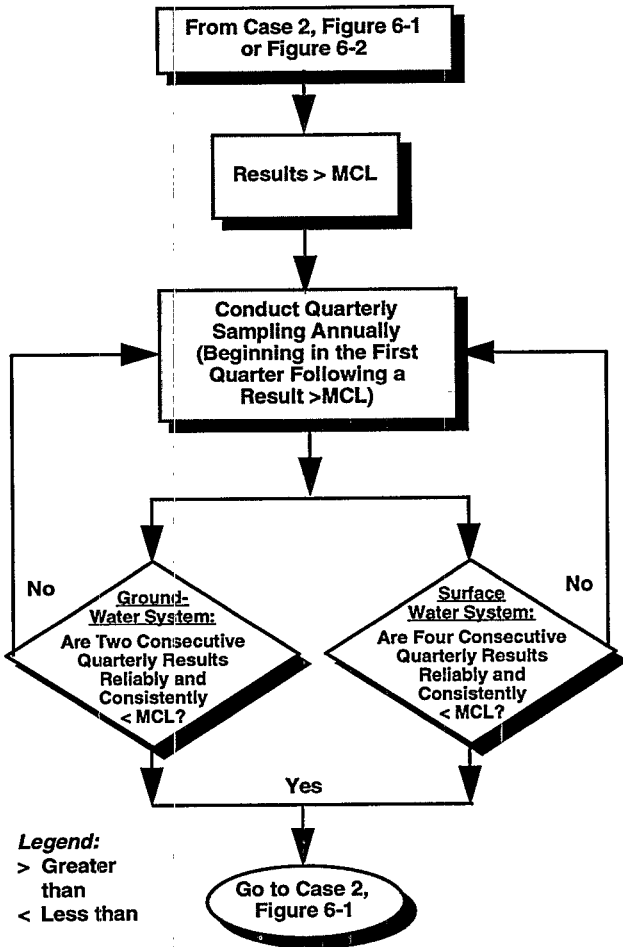
Figure 6-1 Inorganics Initial Sampling Requirements Under Phase II and Phase V



frequency. Reduction in monitoring frequency from quarterly sampling only can occur at the discretion of the state.

P_{II} P_V Confirmation Sample

If the state requires a confirmation sample, the system must take one, at the original sampling point, within 2 weeks for each result that exceeds the MCL. States have the right to request a confirmation sample for any positive or negative results.



**Figure 6-3 Inorganics Increased Sampling
Requirements Under Phase II and
Phase V**

P_{II} **P_V** Compositing

Compositing of up to five samples is allowed at state discretion.

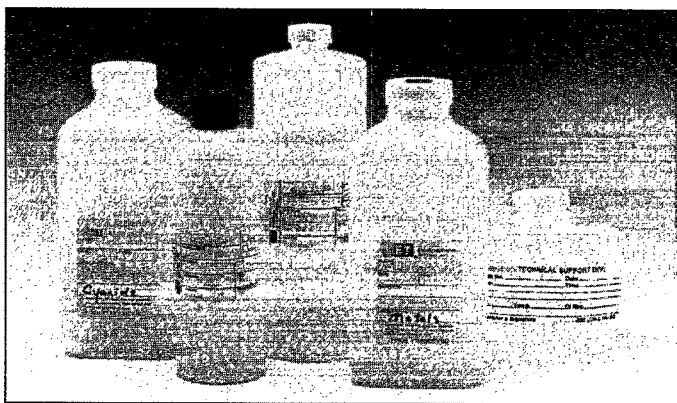
P_{II} **P_V** Waivers

Systems may qualify for a waiver for all inorganics under Phase II and Phase V. In order to qualify for a waiver, a system must have a minimum of three previous samples from a source with all analytical results below the MCL.

Sampling

P_{II} **P_V** Sampling Containers

Glass or plastic bottles generally are used.



Typical inorganic contaminant sampling containers.



If the Cubitainer, shown on the extreme right of the above photograph and on the left of the photograph on page 36, is received collapsed, pull out carefully before sampling.

Procedures

P_{II} P_V

Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.



For further information, please refer to the EPA Manual, *Methods for the Determination of Metals in Environmental Samples* (EPA-600/4-91/010).

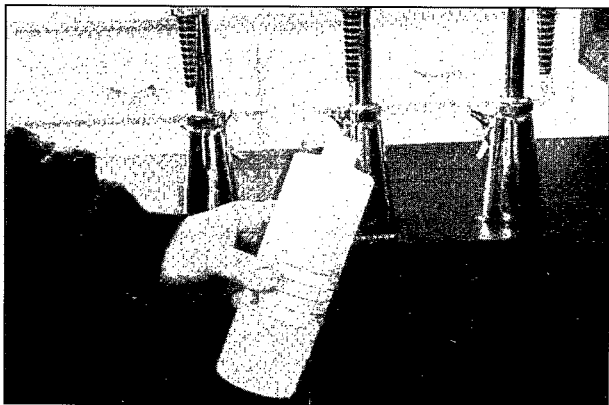
The general sampling procedures for monitoring of the regulated inorganics under Phase II and Phase V are as follows:

- 1 Select the sampling point.
- 2 Remove any attachment from the tap.
- 3 Flush the water for more than 10 minutes or until the water temperature has stabilized.
- 4 While water is flushing, fill out the label with the required information.





Filling out the label.

- 5** Fill the container with the required volume of water. Use separate bottles for mercury and cyanide, as identified by the laboratory.



Collecting the sample.

- 6**  In most cases, the laboratory will have pre-added nitric acid to the bottles (except for cyanide—preservation of samples collected for cyanide analysis involves raising the pH to greater than 12 with sodium hydroxide). Do not add preservative to the bottle unless instructed by the laboratory.

- 7**  If the laboratory so instructs, add the nitric acid to the samples at the ratio of 3 mL acid to 1 L of water (does not apply to cyanide samples).




Nitric acid is a very strong toxic substance. Wear goggles and gloves. Avoid any skin contact with the acid. Use water to wash off any acid from skin or clothing as soon as possible.



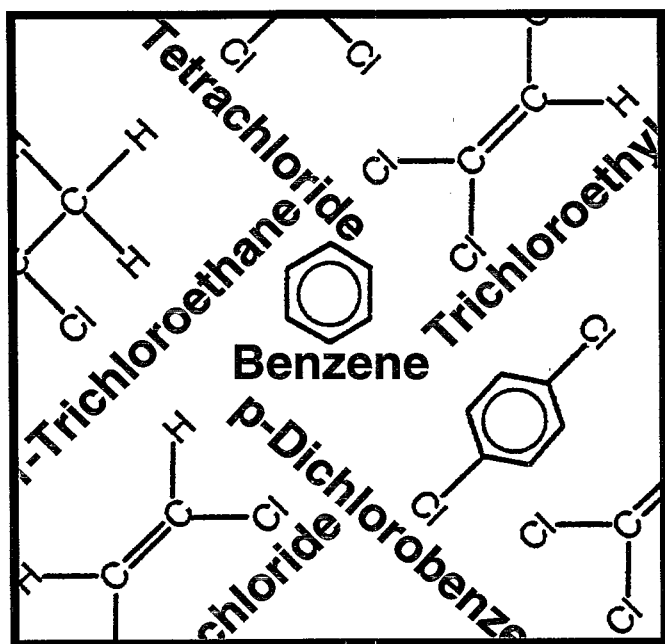
Adding acid to the sample using a pipet.

- 8** Screw the cap on the bottle.
- 9** Repeat steps 4 to 8 for replicate samples.
- 10** Complete the forms supplied by the testing laboratory with the requested information.
Repeat steps 1-10 at other sampling points (if any).
- 11** Pack the samples in an ice chest.
- 12** Ship or deliver samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Volatile Organic Compounds (VOCs)



Volatile Organic Compounds (VOCs)

Summary

P_{II} In January 1991, MCLs and MCLGs for 10 volatile organic compounds (**VOCs**) were promulgated under the EPA Phase II Rule. New monitoring requirements were also promulgated in July 1991 under the Phase II Rule, for the eight VOCs previously regulated in 1987 under the Phase II Rule. A total of 18 VOCs are now regulated under Phase II. VOCs occur in water supplies as a result of their use as industrial solvents, soil fumigants, and additives in gasoline. They have been shown to cause damage to the kidney, liver, and nervous system of laboratory animals. Some of these chemicals also have damaged the liver, nervous system, and circulatory system of human beings. The best available technologies (BATs) for VOC removal are GAC adsorption and packed tower aeration.

P_V In July 1992, MCLs and MCLGs for an additional three VOCs were promulgated under the EPA Phase V Rule (Table 7-1). These VOCs occur in water supplies as a result of their use in the manufacture of paint removers, metal degreasers, and aerosol propellants. They also are used as dye carriers and as precursors in herbicide manufacture. These chemicals have been shown to damage the liver and kidneys of laboratory animals, and have caused cancer in these animals. These VOCs can be removed from drinking water by GAC adsorption and packed tower aeration.

Terms Introduced in This Section

VOCs

Status

Promulgation Dates

Effective Dates



January 30, 1991
(56 FR 3526)

July 1, 1991
(56 FR 30266)

July 30, 1992

January 1, 1993



July 17, 1992
(57 FR 31838)

August 17, 1992
(*monitoring requirements*)

January 17, 1996
(*MCLs*)



MCLs

Table 7-1 lists the MCLs for Phase II and Phase V contaminants.

Monitoring Requirements



Some states may have more stringent monitoring requirements than others; check with your state drinking water representative for exact requirements.



Systems Affected

All CWSs and NTNCWSs.



Sampling Plan and Schedule

The Standardized Monitoring Framework for VOCs is shown in Table 7-2. The framework shows the schedule of initial and repeat sampling for surface and ground-water systems.

Table 7-1 Regulated VOCs Under Phase II and V

Contaminant	MCL (mg/L)	Trigger Level (mg/L)
VOCs Regulated Under Phase II		
Benzene ¹	0.005	0.0005
Carbon tetrachloride ¹	0.005	0.0005
1,2-Dichloroethane	0.005	0.0005
1,1-Dichloroethylene ¹	0.007	0.0005
<i>para</i> -Dichlorobenzene ¹	0.075	0.0005
1,1,1-Trichloroethane ¹	0.20	0.0005
Trichloroethylene ¹	0.005	0.0005
Vinyl chloride ¹	0.002	0.0005
<i>o</i> -Dichlorobenzene	0.6	0.0005
<i>cis</i> -1,2-Dichloroethylene	0.07	0.0005
<i>trans</i> -1,2-Dichloroethylene	0.1	0.0005
1,2-Dichloropropane	0.005	0.0005
Ethylbenzene	0.7	0.0005
Monochlorobenzene	0.1	0.0005
Styrene	0.1	0.0005
Tetrachloroethylene	0.005	0.0005
Toluene	1	0.0005
Xylenes (Total)	10	0.0005
VOCs Regulated Under Phase V		
Dichloromethane	0.005	0.0005
1,2,4-Trichlorobenzene	0.07	0.0005
1,1,2-Trichloroethane	0.005	0.0005

¹These VOCs were previously regulated under the EPA Phase I Rule.

Table 7-2

Standardized Monitoring Framework: VOCs Phase I and Phase V

	Calendar Years	Base Requirements		Reduced Monitoring		Waivers (Based on Vulnerability Assessment)	
		All Systems	SW Systems	SW Systems	GW Systems	SW	GW
First 9-Year Compliance Cycle	1993—1995 Initial Compliance Period ¹	4 consecutive quarterly samples every 3-year period at each sampling point	1 sample every year at each sampling point ²	1 sample every year at each sampling point ²	1 sample every year at each sampling point ²	Sampling at state discretion ²	1 sample during the time of waiver ² (waiver runs for 3 years) ⁵
	1996—1998 Repeat Compliance Period ³	4 consecutive quarterly samples every 3-year period at each sampling point	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point ⁴	1 sample every 3-year period at each sampling point	Sampling at state discretion	1 sample during the time of waiver (waiver runs for 6 years)
	1999—2001 Repeat Compliance Period	4 consecutive quarterly samples every 3-year period at each sampling point	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	1 sample every 3-year period at each sampling point	Sampling at state discretion	
Second 9-Year Compliance Cycle	2002—2004 Repeat Compliance Period	4 consecutive quarterly samples every 3-year period at each sampling point	1 sample every year at each sampling point	1 sample every 3-year period at each sampling point	1 sample every 3-year period at each sampling point	Sampling at state discretion	1 sample during the time of waiver (waiver runs for 6 years)

¹Initial Phase V compliance period for water systems with 150 or more service connections.²Provided initial sampling was completed by 12/31/92 and the system did not detect contaminants.³Initial Phase V compliance period for water systems with fewer than 150 service connections if delayed from 1993-1995 compliance period by the state.⁴Reduction allowed after no detection of contaminants in 3 years of annual sampling data.⁵For ground-water systems the first waiver runs for 3 years. Succeeding waivers run for 6 years.

P_{II} P_V Trigger Level for Increased Monitoring

The detection limit. The detection limit for all VOCs is 0.0005 mg/L.

P_{II} P_V Initial Sampling Requirements

States will designate the year during each compliance period in which each system must sample. There are two cases applicable to water systems (see Figure 7-1).



P_V Systems with 150 or more service connections must begin monitoring for Phase V contaminants in the compliance period that begins January 1, 1993. States may allow systems with fewer than 150 service connections to delay monitoring for Phase V contaminants until the compliance period that begins January 1, 1996. Check with your state drinking water representative for your Phase V initial compliance period.

P_{II} P_V Case 1

Grandfathering: States may allow systems to use data collected after January 1, 1988, and before October 1, 1993, to satisfy the initial base sampling requirements. Systems using grandfathered samples with no detection of any contaminant must monitor annually beginning in the initial compliance period (see Figure 7-1).

P_{II} P_V Case 2

Initial Sampling: If a system does not have data to be grandfathered, it must conduct four consecutive quarterly samplings in the initial compliance period (see Figure 7-1).

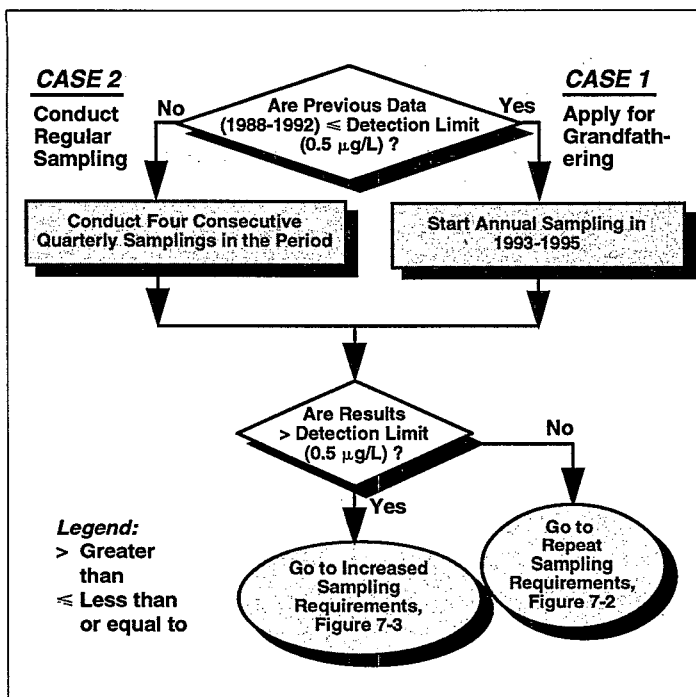
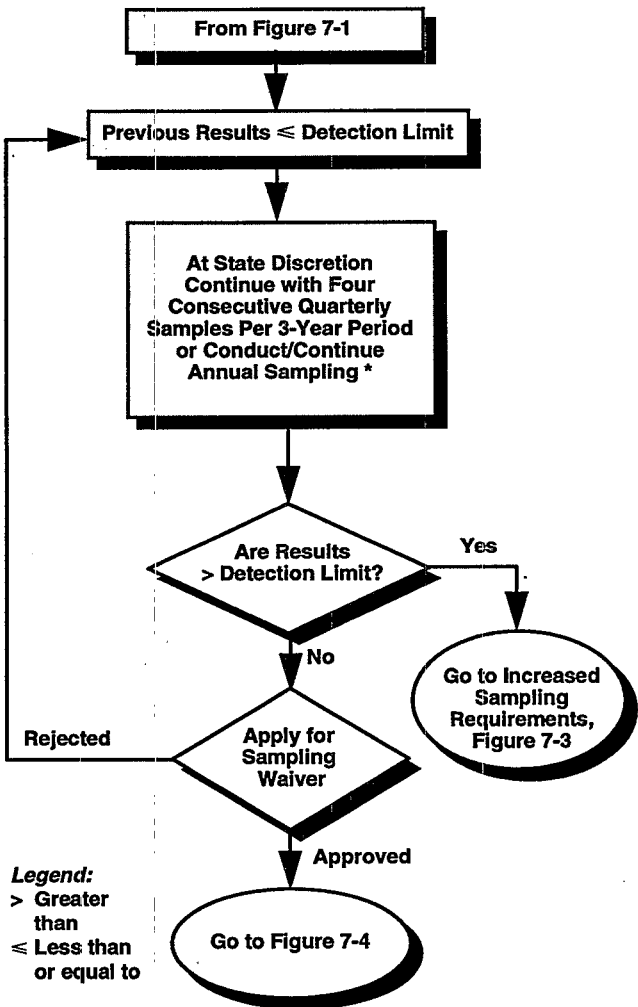


Figure 7-1. VOCs Initial Sampling Requirements Under Phase II and Phase V.

P_{II} P_V Repeat Sampling Requirements

After the initial sampling period, a system has to follow the repeat sampling requirements (Figure 7-2). Systems will continue taking four consecutive quarterly samples during subsequent 3-year periods. *If contaminants are not detected during the initial round of sampling, however, states may allow systems to decrease their sampling frequency in the next compliance period as follows:*

- Ground-water systems must take at least one sample annually. After 3 years of annual sampling with no detections, states may allow ground-water systems to further reduce their sampling frequency to one sample per compliance period.
- Surface water systems must sample annually.



* Ground-water systems with 3 years of annual sampling and no previous detections may be allowed to reduce their sampling frequency, at the discretion of the state, to one sample per 3-year period.

Figure 7-2. VOCs Repeat Sampling Requirements Under Phase II and Phase V

P_{II} **P_V** Increased Sampling

If concentrations of any of the contaminants exceed the detection limit (0.0005 mg/L) in any sample, the system must begin quarterly sampling starting in the next quarter, and continue until the state determines that the system is reliably and consistently below the MCL (Figure 7-3). Systems must take a minimum of four quarterly samples to establish a baseline before the state may reduce the monitoring to annual sampling. Annual sampling must be conducted during the quarter that yielded the highest analytical result.

P_{II} **P_V** Confirmation Sample

If the state requires a confirmation sample, the system must take one, at the original sampling point, within 2 weeks for each result that exceeds the MCL. States have the right to request a confirmation sample for any positive or negative results.

P_{II} **P_V** Compositing

Compositing of up to five samples is allowed at state discretion.

P_{II} **P_V** Waivers

Under federal regulations, states may develop waiver programs. If a waiver is granted for a ground-water source, the system is required to take one sample during the next 3 year compliance period, and then every 6 years thereafter, assuming the waivers are renewed each time (Figure 7-4). For surface water systems that are granted waivers, the repeat monitoring frequency is determined by the state.

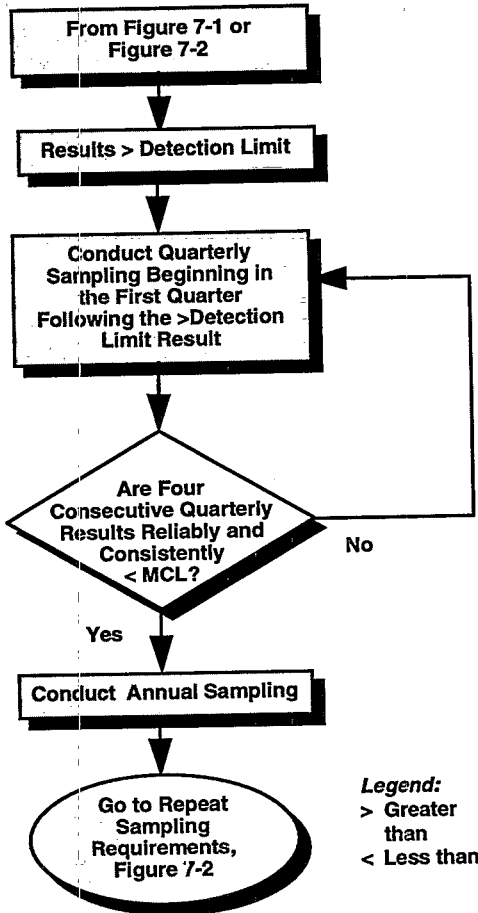
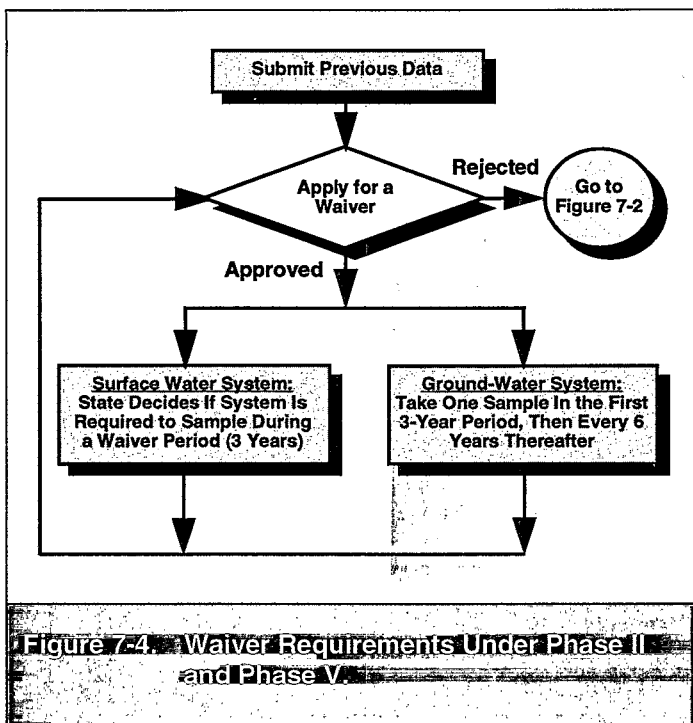


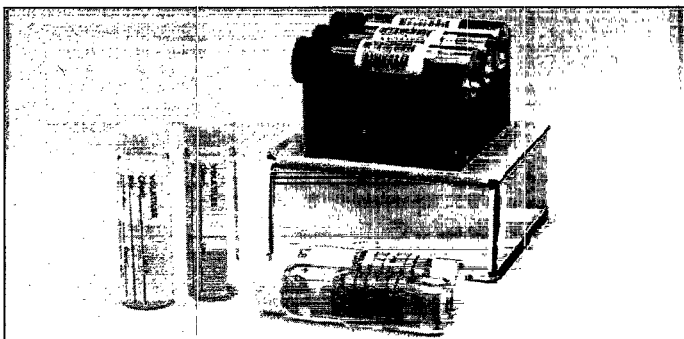
Figure 7-3. VOCs Increased Sampling Requirements Under Phase II and Phase V



Sampling

P_{II} **P_V** Sampling Containers

The testing laboratory generally will supply glass vials with TFE-fluorocarbon lined caps for VOC sampling. The volume of the vials may vary from 40 mL to 120 mL, depending on the analytical method used.



Typical VOC sampling containers.

Procedures

P_{II} **P_V** Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.



For further information, please refer to
EPA's *Manual for the Certification of
Laboratories Analyzing Drinking Water*, Third
Edition (EPA/570/9-90/006)

The general sampling procedures for VOC monitoring are as follows:


1

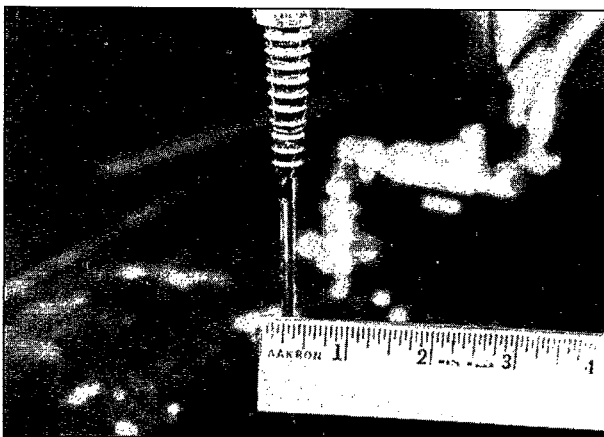


The analytical methods for VOCs call for the addition of preservatives to the vial prior to sampling. In most cases, the testing laboratory will have pre-added proper preservatives to the vials. The preservatives include:


- Sodium thiosulfate—for quenching residual chlorine
- Hydrochloric acid—biocide and pH adjustment for preservation and analysis

Do not add preservatives to the vial unless instructed to do so by the laboratory.

- 2 Locate the sampling point.
- 3 Remove any attachment from the tap.
- 4 Flush the tap for about 10 minutes or until the water temperature has stabilized.
- 5 While water is flushing, fill out the label with the required information.
- 6  Adjust the flow rate to about 500 mL (1 pint) per minute (approximately 1/8-inch diameter stream).



Adjusting the water flow to produce 1/8-inch diameter stream.

- 7  Hold the vial at an angle, and let the water flow along the inner side wall. Introduce the water very gently to reduce agitation and to avoid introducing air bubbles.



Tilting the vial to prevent formation of air bubbles.

8

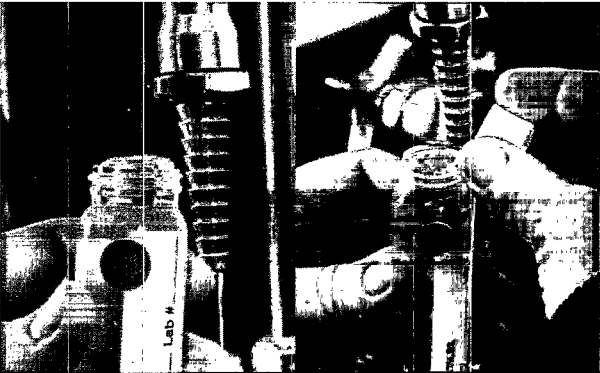


Fill the vial with water to as near the top as possible. *Be careful not to overflow—this could wash out the preservative!*

9



Carefully complete filling the vial to form a meniscus (the curved upper surface of a liquid formed by surface tension), or use the vial cap to top off the vial and form a meniscus.




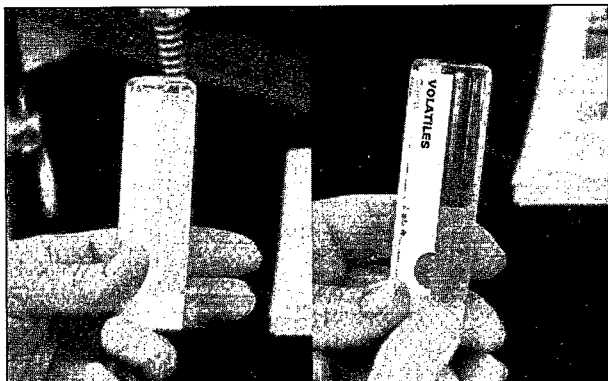
Topping off the vial with the vial cap to form a meniscus.

10




Screw the cap on the vial with the TFE-fluorocarbon (white and shiny) lining facing towards the water sample. *Do not touch the septum, and do not overtighten the cap or it might split.*

- 11**  Invert the vial. Tap against your hand and check for air bubbles. If any are present, add additional water to reform the meniscus and check for bubbles again.



Inverting the vial to determine if there are air bubbles (left) or no air bubbles (right)

- 12**  Shake the bottle vigorously for about 1 minute to let the preservative fully mix with the water sample.

- 13** Repeat the above procedures (5-12) for all replicate samples.

- 14** Complete the forms (if any) supplied by the testing laboratory with the requested information.

Repeat steps 1-14 at other sampling points (if any).

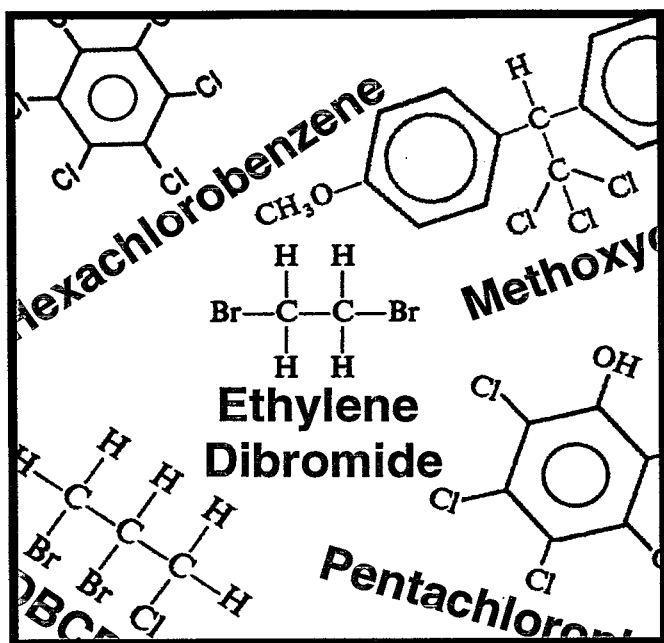
- 15** Pack the samples into an ice chest to keep the temperature of the samples at/or below 4°C.

- 16** Ship or deliver samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Synthetic Organic Chemicals (SOCs)



Synthetic Organic Chemicals (SOCs)

Summary

P_{II} Under Phase II, EPA promulgated MCLs for one polychlorinated biphenyl (**PCB**) and 14 pesticides, including revised MCLs for five previously regulated pesticides. Pesticides enter the water supply usually as the result of their application in agricultural activities. Residues of these chemicals are carried to surface and ground-water systems through farmland runoff, stormwater discharge, and even direct discharge due to aerial spraying over farmland. PCBs are used in electrical equipment. They enter the water supply through wastewater disposal from processes involving such equipment. These chemicals have been shown to cause cancer in laboratory animals, and have damaged the nervous system and circulatory system of human beings. They can be removed effectively from contaminated water by GAC.

P_V In July 1992, MCLs for an additional nine pesticides and six other synthetic organic chemicals (**SOCs**) were promulgated under the EPA Phase V Rule. The nine pesticides regulated under Phase V have been shown to damage the kidneys, liver, gastrointestinal tract, and reproductive organs in laboratory animals. They can be removed from contaminated water by GAC. However, the best available technology for removing glyphosate from water supplies is chlorine or ozone oxidation. The six other SOC_s regulated under Phase V occur in water supplies as a result of their use in the manufacture of plasticizers, solvents, flame retardants, and pesticides, and due to the leaching of coal tar lining and sealants from water storage tanks. These SOC_s have been shown to cause cancer, and to damage the liver, testes, kidneys, and stomach of laboratory animals. The BATs for removing these SOC_s from water supplies are GAC and packed tower aeration.

Terms Introduced in This Section

PCB, PVC, SOC_s

Status

Promulgation Dates

Effective Dates

P_{II}

January 30, 1991
(56 FR 3526)

July 1, 1991
(56 FR 30266)

July 30, 1992

January 1, 1993

P_V

July 17, 1992
(57 FR 31838)

August 17, 1992
(*monitoring requirements*)

January 17, 1994
(*MCLs*)

MCLs

P_{II}

The MCLGs and MCLs for Phase II contaminants, along with their promulgation and effective dates, are listed in Table 8-1.

P_V

Table 8-2 outlines MCLs and MCLGs for Phase V contaminants.

Monitoring Requirements



Some states may have more stringent monitoring requirements than others; check with your state drinking water representative for exact requirements.

Systems Affected

P_{II}

P_V

All CWSs and NTNCWSs.

Table 8-1 Regulated SOCs Under Phase II

Contaminant ¹	EPA Standards (mg/L)	
	MCL	Trigger Level ²
Alachlor (Lasso)	0.002	0.0004
Atrazine (Atranex, Crisazina)	0.003	0.0002
Carbofuran (Furadan 4F)	0.04	0.002
Chlordane	0.002	0.0004
Dibromochloropropane (DBCP) (Nemafume)	0.0002	0.00004
2,4-D (Formula 40, Weedar 64)	0.07	0.0002
Ethylene dibromide (EDB) (Bromofume)	0.00005	0.00002
Heptachlor (H-34, Heptox)	0.0004	0.00009
Heptachlor epoxide	0.0002	0.00004
Lindane	0.0002	0.00004
Methoxychlor (DMDT, Marlate)	0.04	0.0002
Pentachlorophenol	0.001	0.0002
Polychlorinated biphenyls (PCBs) (Aroclors)	0.0005	0.00009
Toxaphene	0.003	0.002
2, 4, 5-TP (Silvex)	0.05	0.0004

¹Parentheses provide pesticide product names.

²Trigger levels have been rounded to one significant figure. Laboratories are permitted to do this as well.

Table 8-2 Regulated SOC's Under Phase V

Contaminant	EPA Standards (mg/L)	
	MCL	Trigger Level¹
Dalapon	0.2	0.002
Dinoseb	0.007	0.0004
Diquat	0.02	0.0009
Endothall	0.1	0.02
Endrin	0.002	0.00002
Glyphosate	0.7	0.01
Oxamyl (Vydate)	0.2	0.004
Picloram	0.5	0.0002
Simazine	0.004	0.0002
Benzo(a)pyrene	0.0002	0.00004
Di(2-ethylhexyl)adipate	0.4	0.001
Di(2-ethylhexyl)phthalate	0.00	60.001
Hexachlorobenzene	0.001	0.0002
Hexachlorocyclopentadiene	0.05	0.0002
2,3,7,8-TCDD (Dioxin)	3×10^{-8}	1×10^{-8}

¹Trigger levels have been rounded to one significant figure. Laboratories are permitted to do this as well.

P_{II} P_V Sampling Plan and Schedule

The Standardized Monitoring Framework for SOC's under Phase II and Phase V is shown in Table 8-3. The framework shows the schedule of initial and repeat sampling for surface and ground-water systems.

P_{II} P_V Trigger Level for Increased Monitoring

Tables 8-1 and 8-2 list the trigger levels for the regulated pesticides under Phase II and Phase V, respectively.

P_{II} P_V Initial Sampling Requirements

The state determines the quarters and year of initial sampling for each water system during the initial compliance period. There are two cases applicable to water systems (see Figure 8-1).



P_V Systems with 150 or more service connections must begin monitoring for Phase V contaminants in the compliance period that begins January 1, 1993. States may allow systems with fewer than 150 service connections to delay monitoring for Phase V contaminants until the compliance period that begins January 1, 1996. Check with your state drinking water representative for your Phase V initial compliance period.

P_{II} P_V Case 1

Grandfathering: States may allow systems to use data collected after January 1, 1990, to satisfy the initial base sampling requirements. If a system has grandfathered data and there are no detections, it does not have to sample during the initial compliance period (see Figure 8-1, Case 1).

Table 8-3 Standardized Monitoring Framework: SOCs, Phase I and Phase V Conditions: Analytical monitoring results < detection limit

	Calendar Years	Sampling Requirements		Reduced Monitoring	Waivers
		All Systems	Systems with No Previous Detection		
First 9-Year Compliance Cycle	1993—1995 <i>Initial Compliance Period¹</i>	4 consecutive quarterly samples at each sampling point	Not applicable	Sampling at state discretion while waiver in effect	
	1996—1998 <i>Repeat Compliance Period²</i>	1 sample every 3-year period at each sampling point	Small systems take 1 sample every 3-year period at each sampling point	Sampling at state discretion while waiver in effect	
	1999—2001 <i>Repeat Compliance Period</i>	1 sample every 3-year period at each sampling point	Small systems take 1 sample every 3-year period at each sampling point	Sampling at state discretion while waiver in effect	
Second 9-Year Compliance Cycle (First Compliance Period)	2002—2004 <i>Repeat Compliance Period</i>	1 sample every 3-year period at each sampling point	Small systems take 1 sample every 3-year period at each sampling point	Sampling at state discretion while waiver in effect	

¹Initial Phase V compliance period for systems with 150 or more service connections.

²Initial Phase V compliance period for systems with fewer than 150 service connections if delayed from 1993-1995 compliance period by the state.

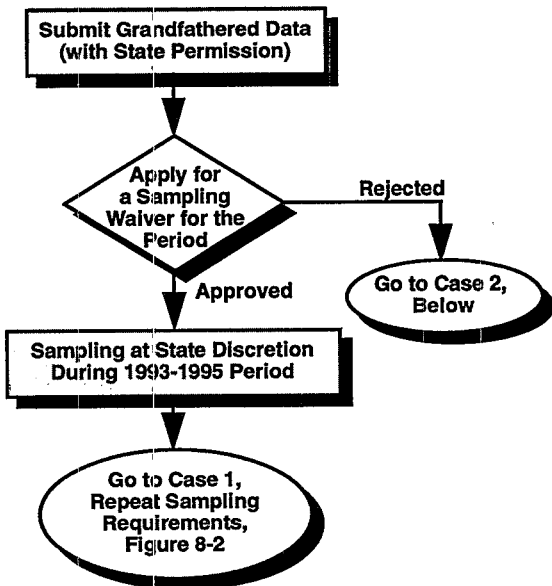
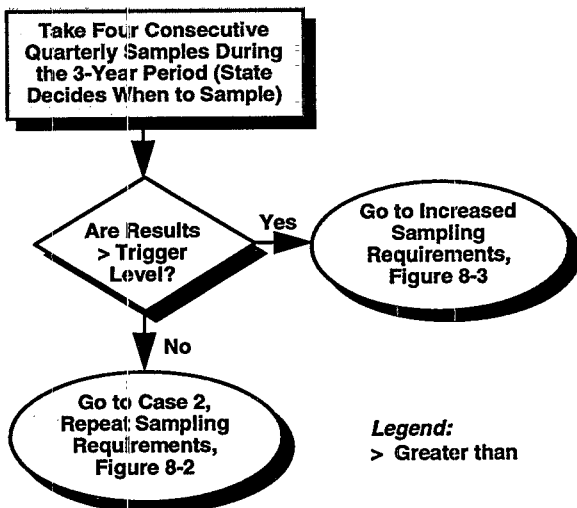
CASE 1: Sampling Waiver**CASE 2: Initial Sampling**

Figure 8-1: SOCs Initial Sampling Requirements Under Phase II and Phase V.

P_{II} P_V Case 2

Initial Sampling: If a system does not have data to be grandfathered, the system must take four consecutive quarterly samples in the initial compliance period at each sampling point (see Figure 8-1, Case 2).

Repeat Sampling Requirements

P_{II} P_V After initial sampling, a system must conduct repeat sampling. There are two cases of applicable repeat sampling requirements (see Figure 8-2, Case 2).

P_{II} P_V Case 1

Waiver: The system may apply for a sampling waiver for the next 3-year period (see Figure 8-2, Case 1).

P_{II} P_V Case 2

Reduced Sampling: Systems will take one sample during the subsequent 3-year compliance periods (see Figure 8-2, Case 2).

Increased Sampling Requirements

P_{II} P_V If contaminants exceed the trigger levels (contaminants are detected) at any time in either initial or repeat sampling, the system must conduct quarterly sampling until the state determines that the system is reliably and consistently below the MCL (see Figure 8-3). Any reduction in quarterly sampling occurs only at the discretion of the state.

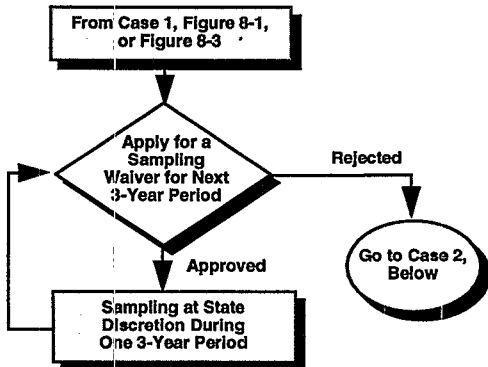
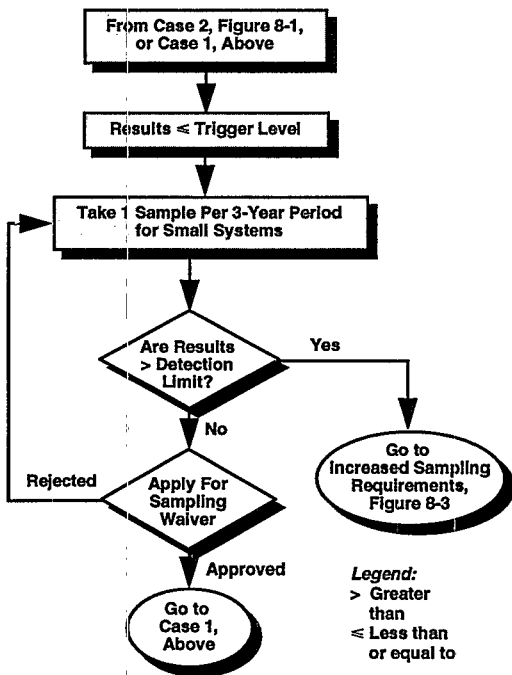
CASE 1: Waiver or Regular Sampling**CASE 2: Reduced Sampling**

Figure 8-2: SOCs Repeat Sampling Requirements Under Phase II and Phase V.

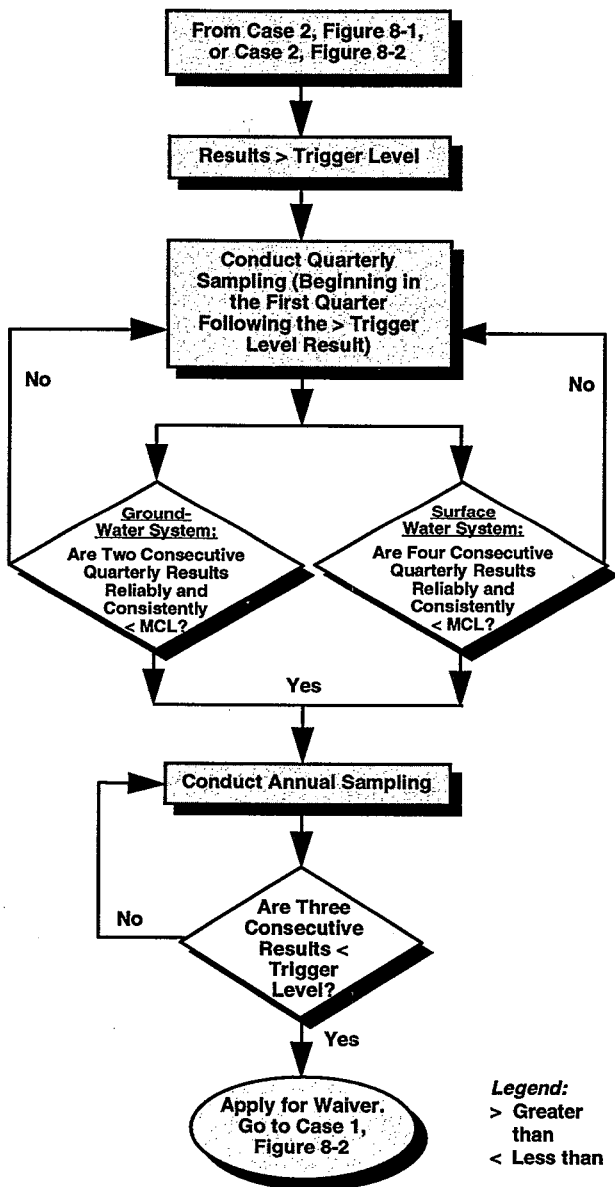


Figure 8-3. SOCs Increased Sampling Requirements Under Phase II and Phase V.

P_{II}**P_V**

Confirmation Sample

If the state requires a confirmation sample, the system must take one, at the original sampling point, within 2 weeks for each result. States have the right to request a confirmation sample for any positive or negative results.

Compositing

P_{II}**P_V**

Compositing of up to five samples is allowed at state discretion.

Waivers

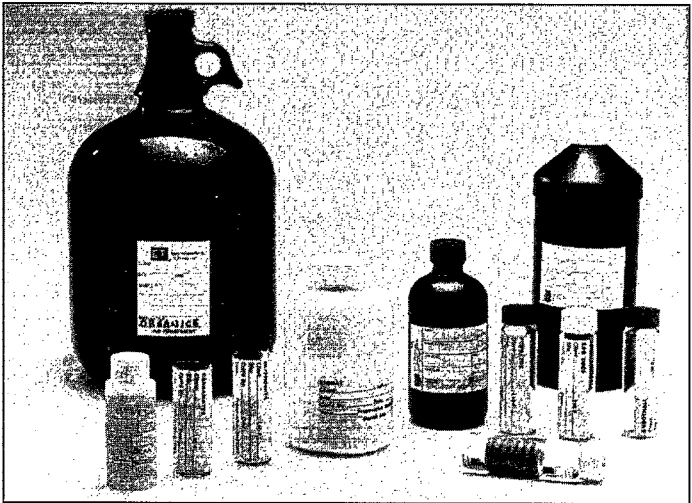
P_{II}**P_V**

A system is eligible for both use and susceptibility waivers provided the system has conducted a vulnerability assessment. A system receiving a waiver will sample at the state's discretion. Waivers are effective for one compliance period and must be renewed in subsequent compliance periods.

Sampling

P_{II} **P_V** Sampling Containers

The testing laboratory generally will supply containers for sampling. (Several containers are required because the laboratory uses several different methods to analyze for all the contaminants.) The volume of the sampling containers may be 40 mL, 60 mL, or 1 L, depending on the analytical method used. The containers must be made of glass, except for the container for diquat, which must be made of high density amber polyvinyl chloride (PVC) or silanized amber glass.



Chemicals and containers used in sampling for SOC_s.

Procedures

P_{II}**P_V**

Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.

The general sampling procedures for SOC monitoring are as follows:

1

Add preservatives to the container prior to sampling, if necessary. The testing laboratory usually pre-adds the preservatives to the sampling containers, however. The preservatives used include:

- Sodium thiosulfate — for quenching residual chlorine.
- Mercuric chloride — biocide for microorganism growth control.



Because of the environmental hazards and costs associated with mercuric chloride, its use is recommended only if there is evidence of biological degradation of a compliance monitoring sample.

- Hydrochloric acid — pH adjustment for preservation and analysis.
- Monochloroacetic acid — pH adjustment.

2

Locate the sampling point.

3

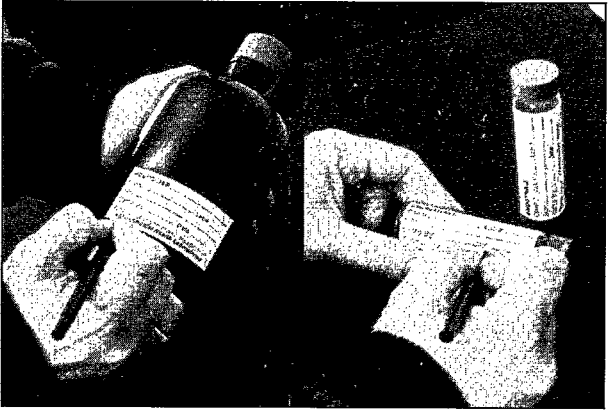
Remove any attachment from the tap.

4

Flush the water for about 10 minutes or until the water temperature has stabilized.

5

While water is flushing, fill out the label with the required information.

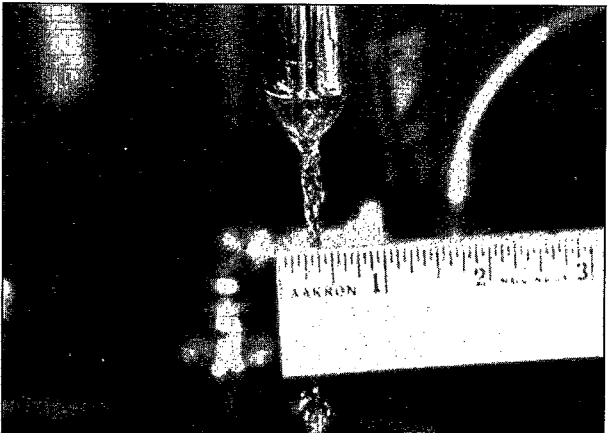


Filling out the label.

6



Adjust the flow rate to about 500 mL (1 pint) per minute (approximately 1/8-inch diameter stream).



Adjusting the water flow to produce 1/8-inch diameter stream.

7



Put the bottle under the tap at an angle to fill it up or to the required volume. *Be careful not to overflow — this could wash out the preservative!*



Collecting the sample.

8



Screw the cap on the bottle with the TFE-fluorocarbon (white and shiny) lining facing towards the water sample. *Do not touch the septum, and do not overtighten the cap.*

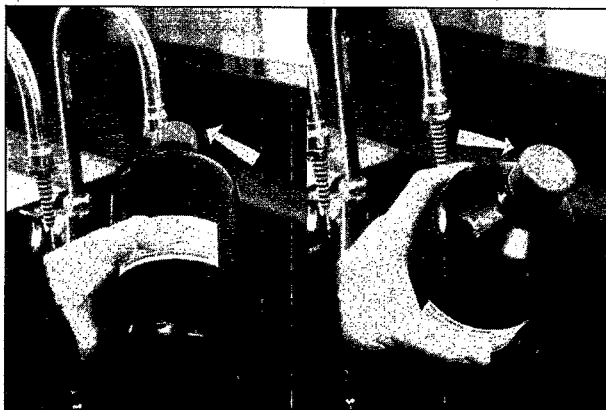


Screwing the cap onto the bottle.

9



Shake the bottle vigorously for about 1 minute to let the preservative fully mix with the water sample.



Shaking the bottle to mix a preservative with the sample.

10 Repeat the above procedures (5-9) for all replicate samples.

11 Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-11 at other sampling points (if any).

12 Pack the samples in an ice chest.

13 Ship samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Other Requirements

Unregulated Contaminants

Sampling requirements and analytical methods for determining the unregulated contaminants are basically the same as those for the regulated contaminants. The lab can run these extra analyses at the same time the analyses for the regulated contaminants are run. EPA uses this information to establish new regulations, evaluate health risks, and keep the public informed of those risks.



For more information on unregulated contaminants, refer to "State Reporting Guidance for Unregulated Contaminants" from the Office of Ground Water and Drinking Water.

Under Phase II and Phase V, CWSs and NTNCWSs must monitor for the following unregulated contaminants:

Organics

Aldicarb (Temik)	Dieldrin
Aldicarb sulfoxide	3-Hydroxycarbofuran
Aldicarb sulfone	Methomyl
Aldrin	Metolachlor
Butachlor	Metribuzin
Carbaryl	Propachlor
Dicamba	

Inorganics

Sulfate

Systems must conduct a one-time round of sampling, unless a waiver has been granted by the state.

- For the 13 unregulated organic chemicals, systems must take four consecutive quarterly samples and report the results to the state.
- For sulfate, systems must take one sample and report the results to the state.
- Sampling must be completed no later than December 31, 1995.

Systems also need to monitor for the remaining unregulated contaminants from Phase I (not currently regulated under Phase II and Phase V). For more information on unregulated contaminants under Phase I see the document listed on Page 101 and the original Pocket Sampling Guide for Operators of Small Water Systems.



Some states may have more stringent monitoring requirements than others. Check with your state drinking water representative for exact requirements.

Treatment Technique Requirements for Acrylamide and Epichlorohydrin

The principal sources of acrylamide and epichlorohydrin in drinking water are impurities in water treatment chemicals and surfaces in contact with drinking water. Because no analytical methods are available for analysis of low levels of these chemicals in drinking water, EPA has set a treatment-related requirement rather than an MCL.

Each public water system must certify annually in writing to the state (using third party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer levels does not exceed the following levels:

Acrylamide = 0.05% dosed at 1 ppm (or equivalent)

Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent)

Glossary

BATs	Best available technologies.
Biocide	A preservative (usually acid, to lower the pH) added to the sample to prevent microbial degradation.
Compliance Cycle	The 9-year calendar year cycle during which public water systems must monitor.
Compliance Monitoring	Monitoring <i>required</i> by a rule.
Compliance Monitoring Samples	Samples that fulfill the criteria of the Phase II and V Rules.
Compliance Period	A 3-year calendar year period within a compliance cycle.
Compositing	Combining more than one sample for analysis.
CWS	Community water system—A PWS that serves at least 15 service connections or 25 year-round residents.
Detection Limit	Concentration at which the presence of a contaminant can be detected.
Entry Point	A place where water enters the distribution system, and usually must be sampled.
Exemptions	A time delay (or release) from compliance issued to a PWS due to compelling factors (such as economics).

Field Trip Blank	Reagent or distilled bottled water transferred to a sample container in the field and treated as a sample in all respects. The field trip blank allows the laboratory to determine whether interferences are present in the field environment.
Followup Monitoring	Monitoring required after a PWS installs treatment. Followup monitoring is required for lead, copper, and other water quality parameters.
FR	<i>Federal Register.</i>
Grandfathering	Acceptance by the state of data collected 3 years prior to the beginning of an initial compliance period to satisfy a system's initial sampling requirements. Grandfathering of data enables an eligible system to sample at repeat frequencies that are generally lower than initial frequencies.
Increased Sampling	Quarterly sampling that must be performed when a system exceeds the MCL for a given contaminant.
Initial Base Sampling	The initial round of sampling required for contaminants under Phase II and Phase V. All systems must sample at a base (or minimum) sampling frequency that is specified by EPA for each contaminant or group of contaminants unless a waiver has been granted by the state (see <i>Waiver</i> below).
IOC	Inorganic compound (or chemical).
Laboratory Trip Blank (Shipping Blank or Travel Blank)	Reagent water placed in a sample container in the laboratory and sent to the field collection area. The container is unopened but treated as a sample in all respects. The laboratory trip blank allows the laboratory to determine whether interferences are introduced into the sample during shipment.

MCL	Maximum Contaminant Level— <i>Enforceable</i> standard that specifies the maximum permissible level of a contaminant in water.
MCLG	Maximum Contaminant Level Goal— <i>Nonenforceable</i> goal that specifies the level of contaminant at which there is no health concern.
NCWS	Non-community water system.
NIPDWR	National Interim Primary Drinking Water Regulations.
NPDWR	National Primary Drinking Water Regulations.
NTNCWS	Non-transient, non-community water system—Public water supply that regularly serves at least 25 of the same persons for over 6 months each year but is not a community water system. Examples include schools, hospitals, and factories.
Phase I	The first phase of EPA's regulatory development approach. It covers the first eight VOCs to be regulated.
Phase II	The second phase of EPA's regulatory approach. Phase II covers additional VOCs, pesticides, and inorganic chemicals.
Phase V	Phase V of EPA's regulatory approach; covers 23 additional inorganic chemicals, VOCs, pesticides, and other organic contaminants.
PCBs	Polychlorinated biphenyls—Organic chemicals once widely used in electrical transformers and other industrial equipment.
ppb	Parts per billion (equivalent to $\mu\text{g/L}$).

ppm	Parts per million (equivalent to mg/L).
Primacy	The responsibility for implementing the requirements of SDWA. Nearly all states have primacy.
Promulgated	Put a regulation into effect by formal public announcement.
PVC	Polyvinyl chloride.
PWS	Public water supply—A system that regularly supplies at least 15 service connections or 25 people.
Reagent Water	Water in which an interferant is not observed at the detection limit of the compound of interest.
Reduced Monitoring	A schedule that allows a system to monitor with less frequency if the system meets the requirement for a certain number of years.
Reliably and Consistently	“Reliably and consistently” below the MCL means that although a system detects contaminants in its water supply, the state has sufficient knowledge of the source or extent of the contamination to predict that the MCL would not be exceeded in the future.
Repeat Sampling	Subsequent rounds of sampling following the initial base sampling. Generally, repeat base sampling requirements can be reduced if initial sampling results in no detects of a contaminant.

Replicate Samples	Multiple field samples collected at the same time and place under identical circumstances. They are placed in separate sample containers and treated identically throughout field and laboratory procedures. Analysis of field replicates provides a measure of the precision associated with sample collection, preservation, storage, and laboratory procedures.
SDWA	Safe Drinking Water Act—Act passed in 1974 greatly expanding the scope of federal responsibility for the safety of drinking water. Amended in 1986.
Septum (plural <i>Septa</i>)	White teflon disk with shiny face and dull sides. Used to seal a vial, and held in place with a cap.
SOC	Synthetic organic compound (or chemical).
THM	Trihalomethanes—Chemicals formed when chlorine reacts with organic materials and chemical contaminants in drinking water. THMs consist of chloroform, bromodichloromethane, bromoform, and dibromochloromethane.
TNCWS	Transient non-community water systems.
Trigger Level	A specified concentration of a contaminant above which a system must increase monitoring.
Variance	An official permit issued to a PWS that is not able to comply with an MCL (or a treatment technique) due to source water quality problems.
VOC	Volatile organic chemical (or compound).

Vulnerability	A system is considered vulnerable if the analysis of several factors shows susceptibility to contamination.
----------------------	---

Waiver	Document that permits system to not monitor.
---------------	--

Bibliography

- Analytical Method for Determination of Asbestos Fibers in Water. 1983. U.S. EPA. Available from the National Technical Information Service, (800) 336-4700, 5285 Port Royal Road, Springfield, VA 22161. NTIS PB83-260471.
- Drinking Water Regulations Personal Computer Applications (DRIPSS) Electronic Bulletin Board (aka, "reg in a box"). Available to EPA and state regulators, local public health officials, outreach providers, and others responsible for implementing drinking water programs. Call 703-339-0420 for further information. To access DRIPSS with a modem, dial 1-800-229-3737.
- Inorganic Chemical Sampling and Analytical Requirements, National Primary Drinking Water Regulations, 40 CFR Part 141.23.
- Manual for the Certification of Laboratories Analyzing Drinking Water, Third Edition. 1990. EPA 570/9-9-/008. U.S. EPA.
- Method of Chemical Analysis of Water and Wastes. 1979. EPA 600/4-79-002. U.S. EPA.
- Methods for the Determination of Metals in Environmental Samples. 1991. EPA 600/4-91/010. U.S. EPA.
- Methods for the Determination of Organic Compounds in Drinking Water. 1988. EPA-600/4-88/039. U.S. EPA.
- Pocket Sampling Guide for Operators of Small Water Systems. 1992. EPA/814-B-92-001. U.S. EPA, Office of Ground Water and Drinking Water.
- Public Notification Handbook for Public Water Systems. 1989. EPA 570/9-89/002. U.S. EPA, Office of Water.
- The Safe Drinking Water Act: A Pocket Guide to the Requirements for the Operators of Small Water Systems. U.S. EPA Region 9. June 1993.
- Standard Methods for the Examination of Water and Wastewater, 17th ed. 1989. American Public Health Association et al.

Standard Methods for the Examination of Water and Wastewater, 16th ed. 1985. American Public Health Association et al.



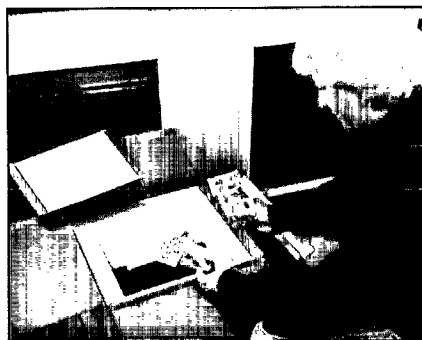
EPA publications may be ordered by
calling the Safe Drinking Water Hotline at
1-800-425-4739

General Sampling Procedures

Procedures

Water treatment plant operators should follow these general procedures for quality sampling. Laboratories may recommend procedures for sampling and addition of preservatives for specific contaminants.

- 1 Collect the samples immediately prior to shipment to the laboratory.
- 2 Read the laboratory's sampling instructions carefully. Sampling containers may contain a preservative. Do not rinse them prior to sample collection. Do not add preservatives to the sample unless specifically instructed to do so by the laboratory. If cold packs will be used, freeze them prior to sample collection.



Inspecting the sampling kit and reading the instructions.



Freezing cold packs for shipment to the lab.

- 3 Choose the sampling point. The sampling point should be representative of the water *after* treatment. Generally, samples should be taken at the tap on the pipeline before the treated water is sent to the distribution system. Sometimes sampling taps (faucets) are available in the plant laboratory for the water entering the distribution system.

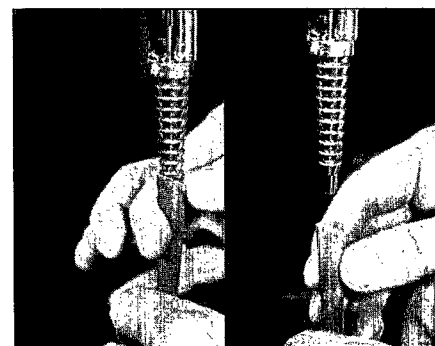


Sampling tap on the pipeline entering the distribution system.



Bottles must NOT be filled near gasoline cars, gasoline-powered motors, paint cans, lighter fluid, paint strippers, pesticide bottles, or exhaust fumes from running engines. Flames and vapors may contaminate the samples.

- 4 Remove any attachment (such as a hose, strainer, or aerator) from the tap.



Removing the hose from the tap.

- 5 Flush the tap for more than 10 minutes or until the water temperature becomes stable. This helps ensure a representative water sample.



Flushing the tap until the water temperature stabilizes.

- 6 While water is running and before collecting the sample, fill out the label with the following information:
 - Entry point ID number (if any)
 - Exact location of sampling
 - Date and time the sample was taken
 - Type of analyses to be conducted

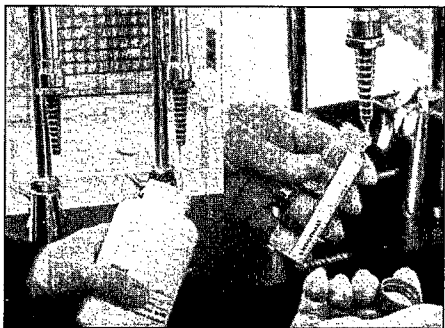
General Sampling Procedures

The laboratory that analyzes your samples will usually provide any forms and/or labels required for recording sampling-related information. Make sure that you provide *all* information requested. Often, the sampling results are reported to the state on the same form that the laboratory sends with the sampling containers to the public water system.



Filling out the label.

- 7 Position the container under the tap and collect the required volume of water (see sections on specific compounds for unique sampling requirements). Introduce the water very gently to reduce agitation and to avoid introducing air bubbles. Fill the bottle so that little or no air space will remain in the bottle after the cap is secured.



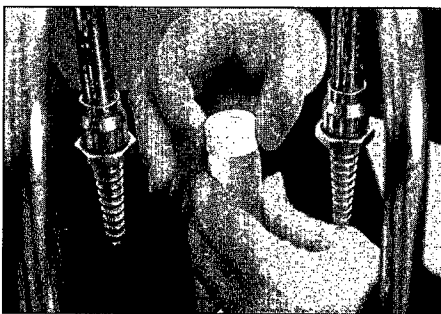
Collecting the sample (different containers shown).

- 8 Follow any instructions provided by the laboratory regarding addition of biocide, acid, and/or preservatives to the container. *Usually, these are added by the laboratory, however, occasionally the laboratory might include another reagent. For example, some laboratories may supply a dechlorination agent (thiosulphate) to be added to samples that have been disinfected by chlorination.*



Adding a dechlorination agent to the sample.

- 9 Screw the cap on the container (with the shiny white side of the septum facing toward the sample). *Do not touch the inside of the cap and do not overtighten. Use extra caps or septa provided by the laboratory if the originals become contaminated or broken.*



Screwing the cap onto the bottle.

- 10 Follow laboratory instructions regarding **replicate samples** (multiple field samples collected under identical circumstances), **field trip blanks**, and **laboratory trip blanks** used by the laboratory for quality control.



Field trip and laboratory blanks.

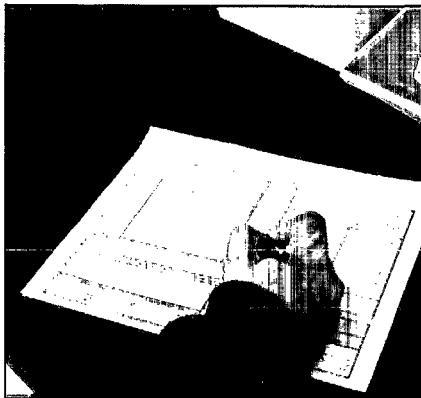
- 11 Complete any other forms supplied by the testing laboratory with the requested information, such as:

- PWS identification number
- Sample collection location
- Sampling time and date
- Sample type (grab or composite, raw, plant tap, entry point or distribution)
- Type of analyses to be conducted

Many states require that "chain-of-custody" procedures be followed for compliance monitoring samples. The typical chain-of-custody form establishes the whereabouts of, and person responsible for, the sample at any point of time. The form must be completed by field personnel at the time that the samples are collected. Use waterproof ink to fill out your form, according to laboratory instructions, as soon as you collect the

General Sampling and Procedures (Continued)

sample. The information on the chain-of-custody form must match the information on the container label. Print or write legibly and note any special conditions that could suggest contamination.

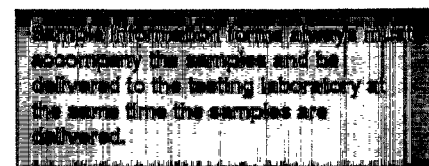


Filling out the chain-of-custody form.

perature, in addition to being protected against breakage or spillage by a suitable shipping case. As mentioned above, the lab will usually provide these cases.



Packing the sample containers for shipment to the lab.



- 12** Pack and transport the samples. Pack the containers in the same manner that they were received to avoid breakage. Samples must be kept at/or below the required temperature (but not allowed to freeze). If they need to be refrigerated, cool them with sufficient ice, or pre-frozen chemical cold packs (blue ice), to keep them below the proper temperature (4°C). To protect samples from breakage, packing materials (such as bottle holders, cardboard, and polystyrene foam) should be used. Ice should not be used as a packing material, since it will melt and leave space leading to breakage of the bottles during shipping. If the samples are collected within a reasonable driving distance of the laboratory, and refrigeration is required, a picnic cooler may be used as a sample carrying case. Samples shipped by commercial carrier must be cooled to the proper tem-

- 13** Ship or deliver samples to the laboratory (or have them picked up) the same day or by overnight courier. The temperature of the samples must be kept at/or below 4°C during shipping and before analysis.



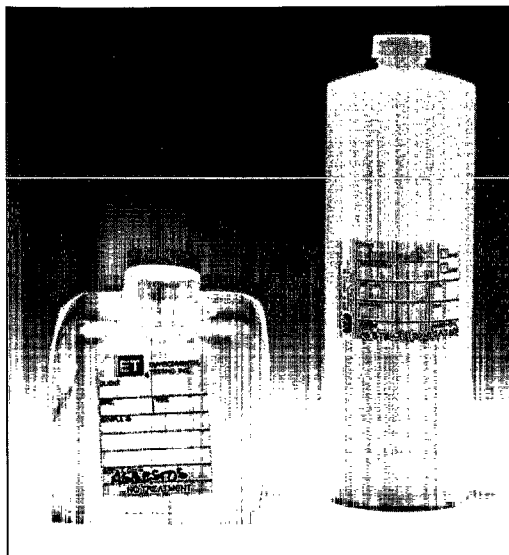
Delivering the samples to the lab by overnight courier.

Asbestos Sampling Procedures

Sampling

P_{II} Sampling Containers

Glass or plastic bottles are required for taking samples. The volume depends on the requirements of the testing lab, but must be at least 1 liter.



Typical asbestos sampling containers.

Procedures

P_{II} Follow the procedures recommended by the laboratory (if any) for sampling.



For more information, refer to *Analytical Method for Determination of Asbestos Fibers in Water*, September 1983. (Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 PB83-260471).

The sampling procedures for asbestos are as follows:

- 1** Locate the sampling point or points (see discussion of sampling points on pages 16-17.)
- 2** Remove any attachment from the tap.
- 3** Flush the tap for about 10 minutes or until the water temperature has stabilized.

- 4** While water is running, fill out the label with the required information.



Filling out the label.

- 5** Fill the bottle with water to the required volume.
- 6** Screw the cap on the bottle.
- 7** Repeat the above procedures (4-6) for all replicate samples.

- 8** Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-8 at other sampling points (if any).

- 9** Pack the samples in an ice chest.
- 10** Ship or deliver samples to the laboratory the same day or by overnight courier.

Nitrite and Nitrate Sampling Procedures

NO_2^-
Nitrite

NO_3^-
Nitrate

Sampling

P₁ Sampling Containers

The testing laboratory generally will supply containers for sampling. The required volumes are 50 mL and 100 mL for nitrite and nitrate, respectively. The containers may be made of glass or plastic.



Typical nitrite and nitrate sampling containers.

Procedures

P₁ Follow the laboratory recommended procedures (if any) for sampling and addition of preservatives.



For further information,
please refer to the EPA
Manual, Method of Chemical
Analysis of Water and Wastes
(EPA 600/4-79-020)


The general sampling procedures for nitrite and nitrate monitoring are as follows (*Steps 6 and 7 are for nitrate samples only*):

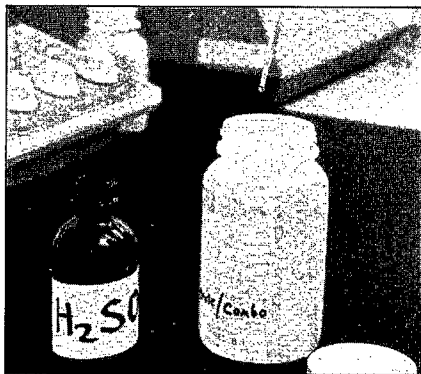
- 1 Locate the sampling point(s).
- 2 Remove any attachment from the tap.
- 3 Flush the tap for about 10 minutes or until the water temperature has stabilized.
- 4 While the water is flushing, fill out the label with the required information.

- 5 Fill the bottle with the required volume of water.




Collecting the sample.

- 6  **FOR NITRATE SAMPLES ONLY:** If so instructed by the laboratory, add sulfuric acid to the non-chlorinated samples to adjust the pH to 2 for preservation. (The laboratory usually pre-adds acid to the containers.)



Adding acid to the sample using a pipet.

- 7  **FOR NITRATE SAMPLES ONLY:** Use pH paper or a meter to measure pH.



Measuring pH using a pH meter.



Due to the strong toxicity and corrosivity of the acid, take appropriate safety precautions. Wear goggles and a pair of rubber gloves while adding the acid.

- 8 Screw the cap on the bottle.

- 9 Repeat the above procedures (4-8) for all replicate samples.


- 10 Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-10 at other sampling points (if any).

- 11 Pack the samples in an ice chest.

- 12 Ship samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Inorganic Compounds (IOCs) Sampling Procedures

Sampling

P_{II} **P_V** Sampling Containers

Glass or plastic bottles generally are used.



Typical inorganic contaminant sampling containers.



If the Cubitainer shown on the extreme right of the above photograph and on the left of the photograph on page 36, is received collapsed, pull out carefully before sampling.

Procedures

P_{II} **P_V**

Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.



For further information, please refer to the EPA Manual, *Methods for the Determination of Metals in Environmental Samples* (EPA 600/4-91/010).

The general sampling procedures for monitoring of the regulated inorganics under Phase II and Phase V are as follows:

- 1** Select the sampling point.
- 2** Remove any attachment from the tap.
- 3** Flush the water for more than 10 minutes or until the water temperature has stabilized.

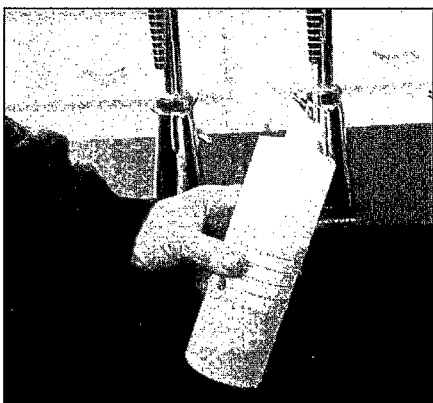
Ni Nickel **Cr** Chromium
Cd Cadmium **Hg** Mercury
Sb Antimony **Ba** Barium **Be** Beryllium
Tl Thallium **Se** Selenium

- 4 While water is flushing, fill out the label with the required information.





Filling out the label.

- 5 Fill the container with the required volume of water. Use separate bottles for mercury and cyanide, as identified by the laboratory.



Collecting the sample.

- 6  In most cases, the laboratory will have pre-added nitric acid to the bottles (except for cyanide—preservation of samples collected for cyanide analysis involves raising the pH to greater than 12 with sodium hydroxide). Do not add preservative to the bottle unless instructed by the laboratory.

- 7  If the laboratory so instructs, add the nitric acid to the samples at the ratio of 3 mL acid to 1 L of water (does not apply to cyanide samples).



Nitric acid is a very strong toxic substance. Wear goggles and gloves. Avoid any skin contact with the acid. Use water to wash off any acid from skin or clothing as soon as possible.



Adding acid to the sample using a pipet.

- 8 Screw the cap on the bottle.

- 9 Repeat steps 4 to 8 for replicate samples.


- 10 Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-10 at other sampling points (if any).

- 11 Pack the samples in an ice chest.

- 12 Ship or deliver samples to the laboratory the same day or by overnight courier.



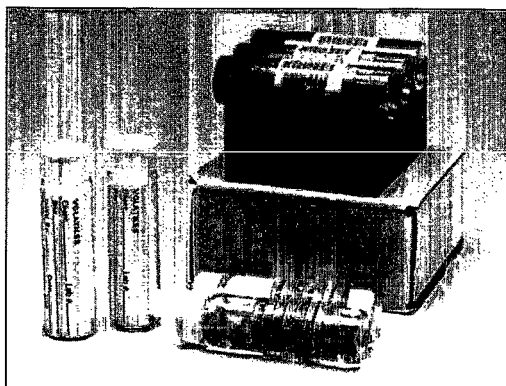
A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Volatile Organic Compounds (VOCs) Sampling Procedures

Sampling

P_{II} P_V Sampling Containers

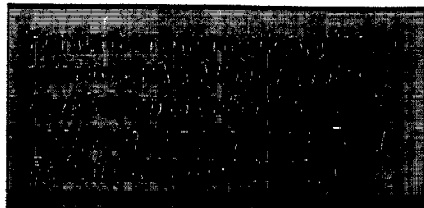
The testing laboratory generally will supply glass vials with TFE-fluorocarbon lined caps for VOC sampling. The volume of the vials may vary from 40 mL to 120 mL, depending on the analytical method used.




Typical VOC sampling containers.

Procedures

P_{II} P_V Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.




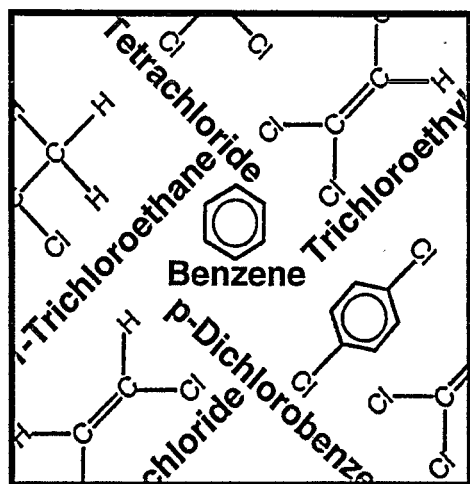
The general sampling procedures for VOC monitoring are as follows:

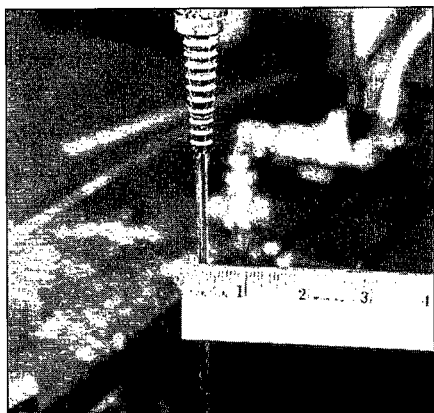
1  The analytical methods for VOCs call for the addition of preservatives to the vial prior to sampling. In most cases, the testing laboratory will have pre-added proper preservatives to the vials. The preservatives include:

- Sodium thiosulfate—for quenching residual chlorine
- Hydrochloric acid—biocide and pH adjustment for preservation and analysis

Do not add preservatives to the vial unless instructed to do so by the laboratory.

- 2** Locate the sampling point.
- 3** Remove any attachment from the tap.
- 4** Flush the tap for about 10 minutes or until the water temperature has stabilized.
- 5** While water is flushing, fill out the label with the required information.
- 6**  Adjust the flow rate to about 500 mL (1 pint) per minute (approximately 1/8-inch diameter stream).



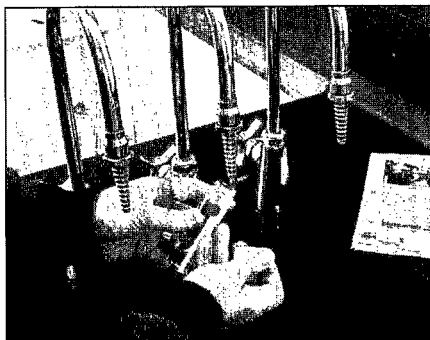


Adjusting the water flow to produce 1/8-inch diameter stream.

7



Hold the vial at an angle, and let the water flow along the inner side wall. Introduce the water very gently to reduce agitation and to avoid introducing air bubbles.



Tilting the vial to prevent formation of air bubbles.

8

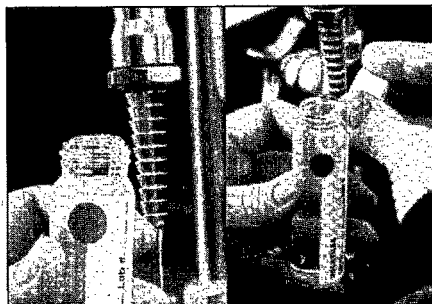


Fill the vial with water to as near the top as possible. *Be careful not to overflow—this could wash out the preservative!*

9



Carefully complete filling the vial to form a meniscus (the curved upper surface of a liquid formed by surface tension), or use the vial cap to top off the vial and form a meniscus.



Topping off the vial with the vial cap to form a meniscus.

10



Screw the cap on the vial with the TFE-fluorocarbon (white and shiny) lining facing towards the water sample. *Do not touch the septum, and do not overtighten the cap or it might split.*

11



Invert the vial. Tap against your hand and check for air bubbles. If any are present, add additional water to reform the meniscus and check for bubbles again.

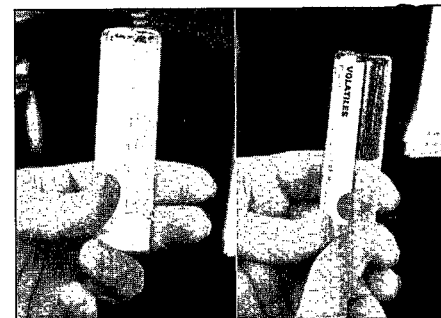
12



Shake the bottle vigorously for about 1 minute to let the preservative fully mix with the water sample.

13

Repeat the above procedures (5-12) for all replicate samples.



Inverting the vial to determine if there are air bubbles (left) or no air bubbles (right)

14

Complete the forms (if any) supplied by the testing laboratory with the requested information.

Repeat steps 1-14 at other sampling points (if any).


15

Pack the samples into an ice chest to keep the temperature of the samples at/or below 4°C.

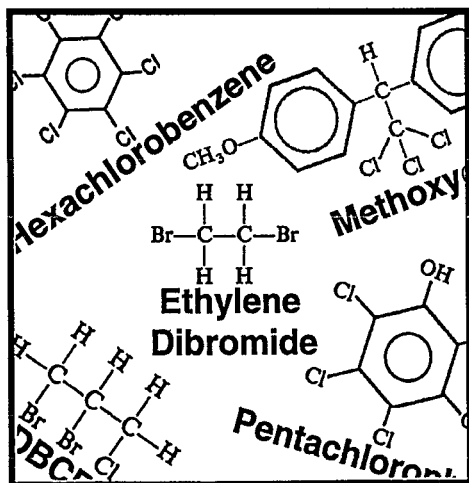
16

Ship or deliver samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.

Synthetic Organic Chemicals (SOCs)



Sampling

P_{II} **P_V** Sampling Containers

The testing laboratory generally will supply containers for sampling. (Several containers are required because the laboratory uses several different methods to analyze for all the contaminants.) The volume of the sampling containers may be 40 mL, 60 mL, or 1 L, depending on the analytical method used. The containers must be made of glass, except for the container for diquat, which must be made of high density amber polyvinyl chloride (PVC) or silanized amber glass.




Chemicals and containers used in sampling for SOCs.

Procedures

P_{II} **P_V** Follow the procedures recommended by the laboratory (if any) for sampling and addition of preservatives.

The general sampling procedures for SOC monitoring are as follows:

1  Add preservatives to the container prior to sampling, if necessary. The testing laboratory usually pre-adds the preservatives to the sampling containers, however. The preservatives used include:

- Sodium thiosulfate — for quenching residual chlorine.
- Mercuric chloride — biocide for microorganism growth control.



Because of the environmental hazards and costs associated with mercuric chloride, its use is recommended only if there is evidence of biological degradation of a compliance monitoring sample.

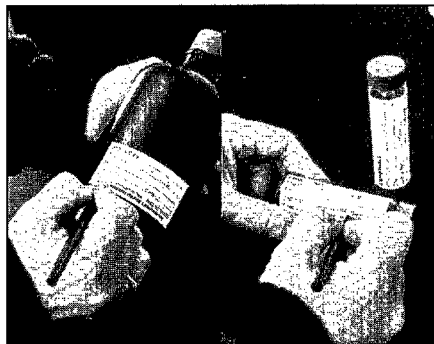
- Hydrochloric acid — pH adjustment for preservation and analysis.
- Monochloroacetic acid — pH adjustment.

2 Locate the sampling point.


3 Remove any attachment from the tap.

4 Flush the water for about 10 minutes or until the water temperature has stabilized.

- 5** While water is flushing, fill out the label with the required information.



Filling out the label.

- 6**  Adjust the flow rate to about 500 mL (1 pint) per minute (approximately 1/8-inch diameter stream).



Adjusting the water flow to produce 1/8-inch diameter stream.

7



- Put the bottle under the tap at an angle to fill it up or to the required volume. *Be careful not to overflow — this could wash out the preservative!*



Collecting the sample.

8



- Screw the cap on the bottle with the TFE-fluorocarbon (white and shiny) lining facing towards the water sample. *Do not touch the septum, and do not overtighten the cap.*



Screwing the cap onto the bottle.

9



- Shake the bottle vigorously for about 1 minute to let the preservative fully mix with the water sample.



Shaking the bottle to mix a preservative with the sample.

10

- Repeat the above procedures (5-9) for all replicate samples.

11

- Complete the forms supplied by the testing laboratory with the requested information.

Repeat steps 1-11 at other sampling points (if any).


12

- Pack the samples in an ice chest.

13

- Ship samples to the laboratory the same day or by overnight courier.



A bottle symbol  indicates a unique procedure required for sampling this contaminant.