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Environmental Assistance Division
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Managing Small Public Water Systems: Part C, Operation and Maintenance

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Introduction

This publication is Part C of a five-part series, Managing Small Public Water Systems (TCEQ publication series RG-501). Part C will help you:

- Create an operation and maintenance (O&M) manual for your public water system (PWS).
- Prepare a schedule to perform preventive and general maintenance.
- Maintain records to demonstrate compliance with all requirements.
- Address specific PWS requirements.

Part C also contains worksheets and tracking charts to help you develop your O&M manual and maintenance schedule.

As you work though Part C, you may find it beneficial to review other parts of the series to help you prepare a comprehensive O&M program. An electronic version of the series is available at the TCEQ Small Business and Local Government Assistance Section's Public Water Supply Compliance Resources webpage at <www.tceq.texas.gov/goto/help4pws>. If you do not have Internet access, call the SBLGA's hotline at 800-447-2827 to request a paper copy of the complete series *Managing Small Public Water Systems* (TCEQ publication RG-501).

Note: This publication is not a substitute for the actual rules. To obtain the most current, official copy of state rules, contact the Secretary of State's office at 512-305-9623. The rules are also available online at <www.tceq.texas.gov/goto/TAC30>.

Implementing an Operation and Maintenance Program

This document (Part C) is designed to help you—the manager or operator of a small public water system (PWS)—put together an operation and maintenance (O&M) manual to keep the system's infrastructure and equipment (assets) in good working condition, extend their useful life, and avoid some of the common O&M violations. Included are many of the forms required by the TCEQ to maintain compliance.

In RG-501a, Asset Management (Part A), you developed an asset management plan for your PWS. You will find Part A very useful when developing your Operation and

Maintenance Program as it contains important information about your assets (equipment) including its age and condition.

Benefits of an O&M Program

The safety of your PWS may be threatened without an effective O&M manual and maintenance schedule (collectively known as an O&M program).

A comprehensive O&M program can help you:

- Save you money by reducing the frequency that expensive assets need to be replaced.
- Estimate expenses for future repairs and replacement of PWS assets.
- Maintain compliance with state and federal environmental rules.

Common O&M Violations

Frequent O&M violations of the TCEQ's rules for PWSs include failure to:

- Inspect the system's pressure tanks, ground storage tanks, and elevated storage tanks annually [30 TAC 290.46(m)(1)].
- Maintain an accurate and up-to-date map of the distribution system, including valves, hydrants, and mains [30 TAC 290.46(n)(2)].
- Inspect pressure tanks to ensure that they are watertight, that pressure-release valves and pressure gauges are working properly, and that the air-to-water ratio is maintained at the proper level [30 TAC 290.46(m)(1)(B)].
- Inspect the interior of all pressure tanks with inspection ports at least every five years [30 TAC 290.46(m)(1)(B)].
- Flush all dead-end mains each month. Dead-end lines and other mains need to be flushed if there are water-quality complaints or if the disinfectant residuals fall below acceptable levels [30 TAC 290.46(l)].
- Post a sign with the name of the water supply and an emergency telephone number of a responsible system official at each of the production, treatment, and storage facilities. The sign must be legible and in plain sight of the public [30 TAC 290.46(t)].

Your O&M Manual

A comprehensive O&M manual will help you keep track of your inspections, equipment, operations, staff, and the maintenance you've done—or need to do—on your system. The following pages form a basic template for an O&M manual. Please remember to update and revise your manual when changes are made at your PWS.

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Public Water Supply
Operation and Maintenance Manual

Record your PWS customer information in the table on this page, which will be the title page of your O&M manual.

Table 1

PWS Data	Your PWS Information
PWS Name	
PWS ID Number	
TCEQ Regulated Entity No. (RN)	
TCEQ Customer Reference No. (CN)	
Date	

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1. Facility Description

Describe your PWS. Include the following information in your description (attached additional pages as needed):

- Water source (aquifer, surface water body, or source of purchased water).
- Emergency interconnections or backup water sources.
- Number of connections (or population).
- Capacity and locations of all pressure tanks, ground storage tanks, and elevated storage tanks.
- Well information, identify each well with the:
  - PWS well name.
  - TCEQ well identification number (PWS ID number followed by a letter).
  - Well depths.
  - A copy of each well driller's log.
  - Location of each well.
  - Date well was drilled.
  - Well pump capacity.
- Distribution map: size of mains, type of pipe (if known), valves, hydrants, location of sampling sites, etc.

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Maps and Supporting Documents

Insert the distribution map, driller's logs, and other supporting documents here.

