



RG-407
July 2007

Disinfectant Residual Reporting for Public Water Systems

Water Supply Division

printed on
recycled paper

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Disinfectant Residual Reporting for Public Water Systems

prepared by
Water Supply Division

RG-407
July 2007



Kathleen Hartnett White, *Chairman*
Larry R. Soward, *Commissioner*
H. S. Buddy Garcia, *Commissioner*

Glenn Shankle, *Executive Director*

We authorize you to use or reproduce any original material contained in this publication—that is, any material we did not obtain from other sources. Please acknowledge the TCEQ as your source.

Copies of this publication are available for public use through the Texas State Library, other state depository libraries, and the TCEQ Library, in compliance with state depository law. For more information on TCEQ publications call 512-239-0028 or visit our Web site at:

<http://www.tceq.state.tx.us/goto/publications>

Published and distributed
by the
Texas Commission on Environmental Quality
PO Box 13087
Austin TX 78711-3087

The TCEQ is an equal opportunity/affirmative action employer. The agency does not allow discrimination on the basis of race, color, religion, national origin, sex, disability, age, sexual orientation or veteran status. In compliance with the Americans with Disabilities Act, this document may be requested in alternate formats by contacting the TCEQ at 512-239-0028, Fax 512-239-4488, or 1-800-RELAY-TX (TDD), or by writing P.O. Box 13087, Austin, TX 78711-3087.

Contents

Introduction	1
What Rules Apply to PWSs in Texas?	1
Who Can Answer Questions about These Rules?.....	2
How Can I Get Copies of TCEQ Publications and Forms?	2
What Can the TCEQ Web Site Show Me about My PWS?	2
When Am I Required to Update Data about My System’s Ownership?	3
1. Applicability	5
Why Must PWSs Track Disinfectant Levels?.....	5
Are Transient Noncommunity (TNC) PWSs Exempt?	5
2. Maximum and Minimum Disinfectant Levels	7
What Are Maximum Residual Disinfectant Levels?	7
Isn’t the Minimum Level More Important than the Maximum?	7
3. Sampling: When? Where? How? Who?	9
3.1. How Often to Sample	9
3.2. Where to Sample	11
Distribution System Monitoring.....	11
Entry-Point Monitoring.....	13
3.3. How to Analyze Your Samples	14
Free Chlorine.....	14
Chloramines (also called “Total” or “Combined” Chlorine)	14
3.4. Who May Collect Samples	14
4. Reporting Requirements	15
4.1. When Is the Report Due?.....	15
4.2. The DL QOR Form.....	15
4.3. How to Make Important Calculations for a DL QOR	16
5. Compliance	19
Compliance with the Minimum Levels of Disinfectant Residuals	19
Compliance with the MRDL	19
Compliance with Monitoring and Reporting Requirements	19
6. Public Notification	21
Public Notice for Minimum Disinfectant Residual Violation	21
How to Issue a Public Notice.....	21
Appendix A. Abbreviations & Acronyms	23
Appendix B. Worksheets for Recording Disinfectant Residuals	24
Appendix C. The DL QOR Form	29

Introduction

This guide is intended for public water systems (PWSs) that use only purchased water or groundwater. It explains how to comply with the Texas requirements for monitoring, maintaining, and reporting disinfectant levels.

These requirements can be found in 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 290.110: Disinfectants. While basic requirements for disinfectants are covered in this guide, more detailed information is available in the rules. If there appears to be a discrepancy between this guidance and the rules, the rules take precedence.

Our web site has links to the Secretary of State's official version of the rules. From our home page, <www.tceq.state.tx.us>, click on "Rules, Policy & Legislation" and then follow the links to the official rules. The rules governing this guide were published in the May 10, 2002, edition of the *Texas Register*. You can request versions of the rules in a user-friendly format by contacting TCEQ Publications Distribution via e-mail at puborder@tceq.state.tx.us, or on our web site by searching for RG-346 and RG-195.

In this guide, the word "you" refers to operators of PWSs. The word "we" refers to us, the Texas Commission on Environmental Quality (TCEQ), and also to our public drinking water program.

What Rules Apply to PWSs in Texas?

The state of Texas has primacy over regulation of public drinking water. This means that we write, adopt, and enforce Texas rules that are at least as stringent as the rules promulgated by the U.S. Environmental Protection Agency (EPA). The Texas rules may be worded differently from the EPA rules, so PWSs in Texas should become familiar with these Texas-specific rules.

PWSs should also be aware that the rules pertaining to drinking water are contained in various parts of the Texas regulations. A PWS must comply with all the applicable requirements. Each rule explains who is affected by it. Some examples of additional rules and their location within the regulations are given below:

- *30 TAC, Chapter 290, Subchapter F.* Requirements regarding harmful or potentially harmful drinking water constituents for PWSs.
- *30 TAC, Chapter 290, Subchapter D.* Rules and regulations for PWSs related to requirements for the design, operation, and maintenance of water sources, treatment plants, and distribution systems.
- *30 TAC, Chapter 291.* Rules and regulations for water utilities related to requirements for rates, capacity development, and Certificates of Convenience and Necessity (CCN).
- *30 TAC, Chapter 293.* Requirements for districts that are also PWSs.

- *30 TAC, Chapter 30*. Requirements for licensing of water works operators. The TCEQ's Operator Licensing Team can answer questions about these requirements at 512-239-6300.
- *Texas Occupations Code Ann., Title 12, Practices and Trades Related to Water, Health, and Safety, Subtitle A, chapters 1901 and 1902*. Requirements for water-well drillers, including those who drill wells for PWSs. If you have questions about these regulations, call 1-800-803-9202 or 512-463-8876.

Who Can Answer Questions about These Rules?

If you have questions about the rules covered by this guide or about a rule that is listed above and has no phone number in its description, call our public drinking water program at 512-239-4691 or e-mail pdws@tceq.state.tx.us.

How Can I Get Copies of TCEQ Publications and Forms?

To get copies of our publications or forms on the Internet, go to our web site, www.tceq.state.tx.us. Under the "Site Navigation" bar, you can click to "Rules, Policy & Legislation" and to "Forms and Publications."

