



RG-421  
January 2005

# Coliform Sampling for Public Water Systems

Water Supply Division

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY



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Prepared by  
Water Supply Division

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# INTRODUCTION

This publication provides guidance on how to comply with Title 30 of the Texas Administrative Code (30 TAC), Chapter 290, Subchapter F: Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems, Section 290.109: Microbial Contaminants.

This guide describes monitoring requirements for coliform organisms, but more detailed information is available in the rules. If there appears to be a discrepancy between this guidance and the rules, follow the rules.

In this guide, the word “you” refers to operators of public water systems. The word “we” refers to the Texas Commission on Environmental Quality (TCEQ), and its Public Drinking Water program.

We have links to the Secretary of State’s official version of the rules on our Web site located at [www.tceq.state.tx.us](http://www.tceq.state.tx.us). At the TCEQ home page, click on “Rules, Policy & Legislation” and follow the links to view the rules online. The rules governing this guide were most recently published in the February 13, 2004, edition of the *Texas Register*.

## What Rules Apply to Public Water Systems in Texas?

The State of Texas has *primacy* over regulation of public drinking water. This means that the TCEQ writes, adopts, and enforces Texas rules that are at least as stringent as the rules promulgated by the United States Environmental Protection Agency (USEPA). The Texas rules may be more specific than or worded differently from the USEPA rules, so public water systems should become familiar with the Texas-specific rules.

Public water systems should be aware of the rules pertaining to drinking water that are contained in various parts of the Texas regulations. A public water system must comply with all the applicable requirements. Each rule provides information concerning exactly which public water systems are affected.

Some examples of additional rules and their location within the regulations are given below:

- **30 TAC Chapter 290, Subchapter D.** Rules and regulations for public water systems related to requirements for water treatment plant design, operation, and maintenance. If you have questions about Subchapter D, call the TCEQ at 512/239-4691.
- **30 TAC Chapter 290, Subchapter F.** Requirements regarding harmful or potentially harmful constituents for water systems that supply potable water to the citizens of Texas. If you have questions about Subchapter F, call the TCEQ at 512/239-4691.

- **30 TAC Chapter 291.** Rules and regulations for water utilities related to requirements for rates, capacity development, and Certificates of Convenience and Necessity (CCN) for utilities. If you have questions about these requirements, call the Water Utilities Rates and Districts Section at 512/239-4691.
- **30 TAC Chapter 293.** Requirements for water districts. If you have questions about these requirements, call the TCEQ Water Utilities Rates and Districts Section at 512/239-4691.
- **30 TAC Chapter 325.** Requirements for certification of water works operators. If you have questions about these requirements, call the TCEQ Operator Certification Team for at 512/239-6300.

## Who Answers Questions Concerning These Rules?

If you have questions about the rules in this guidance manual, call the TCEQ Public Drinking Water program at 512/239-4691.

## How May I Obtain Copies of TCEQ Publications?

There are several ways you can obtain copies of rules, publications, or forms from TCEQ. These include the following:

- On the Internet, go to **www.tceq.state.tx.us**; under the site navigation bar, follow the links to “Rules, Policy & Legislation” and then to “Forms and Publications.”
- If the item you want is not listed on the Web site, TCEQ Publications can help you locate it; contact them as shown in the following bulleted items. Try to provide rule, publication, or form *numbers* as well as the title. This information will help us furnish the correct item to you as quickly as possible.
- Fax your order to 512/239-4488, or order by phone at 512/239-0028.
- Write to: TCEQ Publications  
MC-195  
PO Box 13087  
Austin, TX 78711-3087

# 1 WHICH SYSTEMS DOES THIS RULE APPLY TO?

Every public water system (PWS) is required to monitor for the presence of coliform bacteria. The specific monitoring requirements for your system are based on the number of customers you serve and the type of system you operate. Chapters 3 and 4 of this guide describe the monitoring frequency and location requirements for your system.

Monitoring for the presence of microbes, specifically for coliform bacteria, is a method to determine whether the water in the distribution system of a public water system is contaminated with bacteria from fecal matter. If fecal matter is present in drinking water, it can make consumers very sick, and may possibly kill immunocompromised individuals. Chapter 2 of this guide briefly describes the different types of coliform bacteria that are used as indicator organisms.

Because coliform bacteria are present in many places in the environment, it is important that the person collecting coliform samples use proper procedures and techniques. It is very easy to collect samples incorrectly, but it is not difficult to collect them properly. Chapter 5 of this guide provides instructions on how to correctly collect coliform samples. In addition to good sampling techniques, it is important to have the required paperwork in order when you are preparing samples for delivery to the laboratory. Chapter 6 contains information on this topic.

Occasionally, in spite of your best efforts, coliform bacteria may be detected in your system. Although this is usually not a violation, you will need to collect repeat samples (see Chapter 3). To determine whether you have a violation, refer to Chapter 9. A system that receives a violation must notify its customers of this circumstance. Chapter 10 provides the mandatory language templates used to create various public notices and also explains how to deliver these to your customers.

The Public Drinking Water Section of TCEQ hopes this guide is helpful to you. If you need additional assistance, please contact us at 512/239-4691.

## 2 WHAT ARE COLIFORM ORGANISMS?

Coliform organisms are bacteria commonly found in humans, animals, and the environment. Their presence in drinking water indicates that conditions in the water system may also support the existence of other microbes, including pathogens. Pathogens are microbes (germs or “bugs”) that cause disease. Pathogenic contamination is the greatest public health risk to consumers who obtain their water from a PWS. In Texas, each PWS is required to disinfect the water with chlorine to kill (inactivate) pathogens.

The different kinds of coliform organisms that are tested for include total coliform, fecal coliform, and *E. coli* (*Escherichia coli*). Results for coliform testing are reported as coliform-found (positive) or coliform not-found (negative). Coliform bacteria are surrogates, or indicator organisms, for pathogens. That is, they may not cause illness, but they indicate that conditions are suitable for the existence of other microbes that can cause illness.

### 2.1 The Meaning of a Positive Result (Coliform-Found)

Although a single positive sample is usually not a violation of TCEQ rules, a coliform-found result is always a cause for action on the part of the water system operator. The degree of the concern regarding the sample results depends on the type of coliform that is detected.

Although a total coliform-found result may be due to wind-blown soil or decayed vegetable matter that has contaminated the sample, fecal and *E. coli* results are unmistakable evidence of recent contamination of the water by animal or human feces. Although the detection of fecal coliform or *E. coli* bacteria in a single sample does not indicate that a waterborne disease outbreak is imminent, TCEQ is very concerned about such results. A coliform-found result is the early warning system that alerts you to take action to keep your customers safe.

To determine whether you have a coliform-found result, review the sample analysis form that your lab provides you. Sample results are typically reported as “Positive/Coliform-found” or “Negative/Coliform-not found.”

When coliform bacteria are present in any of your samples, the laboratory is required to contact TCEQ. You may wish to contact TCEQ also, to ensure you are performing the correct corrective actions and any additionally required sampling.

### 2.2 The Meaning of a Negative Result (Coliform-Not Found)

If your sample result is negative (coliform-not found), it indicates that no coliform organisms were detected in your water. This is good, because it shows that your distribution system is being properly disinfected.

## 3 COLIFORM SAMPLE LOCATIONS [290.109(c)]

The following sections will help you determine where to locate your sample sites.

### 3.1 Number of Sample Sites

Every PWS must prepare a site monitoring plan that contains both a list of coliform sample sites and a diagram showing their locations in the distribution system. For more information on this subject, you may refer to the TCEQ document entitled *How to Develop a Monitoring Plan for a Public Water System*, RG-384. The selected sites must be representative of the entire system. If you change a sample site, you must revise the monitoring plan to indicate the new location selected.

Table 3-1 presents the minimum number of sample sites (based on customer population) required. You may, however, select more than the minimum number of sites.

**Table 3-1: Required Number of Distribution System Sample Sites**

Population Served	Coliform Samples	Number of Sample Sites
1 to 1,000 1,001 to 2,500 2,501 to 3,300 3,301 to 4,100 4,101 to 4,900	1 per month 2 per month 3 per month 4 per month 5 per month	At least 5 sites
4,901 to 5,800 5,801 to 6,700 6,701 to 7,600 7,601 to 8,500 8,501 to 12,900 12,901 to 17,200 17,201 to 21,500 21,501 to 25,000 25,001 to 33,000	6 per month 7 per month 8 per month 9 per month 10 per month 15 per month 20 per month 25 per month 30 per month	Same number of sample sites as samples  (Example: A system that collects 6 samples must have at least 6 sample sites)
33,001 to 41,000 41,001 to 50,000	40 per month 50 per month	At least 30 sample sites
50,001 to 59,000 59,001 to 70,000 70,001 to 83,000 83,001 to 96,000 96,001 to 130,000 130,001 to 220,000 220,001 to 320,000 320,001 to 450,000 450,001 to 600,000 600,001 to 780,000 780,001 to 970,000 970,001 to 1,230,000 1,230,001 to 1,520,000 1,520,001 to 1,850,000 1,850,001 to 2,270,000 2,270,001 to 3,020,000 3,020,001 to 3,960,000 3,960,001 or more	60 per month 70 per month 80 per month 90 per month 100 per month 120 per month 150 per month 180 per month 210 per month 240 per month 270 per month 300 per month 330 per month 360 per month 390 per month 420 per month 450 per month 480 per month	Half the number of sample sites as samples  (Example: A system that collects 210 samples must have at least 105 sample sites)

You are required to have only one list of sites that you can use for both coliform and disinfectant monitoring, but you may have two separate lists, if you prefer. The list of sample sites must also include the date each site is monitored.