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2. Start-up and Operating Procedures

Describe your daily, weekly, and monthly operating procedures such as testing water, checking chemical feeds, and washing filters. Describe start-up activities such as the sequence of turning on pumps and equipment. Include a diagram or map of the plant showing details for each piece of equipment.

Daily Procedures

Weekly Procedures

Monthly Procedures

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Plant Map

Insert a map of the plant with all equipment identified here. Include equipment manufacturers, suppliers, and any warranty information.

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3. Routine Maintenance

Describe the routine maintenance performed on all equipment, such as wells, flow meters, pumps, pressure tanks, vehicles, and storage tanks. Indicate when the maintenance takes place, i.e. daily, weekly, monthly, quarterly, etc.

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Housekeeping Schedules

Insert your housekeeping schedules here.

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4. Records and Reporting

Describe daily, weekly, monthly, and annual recordkeeping and reporting requirements. These requirements should include keeping records of:

- Construction and repairs of the water system facilities (including distribution lines).
- Responses to emergencies (such as water outages, major leaks, natural disasters, etc.).
- Certifications and permits, if any, associated with the water plant (such as operator licenses, maps, utility easements, etc.).

Note: A complete table for monitoring, reporting, and record keeping is available in the Compliance module of this series (RG-501d).

Track the disinfectant residual, disinfectant usage, and water production using the charts at the end of this module.

Daily Records or Reports

Weekly Records or Reports

Monthly Records or Reports

Annual Records or Reports

5. Tracking Charts

Tracking Chart 1. Disinfectant Residual

Instructions

Use this chart to document the disinfectant residual at representative locations in the distribution system weekly. Make copies if additional pages are needed. If you have several locations to sample each week, use a separate table for each location, and identify the specific location on each tracking chart used. Transfer your readings to a Disinfectant Level Quarterly Operating Report (DLQOR) form every quarter.

Table 2

Data	Your Information
PWS No.:	
Year:	
Sample Location:	
Reagent Name (for example, DPD colorimetric reagent):	
Date Sampling Kit Purchased:	

Table 3

Week of Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

Notes

Tracking Chart 2. Disinfectant Usage

Instructions

Use this chart to record the amount of chemical disinfectant added to the water each week. Make copies if additional pages are needed.

Table 4 - Quantity of disinfectant added (gallons, cups, or ounces) per week

Week of Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

Notes

Tracking Chart 3. Water Production

Instructions

Use this chart to record the number of gallons of water treated each week. Make copies if additional pages are needed.

Table 5 - Quantity of water treated (gallons) per week

Week of Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1												
2												
3												
4												
5												

Notes

6. Monitoring Plan (Sampling and Analysis)

Insert your monitoring plan here.

Note: All public water systems are required to maintain an up-to-date chemical and microbiological monitoring plan [30 TAC 290.121].

Make sure that your PWS monitoring plan identifies all the sampling locations, describes the sampling frequency, and specifies the analytical procedures and laboratories that the PWS will use [30 TAC 290.121(b)].

For guidance on developing your monitoring plan, (1) refer to "Sampling Requirements" in Part D of this series, Compliance (RG-501d) (2) go to our Public Water System Monitoring Plans webpage at <www.tceq.texas.gov/drinkingwater/monitoring_plans/monitoring_plans.html>.

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7. Staffing and Training

List the members of your staff (both full and part-time personnel), with their job titles, duties, licenses and certifications and training requirements. *Note*: Information on operator licensing is available in the Resources portion of this series (RG-501e).

Table 6: Staff and Training

Staff	Status (full- or part-time)	Job title	Job Duties	Licenses & Certifications	Training Requirements

Staff	Status (full- or part-time)	Job title	Job Duties	Licenses & Certifications	Training Requirements

8. Licensed Operators List

Your O&M manual should include a list of all operators and operating companies that your PWS uses. You may use Table 6 to record this information.

Note: Every year you must submit a list of all operators and operating companies that your PWS uses to the TCEQ [30 TAC Section 290.46(p)(2)]. The TCEQ's Public Drinking Water Section has developed an online Operator Notice Form that you can use to submit your annual list; the form is available at <www.tceq.texas.gov/assets/public/permitting/watersupply/pdw/tcr/Operator%20Notice%20Form.pdf>. You can also print this form, complete it by hand, and submit it as indicated on the form by mail, e-mail or facsimile.

Table 6

Name of Operator or Operating Company (or both if appropriate)	Operator Contact Information	Operator Work Status (full, part-time or volunteer)	Operator License Number	Operator License Class	Operator License Expiration	Operating Company Registration Number (if applicable)

Name of Operator or Operating Company (or both if appropriate)	Operator Contact Information	Operator Work Status (full, part-time or volunteer)	Operator License Number	Operator License Class	Operator License Expiration	Operating Company Registration Number (if applicable)

Guidance on Specific PWS Requirements

Additional requirements that you may need to address at your PWS are discussed in this section. You must determine the applicability of each of these requirements for your PWS.