If the item you want is not listed on our web site, our Publications Distribution unit will help you find it. Contact them in one of these ways:

- Fax your order to: 512-239-4488.
- E-mail your order to: puborder@tceq.state.tx.us
- Write to: TCEQ Publications
Mail Code 195
PO Box 13087
Austin TX 78711-3087
- Phone: 512-239-0028

When ordering a publication, please give the **number** of the rule, publication, or form, as well as its title. This information will help us get the correct item to you quickly.

What Can the TCEQ Web Site Show Me about My PWS?

We have put our Water Utilities Database (WUD) on the web so you can check the data we have about your PWS. To access our main WUD page, go to www.tceq.state.tx.us/goto/iwud.

WUD can help you find your PWS ID number. Every PWS has a seven digit identification number, or PWS ID. The first three digits of your PWS ID tell which county your PWS is in. The last four digits are unique to your PWS in that county. To find your PWS ID from the main WUD page:

1. Under "Search by:" click on "Public Water System (PWS) Name or ID."
2. Following the instructions, enter the first part of the name of your PWS in the box and click "Submit."
3. Find your PWS in the list that appears. The PWS ID will be in the second column of this list.

WUD can show you our data for your PWS. From the main WUD page:

1. Click on “Request a WUD Report.”
2. From the pull-down menu, select “PWS Data Sheet.”
3. Click “Submit.” (This will take you to another page.)
4. On the new page, enter your PWS ID to bring up your data.

If WUD’s data for your PWS is wrong, print out the PWS Data Sheet report and correct the data that is wrong. Attach the corrected report to a note asking us to update the information and mail it to:

Data Management Coordinator, Public Drinking Water Section
TCEQ, Mail Code 155
PO Box 13087
Austin TX 78711

When Am I Required to Update Data about My System’s Ownership?

If any of the data about your system’s ownership changes, you should submit a Core Data Form to the TCEQ’s Central Registry. You can find the Core Data Form on our web site at <www.tceq.state.tx.us/goto/registry>.

You can ask questions about Central Registry by sending an e-mail to registry@tceq.state.tx.us.

1. Applicability

[30 TAC §290.110(a)]

Beginning in January 2004, all community and nontransient noncommunity PWSs that use only purchased water (PW) or groundwater (GW) started reporting information about their distribution system's disinfection to the TCEQ. This guide explains how these PWSs must monitor and report disinfectant information to us.

PWSs that treat surface water already submit information about disinfectant residuals on their Surface Water Monthly Operating Report, so this guidance does not affect them. PWSs that treat surface water or groundwater under the direct influence of surface water (GUI) should obtain and follow *Monthly Testing and Reporting at Surface Water Treatment Plants* (TCEQ publication RG-211).

Why Must PWSs Track Disinfectant Levels?

Since 1947, PWSs in Texas are required to maintain minimum disinfectant levels, in order to protect public health throughout their distribution systems.

The EPA promulgated the Stage 1 Disinfectants and Disinfection Byproducts Rule (DBP1) on December 16, 1998. The TCEQ adopted the provisions of this rule on May 7, 2000. This rule has many requirements, including *maximum residual disinfectant levels* (MRDLs). Because of the MRDLs, PWSs must report their disinfectant residuals to us on the Disinfectant Level Quarterly Operating Report (DL QOR). PWSs must also keep that information on hand to show to the regional investigator who performs the Comprehensive Compliance Investigation (CCI, or "sanitary survey").

Are Transient Noncommunity (TNC) PWSs Exempt?

Not exactly. Transient noncommunity (TNC) PWSs, such as parks, *do not* have to send in the DL QOR. However, TNCs must take samples for disinfectant residual and coliforms in accordance with 30 TAC, Subchapter F, sections 290.109 and 290.110.

2. Maximum and Minimum Disinfectant Levels

[30 TAC §290.110(b)]

What Are Maximum Residual Disinfectant Levels?

In its rules, the EPA noted that there may be increased risks of cancer to people who drink water with *very* high levels of free or combined chlorine. Therefore, the EPA adopted an upper limit to the concentration of disinfectant a distribution system should have, based on all of the sample results. These upper limits are referred to as the Maximum Residual Disinfectant Levels (MRDLs, for short). Table 1 shows the MRDLs for free or combined chlorine [30 TAC §290.110(b)(5)].

Table 1. Maximum Residual Disinfectant Levels for Free or Combined Chlorine

Type of Disinfectant	Maximum milligrams per liter (mg/L)	To see if you comply:
Free chlorine	4.0 mg/L	See if the Running Annual Average (RAA) of all distribution system samples is at or below 4.0 mg/L. If it is, your PWS complies with this rule.
Combined chlorine (also called chloramines)	4.0 mg/L	

Isn't the Minimum Level of Disinfectant in the Distribution System More Important than the Maximum?

Yes. The minimum level of disinfectant in the distribution system **is** more critical than the maximum level, because disinfection kills microbes (germs) that can cause acute diarrhea, nausea, or other illness. The TCEQ's minimum standards for disinfectant in the distribution system have not changed. These standards are shown in Table 2 [30 TAC §290.110(b)(4)].

Table 2. Minimum Disinfectant Levels for Free or Combined Chlorine

Type of Disinfectant	Minimum milligrams per liter (mg/L)	To see if you comply:
Free chlorine	0.2 mg/L	Every month, look at the data for the samples taken that month and the preceding month. If more than 5.0% of the samples in both months are <i>below</i> the minimum, your system has committed a nonacute violation, and you must notify your customers.
Combined chlorine (also called chloramines)	0.5 mg/L	

3. Sampling: When? Where? How? Who?

[30 TAC §290.110(c)]

3.1. How Often to Sample

[30 TAC §290.110(c)(5)]

The number of samples that your PWS must take depends on the number of customers it serves. The two kinds of required samples are:

1. Disinfectant residual samples collected at the same time as coliform samples.
2. Disinfectant residual samples collected throughout the distribution system.

Table 3, on the following page, shows the minimum required number of disinfectant residual samples your PWS must take. (You may collect more if you want.)

Example 1 represents the simplest sampling situation, a PWS that serves up to 750 people. If your PWS serves 751 or more people:

- You must measure disinfectant residual at least once every day.
- You may use the disinfectant residual measurement from a scheduled coliform sample as the measurement for that day.
- Even if you collect several coliform samples on one day, the residuals count for that day only. For example, if you take seven coliform samples on Monday, you still must measure disinfectant residuals each day the rest of the week.

To make sure you make the best use of the samples you take, you need a list that tells *what* to sample for, *when* to take each sample, and *where* to take each sample. This list is actually a required part of your PWS's monitoring plan. To learn more about this, see Section 3.2, "Where to Sample."

Public water systems that haul water, as defined in 30 TAC §290.44 (i), are required to take a disinfectant residual sample from each load of water hauled, and should base their report calculations on this data.

Tip: Know the Population Your PWS Serves

If you don't know exactly how many customers your PWS serves, you can look up the data we have for your PWS on our web site. To find out how, see "What Can the TCEQ Web Site Show Me about My PWS?" in the Preface of this guide. If you are concerned that the population of your system is represented incorrectly in our data, you can arrange to talk to your Regional Investigator about that. You can find contact information for your Regional Office on our web site, at www.tceq.state.tx.us/goto/region.

Table 3. Required Number of Distribution System Disinfectant Samples

Population Served	Number of Monthly Disinfectant Residual Samples Collected with Coliform Samples	Total Number of Monthly Disinfectant Residual Samples Required
1–750	1 per month	Weekly* disinfectant samples
751–1,000	1 per month	Daily* disinfectant samples
1,001–2,500	2 per month	
2,501–3,300	3 per month	
3,301–4,100	4 per month	
4,101–4,900	5 per month	
4,901–5,800	6 per month	
5,801–6,700	7 per month	
6,701–7,600	8 per month	
7,601–8,500	9 per month	
8,501–12,900	10 per month	
12,901–17,200	15 per month	
17,201–21,500	20 per month	
21,501–25,000	25 per month	
25,001–33,000	30 per month	
33,001–41,000	40 per month	
41,001–50,000	50 per month	
50,001–59,000	60 per month	
59,001–70,000	70 per month	
70,001–83,000	80 per month	
83,001–96,000	90 per month	
96,001–130,000	100 per month	
130,001–220,000	120 per month	
220,001–320,000	150 per month	
320,001–450,000	180 per month	
450,001–600,000	210 per month	
600,001–780,000	240 per month	
780,001–970,000	270 per month	
970,001–1,230,000	300 per month	
1,230,001–1,520,000	330 per month	
1,520,001–1,850,000	360 per month	
1,850,001–2,270,000	390 per month	
2,270,001–3,020,000	420 per month	
3,020,001–3,960,000	450 per month	
3,960,001 or more	480 per month	

Note: You may use the disinfectant levels that you measure in your coliform samples for some of these samples. See Example 1 for more details.

Example 1. Determining How Many Samples to Collect in a Month

The Sunshine Mobile Home Park (MHP) PWS serves 14 mobile homes with a total population of 47 people. The PWS's monitoring plan states that all weekly samples will be collected on Monday and that coliform samples will be collected the first Monday of the month.

How many samples must Sunshine MHP collect in January 2009?

Answer: According to Table 3, Sunshine MHP must collect:

- at least one coliform sample every month (because it serves fewer than 1,000 people)
- weekly samples for distribution system disinfectant residuals (because it serves fewer than 751 people)

The first Monday of January 2009 is the 5th of the month. So Sunshine MHP's sampling schedule for January 2009 would look like this:

Sunshine Mobile Home Park Sampling Schedule, Jan. 2009

On Monday	Collect:	On this sample, determine:
Jan. 5	1 sample	coliform <i>and</i> disinfectant residual
Jan. 12	1 sample	disinfectant residual only
Jan. 19	1 sample	disinfectant residual only
Jan. 26	1 sample	disinfectant residual only

So, Sunshine MHP should collect *four* samples in January 2009.

3.2. Where to Sample

[30 TAC §290.110(c)(5)]

Distribution System Monitoring

Every PWS must designate sample sites that are representative of the entire distribution system for both bacteriological (coliform) and disinfectant residual samples. Table 4, on the following page, shows how many sample sites a PWS must have, based on the size of the population it serves. This is the minimum required number of sample sites. You may designate more if you want. You must identify additional sites if that is necessary to adequately represent the quality of water throughout your system.

The sample sites for your PWS should be representative of the whole distribution system that you serve. You may use a single list of sites for both coliform and disinfectant monitoring. The list of sample sites also has to show when each site is monitored. Example 2 includes a hypothetical list of sample sites and when and how often they are sampled.

A PWS that provides water only to wholesale customers should have at least one sample site for each customer, at or near each customer's meter. This may result in fewer than five sites if a wholesale provider has fewer than five customers.

Table 4. Required Number of Coliform Samples and Sampling Sites, by Population Served

Population Served	Required No. of Coliform Samples	Required Number of Disinfectant Residual Sampling Sites
1–1,000 1,001–2,500 2,501–3,300 3,301–4,100 4,101–4,900	1 per month 2 per month 3 per month 4 per month 5 per month	At least 5 sites
4,901–5,800 5,801–6,700 6,701–7,600 7,601–8,500 8,501–12,900 12,901–17,200 17,201–21,500 21,501–25,000 25,001–33,000	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 (<i>Example: A PWS that collects 6 samples must have at least 6 sample sites</i>)
33,001–41,000 41,001–50,000	40 per month 50 per month	At least 30 sample sites
50,001–59,000 59,001–70,000 70,001–83,000 83,001–96,000 96,001–130,000 130,001–220,000 220,001–320,000 320,001–450,000 450,001–600,000 600,001–780,000 780,001–970,000 970,001–1,230,000 1,230,001–1,520,000 1,520,001–1,850,000 1,850,001–2,270,000 2,270,001–3,020,000 3,020,001–3,960,000 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 as many sample sites as samples (<i>Example: A PWS that collects 210 samples must have at least 105 sample sites</i>)

Example 2. Distribution System Sample Site List

The City of Schulzetown has a population of 3,700.

What would Schulzetown's list of sample sites look like?

Answer: According to Tables 3 and 4, Schulzetown must:

- have at least five sample sites
(because they serve between 3,301 and 4,100 people)
- collect four coliform samples a month
(because they serve between 3,301 and 4,100 people)
- collect *daily* disinfectant residual samples
(because they serve more than 750 people)

To develop a set of five sampling sites that produce results that are representative of the entire distribution system, Schulzetown's operator picked locations in all parts of town and developed a sampling schedule. Because the operator is the only person available to do the sampling, weekend samples are collected at the operator's house.

Schulzetown PWS Monitoring Plan

Sample Site	Samples Collected When?	
	Coliform	Disinfectant
City Hall (middle of town)	Rotate through all five sites, taking one sample on the first four Wednesdays of the month.	Every Wednesday
4321 Garza North St.		Every Monday and Thursday
5432 Garza South St.		Every Tuesday and Friday
7654 Far West Way		Every Monday and Thursday
6543 Far East Way		Every Tuesday and Friday
157 Golf Club Drive (operator's house, in the middle of town)	<i>Alternate site.</i> Use whenever one of the five other sites cannot be used (e.g., too windy, occupant on vacation, pesticide being sprayed).	Every Saturday and Sunday

This kind of list of sample sites has been called the “BacT List” in the past, but it can also be referred to as a monitoring plan. In fact, one of these lists must be included as part of a PWS's official monitoring plan, which has been a requirement for all PWSs since January 1, 2004. To learn more about the requirements for monitoring plans, see *How to Develop a Monitoring Plan for a Public Water System* (TCEQ publication RG-384).

Entry-Point Monitoring

Technically speaking, the “entry point” to your distribution system is not a part of the distribution system itself. The definition of an entry point is “the point at which freshly treated water enters the distribution system.” You can find more

information about entry points in *How to Develop a Monitoring Plan for a Public Water System* (TCEQ publication RG-384).

We highly recommend that you monitor the disinfectant level at your PWS's entry point. This is your primary process control point. By monitoring at the entry point, you can make sure that the disinfection process is working properly and that you have enough disinfectant in the water. Indeed, under the rules, surface-water and GUI PWSs must monitor disinfectant levels at the entry point [30 TAC §290.110(c)(2)].

3.3. How to Analyze Your Samples

[30 TAC §290.110(d)(3)(C)(ii)]

For each of the methods listed below—all of which are EPA-approved—you can buy test kits that allow you to analyze samples in the field. Kits designed for testing swimming pools might not be suitable for these analyses. **Be sure the test kit is labeled as EPA-approved for drinking water analysis.** The kit must be able to measure to at least 0.1 mg/L chlorine or chloramine residual. Your testing equipment should also be checked against chlorine solutions of known concentration once every 30 days.

Free Chlorine

Use one of these approved methods to measure the free chlorine residual:

- syringaldazine (FACTS)
- amperometric titration
- DPD ferrous titration
- DPD colorimetric with a colorimeter, spectrophotometer, or color comparator for a distribution system, but with only a colorimeter or spectrophotometer for an entry point

Chloramines (also called “Total” or “Combined” Chlorine)

Use one of these approved methods to measure the chloramine residual:

- amperometric titration
- DPD ferrous titration
- DPD colorimetric with a colorimeter, spectrophotometer, or color comparator for distribution system, but with only a colorimeter or spectrophotometer for entry point

3.4. Who May Collect Samples

[30 TAC §30.5(a), 30.381, and 30.387]

Call our Operator Licensing Section at 512-239-6300 to learn which sampling must be performed by licensed operators.

4. Reporting Requirements

[30 TAC §290.110(e)]

4.1. When Is the Report Due?

As of January 2004, every PWS that uses groundwater or purchased water must keep track of the levels of disinfectant residuals in its distribution system, and report these levels on the Disinfectant Level Quarterly Operating Report (DL QOR). Table 5 shows when each quarter's report is due:

Table 5. What Your DL QOR Covers and When It Is Due

<i>Quarter 1</i>	<i>Quarter 2</i>	<i>Quarter 3</i>	<i>Quarter 4</i>
Data for Jan., Feb., & March	Data for April, May, & June	Data for July, Aug., & Sept.	Data for Oct., Nov., & Dec.
Report due April 10	Report due July 10	Report due October 10	Report due January 10

The first step in complying with the reporting requirements for disinfectant residuals is to record your data carefully each time you sample. You may already have a good method for doing this; if not, you may find the worksheets in Appendix B helpful.

4.2. The DL QOR Form

After you have gathered the data for a quarter, you must report it to the TCEQ on the DL QOR form. See the end of this guide (Appendix C) for a blank DL QOR form that you can photocopy and use.

You can also download copies of the DL QOR form from our web site, or even access the form and fill it out online. To get to the form, go to <www.tceq.state.tx.us/goto/dlqor>.

At the end of this guide, in Appendix C, you will find a sample DL QOR as the operator of the PWS mentioned in Example 1 might complete it.

Other Reports

Every PWS that uses groundwater or purchased water must fill out the Ground Water/Purchased Water Monthly Operating Report, Form TCEQ-0811. You **do not** have to send this form to the TCEQ—instead, just keep it on file and show it to your TCEQ regional investigator during the comprehensive compliance investigation.

4.3. How to Make Important Calculations for a DL QOR

You should be able to complete the DL QOR using a calculator. Here, we present examples of each calculation you must make for the DL QOR. Please note that the PDF version of the DL QOR form will perform many (but not all) of the required calculations automatically.

Example 3. Calculating “Average of All Disinfectant Residuals for This Month”

As described in Example 1, the Sunshine Mobile Home Park PWS should take four samples in January 2009. Assume that their samples show these levels of residual disinfectant:

Date sample collected:	Jan. 5	Jan. 12	Jan. 19	Jan. 26
Residual disinfectant level:	5.0 mg/L	1.9 mg/L	0.1 mg/L	1.0 mg/L

What is the average of all disinfectant residuals for January?

Answer: Calculating the average value takes these three steps:

1. Add up the disinfectant residuals:
 $5.0 \text{ mg/L} + 1.9 \text{ mg/L} + 0.1 \text{ mg/L} + 1.0 \text{ mg/L} = 8.0 \text{ mg/L}$
2. Count the total number of samples collected in the month—in this case, 4.
3. Divide the sum of the measured residuals (from Step 1) by the number of samples collected (from Step 2):
$$\frac{8.0 \text{ mg/L (total)}}{4 \text{ samples}} = 2.0 \text{ mg/L (average)}$$

So, the operator should write “4” under the number of readings and “2.0 mg/L” under “Average of all disinfectant residuals for this month” in the January portion of the DL QOR for the first quarter of 2009.