### 3.2 Selecting Proper Sampling Sites

A critically important factor to consider in choosing sample sites is the potential for contamination. You should select sites in locations where fecal contamination is least likely to occur.

The *best* option is to use a hose bib-type faucet located outdoors. Do *not* use a faucet in a restroom, a kitchen, or a location where food (particularly raw meat) is prepared. Do not collect samples from a drinking fountain.

Select a faucet with the following features:

- does not leak;
- has an outlet at least 18 inches above the ground or floor level;
- is constructed of materials that will allow you to heat it with a torch or use a strong chlorine solution to clean the faucet;
- has a downward-pointing outlet;
- is not located in or near tall grass or shrubs; and
- does not have any attachment such as a water hose.

Some water systems have reported problems sampling at vacuum breakers; therefore, we recommend that you avoid these.

## 4 FREQUENCY OF ROUTINE AND REPEAT SAMPLES

The two primary types of coliform samples that public water systems must collect are routine distribution and repeat samples.

### 4.1 Routine Coliform Samples

Routine distribution samples are those that a public water system must collect every month. The number of samples that you must collect depends on the size and type of system that you operate. Table 4-1 shows the required minimum number of routine distribution system samples a system must collect monthly.

**Table 4-1: Required Number of Routine Distribution Samples**

Population Served	Minimum Number of Routine Coliform Samples Per Month	Schedule
1 to 1,000	1	Sample once during the month.
1,001 to 2,500	2	Samples may be collected on one day at different sites, or twice a month at regular intervals.
2,501 to 3,300	3	
3,301 to 4,100	4	
4,101 to 4,900	5	
4,901 to 5,800	6	Sample twice a month at regular intervals.
5,801 to 6,700	7	
6,701 to 7,600	8	
7,601 to 8,500	9	
8,501 to 12,900	10	
12,901 to 17,200	15	Sample three times a month at regular intervals.
17,201 to 21,500	20	Sample four times a month at regular intervals.
21,501 to 25,000	25	
25,001 to 33,000	30	Daily sampling is required.  For clarification on TCEQ's interpretation of daily sampling, contact the Drinking Water Quality Team at 512/239-4691.
33,001 to 41,000	40	
41,001 to 50,000	50	
50,001 to 59,000	60	
59,001 to 70,000	70	
70,001 to 83,000	80	
83,001 to 96,000	90	
96,001 to 130,000	100	
130,001 to 220,000	120	
220,001 to 320,000	150	
320,001 to 450,000	180	
450,001 to 600,000	210	
600,001 to 780,000	240	
780,001 to 970,000	270	
970,001 to 1,230,000	300	
1,230,001 to 1,520,000	330	
1,520,001 to 1,850,000	360	
1,850,001 to 2,270,000	390	
2,270,001 to 3,020,000	420	
3,020,001 to 3,960,000	450	
3,960,001 or more	480	

You must collect your samples each month. Samples will be credited to your system *only* in the month in which they are collected. For example, samples collected on May 1 will *not* be credited for your April requirement. This

stipulation is related to data quality objectives that TCEQ and the certified labs must satisfy.

## 4.2 Repeat Coliform Samples

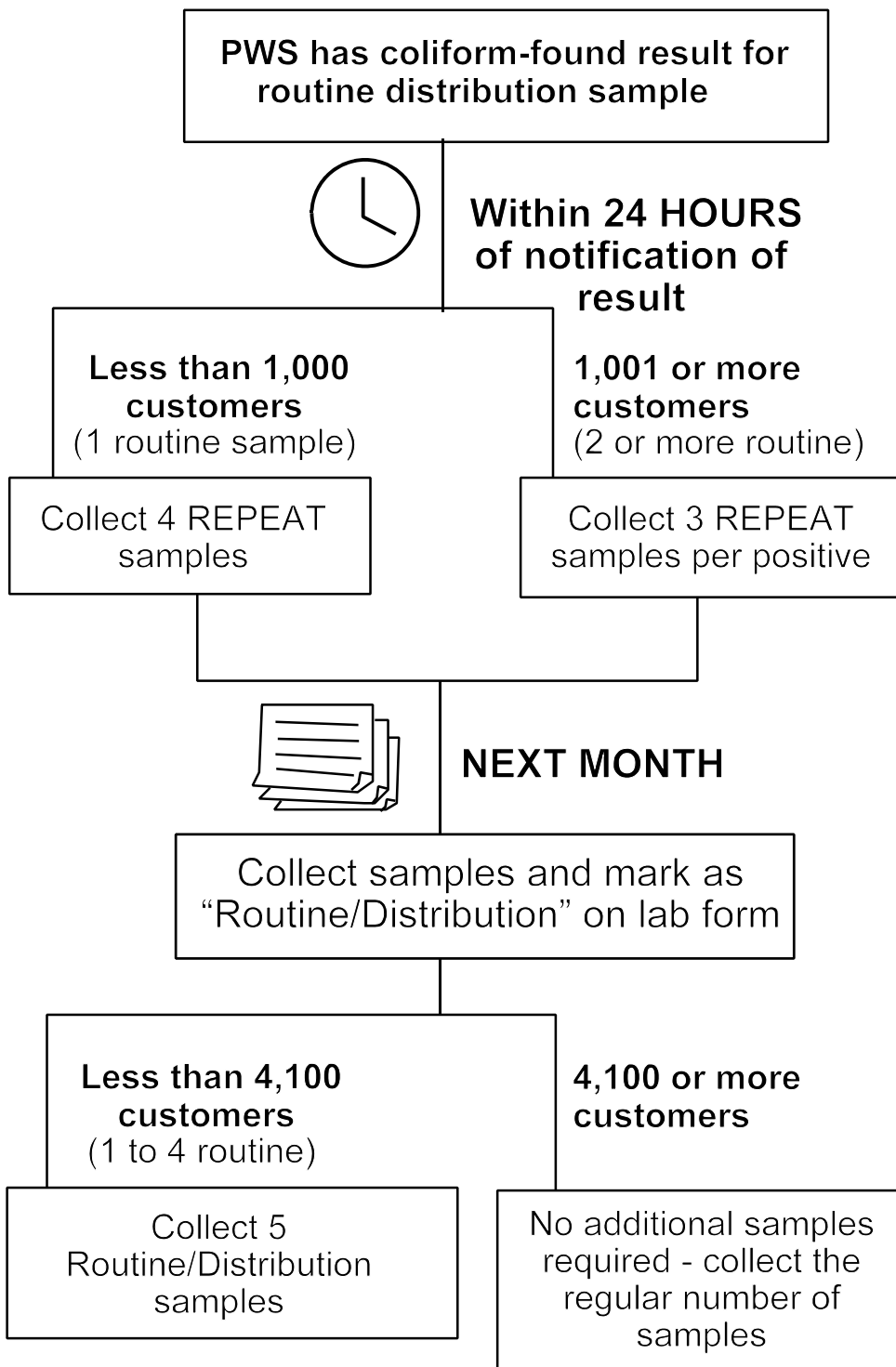
If you receive a positive (coliform-found) result, you must collect repeat samples within 24 hours of notification of the results by the lab or TCEQ. The number of repeats required depends on the number of monthly routine samples the water system collects.

Table 4-2 indicates the repeat sample requirements. Additionally, Figure 4-1 provides a flow chart you may use to determine how many repeat samples to collect.

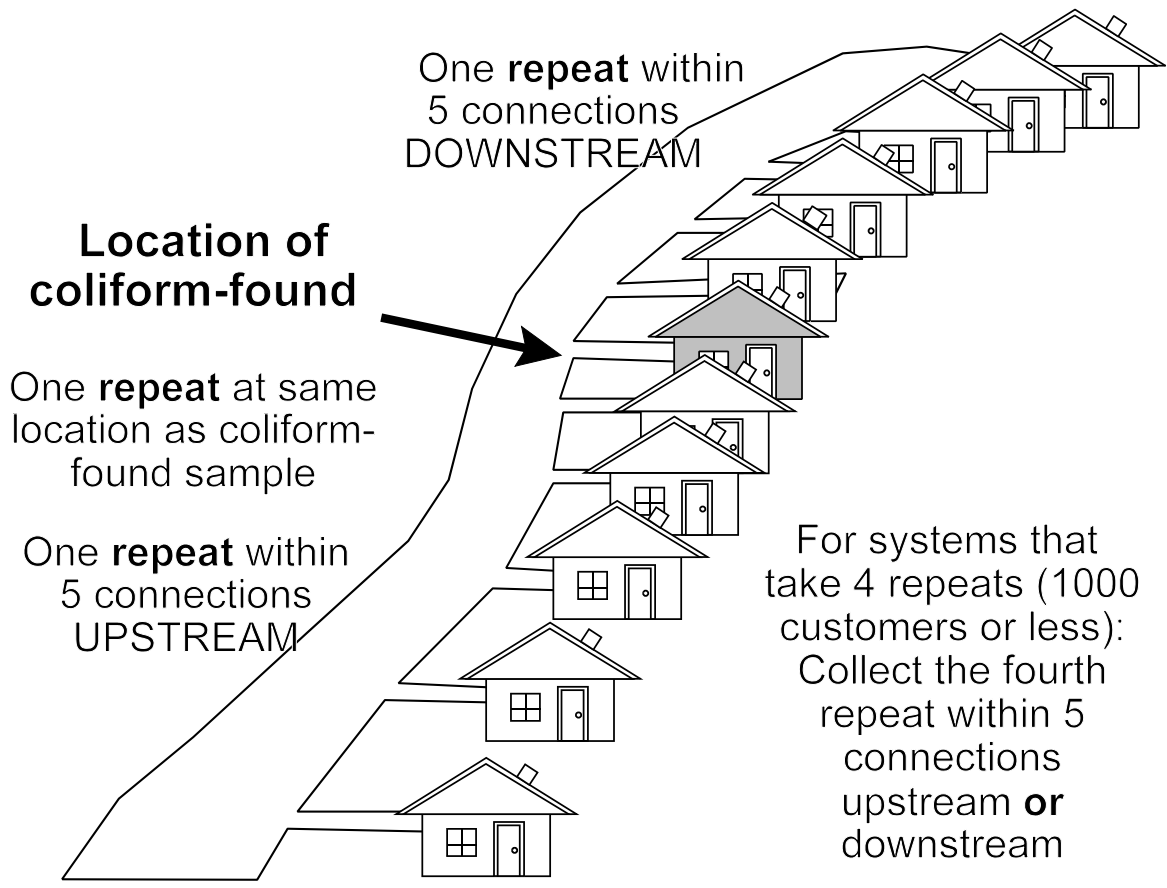
**Table 4-2: Number and Location of Repeat Samples**

If your PWS collects....	
<b>1</b> Routine Monthly Sample	<b>2, 3, or 4</b> Routine Monthly Samples
<b>Within 24 hours of notification of the positive:</b> Collect <b>4</b> repeat samples (mark "Repeat" on the lab submission form)	<b>Within 24 hours of notification of the positive:</b> Collect <b>3</b> repeat samples for <b>each</b> coliform-found sample (mark "Repeat" on the lab submission form)
<b>Locations:</b> Repeat 1 is collected at the original positive location Repeat 2 is collected upstream from the positive within 5 connections Repeat 3 is collected downstream from the positive within 5 connections Repeat 4 is collected upstream <b>or</b> downstream within 5 connections	<b>Locations:</b> Repeat 1 is collected at the original positive location Repeat 2 is collected upstream from the positive within 5 connections Repeat 3 is collected downstream from the positive within 5 connections
<b>In the month following a coliform-found result:</b> Collect <b>5</b> routine distribution samples (mark "Routine/Distribution" on the lab submission form)	
<b>NOTE:</b> Systems that routinely collect 5 or more samples per month do not have additional distribution sampling requirements. However, TCEQ encourages these systems to collect additional samples in the location where a coliform-found result occurred.	

State-certified laboratories make every effort to report positive results to TCEQ as soon as they are available. However, whenever a fecal coliform or *E. coli* result is received, we **strongly** encourage the PWS to contact TCEQ at 512/239-4691.



**Figure 4-1: Repeat Sample Flowchart**



**Figure 4-2: Repeat Sample Locations**

## 5 HOW TO PROPERLY COLLECT COLIFORM SAMPLES

It is extremely important that you collect samples correctly. If an operator collects a sample incorrectly, the sample may be contaminated with microbes, and the results used to describe the condition of your water system can be false.

You must measure and record the disinfectant residual each time you collect a coliform sample. The TCEQ document titled *Disinfectant Residual Reporting for Public Water Systems*, RG-407, provides more information on disinfection.

### 5.1 Coliform Sample Collection Procedures

If you carefully follow the procedure shown in Figure 5-1, you should be able to obtain acceptable samples every time. *Never* collect a coliform sample if you cannot detect a disinfectant residual at the sampling site.

If there is no disinfectant residual, it indicates a problem that you should identify and repair immediately. You may need to determine if your chlorinator is working properly or flush the transmission mains. In any case, you should repair any problems before collecting additional samples.

## Recommended Coliform Sample Collection Procedures

### 1. Wash your hands

Always wash your hands before you collect the samples. Poor hygiene is a common reason samples become contaminated. You may also use sterile plastic gloves.

### 2. Flush the line

Let the water run out of the faucet for several minutes. This is called “flushing.” Flush until the water is cold and you get a chlorine residual measurement.

### 3. Measure the chlorine content

Check the chlorine (or chloramine) residual. Record the result of this measurement in the space provided.

*Note:* If there is no chlorine (or chloramine) residual, do *not* collect a sample. Continue to flush the faucet until a residual is detected. If no residual is detected, check for problems with the chlorination system. If no disinfectant is present, your system is vulnerable to pathogens.

If it takes several minutes of flushing to obtain a chlorine residual at a faucet, do not take the sample immediately. Wait 10 to 15 minutes. The chlorine needs to sit in the piping long enough to kill all bacteria that may be present.

### 4. Flame the faucet

Disinfect the faucet outlet by flaming with a torch. Flame the faucet outlet for several seconds to ensure the destruction of any bacteria. You may wash the faucet with a strong chlorine bleach solution instead, but the flame method is better. If you use bleach, let it stay in contact with the outlet for several minutes. Unlike flaming, bleach needs more time to kill the bacteria.

### 5. Collect the sample

Using a pencil-sized stream (about 1/4-inch diameter) of water, fill the bottle to the 100-milliliter (mL) line. The discharge from the faucet should be a smooth stream, not a spray. Direct the stream downward to the inside of the bottle to make sure it does not splash. Do not over- or under-fill the bottle.

**Figure 5-1: Recommended Coliform Sample Collection Procedures**

## 5.2 Precautions for Sample Collectors

If samples are collected by PWS personnel, prepare a standard operating procedure (SOP) for collecting samples and have your operators review and understand the process. If you hire an operating company, make sure they have an SOP that is consistent with the practices described in this guide.

Proper sampling technique will ensure that you collect samples that accurately describe the water quality of your system. Proper procedures include the following actions:

- Do not use sample bottles that are more than six months old. If you are unsure how old a bottle is, discard it. Store unused bottles in a cool, dry area. Do not subject the bottles to high heat or damp conditions. Only use bottles you have obtained from a certified lab. Always have extra bottles available.
- Do not collect samples on windy or rainy days. Because coliform bacteria are present in the soil, dust or wind-blown debris can contaminate your sample. Rainwater dripping from a roof may also contaminate the sample.
- Deliver the sample to the lab within 30 hours after collection or the sample will be marked “Unsuitable” because it will be too old for proper analysis.
- Keep the sample cool during transport to the lab. Samples should be stored on ice because warm temperatures allow bacteria to multiply. If you are going to hold the sample before delivery to the lab, refrigerate it.
- Treat the bottle with care. It is sterile, and you will compromise the result if you touch the inside of the bottle or cap, if you place the cap on the ground, or if you hold it upside down. Hold the cap with two fingers while collecting the sample, and do not touch the interior portion of the cap or bottle. Improper handling can create false-positive results.
- Do not rinse the bottle before collecting the sample. The pill, powder, or liquid inside is there for a purpose and will not affect the result.
- Fill the sample bottle to the shoulder only. There must be 100 mL of water in the bottle. Do not over- or under-fill the bottle.

## 6 COMPLETING THE LAB SUBMISSION FORM

Fill out the laboratory submission form **correctly and completely!** This is as important as collecting the sample properly.

**If you fill out the form incorrectly, you will *not* receive credit for your results, and TCEQ will consider it as if you had failed to collect a sample.** If we receive incomplete or inaccurate forms, we cannot credit a sample to your system. When that happens, we will send you a notice of violation for failing to monitor.

An example of a typical lab submission form for a bacteriological sample is shown on page 17. Your lab's form may vary slightly from this example, but it should include the same essential information. The sample collector must include all of the information described in the following instructions. There is also information to be filled out by the lab; the sample collector should leave these areas blank.

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### INSTRUCTIONS FOR COMPLETING THE BACTERIOLOGICAL SAMPLE SUBMISSION FORM

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#### ***SAMPLE IDENTIFICATION***

##### **Lab ID, Sample Number, Date Received, and Report Date**

These are completed by the laboratory.

##### **Public Water System Identification Number (PWS ID)**

The PWS ID is a seven-digit number assigned to each public water system in Texas. The first three digits indicate the county where the system is located. For example, 001 is Anderson County, and 254 is Zavala County. The last four digits are assigned sequentially.

If you do not know your system's PWS ID, call the TCEQ Public Drinking Water Section at 512/239-4691.

##### **Public Water System Name**

The name of your public water system. You should use the same name that TCEQ uses. If you are unsure whether TCEQ uses the correct name for your PWS, call the TCEQ Public Drinking Water Section at 512/239-4691.

##### **Send Sample Results To**

Write the address where you want the results sent. Make sure this is legible, or you may not receive your sample results.

##### **Owner/PWS, Operator, Other**

Check the entity sending in the sample. If samples are collected by direct employees of a PWS, check "Owner/PWS." If an operating company, or contractor, collects the samples, check "Operator." The "Other" category is provided for samples that are not taken in a public water system.

## **SAMPLE SITE / COLLECTION DATE and TIME**

### **Date/Time Collected**

Clearly write the date and time of day that the sample was collected.

### **Sample Site**

Write the address or other description of where the sample was collected. Your Monitoring Plan may contain a numbered list of sample sites, but do not write the site number.

### **Sampler Name and Phone Number**

Write the name of the person collecting the sample and the person's phone number. If the lab has questions concerning the sample, the lab will need to contact the person who collected the sample.

### **System Type**

To receive credit from the for your samples, you must indicate "Public" as the system type. The other sample types are provided mainly for the lab's other customers. In some cases, a public water system may take a sample in response to a complaint from a customer. In that case, you could indicate "Private/Individual" as the system type, and the sample would not be considered as part of the system's compliance record.

### **Sample Type (PWS Only)**

Indicate the sample type as follows.

Routine samples from public water systems should be marked "Distribution."

Repeat samples are collected after coliform is found in a routine sample and should be marked "Repeat." You should note the sample ID of the coliform-found sample that the repeats are for.

"Construction" indicates the sample was collected following construction events in the distribution system.

"Raw" is used for samples collected directly from the well and not treated with disinfectant.

"Special" can be used for any other samples, such as diagnostic purposes or customer complaint samples.

**Only one sample type should be checked for each sample.**

### **Water Source**

Indicate the source of the water (Groundwater or Surface Water).

### **Disinfectant Residual**

You are required to measure and record the chlorine residual every time you collect a routine, repeat, raw, or construction sample. If you disinfect only with chlorine, you will need to measure the "free chlorine" residual. If you use both chlorine and ammonia, which forms chloramines, you need to measure the "total chlorine" residual.

Check the box that indicates the type of disinfectant used in the distribution system. Reporting requirements for disinfectant residual are described in the document, *Disinfectant Residual Reporting for Public Water Systems*, RG-407.

### **Number of Samples Collected on this Date**

Indicate how many samples were collected for this PWS on this date. This information is requested so that TCEQ can more easily track your sample results.

### ***LABORATORY REPORT (completed by laboratory, not collector)***

#### **Lab Test Method Used**

The laboratory will indicate here whether Colilert, Colisure, or another approved analytical method was used.

#### **Coliform Organisms**

This section is where the laboratory will indicate whether coliform bacteria were found in your water sample. If the box labeled "Found" is checked, it means that coliform bacteria were present in your water. If this was a routine distribution sample, you are required to do repeat sampling within 24 hours of receiving notice of this result.

#### **Unsuitable for Analysis**

If a routine distribution or repeat sample is marked "Unsuitable for Analysis," you must collect a replacement sample within 24 hours. The lab may not be able to analyze a sample for many reasons, including the following:

- *Sample too old*  
In order to accurately represent the water in the distribution system at the time the sample is taken, the sample must be analyzed within 30 hours of collection. The longer a sample sits, the greater the possibility that microbes will regrow in the sample.
- *Quantity insufficient*  
The laboratory needs at least 100 mL (about a quart) of water to analyze. If the laboratory does not receive an adequate volume, the lab analyst cannot perform the analysis.
- *Form incomplete, inaccurate, or illegible*  
If the laboratory analyst cannot tell exactly when the sample was collected, the analyst cannot determine whether the sample is too old, and therefore cannot analyze it. Also, if the date of collection is incorrect (for example, if it is a future date) the tracking record is flawed, and the sample will not be acceptable to the TCEQ. The submission form is a type of chain-of-custody report. Therefore, it must be complete, accurate, and legible to be acceptable.
- *Heavy silt/bacteria/turbidity*  
Water from public water systems is usually quite clear. If the laboratory receives a sample that is very dirty, it can use the methods that are used for potable water samples.
- *Sample leaked in transit*  
If a sample bottle has water leaking out, it is possible that contamination may leak in. This would be especially true of a sample that was shipped in the same cooler as samples from a wastewater plant (a practice that is not recommended). Additionally, a leaking sample may make forms illegible, or may make the quantity of sample insufficient for analysis.
- *Chlorine residual*  
The coliform sample bottles provided by the lab contain a preservative that quenches the chlorine in the sample. If a chlorine residual is still present when the lab receives the sample, it means the preservative was not added, or may have been rinsed out. In any case, the sample is not suitable for analysis.

### ***SUBMISSION INFORMATION***

After analysis, the laboratory sends one copy of the completed form to the PWS, and also submits a copy to TCEQ. Sometimes, if an analysis form is lost in transit, the TCEQ may contact the PWS to request a copy of the analysis form. It is the responsibility of each PWS to retain these forms, and to provide copies to TCEQ upon request.

**NAME OF LAB**

Lab Address  
Lab Phone Number

**SAMPLE IDENTIFICATION**

LAB ID \_\_\_\_\_ Sample Number \_\_\_\_\_ Date Received \_\_\_\_\_  
MO/DAY/YR

PUBLIC WATER SYSTEM ID \_\_\_\_\_ Report Date \_\_\_\_\_  
Seven digits (REQUIRED) MO/DAY/YR

PUBLIC WATER SYSTEM NAME \_\_\_\_\_ COUNTY \_\_\_\_\_

Send Name \_\_\_\_\_  
Sample Street Address \_\_\_\_\_  
Results City, State Zip \_\_\_\_\_  
To: Phone \_\_\_\_\_

Owner/PWS  Operator  Other

**SAMPLE SITE / COLLECTION DATE and TIME**

Date/Time Collected: \_\_\_\_\_  
Month Day Year Time of Day  am  pm

Sample Site: \_\_\_\_\_  
(Address or other description, not sample site number)

Sampler Name/Phone: \_\_\_\_\_

SYSTEM TYPE	SAMPLE TYPE (check ONE type only)	WATER SOURCE
<input checked="" type="checkbox"/> Public	(Public Systems Only)	<input type="checkbox"/> Groundwater
<input type="checkbox"/> Private/Individual	<input type="checkbox"/> Distribution <input type="checkbox"/> Raw: well #	<input type="checkbox"/> Surface water
<input type="checkbox"/> Other	<input type="checkbox"/> Construction <input type="checkbox"/> Special _____	(Well)
	<input type="checkbox"/> Repeat for sample # _____	<input type="checkbox"/> Surface water
	<input type="checkbox"/> Other: _____	(Lake, River)

DISINFECTANT RESIDUAL (Mandatory) \_\_\_\_\_ mg/L  Free Chlorine  
(Sample should not be collected if residual is not present)  Chloramine (Total Chlorine)  
Number of samples collected on this date \_\_\_\_\_

**LABORATORY REPORT (Collector: Do Not Write Below)**

Lab Test Method Used: \_\_\_\_\_

**COLIFORM ORGANISMS:**

**Total Coliform**

Found  NOT Found

**Fecal coliform / Escherichia coli (Circle type of organism found)**

Found  NOT Found

REPEATS (required for distribution samples only)

Unsuitable for analysis (see below)

Analyst Initials: \_\_\_\_\_

**SAMPLE UNSUITABLE FOR ANALYSIS (PWS must replace unsuitable sample with in 24hrs.)**

- Sample too old. Not received within 30 hours of collection
- Heavy SILT / BACTERIA / TURBIDITY PRESENT (circle).
- Quantity insufficient for analysis (100 mL. required)
- Sample leaked in transit
- Form incomplete / date discrepancy (CIRCLE errors)
- Chlorine residual
- Other reason: DESCRIBE: \_\_\_\_\_

Submit to TCEQ/Public Drinking Water MC-155, PO BOX 13087, Austin, TX 78711 | Fax Positive to 512-239-3666  
TCEQ - 10525 (05-14-04) COPIES: CUSTOMER, LABORATORY, TCEQ

## 7 LABORATORIES AND OPERATING COMPANIES

Public water utilities, private labs, and health departments use the total coliform test to analyze the initial microbiological quality of the water supply. If the total coliform test is negative, the water is considered to be of acceptable microbiological quality at the sampling point. If a total coliform sample result is positive, additional testing is performed for other forms of bacteria, such as fecal coliform or *E. coli*. All TCEQ-certified laboratories are *required* to conduct this additional testing on any coliform-found sample.

To find a list of approved certified labs, go to [www.tceq.state.tx.us](http://www.tceq.state.tx.us). Under the Subject Index, choose “Water,” and under “Public Drinking Water,” choose “Microbiological Monitoring,” then look for “Labs.”

### 7.1 Who Is Allowed to Collect Coliform Samples?

The TCEQ operator licensing rules stipulate that only a licensed drinking water operator may collect coliform samples. There are four classes of certified operators: A, B, C, and D. The class-D operator license allows you to collect coliform samples at community (C) or nontransient noncommunity (NTNC) public water systems. The only exception is that staff employed by a transient noncommunity (TNC) system may collect coliform samples without a license.

If you hire an operating company to collect samples for you, the operating company must employ licensed operators. This is true for all types of systems.

To become licensed as a drinking water operator, you must receive TCEQ training and also obtain experience working at a public water system. For additional information, call the TCEQ’s Operator Licensing Section, 512/239-6133.

The TCEQ Web site maintains a list of licensed drinking water operators in your county or area. To view this list, go to [www.tceq.state.tx.us](http://www.tceq.state.tx.us). Under the Subject Index, choose “Water,” and under “Public Drinking Water,” choose “Water Treatment and Distribution Operators.”

### 7.2 Laboratory Certification

Laboratories that analyze drinking water samples for the presence of coliform bacteria must be certified by the TCEQ Quality Assurance Section. Samples that are analyzed at uncertified labs cannot be used for meeting compliance requirements.

For questions concerning certified labs, call 512/239-3518.

If you have specific questions regarding your sample analysis or billing account, you should contact the laboratory. The TCEQ does not retain copies of laboratory forms of coliform sample results.

## 8 SAMPLE RESULT INVALIDATION

Rules established by TCEQ and the USEPA Safe Drinking Water Act provide a means to invalidate total coliform-found results. Specific reasons may allow a sample result to be declared as unrepresentative of the quality of water available to the consumer. Fecal coliform-found and *E. coli*-found results cannot be invalidated.

Table 8-1 lists the documentation that must be sent to TCEQ to request invalidation.

**Table 8-1: Required Documentation for Invalidation [290.109(c)(4)]**

1	Signed letter stating the action the system has taken or will take to correct this problem
2	Copies of the sample form for the routine total coliform-found and all repeat samples
3	Invalidation Request Checklist showing the specific cause of the total coliform-found sample
4	Copy of standard operating procedure (SOP) for sample collection (used by PWS or contract operator)

If you do not submit *all* items listed in Table 8-1, your request will be returned to you as incomplete and your sample will *not* be invalidated.

You must provide a specific reason to explain why the coliform-found result did not represent the quality of water being served to customers. A total coliform-found result cannot be invalidated simply because a logical explanation can be presented. For example, samples with a low or nonexistent chlorine residual will not be invalidated.

Invalidations will not be granted if repeat samples were not collected, were not properly collected, or were collected more than 10 days after the positive result. Invalidations will not be granted based solely on repeat samples that are coliform-free. Table 8-2 lists the acceptable reasons for invalidation

**Table 8-2: Acceptable Reasons for Invalidation [290.109(c)(4)]**

1	Laboratory determines that improper sample analysis caused the total coliform-positive result [290.109(c)(4)(A)]
2	Laboratory determines the sample was unsuitable for analysis [290.109(c)(4)(D)]
3	Domestic or non-distribution system plumbing caused the total coliform-found result [290.109(c)(4)(B)]
4	Original positive site has a total coliform-found result in the repeat set, with the other repeat results being negative [290.109(c)(4)(B)]
5	Circumstances or conditions exist that do not reflect the actual water quality in the distribution system [290.109(c)(4)(C)]

The invalidation request must be submitted within 14 days of receiving the written notification from the TCEQ that the system has a total coliform-found sample result. The proper number of repeat samples must be collected before making the request. (Refer to Section 4.2 for the requirements for collecting repeat samples.) If an invalidation is granted, you may be required to collect a replacement sample.

A letter describing the situation or event that affected the sample must accompany the Sample Invalidation Request Checklist. (A copy of the checklist is shown on the following page.) You must also submit your standard operating procedures for sample collection. If you use an operating company to collect samples, you must obtain a copy of their SOP and submit it.

For additional information, call the TCEQ Microbiological Monitoring Team at 512/239-4691. We recommend that you call as soon as you have a sample that you believe should be invalidated.

## Sample Invalidation Request Checklist

SEND:  Letter explaining request,  This checklist,  Copies of all pertinent sample analysis forms, and  SOP for sample collection. If any information is incomplete or illegible, your request will not be processed.  
 Mail to: TCEQ/PDW/Microbial Monitoring MC-155, PO BOX 13087, Austin, TX 78711-3087.

<b>PWS Name:</b> _____	<b>PWS ID:</b> _____
------------------------	----------------------

**Sample for which invalidation is requested:**

Sample ID: \_\_\_\_\_ Collection Date: \_\_\_\_\_ Collection Time: \_\_\_\_\_

**Sample Collector**

Collector Name: \_\_\_\_\_  
 Drinking Water License: \_\_\_\_\_ Years experience: \_\_\_\_\_  
 Employed by:  PWS  Contract Operator Name of company: \_\_\_\_\_

**Sample Collection Information** (attach SOP)

Chlorine residual checked at time of collection?  Yes  No Residual \_\_\_\_\_ mg/L  
 Type of disinfectant in distribution system:  Free chlorine  Chloramine (chlorine + ammonia)  
 Faucet disinfected by:  Flame  Alcohol  Bleach  
 Sample bottles:  Provided by lab?  Over six months old? Iced during shipment?  Yes  No  
 Sample collector followed SOP?  Yes  No

**Weather Information** (at time of collection)

Conditions:  Clear  Cloudy  Windy  Rainy Wind speed: \_\_\_\_\_ miles per hour  
 Other comments: \_\_\_\_\_  
 (Attach applicable weather report if request is to invalidate samples based on local weather conditions)

**Sample Site** (check all that apply)

Active service connection  Home  Business  Dead end pipe  Hose bibb  Storage tank  
 Active service connection  Inactive connection  
 Other (describe sample site): \_\_\_\_\_

**Distribution System Operation**

Flushing frequency: \_\_\_\_\_  
 Plumbing Ordinance adopted?  Yes  No Cross connection program in place?  Yes  No  
 If PWS not required to adopt plumbing ordinance, are Customer Service Inspections performed?  Yes  No  
 Who performs CSIs? \_\_\_\_\_

**Events Before Coliform-found Sample**

Recent outage in area of coliform-found?  Yes  No Date: \_\_\_\_\_ Lowest pressure: \_\_\_\_\_ psi  
 Most recent flushing in area of coliform-found (date): \_\_\_\_\_ (If date unknown, estimate weeks, months, or years)  
 Fire requiring unusually high pumpage in area of coliform-found?  Yes  No Date: \_\_\_\_\_  
 Repair on wells or distribution system in area of coliform-found?  Yes  No Date: \_\_\_\_\_  
 Special samples collected after repair work?  Yes  No Any specials coliform-found?  Yes  No  
 Public notices issued in last six months?  Yes  No Describe: \_\_\_\_\_

**Follow-up Actions to Coliform-found**

System flushed in area?  Yes  No Date: \_\_\_\_\_  
 SOPs modified?  Yes  No If yes, attach modified SOP.  
 Operator training?  Yes  No If yes, describe training \_\_\_\_\_  
 Disinfectant residual changed?  Yes  No If yes, describe change \_\_\_\_\_  
 Any public notice resulting from this coliform-found?  Yes  No If yes, attach copy of notice

I certify that I am familiar with the circumstances described on this checklist and that, to the best of my knowledge, the information contained herein is true, complete, and accurate.

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**Print Name** \_\_\_\_\_  
**Title/Phone:** \_\_\_\_\_

## 9 COMPLIANCE

There are several ways in which a public water system can fail to comply with TCEQ and USEPA rules. Each type of monitoring violation requires that your system issue a public notice, which is described in Chapter 10 of this guide.

Results of all routine distribution and repeat samples that have not been invalidated must be included in determining compliance with the maximum contaminant level (MCL) for total coliform content. Invalidated samples will not be included in determining compliance with the MCL for total coliform.

Special-purpose samples, such as those taken to determine whether disinfection levels are sufficient following pipe placement, replacement, or repair, are not used to determine compliance with the MCL for microbiological contaminants.

### 9.1 Acute MCL Violation [290.109(f)(1)(A) and (B)]

An acute MCL violation occurs when there is a combination of a coliform-found result and a fecal coliform-found or *E. coli*-found result in a routine or repeat sampling set. A system commits an acute MCL violation if any repeat sample is positive for fecal coliform or *E. coli*; or if a total coliform-found repeat sample follows a fecal coliform-found or *E. coli*-found routine sample. If you have an acute MCL violation, you must issue a public notice immediately, as described in Chapter 10.

### 9.2 Nonacute MCL Violation [290.109(f)(2) and (3)]

A system that collects 40 or more bacteriological samples per month commits a nonacute MCL violation if more than 5 percent of the samples collected during a month are total coliform-found, but none of the initial or repeat samples are positive for fecal coliform or *E. coli*.

A system that collects fewer than 40 samples per month commits a nonacute MCL violation if more than one sample collected during a month is total coliform-found, but none of the initial or repeat samples are positive for fecal coliform or *E. coli*.

### 9.3 Monitoring or Reporting Violation [290.109(f)(4) and (5)]

A PWS that fails to provide the required number of suitable samples commits a monitoring violation. A PWS that fails to report the results of the monitoring tests required by this section commits a reporting violation.

A system commits a *major* monitoring violation when it fails to collect any of the required samples; a system has a *minor* monitoring violation when it fails to collect some of the required samples.

## 10 ISSUING PUBLIC NOTICES

The form of a required public notice varies, depending on the severity of the health threat involved. The most urgent form of public notice is the Boil Water Notice (BWN), which is issued when a potential threat to human health is found to exist.

### 10.1 Boil Water Notices

A BWN is issued by either a PWS or the TCEQ whenever a circumstance occurs that has the potential of compromising the bacteriological integrity of the water or when a circumstance indicates that public health is at risk. An example of the mandatory language used for a BWN is presented in Figure 10-1.

#### **Circumstances Requiring a Boil Water Notice**

***Acute Coliform MCL Violation.*** If a system receives an acute MCL violation, as described in Chapter 9, the system must issue a BWN.

***Flooding or Contamination of a Well.*** The most commonly issued BWN to the general public occurs after flooding that contaminates wells and water lines. In this case, flood water that contains fecal matter can easily contaminate water supplies.

***Loss of Pressure in the Distribution System.*** The system must issue a BWN when the water pressure in the distribution system falls below 20 pounds per square inch (psi) and creates a potential for contaminants to back-siphon into the drinking water system. A flow chart used to determine if a BWN is required after a loss of pressure is located at [http://info.sos.state.tx.us/fids/30\\_0290\\_0047-27.html](http://info.sos.state.tx.us/fids/30_0290_0047-27.html).

***New or Substantially Reworked Wells.*** If it is necessary to place a new well into service before obtaining negative (coliform-not found) results on three consecutive sampling days, a PWS may issue a BWN to stay in effect until negative results are obtained from the well for three days in a row.

#### **Rescinding a Boil Water Notice**

You cannot rescind a BWN until the situation that is creating a risk to public health is repaired and sampling shows that coliform bacteria are not present. You must receive approval from TCEQ before rescinding a BWN.

## Mandatory Language for a Boil Water Notification

Due to conditions which have occurred recently in the water system, the Texas Commission on Environmental Quality (TCEQ) has required the system to notify all customers to boil their water prior to consumption.

To ensure destruction of all harmful bacteria and other microbes, water for drinking, cooking, and for making ice should be boiled and cooled prior to consumption. The water should be brought to a vigorous rolling boil and then boiled for two minutes. In lieu of boiling, you may purchase bottled water or obtain water from some other suitable source. When it is no longer necessary to boil the water, the water system officials will notify you.

If you have questions regarding this matter, you may contact

(1) \_\_\_\_\_ at (2) \_\_\_\_\_ .

**Instructions: Fill in the numbered areas with the information below.**

- (1) Name of responsible water system official
- (2) Phone number of responsible water system official and other contact numbers

**Figure 10-1: Boil Water Notification Language**

## 10.2 Public Notices for an Acute MCL

If your system has a repeat sample that is fecal coliform-found or *E. coli*-found, or if a total coliform-found repeat sample follows a positive fecal coliform or *E. Coli* routine sample result, it has committed an acute MCL violation. You must immediately issue a public notice according to the following description.

### **Instructions for Notifying Customers of an Acute MCL Coliform Violation**

1. You must notify customers within 24 hours after the TCEQ notifies you of the acute MCL coliform violation. [30 TAC Chapter 290 Subchapter F Section 290.122(a)(2)]
2. You must use the Mandatory Language for an Acute MCL Violation Notification and also the Mandatory Language for a Boil Water Notification provided. [30 TAC Section 290.122(d)] and [30 TAC Section 290.47(e)]

### ***Community Water Systems***

3. You must furnish copies of the notices to radio and television stations in the area served by the public water system. [30 TAC Section 290.122(a)(2)(B)]
4. You must publish the notice in a daily newspaper of general circulation in the area served by the system. If the area is not served by a daily newspaper of general circulation, notice must instead be issued by hand delivery or by continuous posting in conspicuous places within the area served by the system. [30 TAC Section 290.122(a)(2)(C)]

**(skip to step 5)**

### ***Noncommunity Water Systems***

3. You must issue the notice of violation by hand delivery or by continuously posting the notice in conspicuous places within the area served by the water system. [30 TAC Section 290.122(a)(2)(D)]
4. If you issued the initial notice by continuous posting, the posting must continue for as long as the violation exists. If the owner or operator of a noncommunity water system issued the initial notice by hand delivery, notice by hand delivery must be repeated at least every three months for as long as the violation exists. [30 TAC Section 290.122(a)(3)(C)]

**(continue to step 5)**

5. You must issue a notice when the public water system has corrected the acute violation. This notice must be issued in the same manner as the original notice. [30 TAC Section 290.122(a)(4)]
6. Copies of all notifications required must be submitted to TCEQ within ten days of its distribution. [30 TAC Section 290.122(a)(5) and (f)]

## Mandatory Language for an Acute MCL Coliform Violation

The (1) \_\_\_\_\_ water system collected (2) \_\_\_\_\_ water samples during the month of (3) \_\_\_\_\_, that contained coliform bacteria. Of these, (4) \_\_\_\_\_ samples contained fecal coliform/*E. coli* bacteria. This water system is required to submit a minimum of (5) \_\_\_\_\_ water samples each month for bacteriological analysis. Additional samples are required to be collected when routine monthly samples indicate the presence of coliform bacteria.

Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal feces. Microbes in feces can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

If you have questions regarding this matter, you may contact (6) \_\_\_\_\_ at (7) \_\_\_\_\_.

### Instructions: Fill in the numbered areas with the information below.

- (1) Name and ID number of the public water system
- (2) Number of coliform-found samples
- (3) Month and year of coliform-found samples
- (4) Number of samples that were positive for fecal coliform/*E. coli*
- (5) Number of required routine/distribution samples
- (6) Name of water system official
- (7) Phone number of water system official

**Figure 10-2: Acute MCL Coliform Violation Language**

## 10.3 Nonacute Public Notices

If your system collects 40 or more bacteriological samples per month and three or more sample results are total coliform-found, the system commits a nonacute MCL violation. The initial or repeat samples should not be positive for fecal coliform or *E. coli*.

If your system collects fewer than 40 samples per month, it commits a nonacute MCL violation if more than one sample collected is total coliform-found, and none of the initial or repeat samples are positive for fecal coliform or *E. coli*. The required language is presented in Figure 10.3.

### **Instructions for Notifying Customers of an MCL Coliform Violation**

1. You must notify customers within 30 days of being notified by the TCEQ of the MCL coliform violation. [30 TAC Section 290.122(b)(2)]
2. You must use the mandatory language provided for the MCL Coliform Violation [30 TAC Section 290.122(b) and (d)]

### ***Community Public Water Systems:***

3. The owner or operator of a community water system must publish the notice in a daily newspaper of general circulation in the area served by the system. If the area served by the PWS is not served by such a newspaper, the notice must be published in a weekly newspaper of general circulation serving the area. If neither type of newspaper is available, the notice must be issued by hand delivery or by continuous posting in conspicuous places within the area served by the system. [30 TAC Section 290.122(c)(2)(A)]  
**(skip to step 4)**

### ***Noncommunity Public Water Systems:***

3. The owner or operator of a noncommunity water system must issue the notice by hand delivery or by continuously posting the notice in conspicuous places within the area served by the system. [30 TAC Section 290.122(2)(B)]  
**(continue to step 4)**
4. The owner or operator of the public water system must issue a notice when the public water system has corrected the violation. This notice must be issued in the same manner as the original notice was issued. [30 TAC Section 290.122(b)(4)]
5. Copies of all notifications required must be submitted to the TCEQ within 10 days of its distribution. [30 TAC Section 290.122(f)]

You must submit copies of all public notices to us by mail or fax.

Mail to: TCEQ  
Drinking Water Protection Team  
MC-155  
P.O. Box 13087  
Austin, TX 78711-3087

Fax to: 512/239-3666

## Mandatory Language for MCL Coliform Violation

The (1)\_\_\_\_\_ water system collected (2)\_\_\_\_\_ water samples during the month of (3)\_\_\_\_\_, that contained coliform bacteria. This water system is required to submit a minimum of (4)\_\_\_\_\_ routine water samples each month for bacteriological analysis. (5)\_\_\_\_\_ routine samples were coliform found and (6)\_\_\_\_\_ repeat samples were coliform-found for the month and year indicated above.

The Texas Commission on Environmental Quality (TCEQ) sets drinking water standards in Texas and has determined that the presence of total coliform is a possible health concern. Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.

For water systems analyzing at least 40 samples per month, no more than 5.0 percent of the monthly samples may be positive for total coliform. For systems analyzing fewer than 40 samples per month, no more than one sample per month may be positive for total coliforms.

If you have questions regarding this matter, you may contact (7)\_\_\_\_\_ at (8)\_\_\_\_\_.

### **Instructions: Fill in the numbered areas with the information below.**

- (1) Name and ID number of public water system
- (2) Number of coliform-found samples
- (3) Month and year of coliform-found samples
- (4) Number of required routine/distribution samples
- (5) Number of routine/distribution coliform-found samples
- (6) Number of repeat coliform-found samples (if there were none, do not put in notice)
- (7) Name of responsible water system official
- (8) Phone number of responsible water system official

**Figure 10-3: MCL Coliform Violation Language**

## 10.4 Monitoring or Reporting Public Notices

If you fail to collect or report samples, you must notify your customers. The TCEQ will send you a reminder letter when you fail to collect or report samples.

If you did collect the monthly routine or repeat samples and you still receive a reminder, it is usually because your lab submission form was incomplete or incorrectly prepared. In this case, fax the sample result to the Microbial Monitoring Team at 512/239-3666, with a note of explanation. When we receive your sample results, we will send you a confirmation letter.

To receive credit for issuing a public notice, you must mail or fax a copy to TCEQ. The copy can be mailed to the Public Drinking Water Section using the address shown at the bottom of the front of the reminder letter. The notice also may also be faxed to us at 512/239-3666. If you are a community public water system and you are not forwarding a newspaper notice to us, please advise us that no newspaper is available to you.

### **Community PWS Notices**

A community PWS must publish the notice in a daily newspaper of general circulation in the area served by the system. If the area served by the PWS is not served by a daily newspaper of general circulation, the notice must instead be published in a weekly newspaper of general circulation serving the area.

If the area is not served by either a daily or weekly newspaper of general circulation, notice must instead be given by hand delivery or by continuous posting in conspicuous places within the area served by the system. A community system must report this violation on the annual Consumer Confidence Report.

### **Noncommunity PWS Notices**

Noncommunity PWS (those that serve other than permanent homes) must post the notice in conspicuous places within the service area of the water system. The notice must remain posted for 30 days.

### **When You Fail to Collect Samples**

#### ***Routine Monitoring Violation***

If your system fails to collect the required number of monthly samples, you must issue a public notice to inform your customers of this fact. The mandatory language that you will use to create this notice is shown in Figure 10-4.

When your system collects a routine distribution sample that tests positive for coliform bacteria, you are required to collect additional (repeat) samples from the same location within 24 hours of being notified of the positive result. The number of repeat samples required will vary depending on the number of distribution samples you regularly collect.

***Repeat Monitoring Violation***

If you fail to collect the required number of repeats, you must notify your customers by posting a public notice. The mandatory language for creating this type of notice is presented in Figure 10-5.

***Increased Monitoring***

Systems that collect one to four monthly compliance samples and receive a positive result will have their monitoring requirement increased to five distribution samples in the month following the positive result. If your system fails to collect the correct number of increased monitoring samples, you must notify your customers by posting a public notice. The mandatory language for creating this type of notice is presented in Figure 10-6.

## Mandatory Language for a Routine Monitoring Violation

(1)\_\_\_\_\_ failed to collect the required number of bacteriological samples for coliform monitoring of the water distribution system during (2)\_\_\_\_\_. This monitoring is required by the Texas Commission on Environmental Quality's "Drinking Water Standards" and the federal "Safe Drinking Water Act," Public Law 95-523.

Bacteriological samples are used to monitor water quality and indicate if the water is free of coliform bacteria. Our water system is required to submit (3)\_\_\_\_\_ bacteriological samples each month. Failure to collect all required bacteriological samples is a violation of the monitoring requirements and we are required to notify you of this violation.

If you have any questions regarding this violation, you may contact (4)\_\_\_\_\_ at (5)\_\_\_\_\_.

**Instructions: Fill in the numbered areas above with the information below:**

- (1) Name and ID number of the public water system
- (2) Month and year that all required samples were not collected
- (3) Number of required routine/distribution samples per month
- (4) Name of the responsible water system official
- (5) Phone number of the responsible water system official

**Figure 10-4: Routine Monitoring Violation Language**

## Mandatory Language for a Repeat Monitoring Violation

Each month, (1)\_\_\_\_\_ is required to submit water samples for bacteriological testing. The samples we submitted during (2)\_\_\_\_\_ contained coliform bacteria. The presence of coliform bacteria indicates a potential problem with our water treatment system or the pipes that distribute the treated water. Whenever we find coliform bacteria in a routine sample, the Texas Commission on Environmental Quality (TCEQ) requires us to collect a specific number of repeat samples to help determine whether or not there is a problem.

***Insert the correct wording for your situation:***

These repeat samples were not collected. *OR*  
We did not collect the correct number of repeat samples.

The failure to collect any or all of these repeat samples is a monitoring violation and we are required to notify you of this violation. If you have any questions regarding this violation, you may contact (3)\_\_\_\_\_ at (4)\_\_\_\_\_ .

**Instructions: Fill in the numbered areas above with the information below.**

- (1) Name and ID number of the public water system
- (2) Month and year of the violation
- (3) Name of the responsible water system official
- (4) Phone number of the responsible water system official

**Figure 10-5: Repeat Monitoring Violation Language**

### **Mandatory Language for Increased Routine Monitoring Violation (T3 and T4)**

In (1)\_\_\_\_\_, (2)\_\_\_\_\_ collected sample(s) for bacteriological analysis. Result(s) indicated the presence of coliform bacteria. Consequently, the Texas Commission on Environmental Quality required our system to submit five routine/distribution samples during (3)\_\_\_\_\_. Because we did not collect all of the required samples, we were cited for a monitoring violation and are required to inform you of this violation.

If you have any questions regarding this violation, you may contact (4)\_\_\_\_\_ at (5)\_\_\_\_\_.

**Instructions: Fill in the numbered areas above with the information below.**

- (1) Month and year of the coliform-found sample(s)
- (2) Name and ID number of the public water system
- (3) Month and year of the violation
- (4) Name of the responsible water system official
- (5) Phone number of the responsible water system official

**Figure 10-6: Increased Routine Monitoring Violation Language**

# 11 CONSTRUCTION, SPECIAL, AND RAW SAMPLES

Some coliform samples are collected when nonstandard operating conditions (such as construction activities or operational testing) exist within the system. These samples may be marked as "Construction" or "Special" on the lab submission form. These sample types are not used for a system's compliance requirements.

Some systems monitor their raw water supplies and collect samples from the source before it has entered the treatment plant or distribution system. As a result, raw water samples will not have a disinfectant residual.

## 11.1 Construction Samples

When a PWS does construction on its distribution system lines, a risk of contamination exists. For this reason, the PWS is required to collect "Construction" samples after the lines have been closed and disinfected.

All newly-installed lines and repaired mains must be disinfected and tested for bacteriological presence. Lines may be placed in service only after sample results are negative for coliform.

A minimum of one sample must be collected for each 1,000 feet of line that is repaired or installed. If a coliform-found result is reported, the process must be repeated until the sample results are negative for coliform. Construction samples are not used for compliance purposes.

## 11.2 Special Samples

Some samples are collected by the water system for their own purposes. For example, if the PWS collects a sample in response to a customer complaint or is attempting to diagnose a specific problem in the system, the sample should be marked "Special." Special samples are not used for compliance purposes.

## 11.3 Raw Samples

A system that operates a well, and does not have a sanitary control easement, is required to collect Raw samples to verify that fecal matter is not contaminating the water. Raw water samples are collected directly from the well and have not been treated with disinfectant. These samples should be marked "Raw" on the lab submission form.

The federal Ground Water Rule will require systems with wells that are hydrogeologically sensitive to collect raw water samples for coliform analysis each month. If a sample is positive, repeat samples will be required. If repeat samples are positive, the system will have a treatment technique **violation**.

# 12 DISTRIBUTION SYSTEM FOLLOW-UP ACTIONS

## 12.1 Coliform Sampling

Coliform sampling is one method of ensuring your system is providing safe drinking water to your customers. Additionally, such sampling can help you become aware of issues regarding operating conditions in your distribution system. When you receive a coliform-found sample result, you should determine if your distribution system is in proper working condition.

## 12.2 Flushing Programs

A flushing program is a good housekeeping task that maintains the health of the distribution system. A flushing program removes impurities (such as sediments and stagnant water) by bringing in fresh, chlorinated water into the system. A routine flushing program improves water quality and removes chlorine-reducing materials from the distribution system. All dead-end mains should be flushed monthly, and also when customers complain about taste, odors, and colored water.

### *How to flush:*

1. Plan and schedule the flushing event.
2. Notify customers of the scheduled flushing.
3. Open and close valves slowly to prevent “water hammer.” Open valves fully to dislodge and flush sediments from mains.
4. Control flow rates (5 cubic feet per second is recommended).
5. Maintain pressure above 20 psi.
6. After flushing for at least 5 minutes, collect samples, and check water color, sediments, turbidity, and chlorine residuals.
7. Record measurement results.

## 12.3 Cross Connection Program

Cross connection control is a prevention of a physical connection between a potable water supply and any other sources of water of unknown or unsafe quality. Examples of cross connections include the following:

1. Private well supplying a home or building, which also has a connection to a public water supply.
2. Water hoses left in standing water, livestock trough, chemical solution tank, laboratory sink, or a water reservoir of unknown quality.
3. Certain types of irrigation systems.
4. Any public water system connection in which the water can return back into the system—for example, from water that is used for condensing, cooling, industrial processes, or any other system of nonpotable usage in which the public water system officials have no sanitary control. These connections will not be allowed.
5. Overhead bulk water dispensing stations. They must be provided with an air

gap between the filling outlet and the receiving tank to protect against siphonage and cross contamination.

No water connections from any public drinking water supply system may be allowed to any residence or establishment where an actual or a potential contamination hazard exists unless the public water facilities are protected from contamination.

Protection must be provided at the meter by an air gap or with a backflow prevention assembly. The type of backflow assembly required is determined by the type of health hazard identified, and can be found at:

[http://info.sos.state.tx.us/fids/30\\_0290\\_0047-32.html](http://info.sos.state.tx.us/fids/30_0290_0047-32.html).

An adequate internal cross connection control program must include annual inspection and testing by a certified backflow prevention assembly tester on all backflow prevention assemblies used for health hazard protection.

## 12.4 Pressure Maintenance Program

A pressure maintenance program is crucial in maintaining pressure throughout the distribution system. Adequate pressures are achieved by proper operation of pumping equipment, elevated storage tanks, and pressure tanks. The distribution system pressure should be maintained between 40 and 60 psi.

TCEQ requires systems be designed to maintain a minimum pressure of 35 psi at all points within the distribution at a flow rate of at least 1.5 gallons per minute (gpm) per connection. For fire protection, the system should be designed to maintain a minimum pressure of 20 psi under a combination of fire conditions and drinking water flow needs.

## 12.5 Chlorine Shocking for Systems Using Free Chlorine

Chlorine shocking is a disinfection process that may be used by systems being placed or returned into service. This process is necessary for disinfecting new lines, repaired mains, storage tanks, and water treatment facilities. The process involves adding chlorine as tablets, as granules, or as a solution into the pipe, storage tank, or facilities before filling with water.

***Proper disinfection is accomplished by either of the following methods:***

1. Introduce 50 ppm (mg/L) chlorine solution, hold in the lines for 24 hours.
2. Introduce 500 ppm (mg/L) chlorine solution, hold in the lines for 30 minutes.

***Before items can be placed in service, the utility must complete the following:***

1. Flush, fill, and pressure test the main.
2. Disinfect the items by the methods listed above.
3. Flush the highly chlorinated water from the lines, tanks, or facilities.
4. Fill the line, tank, or facilities with system water.
5. Collect bacteriological samples and submit to a certified laboratory.

## 12.6 Issues with Chloramination

Some systems elect to use chloramination (combining chlorine and ammonia) for disinfection. The use of chloramines presents benefits and problems that are different from using chlorine alone. Chloramination is not an effective primary disinfectant and requires special consideration for use at dialysis clinics and for aquarium operators.

Chloramination is inherently harder to control because it consists of two chemical components, and its effectiveness as a disinfectant is affected by feed rate, relative proportions, temperature, and pH.

Chloramination is, however, very persistent as a secondary disinfectant, and forms fewer trihalomethanes (THMs) than free chlorine when an identical source of water is used.

Operations and maintenance considerations include nitrification and loss of residual. Also, chloramination requires separate facilities for ammonia and chlorine. The location and placement of feed points require careful engineering analysis, and the formation of scale at the ammonia feed point can be problematic.

## 12.7 Tank Inspection Requirements

Each public water system is required to have an annual inspection of all ground, elevated, and pressure tanks. These inspections may be performed by system personnel or a contracted service, and documentation regarding the findings must be retained for five years.

Items covered in these inspections include structural integrity, interior and exterior coating systems, water tightness, vents, hatches, flap valves, gasketing, instrumentation, and controls.

Pressure tank inspections must also determine that pressure relief devices and pressure gauges are working properly, and that air-water ratios are being maintained at the proper level.

Storage facilities may be drained before inspection, but this may cause unnecessary structural stresses to the tank, or be impractical for other reasons. Tanks that are not drained should be isolated and internally inspected by divers and/or remotely operated robotic vehicles.

Sanitation of finished water must be maintained during inspections. Divers and equipment used in inspections must be disinfected before entering the tank, typically with a solution containing 200 mg/L free chlorine. Divers must be commercially trained, must use proper equipment configurations for potable water and confined space environments, and must be assisted by appropriate support and safety personnel. Water quality should be monitored for bacteriological contamination and turbidity levels both during and after the inspection.

# APPENDIXES

## Appendix I: Acronyms

AOC—assimilable organic carbon

AO— Agreed Order

BACT—bacteriological

BLA—bilateral Agreement

BPAT—backflow prevention assembly testing

CA—Compliance Agreement

CCI—Comprehensive Compliance Investigation

CCR—Consumer Confidence Report

DLQOR—Disinfectant Level Quarterly Operating Report

DWQ—Drinking Water Quality

EAR—Enforcement Action Referral

FOD—Field Operations Division (TCEQ)

GWPWMOR—Groundwater/Purchase Water Monthly Operating Report

HPC—heterotrophic plate count

IDSE—Initial Distribution System Evaluation

LAS—liquid ammonium sulfate

LRAA— locational running annual average

PDW—public drinking water

PWS— public water system

NDMA—nitroso-dimethylamine

NOE—Notice of Enforcement

NOV—Notice of Violation

OCE—Office of Compliance and Enforcement

OPRR—Office of Permitting, Remediation, and Registration

SWAP—Source Water Assessment and Protection (a group in the TCEQ PDW Section)

SWMOR—Surface Water Monthly Operating Report

TCEQ—Texas Commission on Environmental Quality

TROT—Technical Review and Oversight Team (a group in the TCEQ PDW Section)

## Appendix 2: Definitions

**acute**—an immediate or short term health threat or hazard. Typically used in the phrase, “contaminants with acute health effects,” which is sometimes abbreviated to acute contaminants. Acute health effects, as used in the drinking water program, are those that occur shortly after exposure to a drinking water contaminant—usually a matter of hours or days.

**community water system**—a public water system that has a potential to serve at least 15 residential service connections on a year-round basis, or serves at least 25 residents on a year-round basis.

**contamination**—the presence of any foreign substance (organic, inorganic, radiological, or biological) in water, which tends to degrade its quality and can constitute a hazard or impair the usefulness of the water.

**cross-connection**—a physical connection between a public water system and either a supply of unknown or questionable quality, any source that may contain contaminating or polluting substances, or any source of water treated to a lesser degree in the treatment process.

**Cryptosporidium**—a protozoan associated with the disease cryptosporidiosis in humans. The disease can be transmitted through ingestion of drinking water, person-to-person contact, or other exposure routes. Cryptosporidiosis may cause acute diarrhea, abdominal pain, vomiting, and fever that lasts one to two weeks in healthy adults, but may be chronic or fatal in immuno-compromised individuals.

**drinking water**—all water distributed by any agency or individual, public or private, for the purpose of human consumption, or that may be used in the preparation of foods or beverages or for the cleaning of any utensil or article used in the course of preparation or consumption of food or beverages for human beings. The term "drinking water" also includes all water supplied for human consumption or used by any institution catering to the public.

**Drinking Water Standards**—the commission rules covering drinking water standards in 30 TAC Chapter 290 Subchapter F (*Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Supply Systems*, RG-346).

***E. coli (Escherichia coli)***—bacteria that can cause acute intestinal distress.

**fecal coliform**—bacteria used to indicate the presence of other disease-causing organisms. Found in human and animal feces.

***Giardia lamblia***—a protozoan associated with the disease giardiasis. Ingestion of this protozoan in contaminated drinking water, exposure from person-to-person contact, and other exposure routes may cause giardiasis. The symptoms of this gastrointestinal disease may persist for weeks

or months and may include diarrhea, fatigue, and cramps.

**MCL violation**—condition in which a water system has a contaminant in an amount greater than that allowed by the USEPA.

**nonacute or chronic**—typically used in the phrase, “contaminants with chronic health effects,” which is sometimes abbreviated to “chronic contaminants.” Chronic health effects, as used in the drinking water program, are those which occur over many years. The health risk for these contaminants is usually estimated over a 70-year period.

**nontransient noncommunity water system**—a public water system that is not a community water system and regularly serves at least 25 of the same persons at least six months out of the year. This would be like a school or office.

**public water system**—a system for the provision to the public of piped water for human consumption, which includes all uses described under the definition for drinking water. Such a system must have a potential for at least 15 service connections, or serve at least 25 individuals at least 60 days out of the year.

This term includes any collection, treatment, storage, and distribution facilities under the control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Two or more systems with each having a potential to serve fewer than 15 connections or fewer than 25 individuals but owned by the same person, firm, or corporation, and located on adjacent land will be considered a public water system when the number of individuals served by the combined systems totals 25 or more at least 60 days out of the year.

Without excluding other meanings of the terms "individual" or "served," an individual is deemed to be served by a water system if that individual lives in, uses as the place of employment, or works in a place to which drinking water is supplied from the system.

**total coliform**—analytical test that determines the presence or absence of bacteria used as indicators of potential pathogens in drinking water.

**transient noncommunity water system**—a public water system that is not a community water system and serves at least 25 persons at least 60 days out of the year, yet by its characteristics, does not meet the definition of a nontransient noncommunity water system. These systems are typically restaurants, hotels, or camping facilities.