Revised Total Coliform Rule (RTCR)

The federal RTCR protects public health by reducing potential pathways for fecal contamination into public drinking water distribution systems. All PWSs must comply with the RTCR requirements that became effective on April 1, 2016.

The RTCR establishes a maximum contaminant level for *Escherichia coli (E.coli*) and uses *E.coli* and total coliforms to initiate a "find and fix" approach to prevent fecal contamination from entering the distribution system. This rule also requires PWSs to identify sanitary defects and correct them.

The TCEQ's Federal Revised Total Coliform Rule webpage at <www.tceq.texas.gov/drinkingwater/microbial/revised-total-coliform-rule> provides resources and information about how to comply with the RTCR requirements, including:

- Forms and instructions.
- Sample siting plan template.
- Sample siting plan map example.
- Start-up procedures for seasonal PWSs.
- Getting help through our Financial, Managerial, and Technical (FMT) Assistance Program.

Lead and Copper Rule (LCR)

The federal LCR protects public health by minimizing lead and copper levels in drinking water, primarily by reducing corrosivity. **All community water systems and non-transient non-community water systems are subject to the LCR requirements.**

The TCEQ's Drinking Water Lead and Copper Program webpage at <www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html> provides resources and information about how to comply with the LCR, including:

- Guidance on rules.
- Forms and instructions.

- Laboratory information.
- Sampling instructions and guidance.

Disinfectant Level Quarterly Operating Report (DLQOR)

All community and nontransient, noncommunity PWSs that **use only purchased water or groundwater** must monitor the level of disinfectant in the distribution system and use the DLQOR form to report this information to the TCEQ quarterly.

DLQORs may only be submitted by mail or electronically using the TCEQ's Electronic Environmental Reporting System (E2).

The TCEQ's Residual Disinfectant Reporting for Public Water Systems webpage at <www.tceq.texas.gov/drinkingwater/disinfection/dl_qor/index.html> provides resources and information how to comply with DLQOR, including:

- Forms and worksheets.
- Guidance documents.
- Instructions on how to use E2.

Surface Water Monthly Operating Report (SWMOR)

If your PWS treats **surface water or groundwater under the direct influence of surface water**, you must submit SWMORs.

The TCEQ's SWMORs webpage at <www.tceq.texas.gov/drinkingwater/swmor/swmor/swmor-forms-and-instructions> provides forms, instructions, and guidance for SWMORs.

Blending Chloraminated and Chlorinated Waters

If you plan to blend chloraminated and chlorinated water or use both free chlorine and chloramines as disinfectants in the distribution system, you are required to request an exception. ***Your exception request must be granted before you begin blending.***

The PWS's owner, representative, or professional engineer must submit the exception request to the TCEQ in writing. Your request must provide the applicable information described under the Treatment Options heading of this guidance for the specific treatment option (Option 1 or 2) that your PWS uses.

The TCEQ's Requesting an Exception to Rules and Regulations for Public Water Systems webpage at <www.tceq.texas.gov/drinkingwater/trot/exception> provides

additional guidance on the exception request process. Submit your exception request to:

Technical Review and Oversight Team (MC 159)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711- 3087

For more information about preparing an exception request for blending chloraminated and chlorinated waters, see the TCEQ's:

- Requesting an Exception for Blending Chloraminated and Chlorinated Waters checklist at <www.tceq.texas.gov/assets/public/permitting/watersupply/pdw/Blending_Chloramines_Checklist.pdf>.
- Staff guidance on Blending Chlorine and Chloramines at <www.tceq.texas.gov/assets/public/permitting/watersupply/pdw/Blending_Chlorine_and_Chloramines_SG.pdf>.

Blending Treatment Options

Option 1: Chloraminated and Chlorinated Water in the Distribution System

For managed controlled blending: A PWS must develop a method that will ensure chlorine residuals will remain acceptable in a blended distribution system by injecting the appropriate amount of chlorine in one set of water sources to combine with free ammonia present in the chloraminated water.

For this option, your exception request should document:

- How the areas of blending were determined.
- How the areas of blending will be determined during actual operations.
- Sampling type and frequency that the PWS will perform to ensure adequate chlorine/chloramine residuals.
- Sampling type and frequency that the PWS will perform to ensure monochloramine, not di- nor tri-chloramine is being formed.
- Sampling type and frequency that the PWS will perform to ensure nitrification is not present in the blending area.

- Corrective actions to be taken if the sampling shows inadequate disinfectant residuals, taste and odor issues, bacteriological sample issues, or potential nitrification.