Example 4. Calculating “% below MIN for This Month” (Weekly Sampling)

If you are using the PDF version of the form, this calculation is completed automatically.

Sunshine MHP uses free chlorine in their distribution system.

Their results for January were 5.0 mg/L, 1.9 mg/L, 0.1 mg/L, and 1.0 mg/L.

What is the percentage of samples below the minimum residual?

Answer: As in Example 3, we can perform this calculation in three steps:

1. Count the samples that were below the minimum residual this month:
Because Sunshine MHP uses free chlorine, the minimum residual for them is 0.2 mg/L. Only one sample—the one with a reading of 0.1 mg/L—was below this value, so for Sunshine MHP in January the count is 1.
2. Count the total number of samples taken this month—in this case, 4.
3. Now, divide the number of samples below the minimum by the total number of samples taken, and multiply by 100 percent.

$$\left[\frac{1 \text{ (sample below minimum this month)}}{4 \text{ (samples collected this month)}} \right] \times 100\% = 25\%$$

On the DL QOR, Sunshine MHP's operator should enter "1" for the "Number of Samples Below MIN." Then, they should write "25%" under "% below MIN for This Month" for January, or the new automated DL QOR will perform this calculation automatically.

Example 5. Calculating "% below MIN for This Month" (Daily Sampling)

If you are using the PDF version of the form, this calculation is completed automatically.

Chinquapin Oaks PWS serves a population of 21,501, uses only groundwater sources, and disinfects with chloramines. According to Table 3, they must take 25 coliform samples a month and daily disinfectant residual samples. To meet these requirements, their operator set up the following sampling schedule:

Jan 2009 Sampling Dates

				1 Thu 2x(C+DR)	2 Fri DR	3 Sat DR
4 Sun DR	5 Mon 2x(C+DR)	6 Tue C+DR	7 Wed C+DR	8 Thu 2x(C+DR)	9 Fri DR	10 Sat DR
11 Sun DR	12 Mon 2x(C+DR)	13 Tue C+DR	14 Wed C+DR	15 Thu 2x(C+DR)	16 Fri DR	17 Sat DR
18 Sun DR	19 Mon 2x(C+DR)	20 Tue C+DR	21 Wed C+DR	22 Thu 2x(C+DR)	23 Fri DR	24 Sat DR
25 Sun DR	26 Mon 2x(C+DR)	27 Tue C+DR	28 Wed C+DR	29 Thu C+DR	30 Fri DR	31 Sat DR

Key: C = coliform, DR = disinfectant residual, 2x = sample two locations

Assume that four of these samples show less than the minimum residual required under the rule.

What should be written under “% below MIN for This Month” on the DL QOR?

Answer: Under this sampling schedule, Chiquapin Oaks PWS would collect 39 disinfectant residual samples in January 2009—25 that were taken with coliform samples and 14 that were tested for chloramine residual only. If only 4 of these samples were below the minimum residual, then, following the steps from Example 4, the percentage below the minimum residual is:

$$\frac{4 \text{ readings}}{39 \text{ readings}} = 10.3\%$$

On the DL QOR, the Chiquapin Oaks PWS operator should write “10.3%” under “% below MIN for This Month” for January.

Example 6. Calculating “Average of All Disinfectant Residuals for This Quarter”

If you are using the PDF version of the form, this calculation is completed automatically.

In the first quarter of 2009, Sunshine MHP will report these average residual disinfectant levels:

For the month of:	January	February	March
The average residual was:	2.0 mg/L	6.0 mg/L	4.0 mg/L

What is the quarterly average?

Answer: This is another three-step calculation.

1. Add up the monthly averages:
 $2.0 \text{ mg/L} + 6.0 \text{ mg/L} + 4.0 \text{ mg/L} = 12.0 \text{ mg/L}$
2. Count the months—in each quarter, there are 3.
3. Divide the total of the monthly averages (from Step 1) by the number of months (from Step 2):

$$\frac{12.0 \text{ mg/L}}{3 \text{ months}} = 4.0 \text{ mg/L average}$$

So Sunshine MHP’s PWS operator would write “4.0 mg/L” under “Average of all disinfectant residuals for this quarter” on the DL QOR for the first quarter.

5. Compliance

[30 TAC §290.110(f)]

Compliance with the Minimum Levels of Disinfectant Residuals

If a PWS has more than 5 percent of samples collected that measure less than the minimum residual disinfectant concentration each month (“% below MIN” on the DL QOR) for any two consecutive months, it commits a “nonacute treatment technique violation.” Nonacute violations require public notice to customers (see “Public Notification”).

Example 7. Compliance with Minimum Levels of Disinfectant Residuals

Assume that February 2009 turns out to be much better than January for the Chinquapin Oaks PWS—out of 37 samples taken, only 2 are below the minimum residual level.

Do they need to notify their customers?

Answer: First, note that January’s entry for “% below MIN for This Month” was 10.3 percent (Example 5). Then, calculate the value for February (see Example 4 if you need help with this calculation).

So, for the second month in a row, Chinquapin Oaks PWS will have had less than the minimum residual disinfectant concentration in more than 5 percent of their samples. This is a “nonacute treatment technique violation.” The PWS must notify its customers as described in the following section, “Public Notification.”

Compliance with the MRDL

For a PWS to comply with the maximum residual disinfectant levels, the running annual average of all distribution system samples must be less than 4.0 mg/L. (A “running” annual average is calculated at the end of each month, going back a year from that point. For example, at the end of April 2009, the running annual average would include the data for the twelve-month period from May 2008 to April 2009.) Failure to comply will result in a nonacute violation, requiring public notification of customers as described in the following section, “Public Notification.”

Compliance with Monitoring and Reporting Requirements

Failure to monitor or failure to send in reports in accordance with 30 TAC §290.110(f) may result in a nonacute monitoring or reporting violation, requiring public notification of customers.

6. Public Notification

Public Notice for Minimum Disinfectant Residual Violation

A PWS that fails to maintain an adequate level of disinfectant residual in the water served to customers for two consecutive months must notify their customers within 30 days of the end of the second consecutive month [30 TAC §290.122(b)(1), (2)].

Under the mandate of the rule, the public notice must include the following language:

Minimum Residual Treatment Technique Violation

The Texas Commission on Environmental Quality sets drinking water standards and has determined that the presence of microbiological contaminants is a health concern at certain levels of exposure. If water is inadequately treated, microbiological contaminants in that water may cause disease. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and any associated headaches and fatigue. These symptoms, however, are not always associated with disease-causing organisms in drinking water, but may also be caused by a number of factors other than your drinking water.

The TCEQ has set enforceable requirements for treating drinking water to reduce the risk of these adverse health effects. Treatment such as filtering and disinfecting removes or destroys microbiological contaminants. Drinking water that is treated to meet the TCEQ requirements is associated with little to none of this risk and should be considered safe.

The **<INSERT THE NAME OF YOUR PUBLIC WATER SYSTEM HERE>** failed to meet the minimum treatment techniques for the month of **<INSERT THE MONTHS AND YEAR THAT THE VIOLATION OCCURRED>**. Specifically, our water system failed to maintain an acceptable disinfectant residual throughout the distribution system for two consecutive months.

OPTIONAL PARAGRAPHS

If you wish, you may add wording to describe specific steps that you have taken to correct the violation. Do not add any statements that would frustrate the intent of the original notice.

How to Issue a Public Notice

The specific method a PWS uses to issue a notice of violation depends on how word best gets to the community it serves [30 TAC §290.122(b)(2)]:

- If a local daily or weekly newspaper serves the community, the PWS can have the notice printed in the “Notices” section of that newspaper. (Newspapers usually charge a fee for printing these notices.)
- If there is no local newspaper, the PWS can:
 - mail the notice to each customer, or
 - have the notice hand-delivered to each customer, or
 - post the notice beside community mailboxes or in other places where residents would see it, if the community has such places.

Appendix A. Abbreviations & Acronyms

CCI	Comprehensive Compliance Investigation (sanitary survey)
DL QOR	Disinfectant Level Quarterly Operating Report
DPD	N,N-diethyl-p-phenylenediamine
EPA	U.S. Environmental Protection Agency
GUI	groundwater under the direct influence of surface water
GW	groundwater
GWPW MOR	Ground Water/Purchased Water Monthly Operating Report
mg/L	milligrams per liter
MHP	mobile home park
MIN	minimum
MRDL	maximum residual disinfectant level
PW	purchased water
PWS	public water system
PWS ID	public water system identification number
RAA	running annual average
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TNC	transient noncommunity
WUD	Water Utilities Database
§	section

Appendix B. Worksheets for Recording Disinfectant Residuals

There is a broad range in the number of sample results that different PWSs will need to track. In this appendix, we are providing several worksheets to help you keep track of disinfectant residual results for your PWS. These worksheets are designed to assist you; you **do not** need to send them in to us. If you want to develop your own method to keep track, that is fine also.

Worksheet 1. Calculating Residual Disinfectant Levels for Groundwater or Purchased Water PWSs with Fewer than 750 Customers.

If your PWS serves 750 or fewer customers, this worksheet will help you keep track of all the disinfectant data you need to collect each month. There is space to write the disinfectant residual from your single coliform sample, plus repeats (if necessary). There is also space to write the disinfectant residual from each of your weekly distribution system disinfectant residual samples.

Worksheet 2. Calculating Residual Disinfectant Levels for Groundwater or Purchased Water PWSs with 751 to 1,000 Customers.

If your PWS serves from 751 up to 1,000 customers, this worksheet will help you keep track of all the disinfectant data you need to collect each month. There is space to write the disinfectant residual from your single coliform sample, plus repeats (if necessary). There is also space to write the disinfectant residual from each of your daily distribution system disinfectant residual samples.

Worksheet 3. Calculating Daily Disinfectant Residuals for the MRDL Calculation, for Any PWS Collecting Daily Disinfectant Residuals.

If your PWS serves more than 750 customers, you can use this worksheet to keep track of the disinfectant data from your daily distribution system disinfectant residual samples. You will need to use another piece of paper (or Worksheet 4) to keep track of the results for disinfectant residuals that are collected at the same time as your coliform samples.

Worksheet 4. Calculating the Disinfectant Residuals Collected with Coliform Samples for Any PWS Collecting More than One Coliform Sample.

If your PWS serves more than 1,000 customers, you need to collect more than one coliform sample a month. PWSs that serve up to 33,000 customers can use this worksheet to keep track of the disinfectant residuals that are collected at the same time as your coliform samples. You will need to use another piece of paper (or Worksheet 3) to keep track of the results for the disinfectant data from your daily distribution system disinfectant residual samples.

WORKSHEET 1

**Calculating Residual Disinfectant Levels
for Groundwater or Purchased-Water PWSs
with Fewer than 750 Customers**

If you wish, use this worksheet to keep track of the residual disinfectant that you collect with your coliform samples.
Do **NOT** send this worksheet to us. You should send your results to us on the DL QOR form.

PWS Name:	PWS ID:
MONTH:	YEAR:

Disinfectant in Distribution System: **Free chlorine** (MIN = 0.2 mg/L) **Chloramine** (MIN = 0.5 mg/L)

Disinfectant Residual Collected with Coliform Sample(s)

#	Sample Date	Sample Site	Disinfectant Residual	Less than MIN? Y/N	NO residual? Y/N
1					
2					
3					
4					
5					

Groundwater and purchased water systems that serve up to 1,000 people must collect **one** coliform sample a month. The disinfectant should be measured at the same time. If you have a coliform-found sample, you must collect **four** repeat samples immediately. Then, the month after the coliform-found, you must collect follow-up routine samples. That is why this worksheet provides room to keep track of more than one sample. If you have multiple positive results, you will need another piece of paper.

Disinfectant Residual Collected in Distribution System

#	Sample Date	Sample Site	Disinfectant Residual	Less than MIN? Y/N	NO residual? Y/N
1					
2					
3					
4					
5					

Groundwater and purchased water systems that serve up to 750 people must collect **weekly** distribution system disinfectant residual samples. This worksheet provides room to keep track of one sample a week for five weeks. If you collect more samples than that, you will need another piece of paper.

Monthly Summary

Number of Samples	Highest Reading	Lowest Reading	Average	# Below MIN	# with NO residual
(1)	(2)	(3)	(4)	(5)	(6)

These are the numbers that you will need to report on the GW PW Monthly Operating Report form.

- (1) Add up all the disinfectant results from samples collected with coliform samples, plus weekly distribution system samples. Write that number here.
- (2) Write in the highest residual from all your samples.
- (3) Write in the lowest residual from all samples.
- (4) Add up the residual from all samples and divide by the number of samples. Write that number here.
- (5) Write in the number of samples that had less than 0.2 mg/L (if you use free chlorine) or less than 0.5 mg/L (if you use chloramines).
- (6) Write in the number of samples that had no disinfectant at all.

WORKSHEET 2

**Calculating Residual Disinfectant Levels
for Groundwater or Purchased Water PWSs
with 751 to 1,000 Customers**

This worksheet is provided to help systems keep track of the residual disinfectant that you collect with your coliform samples. Do **NOT** send this worksheet to us. You should send your results to us on the DL QOR form.

PWS Name:	PWS ID:
MONTH:	YEAR:

Disinfectant in Distribution System: **Free chlorine** (MIN = 0.2 mg/L) **Chloramine** (MIN = 0.5 mg/L)

Disinfectant Residual Collected with Coliform Sample(s)

#	Sample Date	Sample Site	Disinfectant Residual	Less than MIN? Y/N
1				
2				
3				
4				
5				

Groundwater and purchased water systems that serve up to 1,000 people must collect **one** coliform sample a month. The disinfectant should be measured at the same time. If you have a coliform-found sample, you must collect **four** repeat samples immediately. Then, the month after the coliform-found, you must collect follow-up routine samples. That is why this worksheet provides room to keep track of more than one sample. If you have multiple positive results, use another piece of paper.

Disinfectant Residual Collected Daily

Sample Date	Sample Site	Residual	Less than MIN? Y/N	Sample Date	Sample Site	Residual	Less than MIN? Y/N
1				17			
2				18			
3				19			
4				20			
5				21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			
16							

Groundwater and purchased water systems that serve 750 or more people must collect **one** disinfectant residual sample **daily**. The worksheet provides room to keep track of 31 days. If you collect more than 31 samples in a month you will need another piece of paper.

Monthly Summary

Number of Samples	Highest Reading	Lowest Reading	Average	# Below MIN	# with NO residual
(1)	(2)	(3)	(4)	(5)	(6)

These are the numbers that you will need to report on the GW PW Monthly Operating Report form (TCEQ-0811).

- (1) Add up all the disinfectant results from samples collected with coliform samples, plus weekly distribution system samples. Write that number here.
- (2) Write in the highest residual from all your samples.
- (3) Write in the lowest residual from all samples.
- (4) Add up the residual from all samples and divide by the number of samples. Write that number here.
- (5) Write in the number of samples that had less than 0.2 mg/L for free chlorine, or less than 0.5 mg/L for chloramines.
- (6) Write in the number of samples that had no disinfectant at all.

WORKSHEET 3

**Calculating Daily Disinfectant Residuals
for the MRDL Calculation
for Any PWS
Collecting Daily Disinfectant Residuals**

This worksheet is provided to help systems keep track of the residual disinfectant that you collect with your coliform samples. Do **NOT** send this worksheet to us. You should send your results to us on the DL QOR form.

PWS Name:	PWS ID:
MONTH:	YEAR:

Disinfectant in Distribution System: **Free chlorine** (MIN = 0.2 mg/L) **Chloramine** (MIN = 0.5 mg/L)

Disinfectant Residual Collected Daily

Sample Number	Sample Date	Sample Site	Residual	Less than MIN? Y/N	NO residual? Y/N
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
	Tot:		Sum:	# < MIN:	#=0:

The worksheet provides room to keep track of 31 days. If you collect more than 31 samples in a month, you will need another piece of paper.

WORKSHEET 4

**Calculating the Disinfectant Residuals
Collected with Coliform Samples
for Any PWS**

Collecting More than One Coliform Sample

This worksheet is provided to help systems keep track of the residual disinfectant that you collect with your coliform samples. Do **NOT** send this worksheet to us. You should send your results to us on the DL QOR form.

PWS Name:	PWS ID:
MONTH:	YEAR:

Disinfectant in Distribution System: **Free chlorine** (MIN = 0.2 mg/L) **Chloramine** (MIN = 0.5 mg/L)

Disinfectant Residual Collected With Coliform Samples

Sample Number	Sample Date	Sample Site	Residual	Less than MIN? Y/N	NO residual? Y/N
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
Tot:			Sum:	# < MIN:	#=0:

Systems with 33,000 customers must collect 30 coliform samples every month. If your system collects more than this, you will need another sheet of paper.

Appendix C. The DL QOR Form

All PWSs that use groundwater or purchased water must keep track of the levels of disinfectant residuals in the distribution system, and report them on the Disinfectant Level Quarterly Operating Report (DL QOR). There is one exception: Transient noncommunity PWSs must monitor and record the sample results, but are not required to use the DL QOR form.

This appendix contains:

1. Instructions for completing the DL QOR.
2. A blank copy of the DL QOR form.
3. A sample DL QOR as the operator of Example 1 might complete it.

How to Complete the DL QOR (TCEQ-20067)

These instructions will help you complete the Disinfectant Level Quarterly Operating Report (DL QOR; form TCEQ-20067). To find out whether your public water system (PWS) must complete and submit this form, see *Disinfectant Residual Reporting for Public Water Systems* (TCEQ publication RG-407). If you fill out the form by hand, be sure to use blue or black ink and print clearly. We recommend that you use the Adobe PDF file available on the web that does all of the calculations automatically and can submit data directly to the TCEQ via e-mail.

The DL QOR begins with blanks for basic information about your PWS.

Quarter. Write quarter or select, using the drop-down list.

Year. Write year, or select, using the drop-down list.

PWS Name. Enter the name of your PWS.

PWS ID. Your PWS has a seven-digit PWS identification number issued by the TCEQ. Enter that number here.

Type of Disinfectant Used in Distribution System.

Write the type of disinfectant that is used in your distribution system, or select, using the drop-down list.

The DL QOR form gives you separate, labeled sections to report the data for each month of the quarter.

Monthly Summaries—top

The top of each section has boxes for indicating the month and whether your PWS was active that month.

Month. Each month will be filled in automatically if you are using the PDF form. If not, write in each month. The months in each quarter are as follows.

Quarter:	Months:
1st	January, February, March
2nd	April, May, June
3rd	July, August, September
4th	October, November, December

Was the PWS active this month? If you sent any water to the distribution system this month, your PWS was active.

- If so, check “Yes.”
- If not, check “No”—and attach a copy of your GWPW MOR (TCEQ-0811) for the month to document that you produced no water during this month. *This is one of the few reasons you would have to send us a copy of a GWPW MOR. Be sure to keep the original on file.*

Monthly Summaries—chart

In the chart of each Monthly Summary, you report information about your disinfection process. To complete this part of the DL QOR, you will need to review your daily operating records for that quarter. This information is no longer recorded on your PWS’s Ground Water/Purchased Water Monthly Operating Report (GWPW MOR; form TCEQ-0811) for each month.

Average of all disinfectant residuals for this month.

Enter the average of all the samples you took this month. To calculate the average:

1. Add up the results for every sample.
2. Count the number of samples.
3. Divide the total from Step 1 by the count from Step 2.

Number of residuals collected this month: Put in the number of residual measurement samples taken this month (same number as in Step 2 above).

Number and Percent (%) below MIN for this month. “MIN” is the required minimum residual concentration of disinfectant:

- For *free chlorine*, MIN is 0.2 mg/L.
- For *chloramine*, MIN is 0.5 mg/L. (Chloramine is also called “total chlorine” or “combined chlorine.”)

Write in the number of samples that had a residual below the minimum. Then calculate and enter the percentage of samples that were below the minimum, or use the PDF version of the form for automatic calculations.

Number and Percent (%) with NO residual for this month. Write in the number of samples that had no residual. Then calculate and enter the percentage of samples that had no residual, or use the PDF version of the form for automatic calculations.

“No disinfectant” means that the measured concentration of residual disinfectant was 0.0 mg/L or “not detected.”

Quarterly Summary and Certification

Average of all disinfectant residuals for this quarter.

To calculate this quarterly average:

1. Multiply each of the three monthly averages by the number of samples from that month.
2. Add those values together.
3. Divide by the total number of samples taken in the quarter

Lowest residual for this quarter. Look at all of the results you had during the quarter. Enter the *lowest* measurement that you took during the quarter. (If you ever had no residual in this quarter, enter “0.0 mg/L” here.)

Highest residual for this quarter. Look at all of the results you had during the quarter. Enter the *highest* measurement that you took during the quarter.

Operator’s Signature. Your PWS’s main operator or a PWS responsible party should sign the DL QOR in dark blue or black ink. This signature is required.

Date. The person who signs the form should enter the date as the form is signed. *Use dark blue or black ink.*

Print Name. Type or print the name of the person signing the form.

Title. Type or print the title of the person signing the form. If a certified operator signs the form, also list his or her certificate number and the type of license—for example, *Chief Operator, 123-45-6789 C GW.*

When You Are Done

Mail the completed and signed DL QOR to the address shown at the bottom of the form. The automatic Adobe PDF form allows you to submit your data electronically instead. If you do so, you can save a copy of the automatic return e-mail to show your good-faith effort to submit the DL QOR on time.

Hold On to Your GWPW MORs!

Remember, you *don’t mail us your GWPW MORs except for inactive months.* Keep them on file at your facility. Our regional investigator will review them as part of a comprehensive compliance investigation (CCI, or “sanitary survey”).



DISINFECTANT LEVEL QUARTERLY OPERATING REPORT (DLQOR) FOR GROUNDWATER OR PURCHASED-WATER PUBLIC WATER SYSTEMS-ANY SIZE

Select Quarter:

Select Year:

PWS Name: Town of Schulzestown	PWS ID: 1234567
---------------------------------------	------------------------

Type of Disinfectant Used in Distribution System*:

* If you used chloramines and free chlorine at any time during this quarter, select both.

First Month of Quarter: Monthly Summary

Month: January

Was the PWS active this month? YES NO

Average of all disinfectant residuals for this month	Number of residuals collected this month	Number below MIN for this month	Number with NO residual for this month
1.20 mg/L	53 readings	1 readings 1.9 %	0 readings 0.0 %

Second Month of Quarter: Monthly Summary

Month: February

Was the PWS active this month? YES NO

Average of all disinfectant residuals for this month	Number of residuals collected this month	Number below MIN for this month	Number with NO residual for this month
1.40 mg/L	47 readings	0 readings 0.0 %	0 readings 0.0 %

Third Month of Quarter: Monthly Summary

Month: March

Was the PWS active this month? YES NO

Average of all disinfectant residuals for this month	Number of residuals collected this month	Number below MIN for this month	Number with NO residual for this month
1.10 mg/L	52 readings	1 readings 1.9 %	0 readings 0.0 %

Quarterly Summary and Certification

Average of all disinfectant residuals for this quarter	Lowest residual for this quarter	Highest residual for this quarter
1.23 mg/L	0.10 mg/L	2.50 mg/L

I certify that I am familiar with the information contained in this report and that, to the best of my knowledge, the information is true, complete, and accurate.

Name: **John Q. Operator**
Enter Name

John Q. Operator
Signature

Today's Date:

Title: **Chief Operator**

Phone Number: **(123) 456-7891**

License #: **123456**

Email address: **john.operator@schulzestown.org**

Complete this form for the previous quarter at the beginning of April, July, October, and January; and submit in time for it to be received by the TCEQ by the 10th of the month. Always print and sign form, and keep a copy with your records for TCEQ review.

Step 1:

And

(Submits form data by Email)

(For your own records)

Step 2:

Sign and Mail to:

TCEQ / PDW MC-155
Attn: DLQOR
PO Box 13087
Austin, TX 78711-3087

Click the button below to start over or to reset to enter data for a different system.