For physically isolated areas of the distribution with free chlorine from areas with chloramines: A PWS can eliminate blending in the distribution system by physically isolating the chlorinated and chloraminated water.

For this option, your exception request should include a drawing:

- Of the water treatment systems showing how the treatment systems will be divided.
- Identifying which area(s) will be disinfected by free chlorine and which area(s) will be disinfected by chloramines.

Option 2: Blending Chloraminated and Chlorinated Water in a Tank

Ensure chloramine formation after mixing the sources in the tank: A PWS must develop a method that will ensure that chlorine residuals will remain acceptable in treated water leaving the tank by injecting the appropriate amount of chlorine and ammonia at all times.

For this option, your exception request should document:

- That the tank is completely mixed.
- Free chlorine, total chlorine, free ammonia, and monochloramine sampling locations and frequency that the PWS will perform to know the appropriate amount of chlorine and ammonia dose.
- Calculations used to determine the dose of chlorine and ammonia to apply.
- Sample type and frequency that the PWS will perform to ensure monochloramine—not di- nor tri-chloramine—is being formed.
- Corrective actions to be taken if the sampling shows inadequate disinfectant residuals, taste and odor issues, bacteriological sample issues, or potential nitrification.

Nitrification Action Plan (NAP)

The purpose of a NAP is to ensure that chloramine disinfection is successful by preventing nitrification, responding to nitrification or both. Any water system distributing chloraminated water must maintain a written NAP as part of the system's

O&M manual. The NAP must be maintained as part of the PWS's monitoring plan (30 TAC Chapter 290.121) and it must contain:

- System-specific plan for monitoring free ammonia, monochloramine, total chlorine, nitrite, and nitrate levels.
- System-specific action levels of the above monitored chemicals where action must be taken.
- Specific corrective actions to be taken if the action levels are exceeded.

Go to the TCEQ's webpage, Controlling Nitrification in Public Water Systems with Chloramines at <www.tceq.texas.gov/drinkingwater/disinfection/nitrification.html>, for additional guidance on the rules or for resources to help you develop your NAP. The webpage includes links to:

- **NAP guidance** – one-page sheet that provides basic information about developing your NAP.
- **NAP summary** – more in-depth discussion about NAPs.
- **NAP template** – provides explanation, examples, and a template to help you develop your NAP.

Free, on-site training is available through the TCEQ's FMT program. Call the Water Supply Division at (512) 239-4691 and request the Chloramination and/or Nitrification Action Plan Directed Assistance Modules, or go to the TCEQ's Assistance for Public Drinking Water and Wastewater Systems webpage at <www.tceq.texas.gov/drinkingwater/fmt> to learn more about the FMT Assistance Program.

Water Storage Tank Inspections

TCEQ requires documentation of ***annual*** ground, elevated, and pressure storage tank maintenance inspections [30 TAC 290.46(f)(3)(D)(ii), 290.46(m)(1), and 290.46(m)(2)]. Water system personnel or a contracted inspection service provider can complete inspections.

To meet this requirement use the Potable Water Storage Tank Inspection Form in the next section of this document. A downloadable version of the form is available on the TCEQ's Public Water Supply: Compliance Resources webpage at <www.tceq.texas.gov/assistance/water/pdws>. Click the Water Tank Inspection Form link located under the "Tools" heading to access the form from our webpage.

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POTABLE WATER STORAGE TANK

Inspection Form

Section 290.46(f)(3)(D)(ii) of the Texas Commission on Environmental Quality's *Rules and Regulations for Public Water Systems* requires documentation of annual ground, elevated, and pressure storage tank maintenance inspections. [See also 290.46(m)(1) and 290.46(m)(2)]

Location:
Description:
Date & Material of Exterior Coating System:
Date & Material of Interior Coating System:

Exterior of Tank

O.K.	Problem	NA	Description
			Foundation: settling, cracks, deterioration
			Protective Coating: rust, pitting, corrosion, leaks
			Water Level Indicator: operable, cable access opening protected
			Overflow Pipe: flap valve cover accessible, operable, sealed
			Access Ladder: loose bolts or rungs
			Roof: low spots for ponding water, holes along seams, rust
			Air Vents: proper design, screened, sealed edges and seams
			Cathodic Protection Anode Plates: secured and sealed
			Roof Hatch: proper design, locked, hinge bolts secured, gasket
			Pressure Tank Operational Status: pressure release device, pressure gauge, air-water volume device

Interior of Tank

O.K.	Problem	NA	Description
			Water Quality: insects, floating debris, sediment on the bottom
			Protective Coating: rust, corrosion, scaling
Date:			***Last Inspection of Pressure Tank Interior***

Comments

Name of Inspector:
Date of Inspection: